PRELIMINARY ENGINEERING AND STORMWATER MANAGEMENT REPORT

for

LAURELPARK SUBDIVISION

Report Prepared for:

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Prepared by:

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April 2020

Reference: 16-168

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1.0 INTRODUCTION

Calder Engineering Ltd. has been retained by Laurelpark Inc. to complete a Preliminary Engineering and Stormwater Management Report for the proposed Laurelpark Subdivision in the Palgrave Estate Residential Community of the Town of Caledon. The report is supporting documentation for the respective subdivision Draft Plan application and has been prepared to meet requirements of sections 7.1.18.7 and 7.1.18.8 of the Town of Caledon Official Plan and applicable sections of the Oak Ridges Moraine Conservation Plan (Ontario Regulation 140/02).

The site location is shown in Figure 1.1. The site is bounded by Mount Pleasant Road and estate and rural residential development to the east, estate and rural residential development to the north, agricultural land to the west, and agricultural land and rural residential development to the south. The legal description of the property is Part of Lot 19, Concession 8, former Township of Albion, Town of Caledon, Regional Municipality of Peel.

The overall site comprises approximately 10.38 hectares or 25.64 acres. It is proposed to develop the site with 8 estate residential lots using a combined rural and urban road cross-section, individual private septic systems for sewage disposal, and municipal water. Drainage and storm water would be managed using an adaptive stormwater management approach and application of Low Impact Development (LID) practices. The objective of the adaptive stormwater management approach is to provide the framework and process for meeting Town of Caledon and Conservation Authority stormwater management criteria, and protection of site environmental features.

The objective of this report is to describe proposed road grades, methods for site sanitary and water servicing, plan for drainage and stormwater management, site grading, and other proposed servicing infrastructure. The information provided herein is preliminary and subject to detailed design. Detailed design of the road system, site sanitary and water services, and drainage and stormwater management infrastructure would be undertaken following Draft Plan approval.



FIGURE 1.1
STUDY AREA LOCATION

Reference: Aerial Image from Google Earth (2016)

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2.0 STUDY AREA

2.1 General

The site is bounded by Mount Pleasant Road and estate and rural residential development to the east, estate and rural residential development to the north, agricultural land to the west, and agricultural land and rural residential development to the south. The legal description of the property is Part of Lot 19, Concession 8, former Township of Albion, Town of Caledon, Regional Municipality of Peel.

The overall site comprises approximately 10.38 hectares (ha). It is proposed to develop the site with 8 estate residential lots using a combined rural and urban road cross-section, individual private septic systems for sewage disposal, and municipal water. Drainage and storm water would be managed using an adaptive stormwater management approach and application of Low Impact Development (LID) practices. The objective of the adaptive stormwater management approach is to provide the framework and process for meeting Town of Caledon and Conservation Authority stormwater management criteria, and protection of site environmental features.

Illustrated on Figure 2.1 is the proposed lot pattern and road alignment. Access to the subdivision would be from Mount Pleasant Road for the five lots on the eastern part of the site. The five lots would be located on a cul-de-sac named Tivoli Circle. The three lots on the western part of the site would be accessed from Diamondwood Drive. With respect to these lots, lots 1 and 2 would share a common driveway. The proposed Draft Plan is provided in Appendix A.

2.2 Physiography and Landform

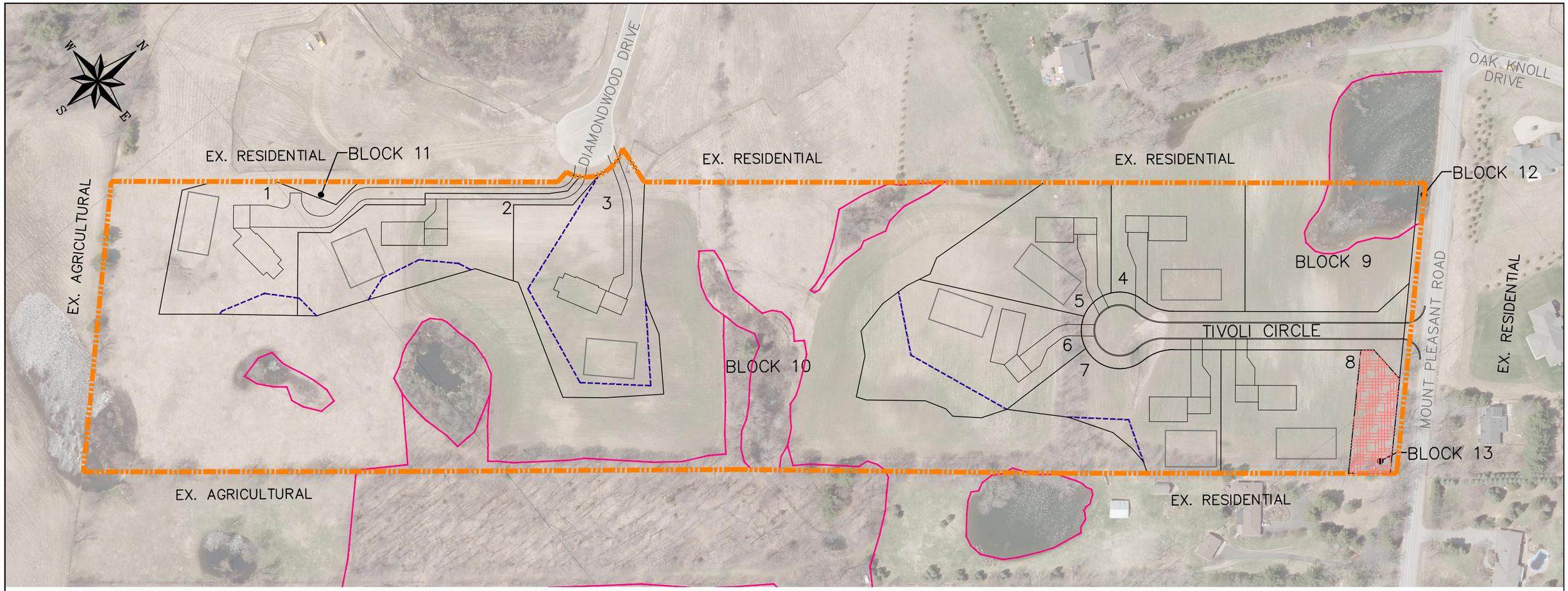
The property is located within the physiographic region referred to as the Oak Ridges Moraine (Chapman and Putnam, 1984). The Oak Ridges Moraine is a prominent physiographic feature in south-central Ontario forming a west to east trending ridge that is approximately 160 kilometres (km) long and 2 to 11 km wide. Extending from the Niagara Escarpment to the Trent Talbot River, the Oak Ridges Moraine consists of several distinct sections. The subject property is located within the Albion Hills area of the Town of Caledon. The Albion Hills typically consist of deep beds of evenly graded fine sand, however, in the vicinity of the property, the physiographic setting consists of a Till Moraine.

The key geological units found within the property are the Thorncliffe Formation, the Northern Till, the Oak Ridges Moraine sediments, and the Halton Till. The property is located on the southern flanks of Mount Wolfe, which is an inlier of the Northern Till, which extends up through the younger deposits of the Oak Ridges Moraine.

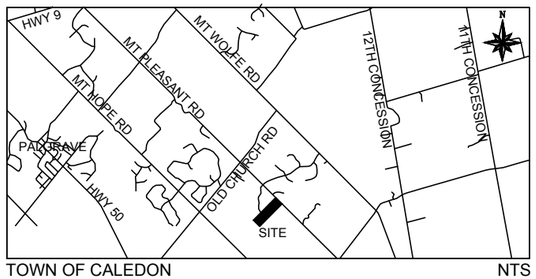
Additional information on local geology, landform, hydrology, and hydrogeology has been provided by Azimuth Environmental Consulting Inc. (2017, 2019).

2.3 Topography

The site topography is undulating and hummocky with moderate to steep slopes. Areas with identified seasonal groundwater levels within a metre of the ground surface (i.e., designated as Environmental Zone 2 areas per the Town of Caledon Official Plan) and wetland features are typically located in the topographic lows.



KEY PLAN



TOWN OF CALEDON NTS

LEGEND

- SITE BOUNDARY
- PROPOSED LOT/BLOCK LINE
- PROPOSED STRUCTURE ENVELOPE
- ORMCP KEY NATURAL HERITAGE FEATURE
- CONCEPTUAL HOUSE LOCATION
- CONCEPTUAL SEPTIC LOCATION
- PROPOSED SWM BLOCK
- 2 PROPOSED LOT/BLOCK NUMBER

NOTES

1. IMAGE SOURCE: FIRST BASE SOLUTIONS, 2002. IMAGE PLACEMENT IS APPROXIMATE AND NOT ORTHORECTIFIED

50m 0 50m 100m

SCALE 1:2000

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LAURELPARK INC.

LAURELPARK SUBDIVISION
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON, REGION OF PEEL

FIGURE 2.1
PROPOSED LOT PATTERN AND ROAD ALIGNMENT

The highest elevation on the site occurs on two small hills within the property (each at approximate elevation 285.5 metres) and the lowest elevation occurs in the southwest corner of the property (approximate elevation 269.5 metres).

The Palgrave Estates Residential Community Secondary Plan (PERCSP) contains policies for development within the Palgrave Estates area which apply to this proposed subdivision. Specific references to topography and slopes within the secondary plan are discussed below.

Section 7.1.9.11 of the PERSCP specifies that structure envelopes will generally be restricted to areas with slopes of 10 per cent or less and may include areas with 11 to 15 per cent slope and occasionally greater than a 15 percent slope in order to permit the advantageous siting of a house designed for steep slopes. Additionally, all structure envelopes must include a well-drained area with slopes of 10 percent or less for a sewage disposal system. Consistent with this policy, all proposed lots have an appropriate area for a sewage disposal system (discussed further in Section 7.1 of this report) and generally include gentler slopes within the structure envelope.

Section 7.1.9.23 of the PERSCP specifies that the continuity and integrity of the lowland open space system must be maintained in estate residential plans of subdivision. The proposed subdivision is in general conformance with this policy based the siting of lots away from the lowland areas, and Key Natural Heritage Features and associated minimum vegetation protection zones.

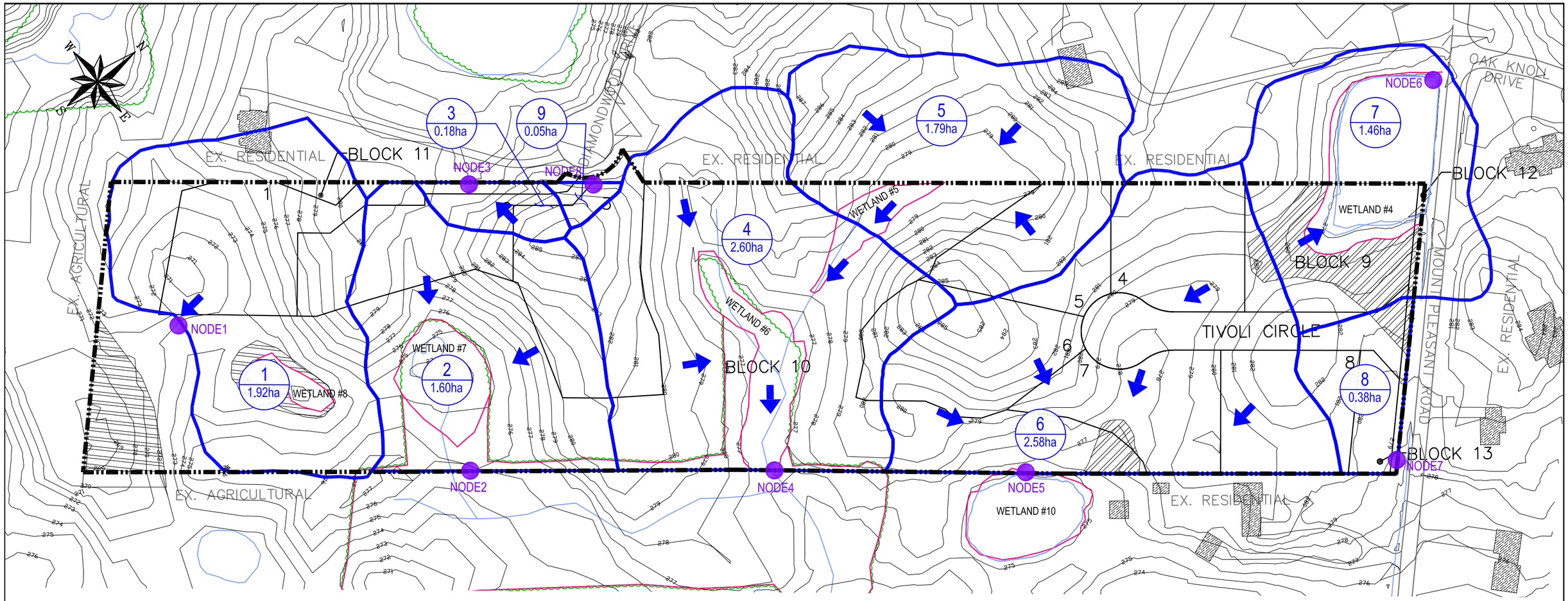
Section 7.1.9.40 of the PERSCP specifies that roads in estate residential developments should follow the topography of the site and Section 7.1.9.41 specifies that the depth of cut for local streets and structure envelopes in future estate residential plans of subdivision will normally be restricted to 1 to 2 metres. The Tivoli Circle horizontal and vertical road alignment and proposed grading for lots 4 through 8 do not result in a depth of cut greater than 2 metres from the existing ground surface. In this regard, the only area where this occurs on the project (i.e., depth of cut greater than 2 metres) is a small localized area on Lot 3. This has been proposed to suit design of the driveway to Lot 1 and Lot 2, provide a gentler transition to natural grades that currently exist, and meet Town of Caledon grading standards.

2.4 Pre-Development Land Uses and Drainage Patterns

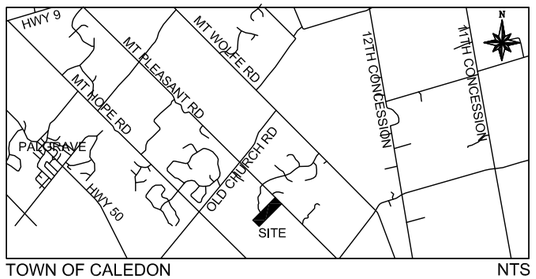
The land was historically cleared and farmed. Currently, portions of the lands are planted with agricultural crops. The remaining areas are either cultural meadows or wetland and hedgerow features. There are no buildings or structures on the property.

The site is part of the Humber River Watershed. Surface flow on the site is typically via sheet flow to the topographic lows and then off-site via either intermittent or ephemeral drainage features. A portion of the site drains northward and a portion drains southward: both to tributaries of Cold Creek which is part of the Humber River Watershed. Cold Creek is a tributary of the main branch of the Humber River. The site falls within the jurisdiction of the Toronto and Region Conservation Authority.

The pre-development drainage patterns have been broken down into the 9 sub-basins shown in Figure 2.2. Sub-basins 3, 7 and 9 drain to the north, and sub-basins 1, 2, 4, 5, 6, and 8 drain to the south. There are several small external drainage areas conveying flow to the site (i.e., part of sub-basins 1, 4, and 5). Summarized in Table 2.1 are pre-development sub-basin characteristics.



KEY PLAN



TOWN OF CALEDON NTS

LEGEND

- SITE BOUNDARY
- STREAM OR WATER BODY
- 279 MAJOR CONTOUR (1m INTERVALS)
- DRAINAGE BOUNDARY
- 3 / 2.57ha SUB-CATCHMENT ID / SUB-CATCHMENT AREA (ha)
- MAJOR FLOW DIRECTION
- EZ2 AREAS
- NODE1 FLOW NODE
- ORMCP KEY NATURAL HERITAGE FEATURE

NOTES

1. CONTOURS GENERATED FROM ORTHOPHOTOGRAPHY DEVELOPED IN THE SPRING OF 2002, AND SURVEYED ELEVATIONS BY CALDER ENGINEERING LTD. (2017 & 2019) AND EPLETT WOROBEC RAIKES SURVYING LTD. (2015). ACTUAL ELEVATIONS MAY VARY FROM THOSE SHOWN.
2. CONTOUR INTERVAL IS 1m.
3. FEATURE LOCATIONS (e.g. TREELINES, BUILDINGS, ETC.) ARE APPROXIMATE.

50m 0 50m 100m

SCALE 1:2000

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FIGURE 2.2
EXISTING DRAINAGE PATTERNS

TABLE 2.1: SUMMARY OF PRE-DEVELOPMENT SUB-BASIN CHARACTERISTICS

Sub-basin	Drainage Area (ha)	Outlet	Receiver
1	1.92	site wetland feature	Cold Creek Tributary, Humber River Watershed
2	1.60	dry swale in Sub-basin 2	Cold Creek Tributary, Humber River Watershed
3	0.18	drainage easement to the north across lots 8 and 9 on adjacent Diamondwood Subdivision to Conservation Area (Block 20, Plan 43M-1787)	Cold Creek Tributary, Humber River Watershed
4	2.60	dry swale on property to the south	Cold Creek Tributary, Humber River Watershed
5	1.79	dry swale on property to the south	Cold Creek Tributary, Humber River Watershed
6	2.58	pond feature on property to the south	Cold Creek Tributary, Humber River Watershed
7	1.46	existing pond and Mount Pleasant Road ditch (draining north)	Cold Creek Tributary, Humber River Watershed
8	0.38	Mount Pleasant Road ditch (draining south)	Cold Creek Tributary, Humber River Watershed
9	0.05	Diamondwood Drive	Cold Creek Tributary, Humber River Watershed
Total:	12.56		

Note:
1. Units: ha – hectares.
2. Refer to Figure 2.2 for sub-basin delineation.

2.5 Surficial Soils

A geotechnical investigation was performed by Terraprobe Inc. (2017) comprising 12 boreholes extending to a depth of approximately 6.5 metres. In addition, 12 test pits were excavated across the site. The borehole and test pit locations, and respective logs are provided in Appendix B. Generally, the site consists of an approximately 250 to 400-millimetre layer of topsoil which overlays typically a native clayey silt/silt soil. In vicinity of two boreholes, a native sandy silt was encountered.

It is indicated in the geotechnical investigation that the native clayey-silt/silt is practically impervious with an estimated coefficient of permeability of 10^{-6} centimetres per second (cm/s) and the native sandy silt has a moderate to relatively low permeability with an estimated coefficient of permeability in the range of 10^{-4} to 10^{-5} cm/s. The sandy silt soil was encountered at boreholes 5 and 12 which are located in vicinity of the two high points on the site.

The surficial soils are identified in the Soil Survey of Peel County (Hoffman and Richards, 1953) as Pontypool Sandy Loam (Psl). Notwithstanding, site investigations indicate the soils are better described as a clayey silt/silt with occasional pockets of sandy silt.

In February 2020, a test pit was excavated in the southeast corner of the site and soil sample collected and submitted for analysis. This work was completed by Calder Engineering Ltd. (2020) and was undertaken to provide information on soil and groundwater conditions in the proposed location of stormwater management facilities. Supporting documentation is provided in Appendix B.

From the test pit excavated in 2020 and soil sample analysis, the following information was obtained:

- soil in location of the test pit can be characterized as sand and silt with trace clay and trace gravel;

- per above, under the Unified Soil Classification System the soil material can be classified as ML (inorganic silts and very fine sands, rock flour, silty or clayey fine sands, clayey silts with slight plasticity);

- per the Ontario Building Code, an ML classified soil has been assigned a Coefficient of Permeability of 10^{-5} to 10^{-6} centimetres per second and a Percolation Time in the range of 20 to 50 minutes per centimetre; and

- the surveyed groundwater level in the test pit was elevation 278.2 metres.

Based on soil colouration observed in the test pit, it is inferred the typical groundwater elevation is likely in the order 1 to 2 metres below the ground surface with groundwater level rising during wet weather conditions to less than 1 metres from the ground surface.

2.6 Geology

The regional and local geology in the study area have been discussed by Azimuth Environmental Consulting Inc. (2017, 2019). With respect to regional geology, the key geological units found within the study area are the Thorncliffe Formation, the Northern Till, the Oak Ridges Moraine sediments, and the Halton Till. The subject property is located on the southern flanks of Mount Wolfe, which is an inlier of the Northern Till, which extends up through the younger deposits of the Oak Ridges Moraine.

With respect to local geology, it is stated by Azimuth Environmental Consulting Inc. that surficial geology is quite consistent across the subject property. The underlying deposits within the upper 6.6 metres of overburden are primarily silty in nature, with some sand and trace clay found in sporadic deposits across the subject property.

2.7 Hydrogeology and Groundwater

To comply with requirements of the Oak Ridges Moraine Conservation Plan (Ontario Regulation 140/02) and the Town of Caledon Palgrave Estates Residential Community Secondary Plan, a hydrogeologic assessment has been conducted by Azimuth Environmental Consulting Inc. (2017, 2019) to determine and describe the hydrogeologic and hydrologic functions of sensitive features. The evaluation focused on the nature of the interaction between the ground water system and the surface water system. The evaluation examined the effect of the proposed development and site alteration on the ground and surface water regimes through the completion of pre and post water balance assessments and RUP evaluation.

It is reported by Azimuth Environmental Consulting Inc. that data compiled during the long-term monitoring program provides sufficient evidence that impacts to surface/ground water quality and quantity will be minimal following construction of the proposed estate residential subdivision. Therefore, it is recommended by Azimuth Environmental Consulting Inc. that no changes to the proposed Draft Plan are recommended (i.e., lot density).

It is concluded by Azimuth Environmental Consulting Inc. that the present hydrologic and hydrogeologic conditions upon the subject property will not experience a significant change due to do the proposed development. By incorporating the criteria as described by Azimuth Environmental Consulting Inc., pre-development infiltration will experience a gain in the order of 10%. This gain in infiltration will have no negative impact on the local ground water regime and associated natural features. In addition, it is stated that the proposed development adheres to the requirements of the Oak Ridges Moraine Conservation Plan, and that no negative post-construction impacts are predicted to occur to the quality/quantity of surface and ground water, ground water recharge, or natural sensitive features.

3.0 STORMWATER MANAGEMENT

3.1 Planning Context

The Provincial Policy Statement, 2014, under Section 3 of the Planning Act, provides that planning for stormwater management shall:

- minimize, or where possible, prevent increase in contaminant loads
- minimize changes in water balance and erosion
- not increase risks to human health and safety and property damage
- maximize the extent and function of vegetative and pervious surfaces
- promote stormwater management best practices, including stormwater attenuation and re-use, and low impact development

A stormwater management plan is required under Sections 45 (1) and 46 (3) of the Oak Ridges Moraine Conservation Plan (ORMCP). In the ORMCP, planning, design, and construction practices are discussed in Section 45 (2) and stormwater management plan criteria are discussed in Section 46 (1). The Town of Caledon is the approval authority for these respective components of the Oak Ridges Moraine Conservation Plan.

In addition to the specific sections of the ORMCP, the Town of Caledon Official Plan provides policies for the Oak Ridges Moraine under Section 7.10 - Oak Ridges Moraine Conservation Plan. In Section 7.10.6.8.1, specified are the requirement for a stormwater management plan as detailed in Section 7.10.6.9. Section 7.6.10.9.1 details objectives of a stormwater management plan and Section 7.10.6.9.2 suggests the application of a 'treatment train' approach to controlling stormwater.

The Palgrave Estates Residential Community Secondary Plan (PERCSP) contains additional policies for stormwater management, specifically:

- Section 7.1.8.9 – estate residential plans will be required to minimize the amount of stormwater draining from the site and adhere to the zero increase in stormwater runoff principle in a manner acceptable to the Town and TRCA

- Section 7.1.8.10 – wherever possible the 100-year design stormwater runoff will be detained and recharged to the groundwater aquifers or slowly released from the site in an environmentally acceptable manner.

The Regional Municipality of Peel Official Plan (Section 2.2.10.5.20) directs the Town of Caledon to require stormwater management plans for applications for development and site alteration in the Protected Countryside, specifically that:

- planning, design and construction practices will minimize vegetation removal, grading and soil compaction, sediment erosion and impervious surfaces

- where appropriate, an integrated treatment approach shall be used to minimize stormwater management flows and structures through such measures as lot level controls and conveyance techniques such as grass swales

- applicable recommendations, standards or targets within watershed plans and water budgets are complied with

The policies associated with these documents have been incorporated into the criteria and objectives of the stormwater management plan proposed for the Laurelpark Subdivision and identified in subsequent sections of this report.

Drainage and storm water are proposed to be managed using an adaptive stormwater management approach and application of Low Impact Development (LID) practices. The objective of the adaptive stormwater management approach is to provide the framework and process for meeting applicable planning policies, and Town of Caledon and Conservation Authority stormwater management criteria and protection of site environmental features. The approach includes:

- establishment of stormwater management criteria
- establishment of performance objectives
- outline of a stormwater management strategy
- monitoring to gain additional information on site natural features and groundwater conditions
- identification of indicators to assess effectiveness of the stormwater management strategy
- identification of triggers to initiate review of the stormwater management strategy
- development of contingency plans and adaptive management measures to offset any identified impacts

3.2 Stormwater Management Criteria

Stormwater management criteria are proposed that are consistent with the Provincial Policy Statement (2014), ORMCP (Ontario Regulation 140/02), and current municipal and Conservation Authority criteria and guidelines, and are intended to avoid impacts to site natural features and local groundwater resources.

Per the Town of Caledon Development Standards Manual (2019), the following stormwater management criteria are specified:

- Quantity Control – peak flows are controlled to pre-development levels;

- Quality Control – water quality treatment in conformance with Provincial requirements as outlined in the Stormwater Management Planning and Design Manual (Ministry of the Environment, 2003); and

- Erosion Control – erosion protection be provided in accordance with the policies of the Toronto and Region Conservation Authority.

In addition, Toronto and Region Conservation Authority stormwater management criteria are as follows:

- Quantity Control – control of 2 to 100-year post-development peak flows to pre-development peak flows based on applicable Unit Flow Equations

- Quality Control – enhanced level of treatment (Level 1)

- Water Balance – retention of storm runoff from the first 5 mm of rainfall on the site through infiltration, evapotranspiration, and/or reuse

3.3 Stormwater Management Performance Objectives

In addition to the stormwater management criteria outlined in Section 3.2, the following performance objectives, consistent with the PPS (Ministry of Municipal Affairs and Housing, 2014), ORMCP (Ontario Regulation 140/02), and Town of Caledon Official Plan are proposed to minimize impact the site and adjacent natural features and groundwater conditions:

- minimize impact to wetland water balances
- minimize impact to wetland water levels
- minimize impact to wetland hydro-periods
- minimize impact to wetland ecology
- minimize impact to groundwater levels and quality

3.4 Stormwater Management Strategy

Consistent with Section 7.10.6.9.2 of the Town of Caledon Official Plan, the proposed stormwater management strategy comprises a “treatment train” approach utilizing a combination of lot level controls and Low Impact Development (LID) measures to minimize potential increases in volume of runoff and provide, as far as practical, a natural hydrologic response. Measures are proposed to be undertaken at the source, and conveyance and end of pipe locations, and are as follows:

- recharge of residential roof and driveway storm water by direction to grassed and naturalized areas to promote filtering and natural infiltration;

- discharge of foundation drain water to rear and side lot areas;

- by lot grading, as far as practical, direction of structure envelope drainage, via sheet flow, towards grassed and naturalized areas versus the road right of way;

- as far as practical, application of grassed swales for road drainage versus a piped storm sewer system;

- use of an oil/grit separator where road drainage is to a bioretention area; and

- use of a bioretention area to temporarily detain and slowly release storm water to meet applicable stormwater management criteria.

The use of grassed swales versus a piped storm sewer system is proposed to encourage passive infiltration of storm water, provide linear storage in the conveyance system to dampen hydrologic response, and provide pre-treatment of storm water prior to discharge to the proposed bioretention area. Additionally, the use of grassed swales rather than a pipe sewer system is consistent with the PPS (2014) by maximizing the extent and function of pervious areas and promoting stormwater management best practices. Where road drainage is directed to the bioretention area, pre-treatment is also provided by an oil/grit separator.

The proposed bioretention area, located in the southeast corner of the site (Draft Plan Block 13), is a hybrid between a traditional "bioretention area" and a "dry" pond as the drainage area serviced of 1.81 hectares is larger than maximum recommended drainage area of approximately 0.8 hectares in the Low Impact Development Stormwater Management Planning and Design Guide (Credit Valley Conservation and Toronto and Region Conservation, 2010). The intent is to provide similar design features and function as a bioretention area. Consistent with the respective design guide, the ratio of impervious drainage area to bioretention cell area of 6.0:1 is within the recommended range of 5:1 to 15:1.

With respect to the proposed bioretention area, factors considered to ensure the proposed facility functions as intended are as follows:

- depth and duration of water pooling after a storm event;
- soil media and volumetric capacity;
- subsurface soil hydraulic conductivity; and
- proximity to the seasonal high-water table.

Design characteristics of the proposed bioretention area are further discussed in Section 3.5.2.

In addition to the above, for the Laurelpark Subdivision an adaptive approach is proposed whereby the stormwater management strategy includes:

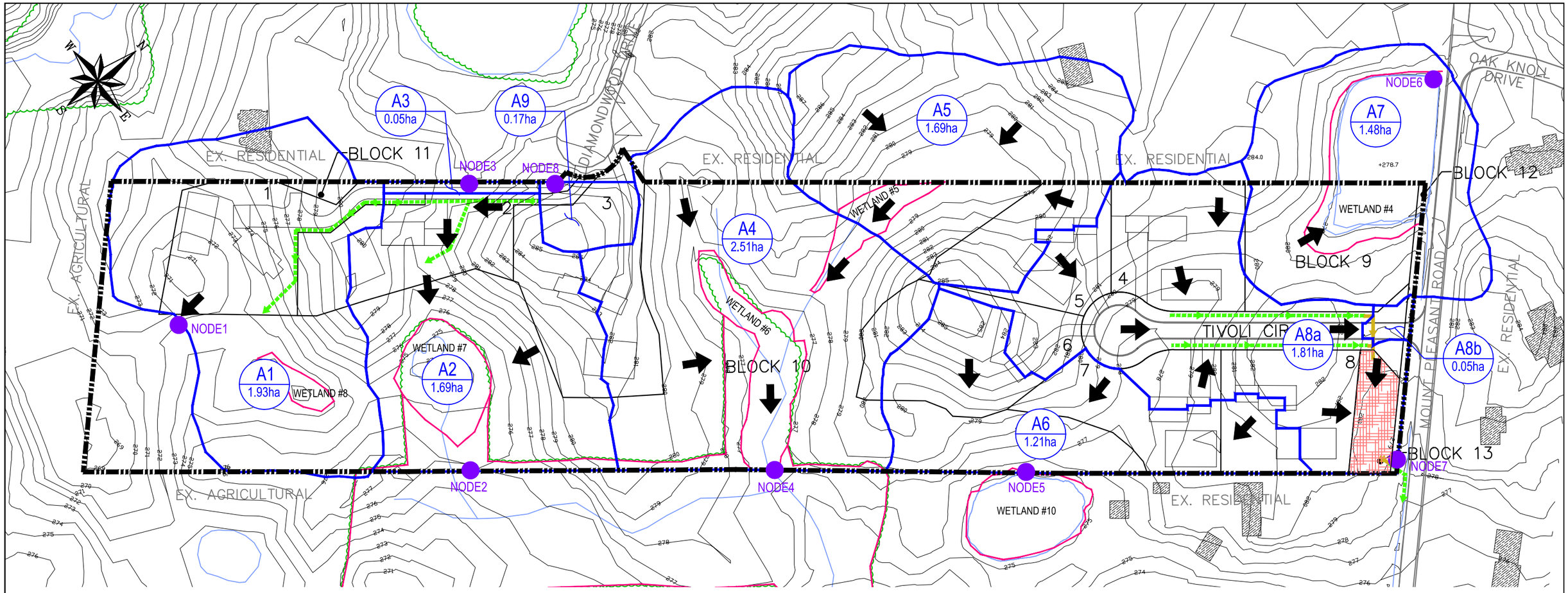
- monitoring to gain additional information on site natural features and groundwater conditions;
- identification of indicators to assess effectiveness of the stormwater management strategy;
- identification of triggers to initiate review of the stormwater management strategy; and
- development of contingency plans and adaptive management measures to offset any identified impacts.

The adaptive management approach is outlined in Section 4.0 and provides a mechanism to refine the stormwater management strategy as more information becomes available and, in the event, other design considerations are identified.

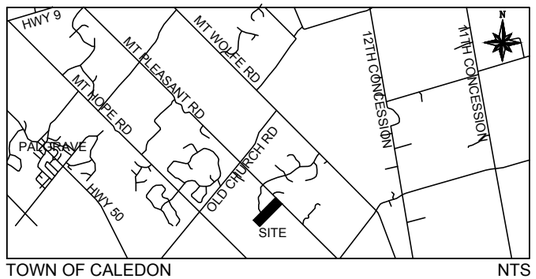
3.5 Stormwater Management Assessment – Quantity Control

3.5.1 Hydrologic Modelling Approach

A hydrologic modelling approach was used to determine and evaluate measures for quantity (peak flow) control. A hydrologic model (SWMHYMO Version 4.07 dated July 1999) was set up to reflect the existing (pre-development) condition shown in Figure 2.2 and post-development condition shown in Figure 3.1. Available soils, land use, and topographic information was used to calculate SWMHYMO parameters, including curve number (CN), time to peak (tp), and catchment slope. Due to the estate residential nature of the subdivision and large associated open space blocks, the catchments typically had a total imperviousness (TIMP) of less than 20% and were modeled using the Calibrate NASHYD command under post-development conditions. The time to peak was calculated using the Airport method. The Atmospheric Environment Service (AES) 6-hour and 12-hour duration storms were applied to



KEY PLAN



TOWN OF CALEDON NTS

LEGEND

- PROPERTY LINE
- STREAM OR WATER BODY
- MAJOR CONTOUR (1m INTERVALS) (279)
- LOT/BLOCK LINES
- ORMCP KEY NATURAL HERITAGE FEATURE
- PROPOSED DRAINAGE BOUNDARY
- PROPOSED SWM BLOCK
- PROP. SWALE
- PROP. STM SEWER
- A7 / 1.66ha — PROPOSED SUB-CATCHMENT ID / PROPOSED SUB-CATCHMENT AREA (ha)
- MAJOR FLOW DIRECTION
- NODE1 — FLOW NODE

NOTES

1. CONTOURS GENERATED FROM ORTHOPHOTOGRAPHY DEVELOPED IN THE SPRING OF 2002, AND SURVEYED ELEVATIONS BY CALDER ENGINEERING LTD. (2017 & 2019) AND EPLETT WOROBEC RAIKES SURVYING LTD. (2015). ACTUAL ELEVATIONS MAY VARY FROM THOSE SHOWN.
2. CONTOUR INTERVAL IS 1m.
3. FEATURE LOCATIONS (e.g. TREELINES, BUILDINGS, ETC.) ARE APPROXIMATE.

50m 0 50m 100m

SCALE 1:2000

Calder Engineering Ltd.
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THE CORPORATION OF THE TOWN OF CALEDON

LAURELPARK INC.

LAURELPARK SUBDIVISION
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON, REGION OF PEEL

FIGURE 3.1
PROPOSED DRAINAGE PATTERNS

determine the critical storm duration. Based on this analysis, the AES 6-hour duration storm was determined to be the critical design storm and applied to estimate peak flows.

For this project, it was determined that only Sub-basin A8a containing the Tivoli Circle road allowance would require control to pre-development flow rates. Under post-development conditions, majority of the road allowance falls within Sub-basin A8a. A small (0.05 hectare area) associated with the subdivision entrance adjacent Mount Pleasant Road drains directly to the road side ditch on Mount Pleasant Road (i.e., Sub-basin A8b). Sub-basin A8a and Sub-basin A8b were modeled using the STANDHYD command in SWMHYMO. With the proposed stormwater management strategy, an effort has been made to separate lot drainage, as far as practical, from road drainage (i.e., from Tivoli Circle). However, there are three areas where lot drainage will report to a road allowance (e.g., sub-basins A8a, A8b, and A9). Sub-basin A9 which is 0.17 hectares drains via sheet flow to Diamondwood Drive. Sub-basin A9 comprises predominately the front yard grassed area associated with Lot 3: it also includes a portion of the driveway access to Lot 1 and Lot 2.

The remaining sub-basins (e.g., sub-basins A1 through A7), will drain typically by sheet flow in a diffuse manner to grassed or naturalized areas. The change in percent imperviousness in these basins would only be associated with houses and driveways, and typically be less than 5 percent. As far as practical, residential roof and driveway storm water will be directed to grassed and naturalized areas to promote filtering and natural infiltration.

Summarized in Table 3.1 are post-development sub-basin characteristics.

TABLE 3.1: SUMMARY OF POST-DEVELOPMENT SUB-BASIN CHARACTERISTICS

Sub-basin	Drainage Area (ha)	Outlet	Receiver
A1	1.94	site wetland feature	Cold Creek Tributary, Humber River Watershed
A2	1.67	dry swale in Sub-basin A2	Cold Creek Tributary, Humber River Watershed
A3	0.05	drainage easement to the north across lots 8 and 9 on adjacent Diamondwood Subdivision to Conservation Area (Block 20, Plan 43M-1787)	Cold Creek Tributary, Humber River Watershed
A4	2.51	dry swale on property to the south	Cold Creek Tributary, Humber River Watershed
A5	1.69	dry swale on property to the south	Cold Creek Tributary, Humber River Watershed
A6	1.18	wetland feature on property to the south	Cold Creek Tributary, Humber River Watershed
A7	1.48	existing pond and Mount Pleasant Road ditch (draining north)	Cold Creek Tributary, Humber River Watershed
A8a	1.81	Mount Pleasant Road ditch (draining south) via Block 13	Cold Creek Tributary, Humber River Watershed
A8b	0.05	Mount Pleasant Road ditch (draining south)	Cold Creek Tributary, Humber River Watershed
A9	0.17	Diamondwood Drive	Cold Creek Tributary, Humber River Watershed
Total:	12.57		

Note:
1. Units: ha – hectares.
2. Refer to Figure 3.1 for sub-basin delineation.

The TRCA Humber River unit flow rate equations were used to calculate pre-development peak flow rates for the site and were used as target flow rates to be managed under post-development conditions. The unit flow rates were calculated using Equation C for Sub-basin 10 from Table E.1: Summary of Unit Flow Relationships, Humber River Watershed, Appendix A of the Toronto and Region Conservation document entitled Stormwater Management Criteria (2012).

One bioretention area is proposed for peak flow control. The location is shown in Figure 3.1. The bioretention area associated with Block 13 of the Draft Plan and will receive drainage from Sub-basin A8a, temporarily detain and release storm water to the ditch on Mount Pleasant Road. This ditch drains south along Mount Pleasant Road and ultimately discharges to a tributary of Cold Creek.

For preliminary design, the storage volume estimated to control to calculated pre-development flow rates was estimated using the COMPUTE VOLUME command in SWMHYMO. Summarized in Table 3.2 is the post-development target release rate for the 100-year design event and estimated storage volume requirements. Estimated pre-development peak flow rates and storage volumes for the 2-year through 100-year design events are summarized in Appendix C. This information was used to develop stage-storage-discharge characteristics and to prepare the concept design for the proposed bioretention area. The bioretention area was sized to provide quantity control for up to the 100-year design event; this is consistent with the PERCSP Section 7.1.8.10.

TABLE 3.2: SUMMARY OF POST-DEVELOPMENT BIORETENTION AREA TARGET 100-YEAR RELEASE RATE

Storm Drainage Block	Sub-basin	Total Drainage Area (ha)	Impervious Drainage Area (ha)	100-Year Target Release Rate (cms)	100-Year Storage Volume (cu.m)
Block 13	**A8a**	1.81	0.40	0.0058	663

Note:
1. Units: ha - hectares; cms - cubic meters per second; cu.m - cubic meters.
2. The 100-Year Target Release Rate calculated using Equation C for Sub-basin 10 from Table E.1: Summary of Unit Flow Relationships, Humber River Watershed, Appendix A of the Toronto and Region Conservation document entitled Stormwater Management Criteria (2012). Drainage area used is 0.38 hectares per the existing condition drainage area (to Node 7).
3. Refer to Figure 3.1 for sub-basin delineation and location of Storm Drainage Block (e.g., bioretention area).
4. Refer to Appendix C for estimated 2-year through 100-year pre-development peak flow rates and storage volumes requirement.

Design characteristics of the bioretention area are described in Section 3.5.2. Operating characteristics for the 2-year through 100-year design events are summarized in Appendix C. These results were obtained by incorporating the bioretention area as a reservoir element in the SWMHYMO model.

Peak flows were estimated at eight locations where surface water discharges from the site. These locations have been denoted as nodes 1, 2, 3, 4, 5, 6, 7, and 8 and are shown on Figure 2.2 and Figure 3.1. The peak flow estimates for post-development conditions include the storage effect of the proposed bioretention area. Summarized in Table 3.3 are estimated pre-development and post-development peak flows at nodes 1, 2, 3, 4, 5, 6, 7 and 8. As shown in Table 3.3, peak flows can be controlled to pre-development levels with the proposed stormwater management approach. The exception is Node 8 (i.e., Sub-basin A9 draining to Diamondwood Drive).

With respect to Node 8, this flow node is associated with Sub-basin A9 (refer to Figure 3.1) and represents drainage from a 0.17 hectare area to the Diamondwood Drive cul-de-sac. Review of engineering drawings for the Diamondwood Subdivision indicate that a corresponding 0.26 hectare drainage area with a runoff coefficient of 0.25 was accounted for in the respective subdivision drainage system design. For comparison purposes, the product of drainage area (A) and runoff coefficient (C) can be compared (i.e., AC) which represents the land use component of the Rational Method peak flow estimation formula. The AC associated with the external area drainage design for the Diamondwood Subdivision was 0.065 (i.e., 0.26 X 0.25) and the AC associated with the same external area as proposed with the Laurelpark Subdivision is 0.0595 (i.e., 0.17 X 0.35). Therefore, as the proposed AC is less for the Laurelpark Subdivision, the drainage from Sub-basin A9 to Node 8 can be considered accommodated in the Diamondwood Subdivision drainage design.

TABLE 3.3: SUMMARY OF ESTIMATED PEAK FLOWS FROM THE PROJECT SITE

Node	Pre-Development Peak Flow (cms)	Post-Development Peak Flow (cms)
2-Year Return Period		
1	0.036	0.028
2	0.033	0.029
3	0.004	0.002
4	0.059	0.056
5	0.034	0.019
6	0.044	0.041
7	0.006	0.003
8	0.001	0.004
5-Year Return Period		
1	0.071	0.056
2	0.064	0.058
3	0.007	0.003
4	0.119	0.113
5	0.069	0.038
6	0.081	0.075
7	0.013	0.005
8	0.002	0.008
10-Year Return Period		
1	0.098	0.079
2	0.088	0.081
3	0.010	0.004
4	0.168	0.159
5	0.096	0.054

6	0.108	0.101
7	0.018	0.006
8	0.003	0.011
25-Year Return Period		
1	0.134	0.110
2	0.120	0.112
3	0.013	0.006
4	0.235	0.223
5	0.135	0.074
6	0.143	0.135
7	0.025	0.007
8	0.004	0.015
50-Year Return Period		
1	0.164	0.135
2	0.146	0.136
3	0.016	0.007
4	0.290	0.276
5	0.166	0.091
6	0.170	0.162
7	0.030	0.008
8	0.005	0.017
100-Year Return Period		
1	0.194	0.161
2	0.172	0.161
3	0.019	0.008
4	0.348	0.331
5	0.198	0.108
6	0.198	0.189
7	0.036	0.009
8	0.006	0.020

Note:
1. Units: cms – cubic metres per second.
2. Refer to Figure 2.2 and Figure 3.1 for location of flow nodes.
3. Pre-development peak flows are based on hydrologic modelling using SWMHYMO.

A summary of model parameters and SWMHYMO input and output files are provided in Appendix C. Also included in Appendix C is the Storm Drainage Area Plan (Drawing 027-D-1, Revision 4 dated March 15, 2007 prepared by G & M Technical Services Ltd.) associated

with the Diamondwood Subdivision illustrating the external area from the Laurelpark Subdivision considered in the Diamondwood Drive drainage design.

3.5.2 Bioretention Area

The bioretention area has been designed in general conformance with guidelines provided in the Low Impact Development Stormwater Management Planning and Design Guide (Credit Valley Conservation and Toronto and Region Conservation, 2010). Key design characteristics of the bioretention area are as follows:

- designed to provide filtration of storm water;
- pre-treatment of storm water provided by a combination of grassed swales and an oil/grit separator;
- provision of a filter bed surface with a mixture of sand, fines, and organic material;
- provision of a subdrain in the filter bed media;
- subject to further groundwater monitoring and detailed design, provision of a geosynthetic liner to minimize risk of groundwater inflow into the filter bed media of the bioretention area;
- shallow depth of flooding (e.g., 0.10 to 0.20 metres) to contain and slowly release storm water during and following small rainfall events via filtration and evapotranspiration; and
- naturalized landscaping.

Summarized in Table 3.4 are characteristics of the bioretention area. As previously noted, pre-treatment of storm water prior to discharge to the bioretention area would be achieved with the grassed swale conveyance system associated with Tivoli Court and an oil/grit separator. In regards to the above and for sizing of Block 13, the volumetric contribution associated with the soil media has not been taken into account. Therefore, the proposed bioretention area has been provided with sufficient storage volume to provide peak flow control without reliance on volumetric storage available in the underlying filter media, pea gravel, and clear stone (i.e., if the bottom of the pond is frozen it will still work). It is anticipated the bioretention area will function as a typical “dry” pond during winter conditions and the spring snowmelt.

TABLE 3.4: SUMMARY OF BIORETENTION AREA CHARACTERISTICS

Bioretention Area	Storage Volume Required for 100-Year Peak Flow Control (cu.m)	Storage Volume Provided in Bioretention Area (cu.m)	Filter Bed Footprint (sq.m)	Typical Operating Depth (m)	Maximum Operating Depth (m)
Block 13	646	750	665	<0.2	0.76

Note:
1. Units: cu.m - cubic meters; sq.m – square metres; m – metres.
2. Storage volume provided is maximum available storage in bioretention area for water quantity/quality control and excludes any storage in the underlying soil media.

Subject to detailed design, the outlet works for the proposed bioretention area will comprise the following:

- perforated pipe outlet set in a perforated corrugated steel pipe (CSP) riser encased with clear stone; and

- an emergency spillway.

With respect to the perforated pipe outlet in the perforated CSP riser, the perforated pipe would be 450 mm diameter with an AASHTO Class II perforation. This perforation pattern would represent 15 slots with a nominal inlet area similar to that of a 40-mm orifice. It is recognized that the Town of Caledon minimum orifice size is 75 mm, however, a smaller size is required to meet the respective unit flow release rates. The proposed smaller effective 40 mm orifice size has been provided with triple protection from clogging (e.g., perforated pipe outlet set in a perforated corrugated steel pipe (CSP) riser encased with clear stone). Routine and annual inspection and maintenance considerations are discussed in Section 6.0. The respective stage-storage-discharge information for the bioretention area is provided in Appendix C.

With respect to soil and groundwater conditions in the proposed bioretention area location, no borehole or test pit information is available in either the geotechnical investigation completed by Terraprobe Inc. (2017) or groundwater monitoring completed by Azimuth Environmental Consulting Inc. (2017, 2019). In February 2020, a test pit in location of the bioretention area was excavated and soil sample collected and submitted for analysis. This work was completed by Calder Engineering Ltd. and supporting documentation is provided in Appendix B. From the excavated test pit and soil sample analysis, the following information was obtained:

- soil in location of the proposed bioretention area can be characterized as sand and silt with trace clay and trace gravel;

- per above, under the Unified Soil Classification System the soil material can be classified as ML (inorganic silts and very fine sands, rock flour, silty or clayey fine sands, clayey silts with slight plasticity);

- per the Ontario Building Code, an ML classified soil has been assigned a Coefficient of Permeability of 10^{-5} to 10^{-6} centimetres per second and a Percolation Time in the range of 20 to 50 minutes per centimetre; and

- the surveyed groundwater level in the test pit was elevation 278.2 metres.

Based on soil colouration observed in the test pit, it is inferred the typical groundwater elevation is likely in the order 1 to 2 metres below the ground surface with groundwater level rising during wet weather conditions to less than 1 metres from the ground surface. Further groundwater monitoring in location of the proposed bioretention area, during the detailed design phase, is recommended to obtain information for the purpose of design. Notwithstanding, at this stage, a geosynthetic liner has been shown on the preliminary engineering drawings to minimize the risk of groundwater seepage into the bioretention area filter media during wet weather conditions and potentially associated elevated groundwater levels. It is noted that the native soil has a low Coefficient of Permeability and the associated rate of seepage would be low.

3.6 Stormwater Management Assessment – Quality Control

3.6.1 Total Suspended Solids Removal Assessment

The stormwater management criteria for quality control is to achieve an enhanced level of treatment (Level 1) consistent with the Stormwater Management Planning and Design Manual (Ministry of the Environment, 2003). Typically, Total Suspended Solids (TSS) is used as the parameter to evaluate water quality and the long-term average removal rate to achieve an enhanced level of treatment (Level 1) is 80%.

A "desk-top" accounting approach was used to calculate a nominal average annual TSS removal over the site. This approach was used to account for the various "treatment train" elements. The site was partitioned according to surface condition and an effective average annual TSS removal rate assumed for each surface condition based on flow path and "treatment train" component(s). The effective average annual TSS removal rate was assumed based on information provided in the Low Impact Development Stormwater Management Planning and Design Guide (Credit Valley Conservation and Toronto and Region Conservation, 2010) and Wet Weather Flow Management Guidelines (City of Toronto, 2006). With this approach, each TSS removal value is multiplied by respective percent of site total area to determine the TSS removal rate for each surface condition. The sum of all TSS removal rates for each surface condition is equal to the TSS removal over the site.

Summarized in Table 3.5 are the various treatment train components and assumed average annual TSS removal rate. Provided in Table 3.6 are computations for the site average annual TSS removal. For instance, Sub-basin A1 would include treatment train components 1 and 2 per Table 3.5 resulting in an effective TSS removal of 88.0%. Based on this approach, the calculated average annual TSS removal rate for the site is 86.8%. This indicates an enhanced level of treatment can be achieved with the proposed stormwater management approach.

TABLE 3.5: SUMMARY OF TREATMENT TRAIN COMPONENTS AND ASSUMED AVERAGE ANNUAL TSS REMOVAL RATE

Treatment Train Component	Treatment Train Type No.	Average Annual TSS Removal Rate[2]
In-line Filter System	1	40%
Grassed Swale	2	80%
Roadside Ditch	3	30%
Oil/Grit Separator	4	50%
Bioretention Area	5	60%

Note:
1. TSS – Total Suspended Solids.
2. For assumed average annual TSS removal rates, refer to Table 5 in the Wet Weather Flow Management Guidelines (City of Toronto, 2006).

TABLE 3.6: ESTIMATION OF SITE AVERAGE ANNUAL TSS REMOVAL

Sub-basin	Treatment Train Components	Drainage Area (ha)	Percent of Site Area	Effective TSS Removal	Overall TSS Removal
A1	1,2	1.93	15.3%	88%	13.5%

A2	1,2	1.69	13.4%	88%	11.8%
A3	3	0.05	0.4%	30%	0.1%
A4	1,2	2.51	19.9%	88%	17.5%
A5	1,2	1.69	13.4%	88%	11.8%
A6	1,2	1.21	9.6%	88%	8.5%
A7	1,2	1.48	11.8%	88%	10.3%
A8a	3,4,5	1.81	14.4%	86%	12.4%
A8b	3	0.05	0.4%	30%	0.1%
A9	1,3	0.17	1.4%	58%	0.8%
Totals:	-	12.59	100%		86.8%

Note:
1. Units: ha – hectares.
2. TSS – Total Suspended Solids.

3.7 Stormwater Management Assessment – Water Balance

The water balance related stormwater management criterion is retention of storm runoff from the first 5 millimetres (mm) of rainfall on the site through infiltration/filtration, evapotranspiration, and/or reuse. This is proposed to be achieved through the use of granular media in the base of the bioretention area.

The estimated impervious area of the site is 7,923 square metres. This represents the surfaces of the road (Tivoli Court), driveways, and roofs. A 5 mm rainfall depth over this area represents 39.6 cubic metres. Approximately 239.4 cubic metres of storage will be provided in the base of the bioretention area. This indicates retention of storm water from the first 5 mm of rainfall on the site can be achieved with the proposed stormwater management approach. Design assumptions and summary computations are provided in Attachment C.

In addition to the above, as far as practical, storm water from the lots will be separated from storm water from the road and directed via grading and sheet flow to grassed and naturalized areas.

3.8 Review and Discussion of Low Impact Development (LID) Options

A review was completed of Low Impact Development (LID) options for the proposed Laurelpark Subdivision and opportunities for integration with the stormwater management planning. A comprehensive discussion of LID's has been provided by Credit Valley Conservation and Toronto and Region Conservation (2010) in the Low Impact Development Stormwater Management Planning and Design Guide.

The proposed stormwater management plan for the Laurelpark Subdivision incorporates the following transport/conveyance controls and end-of-pipe management techniques:

- grassed swales
- oil/grit separator
- bioretention area

With respect to lot level controls, as far as practical, preliminary lot grading designs have directed storm water over grassed areas to adjacent open space areas versus the road network.

In general, due to the presence of low permeability soils on the site (i.e., soils with an infiltration rate greater than 15 millimetres per hour), the application of infiltration type LID's is limited (i.e., soak-away pits, infiltration trenches). Applicable LID's include grassed swales and lengthening of flow paths, vegetated filter strips, and encouragement of rain water harvesting and application of rain gardens and soft versus hard landscaping (i.e., permeable pavers).

In addition, the re-vegetation of agricultural areas, specifically the restoration of the MVPZ areas and lot areas outside of the structure envelopes, and provision of a dense vegetation cover will result in localized areas on the project site with increased infiltration and evapotranspiration (relative to existing conditions). Where storm water from the lots is directed to MVPZ areas and lots areas outside of the structure envelopes, implicitly, these respective areas will act as vegetated filter strips.

For lot level controls, from a planning and implementation perspective, there are limitations on lot coverage and percent imperviousness that is/will be enacted by Town of Caledon Official Plan zoning provisions, the zoning by-law for the project, and the ORMCP. It will be important also, during the site plan/building permit application stage, that intent of lot grading, as shown of the preliminary grading plans and amended during the detailed design phase, is retained and LID's such as grassed swales and vegetated filter strips are incorporated where applicable.

4.0 ADAPTIVE STORMWATER MANAGEMENT PLAN

4.1 Monitoring

The adaptive stormwater management approach includes monitoring to collect additional information on site natural features and groundwater conditions, and assess the effectiveness of the proposed stormwater management strategy. The monitoring program would continue through the design phase, servicing construction phase, and for a term post-construction of services. It is anticipated that the monitoring program would be refined and updated as part of the adaptive stormwater management approach. Summarized in Table 4.1 is the proposed monitoring program.

TABLE 4.1: ADAPTIVE STORMWATER MANAGEMENT PLAN MONITORING PROGRAM

Category and Type of Monitoring	Description	Location
Design Phase		
Surface Water – Baseline Water Quality Sampling	2 sampling rounds to establish baseline conditions	Wetland Features[2]
Surface Water – Wetland Water Levels	Continuous Monitoring	Wetland Features[2]
Groundwater – Baseline Water Quality Sampling	2 sampling rounds to establish baseline conditions	Private Wells in 500 m Radius including select Site Monitoring Wells
Groundwater – Groundwater Levels - Site	Continuous Monitoring	Select Site Monitoring Wells[3]
Municipal Services Construction Phase		
Surface Water – Wetland Water Levels	Continuous Monitoring	Wetland Features[2]
Groundwater – Water Quality Sampling	Pre and Post installation of site municipal services	Private Wells in 500 m Radius including select Site Monitoring Wells
Groundwater – Groundwater Levels - Site	Continuous Monitoring	Site Monitoring Wells[3]
Erosion and Sediment Controls	Routine Inspection	per Erosion and Sediment Control Plan
Post Municipal Services Construction Phase		
Surface Water – Water Quality Sampling	Annual sampling following installation of site municipal services to 4 years post construction	Wetland Features[2]
Surface Water – Wetland Water Levels	Continuous Monitoring to 4 years post construction of municipal services	Wetland Features[2]
Groundwater – Groundwater Levels - Site	Continuous Monitoring to 4 years post construction of municipal services	Existing Monitoring Wells[3]
Erosion and Sediment Controls	Routine Inspection	per Erosion and Sediment Control Plan
LID Features	Annual Inspection, Review of Functionality, and Performance Reporting[4.5]	-

Note:
1. Units: m – metres.
2. Wetland Features – select features to be determined.
3. Existing monitoring wells 4, 5, and 8.
4. Performance Reporting is to include a summary and review of collected monitoring information.

5. Inspection and maintenance considerations for bioretention area are identified in Section 4.5.3 of the Low Impact Development Stormwater Management Planning and Design Guide (Credit Valley Conservation and Toronto and Region Conservation, 2010). Inspection and maintenance considerations for other types of LIDs are also identified in this document.

4.2 Indicators and Triggers

The below indicators are proposed to assess effectiveness of the proposed stormwater management strategy:

Surface Water

- water quality
- wetland water levels
- wetland water balance
- erosion

Groundwater

- water levels
- water quality

Information from the monitoring program would be reviewed annually to identify change in water quality from baseline levels, and change in trends of wetland and groundwater levels. Identified changes would trigger an action plan comprising notification, review, and follow-up additional monitoring/assessment, and implementation of adaptive management measures, as required.

The indicators and threshold values or triggers for implementation of mitigation measures would be determined at the detailed design stage based on review of additional collected baseline information.

4.3 Management Framework and Contingency Planning

As part of the adaptive stormwater management strategy, an administration and contingency planning framework is proposed to be established. This framework would include:

- notification
- performance reporting
- process for implementing potential future adaptive stormwater management measures

Notification would comprise informing the Town of Caledon, Toronto and Region Conservation Authority, and Regional Municipality of Peel of any identified change in water quality from baseline levels or change in trends of wetland and groundwater levels.

Performance reporting would comprise provision of a report on annual basis, in conjunction with the monitoring program outlined in Table 4.1 for the Municipal Services Construction Phase and Post Municipal Services Construction Phase, containing the following information:

- a summary and interpretation of monitoring data and the performance of the Stormwater Management Plan based on established design criteria and performance objectives;

- an evaluation of the Stormwater Management Plan's performance and ability to meet established design criteria and performance objectives, and its effect (if any) on the site wetland features and water balance;

- a description of any operating problems encountered and corrective actions taken during the reporting period and the need for further investigations in the following reporting period for Stormwater Management Plan refinements or ways of improving to meet established design criteria and performance objectives;

- any need for modifications of the monitoring program and/or the Stormwater Management Plan;

- a summary of any complaints received during the reporting period and any steps taken to address the complaints; and

- any other information that is deemed to have been obtained and is relevant for inclusion in the reports from time to time.

4.4 Mitigation Measures and Contingency Planning

As part of the adaptive stormwater management strategy, mitigation measures and contingency plans are proposed for MVPZ encroachment, erosion and sediment control, maintenance of wetland water levels and water balance, maintenance of wetland water quality, and maintenance of groundwater levels and groundwater quality. It is expected these mitigation measures and contingency plans would be updated at the detailed design stage, and, as required, as part of the annual performance reporting associated with the Municipal Services Construction Phase and Post Municipal Services Construction Phase as outlined in Table 4.1.

4.4.1 MVPZ Encroachment

The following mitigation measures are proposed:

Construction Phase

- installation and maintenance of sediment control fencing and other protective measures as specified on the Erosion and Sediment Control Plan

- monitoring of the limit of clearing activities to minimize the extent of disturbed areas

- installation of project fencing as shown of the engineering plans (e.g., along lot lines which abut open spaces areas)

- routine inspection and maintenance of sediment control fencing and other protective measures

Post Services Construction to Assumption

- retaining of sediment control measures in-place until vegetal cover is fully established

- naturalization plantings in areas on lots outside of lot structure envelopes

- inspection of land uses to ensure compliance with the applicable zoning by-laws and that no grading is undertaken outside of approved lot structure envelopes

Contingency Plan

With respect to MVPZ encroachment, contingency measures would be active and adaptive and involve on-going inspection, maintenance, and re-evaluation of both protective barriers and site conditions. This could result in increased frequency of inspections and maintenance, and specification of alternative control measures.

4.4.2 Erosion and Sediment Control

The following mitigation measures are proposed:

Construction Phase

- implementation of the Erosion and Sediment Control Plan as specified on the engineering drawings

- routine inspection and maintenance of erosion and sediment controls

- stabilization of disturbed surfaces as soon as practical

Post Services Construction to Assumption

- implementation of individual lot Erosion and Sediment Control Plans during the home construction phase through the Site Plan/Building Permit application process

- management of mud tracking onto the municipal right-of-way during home construction

- retaining of sediment control measures in-place until vegetal cover is fully established

Contingency Plan

With respect to erosion and sediment control, contingency measures would be active and adaptive and involve on-going inspection, maintenance, and re-evaluation of both proposed erosion and sediment control measures and site conditions. This could result in increased frequency of inspections and maintenance, and specification of alternative control measures.

Notwithstanding the above, even with correctly installed sediment controls, extreme storm events could result in sediment control fencing failure, overflow, or bypass, and other problems which could result in the flow of sediment laden water to either the wetlands or watercourses. In this case, actions could be prescribed to be taken to install temporary measures to control sediment as soon as practical. Additional sediment control materials can be prescribed to be kept on-site during the construction phase for this purpose. If sedimentation results from a construction-related activity, the activity should be prescribed to be stopped until the situation has been assessed and addressed.

4.4.3 Maintenance of Wetland Water Levels and Water Balance

The following mitigation measures are proposed:

Construction Phase

- during construction of site services, installation of trench plugs if groundwater seepage is encountered
- annual review of recorded wetland water levels

Post Services Construction to Assumption

- annual review of recorded wetland water levels
- advising and encouraging application of LIDs on private property such as rainwater harvesting, rain gardens, and grassed swales
- design of lot grading to maximize passive infiltration of stormwater

Contingency Plan

With respect to maintenance of wetland water levels and water balance, contingency measures would be active and adaptive and involve on-going monitoring and data review, and re-evaluation of the stormwater management plan. This could result in additional monitoring, increased frequency of data review, and specification of alternative stormwater management measures.

4.4.4 Maintenance of Wetland Water Quality

The following mitigation measures are proposed:

Construction Phase

- implementation of the Erosion and Sediment Control Plan
- routine inspection and maintenance of erosion and sediment controls
- management of dewatering during trenching and excavation activities to ensure water is discharged in conformance with the Erosion and Sediment Control Plan and any applicable permits
- stabilization of disturbed surfaces as soon as practical
- spill management – requirement for contractor spill contingency plans that outline reporting procedures, clean-up procedures, and appropriate spill management materials and equipment to be maintained at the work site

Post Services Construction to Assumption

- if elevated concentration(s) of water quality parameters are observed, inspection of on-site sewage disposal systems to ensure they are functioning as intended and no illicit connections or discharges are present

- if elevated concentration(s) of water quality parameters are observed, inspection of land uses to ensure compliance with the applicable zoning by-laws and that no uses are present that could potentially impact groundwater quality (e.g., intensive urban horticulture and nutrient or pesticide use, chemical storage or handling)

- advising and encouraging application of LIDs on private property such as rainwater harvesting, rain gardens, and grasses swales

- spill management (during house construction) – requirement for contractor spill contingency plans that outline reporting procedures, clean-up procedures, and appropriate spill management materials and equipment to be maintained at the work site

Contingency Plan

With maintenance of wetland water quality, contingency measures would be active and adaptive and involve on-going inspection, maintenance, and re-evaluation of both proposed control measures and site conditions. This could result in increased frequency of inspections, additional water quality sampling and reporting, and specification of alternative control measures.

Notwithstanding the above, even with correctly installed sediment controls, extreme storm events could result in sediment control fencing failure, overflow, or bypass, and other problems which could result in the flow of sediment laden water to wetlands. In this case, actions could be prescribed to be taken to install temporary measures to control sediment as soon as practical. Additional sediment control materials can be prescribed to be kept on-site during the construction phase for this purpose. If sedimentation results from a construction-related activity, the activity should be prescribed to be stopped until the situation has been assessed and addressed.

4.4.5 Maintenance of Groundwater Levels and Groundwater Quality

The following mitigation measures are proposed:

Construction Phase

- during installation of services, trench plugs be installed if water seepage is observed

- during construction of the bioretention area, if elevated groundwater levels are encountered, either implementation of measures to increase the vertical separation distance between surface and groundwater systems to limit potential hydraulic connectivity or placement of a semi-impermeable barrier in areas of concern

- spill management – requirement for contractor spill contingency plans that outline reporting procedures, clean-up procedures, and appropriate spill management materials and equipment to be maintained at the work site

Post Services Construction to Assumption

- if elevated concentration(s) of water quality parameters are observed, inspection of on-site sewage disposal systems to ensure they are functioning as intended and no illicit connections or discharges are present

- if elevated concentration(s) of water quality parameters are observed, inspection of land uses to ensure compliance with the applicable zoning by-laws and that no uses are present that could potentially impact groundwater quality (e.g., intensive urban horticulture and nutrient or pesticide use, chemical storage or handling)

- spill management (during house construction) – requirement for contractor spill contingency plans that outline reporting procedures, clean-up procedures, and appropriate spill management materials and equipment to be maintained at the work site

Contingency Plan

With respect to maintenance of groundwater levels and groundwater quality, contingency measures would be active and adaptive and involve on-going inspection, maintenance, and re-evaluation of both proposed erosion and sediment control measures and site conditions. This could result in additional monitoring, increased frequency of data review, and specification of alternative stormwater management measures.

5.0 MINOR AND MAJOR DRAINAGE SYSTEM DESIGN

The minor and major drainage system will consist of the proposed road system, grassed swales, and storm sewers. As much as practical, the existing natural drainage patterns will be maintained. The drainage system will be designed to manage storm water for up to the 100-year design storm consistent with Town of Caledon Development Standards Manual (2019) and Toronto and Region Conservation stormwater management criteria. Peak flows up to the 100-year design level would be contained within the municipal road right-of-way and bioretention area prior to release to the environment. Storm sewers are only proposed at the east end of Tivoli Court to collect storm water from grassed swales along each side of the road, and convey storm water to the proposed oil/grit separator and bioretention area.

