Northumberland County

STORMWATER MANAGEMENT AND SERVICING REPORT

Golden Plough Lodge Long Term Care Facility and Northumberland County Archives and Museum

Town of Cobourg

July 2020

19073

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1 INTRODUCTION

1.1 SCOPE OF THE SWM AND SERVICING REPORT

LEA Consulting Ltd. has been retained by Salter Pilon Architecture, to prepare a Stormwater Management and Servicing Report for the proposed new build of a Golden Plough Lodge Long Term Care Facility and County Archives located in the Town of Cobourg. This stormwater management and servicing report shall:

- Examine the potential water quantity and quality impacts of the proposed development and summarize how each will be addressed in accordance with the Ganaraska Region Conservation Authority (GRCA) and MOECP criteria.
- Review the water supply, storm and sanitary servicing requirement of the proposed development, and propose a site servicing plan.

The site will be developed in two phases. Phase 1 consists of the construction of the new 3-storey of a Golden Plough Lodge Long Term Care facility in the undeveloped part of the site. Phase 2 includes the demolition of the existing Golden Plough Lodge building and constructing parking facilities. This report is provided for ultimate site condition.

1.2 SITE LOCATION

The proposed development site is located at the northwest quadrant of Elgin Street West and Burnham Street. The study area consists of the existing Halcyon Place building, Golden Plough Lodge building, Northumberland County Headquarters, parking lots and undeveloped lands. It is bounded by the Burnham Street to the east, existing Church and commercial plaza to the wet, Elgin Street West to the south, and existing stormwater management pond to the north, contributory to Cobourg Creek watershed and under the jurisdiction of Ganaraska Region Conservation Authority (GRCA). Site access, currently via Courthouse Road and Burnham Street and it is approximately 7.78 ha in area. The location, surroundings, and layout of the study area shown below in Figure 1.

Figure 1: Proposed Development SWM Study Area

1.3 STORMWATER MANAGEMENT PLAN OBJECTIVES

The objectives of the stormwater management plan are as follows:

- Determine site-specific stormwater management requirements to ensure that the development project is in conformance with the *Technical and Engineering Guidelines for Stormwater Management Submission* issued by Ganaraska Region Conservation Authority (GRCA), 2014;
- Prepare a stormwater management plan documenting the strategy along with the technical information necessary for the sizing of the proposed stormwater management measures.

1.4 SWM DESIGN CRITERIA – GRCA

The GRCA has issued the *Technical and Engineering Guidelines for Stormwater Management Submission*, (December 2014) to provide direction on how to manage rainfall and runoff inside watersheds. A summary of the stormwater management criteria applicable to this project is as follows:

- Water Quality Control: water quality control, the outflow from SWM facilities must meet enhanced level requirements (80% removal of total suspended solids),
- Erosion Control: For Cobourg Creek watershed, the erosion requirements from the MOE manual will be applied and requiring the 25mm 4-hour Chicago storm to be stored and released over a 24-hour period.
- Water Quantity Control and Discharge to Municipal Infrastructure: water quantity criteria for Cobourg Creek watershed is as follow:
    1. Control 2-yr post-development flow to only 50% of 2-yr pre-development peak flow; and,
    2. Control 5-100-yr post-development flow rates to pre-development flow within the Town of Cobourg, or as dictated by infrastructure limits.

The maximum allowable release rate to the municipal storm sewer system from the development site would be the 5-year pre-development flow rate.

2 EXISTING CONDITIONS

2.1 GENERAL

The site consists of a large area of the vegetated undeveloped lands. To the east of the subject site is Golden Plough Lodge building, Northumberland County Headquarters and parking lots, to the middle of the site is Halcyon Place building and parking lot while to the south limit is a small residential area. Courthouse Road is located within the southwestern part of the site area.

An existing pond hereinafter referred to as “the Pond”, is present directly north of the subject site. An existing ditch at the center of the site extends north from north of Courthouse Road to the northern site boundary, just south of the Pond. Overall, the site is gently sloping downwards to the north. South of the Courthouse Road and southeast part of the site sloping to the south and Elgin Street.

The total drainage area is 7.78 ha. The majority of the site is included in the pond’s catchment area and drains directly to the pond. Pond retrofit drainage area plan and sub-catchments are illustrated in Figure 2 in Appendix H. As shown from Figure 2, run-off from three separate basins C7, C8, and C9 which are part of the site discharge to the pond.

The existing development area is divided into six sub-catchment areas based on the Pond drainage plan and site condition.

Sub-catchment areas are the following:

- Sub-Catchment E1: Existing grass area at the west side of the site. This sub-catchment drains to the pond through the western inlet of the pond (Inlet #1);
- Sub-Catchment E2: The existing Halcyon Place building and the parking lot at the south side of the building. It drains to the existing swale at west of the Halcyon Place building and ultimately outlet to the pond through the south west inlet of the pond (Inlet #2);

- Sub-Catchment E3: The eastern parking lot of the existing Halcyon Place and the existing Golden Plough Ledge building and parking lot which drain to the pond as overland flow and also through inlet #3;
- Sub-Catchment E4: Existing internal roads and parking lot which drains to the pond through Inlet #3 and also a storm sewer which outlet to the north east part pf the pond;
- Sub-Catchment E5: Existing Courthouse Road and existing houses south of Courthouse Road. This area drains to the Elgin Street as surface flow; and
- Sub-Catchment E6: Existing 3-storey building of the Northumberland County Headquarters and parking lot which drain to the Elgin Street and Burnham Street.

The existing sub-catchment areas are summarized in Table 1 below:

Table 1: Area and Runoff Coefficient of Sub-Catchments

Sub-catchment No	Description	Catchment Area (m^2)	Runoff Coefficient	Outlet
E1	Existing Grass Area	15686	0.25	The Pond
E2	Existing Halcyon Place and southern Parking Lot	11324	0.37	The Pond
E3	Existing Golden Plough Ledge and Parking Lot	16085	0.48	The Pond
E4	Existing Internal Roads and Parking Lot	7970	0.52	The Pond
E5	Existing Courthouse Road and Houses	7215	0.47	Elgin Street West
E6	Existing Northumberland County Headquarters and Parking Lot	19537	0.56	Elgin Street West and Burnham Street

Under the existing condition, storm runoff from Sub-Catchments E1, E2, E3, and E4 discharges to the Pond and runoff from Sub-Catchment E5 and E6 drains to the Town's storm sewer network on Elgin Street West and Burnham Street through surface flow and existing catch basins. The current site does not accept any external drainage. Sub-catchment boundaries, overland flow routes, grading and land use details under existing conditions are illustrated in Figure 5 in Appendix L.

2.2 RAINFALL INFORMATION

The rainfall runoff and intensity under existing and proposed conditions are calculated using the following equations:

Rational Formula: $Q = 2.78CIA$ (L/s)

Where: C: runoff coefficient

I: rainfall intensity (mm/hr)

A: drainage area (ha)

IDF Curve Equation: $I = a/(b+T_C)$ (Yarnell Equation)

Where: I: rainfall intensity (mm/hr)

T_C: time of concentration (min)

a, b: parameters

The parameters (a and b) for use in beyond Clarington are defined in Appendix B of the Technical and Engineering Guidelines for Stormwater Management Submission, 2014, GRCA and are summarized below in Table 2.

Table 2: Values of a and c Parameters for the GRCA

Return Period (Year)	2	5	10	25	50	100
a	1778	2464	2819	3886	4750	5588
b	13	16	16	18	24	28

The initial time of concentration, T, of 15 minutes is recommended in section 7.2 of the GRCA document for normal residential and industrial developments.

2.3 PEAK FLOW RATES UNDER EXISTING CONDITIONS

Based on the existing site condition and rainfall parameters, the Rational Method is adopted to calculate peak flows for different design storm events.

The calculated peak flow rates for all sub-catchment areas in the pre-development condition are summarized on the next page in Table 3. Detailed calculations are provided in Appendices A to F.

Table 3: Pre-Development Flow Rates (L/s)

Sub-catchment ID	Description	Pre-Development Flow Rates (L/s)					
		2-year	5-year	10-year	25-year	50-year	100-year
E1	Existing Grass Area	69.2	86.6	99.1	128.3	132.7	141.6
E2	Existing Halcyon Place and southern Parking Lot	74.0	92.7	106.0	137.3	142.0	151.5
E3	Existing Golden Plough Ledge and Parking Lot	135.8	169.9	194.4	251.8	260.4	277.8
E4	Existing Internal Roads and Parking Lot	73.5	92.0	105.2	136.2	140.9	150.4
E5	Existing Courthouse Road and Houses	59.6	74.5	85.3	110.4	114.2	121.9
E6	Existing Northumberland County Headquarters and Parking Lot	193.7	242.5	277.4	359.2	371.5	396.4

2.4 ALLOWABLE FLOW RATE

Sub-catchment E1, E2, E3 and E4

As noted in section 2.1, under existing condition, the storm runoff from Sub-Catchments E1, E2, E3 and E4 discharge to the Pond and are included in the Pond's catchment area and therefore in the Pond size calculations.

The Pond was constructed in early 1997 by Northumberland County in accordance with a development agreement agreed to by Royal Cobourg Centers (Walmart). At the time of design, the Pond was sized based on 65% development coverage.

In May of 2001, GRCA advised that the Pond did not meet the quality and quantity guidelines set by MOEE. Therefore, a retrofit design for the Pond was completed in 2003. The Pond was to be converted to a "wet" facility to provide enhanced quality protection with minimum expansion to the pond footprint. Figure 2 in Appendix H illustrates the drainage area plan of the Pond that was provided in pond retrofit design studies.

The review of the drainage area plan and stormwater calculations of the pond retrofit design shows:

- the Sub-Catchments C7, C8 and C9 on the pond drainage plan as shown in Figure 2 are conform with the pre-development Sub-Catchments E1, E2, E3 and E4 in Figure 5 and the post-development Sub-Catchments P1, P2, P3 and P4 in Figure 6.
- The 75% of imperviousness had been considered for sub-Catchment C7 of the pond retrofit drainage calculations. The calculated 100-year flow is 0.59 m^3/s.

- The 85% of imperviousness had been considered as the future condition of the sub-Catchment C8 the calculated 100-year flow is 0.37 m^3/s.
- The 75% of imperviousness had been considered for sub-catchment C9 for future development condition with a calculated 100-year flow of 0.09 m^3/s.

Therefore, the total design flow from sub-catchment C7, C8 and C9 to the pond considered in pond retrofit design is 1.05 m^3/s. this flow could be considered as maximum allowable discharge flow rate from the development site (Sub-Catchments P1, P2, P3 and P4) to the pond under post-development condition.

Storm drainage area plan and VO model output for pond retrofit design are provided in Appendix H.

Sub-catchment E5

As mentioned in section 2.1, the sub-catchment E5 includes the existing Courthouse Road houses and drains to the Courthouse road and Elgin Street storm sewers as surface flow. In order to maintain the current drainage pattern, the storm flow from this sub-catchment will be discharged existing storm sewers on the Courthouse Road under proposed condition. Therefore, according to the GRCA guidelines, the allowable release rate from this sub-catchment would be 29.8 L/s and 74.5 L/s based on the 50% of 2-year pre-development and 5-year pre-development flow rate respectively.

Sub-catchment E6

Since the sub-catchment E6 will not be changed under pos-development condition, the storm flow rate and drainage pattern will be remained same as the existing condition.

3 POST-DEVELOPMENT CONDITIONS

3.1 GENERAL

Phase 1 of the proposed development consists of the construction of a new 3-storey building of Golden Plough Lodge and County Archives on the west, new parking lots on the north, and a new road and parking lot on the south of the site area. The existing Halcyon Place will remain.

In Phase 2 of the development, the existing Golden Plough Building will be demolished to make way for the roadway. The existing 2-storey building and parking lot at the southeast of the site will remain. Therefore, sub-catchment E6 will remain as-Is.

Based on the proposed site condition, six main sub-catchment areas P1 through P6 are delineated. The propose sub-catchment areas are listed below:

- Sub-Catchment P1: Proposed 3-storey new Golden Plough Lodge and parking lot north of the Lodge;
- Sub-Catchment P2: Existing Halcyon Place building, existing Halcyon Place south Parking Lot and proposed north parking lot;
- Sub-Catchment P3: Proposed new internal roadway;
- Sub-Catchment P4: Existing internal roads and parking lot;

- Sub-Catchment P5: Proposed new parking lot and roadway;

  Due to the proposed retaining wall at the south of the new parking area and the existing grades at the west and south side of the Sub-Catchment P5, it is not feasible to control storm flow from this area. Therefore, Sub-Catchment P5 is further divided into two sub-catchments, P5-1 (over-controlled) and P5-2 (uncontrolled).

- Sub-Catchment P6: Existing 3-storey building of the Northumberland County Headquarters and parking lot.

The existing sub-catchment areas are summarized in Table 4 below:

Table 4: Area and Runoff Coefficient of Sub-Catchments

Sub-catchment ID	Description	Catchment Area (m^2)	Runoff Coefficient	Outlet
P1	New Golden Plough Lodge	16270	0.71	The Pond
P2	Existing Halcyon Place and parking	15140	0.56	The Pond
P3	New internal road and sidewalk	11059	0.44	The Pond
P4	Existing Internal Roads and Parking Lot	7970	0.33	The Pond
P5	New Roadway and Parking Lot	7758	0.58	Courthouse Road & Elgin Street West
P6	Existing Northumberland County Headquarters and Parking Lot	19645	0.56	Elgin Street West and Burnham Street

3.2 PEAK FLOW RATES UNDER PROPOSED CONDITION

Based on the proposed site condition and rainfall parameters, the Rational Method is adopted to calculate peak flows at different design storm events. The calculated peak flow rates for the site area in the post-development condition are summarized in Table 5. Detailed calculations are provided in Appendices A to F.

Table 5: Post-Development Peak Flow Rates (L/s)

Sub-Catchment ID		Description	Post-Development Flow Rates (L/s)					
			2-year	5-year	10-year	25-year	50-year	100-year
P1		New Golden Plough Lodge	203.2	254.4	291.0	376.9	389.8	415.9
P2		Existing Halcyon Place and parking	148.7	186.1	212.9	275.7	285.2	304.3
P3		New internal road and sidewalk	84.9	106.3	121.6	157.5	162.9	173.8
P4		Existing Internal Roads and Parking Lot	46.9	58.7	67.1	87.0	89.9	96.0
P5	P5-1	New Roadway and Parking Lot	52.3	65.4	74.9	96.9	100.3	107.0
	P5-2		27.4	34.3	39.3	50.9	52.6	56.1
P6		Northumberland County Headquarters and parking	195.4	244.6	279.8	362.4	374.8	399.9

3.3 IMPACT ON WATER ENVIRONMENT

Based on the review and analysis for existing and proposed site conditions, Table 6 summarizes the key hydrologic parameters of the site under the existing and the proposed conditions.

Table 6: Key Hydrologic Parameters

Sub-Catchment ID		Imperviousness (%)			Runoff Coefficient		100-year Flow Rate (L/s)	
Pre-Dev	Post-Dev	Pre-Dev	Post-Dev	Pond retrofit Design	Pre-Dev	Post-Dev	Pre-Dev	Post-Dev
E1	P1	0	70	75.0 – 85.0	0.25	0.71	141.6	415.9
E2	P2	19	47		0.37	0.56	151.5	304.3
E3	P3	35	29		0.48	0.44	277.8	173.8
E4	P4	42	13		0.52	0.33	150.4	96.0
E5	P5-1	34	76	N/A	0.47	0.74	121.9	107.0
	P5-2		25			0.41		56.1
E6	P6	48	48	N/A	0.56	0.56	396.4	399.9

As mentioned in section 2.4, comparing of the Pond drainage plan in Figure 2 in Appendix H with site drainage plans in Figure 5 and Figure 6 in Appendix L shows that the Sub-Catchments C7, C8 and C9 on the Pond drainage plan conform with the site sub-catchments E1 to E4 and P1 to P4 under pre and post-development conditions.

As shown in Table 6, for sub-catchment P1, P2, P3 and P4, the proposed imperviousness is lower than the 75% -85% imperviousness which is considered in the Pond's retrofit design. Moreover, the imperviousness, the total runoff flow from Sub-Catchment P1, P2, P3 and P4 is calculated 0.990 m^3/s under post-development condition that is less than 1.05 m^3/s allowable flow rate to the pond as mentioned in section 2.4. Therefore, the Pond can be utilized for water quantity and quality control for sub-catchment P1, P2, P3, and P4 and no more mitigation measures would be required.

Regarding the sub-catchment P5, the site imperviousness, runoff coefficient and runoff flow are increased under post-development condition. Therefore, the mitigation measures are required in accordance with the GRCA's design criteria.

Since the sub-catchment P6 will remain same as the existing condition, the stormwater management mitigation will not be required.

4 PROPOSED SWM PLAN

4.1 WATER QUANTITY CONTROL REQUIREMENT

Sub-catchment P1, P2, P3 and P4: As noted in Section 3.3, since the total 100-year discharge flow from Sub-Catchment P1, P2, P3 and P4 (0.990 m^3/s) is less than calculated 100-year flow rate (1.05 m^3/s) in pond retrofit design study from same drainage area, additional quantity control for Sub-Catchments P1, P2, P3 and P4 will not be required.

Sub-catchment P5: Due to the proposed retaining wall at the south of the new parking area and the existing grades at the west and south side of the Sub-Catchment P5, it is not feasible to control storm flow from this area. Therefore, Sub-Catchment P5 is further divided into two sub-catchments, P5-1 (over-controlled) and P5-2 (uncontrolled). Storm flow from the Sub-Catchment P5-1 will discharge to the existing municipal storm sewer on Courthouse Road. As mentioned in section 2.4, according to the GRCA guidelines, the allowable release rate from this sub-catchment would be 74.5 L/s based on the 5-year pre-development flow rate. Since it is not feasible to control the discharging flow from sub-catchment P5-2 due to existing topography, the allowable release rate for overcontrolled Sub-Catchment P5-1 would be 18.4 L/s which is the the 5-year pre-development flow rate from sub-catchment E5 minus 100-year post development flow from uncontrolled sub-catchment P5-2.

Based on the post-development conditions, the stormwater detention requirements for the sub-catchment P5 at 100-year storm event are estimated in Appendix E, summarized in Table 7.

Table 7: 100-year Stormwater Storage Volumes (m^3)

Sub-Catchment No.	Description	Storage Volume	
		Required	Provided
P5-1	New Roadway and Parking Lot	122.1	125.0

- A total 140.0 m^3 open bottom underground storage tank with 125.3 m^3 detention storage volume (Layfield Brentwood stormtank) within the proposed southern parking lot will be provided to control the stormwater discharge at or below the allowable release rates to the existing municipal storm sewer. According to geotechnical report provided by Golder Associates Ltd dated June 5, 2019, the groundwater level at storage tank location is 105.8m. Therefore, to prevent groundwater flow into the tank and provide a sealed storage, a liner has been considered under and sides of the proposed storm storage tank. To control the discharge flow from the tank, a 85mm orifice plate will be installed at downstream side of the control manhole 9 to control the discharging flow to the Courthouse Road storm sewer under 5- year to 100-year storm events. Orifice calculations and specifications are presented in Appendix E.

Sub-catchment P6: The sub-catchment P6 to remain as-is and therefore, water quantity control will not be required.

4.2 WATER QUALITY CONTROL

The pond is designed as a single cell wet quality/quantity management facility and enhanced level of quality control are provided for Sub-Catchment P1, P2, P3, and P4, the use of water quality treatment is not required. However, since Sub-Catchment P5 does not discharge to the existing pond, water quality treatment is considered to achieve the 80% TSS removal for the proposed development.

Under the post-development conditions, landscape areas will remove TSS from the rainfall runoff. Table 8 provides a preliminary estimate of TSS removal level of stormwater leaving the site

Table 8: TSS Removal Assessment of Study Area

Sub-Catchment	Land Use	Area (m^2)	TSS Removal Efficiency (%)	Composite TSS Removal Efficiency (%)
P5-1	Roadway and Parking lot	3026	0	0.0
	Landscape Area	959	80	19.3
	Jellyfish	3985	80	80.0
	Total	3985	-	>80.0

To achieve a TSS removal of 80%, a StormFilter model SFPD0612 with 18" high cartridges will be installed in downstream of the storage tank. Sizing details, typical drawings and certificate are provided in Appendix E.

4.3 EROSION CONTROL

The erosion control for sub-catchment P1, P2, P3, and P4 are considered as part of the pond retrofit design. Based on the enquiry from GRCA, since runoff from all events from sub-catchment P5 will be discharged to the Town's storm sewer, the retaining of 25mm 4-hour Chicago storm for 24 hours for erosion control will not be required.

5 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

During site construction, it is recommended that all erosion and sediment control Best Management Practices (BMPs) shall be constructed and maintained in accordance with the Greater Golden Horseshoe Area Conservation Authorities' (GGHA CAs) Erosion & Sediment Control Guidelines for Urban Construction (December 2006). In brief, the measures below are proposed to be provided on-site during the entire period of construction:

- Siltation control fence along the perimeter of the construction site before commencement of construction;
- Sediment control measures to prevent silt entry at all the existing catch basins;
- Granular mud-mats at all construction egress locations (see mud-mat details);
- An inspection and monitoring program following the GGHA CA's Erosion and Sediment Control Guidelines for Urban Construction (December 2006).

The above and additional Erosion and Sediment Control measures are summarized in the following Table 9.

Table 9: Erosion and Sediment Control Measures

Activity	Erosion Control Practice
Area Grading	- Construct and maintain entrance "mud-mat". - Construct and maintain silt fencing around the downstream and west side of the site. - Locate stockpiles away from sensitive areas.
Servicing and Asphalt Works	- Limit open trench lengths to minimize erosion potential of excavated material. - Prevent erosion of material stockpiles. - During work stoppages or inclement weather, plug ends of open sewers to prevent downstream sedimentation. - Protect catch basins inlets with filter cloth wrapping.
Maintenance	- Remove accumulated sediments when depth exceeds 0.30m. - Maintain and repair siltation control fencing as required. - Maintain and repair catch basin sediment controls as required.

6 SITE SERVICING

The purpose of this site servicing report is to review the site servicing requirement for the proposed development and propose a site servicing plan, including water supply, sanitary and storm services. Refer to Appendix L and Dwg. C-05 to C-08 - Site Servicing Plan for details of the proposed site service connections.

6.1 EXISTING MUNICIPAL SERVICES

Base on the survey, SUE investigations and Town's records, the existing underground sewers and watermains in the vicinity of the proposed development area include the followings:

Courthouse Road

- a 200mm dia. DI watermain line;
- an 150mm to 200mm dia. PVC sanitary sewer line
- a 300mm dia. storm sewer line.

Elgin Street

- a 300mm dia. PVC watermain line;
- a 250mm dia. PVC sanitary sewer line.
- a 375 mm dia. HDPE storm sewer line;

Strathy Road

- a 300mm dia. PVC watermain line;
- a 250mm dia. PVC sanitary sewer line.
- a 300mm to 375 mm dia. Conc. storm sewer line;

Northwest corner of the site

- a 450mm dia. DI watermain line;
- a 200mm dia. PVC sanitary sewer line.
- a 975mm x 1535mm HECP storm sewer line;

Burnham Street

- a 300mm dia. PVC watermain line;
- a 250mm dia. PVC sanitary sewer line.
- a 300mm to 450 mm dia. Conc. storm sewer line;

6.2 PROPOSED SITE SERVICE CONNECTIONS

Design Parameters

The sanitary demands for the proposed site are based on the following Town of Cobourg design guidelines:

- Sanitary demand rate of 364 L/person/day for new residential development;
- Population densities of 1.61 person/bed for185 bed. According to the coordination with Town of Cobourg, each bed has been considered as a single bed apartment and Durham Region criteria for population density has been followed;
- Infiltration Allowance of 22.5 m^3/gross/ha/day (0.26 L/s/ha); and,
- Peaking Factor based on the Harmon Equation.

The domestic water demands for the proposed site are based on the following criteria:

- Water demand rate of (180-1500) L/capita/day for household.
- Population densities of 1.61 person/bed (185 bed);

- Peaking Factor for drinking-water systems serving fewer than 500 people– 5.4 (Peak Hour) and 3.6 (Maximum Day).

The demand and peaking factors are based on the Ministry of Environment *Design Guidelines for Drinking-Water Systems, 2008,* Section 3.4.5.1.

Based on the design criteria and project statistics of proposed development provided by the architect, sanitary flow and water demand are estimated in Appendix I and summarized below in Table 10. Storm flow discharge rates have been provided in the previous section of this report.

Table 10: Site Servicing Requirement

Building	Sanitary Flow Rate(L/s)		Water Demand (L/s)
	Town Criteria	Ontario Building Code	
New Golden Plough Lodge	5.08	13.25 *	184.8

*The sanitary flow rate for all fixtures calculated by design team mechanical engineer based on the Ontario Building Code and will be 13.25 L/s for the proposed development.

Through discussion with the design team mechanical engineer, the locations and sizes of the proposed site service connections for new Golden Plough Lodge building have been determined to satisfy the requirements of the Town of Cobourg and Northumberland County. In summary:

Storm Service: as mentioned in section 4.1, sub-catchment P1 to P4 will be discharged to the existing pond and sub-catchment P5 will be connected to the towns storm sewer system:

- Sub-catchment P1: A 525mm concrete storm service will be installed in the northwest of the site, outlet to the Pond trough the Pond inlet 1. A headwall and flap gate and riprap protection have been considered at the pipe outlet.
- Sub-catchment P2: A 450mm concrete storm service will be installed in the proposed northern parking lot and discharge to the pond through the pond inlet 2. the existing 500mm CSP culvert to be replaced with new 450mm concrete pipe. A headwall and flap gate will be installed at the outlet of the pipe.
- Sub-catchment P3 and P4: same as the existing condition, a part of the storm runoff from these two sub-catchments will be discharge to the Pond as a surface flow. the rest of the stomwater will be captured by proposed catch basins and ultimately discharge to the Pond through a new inlet at the southeast of the Pond. A proposed 450mm Concrete storm pipe with a headwall and flap gate and riprap protection will be installed to provide storm service.
- Sub-catchment P5-1: a 250mm PVC storm service connection will be installed in the southern parking lot and connected to the proposed manhole number 5 and discharged to the existing 300mm storm sewer on the Courthouse Road.

Proposed storm pipe size calculations are provided in Appendix G.

Sanitary Service: Based on the mechanical design, a 200mm pipe will be required to provide servicing to the proposed building. According to the discussion with Town of Cobourg, a 200mm PVC sanitary pipe will be installed within the site to convey the sanitary flow from north of the proposed building to the south of the

site and connected to existing 200mm sanitary sewer in Courthouse road to provide sanitary service to the proposed development. The total length of the proposed sanitary service is 300m.

Water Services: Under the proposed condition, a watermain loop has been proposed to provide connection between the existing 200mm watermain in Courthouse Road, 300mm watermain in Burnham Street and 450mm watermain in northwest corner of the site. for this purpose, two new 200mm PVC watermain will be installed along the west of the new building and east of the existing Halcyon Place building. A part of this loop is in conflict with the existing Golden Plough Lodge building which will be installed to complete the loop after demolition of the building in the final construction stage.

The proposed water service connection of the new building includes:

- Domestic Water Service: A new 150mm PVC domestic water service connection will be installed at the north side to service the proposed building and connected to the proposed 200mm fire protection service with a cut-in Tee.
- Fire Protection Service: A new 200mm PVC water service will be installed and connect to the proposed 200mm PVC watermain loop.

Refer to Dwg. C-05 to C-08-site servicing plan in Appendix L for details of proposed service connections.

6.3 ASSESSMENT OF EXISTING MUNICIPAL SERVICE

The capacity of existing municipal watermains and sewers shall be reviewed based on the site servicing requirement, sewer model and hydrant flow test data.

6.3.1 Adequacy of Existing Sanitary Sewers

To review the capacity of the existing sanitary sewers, a downstream capacity analysis has been undertaken for the existing sanitary sewer along Courthouse Road and Elgin Street from the proposed sanitary service connection point at south of the site to Elgin Street and Burnham Street intersection at southeast corner of the site. The analysis was carried out using both design sheet and Autodesk Storm and Sanitary Analysis (SSA) through:

- Delineating sanitary servicing areas boundary based on the Town's drainage area plan provided in "Development Area B Conceptual servicing report, dated 2000" and google maps;
- Identifying types of existing properties within the servicing areas;
- Estimating gross floor area (GFA) of the buildings and their respective populations based on the information provided by County or online information;
- Estimating drainage areas; and
- Estimating sanitary design flow rates.

The sanitary sewer demand for the downstream condition are assessed based on the following Town of Cobourg and MOE design criteria:

- Sanitary demand rate of 112 m^3/gross ha/day including infiltration and peaking factor effect for institutions uses;
- Sanitary demand rate of maximum 5.0 L/day based on the total floor area for commercial uses (shopping centre);
- Population densities of 1.61 person/bed for healthcare buildings;
- Sanitary demand rate of 364 L/person/day for new residential development
- Infiltration Allowance of 22.5 m^3/gross/ha/day (0.26 L/s/ha); and,
- Peaking Factor based on the Harmon Equation.

At the beginning of the analysis, Town's GIS information of existing sewers along Courthouse Road and Elgin Street are reviewed to determine the servicing boundary and to obtain information about the existing sewers. The SSA combined sewer models are then set up based on pipe length, pipe diameters, pipe inverts provided in the survey and SUE drawings. Refer to Figure 4 and Figure 5 in Appendix J for details.

Sanitary flows which are estimated based on the criteria listed above and also based on the Ontario Building Code by mechanical engineer, are assigned to each individual manhole as a fixed rate for both existing and proposed conditions. Hydraulic analyses are successfully undertaken through SSA for each scenario. Refer to Appendix J for calculation design sheet and detail SSA model output.

Table 11 on the next page summarizes the sanitary flows for the sanitary sewers within the drainage boundary in the pre- and post-development conditions.

Table 11: Sanitary Flow Analysis Summary

Street	Sewer Leg		Pipe Size (mm)	Full Flow Capacity (L/s)	Ex. San Flow (L/s)	Prop. San Flow (L/s)		Spare Flow Capacity Remained (L/s)		
								Ex.	Prop.	
	From	To				Town Criteria	OBC		Town Criteria	OBC
Courthouse Road										
Courthouse Rd.	MH 5	MH 8	150	36.08	1.32	1.32	1.32	34.76	34.76	34.76
Courthouse Rd.	MH 8	MH 93	200	63.66	1.32	6.40	15.01	62.34	57.26	48.65
Elgin Street										
Elgin St.	MH 94	MH 93	250	57.66	18.27	18.27	18.27	39.38	39.38	39.38
Elgin St.	MH 93	MH 91	250	79.12	21.47	26.55	35.16	57.64	52.56	43.95
Elgin St.	MH 91	MH 61	250	79.78	21.47	26.55	35.16	58.31	52.23	44.62
Burnham Street										
Burnham St.	North	MH 61	250	106.38	22.63	18.74	18.74	83.75	87.64	87.64
Burnham St.	MH 61	South	250	107.04	44.10	45.29	53.90	62.94	61.75	53.14

As shown in Table 11, there is an increase in discharge rate for all sewers in downstream of the connection point in Courthouse Road and Elgin Street under the post-development condition.

Furthermore, the sanitary flow of the Burnham Street sewers will be decreased after demolition of the existing Golden Plough Lodge building under proposed condition.

Although an increase in flow is observed for sewers in the post-development condition, all sewers have spare flow capacity to accommodate the increase in sanitary discharge for both Town criteria and OBC methods. Therefore, the existing sanitary sewer system can accommodate the proposed development under post-development condition.

6.3.2 Adequacy of Existing Storm Sewers

Since under proposed conditions, sub-catchment P5 will be the only area of the site that outlet to the Town's storm sewers, calculations are undertaken to compare the discharge flow rates under both existing and proposed conditions in Appendix E. The existing and proposed discharge flow rates are summarized in Table 12.

Table 12: Discharging Flow Rates Comparison to the Courthouse Road (Elgin St.) Sewer

Sub-Catchment ID		Description	Post-Development Flow Rates (L/s)					
			2-year	5-year	10-year	25-year	50-year	100-year
E4		Existing Condition	59.6	74.5	85.3	110.4	114.2	121.9
P5	P5-1	Proposed Condition	11.7	12.9	13.7	15.7	16.4	18.4
	P5-2		27.4	34.3	39.3	50.9	52.6	56.1
	Total		39.1	47.2	53.0	66.6	69.0	74.5

Table 12 shows that with the implementation of the stromwater management plan, the discharge flow to the 300mm storm sewer on Courthouse Road will decrease by 27.7% for 5-year storm event under post-development condition. Therefore, the proposed development will not contravene Ministry of Environment Procedure F-5-5.

6.3.3 Adequacy of Existing Water mains

In order to evaluate the adequacy of the existing watermain located on Strathy Road and Elgin Street, two hydrant flow tests were conducted by Classic Fire Protection on June 18th, 2019. Test results are included in Appendix K.

Elgin Street: As shown by the test readings on Elgin Street, the available water pressure ranges from 78 psi with a flow of 984.6 US GPM to 72 psi with a flow of 1460.4 US GPM during the flow test with a static pressure of 82 psi. At the design water demand of 184.8 L/s (or 2928.7 US GPM) generated from the proposed site, the extrapolated flow test results show a residual pressure of 40.9 psi, which is greater than the minimum

requirement of 20 psi (150 kPa). Therefore, adequate water supply and pressure are available to serve the proposed site.

Strathy Road: As shown by the test readings on Strathy Avenue, the available water pressure ranges from 65 psi with a flow of 1008.9 US GPM to 59 psi with a flow of 1493.2 US GPM during the flow test with a static pressure of 75 psi. At the design water demand of 184.8 L/s (or 2928.7 US GPM) generated from the proposed site, the extrapolated flow test results show a residual pressure of 19.4 psi, which is less than the minimum requirement of 20 psi (150 kPa). A reason for this low pressure is this fact that, the water tower east of Strathy Road has been under maintenance in time of the conducting of the pressure test and affected the flow test data and pressure has been lower than the real pressure. It was confirmed with the Town staff on site that water pressure will increase once the water tower is tied back into the system. Furthermore, the other connection to the Elgin Street can provide the adequate pressure in the proposed watermain loop.

7 CONCLUSIONS

7.1 STORMWATER MANAGEMENT PLAN

- Water Quantity: On-site storage volume of approximately 125 m^3 will be required in order to control all flow to 5-year pre-development level for sub-catchment P5-1. Underground stormwater storage is proposed for sub-catchment P5-1 to satisfy the on-site storage requirement as shown on Dwg. C-08 in Appendix L. For the stormwater storage tank drawings and details refer to Appendix E.
- Water Quality: To satisfy the MOE's 80% TSS removal, a StormFilter unit is required for Sub-catchment P5-1. details of the proposed Jellyfish unit are shown in Appendix E.

Temporary Erosion and Sediment Control during Construction

- Temporary erosion and sediment control measures should be provided before construction and maintained during construction in accordance with the GGHA CA's Erosion & Sediment Control Guidelines for Urban Construction and other requirements.

7.2 SITE SERVICING REQUIREMENT

- Storm Service: as mentioned in section 4.1, sub-catchment P1, P2, P3 and P4 will be discharged to the existing pond. For sub-catchment P5, A 250mm dia. PVC storm service connection will be installed in the southern parking lot and connected to the existing 300m storm sewer on the Courthouse Road.
- Sanitary Service: A proposed 200mm PVC sanitary service connection will be installed from north of the proposed building and conveyed flow to the south and ultimately connected to the existing 200mm PVC sanitary sewer in Courthouse road through a proposed manhole.
- Water Services: New water service for the proposed building will consist of a 150mm domestic water and a 200mm fire service connection. The total water demand for the development is 184.8 L/s (or 2928.7 USGPM).

Prepared By:

LEA Consulting Ltd.