Summarized in Table 5.1 are site drainage conveyance features and design criteria. As shown in Table 5.1, drainage conveyance features have been sized to convey design peak flows. Supporting engineering drawings and design calculations are provided in Appendix E.

Design calculations were also undertaken for grassed swales along the Tivoli Court road right-of-way to ensure the following:

- that flooding of private property will not occur under the 100-year design event; and
- that ditch average flow velocity will not exceed the maximum permissible average flow velocity that would result in erosion in a grassed channel.

The design calculations for grassed swales are provided in Table E.2 (Appendix E). The results of design calculations for grassed swales indicate for the 100-year design event that flow depths will range from 0.21 to 0.26 metres and flow velocities will range from 0.73 to 0.85 metres per second. The minimum grassed swale depth is 0.55 metres, therefore, the 100-year design event will be contained within the road right-of-way. Per the Ministry of Transportation Drainage Manual (1997), the maximum permissible average velocity for a grassed channel (erosion resistant soil) is in the order of 1.5 metres per second, therefore, the maximum permissible average flow velocity for grassed channels is not exceeded.

TABLE 5.1: SUMMARY OF DRAINAGE CONVEYANCE FEATURE CHARACTERISTICS

Drainage Feature	Design Criteria	Type	Size	Hydraulic Capacity (cms)	Design Peak Flow (cms)
Tivoli Circle Grassed Swales					
Road Cross-Section	100-year	Grassed Swale	V-shaped with 4H:1V side slopes	1.686	0.235–N.Side 0.125–S.Side
Tivoli Circle Storm Sewers					
MH1 to OGS	5-year	Storm Sewer	375 mm	0.124	0.109
OGS to Block 13	5-Year	Storm Sewer	450 mm	0.202	0.165

Note:
1. Units: cms – cubic metres per second; m – metres; mm – millimetres.
2. Design calculations for storm sewers and grassed swales are provided in Appendix E (Table E.1 and Table E.2).
3. Storm sewer sizes are preliminary and subject to detailed design.
4. MH1 – Maintenance Hole 1.
5. OGS – oil/grit separator.

In addition, the ditch topography along the west side of Mount Pleasant was surveyed and hydraulic computations undertaken to confirm the respective ditch has capacity to accommodate flow from the proposed subdivision. As previously described, the proposed bioretention area will drain to the Mount Pleasant ditch in vicinity of Node 7 as shown on Figure 3.1. It should be noted that peak flows from the site at Node 7 will be limited to estimated pre-development peak flows based on the TRCA Humber River unit flow rate equations.

Based on the topographic survey, the Mount Pleasant ditch is typically v-shaped with 2 horizontal to 1 vertical sides slopes, nominal depth of 0.35 metres, and at a 3.8 percent slope. The hydraulic capacity of this ditch section is 0.411 cubic metres per second (cms). The computed 100-year peak flow to the ditch immediately downstream of Node 7 is 0.078 cms. Therefore, the Mount Pleasant ditch can accommodate the projected peak flows from the site. Supporting computations are provided in Appendix E (Table E.3).

Hydraulic computation of outlet velocity associated with the proposed bioretention area outlet structure was undertaken (i.e., outlet pipe to the ditch along Mount Pleasant). The respective outlet velocity under the 100-year design event was computed to be approximately 1 metre per second. To minimize risk of erosion, the minimum nominal size of rip rap required is 50 millimetres. Subject to detailed design, it is anticipated that minimum size of rip rap specified will be in the order of 100 millimetres to 150 millimetres with possibly larger sized rip rap extending from the outlet headwall downstream for a metre. Supporting computations are provided in Appendix E (Table E.4).

6.0 DRAINAGE SYSTEM OPERATION AND MAINTENANCE CONSIDERATIONS

Listed below are operation and maintenance considerations for the drainage system and stormwater management features. Inspection and maintenance considerations for bioretention area are identified in Section 4.5.3 of the Low Impact Development Stormwater Management Planning and Design Guide (Credit Valley Conservation and Toronto and Region Conservation, 2010). Inspection and maintenance considerations for other types of LIDs are also identified in the respective design guide.

1. Construction of the drainage works, specifically Low Impact Development (LID) features be scheduled and phased to ensure integrity is not compromised during construction.

2. Drainage works, stormwater management measures, and LID features be inspected on a routine basis to verify they are functioning as intended. This could include periodic inspections after major storm events to determine whether corrective actions are required. For the first two years following construction the LID features should be inspected quarterly and after major storm events. Subsequently, inspections should be conducted in the spring and fall of each year and after major storm events.

3. The grassed swales be maintained on a routine basis to remove any accumulated trash, mow grass, and remove woody material. It is anticipated that significant portions of the system will be maintained by private property owners.

4. The grassed swale system be inspected on a routine basis and any identified erosion, gullies, rills, or bare spots repaired.

5. With respect to the bioretention area, summarized in Table 6.1 are suggested routine inspection and maintenance activities, and annual spring inspection and maintenance activities. This information is adapted from Credit Valley Conservation and Toronto and Region Conservation (2010).

6. Signage be posted indicating natural or environmental protection areas, and that they are not to be disturbed or altered without authorization from the Town of Caledon or Toronto Region Conservation Authority.

In addition to the above, operation and maintenance considerations for stormwater management facilities are outlined in the Town of Caledon Development Standards Manual (2019).

TABLE 6.1: BIORETENTION AREA INSPECTION AND MAINTENANCE ACTIVITIES

Activity/Inspection Item	Schedule/Corrective Action
Routine Inspection and Maintenance Activities	
Inspect for vegetation density, damage by foot or vehicular traffic, channelization, accumulation of debris, trash and sediment, and structural damage to either pre-treatment devices or outlet works.	After every major storm event, quarterly for first two years, and twice annually thereafter.
Regular watering may be required during the first two years until vegetation established.	As needed for the first two years of operation.

Remove trash and debris from pre-treatment devices, bioretention area surface, and inlets and outlets.	At least twice annually. More frequently if desired for aesthetic reasons.
Remove accumulated sediment from pre-treatment devices and inlet/outlet areas, remove accumulated sediment on bioretention area surface, trim trees and shrubs, replace vegetation and remove invasive growth, repair eroded or sparsely vegetated areas.	Annually or as needed.
Annual Inspection Items and Corrective Actions	
Vegetation health, diversity, and density.	Remove dead and diseased plants, add reinforcement planting to maintain desired vegetation density, prune woody matter, check soil pH for specific vegetation, add mulch to maintain 25 mm layer if applicable.
Sediment build-up and clogging of inlets/outlets.	Remove sand that may accumulate at the inlets/outlets or on the surface following snow melt, examine the contributing drainage area for bare soil and stabilize accordingly, check that pre-treatment device or measures are properly functioning.
Ponding for more than 48 hours.	Check outlet piping for clogging and flush out, apply core aeration or deep tilling, mix amendments into the soil, remove and replace top 75 mm of bioretention soil.

7.0 SANITARY AND WATER SERVICING PLAN

The proposed Laurelpark Subdivision will be serviced with municipal water and private on-site sewage disposal systems. Consistent with Section 44 (4) of the Oak Ridges Moraine Conservation Plan (ORMCP), the construction of partial services is permitted within the Palgrave Estates Residential Community. Section 43 of the ORMCP requires that water and sewage services maintain the ecological integrity of hydrological features and key natural heritage features, maintain quantity and quality of groundwater and surface water, maintain stream baseflows, comply with the applicable watershed plan and water budget and conservation plan, that the water use projected for the development will be sustainable, and that water and service trenches be planned designed and constructed so as to keep disruption of natural groundwater flow to a minimum.

The Regional Municipality of Peel Official Plan requires that proposals for water infrastructure within or crossing areas designated as Protected Countryside demonstrate that:

- servicing can be provided in a manner that does not negatively impact ecological features and functions, quality and quantity of ground and surface water, including stream baseflow, and is sufficient to accommodate the proposed use;

- applicable recommendations, standards or targets within watershed plans and water budgets are reflected; and

- any sewage and water servicing installation is planned, designed and constructed to minimize surface and groundwater disruption.

The sanitary and water servicing plan for the proposed Laurelpark Subdivision is consistent with these policies. For instance, the site water balance has been considered, proposed services are shallow in depth and will not impact the local and regional groundwater regime, and an adaptive stormwater management approach is proposed.

7.1 Sanitary Servicing Plan

Consistent with Section 7.1.8.1 of the Town of Caledon Official Plan, sanitary servicing for the proposed subdivision will be by individual on-site sewage disposal systems (e.g., septic systems) conforming to the Ontario Building Code. Subject to detailed design at the Building Permit application stage, it is anticipated that the on-site sewage disposal systems would comprise a septic tank(s) sized at twice the daily design flow, effluent filter, tertiary treatment unit, dispersal bed, and ancillary piping, pumping system(s), and controls. A tertiary treatment unit is anticipated to be required to fit the respective dispersal bed within the lot structure envelope in conjunction with the dwelling and driveway features. Alternative tertiary treatment units can be found in Supplementary Standard SB-5, Approved Treatment Units, of the Ontario Building Code.

Illustrated on drawings 16-168-A-4 and 16-168-A-5 (Appendix E) are preliminary grading plans for the subdivision with preliminary sitings of the dwellings and dispersal beds. As shown, the dispersal beds have been sited on lands within structure envelopes where the slope is less than 10% consistent with Section 7.1.9.11 of the Town of Caledon Official Plan. It should be noted that the maximum slope for siting of dispersal or leaching beds, per the Ontario Building Code, is 25% (i.e., 4 horizontal to 1 vertical). Section 7.1.9.32 of the PERCSP identifies that sewage disposal systems will be normally located a minimum of 30 metres from any pond or

stream to minimize nutrient enrichment. Proposed preliminary sitings for dispersal beds associated with sewage disposal systems are consistent with this policy. Supporting nutrient loading computations have been provided by Azimuth Environmental Consulting Inc. (2017, 2019).

The septic system dispersal bed sizes shown on the grade control plans are based on the following assumptions:

- the lots will be serviced with a dispersal bed contact area of 500 square metres or less (an area of 500 square metres is shown on the engineering plans provided in Appendix E); and

- in-situ soil percolation rate or `T` time is greater than 50 minutes per centimeter.

With a typical tertiary treatment system, a dispersal bed with a contact area of 500 square metres and in-situ soil percolation rate or `T` time of greater than 50 minutes per centimeter can accommodate a maximum daily design flow of 4,000 litres per day.

By way of example, a maximum daily design flow of 4,000 litres per day is representative of an approximately 400 square metre (4,306 square foot) home with four bedrooms. This is consistent with the size of homes anticipated for the proposed subdivision.

Detailed engineering design of the on-site sewage disposal will be undertaken at the Building Permit application stage and reflect site specific soil conditions and house designs. Detailed design of the on-site sewage disposal systems would be in general conformance with the Ontario Building Code.

7.2 Water Servicing Plan

7.2.1 Water Demand

The proposed subdivision comprises 8 estate residential lots. The estimated water demand is summarized in Table 7.1.

TABLE 7.1: ESTIMATED WATER DEMAND FOR THE LAURELPARK SUBDIVISION

Population Type	Number of Units	Population Density	Average Consumption Rate (L/cap/day)	Subdivision Average Day Consumption (L/day)	Subdivision Max. Day Consumption (L/day)	Subdivision Peak Hour Consumption (L/hour)
Residential	8	2.7	280	6,048	12,096	2,660

Note:
1. Units: L/cap/day – litres per capita per day; L/day – litres per day; L/hour – litres per hour.
2. Consumption values determined by rounding the total subdivision population to 22 people.

7.2.2 Water Supply and Distribution

The Laurelpark Subdivision will be serviced by municipal water. There is an existing 300-millimetre diameter watermain located on the west side of Mount Pleasant Road and a 50-millimetre watermain on the Diamondwood Drive cul-de-sac. It is proposed that lots 4 through 8 on Tivoli Circle of the Laurelpark Subdivision be serviced by a 150-millimetre diameter

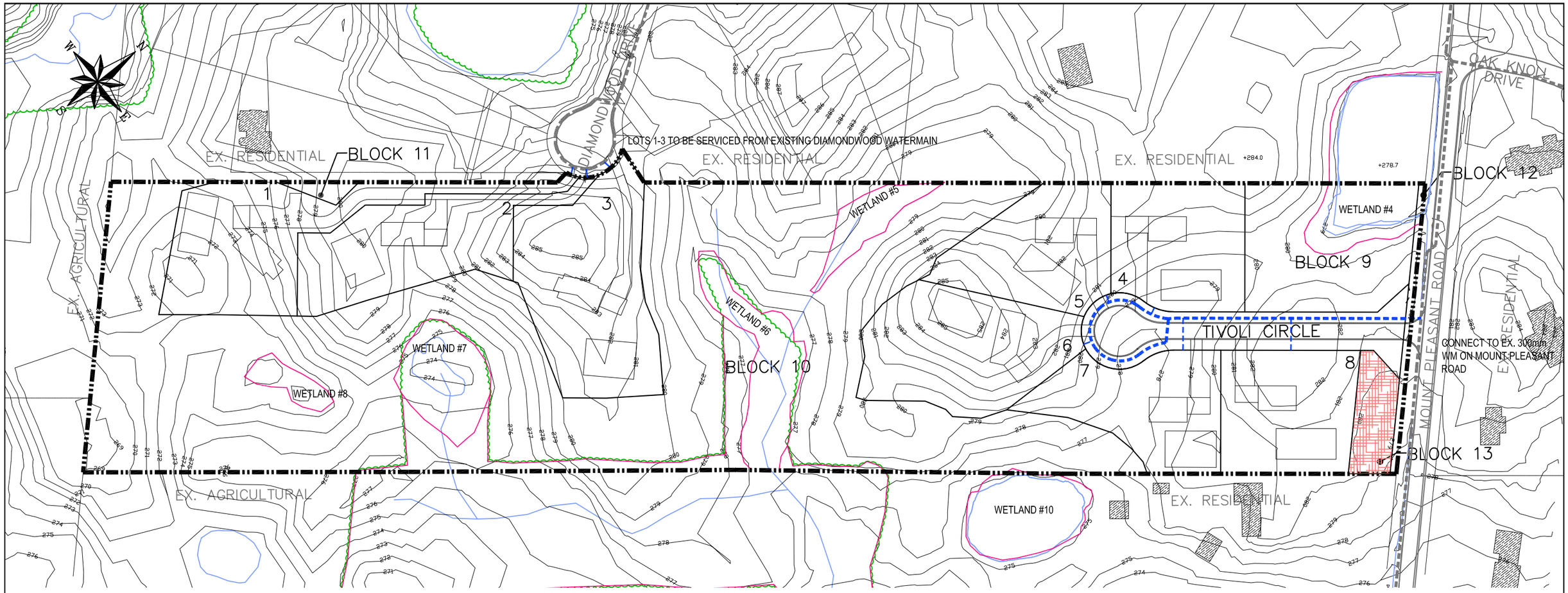
watermain connected to the 300-millimetre watermain on Mount Pleasant Road. The Tivoli Circle watermain would be complete with required appurtenances such as valving and hydrants. A schematic of the water servicing plan is provided in Figure 7.1.

On the western portion of the site, the water services for lots 1, 2, and 3 would be connected to the existing 50-millimetre diameter watermain associated with the Diamondwood Drive cul-de-sac. Each lot would have a separate water service.

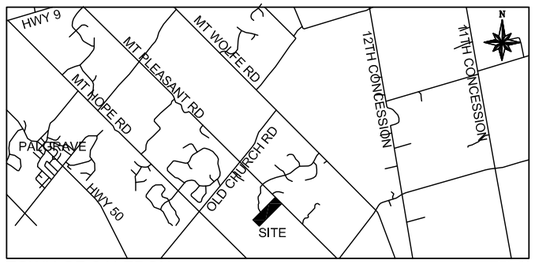
The water distribution system would be designed, supplied, and installed in general conformance with the Region of Peel Public Works Design, Specifications and Procedures Manual, Linear Infrastructure, Watermain Design Criteria (2010).

7.2.3 Water Services

All water services will be single service connections that are supplied and installed in general conformance with the Region of Peel Public Works Design, Specifications and Procedures Manual, Linear Infrastructure, Watermain Design Criteria (2010). The minimum water service size will be 25 millimetres (mm) consistent with Region of Peel design criteria.



KEY PLAN



TOWN OF CALEDON NTS

LEGEND

- PROPERTY LINE
- 279 MAJOR CONTOUR (1m INTERVALS)
- LOT/BLOCK LINES
- PROPOSED SWM BLOCK
- PROPOSED WATERMAIN
- EXISTING WATERMAIN
- PROPOSED WATER SERVICE c/w WATER BOX

NOTES

1. CONTOURS GENERATED FROM ORTHOPHOTOGRAPHY DEVELOPED IN THE SPRING OF 2002, AND SURVEYED ELEVATIONS BY CALDER ENGINEERING LTD. (2017 & 2019) AND EPLETT WOROBEC RAIKES SURVYING LTD. (2015). ACTUAL ELEVATIONS MAY VARY FROM THOSE SHOWN.
2. CONTOUR INTERVAL IS 1m.
3. FEATURE LOCATIONS (e.g. TREELINES, BUILDINGS, ETC.) ARE APPROXIMATE.

50m 0 50m 100m

Calder Engineering Ltd.
T 905-857-7600 W www.caldereng.com

THE CORPORATION OF THE TOWN OF CALEDON

LAURELPARK INC.

LAURELPARK SUBDIVISION
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON, REGION OF PEEL

FIGURE 7.1
PROPOSED WATERMAIN SERVICING

8.0 ROADWAY AND GRADING

8.1 General Description and Location

Access to the subdivision would be from Mount Pleasant Road for the five lots on the eastern part of the site. The five lots would be located on a cul-de-sac named Tivoli Circle. The three lots on the western part of the site would be accessed from Diamondwood Drive. With respect to these lots, lots 1 and 2 would share a common driveway. The internal road layout is shown in Figure 2.1, and preliminary road and driveway profiles and cross-sections provided are provided in Appendix E.

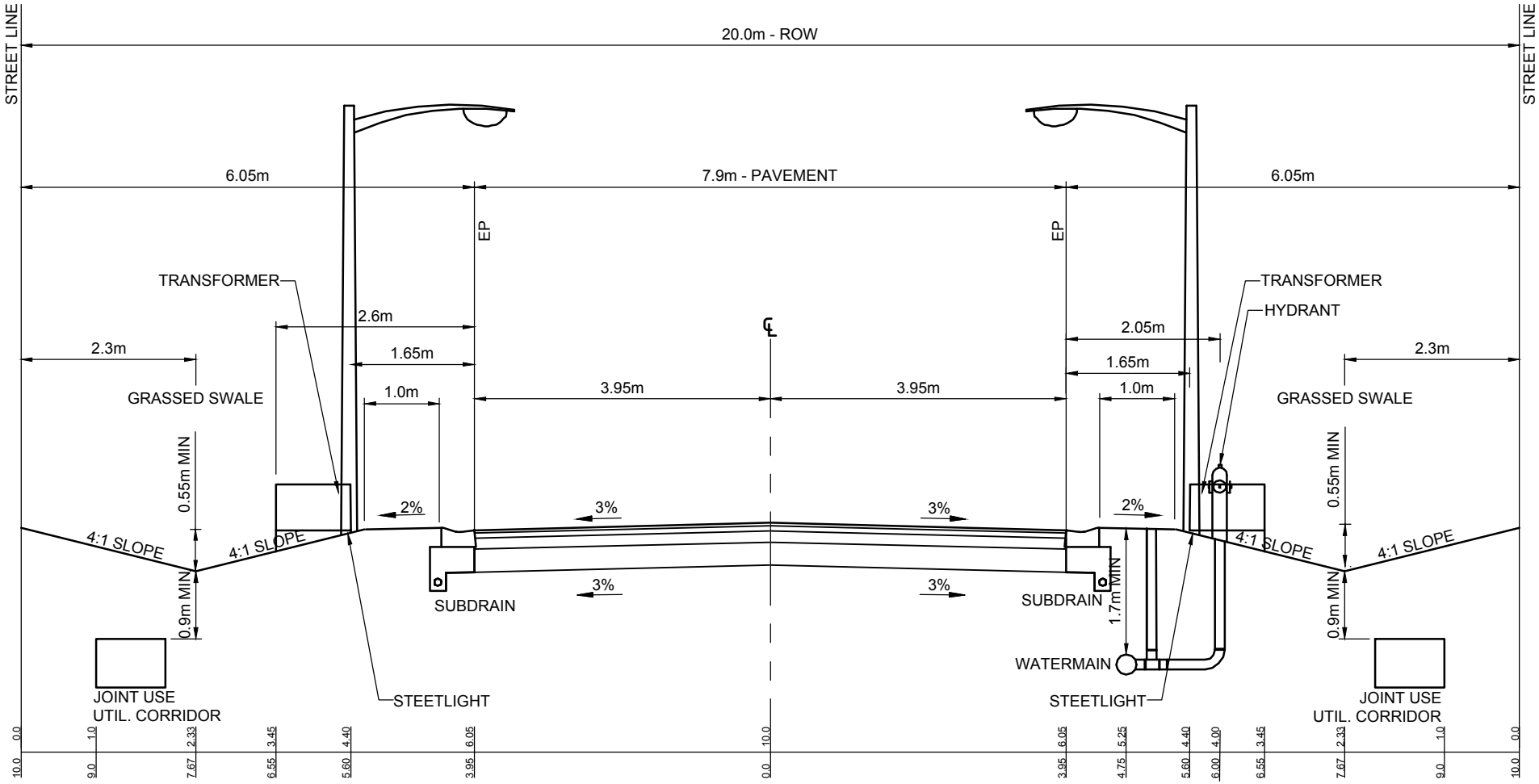
For lots 1, 2, and 3, driveway design, including provision for fire department access, would be undertaken at the Site Plan and Build Permit application stages. At this stage (Draft Plan approval), only the driveway for Lot 1 is expected to exceed 90 metres in length from a public thoroughfare: a turnaround around area has been included for Lot 1.

Lots 4, 5, 6, 7, and 8 would be located on Tivoli Circle. The proposed road associated with Tivoli Circle will comprise a combined rural and urban road cross-section. The right of way width for Tivoli Circle would be 20 metres. The pavement width would be 7.9 metres consistent with Town of Caledon Standard No. 202.

The cross section of Tivoli Circle (refer to Figure 8.1) would comprise a curbed road with grass swales to better reflect the rural setting, accept drainage from adjacent lots where applicable, encourage passive infiltration of storm water, provide linear storage in the conveyance system to dampen hydrologic response, and provide pre-treatment of storm water prior to discharge to the bioretention area. Within the road right of way, where applicable, driveway culverts would be provided for the lots and also, if required, to access infrastructure such as fire hydrants and transformers. Where possible, the utilities and services would be located along one side of the road. Drainage from the paved section of road to the grass swales would be via curb outlets.

8.2 Road Design

The proposed road horizontal alignment, vertical profile, and preliminary road grades are shown on the engineering drawings provided in Appendix E. Design of the road in both plan and profile is in general conformance with Town of Caledon Development Standards Manual (2019). Vertical curves have been incorporated in the preliminary road design for Tivoli Circle and driveways for lots 1, 2, and 3. A schematic of the typical road cross-section for Tivoli Circle is provided in Figure 8.1.



NOTES

1. CROSS SECTION ORIENTED LOOKING WEST INTO THE SUBDIVISION.
2. THE INFORMATION SHOWN HEREIN IS PRELIMINARY AND SUBJECT TO DETAILED DESIGN.

FIGURE 8.1

LAURELPARK SUBDIVISION - PROPOSED TYPICAL 20.0m ROW ROAD CROSS-SECTION

SCALE: N.T.S.

Calder Engineering Ltd.

9.0 EROSION AND SEDIMENT CONTROL

9.1 General

An Erosion and Sediment Control Plan will be prepared at the detailed design stage consistent with the Town of Caledon Development Standards Manual (2019) and the Erosion & Sediment Control Guideline for Urban Construction prepared by the Greater Golden Horseshoe Area Conservation Authorities (2006). For project construction, the key items will be limiting construction activities to defined working areas, managing water from dewatering activities, and managing surface runoff. Summarized in Table 9.1 are general procedures and mitigation measures to be implemented to avoid impacts. A preliminary Erosion and Sediment Control Plan for the project is provided in Appendix E.

TABLE 9.1: GENERAL PROCEDURES AND MITIGATION MEASURES FOR EROSION AND SEDIMENT CONTROL

Principle No.	Description
1.	Prepare a typical Erosion and Sediment Control Plan for the project construction outside of stream crossings and water bodies.
2.	Install temporary sediment controls prior to the start of construction per the typical details on the Erosion and Sediment Control Plan.
3.	Delineate the working area prior to the start of construction and confine operations to the defined area.
4.	Enclose temporary topsoil and subsoil stockpile areas with sediment control fence.
5.	Maintain construction accesses, working areas, and temporary material storage areas in good repair.
6.	Operate machinery in a manner that minimizes disturbance to the environment: - protect entrances at machinery access points (e.g., using swamp mats, log mats, or rock pads), and establish single site entry and exit points. - construction equipment and machinery to arrive on site in a clean condition and be maintained free of fluid leaks. - no equipment operation on the streambed and in flowing water. - wash, refuel and service machinery and store fuel and other materials in designated areas away from water bodies. - keep an emergency spill kit on site in case of fluid leaks or spills.
7.	Inspect, maintain, and repair sediment controls until completion of construction and site restoration.
8.	Keep additional erosion and sediment control materials, such as sediment control fencing and clear stone, on-site for emergencies and repairs.
9.	Remove and dispose temporary sediment controls following completion of construction and site restoration.
10.	Vegetate any disturbed areas by planting and seeding preferably with native grasses and cover such areas with mulch to prevent soil erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with mulch, straw, or erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following growing season.

The erosion and sediment controls will comprise management actions and measures to be implemented prior to any land grading or construction activities on the site. Consistent with

the Town of Caledon Development Standards Manual (2019), erosion and temporary sediment controls would be inspected on a weekly basis and after each rain event 10 millimetres or greater or a significant snow melt. These inspections would ensure that the controls are in proper working condition and maintained. A permanent record of these inspections is required to be forwarded to the Town of Caledon Finance and Infrastructure Department within five days of the inspection.

All disturbed ground left inactive, including topsoil stockpiles, would be stabilized by seeding, sodding, mulching or covering, or equivalent control measures. The period of time of inactivity shall not exceed 30 days, unless otherwise authorized by the Project Manager.

9.2 Topsoil Management Plan

Consistent with the Town of Caledon Development Standards Manual (2019), all stockpiles containing more than 100 cubic metres of material shall be located a minimum of 10 metres away from the roadway, drainage channels, or an occupied residential lot. The maximum side-slopes for topsoil stockpiles shall be 3.0 horizontal to 1.0 vertical. Location of topsoil stockpiles on lands to be dedicated to the public is prohibited. Topsoil stockpiles shall be located, where possible, on private lands between houses and on rear yards.

The Geotechnical Report for the project prepared by Terraprobe Inc. (2017) has identified a 250 to 400 mm layer of topsoil across the site. Construction of site services will involve stripping and stockpiling of topsoil associated with the road right of way and a strip along the right of way to facilitate grading.

Based on an assumed average topsoil depth of 300 mm, it is estimated that the volume of topsoil to be managed during the site servicing phase is 2,000 cubic metres. The estimated 2,000 cubic metres of topsoil would be managed as follows:

- 2,000 cubic metres stripped from the road right-of-way plus an average width of 5 metres on each side and stockpiled

- 1,500 cubic metres of topsoil removed from the stockpiles and placed on the boulevard and bioretention area

- the remaining 500 cubic metres of topsoil from the stockpiles spread on the lots as lot and house construction progresses

It is anticipated that no topsoil will be either exported from the site or imported to the site.

Each estate lot, within the structure envelope, will be individually graded based on house design and orientation, and driveway and septic system design. Topsoil would remain on the property during grading. Once house, driveway, septic system construction, and lot grading is completed, the topsoil would be spread and seeded. Any lots with a topsoil deficit could have material supplemented from the topsoil stockpile.

The location of topsoil stockpile(s) would be determined following Draft Plan approval at the detailed design stage. For erosion and sediment control planning, it would be specified that any stockpiles remaining at the end of the season will be hydroseeded with a native seed mixture and closed off with full perimeter sediment control fence.

9.3 Emergency Contact Information

As part of the erosion and sediment control planning process, emergency contact numbers would be provided on the project engineering drawings, and a contact list kept on-site and be readily available. An example emergency contact list is provided in Table 9.1. The applicable contacts would be confirmed and updated, as required, at the detailed design and construction stages.

TABLE 9.1: EROSION AND SEDIMENT CONTROL PLAN EMERGENCY CONTACT LIST

Name/Agency	Phone Number
Town of Caledon – Finance and Infrastructure	(905) 584-2272
Toronto and Region Conservation Authority	(416) 661-6600
Ministry of the Environment, Conservation and Parks Spills Reporting	(416) 325-3000
Owner – Laurelpark Inc.	(905) 822-2615
Project Engineer – Calder Engineering Ltd.	(905) 857-7600

10.0 UTILITY SERVICES

It is proposed that gas and communication utilities will be provided for the Laurelpark Subdivision by connection to existing utilities either (i) in vicinity of the intersection of Oak Knoll Drive and Mount Pleasant Road, (ii) along Mount Pleasant Road, or (iii) available from Diamondwood Drive. Oak Knoll Drive is located approximately 130 metres north of the proposed entrance to the Laurelpark Subdivision.

Electrical power to the site will be provided by connection to existing power line infrastructure either on Mount Pleasant Road or Diamondwood Drive.

11.0 SUMMARY

1. Calder Engineering Ltd. has been retained by Laurelpark Inc. to complete a Preliminary Engineering and Stormwater Management Report for the proposed Laurelpark Subdivision in the Palgrave Estate Residential Community of the Town of Caledon. The report is supporting documentation for the respective subdivision Draft Plan application and has been prepared to meet requirements of sections 7.1.18.7 and 7.1.18.8 of the Town of Caledon Official Plan and applicable sections of the Oak Ridges Moraine Conservation Plan (Ontario Regulation 140/02).

2. The overall site comprises approximately 10.38 hectares or 25.64 acres. It is proposed to develop the site with 8 estate residential lots using a combined rural and urban road cross-section, individual private septic systems for sewage disposal, and municipal water. Drainage and storm water would be managed using an adaptive stormwater management approach and application of Low Impact Development (LID) practices. The objective of the adaptive stormwater management approach is to provide the framework and process for meeting Town of Caledon and Conservation Authority stormwater management criteria, and protection of site environmental features.

3. The site is part of the Humber River Watershed. Surface flow on the site is typically via sheet flow to the topographic lows and then off-site via either intermittent or ephemeral drainage features. A portion of the site drains northward and a portion drains southward: both to tributaries of Cold Creek which is part of the Humber River Watershed. Cold Creek is a tributary of the main branch of the Humber River. The site falls within the jurisdiction of the Toronto and Region Conservation Authority.

4. Drainage and storm water would be managed using an adaptive stormwater management approach and application of Low Impact Development (LID) practices. The objective of the adaptive stormwater management approach is to provide the framework and process for meeting Town of Caledon and Conservation Authority stormwater management criteria and protection of site environmental features. The approach includes:

    - establishment of stormwater management criteria
    - establishment of performance objectives
    - outline of a stormwater management strategy
    - monitoring to gain additional information on site natural features and groundwater conditions
    - identification of indicators to assess effectiveness of the stormwater management strategy
    - identification of triggers to initiate review of the stormwater management strategy
    - development of contingency plans and adaptive management measures to offset any identified impacts

5. The proposed stormwater management strategy comprises a “treatment train” approach utilizing a combination of lot level controls and Low Impact Development (LID) measures to minimize potential increases in volume of runoff and provide, as far as practical, a natural hydrologic response. Measures are proposed to be undertaken at the source, and conveyance and end of pipe locations, and are as follows:

- recharge of residential roof and driveway storm water by direction to grassed and naturalized areas to promote filtering and natural infiltration;

- discharge of foundation drain water to rear and side lot areas;

- by lot grading, direction of structure envelope drainage, via sheet flow, towards grassed and naturalized areas versus the road right of way;

- as far as practical, application of grassed swales for road drainage versus a piped storm sewer system;

- use of an oil/grit separator where road drainage is to a bioretention area; and

- use of a bioretention area to temporarily detain and slowly release storm water to meet applicable stormwater management criteria.

The use of grassed swales versus a piped storm sewer system is proposed to encourage passive infiltration of storm water, provide linear storage in the conveyance system to dampen hydrologic response, and provide pre-treatment of storm water prior to discharge to the bioretention area. Where road drainage is directed to a bioretention area, pre-treatment is provided by a combination of grassed swales and an oil/grit separator.

6. Hydrologic modelling and “desk-top” assessments were performed to develop and evaluate the proposed Stormwater Management Plan. Based on the respective technical analyses, proposed stormwater management criteria for quantity control, quality control, erosion control, and water balance can be achieved.

7. The minor and major drainage system will consist of both the proposed road system, grassed swales, and storm sewers. As much as practical, the existing natural drainage patterns will be maintained. The drainage system will be designed to manage storm water for up to the 100-year design storm consistent with Town of Caledon Development Standards Manual (2019) and Toronto and Region Conservation stormwater management criteria. Peak flows up to the 100-year design level would be contained within the municipal road right-of-way, and a bioretention area prior to release to the environment.

8. Sanitary servicing for the proposed subdivision will be by individual on-site sewage disposal systems (e.g., septic systems). Subject to detailed design at the Building Permit application stage, it is anticipated that the on-site sewage disposal systems would comprise a septic tank(s) sized at twice the daily design flow, effluent filter, tertiary treatment unit, dispersal bed, and ancillary piping, pumping system(s), and controls. A tertiary treatment unit is anticipated required to fit the respective dispersal bed within the lot structure envelope in conjunction with the dwelling and driveway features.

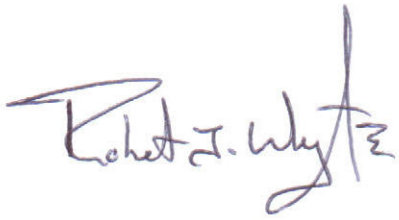
9. The Laurelpark Subdivision will be serviced by municipal water. There is an existing 300-millimetre diameter watermain located on the west side of Mount Pleasant Road and a 50-millimetre watermain on the Diamondwood Drive cul-de-sac. It is proposed that lots 4 through 8 on Tivoli Circle of the Laurelpark Subdivision be serviced by a 150-millimetre diameter watermain connected to the 300-millimetre watermain on Mount Pleasant

Road. The Tivoli Circle watermain would be complete with required appurtenances such as valving and hydrants. On the western portion of the site, the water services for lots 1, 2, and 3 would be connected to the existing 50-millimetre diameter watermain associated with the Diamondwood Drive cul-de-sac. Each lot would have a separate water service. The water distribution system would be designed, supplied, and installed in general conformance with the Region of Peel Public Works Design, Specifications and Procedures Manual, Linear Infrastructure, Watermain Design Criteria (2010).

10. Considerations are provided for erosion and sediment control planning and a preliminary Erosion and Sediment Control Plan prepared for the project. Erosion and sediment control planning would be undertaken consistent with the Town of Caledon Development Standards Manual (2019) and the Erosion & Sediment Control Guideline for Urban Construction prepared by the Greater Golden Horseshoe Area Conservation Authorities (2006).

Respectfully submitted,

CALDER ENGINEERING LTD.





Robert J. Whyte, M.Sc., P.Eng.
Project Manager

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APPENDIX A

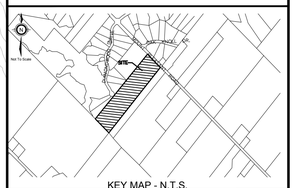
DRAFT PLAN

DRAFT PLAN OF SUBDIVISION

LAURELPARK ESTATES

PLAN OF SURVEY OF
PART OF LOT 19, CONCESSION 8
(GEOGRAPHIC TOWNSHIP OF ALBION)
TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL

PIN 14333-0428



KEY MAP - N.T.S.

BENCHMARK
AN ELEVATION OF 283.85m

INFORMATION REQUIRED

UNDER SECTION 51 (17) OF THE PLANNING ACT, R.S.O. 1990. c.P.13 AS AMENDED

(a) - AS SHOWN
(b) - AS SHOWN
(c) - AS SHOWN
(d) - AS LISTED BELOW
(e) - AS SHOWN
(f) - AS SHOWN
(g) - AS SHOWN
(h) - MUNICIPAL WATER
(i) - GLACIAL TILL
(j) - AS SHOWN
(k) - SEPTIC SANITARY AND STORM SEWERS
(l) - NONE

SURVEYOR'S CERTIFICATE

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

SIGNED _____

PETER T. RAIKES, BSc., CLS, O.L.S.
EPLETT WORDBEC RAIKES SURVEYING INC.
Ontario Land Surveyors

DATE _____

OWNER'S CERTIFICATE

I HEREBY CONSENT TO THE FILING OF THIS PLAN BY IBI GROUP, IN DRAFT FORM.

SIGNED _____

MARK CROWE
LAURELPARK INC.

DATE _____

SIGNED _____

GIUSEPPE AND EKATERINI TASSONE
44 DIAMONDWOOD DRIVE (LOT 9)

DATE _____

SIGNED _____

GIUSEPPE PAGANO AND LISA MARIE DONOVAN
35 DIAMONDWOOD DRIVE (LOT 10)

DATE _____

LAND USE SCHEDULE

LOTS/BLKS	LAND USE	AREA	POTENTIAL # OF UNITS MIN	MAX
RESIDENTIAL				
LOTS 1-8	ESTATE RESIDENTIAL	4.217	8	8
BLKS. 9,10 & 11	OPEN SPACE	5.577		
BLK. 12	ROAD WIDENING	0.048		
BLK. 13	SWM POND	0.128		
ROW		0.410		
TOTAL		10.381	8	8

#	DATE	BY	DESCRIPTION
			REVISIONS
7	2020-02-18	BC	REVISIONS TO P/N
6	2020-02-06	BC	REVISIONS TO DRAFT PLAN PER CALDER REVISIONS
5	2019-03-18	BC	REVISIONS TO DRAFT PLAN
4	2018-10-16	BC	REVISIONS TO DRAFT PLAN PER CALDER REVISIONS
3	2018-08-09	BC	REVISIONS TO DRAFT PLAN
2	2018-03-26	BC	REVISIONS TO DRAFT PLAN PER CITY COMMENTS
1	2017-06-13	GD	DRAFT PLAN FOR SUBMISSION

APPROVALS

APPROVED: DATE:

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED UNDER THE SUPERVISION OF A REGISTERED PROFESSIONAL PLANNER, WITHIN THE MEANING OF THE ONTARIO PROFESSIONAL PLANNERS INSTITUTE ACT, 1994

DESIGNED BY:	GD	DATE:	2018-03-26
DRAWN BY:	BC	FILE NUMBER:	39680
CHECKED BY:	SA	SHEET NUMBER:	DP1

IBI GROUP
200 East Wing-360 James Street North
Hamilton ON L8L 1H5 Canada
tel 905 546 1010 fax 905 546 1011
ibigroup.com

LOT BREAKDOWN

LOT #	STRUCTURAL ENVELOPE AREA (ha) (developable land)	NATURAL AREA (ha) (Protected/Restoration Area)	TOTAL LOT AREA (ha)
1	0.564	0.032	0.596
2	0.475	0.050	0.525
3	0.500	0.191	0.691
4	0.451	0.000	0.451
5	0.452	0.000	0.452
6	0.408	0.193	0.601
7	0.428	0.022	0.450
8	0.451	0.000	0.451

PROTECTED/RESTORATION AREAS
TOTAL AREA = 0.488ha

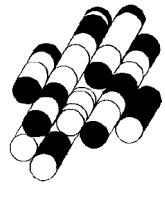
FILE:J:\39680_Laurelpark\5.9 Drawings\59plnn\current\39680dp.dwg LAYOUT:DRAFT PLAN
LAST SAVED BY:Brianne.comley, Tuesday, February 18, 2020 3:32:23 PM PLOTTED BY:Brianne Comley Tuesday, February 18, 2020 3:32:41 PM

APPENDIX B

GEOTECHNICAL DOCUMENTS

APPENDIX

TERRAPROBE INC.



Terraprobe

ABBREVIATIONS AND TERMINOLOGY

SAMPLING METHODS

AS	auger sample
CORE	cored sample
DP	direct push
FV	field vane
GS	grab sample
SS	split spoon
ST	shelby tube
WS	wash sample

PENETRATION RESISTANCE

Standard Penetration Test (SPT) resistance ('N' values) is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a standard 50 mm (2 in.) diameter split spoon sampler for a distance of 0.3 m (12 in.).

Dynamic Cone Test (DCT) resistance is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a conical steel point of 50 mm (2 in.) diameter and with 60° sides on 'A' size drill rods for a distance of 0.3 m (12 in.)."

COHESIONLESS SOILS

Compactness	'N' value
very loose	< 4
loose	4 – 10
compact	10 – 30
dense	30 – 50
very dense	> 50

COHESIVE SOILS

Consistency	'N' value	Undrained Shear Strength (kPa)
very soft	< 2	< 12
soft	2 – 4	12 – 25
firm	4 – 8	25 – 50
stiff	8 – 15	50 – 100
very stiff	15 – 30	100 – 200
hard	> 30	> 200

COMPOSITION

Term (e.g)	% by weight
trace silt	< 10
some silt	10 – 20
silt*y*	20 – 35
sand *and* silt	> 35

TESTS AND SYMBOLS

MH	mechanical sieve and hydrometer analysis
w, w_c	water content
w_L, LL	liquid limit
w_P, PL	plastic limit
I_P, PI	plasticity index
k	coefficient of permeability
γ	soil unit weight, bulk
G_s	specific gravity
φ'	internal friction angle
c'	effective cohesion
c_u	undrained shear strength

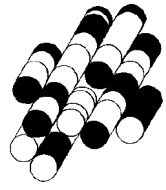
▽	Unstabilized water level
▼	1st water level measurement
▼	2nd water level measurement
▼	Most recent water level measurement
3.0 +	Undrained shear strength from field vane (with sensitivity)
C_c	compression index
c_v	coefficient of consolidation
m_v	coefficient of compressibility
e	void ratio

FIELD MOISTURE DESCRIPTIONS

Damp	refers to a soil sample that does not exhibit any observable pore water from field/hand inspection.
Moist	refers to a soil sample that exhibits evidence of existing pore water (e.g. sample feels cool, cohesive soil is at plastic limit) but does not have visible pore water
Wet	refers to a soil sample that has visible pore water

BOREHOLE LOGS

TERRAPROBE INC.



Terraprobe

BOREHOLE LOG 1

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No.: 11-13-3052

Date started : May 16, 2013

Sheet No. : 1 of 1

Position : E: 598025, N: 4865443 (UTM 17T)

Elevation Datum : Geodetic (NAD83)

Rig type : track-mounted

Drilling Method : Solid stem augers

Depth Scale (m)	Elev / Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
0	273.1	**GROUND SURFACE**				
	272.8 / 0.3	250mm **TOPSOIL**		1	SS	5
		Trace organics (WEATHERED/DISTURBED)				
	272.3 / 0.8	**SILT**, trace to some sand, trace to some clay, trace gravel, compact, brown, moist		2	SS	23
1				3	SS	24
2				4	SS	26
3				5	SS	23
4	268.5 / 4.6	**CLAYEY SILT to SILT AND CLAY**, trace sand, trace gravel, stiff to very stiff, grey, moist (GLACIAL TILL)		6	SS	13
5						
6	266.5 / 6.6			7	SS	20

END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

Elevation Scale (m): 273, 272, 271, 270, 269, 268, 267

Penetration Test Values (Blows / 0.3m) × Dynamic Cone: 10, 20, 30, 40

Undrained Shear Strength (kPa): ○ Unconfined, ● Pocket Penetrometer, + Field Vane, ■ Lab Vane; 40, 80, 120, 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit; PL, MC, LL; 10, 20, 30

Headspace Vapour

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)

GR SA SI CL

0 1 80 19

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
May 24, 2013	0.4	272.7

library: library - terraprobe gint.glb report: terraprobe soil log file: 11-13-3052 bh logs.gpj

Terraprobe

BOREHOLE LOG 2

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No.: 11-13-3052

Date started : May 16, 2013

Sheet No. : 1 of 1

Position : E: 598111, N: 4865495 (UTM 17T)

Elevation Datum : Geodetic (NAD83)

Rig type : track-mounted

Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
0	280.0	**GROUND SURFACE**				
	279.7	300mm **TOPSOIL**		1	SS	5
	0.3	Trace organics (WEATHERED/DISTURBED)				
	279.2					
	0.8	**SILT**, trace to some sand, trace to some clay, trace gravel, (possible intermittent sand seams), compact, brown, moist		2	SS	13
1						
				3	SS	28
2						
				4	SS	20
3		...silty sand		5	SS	23
4						
				6	SS	29
5						
	273.9					
6	6.1	**CLAYEY SILT**, trace sand, trace gravel, hard, brown, moist (GLACIAL TILL)		7	SS	35
	273.4					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 280, 279, 278, 277, 276, 275, 274

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

0 12 77 11

Unstabilized water level measured at 6.0m below ground surface; borehole was open upon completion of drilling.

library: library - terraprobe gint.glb report: terraprobe soil log file: 11-13-3052 bh logs.gpj

Terraprobe

BOREHOLE LOG 3

Client : Laurelpark Inc.
Project : Palgrave Estates II
Location : Caledon, Ontario

Project No.: 11-13-3052
Date started : May 16, 2013
Sheet No. : 1 of 1

Position : E: 295137, N: 4865588 (UTM 17T)
Elevation Datum : Geodetic (NAD83)
Rig type : track-mounted
Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
0	281.9	**GROUND SURFACE**				
		400mm **TOPSOIL**		1	SS	4
	281.5 0.4	Trace organics (WEATHERED/DISTURBED)				
	281.1 0.8	**SILT**, trace to some sand, trace to some clay, trace gravel, compact to dense, brown, moist		2	SS	28
1				3	SS	23
2		...silty sand below		4	SS	17
3				5	SS	25
4				6	SS	39
5						
6		...some clay		7	SS	48
	275.3 6.6					

Elevation Scale (m): 281, 280, 279, 278, 277, 276

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

library: library - terraprobe.gint.glb **report:** terraprobe soil log **file:** 11-13-3052 bh logs.gpj

Terraprobe

BOREHOLE LOG 4

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No.: 11-13-3052

Date started : May 16, 2013

Sheet No. : 1 of 1

Position : E: 598223, N: 4865593 (UTM 17T)

Elevation Datum : Geodetic (NAD83)

Rig type : track-mounted

Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity (PL, MC, LL)	Headspace Vapour	Instrument Details	Unstabilized Water Level	Lab Data and Comments / GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	281.9	**GROUND SURFACE**											
	281.6	300mm **TOPSOIL**		1	SS	6							
	0.3	Trace organics (WEATHERED/DISTURBED)											
	281.1												
	0.8	**SILT**, some clay to clayey silt, trace sand, trace gravel, stiff to hard, brown, moist (GLACIAL TILL)		2	SS	13	281						
1													
				3	SS	24	280						
2													
				4	SS	31	279						
3													
				5	SS	26	278						3 9 69 19
4													
				6	SS	42	277						
5													
		...grey below		7	SS	27	276						
6	275.3												
	6.6	**END OF BOREHOLE**											

Penetration Test Values (Blows / 0.3m): × Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): ○ Unconfined ● Pocket Penetrometer + Field Vane ■ Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit | Natural Water Content | Liquid Limit; PL MC LL; 10 20 30

Borehole was dry and open upon completion of drilling.

library: library - terraprobe gint.glb report: terraprobe soil log file: 11-13-3052 bh logs.gpj

Terraprobe

BOREHOLE LOG 5

Client : Laurelpark Inc.
Project : Palgrave Estates II
Location : Caledon, Ontario

Project No.: 11-13-3052
Date started : May 16, 2013
Sheet No. : 1 of 1

Position : E: 598309, N: 4865735 (UTM 17T)
Elevation Datum : Geodetic (NAD83)
Rig type : track-mounted
Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)
	285.2	**GROUND SURFACE**					
0	284.9	300mm **TOPSOIL**		1	SS	7	285
	0.3	Trace organics (WEATHERED/DISTURBED)					
	284.4						
	0.8	**SANDY SILT to SILT AND SAND**, trace clay, trace gravel, compact to dense, brown, moist		2	SS	18	
1							284
				3	SS	20	
2							283
				4	SS	20	
3		...silty sand		5	SS	28	282
4							281
				6	SS	31	
5							280
6		...very dense		7	SS	76	279
	278.6						
	6.6	**END OF BOREHOLE**					

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40
Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Instrument Details

Unstabilized Water Level

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL
1 67 29 3

Borehole was dry and open upon completion of drilling.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
May 24, 2013	dry	n/a

library: library - terraprobe.gint.glb report: terraprobe soil log file: 11-13-3052 bh logs.gpj

Terraprobe

BOREHOLE LOG 6

Client : Laurelpark Inc.
Project : Palgrave Estates II
Location : Caledon, Ontario

Project No.: 11-13-3052
Date started : May 15, 2013
Sheet No. : 1 of 1

Position : E: 598386, N: 4865796 (UTM 17T)
Elevation Datum : Geodetic (NAD83)
Rig type : track-mounted
Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
	278.0	**GROUND SURFACE**				
0	277.7	300mm **TOPSOIL**		1	SS	5
	0.3	**FILL**, clayey silt, trace to some sand, trace gravel, trace organics, topsoil, firm, brown / grey, moist				
1		...(REWORKED/DISTURBED)		2	SS	6
	276.5					
	1.5	**SILT**, trace to some sand, trace to some clay, trace gravel, (possible intermittent sand seams), compact to dense, brown, moist		3	SS	31
2				4	SS	18
3		...grey below		5	SS	32
4						
				6	SS	49
5						
6		...very dense		7	SS	70
	271.4					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 278, 277, 276, 275, 274, 273, 272

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

spoon wet

0 11 79 10

Unstabilized water level measured at 1.2m below ground surface; borehole was open upon completion of drilling.

library: library - terraprobe.gint.glb report: terraprobe soil log file: 11-13-3052 bh logs.gpj

Terraprobe

BOREHOLE LOG 7

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No.: 11-13-3052

Date started : May 15, 2013

Sheet No. : 1 of 1

Position : E: 598421, N: 4865843 (UTM 17T)

Elevation Datum : Geodetic (NAD83)

Rig type : track-mounted

Drilling Method : Solid stem augers

Depth Scale (m)	Elev / Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value	Elevation Scale (m)
0	280.3	**GROUND SURFACE**					280
	279.9 / 0.4	350mm **TOPSOIL**		1	SS	6	
	279.5 / 0.8	Trace organics (WEATHERED/DISTURBED)					
1		**SILT**, trace to some sand, trace to some clay, trace gravel, (possible intermittent sand seams), compact to very dense, brown, moist		2	SS	17	279
				3	SS	25	
2							278
				4	SS	34	
3				5	SS	55	277
4							276
		...grey below		6	SS	67	
5							275
6				7	SS	68	274
	273.7 / 6.6						

END OF BOREHOLE

Unstabilized water level measured at 5.9m below ground surface; borehole was open upon completion of drilling.

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40
Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

spoon wet



library: library - terraprobe gint.glb report: terraprobe soil log file: 11-13-3052 bh logs.gpj

Terraprobe

BOREHOLE LOG 8

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No.: 11-13-3052

Date started : May 15, 2013

Sheet No. : 1 of 1

Position : E: 598465, N: 4865898 (UTM 17T)

Elevation Datum : Geodetic (NAD83)

Rig type : track-mounted

Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
	280.9	**GROUND SURFACE**				
0	280.6	300mm **TOPSOIL**		1	SS	6
	0.3	**FILL**, clayey silt, trace to some sand, trace gravel, trace organics, topsoil, firm, brown / grey, moist				
1		...(REWORKED/DISTURBED)		2	SS	7
	279.4					
	1.5	**SILT**, trace to some sand, trace to some clay, trace gravel, (possible intermittent sand seams), compact to very dense, brown, moist to wet		3	SS	13
2						
				4	SS	25
3						
				5	SS	45
4						
				6	SS	73
5						
6		...grey below		7	SS	56
	274.3					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 280, 279, 278, 277, 276, 275

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

spoon wet

0 11 77 12

Unstabilized water level measured at 5.5m below ground surface; borehole was open upon completion of drilling.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
May 24, 2013	0.6	280.3

library: library - terraprobe gint.glb report: terraprobe soil log file: 11-13-3052 bh logs.gpj

Terraprobe

BOREHOLE LOG 9

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No.: 11-13-3052

Date started : May 16, 2013

Sheet No. : 1 of 1

Position : E: 598343, N: 4865854 (UTM 17T)

Elevation Datum : Geodetic (NAD83)

Rig type : track-mounted

Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)
	282.7	**GROUND SURFACE**					
0	282.4	300mm **TOPSOIL**		1	SS	6	
	0.3	Trace organics (WEATHERED/DISTURBED)					
	281.9						282
1	0.8	**SILT**, trace to some sand, trace to some clay, trace gravel, compact to dense, brown, moist		2	SS	12	
				3	SS	12	281
2							
				4	SS	30	280
3							
				5	SS	34	279
4							
				6	SS	45	278
5							
							277
6				7	SS	41	
	276.1						
	6.6	**END OF BOREHOLE**					

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL
0 8 77 15

Borehole was dry and open upon completion of drilling.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
May 24, 2013	2.5	280.2

library: library - terraprobe gint.glb report: terraprobe soil log file: 11-13-3052 bh logs.gpj

Terraprobe

BOREHOLE LOG 10

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No.: 11-13-3052

Date started : May 15, 2013

Sheet No. : 1 of 1

Position : E: 598480, N: 4865808 (UTM 17T)

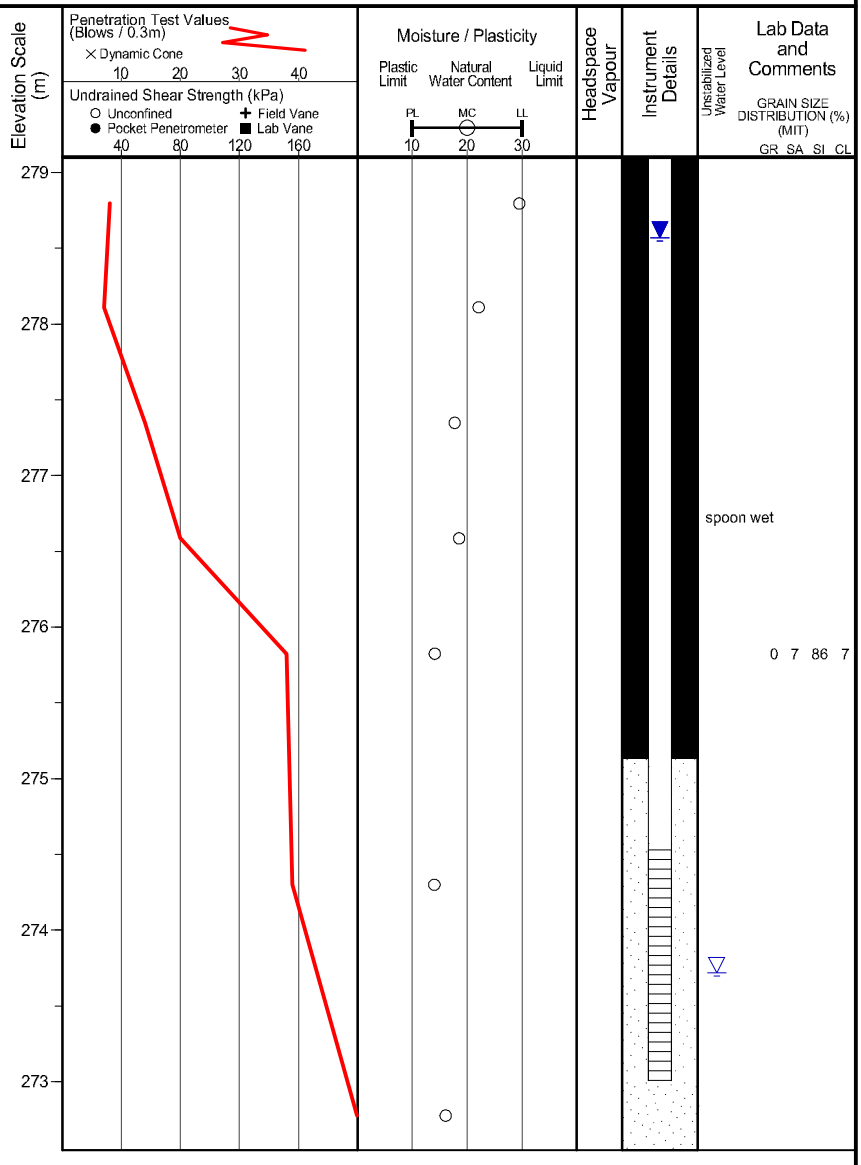
Elevation Datum : Geodetic (NAD83)

Rig type : track-mounted

Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
	279.1	**GROUND SURFACE**				
0	278.7	350mm **TOPSOIL**		1	SS	8
	0.4	**FILL**, silt, some sand, trace to some clay, trace organics, topsoil presence, loose, brown / grey, moist ...(REWORKED/DISTURBED)		2	SS	7
1	277.6					
	1.5	**SILT**, trace to some sand, trace to some clay, trace gravel, (possible intermittent sand seams), compact to dense, brown, moist		3	SS	14
2				4	SS	20
3				5	SS	38
4		...grey below		6	SS	39
5						
6	273.0					
	6.1	**CLAYEY SILT**, trace sand, trace gravel, hard, grey, moist (GLACIAL TILL)		7	SS	58
	272.5					
	6.6	**END OF BOREHOLE**				

Unstabilized water level measured at 5.4m below ground surface; borehole was open upon completion of drilling.



WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
May 24, 2013	0.5	278.6

library: library - terraprobe gint.glb report: terraprobe soil log file: 11-13-3052 bh logs.gpj

Terraprobe

BOREHOLE LOG 11

Client : Laurelpark Inc.
Project : Palgrave Estates II
Location : Caledon, Ontario

Project No.: 11-13-3052
Date started : May 16, 2013
Sheet No. : 1 of 1

Position : E: 598392, N: 4865760 (UTM 17T)
Elevation Datum : Geodetic (NAD83)
Rig type : track-mounted
Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
0	280.2	**GROUND SURFACE**				
	279.9 0.3	300mm **TOPSOIL**		1	SS	6
	279.4 0.8	Trace organics (WEATHERED/DISTURBED)				
1		**SILT**, trace to some sand, trace to some clay, trace gravel, (possible intermittent sand seams), compact to very dense, brown, moist		2	SS	24
				3	SS	37
2						
				4	SS	62
3		...grey below		5	SS	49
4						
				6	SS	62
5						
6				7	SS	62
	273.8 6.4	**END OF BOREHOLE**				

Elevation Scale (m): 280, 279, 278, 277, 276, 275, 274

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40
Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL
0 7 81 12
0 9 80 11

Borehole was dry and open upon completion of drilling.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
May 24, 2013	1.2	279.0

library: library - terraprobe gint.glb report: terraprobe soil log file: 11-13-3052 bh logs.gpj

Terraprobe

BOREHOLE LOG 12

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No.: 11-13-3052

Date started : May 16, 2013

Sheet No. : 1 of 1

Position : E: 598168, N: 4865581 (UTM 17T)

Elevation Datum : Geodetic (NAD83)

Rig type : track-mounted

Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
	285.3	**GROUND SURFACE**				
0	284.9	350mm **TOPSOIL**		1	SS	4
	0.4	Trace organics (WEATHERED/DISTURBED)				
	284.5					
	0.8	**SANDY SILT to SILT AND SAND**, trace clay, trace gravel, compact to very dense, brown, moist		2	SS	26
1						
				3	SS	20
2						
				4	SS	24
3				5	SS	41
4						
				6	SS	67
5						
6				7	SS	43
	278.7					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 285, 284, 283, 282, 281, 280, 279

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL
0 36 57 7

Borehole was dry and open upon completion of drilling.

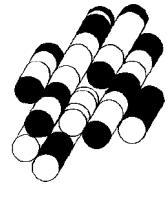
WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
May 24, 2013	dry	n/a

library: library - terraprobe gint.glb report: terraprobe soil log file: 11-13-3052 bh logs.gpj

TEST PIT LOGS

TERRAPROBE INC.



Terraprobe

TEST PIT LOG 1

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No. : 11-13-3052

Date excavated : August 15, 2013

Sheet No. : 1 of 1

Position : E: 598036, N: 4865443 (UTM 17T) Elevation Datum : N/A

Rig type : BACKHOE

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type
0.0		**GROUND SURFACE**			
		300mm **TOPSOIL**			
	0.3	Trace organics (WEATHERED/DISTURBED)		1	GS
0.5	0.5	**SILT**, trace to some sand, trace to some clay, trace gravel, compact, brown / grey, moist		2	GS
1.0					
1.5					
2.0		...wet below		3	GS
	2.4	**END OF TEST PIT**			

Elevation Scale (m)

Undrained Shear Strength (kPa)
○ Unconfined
● Pocket Penetrometer
+ Field Vane
■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit (PL) | Natural Water Content (MC) | Liquid Limit (LL)
10 20 30

Headspace Vapour

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Unstabilized water level measured at 2.3m below grade; test pit was open upon completion of excavation.

SEEPAGE MEASUREMENTS

Time	Water Depth (m)	Elevation (m)
8/19/2013	1.9	
8/23/2013	1.7	

library: library - terraprobe gint.glb report: terraprobe test pit log file: 11-13-3052 test pit logs.gpj

Terraprobe

TEST PIT LOG 2

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No. : 11-13-3052

Date excavated : August 15, 2013

Sheet No. : 1 of 1

Position : E: 598040, N: 4865462 (UTM 17T) Elevation Datum : N/A

Rig type : BACKHOE

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type
0.0		**GROUND SURFACE**			
		250mm **TOPSOIL**			
	0.3	Trace organics (WEATHERED/DISTURBED)		1	GS
0.5	0.5	**SILT**, trace to some sand, trace to some clay, trace gravel, compact, brown / grey, moist		2	GS
1.0	1.2	**SANDY SILT**, trace clay, compact, brown / grey, moist		3	GS
1.5	1.7	**SILTY SAND**, trace clay, dense, brown / grey, wet		4	GS
2.0	2.4	**END OF TEST PIT**			

Elevation Scale (m)

Undrained Shear Strength (kPa)
○ Unconfined
● Pocket Penetrometer
+ Field Vane
■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit (PL) | Natural Water Content (MC) | Liquid Limit (LL)
10 20 30

Headspace Vapour

Unstabilized Water Level

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

...at 1.7m, water seepage

▽

Unstabilized water level measured at 2.3m below grade; test pit was open upon completion of excavation.

SEEPAGE MEASUREMENTS

Time	Water Depth (m)	Elevation (m)
8/19/2013	2.2	
8/23/2013	2.0	

library: library - terraprobe gint.glb report: terraprobe test pit log file: 11-13-3052 test pit logs.gpj

Terraprobe

TEST PIT LOG 3

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No. : 11-13-3052

Date excavated : August 15, 2013

Sheet No. : 1 of 1

Position : E: 598073, N: 4865443 (UTM 17T) Elevation Datum : N/A

Rig type : BACKHOE

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type
0.0		**GROUND SURFACE**			
		300mm **TOPSOIL**			
	0.3	Trace organics (WEATHERED/DISTURBED)		1	GS
0.5	0.5	**SILTY SAND**, trace clay, trace organics, very loose, dark brown, moist / wet		2	GS
	0.9	**SAND**, trace silt, trace clay, trace organics, very loose, brown, wet		3	GS
1.0					
1.5	1.5	**CLAYEY SILT**, some sand, stiff, grey, moist wet		4	GS
	2.0	**END OF TEST PIT**			

Elevation Scale (m)

Undrained Shear Strength (kPa)
○ Unconfined
● Pocket Penetrometer
+ Field Vane
■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

▽ ...at 0.8m, water seepage

Unstabilized water level measured at 0.8m below grade; test pit was open upon completion of excavation.

SEEPAGE MEASUREMENTS

Time	Water Depth (m)	Elevation (m)
8/19/2013	0.8	
8/23/2013	0.6	

library: library - terraprobe gint.glb report: terraprobe test pit log file: 11-13-3052 test pit logs.gpj

Terraprobe

TEST PIT LOG 4

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No. : 11-13-3052

Date excavated : August 15, 2013

Sheet No. : 1 of 1

Position : E: 598076, N: 4865460 (UTM 17T) Elevation Datum : N/A

Rig type : BACKHOE

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type
0.0		**GROUND SURFACE**			
		250mm **TOPSOIL**			
	0.3	Trace organics (WEATHERED/DISTURBED)		1	GS
0.5	0.5	**SILT**, trace to some sand, trace to some clay, trace gravel, compact, brown / grey, moist		2	GS
1.0					
1.5					
	1.7	**SILTY SAND**, trace clay, compact, brown, wet		3	GS
2.0					
	2.4	**END OF TEST PIT**			

Elevation Scale (m)

Undrained Shear Strength (kPa)
○ Unconfined
● Pocket Penetrometer
+ Field Vane
■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit (PL) | Natural Water Content (MC) | Liquid Limit (LL)
10 20 30

Headspace Vapour

Unstabilized Water Level

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

...at 1.8m, water seepage

Unstabilized water level measured at 2.3m below grade; test pit was open upon completion of excavation.

SEEPAGE MEASUREMENTS

Time	Water Depth (m)	Elevation (m)
8/19/2013	1.8	
8/23/2013	1.7	

library: library - terraprobe gint.glb report: terraprobe test pit log file: 11-13-3052 test pit logs.gpj

Terraprobe

TEST PIT LOG 5

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No. : 11-13-3052

Date excavated : August 19, 2013

Sheet No. : 1 of 1

Position : E: 598376, N: 4865832 (UTM 17T) Elevation Datum : N/A

Rig type : BACKHOE

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type
0.0		**GROUND SURFACE**			
		350mm **TOPSOIL**			
	0.4	Trace organics (WEATHERED/DISTURBED)		1	GS
0.5	0.6	**SANDY SILT to SAND**, trace to some clay, trace gravel, (intermittent sand seams), compact to dense, brown / grey, moist		2	GS
1.0					
1.5					
	1.8	**SILT**, some sand to sandy, trace clay (intermittent sand seams), compact, wet		3	GS
	2.0	**END OF TEST PIT**			

Elevation Scale (m)

Undrained Shear Strength (kPa)
○ Unconfined
● Pocket Penetrometer
+ Field Vane
■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

...at 1.8m, water seepage

Unstabilized water level measured at 2.0m below grade; test pit was open upon completion of excavation.

SEEPAGE MEASUREMENTS

Time	Water Depth (m)	Elevation (m)
8/23/2013	1.9	

library: library - terraprobe gint.glb report: terraprobe test pit log file: 11-13-3052 test pit logs.gpj

Terraprobe

TEST PIT LOG 6

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No. : 11-13-3052

Date excavated : August 19, 2013

Sheet No. : 1 of 1

Position : E: 598387, N: 4865862 (UTM 17T) Elevation Datum : N/A

Rig type : BACKHOE

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type
0.0		**GROUND SURFACE**			
		350mm **TOPSOIL**			
	0.4	Trace organics (WEATHERED/DISTURBED)			
0.5				1	GS
	0.7	**SAND**, trace to some silt, trace clay, compact to dense, brown, moist			
1.0				2	GS
	1.4	**SILT**, some sand to sandy, trace clay, very dense, brown, wet			
1.5				3	GS
	2.0	**END OF TEST PIT**			

Elevation Scale (m)

Undrained Shear Strength (kPa)
○ Unconfined
● Pocket Penetrometer
+ Field Vane
■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

...at 1.3m, water seepage

Unstabilized water level measured at 2.0m below grade; test pit was open upon completion of excavation.

SEEPAGE MEASUREMENTS

Time	Water Depth (m)	Elevation (m)
8/23/2013	1.5	

library: library - terraprobe gint.glb report: terraprobe test pit log file: 11-13-3052 test pit logs.gpj

Terraprobe

TEST PIT LOG 7

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No. : 11-13-3052

Date excavated : August 19, 2013

Sheet No. : 1 of 1

Position : E: 598393, N: 4865838 (UTM 17T) Elevation Datum : N/A

Rig type : BACKHOE

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type
0.0		**GROUND SURFACE**			
		300mm **TOPSOIL**			
0.5	0.5	Trace organics (WEATHERED/DISTURBED)		1	GS
	0.7	**SANDY SILT**, trace clay, trace gravel, compact to dense, brown / grey, moist		2	GS
1.0					
	1.4	**SANDY SILT to SAND**, trace clay, compact, brown / grey, wet		3	GS
1.5					
	1.9 2.0	**SILT**, trace to some sand, trace to some clay, dense, brown / grey, wet		4	GS

END OF TEST PIT

Unstabilized water level measured at 2.0m below grade; test pit was open upon completion of excavation.

Elevation Scale (m)

Undrained Shear Strength (kPa)
○ Unconfined
● Pocket Penetrometer
+ Field Vane
■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

...at 1.4m, water seepage

SEEPAGE MEASUREMENTS

Time	Water Depth (m)	Elevation (m)
8/23/2013	1.4	

library: library - terraprobe gint.glb report: terraprobe test pit log file: 11-13-3052 test pit logs.gpj

Terraprobe

TEST PIT LOG 8

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No. : 11-13-3052

Date excavated : August 16, 2013

Sheet No. : 1 of 1

Position : E: 598436, N: 4865818 (UTM 17T) Elevation Datum : N/A

Rig type : BACKHOE

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type
0.0		**GROUND SURFACE**			
		250mm **TOPSOIL**			
	0.3	Trace organics (WEATHERED/DISTURBED)			
0.5				1	GS
	0.6	**SILT**, trace to some sand, trace to some clay, (intermittent sand seams), compact to dense, brown / grey, moist			
1.0					
				2	GS
1.5					
	1.7	**SILT**, trace to some sand, trace to some clay, (intermittent sand seams), compact to dense, brown / grey, wet			
2.0					
				3	GS
2.5	2.5	**END OF TEST PIT**			

Elevation Scale (m)

Undrained Shear Strength (kPa)
○ Unconfined
● Pocket Penetrometer
+ Field Vane
■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

...at 1.7m, water seepage

Unstabilized water level measured at 2.1m below grade; test pit was open upon completion of excavation.

SEEPAGE MEASUREMENTS

Time	Water Depth (m)	Elevation (m)
8/19/2013	2.2	
8/23/2013	2.1	

library: library - terraprobe gint.glb report: terraprobe test pit log file: 11-13-3052 test pit logs.gpj

Terraprobe

TEST PIT LOG 9

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No. : 11-13-3052

Date excavated : August 16, 2013

Sheet No. : 1 of 1

Position : E: 598456, N: 4865792 (UTM 17T) Elevation Datum : N/A

Rig type : BACKHOE

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type
0.0		**GROUND SURFACE**			
		200mm **TOPSOIL**			
	0.2	Trace organics (WEATHERED/DISTURBED)			
0.5				1	GS
	0.6	**SILT**, trace to some sand, trace clay, (intermittent sand seams), compact to dense, brown, moist			
1.0					
1.5					
				2	GS
2.0		...wet			
	2.1	**END OF TEST PIT**			

Elevation Scale (m)

Undrained Shear Strength (kPa)
○ Unconfined
● Pocket Penetrometer
+ Field Vane
■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Unstabilized water level measured at 2.0m below grade; test pit was open upon completion of excavation.

SEEPAGE MEASUREMENTS

Time	Water Depth (m)	Elevation (m)
8/19/2013	2.0	
8/23/2013	2.0	

library: library - terraprobe gint.glb report: terraprobe test pit log file: 11-13-3052 test pit logs.gpj

Terraprobe

TEST PIT LOG 10

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No. : 11-13-3052

Date excavated : August 19, 2013

Sheet No. : 1 of 1

Position : E: 598432, N: 4865786 (UTM 17T) Elevation Datum : N/A

Rig type : BACKHOE

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type
0.0		**GROUND SURFACE**			
		300mm **TOPSOIL**			
	0.3	Trace organics (WEATHERED/DISTURBED)		1	GS
0.5	0.5	**CLAYEY SILT**, trace to some sand, very stiff, brown / grey, moist		2	GS
1.0					
1.5					
	1.8	**SILT**, trace to some sand, trace to some clay, compact to dense, brown / grey, moist to wet		3	GS
2.0					
	2.1	**END OF TEST PIT**			

Elevation Scale (m)

Undrained Shear Strength (kPa)
○ Unconfined
● Pocket Penetrometer
+ Field Vane
■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

...at 1.8m, water seepage

▽

Unstabilized water level measured at 2.0m below grade; test pit was open upon completion of excavation.

SEEPAGE MEASUREMENTS

Time	Water Depth (m)	Elevation (m)
8/23/2013	1.9	

library: library - terraprobe gint.glb report: terraprobe test pit log file: 11-13-3052 test pit logs.gpj

Terraprobe

TEST PIT LOG 11

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No. : 11-13-3052

Date excavated : August 19, 2013

Sheet No. : 1 of 1

Position : E: 598415, N: 4865777 (UTM 17T) Elevation Datum : N/A

Rig type : BACKHOE

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type
0.0		**GROUND SURFACE**			
		300mm **TOPSOIL**			
	0.3	Trace organics (WEATHERED/DISTURBED)		1	GS
0.5	0.6	**CLAYEY SILT**, trace to some sand, trace gravel, stiff, brown / grey, moist			
1.0		...wet		2	GS
				3	GS
1.5	1.5	**SILT**, trace to some sand, trace to some clay, compact to dense, brown / grey, moist			
		...wet		4	GS
	2.0	**END OF TEST PIT**			

Elevation Scale (m)

Undrained Shear Strength (kPa)
○ Unconfined
● Pocket Penetrometer
+ Field Vane
■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit (PL) | Natural Water Content (MC) | Liquid Limit (LL)
10 20 30

Headspace Vapour

Unstabilized Water Level

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

...at 1.4m, water seepage

Unstabilized water level measured at 2.0m below grade; test pit was open upon completion of excavation.

SEEPAGE MEASUREMENTS

Time	Water Depth (m)	Elevation (m)
8/23/2013	1.5	

library: library - terraprobe gint.glb report: terraprobe test pit log file: 11-13-3052 test pit logs.gpj

Terraprobe

TEST PIT LOG 12

Client : Laurelpark Inc.

Project : Palgrave Estates II

Location : Caledon, Ontario

Project No. : 11-13-3052

Date excavated : August 16, 2013

Sheet No. : 1 of 1

Position : E: 598405, N: 4865760 (UTM 17T) Elevation Datum : N/A

Rig type : BACKHOE

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type
0.0		**GROUND SURFACE**			
		250mm **TOPSOIL**			
	0.3	Trace organics (WEATHERED/DISTURBED)			
0.5				1	GS
	0.7	**SANDY SILT**, (intermittent sand seams), compact to dense, brown, moist			
1.0		...intermittent sand seams			
1.5				2	GS
	1.6	**SILT**, trace to some sand, trace to some gravel, compact to dense, brown / grey, moist			
2.0				3	GS
	2.2	**END OF TEST PIT**			

Test pit was dry and open upon completion of excavation.

Elevation Scale (m)

Undrained Shear Strength (kPa)
○ Unconfined
● Pocket Penetrometer
+ Field Vane
■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour

Unstabilized Water Level

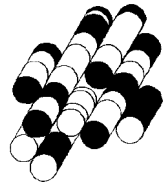
Lab Data and Comments

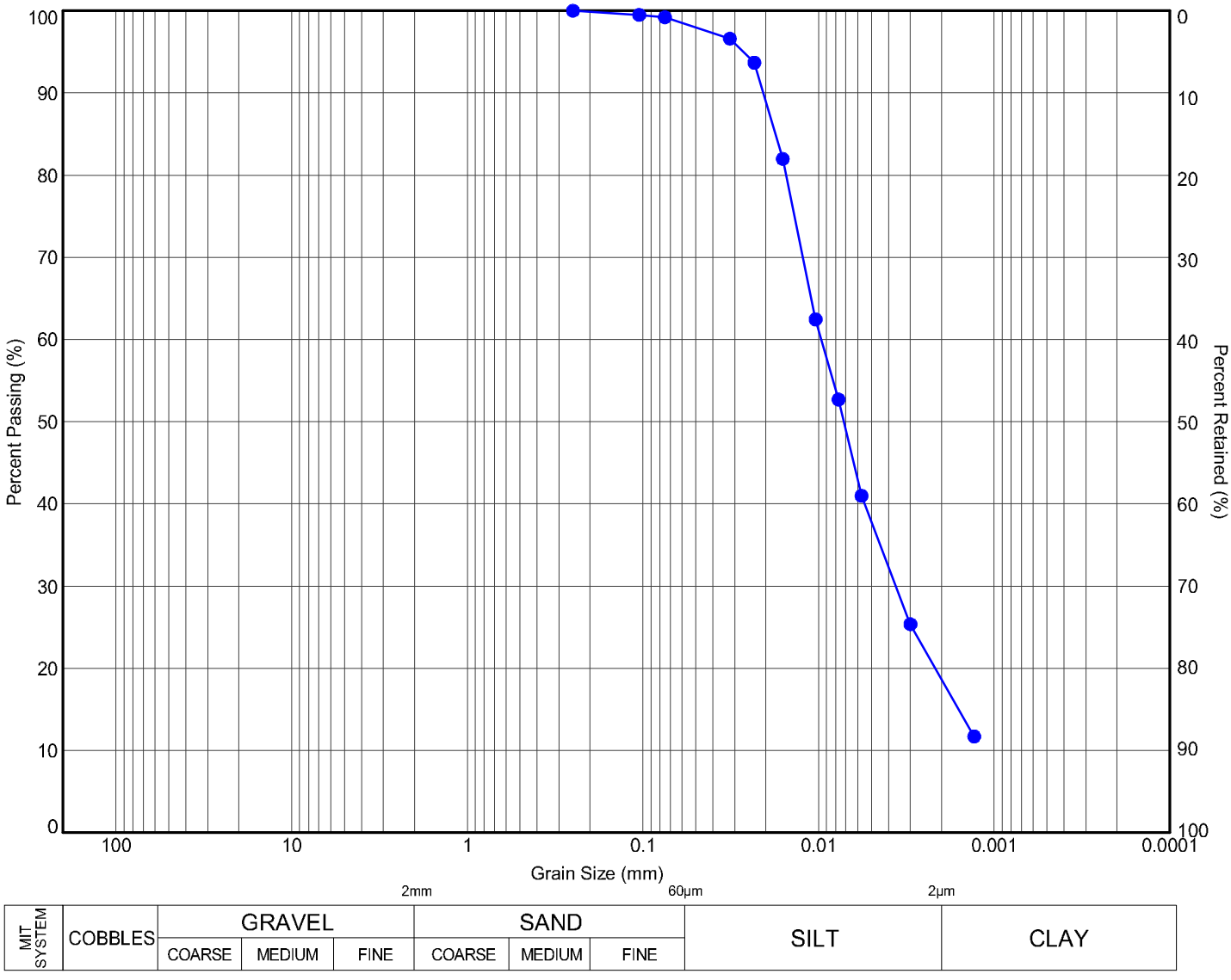
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

library: library - terraprobe gint.glb report: terraprobe test pit log file: 11-13-3052 test pit logs.gpj

SIEVE AND HYDROMETER ANALYSIS

TERRAPROBE INC.





MIT SYSTEM

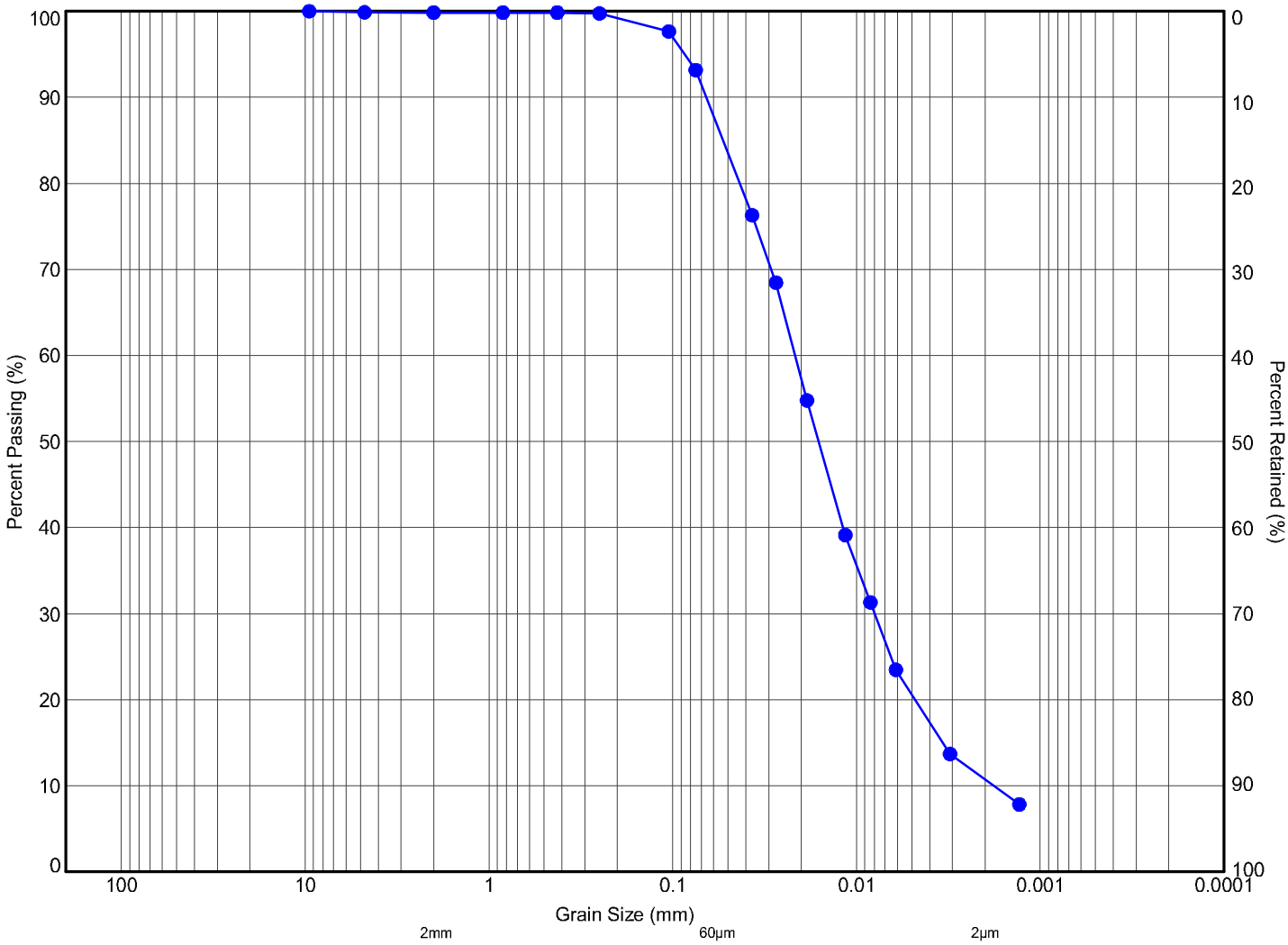
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**1**	SS5	3.3	269.8	0	1	80	19	

Terraprobe

11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title: **GRAIN SIZE DISTRIBUTION**
SILT, SOME CLAY, TRACE SAND

File No.: **11-13-3052**



MIT SYSTEM

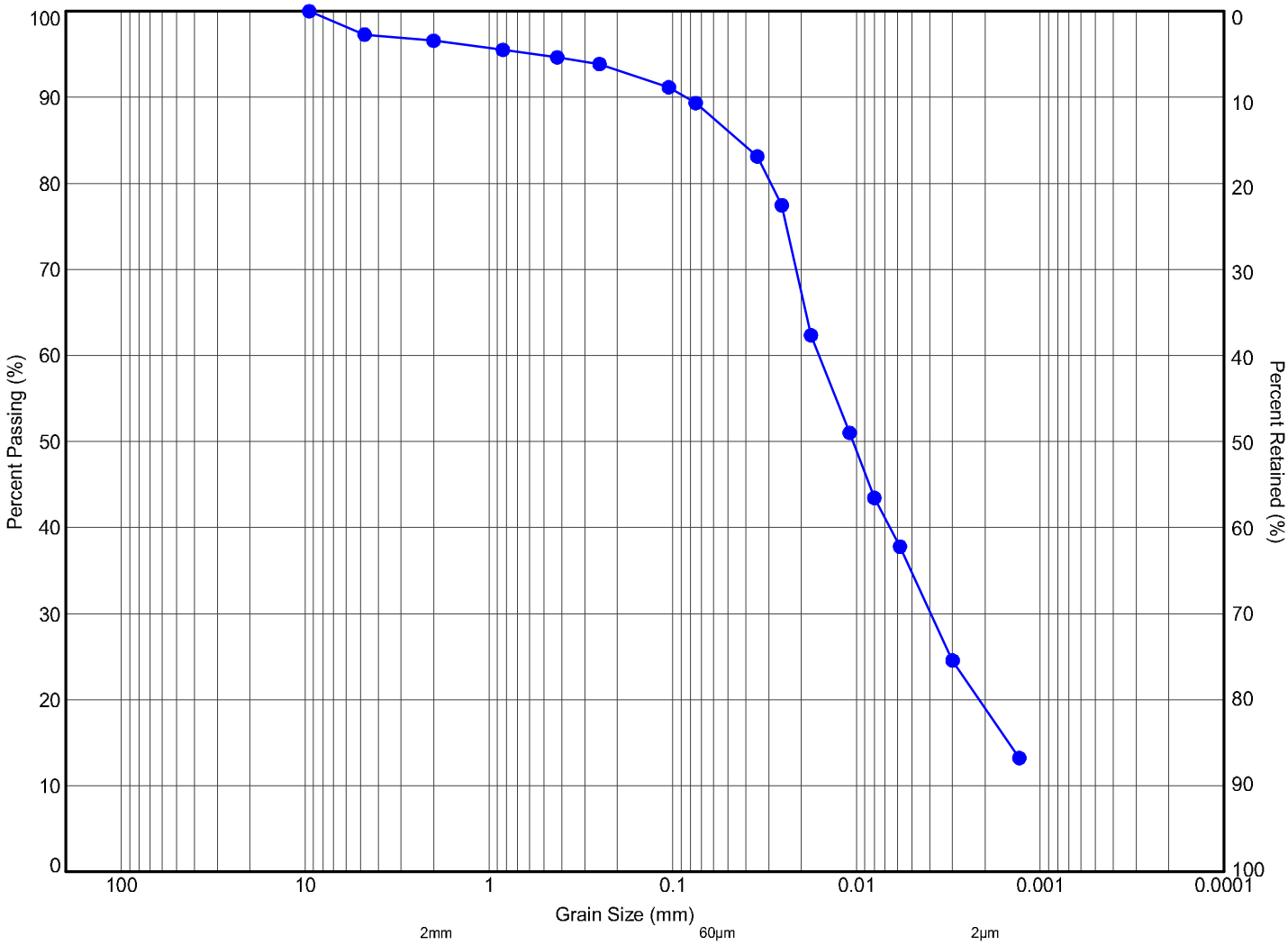
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**2**	SS4	2.5	277.5	0	12	77	11	

Terraprobe

11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title: **GRAIN SIZE DISTRIBUTION**
SILT, SOME SAND, SOME CLAY

File No.: **11-13-3052**



MIT SYSTEM

	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**4**	SS5	3.3	278.6	3	9	69	19	

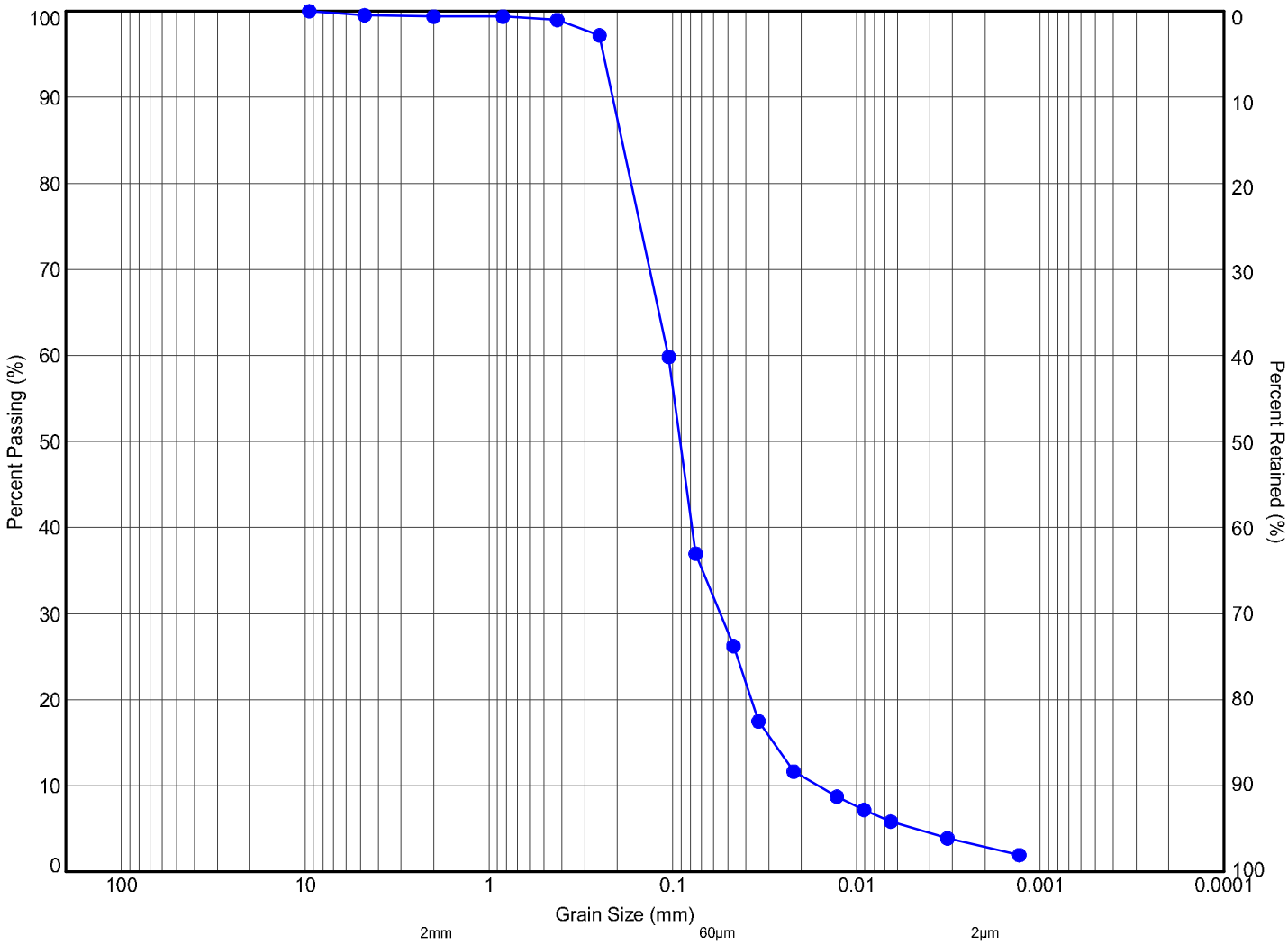
Terraprobe

11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

GRAIN SIZE DISTRIBUTION
SILT, SOME CLAY, TRACE SAND, TRACE GRAVEL

File No.: **11-13-3052**



MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM

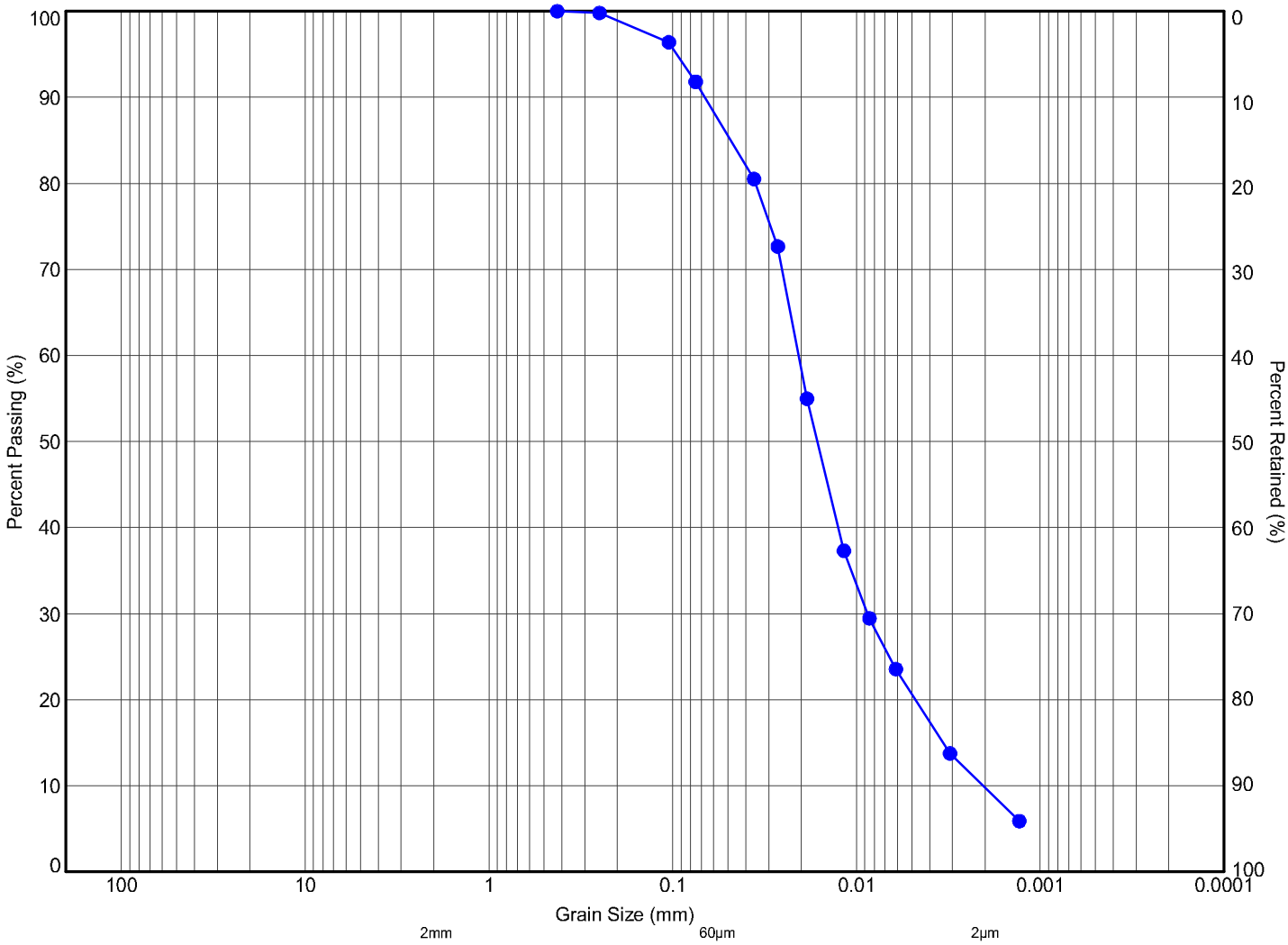
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**5**	SS5	3.3	281.9	1	67	29	3	

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

GRAIN SIZE DISTRIBUTION
SILTY SAND, TRACE CLAY, TRACE GRAVEL

File No.: **11-13-3052**



MIT SYSTEM

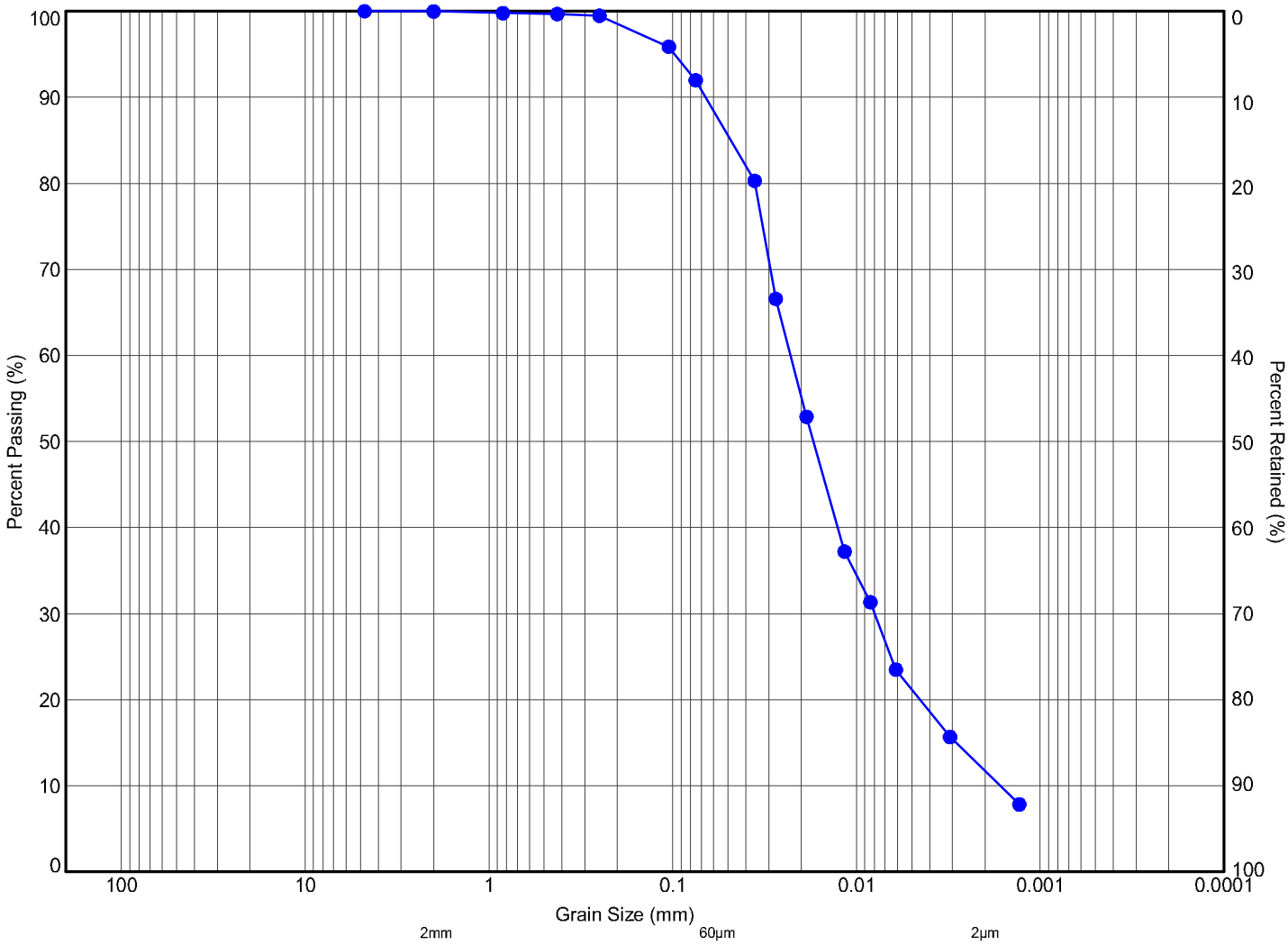
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**6**	SS7	6.3	271.7	0	11	79	10	

Terraprobe

11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title: **GRAIN SIZE DISTRIBUTION**
SILT, SOME SAND, SOME CLAY

File No.: **11-13-3052**



MIT SYSTEM

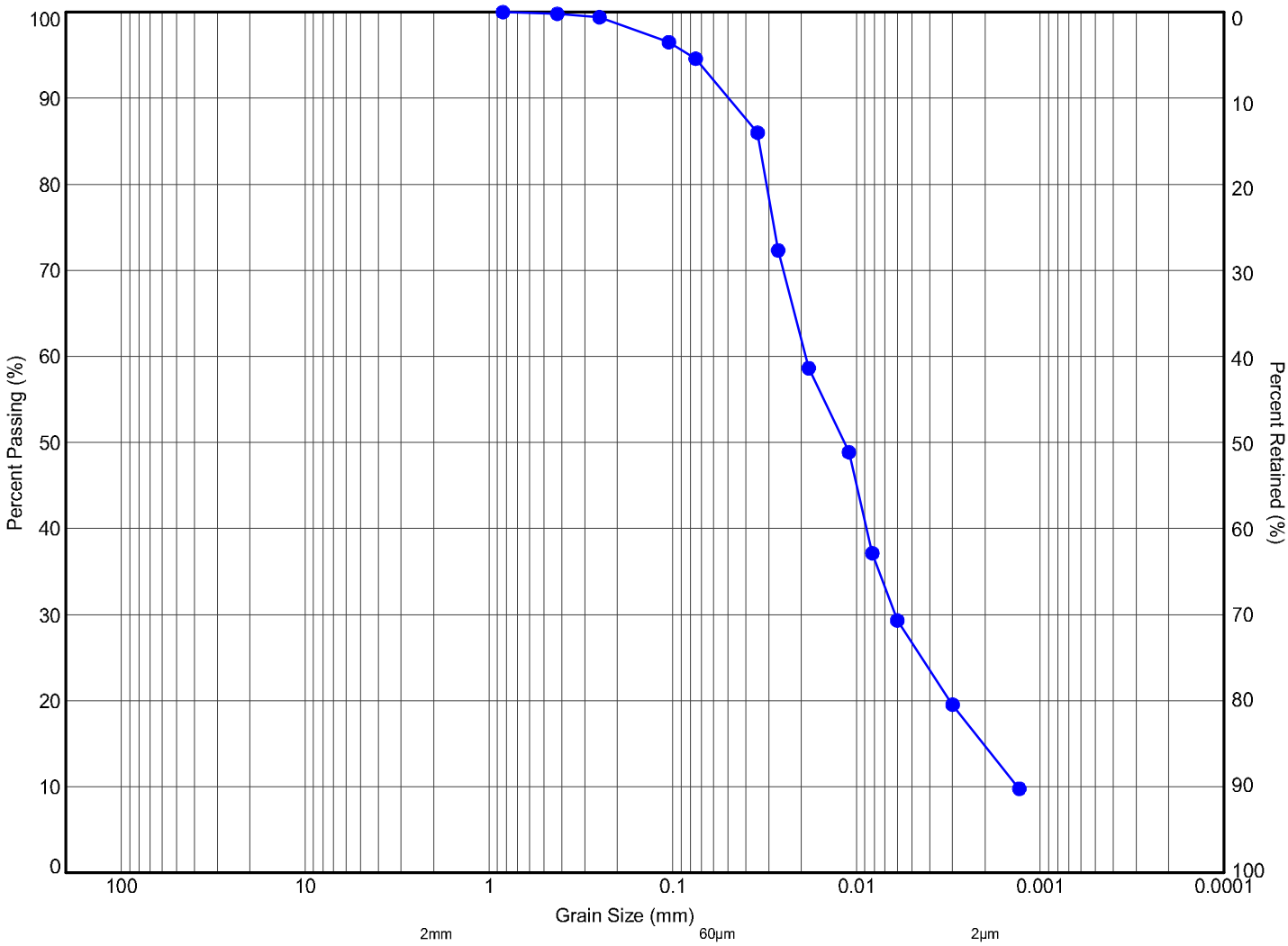
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**8**	SS6	4.8	276.1	0	11	77	12	

Terraprobe

11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title: **GRAIN SIZE DISTRIBUTION**
SILT, SOME CLAY, SOME SAND

File No.: **11-13-3052**



MIT SYSTEM

	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**9**	SS3	1.8	280.9	0	8	77	15	

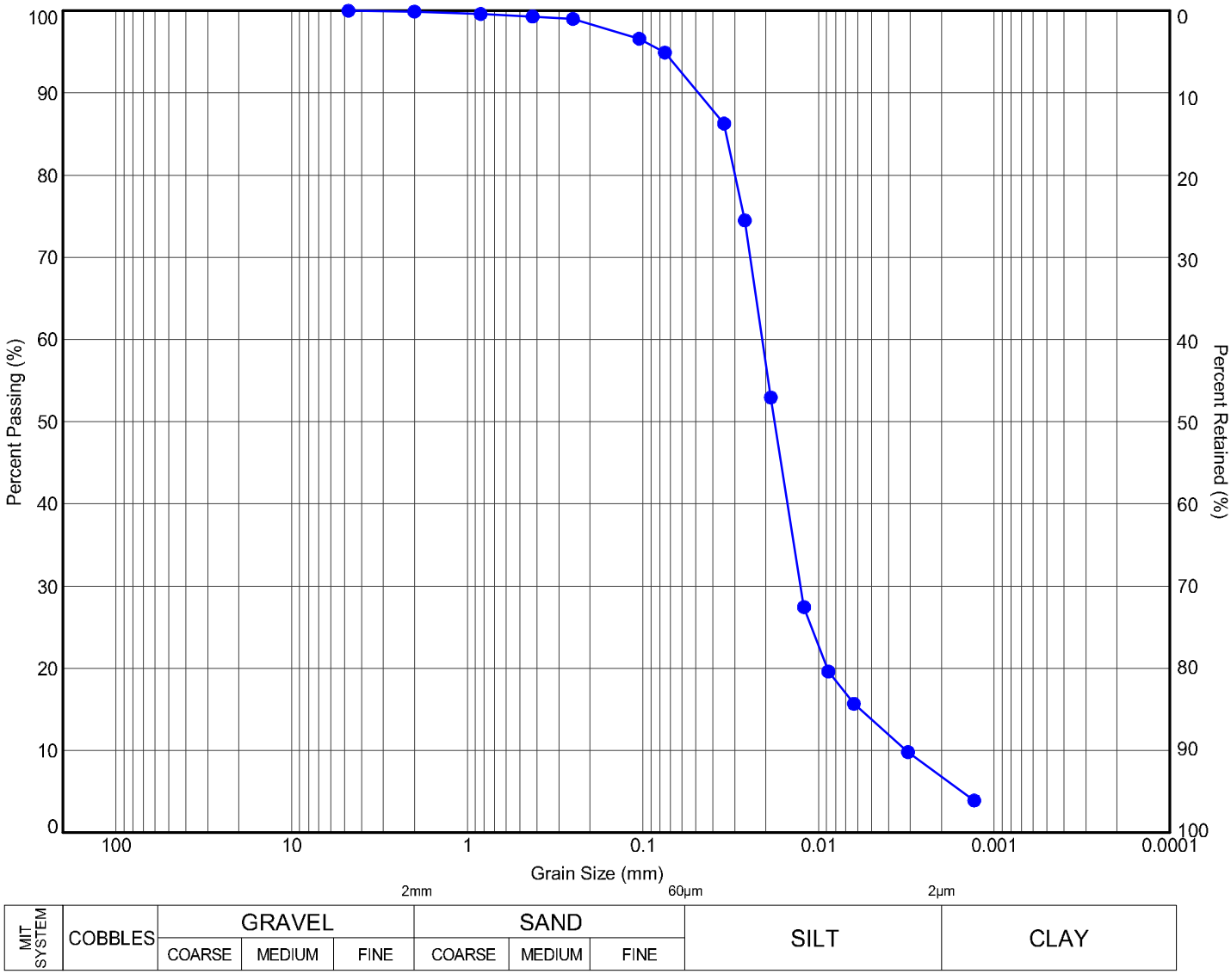
Terraprobe

11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

GRAIN SIZE DISTRIBUTION
SILT, SOME CLAY, TRACE SAND

File No.: **11-13-3052**



MIT SYSTEM

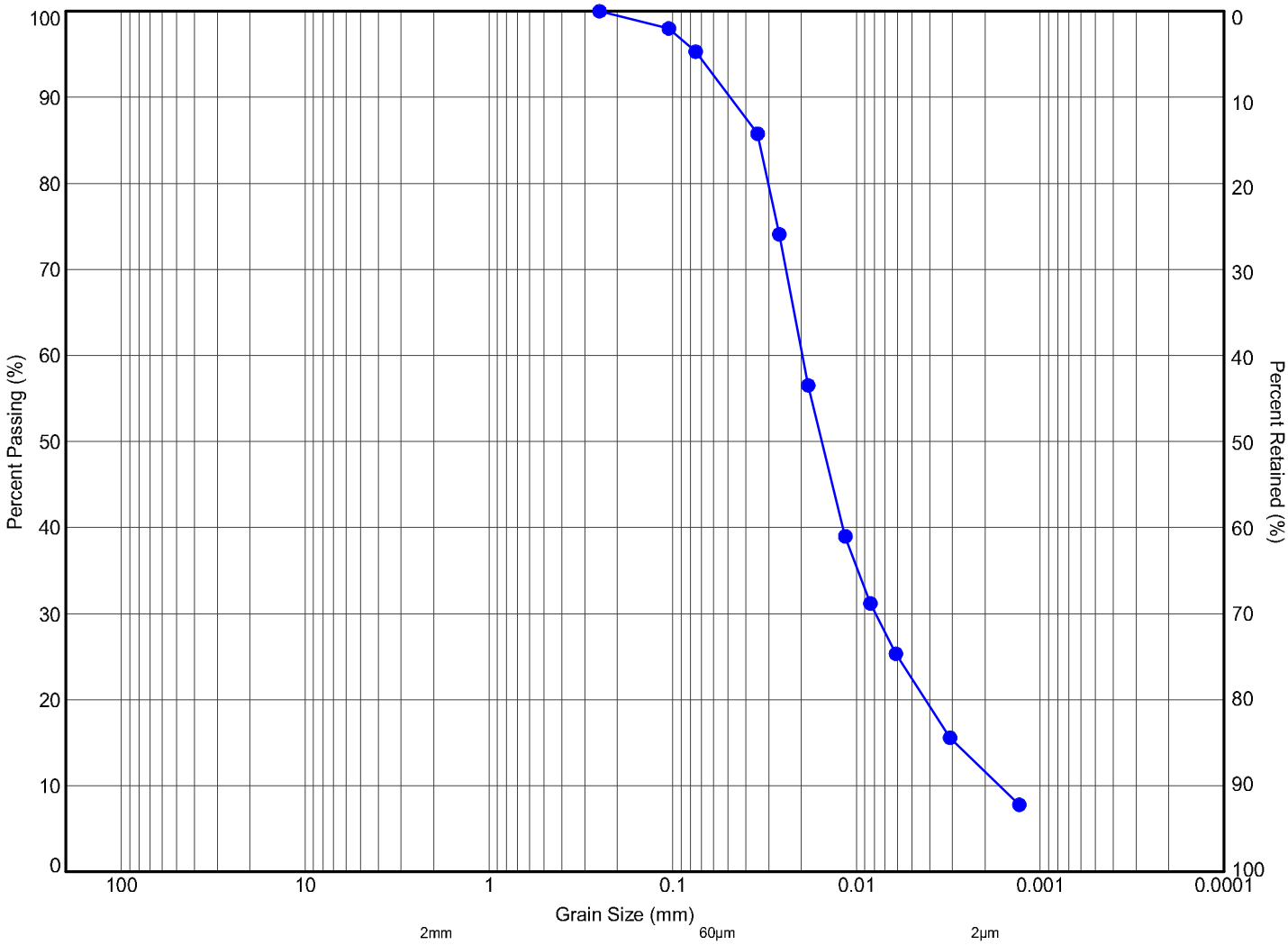
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**10**	SS5	3.3	275.8	0	7	86	7	

Terraprobe

11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title: **GRAIN SIZE DISTRIBUTION**
SILT, TRACE CLAY, TRACE SAND

File No.: **11-13-3052**



MIT SYSTEM

	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**11**	SS4	2.5	277.7	0	7	81	12	

Terraprobe

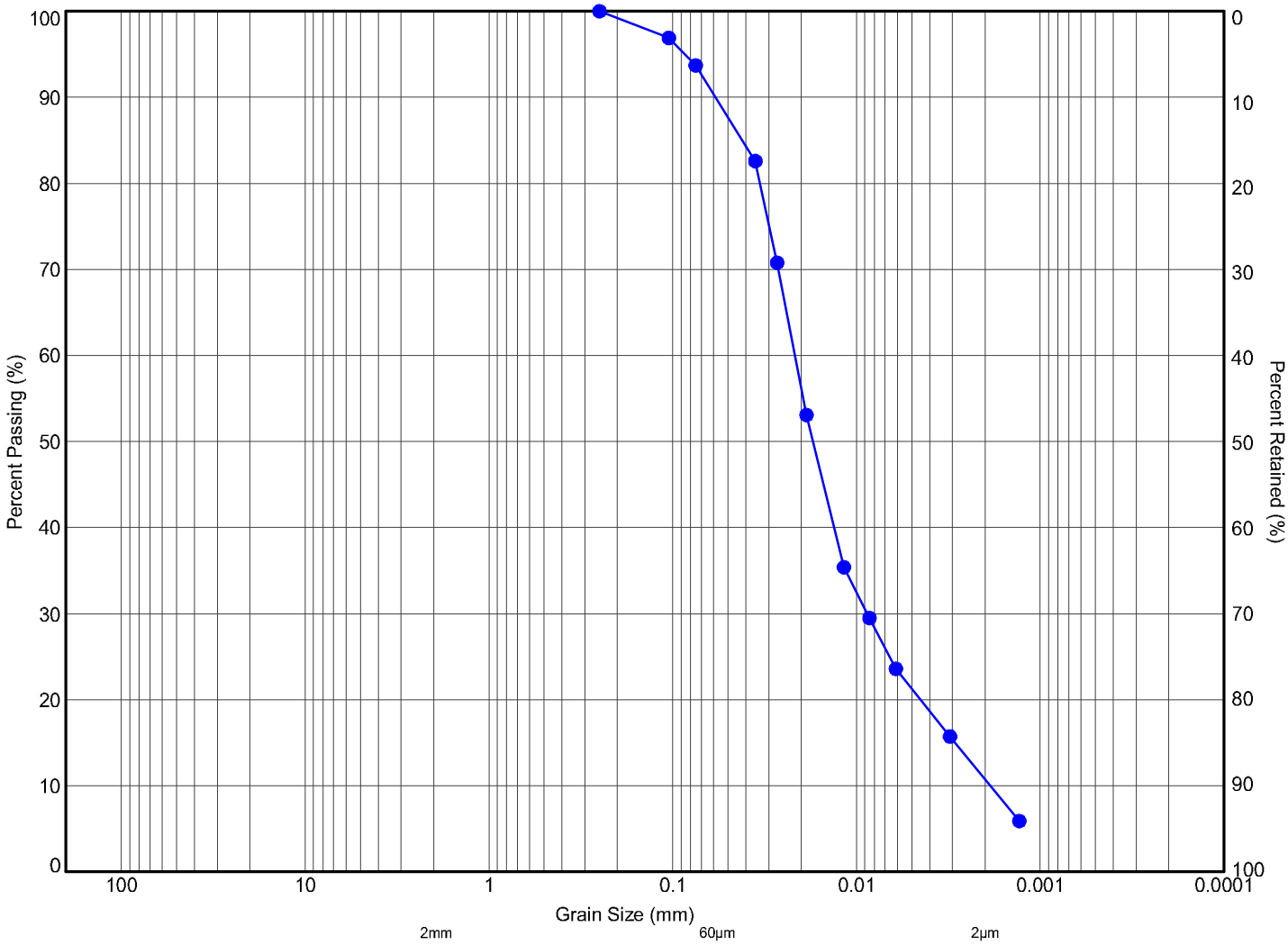
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

GRAIN SIZE DISTRIBUTION
SILT, SOME CLAY, TRACE SAND

File No.:

11-13-3052



MIT SYSTEM	COBBLES	GRAVEL (2mm)			SAND (60µm)			SILT	CLAY (2µm)
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM

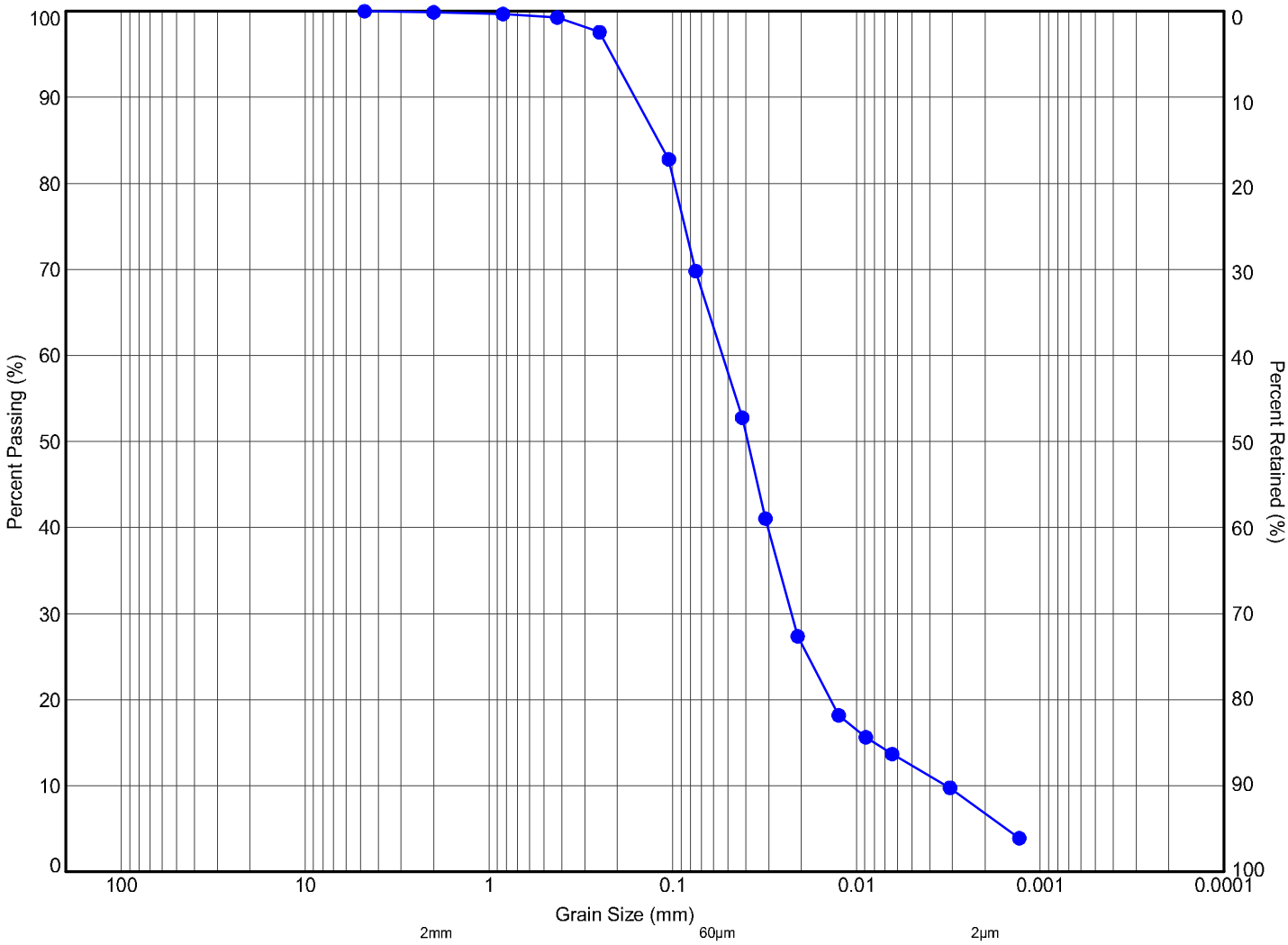
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**11**	SS7	6.2	274.0	0	9	80	11	

Terraprobe

11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title: **GRAIN SIZE DISTRIBUTION**
SILT, SOME CLAY, TRACE SAND

File No.: **11-13-3052**



MIT SYSTEM

	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**12**	SS3	1.8	283.5	0	36	57	7	

Terraprobe

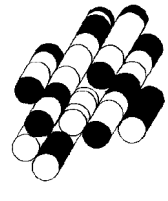
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

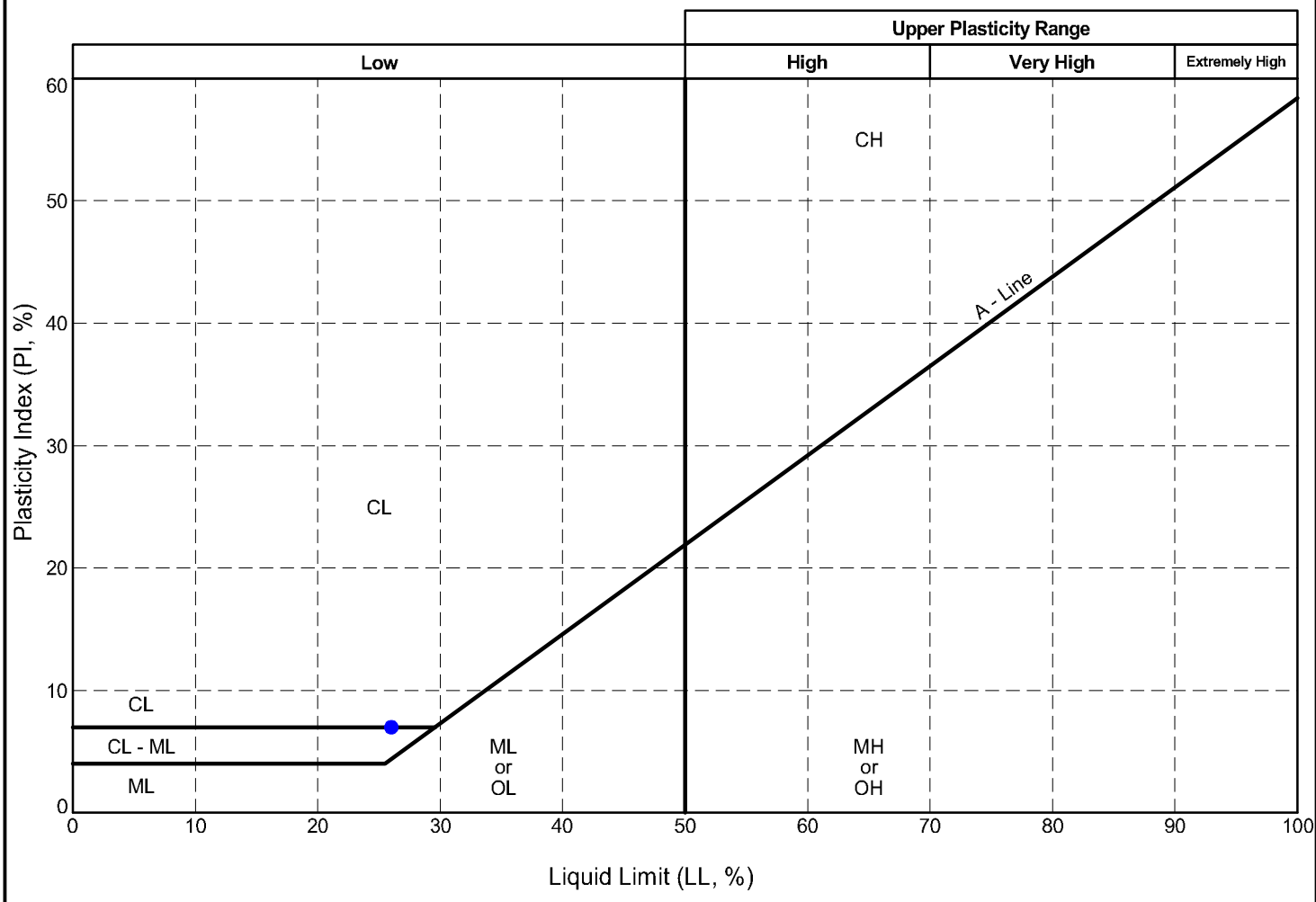
Title: **GRAIN SIZE DISTRIBUTION**
SILT AND SAND, TRACE CLAY

File No.: **11-13-3052**

ATTERBERG LIMITS TEST RESULTS

TERRAPROBE INC.



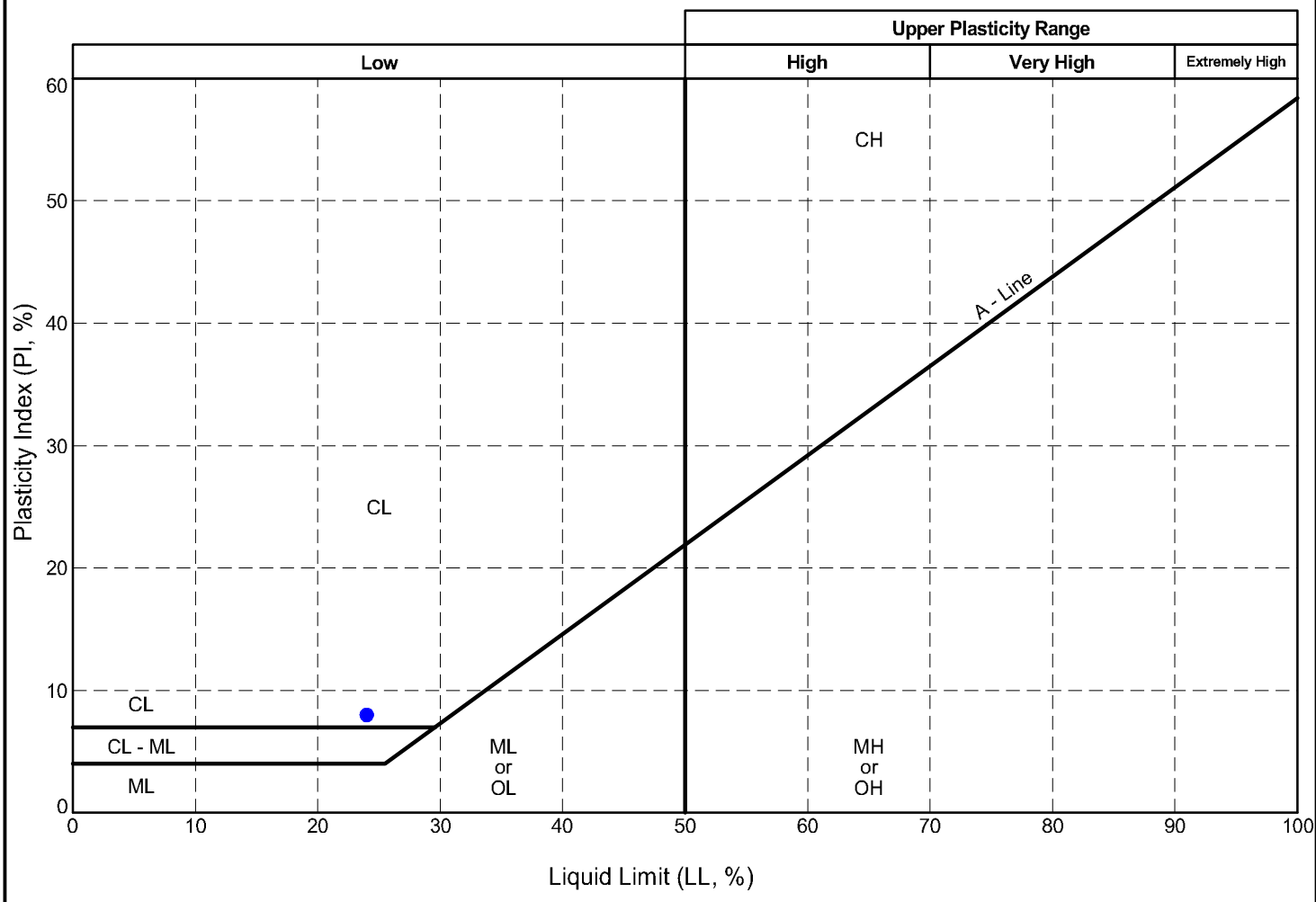


	Borehole	Sample	Depth (m)	Elev. (m)	LL (%)	PL (%)	PI (%)	Description
●	1	SS5	3.3	269.8	26	19	7	SLIGHTLY PLASTIC, SLIGHT OR LOW COMPRESSIBILITY

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title: **ATTERBERG LIMITS CHART**

File No.: **11-13-3052**



	Borehole	Sample	Depth (m)	Elev. (m)	LL (%)	PL (%)	PI (%)	Description
●	4	SS5	3.3	278.6	24	16	8	SLIGHTLY PLASTIC

Terraprobe

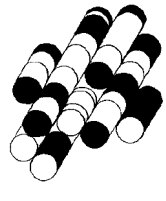
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

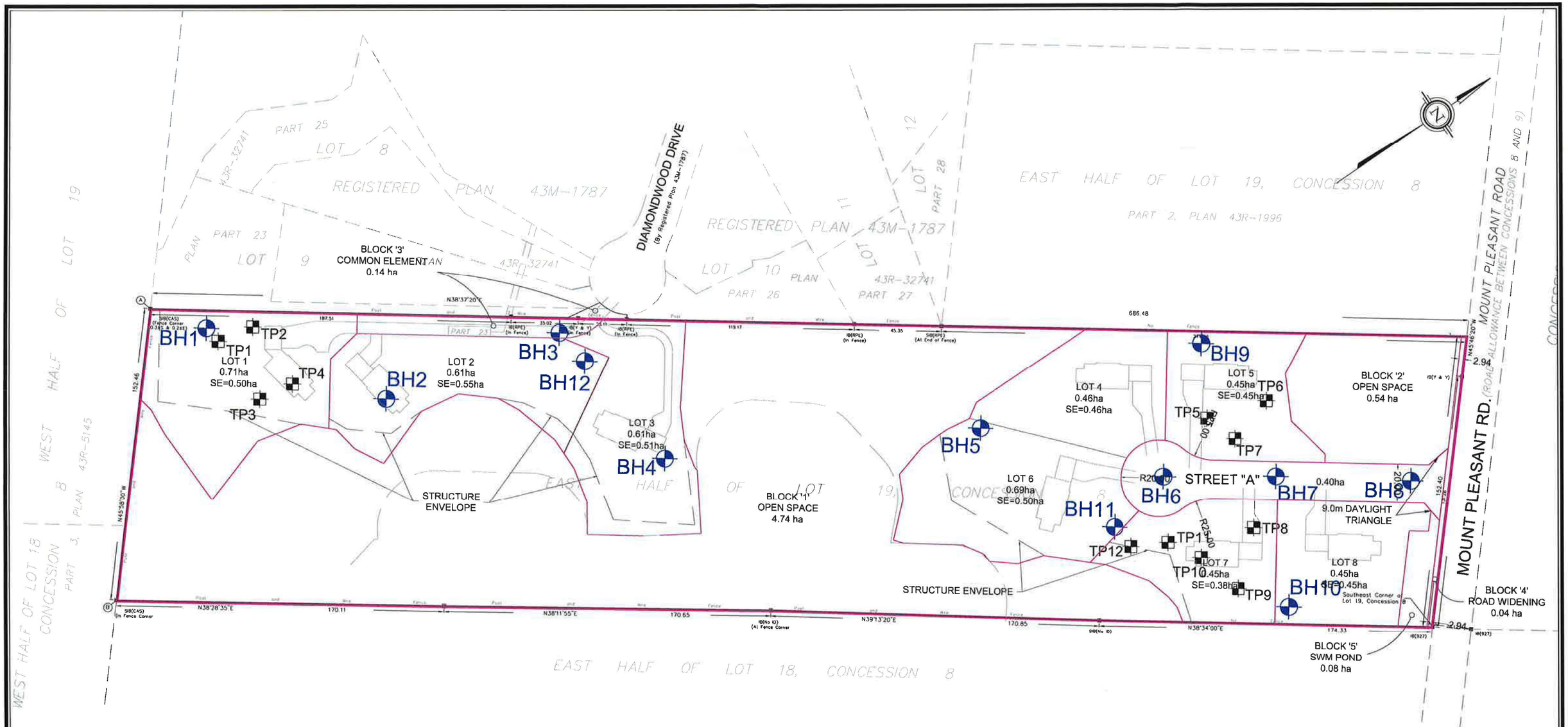
Title: **ATTERBERG LIMITS CHART**

File No.: **11-13-3052**

FIGURES

TERRAPROBE INC.





REFERENCE

Drawing provided in digital format by Laurelpark Inc., drawing file x39680_Laurelpark_DP_20170509.dwg, 124821 SKETCH To Vienna, july 17, 2012.dwg. received June 21, 2017 by email.