Farshid Morshedi, P.Eng.
Water Resources Engineer

APPENDIX A

Stormwater Peak Flow Calculations Sub-Catchment E1 and P1

LEA Consulting Ltd. Consulting Engineers and Planners	Land Use			
	Prepared:	F.M.	Page No.	A-01
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E1(Pre-Dev) & P1(Post-Dev),Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

EXISTING CONDITIONS:

Sub-Catchment E1

Existing Land Use	Area (m^2)
Vegetated Area	15686
Total Sub-Catchment Area:	**15686**

PROPOSED DEVELOPMENT:

Sub-Catchment P1

Proposed Land Use	Area (m^2)
Building	5541
Green Roof	1192
Paved Area	5926
Landscaped Area	3611
Total Area:	**16270**

LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation			
	Prepared:	F.M.	Page No.	A-02
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E1(Pre-Dev) & P1(Post-Dev),Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Pre-Development Composite Runoff Coefficient "C"

Land Use	Area (ha)	C	Composite "C"
Landscaped Area	1.569	0.25	
Total Sub-Catchment Area:	**1.569**		**0.25**
Imperviousness:			**0.00**

Post-Development Composite Runoff Coefficient "C"

Land Use	Area (ha)	C	Composite "C"
Building	0.554	0.90	
Green Roof	0.119	0.25	
Paved Area	0.593	0.90	
Landscaped Area	0.361	0.25	
Total Area:	**1.627**		**0.71**
Imperviousness:			**0.70**

LEA Consulting Ltd. Consulting Engineers and Planners	Pre-Development Peak Flow Rates Calculation			
	Prepared:	F.M.	Page No.	A-03
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E1(Pre-Dev) & P1(Post-Dev),Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Rational Formulae: Q = 2.78 CIA (L/s)

Site Area:	1.569	ha
Time of Concentration:	15	minutes as per GRCA Guidelines
Runoff Coefficient :	0.25	Pre-development condition

Rainfall Intensity: $I = a/(b+T^{c)}$ (GRCA Criteria)

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under existing site conditions (L/s):	69.2	86.6	99.1	128.3	132.7	141.6

LEA Consulting Ltd. Consulting Engineers and Planners	Post-Development Peak Flow Rates Calculation			
	Prepared:	F.M.	Page No.	A-04
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E1(Pre-Dev) & P1(Post-Dev),Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Rational Formulae: Q = 2.78 CIA (L/s)

Overcontrolled Area:	1.627	ha
Time of Concentration:	15	minutes as per GRCA Guidelines
Runoff Coefficient :	0.71	Pre-development condition

Rainfall Intensity: $I = a/(b+T^{c)}$ (GRCA Criteria)

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under existing site conditions (L/s):	203.2	254.4	291.0	376.9	389.8	415.9

APPENDIX B

Stormwater Peak Flow Calculations Sub-Catchment E2 and P2

LEA Consulting Ltd. Consulting Engineers and Planners	Land Use			
	Prepared:	F.M.	Page No.	B-01
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E2 (Pre-Deve) & P2 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

EXISTING CONDITIONS:

Sub-Catchment E2

Existing Land Use	Area (m^2)
Building	1352
Paved area	748
Vegetated Area	9224
Total Sub-Catchment Area:	**11324**

PROPOSED DEVELOPMENT:

Sub-Catchment P2

Proposed Land Use	Area (m^2)
Building	1352
Paved Area	5793
Landscaped Area	7995
Total Sub-Catchment Area:	**15140**

LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation			
	Prepared:	F.M.	Page No.	B-02
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment C2 (Pre-Deve) & P2 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Pre-Development Composite Runoff Coefficient "C"

Land Use	Area (ha)	C	Composite "C"
Building	0.135	0.90	
Paved area	0.075	0.90	
Vegetated Area	0.922	0.25	
Total Sub-Catchment Area:	**1.132**		**0.37**
Imperviousness Percent:			**0.19**

Post-Development Composite Runoff Coefficient "C"

Land Use	Area (ha)	C	Composite "C"
Building	0.135	0.90	
Paved Area	0.579	0.90	
Landscaped Area	0.800	0.25	
Total Sub-Catchment Area:	**1.514**		**0.56**
Imperviousness Percent:			**0.47**

LEA Consulting Ltd. Consulting Engineers and Planners	Pre-Development Peak Flow Rates Calculation			
	Prepared:	F.M.	Page No.	B-03
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E2 (Pre-Deve) & P2 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Rational Formulae: Q = 2.78 CIA (L/s)

Site Area:	1.132	ha
Time of Concentration:	15	minutes as per GRCA Guidelines
Runoff Coefficient :	0.37	Pre-development condition

Rainfall Intensity: $I = a/(b+T^{c)}$ (GRCA Criteria)

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under existing site conditions (L/s):	74.0	92.7	106.0	137.3	142.0	151.5

LEA Consulting Ltd. Consulting Engineers and Planners	Post-Development Peak Flow Rates Calculation			
	Prepared:	F.M.	Page No.	B-04
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E2 (Pre-Deve) & P2 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Rational Formulae: Q = 2.78 CIA (L/s)

Site Area:	1.514	ha
Time of Concentration:	15	minutes as per GRCA Guidelines
Runoff Coefficient :	0.56	Pre-development condition

Rainfall Intensity: $I = a/(b+T^{c)}$ (GRCA Criteria)

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under existing site conditions (L/s):	148.7	186.1	212.9	275.7	285.2	304.3

APPENDIX C

Stormwater Peak Flow Calculations Sub-Catchment E3 and P3

LEA Consulting Ltd. Consulting Engineers and Planners	Land Use			
	Prepared:	F.M.	Page No.	C-01
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E3(Pre-Dev) & P3(Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

EXISTING CONDITIONS:

Sub-Catchment E3

Existing Land Use	Area (m^2)
Building	5310
Paved area	344
Vegetated Area	10431
Total Sub-Catchment Area:	**16085**

PROPOSED DEVELOPMENT:

Sub-Catchment P3

Proposed Land Use	Area (m^2)
Road	2115
Sidewalk	1038
Landscaped Area	7906
Total Sub-Catchment Area:	**11059**

LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation			
	Prepared:	F.M.	Page No.	C-02
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E3(Pre-Dev) & P3(Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Pre-Development Composite Runoff Coefficient "C"

Land Use	Area (ha)	C	Composite "C"
Building	0.531	0.90	
Paved area	0.034	0.90	
Vegetated Area	1.043	0.25	
Total Sub-Catchment Area:	**1.609**		**0.48**
Imperviousness Percent:			**0.35**

Post-Development Composite Runoff Coefficient "C"

Land Use	Area (ha)	C	Composite "C"
Road	0.212	0.90	
Sidewalk	0.104	0.90	
Landscaped Area	0.791	0.25	
Total Sub-Catchment Area:	**1.106**		**0.44**
Imperviousness Percent:			**0.29**

LEA Consulting Ltd. Consulting Engineers and Planners	Pre-Development Peak Flow Rates Calculation			
	Prepared:	F.M.	Page No.	C-03
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E3(Pre-Dev) & P3(Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Rational Formulae: Q = 2.78 CIA (L/s)

Site Area:	1.609	ha
Time of Concentration:	15	minutes as per GRCA Guidelines
Runoff Coefficient :	0.48	Pre-development condition

Rainfall Intensity: $I = a/(b+T^{c)}$ (GRCA Criteria)

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under existing site conditions (L/s):	135.8	169.9	194.4	251.8	260.4	277.8

LEA Consulting Ltd. Consulting Engineers and Planners	Post-Development Peak Flow Rates Calculation			
	Prepared:	F.M.	Page No.	C-04
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E3(Pre-Dev) & P3(Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Rational Formulae: Q = 2.78 CIA (L/s)

Site Area:	1.106	ha
Time of Concentration:	15	minutes as per GRCA Guidelines
Runoff Coefficient :	0.44	Post-development condition

Rainfall Intensity: $I = a/(b+T^{c)}$ (GRCA Criteria)

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under proposed site conditions (L/s):	84.9	106.3	121.6	157.5	162.9	173.8

APPENDIX D

Stormwater Peak Flow Calculations Sub-Catchment E4 and P4

LEA Consulting Ltd. Consulting Engineers and Planners	Land Use			
	Prepared:	F.M.	Page No.	F-01
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E4(Pre-Dev) & P4(Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

EXISTING CONDITIONS:

Sub-Catchment E4

Existing Land Use	Area (m^2)
Building	0
Paved area	3342
Vegetated Area	4628
Total Sub-Catchment Area:	**7970**

PROPOSED DEVELOPMENT:

Sub-Catchment P4

Proposed Land Use	Area (m^2)
Road	534
Sidewalk	490
Landscaped Area	6946
Total Sub-Catchment Area:	**7970**

LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation			
	Prepared:	F.M.	Page No.	F-02
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E4(Pre-Dev) & P4(Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Pre-Development Composite Runoff Coefficient "C"

Land Use	Area (ha)	C	Composite "C"
Building	0.000	0.90	
Paved area	0.334	0.90	
Vegetated Area	0.463	0.25	
Total Sub-Catchment Area:	**0.797**		**0.52**
Imperviousness Percent:			**0.42**

Post-Development Composite Runoff Coefficient "C"

Land Use	Area (ha)	C	Composite "C"
Road	0.053	0.90	
Sidewalk	0.049	0.90	
Landscaped Area	0.695	0.25	
Total Sub-Catchment Area:	**0.797**		**0.33**
Imperviousness Percent:			**0.13**

LEA Consulting Ltd. Consulting Engineers and Planners	Pre-Development Peak Flow Rates Calculation			
	Prepared:	F.M.	Page No.	F-03
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E4(Pre-Dev) & P4(Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Rational Formulae: Q = 2.78 CIA (L/s)

Site Area:	0.797	ha
Time of Concentration:	15	minutes as per GRCA Guidelines
Runoff Coefficient :	0.52	Pre-development condition

Rainfall Intensity: $I = a/(b+T^{c)}$ (GRCA Criteria)

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under existing site conditions (L/s):	73.5	92.0	105.2	136.2	140.9	150.4

LEA Consulting Ltd. Consulting Engineers and Planners	Post-Development Peak Flow Rates Calculation			
	Prepared:	F.M.	Page No.	F-04
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E4(Pre-Dev) & P4(Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Rational Formulae: Q = 2.78 CIA (L/s)

Site Area:	0.797	ha
Time of Concentration:	15	minutes as per GRCA Guidelines
Runoff Coefficient :	0.33	Pre-development condition

Rainfall Intensity: $I = a/(b+T^{c)}$ (GRCA Criteria)

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under proposed site conditions (L/s):	46.9	58.7	67.1	87.0	89.9	96.0

APPENDIX E

Stormwater Peak Flow and Storage Calculations Sub-Catchment E5 and P5

LEA Consulting Ltd. Consulting Engineers and Planners	Land Use			
	Prepared:	F.M.	Page No.	E-1
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E5 (Pre-Dev) & P5 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

EXISTING CONDITIONS:

Sub-Catchment E5

Existing Land Use	Area (m^2)
Building	400
Paved area	2019
Vegetated Area	4796
Total Sub-Catchment Area:	**7215**

PROPOSED DEVELOPMENT:

Sub-Catchment P5-1 Over-controlled Area

Proposed Land Use	Area (m^2)
Paved Area	3026
Landscaped Area	959

LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation			
	Prepared:	F.M.	Page No.	E-2
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E5(Pre-Dev) & P5(Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Pre-Development Composite Runoff Coefficient "C"

Sub-Catchment E5

Land Use	Area (ha)	C	Composite "C"
Building	0.040	0.90	
Paved area	0.202	0.90	
Vegetated Area	0.480	0.25	
Total Sub-Catchment Area:	**0.722**		**0.47**
Imperviousness:			**0.34**

Post-Development Composite Runoff Coefficient "C"

Sub-Catchment P5-1 Over-controlled Area

Land Use	Area (ha)	C	Composite "C"
Paved Area	0.303	0.90	
Landscaped Area	0.096	0.25	

LEA Consulting Ltd. Consulting Engineers and Planners	Pre-Development Peak Flow Rates Calculation			
	Prepared:	F.M.	Page No.	E-3
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E5 (Pre-Dev) & P5 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Rational Formulae: Q = 2.78 CIA (L/s)

Site Area:	0.722	ha
Time of Concentration:	15	minutes as per GRCA Guidelines
Runoff Coefficient :	0.47	Pre-development condition

Rainfall Intensity: $I = a/(b+T^{c)}$ (GRCA Criteria)

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under existing site conditions (L/s):	59.6	74.5	85.3	110.4	114.2	121.9

Due to the proposed retaining wall at the south of the new parking area and the existing grades at the west and south side of the Sub-Catchment P5, it is not feasible to control storm flow from sub-catchment P5-2 therefore, flow from sub-catchment P5-1 to be overcontrolled.

Allowable discharge rate from sub-catchment E5 @ 5yr storm: 74.5 L/s
100yr discharge rate from Sub-Catchment E5-2 Uncontrolled Area: 56.1 L/s
Allowable 100yr discharge rate from sub-Catchment E1-1 Over-controlled Area: 18.4 L/s

LEA Consulting Ltd. Consulting Engineers and Planners	Post-Development Peak Flow Rates Calculation			
	Prepared:	F.M.	Page No.	E-4
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E5 (Pre-Dev) & P5 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Rational Formulae: Q = 2.78 CIA (L/s)

Overcontrolled Area:	0.399	ha
Time of Concentration:	15	minutes as per GRCA Guidelines
Runoff Coefficient :	0.74	Pre-development condition
Uncontrolled Area:	0.377	
Time of Concentration:	15	
Runoff Coefficient :	0.41	

Rainfall Intensity: $I = a/(b+T^{c)}$ (GRCA Criteria)

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Sub-Catchment P5-1 Over-controlled Area
Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under proposed site conditions (L/s):	52.3	65.4	74.9	96.9	100.3	107.0

Sub-Catchment P5-2 Uncontrolled Area
Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under proposed site conditions (L/s):	27.4	34.3	39.3	50.9	52.6	56.1

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (2-Year Storm)			
	Prepared:	F.M.	Page No.	E-5
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E5 (Pre-Dev) & P5 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Total Drainage Area (ha) = 0.399 ha
Drainage Area Composite C = 0.74
Allowable Release Rate (5-year) = 18.41 L/s
Return Period = 2 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m^3)	Release Rate (L/s)	Release Flow Volume (m^3)	Required Storage Volume (m^3)
15	63.50	52.27	47.04	18.41	16.57	30.47
17	59.27	48.79	49.76	18.41	18.78	30.98
32	39.51	32.52	62.45	18.41	35.35	27.10
47	29.63	24.39	68.79	18.41	51.92	16.87
62	23.71	19.51	72.59	18.41	68.50	4.09
77	19.76	16.26	75.13	18.41	85.07	-9.94
92	16.93	13.94	76.94	18.41	101.64	-24.70
107	14.82	12.20	78.30	18.41	118.21	-39.91
122	13.17	10.84	79.36	18.41	134.78	-55.42
137	11.85	9.76	80.20	18.41	151.35	-71.15
152	10.78	8.87	80.90	18.41	167.92	-87.02
167	9.88	8.13	81.47	18.41	184.50	-103.03
182	9.12	7.51	81.96	18.41	201.07	-119.11
197	8.47	6.97	82.38	18.41	217.64	-135.26
212	7.90	6.50	82.74	18.41	234.21	-151.47
227	7.41	6.10	83.06	18.41	250.78	-167.72

Required Storage Volume = 30.98 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (5-Year Storm)			
	Prepared:	F.M.	Page No.	E-6
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E5 (Pre-Dev) & P5 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Total Drainage Area (ha) = 0.399 ha
Drainage Area Composite C = 0.74
Allowable Release Rate (5-year) = 18.41 L/s Overcontrolled
Return Period = 5 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m^3)	Release Rate (L/s)	Release Flow Volume (m^3)	Required Storage Volume (m^3)
15	79.48	65.43	58.89	18.41	16.57	42.32
17	74.67	61.46	62.69	18.41	18.78	43.91
19	70.40	57.95	66.06	18.41	20.99	45.07
21	66.59	54.82	69.07	18.41	23.20	45.87
23	63.18	52.01	71.77	18.41	25.41	46.36
25	60.10	49.47	74.21	18.41	27.62	46.59
27	57.30	47.17	76.41	18.41	29.83	46.58
29	54.76	45.07	78.43	18.41	32.04	46.39
31	52.43	43.15	80.27	18.41	34.25	46.02
33	50.29	41.39	81.96	18.41	36.46	45.50
35	48.31	39.77	83.52	18.41	38.67	44.85
37	46.49	38.27	84.96	18.41	40.88	44.08
39	44.80	36.88	86.29	18.41	43.09	43.20
41	43.23	35.58	87.54	18.41	45.30	42.24
43	41.76	34.38	88.69	18.41	47.51	41.18
45	40.39	33.25	89.78	18.41	49.71	40.07
47	39.11	32.19	90.79	18.41	51.92	38.87
49	37.91	31.20	91.74	18.41	54.13	37.61
51	36.78	30.27	92.63	18.41	56.34	36.29

Required Storage Volume = 46.59 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (10-Year Storm)			
	Prepared:	F.M.	Page No.	E-7
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E5 (Pre-Dev) & P5 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Total Drainage Area (ha) = 0.399 ha
Drainage Area Composite C = 0.74
Allowable Release Rate (5-year) = 18.41 L/s Overcontrolled
Return Period = 10 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m^3)	Release Rate (L/s)	Release Flow Volume (m^3)	Required Storage Volume (m^3)
15	90.94	74.85	67.37	18.41	16.57	50.80
17	85.42	70.32	71.72	18.41	18.78	52.94
19	80.54	66.30	75.58	18.41	20.99	54.59
21	76.19	62.72	79.02	18.41	23.20	55.82
23	72.28	59.50	82.11	18.41	25.41	56.70
25	68.76	56.60	84.90	18.41	27.62	57.28
27	65.56	53.97	87.42	18.41	29.83	57.59
29	62.64	51.57	89.73	18.41	32.04	57.69
31	59.98	49.37	91.83	18.41	34.25	57.58
33	57.53	47.36	93.77	18.41	36.46	57.31
35	55.27	45.50	95.55	18.41	38.67	56.88
37	53.19	43.78	97.20	18.41	40.88	56.32
39	51.25	42.19	98.73	18.41	43.09	55.64
41	49.46	40.71	100.15	18.41	45.30	54.85
43	47.78	39.33	101.47	18.41	47.51	53.96
45	46.21	38.04	102.71	18.41	49.71	53.00
47	44.75	36.83	103.87	18.41	51.92	51.95
49	43.37	35.70	104.96	18.41	54.13	50.83
51	42.07	34.63	105.98	18.41	56.34	49.64

Required Storage Volume = 57.69 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (25-Year Storm)			
	Prepared:	F.M.	Page No.	E-8
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E5 (Pre-Dev) & P5 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Total Drainage Area (ha)	= 0.399	ha	
Drainage Area Composite C	= 0.74		
Allowable Release Rate (5-year)	= 18.41	L/s	Overcontrolled
Return Period	= 25	Year	

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m^3)	Release Rate (L/s)	Release Flow Volume (m^3)	Required Storage Volume (m^3)
15	117.76	96.93	87.24	18.41	16.57	70.67
17	111.03	91.39	93.22	18.41	18.78	74.44
19	105.03	86.45	98.56	18.41	20.99	77.57
21	99.64	82.02	103.35	18.41	23.20	80.15
23	94.78	78.02	107.67	18.41	25.41	82.26
25	90.37	74.39	111.59	18.41	27.62	83.97
27	86.36	71.08	115.16	18.41	29.83	85.33
29	82.68	68.06	118.42	18.41	32.04	86.38
31	79.31	65.28	121.42	18.41	34.25	87.17
33	76.20	62.72	124.19	18.41	36.46	87.73
35	73.32	60.35	126.75	18.41	38.67	88.08
37	70.65	58.16	129.12	18.41	40.88	88.24
39	68.18	56.12	131.32	18.41	43.09	88.23
41	65.86	54.22	133.37	18.41	45.30	88.07
43	63.70	52.44	135.29	18.41	47.51	87.78
45	61.68	50.77	137.09	18.41	49.71	87.38
47	59.78	49.21	138.78	18.41	51.92	86.86
49	58.00	47.74	140.37	18.41	54.13	86.24
51	56.32	46.36	141.86	18.41	56.34	85.52

Required Storage Volume = 88.24 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (50-Year Storm)			
	Prepared:	F.M.	Page No.	E-9
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E5 (Pre-Dev) & P5 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Total Drainage Area (ha) = 0.399 ha

Drainage Area Composite C = 0.74

Allowable Release Rate (5-year) = 18.4 L/s Overcontrolled

Return Period = 50 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m^3)	Release Rate (L/s)	Release Flow Volume (m^3)	Required Storage Volume (m^3)
15	121.79	100.26	90.23	18.41	16.57	73.66
17	115.85	95.37	97.27	18.41	18.78	78.49
19	110.47	90.93	103.66	18.41	20.99	82.67
21	105.56	86.89	109.48	18.41	23.20	86.28
23	101.06	83.19	114.80	18.41	25.41	89.39
25	96.94	79.80	119.69	18.41	27.62	92.07
27	93.14	76.67	124.20	18.41	29.83	94.37
29	89.62	73.77	128.37	18.41	32.04	96.33
31	86.36	71.09	132.23	18.41	34.25	97.98
33	83.33	68.60	135.82	18.41	36.46	99.36
35	80.51	66.27	139.17	18.41	38.67	100.50
37	77.87	64.10	142.30	18.41	40.88	101.42
39	75.40	62.06	145.23	18.41	43.09	102.14
41	73.08	60.15	147.98	18.41	45.30	102.68
43	70.90	58.36	150.57	18.41	47.51	103.06
45	68.84	56.67	153.00	18.41	49.71	103.29
47	66.90	55.07	155.30	18.41	51.92	103.38
49	65.07	53.56	157.47	18.41	54.13	103.34
51	63.33	52.13	159.53	18.41	56.34	103.19
53	61.69	50.78	161.48	18.41	58.55	102.93
55	60.13	49.49	163.33	18.41	60.76	102.57
57	58.64	48.27	165.09	18.41	62.97	102.12

Required Storage Volume = 103.38 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (100 - Year Storm)			
	Prepared:	F.M.	Page No.	E-10
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E5 (Pre-Dev) & P5 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Total Drainage Area (ha) = 0.399 ha
Drainage Area Composite C = 0.74
Allowable Release Rate (5-year) = 18.41 L/s Overcontrolled
Return Period = 100 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m^3)	Release Rate (L/s)	Release Flow Volume (m^3)	Required Storage Volume (m^3)
15	129.95	106.97	96.28	18.41	16.57	79.71
17	124.18	102.22	104.26	18.41	18.78	85.48
19	118.89	97.87	111.57	18.41	20.99	90.58
21	114.04	93.87	118.28	18.41	23.20	95.08
23	109.57	90.19	124.47	18.41	25.41	99.06
25	105.43	86.79	130.18	18.41	27.62	102.56
27	101.60	83.63	135.49	18.41	29.83	105.66
29	98.04	80.70	140.42	18.41	32.04	108.38
31	94.71	77.96	145.01	18.41	34.25	110.76
33	91.61	75.41	149.31	18.41	36.46	112.85
35	88.70	73.01	153.33	18.41	38.67	114.66
37	85.97	70.77	157.10	18.41	40.88	116.22
39	83.40	68.65	160.65	18.41	43.09	117.56
41	80.99	66.66	163.99	18.41	45.30	118.69
43	78.70	64.79	167.15	18.41	47.51	119.64
45	76.55	63.01	170.13	18.41	49.71	120.42
47	74.51	61.33	172.95	18.41	51.92	121.03
49	72.57	59.74	175.63	18.41	54.13	121.50
51	70.73	58.23	178.17	18.41	56.34	121.83
53	68.99	56.79	180.59	18.41	58.55	122.04
55	67.33	55.42	182.89	18.41	60.76	122.13
57	65.74	54.12	185.08	18.41	62.97	122.11
59	64.23	52.87	187.17	18.41	65.18	121.99

Required Storage Volume = 122.13 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	Orifice Tube Size Calculation (at MH.9)			
	Prepared:	F.M.	Page No.	E-11
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E5 (Pre-Dev) & P5 (Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Orifice Discharge Formula: $Q = CA \times \sqrt{2gh}$

Calculate Approximate Diameter Knowing Max. Q & Depth			Calculate Flows For Assumed Diameter		
Max. Flow:	18.4	l/s	Diameter:	85	mm
100-yr Elev.:	107.25	m	Area:	0.006	m^2
Total Depth:	1.17	m	Coeff:	0.7	pipe
Req'd Area:	0.006	m^2	Gravitational Accel:	9.81	m/s^2
Req'd Dia.:	85	mm	Invert	106.08	m
Orifice C/L Elev.:	106.123	m			
H.W.L	213.330	m			

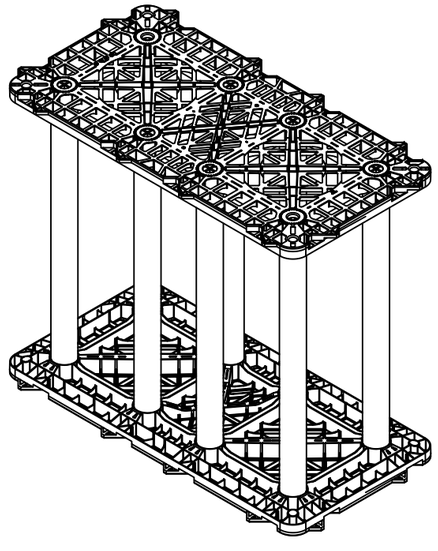
Depth (m)	Head (m)	Q (l/s)	Elevation (m)	Remarks
0		0.00	106.080	Orifice Invert
0.04	0.00	0.0	106.123	Center Elev. of Orifice
0.09	0.04	3.6	106.165	Top Elev. of Orifice
0.21	0.16	7.1	106.285	
0.31	0.26	9.0	106.385	
0.41	0.36	10.6	106.485	
0.51	0.46	12.0	106.585	
0.61	0.56	13.2	106.685	
0.71	0.66	14.3	106.785	
0.81	0.76	15.4	106.885	
0.91	0.86	16.3	106.985	
1.01	0.96	17.3	107.085	
1.11	1.06	18.1	107.185	
1.17	**1.12**	**18.6**	**107.245**	**HWL**

LAYFIELD

BRENTWOOD STORMTANK
MODULE SHOP DRAWINGS

GOLDEN PLOUGH LODGE DEVELOPMENT

Cobourg, ON



Pages:

LAYFIELD

117 Basaltic Rd,
Concord, ON L4K 1G4 Canada
Ph: (905) 761-9123
www.layfieldgroup.com

SINGLE STACK MODULE SYSTEM

Total Storage Volume	140.06 m³
Module Storage Volume	109.73 m³
Stone Storage Volume	30.33 m³
System Footprint	137.72 m²
Estimated Geotextile Fabric	700 m²
Estimated Stone Volume	75.83 m³
Excavation Required	188.89 m³
Excavation Depth	1.68 m
Stone Type	19mm clear
Stone Void Space	40%
Module Type	ST-36

GOLDEN PLOUGH LODGE DEVELOPMENT

Cobourg, ON

REV.	Record of Changes	Date	By
△	Preliminary Drawing	03MAR2020	AC
△	Revised Drawing	10MAR2020	AC
△	Revised Drawing	25MAY2020	AC

Page Name: Cover Page

Drawn by: AC | Checked By: AW

Scale: NTS | Date: 03MAR2020

Sheet: **01 OF 07**

ANSI B Size Page (Horizontal)

Material Quantity (ST-36)

ST-36	216
Platens	432
36" Columns	1728
36" Side Panels	106
10" Observation Port	4
6" Saddle Port	1

Elevations

Leveling Stone Invert	105.9066
Module Invert	106.0590
Top of Module	106.9734
Top of Stone Backfill	107.2782
Minimum Finished Grade	107.5830
Maximum Finished Grade	109.4090

Contractor to confirm that quantities shipped to site match those listed above. Please report any discrepancy or damage to Layfield immediately.

a. All dimensions are measured in meters unless noted otherwise.

b. Reference Brentwood Industries standard drawings and notes for detailed information.

c. Reference current Brentwoood Module installation instructions for proper installation practices.
[http://www.brentwoodindustries.com/products/stormwater-management/stormtank/module.php#feature5]

d. Engineer of record to confirm conformance to manufacturer's allowable proximity to other structures and slopes.

e. All inlet and pipe locations and designs by others.

f. The sub-grade and side backfill needs to be compacted to 95%, unless noted otherwise.

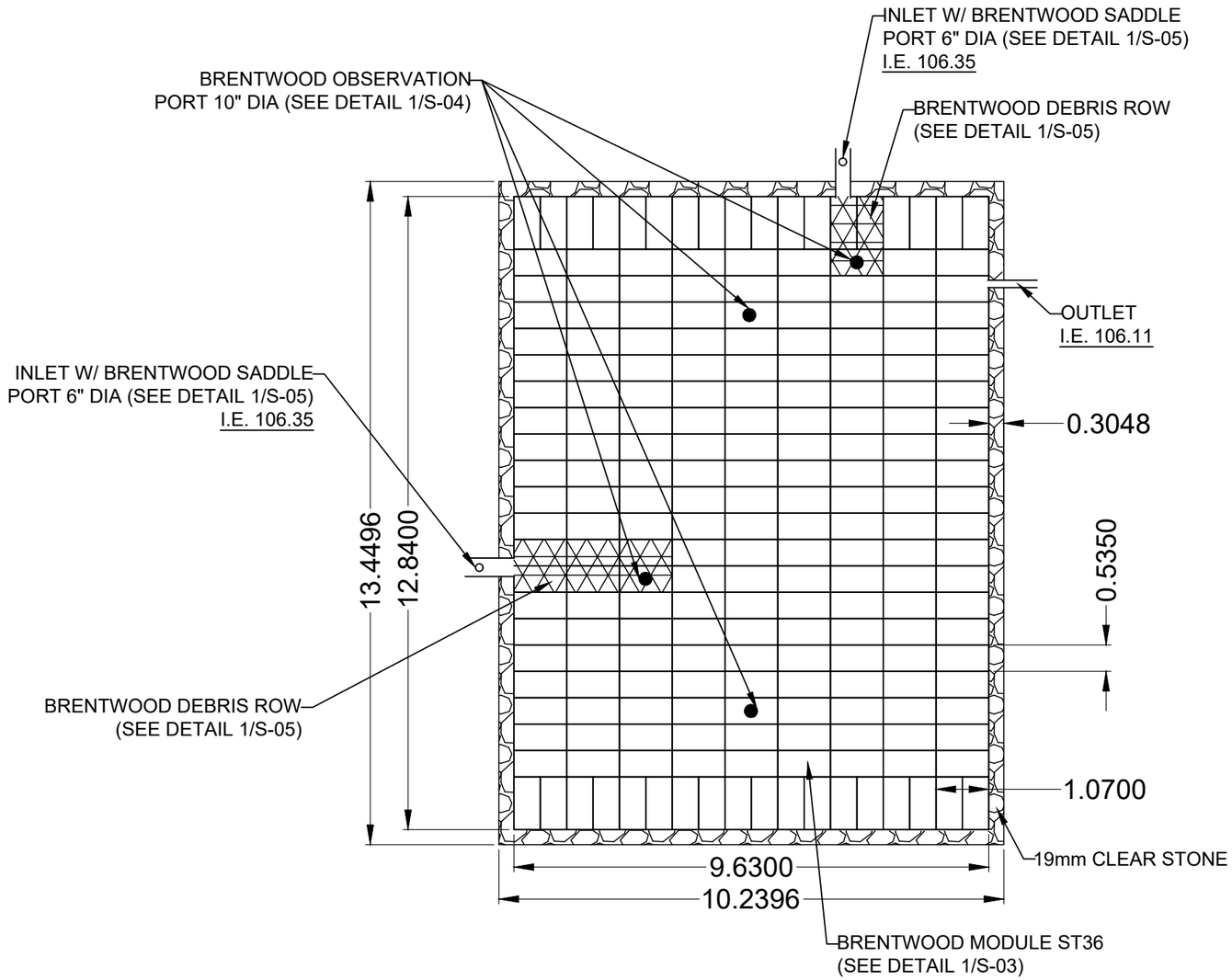
g. During and after installation, the Brentwood Module area should be clearly marked and roped off to prevent unauthorized construction and equipment trafficking over the modules.

h. Top of Ground water is to be maintained 610 mm (2 ft) below the module to prevent buoyancy, unless otherwise noted by engineer.

i. The quantities related to stone and geosynthetics are estimated values as the roll size, overlaps, waste, ect. may vary.

1 S-02 **NOTES**

STORAGE VOLUME ABOVE ELEVATION 106.11- 125.26 CU.M.