LEGEND

- Test Pit Locations
- Borehole Locations
- Property Boundary

30m 0 60m

SCALE 1: 2,000

Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

Title: **BOREHOLE AND TEST PIT LOCATION PLAN**

File No. 11-13-3052

FIGURE : 2

April 29, 2020

Laurelpark Inc.
2458 Dundas Street West, Unit 9
Mississauga, Ontario
L5K 1R8

Attention: **Ms. Carmen N. Jandu, MCIP, RPP**

Reference: **Test Pit Excavation and Soil Analysis**
Proposed Bioretention Area Location
Laurelpark Subdivision
Town of Caledon, Regional Municipality of Peel

Dear Ms. Jandu:

A test pit was excavated in the southeast corner of the site on February 21, 2020, and soil sample collected and submitted for analysis. This work was completed by Calder Engineering Ltd. and was undertaken to provide information on soil and groundwater conditions in the proposed location of stormwater management facilities in the Laurelpark Subdivision.

The test pit was excavated by Headwaters Construction Ltd. with a Kubota excavator. The collected soil sample was submitted to Terraprobe Inc. for soil classification and grain size analysis. The soil sample was collected at a depth of approximately one metre from the ground surface. Attached are the following:

- Drawing 16-168-06 illustrating test pit location and test pit log
- photographs of the test pit (Figure 1 and Figure 2)
- soil analysis report from Terraprobe Inc. dated March 4, 2020

Reference coordinates for the test pit location (Grid: UTM Zone 17; Datum: NAD83) are as follows:

- Northing – 4,865,882
- Easting – 598,486

From the test pit and soil sample analysis, the following information was obtained:

- soil in location of the test pit can be characterized as sand and silt with trace clay and trace gravel;

- per above, under the Unified Soil Classification System the soil material can be classified as ML (inorganic silts and very fine sands, rock flour, silty or clayey fine sands, clayey silts with slight plasticity);

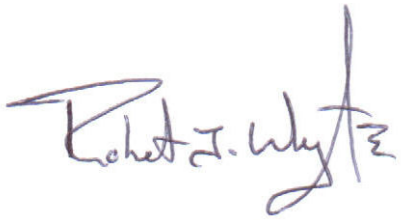
- per the Ontario Building Code, an ML classified soil has been assigned a Coefficient of Permeability of 10-5 to 10-6 centimetres per second and a Percolation Time in the range of 20 to 50 minutes per centimetre; and

- the surveyed groundwater level in the test pit was approximately elevation 278.2 metres.

The information provided herein is based on site conditions at the time of the site investigation conducted on February 21, 2020 and is to the best of my knowledge as of this date. Should you have any questions regarding the information contained herein, please contact myself at (905) 857-7600.

Yours Sincerely,

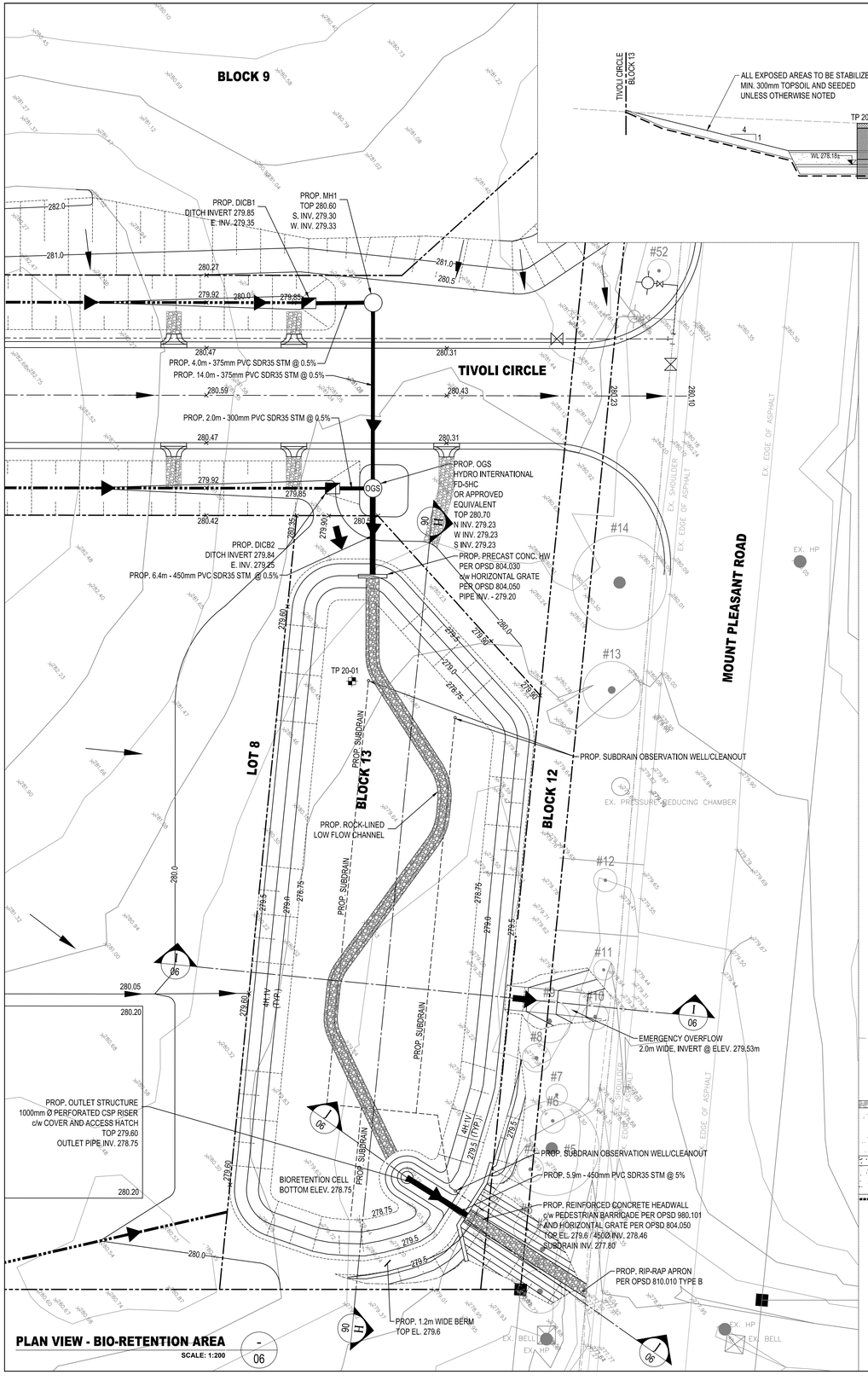
CALDER ENGINEERING LTD.





Robert Whyte, M.Sc., P.Eng.
Project Manager

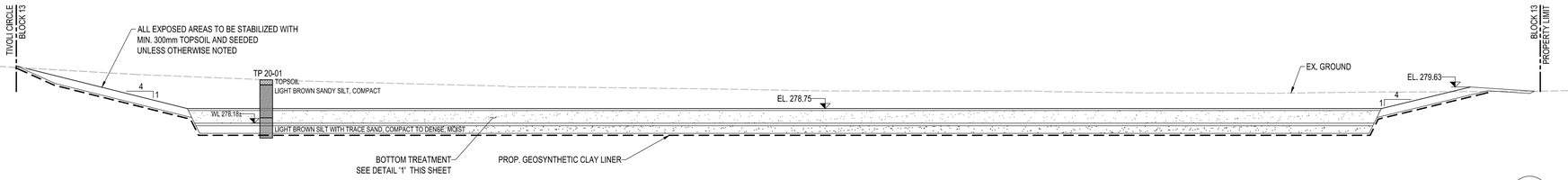
RJW/rw



PLAN VIEW - BIO-RETENTION AREA

SCALE: 1:200

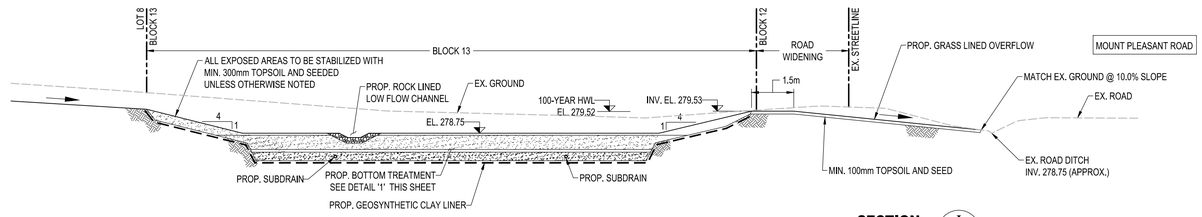
- / 06



SECTION H

SCALE: 1:100

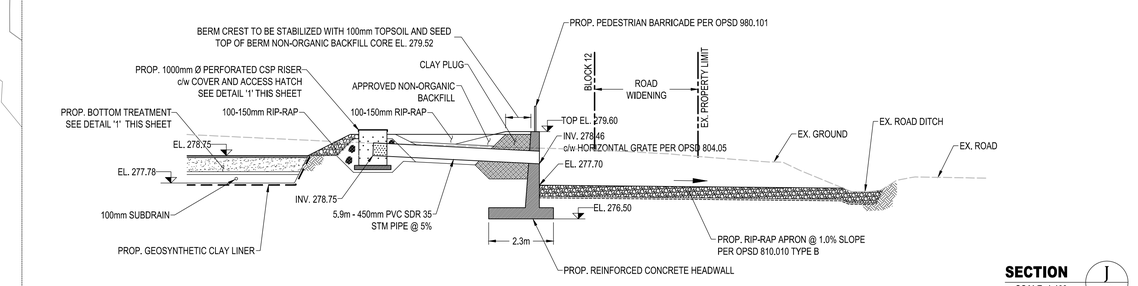
06



SECTION I

SCALE: 1:100

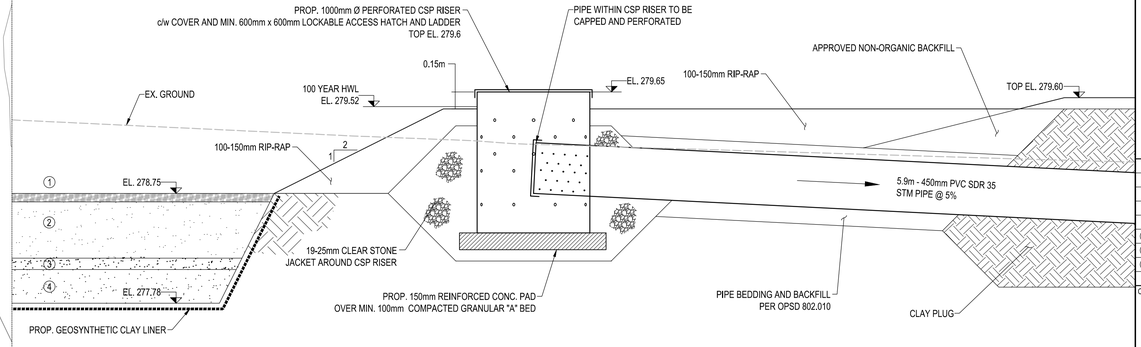
06



SECTION J

SCALE: 1:100

06



1. 75mm LAYER OF SHREDDED HARDWOOD MULCH
2. 500mm LAYER OF BIOFILTER FILTER MEDIA
3. 100mm LAYER OF PEA GRAVEL
4. 300mm LAYER OF WASHED 50mm CLEARSTONE
5. 100mm DIAMETER SUBDRAIN

BIOFILTER FILTER MEDIA NOTES:

1. SOIL MIXTURE TO CONTAIN (BY WEIGHT):
   - 85 TO 88% SAND
   - 8 TO 12% SOIL FINES
   - 3 TO 5% ORGANIC MATTER (LEAF COMPOST)
2. PHOSPHORUS SOIL TEST INDEX (P-INDEX) VALUE: 10-30 PPM
3. CATIONIC EXCHANGE CAPACITY: GREATER THAN 10 meq/100g
4. FILTER MEDIA TO BE FREE OF STONES, STUMPS, ROOTS AND OTHER LARGE DEBRIS
5. pH: 5.5 TO 7.5
6. INFILTRATION RATE: GREATER THAN 25mm/hr

DETAIL - OUTLET CONTROL STRUCTURE

SCALE: 1:25

1 / 06

GENERAL NOTES

1. THE INFORMATION SHOWN HEREIN IS PRELIMINARY AND SUBJECT TO DETAIL DESIGN.
2. SECTIONS GENERATED FROM ORTHOPHOTOGRAPHY DEVELOPED IN THE SPRING OF 2002, AND SURVEYED ELEVATIONS BY CALDER ENGINEERING LTD. (2017 & 2019) AND EPLETT WOROBEC RAIKES SURVEYING LTD. (2015). ACTUAL ELEVATIONS MAY VARY FROM THOSE SHOWN.

Calder Engineering Ltd.
T 905-857-7600 E calder@caldereng.com W www.caldereng.com

DESIGNED BY | APPROVED BY

N°	Date	Revisions	Dwn.	Dsg'd.	Chk'd.
C	28/FEB/2020	THIRD SUBMISSION	KNC	KNC	RJW
B	03/MAY/2019	SECOND SUBMISSION	KNC	DH	RJW
A	15/MAR/2017	FIRST SUBMISSION	KNC	DH	RJW

Client:

LAURELPARK INC.

Project Name:

LAURELPARK SUBDIVISION
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON, REGIONAL MUNICIPALITY OF PEEL

Title Name:

BIORETENTION FACILITY
PLAN VIEW AND SECTIONS

Drawing N°: **16-168-06**

Sheet N°: 6 OF 10

Scale: AS NOTED

Rev. N°: C



FIGURE 2: Laurelpark Subdivision – Test Pit 20-01 – Soil Profile (February 21, 2020)



FIGURE 3: Laurelpark Subdivision – Test Pit 20-01 – Bottom of Test Pit (February 21, 2020)

Terraprobe
Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

March 4, 2020

File No. 1-20-0076-24
Brampton Office

Calder Engineering Ltd.
6440 King Street
Caledon, Ontario
L7C 0S1

Attention: Mr. Robert Whyte, rwhyte@caldereng.com

RE: ESTIMATION OF SOIL PERCOLATION RATE
SUBMITTED SOIL SAMPLE
LAUREL PARK SUBDIVISION
CALEDON, ONTARIO

Dear Sir:

As requested, Terraprobe Inc. has performed grain size distribution analysis on the soil sample delivered to our laboratory on February 25, 2020. Terraprobe Inc. is providing the attached estimated percolation rate ('T-Time') for the soil received. The sample was identified as from the above noted site.

A grain distribution curve was plotted for the submitted sample (Lab No. 1050) and is enclosed with this letter. The results indicated *Sand and Silt, trace clay, trace gravel*. Based on the grain distribution, this material merits classification as ML under the Unified Soil Classification System. The Supplementary Standard to the Ontario Building Code 2012 document *Percolation Time and Soil Descriptions* (SB-6) assigns percolation rates of 20-50 min/cm for soils within the ML classification. Based on the sand and silt content represented by the grain size distribution curve, a percolation rate of 42 min / cm is considered appropriate for this sample.

It should be noted that Terraprobe Inc. did not conduct a field investigation in conjunction with the collection of this sample, or witness the collection of the sample tested. Terraprobe Inc. assumes no responsibility for the application of the above noted percolation rate ('T- Time') for use in design of an on- site sewage disposal system. The design of on-site sewage system must be conducted by a qualified professional with due regard for a number of site-specific conditions in addition to the percolation rate of the soil.

Terraprobe Inc. does not present the estimate percolation rate given in this report as a warranty of performance for the soil tested. The client or any third party using this information as a basis for the tile field design assumes all risk associated with their evaluation of this report and all other criteria used in the design of any private disposal system.

We trust this information is sufficient for your present purposes. Should you have any questions concerning this or any related matter, please do not hesitate to contact the undersigned at our Brampton office.

Respectfully submitted,
Terraprobe Inc.,



Gary Liou, M.Sc., P.Eng.

Brampton Office

Enclosure: T-Time Analysis Test Report

Terraprobe

T-TIME ANALYSIS
TEST REPORT

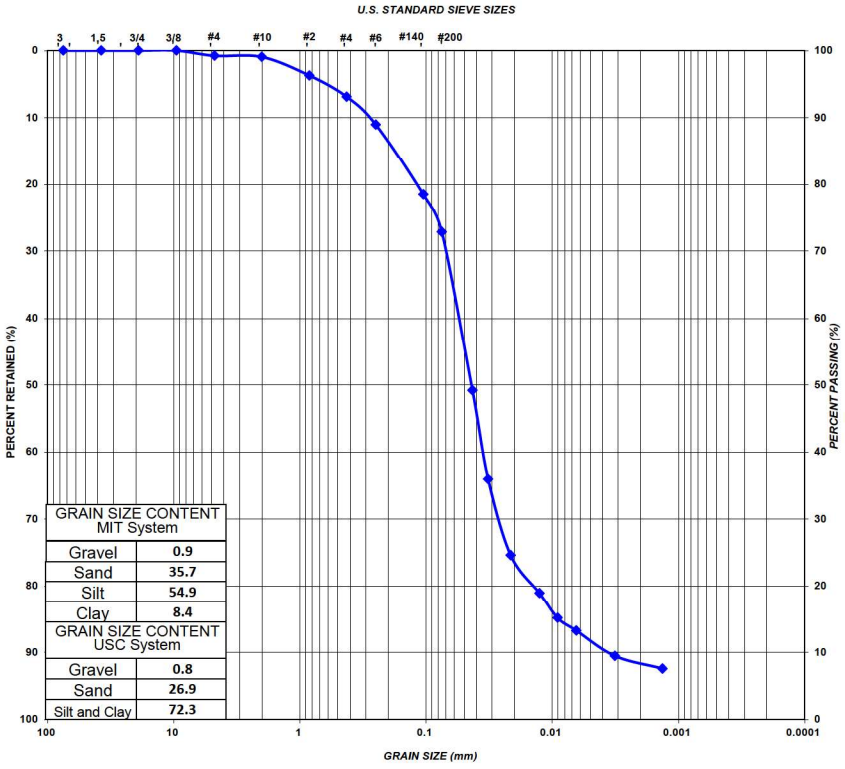
PROJECT: **Laurel Park Subdivision (16-168)**
LOCATION: **Caledon, On.**
CLIENT: **Calder Engineering**
CONTACT: **Robert Whyte**
SOIL SAMPLE: **1**

FILE NO.: **1-20-0076-24**
LAB NO.: **1050**
SAMPLE DATE: **Feb 25, 2020**
SAMPLED BY: **Client**

MIT DESCRIPTION: **SAND AND SILT, trace clay, trace gravel**
USC SYMBOL: **ML**

**** To be read in conjunction with cover letter only ****
Estimated rate of Percolation = 42 min/cm

GRAIN SIZE DISTRIBUTION



GRAIN SIZE CONTENT MIT System	
Gravel	**0.9**
Sand	**35.7**
Silt	**54.9**
Clay	**8.4**
GRAIN SIZE CONTENT USC System	
Gravel	**0.8**
Sand	**26.9**
Silt and Clay	**72.3**

MIT SYSTEM	GRAVEL		COARSE	MEDIUM	FINE	SILT	CLAY
			SAND				
UNIFIED SYSTEM	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY	
	GRAVEL		SAND				

Plot Data

75.0000	100.0000
37.5000	100.0000
19.0000	100.0000
9.5000	100.0000
4.7500	99.3292
2.0000	99.0575
0.8400	96.2838
0.4250	93.1140
0.2500	88.9536
0.1050	78.4535
0.0750	72.8072
0.0429	49.1860
0.0322	35.9436
0.0213	24.5930
0.0126	18.9177
0.0090	15.1342
0.0064	13.2424
0.0032	9.4588
0.0013	7.5671

System: "''''	Size (mm)	Percent Passing	Percentage of fraction	Terraprobe Composition	
Gravel	2.00	99.06	**0.9**	Trace	**0.8**
Sand	0.060	63.39	**35.7**	And	**26.9**
Silt	0.002	8.45	**54.9**	And	**72.3**
Clay			**8.4**	Trace	
			100.0		

SAND AND SILT, trace clay, trace gravel

APPENDIX C

STORMWATER MANAGEMENT SUPPORTING CALCULATIONS AND DOCUMENTATION

Table C.1.1
LAURELPARK, SWMHYMO PARAMETERS
EXISTING CONDITIONS

NASHYD PARAMETERS

Catchment	NHYD	DT min	Area ha	DWF cms	CN/C Group	CN/C	IA mm	N	TP hrs	Runoff Coeff. C	Slope (%)
1	**1**	1	1.92	0	BC	76	10	3	0.14	0.35	10.00
2	**2**	1	1.60	0	BC	78	10	3	0.14	0.35	13.22
3	**3**	1	0.18	0	BC	75	10	3	0.09	0.35	13.21
4	**4**	1	2.60	0	BC	70	10	3	0.17	0.35	11.84
5	**5**	1	1.79	0	BC	68	10	3	0.13	0.35	12.03
6	**6**	1	2.58	0	BC	75	10	3	0.26	0.28	4.12
7	**7**	1	1.46	0	BC	83	10	3	0.09	0.35	9.22
8	8	1	0.38	0	BC	75	10	3	0.16	0.28	4.91
9	9	2	0.05	0	BC	75	10	3	0.06	0.36	15.51

Notes:
1. Assumed row crop with good drainage in BC soil category ->
   Reference: MTO Design Chart 1.09: Soil/Land Use Curve Numbers
2. Time to Peak (TP) was calculated using Airport Method. TP=2/3 of Time of Concentration.

Table C.1.2
LAURELPARK, WEIGHTED CN VALUES
PROPOSED CONDITIONS:

NASHYD PARAMETERS

Sub-Basin	NHYD ID	DT min	Area ha	DWF cms	CN/C Group	Weighted CN	IA mm	N	TP hrs
A1	A1	1	1.93	0	BC	75	10	3	0.22
A2	A2	1	1.69	0	BC	78	10	3	0.20
A4	A4	1	2.51	0	BC	70	10	3	0.17
A5	A5	1	1.69	0	BC	68	10	3	0.14
A6	A6	1	1.21	0	BC	76	10	3	0.20
A7	A7	1	1.48	0	BC	81	10	3	0.09
A9	A9	1	0.17	0	BC	79	10	3	0.09

STANDHYD PARAMETERS

Sub-Basin	NHYD ID	Area ha	CN	TIMP	XIMP	IAPer mm	SLPP %	LGP m	MNP	SCP min	IAimp mm	SLPI %	LGI m	MNI	SCI min
A3	A3	0.05	75	0.50	0.001	10	4.0%	15	0.25	0	0.7	5.0%	90	0.013	0
A8a	A8a	1.81	75	0.22	0.001	10	3.0%	40	0.25	0	0.7	4.0%	164	0.013	0
A8b	A8b	0.05	75	0.44	0.430	10	20.0%	10	0.25	0	0.7	2.2%	15	0.013	0

Table C.1.3

LAURELPARK, WEIGHTED CN VALUES

NASHYD PARAMETERS

EXISTING CONDITIONS:

Catchment	NHYD	total Nashyd area (ha)	total Nashyd area (sq.m)	Pervious Grassed (sq.m)	Pond/ Wetland (sq.m)	Impervious (sq.m)	Pervious CN	Wetland CN	Impervious CN	Weighted CN
1.0	1.0	1.92	19,243	18,481	603	159	75	100	98	76
2.0	2.0	1.60	16,018	13,839	2,179	0	75	100	98	78
3.0	3.0	0.18	1,791	1,791	0	0	75	100	98	75
4.0	4.0	2.60	26,040	23,116	2,924	0	66	100	98	70
5.0	5.0	1.79	17,886	17,057	669	161	66	100	98	68
6.0	6.0	2.58	25,823	25,823	0	0	75	100	98	75
7.0	7.0	1.46	14,598	9,793	4,685	120	75	100	98	83
8.0	8.0	0.38	3,832	3,832	0	0	75	100	98	75
9.0	9.0	0.05	536	536	0	0	75	100	98	75

PROPOSED CONDITIONS:

Catchment	NHYD	total area (ha)	total area (sq.m)	Pervious Grassed (sq.m)	Pervious Rehabilitation (sq.m)	Wetland (sq.m)	Impervious (sq.m)	Pervious CN	Pervious CN (rehabilitation)	Wetland CN	Impervious CN	Weighted CN
A1	A1	1.93	19,338	12,500	5,140	603	1,094	75	66	100	98	75
A2	A2	1.69	16,873	10,787	2,914	2,179	992	75	66	100	98	78
A3	A3	0.05	489	245	0	0	244	75	66	100	98	
A4	A4	2.51	25,100	15,510	6,292	2,924	374	66	66	100	98	70
A5	A5	1.69	16,940	15,776	315	669	181	66	66	100	98	68
A6	A6	1.21	12,051	11,490	0	0	561	75	66	100	98	76
A7	A7	1.48	14,750	6,725	3,340	4,685	0	75	66	100	98	81
A8a	A8a	1.81	18,109	13,958	153	0	3,998	75	66	100	98	
A8b	A8b	0.05	451	250	0	0	201	75	66	100	98	
A9	A9	0.17	1,715	1,438	0	0	277	75	66	100	98	79

Notes:

1. Assumed row crop with good drainage in BC soil category -> CN range 75 to 82
   Proposed condition, lawn: Assumed row crop with good drainage in BC soil category -> CN range 75 to 82
   Reference: MTO Design Chart 1.09: Soil/Land Use Curve Numbers
2. Units: ha-hectares; sq.m-square meters.

Table C.1.4
LAURELPARK, TIME TO PEAK CALCULATIONS

Bransby Williams Method

$$T_c = \frac{0.057L}{S^{0.2}A^{0.1}}$$

Where; T_c = Time of Concentration (min.)
L = Length of watershed (m)
S = slope of watershed (%)
A = watershed area (ha.)

Kirpich Formula

$$T_c = \frac{0.06628L^{0.77}}{S^{0.385}}$$

Where; T_c = Time of Concentration (hr.)
L = Length of watershed (km)
S = slope of watershed (m/m)

Watt & Chow

$$T_c = 0.0293(L/S^{0.5})^{0.79}$$

Where; T_c = Time of Concentration (min.)
L = Length of watershed (m)
S = slope of watershed (m/m)

Airport Method

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

Where; T_c = Time of Concentration (min.)
C = Runoff Coefficient
L = Length of watershed (m)
S = slope of watershed (%)

Catchment	Catchment				T_c							$T_p = {}^2/_3 T_c$					
	Area	Length	Runoff Coeff.	Slope	Bransby Williams		Kirpich	Watt & Chow		Airport Method		Bransby Williams	Kirpich	Watt & Chow	Airport Method	Airport Method	Catchment
	(ha.)	(m)	C	(%)	(min.)	(hr.)	(hr.)	(min.)	(hr.)	(min.)	(hr.)	(hr.)	(hr.)	(hr.)	(hr.)	(min)	
EXISTING CONDITIONS (NASHYD)																	
1.0	1.92	123.16	0.35	10.00	4	0.1	0.0	3.3	0.1	12.69	0.21	0.05	0.03	0.04	0.14	8.5	1.0
2.0	1.60	136.02	0.35	13.22	4	0.1	0.0	3.2	0.1	12.16	0.20	0.05	0.03	0.04	0.14	8.1	2.0
3.0	0.18	55.83	0.35	13.21	2	0.0	0.0	1.6	0.0	7.80	0.13	0.03	0.02	0.02	0.09	5.2	3.0
4.0	2.60	193.39	0.35	11.84	6	0.1	0.0	4.4	0.1	15.04	0.25	0.07	0.04	0.05	0.17	10.0	4.0
5.0	1.79	117.37	0.35	12.03	4	0.1	0.0	2.9	0.0	11.66	0.19	0.04	0.03	0.03	0.13	7.8	5.0
6.0	2.58	194.36	0.28	4.12	8	0.1	0.1	6.6	0.1	23.36	0.39	0.08	0.06	0.07	0.26	15.6	6.0
7.0	1.46	48.79	0.35	9.22	2	0.0	0.0	1.6	0.0	8.20	0.14	0.02	0.02	0.02	0.09	5.5	7.0
8.0	0.38	81.41	0.28	4.91	4	0.1	0.0	3.1	0.1	14.26	0.24	0.04	0.03	0.03	0.16	9.5	8.0
9.0	0.05	25.79	0.36	15.51	1	0.0	0.0	0.8	0.0	4.96	0.08	0.01	0.01	0.01	0.06	3.3	9.0

Notes:
1. Assumed row crops land, good drainage, silt loam and hilly
2. Runoff coeff < 0.4 therefore used airport method

Catchment	Catchment				T_c							$T_p = {}^2/_3 T_c$					
	Area	Length	Runoff Coeff.	Slope	Bransby Williams		Kirpich	Watt & Chow		Airport Method		Bransby Williams	Kirpich	Watt & Chow	Airport Method	Airport Method	Catchment
	(ha.)	(m)	C	(%)	(min.)	(hr.)	(hr.)	(min.)	(hr.)	(min.)	(hr.)	(hr.)	(hr.)	(hr.)	(hr.)	(min)	
PROPOSED CONDITIONS (NASHYD): Bioretention areas																	
A1	1.93	151.55	0.28	4.55	6	0.1	0.1	5.2	0.1	19.96	0.33	0.07	0.05	0.06	0.22	13.3	A1
A2	1.69	141.87	0.28	5.42	5	0.1	0.0	4.6	0.1	18.23	0.30	0.06	0.05	0.05	0.20	12.2	A2
A4	2.51	191.20	0.35	11.18	6	0.1	0.0	4.4	0.1	15.24	0.25	0.07	0.04	0.05	0.17	10.2	A4
A5	1.69	139.08	0.35	12.03	5	0.1	0.0	3.3	0.1	12.69	0.21	0.05	0.03	0.04	0.14	8.5	A5
A6	1.21	145.69	0.28	5.49	6	0.1	0.0	4.7	0.1	18.39	0.31	0.06	0.05	0.05	0.20	12.3	A6
A7	1.48	48.79	0.35	9.22	2	0.0	0.0	1.6	0.0	8.20	0.14	0.02	0.02	0.02	0.09	5.5	A7
A9	0.17	44.00	0.35	8.64	2	0.0	0.0	1.5	0.0	7.96	0.13	0.02	0.02	0.02	0.09	5.3	A9

TABLE C.2
SUMMARY OF PRE-DEVELOPMENT FLOW RATES, OUTLET FLOW RATES, STORAGE VOLUME USED, AND ASSOCIATED WATER LEVEL FOR THE 2 TO 100-YEAR DESIGN STORM

SWM Block / Discharge Point	Sub-basin	Drainage Area (ha)	2 Year Return Period				5 Year Return Period				10 Year Return Period			
			Unit Flow Rate (cms)	Outlet Flow Rate (cms)	Storage Volume Used (cu.m)	Water Level Based on Vol. Used (m)	Unit Flow Rate (cms)	Outlet Flow Rate (cms)	Storage Volume Used (cu.m)	Water Level Based on Vol. Used (m)	Unit Flow Rate (cms)	Outlet Flow Rate (cms)	Storage Volume Used (cu.m)	Water Level Based on Vol. Used (m)
SWM Block 13	A8a	1.81	0.001	0.001	134	278.94	0.002	0.002	248	279.08	0.003	0.002	334	279.18

SWM Block / Discharge Point	Sub-basin	Drainage Area (ha)	25 Year Return Period				50 Year Return Period				100 Year Return Period			
			Unit Flow Rate (cms)	Outlet Flow Rate (cms)	Storage Volume Used (cu.m)	Water Level Based on Vol. Used (m)	Unit Flow Rate (cms)	Outlet Flow Rate (cms)	Storage Volume Used (cu.m)	Water Level Based on Vol. Used (m)	Unit Flow Rate (cms)	Outlet Flow Rate (cms)	Storage Volume Used (cu.m)	Water Level Based on Vol. Used (m)
SWM Block 13	A8a	1.81	0.004	0.003	453	279.31	0.005	0.003	548	279.41	0.006	0.004	646	279.51

Return Period	Unit Flow Equation (l/s/ha)
100-year	Q =14.140 - 1.096 * ln (A)
50-Year	Q =11.920 - 0.921 * ln (A)
25-year	Q =9.838 - 0.757 * ln (A)
10-year	Q =7.443 - 0.578 * ln (A)
5-Year	Q =5.557 - 0.427 * ln (A)
2-Year	Q =3.142 - 0.233 * ln (A)

Notes:
1. Unit flow equation taken from Table E.1 Summary of Unit Flow Rate Relationships, Humber River Watershed, Equation C Sub-Basin 11, where Q=unit flow rate in l/s/ha, and A=area in hectares.
2. units: ha-hectares; cms-cubic meters per second; cu.m-cubic meters

TABLE C.3
Laurel Park
Outlet Calculations for Bioretention Area

For 40mm Orifice:
Q=Cd*A*sqrt(2*g*H)
Where: Cd = 0.62
A=Area of orifice (sq.m) {3.14r^2}
g=gravity (m/s)
H= Head above orifice invert (m)

For broad crested weir
Q=cLH(3/2)
C= 1.6
L = top width of the trapezoid
H = head above invert

B 2
R 4

Drainage From: A8

Orifice Diameter= 0.04 m

Elev. (m)	Q - 40mm orifice cms	Weir flow cms	Total Q cms	Comments
278.75	0.0000		0.0000	base elev; pipe invert
278.80	0.0008		0.0008	
278.90	0.0013		0.0013	
279.00	0.0017		0.0017	
279.10	0.0020		0.0020	
279.20	0.0023		0.0023	
279.30	0.0026		0.0026	
279.40	0.0028		0.0028	
279.41	0.0028		0.0028	
279.45	0.0029		0.0029	
279.50	0.0030		0.0030	
279.52	0.0030	0.0000	0.0030	Spillway invert
279.53	0.0030	0.0033	0.0064	
279.60	0.0032	0.0956	0.0988	

(TRCA Existing Conditions)

Unit flow rates:	
100 year	0.0058
50 year	0.0049
25 year	0.0040
10 year	0.0031
5 year	0.0023
2 year	0.0013

SWM Block: **Drainage From: A8**
Route Reservoir

Elev. (m)	Total Q cms	Storage (ha-m)	Storage (cu.m)	
278.75	0.0000	0.000	0.0	Base of pond, outlet pipe invert
278.80	0.0008	0.003	33.9	
278.90	0.0013	0.011	105.2	
279.00	0.0017	0.018	181.6	
279.10	0.0020	0.026	263.1	
279.20	0.0023	0.035	349.9	
279.30	0.0026	0.044	442.1	
279.40	0.0028	0.054	539.7	
279.50	0.0030	0.064	643.0	
279.52	0.0030	0.066	664.4	
279.53	0.0064	0.068	675.3	Spillway invert
279.60	0.0988	0.075	750.0	Perimeter Crest Elevation

```
00001> 2     Metric units
00002> *#*************************************************************************
00003> *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00004> *#  Date        : [2018-11-30]
00005> *#  Modeller    : [    MYS    ]
00006> *#  Company     : Calder Engineering Ltd.
00007> *#  License #   :  3375279
00008> *#*************************************************************************
00009> *# Existing Conditions
00010> *#*************************************************************************
00011> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
00012> *%
00013> *%-----------------|-------------------------------------------------------|
00014> READ STORM          STORM_FILENAME=["100Y6.STM"]
00015> *%-----------------|-------------------------------------------------------|
00016> *# Node 1: Flow from Basin 1
00017> *%-----------------|-------------------------------------------------------|
00018> CALIB NASHYD        ID=[ 1 ], NHYD=["1"], DT=[ 1 ]min, AREA=[ 1.92](ha),
00019>                     DWF=[ 0 ](cms),  CN/C=[ 76 ], IA=[ 10 ](mm),
00020>                     N=[  3 ], TP=[  0.14 ]hrs,
00021>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00022> *%-----------------|-------------------------------------------------------|
00023> *# Node 2: Flow from Basin 2
00024> *%-----------------|-------------------------------------------------------|
00025> CALIB NASHYD        ID=[ 2 ], NHYD=["2"], DT=[ 1]min, AREA=[ 1.60](ha),
00026>                     DWF=[ 0 ](cms),  CN/C=[ 78 ], IA=[ 10 ](mm),
00027>                     N=[ 3  ], TP=[  0.14 ]hrs,
00028>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00029> *%-----------------|-------------------------------------------------------|
00030> *# Node 3: Flow from Basin 3
00031> *%-----------------|-------------------------------------------------------|
00032> CALIB NASHYD        ID= [ 3 ], NHYD=["3"], DT=[ 1 ]min, AREA=[ 0.18  ](ha),
00033>                     DWF=[ 0 ](cms),  CN/C=[75 ], IA=[ 10 ](mm),
00034>                     N=[  3 ], TP=[ 0.09 ]hrs,
00035>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00036> *%-----------------|-------------------------------------------------------|
00037> *# Node 4: Flow from Basin 4 and 5
00038> *%-----------------|-------------------------------------------------------|
00039> CALIB NASHYD        ID= [ 4 ], NHYD=["4"], DT=[ 1 ]min, AREA=[ 2.60  ](ha),
00040>                     DWF=[ 0 ](cms),  CN/C=[70 ], IA=[ 10 ](mm),
00041>                     N=[  3 ], TP=[ 0.17 ]hrs,
00042>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00043> *%-----------------|-------------------------------------------------------|
00044> CALIB NASHYD        ID= [ 5 ], NHYD=["5"], DT=[ 1 ]min, AREA=[ 1.79  ](ha),
00045>                     DWF=[ 0 ](cms),  CN/C=[68], IA=[ 10 ](mm),
00046>                     N=[  3 ], TP=[ 0.13  ]hrs,
00047>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00048> *%-----------------|-------------------------------------------------------|
00049> ADD HYD             IDsum=[ 6 ], NHYD=[ "N4"], IDs to add=[ 4+5 ]
00050> *%-----------------|-------------------------------------------------------|
00051> *# Node 5: Flow from Basin 6
00052> *%-----------------|-------------------------------------------------------|
00053> CALIB NASHYD        ID= [ 7 ], NHYD=["6"], DT=[ 1 ]min, AREA=[ 2.58  ](ha),
00054>                     DWF=[ 0 ](cms),  CN/C=[75], IA=[ 10 ](mm),
00055>                     N=[  3 ], TP=[ 0.26  ]hrs,
00056>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00057> *%-----------------|-------------------------------------------------------|
00058> *# Node 6: Flow from Basin 7
00059> *%-----------------|-------------------------------------------------------|
00060> CALIB NASHYD        ID= [ 8 ], NHYD=["7"], DT=[ 1 ]min, AREA=[ 1.46 ](ha),
00061>                     DWF=[ 0 ](cms),  CN/C=[83], IA=[ 10 ](mm),
00062>                     N=[  3 ], TP=[ 0.09  ]hrs,
00063>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00064> *%-----------------|-------------------------------------------------------|
00065> *# Node 7: Flow from Basin 8
00066> *%-----------------|-------------------------------------------------------|
00067> CALIB NASHYD        ID= [ 9 ], NHYD=["8"], DT=[ 1 ]min, AREA=[ 0.38  ](ha),
00068>                     DWF=[ 0 ](cms),  CN/C=[75], IA=[ 10 ](mm),
00069>                     N=[  3 ], TP=[ 0.16  ]hrs,
00070>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00071> *%-----------------|-------------------------------------------------------|
00072> *# Node 8: Flow from Basin 9
00073> *%-----------------|-------------------------------------------------------|
00074> CALIB NASHYD        ID= [ 1 ], NHYD=["9"], DT=[ 1 ]min, AREA=[ 0.05  ](ha),
00075>                     DWF=[ 0 ](cms),  CN/C=[75], IA=[ 10 ](mm),
00076>                     N=[  3 ], TP=[ 0.06  ]hrs,
00077>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00078> *%-----------------|-------------------------------------------------------|
00079> FINISH
00080>
00081>
00082>
00083>
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```

```
00001> 2     Metric units
00002> *#*************************************************************************
00003> *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00004> *#  Date        : [2020-04-17]
00005> *#  Modeller    : [    MYS, KC    ]
00006> *#  Company     : Calder Engineering Ltd.
00007> *#  License #   :  3375279
00008> *#*************************************************************************
00009> *# Proposed Conditions: bottom at 278.75, pipe invert at 278.75
00010> *  overflow at 279.52 and top of berm at 279.62
00011> *  updated with revised drainage areas and pond design February 2020
00012> *  Filename: L-P.dat
00013> *#*************************************************************************
00014> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
00015> *%
00016> *%----------------|-------------------------------------------------------|
00017> READ STORM          STORM_FILENAME=["25mm-4hr.STM"]
00018> *%----------------|-------------------------------------------------------|
00019> *# Node 1: Flow from Basin 1
00020> *%----------------|-------------------------------------------------------|
00021> CALIB NASHYD        ID=[ 1 ], NHYD=["A1"], DT=[ 1 ]min, AREA=[ 1.93 ](ha),
00022>                     DWF=[ 0 ](cms),  CN/C=[ 75 ], IA=[ 10 ](mm),
00023>                     N=[  3 ], TP=[  0.22 ]hrs,
00024>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00025> *%----------------|-------------------------------------------------------|
00026> *# Node 2: Flow from Basin 2
00027> *%----------------|-------------------------------------------------------|
00028> CALIB NASHYD        ID=[ 2 ], NHYD=["A2"], DT=[ 1 ]min, AREA=[ 1.69 ](ha),
00029>                     DWF=[ 0 ](cms),  CN/C=[ 78 ], IA=[ 10 ](mm),
00030>                     N=[  3 ], TP=[  0.20 ]hrs,
00031>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00032> *%----------------|-------------------------------------------------------|
00033> *# Node 3: Flow from Basin 3
00034> *%----------------|-------------------------------------------------------|
00035> CALIB STANDHYD      ID=[3 ], NHYD=[" A3"], DT=[ 1  ](min), AREA=[ 0.05](ha),
00036>                     XIMP=[ 0.001  ], TIMP=[0.50 ], DWF=[ 0  ](cms), LOSS=[2],
00037>                     SCS curve number CN=[ 75  ],
00038>                     Pervious   surfaces: IAper=[ 10  ](mm), SLPP=[ 4  ](%),
00039>                                          LGP=[ 15 ](m), MNP=[0.25  ], SCP=[0  ](
00040>                     Impervious surfaces: IAimp=[ 0.7 ](mm), SLPI=[ 5 ](%),
00041>                                          LGI=[ 90](m), MNI=[ 0.013 ], SCI=[ 0 ](
00042>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00043> *%----------------|-------------------------------------------------------|
00044> *# Node 4: Flow from Basin 4 + 5
00045> *%----------------|-------------------------------------------------------|
00046> CALIB NASHYD        ID= [ 4 ], NHYD=["A4"], DT=[ 1 ]min, AREA=[ 2.51  ](ha),
00047>                     DWF=[ 0 ](cms),  CN/C=[70 ], IA=[ 10 ](mm),
00048>                     N=[  3 ], TP=[ 0.17 ]hrs,
00049>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00050> *%----------------|-------------------------------------------------------|
00051> CALIB NASHYD        ID= [ 5 ], NHYD=["A5"], DT=[ 1 ]min, AREA=[ 1.69  ](ha),
00052>                     DWF=[ 0 ](cms),  CN/C=[68], IA=[ 10 ](mm),
00053>                     N=[  3 ], TP=[ 0.14  ]hrs,
00054>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00055> *%----------------|-------------------------------------------------------|
00056> ADD HYD             IDsum=[ 6 ], NHYD=["N4"], IDs to add=[4+5 ]
00057> *%----------------|-------------------------------------------------------|
00058> *# Node 5: Flow from Basin 6
00059> *%----------------|-------------------------------------------------------|
00060> CALIB NASHYD        ID= [ 7 ], NHYD=["A6"], DT=[ 1 ]min, AREA=[ 1.21  ](ha),
00061>                     DWF=[ 0 ](cms),  CN/C=[76], IA=[ 10 ](mm),
00062>                     N=[  3 ], TP=[ 0.20  ]hrs,
00063>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00064> *%----------------|-------------------------------------------------------|
00065> *# Node 6: Flow from Basin 7
00066> *%----------------|-------------------------------------------------------|
00067> CALIB NASHYD        ID= [ 8 ], NHYD=["A7"], DT=[ 1 ]min, AREA=[ 1.48 ](ha),
00068>                     DWF=[ 0 ](cms),  CN/C=[81], IA=[ 10 ](mm),
00069>                     N=[  3 ], TP=[ 0.09  ]hrs,
00070>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00071> *%----------------|-------------------------------------------------------|
00072> *# Node 7: Flow from Basin 8
00073> *%----------------|-------------------------------------------------------|
00074> CALIB STANDHYD      ID=[9], NHYD=["A8"], DT=[ 1  ](min), AREA=[ 1.86 ](ha),
00075>                     XIMP=[ 0.001  ], TIMP=[0.22   ], DWF=[ 0  ](cms), LOSS=[2],
00076>                     SCS curve number CN=[ 75  ],
00077>                     Pervious   surfaces: IAper=[ 10  ](mm), SLPP=[ 3.0  ](%),
00078>                                          LGP=[ 40 ](m), MNP=[0.25  ], SCP=[0  ](
00079>                     Impervious surfaces: IAimp=[ 0.7 ](mm), SLPI=[ 3 ](%),
00080>                                          LGI=[ 164](m), MNI=[ 0.013 ], SCI=[ 0 ]
00081>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00082> *%----------------|-------------------------------------------------------|
00083> ROUTE RESERVOIR     IDout=[ 1 ],   NHYD=["SWM-out" ],  IDin=[  9 ],
00084>                     RDT=[ 1   ](min),
00085>                           TABLE of ( OUTFLOW-STORAGE ) values
00086>                                      (cms) - (ha-m)
00087>                                    [    0.0, 0.000 ]
00088>                                    [ 0.0008, 0.003 ]
00089>                                    [ 0.0013, 0.011 ]
00090>                                    [ 0.0017, 0.018 ]
00091>                                    [ 0.0020, 0.026 ]
00092>                                    [ 0.0023, 0.035 ]
00093>                                    [ 0.0026, 0.044 ]
00094>                                    [ 0.0028, 0.054 ]
00095>                                    [ 0.0030, 0.064 ]
00096>                                    [ 0.0030, 0.066 ]
00097>                                    [ 0.0064, 0.068 ]
00098>                                    [ 0.0988, 0.075 ]
00099>                                    [   -1  ,  -1  ]  (max twenty pts)
00100>                           IDovf=[ 2  ], NHYDovf=["SWM-OVF" ]
00101> *%----------------|-------------------------------------------------------|
00102> *%----------------|-------------------------------------------------------|
00103> *# Node 8: Flow from Basin 9
00104> *%----------------|-------------------------------------------------------|
00105> CALIB NASHYD        ID= [ 5 ], NHYD=["A9"], DT=[ 1 ]min, AREA=[ 0.17  ](ha),
00106>                     DWF=[ 0 ](cms),  CN/C=[79], IA=[ 10 ](mm),
00107>                     N=[  3 ], TP=[ 0.09  ]hrs,
00108>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00109> *%----------------|-------------------------------------------------------|
00110> FINISH
00111>
00112>
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00001> ================================================================================
00002>
00003>    SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>    S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>    SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>        S  W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>    SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
00008>                                                          9   9  9   9   # 3375279
00009>          StormWater Management HYdrologic Model          999    999    =========
00010>
00011>  ********************************************************************************
00012>  ***************************** SWMHYMO Ver/4.05  ********************************
00013>  *********  A single event and continuous hydrologic simulation model  *********
00014>  *********     based on the principles of HYMO and its successors      *********
00015>  *********                    OTTHYMO-83 and OTTHYMO-89.                *********
00016>  ********************************************************************************
00017>  ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018>  *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019>  *********                  Gatineau, Quebec: (819) 243-6858           *********
00020>  *********                  E-Mail: swmhymo@jfsa.Com                   *********
00021>  ********************************************************************************
00022>
00023>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++++ Licensed user: Calder Engineering Ltd.                      +++++++++
00025>  +++++++++                Bolton               SERIAL#:3375279        +++++++++
00026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *********          ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030>  *********          Maximum value for ID numbers  :     10            *********
00031>  *********          Max. number of rainfall points: 105408            *********
00032>  *********          Max. number of flow points    : 105408            *********
00033>  ********************************************************************************
00034>
00035>
00036>  *********************   D E T A I L E D   O U T P U T   **********************
00037>  ********************************************************************************
00038>  *         DATE: 2018-11-30     TIME: 16:16:31     RUN COUNTER: 000921         *
00039>  ********************************************************************************
00040>  * Input   filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.dat               *
00041>  * Output  filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.out               *
00042>  * Summary filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.sum               *
00043>  * User comments:                                                             *
00044>  * 1:_____________________________________________________________________    *
00045>  * 2:_____________________________________________________________________    *
00046>  * 3:                                                                         *
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*******************************************************************************
00052> *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00053> *#  Date        : [2018-11-30]
00054> *#  Modeller    : [    MYS    ]
00055> *#  Company     : Calder Engineering Ltd.
00056> *#  License #   :  3375279
00057> *#*******************************************************************************
00058> *# Existing Conditions
00059> *#*******************************************************************************
00060> --------------------
00061> | START            |  Project  dir.: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\
00062> --------------------  Rainfall dir.: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\
00063>     TZERO =   .00 hrs on        0
00064>     METOUT=   2 (output = METRIC)
00065>     NRUN  = 001
00066>     NSTORM=   0
00067> --------------------------------------------------------------------------------
00068> 001:0002--------------------------------------------------------------------------
00069> --------------------
00070> | READ STORM       |    Filename: 2yr/6hr
00071> | Ptotal=  36.00 mm|    Comments: 2yr/6hr
00072> --------------------
00073>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00074>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00075>                .25    .000 |   2.00  12.240 |   3.75   5.040 |   5.50    .720
00076>                .50    .720 |   2.25  12.240 |   4.00   2.880 |   5.75    .720
00077>                .75    .720 |   2.50  33.120 |   4.25   2.880 |   6.00    .720
00078>               1.00    .720 |   2.75  33.120 |   4.50   1.440 |   6.25    .720
00079>               1.25    .720 |   3.00   9.360 |   4.75   1.440 |
00080>               1.50   4.320 |   3.25   9.360 |   5.00    .720 |
00081>               1.75   4.320 |   3.50   5.040 |   5.25    .720 |
00082>
00083> --------------------------------------------------------------------------------
00084> 001:0003--------------------------------------------------------------------------
00085> *# Node 1: Flow from Basin 1
00086> ----------------------
00087> | CALIB NASHYD       |   Area    (ha)=    1.92   Curve Number   (CN)=76.00
00088> | 01:1      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00089> ----------------------   U.H. Tp(hrs)=    .140
00090>
00091>     Unit Hyd Qpeak  (cms)=     .524
00092>
00093>     PEAK FLOW       (cms)=     .036 (i)
00094>     TIME TO PEAK    (hrs)=    2.800
00095>     RUNOFF VOLUME    (mm)=    6.365
00096>     TOTAL RAINFALL   (mm)=   36.000
00097>     RUNOFF COEFFICIENT   =     .177
00098>
00099>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00100>
00101> --------------------------------------------------------------------------------
00102> 001:0004--------------------------------------------------------------------------
00103> *# Node 2: Flow from Basin 2
00104> ----------------------
00105> | CALIB NASHYD       |   Area    (ha)=    1.60   Curve Number   (CN)=78.00
00106> | 02:2      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00107> ----------------------   U.H. Tp(hrs)=    .140
00108>
00109>     Unit Hyd Qpeak  (cms)=     .437
00110>
00111>     PEAK FLOW       (cms)=     .033 (i)
00112>     TIME TO PEAK    (hrs)=    2.800
00113>     RUNOFF VOLUME    (mm)=    6.923
00114>     TOTAL RAINFALL   (mm)=   36.000
00115>     RUNOFF COEFFICIENT   =     .192
00116>
00117>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00118>
00119> --------------------------------------------------------------------------------
00120> 001:0005--------------------------------------------------------------------------
00121> *# Node 3: Flow from Basin 3
00122> ----------------------
00123> | CALIB NASHYD       |   Area    (ha)=     .18   Curve Number   (CN)=75.00
00124> | 03:3      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00125> ----------------------   U.H. Tp(hrs)=    .090
00126>
00127>     Unit Hyd Qpeak  (cms)=     .076
00128>
00129>     PEAK FLOW       (cms)=     .004 (i)
00130>     TIME TO PEAK    (hrs)=    2.767
00131>     RUNOFF VOLUME    (mm)=    6.107
00132>     TOTAL RAINFALL   (mm)=   36.000
00133>     RUNOFF COEFFICIENT   =     .170
00134>
00135>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00136>
00137> --------------------------------------------------------------------------------
00138> 001:0006--------------------------------------------------------------------------
00139> *# Node 4: Flow from Basin 4 and 5
00140> ----------------------
00141> | CALIB NASHYD       |   Area    (ha)=    2.60   Curve Number   (CN)=70.00
00142> | 04:4      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00143> ----------------------   U.H. Tp(hrs)=    .170
00144>
00145>     Unit Hyd Qpeak  (cms)=     .584
00146>
00147>     PEAK FLOW       (cms)=     .035 (i)
00148>     TIME TO PEAK    (hrs)=    2.833
00149>     RUNOFF VOLUME    (mm)=    5.013
00150>     TOTAL RAINFALL   (mm)=   36.000
00151>     RUNOFF COEFFICIENT   =     .139
00152>
00153>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00154>
00155> --------------------------------------------------------------------------------
00156> 001:0007--------------------------------------------------------------------------
00157> ----------------------
00158> | CALIB NASHYD       |   Area    (ha)=    1.79   Curve Number   (CN)=68.00
00159> | 05:5      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00160> ----------------------   U.H. Tp(hrs)=    .130
00161>
00162>     Unit Hyd Qpeak  (cms)=     .526
00163>
00164>     PEAK FLOW       (cms)=     .025 (i)
00165>     TIME TO PEAK    (hrs)=    2.800
00166>     RUNOFF VOLUME    (mm)=    4.645
00167>     TOTAL RAINFALL   (mm)=   36.000
00168>     RUNOFF COEFFICIENT   =     .129
00169>
00170>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00171>
00172> --------------------------------------------------------------------------------
00173> 001:0008--------------------------------------------------------------------------
00174> ------------------------
00175> | ADD HYD (N4        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00176> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
00177>                        ID1 04:4             2.60     .035    2.83   5.01    .000
00178>                       +ID2 05:5             1.79     .025    2.80   4.64    .000
00179>                        ========================================================
00180>                        SUM 06:N4            4.39     .059    2.82   4.86    .000
00181>
00182>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00183>
00184> --------------------------------------------------------------------------------
00185> 001:0009--------------------------------------------------------------------------
00186> *# Node 5: Flow from Basin 6
00187> ----------------------
00188> | CALIB NASHYD       |   Area    (ha)=    2.58   Curve Number   (CN)=75.00
00189> | 07:6      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00190> ----------------------   U.H. Tp(hrs)=    .260
00191>
00192>     Unit Hyd Qpeak  (cms)=     .379
00193>
00194>     PEAK FLOW       (cms)=     .034 (i)
00195>     TIME TO PEAK    (hrs)=    2.950
00196>     RUNOFF VOLUME    (mm)=    6.108
00197>     TOTAL RAINFALL   (mm)=   36.000
00198>     RUNOFF COEFFICIENT   =     .170
00199>
00200>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00201>
00202> --------------------------------------------------------------------------------
00203> 001:0010--------------------------------------------------------------------------
00204> *# Node 6: Flow from Basin 7
00205> ----------------------
00206> | CALIB NASHYD       |   Area    (ha)=    1.46   Curve Number   (CN)=83.00
00207> | 08:7      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00208> ----------------------   U.H. Tp(hrs)=    .090
00209>
00210>     Unit Hyd Qpeak  (cms)=     .620
00211>
00212>     PEAK FLOW       (cms)=     .044 (i)
00213>     TIME TO PEAK    (hrs)=    2.767
00214>     RUNOFF VOLUME    (mm)=    8.664
00215>     TOTAL RAINFALL   (mm)=   36.000
00216>     RUNOFF COEFFICIENT   =     .241
00217>
00218>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00219>
00220> --------------------------------------------------------------------------------
00221> 001:0011--------------------------------------------------------------------------
00222> *# Node 7: Flow from Basin 8
00223> ----------------------
00224> | CALIB NASHYD       |   Area    (ha)=     .38   Curve Number   (CN)=75.00
00225> | 09:8      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00226> ----------------------   U.H. Tp(hrs)=    .160
00227>
00228>     Unit Hyd Qpeak  (cms)=     .091
00229>
00230>     PEAK FLOW       (cms)=     .006 (i)
00231>     TIME TO PEAK    (hrs)=    2.833
00232>     RUNOFF VOLUME    (mm)=    6.108
00233>     TOTAL RAINFALL   (mm)=   36.000
00234>     RUNOFF COEFFICIENT   =     .170
00235>
00236>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00237>
00238> --------------------------------------------------------------------------------
00239> 001:0012--------------------------------------------------------------------------
00240> *# Node 8: Flow from Basin 9
00241> ----------------------
00242> | CALIB NASHYD       |   Area    (ha)=     .05   Curve Number   (CN)=75.00
00243> | 01:9      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00244> ----------------------   U.H. Tp(hrs)=    .060
00245>
00246>     Unit Hyd Qpeak  (cms)=     .032
00247>
00248>     PEAK FLOW       (cms)=     .001 (i)
00249>     TIME TO PEAK    (hrs)=    2.750
00250>     RUNOFF VOLUME    (mm)=    6.105
00251>     TOTAL RAINFALL   (mm)=   36.000
00252>     RUNOFF COEFFICIENT   =     .170
00253>
00254>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00255>
00256> --------------------------------------------------------------------------------
00257> 001:0013--------------------------------------------------------------------------
00258>       FINISH
00259> --------------------------------------------------------------------------------
00260> ********************************************************************************
00261>      WARNINGS / ERRORS / NOTES
00262>      -------------------------
00263>    Simulation ended on 2018-11-30     at 16:16:31
00264> ================================================================================
00265>
00266>
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```
00001> ================================================================================
00002>
00003>    SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>    S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>    SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>        S  W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>    SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
00008>                                                          9   9  9   9   # 3375279
00009>          StormWater Management HYdrologic Model          999    999    =========
00010>
00011>  ********************************************************************************
00012>  ***************************** SWMHYMO Ver/4.05  ********************************
00013>  *********  A single event and continuous hydrologic simulation model  *********
00014>  *********     based on the principles of HYMO and its successors      *********
00015>  *********                    OTTHYMO-83 and OTTHYMO-89.                *********
00016>  ********************************************************************************
00017>  ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018>  *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019>  *********                  Gatineau, Quebec: (819) 243-6858           *********
00020>  *********                  E-Mail: swmhymo@jfsa.Com                   *********
00021>  ********************************************************************************
00022>
00023>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++++ Licensed user: Calder Engineering Ltd.                      +++++++++
00025>  +++++++++                Bolton               SERIAL#:3375279        +++++++++
00026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *********          ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030>  *********          Maximum value for ID numbers  :     10            *********
00031>  *********          Max. number of rainfall points: 105408            *********
00032>  *********          Max. number of flow points    : 105408            *********
00033>  ********************************************************************************
00034>
00035>
00036>  *********************   D E T A I L E D   O U T P U T   **********************
00037>  ********************************************************************************
00038>  *         DATE: 2018-11-30     TIME: 16:15:54     RUN COUNTER: 000919         *
00039>  ********************************************************************************
00040>  * Input   filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.dat               *
00041>  * Output  filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.out               *
00042>  * Summary filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.sum               *
00043>  * User comments:                                                             *
00044>  * 1:_____________________________________________________________________    *
00045>  * 2:_____________________________________________________________________    *
00046>  * 3:                                                                         *
00047>  ********************************************************************************
00048>
00049>  -------------------------------------------------------------------------------
00050>  001:0001--------------------------------------------------------------------------
00051>  *#*****************************************************************************
00052>  *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00053>  *#  Date        : [2018-11-30]
00054>  *#  Modeller    : [    MYS    ]
00055>  *#  Company     : Calder Engineering Ltd.
00056>  *#  License #   :  3375279
00057>  *#*****************************************************************************
00058>  *# Existing Conditions
00059>  *#*****************************************************************************
00060>  --------------------
00061>  | START            |  Project  dir.: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\
00062>  --------------------  Rainfall dir.: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\
00063>      TZERO =   .00 hrs on        0
00064>      METOUT=   2 (output = METRIC)
00065>      NRUN  = 001
00066>      NSTORM=   0
00067>  -------------------------------------------------------------------------------
00068>  001:0002--------------------------------------------------------------------------
00069>  --------------------
00070>  | READ STORM       |    Filename: 5yr/6hr
00071>  | Ptotal=  47.81 mm|    Comments: 5yr/6hr
00072>  --------------------
00073>                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00074>                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00075>                 .25    .000 |   2.00  16.250 |   3.75   6.690 |   5.50    .960
00076>                 .50    .960 |   2.25  16.250 |   4.00   3.820 |   5.75    .960
00077>                 .75    .960 |   2.50  43.980 |   4.25   3.820 |   6.00    .960
00078>                1.00    .960 |   2.75  43.980 |   4.50   1.910 |   6.25    .960
00079>                1.25    .960 |   3.00  12.430 |   4.75   1.910 |
00080>                1.50   5.740 |   3.25  12.430 |   5.00    .960 |
00081>                1.75   5.740 |   3.50   6.690 |   5.25    .960 |
00082>
00083>  -------------------------------------------------------------------------------
00084>  001:0003--------------------------------------------------------------------------
00085>  *# Node 1: Flow from Basin 1
00086>  ----------------------
00087>  | CALIB NASHYD       |   Area    (ha)=    1.92   Curve Number   (CN)=76.00
00088>  | 01:1      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00089>  ----------------------   U.H. Tp(hrs)=    .140
00090>
00091>       Unit Hyd Qpeak  (cms)=     .524
00092>
00093>       PEAK FLOW       (cms)=     .071 (i)
00094>       TIME TO PEAK    (hrs)=    2.800
00095>       RUNOFF VOLUME    (mm)=   12.113
00096>       TOTAL RAINFALL   (mm)=   47.810
00097>       RUNOFF COEFFICIENT   =     .253
00098>
00099>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00100>
00101>  -------------------------------------------------------------------------------
00102>  001:0004--------------------------------------------------------------------------
00103>  *# Node 2: Flow from Basin 2
00104>  ----------------------
00105>  | CALIB NASHYD       |   Area    (ha)=    1.60   Curve Number   (CN)=78.00
00106>  | 02:2      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00107>  ----------------------   U.H. Tp(hrs)=    .140
00108>
00109>       Unit Hyd Qpeak  (cms)=     .437
00110>
00111>       PEAK FLOW       (cms)=     .064 (i)
00112>       TIME TO PEAK    (hrs)=    2.800
00113>       RUNOFF VOLUME    (mm)=   13.061
00114>       TOTAL RAINFALL   (mm)=   47.810
00115>       RUNOFF COEFFICIENT   =     .273
00116>
00117>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00118>
00119>  -------------------------------------------------------------------------------
00120>  001:0005--------------------------------------------------------------------------
00121>  *# Node 3: Flow from Basin 3
00122>  ----------------------
00123>  | CALIB NASHYD       |   Area    (ha)=     .18   Curve Number   (CN)=75.00
00124>  | 03:3      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00125>  ----------------------   U.H. Tp(hrs)=    .090
00126>
00127>       Unit Hyd Qpeak  (cms)=     .076
00128>
00129>       PEAK FLOW       (cms)=     .007 (i)
00130>       TIME TO PEAK    (hrs)=    2.767
00131>       RUNOFF VOLUME    (mm)=   11.671
00132>       TOTAL RAINFALL   (mm)=   47.810
00133>       RUNOFF COEFFICIENT   =     .244
00134>
00135>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00136>
00137>  -------------------------------------------------------------------------------
00138>  001:0006--------------------------------------------------------------------------
00139>  *# Node 4: Flow from Basin 4 and 5
00140>  ----------------------
00141>  | CALIB NASHYD       |   Area    (ha)=    2.60   Curve Number   (CN)=70.00
00142>  | 04:4      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00143>  ----------------------   U.H. Tp(hrs)=    .170
00144>
00145>       Unit Hyd Qpeak  (cms)=     .584
00146>
00147>       PEAK FLOW       (cms)=     .070 (i)
00148>       TIME TO PEAK    (hrs)=    2.817
00149>       RUNOFF VOLUME    (mm)=    9.747
00150>       TOTAL RAINFALL   (mm)=   47.810
00151>       RUNOFF COEFFICIENT   =     .204
00152>
00153>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00154>
00155>  -------------------------------------------------------------------------------
00156>  001:0007--------------------------------------------------------------------------
00157>  ----------------------
00158>  | CALIB NASHYD       |   Area    (ha)=    1.79   Curve Number   (CN)=68.00
00159>  | 05:5      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00160>  ----------------------   U.H. Tp(hrs)=    .130
00161>
00162>       Unit Hyd Qpeak  (cms)=     .526
00163>
00164>       PEAK FLOW       (cms)=     .050 (i)
00165>       TIME TO PEAK    (hrs)=    2.800
00166>       RUNOFF VOLUME    (mm)=    9.086
00167>       TOTAL RAINFALL   (mm)=   47.810
00168>       RUNOFF COEFFICIENT   =     .190
00169>
00170>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00171>
00172>  -------------------------------------------------------------------------------
00173>  001:0008--------------------------------------------------------------------------
00174>  ------------------------
00175>  | ADD HYD (N4        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00176>  ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
00177>                         ID1 04:4             2.60     .070    2.82   9.75    .000
00178>                        +ID2 05:5             1.79     .050    2.80   9.09    .000
00179>                         ========================================================
00180>                         SUM 06:N4            4.39     .119    2.80   9.48    .000
00181>
00182>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00183>
00184>  -------------------------------------------------------------------------------
00185>  001:0009--------------------------------------------------------------------------
00186>  *# Node 5: Flow from Basin 6
00187>  ----------------------
00188>  | CALIB NASHYD       |   Area    (ha)=    2.58   Curve Number   (CN)=75.00
00189>  | 07:6      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00190>  ----------------------   U.H. Tp(hrs)=    .260
00191>
00192>       Unit Hyd Qpeak  (cms)=     .379
00193>
00194>       PEAK FLOW       (cms)=     .069 (i)
00195>       TIME TO PEAK    (hrs)=    2.917
00196>       RUNOFF VOLUME    (mm)=   11.672
00197>       TOTAL RAINFALL   (mm)=   47.810
00198>       RUNOFF COEFFICIENT   =     .244
00199>
00200>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00201>
00202>  -------------------------------------------------------------------------------
00203>  001:0010--------------------------------------------------------------------------
00204>  *# Node 6: Flow from Basin 7
00205>  ----------------------
00206>  | CALIB NASHYD       |   Area    (ha)=    1.46   Curve Number   (CN)=83.00
00207>  | 08:7      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00208>  ----------------------   U.H. Tp(hrs)=    .090
00209>
00210>       Unit Hyd Qpeak  (cms)=     .620
00211>
00212>       PEAK FLOW       (cms)=     .081 (i)
00213>       TIME TO PEAK    (hrs)=    2.767
00214>       RUNOFF VOLUME    (mm)=   15.914
00215>       TOTAL RAINFALL   (mm)=   47.810
00216>       RUNOFF COEFFICIENT   =     .333
00217>
00218>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00219>
00220>  -------------------------------------------------------------------------------
00221>  001:0011--------------------------------------------------------------------------
00222>  *# Node 7: Flow from Basin 8
00223>  ----------------------
00224>  | CALIB NASHYD       |   Area    (ha)=     .38   Curve Number   (CN)=75.00
00225>  | 09:8      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00226>  ----------------------   U.H. Tp(hrs)=    .160
00227>
00228>       Unit Hyd Qpeak  (cms)=     .091
00229>
00230>       PEAK FLOW       (cms)=     .013 (i)
00231>       TIME TO PEAK    (hrs)=    2.817
00232>       RUNOFF VOLUME    (mm)=   11.672
00233>       TOTAL RAINFALL   (mm)=   47.810
00234>       RUNOFF COEFFICIENT   =     .244
00235>
00236>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00237>
00238>  -------------------------------------------------------------------------------
00239>  001:0012--------------------------------------------------------------------------
00240>  *# Node 8: Flow from Basin 9
00241>  ----------------------
00242>  | CALIB NASHYD       |   Area    (ha)=     .05   Curve Number   (CN)=75.00
00243>  | 01:9      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00244>  ----------------------   U.H. Tp(hrs)=    .060
00245>
00246>       Unit Hyd Qpeak  (cms)=     .032
00247>
00248>       PEAK FLOW       (cms)=     .002 (i)
00249>       TIME TO PEAK    (hrs)=    2.750
00250>       RUNOFF VOLUME    (mm)=   11.670
00251>       TOTAL RAINFALL   (mm)=   47.810
00252>       RUNOFF COEFFICIENT   =     .244
00253>
00254>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00255>
00256>  -------------------------------------------------------------------------------
00257>  001:0013--------------------------------------------------------------------------
00258>        FINISH
00259>  -------------------------------------------------------------------------------
00260>  ********************************************************************************
00261>       WARNINGS / ERRORS / NOTES
00262>       -------------------------
00263>     Simulation ended on 2018-11-30     at 16:15:54
00264>  ================================================================================
00265>
00266>
```

```
00001> ================================================================================
00002>
00003>    SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>    S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>    SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>        S  W W W  M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>    SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
00008>                                                          9   9  9   9   # 3375279
00009>          StormWater Management HYdrologic Model           999    999    =========
00010>
00011>  ********************************************************************************
00012>  ***************************** SWMHYMO Ver/4.05  ********************************
00013>  *********  A single event and continuous hydrologic simulation model  *********
00014>  *********     based on the principles of HYMO and its successors      *********
00015>  *********                    OTTHYMO-83 and OTTHYMO-89.                *********
00016>  ********************************************************************************
00017>  ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018>  *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019>  *********                  Gatineau, Quebec: (819) 243-6858           *********
00020>  *********                  E-Mail: swmhymo@jfsa.Com                   *********
00021>  ********************************************************************************
00022>
00023>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++++ Licensed user: Calder Engineering Ltd.                      +++++++++
00025>  +++++++++                Bolton                SERIAL#:3375279       +++++++++
00026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *********          ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030>  *********          Maximum value for ID numbers  :     10            *********
00031>  *********          Max. number of rainfall points: 105408            *********
00032>  *********          Max. number of flow points    : 105408            *********
00033>  ********************************************************************************
00034>
00035>
00036>  *********************   D E T A I L E D   O U T P U T   **********************
00037>  ********************************************************************************
00038>  *         DATE: 2018-11-30     TIME: 16:15:18     RUN COUNTER: 000917         *
00039>  ********************************************************************************
00040>  * Input   filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.dat               *
00041>  * Output  filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.out               *
00042>  * Summary filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.sum               *
00043>  * User comments:                                                             *
00044>  * 1:_____________________________________________________________________    *
00045>  * 2:_____________________________________________________________________    *
00046>  * 3:                                                                         *
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*******************************************************************************
00052> *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00053> *#  Date        : [2018-11-30]
00054> *#  Modeller    : [    MYS    ]
00055> *#  Company     : Calder Engineering Ltd.
00056> *#  License #   :  3375279
00057> *#*******************************************************************************
00058> *# Existing Conditions
00059> *#*******************************************************************************
00060> --------------------
00061> | START            |  Project  dir.: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\
00062> --------------------  Rainfall dir.: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\
00063>     TZERO =   .00 hrs on        0
00064>     METOUT=   2 (output = METRIC)
00065>     NRUN  = 001
00066>     NSTORM=   0
00067> --------------------------------------------------------------------------------
00068> 001:0002--------------------------------------------------------------------------
00069> --------------------
00070> | READ STORM       |    Filename: 10yr/6hr
00071> | Ptotal=  55.69 mm|    Comments: 10yr/6hr
00072> --------------------
00073>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00074>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00075>                .25    .000 |   2.00  18.940 |   3.75   7.800 |   5.50   1.110
00076>                .50   1.110 |   2.25  18.940 |   4.00   4.460 |   5.75   1.110
00077>                .75   1.110 |   2.50  51.240 |   4.25   4.460 |   6.00   1.110
00078>               1.00   1.110 |   2.75  51.240 |   4.50   2.230 |   6.25   1.110
00079>               1.25   1.110 |   3.00  14.480 |   4.75   2.230 |
00080>               1.50   6.680 |   3.25  14.480 |   5.00   1.110 |
00081>               1.75   6.680 |   3.50   7.800 |   5.25   1.110 |
00082>
00083> --------------------------------------------------------------------------------
00084> 001:0003--------------------------------------------------------------------------
00085> *# Node 1: Flow from Basin 1
00086> ----------------------
00087> | CALIB NASHYD       |   Area    (ha)=    1.92   Curve Number   (CN)=76.00
00088> | 01:1      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00089> ----------------------   U.H. Tp(hrs)=    .140
00090>
00091>     Unit Hyd Qpeak  (cms)=     .524
00092>
00093>     PEAK FLOW       (cms)=     .098 (i)
00094>     TIME TO PEAK    (hrs)=    2.800
00095>     RUNOFF VOLUME    (mm)=   16.581
00096>     TOTAL RAINFALL   (mm)=   55.690
00097>     RUNOFF COEFFICIENT   =     .298
00098>
00099>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00100>
00101> --------------------------------------------------------------------------------
00102> 001:0004--------------------------------------------------------------------------
00103> *# Node 2: Flow from Basin 2
00104> ----------------------
00105> | CALIB NASHYD       |   Area    (ha)=    1.60   Curve Number   (CN)=78.00
00106> | 02:2      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00107> ----------------------   U.H. Tp(hrs)=    .140
00108>
00109>     Unit Hyd Qpeak  (cms)=     .437
00110>
00111>     PEAK FLOW       (cms)=     .088 (i)
00112>     TIME TO PEAK    (hrs)=    2.800
00113>     RUNOFF VOLUME    (mm)=   17.792
00114>     TOTAL RAINFALL   (mm)=   55.690
00115>     RUNOFF COEFFICIENT   =     .319
00116>
00117>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00118>
00119> --------------------------------------------------------------------------------
00120> 001:0005--------------------------------------------------------------------------
00121> *# Node 3: Flow from Basin 3
00122> ----------------------
00123> | CALIB NASHYD       |   Area    (ha)=     .18   Curve Number   (CN)=75.00
00124> | 03:3      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00125> ----------------------   U.H. Tp(hrs)=    .090
00126>
00127>     Unit Hyd Qpeak  (cms)=     .076
00128>
00129>     PEAK FLOW       (cms)=     .010 (i)
00130>     TIME TO PEAK    (hrs)=    2.767
00131>     RUNOFF VOLUME    (mm)=   16.013
00132>     TOTAL RAINFALL   (mm)=   55.690
00133>     RUNOFF COEFFICIENT   =     .288
00134>
00135>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00136>
00137> --------------------------------------------------------------------------------
00138> 001:0006--------------------------------------------------------------------------
00139> *# Node 4: Flow from Basin 4 and 5
00140> ----------------------
00141> | CALIB NASHYD       |   Area    (ha)=    2.60   Curve Number   (CN)=70.00
00142> | 04:4      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00143> ----------------------   U.H. Tp(hrs)=    .170
00144>
00145>     Unit Hyd Qpeak  (cms)=     .584
00146>
00147>     PEAK FLOW       (cms)=     .099 (i)
00148>     TIME TO PEAK    (hrs)=    2.817
00149>     RUNOFF VOLUME    (mm)=   13.508
00150>     TOTAL RAINFALL   (mm)=   55.690
00151>     RUNOFF COEFFICIENT   =     .243
00152>
00153>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00154>
00155> --------------------------------------------------------------------------------
00156> 001:0007--------------------------------------------------------------------------
00157> ----------------------
00158> | CALIB NASHYD       |   Area    (ha)=    1.79   Curve Number   (CN)=68.00
00159> | 05:5      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00160> ----------------------   U.H. Tp(hrs)=    .130
00161>
00162>     Unit Hyd Qpeak  (cms)=     .526
00163>
00164>     PEAK FLOW       (cms)=     .070 (i)
00165>     TIME TO PEAK    (hrs)=    2.783
00166>     RUNOFF VOLUME    (mm)=   12.635
00167>     TOTAL RAINFALL   (mm)=   55.690
00168>     RUNOFF COEFFICIENT   =     .227
00169>
00170>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00171>
00172> --------------------------------------------------------------------------------
00173> 001:0008--------------------------------------------------------------------------
00174> ------------------------
00175> | ADD HYD (N4        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00176> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
00177>                        ID1 04:4             2.60     .099    2.82  13.51    .000
00178>                       +ID2 05:5             1.79     .070    2.78  12.64    .000
00179>                        ========================================================
00180>                        SUM 06:N4            4.39     .168    2.80  13.15    .000
00181>
00182>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00183>
00184> --------------------------------------------------------------------------------
00185> 001:0009--------------------------------------------------------------------------
00186> *# Node 5: Flow from Basin 6
00187> ----------------------
00188> | CALIB NASHYD       |   Area    (ha)=    2.58   Curve Number   (CN)=75.00
00189> | 07:6      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00190> ----------------------   U.H. Tp(hrs)=    .260
00191>
00192>     Unit Hyd Qpeak  (cms)=     .379
00193>
00194>     PEAK FLOW       (cms)=     .096 (i)
00195>     TIME TO PEAK    (hrs)=    2.900
00196>     RUNOFF VOLUME    (mm)=   16.014
00197>     TOTAL RAINFALL   (mm)=   55.690
00198>     RUNOFF COEFFICIENT   =     .288
00199>
00200>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00201>
00202> --------------------------------------------------------------------------------
00203> 001:0010--------------------------------------------------------------------------
00204> *# Node 6: Flow from Basin 7
00205> ----------------------
00206> | CALIB NASHYD       |   Area    (ha)=    1.46   Curve Number   (CN)=83.00
00207> | 08:7      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00208> ----------------------   U.H. Tp(hrs)=    .090
00209>
00210>     Unit Hyd Qpeak  (cms)=     .620
00211>
00212>     PEAK FLOW       (cms)=     .108 (i)
00213>     TIME TO PEAK    (hrs)=    2.767
00214>     RUNOFF VOLUME    (mm)=   21.364
00215>     TOTAL RAINFALL   (mm)=   55.690
00216>     RUNOFF COEFFICIENT   =     .384
00217>
00218>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00219>
00220> --------------------------------------------------------------------------------
00221> 001:0011--------------------------------------------------------------------------
00222> *# Node 7: Flow from Basin 8
00223> ----------------------
00224> | CALIB NASHYD       |   Area    (ha)=     .38   Curve Number   (CN)=75.00
00225> | 09:8      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00226> ----------------------   U.H. Tp(hrs)=    .160
00227>
00228>     Unit Hyd Qpeak  (cms)=     .091
00229>
00230>     PEAK FLOW       (cms)=     .018 (i)
00231>     TIME TO PEAK    (hrs)=    2.800
00232>     RUNOFF VOLUME    (mm)=   16.014
00233>     TOTAL RAINFALL   (mm)=   55.690
00234>     RUNOFF COEFFICIENT   =     .288
00235>
00236>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00237>
00238> --------------------------------------------------------------------------------
00239> 001:0012--------------------------------------------------------------------------
00240> *# Node 8: Flow from Basin 9
00241> ----------------------
00242> | CALIB NASHYD       |   Area    (ha)=     .05   Curve Number   (CN)=75.00
00243> | 01:9      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00244> ----------------------   U.H. Tp(hrs)=    .060
00245>
00246>     Unit Hyd Qpeak  (cms)=     .032
00247>
00248>     PEAK FLOW       (cms)=     .003 (i)
00249>     TIME TO PEAK    (hrs)=    2.750
00250>     RUNOFF VOLUME    (mm)=   16.011
00251>     TOTAL RAINFALL   (mm)=   55.690
00252>     RUNOFF COEFFICIENT   =     .288
00253>
00254>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00255>
00256> --------------------------------------------------------------------------------
00257> 001:0013--------------------------------------------------------------------------
00258>       FINISH
00259> --------------------------------------------------------------------------------
00260> ********************************************************************************
00261>      WARNINGS / ERRORS / NOTES
00262>      -------------------------
00263>    Simulation ended on 2018-11-30     at 16:15:18
00264> ================================================================================
00265>
00266>
```

```
00001> ================================================================================
00002>
00003>    SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>    S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>    SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>        S  W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>    SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
00008>                                                          9   9  9   9   # 3375279
00009>          StormWater Management HYdrologic Model          999    999    =========
00010>
00011>  ********************************************************************************
00012>  ***************************** SWMHYMO Ver/4.05  ********************************
00013>  *********  A single event and continuous hydrologic simulation model  *********
00014>  *********     based on the principles of HYMO and its successors      *********
00015>  *********                    OTTHYMO-83 and OTTHYMO-89.                *********
00016>  ********************************************************************************
00017>  ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018>  *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019>  *********                  Gatineau, Quebec: (819) 243-6858           *********
00020>  *********                  E-Mail: swmhymo@jfsa.Com                   *********
00021>  ********************************************************************************
00022>
00023>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++++ Licensed user: Calder Engineering Ltd.                      +++++++++
00025>  +++++++++                Bolton                SERIAL#:3375279       +++++++++
00026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *********          ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030>  *********          Maximum value for ID numbers  :     10            *********
00031>  *********          Max. number of rainfall points: 105408            *********
00032>  *********          Max. number of flow points    : 105408            *********
00033>  ********************************************************************************
00034>
00035>
00036>  *********************   D E T A I L E D   O U T P U T   **********************
00037>  ********************************************************************************
00038>  *         DATE: 2018-11-30     TIME: 16:14:36     RUN COUNTER: 000915         *
00039>  ********************************************************************************
00040>  * Input   filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.dat               *
00041>  * Output  filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.out               *
00042>  * Summary filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.sum               *
00043>  * User comments:                                                             *
00044>  * 1:_____________________________________________________________________    *
00045>  * 2:_____________________________________________________________________    *
00046>  * 3:                                                                         *
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*******************************************************************************
00052> *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00053> *#  Date        : [2018-11-30]
00054> *#  Modeller    : [    MYS    ]
00055> *#  Company     : Calder Engineering Ltd.
00056> *#  License #   :  3375279
00057> *#*******************************************************************************
00058> *# Existing Conditions
00059> *#*******************************************************************************
00060> --------------------
00061> | START            |  Project  dir.: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\
00062> --------------------  Rainfall dir.: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\
00063>     TZERO =   .00 hrs on        0
00064>     METOUT=   2 (output = METRIC)
00065>     NRUN  = 001
00066>     NSTORM=   0
00067> --------------------------------------------------------------------------------
00068> 001:0002--------------------------------------------------------------------------
00069> --------------------
00070> | READ STORM       |    Filename: 25yr/6hr
00071> | Ptotal=  65.59 mm|    Comments: 25yr/6hr
00072> --------------------
00073>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00074>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00075>                .25    .000 |   2.00  22.300 |   3.75   9.180 |   5.50   1.310
00076>                .50   1.310 |   2.25  22.300 |   4.00   5.250 |   5.75   1.310
00077>                .75   1.310 |   2.50  60.350 |   4.25   5.250 |   6.00   1.310
00078>               1.00   1.310 |   2.75  60.350 |   4.50   2.620 |   6.25   1.310
00079>               1.25   1.310 |   3.00  17.060 |   4.75   2.620 |
00080>               1.50   7.870 |   3.25  17.060 |   5.00   1.310 |
00081>               1.75   7.870 |   3.50   9.180 |   5.25   1.310 |
00082>
00083> --------------------------------------------------------------------------------
00084> 001:0003--------------------------------------------------------------------------
00085> *# Node 1: Flow from Basin 1
00086> ----------------------
00087> | CALIB NASHYD       |   Area    (ha)=    1.92   Curve Number   (CN)=76.00
00088> | 01:1      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00089> ----------------------   U.H. Tp(hrs)=    .140
00090>
00091>      Unit Hyd Qpeak  (cms)=     .524
00092>
00093>      PEAK FLOW       (cms)=     .134 (i)
00094>      TIME TO PEAK    (hrs)=    2.783
00095>      RUNOFF VOLUME    (mm)=   22.756
00096>      TOTAL RAINFALL   (mm)=   65.590
00097>      RUNOFF COEFFICIENT   =     .347
00098>
00099>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00100>
00101> --------------------------------------------------------------------------------
00102> 001:0004--------------------------------------------------------------------------
00103> *# Node 2: Flow from Basin 2
00104> ----------------------
00105> | CALIB NASHYD       |   Area    (ha)=    1.60   Curve Number   (CN)=78.00
00106> | 02:2      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00107> ----------------------   U.H. Tp(hrs)=    .140
00108>
00109>      Unit Hyd Qpeak  (cms)=     .437
00110>
00111>      PEAK FLOW       (cms)=     .120 (i)
00112>      TIME TO PEAK    (hrs)=    2.783
00113>      RUNOFF VOLUME    (mm)=   24.288
00114>      TOTAL RAINFALL   (mm)=   65.590
00115>      RUNOFF COEFFICIENT   =     .370
00116>
00117>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00118>
00119> --------------------------------------------------------------------------------
00120> 001:0005--------------------------------------------------------------------------
00121> *# Node 3: Flow from Basin 3
00122> ----------------------
00123> | CALIB NASHYD       |   Area    (ha)=     .18   Curve Number   (CN)=75.00
00124> | 03:3      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00125> ----------------------   U.H. Tp(hrs)=    .090
00126>
00127>      Unit Hyd Qpeak  (cms)=     .076
00128>
00129>      PEAK FLOW       (cms)=     .013 (i)
00130>      TIME TO PEAK    (hrs)=    2.767
00131>      RUNOFF VOLUME    (mm)=   22.032
00132>      TOTAL RAINFALL   (mm)=   65.590
00133>      RUNOFF COEFFICIENT   =     .336
00134>
00135>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00136>
00137> --------------------------------------------------------------------------------
00138> 001:0006--------------------------------------------------------------------------
00139> *# Node 4: Flow from Basin 4 and 5
00140> ----------------------
00141> | CALIB NASHYD       |   Area    (ha)=    2.60   Curve Number   (CN)=70.00
00142> | 04:4      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00143> ----------------------   U.H. Tp(hrs)=    .170
00144>
00145>      Unit Hyd Qpeak  (cms)=     .584
00146>
00147>      PEAK FLOW       (cms)=     .139 (i)
00148>      TIME TO PEAK    (hrs)=    2.817
00149>      RUNOFF VOLUME    (mm)=   18.792
00150>      TOTAL RAINFALL   (mm)=   65.590
00151>      RUNOFF COEFFICIENT   =     .287
00152>
00153>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00154>
00155> --------------------------------------------------------------------------------
00156> 001:0007--------------------------------------------------------------------------
00157> ----------------------
00158> | CALIB NASHYD       |   Area    (ha)=    1.79   Curve Number   (CN)=68.00
00159> | 05:5      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00160> ----------------------   U.H. Tp(hrs)=    .130
00161>
00162>      Unit Hyd Qpeak  (cms)=     .526
00163>
00164>      PEAK FLOW       (cms)=     .098 (i)
00165>      TIME TO PEAK    (hrs)=    2.783
00166>      RUNOFF VOLUME    (mm)=   17.646
00167>      TOTAL RAINFALL   (mm)=   65.590
00168>      RUNOFF COEFFICIENT   =     .269
00169>
00170>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00171>
00172> --------------------------------------------------------------------------------
00173> 001:0008--------------------------------------------------------------------------
00174> ------------------------
00175> | ADD HYD (N4        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00176> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
00177>                        ID1 04:4             2.60     .139    2.82  18.79    .000
00178>                       +ID2 05:5             1.79     .098    2.78  17.65    .000
00179>                        ============================================================
00180>                        SUM 06:N4            4.39     .235    2.80  18.32    .000
00181>
00182>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00183>
00184> --------------------------------------------------------------------------------
00185> 001:0009--------------------------------------------------------------------------
00186> *# Node 5: Flow from Basin 6
00187> ----------------------
00188> | CALIB NASHYD       |   Area    (ha)=    2.58   Curve Number   (CN)=75.00
00189> | 07:6      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00190> ----------------------   U.H. Tp(hrs)=    .260
00191>
00192>      Unit Hyd Qpeak  (cms)=     .379
00193>
00194>      PEAK FLOW       (cms)=     .135 (i)
00195>      TIME TO PEAK    (hrs)=    2.900
00196>      RUNOFF VOLUME    (mm)=   22.033
00197>      TOTAL RAINFALL   (mm)=   65.590
00198>      RUNOFF COEFFICIENT   =     .336
00199>
00200>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00201>
00202> --------------------------------------------------------------------------------
00203> 001:0010--------------------------------------------------------------------------
00204> *# Node 6: Flow from Basin 7
00205> ----------------------
00206> | CALIB NASHYD       |   Area    (ha)=    1.46   Curve Number   (CN)=83.00
00207> | 08:7      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00208> ----------------------   U.H. Tp(hrs)=    .090
00209>
00210>      Unit Hyd Qpeak  (cms)=     .620
00211>
00212>      PEAK FLOW       (cms)=     .143 (i)
00213>      TIME TO PEAK    (hrs)=    2.767
00214>      RUNOFF VOLUME    (mm)=   28.716
00215>      TOTAL RAINFALL   (mm)=   65.590
00216>      RUNOFF COEFFICIENT   =     .438
00217>
00218>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00219>
00220> --------------------------------------------------------------------------------
00221> 001:0011--------------------------------------------------------------------------
00222> *# Node 7: Flow from Basin 8
00223> ----------------------
00224> | CALIB NASHYD       |   Area    (ha)=     .38   Curve Number   (CN)=75.00
00225> | 09:8      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00226> ----------------------   U.H. Tp(hrs)=    .160
00227>
00228>      Unit Hyd Qpeak  (cms)=     .091
00229>
00230>      PEAK FLOW       (cms)=     .025 (i)
00231>      TIME TO PEAK    (hrs)=    2.800
00232>      RUNOFF VOLUME    (mm)=   22.032
00233>      TOTAL RAINFALL   (mm)=   65.590
00234>      RUNOFF COEFFICIENT   =     .336
00235>
00236>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00237>
00238> --------------------------------------------------------------------------------
00239> 001:0012--------------------------------------------------------------------------
00240> *# Node 8: Flow from Basin 9
00241> ----------------------
00242> | CALIB NASHYD       |   Area    (ha)=     .05   Curve Number   (CN)=75.00
00243> | 01:9      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00244> ----------------------   U.H. Tp(hrs)=    .060
00245>
00246>      Unit Hyd Qpeak  (cms)=     .032
00247>
00248>      PEAK FLOW       (cms)=     .004 (i)
00249>      TIME TO PEAK    (hrs)=    2.750
00250>      RUNOFF VOLUME    (mm)=   22.030
00251>      TOTAL RAINFALL   (mm)=   65.590
00252>      RUNOFF COEFFICIENT   =     .336
00253>
00254>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00255>
00256> --------------------------------------------------------------------------------
00257> 001:0013--------------------------------------------------------------------------
00258>       FINISH
00259> --------------------------------------------------------------------------------
00260> ********************************************************************************
00261>      WARNINGS / ERRORS / NOTES
00262>      -------------------------
00263>    Simulation ended on 2018-11-30     at 16:14:36
00264> ================================================================================
00265>
00266>
```

```
00001> ================================================================================
00002>
00003>    SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>    S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>    SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>        S  W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>    SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
00008>                                                          9   9  9   9   # 3375279
00009>          StormWater Management HYdrologic Model          999    999    =========
00010>
00011>  ********************************************************************************
00012>  ***************************** SWMHYMO Ver/4.05  ************************
00013>  *********  A single event and continuous hydrologic simulation model  *********
00014>  *********     based on the principles of HYMO and its successors      *********
00015>  *********                    OTTHYMO-83 and OTTHYMO-89.                *********
00016>  ********************************************************************************
00017>  ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018>  *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019>  *********                  Gatineau, Quebec: (819) 243-6858           *********
00020>  *********                  E-Mail: swmhymo@jfsa.Com                   *********
00021>  ********************************************************************************
00022>
00023>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++++ Licensed user: Calder Engineering Ltd.                      +++++++++
00025>  +++++++++                Bolton              SERIAL#:3375279         +++++++++
00026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *********          ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030>  *********          Maximum value for ID numbers  :     10            *********
00031>  *********          Max. number of rainfall points: 105408            *********
00032>  *********          Max. number of flow points    : 105408            *********
00033>  ********************************************************************************
00034>
00035>
00036>  *********************   D E T A I L E D   O U T P U T   **********************
00037>  ********************************************************************************
00038>  *         DATE: 2018-11-30     TIME: 16:14:02     RUN COUNTER: 000914         *
00039>  ********************************************************************************
00040>  * Input   filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.dat               *
00041>  * Output  filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.out               *
00042>  * Summary filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.sum               *
00043>  * User comments:                                                             *
00044>  * 1:_____________________________________________________________________    *
00045>  * 2:_____________________________________________________________________    *
00046>  * 3:                                                                         *
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*******************************************************************************
00052> *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00053> *#  Date        : [2018-11-30]
00054> *#  Modeller    : [    MYS    ]
00055> *#  Company     : Calder Engineering Ltd.
00056> *#  License #   :  3375279
00057> *#*******************************************************************************
00058> *# Existing Conditions
00059> *#*******************************************************************************
00060> --------------------
00061> | START            |  Project  dir.: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\
00062> --------------------  Rainfall dir.: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\
00063>     TZERO =   .00 hrs on        0
00064>     METOUT=   2 (output = METRIC)
00065>     NRUN  = 001
00066>     NSTORM=   0
00067> --------------------------------------------------------------------------------
00068> 001:0002--------------------------------------------------------------------------
00069> --------------------
00070> | READ STORM      |    Filename: 50yr/6hr
00071> | Ptotal=  73.00 mm|    Comments: 50yr/6hr
00072> --------------------
00073>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00074>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00075>                .25    .000 |   2.00  24.820 |   3.75  10.220 |   5.50   1.460
00076>                .50   1.460 |   2.25  24.820 |   4.00   5.840 |   5.75   1.460
00077>                .75   1.460 |   2.50  67.160 |   4.25   5.840 |   6.00   1.460
00078>               1.00   1.460 |   2.75  67.160 |   4.50   2.920 |   6.25   1.460
00079>               1.25   1.460 |   3.00  18.980 |   4.75   2.920 |
00080>               1.50   8.760 |   3.25  18.980 |   5.00   1.460 |
00081>               1.75   8.760 |   3.50  10.220 |   5.25   1.460 |
00082>
00083> --------------------------------------------------------------------------------
00084> 001:0003--------------------------------------------------------------------------
00085> *# Node 1: Flow from Basin 1
00086> ----------------------
00087> | CALIB NASHYD       |   Area    (ha)=    1.92   Curve Number   (CN)=76.00
00088> | 01:1      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00089> ----------------------   U.H. Tp(hrs)=    .140
00090>
00091>      Unit Hyd Qpeak  (cms)=     .524
00092>
00093>      PEAK FLOW       (cms)=     .164 (i)
00094>      TIME TO PEAK    (hrs)=    2.783
00095>      RUNOFF VOLUME    (mm)=   27.714
00096>      TOTAL RAINFALL   (mm)=   73.000
00097>      RUNOFF COEFFICIENT   =     .380
00098>
00099>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00100>
00101> --------------------------------------------------------------------------------
00102> 001:0004--------------------------------------------------------------------------
00103> *# Node 2: Flow from Basin 2
00104> ----------------------
00105> | CALIB NASHYD       |   Area    (ha)=    1.60   Curve Number   (CN)=78.00
00106> | 02:2      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00107> ----------------------   U.H. Tp(hrs)=    .140
00108>
00109>      Unit Hyd Qpeak  (cms)=     .437
00110>
00111>      PEAK FLOW       (cms)=     .146 (i)
00112>      TIME TO PEAK    (hrs)=    2.783
00113>      RUNOFF VOLUME    (mm)=   29.478
00114>      TOTAL RAINFALL   (mm)=   73.000
00115>      RUNOFF COEFFICIENT   =     .404
00116>
00117>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00118>
00119> --------------------------------------------------------------------------------
00120> 001:0005--------------------------------------------------------------------------
00121> *# Node 3: Flow from Basin 3
00122> ----------------------
00123> | CALIB NASHYD       |   Area    (ha)=     .18   Curve Number   (CN)=75.00
00124> | 03:3      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00125> ----------------------   U.H. Tp(hrs)=    .090
00126>
00127>      Unit Hyd Qpeak  (cms)=     .076
00128>
00129>      PEAK FLOW       (cms)=     .016 (i)
00130>      TIME TO PEAK    (hrs)=    2.767
00131>      RUNOFF VOLUME    (mm)=   26.877
00132>      TOTAL RAINFALL   (mm)=   73.000
00133>      RUNOFF COEFFICIENT   =     .368
00134>
00135>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00136>
00137> --------------------------------------------------------------------------------
00138> 001:0006--------------------------------------------------------------------------
00139> *# Node 4: Flow from Basin 4 and 5
00140> ----------------------
00141> | CALIB NASHYD       |   Area    (ha)=    2.60   Curve Number   (CN)=70.00
00142> | 04:4      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00143> ----------------------   U.H. Tp(hrs)=    .170
00144>
00145>      Unit Hyd Qpeak  (cms)=     .584
00146>
00147>      PEAK FLOW       (cms)=     .171 (i)
00148>      TIME TO PEAK    (hrs)=    2.817
00149>      RUNOFF VOLUME    (mm)=   23.095
00150>      TOTAL RAINFALL   (mm)=   73.000
00151>      RUNOFF COEFFICIENT   =     .316
00152>
00153>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00154>
00155> --------------------------------------------------------------------------------
00156> 001:0007--------------------------------------------------------------------------
00157> ----------------------
00158> | CALIB NASHYD       |   Area    (ha)=    1.79   Curve Number   (CN)=68.00
00159> | 05:5      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00160> ----------------------   U.H. Tp(hrs)=    .130
00161>
00162>      Unit Hyd Qpeak  (cms)=     .526
00163>
00164>      PEAK FLOW       (cms)=     .120 (i)
00165>      TIME TO PEAK    (hrs)=    2.783
00166>      RUNOFF VOLUME    (mm)=   21.744
00167>      TOTAL RAINFALL   (mm)=   73.000
00168>      RUNOFF COEFFICIENT   =     .298
00169>
00170>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00171>
00172> --------------------------------------------------------------------------------
00173> 001:0008--------------------------------------------------------------------------
00174> ------------------------
00175> | ADD HYD (N4        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00176> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
00177>                        ID1 04:4             2.60     .171    2.82  23.09    .000
00178>                       +ID2 05:5             1.79     .120    2.78  21.74    .000
00179>                        ========================================================
00180>                        SUM 06:N4            4.39     .290    2.80  22.54    .000
00181>
00182>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00183>
00184> --------------------------------------------------------------------------------
00185> 001:0009--------------------------------------------------------------------------
00186> *# Node 5: Flow from Basin 6
00187> ----------------------
00188> | CALIB NASHYD       |   Area    (ha)=    2.58   Curve Number   (CN)=75.00
00189> | 07:6      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00190> ----------------------   U.H. Tp(hrs)=    .260
00191>
00192>      Unit Hyd Qpeak  (cms)=     .379
00193>
00194>      PEAK FLOW       (cms)=     .166 (i)
00195>      TIME TO PEAK    (hrs)=    2.883
00196>      RUNOFF VOLUME    (mm)=   26.878
00197>      TOTAL RAINFALL   (mm)=   73.000
00198>      RUNOFF COEFFICIENT   =     .368
00199>
00200>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00201>
00202> --------------------------------------------------------------------------------
00203> 001:0010--------------------------------------------------------------------------
00204> *# Node 6: Flow from Basin 7
00205> ----------------------
00206> | CALIB NASHYD       |   Area    (ha)=    1.46   Curve Number   (CN)=83.00
00207> | 08:7      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00208> ----------------------   U.H. Tp(hrs)=    .090
00209>
00210>      Unit Hyd Qpeak  (cms)=     .620
00211>
00212>      PEAK FLOW       (cms)=     .170 (i)
00213>      TIME TO PEAK    (hrs)=    2.767
00214>      RUNOFF VOLUME    (mm)=   34.506
00215>      TOTAL RAINFALL   (mm)=   73.000
00216>      RUNOFF COEFFICIENT   =     .473
00217>
00218>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00219>
00220> --------------------------------------------------------------------------------
00221> 001:0011--------------------------------------------------------------------------
00222> *# Node 7: Flow from Basin 8
00223> ----------------------
00224> | CALIB NASHYD       |   Area    (ha)=     .38   Curve Number   (CN)=75.00
00225> | 09:8      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00226> ----------------------   U.H. Tp(hrs)=    .160
00227>
00228>      Unit Hyd Qpeak  (cms)=     .091
00229>
00230>      PEAK FLOW       (cms)=     .030 (i)
00231>      TIME TO PEAK    (hrs)=    2.800
00232>      RUNOFF VOLUME    (mm)=   26.877
00233>      TOTAL RAINFALL   (mm)=   73.000
00234>      RUNOFF COEFFICIENT   =     .368
00235>
00236>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00237>
00238> --------------------------------------------------------------------------------
00239> 001:0012--------------------------------------------------------------------------
00240> *# Node 8: Flow from Basin 9
00241> ----------------------
00242> | CALIB NASHYD       |   Area    (ha)=     .05   Curve Number   (CN)=75.00
00243> | 01:9      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00244> ----------------------   U.H. Tp(hrs)=    .060
00245>
00246>      Unit Hyd Qpeak  (cms)=     .032
00247>
00248>      PEAK FLOW       (cms)=     .005 (i)
00249>      TIME TO PEAK    (hrs)=    2.750
00250>      RUNOFF VOLUME    (mm)=   26.875
00251>      TOTAL RAINFALL   (mm)=   73.000
00252>      RUNOFF COEFFICIENT   =     .368
00253>
00254>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00255>
00256> --------------------------------------------------------------------------------
00257> 001:0013--------------------------------------------------------------------------
00258>       FINISH
00259> --------------------------------------------------------------------------------
00260> ********************************************************************************
00261>      WARNINGS / ERRORS / NOTES
00262>      -------------------------
00263>    Simulation ended on 2018-11-30     at 16:14:03
00264> ================================================================================
00265>
00266>
```

```
00001> ================================================================================
00002>
00003>    SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>    S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>    SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>        S  W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>    SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
00008>                                                          9   9  9   9   # 3375279
00009>          StormWater Management HYdrologic Model          999    999    =========
00010>
00011>  ********************************************************************************
00012>  ***************************** SWMHYMO Ver/4.05  ********************************
00013>  *********  A single event and continuous hydrologic simulation model  *********
00014>  *********     based on the principles of HYMO and its successors      *********
00015>  *********                    OTTHYMO-83 and OTTHYMO-89.                *********
00016>  ********************************************************************************
00017>  ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018>  *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019>  *********                  Gatineau, Quebec: (819) 243-6858           *********
00020>  *********                  E-Mail: swmhymo@jfsa.Com                   *********
00021>  ********************************************************************************
00022>
00023>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++++ Licensed user: Calder Engineering Ltd.                      +++++++++
00025>  +++++++++                Bolton              SERIAL#:3375279         +++++++++
00026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *********          ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030>  *********          Maximum value for ID numbers  :     10            *********
00031>  *********          Max. number of rainfall points: 105408            *********
00032>  *********          Max. number of flow points    : 105408            *********
00033>  ********************************************************************************
00034>
00035>
00036>  *********************   D E T A I L E D   O U T P U T   **********************
00037>  ********************************************************************************
00038>  *         DATE: 2018-11-30     TIME: 16:13:07     RUN COUNTER: 000913         *
00039>  ********************************************************************************
00040>  * Input   filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.dat               *
00041>  * Output  filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.out               *
00042>  * Summary filename: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\L-ex.sum               *
00043>  * User comments:                                                             *
00044>  * 1:_____________________________________________________________________    *
00045>  * 2:_____________________________________________________________________    *
00046>  * 3:                                                                         *
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*******************************************************************************
00052> *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00053> *#  Date        : [2018-11-30]
00054> *#  Modeller    : [    MYS    ]
00055> *#  Company     : Calder Engineering Ltd.
00056> *#  License #   :  3375279
00057> *#*******************************************************************************
00058> *# Existing Conditions
00059> *#*******************************************************************************
00060> --------------------
00061> | START            |  Project  dir.: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\
00062> --------------------  Rainfall dir.: C:\PROGRA~2\SWMHYMO\PROJECTS\L2018\
00063>     TZERO =   .00 hrs on        0
00064>     METOUT=   2 (output = METRIC)
00065>     NRUN  = 001
00066>     NSTORM=   0
00067> --------------------------------------------------------------------------------
00068> 001:0002--------------------------------------------------------------------------
00069> --------------------
00070> | READ STORM       |    Filename: 100yr/6hr
00071> | Ptotal=  80.31 mm|    Comments: 100yr/6hr
00072> --------------------
00073>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00074>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00075>                .25    .000 |   2.00  27.300 |   3.75  11.240 |   5.50   1.610
00076>                .50   1.610 |   2.25  27.300 |   4.00   6.420 |   5.75   1.610
00077>                .75   1.610 |   2.50  73.880 |   4.25   6.420 |   6.00   1.610
00078>               1.00   1.610 |   2.75  73.880 |   4.50   3.210 |   6.25   1.610
00079>               1.25   1.610 |   3.00  20.880 |   4.75   3.210 |
00080>               1.50   9.640 |   3.25  20.880 |   5.00   1.610 |
00081>               1.75   9.640 |   3.50  11.240 |   5.25   1.610 |
00082>
00083> --------------------------------------------------------------------------------
00084> 001:0003--------------------------------------------------------------------------
00085> *# Node 1: Flow from Basin 1
00086> ----------------------
00087> | CALIB NASHYD       |   Area    (ha)=    1.92   Curve Number   (CN)=76.00
00088> | 01:1      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00089> ----------------------   U.H. Tp(hrs)=    .140
00090>
00091>      Unit Hyd Qpeak  (cms)=     .524
00092>
00093>      PEAK FLOW       (cms)=     .194 (i)
00094>      TIME TO PEAK    (hrs)=    2.783
00095>      RUNOFF VOLUME    (mm)=   32.842
00096>      TOTAL RAINFALL   (mm)=   80.310
00097>      RUNOFF COEFFICIENT   =     .409
00098>
00099>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00100>
00101> --------------------------------------------------------------------------------
00102> 001:0004--------------------------------------------------------------------------
00103> *# Node 2: Flow from Basin 2
00104> ----------------------
00105> | CALIB NASHYD       |   Area    (ha)=    1.60   Curve Number   (CN)=78.00
00106> | 02:2      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00107> ----------------------   U.H. Tp(hrs)=    .140
00108>
00109>      Unit Hyd Qpeak  (cms)=     .437
00110>
00111>      PEAK FLOW       (cms)=     .172 (i)
00112>      TIME TO PEAK    (hrs)=    2.783
00113>      RUNOFF VOLUME    (mm)=   34.825
00114>      TOTAL RAINFALL   (mm)=   80.310
00115>      RUNOFF COEFFICIENT   =     .434
00116>
00117>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00118>
00119> --------------------------------------------------------------------------------
00120> 001:0005--------------------------------------------------------------------------
00121> *# Node 3: Flow from Basin 3
00122> ----------------------
00123> | CALIB NASHYD       |   Area    (ha)=     .18   Curve Number   (CN)=75.00
00124> | 03:3      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00125> ----------------------   U.H. Tp(hrs)=    .090
00126>
00127>      Unit Hyd Qpeak  (cms)=     .076
00128>
00129>      PEAK FLOW       (cms)=     .019 (i)
00130>      TIME TO PEAK    (hrs)=    2.767
00131>      RUNOFF VOLUME    (mm)=   31.897
00132>      TOTAL RAINFALL   (mm)=   80.310
00133>      RUNOFF COEFFICIENT   =     .397
00134>
00135>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00136>
00137> --------------------------------------------------------------------------------
00138> 001:0006--------------------------------------------------------------------------
00139> *# Node 4: Flow from Basin 4 and 5
00140> ----------------------
00141> | CALIB NASHYD       |   Area    (ha)=    2.60   Curve Number   (CN)=70.00
00142> | 04:4      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00143> ----------------------   U.H. Tp(hrs)=    .170
00144>
00145>      Unit Hyd Qpeak  (cms)=     .584
00146>
00147>      PEAK FLOW       (cms)=     .205 (i)
00148>      TIME TO PEAK    (hrs)=    2.817
00149>      RUNOFF VOLUME    (mm)=   27.591
00150>      TOTAL RAINFALL   (mm)=   80.310
00151>      RUNOFF COEFFICIENT   =     .344
00152>
00153>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00154>
00155> --------------------------------------------------------------------------------
00156> 001:0007--------------------------------------------------------------------------
00157> ----------------------
00158> | CALIB NASHYD       |   Area    (ha)=    1.79   Curve Number   (CN)=68.00
00159> | 05:5      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00160> ----------------------   U.H. Tp(hrs)=    .130
00161>
00162>      Unit Hyd Qpeak  (cms)=     .526
00163>
00164>      PEAK FLOW       (cms)=     .144 (i)
00165>      TIME TO PEAK    (hrs)=    2.783
00166>      RUNOFF VOLUME    (mm)=   26.040
00167>      TOTAL RAINFALL   (mm)=   80.310
00168>      RUNOFF COEFFICIENT   =     .324
00169>
00170>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00171>
00172> --------------------------------------------------------------------------------
00173> 001:0008--------------------------------------------------------------------------
00174> ------------------------
00175> | ADD HYD (N4        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00176> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
00177>                        ID1 04:4             2.60     .205    2.82  27.59    .000
00178>                       +ID2 05:5             1.79     .144    2.78  26.04    .000
00179>                        ========================================================
00180>                        SUM 06:N4            4.39     .348    2.80  26.96    .000
00181>
00182>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00183>
00184> --------------------------------------------------------------------------------
00185> 001:0009--------------------------------------------------------------------------
00186> *# Node 5: Flow from Basin 6
00187> ----------------------
00188> | CALIB NASHYD       |   Area    (ha)=    2.58   Curve Number   (CN)=75.00
00189> | 07:6      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00190> ----------------------   U.H. Tp(hrs)=    .260
00191>
00192>      Unit Hyd Qpeak  (cms)=     .379
00193>
00194>      PEAK FLOW       (cms)=     .198 (i)
00195>      TIME TO PEAK    (hrs)=    2.883
00196>      RUNOFF VOLUME    (mm)=   31.898
00197>      TOTAL RAINFALL   (mm)=   80.310
00198>      RUNOFF COEFFICIENT   =     .397
00199>
00200>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00201>
00202> --------------------------------------------------------------------------------
00203> 001:0010--------------------------------------------------------------------------
00204> *# Node 6: Flow from Basin 7
00205> ----------------------
00206> | CALIB NASHYD       |   Area    (ha)=    1.46   Curve Number   (CN)=83.00
00207> | 08:7      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00208> ----------------------   U.H. Tp(hrs)=    .090
00209>
00210>      Unit Hyd Qpeak  (cms)=     .620
00211>
00212>      PEAK FLOW       (cms)=     .198 (i)
00213>      TIME TO PEAK    (hrs)=    2.767
00214>      RUNOFF VOLUME    (mm)=   40.410
00215>      TOTAL RAINFALL   (mm)=   80.310
00216>      RUNOFF COEFFICIENT   =     .503
00217>
00218>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00219>
00220> --------------------------------------------------------------------------------
00221> 001:0011--------------------------------------------------------------------------
00222> *# Node 7: Flow from Basin 8
00223> ----------------------
00224> | CALIB NASHYD       |   Area    (ha)=     .38   Curve Number   (CN)=75.00
00225> | 09:8      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00226> ----------------------   U.H. Tp(hrs)=    .160
00227>
00228>      Unit Hyd Qpeak  (cms)=     .091
00229>
00230>      PEAK FLOW       (cms)=     .036 (i)
00231>      TIME TO PEAK    (hrs)=    2.800
00232>      RUNOFF VOLUME    (mm)=   31.898
00233>      TOTAL RAINFALL   (mm)=   80.310
00234>      RUNOFF COEFFICIENT   =     .397
00235>
00236>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00237>
00238> --------------------------------------------------------------------------------
00239> 001:0012--------------------------------------------------------------------------
00240> *# Node 8: Flow from Basin 9
00241> ----------------------
00242> | CALIB NASHYD       |   Area    (ha)=     .05   Curve Number   (CN)=75.00
00243> | 01:9      DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00244> ----------------------   U.H. Tp(hrs)=    .060
00245>
00246>      Unit Hyd Qpeak  (cms)=     .032
00247>
00248>      PEAK FLOW       (cms)=     .006 (i)
00249>      TIME TO PEAK    (hrs)=    2.750
00250>      RUNOFF VOLUME    (mm)=   31.896
00251>      TOTAL RAINFALL   (mm)=   80.310
00252>      RUNOFF COEFFICIENT   =     .397
00253>
00254>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00255>
00256> --------------------------------------------------------------------------------
00257> 001:0013--------------------------------------------------------------------------
00258>       FINISH
00259> --------------------------------------------------------------------------------
00260> ********************************************************************************
00261>      WARNINGS / ERRORS / NOTES
00262>      -------------------------
00263>    Simulation ended on 2018-11-30     at 16:13:07
00264> ================================================================================
00265>
00266>
```

```
00001> ================================================================================
00002>
00003>   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>       S  W W W  M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9    =========
00008>                                                          9   9  9   9   # 3375279
00009>         StormWater Management HYdrologic Model            999    999    =========
00010>
00011>  ********************************************************************************
00012>  ***************************** SWMHYMO Ver/4.05  ********************************
00013>  *********  A single event and continuous hydrologic simulation model  *********
00014>  *********     based on the principles of HYMO and its successors      *********
00015>  *********                    OTTHYMO-83 and OTTHYMO-89.                *********
00016>  ********************************************************************************
00017>  ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018>  *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019>  *********                  Gatineau, Quebec: (819) 243-6858           *********
00020>  *********                  E-Mail: swmhymo@jfsa.com                   *********
00021>  ********************************************************************************
00022>
00023>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++++ Licensed user: Calder Engineering Ltd.                      +++++++++
00025>  +++++++++                Bolton               SERIAL#:3375279        +++++++++
00026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030>  *********           Maximum value for ID numbers  :     10            *********
00031>  *********           Max. number of rainfall points: 105408            *********
00032>  *********           Max. number of flow points    : 105408            *********
00033>  ********************************************************************************
00034>
00035>
00036>  **********************   D E T A I L E D   O U T P U T   **********************
00037>  ********************************************************************************
00038>  *         DATE: 2020-04-17     TIME: 12:38:14     RUN COUNTER: 000347         *
00039>  ********************************************************************************
00040>  * Input   filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.dat     *
00041>  * Output  filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.out     *
00042>  * Summary filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.sum     *
00043>  * User comments:                                                             *
00044>  * 1:_____________________________________________________________________    *
00045>  * 2:_____________________________________________________________________    *
00046>  * 3:_____________________________________________________________________    *
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*******************************************************************************
00052> *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00053> *#  Date        : [2020-04-17]
00054> *#  Modeller    : [    MYS, KC    ]
00055> *#  Company     : Calder Engineering Ltd.
00056> *#  License #   :  3375279
00057> *#*******************************************************************************
00058> *# Proposed Conditions: bottom at 278.75, pipe invert at 278.75
00059> *  overflow at 279.52 and top of berm at 279.62
00060> *  updated with revised drainage areas and pond design February 2020
00061> *  Filename: L-P.dat
00062> *#*******************************************************************************
00063> --------------------
00064> | START            |  Project  dir.: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\20
00065> --------------------  Rainfall dir.: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\20
00066>     TZERO =   .00 hrs on       0
00067>     METOUT=   2 (output = METRIC)
00068>     NRUN  = 001
00069>     NSTORM=   0
00070> --------------------------------------------------------------------------------
00071> 001:0002--------------------------------------------------------------------------
00072> --------------------
00073> | READ STORM       |    Filename: 2yr/6hr
00074> | Ptotal=  36.00 mm|    Comments: 2yr/6hr
00075> --------------------
00076>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00077>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00078>                .25    .000 |   2.00  12.240 |   3.75   5.040 |   5.50    .720
00079>                .50    .720 |   2.25  12.240 |   4.00   2.880 |   5.75    .720
00080>                .75    .720 |   2.50  33.120 |   4.25   2.880 |   6.00    .720
00081>               1.00    .720 |   2.75  33.120 |   4.50   1.440 |   6.25    .720
00082>               1.25    .720 |   3.00   9.360 |   4.75   1.440 |
00083>               1.50   4.320 |   3.25   9.360 |   5.00    .720 |
00084>               1.75   4.320 |   3.50   5.040 |   5.25    .720 |
00085>
00086> --------------------------------------------------------------------------------
00087> 001:0003--------------------------------------------------------------------------
00088> *# Node 1: Flow from Basin 1
00089> ----------------------
00090> | CALIB NASHYD       |   Area    (ha)=    1.93   Curve Number   (CN)=75.00
00091> | 01:A1     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00092> ----------------------   U.H. Tp(hrs)=    .220
00093>
00094>     Unit Hyd Qpeak  (cms)=     .335
00095>
00096>     PEAK FLOW       (cms)=     .028 (i)
00097>     TIME TO PEAK    (hrs)=    2.883
00098>     RUNOFF VOLUME    (mm)=    6.108
00099>     TOTAL RAINFALL   (mm)=   36.000
00100>     RUNOFF COEFFICIENT   =     .170
00101>
00102>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00103>
00104> --------------------------------------------------------------------------------
00105> 001:0004--------------------------------------------------------------------------
00106> *# Node 2: Flow from Basin 2
00107> ----------------------
00108> | CALIB NASHYD       |   Area    (ha)=    1.69   Curve Number   (CN)=78.00
00109> | 02:A2     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00110> ----------------------   U.H. Tp(hrs)=    .200
00111>
00112>     Unit Hyd Qpeak  (cms)=     .323
00113>
00114>     PEAK FLOW       (cms)=     .029 (i)
00115>     TIME TO PEAK    (hrs)=    2.867
00116>     RUNOFF VOLUME    (mm)=    6.923
00117>     TOTAL RAINFALL   (mm)=   36.000
00118>     RUNOFF COEFFICIENT   =     .192
00119>
00120>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00121>
00122> --------------------------------------------------------------------------------
00123> 001:0005--------------------------------------------------------------------------
00124> *# Node 3: Flow from Basin 3
00125> ----------------------
00126> | CALIB STANDHYD     |   Area    (ha)=     .05
00127> | 03: A3    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=     .10
00128> ----------------------
00129>                              IMPERVIOUS    PERVIOUS (i)
00130>     Surface Area     (ha)=        .03          .03
00131>     Dep. Storage     (mm)=        .70        10.00
00132>     Average Slope     (%)=       5.00         4.00
00133>     Length            (m)=      90.00        15.00
00134>     Mannings n             =       .013         .250
00135>
00136>     Max.eff.Inten.(mm/hr)=      33.12        34.21
00137>                 over (min)       2.00         7.00
00138>     Storage Coeff.  (min)=       2.30 (ii)    7.19 (ii)
00139>     Unit Hyd. Tpeak (min)=       2.00         7.00
00140>     Unit Hyd. peak  (cms)=        .54          .16
00141>                                                          *TOTALS*
00142>     PEAK FLOW       (cms)=        .00          .00          .002 (iii)
00143>     TIME TO PEAK    (hrs)=       2.37         2.77         2.767
00144>     RUNOFF VOLUME    (mm)=      35.30        13.09        13.116
00145>     TOTAL RAINFALL   (mm)=      36.00        36.00        36.000
00146>     RUNOFF COEFFICIENT   =        .98          .36          .364
00147>
00148>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00149>           CN* =  75.0    Ia = Dep. Storage  (Above)
00150>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00151>           THAN THE STORAGE COEFFICIENT.
00152>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00153>
00154> --------------------------------------------------------------------------------
00155> 001:0006--------------------------------------------------------------------------
00156> *# Node 4: Flow from Basin 4 + 5
00157> ----------------------
00158> | CALIB NASHYD       |   Area    (ha)=    2.51   Curve Number   (CN)=70.00
00159> | 04:A4     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00160> ----------------------   U.H. Tp(hrs)=    .170
00161>
00162>     Unit Hyd Qpeak  (cms)=     .564
00163>
00164>     PEAK FLOW       (cms)=     .033 (i)
00165>     TIME TO PEAK    (hrs)=    2.833
00166>     RUNOFF VOLUME    (mm)=    5.013
00167>     TOTAL RAINFALL   (mm)=   36.000
00168>     RUNOFF COEFFICIENT   =     .139
00169>
00170>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00171>
00172> --------------------------------------------------------------------------------
00173> 001:0007--------------------------------------------------------------------------
00174> ----------------------
00175> | CALIB NASHYD       |   Area    (ha)=    1.69   Curve Number   (CN)=68.00
00176> | 05:A5     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00177> ----------------------   U.H. Tp(hrs)=    .140
00178>
00179>     Unit Hyd Qpeak  (cms)=     .461
00180>
00181>     PEAK FLOW       (cms)=     .023 (i)
00182>     TIME TO PEAK    (hrs)=    2.817
00183>     RUNOFF VOLUME    (mm)=    4.645
00184>     TOTAL RAINFALL   (mm)=   36.000
00185>     RUNOFF COEFFICIENT   =     .129
00186>
00187>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00188>
00189> --------------------------------------------------------------------------------
00190> 001:0008--------------------------------------------------------------------------
00191> ------------------------
00192> | ADD HYD (N4       ) | ID: NHYD        AREA     QPEAK   TPEAK   R.V.    DWF
00193> ------------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
00194>                       ID1 04:A4          2.51     .033    2.83   5.01    .000
00195>                     +ID2 05:A5           1.69     .023    2.82   4.64    .000
00196>                       ========================================================
00197>                       SUM 06:N4          4.20     .056    2.82   4.86    .000
00198>
00199>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00200>
00201> --------------------------------------------------------------------------------
00202> 001:0009--------------------------------------------------------------------------
00203> *# Node 5: Flow from Basin 6
00204> ----------------------
00205> | CALIB NASHYD       |   Area    (ha)=    1.21   Curve Number   (CN)=76.00
00206> | 07:A6     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00207> ----------------------   U.H. Tp(hrs)=    .200
00208>
00209>     Unit Hyd Qpeak  (cms)=     .231
00210>
00211>     PEAK FLOW       (cms)=     .019 (i)
00212>     TIME TO PEAK    (hrs)=    2.867
00213>     RUNOFF VOLUME    (mm)=    6.364
00214>     TOTAL RAINFALL   (mm)=   36.000
00215>     RUNOFF COEFFICIENT   =     .177
00216>
00217>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00218>
00219> --------------------------------------------------------------------------------
00220> 001:0010--------------------------------------------------------------------------
00221> *# Node 6: Flow from Basin 7
00222> ----------------------
00223> | CALIB NASHYD       |   Area    (ha)=    1.48   Curve Number   (CN)=81.00
00224> | 08:A7     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00225> ----------------------   U.H. Tp(hrs)=    .090
00226>
00227>     Unit Hyd Qpeak  (cms)=     .628
00228>
00229>     PEAK FLOW       (cms)=     .041 (i)
00230>     TIME TO PEAK    (hrs)=    2.767
00231>     RUNOFF VOLUME    (mm)=    7.899
00232>     TOTAL RAINFALL   (mm)=   36.000
00233>     RUNOFF COEFFICIENT   =     .219
00234>
00235>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00236>
00237> --------------------------------------------------------------------------------
00238> 001:0011--------------------------------------------------------------------------
00239> *# Node 7: Flow from Basin 8
00240> ----------------------
00241> | CALIB STANDHYD     |   Area    (ha)=    1.86
00242> | 09:A8     DT= 1.00 |   Total Imp(%)=   22.00   Dir. Conn.(%)=     .10
00243> ----------------------
00244>                              IMPERVIOUS    PERVIOUS (i)
00245>     Surface Area     (ha)=        .41          1.45
00246>     Dep. Storage     (mm)=        .70         10.00
00247>     Average Slope     (%)=       3.00          3.00
00248>     Length            (m)=     164.00         40.00
00249>     Mannings n             =       .013          .250
00250>
00251>     Max.eff.Inten.(mm/hr)=      33.12        12.52
00252>                 over (min)       4.00        18.00
00253>     Storage Coeff.  (min)=       3.85 (ii)   18.20 (ii)
00254>     Unit Hyd. Tpeak (min)=       4.00        18.00
00255>     Unit Hyd. peak  (cms)=        .29          .06
00256>                                                          *TOTALS*
00257>     PEAK FLOW       (cms)=        .00          .03          .033 (iii)
00258>     TIME TO PEAK    (hrs)=       2.65         2.97         2.967
00259>     RUNOFF VOLUME    (mm)=      35.30         8.43         8.455
00260>     TOTAL RAINFALL   (mm)=      36.00        36.00        36.000
00261>     RUNOFF COEFFICIENT   =        .98          .23          .235
00262>
00263>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00264>           CN* =  75.0    Ia = Dep. Storage  (Above)
00265>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00266>           THAN THE STORAGE COEFFICIENT.
00267>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00268>
00269> --------------------------------------------------------------------------------
00270> 001:0012--------------------------------------------------------------------------
```

```
00271> ---------------------
00272> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00273> |  IN>09:(A8    )   |
00274> | OUT<01:(SWM-ou)   |    =========  OUTLFOW STORAGE TABLE  =========
00275> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00276>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
00277>                             .000  .0000E+00   |     .003  .4400E-01
00278>                             .001  .3000E-02   |     .003  .5400E-01
00279>                             .001  .1100E-01   |     .003  .6400E-01
00280>                             .002  .1800E-01   |     .003  .6600E-01
00281>                             .002  .2600E-01   |     .006  .6800E-01
00282>                             .002  .3500E-01   |     .099  .7500E-01
00283>
00284>     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
00285>     --------------------        (ha)     (cms)     (hrs)       (mm)
00286>     INFLOW >09: (A8    )        1.86      .033     2.967      8.455
00287>     OUTFLOW<01: (SWM-ou)        1.86      .001     6.500      8.455
00288>    OVERFLOW<02: (SWM-OV)         .00      .000      .000       .000
00289>
00290>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00291>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00292>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00293>
00294>
00295>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    4.449
00296>                    TIME SHIFT OF PEAK FLOW         (min)=   212.00
00297>                    MAXIMUM  STORAGE   USED       (ha.m.)=.1381E-01
00298>
00299> --------------------------------------------------------------------------------
00300> 001:0013-------------------------------------------------------------------------
00301> *# Node 8: Flow from Basin 9
00302> ---------------------
00303> | CALIB NASHYD      |   Area    (ha)=     .17   Curve Number   (CN)=79.00
00304> | 05:A9     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00305> ---------------------   U.H. Tp(hrs)=    .090
00306>
00307>     Unit Hyd Qpeak  (cms)=     .072
00308>
00309>     PEAK FLOW       (cms)=     .004 (i)
00310>     TIME TO PEAK    (hrs)=    2.767
00311>     RUNOFF VOLUME    (mm)=    7.227
00312>     TOTAL RAINFALL   (mm)=   36.000
00313>     RUNOFF COEFFICIENT   =     .201
00314>
00315>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00316>
00317> --------------------------------------------------------------------------------
00318> 001:0014-------------------------------------------------------------------------
00319>       FINISH
00320> --------------------------------------------------------------------------------
00321> ********************************************************************************
00322>     WARNINGS / ERRORS / NOTES
00323>     ------------------------
00324>    Simulation ended on 2020-04-17     at 12:38:14
00325> ================================================================================
00326>
00327>
```

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00001> ================================================================================
00002>
00003>   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>       S  W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
00008>                                                         9   9  9   9   # 3375279
00009>          StormWater Management HYdrologic Model          999    999    =========
00010>
00011> ********************************************************************************
00012> ***************************** SWMHYMO Ver/4.05  ********************************
00013> *********  A single event and continuous hydrologic simulation model  *********
00014> *********     based on the principles of HYMO and its successors      *********
00015> *********                    OTTHYMO-83 and OTTHYMO-89.                *********
00016> ********************************************************************************
00017> ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018> *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019> *********                  Gatineau, Quebec: (819) 243-6858           *********
00020> *********                  E-Mail: swmhymo@jfsa.com                   *********
00021> ********************************************************************************
00022>
00023> ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024> +++++++++ Licensed user: Calder Engineering Ltd.                      +++++++++
00025> +++++++++                Bolton               SERIAL#:3375279        +++++++++
00026> ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028> ********************************************************************************
00029> *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030> *********           Maximum value for ID numbers  :     10            *********
00031> *********           Max. number of rainfall points: 105408            *********
00032> *********           Max. number of flow points    : 105408            *********
00033> ********************************************************************************
00034>
00035>
00036> **********************   D E T A I L E D   O U T P U T   **********************
00037> ********************************************************************************
00038> *         DATE: 2020-04-17     TIME: 12:37:11     RUN COUNTER: 000346         *
00039> ********************************************************************************
00040> * Input   filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.dat     *
00041> * Output  filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.out     *
00042> * Summary filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.sum     *
00043> * User comments:                                                             *
00044> * 1:_____________________________________________________________________     *
00045> * 2:_____________________________________________________________________     *
00046> * 3:_____________________________________________________________________     *
00047> ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*******************************************************************************
00052> *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00053> *#  Date        : [2020-04-17]
00054> *#  Modeller    : [    MYS, KC    ]
00055> *#  Company     : Calder Engineering Ltd.
00056> *#  License #   :  3375279
00057> *#*******************************************************************************
00058> *# Proposed Conditions: bottom at 278.75, pipe invert at 278.75
00059> *  overflow at 279.52 and top of berm at 279.62
00060> *  updated with revised drainage areas and pond design February 2020
00061> *  Filename: L-P.dat
00062> *#*******************************************************************************
00063> --------------------
00064> | START            |  Project  dir.: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\20
00065> --------------------  Rainfall dir.: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\20
00066>     TZERO =   .00 hrs on       0
00067>     METOUT=   2 (output = METRIC)
00068>     NRUN  = 001
00069>     NSTORM=   0
00070> --------------------------------------------------------------------------------
00071> 001:0002--------------------------------------------------------------------------
00072> --------------------
00073> | READ STORM       |    Filename: 5yr/6hr
00074> | Ptotal=  47.81 mm|    Comments: 5yr/6hr
00075> --------------------
00076>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00077>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00078>                .25    .000 |   2.00  16.250 |   3.75   6.690 |   5.50    .960
00079>                .50    .960 |   2.25  16.250 |   4.00   3.820 |   5.75    .960
00080>                .75    .960 |   2.50  43.980 |   4.25   3.820 |   6.00    .960
00081>               1.00    .960 |   2.75  43.980 |   4.50   1.910 |   6.25    .960
00082>               1.25    .960 |   3.00  12.430 |   4.75   1.910 |
00083>               1.50   5.740 |   3.25  12.430 |   5.00    .960 |
00084>               1.75   5.740 |   3.50   6.690 |   5.25    .960 |
00085>
00086> --------------------------------------------------------------------------------
00087> 001:0003--------------------------------------------------------------------------
00088> *# Node 1: Flow from Basin 1
00089> ---------------------
00090> | CALIB NASHYD       |   Area    (ha)=    1.93   Curve Number   (CN)=75.00
00091> | 01:A1     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00092> ---------------------   U.H. Tp(hrs)=    .220
00093>
00094>     Unit Hyd Qpeak  (cms)=     .335
00095>
00096>     PEAK FLOW       (cms)=     .056 (i)
00097>     TIME TO PEAK    (hrs)=    2.867
00098>     RUNOFF VOLUME    (mm)=   11.672
00099>     TOTAL RAINFALL   (mm)=   47.810
00100>     RUNOFF COEFFICIENT   =     .244
00101>
00102>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00103>
00104> --------------------------------------------------------------------------------
00105> 001:0004--------------------------------------------------------------------------
00106> *# Node 2: Flow from Basin 2
00107> ---------------------
00108> | CALIB NASHYD       |   Area    (ha)=    1.69   Curve Number   (CN)=78.00
00109> | 02:A2     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00110> ---------------------   U.H. Tp(hrs)=    .200
00111>
00112>     Unit Hyd Qpeak  (cms)=     .323
00113>
00114>     PEAK FLOW       (cms)=     .058 (i)
00115>     TIME TO PEAK    (hrs)=    2.850
00116>     RUNOFF VOLUME    (mm)=   13.061
00117>     TOTAL RAINFALL   (mm)=   47.810
00118>     RUNOFF COEFFICIENT   =     .273
00119>
00120>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00121>
00122> --------------------------------------------------------------------------------
00123> 001:0005--------------------------------------------------------------------------
00124> *# Node 3: Flow from Basin 3
00125> ---------------------
00126> | CALIB STANDHYD     |   Area    (ha)=     .05
00127> | 03: A3    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=     .10
00128> ---------------------
00129>                              IMPERVIOUS    PERVIOUS (i)
00130>     Surface Area     (ha)=        .03          .03
00131>     Dep. Storage     (mm)=        .70        10.00
00132>     Average Slope     (%)=       5.00         4.00
00133>     Length            (m)=      90.00        15.00
00134>     Mannings n             =       .013         .250
00135>
00136>     Max.eff.Inten.(mm/hr)=      43.98        54.81
00137>                 over (min)        2.00         6.00
00138>     Storage Coeff.  (min)=       2.06 (ii)    6.10 (ii)
00139>     Unit Hyd. Tpeak (min)=       2.00         6.00
00140>     Unit Hyd. peak  (cms)=        .56          .19
00141>                                                          *TOTALS*
00142>     PEAK FLOW       (cms)=        .00          .00          .003 (iii)
00143>     TIME TO PEAK    (hrs)=       2.72         2.77         2.767
00144>     RUNOFF VOLUME    (mm)=      47.11        21.51        21.536
00145>     TOTAL RAINFALL   (mm)=      47.81        47.81        47.810
00146>     RUNOFF COEFFICIENT   =        .99          .45          .450
00147>
00148>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00149>           CN* =  75.0    Ia = Dep. Storage  (Above)
00150>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00151>           THAN THE STORAGE COEFFICIENT.
00152>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00153>
00154> --------------------------------------------------------------------------------
00155> 001:0006--------------------------------------------------------------------------
00156> *# Node 4: Flow from Basin 4 + 5
00157> ---------------------
00158> | CALIB NASHYD       |   Area    (ha)=    2.51   Curve Number   (CN)=70.00
00159> | 04:A4     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00160> ---------------------   U.H. Tp(hrs)=    .170
00161>
00162>     Unit Hyd Qpeak  (cms)=     .564
00163>
00164>     PEAK FLOW       (cms)=     .068 (i)
00165>     TIME TO PEAK    (hrs)=    2.817
00166>     RUNOFF VOLUME    (mm)=    9.747
00167>     TOTAL RAINFALL   (mm)=   47.810
00168>     RUNOFF COEFFICIENT   =     .204
00169>
00170>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00171>
00172> --------------------------------------------------------------------------------
00173> 001:0007--------------------------------------------------------------------------
00174> ---------------------
00175> | CALIB NASHYD       |   Area    (ha)=    1.69   Curve Number   (CN)=68.00
00176> | 05:A5     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00177> ---------------------   U.H. Tp(hrs)=    .140
00178>
00179>     Unit Hyd Qpeak  (cms)=     .461
00180>
00181>     PEAK FLOW       (cms)=     .046 (i)
00182>     TIME TO PEAK    (hrs)=    2.800
00183>     RUNOFF VOLUME    (mm)=    9.086
00184>     TOTAL RAINFALL   (mm)=   47.810
00185>     RUNOFF COEFFICIENT   =     .190
00186>
00187>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00188>
00189> --------------------------------------------------------------------------------
00190> 001:0008--------------------------------------------------------------------------
00191> ------------------------
00192> | ADD HYD (N4         ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00193> ------------------------                   (ha)     (cms)   (hrs)   (mm)    (cms)
00194>                         ID1 04:A4          2.51     .068    2.82   9.75    .000
00195>                       +ID2 05:A5           1.69     .046    2.80   9.09    .000
00196>                         ========================================================
00197>                         SUM 06:N4          4.20     .113    2.82   9.48    .000
00198>
00199>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00200>
00201> --------------------------------------------------------------------------------
00202> 001:0009--------------------------------------------------------------------------
00203> *# Node 5: Flow from Basin 6
00204> ---------------------
00205> | CALIB NASHYD       |   Area    (ha)=    1.21   Curve Number   (CN)=76.00
00206> | 07:A6     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00207> ---------------------   U.H. Tp(hrs)=    .200
00208>
00209>     Unit Hyd Qpeak  (cms)=     .231
00210>
00211>     PEAK FLOW       (cms)=     .038 (i)
00212>     TIME TO PEAK    (hrs)=    2.850
00213>     RUNOFF VOLUME    (mm)=   12.113
00214>     TOTAL RAINFALL   (mm)=   47.810
00215>     RUNOFF COEFFICIENT   =     .253
00216>
00217>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00218>
00219> --------------------------------------------------------------------------------
00220> 001:0010--------------------------------------------------------------------------
00221> *# Node 6: Flow from Basin 7
00222> ---------------------
00223> | CALIB NASHYD       |   Area    (ha)=    1.48   Curve Number   (CN)=81.00
00224> | 08:A7     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00225> ---------------------   U.H. Tp(hrs)=    .090
00226>
00227>     Unit Hyd Qpeak  (cms)=     .628
00228>
00229>     PEAK FLOW       (cms)=     .075 (i)
00230>     TIME TO PEAK    (hrs)=    2.767
00231>     RUNOFF VOLUME    (mm)=   14.679
00232>     TOTAL RAINFALL   (mm)=   47.810
00233>     RUNOFF COEFFICIENT   =     .307
00234>
00235>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00236>
00237> --------------------------------------------------------------------------------
00238> 001:0011--------------------------------------------------------------------------
00239> *# Node 7: Flow from Basin 8
00240> ---------------------
00241> | CALIB STANDHYD     |   Area    (ha)=    1.86
00242> | 09:A8     DT= 1.00 |   Total Imp(%)=   22.00   Dir. Conn.(%)=     .10
00243> ---------------------
00244>                              IMPERVIOUS    PERVIOUS (i)
00245>     Surface Area     (ha)=        .41         1.45
00246>     Dep. Storage     (mm)=        .70        10.00
00247>     Average Slope     (%)=       3.00         3.00
00248>     Length            (m)=     164.00        40.00
00249>     Mannings n             =       .013         .250
00250>
00251>     Max.eff.Inten.(mm/hr)=      43.98        23.48
00252>                 over (min)        3.00        15.00
00253>     Storage Coeff.  (min)=       3.43 (ii)   14.59 (ii)
00254>     Unit Hyd. Tpeak (min)=       3.00        15.00
00255>     Unit Hyd. peak  (cms)=        .34          .08
00256>                                                          *TOTALS*
00257>     PEAK FLOW       (cms)=        .00          .07          .067 (iii)
00258>     TIME TO PEAK    (hrs)=       2.75         2.88         2.883
00259>     RUNOFF VOLUME    (mm)=      47.11        15.08        15.113
00260>     TOTAL RAINFALL   (mm)=      47.81        47.81        47.810
00261>     RUNOFF COEFFICIENT   =        .99          .32          .316
00262>
00263>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00264>           CN* =  75.0    Ia = Dep. Storage  (Above)
00265>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00266>           THAN THE STORAGE COEFFICIENT.
00267>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00268>
00269> --------------------------------------------------------------------------------
00270> 001:0012--------------------------------------------------------------------------
```