2 S-02 **MODULE LAYOUT**
SCALE: NTS

NOTE: LOCATION OF DEBRIS ROW AND OBSERVATION PORT IS TO BE CONFIRMED

LAYFIELD
117 Basaltic Rd,
Concord, ON L4K 1G4 Canada
Ph: (905) 761-9123
www.layfieldgroup.com

SINGLE STACK MODULE SYSTEM

Total Storage Volume	140.06 m³
Module Storage Volume	109.73 m³
Stone Storage Volume	30.33 m³
System Footprint	137.72 m²
Estimated Geotextile Fabric	700 m²
Estimated Stone Volume	75.83 m³
Excavation Required	188.89 m³
Excavation Depth	1.68 m
Stone Type	19mm clear
Stone Void Space	40%
Module Type	ST-36

GOLDEN PLOUGH LODGE DEVELOPMENT
Cobourg, ON

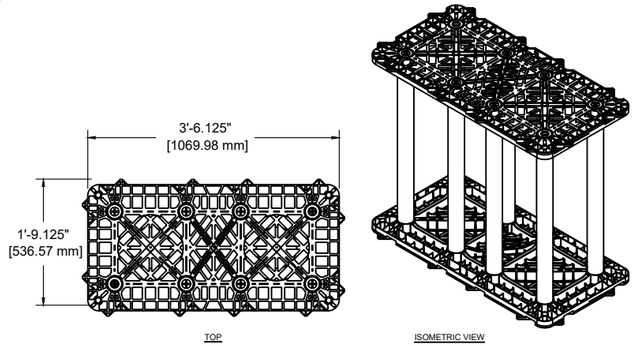
REV.	Record of Changes	Date	By
△	Preliminary Drawing	03MAR2020	AC
△	Revised Drawing	10MAR2020	AC
△	Revised Drawing	25MAY2020	AC

Page Name: Module Layout

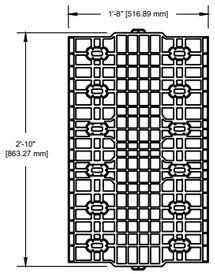
Drawn by: AC	Checked By: AW
Scale: NTS	Date: 03MAR2020

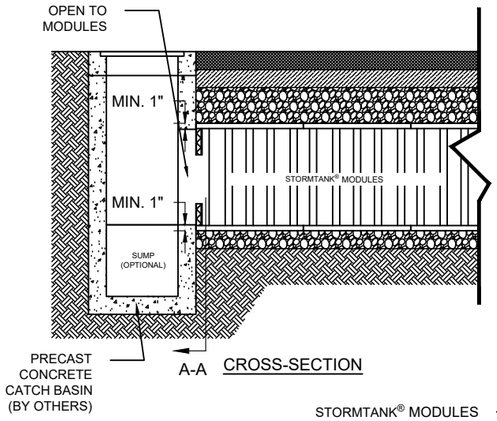
Sheet:

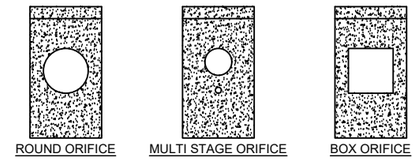
02 OF 07



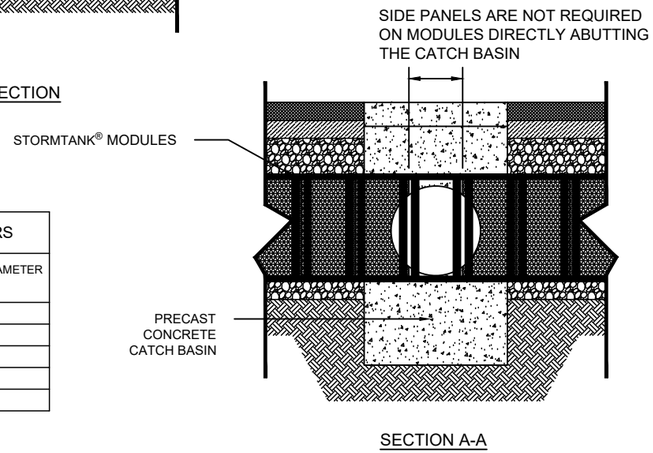
20 SERIES MODULE				
MODEL	HEIGHT (mm)	CAPACITY (m^3)	NOMINAL VOID	NOMINAL WEIGHT (kg)
2018	18" (457.2)	8.767 cf (0.2488)	95.50%	26.81 lbs. (12.16)
2024	24" (609.6)	11.789 cf (0.3346)	96.25%	29.39 lbs. (13.33)
2036	36" (914.4)	17.832 cf (0.5062)	97.05%	34.55 lbs. (15.67)







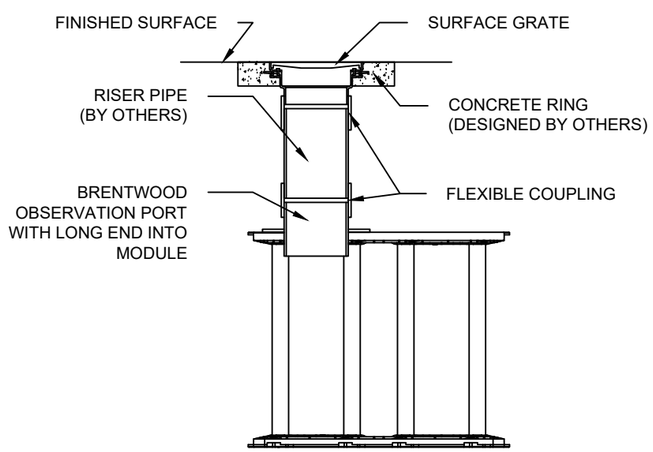
MAXIMUM PIPE DIAMETERS	
MODULE	NOMINAL PIPE DIAMETER (mm)
ST-18	14" (356)
ST-24	20" (508)
ST-30	26" (660)
ST-33	29" (737)
ST-36	32" (813)



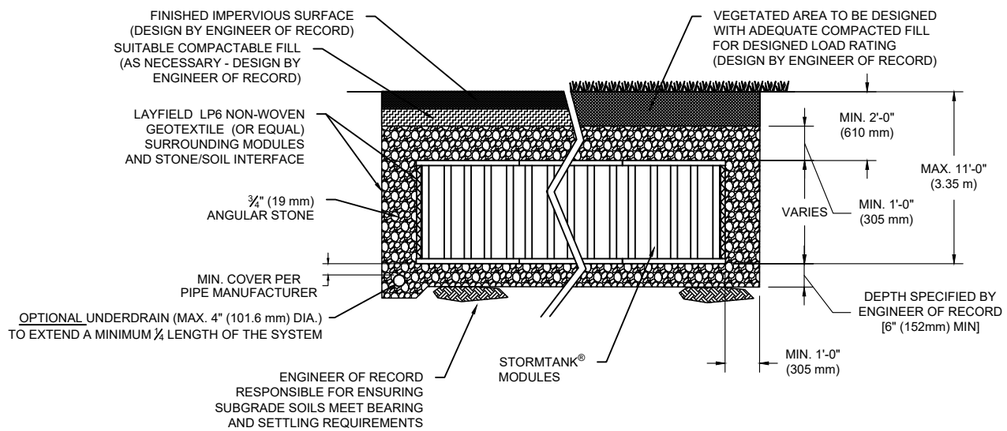
1 S-03 36"(914 mm) SIDE PANEL DETAIL

2 S-03 36"(914 mm) SIDE PANEL DETAIL

3 S-03 TYP. CATCH BASIN ABUTMENT DETAIL



4 S-03 SINGLE STACK OBSERVATION PORT DETAIL



5 S-03 TYPICAL SINGLE STACKED SYSTEM BASIC CROSS-SECTION

LAYFIELD
117 Basaltic Rd,
Concord, ON L4K 1G4 Canada
Ph: (905) 761-9123
www.layfieldgroup.com

SINGLE STACK MODULE SYSTEM

Total Storage Volume	140.06 m^3
Module Storage Volume	109.73 m^3
Stone Storage Volume	30.33 m^3
System Footprint	137.72 m^2
Estimated Geotextile Fabric	700 m^2
Estimated Stone Volume	75.83 m^3
Excavation Required	188.89 m^3
Excavation Depth	1.68 m
Stone Type	19mm clear
Stone Void Space	40%
Module Type	ST-36

GOLDEN PLOUGH LODGE DEVELOPMENT

Cobourg, ON

REV.	Record of Changes	Date	By
1	Preliminary Drawing	03MAR2020	AC
2	Revised Drawing	10MAR2020	AC
3	Revised Drawing	25MAY2020	AC

Page Name: TYP. Construction Details

Drawn by: AC | Checked By: AW

Scale: NTS | Date: 03MAR2020

Sheet: **03 OF 07**

ANSI B Size Page (Horizontal)

STEP 1:

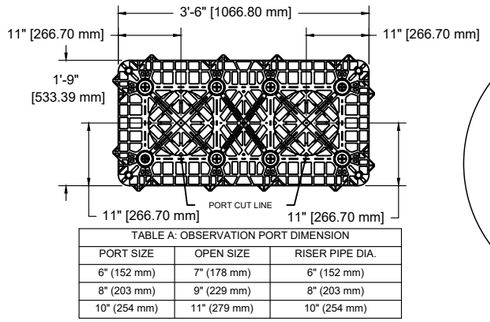
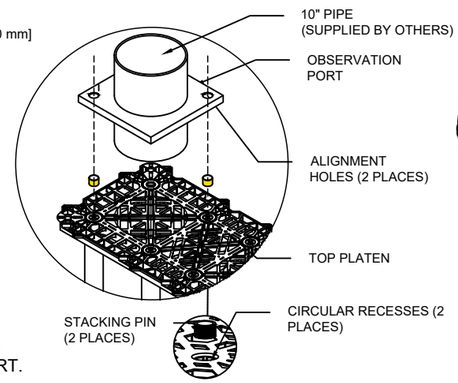


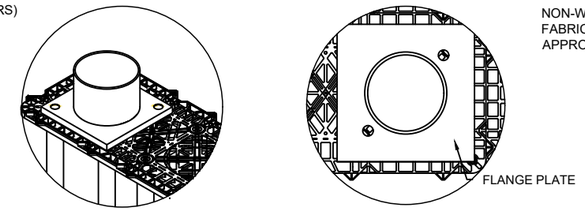
TABLE A: OBSERVATION PORT DIMENSION		
PORT SIZE	OPEN SIZE	RISER PIPE DIA.
6" (152 mm)	7" (178 mm)	6" (152 mm)
8" (203 mm)	9" (229 mm)	8" (203 mm)
10" (254 mm)	11" (279 mm)	10" (254 mm)

LAYOUT & CUT OPENING INTO EITHER CIRCLE SHOWN ON TOP PLATEN FOR BRENTWOOD OBSERVATION PORT.

STEP 2:

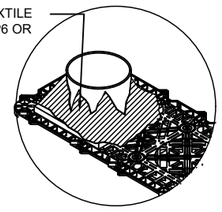


STEP 3:



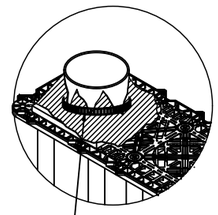
INSTALL OBSERVATION PORT

STEP 4:



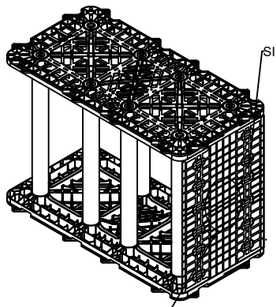
INSTALL GEOTEXTILE:
WRAP SPECIFIED GEOTEXTILE FABRIC AROUND ENTIRE INSTALLATION OF STORNTANK MODULES. CUT "X" PATTERN INTO GEOTEXTILE FABRIC AT OBSERVATION PORT AND PEEL EDGES OUT

STEP 5:

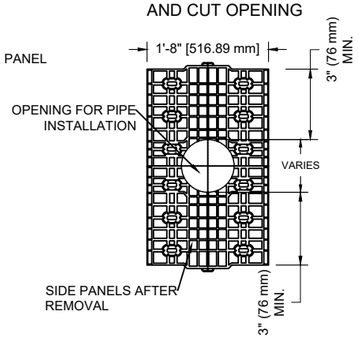


1 S-04 TYP. OBSERVATION PORT INSTALLATION DETAIL

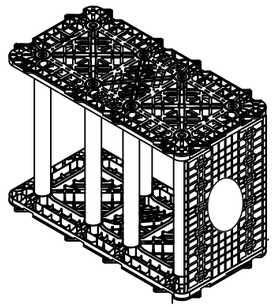
STEP 1:
LOCATE AND MARK OPENING



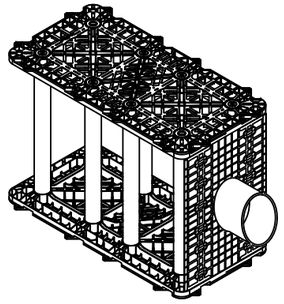
STEP 2:
REMOVE SIDE PANELS FROM MODULES AND CUT OPENING

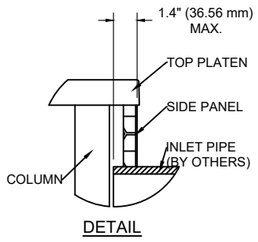


STEP 3:
REINSTALL SIDE PANELS



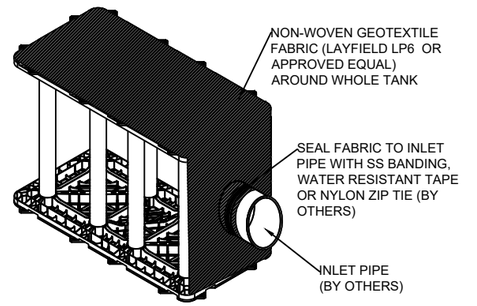
STEP 4:
INSTALL PIPE (SLIP FIT)





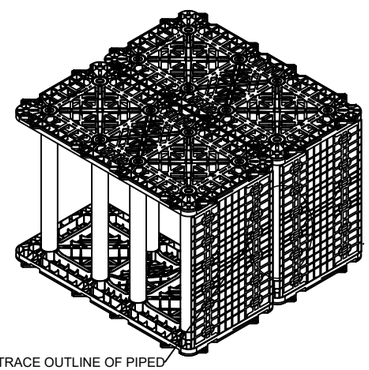
DETAIL

STEP 5:
WRAP AND SECURE GEOTEXTILE

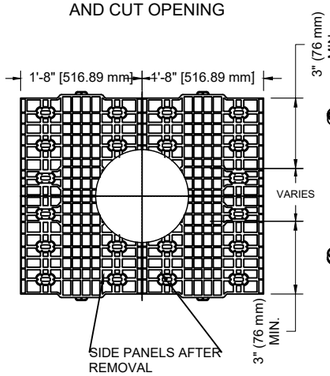


2 S-04 SMALL DIAMETER (14" [356 mm] AND SMALLER) PIPE CONNECTION DETAIL

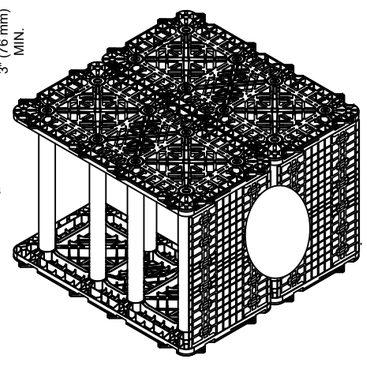
STEP 1:
LOCATE AND MARK OPENING



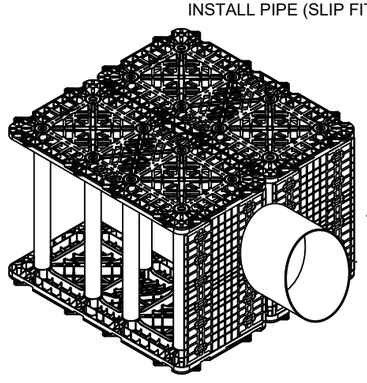
STEP 2:
REMOVE SIDE PANELS FROM MODULES AND CUT OPENING

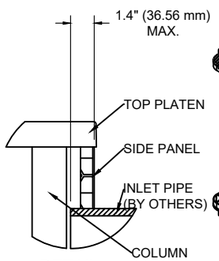


STEP 3:
REINSTALL SIDE PANELS



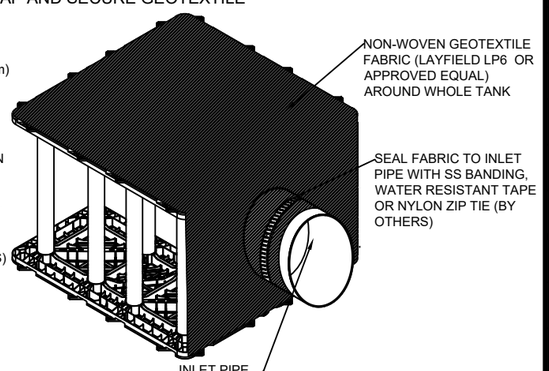
STEP 4:
INSTALL PIPE (SLIP FIT)





DETAIL

STEP 5:
WRAP AND SECURE GEOTEXTILE



3 S-04 LARGE DIAMETER (15" [381 mm] AND GREATER) PIPE CONNECTION DETAIL

LAYFIELD

117 Basaltic Rd,
Concord, ON L4K 1G4 Canada
Ph: (905) 761-9123
www.layfieldgroup.com

SINGLE STACK MODULE SYSTEM

Total Storage Volume	140.06 m³
Module Storage Volume	109.73 m³
Stone Storage Volume	30.33 m³
System Footprint	137.72 m²
Estimated Geotextile Fabric	700 m²
Estimated Stone Volume	75.83 m³
Excavation Required	188.89 m³
Excavation Depth	1.68 m
Stone Type	19mm clear
Stone Void Space	40%
Module Type	ST-36

GOLDEN PLOUGH LODGE DEVELOPMENT

Cobourg, ON

REV.	Record of Changes	Date	By
△	Preliminary Drawing	03MAR2020	AC
△	Revised Drawing	10MAR2020	AC
△	Revised Drawing	25MAY2020	AC

Page Name: TYP. Pipe Penetration Details

Drawn by:	Checked By:
AC	AW
Scale: NTS	Date: 03MAR2020

Sheet:

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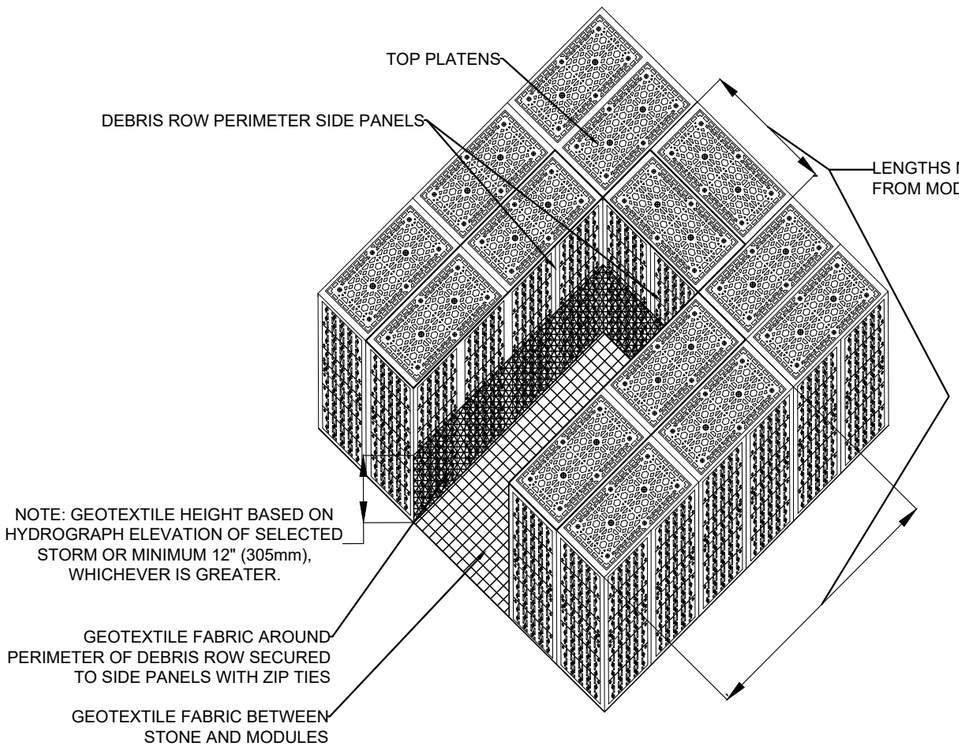
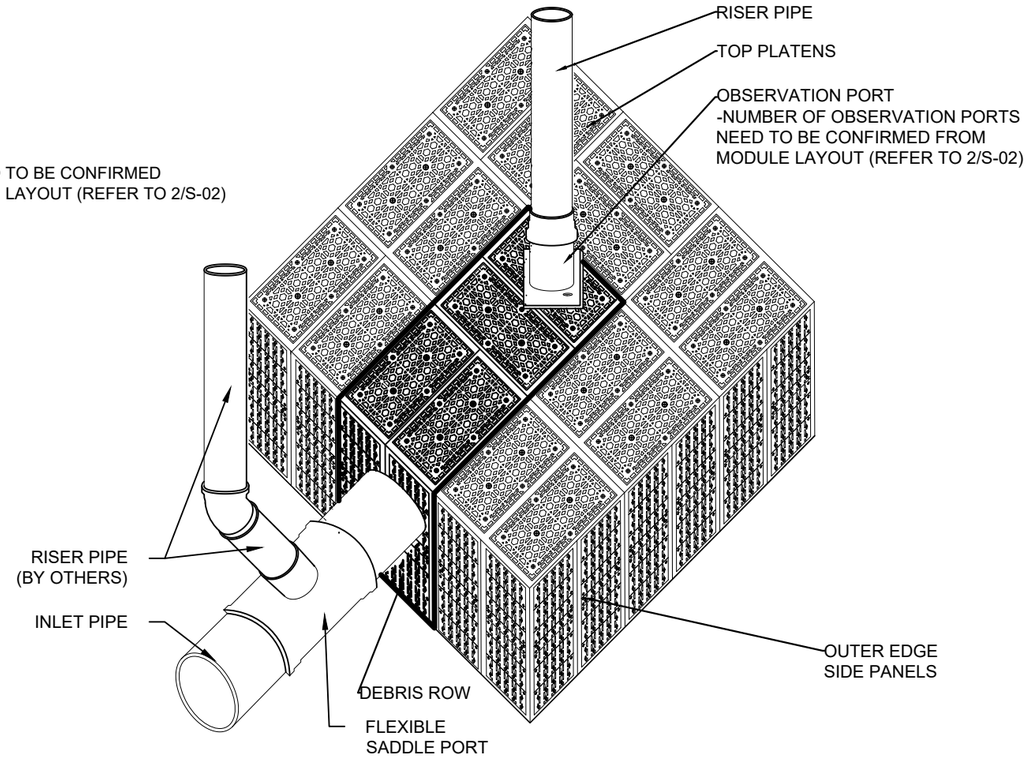
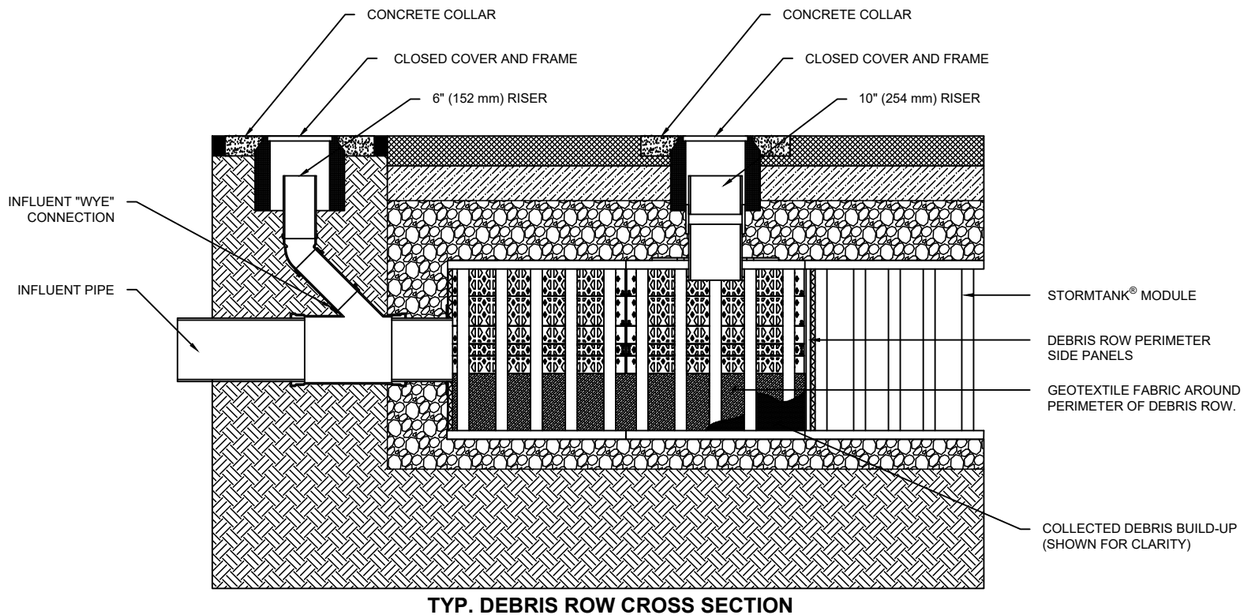


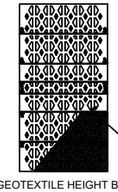
SIDE PANELS AND GEOTEXTILE FABRIC ALONG THE PERIMETER OF DEBRIS ROW



FINISHED DEBRIS ROW WITH INLET AND OBSERVATION PORT



TYP. DEBRIS ROW CROSS SECTION



NOTE: GEOTEXTILE HEIGHT BASED ON HYDROGRAPH ELEVATION OF SELECTED STORM OR MINIMUM 12" (305mm), WHICHEVER IS GREATER.

1 S-05 **TYP. DEBRIS ROW DETAIL**

LAYFIELD
117 Basaltic Rd,
Concord, ON L4K 1G4 Canada
Ph: (905) 761-9123
www.layfieldgroup.com

SINGLE STACK MODULE SYSTEM

Total Storage Volume	140.06 m³
Module Storage Volume	109.73 m³
Stone Storage Volume	30.33 m³
System Footprint	137.72 m²
Estimated Geotextile Fabric	700 m²
Estimated Stone Volume	75.83 m³
Excavation Required	188.89 m³
Excavation Depth	1.68 m
Stone Type	19mm clear
Stone Void Space	40%
Module Type	ST-36

GOLDEN PLOUGH LODGE DEVELOPMENT

Cobourg, ON

REV.	Record of Changes	Date	By
1	Preliminary Drawing	03MAR2020	AC
2	Revised Drawing	10MAR2020	AC
3	Revised Drawing	25MAY2020	AC

Page Name: TYP. Debris Row Details

Drawn by: AC | Checked By: AW

Scale: NTS | Date: 03MAR2020

Sheet: **05 OF 07**

General Conditions

- Review installation procedures and coordinate the installation with other construction activities, such as grading, excavation, utilities, construction access, erosion control, etc.
- Engineered Drawings supersede all provided documentation, as the information furnished in this document is based on a typical installation.
- When installed based on Brentwood's Site Preparation and Installation Instructions or similar, a StormTank® system can support an HS-20 load.
- Coordinate the installation with manufacturer's representative/distributor to be on-site to review start up procedures and installation instructions.
- Components shall be unloaded, handled and stored in an area protected from traffic and in a manner to prevent damage.
- Assembled modules may be walked on, but vehicular traffic is prohibited until backfilled per Manufacturer's requirements. Protect the installation against damage with highly visible construction tape, fencing, or other means until construction is complete.

Ensure all construction occurs in accordance with Federal, Provincial and Local Laws, Ordinances, Regulations and Safety Requirements.

- Extra care and caution should be taken when temperatures are at or below 40° F (4.4° C).

1.0 StormTank® Assembly

StormTank® Modules:

StormTank® modules are delivered to the site as palletized components requiring simple assembly. No special equipment, tools or bonding agents are required; only a rubber mallet. A single worker can typically assemble a module in two minutes.

ASSEMBLY INSTRUCTIONS:

1. Place a platen on a firm level surface and insert the eight (8) columns into the platen receiver cups. Firmly tap each column with a rubber mallet to ensure the column is seated.
2. Place a second platen on a firm level surface. Flip the previously assembled components upside down onto the second platen, aligning the columns into the platen receiver cups.
3. Once aligned, seat the top assembly by alternating taps, with a rubber mallet at each structural column until all columns are firmly seated.

SIDE PANEL

4. If side panels are required, firmly tap the top platen upward to raise the top platen. Insert the side panel into the bottom platen.
5. Align the top of the side panel with the top platen and firmly seat the top platen utilizing a rubber mallet.

GENERAL NOTES:

- Remove packaging material and check for any damage. Report any damaged components to a StormTank® Distributor or Brentwood personnel.
- StormTank® components are backed by a one year warranty, when installed per manufacturer's recommendations.

2.0 Basin Excavation

1. Stake out and excavate to elevations per approved plans.Excavation Requirements:
   a. Sub-grade excavation must be a minimum of 6" (152 mm) below designed StormTank® Module invert.
   b. The excavation should extend a minimum of 12" (305 mm) beyond the StormTank® dimensions in each length and width (an additional 24" [610 mm] in total length and total width) to allow for adequate placement of side backfill material.
   c. Remove objectionable material encountered within the excavation, including protruding material from the walls.
   d. Furnish, install, monitor and maintain excavation support (e.g., shoring, bracing, trench boxes, etc.) as required by Federal, Provincial and Local Laws, Ordinances, Regulations and Safety Requirements.

3.0 Sub-Grade Requirements

1. Sub-grade shall be unfrozen, level (plus or minus 1%), and free of lumps or debris with no standing water, mud or muck. Do not use materials nor mix with materials that are frozen and/or coated with ice or frost.

2. Unstable, unsuitable and/or compromised areas should be brought to the Engineer's attention and mitigating efforts determined prior to compacting the sub-grade.

3. Sub-grade must be compacted to 95% Standard Proctor Density or as approved by the Engineer of Record. If code requirements restrict subgrade compaction, it is the requirement of the geotechnical Engineer to verify that the bearing capacity and settlement criteria for support of the system are met. *

* The Engineer of Record shall reference Brentwood document Appendix A for minimum soil bearing capacity required based on Load Rating and top cover depth. Minimum soil bearing capacity is required so that settlements are less than 1" through the entire sub-grade and do not exceed long-term 1/2" differential settlement between any two adjacent units within the system. Sub-grade must be designed to ensure soil bearing capacity is maintained throughout all soil saturation levels.

4.0 Leveling Bed Installation

1. Install geotextile fabric and/or liner material, as specified.
   a. Geotextile fabric shall be placed per manufacturer's recommendations.
   b. Additional material to be utilized for wrapping above the system must be protected from damage until use.

2. After the geotextile is secured, place a minimum 6" (152 mm) Leveling Bed.
   a. Material should be a 3/4" (19 mm) angular stone meeting Appendix B – Acceptable Fill Material.
   b. Material should be raked free of voids, lumps, debris, sharp objects and plate vibrated to a level with a maximum 1% slope.

3. Correct any unsatisfactory conditions.

5.0 StormTank® Module Placement

1. 1. Install geotextile fabric and/or liner material, as specified.
   a. Geotextile fabric shall be placed per manufacturer's recommendations.
   b. Additional material to be utilized for wrapping above the system must be protected from damage until use.

2. Mark the footprint of the modules for placement.
   a. Ensure module perimeter outline is square or similar prior to Module placement.
   b. Care should be taken to note any connections, ports or other irregular units to be placed.

3. Install the individual modules by hand, as detailed below.
   a. The modules should be installed as shown in the StormTank® submittal drawings with the short side of perimeter modules facing outward, except as otherwise required.
   b. Make sure the top/bottom platens are in alignment in all directions to within a maximum 1/4" (6.4 mm).
   c. For double stack configurations:
      i. Install the bottom module first. **DO NOT INTERMIX VARIOUS MODULE HEIGHTS ACROSS LAYERS.** Backfilling prior to proceeding to second layer is optional.
      ii. Insert stacking pins (2 per module) into the top platen of the bottom module.
      iii. Place the upper module directly on top of the bottom module in the same direction, making sure to engage the pins.

4. Install the modules to completion, taking care to avoid damage to the geotextile and/or liner material.

5. Locate any ports or other penetration of the StormTank®.
   a. Install ports/penetrations in accordance with the approved submittals, contract documents and manufacturer's recommendations.

6. Upon completion of module installation, wrap the modules in geotextile fabric and/or liner.
   a. Geotextile fabric shall be wrapped and secured per manufacturer's recommendations.
   b. Seal any ports/penetrations per Manufacturer's requirements

Notes:

- If damage occurs to the geotextile fabric or impermeable liner, repair the material in accordance with the geotextile/liner Manufacturer's recommendations.

6.0 Side Backfill

1. Inspect all geotextile, ensuring that no voids or damage exists; which will allow sediment into the StormTank® system.

2. Adjust the stone/soil interface geotextile along the side of the native soil to ensure the geotextile is taught to the native soil.

3. Once the geotextile is secured, begin to place the Side Backfill.
   a. a. Material should be a 3/4" (19 mm) angular stone meeting Appendix B – Acceptable Fill Material.
   b. b. Backfill sides "evenly" around the perimeter without exceeding single 12" (305 mm) lifts.
   c. Place material utilizing an excavator, dozer or conveyor boom.
   d. Utilize a plate vibrator to settle the stone and provide a uniform distribution.

Notes:

- Do not apply vehicular load to the modules during placement of side backfill. All material placement should occur with equipment located on the native soil surrounding the system.
- If damage occurs to the geotextile fabric or impermeable liner, repair the material in accordance with the geotextile/liner Manufacturer's recommendations.

7.0 Top Backfill (Stone)

1. Begin to place the Top Backfill.
   a. Material should be a 3/4" (19 mm) angular stone meeting Appendix B – Acceptable Fill Material.
   b. Place material utilizing an excavator, dozer or conveyor boom (Appendix C – Material Placement) and use a walk-behind plate vibrator to settle the stone and provide an even distribution.

DO NOT DRIVE ON THE MODULES WITHOUT A MINIMUM 12" (305 mm) COVER.

2. Upon completion of Top Backfilling, wrap the system in geotextile fabric and/or liner per manufacturer's recommendations.

3. Install metallic tape around the perimeter of the system to mark the area for future utility detection.

Notes:

- If damage occurs to the geotextile fabric or impermeable liner, repair the material in accordance with the geotextile/liner Manufacturer's recommendations.

8.0 Suitable Compactable Fill

Following Top Backfill placement and geotextile fabric wrapping; complete the installation as noted below.

Vegetated Area

1. Place fill onto the geotextile.
   a. Maximum 12" (305 mm) lifts, compacted with a vibratory plate or walk behind roller to a minimum of 90% Standard Proctor Density.
   b. The minimum top cover to finished grade should not be less than 24" (610 mm) and the maximum depth from final grade to the bottom of the lowest module should not exceed 11' (3.35 m).

2. Finish to the surface and complete with vegetative cover.

Impervious Area

1. Place fill onto the geotextile.
   a. Maximum 12" (305 mm) lifts, compacted with a vibratory plate or walk behind roller to a minimum of 90% Standard Proctor Density.
   b. The minimum top cover to finished grade should not be less than 24" (610 mm) and the maximum depth from final grade to the bottom of the lowest module should not exceed 11' (3.35 m).

2. Finish to the surface and complete with asphalt, concrete, etc.

Notes:

- A vibratory roller may only be utilized after a minimum 24" (610 mm) of compacted material has been installed or for the installation of the asphalt wearing course.
- If damage occurs to the geotextile fabric, repair the material in accordance with the geotextile Manufacturer's recommendations.
- For most recent installation guidelines visit: http://www.brentwoodindustries.com/products/stormwater-management/stormtank/module.php#feature5

9.0 Inspection and Maintenance

If the following inspections and maintenance procedures are not followed as specified below then the end-user is responsible for the performance of the modules. These Maintenance procedure must be performed after a heavy rainfall, flooding or any incident that will vary the flow of water drastically.

Inspection

1. Inspect all observation ports, inflow and outflow connection and the discharge area
2. Identify and log any sediment and debris accumulation, system backup, or discharge rate changes.
3. If there is a sufficient need for a cleanout, contact a local cleaning company for assistance.

Cleaning:

1. If a pretreatment device is installed, follow manufacturer recommendations.
2. Using vacuum pump truck, evacuate debris from the inflow and outflow points.
3. Flush the system with clean water, forcing debris from the system.
4. Repeat steps 2 and 3 until no debris is evident.

LAYFIELD
117 Basaltic Rd,
Concord, ON L4K 1G4 Canada
Ph: (905) 761-9123
www.layfieldgroup.com

SINGLE STACK MODULE SYSTEM

Total Storage Volume	140.06 m³
Module Storage Volume	109.73 m³
Stone Storage Volume	30.33 m³
System Footprint	137.72 m²
Estimated Geotextile Fabric	700 m²
Estimated Stone Volume	75.83 m³
Excavation Required	188.89 m³
Excavation Depth	1.68 m
Stone Type	19mm clear
Stone Void Space	40%
Module Type	ST-36

GOLDEN PLOUGH LODGE DEVELOPMENT

Cobourg, ON

REV.	Record of Changes	Date	By
1	Preliminary Drawing	03MAR2020	AC
2	Revised Drawing	10MAR2020	AC
3	Revised Drawing	25MAY2020	AC

Page Name: Supplementary Notes

Drawn by:	Checked By:
AC	AW
Scale: NTS	Date: 03MAR2020

Sheet:

06 OF 07

Appendix A - Bearing Capacity Tables

Cover		HS-25 (Unfactored)		HS-25 (Factored)	
English (in.)	Metric (mm)	English (ksf)	Metric (kPa)	English (ksf)	Metric (kPa)
24	610	1.89	90.45	4.75	227.43
25	635	1.82	86.96	4.53	216.9
26	660	1.75	83.78	4.34	207.8
27	686	1.69	80.88	4.16	199.18
28	711	1.63	78.24	3.99	191.04
29	737	1.58	75.82	3.84	183.86
30	762	1.54	73.62	3.7	177.16
31	787	1.5	71.6	3.57	170.93
32	813	1.46	69.75	3.45	165.19
33	838	1.42	68.06	3.34	159.92
34	864	1.39	66.51	3.24	155.13
35	889	1.36	65.1	3.14	150.34
36	914	1.33	63.8	3.05	146.03
37	940	1.31	62.62	2.97	142.2
38	965	1.29	61.54	2.9	138.85
39	991	1.26	60.55	2.83	135.5
40	1,016	1.25	59.65	2.76	132.15
41	1,041	1.23	58.84	2.7	129.28
42	1,067	1.21	58.09	2.67	127.84
43	1,092	1.2	57.42	2.6	124.49
44	1,118	1.19	56.81	2.55	122.09
45	1,143	1.18	56.26	2.5	119.7
46	1,168	1.16	55.77	2.46	117.79
47	1,194	1.16	55.33	2.42	115.87
48	1,219	1.15	54.94	2.39	114.43
49	1,245	1.14	54.59	2.36	113
50	1,270	1.13	54.29	2.33	111.56
51	1,295	1.13	54.03	2.3	110.12
52	1,321	1.12	53.8	2.27	108.69
53	1,346	1.12	53.62	2.25	107.73
54	1,372	1.12	53.46	2.23	106.77
55	1,397	1.11	53.34	2.21	105.82
56	1,422	1.11	53.24	2.19	104.86
57	1,448	1.11	53.18	2.17	103.9
58	1,473	1.11	53.14	2.16	103.42
59	1,499	1.11	53.12	2.14	102.46
60	1,524	1.11	53.13	2.13	101.98
61	1,549	1.11	53.16	2.12	101.51
62	1,575	1.11	53.21	2.11	101.03
63	1,600	1.11	53.28	2.1	100.55
64	1,626	1.11	53.37	2.09	100.07
65	1,651	1.12	53.48	2.08	99.59
66	1,676	1.12	53.61	2.08	99.59
67	1,702	1.12	53.75	2.07	99.11
68	1,727	1.13	53.91	2.07	99.11
69	1,753	1.13	54.08	2.06	98.63
70	1,778	1.13	54.26	2.06	98.63
71	1,803	1.14	54.46	2.06	98.63

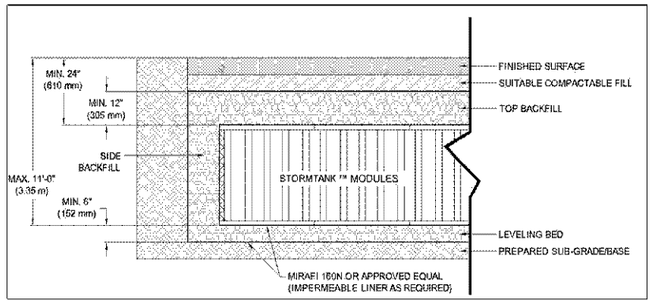
Cover		HS-25 (Unfactored)		HS-25 (Factored)	
English (in.)	Metric (mm)	English (ksf)	Metric (kPa)	English (ksf)	Metric (kPa)
67	1,702	1.12	53.75	2.07	99.11
68	1,727	1.13	53.91	2.07	99.11
69	1,753	1.13	54.08	2.06	98.63
70	1,778	1.13	54.26	2.06	98.63
71	1,803	1.14	54.46	2.06	98.63
72	1,829	1.14	54.67	2.06	98.63
73	1,854	1.15	54.9	2.06	98.63
74	1,880	1.15	55.13	2.06	98.63
75	1,905	1.16	55.38	2.06	98.63
76	1,930	1.16	55.64	2.06	98.63
77	1,956	1.17	55.9	2.06	98.63
78	1,981	1.17	56.18	2.06	98.63
79	2,007	1.18	56.46	2.07	99.11
80	2,032	1.19	56.76	2.07	99.11
81	2,057	1.19	57.06	2.07	99.11
82	2,083	1.2	57.37	2.08	99.59
83	2,108	1.2	57.69	2.08	99.59
84	2,134	1.21	58.02	2.09	100.07
85	2,159	1.22	58.35	2.09	100.07
86	2,184	1.23	58.69	2.1	100.55
87	2,210	1.23	59.04	2.11	101.03
88	2,235	1.24	59.39	2.11	101.03
89	2,261	1.25	59.75	2.12	101.51
90	2,286	1.26	60.11	2.13	101.98
91	2,311	1.26	60.48	2.13	101.98
92	2,337	1.27	60.86	2.14	102.46
93	2,362	1.28	61.24	2.15	102.94
94	2,388	1.29	61.62	2.16	103.42
95	2,413	1.3	62.01	2.17	103.9
96	2,438	1.3	62.41	2.18	104.38
97	2,464	1.31	62.81	2.19	104.86
98	2,489	1.32	63.21	2.2	105.34
99	2,515	1.33	63.62	2.21	105.82
100	2,540	1.34	64.03	2.22	106.29
101	2,565	1.35	64.45	2.23	106.77
102	2,591	1.35	64.87	2.24	107.25
103	2,616	1.36	65.29	2.25	107.73
104	2,642	1.37	65.72	2.27	108.69
105	2,667	1.38	66.15	2.28	109.17
106	2,692	1.39	66.58	2.29	109.65
107	2,718	1.4	67.02	2.3	110.12
108	2,743	1.41	67.45	2.31	110.6
109	2,769	1.42	67.9	2.33	111.56
110	2,794	1.43	68.34	2.34	112.04
111	2,819	1.44	68.79	2.35	112.52
112	2,845	1.45	69.24	2.36	113
113	2,870	1.46	69.69	2.38	113.96
114	2,896	1.47	70.15	2.39	114.43

Notes: 1. Additional load ratings and associated bearing capacities may be applicable on a case by case basis. Please contact your local Brentwood Representative.