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00271> --------------------
00272> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00273> |  IN>09:(A8    )   |
00274> | OUT<01:(SWM-ou)   |    =========  OUTLFOW STORAGE TABLE  =========
00275> --------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00276>                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
00277>                            .000  .0000E+00   |     .003  .4400E-01
00278>                            .001  .3000E-02   |     .003  .5400E-01
00279>                            .001  .1100E-01   |     .003  .6400E-01
00280>                            .002  .1800E-01   |     .003  .6600E-01
00281>                            .002  .2600E-01   |     .006  .6800E-01
00282>                            .002  .3500E-01   |     .099  .7500E-01
00283>
00284>     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
00285>     --------------------        (ha)     (cms)     (hrs)       (mm)
00286>     INFLOW >09: (A8    )       1.86      .067     2.883     15.113
00287>     OUTFLOW<01: (SWM-ou)       1.86      .002     6.500     15.112
00288>    OVERFLOW<02: (SWM-OV)        .00      .000      .000       .000
00289>
00290>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00291>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00292>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00293>
00294>
00295>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    2.941
00296>                    TIME SHIFT OF PEAK FLOW         (min)=   217.00
00297>                    MAXIMUM  STORAGE   USED       (ha.m.)=.2546E-01
00298>
00299> ------------------------------------------------------------------------------
00300> 001:0013--------------------------------------------------------------------
00301> *# Node 8: Flow from Basin 9
00302> ---------------------
00303> | CALIB NASHYD      |   Area    (ha)=     .17   Curve Number   (CN)=79.00
00304> | 05:A9     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00305> ---------------------   U.H. Tp(hrs)=    .090
00306>
00307>     Unit Hyd Qpeak  (cms)=     .072
00308>
00309>     PEAK FLOW       (cms)=     .008 (i)
00310>     TIME TO PEAK    (hrs)=    2.767
00311>     RUNOFF VOLUME    (mm)=   13.572
00312>     TOTAL RAINFALL   (mm)=   47.810
00313>     RUNOFF COEFFICIENT   =     .284
00314>
00315>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00316>
00317> ------------------------------------------------------------------------------
00318> 001:0014--------------------------------------------------------------------
00319>       FINISH
00320> ------------------------------------------------------------------------------
00321> ********************************************************************************
00322>     WARNINGS / ERRORS / NOTES
00323>     ------------------------
00324>    Simulation ended on 2020-04-17     at 12:37:11
00325> ================================================================================
00326>
00327>
```

```
00001> ================================================================================
00002>
00003>    SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>    S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>    SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>        S  W W W  M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>    SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
00008>                                                          9   9  9   9   # 3375279
00009>          StormWater Management HYdrologic Model           999    999    =========
00010>
00011> ********************************************************************************
00012> ***************************** SWMHYMO Ver/4.05  ********************************
00013> *********  A single event and continuous hydrologic simulation model  *********
00014> *********     based on the principles of HYMO and its successors      *********
00015> *********                    OTTHYMO-83 and OTTHYMO-89.                *********
00016> ********************************************************************************
00017> ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018> *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019> *********                  Gatineau, Quebec: (819) 243-6858           *********
00020> *********                  E-Mail: swmhymo@jfsa.com                   *********
00021> ********************************************************************************
00022>
00023> ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024> +++++++++ Licensed user: Calder Engineering Ltd.                      +++++++++
00025> +++++++++                 Bolton               SERIAL#:3375279       +++++++++
00026> ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028> ********************************************************************************
00029> *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030> *********           Maximum value for ID numbers  :     10            *********
00031> *********           Max. number of rainfall points: 105408            *********
00032> *********           Max. number of flow points    : 105408            *********
00033> ********************************************************************************
00034>
00035>
00036> *********************   D E T A I L E D   O U T P U T   **********************
00037> ********************************************************************************
00038> *         DATE: 2020-04-17     TIME: 12:35:33     RUN COUNTER: 000345         *
00039> ********************************************************************************
00040> * Input   filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.dat     *
00041> * Output  filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.out     *
00042> * Summary filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.sum     *
00043> * User comments:                                                             *
00044> * 1:_____________________________________________________________________     *
00045> * 2:_____________________________________________________________________     *
00046> * 3:_____________________________________________________________________     *
00047> ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*****************************************************************************
00052> *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00053> *#  Date        : [2020-04-17]
00054> *#  Modeller    : [    MYS, KC    ]
00055> *#  Company     : Calder Engineering Ltd.
00056> *#  License #   :  3375279
00057> *#*****************************************************************************
00058> *# Proposed Conditions: bottom at 278.75, pipe invert at 278.75
00059> *  overflow at 279.52 and top of berm at 279.62
00060> *  updated with revised drainage areas and pond design February 2020
00061> *  Filename: L-P.dat
00062> *#*****************************************************************************
00063> --------------------
00064> | START            |  Project  dir.: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\20
00065> --------------------  Rainfall dir.: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\20
00066>     TZERO =   .00 hrs on       0
00067>     METOUT=   2 (output = METRIC)
00068>     NRUN  = 001
00069>     NSTORM=   0
00070> --------------------------------------------------------------------------------
00071> 001:0002--------------------------------------------------------------------------
00072> --------------------
00073> | READ STORM       |    Filename: 10yr/6hr
00074> | Ptotal=  55.69 mm|    Comments: 10yr/6hr
00075> --------------------
00076>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00077>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00078>                .25    .000 |   2.00  18.940 |   3.75   7.800 |   5.50   1.110
00079>                .50   1.110 |   2.25  18.940 |   4.00   4.460 |   5.75   1.110
00080>                .75   1.110 |   2.50  51.240 |   4.25   4.460 |   6.00   1.110
00081>               1.00   1.110 |   2.75  51.240 |   4.50   2.230 |   6.25   1.110
00082>               1.25   1.110 |   3.00  14.480 |   4.75   2.230 |
00083>               1.50   6.680 |   3.25  14.480 |   5.00   1.110 |
00084>               1.75   6.680 |   3.50   7.800 |   5.25   1.110 |
00085>
00086> --------------------------------------------------------------------------------
00087> 001:0003--------------------------------------------------------------------------
00088> *# Node 1: Flow from Basin 1
00089> ---------------------
00090> | CALIB NASHYD       |   Area    (ha)=    1.93   Curve Number   (CN)=75.00
00091> | 01:A1     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00092> ---------------------   U.H. Tp(hrs)=    .220
00093>
00094>     Unit Hyd Qpeak  (cms)=     .335
00095>
00096>     PEAK FLOW       (cms)=     .079 (i)
00097>     TIME TO PEAK    (hrs)=    2.867
00098>     RUNOFF VOLUME    (mm)=   16.014
00099>     TOTAL RAINFALL   (mm)=   55.690
00100>     RUNOFF COEFFICIENT   =     .288
00101>
00102>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00103>
00104> --------------------------------------------------------------------------------
00105> 001:0004--------------------------------------------------------------------------
00106> *# Node 2: Flow from Basin 2
00107> ---------------------
00108> | CALIB NASHYD       |   Area    (ha)=    1.69   Curve Number   (CN)=78.00
00109> | 02:A2     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00110> ---------------------   U.H. Tp(hrs)=    .200
00111>
00112>     Unit Hyd Qpeak  (cms)=     .323
00113>
00114>     PEAK FLOW       (cms)=     .081 (i)
00115>     TIME TO PEAK    (hrs)=    2.833
00116>     RUNOFF VOLUME    (mm)=   17.792
00117>     TOTAL RAINFALL   (mm)=   55.690
00118>     RUNOFF COEFFICIENT   =     .319
00119>
00120>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00121>
00122> --------------------------------------------------------------------------------
00123> 001:0005--------------------------------------------------------------------------
00124> *# Node 3: Flow from Basin 3
00125> ---------------------
00126> | CALIB STANDHYD     |   Area    (ha)=     .05
00127> | 03: A3    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=     .10
00128> ---------------------
00129>                              IMPERVIOUS    PERVIOUS (i)
00130>     Surface Area     (ha)=        .03         .03
00131>     Dep. Storage     (mm)=        .70       10.00
00132>     Average Slope     (%)=       5.00        4.00
00133>     Length            (m)=      90.00       15.00
00134>     Mannings n             =       .013        .250
00135>
00136>     Max.eff.Inten.(mm/hr)=      51.24       69.08
00137>                 over (min)       2.00        6.00
00138>     Storage Coeff.  (min)=       1.93 (ii)   5.62 (ii)
00139>     Unit Hyd. Tpeak (min)=       2.00        6.00
00140>     Unit Hyd. peak  (cms)=        .58         .20
00141>                                                          *TOTALS*
00142>     PEAK FLOW       (cms)=        .00         .00          .004 (iii)
00143>     TIME TO PEAK    (hrs)=       2.52        2.75         2.750
00144>     RUNOFF VOLUME    (mm)=      54.99       27.60        27.633
00145>     TOTAL RAINFALL   (mm)=      55.69       55.69        55.690
00146>     RUNOFF COEFFICIENT   =        .99         .50          .496
00147>
00148>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00149>           CN* =  75.0    Ia = Dep. Storage  (Above)
00150>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00151>           THAN THE STORAGE COEFFICIENT.
00152>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00153>
00154> --------------------------------------------------------------------------------
00155> 001:0006--------------------------------------------------------------------------
00156> *# Node 4: Flow from Basin 4 + 5
00157> ---------------------
00158> | CALIB NASHYD       |   Area    (ha)=    2.51   Curve Number   (CN)=70.00
00159> | 04:A4     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00160> ---------------------   U.H. Tp(hrs)=    .170
00161>
00162>     Unit Hyd Qpeak  (cms)=     .564
00163>
00164>     PEAK FLOW       (cms)=     .095 (i)
00165>     TIME TO PEAK    (hrs)=    2.817
00166>     RUNOFF VOLUME    (mm)=   13.508
00167>     TOTAL RAINFALL   (mm)=   55.690
00168>     RUNOFF COEFFICIENT   =     .243
00169>
00170>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00171>
00172> --------------------------------------------------------------------------------
00173> 001:0007--------------------------------------------------------------------------
00174> ---------------------
00175> | CALIB NASHYD       |   Area    (ha)=    1.69   Curve Number   (CN)=68.00
00176> | 05:A5     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00177> ---------------------   U.H. Tp(hrs)=    .140
00178>
00179>     Unit Hyd Qpeak  (cms)=     .461
00180>
00181>     PEAK FLOW       (cms)=     .064 (i)
00182>     TIME TO PEAK    (hrs)=    2.800
00183>     RUNOFF VOLUME    (mm)=   12.635
00184>     TOTAL RAINFALL   (mm)=   55.690
00185>     RUNOFF COEFFICIENT   =     .227
00186>
00187>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00188>
00189> --------------------------------------------------------------------------------
00190> 001:0008--------------------------------------------------------------------------
00191> ------------------------
00192> | ADD HYD (N4         ) | ID: NHYD        AREA     QPEAK   TPEAK   R.V.    DWF
00193> ------------------------                  (ha)     (cms)   (hrs)   (mm)    (cms)
00194>                         ID1 04:A4          2.51     .095    2.82  13.51    .000
00195>                       +ID2 05:A5           1.69     .064    2.80  12.64    .000
00196>                         ========================================================
00197>                         SUM 06:N4          4.20     .159    2.80  13.16    .000
00198>
00199>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00200>
00201> --------------------------------------------------------------------------------
00202> 001:0009--------------------------------------------------------------------------
00203> *# Node 5: Flow from Basin 6
00204> ---------------------
00205> | CALIB NASHYD       |   Area    (ha)=    1.21   Curve Number   (CN)=76.00
00206> | 07:A6     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00207> ---------------------   U.H. Tp(hrs)=    .200
00208>
00209>     Unit Hyd Qpeak  (cms)=     .231
00210>
00211>     PEAK FLOW       (cms)=     .054 (i)
00212>     TIME TO PEAK    (hrs)=    2.850
00213>     RUNOFF VOLUME    (mm)=   16.581
00214>     TOTAL RAINFALL   (mm)=   55.690
00215>     RUNOFF COEFFICIENT   =     .298
00216>
00217>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00218>
00219> --------------------------------------------------------------------------------
00220> 001:0010--------------------------------------------------------------------------
00221> *# Node 6: Flow from Basin 7
00222> ---------------------
00223> | CALIB NASHYD       |   Area    (ha)=    1.48   Curve Number   (CN)=81.00
00224> | 08:A7     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00225> ---------------------   U.H. Tp(hrs)=    .090
00226>
00227>     Unit Hyd Qpeak  (cms)=     .628
00228>
00229>     PEAK FLOW       (cms)=     .101 (i)
00230>     TIME TO PEAK    (hrs)=    2.767
00231>     RUNOFF VOLUME    (mm)=   19.831
00232>     TOTAL RAINFALL   (mm)=   55.690
00233>     RUNOFF COEFFICIENT   =     .356
00234>
00235>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00236>
00237> --------------------------------------------------------------------------------
00238> 001:0011--------------------------------------------------------------------------
00239> *# Node 7: Flow from Basin 8
00240> ---------------------
00241> | CALIB STANDHYD     |   Area    (ha)=    1.86
00242> | 09:A8     DT= 1.00 |   Total Imp(%)=   22.00   Dir. Conn.(%)=     .10
00243> ---------------------
00244>                              IMPERVIOUS    PERVIOUS (i)
00245>     Surface Area     (ha)=        .41        1.45
00246>     Dep. Storage     (mm)=        .70       10.00
00247>     Average Slope     (%)=       3.00        3.00
00248>     Length            (m)=     164.00       40.00
00249>     Mannings n             =       .013        .250
00250>
00251>     Max.eff.Inten.(mm/hr)=      51.24       31.83
00252>                 over (min)       3.00       13.00
00253>     Storage Coeff.  (min)=       3.23 (ii)  13.11 (ii)
00254>     Unit Hyd. Tpeak (min)=       3.00       13.00
00255>     Unit Hyd. peak  (cms)=        .36         .09
00256>                                                          *TOTALS*
00257>     PEAK FLOW       (cms)=        .00         .10          .095 (iii)
00258>     TIME TO PEAK    (hrs)=       2.62        2.85         2.850
00259>     RUNOFF VOLUME    (mm)=      54.99       20.11        20.149
00260>     TOTAL RAINFALL   (mm)=      55.69       55.69        55.690
00261>     RUNOFF COEFFICIENT   =        .99         .36          .362
00262>
00263>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00264>           CN* =  75.0    Ia = Dep. Storage  (Above)
00265>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00266>           THAN THE STORAGE COEFFICIENT.
00267>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00268>
00269> --------------------------------------------------------------------------------
00270> 001:0012--------------------------------------------------------------------------
```

```
00271> ---------------------
00272> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00273> |  IN>09:(A8    )   |
00274> | OUT<01:(SWM-ou)   |    =========  OUTLFOW STORAGE TABLE  =========
00275> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00276>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
00277>                             .000  .0000E+00   |     .003  .4400E-01
00278>                             .001  .3000E-02   |     .003  .5400E-01
00279>                             .001  .1100E-01   |     .003  .6400E-01
00280>                             .002  .1800E-01   |     .003  .6600E-01
00281>                             .002  .2600E-01   |     .006  .6800E-01
00282>                             .002  .3500E-01   |     .099  .7500E-01
00283>
00284>     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
00285>     --------------------        (ha)     (cms)     (hrs)       (mm)
00286>     INFLOW >09: (A8    )       1.86      .095     2.850     20.149
00287>     OUTFLOW<01: (SWM-ou)       1.86      .002     6.483     20.148
00288>    OVERFLOW<02: (SWM-OV)        .00      .000      .000       .000
00289>
00290>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00291>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00292>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00293>
00294>
00295>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    2.388
00296>                    TIME SHIFT OF PEAK FLOW         (min)=   218.00
00297>                    MAXIMUM  STORAGE   USED       (ha.m.)=.3440E-01
00298>
00299> --------------------------------------------------------------------------------
00300> 001:0013-------------------------------------------------------------------------
00301> *# Node 8: Flow from Basin 9
00302> ---------------------
00303> | CALIB NASHYD      |   Area    (ha)=     .17   Curve Number   (CN)=79.00
00304> | 05:A9     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00305> ---------------------   U.H. Tp(hrs)=    .090
00306>
00307>     Unit Hyd Qpeak  (cms)=     .072
00308>
00309>     PEAK FLOW       (cms)=     .011 (i)
00310>     TIME TO PEAK    (hrs)=    2.767
00311>     RUNOFF VOLUME    (mm)=   18.439
00312>     TOTAL RAINFALL   (mm)=   55.690
00313>     RUNOFF COEFFICIENT   =     .331
00314>
00315>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00316>
00317> --------------------------------------------------------------------------------
00318> 001:0014-------------------------------------------------------------------------
00319>       FINISH
00320> --------------------------------------------------------------------------------
00321> ********************************************************************************
00322>     WARNINGS / ERRORS / NOTES
00323>     -------------------------
00324>    Simulation ended on 2020-04-17     at 12:35:33
00325> ================================================================================
00326>
00327>
```

```
00001> ================================================================================
00002>
00003>   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>       S  W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
00008>                                                        9   9  9   9   # 3375279
00009>          StormWater Management HYdrologic Model         999    999    =========
00010>
00011> ********************************************************************************
00012> ***************************** SWMHYMO Ver/4.05  ********************************
00013> *********  A single event and continuous hydrologic simulation model  *********
00014> *********     based on the principles of HYMO and its successors      *********
00015> *********                    OTTHYMO-83 and OTTHYMO-89.                *********
00016> ********************************************************************************
00017> ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018> *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019> *********                  Gatineau, Quebec: (819) 243-6858           *********
00020> *********                  E-Mail: swmhymo@jfsa.com                   *********
00021> ********************************************************************************
00022>
00023> ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024> +++++++++ Licensed user: Calder Engineering Ltd.                      +++++++++
00025> +++++++++                Bolton               SERIAL#:3375279        +++++++++
00026> ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028> ********************************************************************************
00029> *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030> *********           Maximum value for ID numbers  :     10            *********
00031> *********           Max. number of rainfall points: 105408            *********
00032> *********           Max. number of flow points    : 105408            *********
00033> ********************************************************************************
00034>
00035>
00036> *********************   D E T A I L E D   O U T P U T   **********************
00037> ********************************************************************************
00038> *         DATE: 2020-04-17     TIME: 12:34:09     RUN COUNTER: 000344         *
00039> ********************************************************************************
00040> * Input   filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.dat     *
00041> * Output  filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.out     *
00042> * Summary filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.sum     *
00043> * User comments:                                                             *
00044> * 1:_____________________________________________________________________     *
00045> * 2:_____________________________________________________________________     *
00046> * 3:_____________________________________________________________________     *
00047> ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*****************************************************************************
00052> *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00053> *#  Date        : [2020-04-17]
00054> *#  Modeller    : [    MYS, KC    ]
00055> *#  Company     : Calder Engineering Ltd.
00056> *#  License #   :  3375279
00057> *#*****************************************************************************
00058> *# Proposed Conditions: bottom at 278.75, pipe invert at 278.75
00059> *  overflow at 279.52 and top of berm at 279.62
00060> *  updated with revised drainage areas and pond design February 2020
00061> *  Filename: L-P.dat
00062> *#*****************************************************************************
00063> --------------------
00064> | START            |  Project  dir.: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\20
00065> --------------------  Rainfall dir.: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\20
00066>     TZERO =   .00 hrs on       0
00067>     METOUT=   2 (output = METRIC)
00068>     NRUN  = 001
00069>     NSTORM=   0
00070> --------------------------------------------------------------------------------
00071> 001:0002--------------------------------------------------------------------------
00072> --------------------
00073> | READ STORM       |    Filename: 25yr/6hr
00074> | Ptotal=  65.59 mm|    Comments: 25yr/6hr
00075> --------------------
00076>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00077>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00078>                .25    .000 |   2.00  22.300 |   3.75   9.180 |   5.50   1.310
00079>                .50   1.310 |   2.25  22.300 |   4.00   5.250 |   5.75   1.310
00080>                .75   1.310 |   2.50  60.350 |   4.25   5.250 |   6.00   1.310
00081>               1.00   1.310 |   2.75  60.350 |   4.50   2.620 |   6.25   1.310
00082>               1.25   1.310 |   3.00  17.060 |   4.75   2.620 |
00083>               1.50   7.870 |   3.25  17.060 |   5.00   1.310 |
00084>               1.75   7.870 |   3.50   9.180 |   5.25   1.310 |
00085>
00086> --------------------------------------------------------------------------------
00087> 001:0003--------------------------------------------------------------------------
00088> *# Node 1: Flow from Basin 1
00089> ----------------------
00090> | CALIB NASHYD       |   Area    (ha)=    1.93   Curve Number   (CN)=75.00
00091> | 01:A1     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00092> ----------------------   U.H. Tp(hrs)=    .220
00093>
00094>     Unit Hyd Qpeak  (cms)=     .335
00095>
00096>     PEAK FLOW       (cms)=     .110 (i)
00097>     TIME TO PEAK    (hrs)=    2.850
00098>     RUNOFF VOLUME    (mm)=   22.033
00099>     TOTAL RAINFALL   (mm)=   65.590
00100>     RUNOFF COEFFICIENT   =     .336
00101>
00102>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00103>
00104> --------------------------------------------------------------------------------
00105> 001:0004--------------------------------------------------------------------------
00106> *# Node 2: Flow from Basin 2
00107> ----------------------
00108> | CALIB NASHYD       |   Area    (ha)=    1.69   Curve Number   (CN)=78.00
00109> | 02:A2     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00110> ----------------------   U.H. Tp(hrs)=    .200
00111>
00112>     Unit Hyd Qpeak  (cms)=     .323
00113>
00114>     PEAK FLOW       (cms)=     .112 (i)
00115>     TIME TO PEAK    (hrs)=    2.833
00116>     RUNOFF VOLUME    (mm)=   24.288
00117>     TOTAL RAINFALL   (mm)=   65.590
00118>     RUNOFF COEFFICIENT   =     .370
00119>
00120>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00121>
00122> --------------------------------------------------------------------------------
00123> 001:0005--------------------------------------------------------------------------
00124> *# Node 3: Flow from Basin 3
00125> ----------------------
00126> | CALIB STANDHYD     |   Area    (ha)=     .05
00127> | 03: A3    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=     .10
00128> ----------------------
00129>                              IMPERVIOUS    PERVIOUS (i)
00130>     Surface Area     (ha)=        .03         .03
00131>     Dep. Storage     (mm)=        .70       10.00
00132>     Average Slope     (%)=       5.00        4.00
00133>     Length            (m)=      90.00       15.00
00134>     Mannings n             =       .013        .250
00135>
00136>     Max.eff.Inten.(mm/hr)=      60.35       87.89
00137>                over (min)       2.00        5.00
00138>     Storage Coeff.  (min)=       1.81 (ii)    5.16 (ii)
00139>     Unit Hyd. Tpeak (min)=       2.00        5.00
00140>     Unit Hyd. peak  (cms)=        .61         .22
00141>                                                          *TOTALS*
00142>     PEAK FLOW       (cms)=        .00         .01          .006 (iii)
00143>     TIME TO PEAK    (hrs)=       2.53        2.75         2.750
00144>     RUNOFF VOLUME    (mm)=      64.89       35.65        35.679
00145>     TOTAL RAINFALL   (mm)=      65.59       65.59        65.590
00146>     RUNOFF COEFFICIENT   =        .99         .54          .544
00147>
00148>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00149>           CN* =  75.0    Ia = Dep. Storage  (Above)
00150>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00151>           THAN THE STORAGE COEFFICIENT.
00152>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00153>
00154> --------------------------------------------------------------------------------
00155> 001:0006--------------------------------------------------------------------------
00156> *# Node 4: Flow from Basin 4 + 5
00157> ----------------------
00158> | CALIB NASHYD       |   Area    (ha)=    2.51   Curve Number   (CN)=70.00
00159> | 04:A4     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00160> ----------------------   U.H. Tp(hrs)=    .170
00161>
00162>     Unit Hyd Qpeak  (cms)=     .564
00163>
00164>     PEAK FLOW       (cms)=     .134 (i)
00165>     TIME TO PEAK    (hrs)=    2.817
00166>     RUNOFF VOLUME    (mm)=   18.792
00167>     TOTAL RAINFALL   (mm)=   65.590
00168>     RUNOFF COEFFICIENT   =     .287
00169>
00170>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00171>
00172> --------------------------------------------------------------------------------
00173> 001:0007--------------------------------------------------------------------------
00174> ----------------------
00175> | CALIB NASHYD       |   Area    (ha)=    1.69   Curve Number   (CN)=68.00
00176> | 05:A5     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00177> ----------------------   U.H. Tp(hrs)=    .140
00178>
00179>     Unit Hyd Qpeak  (cms)=     .461
00180>
00181>     PEAK FLOW       (cms)=     .090 (i)
00182>     TIME TO PEAK    (hrs)=    2.800
00183>     RUNOFF VOLUME    (mm)=   17.646
00184>     TOTAL RAINFALL   (mm)=   65.590
00185>     RUNOFF COEFFICIENT   =     .269
00186>
00187>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00188>
00189> --------------------------------------------------------------------------------
00190> 001:0008--------------------------------------------------------------------------
00191> ------------------------
00192> | ADD HYD (N4         ) | ID: NHYD        AREA     QPEAK   TPEAK   R.V.    DWF
00193> ------------------------                  (ha)     (cms)   (hrs)   (mm)    (cms)
00194>                         ID1 04:A4          2.51     .134    2.82  18.79    .000
00195>                       +ID2 05:A5           1.69     .090    2.80  17.65    .000
00196>                         ========================================================
00197>                         SUM 06:N4          4.20     .223    2.80  18.33    .000
00198>
00199>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00200>
00201> --------------------------------------------------------------------------------
00202> 001:0009--------------------------------------------------------------------------
00203> *# Node 5: Flow from Basin 6
00204> ----------------------
00205> | CALIB NASHYD       |   Area    (ha)=    1.21   Curve Number   (CN)=76.00
00206> | 07:A6     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00207> ----------------------   U.H. Tp(hrs)=    .200
00208>
00209>     Unit Hyd Qpeak  (cms)=     .231
00210>
00211>     PEAK FLOW       (cms)=     .074 (i)
00212>     TIME TO PEAK    (hrs)=    2.833
00213>     RUNOFF VOLUME    (mm)=   22.755
00214>     TOTAL RAINFALL   (mm)=   65.590
00215>     RUNOFF COEFFICIENT   =     .347
00216>
00217>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00218>
00219> --------------------------------------------------------------------------------
00220> 001:0010--------------------------------------------------------------------------
00221> *# Node 6: Flow from Basin 7
00222> ----------------------
00223> | CALIB NASHYD       |   Area    (ha)=    1.48   Curve Number   (CN)=81.00
00224> | 08:A7     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00225> ----------------------   U.H. Tp(hrs)=    .090
00226>
00227>     Unit Hyd Qpeak  (cms)=     .628
00228>
00229>     PEAK FLOW       (cms)=     .135 (i)
00230>     TIME TO PEAK    (hrs)=    2.767
00231>     RUNOFF VOLUME    (mm)=   26.832
00232>     TOTAL RAINFALL   (mm)=   65.590
00233>     RUNOFF COEFFICIENT   =     .409
00234>
00235>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00236>
00237> --------------------------------------------------------------------------------
00238> 001:0011--------------------------------------------------------------------------
00239> *# Node 7: Flow from Basin 8
00240> ----------------------
00241> | CALIB STANDHYD     |   Area    (ha)=    1.86
00242> | 09:A8     DT= 1.00 |   Total Imp(%)=   22.00   Dir. Conn.(%)=     .10
00243> ----------------------
00244>                              IMPERVIOUS    PERVIOUS (i)
00245>     Surface Area     (ha)=        .41        1.45
00246>     Dep. Storage     (mm)=        .70       10.00
00247>     Average Slope     (%)=       3.00        3.00
00248>     Length            (m)=     164.00       40.00
00249>     Mannings n             =       .013        .250
00250>
00251>     Max.eff.Inten.(mm/hr)=      60.35       42.58
00252>                over (min)       3.00       12.00
00253>     Storage Coeff.  (min)=       3.03 (ii)   11.82 (ii)
00254>     Unit Hyd. Tpeak (min)=       3.00       12.00
00255>     Unit Hyd. peak  (cms)=        .37         .10
00256>                                                          *TOTALS*
00257>     PEAK FLOW       (cms)=        .00         .13          .134 (iii)
00258>     TIME TO PEAK    (hrs)=       2.62        2.83         2.833
00259>     RUNOFF VOLUME    (mm)=      64.89       26.95        26.988
00260>     TOTAL RAINFALL   (mm)=      65.59       65.59        65.590
00261>     RUNOFF COEFFICIENT   =        .99         .41          .411
00262>
00263>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00264>           CN* =  75.0    Ia = Dep. Storage  (Above)
00265>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00266>           THAN THE STORAGE COEFFICIENT.
00267>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00268>
00269> --------------------------------------------------------------------------------
00270> 001:0012--------------------------------------------------------------------------
```

```
00271> ---------------------
00272> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00273> |  IN>09:(A8    )   |
00274> | OUT<01:(SWM-ou)   |    =========  OUTLFOW STORAGE TABLE  =========
00275> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00276>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
00277>                             .000  .0000E+00   |     .003  .4400E-01
00278>                             .001  .3000E-02   |     .003  .5400E-01
00279>                             .001  .1100E-01   |     .003  .6400E-01
00280>                             .002  .1800E-01   |     .003  .6600E-01
00281>                             .002  .2600E-01   |     .006  .6800E-01
00282>                             .002  .3500E-01   |     .099  .7500E-01
00283>
00284>     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
00285>     --------------------        (ha)     (cms)     (hrs)       (mm)
00286>     INFLOW >09: (A8    )       1.86      .134     2.833     26.988
00287>     OUTFLOW<01: (SWM-ou)       1.86      .003     6.483     26.987
00288>    OVERFLOW<02: (SWM-OV)        .00      .000      .000       .000
00289>
00290>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00291>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00292>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00293>
00294>
00295>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.981
00296>                    TIME SHIFT OF PEAK FLOW         (min)=   219.00
00297>                    MAXIMUM  STORAGE   USED       (ha.m.)=.4660E-01
00298>
00299> --------------------------------------------------------------------------------
00300> 001:0013-------------------------------------------------------------------------
00301> *# Node 8: Flow from Basin 9
00302> ---------------------
00303> | CALIB NASHYD      |   Area    (ha)=     .17   Curve Number   (CN)=79.00
00304> | 05:A9     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00305> ---------------------   U.H. Tp(hrs)=    .090
00306>
00307>     Unit Hyd Qpeak  (cms)=     .072
00308>
00309>     PEAK FLOW       (cms)=     .015 (i)
00310>     TIME TO PEAK    (hrs)=    2.767
00311>     RUNOFF VOLUME    (mm)=   25.101
00312>     TOTAL RAINFALL   (mm)=   65.590
00313>     RUNOFF COEFFICIENT   =     .383
00314>
00315>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00316>
00317> --------------------------------------------------------------------------------
00318> 001:0014-------------------------------------------------------------------------
00319>       FINISH
00320> --------------------------------------------------------------------------------
00321> ********************************************************************************
00322>     WARNINGS / ERRORS / NOTES
00323>     -------------------------
00324>    Simulation ended on 2020-04-17     at 12:34:09
00325> ================================================================================
00326>
00327>
```

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00001> ================================================================================
00002>
00003>   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>       S  W W W  M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9    =========
00008>                                                          9   9  9   9   # 3375279
00009>          StormWater Management HYdrologic Model           999    999    =========
00010>
00011> ********************************************************************************
00012> ***************************** SWMHYMO Ver/4.05  ********************************
00013> *********  A single event and continuous hydrologic simulation model  *********
00014> *********     based on the principles of HYMO and its successors      *********
00015> *********                    OTTHYMO-83 and OTTHYMO-89.                *********
00016> ********************************************************************************
00017> ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018> *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019> *********                  Gatineau, Quebec: (819) 243-6858           *********
00020> *********                  E-Mail: swmhymo@jfsa.Com                   *********
00021> ********************************************************************************
00022>
00023> +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024> +++++++++ Licensed user: Calder Engineering Ltd.                      +++++++++
00025> +++++++++                Bolton               SERIAL#:3375279        +++++++++
00026> +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028> ********************************************************************************
00029> *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030> *********           Maximum value for ID numbers  :     10            *********
00031> *********           Max. number of rainfall points: 105408            *********
00032> *********           Max. number of flow points    : 105408            *********
00033> ********************************************************************************
00034>
00035>
00036> **********************   D E T A I L E D   O U T P U T   **********************
00037> ********************************************************************************
00038> *         DATE: 2020-04-17     TIME: 12:32:51     RUN COUNTER: 000343         *
00039> ********************************************************************************
00040> * Input   filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.dat     *
00041> * Output  filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.out     *
00042> * Summary filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.sum     *
00043> * User comments:                                                             *
00044> * 1:_____________________________________________________________________     *
00045> * 2:_____________________________________________________________________     *
00046> * 3:_____________________________________________________________________     *
00047> ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*****************************************************************************
00052> *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00053> *#  Date        : [2020-04-17]
00054> *#  Modeller    : [    MYS, KC    ]
00055> *#  Company     : Calder Engineering Ltd.
00056> *#  License #   :  3375279
00057> *#*****************************************************************************
00058> *# Proposed Conditions: bottom at 278.75, pipe invert at 278.75
00059> *  overflow at 279.52 and top of berm at 279.62
00060> *  updated with revised drainage areas and pond design February 2020
00061> *  Filename: L-P.dat
00062> *#*****************************************************************************
00063> --------------------
00064> | START            |  Project  dir.: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\20
00065> --------------------  Rainfall dir.: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\20
00066>     TZERO =   .00 hrs on       0
00067>     METOUT=   2 (output = METRIC)
00068>     NRUN  = 001
00069>     NSTORM=   0
00070> --------------------------------------------------------------------------------
00071> 001:0002--------------------------------------------------------------------------
00072> --------------------
00073> | READ STORM       |    Filename: 50yr/6hr
00074> | Ptotal=  73.00 mm|    Comments: 50yr/6hr
00075> --------------------
00076>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00077>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00078>                .25    .000 |   2.00  24.820 |   3.75  10.220 |   5.50   1.460
00079>                .50   1.460 |   2.25  24.820 |   4.00   5.840 |   5.75   1.460
00080>                .75   1.460 |   2.50  67.160 |   4.25   5.840 |   6.00   1.460
00081>               1.00   1.460 |   2.75  67.160 |   4.50   2.920 |   6.25   1.460
00082>               1.25   1.460 |   3.00  18.980 |   4.75   2.920 |
00083>               1.50   8.760 |   3.25  18.980 |   5.00   1.460 |
00084>               1.75   8.760 |   3.50  10.220 |   5.25   1.460 |
00085>
00086> --------------------------------------------------------------------------------
00087> 001:0003--------------------------------------------------------------------------
00088> *# Node 1: Flow from Basin 1
00089> ---------------------
00090> | CALIB NASHYD       |   Area    (ha)=    1.93   Curve Number   (CN)=75.00
00091> | 01:A1     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00092> ---------------------   U.H. Tp(hrs)=    .220
00093>
00094>     Unit Hyd Qpeak  (cms)=     .335
00095>
00096>     PEAK FLOW       (cms)=     .135 (i)
00097>     TIME TO PEAK    (hrs)=    2.850
00098>     RUNOFF VOLUME    (mm)=   26.878
00099>     TOTAL RAINFALL   (mm)=   73.000
00100>     RUNOFF COEFFICIENT   =     .368
00101>
00102>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00103>
00104> --------------------------------------------------------------------------------
00105> 001:0004--------------------------------------------------------------------------
00106> *# Node 2: Flow from Basin 2
00107> ---------------------
00108> | CALIB NASHYD       |   Area    (ha)=    1.69   Curve Number   (CN)=78.00
00109> | 02:A2     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00110> ---------------------   U.H. Tp(hrs)=    .200
00111>
00112>     Unit Hyd Qpeak  (cms)=     .323
00113>
00114>     PEAK FLOW       (cms)=     .136 (i)
00115>     TIME TO PEAK    (hrs)=    2.833
00116>     RUNOFF VOLUME    (mm)=   29.478
00117>     TOTAL RAINFALL   (mm)=   73.000
00118>     RUNOFF COEFFICIENT   =     .404
00119>
00120>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00121>
00122> --------------------------------------------------------------------------------
00123> 001:0005--------------------------------------------------------------------------
00124> *# Node 3: Flow from Basin 3
00125> ---------------------
00126> | CALIB STANDHYD     |   Area    (ha)=     .05
00127> | 03: A3    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=     .10
00128> ---------------------
00129>                              IMPERVIOUS    PERVIOUS (i)
00130>     Surface Area     (ha)=        .03          .03
00131>     Dep. Storage     (mm)=        .70        10.00
00132>     Average Slope     (%)=       5.00         4.00
00133>     Length            (m)=      90.00        15.00
00134>     Mannings n             =       .013         .250
00135>
00136>     Max.eff.Inten.(mm/hr)=      67.16       101.88
00137>                 over (min)       2.00         5.00
00138>     Storage Coeff.  (min)=       1.74 (ii)    4.89 (ii)
00139>     Unit Hyd. Tpeak (min)=       2.00         5.00
00140>     Unit Hyd. peak  (cms)=        .62          .23
00141>                                                          *TOTALS*
00142>     PEAK FLOW       (cms)=        .00          .01          .007 (iii)
00143>     TIME TO PEAK    (hrs)=       2.75         2.75         2.750
00144>     RUNOFF VOLUME    (mm)=      72.30        41.89        41.919
00145>     TOTAL RAINFALL   (mm)=      73.00        73.00        73.000
00146>     RUNOFF COEFFICIENT   =        .99          .57          .574
00147>
00148>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00149>           CN* =  75.0    Ia = Dep. Storage  (Above)
00150>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00151>           THAN THE STORAGE COEFFICIENT.
00152>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00153>
00154> --------------------------------------------------------------------------------
00155> 001:0006--------------------------------------------------------------------------
00156> *# Node 4: Flow from Basin 4 + 5
00157> ---------------------
00158> | CALIB NASHYD       |   Area    (ha)=    2.51   Curve Number   (CN)=70.00
00159> | 04:A4     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00160> ---------------------   U.H. Tp(hrs)=    .170
00161>
00162>     Unit Hyd Qpeak  (cms)=     .564
00163>
00164>     PEAK FLOW       (cms)=     .165 (i)
00165>     TIME TO PEAK    (hrs)=    2.817
00166>     RUNOFF VOLUME    (mm)=   23.095
00167>     TOTAL RAINFALL   (mm)=   73.000
00168>     RUNOFF COEFFICIENT   =     .316
00169>
00170>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00171>
00172> --------------------------------------------------------------------------------
00173> 001:0007--------------------------------------------------------------------------
00174> ---------------------
00175> | CALIB NASHYD       |   Area    (ha)=    1.69   Curve Number   (CN)=68.00
00176> | 05:A5     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00177> ---------------------   U.H. Tp(hrs)=    .140
00178>
00179>     Unit Hyd Qpeak  (cms)=     .461
00180>
00181>     PEAK FLOW       (cms)=     .111 (i)
00182>     TIME TO PEAK    (hrs)=    2.783
00183>     RUNOFF VOLUME    (mm)=   21.744
00184>     TOTAL RAINFALL   (mm)=   73.000
00185>     RUNOFF COEFFICIENT   =     .298
00186>
00187>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00188>
00189> --------------------------------------------------------------------------------
00190> 001:0008--------------------------------------------------------------------------
00191> ------------------------
00192> | ADD HYD (N4         ) | ID: NHYD        AREA     QPEAK   TPEAK   R.V.    DWF
00193> ------------------------                  (ha)     (cms)   (hrs)   (mm)    (cms)
00194>                         ID1 04:A4          2.51     .165    2.82  23.09    .000
00195>                       +ID2 05:A5           1.69     .111    2.78  21.74    .000
00196>                         ========================================================
00197>                         SUM 06:N4          4.20     .276    2.80  22.55    .000
00198>
00199>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00200>
00201> --------------------------------------------------------------------------------
00202> 001:0009--------------------------------------------------------------------------
00203> *# Node 5: Flow from Basin 6
00204> ---------------------
00205> | CALIB NASHYD       |   Area    (ha)=    1.21   Curve Number   (CN)=76.00
00206> | 07:A6     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00207> ---------------------   U.H. Tp(hrs)=    .200
00208>
00209>     Unit Hyd Qpeak  (cms)=     .231
00210>
00211>     PEAK FLOW       (cms)=     .091 (i)
00212>     TIME TO PEAK    (hrs)=    2.833
00213>     RUNOFF VOLUME    (mm)=   27.714
00214>     TOTAL RAINFALL   (mm)=   73.000
00215>     RUNOFF COEFFICIENT   =     .380
00216>
00217>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00218>
00219> --------------------------------------------------------------------------------
00220> 001:0010--------------------------------------------------------------------------
00221> *# Node 6: Flow from Basin 7
00222> ---------------------
00223> | CALIB NASHYD       |   Area    (ha)=    1.48   Curve Number   (CN)=81.00
00224> | 08:A7     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00225> ---------------------   U.H. Tp(hrs)=    .090
00226>
00227>     Unit Hyd Qpeak  (cms)=     .628
00228>
00229>     PEAK FLOW       (cms)=     .162 (i)
00230>     TIME TO PEAK    (hrs)=    2.767
00231>     RUNOFF VOLUME    (mm)=   32.379
00232>     TOTAL RAINFALL   (mm)=   73.000
00233>     RUNOFF COEFFICIENT   =     .444
00234>
00235>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00236>
00237> --------------------------------------------------------------------------------
00238> 001:0011--------------------------------------------------------------------------
00239> *# Node 7: Flow from Basin 8
00240> ---------------------
00241> | CALIB STANDHYD     |   Area    (ha)=    1.86
00242> | 09:A8     DT= 1.00 |   Total Imp(%)=   22.00   Dir. Conn.(%)=     .10
00243> ---------------------
00244>                              IMPERVIOUS    PERVIOUS (i)
00245>     Surface Area     (ha)=        .41          1.45
00246>     Dep. Storage     (mm)=        .70         10.00
00247>     Average Slope     (%)=       3.00          3.00
00248>     Length            (m)=     164.00         40.00
00249>     Mannings n             =       .013          .250
00250>
00251>     Max.eff.Inten.(mm/hr)=      67.16         51.12
00252>                 over (min)       3.00         11.00
00253>     Storage Coeff.  (min)=       2.90 (ii)   11.07 (ii)
00254>     Unit Hyd. Tpeak (min)=       3.00         11.00
00255>     Unit Hyd. peak  (cms)=        .38          .10
00256>                                                          *TOTALS*
00257>     PEAK FLOW       (cms)=        .00          .17          .165 (iii)
00258>     TIME TO PEAK    (hrs)=       2.75         2.82         2.817
00259>     RUNOFF VOLUME    (mm)=      72.30        32.37        32.409
00260>     TOTAL RAINFALL   (mm)=      73.00        73.00        73.000
00261>     RUNOFF COEFFICIENT   =        .99          .44          .444
00262>
00263>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00264>           CN* =  75.0    Ia = Dep. Storage  (Above)
00265>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00266>           THAN THE STORAGE COEFFICIENT.
00267>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00268>
00269> --------------------------------------------------------------------------------
00270> 001:0012--------------------------------------------------------------------------
```

```
00271> ---------------------
00272> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00273> |  IN>09:(A8    )   |
00274> | OUT<01:(SWM-ou)   |    =========  OUTLFOW STORAGE TABLE  =========
00275> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00276>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
00277>                             .000  .0000E+00   |     .003  .4400E-01
00278>                             .001  .3000E-02   |     .003  .5400E-01
00279>                             .001  .1100E-01   |     .003  .6400E-01
00280>                             .002  .1800E-01   |     .003  .6600E-01
00281>                             .002  .2600E-01   |     .006  .6800E-01
00282>                             .002  .3500E-01   |     .099  .7500E-01
00283>
00284>     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00285>     --------------------       (ha)     (cms)     (hrs)       (mm)
00286>     INFLOW >09: (A8    )       1.86      .165     2.817     32.409
00287>     OUTFLOW<01: (SWM-ou)       1.86      .003     6.483     32.408
00288>    OVERFLOW<02: (SWM-OV)        .00      .000      .000       .000
00289>
00290>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00291>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00292>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00293>
00294>
00295>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.722
00296>                    TIME SHIFT OF PEAK FLOW         (min)=   220.00
00297>                    MAXIMUM  STORAGE   USED       (ha.m.)=.5637E-01
00298>
00299> --------------------------------------------------------------------------------
00300> 001:0013-------------------------------------------------------------------------
00301> *# Node 8: Flow from Basin 9
00302> ---------------------
00303> | CALIB NASHYD      |   Area    (ha)=     .17   Curve Number   (CN)=79.00
00304> | 05:A9     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00305> ---------------------   U.H. Tp(hrs)=    .090
00306>
00307>     Unit Hyd Qpeak  (cms)=     .072
00308>
00309>     PEAK FLOW       (cms)=     .017 (i)
00310>     TIME TO PEAK    (hrs)=    2.767
00311>     RUNOFF VOLUME    (mm)=   30.408
00312>     TOTAL RAINFALL   (mm)=   73.000
00313>     RUNOFF COEFFICIENT   =     .417
00314>
00315>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00316>
00317> --------------------------------------------------------------------------------
00318> 001:0014-------------------------------------------------------------------------
00319>       FINISH
00320> --------------------------------------------------------------------------------
00321> ********************************************************************************
00322>     WARNINGS / ERRORS / NOTES
00323>     -------------------------
00324>    Simulation ended on 2020-04-17     at 12:32:52
00325> ================================================================================
00326>
00327>
```

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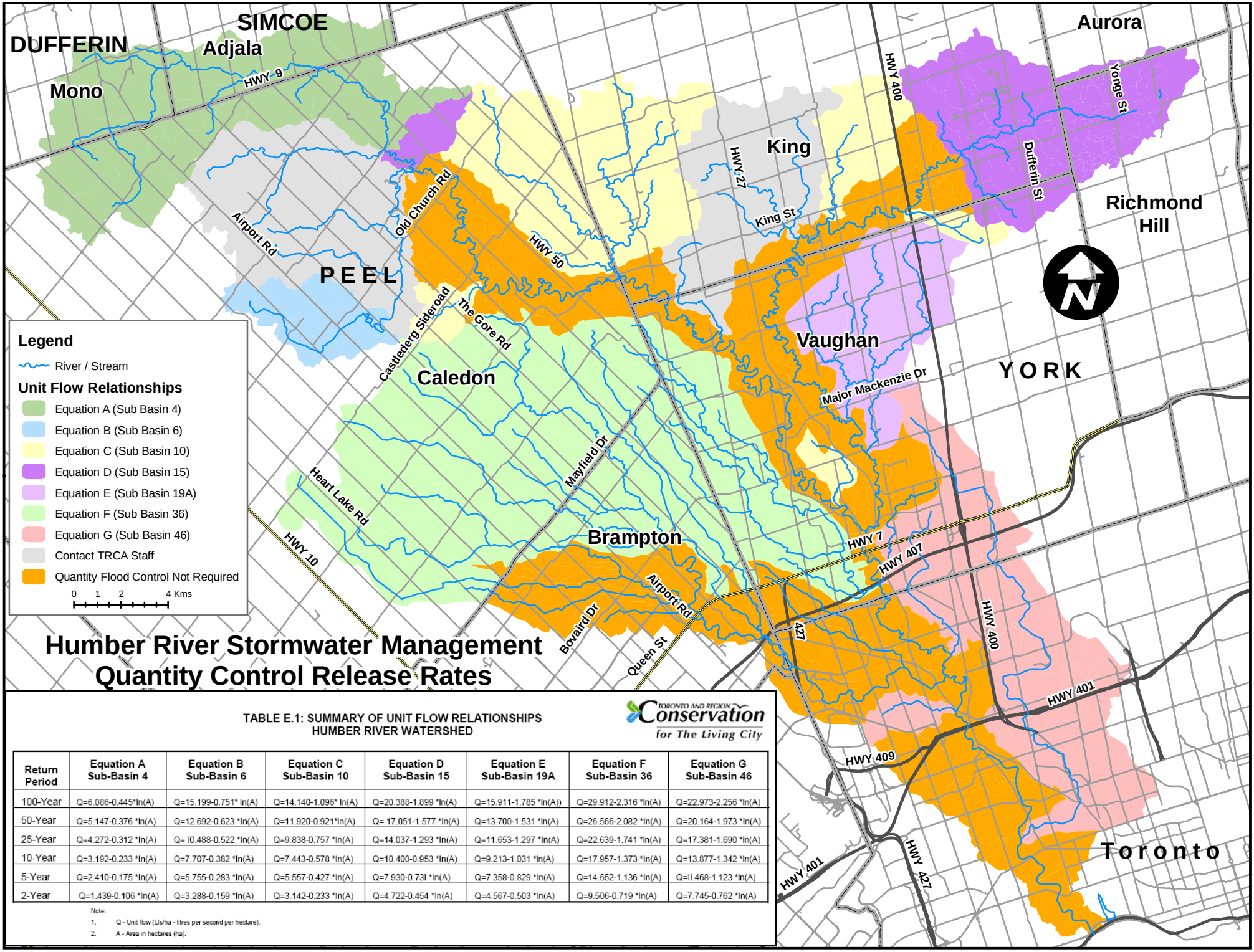
00001> ================================================================================
00002>
00003>    SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>    S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>    SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>        S  W W W  M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>    SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
00008>                                                          9   9  9   9   # 3375279
00009>          StormWater Management HYdrologic Model           999    999    =========
00010>
00011>  ********************************************************************************
00012>  ***************************** SWMHYMO Ver/4.05  ********************************
00013>  *********  A single event and continuous hydrologic simulation model  *********
00014>  *********     based on the principles of HYMO and its successors      *********
00015>  *********                    OTTHYMO-83 and OTTHYMO-89.                *********
00016>  ********************************************************************************
00017>  ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018>  *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019>  *********                  Gatineau, Quebec: (819) 243-6858           *********
00020>  *********                  E-Mail: swmhymo@jfsa.Com                   *********
00021>  ********************************************************************************
00022>
00023>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++++ Licensed user: Calder Engineering Ltd.                       +++++++++
00025>  +++++++++                Bolton               SERIAL#:3375279        +++++++++
00026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *********          ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030>  *********          Maximum value for ID numbers  :     10            *********
00031>  *********          Max. number of rainfall points: 105408            *********
00032>  *********          Max. number of flow points    : 105408            *********
00033>  ********************************************************************************
00034>
00035>
00036>  *********************   D E T A I L E D   O U T P U T   **********************
00037>  ********************************************************************************
00038>  *         DATE: 2020-04-17     TIME: 12:28:17     RUN COUNTER: 000342         *
00039>  ********************************************************************************
00040>  * Input   filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.dat     *
00041>  * Output  filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.out     *
00042>  * Summary filename: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\2020\L-P.sum     *
00043>  * User comments:                                                             *
00044>  * 1:_____________________________________________________________________    *
00045>  * 2:_____________________________________________________________________    *
00046>  * 3:_____________________________________________________________________    *
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001----------------------------------------------------------------------
00051> *#*******************************************************************************
00052> *#  Project Name: [Laurel Park]    Project Number: [ 16-168 ]
00053> *#  Date        : [2020-04-17]
00054> *#  Modeller    : [    MYS, KC    ]
00055> *#  Company     : Calder Engineering Ltd.
00056> *#  License #   :  3375279
00057> *#*******************************************************************************
00058> *# Proposed Conditions: bottom at 278.75, pipe invert at 278.75
00059> *  overflow at 279.52 and top of berm at 279.62
00060> *  updated with revised drainage areas and pond design February 2020
00061> *  Filename: L-P.dat
00062> *#*******************************************************************************
00063> --------------------
00064> | START            |  Project  dir.: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\20
00065> --------------------  Rainfall dir.: C:\USERS\CALDER\DOCUME~1\SWMMHY~1\16-168\20
00066>     TZERO =   .00 hrs on       0
00067>     METOUT=   2 (output = METRIC)
00068>     NRUN  = 001
00069>     NSTORM=   0
00070> --------------------------------------------------------------------------------
00071> 001:0002----------------------------------------------------------------------
00072> --------------------
00073> | READ STORM       |    Filename: 100yr/6hr
00074> | Ptotal=  80.31 mm|    Comments: 100yr/6hr
00075> --------------------
00076>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00077>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00078>                .25    .000 |   2.00  27.300 |   3.75  11.240 |   5.50   1.610
00079>                .50   1.610 |   2.25  27.300 |   4.00   6.420 |   5.75   1.610
00080>                .75   1.610 |   2.50  73.880 |   4.25   6.420 |   6.00   1.610
00081>               1.00   1.610 |   2.75  73.880 |   4.50   3.210 |   6.25   1.610
00082>               1.25   1.610 |   3.00  20.880 |   4.75   3.210 |
00083>               1.50   9.640 |   3.25  20.880 |   5.00   1.610 |
00084>               1.75   9.640 |   3.50  11.240 |   5.25   1.610 |
00085>
00086> --------------------------------------------------------------------------------
00087> 001:0003----------------------------------------------------------------------
00088> *# Node 1: Flow from Basin 1
00089> ----------------------
00090> | CALIB NASHYD       |   Area    (ha)=    1.93   Curve Number   (CN)=75.00
00091> | 01:A1     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00092> ----------------------   U.H. Tp(hrs)=    .220
00093>
00094>     Unit Hyd Qpeak  (cms)=     .335
00095>
00096>     PEAK FLOW       (cms)=     .161 (i)
00097>     TIME TO PEAK    (hrs)=    2.850
00098>     RUNOFF VOLUME    (mm)=   31.898
00099>     TOTAL RAINFALL   (mm)=   80.310
00100>     RUNOFF COEFFICIENT   =     .397
00101>
00102>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00103>
00104> --------------------------------------------------------------------------------
00105> 001:0004----------------------------------------------------------------------
00106> *# Node 2: Flow from Basin 2
00107> ----------------------
00108> | CALIB NASHYD       |   Area    (ha)=    1.69   Curve Number   (CN)=78.00
00109> | 02:A2     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00110> ----------------------   U.H. Tp(hrs)=    .200
00111>
00112>     Unit Hyd Qpeak  (cms)=     .323
00113>
00114>     PEAK FLOW       (cms)=     .161 (i)
00115>     TIME TO PEAK    (hrs)=    2.833
00116>     RUNOFF VOLUME    (mm)=   34.825
00117>     TOTAL RAINFALL   (mm)=   80.310
00118>     RUNOFF COEFFICIENT   =     .434
00119>
00120>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00121>
00122> --------------------------------------------------------------------------------
00123> 001:0005----------------------------------------------------------------------
00124> *# Node 3: Flow from Basin 3
00125> ----------------------
00126> | CALIB STANDHYD     |   Area    (ha)=    .05
00127> | 03: A3    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=     .10
00128> ----------------------
00129>                              IMPERVIOUS    PERVIOUS (i)
00130>     Surface Area     (ha)=        .03         .03
00131>     Dep. Storage     (mm)=        .70        10.00
00132>     Average Slope     (%)=       5.00         4.00
00133>     Length            (m)=      90.00        15.00
00134>     Mannings n            =       .013         .250
00135>
00136>     Max.eff.Inten.(mm/hr)=      73.88       115.79
00137>                over (min)        2.00         5.00
00138>     Storage Coeff.  (min)=       1.67 (ii)    4.67 (ii)
00139>     Unit Hyd. Tpeak (min)=       2.00         5.00
00140>     Unit Hyd. peak  (cms)=        .63          .24
00141>                                                          *TOTALS*
00142>     PEAK FLOW       (cms)=        .00          .01          .008 (iii)
00143>     TIME TO PEAK    (hrs)=       2.70         2.75         2.750
00144>     RUNOFF VOLUME    (mm)=      79.61        48.19        48.220
00145>     TOTAL RAINFALL   (mm)=      80.31        80.31        80.310
00146>     RUNOFF COEFFICIENT   =        .99          .60          .600
00147>
00148>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00149>           CN* =  75.0    Ia = Dep. Storage  (Above)
00150>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00151>           THAN THE STORAGE COEFFICIENT.
00152>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00153>
00154> --------------------------------------------------------------------------------
00155> 001:0006----------------------------------------------------------------------
00156> *# Node 4: Flow from Basin 4 + 5
00157> ----------------------
00158> | CALIB NASHYD       |   Area    (ha)=    2.51   Curve Number   (CN)=70.00
00159> | 04:A4     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00160> ----------------------   U.H. Tp(hrs)=    .170
00161>
00162>     Unit Hyd Qpeak  (cms)=     .564
00163>
00164>     PEAK FLOW       (cms)=     .198 (i)
00165>     TIME TO PEAK    (hrs)=    2.817
00166>     RUNOFF VOLUME    (mm)=   27.591
00167>     TOTAL RAINFALL   (mm)=   80.310
00168>     RUNOFF COEFFICIENT   =     .344
00169>
00170>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00171>
00172> --------------------------------------------------------------------------------
00173> 001:0007----------------------------------------------------------------------
00174> ----------------------
00175> | CALIB NASHYD       |   Area    (ha)=    1.69   Curve Number   (CN)=68.00
00176> | 05:A5     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00177> ----------------------   U.H. Tp(hrs)=    .140
00178>
00179>     Unit Hyd Qpeak  (cms)=     .461
00180>
00181>     PEAK FLOW       (cms)=     .133 (i)
00182>     TIME TO PEAK    (hrs)=    2.783
00183>     RUNOFF VOLUME    (mm)=   26.040
00184>     TOTAL RAINFALL   (mm)=   80.310
00185>     RUNOFF COEFFICIENT   =     .324
00186>
00187>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00188>
00189> --------------------------------------------------------------------------------
00190> 001:0008----------------------------------------------------------------------
00191> ------------------------
00192> | ADD HYD (N4       ) | ID: NHYD        AREA     QPEAK   TPEAK   R.V.    DWF
00193> ------------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
00194>                        ID1 04:A4         2.51     .198    2.82  27.59     .000
00195>                      +ID2 05:A5          1.69     .133    2.78  26.04     .000
00196>                        ============================================================
00197>                        SUM 06:N4         4.20     .331    2.80  26.97     .000
00198>
00199>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00200>
00201> --------------------------------------------------------------------------------
00202> 001:0009----------------------------------------------------------------------
00203> *# Node 5: Flow from Basin 6
00204> ----------------------
00205> | CALIB NASHYD       |   Area    (ha)=    1.21   Curve Number   (CN)=76.00
00206> | 07:A6     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00207> ----------------------   U.H. Tp(hrs)=    .200
00208>
00209>     Unit Hyd Qpeak  (cms)=     .231
00210>
00211>     PEAK FLOW       (cms)=     .108 (i)
00212>     TIME TO PEAK    (hrs)=    2.833
00213>     RUNOFF VOLUME    (mm)=   32.842
00214>     TOTAL RAINFALL   (mm)=   80.310
00215>     RUNOFF COEFFICIENT   =     .409
00216>
00217>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00218>
00219> --------------------------------------------------------------------------------
00220> 001:0010----------------------------------------------------------------------
00221> *# Node 6: Flow from Basin 7
00222> ----------------------
00223> | CALIB NASHYD       |   Area    (ha)=    1.48   Curve Number   (CN)=81.00
00224> | 08:A7     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00225> ----------------------   U.H. Tp(hrs)=    .090
00226>
00227>     Unit Hyd Qpeak  (cms)=     .628
00228>
00229>     PEAK FLOW       (cms)=     .189 (i)
00230>     TIME TO PEAK    (hrs)=    2.767
00231>     RUNOFF VOLUME    (mm)=   38.059
00232>     TOTAL RAINFALL   (mm)=   80.310
00233>     RUNOFF COEFFICIENT   =     .474
00234>
00235>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00236>
00237> --------------------------------------------------------------------------------
00238> 001:0011----------------------------------------------------------------------
00239> *# Node 7: Flow from Basin 8
00240> ----------------------
00241> | CALIB STANDHYD     |   Area    (ha)=    1.86
00242> | 09:A8     DT= 1.00 |   Total Imp(%)=   22.00   Dir. Conn.(%)=     .10
00243> ----------------------
00244>                              IMPERVIOUS    PERVIOUS (i)
00245>     Surface Area     (ha)=        .41         1.45
00246>     Dep. Storage     (mm)=        .70        10.00
00247>     Average Slope     (%)=       3.00         3.00
00248>     Length            (m)=     164.00        40.00
00249>     Mannings n            =       .013         .250
00250>
00251>     Max.eff.Inten.(mm/hr)=      73.88        59.81
00252>                over (min)        3.00        10.00
00253>     Storage Coeff.  (min)=       2.79 (ii)   10.47 (ii)
00254>     Unit Hyd. Tpeak (min)=       3.00        10.00
00255>     Unit Hyd. peak  (cms)=        .39          .11
00256>                                                          *TOTALS*
00257>     PEAK FLOW       (cms)=        .00          .20          .198 (iii)
00258>     TIME TO PEAK    (hrs)=       2.72         2.80         2.800
00259>     RUNOFF VOLUME    (mm)=      79.61        37.92        37.966
00260>     TOTAL RAINFALL   (mm)=      80.31        80.31        80.310
00261>     RUNOFF COEFFICIENT   =        .99          .47          .473
00262>
00263>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00264>           CN* =  75.0    Ia = Dep. Storage  (Above)
00265>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00266>           THAN THE STORAGE COEFFICIENT.
00267>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00268>
00269> --------------------------------------------------------------------------------
00270> 001:0012----------------------------------------------------------------------
```