Appendix B - ACCEPTABLE FILL MATERIALS

Material Location	Description	AASHTO M43 Designation	ASTM D2321 Class	Compaction/Density
Finished Surface	Topsoil, hardscape, stone, concrete or asphalt per engineer of record.	N/A	N/A	Prepare per engineered plans.
Suitable Compaction Fill	Granular well graded soil/aggregate, typically road base or earthen fill, maximum 4" particle size.	56, 57, 6, 67, 68 Earth	I & II III (Earth Only)	Place in max. 12" lifts to a min. 90% standard proctor density.
Top Backfill	Crushed angular stone placed between modules and road base or earthen fill.	56, 57, 6, 67, 68	I & II	Plate compacted to provide evenly distributed layers.
Side Backfill	Crushed angular stone placed between earthen walls amd modules.	56, 57, 6, 67, 68	I & II	Place in uniform 12" lifts around the system.
Leveling Bed	Crushed angular stone placed to provide level surface for installation of modules.	56, 57, 6, 67, 68	I & II	Plate vibrated to achieve level surface.

* See Appendix C - Material Placement for limitations



Notes:
2. All stone must be angular stone meeting ASTM D2321. Recycled concrete may be utilized when meeting acceptable gradation and ASTM standards.
3. The sub-grade is to be prepared to meet bearing and compaction requirements. Please see engineer of record's design.
4. Storage of materials such as construction materials, equipment, soils, etc. over the StormTank® system is strictly prohibit
5. Please contact a Geotechnical Engineer and the Brentwood representative prior to utilization of any material not listed abo

Appendix C - MATERIAL PLACEMENT GUIDELINES

Material Location	Placement Methods	Tired Equipment Limitations	Tracked Equipment Limitations	Roller Limitations
Finished Surface	Numerous methods may be utilized. Material dumping on to system be limited unless otherwise noted.	Asphalt can be dumped into pavers.		Vibratory rollers may only be utilized if compacted cover exceeds 24" (610 mm) or for pavement installation.
Suitable Compactable Fill	Utilize an excavator, skid loader or dozer to place material. (Max. gross operating load of 6000 lbs. [2,721 kg] or less).	No DUMPING by dump trucks. No wheel loads unitil approved by Engineer of Record.	SMALL DOZERS ONLY (Max. gross operating load of 6,000 lbs. [2,721 kg] or less).	Static rollers ONLY are permitted until compacted cover exceeds 24" (610 mm).
Top Backfill	Utilize an excavator bucket or stone conveyor, positioned off of system, to uniformly backfill on the top of modules. No DUMPING directly onto modules by dump trucks.	No DUMPING by dump trucks. No wheel loads unitill approved by Engineer of Record.	Utilize an excavator or skid loader (Max. gross operating load of 6,000 lbs. [2,721 kg] once a min. 12" (305 mm) has been placed and compacted.	No rollers allowed at this time.
Side Backfill	Utilize an excavator bucket or stone conveyor, positioned off of system, to uniformly backfill on the top of modules. Stone to be placed in max. 12" (305mm) lifts until stone reaches the top of modules.	No equipment is permitted on the modules during the side backfilling progress.		
Levelling Bed	No limitations			

Notes:
1. Storage of materials such as construction materials, equipment, soils, etc. over the StormTank® system is strictly ***prohibited.***
2. Please contact a Brentwood representative/distributor prior to utilization of any equipment not listed above.
3. During paving operations, it may be necessary to utilize dump operations for paving equipment. Additional precautions should be utilized to limit heh dump distance and prevent rutting of road base.
4. It is recommended that all backfilling operations be completed with low ground pressure vehides such as mini excavators, skid steers, etc. ***All*** *equipment is to access system by a level approach to the system.*

LAYFIELD
117 Basaltic Rd,
Concord, ON L4K 1G4 Canada
Ph: (905) 761-9123
www.layfieldgroup.com

SINGLE STACK MODULE SYSTEM

Total Storage Volume	140.06 m³
Module Storage Volume	109.73 m³
Stone Storage Volume	30.33 m³
System Footprint	137.72 m²
Estimated Geotextile Fabric	700 m²
Estimated Stone Volume	75.83 m³
Excavation Required	188.89 m³
Excavation Depth	1.68 m
Stone Type	19mm clear
Stone Void Space	40%
Module Type	ST-36

GOLDEN PLOUGH LODGE DEVELOPMENT

Cobourg, ON

REV.	Record of Changes	Date	By
△	Preliminary Drawing	03MAR2020	AC
△	Revised Drawing	10MAR2020	AC
△	Revised Drawing	25MAY2020	AC

Page Name: Supplementary Notes

Drawn by:	Checked By:
AC	AW
Scale: NTS	Date: 03MAR2020

Sheet: **07 OF 07**

ANSI B Size Page (Horizontal)

20 Series Volume Calculator

STORMTANK
Expect Results™

Inputs

Project Name:	Tank-1			
Engineer:		Date:	1/27/2020	
Units:	SI	Height:	0.9144	
Liner:	No	Location:	N/A	
Stone Storage:	All	Porosity:	40%	
Stone Invert:	0			

Dimensions

Module		
Footprint:	123.6492	m^2
Perimeter:	44.9400	m
Excavation		
Footprint:	137.7185	m^2
Perimeter:	47.3784	m
Stone		
Leveling Bed:	0.1524	m
Top Backfill:	0.3048	m
Compacted Fill:	0	m

Results

Capacity:

Stone Storage Volume:	30.3320	m^3
Module Storage Volume:	109.7264	m^3
Total Storage Volume:	140.0584	m^3

Quantities:

Required Excavation:	188.8947	m^3
Required Stone:	75.8299	m^3
Estimated Geotextile:		
Surrounding Module:	320.4350	m^2
Surrounding Excavation:	378.2458	m^2
Estimated Liner:	0.0000	m^2

(Estimations include 10% for scrap and overlap)

Component Quantities:

	Bottom Layer	
Height	0.9144	m
# of Modules	216	
# of Platens	432	
# of Side Panels	84	
# of Columns	1,728	

Stage Storage

Height	Elev.	Stone Stage	Module Stage	Stage	Total
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.1524	0.1524	8.3953	0.0000	8.3953	8.3953
0.3048	0.3048	0.8577	18.2877	19.1454	27.5407
0.4572	0.4572	0.8577	18.2877	19.1454	46.6861
0.6096	0.6096	0.8577	18.2877	19.1454	65.8315
0.7620	0.7620	0.8577	18.2877	19.1454	84.9769
0.9144	0.9144	0.8577	18.2877	19.1454	104.1224
1.0668	1.0668	0.8577	18.2877	19.1454	123.2678
1.2192	1.2192	8.3953	0.0000	8.3953	131.6631
1.3716	1.3716	8.3953	0.0000	8.3953	140.0584

Determining Number of Cartridges for Flow Based Systems

Date	**04/03/2020**	**Black Cells =**	**Calculation**

Site Information

Project Name	**Golden Plough Lodge Redevelopment**		
Project Location	**Cobourg, ON**		
Catchment ID	**P5-1**		
Drainage Area, Ad	**0.98**	ac	(0.3985 ha)
Impervious Area, Ai	**0.75**	ac	
Pervious Area, Ap	**0.24**		
% Impervious	**76%**		
Runoff Coefficient, Rc	**0.74**		
Treatment storm flow rate, Q_{treat}	**0.11**	cfs	(3 L/s)
Peak storm flow rate, Q_{peak}	**0.65**	cfs	(18.4 L/s)

Filter System

Filtration brand	**StormFilter**	
Cartridge height	**18**	in
Specific Flow Rate	**1.00**	gpm/ft^2
Flow rate per cartridge	**7.50**	gpm

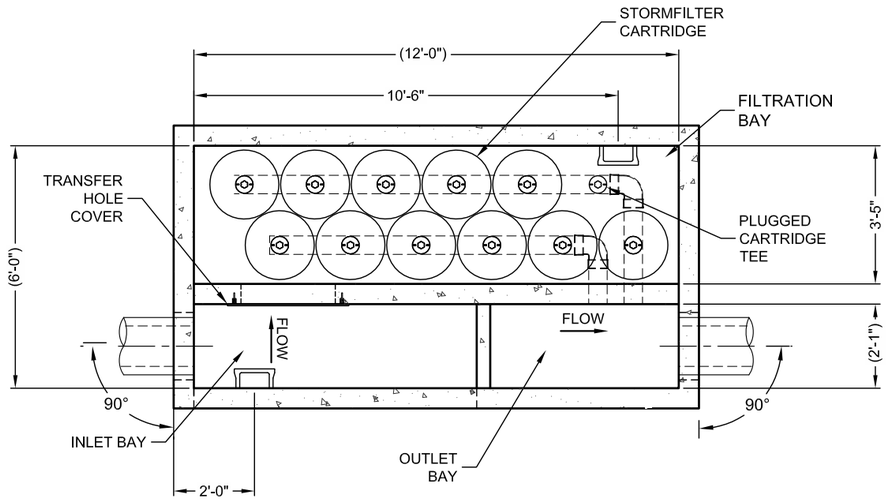
SUMMARY

Number of Cartridges	9
Media Type	Perlite

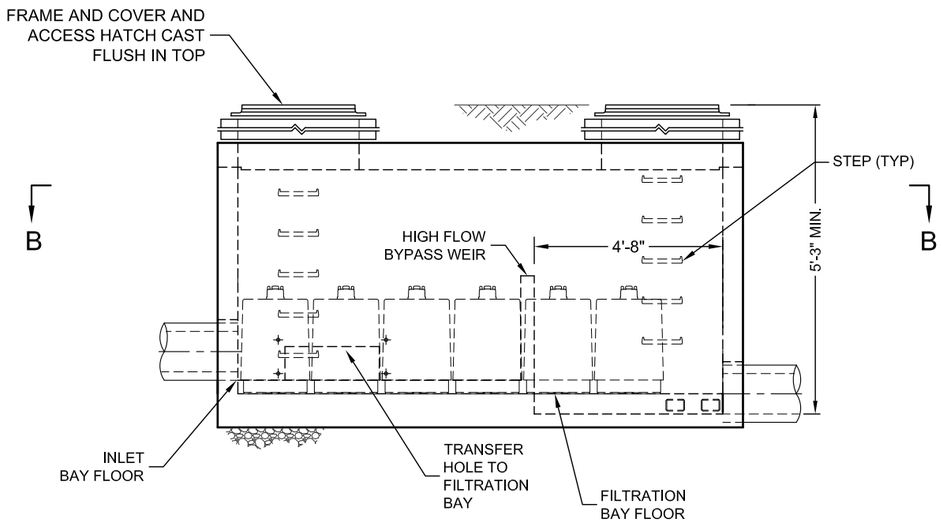
Event Mean Concentration (EMC)	**150**	mg/L
Annual TSS Removal	**80%**	
Percent Runoff Capture	**90%**	

Recommend SFPD0612 vault or CIP

200 Enterprise Drive
Scarborough, ME 04074
Phone 877-907-8676
Fax 207-885-9825



SECTION B-B
VAULT STYLE: 51L

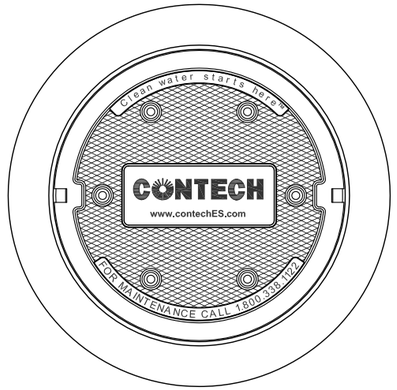


ELEVATION

STORMFILTER DESIGN TABLE

- THE 6' x 12' PEAK DIVERSION STORMFILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCALLY APPROVED SURFACE AREA SPECIFIC FLOW RATE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD.
- THE PEAK DIVERSION STORMFILTER IS AVAILABLE IN A LEFT INLET (AS SHOWN) OR RIGHT INLET CONFIGURATION.
- ALL PARTS AND INTERNAL ASSEMBLY PROVIDED BY CONTECH UNLESS OTHERWISE NOTED.

CARTRIDGE HEIGHT	27"		18"		LOW DROP	
SYSTEM HYDRAULIC DROP (H - REQ'D. MIN.)	3.05'		2.3'		1.8'	
HEIGHT OF WEIR (W)	3.00'		2.25'		1.75'	
TREATMENT BY MEDIA SURFACE AREA	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²
CARTRIDGE FLOW RATE (gpm)	22.5	11.25	15	7.5	10	5



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs)	*
PEAK FLOW RATE (cfs)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
# OF CARTRIDGES REQUIRED	*
CARTRIDGE FLOW RATE	*
MEDIA TYPE (CSF, PERLITE, ZPG)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE	*	*	*
OUTLET PIPE	*	*	*

INLET BAY RIM ELEVATION	*
FILTER BAY RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:
INTERNAL WEIR ELEVATION: XX.XX

PERFORMANCE SPECIFICATION

FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7-INCHES**. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **37 SECONDS**. SPECIFIC FLOW RATE SHALL BE **2 GPM/SF (MAXIMUM)**. SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF OF MEDIA (MAXIMUM).**

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
4. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
5. STRUCTURE SHALL MEET AASHTO HS-20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
F. CONTRACTOR TO REMOVE THE TRANSFER HOLE COVER WHEN THE SYSTEM IS BROUGHT ONLINE.

CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-526-3999 513-645-7000 513-645-7993 FAX

THE STORMWATER MANAGEMENT STORMFILTER 6' x 12' PEAK DIVERSION STORMFILTER STANDARD DETAIL

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
Mail Code 401-02B
Post Office Box 420
Trenton, New Jersey 08625-0420
609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

December 14, 2016

Derek M. Berg
Director - Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Laboratory Certification
Stormwater Management StormFilter® (StormFilter) by Contech Engineered Solutions LLC
Off-line Installation

TSS Removal Rate 80%

Dear Mr. Berg:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions LLC has requested a Laboratory Certification for the StormFilter System.

This project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the afore-mentioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix for this device is published online at http://www.njcat.org/verification-process/technology-verification-database.html.

The NJDEP certifies the use of the StormFilter System by Contech Engineered Solutions LLC at a TSS removal rate of 80%, when designed, operated and maintained in accordance with the information provided in the Verification Appendix and subject to the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 2.12 gpm/sf of effective filtration treatment area.

2. The StormFilter System shall be installed using the same configuration as the unit tested by NJCAT, and sized in accordance with the criteria specified in item 6 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter), to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual which can be found on-line at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the StormFilter, which is attached to this document. However, it is recommended to review the maintenance website at http://www.conteches.com/DesktopModules/Bring2mind/DMX/Download.aspx?EntryId=2813&PortalId=0&DownloadMethod=attachment for any changes to the maintenance requirements.

6. Sizing Requirements:

   The example below demonstrates the sizing procedure for a StormFilter System.

   Example: A 0.25 acre impervious site is to be treated to 80% TSS removal using a StormFilter System. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs or 354.58 gpm.

   The calculation of the minimum number of cartridges for use in the StormFilter System is based upon both the MTFR and the maximum inflow drainage area. It is necessary to calculate the required cartridges using both methods and to rely on the method that results in the highest minimum number of cartridges determined by the two methods.

   Inflow Drainage Area Evaluation:

   The drainage area to the StormFilter System in this example is 0.25 acres. Based upon the information in Table 1 below, the following minimum number of cartridges are required in a StormFilter System to treat the impervious area without exceeding the maximum drainage area:

1. Five (5) 12” cartridges,
2. Three (3) 18” cartridges, or
3. Two (2) 27” cartridges

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was determined based on the following:

time of concentration = 10 minutes
i=3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
c=0.99 (runoff coefficient for impervious)
Q=ciA=0.99x3.2x0.25=0.79 cfs=0.79x448.83 gpm=354.58 gpm

Based on a flow rate of 354.58 gpm, the following minimum number of cartridges are required in a StormFilter System to treat the impervious area without exceeding the MTFR:

1. Thirty-six (36) 12” cartridges,
2. Twenty-four (24) 18” cartridges, or
3. Sixteen (16) 27” cartridges

The MTFR Evaluation results will be used since that method results in the higher minimum number of cartridges determined by the two methods.

The sizing table corresponding to the available system models are noted below:

TABLE 1 STORMFILTER CARTRIDGE HEIGHTS AND NEW JERSEY TREATMENT CAPACITIES

StormFilter Cartridge Heights and New Jersey Treatment Capacities				
StormFilter Cartridge Height	**Filtration Surface Area (sq.ft)**	**MTFR[1] (GPM)**	**Mass Capture Capacity (lbs)**	**Maximum Allowable Inflow Area[2] (acres)**
Low Drop (12")	4.71	10	36.3	0.061
18"	7.07	15	54.5	0.09
27"	10.61	22.5	81.8	0.136

Notes:

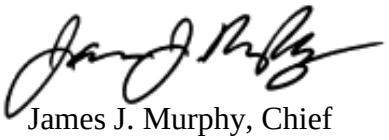
1. *MTFR calculated based on 4.72x10-3 cfs/sf (2.12 gpm/sf) of effective filtration treatment area.*
2. *Based upon the equation found in the NJDEP Filter Protocol Maximum Inflow Drainage Area (acres) = weight of TSS before 10% loss in MTFR (lbs)/600 lbs/acre of drainage area annually.*

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of

indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Shashi Nayak of my office at (609) 633-7021.

Sincerely,



James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP - DLUR
Ravi Patraju, NJDEP - BES
Gabriel Mahon, NJDEP - BNPC
Shashi Nayak, NJDEP - BNPC

CONTECH®
ENGINEERED SOLUTIONS

StormFilter Inspection and Maintenance Procedures

The Stormwater Management StormFilter®

Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

1. **Inspection**
   - Inspection of the vault interior to determine the need for maintenance.
2. **Maintenance**
   - Cartridge replacement
   - Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/ maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis, in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

The average maintenance lifecycle is approximately 1-5 years. Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

Regulatory requirements or a chemical spill can shift maintenance timing as well. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs..

Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct an inspection:

Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to weather or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)

1. Sediment loading on the vault floor.
   a. If >4" of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
   a. If >1/4" of accumulation, maintenance is required.
3. Submerged cartridges.
   a. If >4" of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
   a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
   a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
   a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
   a. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, maintenance is required.

Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from Contech Engineered Solutions.

Warning: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

   Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact Contech Engineered Solutions for suggested attachment devices.

B. Remove the used cartridges (up to 250 lbs. each) from the vault.

Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps a through c until all cartridges have been removed.

Method 2:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood and float.

D. At location under structure access, tip the cartridge on its side.

E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

F. Set the empty, used cartridge aside or load onto the hauling truck.

G. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used **empty** cartridges to Contech Engineered Solutions.

Related Maintenance Activities - Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Inspection Report

Date: Personnel:

Location: System Size:

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

Sediment Thickness in Forebay: Date:

Sediment Depth on Vault Floor:

Structural Damage:

Estimated Flow from Drainage Pipes (if available):

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water:

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal:

☐ Minor Structural Repairs:

☐ Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source:

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source:

Erosion of Landscaped Areas: Yes ☐ No ☐ Source:

Items Needing Further Work:

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

List Safety Procedures and Equipment Used: _____

_____

_____

System Observations

Months in Service:

Oil in Forebay (if present): Yes ☐ No ☐

Sediment Depth in Forebay (if present): _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: _____

Replace Cartridges: Yes ☐ No ☐ Details: _____

Sediment Removed: Yes ☐ No ☐ Details: _____

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes:

_____

_____

_____

_____

_____

_____

_____

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Support

- Drawings and specifications are available at www.conteches.com.
- Site-specific design support is available from our engineers.

800.338.1122
www.conteches.com

APPENDIX F

Stormwater Peak Flow Calculations Sub-Catchment E6 and P6

LEA Consulting Ltd. Consulting Engineers and Planners	Land Use			
	Prepared:	F.M.	Page No.	F-01
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E6 (Pre-Dev) & P6(Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

EXISTING CONDITIONS:

Sub-Catchment E6

Existing Land Use	Area (m^2)
Building	2005
Paved area	7374
Landscaped Area	10158
Total Sub-Catchment Area:	**19537**

PROPOSED DEVELOPMENT:

Sub-Catchment P6

Proposed Land Use	Area (m^2)
Building	2005
Paved area	7482
Landscaped Area	10158
Total Sub-Catchment Area:	**19645**

LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation			
	Prepared:	F.M.	Page No.	F-02
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E6 (Pre-Dev) & P6(Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Pre-Development Composite Runoff Coefficient "C"

Sub-Catchment E6

Land Use	Area (ha)	C	Composite "C"
	0.201	0.90	
Paved area	0.737	0.90	
Landscaped Area	1.016	0.25	
Total Sub-Catchment Area:	**1.954**		**0.56**
Imperviousness Percent:			**0.48**

Sub-Catchment P6

Post-Development Composite Runoff Coefficient "C"

Land Use	Area (ha)	C	Composite "C"
Building	0.201	0.90	
Paved area	0.748	0.90	
Landscaped Area	1.016	0.25	
Total Sub-Catchment Area:	**1.965**		**0.56**
Imperviousness Percent:			**0.48**

LEA Consulting Ltd. Consulting Engineers and Planners	Pre-Development Peak Flow Rates Calculation			
	Prepared:	F.M.	Page No.	F-03
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E6 (Pre-Dev) & P6(Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Rational Formulae: Q = 2.78 CIA (L/s)

Site Area:	1.954	ha
Time of Concentration:	15	minutes as per GRCA Guidelines
Runoff Coefficient :	0.56	Pre-development condition

Rainfall Intensity: $I = a/(b+T^{c)}$

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under existing site conditions (L/s):	193.7	242.5	277.4	359.2	371.5	396.4

LEA Consulting Ltd. Consulting Engineers and Planners	Post-Development Peak Flow Rates Calculation			
	Prepared:	F.M.	Page No.	F-04
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street, Sub-Catchment E6 (Pre-Dev) & P6(Post-Dev), Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Rational Formulae: Q = 2.78 CIA (L/s)

Site Area:	1.965	ha
Time of Concentration:	15	minutes as per GRCA Guidelines
Runoff Coefficient :	0.56	Pre-development condition

Rainfall Intensity: $I = a/(b+T^{c)}$

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under Proposed site conditions (L/s):	195.4	244.6	279.8	362.4	374.8	399.9

APPENDIX G

Storm Pipe Size Calculations

DEVELOPMENT:	**19073**	**SHEET No.:**	**DATE:**	23/07/2020	
CONSULTANT:	**LEA Consulting Ltd**	**DESIGNED BY:**	**F.M.**		
MAJOR DRAINAGE AREA:		**CHECKED BY:**	**R.B.**		

300-450mm STORM SEWER IN UNIVERSITY AVENUE WEST.

Town of Cobourg Intensity 5yr (Yarnel parameters) = 2464/(tc+16)

Pre-Development Condition

FROM UPSTREAM	TO DOWNSTREAM	AREA	RUNOFF COEFFICIENT	AREA	RUNOFF COEFFICIENT	AREA TIMES RUNOFF COEFFICIENT	ACCUMULATIVE AREA DRAINED BY SECTION	ACCUMULATIVE AREA TIMES RUNOFF COEFFICIENT FOR SECTION	FLOW TIME TO SECTION FROM EXTREME UPSTREAM INLET	INITIAL TIME OF CONCENTRATION AT EXTREME UPSTREAM INL.	TIME OF CONCENTRATION UPSTREAM END OF SECTION	INTENSITY OF RAINFALL (5yr)	QUANTITY OF FLOW TO BE ACCOMODATED IN SECTION	TYPE OF PIPE	MANNING ROUGHNESS COEFFICIENT	SLOPE	DIAMETER	LENGTH OF SECTION	VELOCITY OF FLOW WITH PIPE FLOWING FULL	CAPACITY OF PIPE FLOWING FULL	TIME OF FLOW IN SECTION	QUANTITY OF FLOW TO PIPE FLOWING FULL	Comment
MH#	MH#	A1 ha	C1	A2 ha	C2	AxC	SUM. A ha	SUM AxC	tc_f min	tc_i min	$tc=tc_f+tc_i$ min	i mm/hr	Q=iAC/360 m^3/sec		n	S %	D mm	L m	V m/sec	Q_f m^3/sec	t=L/Vx60 min	Q/Q_f %	
CB4	CBMH4	0.0713	0.90	0.0413	0.25	0.074	0.1126	0.0745	0	15	15.00	79.5	**0.016**	PVC	0.013	1.00	300	21.00	1.37	0.097	0.26	0.17	
CBNH4	CBMH1	0.0819	0.90	0.0460	0.25	0.085	0.2405	0.16	0.26	15	15.26	78.8	**0.035**	PVC	0.013	1.50	300	83.70	1.68	0.118	0.83	0.30	
CBMH1	MH2	0.6483	0.90	0.2141	0.25	0.637	1.1029	0.80	1.09	15	16.09	76.8	**0.170**	CONC	0.013	1.50	450	67.70	2.20	0.349	0.51	0.49	
MH2	MH1	0.1549	0.90	0.0225	0.25	0.145	1.2803	0.94	1.60	15	16.60	75.6	**0.198**	CONC	0.013	1.50	450	44.40	2.20	0.349	0.34	0.57	
MH1	OUTLET#1	0.2323	0.90	0.0337	0.25	0.217	1.5463	1.16	1.94	15	16.94	74.8	**0.241**	CONC	0.013	1.50	525	21.00	2.43	0.527	0.14	0.46	
DICB5	CBMH3	0.0056	0.90	0.0504	0.25	0.018	0.0560	0.0176	0	15	15.00	79.5	**0.004**	PVC	0.013	1.00	300	29.40	1.37	0.097	0.36	0.04	
CBMH3	CBMH2	0.1075	0.90	0.0081	0.25	0.099	0.1156	0.1164	0.36	15	15.36	78.6	**0.025**	PVC	0.013	1.50	300	25.40	1.68	0.118	0.25	0.21	
CBMH2	STORM TANK	0.0953	0.90	0.0072	0.25	0.088	0.1025	0.2040	0.61	15	15.61	77.9	**0.044**	PVC	0.013	1.50	300	1.20	1.68	0.118	0.01	0.37	
CBMH5	STORM TANK	0.1031	0.90	0.0000	0.25	0.093	0.1031	0.0928	0.0	15	15.00	79.5	**0.020**	PVC	0.013	1.00	300	44.50	1.37	0.097	0.54	0.21	
EX. CULVERT	Ex. MH23	0.1761	0.90	0.2266	0.25	0.215	0.4027	0.2151	0	15	15.00	79.5	**0.048**	CSP	0.024	1.60	450	5.60	1.23	0.195	0.08	0.24	
EX. MH23	MH4	0.0000	0.90	0.0000	0.25	0.000	0.0000	0.2151	0.08	15	15.08	79.3	**0.047**	CSP	0.024	0.45	600	17.90	0.79	0.223	0.38	0.21	
MH4	MH3	0.0000	0.90	0.0000	0.25	0.000	0.4027	0.2151	0.45	15	15.45	78.3	**0.047**	CONC	0.013	1.00	450	28.70	1.79	0.285	0.27	0.16	
DICB1	MH7	0.1398	0.90	0.1150	0.25	0.155	0.2548	0.1546	0	15	15.00	79.5	**0.034**	PVC	0.013	0.65	375	40.60	1.28	0.141	0.53	0.24	
CB3	MH7	0.0717	0.90	0.0339	0.25	0.073	0.1056	0.0730	0	15	15.00	79.5	**0.016**	PVC	0.013	0.50	300	22.60	0.97	0.068	0.39	0.24	
MH7	MH6	0.1368	0.90	0.0460	0.25	0.135	0.5432	0.3622	0.39	15	15.39	78.5	**0.079**	PVC	0.013	1.00	375	20.90	1.59	0.175	0.22	0.45	
MH6	MH3	0.1543	0.90	0.1714	0.25	0.182	0.8689	0.5439	0.61	15	15.61	78.0	**0.118**	CONC	0.013	1.00	375	7.30	1.59	0.175	0.08	0.67	
MH3	OUTLET#2	0.0000	0.90	0.0000	0.25	0.000	1.2716	0.7591	0.69	15	15.69	77.8	**0.164**	CONC	0.013	1.00	450	38.90	1.79	0.285	0.36	0.58	
DDICB1	MH8	0.2068	0.90	1.2744	0.25	0.505	1.4812	0.5047	0	15	15.00	79.5	**0.111**	PVC	0.013	0.70	375	24.10	1.33	0.147	0.30	0.76	
MH8	OUTLET#3	0.2218	0.90	0.1012	0.25	0.225	1.8042	0.7296	0.30	15	15.30	78.7	**0.160**	CONC	0.013	0.90	450	40.00	1.70	0.270	0.39	0.59	

APPENDIX H

Pond Retrofit Design and Vo Model Output

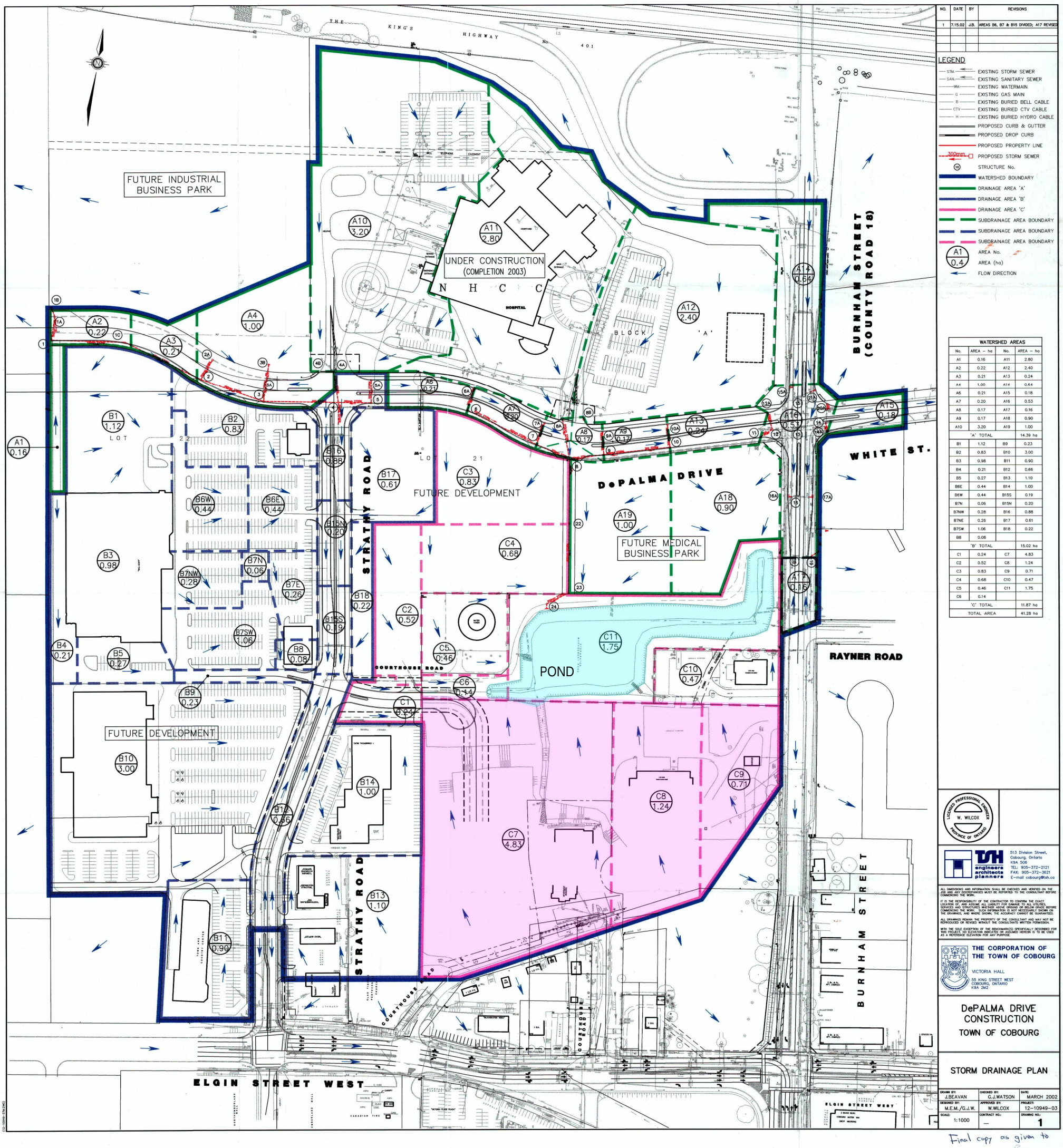


Fig. 2- Pond retrofit study- drainage area plan

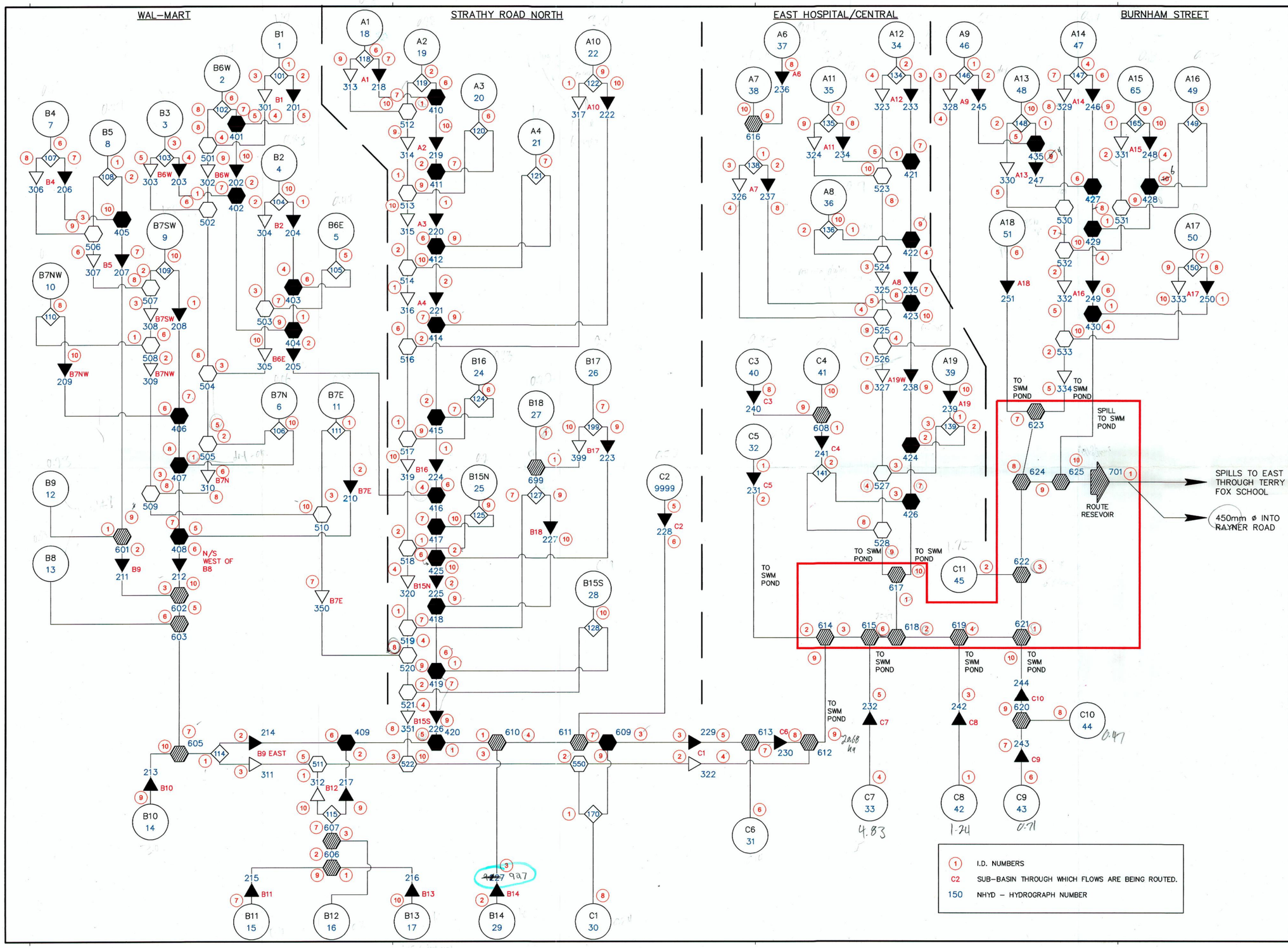
March 2003

WAL-MART

STRATHY ROAD NORTH

EAST HOSPITAL/CENTRAL

BURNHAM STREET



LEGEND

- B1 / 1 — COMPUTE STANDHYD
- 100 — COMPUTE DUHYD
- 200 — ROUTE CHANNEL
- 300 — ROUTE PIPE
- 400 — ADD MAJOR
- 500 — ADD MINOR
- 600 — ADD MINOR AND MAJOR
- 700 — ROUTE RESEVOIR
- STORMWATER MANAGEMENT POND

NOTE:

IT IS THE RESPONSIBILITY OF THE CONTRACTORS TO INFORM THEMSELVES OF THE EXACT LOCATION OF, AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES, SERVICES AND STRUCTURES WHETHER ABOVE GROUND OR BELOW GRADE BEFORE COMMENCING THE WORK. SUCH INFORMATION IS NOT NECESSARILY SHOWN ON THE DRAWING, AND WHERE SHOWN, THE ACCURACY CANNOT BE GUARANTEED.

WITH THE SOLE EXCEPTION OF THE BENCHMARK(S) SPECIFICALLY DESCRIBED FOR THIS PROJECT, NO ELEVATION INDICATED OR ASSUMED HEREON IS TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

No.	DATE	BY	ISSUES / REVISIONS
3	03.01.03	GJW	GRCA COMMENTS
2	18.10.02	GJW	SWM POND LOCATION ADDED
1	26.08.02	GJW	STANDHYD B17 REVISED

(1) I.D. NUMBERS
C2 SUB-BASIN THROUGH WHICH FLOWS ARE BEING ROUTED.
150 NHYD – HYDROGRAPH NUMBER

TSH engineers architects planners
513 Division Street
Cobourg, Ontario
K9A 5G8
TEL: 905-372-2121
FAX: 905-372-3621
E-mail cobourg@tsh.ca
www.tsh.ca

CLIENT:

THE CORPORATION OF THE TOWN OF COBOURG

VICTORIA HALL
55 KING STREET WEST
COBOURG, ONTARIO
K9A 2M2

PROJECT:

BURNHAM STREET SWM FACILITY

DRAWING:

OTTHYMO SCHEMATIC

DRAWN BY:	CHECKED BY:	PROJECT No. :
J. BEAVAN	G.J. WATSON	12-29112
DESIGNED BY:	APPROVED BY:	DRAWING No.
G.J. WATSON	W. WILCOX	SCH
SCALE: N/A	DATE: SEPTEMBER 2002	

C:\SSK\PROJ\12-29112\dwg\29112SCH.dwg Fri Jan 17 14:10:55 2003

29112SCH.DWG

```
| ADD HYD   (0614) |
|   2 +  9 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
          ID1= 2 (0231):       .46       .02      1.75     42.55
        + ID2= 9 (0612):     20.68      3.73      1.50     51.84
          ================================================
          ID = 3 (0614):     21.14      3.75      1.50     51.64

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*
******************* BASIN C7
*
--------------------
| DESIGN           |
| STANDHYD  (0033) |   Area     (ha)=   4.83
|ID= 4 DT= 5.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        3.62          1.21
     Dep. Storage      (mm)=         .80          1.50
     Average Slope      (%)=        2.63          2.63
     Length             (m)=      179.44         40.00
     Mannings n            =        .013          .250

     Max.eff.Inten.(mm/hr)=      202.29         85.39
               over (min)          5.00         10.00
     Storage Coeff.  (min)=        2.05 (ii)     5.21 (ii)
     Unit Hyd. Tpeak (min)=        5.00         10.00
     Unit Hyd. peak  (cms)=         .31           .16
                                                          *TOTALS*
     PEAK FLOW       (cms)=        1.90           .17        1.98 (iii)
     TIME TO PEAK    (hrs)=        1.33          1.42        1.33
     RUNOFF VOLUME    (mm)=       56.38         26.01       48.79
     TOTAL RAINFALL   (mm)=       57.18         57.18       57.18
     RUNOFF COEFFICIENT    =        .99           .45         .85

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*
****************** ROUTE LOCAL COMBINED FLOW THROUGH C7
*
--------------------
| ROUTE     (0232) |     Routing time step (min) =  5.00
| CHANNEL  #SEG= 1 |
| IN= 4---> OUT= 5 |     Slopes (%), CHANNEL=2.63   FLOODPLAIN=2.63
--------------------                 LENGTH =  210.00     (m)

               <------ DATA FOR SECTION (   2.0) ------>
               Distance      Elevation       Manning
                    .00         104.70         .2500      Main Channel
                  15.00         104.73         .2500      Main Channel
                  36.00         104.58         .2500      Main Channel
```

55.00	104.55	.2500	Main Channel
59.00	104.41	.2500	Main Channel
65.00	104.45	.2500	Main Channel
75.00	105.92	.2500	Main Channel
90.00	106.99	.2500	Main Channel
113.00	107.05	.2500	Main Channel

<---------- TRAVEL TIME TABLE ---------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
.015	104.425	.449E+01	.001	.025	137.91
.031	104.441	.180E+02	.003	.040	86.87
.046	104.456	.398E+02	.011	.057	61.93
.062	104.472	.647E+02	.023	.074	47.02
.077	104.487	.913E+02	.039	.090	39.07
.093	104.503	.120E+03	.059	.103	34.01
.108	104.518	.150E+03	.082	.115	30.45
.124	104.534	.182E+03	.109	.126	27.78
.139	104.549	.216E+03	.140	.136	25.69
.155	104.565	.265E+03	.129	.102	34.22
.170	104.580	.347E+03	.155	.094	37.25
.186	104.596	.448E+03	.226	.106	33.01
.201	104.611	.556E+03	.310	.117	29.91
.217	104.627	.672E+03	.407	.127	27.53
.232	104.642	.796E+03	.518	.137	25.62
.248	104.658	.927E+03	.643	.146	24.04
.263	104.673	.107E+04	.782	.154	22.72
.279	104.689	.121E+04	.936	.162	21.58
.294	104.704	.137E+04	1.105	.170	20.60

**** WARNING: TRAVEL TIME TABLE EXCEEDED

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
	<---- hydrograph ---->				<-pipe / channel->	
INFLOW : ID= 4 (0033)	4.83	1.98	1.33	48.79	.27	.16
OUTFLOW: ID= 5 (0232)	4.83	.59	1.50	48.63	.24	.14

**** WARNING: COMPUTATIONS FAILED TO CONVERGE.

---

*

****************** ADD COMBINED FLOWS AT SWM POND

*

ADD HYD (0615)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
3 + 5 = 6				
ID1= 3 (0614):	21.14	3.75	1.50	51.64
+ ID2= 5 (0232):	4.83	.59	1.50	48.63
ID = 6 (0615):	25.97	4.33	1.50	51.08

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

*

****

* CENTRAL EASEMENT (HOSPITAL EAST) SUB-BASIN *

****

*

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--------------------------------------------------------------------------------
*
****************** BASIN C8
*
--------------------
| DESIGN           |
| STANDHYD  (0042) |   Area     (ha)=    1.24
|ID= 1 DT= 5.0 min |   Total Imp(%)=   85.00   Dir. Conn.(%)=   50.00
--------------------