```
00271> ---------------------
00272> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00273> |  IN>09:(A8    )   |
00274> | OUT<01:(SWM-ou)   |    =========  OUTLFOW STORAGE TABLE  =========
00275> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00276>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
00277>                             .000  .0000E+00   |     .003  .4400E-01
00278>                             .001  .3000E-02   |     .003  .5400E-01
00279>                             .001  .1100E-01   |     .003  .6400E-01
00280>                             .002  .1800E-01   |     .003  .6600E-01
00281>                             .002  .2600E-01   |     .006  .6800E-01
00282>                             .002  .3500E-01   |     .099  .7500E-01
00283>
00284>     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
00285>     --------------------        (ha)     (cms)     (hrs)       (mm)
00286>     INFLOW >09: (A8    )       1.86      .198     2.800     37.966
00287>     OUTFLOW<01: (SWM-ou)       1.86      .004     6.433     37.965
00288>    OVERFLOW<02: (SWM-OV)        .00      .000      .000       .000
00289>
00290>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00291>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00292>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00293>
00294>
00295>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.827
00296>                    TIME SHIFT OF PEAK FLOW         (min)=   218.00
00297>                    MAXIMUM  STORAGE   USED       (ha.m.)=.6637E-01
00298>
00299> --------------------------------------------------------------------------------
00300> 001:0013-------------------------------------------------------------------------
00301> *# Node 8: Flow from Basin 9
00302> ---------------------
00303> | CALIB NASHYD      |   Area    (ha)=     .17   Curve Number   (CN)=79.00
00304> | 05:A9     DT= 1.00 |   Ia      (mm)=  10.000   # of Linear Res.(N)= 3.00
00305> ---------------------   U.H. Tp(hrs)=    .090
00306>
00307>     Unit Hyd Qpeak  (cms)=     .072
00308>
00309>     PEAK FLOW       (cms)=     .020 (i)
00310>     TIME TO PEAK    (hrs)=    2.767
00311>     RUNOFF VOLUME    (mm)=   35.866
00312>     TOTAL RAINFALL   (mm)=   80.310
00313>     RUNOFF COEFFICIENT   =     .447
00314>
00315>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00316>
00317> --------------------------------------------------------------------------------
00318> 001:0014-------------------------------------------------------------------------
00319>       FINISH
00320> --------------------------------------------------------------------------------
00321> ********************************************************************************
00322>     WARNINGS / ERRORS / NOTES
00323>     -------------------------
00324>    Simulation ended on 2020-04-17     at 12:28:17
00325> ================================================================================
00326>
00327>
```



Humber River Stormwater Management Quantity Control Release Rates

TABLE E.1: SUMMARY OF UNIT FLOW RELATIONSHIPS
HUMBER RIVER WATERSHED

Return Period	Equation A Sub-Basin 4	Equation B Sub-Basin 6	Equation C Sub-Basin 10	Equation D Sub-Basin 15	Equation E Sub-Basin 19A	Equation F Sub-Basin 36	Equation G Sub-Basin 46
100-Year	Q=6.086-0.445*ln(A)	Q=15.199-0.751* ln(A)	Q=14.140-1.096* ln(A)	Q=20.388-1.899 *ln(A)	Q=15.911-1.785 *ln(A))	Q=29.912-2.316 *ln(A)	Q=22.973-2.256 *ln(A)
50-Year	Q=5.147-0.376 *ln(A)	Q=12.692-0.623 *ln(A)	Q=11.920-0.921*ln(A)	Q= 17.051-1.577 *ln(A)	Q=13.700-1.531 *ln(A)	Q=26.566-2.082 *ln(A)	Q=20.164-1.973 *ln(A)
25-Year	Q=4.272-0.312 *ln(A)	Q= l0.488-0.522 *ln(A)	Q=9.838-0.757 *ln(A)	Q=14.037-1.293 *ln(A)	Q=11.653-1.297 *ln(A)	Q=22.639-1.741 *ln(A)	Q=17.381-1.690 *ln(A)
10-Year	Q=3.192-0.233 *ln(A)	Q=7.707-0.382 *ln(A)	Q=7.443-0.578 *ln(A)	Q=10.400-0.953 *ln(A)	Q=9.213-1.031 *ln(A)	Q=17.957-1.373 *ln(A)	Q=13.877-1.342 *ln(A)
5-Year	Q=2.410-0.175 *ln(A)	Q=5.755-0.283 *ln(A)	Q=5.557-0.427 *ln(A)	Q=7.930-0.73l *ln(A)	Q=7.358-0.829 *ln(A)	Q=14.652-1.136 *ln(A)	Q=ll.468-1.123 *ln(A)
2-Year	Q=1.439-0.106 *ln(A)	Q=3.288-0.159 *ln(A)	Q=3.142-0.233 *ln(A)	Q=4.722-0.454 *ln(A)	Q=4.567-0.503 *ln(A)	Q=9.506-0.719 *ln(A)	Q=7.745-0.762 *ln(A)

Note:
1. Q - Unit flow (Lls/ha - litres per second per hectare).
2. A - Area in hectares (ha).

TORONTO AND REGION Conservation for The Living City

APPENDIX D

LID CONCEPT DETAILS

BIORETENTION

CVC/TRCA LOW IMPACT DEVELOPMENT
PLANNING AND DESIGN GUIDE - FACT SHEET

GENERAL DESCRIPTION

As a stormwater filter and infiltration practice, bioretention temporarily stores, treats and infiltrates runoff. Depending on native soil infiltration rate and physical constraints, the system may be designed without an underdrain for full infiltration, with an underdrain for partial infiltration, or with an impermeable liner and underdrain for filtration only (i.e., a biofilter). The primary component of the practice is the filter bed which is a mixture of sand, fines and organic material. Other elements include a mulch ground cover and plants adapted to the conditions of a stormwater practice. Bioretention is designed to capture small storm events or the water quality storage requirement. An overflow or bypass is necessary to pass large storm event flows. Bioretention can be adapted to fit into many different development contexts and provide a convenient area for snow storage and treatment.













DESIGN GUIDANCE

SOIL CHARACTERISTICS

Bioretention can be constructed over any soil type, but hydrologic soil group A and B are best for achieving water balance goals. If possible, bioretention should be sited in the areas of the development with the highest native soil infiltration rates. Bioretention in soils with infiltration rates less than 15 mm/hr will require an underdrain. Designers should verify the native soil infiltration rate at the proposed location and depth through measurement of hydraulic conductivity under field saturated conditions.

GEOMETRY & SITE LAYOUT

Key geometry and site layout factors include:

- The minimum footprint of the filter bed area is based on the drainage area. Typical drainage areas to bioretention are between 100 m2 to 0.5 hectares. The maximum recommended drainage area is 0.8 hectares. Typical ratios of impervious drainage area to treatment facility area range from 5:1 to 15:1.
- Bioretention can be configured to fit into many locations and shapes. However, cells that are narrow may concentrate flow as it spreads throughout the cell and result in erosion.
- The filter bed surface should be level to encourage stormwater to spread out evenly over the surface.

PRE-TREATMENT

Pretreatment prevents premature clogging by capturing coarse sediment particles before they reach the filter bed. Where the runoff source area produces little sediment, such as roofs, bioretention can function effectively without pretreatment. To treat parking area or road runoff, a two-cell design that incorporates a forebay is recommended. Pretreatment practices that may be feasible, depending on the method of conveyance and the availability of space include:

- *Two-cell design (channel flow):* Forebay ponding volume should account for 25% of the water quality storage requirement and be designed with a 2:1 length to width ratio.
- *Vegetated filter strip (sheet flow):* Should be a minimum of three (3) metres in width. If smaller strips are used, more frequent maintenance of the filter bed can be anticipated.
- *Gravel diaphragm (sheet flow):* A small trench filled with pea gravel, which is perpendicular to the flow path between the edge of the pavement and the bioretention practice will promote settling out of sediment and maintain sheet flow into the facility. A drop of 50-150 mm into the gravel diaphragm can be used to dissipate energy and promote settling.
- *Rip rap and/or dense vegetation (channel flow):* Suitable for small bioretention cells with drainage areas less than 100 square metres.

GRAVEL STORAGE LAYER

- DEPTH: Should be a minimum of 300 mm deep and sized to provide the required storage volume. Granular material should be 50 mm diameter clear stone.
- PEA GRAVEL CHOKING LAYER: A 100 mm deep layer of pea gravel (3 to 10 mm diameter clear stone) should be placed on top of the coarse gravel storage layer as a choking layer separating it from the overlying filter media bed.

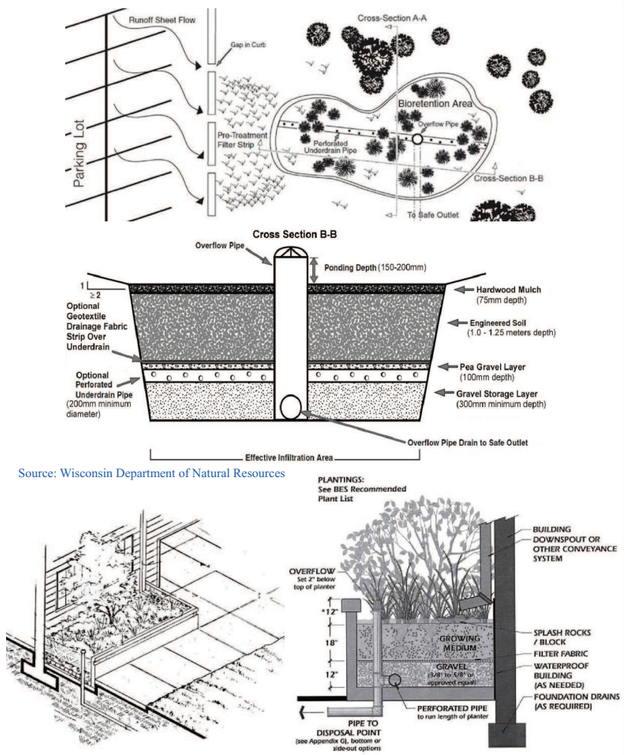
FILTER MEDIA

- COMPOSITION: To ensure a consistent and homogeneous bed, filter media should come pre-mixed from an approved vendor.
- DEPTH: Recommended depth is between 1.0 and 1.25 m. However in constrained applications, pollutant removal benefits may be achieved in beds as shallow as 500 mm. If trees are to be included in the design, bed depth must be at least 1.0 m.
- MULCH: A 75 mm layer of mulch on the surface of the filter bed enhances plant survival, suppresses weed growth and pretreats runoff before it reaches the filter bed.

CONVEYANCE AND OVERFLOW

Bioretention can be designed to be inline or offline from the drainage system. Inline bioretention accepts all flow from a drainage area and conveys larger event flows through an overflow outlet. Overflow structures must be sized to safely convey larger storm events out of the facility. The invert of the overflow should be placed at the maximum water surface elevation of the bioretention area, which is typically 150-250 mm above the filter bed surface.

Offline bioretention practices use flow splitters or bypass channels that only allow the required water quality storage volume to enter the facility. This may be achieved with a pipe, weir, or curb opening sized for the target flow, but in conjunction, create a bypass channel so that higher flows do not pass over the surface of the filter bed. Using a weir or curb opening minimizes clogging and reduces maintenance frequency.



Source: Wisconsin Department of Natural Resources

Source: City of Portland

ABILITY TO MEET SWM OBJECTIVES

BMP	Water Balance Benefit	Water Quality Improvement	Stream Channel Erosion Control Benefits
Bioretention with no underdrain	Yes	Yes - size for water quality storage requirement	Partial - based on available storage volume and infiltration rates
Bioretention with underdrain	Partial - based on available storage volume beneath the underdrain and soil infiltration rate	Yes - size for water quality storage requirement	Partial - based on available storage volume beneath the underdrain and soil infiltration rate
Bioretention with underdrain and impermeable liner	Partial - some volume reduction through evapotranspiration	Yes - size for water quality storage requirement	Partial - some volume reduction through evapotranspiration

UNDERDRAIN

- Only needed where native soil infiltration rate is less than 15 mm/hr (hydraulic conductivity of less than 1x10-6 cm/s).
- Should consist of a perforated pipe embedded in the coarse gravel storage layer at least 100 mm above the bottom.
- A strip of geotextile filter fabric placed between the filter media and pea gravel choking layer over the perforated pipe is optional to help prevent fine soil particles from entering the underdrain.
- A vertical standpipe connected to the underdrain can be used as a cleanout and monitoring well.

MONITORING WELLS

A capped vertical stand pipe consisting of an anchored 100 to 150 mm diameter perforated pipe with a lockable cap installed to the bottom of the facility is recommended for monitoring drainage time between storms.

GENERAL SPECIFICATIONS

Material	Specification	Quantity
Filter Media Composition	Filter Media Soil Mixture to contain: • 85 to 88% sand • 8 to 12% soil fines • 3 to 5% organic matter (leaf compost) Other Criteria: • Phosphorus soil test index (P-Index) value between 10 to 30 ppm • Cationic exchange capacity (CEC) greater than 10 meq/100 g • Free of stones, stumps, roots and other large debris • pH between 5.5 to 7.5 • Infiltration rate greater than 25 mm/hr	Recommended depth is between 1.0 and 1.25 metres.
Mulch Layer	Shredded hardwood bark mulch	A 75 mm layer on the surface of the filter bed
Geotextile	Material specifications should conform to Ontario Provincial Standard Specification (OPSS) 1860 for Class II geotextile fabrics. Should be woven monofilament or non-woven needle punched fabrics. Woven slit film and non-woven heat bonded fabrics should not be used as they are prone to clogging. For further guidance see CVC/TRCA LID SWM Planning and Design Guide, Table 4.5.5.	Strip over the perforated pipe underdrain (if present) between the filter media bed and gravel storage layer (stone reservoir)
Gravel	Washed 50 mm diameter clear stone should be used to surround the underdrain and for the gravel storage layer Washed 3 to 10 mm diameter clear stone should be used for pea gravel choking layer.	Volume based on dimensions, assuming a void space ratio of 0.4.
Underdrain	Perforated HDPE or equivalent, minimum 100 mm diameter, 200 mm recommended.	• Perforated pipe for length of cell. • Non-perforated pipe as needed to connect with storm drain system. • One or more caps. • T's for underdrain configuration

CONSTRUCTION CONSIDERATIONS

Ideally, bioretention sites should remain outside the limit of disturbance until construction of the bioretention begins to prevent soil compaction by heavy equipment. Locations should not be used as sediment basins during construction, as the concentration of fines will prevent post-construction infiltration. To prevent sediment from clogging the surface of a bioretention cell, stormwater should be diverted away from the bioretention until the drainage area is fully stabilized.

For further guidance regarding key steps during construction, see the CVC/TRCA LID SWM Planning and Design Guide, Section 4.5.2 - Construction Considerations)

OPERATION AND MAINTENANCE

Bioretention requires routine inspection and maintenance of the landscaping as well as periodic inspection for less frequent maintenance needs or remedial maintenance. Generally, routine maintenance will be the same as for any other landscaped area; weeding, pruning, and litter removal. Regular watering may be required during the first two years until vegetation is established.

For the first two years following construction the facility should be inspected at least quarterly and after every major storm event (> 25 mm). Subsequently, inspections should be conducted in the spring and fall of each year and after major storm events. Inspect for vegetation density (at least 80% coverage), damage by foot or vehicular traffic, channelization, accumulation of debris, trash and sediment, and structural damage to pretreatment devices.

Trash and debris should be removed from pretreatment devices, the bioretention area surface and inlet and outlets at least twice annually. Other maintenance activities include reapplying mulch, pruning, weeding replacing dead vegetation and repairing eroded areas as needed. Remove accumulated sediment on the bioretention area surface when dry and exceeding 25 mm depth.

SITE CONSIDERATIONS

Wellhead Protection

Facilities receiving road or parking lot runoff should not be located within two (2) year time-of-travel wellhead protection areas.

Available Space

Reserve open areas of about 10 to 20% of the size of the contributing drainage area.

Site Topography

Contributing slopes should be between 1 to 5%. The surface of the filter bed should be flat to allow flow to spread out. A stepped multi-cell design can also be used.

Available Head

If an underdrain is used, then 1 to 1.5 metres elevation difference is needed between the inflow point and the downstream storm drain invert.

Water Table

A minimum of one (1) metre separating the seasonally high water table or top of bedrock elevation and the bottom of the practice is necessary.

Soils

Bioretention can be located over any soil type, but hydrologic soil group A and B soils are best for achieving water balance benefits. Facilities should be located in portions of the site with the highest native soil infiltration rates. Where infiltration rates are less than 15 mm/hr (hydraulic conductivity less than 1x10-6 cm/s) an underdrain is required. Native soil infiltration rate at the proposed facility location and depth should be confirmed through measurement of hydraulic conductivity under field saturated conditions.

Drainage Area & Runoff Volume

Typical contributing drainage areas are between 100 m2 to 0.5 hectares. The maximum recommended contributing drainage area is 0.8 hectares. Typical ratios of impervious drainage area to treatment facility area range from 5:1 to 15:1.

Pollution Hot Spot Runoff

To protect groundwater from possible contamination, runoff from pollution hot spots should not be treated by bioretention facilities designed for full or partial infiltration. Facilities designed with an impermeable liner (filtration only facilities) can be used to treat runoff from pollution hot spots.

Proximity to Underground Utilities

Designers should consult local utility design guidance for the horizontal and vertical clearances required between storm drains, ditches, and surface water bodies.

Overhead Wires

Check whether the future tree canopy height in the bioretention area will interfere with existing overhead phone and power lines.

Setback from Buildings

If an impermeable liner is used, no setback is needed. If not, a four (4) metre setback from building foundations should be applied.

TORONTO AND REGION Conservation for The Living City

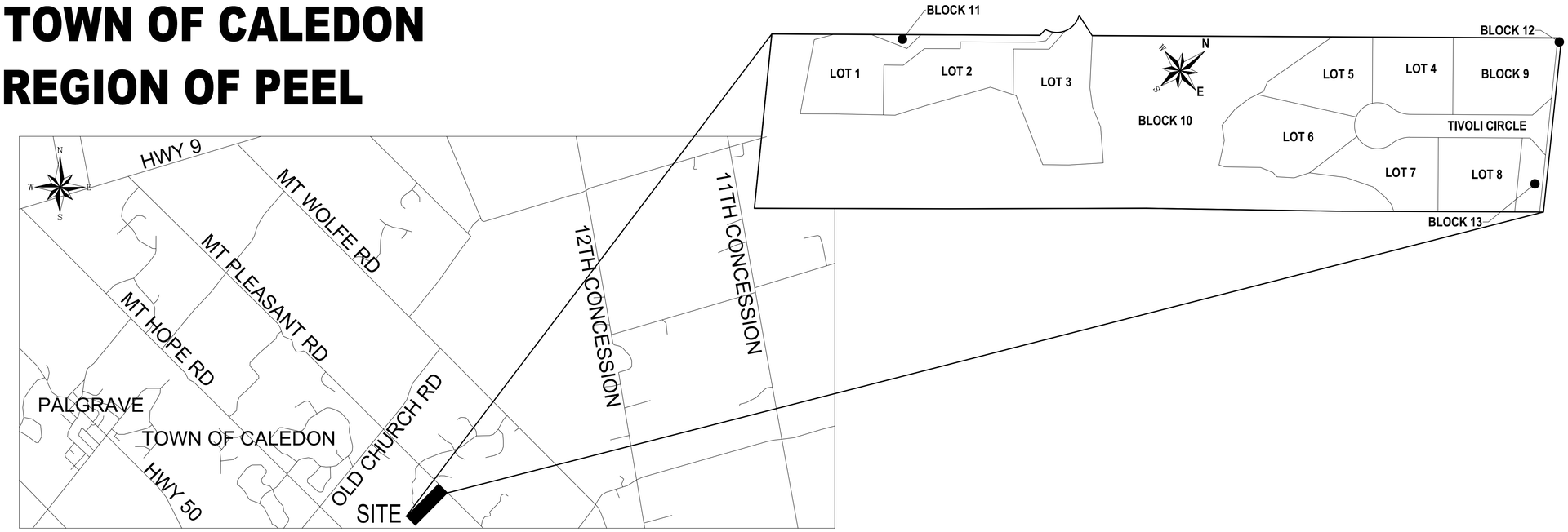
CVC CREDIT VALLEY CONSERVATION

FOR FURTHER DETAILS SEE SECTION 4.5 OF THE CVC/TRCA LID SWM GUIDE

APPENDIX E

PRELIMINARY ENGINEERING DRAWINGS AND CALCULATIONS

LAURELPARK SUBDIVISION - PRELIMINARY ENGINEERING DRAWINGS
DRAFT PLAN 21T-17006C
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON
REGION OF PEEL



LIST OF DRAWINGS

TITLE	DRAWING	SHEET
GENERAL PLAN	16-168-01	1
PLAN AND PROFILE - TIVOLI CIRCLE	16-168-02	2
PLAN AND PROFILE - LOTS 1 AND 2 SHARED DRIVEWAY	16-168-03	3
PRELIMINARY GRADING PLAN - SHEET 1 OF 2	16-168-04	4
PRELIMINARY GRADING PLAN - SHEET 2 OF 2	16-168-05	5
BIORETENTION FACILITY PLAN VIEW AND SECTIONS	16-168-06	6
LOTS 1 & 2 DRIVEWAY SECTIONS	16-168-07	7
LOTS 1 TO 3 DRIVEWAY PROFILES	16-168-08	8
PRELIMINARY EROSION AND SEDIMENT CONTROL PLAN - SHEET 1 OF 2	16-168-09	9
PRELIMNARY EROSION AND SEDIMENT CONTROL PLAN - SHEET 2 OF 2	16-168-10	10

THE CORPORATION
OF THE
TOWN OF CALEDON

LIST OF TOWN INFRASTRUCTURE

LENGTH OF ROAD	171m
LENGTH OF STORM SEWER	32.5m
NUMBER OF MANHOLES	2
NUMBER OF CATCH BASINS	2
NUMBER OF STREET LIGHTS	TBD
NUMBER OF OGS UNITS	1
NUMBER OF BIORETENTION FACILITIES	1

REGION OF PEEL

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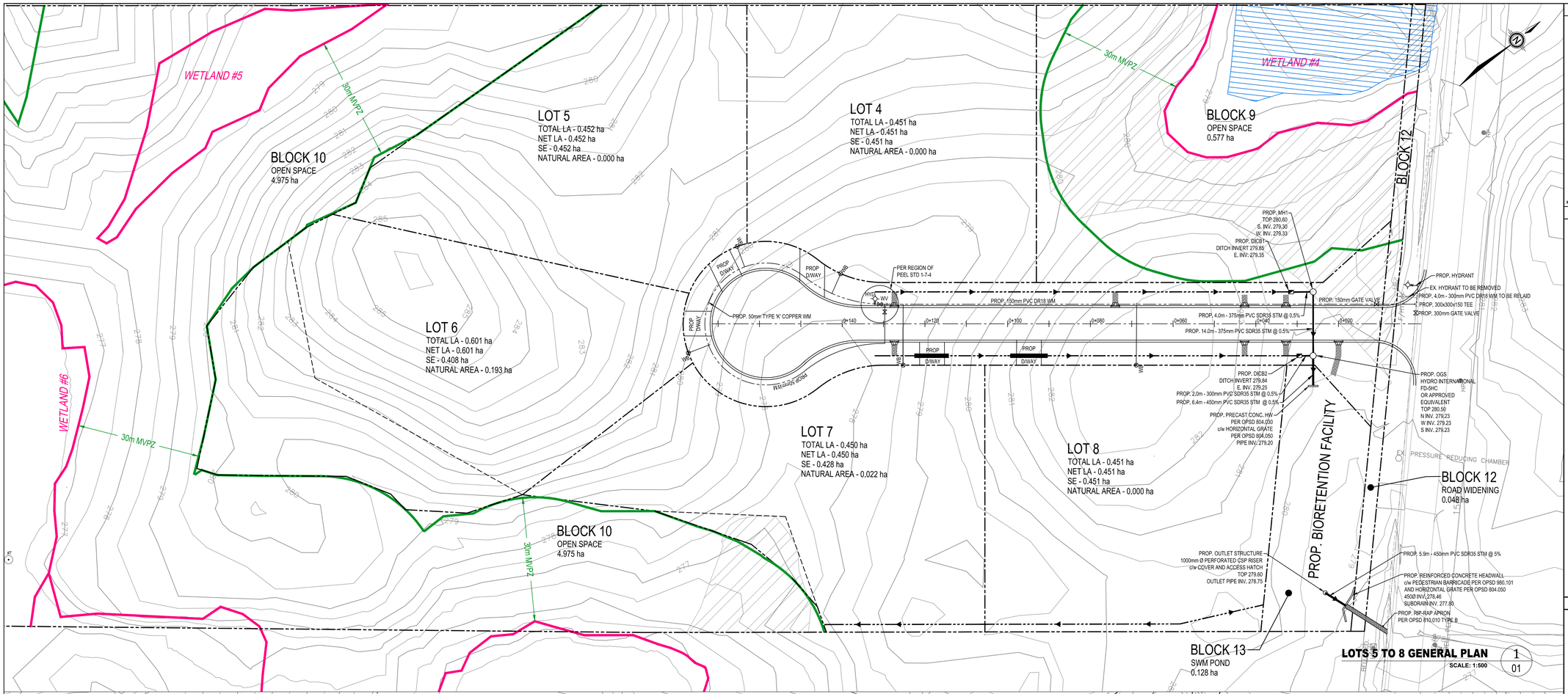
LAURELPARK INC.
2458 DUNDAS STREET WEST
UNIT 9
MISSISSAUGA, ON L5K 1R8

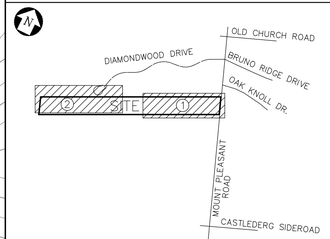
ISSUED FOR DRAFT PLAN APPROVAL
REVISION C, FEBRUARY 28, 2020



LOTS 5 TO 8 GENERAL PLAN — SCALE: 1:500 — 1/01

LOTS 1 TO 3 GENERAL PLAN — SCALE: 1:500 — 2/01

KEY PLAN



KEY PLAN — TOWN OF CALEDON — NTS

LEGEND

- KEY NATURAL HERITAGE FEATURE
- KEY NATURAL HERITAGE FEATURE 30m MINIMUM VEGETATION PROTECTION ZONE (MVPZ)
- ENVIRONMENTAL ZONE 2
- PROP. GRASSED SWALE
- LIMIT OF STRUCTURE ENVELOPE

10m 0 10m 20m
SCALE 1:500

GENERAL NOTES

1. THE INFORMATION SHOWN HEREIN IS PRELIMINARY AND SUBJECT TO DETAIL DESIGN.
2. CONTOURS GENERATED FROM ORTHOPHOTOGRAPHY DEVELOPED IN THE SPRING OF 2002, AND SURVEYED ELEVATIONS BY CALDER ENGINEERING LTD. (2017 & 2019) AND EPLETT WOROBEC RAIKES SURVEYING LTD. (2015). ACTUAL ELEVATIONS MAY VARY FROM THOSE SHOWN.
3. EZ2 ZONE LIMITS INFERRED FROM INFORMATION PROVIDED BY AZIMUTH ENVIRONMENTAL CONSULTANTS INC. DATED NOVEMBER 2016.

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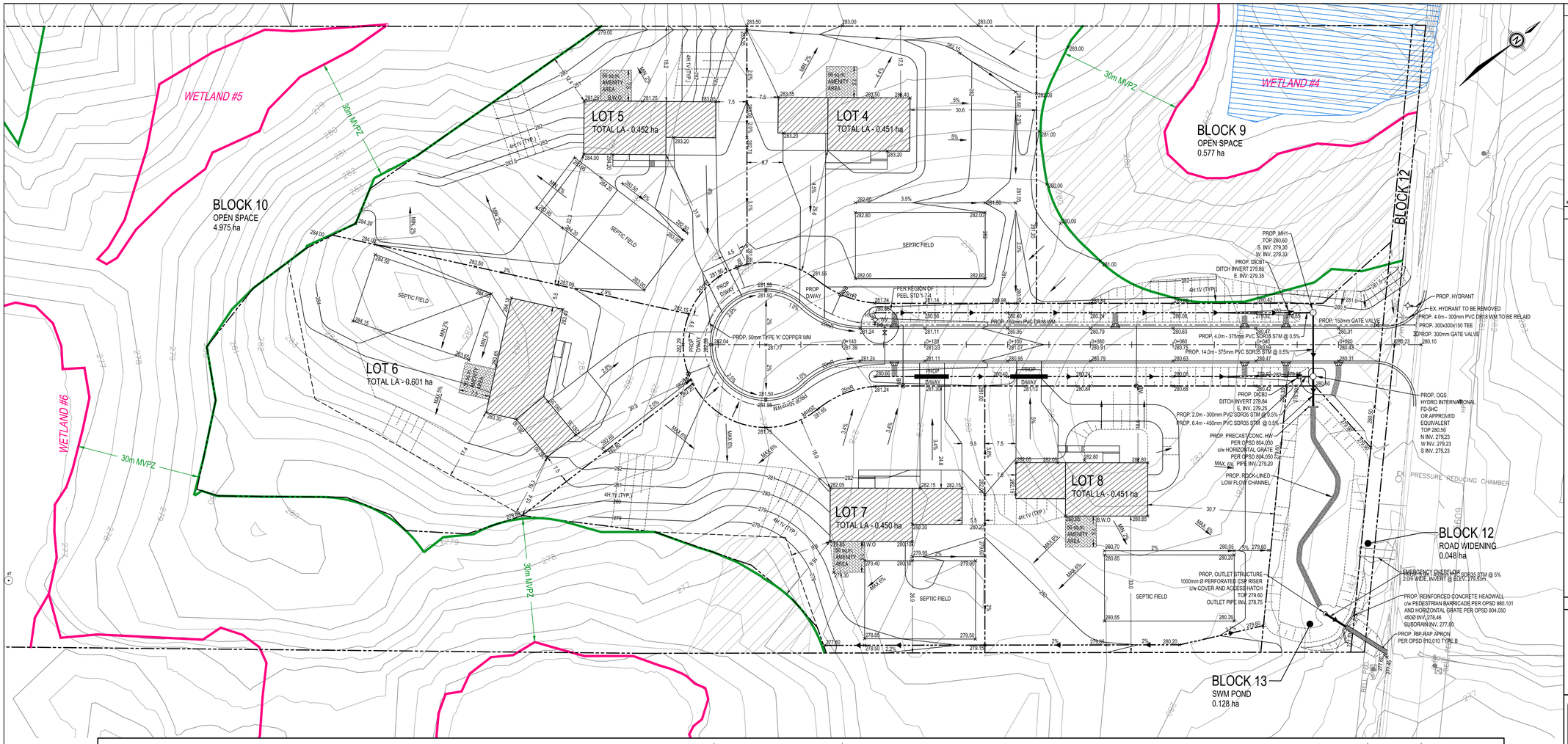
N°	Date	Revisions	Dwn.	Dsg'd.	Chk'd.
C	28/FEB/2020	THIRD SUBMISSION	KNC	KNC	RJW
B	03/MAY/2019	SECOND SUBMISSION	KNC	KNC	RJW
A	15/MAR/2017	FIRST SUBMISSION	KNC	DH	RJW

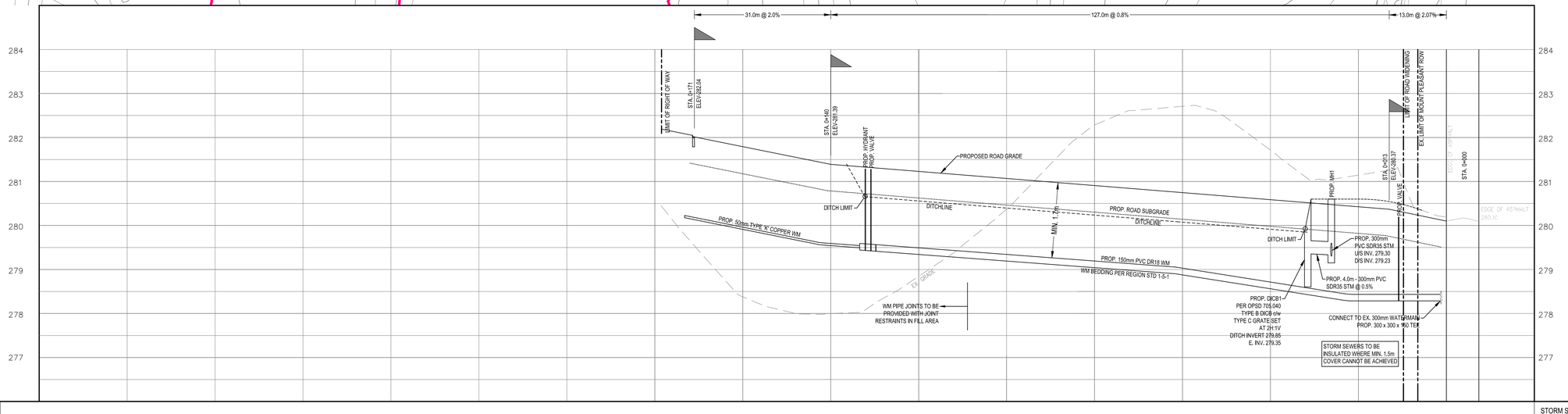
Client: **LAURELPARK INC.**

Project Name: **LAURELPARK SUBDIVISION**
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON, REGIONAL MUNICIPALITY OF PEEL

Title Name: **GENERAL PLAN**

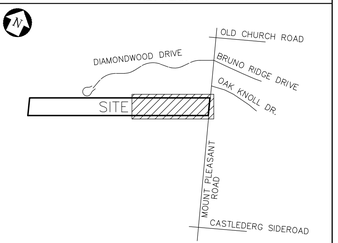
Drawing N°: **16-168-01**
Sheet N°: 1 OF 10
Scale: 1:500
Rev. N°: C





STORM SEWER INVERT											STORM SEWER INVERT
PROPOSED ROAD GRADE											PROPOSED ROAD GRADE
℄ CHAINAGE	0+180	0+160	0+140	0+120	0+100	0+080	0+060	0+040	0+020	0+000	℄ CHAINAGE
			281.39	281.23	281.07	280.91	280.75	280.59	280.43	280.10	

KEY PLAN



KEY PLAN — TOWN OF CALEDON — NTS

LEGEND

- 279.90 — PROP. ELEVATION
- KEY NATURAL HERITAGE FEATURE
- KEY NATURAL HERITAGE FEATURE 30m MINIMUM VEGETATION PROTECTION ZONE (MVPZ)
- ENVIRONMENTAL ZONE 2
- PROP. GRASSED SWALE
- LIMIT OF STRUCTURE ENVELOPE
- 7.5 / 2.5 — 56 sq.m. BACKYARD AMENITY AREA (CONCEPT PLAN)

10m 0 10m 20m
SCALE 1:500

GENERAL NOTES

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DESIGNED BY | APPROVED BY

N°	Date	Revisions	Dwn.	Dsg'd.	Chk'd.
C	28/FEB/2020	THIRD SUBMISSION	KNC	KNC	RJW
B	03/MAY/2019	SECOND SUBMISSION	KNC	KNC	RJW
A	15/MAR/2017	FIRST SUBMISSION	KNC	DH	RJW

Client:

LAURELPARK INC.

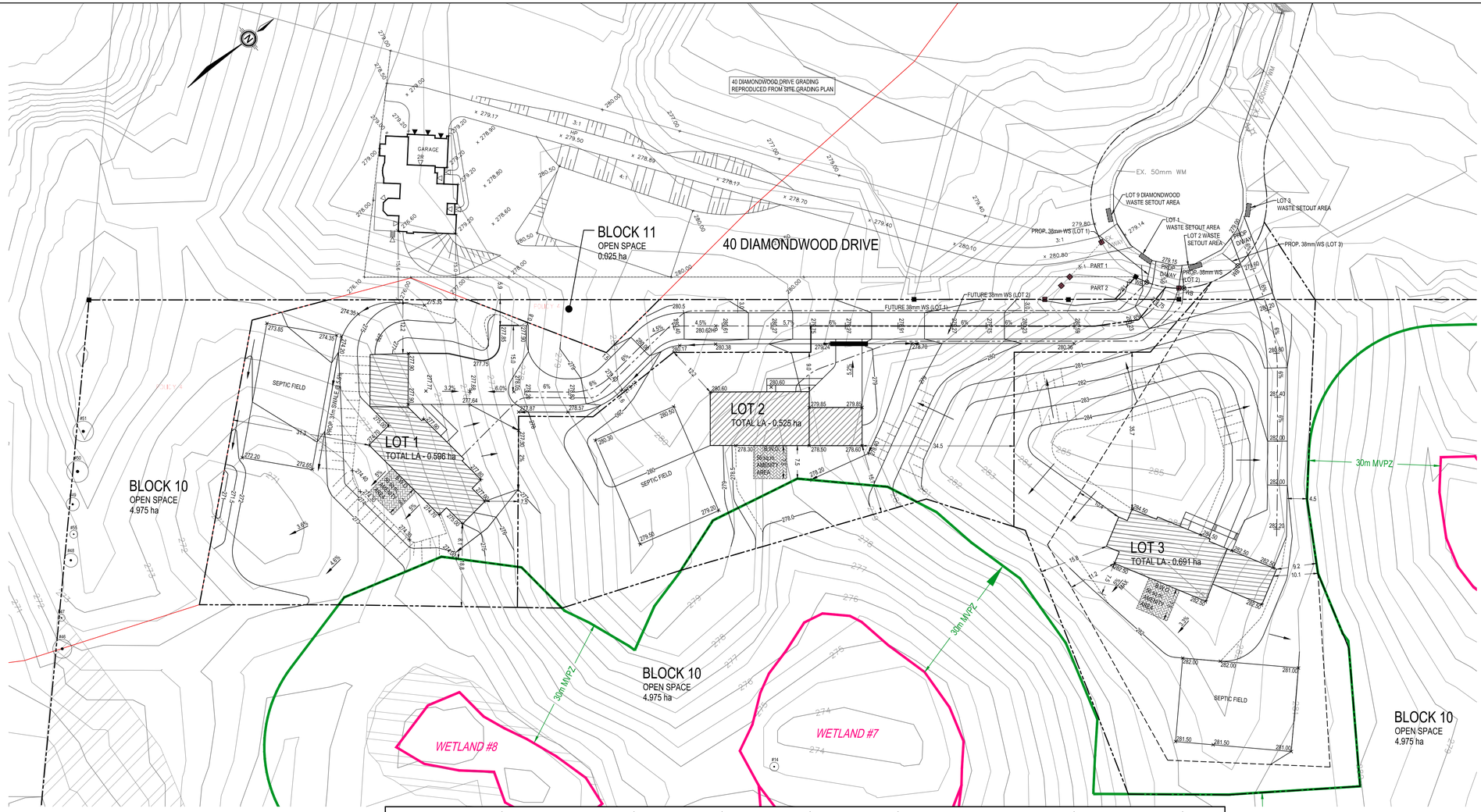
Project Name:

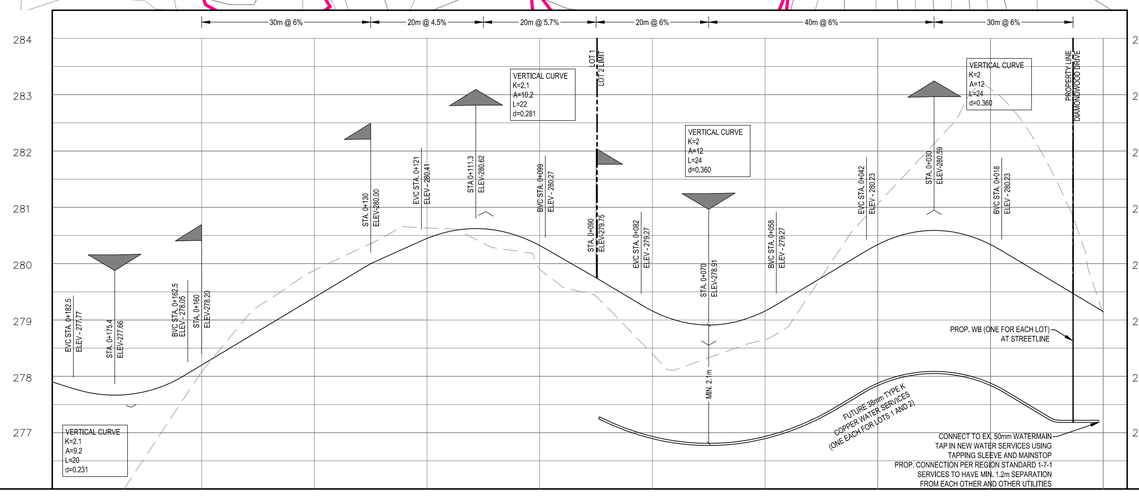
LAURELPARK SUBDIVISION
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON, REGIONAL MUNICIPALITY OF PEEL

Title Name:

PLAN AND PROFILE
TIVOLI CIRCLE

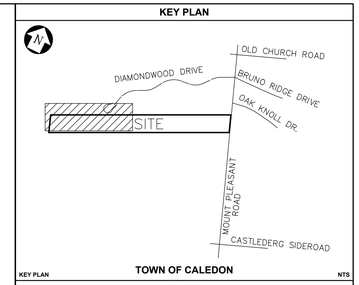
Drawing N°: **16-168-02**
Sheet N°: 2 OF 10
Scale: H 1:500 V 1:50
Rev. N°: C





STORM SEWER INVERT											STORM SEWER INVERT
PROPOSED ROAD GRADE		278.08	278.20	279.88	279.40	280.43	280.45	279.88	280.30	279.40	279.15
℄ CHAINAGE	0+180	0+160	0+140	0+120	0+100	0+080	0+060	0+040	0+020	0+000	℄ CHAINAGE

KEY PLAN



KEY PLAN — TOWN OF CALEDON — NTS

LEGEND

279.90	PROP. ELEVATION
	KEY NATURAL HERITAGE FEATURE
	KEY NATURAL HERITAGE FEATURE 30m MINIMUM VEGETATION PROTECTION ZONE (MVPZ)
	ENVIRONMENTAL ZONE 2
	PROP. GRASSED SWALE
	LIMIT OF STRUCTURE ENVELOPE
7.5 / 7.5	56 sq.m. BACKYARD AMENITY AREA (CONCEPT PLAN)

10m 0 10m 20m
SCALE 1:500

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DESIGNED BY — APPROVED BY

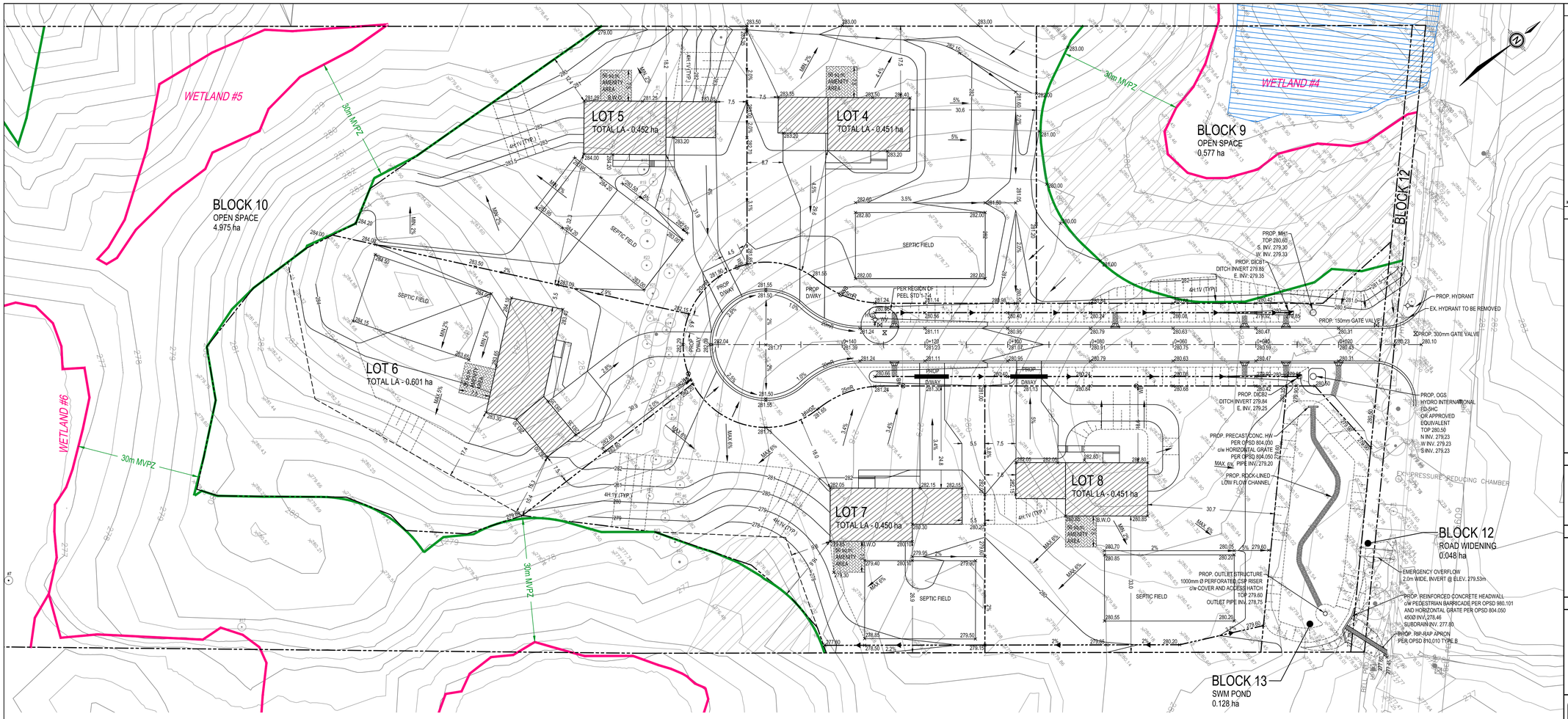
N°	Date	Revisions	Dwn.	Dsg'd.	Chk'd.
C	28/FEB/2020	THIRD SUBMISSION	KNC	KNC	RJW
B	03/MAY/2019	SECOND SUBMISSION	KNC	KNC	RJW
A	15/MAR/2017	FIRST SUBMISSION	KNC	DH	RJW

Client:
LAURELPARK INC.

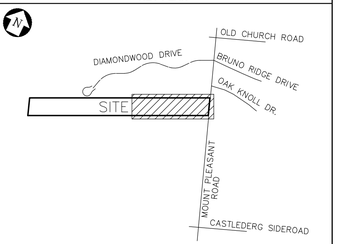
Project Name:
LAURELPARK SUBDIVISION
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON, REGIONAL MUNICIPALITY OF PEEL

Title Name:
PLAN AND PROFILE
LOTS 1 AND 2 SHARED DRIVEWAY

Drawing N°: 16-168-03
Sheet N°: 3 OF 10
Scale: H 1:500 V 1:50
Rev. N°: C



KEY PLAN



KEY PLAN — TOWN OF CALEDON — NTS

LEGEND

- EX. ELEVATION
- 279.90 PROP. ELEVATION
- KEY NATURAL HERITAGE FEATURE
- KEY NATURAL HERITAGE FEATURE 30m MINIMUM VEGETATION PROTECTION ZONE (MVPZ)
- ENVIRONMENTAL ZONE 2
- 7.5 / 7.5 — 56 sq.m. BACKYARD AMENITY AREA (CONCEPT PLAN)

10m 0 10m 20m
SCALE 1:500

LOT COVERAGE (sq.m.)

	LOT 4	LOT 5	LOT 6	LOT 7	LOT 8
BLDG	360	360	448	360	380
SEPTIC	500	501	501	507	501
D/WAY	311	299	301	253	193
AMENITY	56	56	56	56	56

LOT GRADING ASSUMPTIONS

	LOT 4	LOT 5	LOT 6	LOT 7	LOT 8
FFE	283.65	284.38	283.58	282.69	283.64
BFE	280.90	281.58	280.84	279.95	280.90