                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=         1.05           .19
     Dep. Storage      (mm)=          .80          1.50
     Average Slope      (%)=         2.61          2.61
     Length             (m)=        90.92         40.00
     Mannings n             =         .013          .250
```

Max.eff.Inten.(mm/hr)=	202.29	342.35		
over (min)	5.00	5.00		
Storage Coeff. (min)=	1.37 (ii)	4.40 (ii)		
Unit Hyd. Tpeak (min)=	5.00	5.00		
Unit Hyd. peak (cms)=	.33	.23		
			TOTALS	
PEAK FLOW (cms)=	.34	.19	.53 (iii)	
TIME TO PEAK (hrs)=	1.33	1.33	1.33	
RUNOFF VOLUME (mm)=	56.38	42.46	49.42	
TOTAL RAINFALL (mm)=	57.18	57.18	57.18	
RUNOFF COEFFICIENT =	.99	.74	.86	

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---

*
****************** ROUTE COMBINED FLOW THROUGH C8
*

ROUTE (0242)	Routing time step (min) = 5.00
CHANNEL #SEG= 2	
IN= 1---> OUT= 3	Slopes (%), CHANNEL=2.61 FLOODPLAIN=2.61
	LENGTH = 170.00 (m)

<------ DATA FOR SECTION (1.4) ------>

Distance	Elevation	Manning	
.00	105.20	.2500	
50.00	104.80	.2500 / .0130	Main Channel
90.00	105.20	.0130	Main Channel

<---------- TRAVEL TIME TABLE ---------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
.021	104.821	.847E+01	.014	.283	10.03
.042	104.842	.339E+02	.089	.448	6.32
.063	104.863	.763E+02	.264	.588	4.82
.084	104.884	.136E+03	.568	.712	3.98
.105	104.905	.212E+03	1.029	.826	3.43
.126	104.926	.305E+03	1.674	.933	3.04
.147	104.947	.415E+03	2.525	1.034	2.74
.168	104.968	.542E+03	3.605	1.130	2.51
.189	104.989	.686E+03	4.936	1.222	2.32
.211	105.010	.847E+03	6.537	1.311	2.16
.232	105.032	.103E+04	8.428	1.397	2.03
.253	105.053	.122E+04	10.630	1.481	1.91
.274	105.074	.143E+04	13.159	1.562	1.81
.295	105.095	.166E+04	16.034	1.641	1.73
.316	105.116	.191E+04	19.273	1.718	1.65
.337	105.137	.217E+04	22.892	1.794	1.58
.358	105.158	.245E+04	26.909	1.868	1.52
.379	105.179	.275E+04	31.340	1.940	1.46
.400	105.200	.306E+04	36.200	2.012	1.41

<---- hydrograph ----> <-pipe / channel->

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 1 (0042)	1.24	.53	1.33	49.42	.08	.70
OUTFLOW: ID= 3 (0242)	1.24	.37	1.42	49.38	.07	.63

---

*

****************** ADD COMBINED FLOWS AT SWM POND

*

ADD HYD (0619)		AREA	QPEAK	TPEAK	R.V.
2 + 3 = 4		(ha)	(cms)	(hrs)	(mm)
	ID1= 2 (0618):	34.43	5.92	1.42	50.81
	+ ID2= 3 (0242):	1.24	.37	1.42	49.38
	ID = 4 (0619):	35.67	6.29	1.42	50.76

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

*

****************** BASIN C9

*

DESIGN STANDHYD (0043) ID= 6 DT= 5.0 min	Area (ha)= .71	Total Imp(%)= 75.00	Dir. Conn.(%)= 1.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.53	.18	
Dep. Storage	(mm)=	.80	1.50	
Average Slope	(%)=	2.63	2.63	
Length	(m)=	68.80	40.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	202.29	425.84	
over	(min)	5.00	5.00	
Storage Coeff.	(min)=	1.15 (ii)	4.79 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	.34	.22	
				TOTALS
PEAK FLOW	(cms)=	.00	.22	.23 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33
RUNOFF VOLUME	(mm)=	56.38	44.29	44.41
TOTAL RAINFALL	(mm)=	57.18	57.18	57.18
RUNOFF COEFFICIENT	=	.99	.77	.78

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
*
****************** ROUTE COMBINED BASIN FLOW THROUGH C9
*
--------------------
| ROUTE      (0243) |      Routing time step (min) =  5.00
| CHANNEL  #SEG= 1  |
| IN= 6---> OUT= 7  |      Slopes (%), CHANNEL=2.63    FLOODPLAIN=2.63
--------------------                   LENGTH =  110.00     (m)

                <------ DATA FOR SECTION (   1.4) ------>
                Distance       Elevation        Manning
                     .00         106.50          .2500      Main Channel
                   20.00         105.90          .2500      Main Channel
                   70.00         106.50          .2500      Main Channel

        <---------------------- TRAVEL TIME TABLE ---------------------->
         DEPTH     ELEV       VOLUME     FLOW RATE     VELOCITY    TRAV.TIME
          (m)       (m)      (cu.m.)       (cms)         (m/s)       (min)
         .032   105.932     .640E+01       .002          .041       44.91
         .063   105.963     .256E+02       .015          .065       28.29
         .095   105.995     .576E+02       .044          .085       21.59
         .126   106.026     .102E+03       .096          .103       17.82
         .158   106.058     .160E+03       .174          .119       15.36
         .189   106.089     .230E+03       .282          .135       13.60
         .221   106.121     .314E+03       .426          .149       12.27
         .253   106.153     .410E+03       .608          .163       11.23
         .284   106.184     .518E+03       .832          .177       10.38
         .316   106.216     .640E+03      1.102          .189        9.67
         .347   106.247     .774E+03      1.421          .202        9.08
         .379   106.279     .921E+03      1.793          .214        8.57
         .411   106.311     .108E+04      2.219          .226        8.12
         .442   106.342     .125E+04      2.704          .237        7.73
         .474   106.374     .144E+04      3.250          .248        7.38
         .505   106.405     .164E+04      3.861          .259        7.07
         .537   106.437     .185E+04      4.538          .270        6.79
         .568   106.468     .207E+04      5.285          .280        6.54
         .600   106.500     .231E+04      6.105          .291        6.31

                                      <---- hydrograph ---->   <-pipe / channel->
                                AREA     QPEAK    TPEAK    R.V.   MAX DEPTH  MAX VEL
                                (ha)     (cms)    (hrs)    (mm)      (m)       (m/s)
  INFLOW : ID= 6 (0043)          .71       .23     1.33   44.41       .17        .13
  OUTFLOW: ID= 7 (0243)          .71       .09     1.50   44.08       .12        .10


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

APPENDIX I

Sanitary and Water Demand Calculations

LEA Consulting Ltd. Consulting Engineers and Planners	**Sanitary Flow Rate Calculation**			
	Prepared:	F.M.	Page No.	I-01
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Proposed New Golden Plough Lodge

POPULATION CALCULATION

(Based on the Architect Statistics)

Bulding site area	17000.0	m^2
No. of Beds	180.0	cap
Population (1.61 CPU)	**289.8**	cap

SANITARY FLOW CALCULATION

(Based on the Town of Cobourg Design Guidelines)

Harmon Peaking Factor: $K_H=1+(14/(4+(P/1000)^{0.5}))$

Peaking Factor (K_H)	4.08	
Max. Peaking factor based on Town of Cobourg Design Guidelines	3.80	
Average Daily Wastewater Flow	364	L/cap/day
Total Domestic Flow	4.64	L/sec
Infiltration Allowance (@ 0.26 L/sec/ha)	0.44	L/sec
Design Flow	**5.08**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Water Demand Calculation			
	Prepared:	F.M.	Page No.	I-02
	R.B.	R.B.		
Project: 555 Courthouse Road and 983 Burnham street Town of Cobourg	19073	19073		
	Date:	23-Jul-20		

Proposed New Golden Plough Lodge
This calculation is following the "Water Supply for Public Fire Protection"
by Fire Underwriters Survey.

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

where F = the required fire flow in litres p 180
C = coefficient related to the type of construction.
= 0.8 for fire non-combastable construction
A = the total floor area in square metres. For fire resistive buildings, consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors.

STEP 1 According the building stats,

		Area (m2)
1st Floor	adjoining	6198
2nd Floor	largest	4990
3rd Floor	adjoining	5016
A		7793

Therefore, F = 16000 **l/min**

STEP 2 **Occupancy reduction:**

For occupancies with a low contents fire hazard, the reduction rate is 25%,
Therefore: F = 12000 l/min

Reduction for sprinkler protection:
Using the NFPA sprinkler system, a reduction rate of 30% is used.
Therefore: F = 8400 l/min

STEP 3 Separation charge:
Charge for the separations on each side:

Separation	Charge	
more than 45m	0%	South
more than 45m	0%	North
30.1 to 45m	5%	East
30.1 to 45m	5%	West

Total charge in % 10%
Total charge in l/min 1200

STEP 4 Required Fire Flow: 10000 l/min
or 166.67 l/s
or 2642 US GPM

LEA Consulting Ltd. Consulting Engineers and Planners	Water Demand Calculation			
	Prepared:	F.M.	Page No.	I-03
	R.B.	R.B.		
Project: 555 Courthouse Road and 983 Burnham street Town of Cobourg	19073	19073		
	Date:	23-Jul-20		

Proposed New Golden Plough Lodge

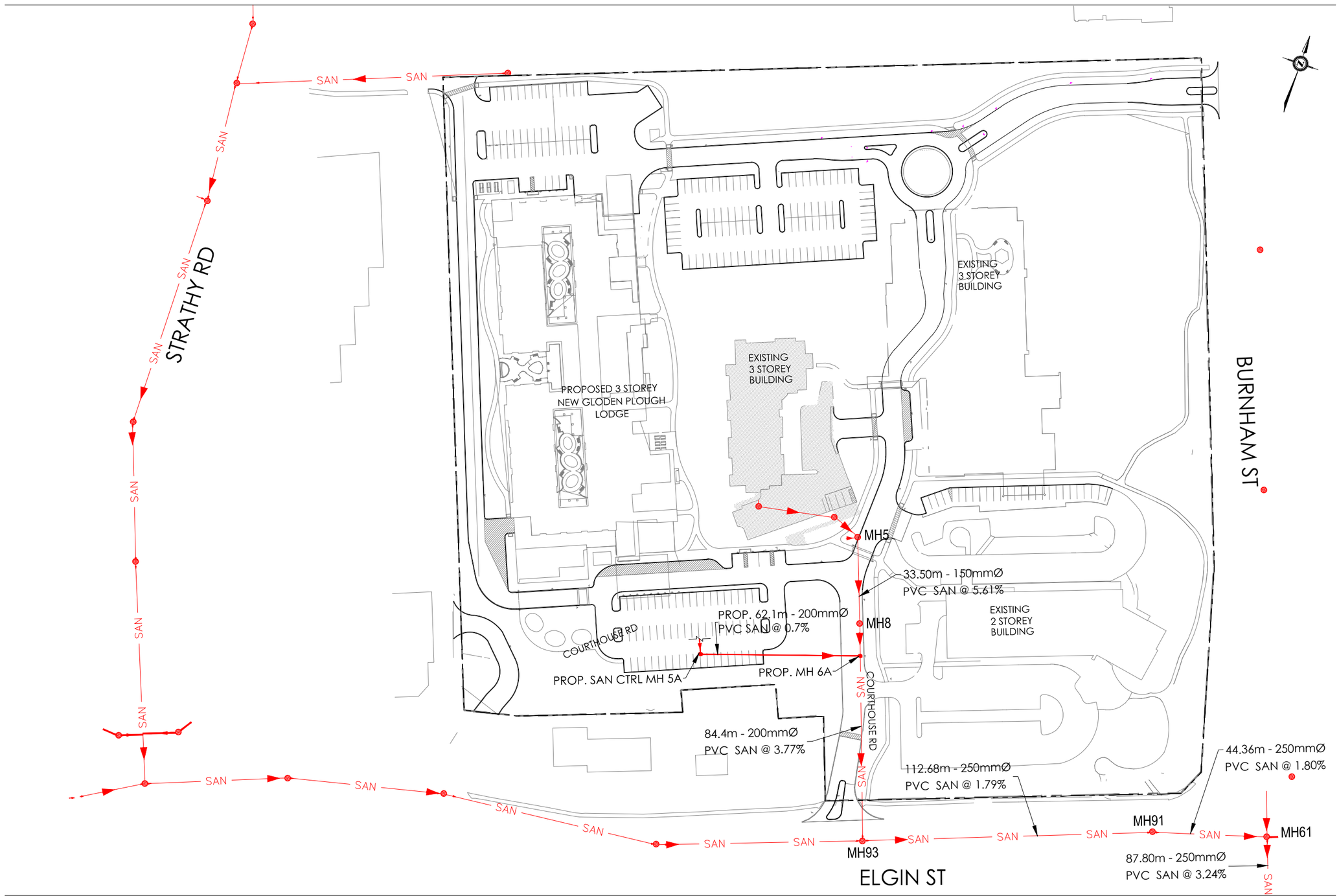
Total Population: **290** (See Page E-01)

Peak Hour Demand Calculation:			
(Based on the MOE Design Guidelines for Drinking Wate	180		
Maximum Household Water Demand		1500	L/cap/day
Peaking Factor		5.40	
Peak Hour Demand		**27.17**	L/sec

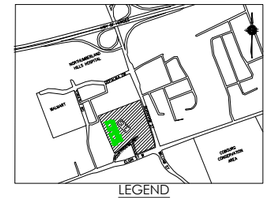
Maximum Day Demand Calculation:			
(Based on the MOE Design Guidelines for Drinking Water Systems Table 3.3)			
Maximum Household Water Demand		1500	L/cap/day
Peaking Factor		3.60	
Maximum Day Demand		**18.11**	L/sec
Fire Flow for High Rise Residential:		166.7	L/sec
Max. Day Demand plus Fire Flow:		**184.8**	L/sec
Design Water Demand		**184.8**	L/sec
		2928.7	**US GPM**

APPENDIX J

Existing Sanitary Sewers Analysis



KEY PLAN



LEGEND

- MH — EXISTING MANHOLE
- PROPERTY LINE
- SAN — STUDY AREA

No.	Revision	Date

Orientation

Seal

salterpilonarchitecture

151 Ferris Lane, Suite 400 Barrie, Ontario L4M 6C1
salterpilon.com t: 705.737.3530

Project Information

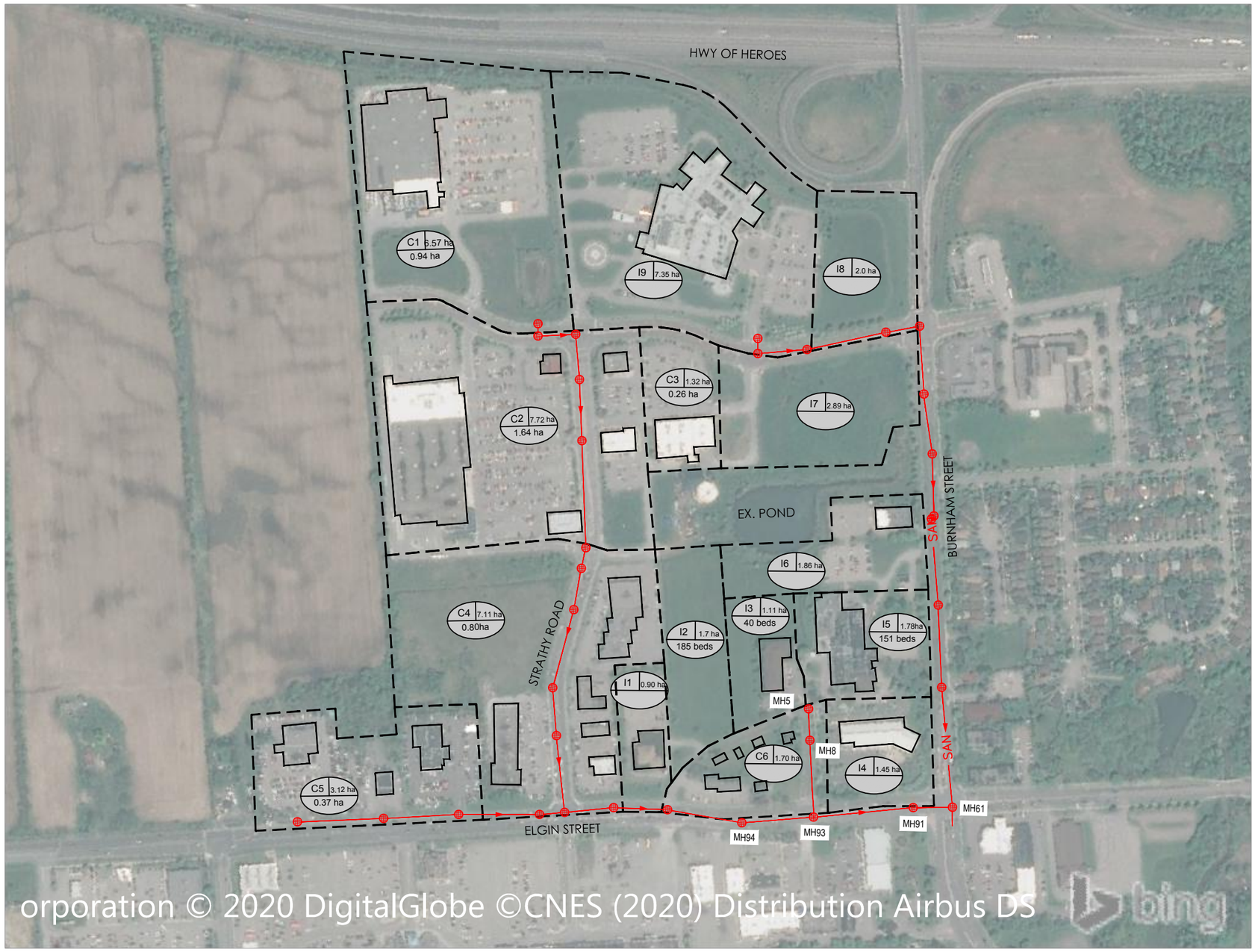
For

Drawing Title

EXISTING SANITARY SEWERS PLAN

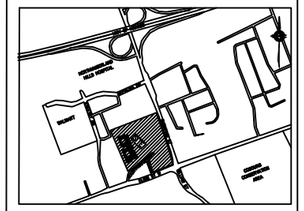
Date	Project No	Drawing No
NOVEMBER 10, 2018	19073	FIG.3
Drawn by: F.M.		
Scale: 1:1500		

DRAWING NAME: P:\19073 – Glden Plough LTC\Drafting\Current Drawing\19-3– Existing Sanitary Plan.dwg – Nov 16, 2020–12:56pm



SANITARY DRAINAGE LAND–USE

C1	COMMERCIAL	HOME DEPOT
C2	COMMERCIAL	WALMART SUPER CENTRE & SHOPPING STORES
C3	COMMERCIAL	WINNERS
C4	COMMERCIAL	SHOPPING STORES
C5	COMMERCIAL	CHEVROLET AND FORD DEALERS
C6	RESIDENTIAL & COMMERCIAL	SINGLE HOUSES AND SHOPPING STORES
I1	INSTITUTIONAL	CHURCH
I2	RESIDENTIAL	PROPOSED GOLDEN PLOUGH LODGE
I3	RESIDENTIAL	HALCYON PLACEBUILDING
I4	INSTITUTIONAL	EXISTING NORTHUMBERLAND COUNTY HEADQUARTERS
I5	RESIDENTIAL	EXISTING GOLDEN PLOUGH LODGE
I6	INSTITUTIONAL	HIGHLAND SHORES CHILDREN'S AID
I7	INSTITUTIONAL	UNDEVELOPED LANDS
I8	INSTITUTIONAL	UNDEVELOPED LANDS
I9	INSTITUTIONAL	NORTHUMBERLAND HILLS HOSPITAL



SANITARY DRAINAGE AREA

SAN — EXISTING SANITARY SEWER

EXISTING SANITARY MANHOLE

C1 6.6 ha 0.94 ha — COMMERCIAL CATCHMENT ID/ TOTAL AREA /BUILDING AREA

I3 1.11 ha 40 BED — INSTITUTIONAL CATCHMENT ID/ TOTAL AREA / No. OF BEDS

No.	Revision	Date

Orientation

Seal

salterpilonarchitecture

151 Ferris Lane, Suite 400 Barrie, Ontario L4M 6C1
salterpilon.com t: 705.737.3530

Project Information

For

Drawing Title

SANITARY DRAINAGE AREA PLAN

Date	Project No	Drawing No
FEBRUARY 10, 2020	19073	FIG.4
Drawn by M.N.		
Scale 1:5000		

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation - C1			
	Prepared:	M.N.	Page No.	I-01
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area	C1	Commercial	65,700	m^2
			6.57	ha

POPULATION CALCULATION

Bulding Footprint (Home Depot)	9,350	m^2
Swage Flow Rate (Commercial)	5	L/day/m^2

SANITARY FLOW CALCULATION

(Based on the MOE Design Guidelines)

Peaking Factor	4.13	
Average Daily Wastewater Flow	2.23	L/sec
Infiltration Allowance (@ 0.26 L/sec/ha)	1.71	L/sec
Design Flow	**3.94**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation - C2			
	Prepared:	M.N.	Page No.	I-02
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area	C2	Commercial	77,200	m^2
			7.72	ha

POPULATION CALCULATION

Bulding Footprint (Walmart Center)	13,718	m^2
Bulding Footprint (Other Commercials)	2,694	m^2
Swage Flow Rate	5.0	L/day/m^2

SANITARY FLOW CALCULATION

(Based on the MOE Design Guidelines)

Peaking Factor	4.13	
Average Daily Wastewater Flow	3.92	L/sec
Infiltration Allowance (@ 0.26 L/sec/ha)	2.01	L/sec
Design Flow	**5.93**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation - C3			
	Prepared:	M.N.	Page No.	I-03
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area	C3	Commercial	13,200	m^2
			1.32	ha

POPULATION CALCULATION

Bulding Footprint (Smart Centres Cobourg)	2,620	m^2
Swage Flow Rate (Commercial)	5	L/day/m^2

(Based on the MOE Design Guidelines)

Peaking Factor	4.13	
Average Daily Wastewater Flow	0.63	L/sec
Infiltration Allowance (@ 0.26 L/sec/ha)	0.34	L/sec
Design Flow	**0.97**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation - C4			
	Prepared:	M.N.	Page No.	I-04
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area	C4	71,100	m^2
		7.11	ha

POPULATION CALCULATION

Bulding Footprint (Commercial Building)	8,033	m^2
Swage Flow Rate (Commercial)	5	L/day/m^2

SANITARY FLOW CALCULATION

(Based on the MOE Design Guidelines)

Peaking Factor	4.13	
Average Daily Wastewater Flow	1.92	L/sec
Infiltration Allowance (@ 0.26 L/sec/ha)	1.85	L/sec
Design Flow	**3.77**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation - C5			
	Prepared:	M.N.	Page No.	I-05
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area	C5	Commercial	31,200	m^2
			3.12	ha

POPULATION CALCULATION

Bulding Footprint (Commercial)	3,709	m^2
Swage Flow Rate (Commercial)	5	L/day/m^2

SANITARY FLOW CALCULATION

(Based on the MOE Design Guidelines)

Peaking Factor	4.13	
Average Daily Wastewater Flow	0.89	L/sec
Infiltration Allowance (@ 0.26 L/sec/ha)	0.81	L/sec
Design Flow	**1.70**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation - I1			
	Prepared:	M.N.	Page No.	I-06
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area	I1	Institutional	9,000	m^2
			0.90	ha

POPULATION CALCULATION

Site Area (Church, Parking and Green Area)	9000.0	m^2
Design flow (Institutional/Schools) including infiltration and Peaking Factor	112.0	m^3/gross ha/day

SANITARY FLOW CALCULATION

(Based on the Town of Cobourg Design Guidelines)

Total Sanitary Flow	1.17	L/sec
Design Flow	**1.17**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation - I2			
	Prepared:	M.N.	Page No.	I-07
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area	I2	Institutional	17,000	m^2
			1.70	ha

Proposed GPL

POPULATION CALCULATION

(Based on the Architect Statistics)

Bulding Footprint (Proposed GPL)	7372.0	m^2
No. of Beds	180.0	cap
Population (Proposed GPL)	**289.8**	cap

SANITARY FLOW CALCULATION

(Based on the Town of Cobourg Design Guidelines)

Harmon Peaking Factor: $K_H=1+(14/(4+(P/1000)^{0.5}))$

Peaking Factor (K_H)	4.08	
Max. Peaking factor based on Town of Cobourg Design Guidelines	3.80	
Average Daily Wastewater Flow	364	L/cap/day
Total Domestic Flow	4.64	L/sec
Infiltration Allowance (@ 0.26 L/sec/ha)	0.44	L/sec
Design Flow	**5.08**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation - I3			
	Prepared:	M.N.	Page No.	I-08
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area	I3	Institutional	11,100	m^2
			1.11	ha

Existing Halcyon Place

POPULATION CALCULATION

(Based on the Architect Statistics)

Bulding Footprint (Existing Halcyon Place)	4180.0	m^2
No. of Beds	40.0	cap
Population (Existing Halcyon Place)	**64.4**	cap

SANITARY FLOW CALCULATION

(Based on the Town of Cobourg Design Guidelines)

Harmon Peaking Factor: $K_H=1+(14/(4+(P/1000)^{0.5}))$

Peaking Factor (K_H)	4.29	
Max. Peaking factor based on Town of Cobourg Design Guidelines	3.80	
Average Daily Wastewater Flow	364	L/cap/day
Total Domestic Flow	1.03	L/sec
Infiltration Allowance (@ 0.26 L/sec/ha)	0.29	L/sec
Design Flow	**1.32**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation- C6			
	Prepared:	M.N.	Page No.	I-09
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area	C6	Commercial and Residential	17,000	m^2
			1.70	ha

POPULATION CALCULATION

Residential		
Building Footprint	521.6	m^2
Number of Residential Units (Detached)	5	
Population per unit	3.23	
Population	**16.2**	
Commercial		
Building Footprint	609.0	m^2
Swage Flow Rate (Commercial)	5.0	$L/day/m^2$

SANITARY FLOW CALCULATION

(Based on the Town of Cobourg Design Guidelines for Residential and MOE Design Guildline for Commercial)

Residential:

Harmon Peaking Factor:	$K_H=1+(14/(4+(P/1000)^{0.5}))$		
Peaking Factor (K_H)		4.39	
Max. Peaking factor based on Town of Cobourg Design Guidelines		3.80	
Average Daily Wastewater Flow		364	L/cap/day
Total Domestic Flow		**0.26**	L/sec

Commercial:

Peaking Factor	4.13	
Average Daily Wastewater Flow	0.15	
Commercial Design Flow	**0.15**	L/sec

Infiltration Allowance (@ 0.26 L/sec/ha)	**0.44**	L/sec
Design Flow	**0.85**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation - I4			
	Prepared:	M.N.	Page No.	I-010
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area I4 Institutional 14,500 m^2

1.45 ha

Existing Community Center

POPULATION CALCULATION

Site Area (Community Center, Parking, Green Area)	14500.0	m^2
Bulding Footprint (Community Center-555 Courthouse Road)	3995.0	m^2
Design flow (Institutional/Schools) including infiltration and Peaking Factor	112.0	m^3/gross ha/day

SANITARY FLOW CALCULATION

(Based on the Town of Cobourg Design Guidelines)

Total Sanitary Flow	1.88	L/sec
Design Flow	**1.88**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation- I5			
	Prepared:	M.N.	Page No.	I-011
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area	I5	Institutional	17,800	m^2
			1.78	ha

Existing GPL

POPULATION CALCULATION	**66000**	
(Based on the Architect Statistics)		
Bulding Footprint (Existing GPL)	9200.0	m^2
No. of Beds	151.0	cap
Population (Existing GPL)	**243.1**	cap

SANITARY FLOW CALCULATION

(Based on the Town of Cobourg Design Guidelines)

Harmon Peaking Factor: $K_H=1+(14/(4+(P/1000)^{0.5}))$

Peaking Factor (K_H)	4.12	
Max. Peaking factor based on Town of Cobourg Design Guidelines	3.80	
Average Daily Wastewater Flow	364	L/cap/day
Total Domestic Flow	3.89	L/sec
Infiltration Allowance (@ 0.26 L/sec/ha)	0.46	L/sec
Design Flow	**4.35**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation - I6			
	Prepared:	M.N.	Page No.	I-012
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area	I6	Institutional	18,600	m^2
			1.86	ha

POPULATION CALCULATION

Site Area	18600.0	m^2
Design flow (Institutional/Schools) including infiltration and Peaking Factor	112.0	m^3/gross ha

SANITARY FLOW CALCULATION

(Based on the Town of Cobourg Design Guidelines)

Total Sanitary Flow	2.41	L/sec
Design Flow	**2.41**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation - I7			
	Prepared:	M.N.	Page No.	I-013
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area I7 Institutional 28,900 m^2

2.89 ha

Medical Business Park

POPULATION CALCULATION

Site Area	28900.0	m^2
Design flow (Institutional/Schools) including infiltration and Peaking Factor	112.0	m^3/gross ha/day

SANITARY FLOW CALCULATION

(Based on the Town of Cobourg Design Guidelines)

Total Sanitary Flow	3.75	L/sec
Design Flow	**3.75**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation - I8			
	Prepared:	M.N.	Page No.	I-014
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area I8 Institutional 20,000 m^2

2.00 ha

MEDICAL CLINIC

POPULATION CALCULATION

Site Area 20000.0 m^2

Design flow (Institutional/Schools) 112.0 m^3/gross ha/day
including infiltration and Peaking Factor

SANITARY FLOW CALCULATION

(Based on the Town of Cobourg Design Guidelines)

Total Sanitary Flow 2.59 L/sec

Design Flow **2.59** L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation - I9			
	Prepared:	M.N.	Page No.	I-015
	Checked:	F.M.		
Project: 555 Courthouse Road and 983 Burnham street -Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Drainage Area	I9	Institutional	73,500	m^2
HOSPITAL			7.35	ha

POPULATION CALCULATION

Site Area	73500.0	m^2
Design flow (Institutional/Schools) including infiltration and Peaking Factor	112.0	m^3/gross ha

SANITARY FLOW CALCULATION

(Based on the Town of Cobourg Design Guidelines)

Total Sanitary Flow	9.53	L/sec
Design Flow	**9.53**	L/sec

Sanitary Sewer Design

Existing Condition Sanitary Flow

DESIGN COEFFICIENTS			Referemce
Residential	364	L/cap/day	Town of Cobourg Design Guideline
Industrial/ Institutional	112	m3/gross ha/day Including infiltration and peaking effect	Town of Cobourg Design Guideline
Commercial	5	L/day/m2	MOE
Existing Infiltration Allowance	0.26	L/s/ha	Town of Cobourg Design Guideline
Signle Family Dwelling	3.23	Person/Unit	Town of Cobourg Design Guideline
# beds	1.61	Person/Bed	

CITY FILE No.:
PROJECT No.: 19073
PROJECT NAME: 19073 - GPL
LOCATION: Town of Cobourg

DATE: 23-Jul-20
DESIGNED BY: M.N.
CHECKED BY: F.M.

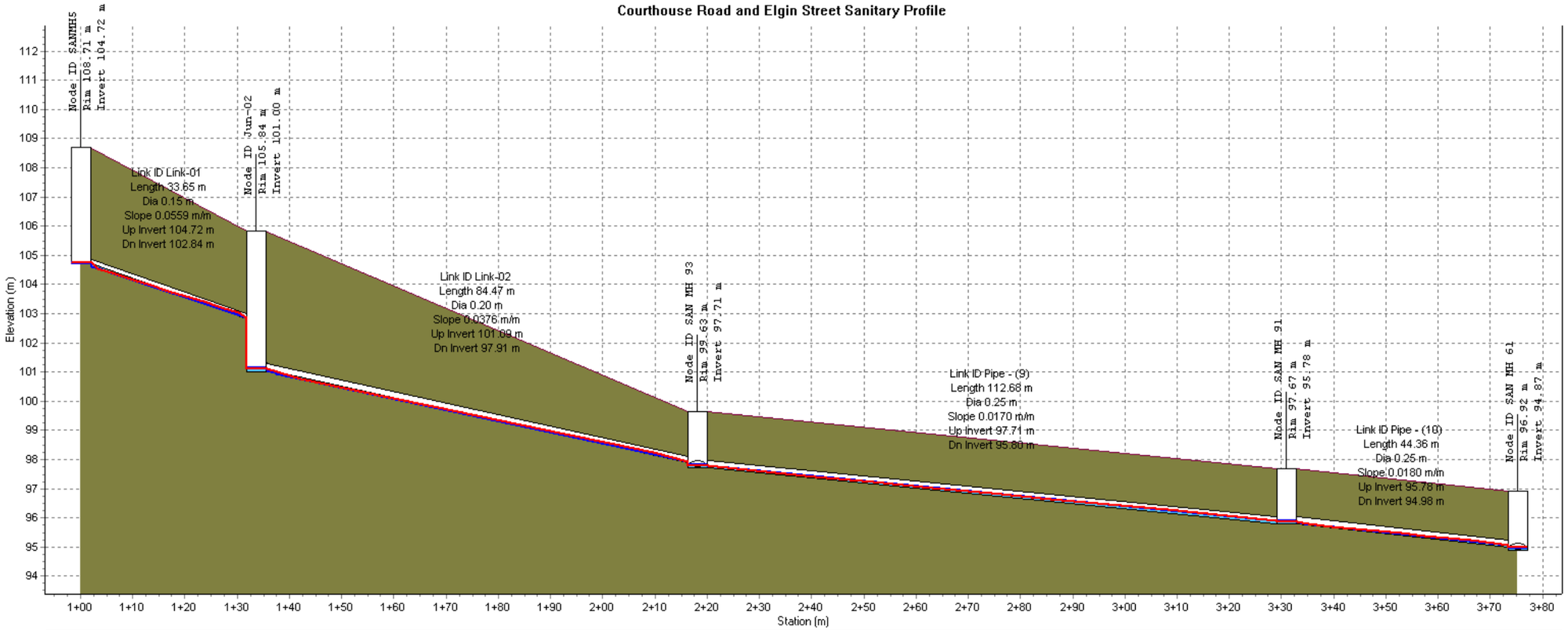
LEA Consulting Ltd.
9th, 625 Cochrane Drive, Markham

Street Name	MH. TO MH.		Sanitary Drainage Area	Residential Unit	Number of Beds	Industrial Area	Commercial Area	Institutional/ School Area	Residential Population	Catchment Drainage Area (ha)	Cumulative Area Served (ha)	Peaking Factor	Residential Flow (L/sec)	Industrial Flow (L/sec)	Commercial Flow (L/sec)	Institutional Flow (L/sec)	Catchment Infiltration Flow (L/s)	Cumulative Infiltration Flow (L/s)	Cumulative Total Flow (L/sec)	Incremental Flow (L/s)	Type of Pipe Factor (n)	Pipe Size (mm)	Grade (%)	Full Flow Capacity (L/s)	Length of Sewer (meters)	Full Flow Velocity (m/sec)	% Full	Spare Flow Cap(L/s)
	Courthouse Road																											
Courthouse Road	MH5	MH8	I3		40.0				64.4	1.11	1.11	3.80	1.03		0.00		0.29	0.29	1.32	1.32	0.011	150	5.61%	36.08	23.78	2.04	4%	34.76
Courthouse Road	Mh8	MH93										3.80						0.29	1.32	0.00	0.011	200	3.77%	63.66	47.14	2.03	2%	62.34
	Elgin Street																											
Elgin Street	MH 94	MH 93	C1, C2, C3, C4, C5, C6, I1* & I2*	5.00			4.07	0.90	16.2	30.14	30.14	4.13	0.26		9.74		8.28	8.28	18.27	18.27	0.011	250	0.94%	57.66	80.07	1.17	32%	39.38
Elgin Street	MH 93	MH 91	I4 *					1.45		1.45	31.59	3.80				1.88		8.57	21.47	1.88	0.011	250	1.77%	79.12	112.68	1.61	27%	57.64
Elgin Street	MH 91	MH 61								0.00	31.59	3.80						8.57	21.47	0.00	0.011	250	1.80%	79.78	44.36	1.63	27%	58.31
	Burnham Street																											
Burnham Street	North	MH 61	I5, I6, I7, I8, I9 *		151.0			14.1	243.1	15.88	15.88	3.80	3.89			18.28	0.46	0.46	22.63	22.63	0.011	250	3.20%	106.38	44.36	2.17	21%	83.75
Burnham Street	MH 61	South																9.03	44.10	0.00	0.011	250	3.24%	107.04	87.80	2.18	41%	62.94

***** Sanitary drainage area of I1, I4, I6, I7, I8 and I9: Theere is not any available information for these institutional land uses to calculate populations. The sanitary flow has been calculated based on the Town design Guideline which is 112 m^3/ gross ha /day including infiltration and peaking effect.
Refer to Fig.3 for drainage areas and population.

Existing Condition

Courthouse Road and Elgin Street Sanitary Profile



Node ID:	SANMH5	Jun-02	SAN MH 93	SAN MH 91	SAN MH 61
Rim (m):	108.71	105.84	99.63	97.67	96.92
Invert (m):	104.72	101.00	97.71	95.78	94.87
Min Pipe Cover (m):	3.84	2.85	1.52	1.62	1.69
Max HGL (m):	104.74	101.11	97.80	95.87	94.98

Link ID:	Link-01	Link-02	Pipe - (9)	Pipe - (10)
Length (m):	33.65	84.47	112.68	44.36
Dia (m):	0.15	0.20	0.25	0.25
Slope (m/m):	0.0559	0.0376	0.0170	0.0180
Up Invert (m):	104.72	101.09	97.71	95.78
Dn Invert (m):	102.84	97.91	95.80	94.98
Max Q (lps):	1.32	1.32	22.79	22.79
Max Vel (m/s):	1.08	0.90	1.52	1.52
Max Depth (m):	0.02	0.02	0.09	0.09

Sanitary Sewer Design

Proposed Condition Sanitary Flow
(Based on the Town Criteria)

DESIGN COEFFICIENTS			Referemce
Residential	364	L/cap/day	Town of Cobourg Design Guideline
Industrial/ Institutional	112	m3/gross ha/day Including infiltration and peaking effect	Town of Cobourg Design Guideline
Commercial	5	L/day/m2	MOE
Existing Infiltration Allowance	0.26	L/s/ha	Town of Cobourg Design Guideline
Signle Family Dwelling	3.23	Person/Unit	Town of Cobourg Design Guideline
# beds	1.61	Person/Bed	

CITY FILE No.:
PROJECT No.: 19073
PROJECT NAME: 19073 - GPL
LOCATION: Town of Cobourg

DATE: 23-Jul-20
DESIGNED BY: M.N.
CHECKED BY: F.M.

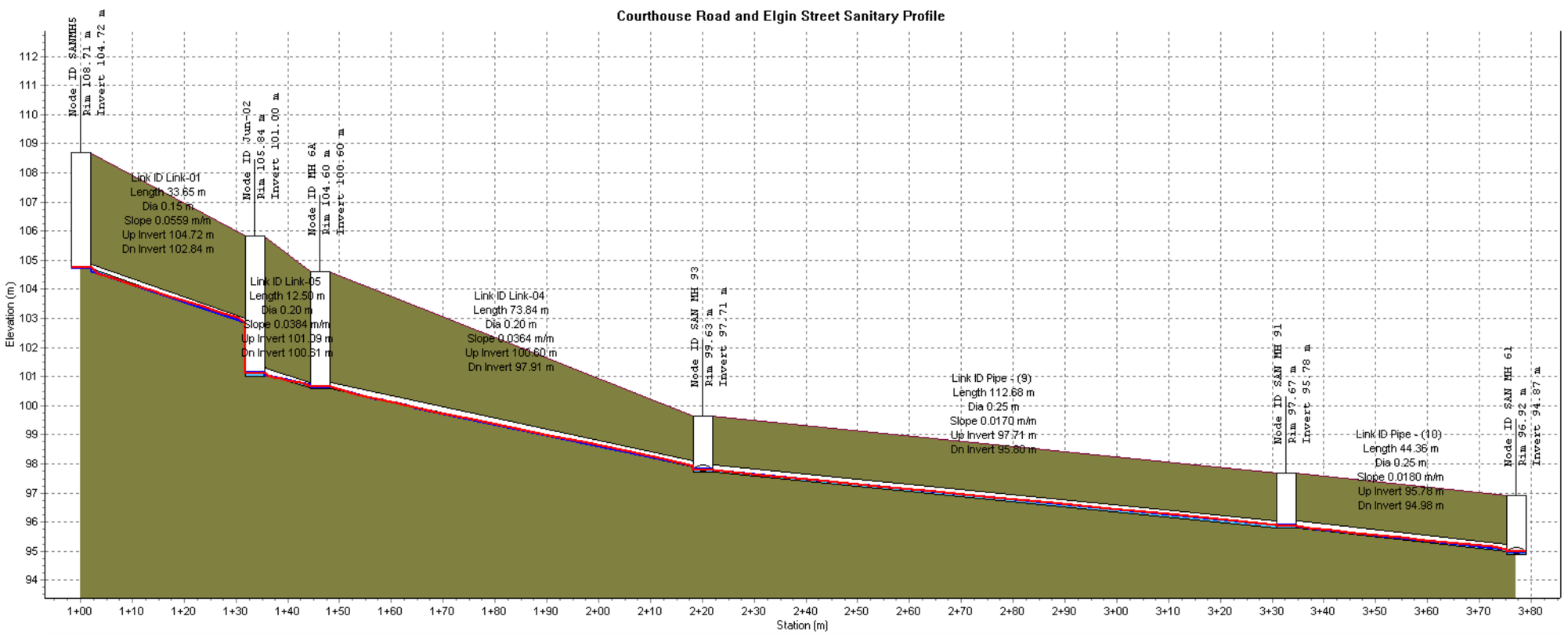
LEA Consulting Ltd.
9th, 625 Cochrane Drive, Markham

Street Name	MH. TO MH.		Sanitary Draiange Area	Residential Unit	Number of Beds	Industrial Area	Commercial Area	Institutional/ School Area	Residential Population	Catchment Drainage Area (ha)	Cumulative Area Served (ha)	Peaking Factor	Residential Flow (L/sec)	Industrial Flow (L/sec)	Commercial Flow (L/sec)	Institutional Flow (L/sec)	Catchment Infiltration Flow (L/s)	Cumulative Infiltration Flow (L/s)	Cumulative Total Flow (L/sec)	Incremental Flow (L/s)	Type of Pipe Factor (n)	Pipe Size (mm)	Grade (%)	Full Flow Capacity (L/s)	Length of Sewer (meters)	Full Flow Velocity (m/sec)	% Full	Spare Flow Cap(L/s)
	Courthouse Road																											
Strathy Road	MH5	MH8	I3		40.0				64.4	1.11	1.11	3.80	1.03		0.00		0.29	0.29	1.32	1.32	0.011	150	5.61%	36.08	23.78	2.04	4%	34.76
Strathy Road	Mh8	MH93	I2		180.0				289.8	1.70	2.81	3.80	4.64		0.00		0.44	0.73	6.40	5.08	0.011	200	3.77%	63.66	47.14	2.03	10%	57.26
	Elgin Street																											
Elgin Street	MH 94	MH 93	C1, C2, C3, C4, C5, C6 & I1	5.00			4.07	0.90	16.2	30.14	30.14	4.13	0.26		9.74		8.28	8.28	18.27	18.27	0.011	250	0.94%	57.66	80.07	1.17	32%	39.38
Elgin Street	MH 93	MH 91	I4 *					1.45		1.45	31.59	3.80				1.88		9.01	26.55	1.88	0.011	250	1.77%	79.12	112.68	1.61	34%	52.56
Elgin Street	MH 91	MH 61								0.00	31.59	3.80						9.01	26.55	0.00	0.011	250	1.80%	79.78	44.36	1.63	33%	53.23
	Burnham Street																											
Burnham Street	North	MH 61	I5, I6, I7, I8, I9 *					14.1		15.64	15.64	3.80				18.28	0.46	0.46	18.74	18.74	0.011	250	3.20%	106.38	44.36	2.17	18%	87.64
Burnham Street	MH 61	South																9.47	45.29	0.00	0.011	250	3.24%	107.04	87.80	2.18	42%	61.75

* Sanitary drainage area of I1, I4, I6, I7, I8 and I9: Theere is not any available information for these institutional land uses to calculate populations. The sanitary flow has been calculated based on the Town design Guideline which is 112 m^3/ gross ha /day including infiltration and peaking effect.
Refer to Fig.3 for drainage areas and population.

Proposed Condition (5.08 L/s)

Courthouse Road and Elgin Street Sanitary Profile



Node ID:	SANMH5	Jun-02	MH 6A	SAN MH 93	SAN MH 91	SAN MH 61
Rim (m):	108.71	105.84	104.60	99.63	97.67	96.92
Invert (m):	104.72	101.00	100.60	97.71	95.78	94.87
Min Pipe Cover (m):	3.84	2.85	3.79	1.66	1.62	1.69
Max HGL (m):	104.74	101.11	100.64	97.81	95.88	94.98

Link ID:	Link-01	Link-05	Link-04	Pipe - (9)	Pipe - (10)
Length (m):	33.65	12.50	73.84	112.68	44.36
Dia (m):	0.15	0.20	0.20	0.25	0.25
Slope (m/m):	0.0559	0.0384	0.0364	0.0170	0.0180
Up Invert (m):	104.72	101.09	100.60	97.71	95.78
Dn Invert (m):	102.84	100.61	97.91	95.80	94.98
Max Q (lps):	1.32	1.40	6.40	27.87	27.87
Max Vel (m/s):	1.08	0.69	1.49	1.61	1.60
Max Depth (m):	0.02	0.02	0.04	0.10	0.10

Sanitary Sewer Design

Proposed Condition Sanitary Flow
(Based on Ontario Building Code)

DESIGN COEFFICIENTS			Referemce
Residential	364	L/cap/day	Town of Cobourg Design Guideline
Industrial/ Institutional	112	m3/gross ha/day Including infiltration and peaking effect	Town of Cobourg Design Guideline
Commercial	5	L/day/m2	MOE
Existing Infiltration Allowance	0.26	L/s/ha	Town of Cobourg Design Guideline
Signle Family Dwelling	3.23	Person/Unit	Town of Cobourg Design Guideline
# beds	1.61	Person/Bed	

CITY FILE No.:
PROJECT No.: 19073
PROJECT NAME: 19073 - GPL
LOCATION: Town of Cobourg

DATE: 23-Jul-20
DESIGNED BY: M.N.
CHECKED BY: F.M.

LEA Consulting Ltd.
9th, 625 Cochrane Drive, Markham

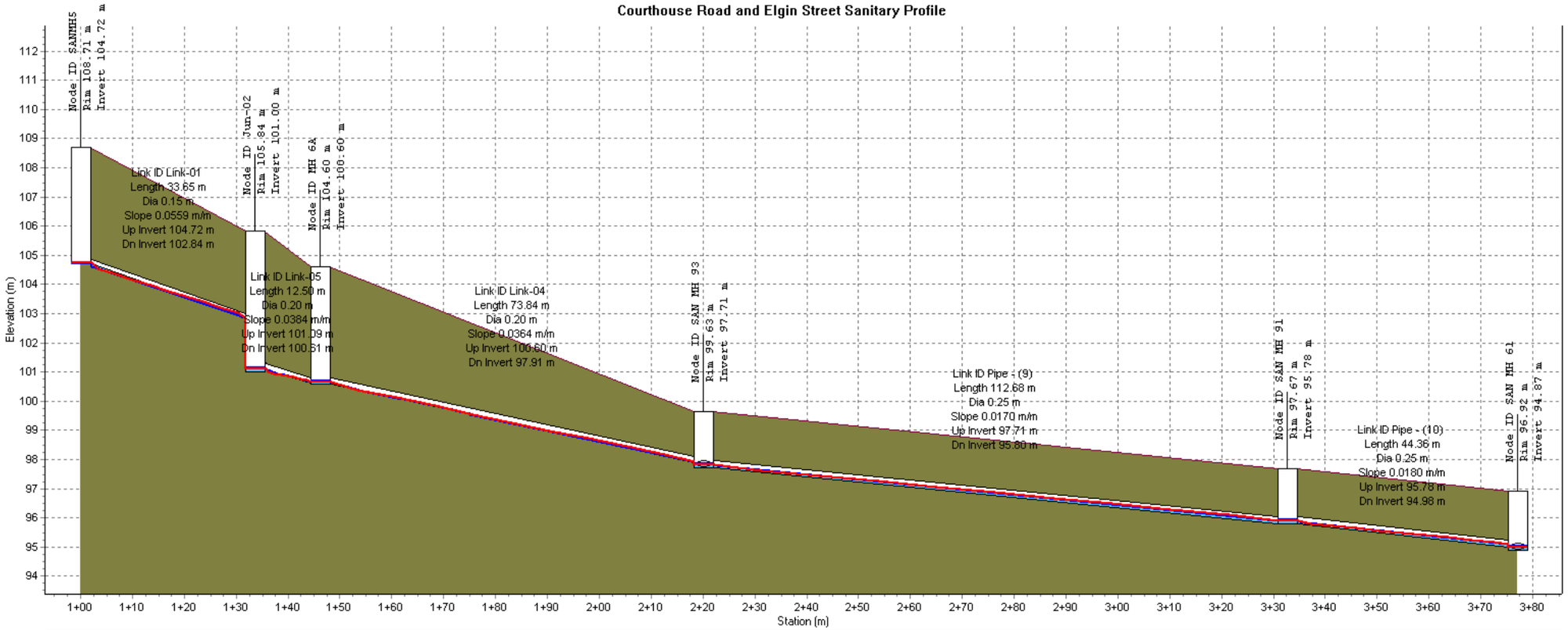
Street Name	MH. TO MH.		Sanitary Draiange Area	Residential Unit	Number of Beds	Industrial Area	Commercial Area	Institutional/ School Area	Residential Population	Catchment Drainage Area (ha)	Cumulative Area Served (ha)	Peaking Factor	Residential Flow (L/sec)	Industrial Flow (L/sec)	Commercial Flow (L/sec)	Institutional Flow (L/sec)	Catchment Infiltration Flow (L/s)	Cumulative Infiltration Flow (L/s)	Cumulative Total Flow (L/sec)	Incremental Flow (L/s)	Type of Pipe Factor (n)	Pipe Size (mm)	Grade (%)	Full Flow Capacity (L/s)	Length of Sewer (meters)	Full Flow Velocity (m/sec)	% Full	Spare Flow Cap(L/s)
	Courthouse Road																											
Strathy Road	MH5	MH8	I3		40.0				64.4	1.11	1.11	3.80	1.03		0.00		0.29	0.29	1.32	1.32	0.011	150	5.61%	36.08	23.78	2.04	4%	34.76
Strathy Road	Mh8	MH93	I2		180.0				289.8	1.70	2.81	3.80	13.25		0.00		0.44	0.73	15.01	13.69	0.011	200	3.77%	63.66	47.14	2.03	24%	48.65
	Elgin Street																											
Elgin Street	MH 94	MH 93	C1, C2, C3, C4, C5, C6 & I1	5.00			4.07	0.90	16.2	30.14	30.14	4.13	0.26		9.74		8.28	8.28	18.27	18.27	0.011	250	0.94%	57.66	80.07	1.17	32%	39.38
Elgin Street	MH 93	MH 91	I4 *					1.45		1.45	31.59	3.80				1.88		9.01	35.16	1.88	0.011	250	1.77%	79.12	112.68	1.61	44%	43.95
Elgin Street	MH 91	MH 61								0.00	31.59	3.80						9.01	35.16	0.00	0.011	250	1.80%	79.78	44.36	1.63	44%	44.62
	Burnham Street																											
Burnham Street	North	MH 61	I5, I6, I7, I8, I9 *					14.1		15.64	15.64	3.80				18.28	0.46	0.46	18.74	18.74	0.011	250	3.20%	106.38	44.36	2.17	18%	87.64
Burnham Street	MH 61	South																9.47	53.90	0.00	0.011	250	3.24%	107.04	87.80	2.18	50%	53.14

***** Sanitary drainage area of I1, I4, I6, I7, I8 and I9: Theere is not any available information for these institutional land uses to calculate populations. The sanitary flow has been calculated based on the Town design Guideline which is 112 m^3/ gross ha /day including infiltration and peaking effect.

Refer to Fig.3 for drainage areas and population.

Proposed Condition (13.25 L/s)

Courthouse Road and Elgin Street Sanitary Profile



Node ID:	SANMH5	Jun-02	MH 6A	SAN MH 93	SAN MH 91	SAN MH 61
Rim (m):	108.71	105.84	104.60	99.63	97.67	96.92
Invert (m):	104.72	101.00	100.60	97.71	95.78	94.87
Min Pipe Cover (m):	3.84	2.85	3.79	1.66	1.62	1.69
Max HGL (m):	104.74	101.11	100.66	97.82	95.90	95.00

Link ID:	Link-01	Link-05	Link-04	Pipe - (9)	Pipe - (10)
Length (m):	33.65	12.50	73.84	112.68	44.36
Dia (m):	0.15	0.20	0.20	0.25	0.25
Slope (m/m):	0.0559	0.0384	0.0364	0.0170	0.0180
Up Invert (m):	104.72	101.09	100.60	97.71	95.78
Dn Invert (m):	102.84	100.61	97.91	95.80	94.98
Max Q (lps):	1.32	1.37	15.01	36.48	36.48
Max Vel (m/s):	1.08	0.37	1.82	1.72	1.71
Max Depth (m):	0.02	0.04	0.06	0.11	0.11

APPENDIX K

Hydrant Flow Test Data and Watermain Adequacy Assessment

LEA Consulting Ltd. Consulting Engineers and Planners	Residual Pressure			
	Prepared:	F.M.	Page No.	K-01
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Hydrant Test Readings (300mm watermain, Strathy Rd.) undertaken on June 18, 2019, by Classic Fire Protection Inc.

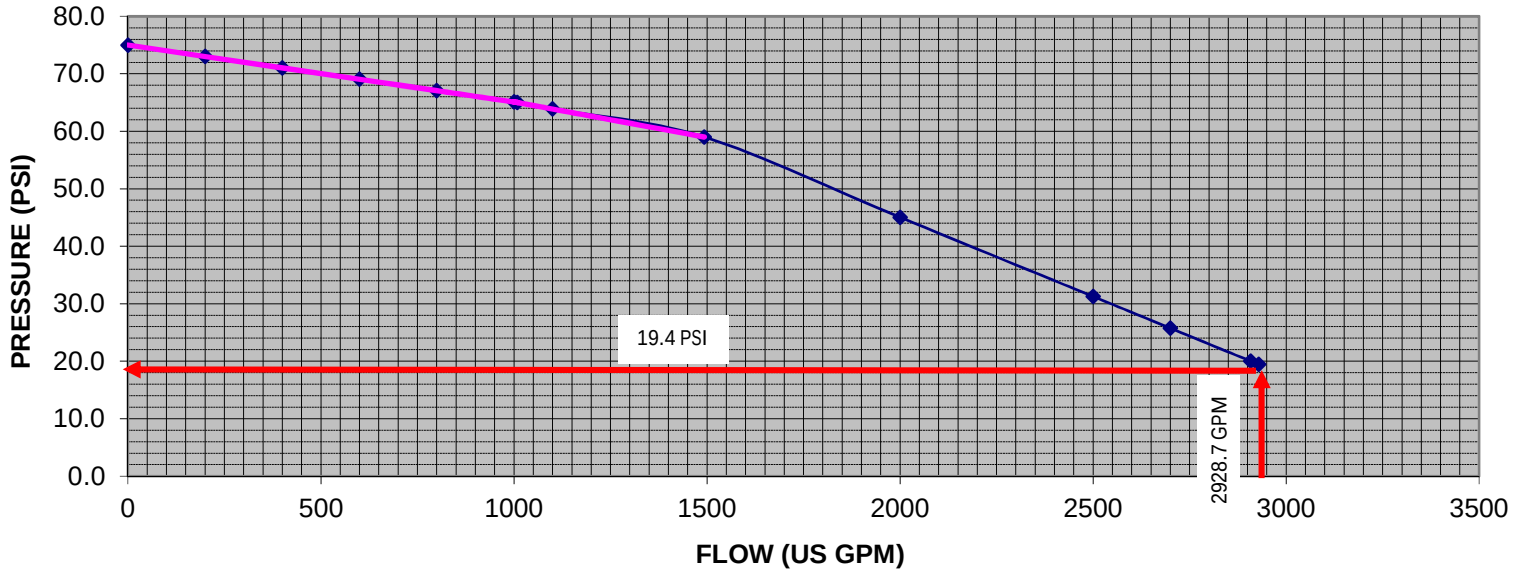
Flow		Residual Pressure		
0	US GPM	75	psi	
1008.9	US GPM	65	psi	
1493.2	US GPM	59	psi	
2908.6	US GPM	20	psi	Focus Fire Protection Estimate

Interpolated

Flow (US GPM)	Residual Pressure (psi)
0	**75.0**
200	73.0
400	71.0
600	69.1
800	67.1
1008.9	**65.0**
1000	65.1
1100	63.9
1493.2	**59.0**
2000	45.0
2500	31.3
2700	25.7
2908.6	**20.0**
2929	19.4

Existing 300mm Watermain on Strathy Rd., Town of Cobourg

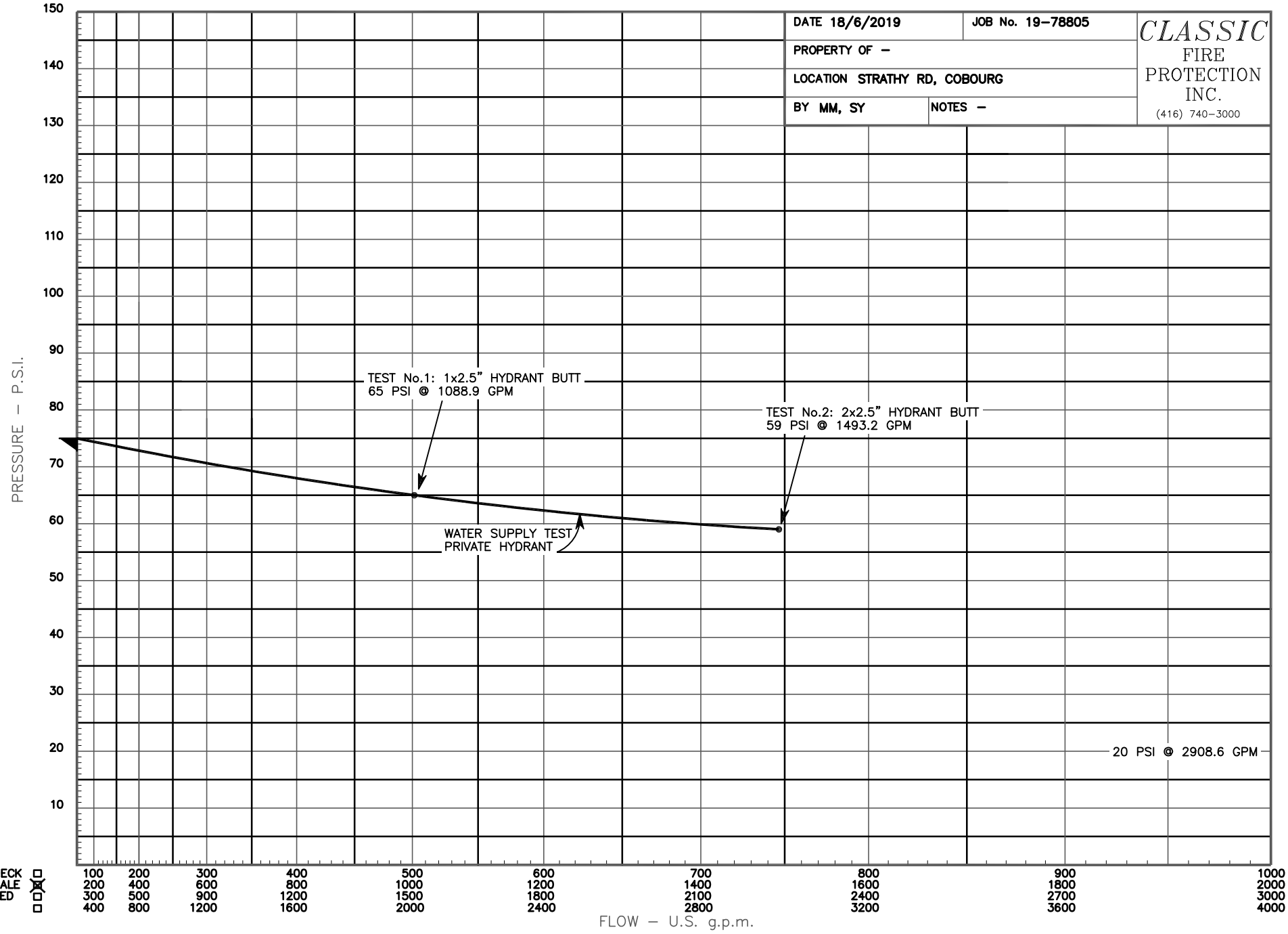
FLOW TEST CHART (BASED ON CLASSICFIRE PROTECTION TEST, May 23, 2019)
Page: K-02

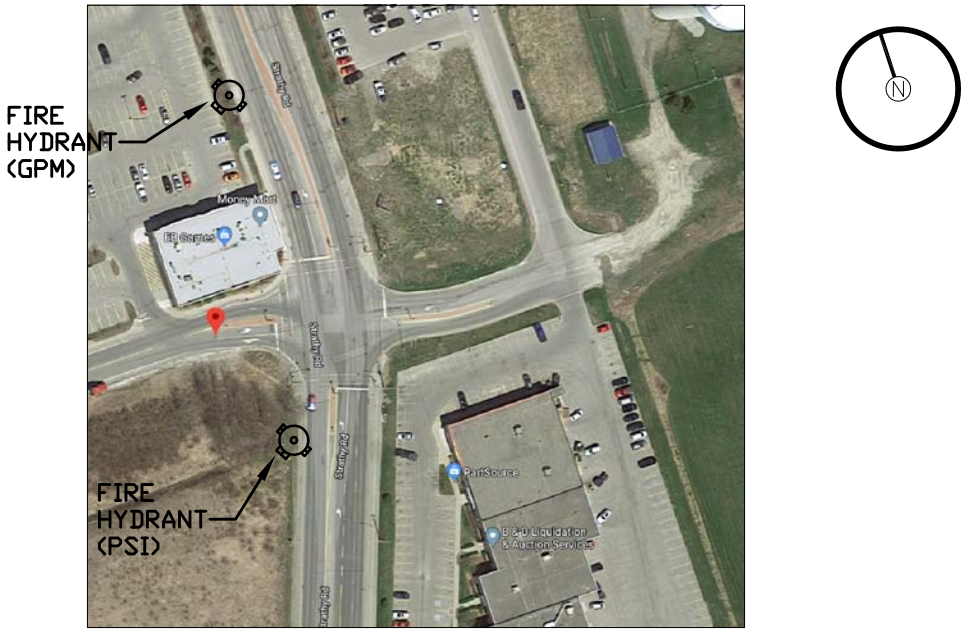


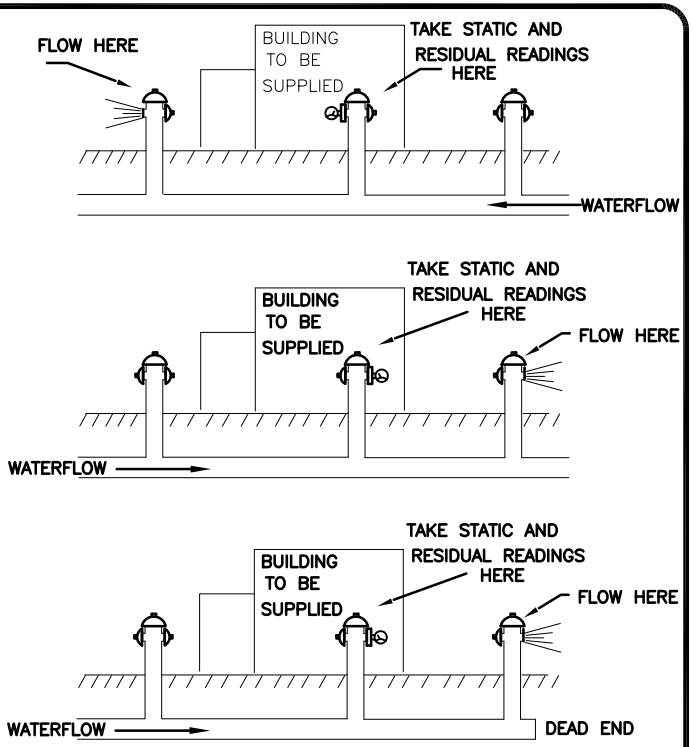
WATER SUPPLY GRAPH

DATE 18/6/2019	JOB No. 19–78805
PROPERTY OF –	
LOCATION STRATHY RD, COBOURG	
BY MM, SY	NOTES –

CLASSIC FIRE PROTECTION INC.
(416) 740–3000

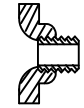


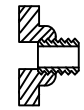


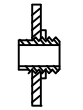


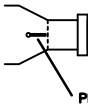
TEST:	PLAY PIPE	C=	STATIC(PSI)	RESIDUAL(PSI)	PITOT(PSI)	FLOW(USGPM)
	1x1 1/8					
	2x1 1/8					
	3x1 1/8					
	4x1 1/8					
	1x1 3/4					
	2x1 3/4					
	3x1 3/4					
	4x1 3/4					
	HYDRANT BUTT					
1	1x2 1/2	.835	75	65	42	1008.9
2	2x2 1/2	.835	75	59	23	1493.2
	3x2 1/2					
	4x2 1/2					
	FM NOZZLE					
	1x2 1/4	.88				
	2x2 1/4	.88				
	3x2 1/4	.88				
	4x2 1/4	.88				

OUTLET TYPE

☐  COEF.=0.90 OUTLET SMOOTH AND WELL ROUNDED

☐  COEF.=0.80 OUTLET SQUARE AND SHARP

☐  COEF.=0.70 OUTLET SQUARE AND PROJECTING INTO BARREL

☒  COEF.=0.835 MODEL LPD-250A DECHLORINATOR DIFFUSER

PITOT TUBE

Client:
LEA Consulting Ltd.
625 Cochrane Dr.
Markham, ON

Location:
Strathy Rd
Cobourg, ON

DEDICATED SERVICE SINCE 1988
CLASSIC FIRE PROTECTION INC.
645 GARYRAY DR.
North York, ON
M9L 1P9
(416) 740-3000
Web: www.classicfire.com

LEA Consulting Ltd. Consulting Engineers and Planners	Residual Pressure			
	Prepared:	F.M.	Page No.	K-03
	Checked:	R.B.		
Project: 555 Courthouse Road and 983 Burnham street Town of Cobourg	Proj. #	19073		
	Date:	23-Jul-20		

Hydrant Test Readings (300mm watermain, Elgin St.)
undertaken on June 18, 2019, by Classic Fire Protection Inc.

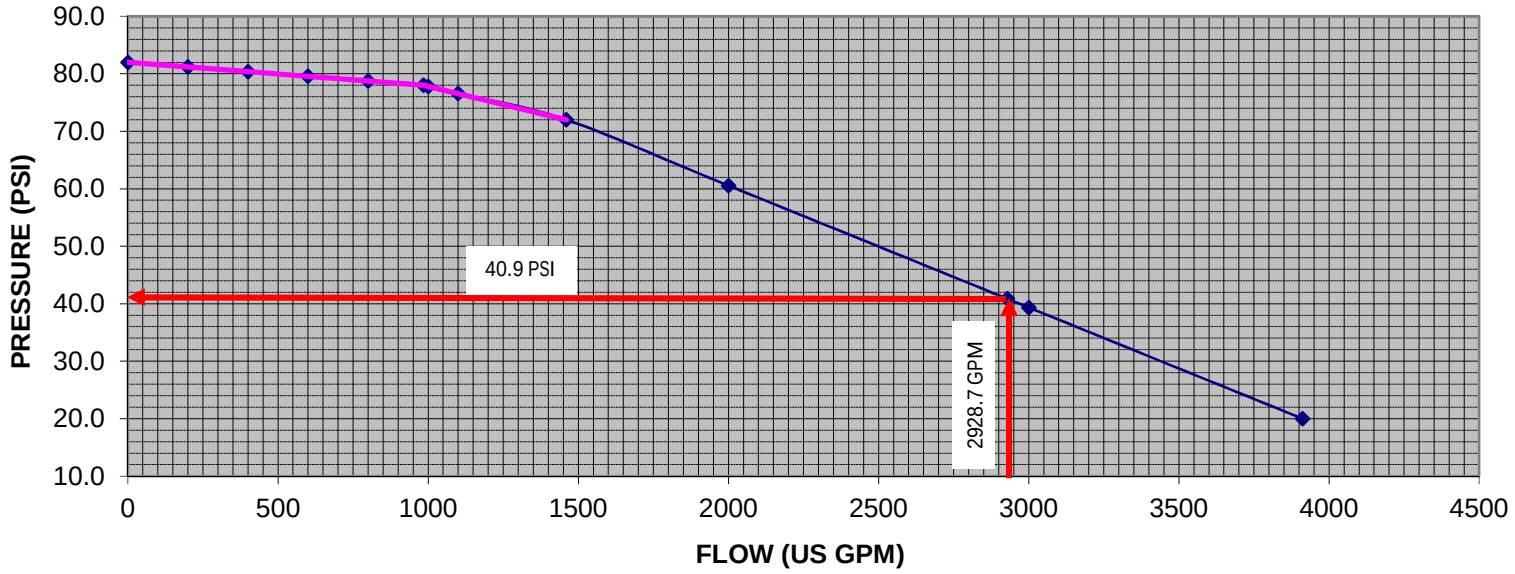
Flow		Residual Pressure		
0	US GPM	82	psi	
984.6	US GPM	78	psi	
1460.4	US GPM	72	psi	
3911.6	US GPM	20	psi	Focus Fire Protection Estimate

Interpolated

Flow (US GPM)	Residual Pressure (psi)
0	**82.0**
200	81.2
400	80.4
600	79.6
800	78.7
984.6	**78.0**
1000	77.8
1100	76.5
1460.4	**72.0**
2000	60.6
2928.7	40.9
3000	39.3
3911.6	**20.0**

Existing 300mm Watermain on Elgin St., Town of Cobourg

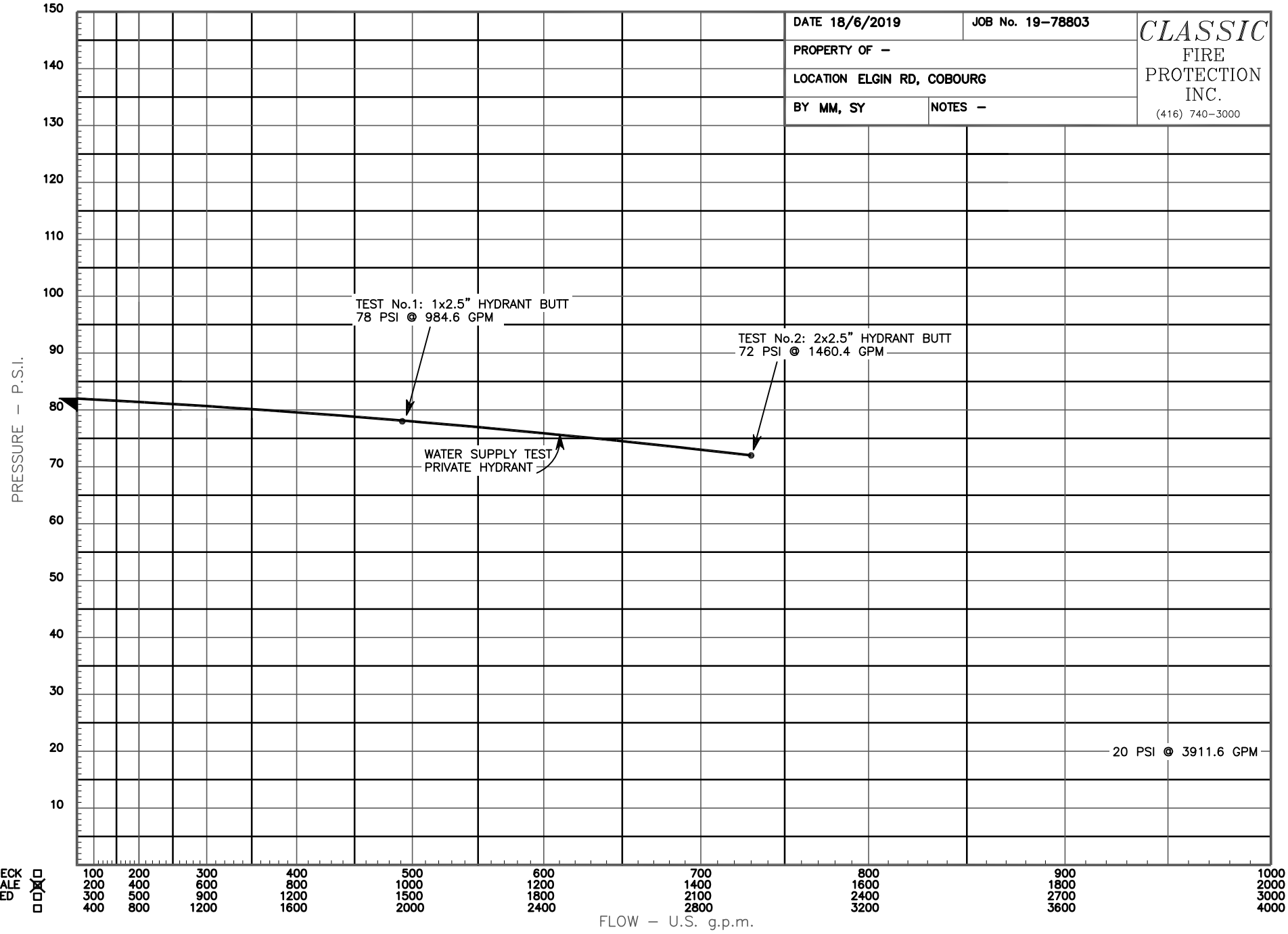
FLOW TEST CHART (BASED ON CLASSICFIRE PROTECTION TEST, May 23, 2019)
Page: K-04

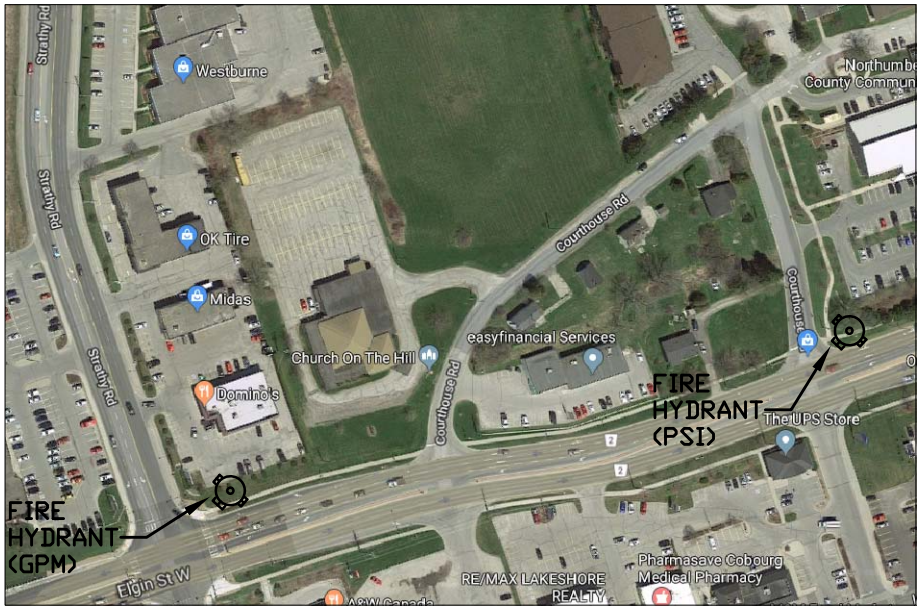


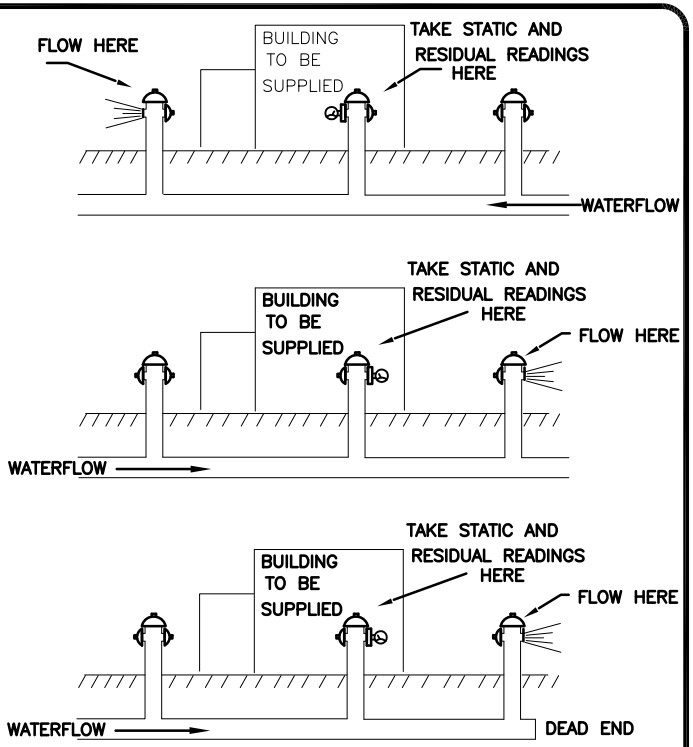
WATER SUPPLY GRAPH

DATE 18/6/2019	JOB No. 19–78803
PROPERTY OF –	
LOCATION ELGIN RD, COBOURG	
BY MM, SY	NOTES –

CLASSIC FIRE PROTECTION INC.
(416) 740–3000

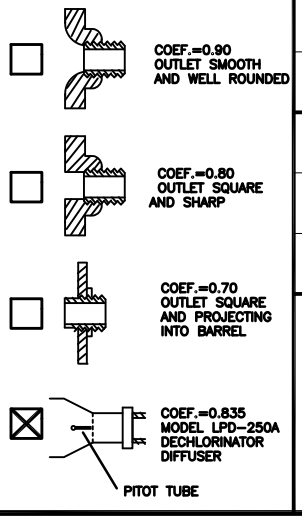






TEST:	PLAY PIPE	C=	STATIC(PSI)	RESIDUAL(PSI)	PITOT(PSI)	FLOW(USGPM)
	1x1 1/8					
	2x1 1/8					
	3x1 1/8					
	4x1 1/8					
	1x1 3/4					
	2x1 3/4					
	3x1 3/4					
	4x1 3/4					
	HYDRANT BUTT					
1	1x2 1/2	.835	82	78	40	984.6
2	2x2 1/2	.835	82	72	22	1460.4
	3x2 1/2					
	4x2 1/2					
	FM NOZZLE					
	1x2 1/4	.88				
	2x2 1/4	.88				
	3x2 1/4	.88				
	4x2 1/4	.88				

OUTLET TYPE



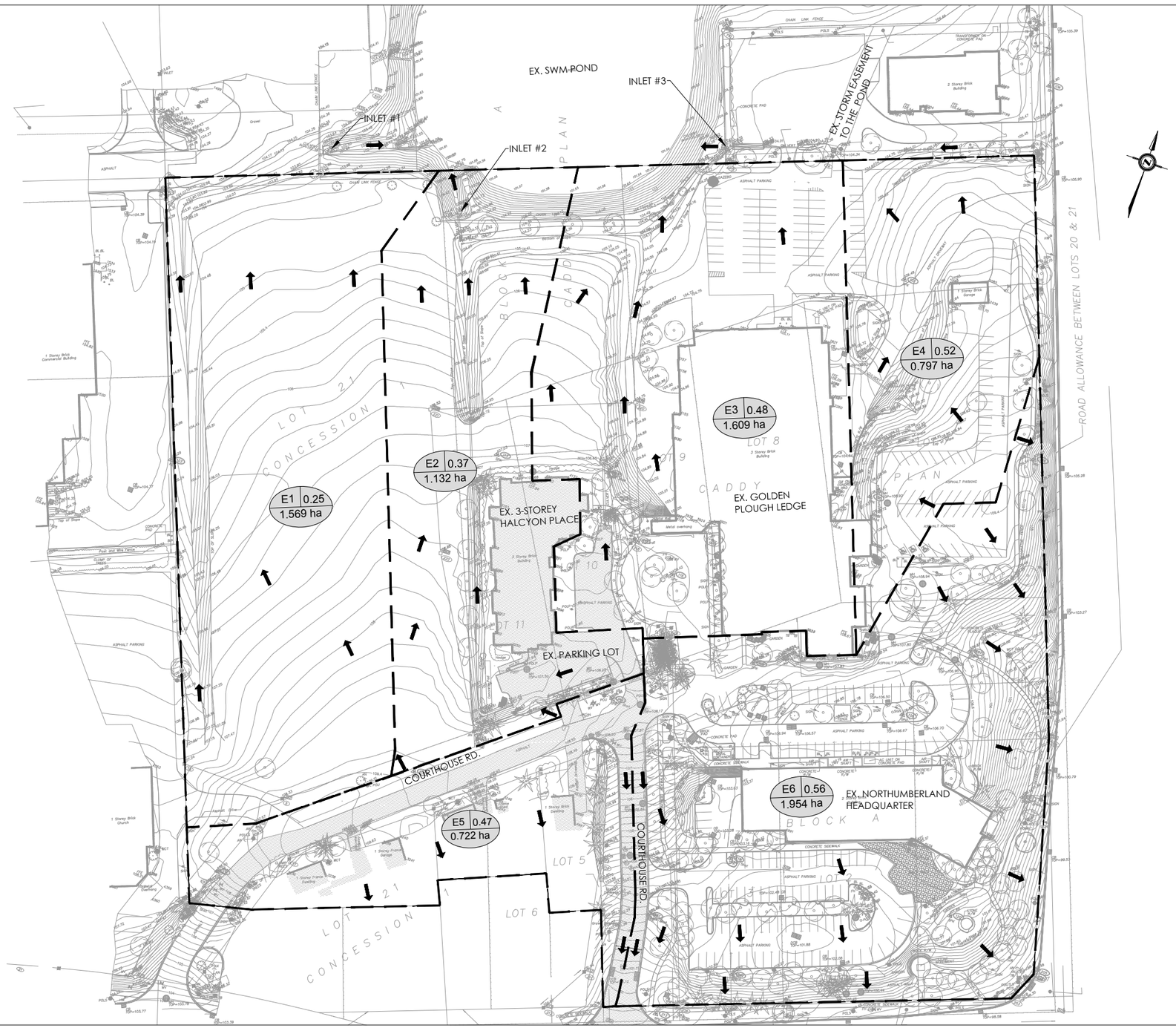
Client:
LEA Consulting Ltd.
625 Cochrane Dr.
Markham, ON

Location:
Elgin Rd
Cobourg, ON

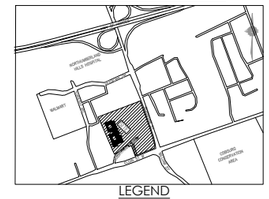
DEDICATED SERVICE SINCE 1988
CLASSIC FIRE PROTECTION INC.
645 GARYRAY DR.
North York, ON
M9L 1P9
(416) 740-3000
Web: www.classicfire.com

APPENDIX L

Figures and Drawings



KEY PLAN



LEGEND

MH	EXISTING MANHOLE
CB	EXISTING CATCH BASIN
DIC	EXISTING DITCH INLET
POA	EXISTING ANCHOR POLE
POU	EXISTING UTILITY POLE
POLS	EXISTING LIGHT STANDARD
GM	EXISTING GAS METER
GV	EXISTING GAS VALVE
WV	EXISTING WATER VALVE
FH	EXISTING FIRE HYDRANT
	EXISTING TREE
	PROPOSED TREE
	PROPERTY LINE
	STUDY AREA
	SUB-CATCHMENT BOUNDARY
	OVERLAND FLOW ROUTE
C1 0.25 0.569 ha	CATCHMENTID/ RUNOFF COEFFICIENT/ DRAINAGE AREA (ha)

No.	Revision	Date
5	ISSUED FOR SPA RESUBMISSION	23/07/2020
4	ISSUED FOR SPA RESUBMISSION	02/06/2020
3	ISSUED FOR SPA RESUBMISSION	13/03/2020
2	ISSUED FOR SPA	12/08/2019
1	ISSUED FOR PART A	28/11/2018

Orientation

Seal

All dimensions to be checked and verified on the job. Any discrepancies are to be reported to the Consultant. All drawings remain the property of the Consultant. Only latest approved drawings to be used for construction.

salterpilonarchitecture

151 Ferris Lane, Suite 400 Barrie, Ontario L4M 6C1
salterpilon.com t: 705.737.3530

Project Information

GPL LTC FACILITY & NCAM

555 Courthouse Road. Cobourg, ON. K9A 5J6

For

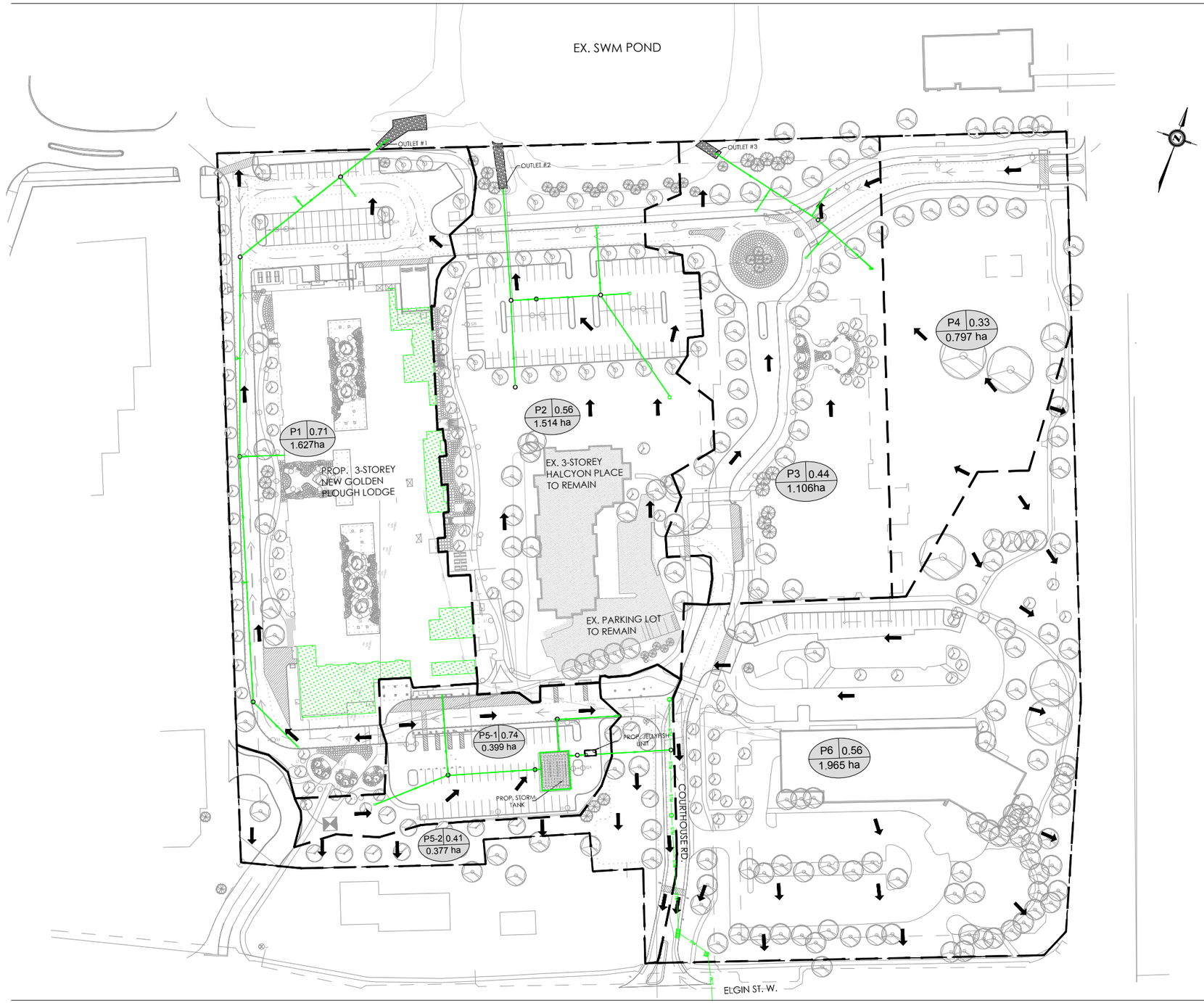
Northumberland County

Drawing Title

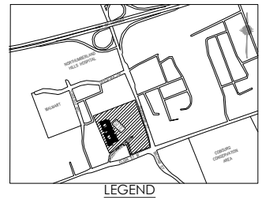
EXISTING DRAINAGE CONDITION

Date	Project No	Drawing No
NOVEMBER 10, 2018	19073	FIG.5
Drawn by F.M.		
Scale 1:1500		

DRAWING NAME: P:\19073\Drafting\Current Drawing\FIG-5 - Existing Drainage Plan.dwg Jul 23, 2020-8:57am



KEY PLAN



LEGEND

- MH — EXISTING MANHOLE
- CB — EXISTING CATCH BASIN
- DIC — EXISTING DITCH INLET
- POA — EXISTING ANCHOR POLE
- POU — EXISTING UTILITY POLE
- POLS — EXISTING LIGHT STANDARD
- GM — EXISTING GAS METER
- GV — EXISTING GAS VALVE
- WV — EXISTING WATER VALVE
- FH — EXISTING FIRE HYDRANT
- EXISTING TREE
- PROPOSED TREE
- PROPERTY LINE
- STUDY AREA
- SUB-CATCHMENT BOUNDARY
- OVERLAND FLOW ROUTE
- C1 | 0.90 | 0.388 ha — CATCHMENT ID/ RUNOFF COEFFICIENT/ DRAINAGE AREA (ha)
- PROPOSED GREEN ROOF
- PROPOSED CATCH BASIN
- PROPOSED STORM MANHOLE
- PROPOSED CATCH BASIN MANHOLE
- PROPOSED OIL GRIT SEPARATOR

No.	Revision	Date
5	ISSUED FOR SPA RESUBMISSION	23/07/2020
4	ISSUED FOR SPA RESUBMISSION	02/06/2020
3	ISSUED FOR SPA RESUBMISSION	13/03/2020
2	ISSUED FOR SPA	12/08/2019
1	ISSUED FOR PART A	28/11/2018

Orientation

Seal

salterpilonarchitecture

151 Ferris Lane, Suite 400 Barrie, Ontario L4M 6C1
salterpilon.com t: 705.737.3530

Project Information

GPL LTC FACILITY & NCAM

555 Courthouse Road, Cobourg, ON, K9A 5J6

For

Northumberland County

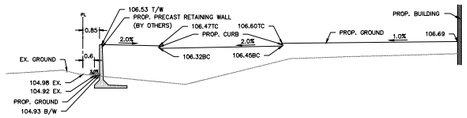
Drawing Title

PROPOSED DRAINAGE CONDITION

Date	Project No	Drawing No
NOVEMBER 10, 2018	19073	FIG.6
Drawn by F.M.		
Scale 1:1500		

DRAWING NAME: F:\WORK\Working\Common Drawing\FIG-6-Proposed Drainage Plan.dwg

Jul 23, 2020-8:51am

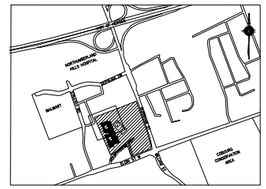


GRADING SECTION A–A
RETAINING WALL ALONG WEST PROPERTY LINE
SC: 1:100

BURNHAM ST.
SWM POND

MATCH TO EX. DITCH INVERT
REALIGN & REGRADE EXISTING DITCH
PROP. RIP RAP
REGRADE EXISTING ROAD/ENTRANCE AREA TO ELIMINATE DEPRESSION, PROVIDE POSITIVE DRAINAGE TOWARDS DITCH
PROP. BF CURB CUT WITH TACTILE STRIP INDICATOR
NEW CONTINUOUS ASPHALT WALKWAY TO STRATHY RD. (REFER TO SITE PLAN FOR DETAIL)
BARRIER-FREE CURB CUT (REFER TO SITE PLAN FOR DETAIL)
PROP. CIP CONC. RETAINING WALL (BY OTHERS)
PROPOSED ASPHALT WALKWAY
PROTECT AND MAINTAIN EX. TOP OF SLOPE
LIMIT OF GRADING
PROPOSED ROADSIDE DITCH DEPTH = 0.30m±
CONCRETE SIDEWALK RAMPS PER OPSD 310.030 (TYP.).
PROPOSED 3.0m CURB OPENING TYP.
PROPOSED 1.8m CURB OPENING
PROPOSED TACTILE STRIP INDICATOR
MATCH LINE A–A REFER TO DWG. C-04
RETAINING WALL (BY OTHERS)
PROP. BF CURB CUT WITH TACTILE STRIP INDICATOR
PROPOSED 100mmø SDDC-COVERED SUBDRAIN
EXISTING 1 STOREY BUILDING TO REMAIN
PRECAST RETAINING WALL (BY OTHERS)
0.6m STRIP UNDISTURBED AREA FROM PROPERTY LINE
COURTYARD EL. 109.05m
PROPOSED 3 STOREY NEW GLODEN PLOUGH LODGE
F. F. E. LEVEL 1 : 109.20
F. F. E. LEVEL 0 : 105.20
F.F.E. (LEVEL 1) =109.20m
BASEMENT EL. =105.20m
FILL EX. DITCH
EX. DITCH TO REMAIN
3 Storey Brick Building
HALCYON PLACE (3 STOREY) (TO REMAIN)
PROPOSED RAISED WALKWAY
MATCH LINE D–D REFER TO DWG. C-04
NOT FOR CONSTRUCTION

KEY PLAN



LEGEND

EXISTING STORM MANHOLE	PROPOSED V&B
EXISTING SANITARY MANHOLE	PROPOSED CHECK VALVE IN CHAMBER