GFE	283.25 (2R)	283.25 (6R)	283.40 (1R)	282.20 (3R)	282.05 (8R)

ASSUMED 9' (2.74m) CEILINGS

GENERAL NOTES

1. THE INFORMATION SHOWN HEREIN IS PRELIMINARY AND SUBJECT TO DETAIL DESIGN.
2. CONTOURS GENERATED FROM ORTHOPHOTOGRAPHY DEVELOPED IN THE SPRING OF 2002, AND SURVEYED ELEVATIONS BY CALDER ENGINEERING LTD. (2017 & 2019) AND EPLETT WOROBEC RAIKES SURVEYING LTD. (2015). ACTUAL ELEVATIONS MAY VARY FROM THOSE SHOWN.
3. EZ2 ZONE LIMITS INFERRED FROM INFORMATION PROVIDED BY AZIMUTH ENVIRONMENTAL CONSULTANTS INC. DATED NOVEMBER 2016.

Calder Engineering Ltd.
T 905-857-7600 E calder@caldereng.com W www.caldereng.com

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Client:

LAURELPARK INC.

Project Name:

LAURELPARK SUBDIVISION
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON, REGIONAL MUNICIPALITY OF PEEL

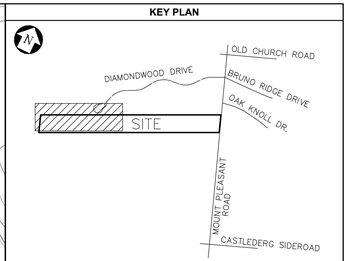
Title Name:

PRELIMINARY GRADING PLAN
SHEET 1 OF 2

Drawing N°: **16-168-04**
Sheet N°: 4 OF 10
Scale: 1:500
Rev. N°: C



KEY PLAN



KEY PLAN — TOWN OF CALEDON — NTS

LEGEND

- EX. ELEVATION
- PROP. ELEVATION
- KEY NATURAL HERITAGE FEATURE
- KEY NATURAL HERITAGE FEATURE 30m MINIMUM VEGETATION PROTECTION ZONE (MVPZ)
- ENVIRONMENTAL ZONE 2
- 56 sq.m. BACKYARD AMENITY AREA (CONCEPT PLAN)

SCALE 1:500

LOT COVERAGE (sq.m.)

	LOT 1	LOT 2	LOT 3
BLDG	448	379	428
SEPTIC	500	501	503
D/WAY	1014	402	378
AMENITY	56	56	56

LOT GRADING ASSUMPTIONS

	LOT 1	LOT 2	LOT 3
FFE	278.13	281.20	285.44
BFE	275.39	278.46	282.70
GFE	277.95 (1R)	279.90 (7R)	282.55 (1R)

ASSUMED 9' (2.74m) CEILINGS

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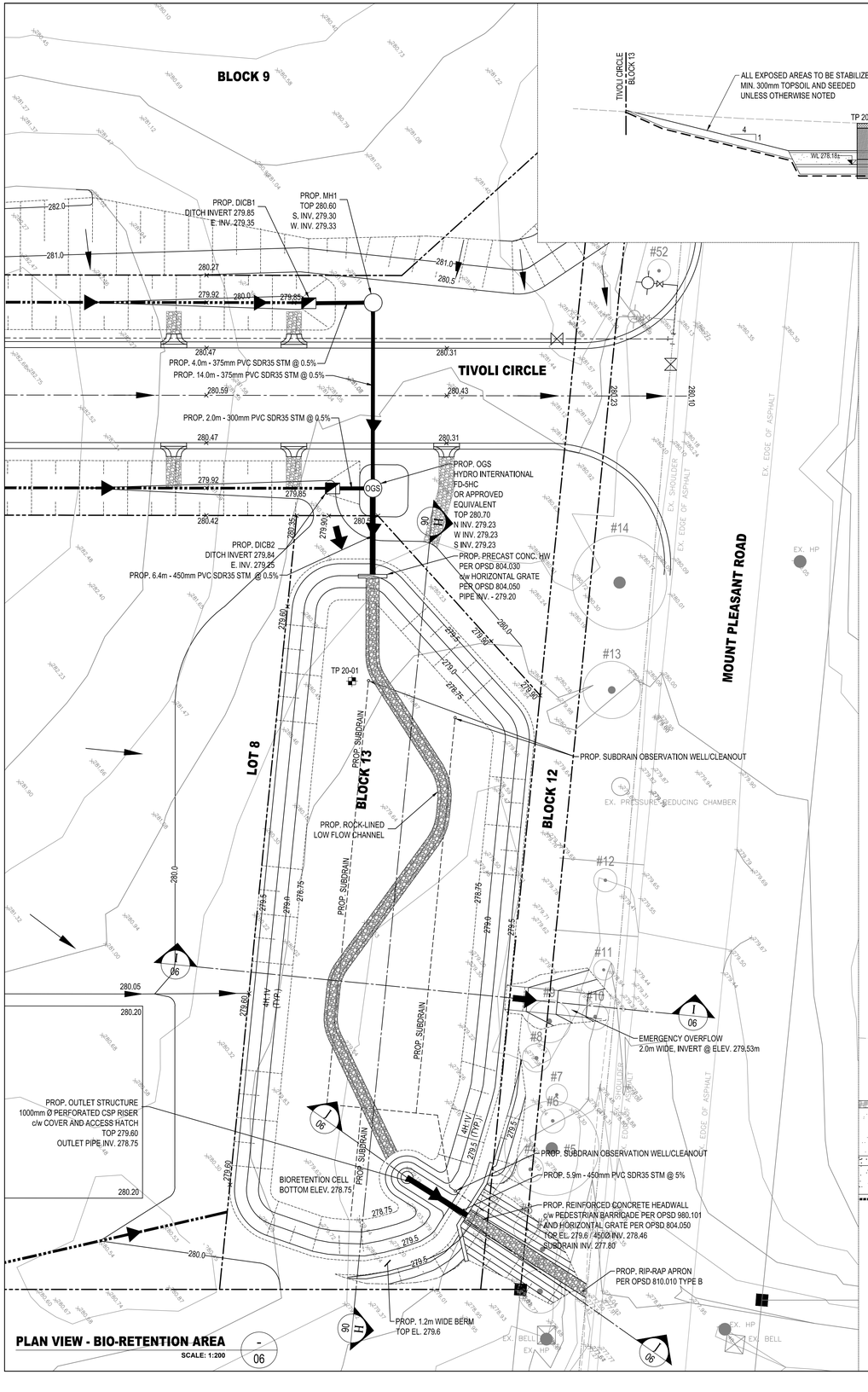
Client: **LAURELPARK INC.**

Project Name: **LAURELPARK SUBDIVISION**
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON, REGIONAL MUNICIPALITY OF PEEL

Title Name: **PRELIMINARY GRADING PLAN**
SHEET 2 OF 2

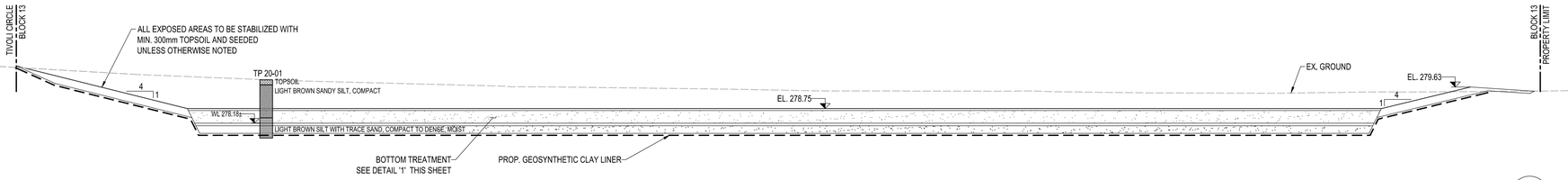
Drawing N°: **16-168-05**
Sheet N°: 5 OF 10
Scale: 1:500
Rev. N°: B



PLAN VIEW - BIO-RETENTION AREA

SCALE: 1:200

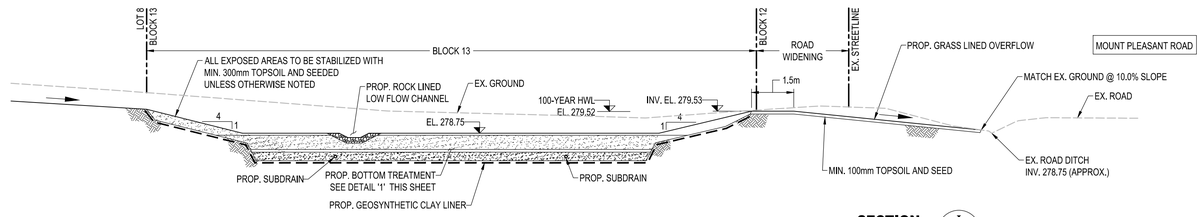
- / 06



SECTION H

SCALE: 1:100

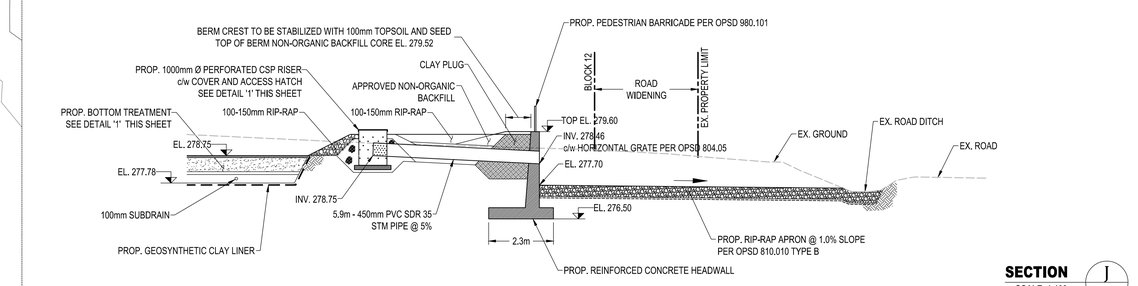
06



SECTION I

SCALE: 1:100

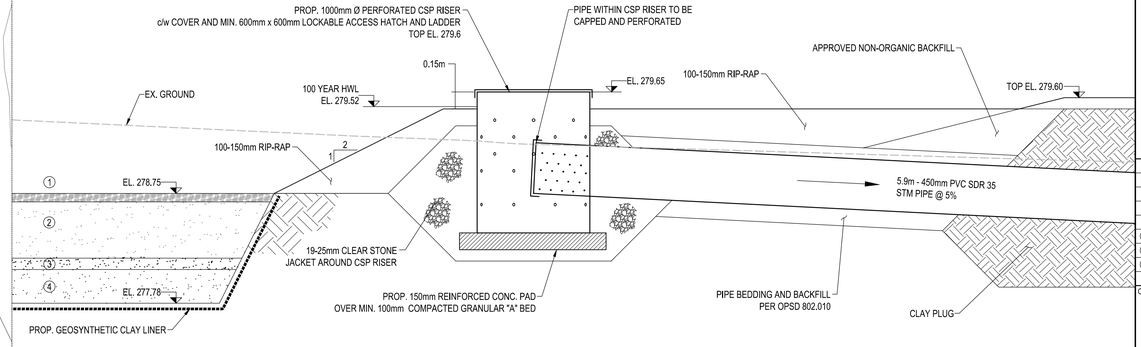
06



SECTION J

SCALE: 1:100

06



1. 75mm LAYER OF SHREDDED HARDWOOD MULCH
2. 500mm LAYER OF BIOFILTER FILTER MEDIA
3. 100mm LAYER OF PEA GRAVEL
4. 300mm LAYER OF WASHED 50mm CLEARSTONE
5. 100mm DIAMETER SUBDRAIN

BIOFILTER FILTER MEDIA NOTES:

1. SOIL MIXTURE TO CONTAIN (BY WEIGHT):
   - 85 TO 88% SAND
   - 8 TO 12% SOIL FINES
   - 3 TO 5% ORGANIC MATTER (LEAF COMPOST)
2. PHOSPHORUS SOIL TEST INDEX (P-INDEX) VALUE: 10-30 PPM
3. CATIONIC EXCHANGE CAPACITY: GREATER THAN 10 meq/100g
4. FILTER MEDIA TO BE FREE OF STONES, STUMPS, ROOTS AND OTHER LARGE DEBRIS
5. pH: 5.5 TO 7.5
6. INFILTRATION RATE: GREATER THAN 25mm/hr

DETAIL - OUTLET CONTROL STRUCTURE

SCALE: 1:25

1 / 06

GENERAL NOTES

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Client:

LAURELPARK INC.

Project Name:

LAURELPARK SUBDIVISION
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON, REGIONAL MUNICIPALITY OF PEEL

Title Name:

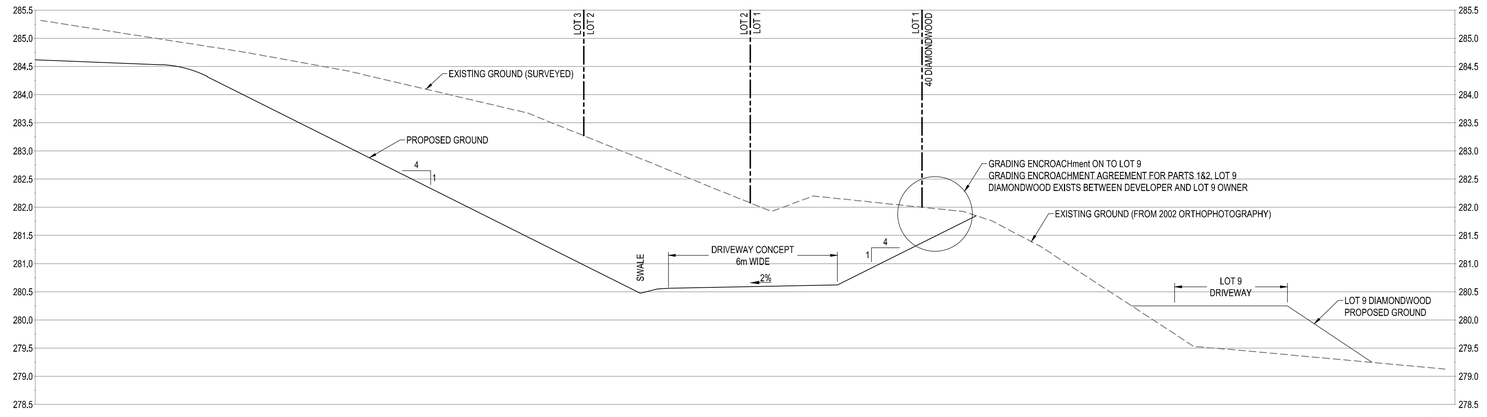
BIORETENTION FACILITY
PLAN VIEW AND SECTIONS

Drawing N°: **16-168-06**

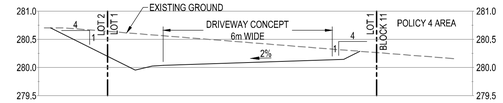
Sheet N°: 6 OF 10

Scale: AS NOTED

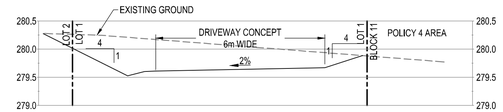
Rev. N°: C



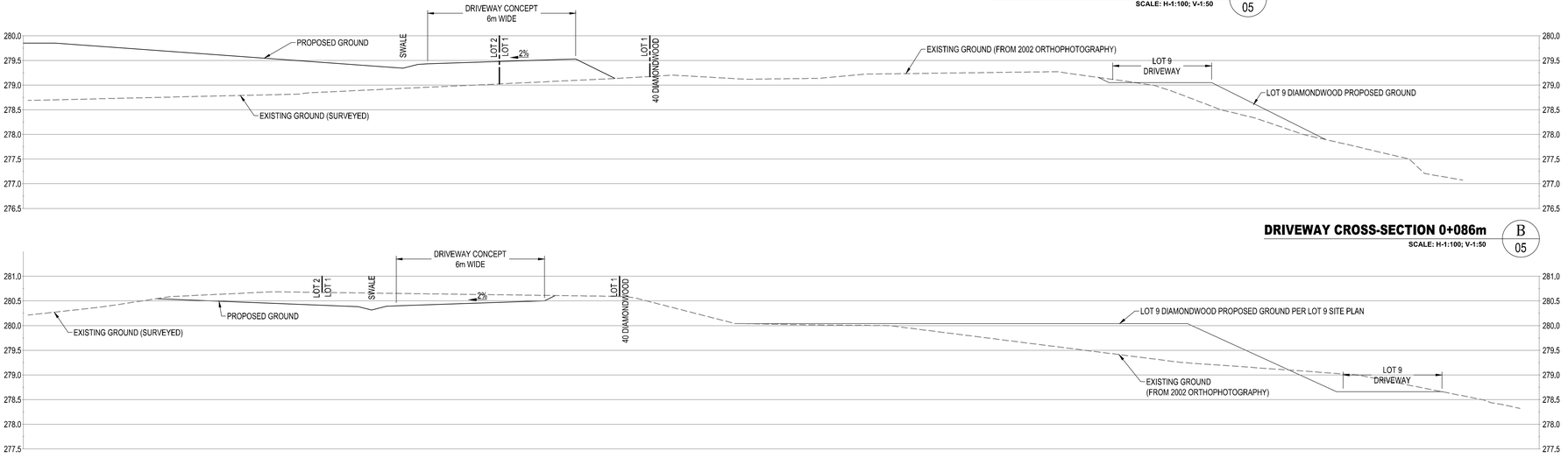
DRIVEWAY CROSS-SECTION 0+030m A 05
SCALE: H-1:100; V-1:50



DRIVEWAY CROSS-SECTION 0+128m D 05
SCALE: H-1:100; V-1:50

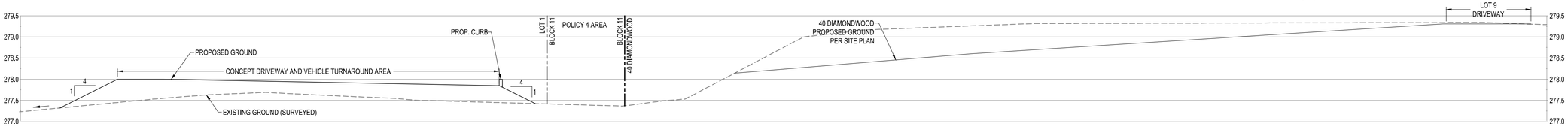


DRIVEWAY CROSS-SECTION 0+136m E 05
SCALE: H-1:100; V-1:50

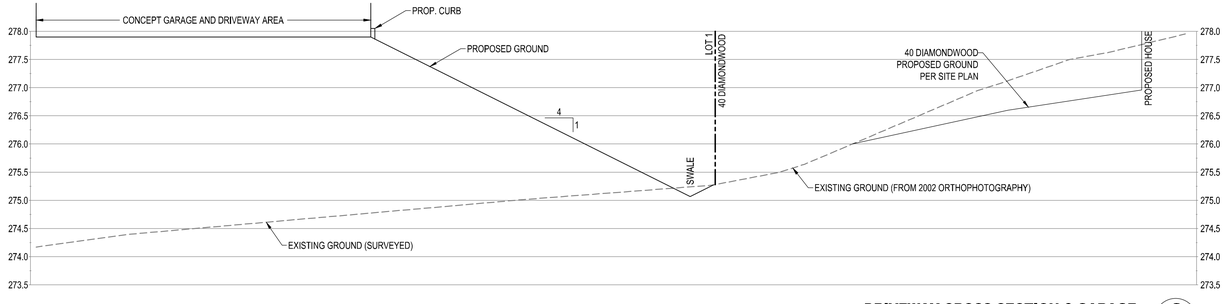


DRIVEWAY CROSS-SECTION 0+086m B 05
SCALE: H-1:100; V-1:50

DRIVEWAY CROSS-SECTION 0+120m C 05
SCALE: H-1:100; V-1:50



DRIVEWAY CROSS-SECTION @ VEHICLE TURNAROUND F 05
SCALE: H-1:100; V-1:50



DRIVEWAY CROSS-SECTION @ GARAGE G 05
SCALE: H-1:100; V-1:50

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3. LOT 9 DIAMONDWOOD SECTIONS GENERATED FROM ORTHOPHOTOGRAPHY DEVELOPED IN THE SPRING OF 2002 AND THE PROPOSED GRADING PLAN FOR LOT 9 DIAMONDWOOD RECEIVED IN DIGITAL FORMAT. ACTUAL ELEVATIONS MAY VARY FROM THOSE SHOWN.

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Client:

LAURELPARK INC.

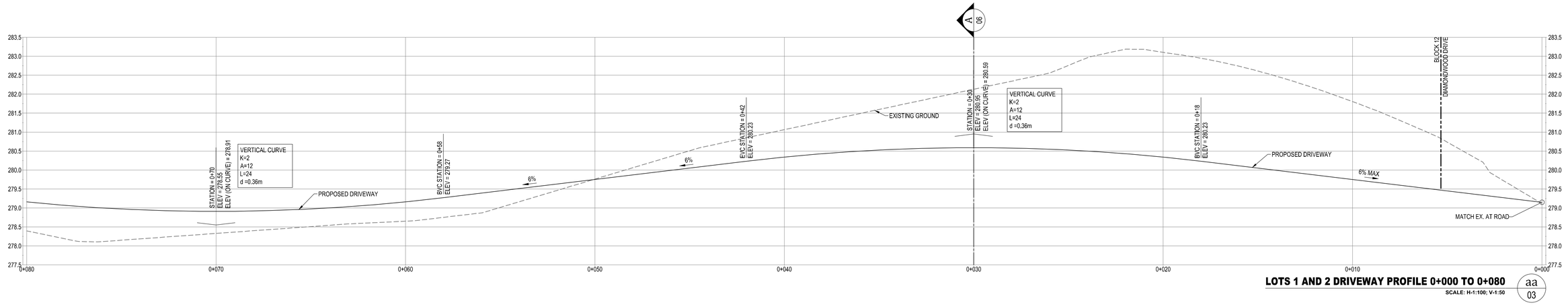
Project Name:

LAURELPARK SUBDIVISION
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON, REGIONAL MUNICIPALITY OF PEEL

Title Name:

LOT 1 & 2 DRIVEWAY SECTIONS

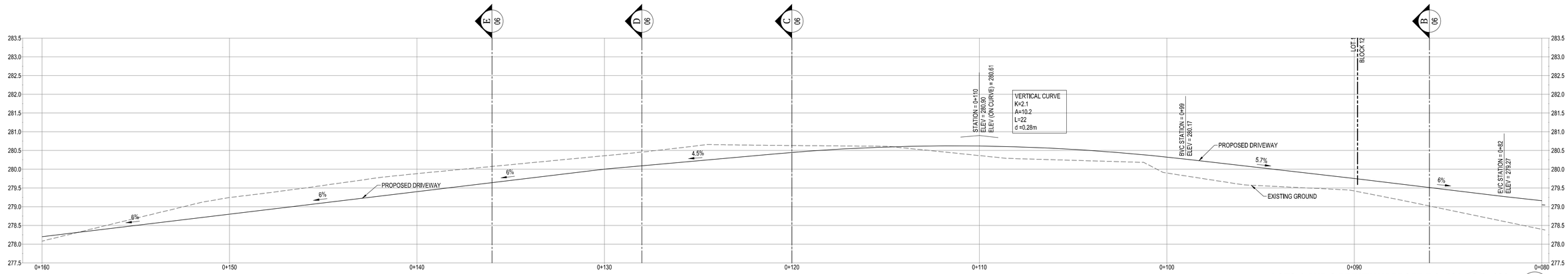
Drawing N°: **16-168-07**
Sheet N°: 7 OF 10
Scale: AS NOTED
Rev. N°: C



LOTS 1 AND 2 DRIVEWAY PROFILE 0+000 TO 0+080

SCALE: H-1:100; V-1:50

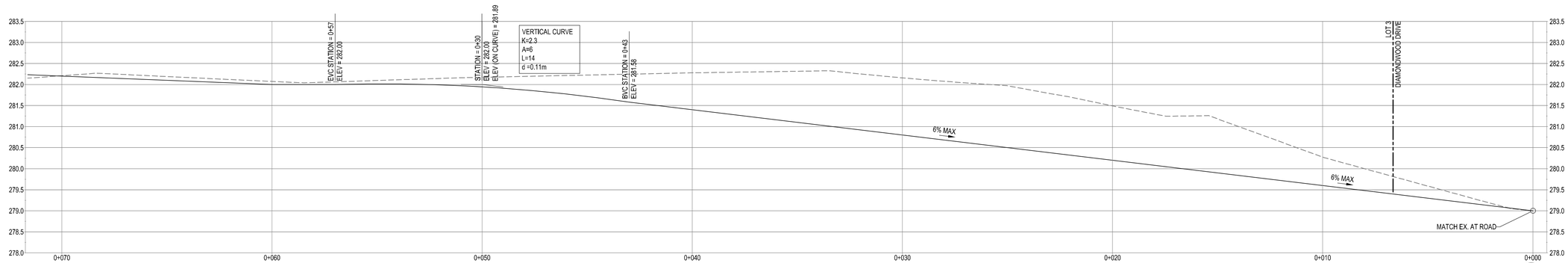
aa 03



LOTS 1 AND 2 DRIVEWAY PROFILE 0+080 TO 0+160

SCALE: H-1:100; V-1:50

aa 03



LOT 3 DRIVEWAY PROFILE 0+000 TO 0+072

SCALE: H-1:100; V-1:50

bb 03

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Client:

LAURELPARK INC.

Project Name:

LAURELPARK SUBDIVISION

PART OF LOT 19, CONCESSION 8 (ALBION)

TOWN OF CALEDON, REGIONAL MUNICIPALITY OF PEEL

Title Name:

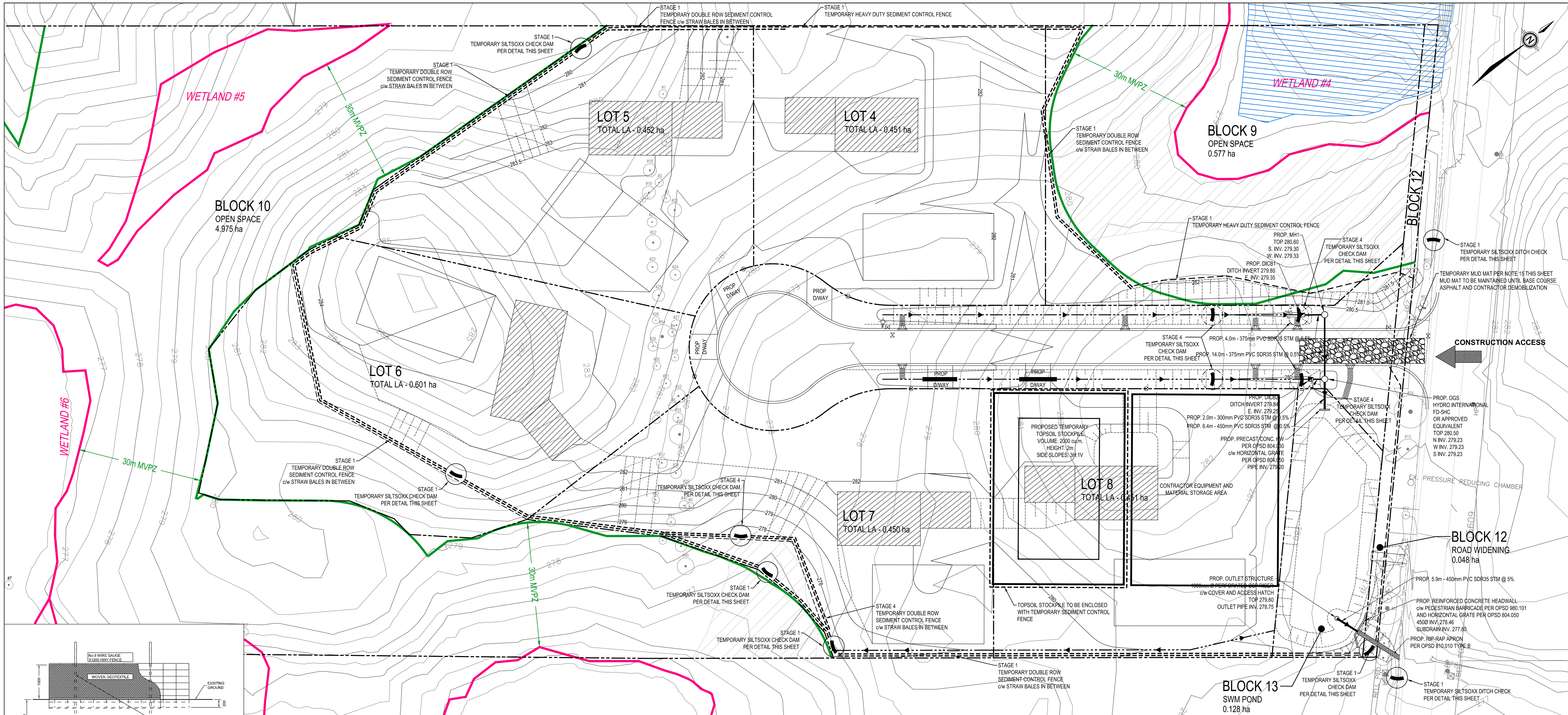
LOTS 1 TO 3 DRIVEWAY PROFILES

Drawing N°: **16-168-08**

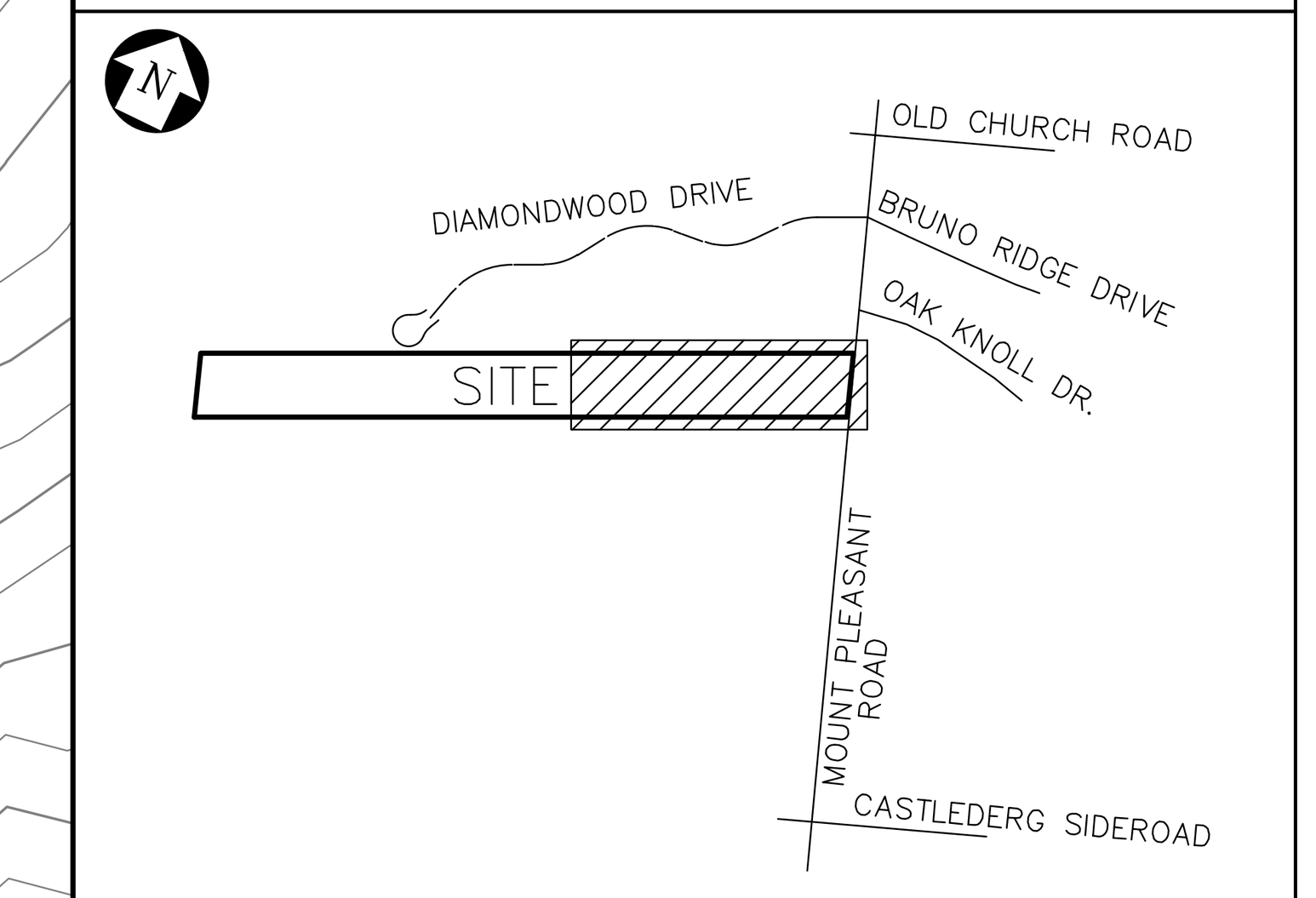
Sheet N°: 8 OF 10

Scale: AS NOTED

Rev. N°: C



KEY PLAN



KEY PLAN — TOWN OF CALEDON — NTS

LEGEND

- KEY NATURAL HERITAGE FEATURE
- KEY NATURAL HERITAGE FEATURE 30m MINIMUM VEGETATION PROTECTION ZONE (MVPZ)
- ENVIRONMENTAL ZONE 2
- SILTSOXX DITCH CHECK PER DETAIL THIS SHEET - 450mm
- SILTSOXX DITCH CHECK PER DETAIL THIS SHEET - 300mm
- HEAVY DUTY SEDIMENT CONTROL FENCE PER MODIFIED TOWN OF CALEDON STANDARD DRAWING 304
- DOUBLE ROW HEAVY DUTY SEDIMENT CONTROL FENCE c/w STRAW BALES IN BETWEEN
- PROPOSED MUD MAT

10m 0 10m 20m
SCALE 1:500

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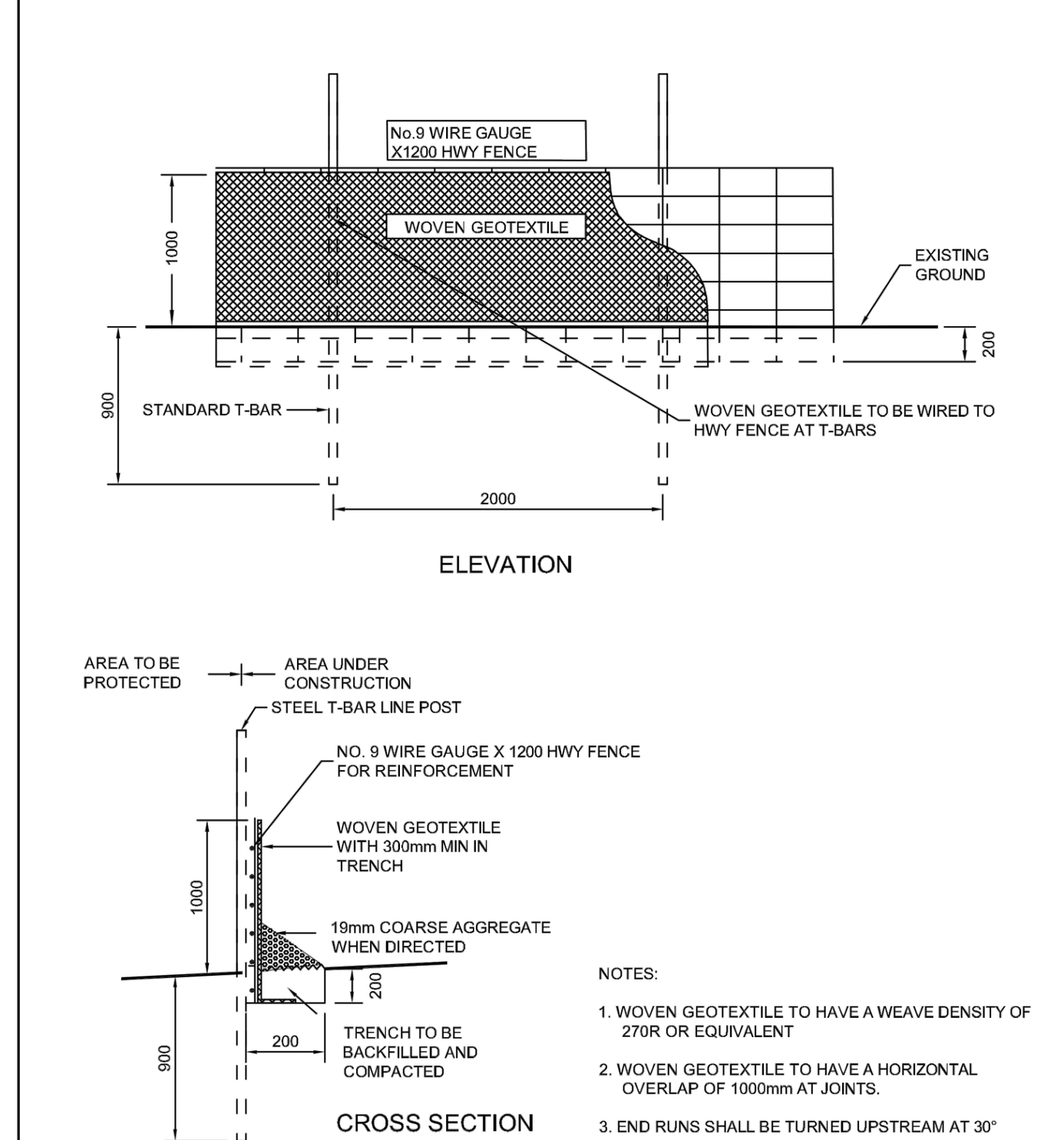
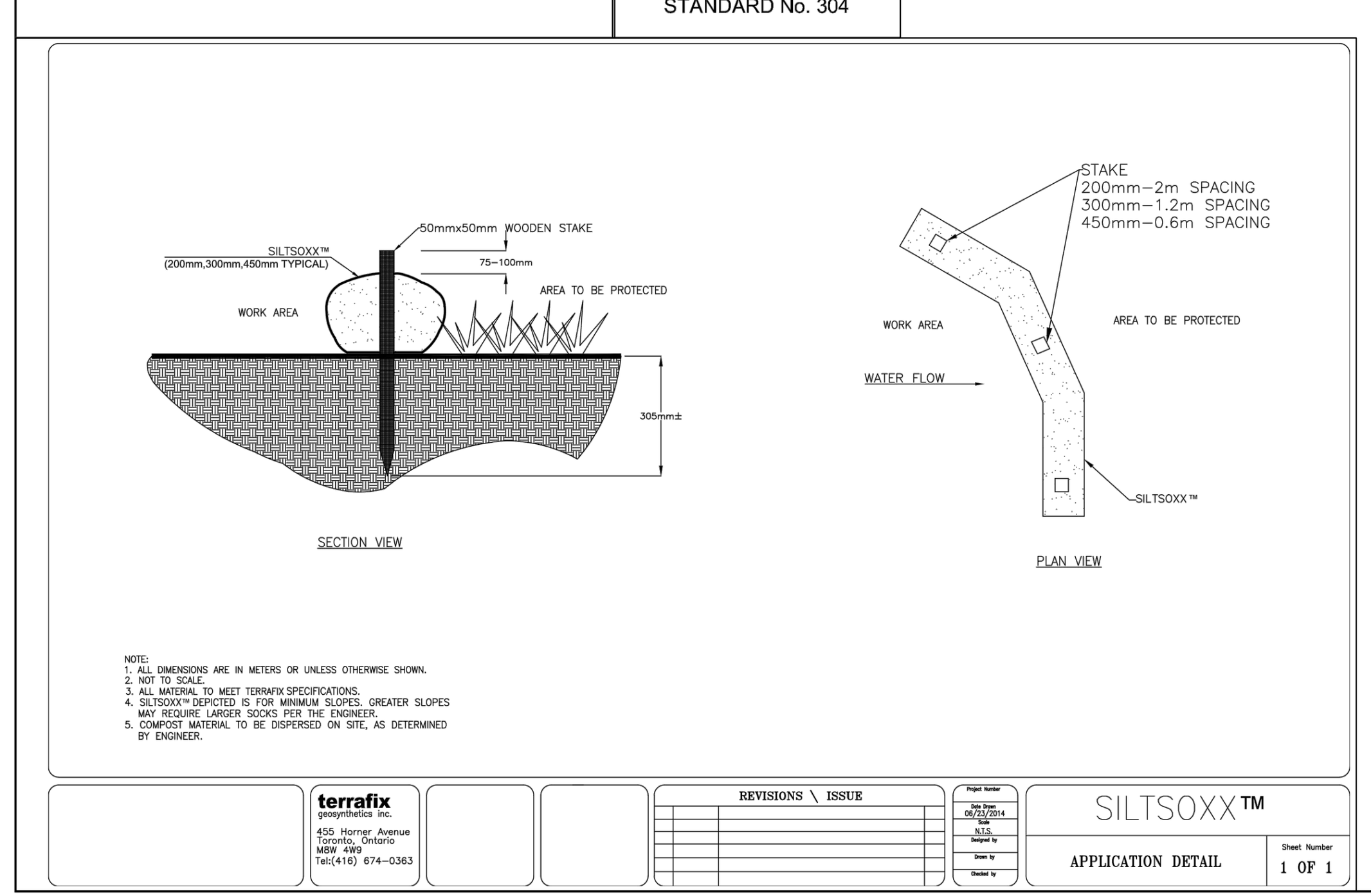


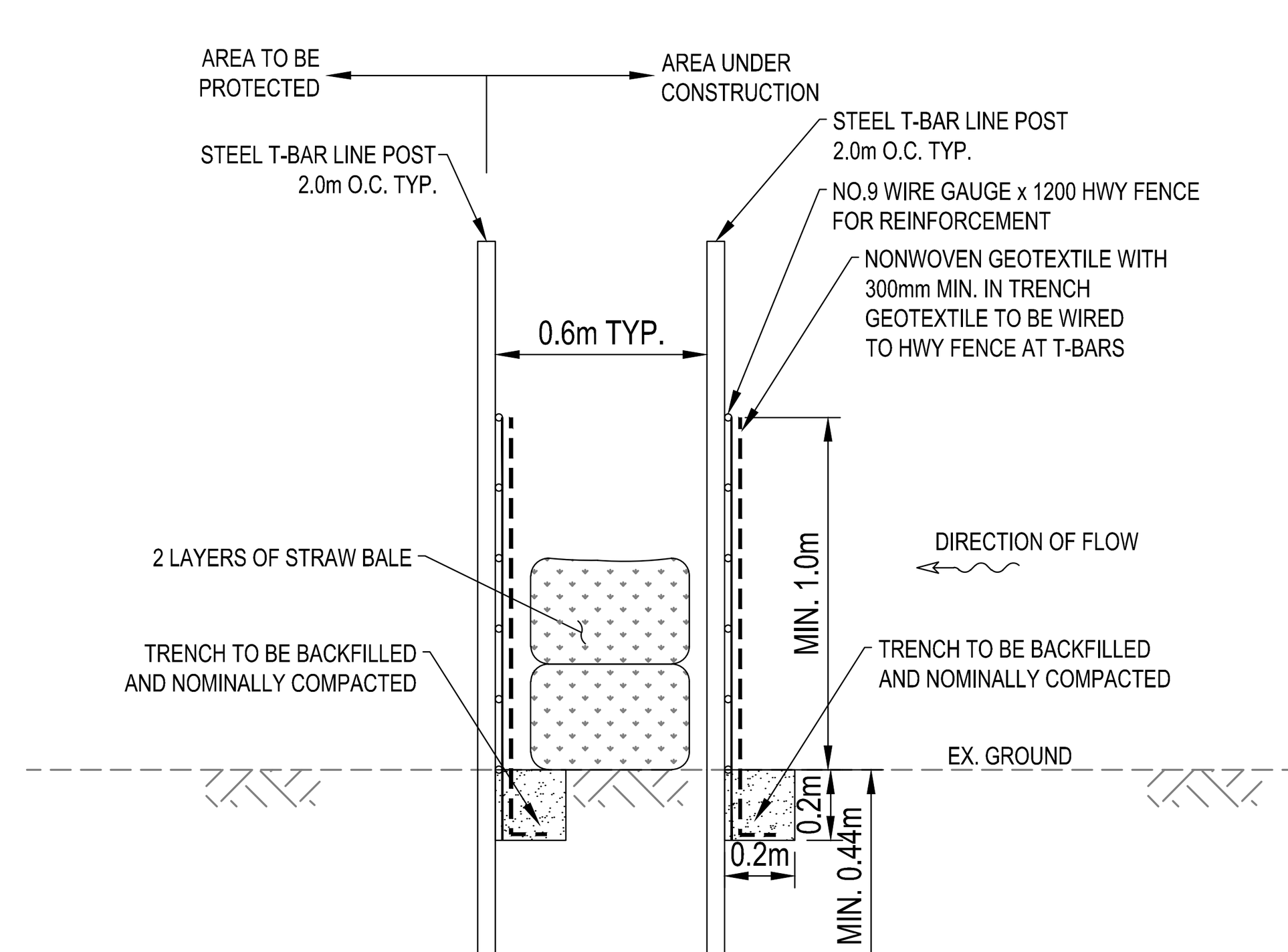
NO.	REVISION	APR'D	DATE
2	NAME CHANGED, STANDARD No. 325.01 NOW 304		JUNE 08
1	SUPPORT FENCING CHANGED TO HWY FENCE		Oct 02

TOWN OF CALEDON — APR'D: C.C. — DATE: APRIL 2000 — DRAWN: BJM — SCALE: N.T.S.

SEDIMENT CONTROL FENCE — STANDARD No. 304

ALL REFERNECES TO "WOVEN" GEOTEXTILE IN STANDARD NO.304 SHALL BE REPLACED WITH NON WOVEN"





NOTES:
1. NONWOVEN GEOTEXTILE TO HAVE A HORIZONTAL OVERLAP OF 1000mm AT JOINTS.
2. END RUNS SHALL BE TURNED UPSTREAM AT 30°.
3. STRAW BALES TO BE PLACED CONTINUOUSLY END TO END BETWEEN SEDIMENT CONTROL FENCE.

DOUBLE SEDIMENT CONTROL FENCE WITH STRAW BALES DETAIL — 2/09 — SCALE: NTS

EMERGENCY CONTACT LIST

NAME/AGENCY	PHONE NUMBER
TOWN OF CALEDON - FINANCE AND INFRASTRUCTURE	905-584-2272
TORONTO AND REGION CONSERVATION	416-661-6600
MINISTRY OF ENVIRONMENT SPILLS REPORTING	416-325-3000
OWNER - LAURELPARK INC.	905-822-2615
PROJECT ENGINEER - CALDER ENGINEERING LTD.	905-857-7600

EROSION AND SEDIMENT CONTROL NOTES

SITE MANAGEMENT

1. EROSION AND SEDIMENT CONTROL (ESC) MEASURES TO BE IMPLEMENTED PRIOR TO, AND MAINTAINED DURING THE CONSTRUCTION PHASES, TO PREVENT ENTRY OF SEDIMENT INTO THE WATER. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF INSPECTION.
2. DISTURBED AREAS TO BE MINIMIZED TO THE EXTENT POSSIBLE, AND TEMPORARILY OR PERMANENTLY STABILIZED OR RESTORED AS THE WORK PROGRESSES.
3. ALL IN-WATER AND NEAR WATER WORKS TO BE CONDUCTED IN THE DRY WITH APPROPRIATE EROSION AND SEDIMENT CONTROLS.
4. THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO MINIMIZE SEDIMENT LADEN RUNOFF FROM LEAVING THE WORK AREAS. IF THE PRESCRIBED MEASURES ON THE PLANS ARE NOT EFFECTIVE IN PREVENTING THE RELEASE OF A DELETERIOUS SUBSTANCE, INCLUDING SEDIMENT, THEN ALTERNATIVE MEASURES MUST BE IMPLEMENTED IMMEDIATELY TO MINIMIZE POTENTIAL ECOLOGICAL IMPACTS. TRCA ENFORCEMENT OFFICER SHOULD BE IMMEDIATELY CONTACTED. ADDITIONAL ESC MEASURES TO BE KEPT ON SITE AND USED AS NECESSARY.
5. AN ENVIRONMENTAL MONITOR TO ATTEND THE SITE TO INSPECT ALL NEW CONTROLS, AS WELL AS ON A REGULAR BASIS, OR FOLLOWING RAIN/SNOWMELT EVENT, TO MONITOR ALL WORKS, AND IN PARTICULAR WORKS RELATED TO EROSION AND SEDIMENT CONTROLS, DEWATERING OR UNWATERING, RESTORATION AND IN-WATER OR NEAR WATER WORKS. SHOULD CONCERNS ARISE ON SITE THE ENVIRONMENTAL MONITOR SHALL CONTACT THE TRCA ENFORCEMENT OFFICER AS WELL AS THE PROPONENT.
6. ALL ACTIVITIES, INCLUDING MAINTENANCE PROCEDURES, TO BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE TO BE CONDUCTED A MINIMUM OF 30 METRES FROM THE WATER.
7. THE PROPONENT/CONTRACTOR SHALL MONITOR THE WEATHER SEVERAL DAYS IN ADVANCE OF THE ONSET OF THE PROJECT TO ENSURE THAT THE WORKS TO BE CONDUCTED DURING FAVOURABLE WEATHER CONDITIONS. SHOULD AN UNEXPECTED STORM ARISE, THE CONTRACTOR SHALL REMOVE ALL UNFIXED ITEMS FROM THE REGIONAL STORM FLOOD PLAIN THAT WOULD HAVE THE POTENTIAL TO CAUSE A SPILL OR AN OBSTRUCTION TO FLOW, E.G. FUEL TANKS, PORTA-POTTIES, MACHINERY, EQUIPMENT, CONSTRUCTION MATERIALS, ETC.
8. ALL DEWATERING/UNWATERING SHALL BE TREATED AND RELEASED TO THE ENVIRONMENT AT LEAST 30 METRES FROM A WATERCOURSE OR WETLAND AND ALLOWED TO DRAIN THROUGH A WELL-VEGETATED AREA. NO DEWATERING EFFLUENT SHALL BE SENT DIRECTLY TO ANY WATERCOURSE, WETLAND OR FOREST, OR ALLOWED TO DRAIN ONTO DISTURBED SOILS WITHIN THE WORK AREA. THESE CONTROL MEASURES SHALL BE MONITORED FOR EFFECTIVENESS AND MAINTAINED OR REVISED TO MEET THE OBJECTIVE OF PREVENTING THE RELEASE OF SEDIMENT LADEN WATER.
9. ALL ACCESS TO THE WORK SITE SHALL BE FROM EITHER SIDE OF THE WATERCOURSE. NO EQUIPMENT OR VEHICLES ARE PERMITTED TO CROSS THE WATERCOURSE UNLESS APPROVED BY THE TRCA.

CONSTRUCTION TIMING

10. IN ORDER TO COMPLY WITH THE MIGRATORY BIRDS CONVENTION ACT, TRCA RECOMMENDS THAT TREE REMOVALS BE COMPLETED BETWEEN AUGUST 1 AND APRIL 1.
11. TO PROTECT LOCAL FISH POPULATIONS DURING THEIR SPAWNING, NURSERY AND MIGRATORY PERIODS, IN-WATER/NEAR WATER ACTIVITIES MAY ONLY OCCUR DURING THE FOLLOWING TIME PERIOD [TRCA TO CONFIRM TIMING WINDOW DURING REVIEW OF FIRST SUBMISSION].

FISH AND WILDLIFE RELOCATION

12. FISH AND WILDLIFE STRANDED WITHIN THE WORK AREA SHALL BE CAPTURED AND RELEASED LIVE IN SUITABLE HABITAT UPSTREAM OF THE WORK AREA UNDER THE SUPERVISION OF A QUALIFIED AQUATIC BIOLOGIST. A PERMIT FROM THE MINISTRY OF NATURAL RESOURCES IS REQUIRED.

ENVIRONMENTAL COMPLIANCE

13. PLEASE NOTIFY THE TRCA AT 416-661-6000 48 HOURS PRIOR TO COMMENCING CONSTRUCTION.
14. AN ENVIRONMENTAL MONITOR TO BE ON SITE, AND PROVIDE ADVICE, TO ENSURE THAT ACTIVITIES THAT COULD HAVE A NEGATIVE IMPACT TO THE NATURAL ENVIRONMENT ARE EFFECTIVELY MITIGATED AS CONSTRUCTION PROCEEDS. THE ENVIRONMENTAL MONITOR SHALL NOTIFY THE TRCA ENFORCEMENT OFFICER AND PROJECT MANAGER IF AN ISSUE ARISES.

EROSION AND SEDIMENT CONTROLS

15. MUD MAT TO BE PROVIDED ON SITE AT ALL LOCATIONS WHERE CONSTRUCTION VEHICLES EXIT THE SITE. MUD MAT(S) SHALL BE A MINIMUM OF 5m WIDE, 30m LONG AND 0.45m DEEP. THE MUD MAT(S) SHALL CONSIST OF 50-100mm CLEAR STONE MATERIAL OR APPROVED EQUIVALENT EXCEPT FOR THE FIRST 15m WHICH SHALL BE 50mm CLEAR STONE. CONTRACTOR TO ENSURE ALL VEHICLES LEAVE THE SITE VIA THE MUD MAT AND THAT THE MUD MAT IS MAINTAINED IN A MANNER TO MAXIMIZE EFFECTIVENESS AT ALL TIMES.
16. TOPSOIL AND MATERIAL STOCKPILES TO BE ENCLOSED WITH SEDIMENT CONTROL FENCE. SEDIMENT CONTROL FENCE FOR STOCKPILES TO BE TERRAFIX TERRAFENCE OR APPROVED EQUIVALENT.
17. REMOVE TEMPORARY SEDIMENT CONTROLS FOLLOWING COMPLETION OF CONSTRUCTION AND SITE STABILIZATION AND REINSTATE AFFECTED AREAS TO EXISTING CONDITIONS OR BETTER. TIMING OF REMOVAL OF TEMPORARY SEDIMENT CONTROLS TO BE APPROVED BY TOWN STAFF.
18. SEDIMENT CONTROL FENCING ON LOTS TO REMAIN IN PLACE UNTIL BUILDER HOME CONSTRUCTION AND THEN EITHER BE MAINTAINED, REMOVED OR AUGMENTED. SEDIMENT CONTROL FENCE TO BE REMOVED BY BUILDER ON COMPLETION OF HOUSE CONSTRUCTION AND LOT RESTORATION.

CONSTRUCTION PHASING

PRIOR TO SITE CONSTRUCTION, THE CONTRACTOR IS TO SCHEDULE A MEETING WITH REPRESENTATIVES FROM THE OWNER, TRCA, AND TOWN TO REVIEW CONSTRUCTION PHASING AND EROSION AND SEDIMENT CONTROL PLANNING, ESTABLISH INSPECTION AND REPORTING PROCEDURES, AND DISCUSS CONTINGENCY PLANNING. ANTICIPATED CONSTRUCTION STAGING IS OUTLINED BELOW.

1. INSTALLATION OF TEMPORARY EROSION AND SEDIMENT CONTROLS INCLUDING SEDIMENT CONTROL FENCE, SILTSOXX DITCH CHECKS (450mm) AND SITE ENTRANCE MUD MATS.
2. BIORETENTION AREA PREGRADING AND BIORETENTION AREA OUTLET CONSTRUCTION (TEMPORARY SEDIMENT CONTROL PONDS).
3. TOPSOIL STRIPPING AND STOCKPILING. ENCLOSE STOCKPILES WITH SEDIMENT CONTROL FENCE.
4. PREGRADING OF ROADS, BOULEVARDS, LOTS, AND BIORETENTION AREA. INSTALLATION OF SILTSOXX DITCH CHECKS (300mm) IN DITCHES. INSTALLATION OF LIGHT DUTY SEDIMENT CONTROL FENCING AT STRUCTURE ENVELOPE LIMITS AS NOTED.

   PREGRADED AREAS TO BE STABILIZED BY HYDROSEEDING c/w APPLICATION OF STRAW MULCH PER OPSS 804 TO A DEPTH OF 25mm TO 50mm IF DURATION BETWEEN STAGE 4 AND STAGE 7 EXCEEDS 30 DAYS.
5. CONSTRUCTION OF UNDERGROUND SERVICES.
6. ROAD AND UTILITY CONSTRUCTION, CURB INSTALLATION, AND ASPHALT SURFACING.
7. REMOVE AND DISPOSE SILTSOXX DITCH CHECKS UNLESS OTHERWISE NOTED. BOULEVARD FINE GRADING, TOPSOIL PLACEMENT, AND RESTORATION / SEEDING.
8. BIORETENTION AREA SEDIMENT CLEANOUT, FILTER MEDIA PLACEMENT, FINE GRADING, LOW FLOW CHANNEL AND OUTLET FILTER STRIP INSTALLATION, TOPSOIL PLACEMENT AND RESTORATION / SEEDING.
9. INSTALLATION OF LANDSCAPING AND BUFFER PLANTINGS.
10. BUILDER HOME CONSTRUCTION: EROSION AND SEDIMENT CONTROL MEASURES TO BE SPECIFIED ON A LOT BY LOT BASIS IN CONJUNCTION WITH SITE PLANS PREPARED AS PART OF BUILDING PERMIT APPLICATION STAGE.

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DESIGNED BY | APPROVED BY

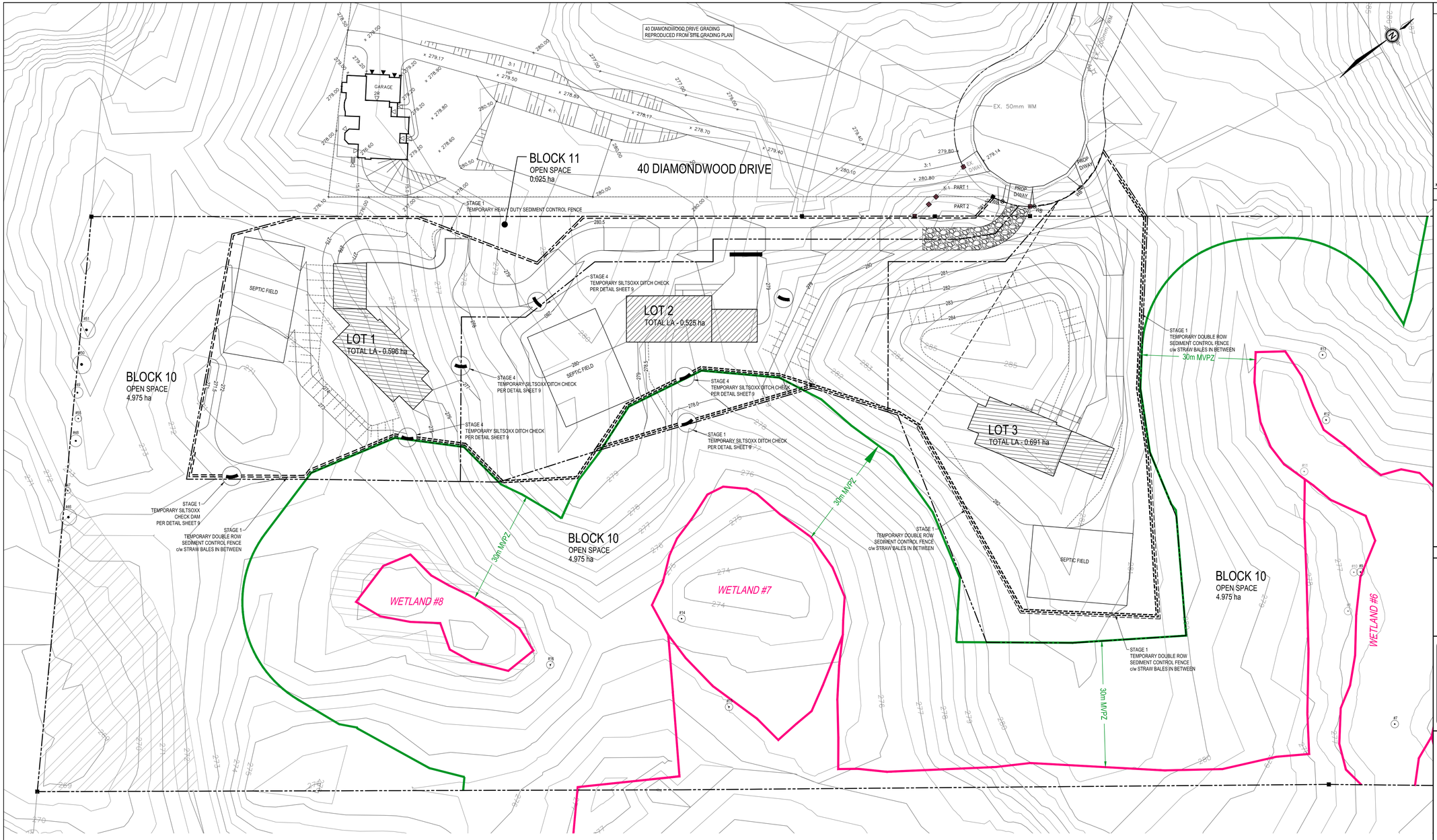
N°	Date	Revisions	Dwn.	Dsg'd.	Chk'd.
C	28/FEB/2020	THIRD SUBMISSION	KNC	KNC	RJW
B	03/MAY/2019	SECOND SUBMISSION	KNC	KNC	RJW
A	15/MAR/2017	FIRST SUBMISSION	KNC	DH	RJW

Client: **LAURELPARK INC.**

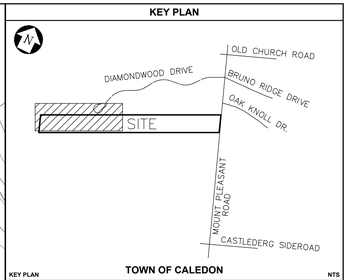
Project Name: **LAURELPARK SUBDIVISION**
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON, REGIONAL MUNICIPALITY OF PEEL

Title Name: **PRELIMINARY EROSION AND SEDIMENT CONTROL PLAN**
SHEET 1 OF 2

Drawing N°:	Sheet N°:	Scale:	Rev. N°:
16-168-09	9 OF 10	1:500	C



KEY PLAN



KEY PLAN — TOWN OF CALEDON — NTS

LEGEND

- KEY NATURAL HERITAGE FEATURE
- KEY NATURAL HERITAGE FEATURE 30m MINIMUM VEGETATION PROTECTION ZONE (MVPZ)
- ENVIRONMENTAL ZONE 2
- SILTSOXX DITCH CHECK PER DETAIL THIS SHEET - 450mm
- SILTSOXX DITCH CHECK PER DETAIL THIS SHEET - 300mm
- HEAVY DUTY SEDIMENT CONTROL FENCE PER MODIFIED TOWN OF CALEDON STANDARD DRAWING 304
- DOUBLE ROW HEAVY DUTY SEDIMENT CONTROL FENCE c/w STRAW BALES IN BETWEEN
- PROPOSED MUD MAT

10m 0 10m 20m
SCALE 1:500

GENERAL NOTES

1. THE INFORMATION SHOWN HEREIN IS PRELIMINARY AND SUBJECT TO DETAIL DESIGN.
2. CONTOURS GENERATED FROM ORTHOPHOTOGRAPHY DEVELOPED IN THE SPRING OF 2002, AND SURVEYED ELEVATIONS BY CALDER ENGINEERING LTD. (2017 & 2019) AND EPLETT WOROBEC RAKES SURVEYING LTD. (2015). ACTUAL ELEVATIONS MAY VARY FROM THOSE SHOWN.
3. EZ2 ZONE LIMITS INFERRED FROM INFORMATION PROVIDED BY AZIMUTH ENVIRONMENTAL CONSULTANTS INC. DATED NOVEMBER 2016.

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DESIGNED BY | APPROVED BY

N°	Date	Revisions	Dwn.	Dsg'd.	Chk'd.
B	03/MAY/2019	SECOND SUBMISSION	KNC	KNC	RJW
A	15/MAR/2017	FIRST SUBMISSION	KNC	DH	RJW

Client:

LAURELPARK INC.

Project Name:

LAURELPARK SUBDIVISION
PART OF LOT 19, CONCESSION 8 (ALBION)
TOWN OF CALEDON, REGIONAL MUNICIPALITY OF PEEL

Title Name:

PRELIMINARY EROSION AND SEDIMENT CONTROL PLAN
SHEET 2 OF 2

Drawing N°:	Sheet N°:	Rev. N°:
16-168-10	10 OF 10	B
	Scale: 1:500	

TABLE E.1: 5-YEAR STORM DESIGN SHEET

Location			Drainage Area				Runoff			Pipe Flow						
Street	From MH	To MH	Area (ha)	C	A x C	Acc. A x C	Tc (min)	I (mm/hr)	Q (L/s)	Pipe Length (m)	Pipe Diameter (m)	Pipe Slope (%)	Full Flow Capacity (L/s)	Full Flow Velocity (m/s)	Time of flow (min.)	% Full Capacity
Tivoli Circle	DICB1	MH1	0.94	0.46	0.431	0.431	15.00	90.91	108.92	4.0	0.375	0.50	124.0	1.1	0.06	87.9%
Tivoli Circle	MH1	OGS			0.000	0.431	15.06	90.72	108.70	14.0	0.375	0.50	124.0	1.1	0.21	87.7%
Tivoli Circle	DICB2	OGS	0.499	0.46	0.229	0.229	15.00	90.91	57.94	2.0	0.300	0.50	68.4	1.0	0.03	84.7%
Block 13	OGS	Block 13			0.000	0.661	15.27	90.09	165.36	6.4	0.450	0.50	201.6	1.3	0.08	82.0%

Notes

Manning's n = 0.013

$$I = \frac{A}{(t_c + B)^C}$$

where:

A= 1593

B= 11

C= 0.8789

CONSULTANT: Calder Engineering Ltd.
PROJECT: Laurelpark Subdiviison
PROJECT NO: 16-168
LOCATION: Town of Caledon

TOWN OF CALEDON

Calder Engineering Ltd.

TABLE E.2 100-YEAR STORM DESIGN SHEET - TIVOLI CIRCLE GRASSED SWALES

Location			Drainage Area				Runoff			Pipe Flow						
Street	From STA	To STA	Area (ha)	C	A x C	Acc. A x C	Tc (min)	I (mm/hr)	Q (L/s)	Ditch Length (m)	Side of Road	Ditch Slope (%)	Full Flow Capacity (L/s)	Flow Velocity (m/s)	Flow Depth (m)	% Full Capacity
Tivoli Circle (North)	0+135	0+033	0.938	0.46	0.431	0.431	10.00	196.54	235.48	102.3	N	0.80	1,686.0	0.85	0.26	14.0%
Tivoli Circle (South)	0+135	0+033	0.499	0.46	0.229	0.229	10.00	196.54	125.26	102.3	S	0.80	1,686.0	0.73	0.21	7.4%

Notes

Manning's n = 0.040

$$I = \frac{A}{(t_c + B)^C}$$

where: A= 4688

B= 17

C= 0.9624

CONSULTANT: Calder Engineering Ltd.
PROJECT: Laurelpark Subdivision
PROJECT NO: 16-168
LOCATION: Town of Caledon

TOWN OF CALEDON

Calder Engineering Ltd.

Notes:

1. Refer to below triangular swale rating curve for hydraulic capacity, flow velocity, and flow depth calculations.

Rating Curve for Triangular Swale

Project: LAURELPARK SUBDIVISION

Mannings Equation: Q = (A * R^0.667 * S^0.5) / n

Side Slope Factor (Z): 4 :1 **Slope (s):** 0.800% **Roughness (n):** 0.040

Depth (m)	Flow (l/s)	Velocity (m/s)	Area A	Wet. Perim. P	Hydrl. Rad. R	Top Width T	Hydr. Depth D	Froude No. F	Type of Flow
0.010	0.0	0.096	0.000	0.082	0.009	0.080	0.005	0.435	sub-critical
0.020	0.2	0.153	0.002	0.165	0.018	0.160	0.010	0.488	sub-critical
0.030	0.7	0.200	0.004	0.247	0.027	0.240	0.015	0.522	sub-critical
0.040	1.6	0.243	0.006	0.330	0.036	0.320	0.020	0.548	sub-critical
0.050	2.8	0.282	0.010	0.412	0.045	0.400	0.025	0.569	sub-critical
0.060	4.6	0.318	0.014	0.495	0.054	0.480	0.030	0.586	sub-critical
0.070	6.9	0.353	0.020	0.577	0.063	0.560	0.035	0.602	sub-critical
0.080	9.9	0.385	0.026	0.660	0.072	0.640	0.040	0.615	sub-critical
0.090	13.5	0.417	0.032	0.742	0.080	0.720	0.045	0.627	sub-critical
0.100	17.9	0.447	0.040	0.825	0.089	0.800	0.050	0.638	sub-critical
0.150	52.7	0.586	0.090	1.237	0.134	1.200	0.075	0.683	sub-critical
0.200	113.6	0.710	0.160	1.649	0.179	1.600	0.100	0.717	sub-critical
0.250	205.9	0.824	0.250	2.062	0.224	2.000	0.125	0.744	sub-critical
0.300	334.9	0.930	0.360	2.474	0.268	2.400	0.150	0.767	sub-critical
0.350	505.1	1.031	0.490	2.886	0.313	2.800	0.175	0.787	sub-critical
0.400	721.2	1.127	0.640	3.298	0.358	3.200	0.200	0.804	sub-critical
0.450	987.3	1.219	0.810	3.711	0.402	3.600	0.225	0.820	sub-critical
0.500	1,307.6	1.308	1.000	4.123	0.447	4.000	0.250	0.835	sub-critical
0.550	1,686.0	1.393	1.210	4.535	0.492	4.400	0.275	0.848	sub-critical

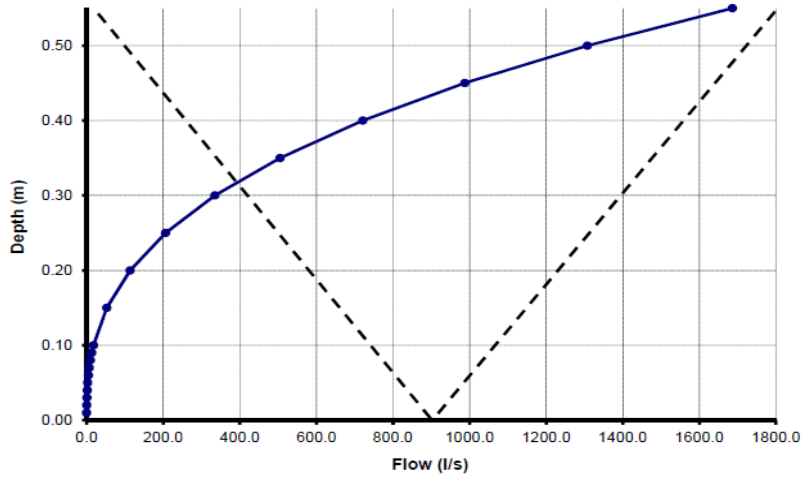


TABLE E.3 100-YEAR STORM DESIGN SHEET - MOUNT PLEASANT DITCH

Location			Drainage Area				Runoff			Pipe Flow						
Street	From MH	To MH	Area (ha)	C	A x C	Acc. A x C	Tc (min)	I (mm/hr)	Q (L/s)	Pipe Length (m)	Pipe Diameter (m)	Pipe Slope (%)	Full Flow Capacity (L/s)	Full Flow Velocity (m/s)	Time of flow (min.)	% Full Capacity
from Bioretention Area									4.00	<--controlled flow: SWMHYMO output for 100-Year design event						
from u/s area to ditch at outlet			0.15	0.90	0.135	0.135	10.00	196.54	73.70							
Mount Pleasant Ditch									77.70							

Notes:
Manning's n = 0.04

$$I = \frac{A}{(t_c + B)^C}$$

where: A= 4688
B= 17
C= 0.9624

IDF information from Town of Caledon Standard 104

CONSULTANT: Calder Engineering Ltd.
PROJECT: Laurelpark
PROJECT NO: 16-168
LOCATION: Town of Caledon

Prepared for: TOWN OF CALEDON

Prepared by: Calder Engineering Ltd.

Notes:
1. Estimated capacity of Mount Pleasant ditch is 411 litres per second (L/s) or 0.411 cubic metres per second (cms).

Rating Curve for Triangular Swale

Project: LAUREL PARK SUBDIVISION
Mount Pleasant Ditch
Ditch Capacity at 0.35 m depth: 0.411 cms
100-Year Design Flow: 0.078 cms

Mannings Equation:
Q = (A * R^0.667 * S^0.5) / n

Side Slope Factor (Z): 2 :1 **Slope (s):** 3.800% **Roughness (n):** 0.040
Depth: 0.35 m

Depth (m)	Flow (l/s)	Velocity (m/s)	Area A	Wet. Perim. P	Hydrl. Rad. R	Top Width T	Hydr. Depth D	Froude No. F	Type of Flow
0.050	2	0.459	0.005	0.224	0.029	0.200	0.025	0.926	*sub-critical*
0.100	15	0.728	0.020	0.447	0.058	0.400	0.050	1.039	*super-critical*
0.150	43	0.954	0.045	0.671	0.087	0.600	0.075	1.112	*super-critical*
0.200	92	1.156	0.080	0.894	0.115	0.800	0.100	1.167	*super-critical*
0.250	168	1.341	0.125	1.118	0.144	1.000	0.125	1.211	*super-critical*
0.300	273	1.514	0.180	1.342	0.173	1.200	0.150	1.248	*super-critical*
0.350	411	1.678	0.245	1.565	0.202	1.400	0.175	1.281	*super-critical*
0.400	587	1.834	0.320	1.789	0.231	1.600	0.200	1.310	*super-critical*
0.450	804	1.984	0.405	2.012	0.260	1.800	0.225	1.336	*super-critical*

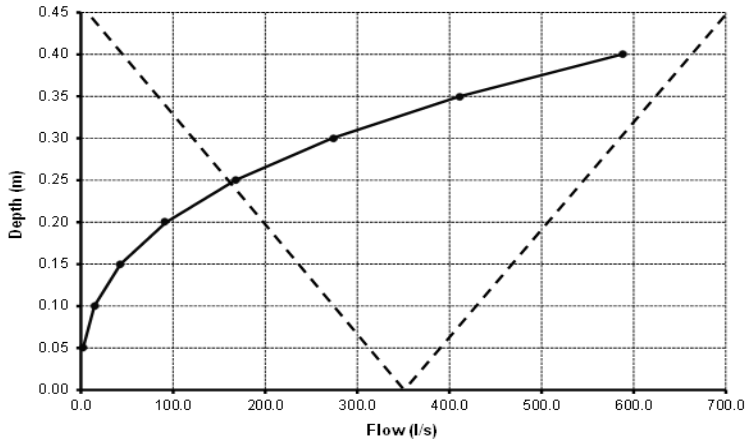


TABLE E.4 BIORETENTION AREA OUTLET STRUCTURE - OUTLET VELOCITY CALCULATIONS

Rating Curve for Circular Pipe

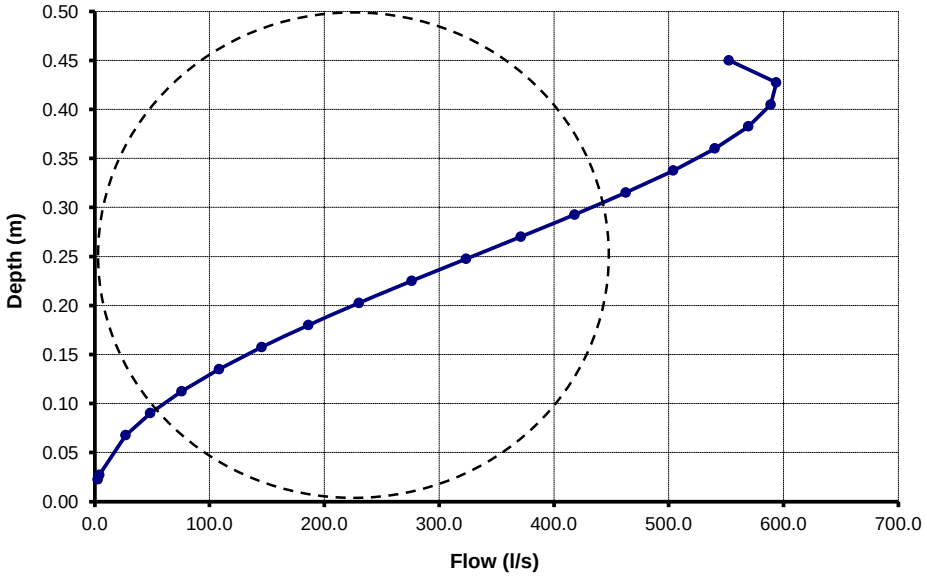
Project:

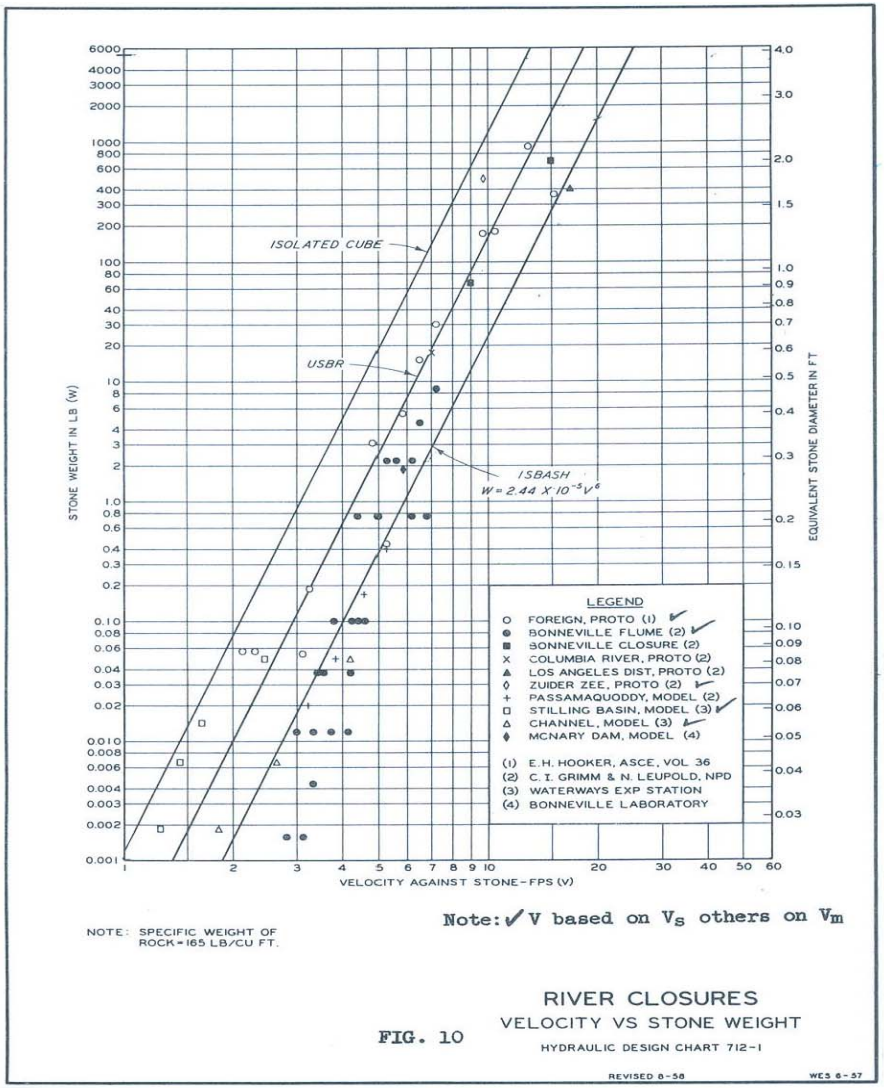
Mannings Equation:
Q = (A * R^0.667 * S^0.5) / n

Diameter (d): 0.450 m **Slope (s):** 5.000% **Roughness (n):** 0.015

Full Pipe Flow = 0.553 m^3/s

Depth (m)	Flow (l/s)	Velocity (m/s)	Area A	Wet. Perim. P	Hydrl. Rad. R	Top Width T	Hydr. Depth D	Froude No. F	Type of Flow
0.023	2.653	0.892	0.003	0.203	0.015	0.196	0.015	2.314	*super-critical*
0.027	4.000	1.011	0.004	0.224	0.018	0.215	0.018	2.379	*super-critical*
0.068	26.855	1.795	0.015	0.358	0.042	0.321	0.047	2.656	*super-critical*
0.090	48.380	2.137	0.023	0.417	0.054	0.360	0.063	2.720	*super-critical*
0.113	75.678	2.434	0.031	0.471	0.066	0.390	0.080	2.751	*super-critical*
0.135	108.190	2.696	0.040	0.522	0.077	0.412	0.097	2.760	*super-critical*
0.158	145.266	2.928	0.050	0.570	0.087	0.429	0.116	2.750	*super-critical*
0.180	186.176	3.134	0.059	0.616	0.096	0.441	0.135	2.726	*super-critical*
0.203	230.121	3.315	0.069	0.662	0.105	0.448	0.155	2.688	*super-critical*
0.225	276.237	3.474	0.080	0.707	0.112	0.450	0.177	2.638	*super-critical*
0.248	323.591	3.610	0.090	0.752	0.119	0.448	0.200	2.576	*super-critical*
0.270	371.176	3.725	0.100	0.797	0.125	0.441	0.226	2.502	*super-critical*
0.293	417.898	3.819	0.109	0.844	0.130	0.429	0.255	2.415	*super-critical*
0.315	462.555	3.890	0.119	0.892	0.133	0.412	0.288	2.313	*super-critical*
0.338	503.792	3.937	0.128	0.942	0.136	0.390	0.328	2.194	*super-critical*
0.360	540.029	3.959	0.136	0.996	0.137	0.360	0.379	2.054	*super-critical*
0.383	569.295	3.951	0.144	1.056	0.136	0.321	0.448	1.884	*super-critical*
0.405	588.829	3.906	0.151	1.124	0.134	0.270	0.558	1.669	*super-critical*
0.428	593.644	3.804	0.156	1.211	0.129	0.196	0.796	1.361	*super-critical*
0.450	552.474	3.474	0.159	1.414	0.113	0.000	-	-	





100-Year Design Flow: 4 Litres per second
Outlet Velocity: 1.01 metres per second
Min. Required Rip Rap Size: 50 milllimetres (approx. minimum nominal size per U.S. Department of Transportation, Hydraulic Engineering Circular No. 11, Hydraulic Design Chart 712-1)