EXISTING CATCHBASIN	PROPOSED STM MH
LS EXISTING LIGHT STANDARD	PROPOSED SAN MH
WV EXISTING WATER VALVE	PROPOSED FIRE HYDRANT
FH EXISTING FIRE HYDRANT	2% FLOW DIRECTION & SLOPE
EXISTING FENCE	PROPOSED CURB CUT
PROPERTY LINE	EXISTING CURB CUT
EXISTING TREE	TC:141.50 EX. EXISTING TOP OF CURB ELEVATION TO REMAIN
141.50 EXISTING ELEVATION	BC:141.50 EX. EXISTING BOTTOM OF CURB ELEVATION TO REMAIN
141.53 PROPOSED GRADE	TC:141.50 PROPOSED TOP OF CURB ELEVATION
EX.141.50 EXISTING GRADE TO REMAIN	BC:141.50 PROPOSED BOTTOM OF CURB ELEVATION
141.50 C/C PROPOSED CURB CUT ELEVATION	RAMP 6.7% SLOP FROM ARCHITECT
141.50 T/G. TOP OF GRATE ELEVATION	PROPOSED TREE & GRATE
141.50 T/W EXISTING TOP OF WALL ELEVATION TO REMAIN	141.50 SW CENTER OF SWALE
141.50 B/W EXISTING BACK OF WALL ELEVATION TO REMAIN	141.50 HP HIGH POINT
141.50 ELEVATION FROM ARCHITECT	LIMIT OF GRADING
CENTER OF SWALE	TYP. OPSD 600 CONC BARRIER CURB

GENERAL NOTES

1. CONTRACTOR MUST CHECK & VERIFY ALL DIMENSIONS ON THE JOB.
2. DO NOT SCALE DRAWINGS.
3. ALL DRAWINGS, SPECIFICATIONS AND RELATED DOCUMENTS ARE THE COPYRIGHT PROPERTY OF THE ARCHITECT AND MUST BE RETURNED UPON REQUEST. REPRODUCTION OF DRAWINGS, SPECIFICATIONS AND RELATED DOCUMENTS IN PART OR IN WHOLE IS FORBIDDEN WITHOUT THE WRITTEN PERMISSION OF THE ARCHITECT.
4. THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS SEALED BY A PROFESSIONAL ENGINEER LICENSED IN ONTARIO.
5. SURVEYING INFORMATION IS REFERENCED FROM IVAN B. WALLACE ONTARIO LAND SURVEYOR LTD - FILE NO. 4-4628_POS, DATED JULY 13TH, 2016.
6. ELEVATIONS ARE GEODETIC AND REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD28) BY DIRECT MEASUREMENT TO A REAL TIME NETWORK.
7. REFER TO DRAWING C-09 FOR THE PAVEMENT STRUCTURE.

KEY PLAN

No.	Revision	Date
14	ISSUED FOR SAP RESUBMISSION	23/07/2020
13	RE-ISSUED FOR BUILDING PERMIT	13/07/2020
12	ISSUED FOR SPA RESUBMISSION	02/06/2020
11	ISSUED FOR MOHLTC WORKING DRAWING REVIEW	20/03/2020
10	ISSUED FOR SPA RESUBMISSION	13/03/2020
9	ISSUED FOR TENDER REVIEW	05/02/2020
8	ISSUED FOR BUILDING PERMIT	23/12/2019
7	ISSUED FOR 60% CONTRACT DOC	06/12/2019
6	ISSUED FOR CLASS B COSTING	28/11/2019
5	RE-ISSUED FOR SPA	04/11/2019
4	ISSUED FOR 30% CONTRACT DOC	17/10/2019
3	ISSUED FOR 100% DD	21/08/2019
2	ISSUED FOR SITE PLAN APPLICATION	12/08/2019
1	ISSUED FOR PART A	28/11/2018

Orientation

Seal

LICENSED PROFESSIONAL ENGINEER
Confirmed
F. MORSHEDI
100029059
23/07/2020
PROVINCE OF ONTARIO

salterpilonarchitecture

151 Ferris Lane, Suite 400 Barrie, Ontario L4M 6C1
salterpilon.com t: 705.737.3530

Project Information

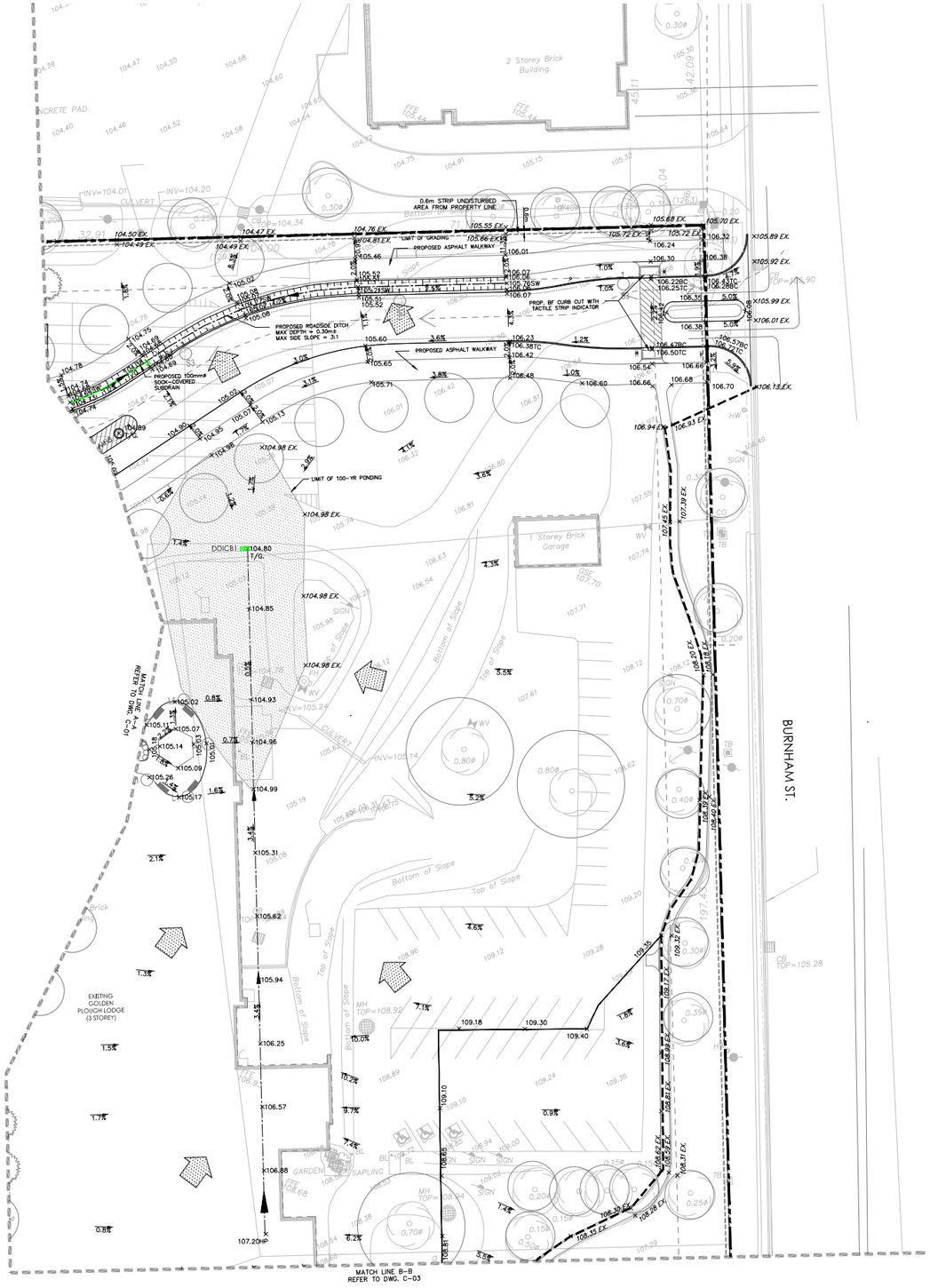
GPL LTC FACILITY & NCAM

For

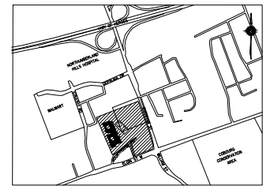
Drawing Title

SITE GRADING PLAN

Date	Project No	Drawing No
MARCH 20, 2020	19073	C–01
Drawn by J.W.		
Scale 1:250		



KEY PLAN



LEGEND

	EXISTING STORM MANHOLE		PROPOSED V&B
	EXISTING SANITARY MANHOLE		PROPOSED CHECK VALVE IN CHAMBER
	EXISTING CATCHBASIN	MH	PROPOSED STM MH
LS	EXISTING LIGHT STANDARD	MH1A	PROPOSED SAN MH
WV	EXISTING WATER VALVE		PROPOSED FIRE HYDRANT
FH	EXISTING FIRE HYDRANT	2%	FLOW DIRECTION & SLOPE
x—x	EXISTING FENCE		PROPOSED CURB CUT
	PROPERTY LINE		EXISTING CURB CUT
	EXISTING TREE	TC:141.50 EX.	EXISTING TOP OF CURB ELEVATION TO REMAIN
141.50	EXISTING ELEVATION	BC:141.50 EX.	EXISTING BOTTOM OF CURB ELEVATION TO REMAIN
141.53	PROPOSED GRADE	TC:141.50	PROPOSED TOP OF CURB ELEVATION
EX.141.50	EXISTING GRADE TO REMAIN	BC:141.50	PROPOSED BOTTOM OF CURB ELEVATION
141.50 C/C	PROPOSED CURB CUT ELEVATION	RAMP 6.7%	SLOP FROM ARCHITECT
141.50 T/G.	TOP OF GRATE ELEVATION		PROPOSED TREE & GRATE
141.50 T/W	EXISTING TOP OF WALL ELEVATION TO REMAIN	141.50 SW	CENTER OF SWALE
141.50 B/W	EXISTING BACK OF WALL ELEVATION TO REMAIN	141.50 HP	HIGH POINT
141.50	ELEVATION FROM ARCHITECT		TYP. OPSD 600 CONC BARRIER CURB
	LIMIT OF GRADING		
	CENTER OF SWALE		

GENERAL NOTES

1. CONTRACTOR MUST CHECK & VERIFY ALL DIMENSIONS ON THE JOB.
2. DO NOT SCALE DRAWINGS.
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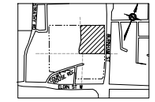
4. THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS SEALED BY A PROFESSIONAL ENGINEER LICENSED IN ONTARIO.
5. SURVEYING INFORMATION IS REFERENCED FROM IVAN B. WALLACE ONTARIO LAND SURVEYOR LTD - FILE NO. 4-4628_POS, DATED JULY 13TH, 2016.
6. ELEVATIONS ARE GEODETIC AND REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD28) BY DIRECT MEASUREMENT TO A REAL TIME NETWORK.
7. REFER TO DRAWING C-09 FOR THE PAVEMENT STRUCTURE.



KEY PLAN

No.	Revision	Date
14	ISSUED FOR SAP RESUBMISSION	23/07/2020
13	RE-ISSUED FOR BUILDING PERMIT	13/07/2020
12	ISSUED FOR SPA RESUBMISSION	02/06/2020
11	ISSUED FOR MOH/LTC WORKING DRAWING REVIEW	20/03/2020
10	ISSUED FOR SPA RESUBMISSION	13/03/2020
9	ISSUED FOR TENDER REVIEW	05/02/2020
8	ISSUED FOR BUILDING PERMIT	23/12/2019
7	ISSUED FOR 60% CONTRACT DOC	06/12/2019
6	ISSUED FOR CLASS B COSTING	28/11/2019
5	RE-ISSUED FOR SPA	04/11/2019
4	ISSUED FOR 30% CONTRACT DOC	17/10/2019
3	ISSUED FOR 100% DD	21/08/2019
2	ISSUED FOR SITE PLAN APPLICATION	12/08/2019
1	ISSUED FOR PART A	28/11/2018

Orientation

Seal

LICENSED PROFESSIONAL ENGINEER
F. MORSHEDI
100229200
23/07/2020
PROVINCE OF ONTARIO

salterpilonarchitecture

151 Ferris Lane, Suite 400 Barrie, Ontario L4M 6C1
salterpilon.com t: 705.737.3530

Project Information

GPL LTC Facility & NCAM

For

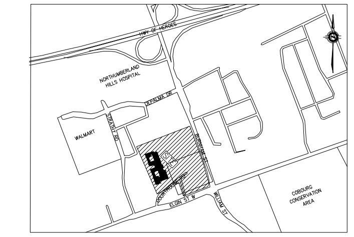
Drawing Title

SITE GRADING PLAN

Date	Project No	Drawing No
MARCH 20, 2020	19073	C-02
Drawn by J.W.		
Scale 1:250		

NOT FOR CONSTRUCTION

KEY PLAN



LEGEND

	EXISTING STORM MANHOLE		PROPOSED V&B
	EXISTING SANITARY MANHOLE		PROPOSED CHECK VALVE IN CHAMBER
	EXISTING CATCHBASIN	MH1	PROPOSED STM MH
LS	EXISTING LIGHT STANDARD	MH1A	PROPOSED SAN MH
WV	EXISTING WATER VALVE		PROPOSED FIRE HYDRANT
FH	EXISTING FIRE HYDRANT	2%	FLOW DIRECTION & SLOPE
	EXISTING FENCE		PROPOSED CURB CUT
	PROPERTY LINE		EXISTING CURB CUT
	EXISTING TREE	TC:141.50 EX.	EXISTING TOP OF CURB ELEVATION TO REMAIN
141.50	EXISTING ELEVATION	BC:141.50 EX.	EXISTING BOTTOM OF CURB ELEVATION TO REMAIN
141.53	PROPOSED GRADE	TC:141.50	PROPOSED TOP OF CURB ELEVATION
EX.141.50	EXISTING GRADE TO REMAIN	BC:141.50	PROPOSED BOTTOM OF CURB ELEVATION
141.50 C/C	PROPOSED CURB CUT ELEVATION	RAMP 6.7%	SLOP FROM ARCHITECT
141.50 T/G.	TOP OF GRATE ELEVATION		PROPOSED TREE & GRATE
141.50 T/W	EXISTING TOP OF WALL ELEVATION TO REMAIN	141.50 SW	CENTER OF SWALE
141.50 B/W	EXISTING BACK OF WALL ELEVATION TO REMAIN	141.50 HP	HIGH POINT
141.50	ELEVATION FROM ARCHITECT		
	LIMIT OF GRADING		TYP. OPSD 600 CONC BARRIER CURB
	CENTER OF SWALE		

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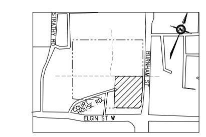

KEY PLAN

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7	ISSUED FOR 60% CONTRACT DOC	06/12/2019
6	ISSUED FOR CLASS B COSTING	28/11/2019
5	RE-ISSUED FOR SPA	04/11/2019
4	ISSUED FOR 30% CONTRACT DOC	17/10/2019
3	ISSUED FOR 100% DD	21/08/2019
2	ISSUED FOR SITE PLAN APPLICATION	12/08/2019
1	ISSUED FOR PART A	28/11/2018

Orientation

Seal

LICENSED PROFESSIONAL ENGINEER
F. MORSHEDI
100229200
23/07/2020
PROVINCE OF ONTARIO

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Project Information

GPL LTC Facility & NCAM

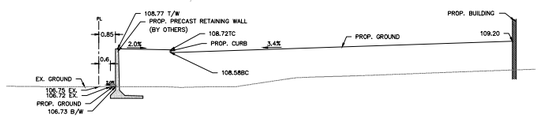
For

Drawing Title

SITE GRADING PLAN

Date	Project No	Drawing No
MARCH 20, 2020	19073	C-03
Drawn by J.W.		
Scale 1:250		

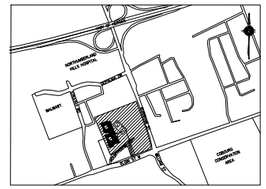
NOT FOR CONSTRUCTION



GRADING SECTION B–B
RETAINING WALL ALONG WEST PROPERTY LINE
SC: 1:100

NOT FOR CONSTRUCTION

KEY PLAN



LEGEND

EXISTING STORM MANHOLE	PROPOSED V&B
EXISTING SANITARY MANHOLE	PROPOSED CHECK VALVE IN CHAMBER
EXISTING CATCHBASIN	PROPOSED STM MH
EXISTING LIGHT STANDARD	PROPOSED SAN MH
EXISTING WATER VALVE	PROPOSED FIRE HYDRANT
EXISTING FIRE HYDRANT	FLOW DIRECTION & SLOPE
EXISTING FENCE	PROPOSED CURB CUT
PROPERTY LINE	EXISTING CURB CUT
EXISTING TREE	EXISTING TOP OF CURB ELEVATION TO REMAIN
EXISTING ELEVATION	EXISTING BOTTOM OF CURB ELEVATION TO REMAIN
PROPOSED GRADE	PROPOSED TOP OF CURB ELEVATION
EXISTING GRADE TO REMAIN	PROPOSED BOTTOM OF CURB ELEVATION
PROPOSED CURB CUT ELEVATION	SLOP FROM ARCHITECT
TOP OF GRATE ELEVATION	PROPOSED TREE & GRATE
EXISTING TOP OF WALL ELEVATION TO REMAIN	CENTER OF SWALE
EXISTING BACK OF WALL ELEVATION TO REMAIN	HIGH POINT
ELEVATION FROM ARCHITECT	TYP. OPSD 600 CONC BARRIER CURB
LIMIT OF GRADING	
CENTER OF SWALE	

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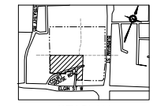
KEY PLAN



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5	RE-ISSUED FOR SPA	04/11/2019
4	ISSUED FOR 30% CONTRACT DOC	17/10/2019
3	ISSUED FOR 100% DD	21/08/2019
2	ISSUED FOR SITE PLAN APPLICATION	12/08/2019
1	ISSUED FOR PART A	28/11/2018

Orientation

Seal

LICENSED PROFESSIONAL ENGINEER
E. MORSHEDI
100270068
23/07/2020
PROVINCE OF ONTARIO

salterpilonarchitecture

151 Ferris Lane, Suite 400 Barrie, Ontario L4M 6C1
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Project Information

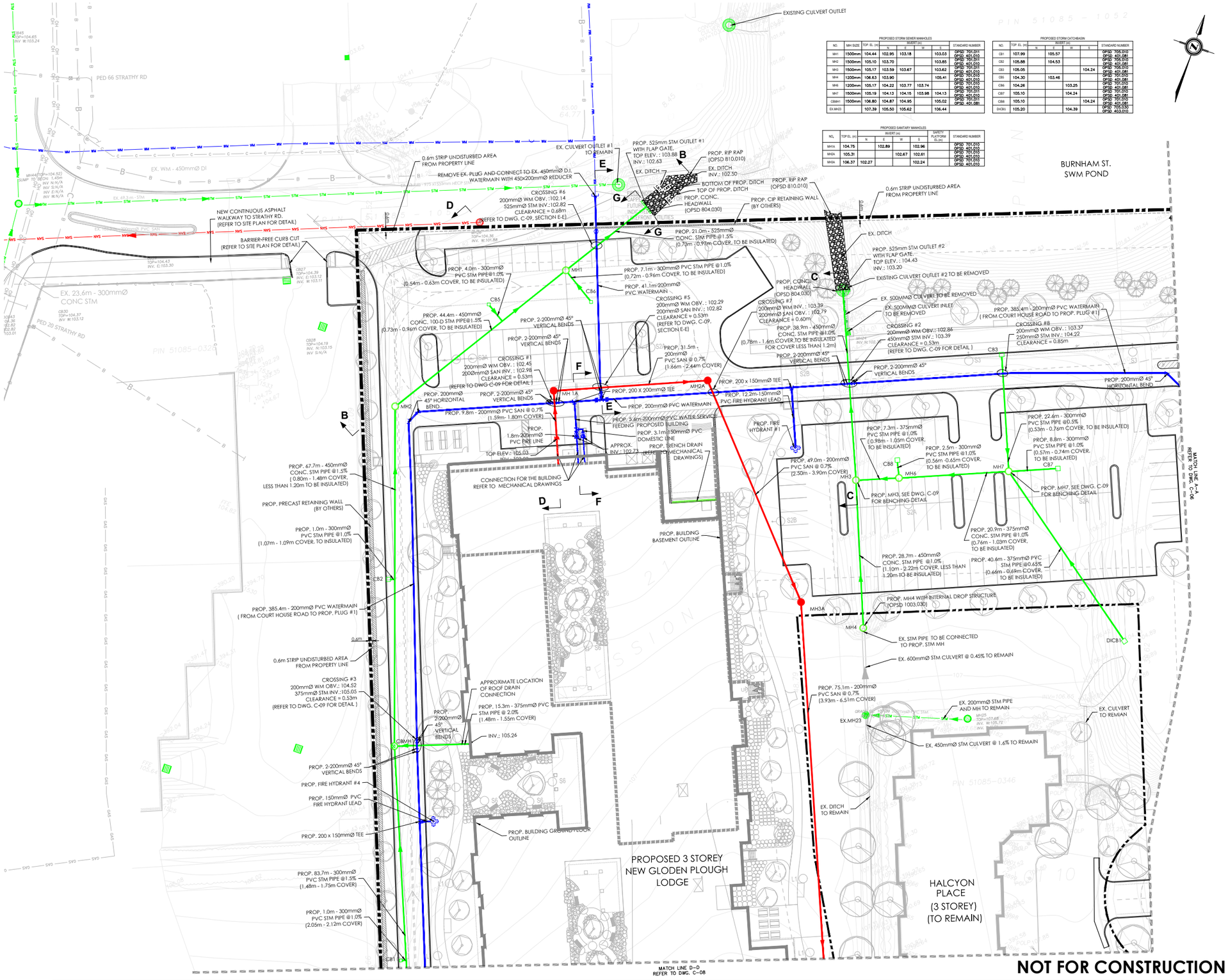
GPL LTC Facility & NCAM

For

Drawing Title

SITE GRADING PLAN

Date	Project No	Drawing No
MARCH 20, 2020	19073	C–04
Drawn by J.W.		
Scale 1: 250		



PROPOSED STORM SEWER MANHOLES

NO.	MH SIZE	TOP EL. (m)	INVERT (m) N	INVERT (m) E	INVERT (m) W	INVERT (m) S	STANDARD NUMBER
MH1	1500mm	104.44	102.95	103.18		103.03	OPSD 701.011 OPSD 401.010
MH2	1500mm	105.10	103.70			103.85	OPSD 701.011 OPSD 401.010
MH3	1500mm	105.17	103.59	103.67		103.62	OPSD 701.011 OPSD 401.010
MH4	1200mm	106.63	103.90			105.41	OPSD 701.010 OPSD 401.010
MH5	1200mm	105.17	104.22	103.77	103.74		OPSD 701.010 OPSD 401.010
MH7	1500mm	105.19	104.13	104.15	103.98	104.13	OPSD 701.011 OPSD 401.010
CBMH1	1500mm	106.80	104.87	104.95		105.02	OPSD 701.011 OPSD 401.081
EX-MH3		107.39	105.50	105.62		106.44	

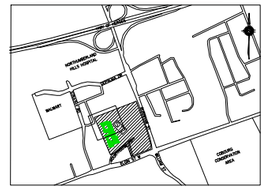
PROPOSED STORM CATCHBASIN

NO.	TOP EL. (m)	INVERT (m) N	INVERT (m) E	INVERT (m) W	INVERT (m) S	STANDARD NUMBER
CB1	107.99		105.57			OPSD 705.010 OPSD 401.081
CB2	105.88		104.53			OPSD 705.010 OPSD 401.081
CB3	105.05				104.24	OPSD 705.010 OPSD 401.081
CB5	104.30		103.46			OPSD 705.010 OPSD 401.081
CB6	104.26				103.25	OPSD 705.010 OPSD 401.081
CB7	105.10				104.24	OPSD 705.010 OPSD 401.081
CB8	105.10				104.24	OPSD 705.010 OPSD 401.081
DICB1	105.20				104.39	OPSD 705.030 OPSD 401.010

PROPOSED SANITARY MANHOLES

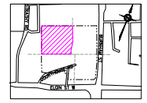
NO.	TOP EL. (m)	INVERT (m) N	INVERT (m) E	INVERT (m) W	INVERT (m) S	SAFETY PLATFORM EL.(m)	STANDARD NUMBER
MH1A	104.75		102.89		102.96		OPSD 701.010 OPSD 401.010
MH2A	105.31			102.67	102.61		OPSD 701.010 OPSD 401.010
MH3A	106.37	102.27			102.24		OPSD 701.010 OPSD 401.010

KEY PLAN



LEGEND

- EXISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE
- EXISTING CATCHBASIN
- EXISTING WATER VALVE
- EXISTING FIRE HYDRANT
- EXISTING PRIVATE FIRE HYDRANT
- EXISTING OUTLET
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATER MAIN
- EXISTING UNDERGROUND BELL CABLE
- EXISTING BELL CONDUIT
- HYDRO OVERHEAD
- HYDRO UNDERGROUND
- EXISTING GAS MAIN
- PROPERTY LINE
- EXISTING TREE
- PROPOSED STORM MANHOLE
- PROPOSED SANITARY MANHOLE
- PROPOSED WATER SERVICE CONNECTION
- EXISTING CATCHBASIN MANHOLE
- PROPOSED FIRE HYDRANT
- PROPOSED WATER VALVE
- PROPOSED BUILDING
- PROPOSED BUILDING
- PROPOSED TREE
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED LIGHT POLE
- EXISTING PEDESTAL
- PROPOSED CATCH BASIN



KEY PLAN

No.	Revision	Date
14	ISSUED FOR SAP RESUBMISSION	23/07/2020
13	RE-ISSUED FOR BUILDING PERMIT	13/07/2020
12	ISSUED FOR SPA RESUBMISSION	02/06/2020
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8	ISSUED FOR BUILDING PERMIT	23/12/2019
7	ISSUED FOR 60% CONTRACT DOC	06/12/2019
6	ISSUED FOR CLASS B COSTING	28/11/2019
5	RE-ISSUED FOR SPA	04/11/2019
4	ISSUED FOR 30% CONTRACT DOC	17/10/2019
3	ISSUED FOR 100% DD	21/08/2019
2	ISSUED FOR SITE PLAN APPLICATION	12/08/2019
1	ISSUED FOR PART A	28/11/2018

Orientation

Seal: LICENSED PROFESSIONAL ENGINEER, E. MORSHEDI, 100070068, 23/07/2020, PROVINCE OF ONTARIO

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salterpilonarchitecture

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salterpilon.com t: 705.737.3530

Project Information

GPL LTC FACILITY & NCAM

555 Courthouse Road, Cobourg, ON, K9A 5J6

For Northumberland County

Drawing Title

SITE SERVICING PLAN

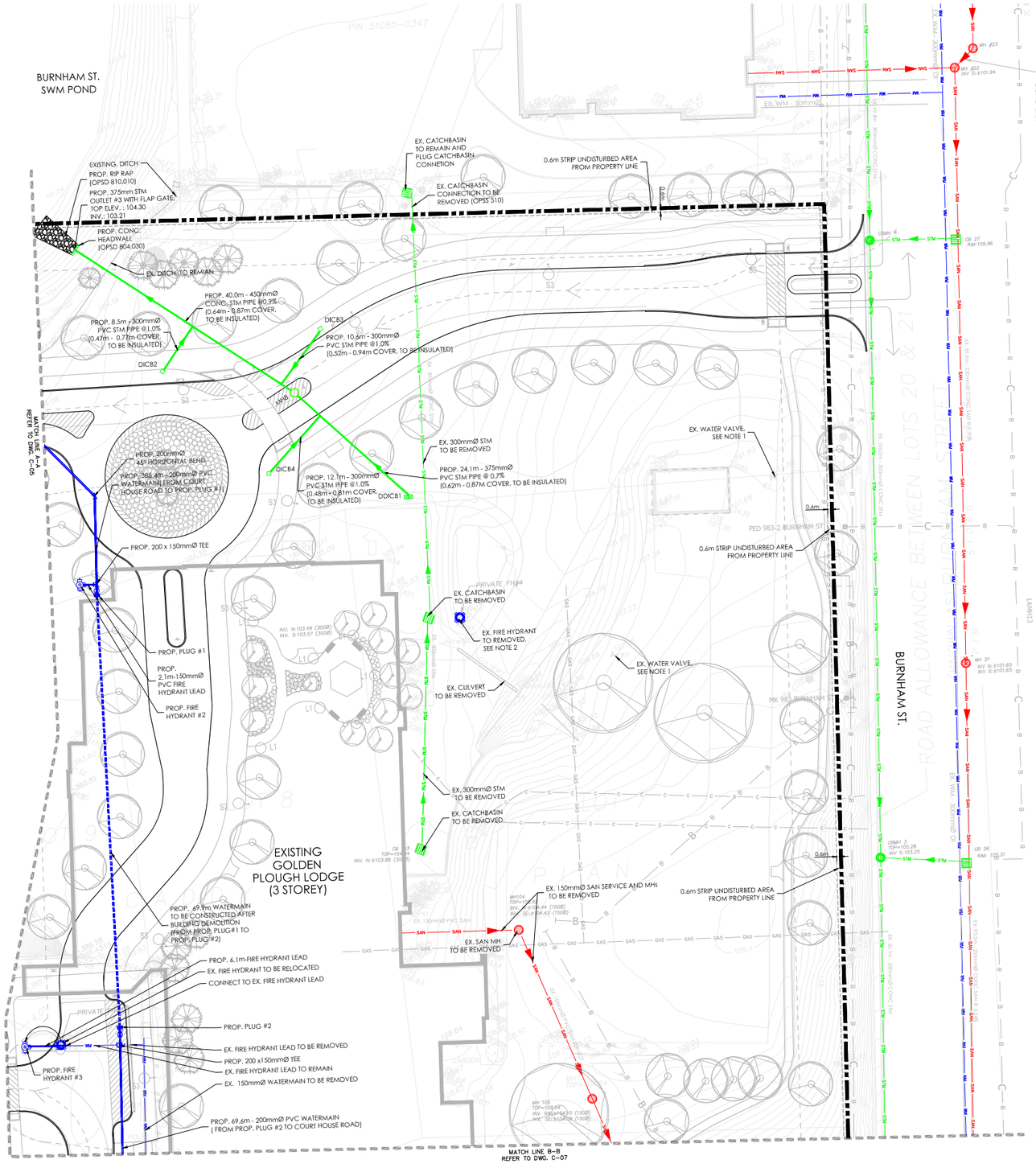
Date	Project No	Drawing No
OCTOBER 30, 2019	19073	C-05
Drawn by J.W.		
Scale 1:250		

PROPOSED STORM SEWER MANHOLES

NO.	MH SIZE	TOP EL (m)	INVERT (m)				STANDARD NUMBER
			N	E	W	S	
MH8	1200mm	104.89		103.65	103.57		OPSD 701.010 OPSD 401.010

PROPOSED STORM CATCHBASIN

NO.	TOP EL (m)	INVERT (m)				STANDARD NUMBER
		N	E	W	S	
DICB2	104.28	103.66				OPSD 705.030 OPSD 403.010
DICB3	104.38			103.76		OPSD 705.030 OPSD 403.010
DICB4	104.70	103.99				OPSD 705.030 OPSD 403.010
DICB1	104.80			103.82		OPSD 705.030 OPSD 403.010



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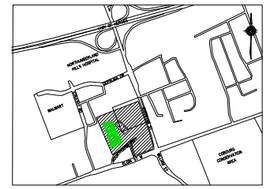

LEGEND

- EXISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE
- EXISTING CATCHBASIN
- EXISTING WATER VALVE
- EXISTING FIRE HYDRANT
- EXISTING PRIVATE FIRE HYDRANT
- EXISTING OUTLET
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATER MAIN
- EXISTING UNDERGROUND BELL CABLE
- EXISTING BELL CONDUIT
- HYDRO OVERHEAD
- HYDRO UNDERGROUND
- EXISTING GAS MAIN
- PROPERTY LINE
- EXISTING TREE
- MH1 PROPOSED STORM MANHOLE
- MH 1A PROPOSED SANITARY MANHOLE
- PROPOSED WATER SERVICE CONNECTION
- EXISTING CATCHBASIN MANHOLE
- PROPOSED FIRE HYDRANT
- PROPOSED WATER VALVE
- PROPOSED BUILDING
- PROPOSED BUILDING
- PROPOSED TREE
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED LIGHT POLE
- EXISTING PEDESTAL
- CB1 PROPOSED CATCH BASIN

NOTE:

1. CONTRACTOR SHALL LOCATE AND DECOMMISSION THE EXISTING WATER VALVE CONNECTIONS.
2. CONTRACTOR SHALL LOCATE, DECOMMISSION AND REMOVE EXISTING HYDRANT LEAD..

KEY PLAN

No.	Revision	Date
14	ISSUED FOR SAP RESUBMISSION	23/07/2020
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3	ISSUED FOR 100% DD	21/08/2019
2	ISSUED FOR SITE PLAN APPLICATION	12/08/2019
1	ISSUED FOR PART A	28/11/2018

Orientation

Seal

LICENSED PROFESSIONAL ENGINEER F. MORSHEDI 100125008 23/07/2020 PROVINCE OF ONTARIO

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Project Information

GPL LTC FACILITY & NCAM

555 Courthouse Road, Cobourg, ON, K9A 5J6

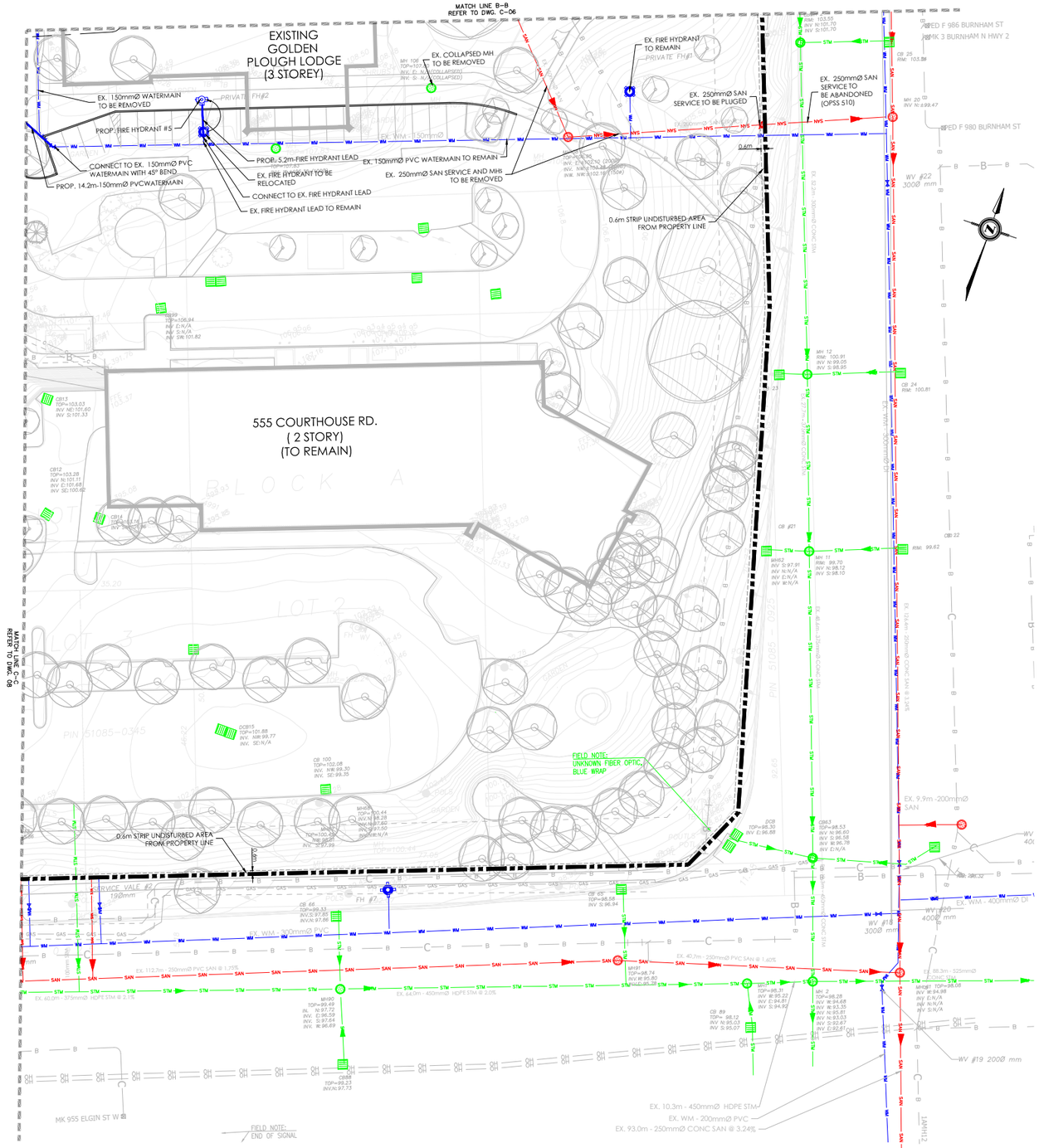
For Northumberland County

Drawing Title

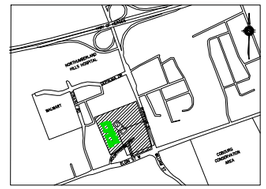
SITE SERVICING PLAN

Date	Project No	Drawing No
OCTOBER 30, 2019	19073	C-06
Drawn by J.W.		
Scale 1:250		

NOT FOR CONSTRUCTION



KEY PLAN



LEGEND

- EXISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE
- EXISTING CATCHBASIN
- EXISTING WATER VALVE
- EXISTING FIRE HYDRANT
- EXISTING PRIVATE FIRE HYDRANT
- EXISTING OUTLET
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATER MAIN
- EXISTING UNDERGROUND BELL CABLE
- EXISTING BELL CONDUIT
- HYDRO OVERHEAD
- HYDRO UNDERGROUND
- EXISTING GAS MAIN
- PROPERTY LINE
- EXISTING TREE
- PROPOSED STORM MANHOLE
- PROPOSED SANITARY MANHOLE
- PROPOSED WATER SERVICE CONNECTION
- EXISTING CATCHBASIN MANHOLE
- PROPOSED FIRE HYDRANT
- PROPOSED WATER VALVE
- PROPOSED BUILDING
- PROPOSED BUILDING
- PROPOSED TREE
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED LIGHT POLE
- EXISTING PEDESTAL
- PROPOSED CATCH BASIN

KEY PLAN

No.	Revision	Date
14	ISSUED FOR SAP RESUBMISSION	23/07/2020
13	RE-ISSUED FOR BUILDING PERMIT	13/07/2020
12	ISSUED FOR SPA RESUBMISSION	02/06/2020
11	ISSUED FOR MOH/LTC WORKING REVIEW	20/03/2020
10	ISSUED SPA RESUBMISSION	13/03/2020
9	ISSUED FOR TENDER REVIEW	05/02/2020
8	ISSUED FOR BUILDING PERMIT	23/12/2019
7	ISSUED FOR 60% CONTRACT DOC	06/12/2019
6	ISSUED FOR CLASS B COSTING	28/11/2019
5	RE-ISSUED FOR SPA	04/11/2019
4	ISSUED FOR 30% CONTRACT DOC	17/10/2019
3	ISSUED FOR 100% DD	21/09/2019
2	ISSUED FOR SITE PLAN APPLICATION	12/08/2019
1	ISSUED FOR PART A	28/11/2018

Orientation

Seal

LICENSED PROFESSIONAL ENGINEER
F. MORSHEDI
100237039
23/07/2020
PROVINCE OF ONTARIO

All dimensions to be checked and verified on the job. Any discrepancies are to be reported to the Consultant. All drawings remain the property of the Consultant. Only latest approved drawings to be used for construction.

salterpilonarchitecture

151 Ferris Lane, Suite 400 Barrie, Ontario L4M 6C1
salterpilon.com t: 705.737.3530

Project Information

GPL LTC FACILITY & NCAM

555 Courthouse Road, Cobourg, ON, K9A 5J6

For Northumberland County

Drawing Title

SITE SERVICING PLAN

Date	Project No	Drawing No
OCTOBER 30, 2019	19073	C-07
Drawn by J.W.		
Scale 1: 250		

NOT FOR CONSTRUCTION

MATCH LINE D–D
REFER TO DWG. C–05

PROPOSED 3 STOREY
NEW GLODEN PLOUGH
LODGE

HALCYON
PLACE
(3 STOREY)
(TO REMAIN)

CHURCH ON THE HILL
594 COURTHOUSE RD.
(1 STORY)

COURT HOUSE ROAD

ELGIN ST.

PROP. 83.7m - 300mmØ PVC STM PIPE @1.5% (1.48m - 1.75m COVER)

PROP. PROPERTY LINE

PROP. 385.4m - 200mmØ PVC WATERMAIN (FROM COURT HOUSE ROAD TO PROP. PLUG #1)

0.6m STRIP UNDISTURBED AREA FROM PROPERTY LINE

CROSSING #4
200mmØ WM OBV.: 105.87
250mmØ STM INV.: 106.40
CLEARANCE = 0.53m
(REFER TO DWG. C-09 FOR DETAIL)

PROP. 2-200mmØ 45° VERTICAL BENDS

PROP. 21.0m - 300mmØ PVC STM PIPE @1.0% (1.53m - 1.67m COVER)

PROP. PRECAST RETAINING WALL (BY OTHERS)

PROP: 200mmØ 22.5° HORIZONTAL BEND

EX. FIRE HYDRANT TO REMAIN

EX. 200mmØ D.I. WATERMAIN TO REMAIN

PROP. 200 x 200x200mmØ TEE

EX. DITCH INLET

PROPOSED PAD MOUNT TRANSFORMER BY HYDRO REFER TO ELECTRICAL DWGS

0.6m STRIP UNDISTURBED AREA FROM PROPERTY LINE

PROP. BUILDING GROUND FLOOR OUTLINE

PROP. BUILDING CANOPIES

PROP. INCOMING GAS SERVICE AND PRV/METERING ASSEMBLY BY GAS COMPANY

PROP. FIRE DEPARTMENT SIAMESE CONNECTION (BY OTHERS)
INV.: 107.31

REFER TO ARCHITECTURAL DWGS FOR WOOD CANOPY DRAIN CONNECTION

PROP. ARMOUR STONE RETAINING WALL (BY OTHERS)

PROP. FIRE HYDRANT #6
PROP. 7.5m-150mmØ PVC FIRE HYDRANT LEAD

CROSSING #11
300mmØ STM OBV.: 107.91
EX. GAS INV.: 107.78
CLEARANCE = 0.07m

PROP. 19.4m - 300mmØ PVC STM PIPE @1.0% (1.72m - 1.77m COVER)

PROP. 200 x 150mmØ TEE

PROP. 73.3m - 200mmØ PVC SAN @ 0.7% (6.54m - 7.17m COVER)

CROSSING #9
200mmØ SAN OBV.: 101.54
EX. 200mmØ WM INV.: 107.07
CLEARANCE = 5.53m

CROSSING #10
300mmØ STM INV.: 106.60
200mmØ SAN OBV.:101.44
CLEARANCE = 5.16m

PROP. 27.5m - 200mmØ PVC STM PIPE @1.5% (1.17m - 1.47m COVER, LESS THAN 1.20m TO BE INSULATED)

PROP. 28.9m - 300mmØ PVC STM PIPE @1.5% (1.22m - 1.50m COVER)

PROP. 26.3m - 300mmØ PVC STM PIPE @1.0% (0.70m - 1.14m COVER, TO BE INSULATED)

PROP. 1.2m - 375mmØ PVC STM PIPE @1.5% (1.51m - 1.56m COVER)

INV.: 106.35

INV.: 106.11

PROP. JELLYFISH STORMFILTER (4OC1_STP0047 OR APPROVED EQUIVALENT)

PROP. 1.7m - 250mmØ PVC STM PIPE @1.0% (2.05m - 2.06m COVER)

85mm ORIFICE PLATE, INV.: 106.08

PROP. 2.9m - 150mmØ PVC STM PIPE @1.0% (2.11m - 2.20m COVER)

PROP. 140m³ UNDERGROUND STM STORAGE; DETENTION VOLUME: 125m³ 13.45m(L) X 10.24m(W) - BRENTWOOD STORMTANK WITH LINER AT BOTTOM AND SIDES (REFER TO DWG. C-09, SECTION A-A) OR APPROVED EQUIVALENT

PROP. PRECAST RETAINING WALL (BY OTHERS)

PROP. 62.1m - 200mmØ PVC SAN @ 0.7% (4.0m - 7.23m COVER)

PROP. 19.4m - 300mmØ PVC STM PIPE @1.0% (1.20m - 1.61m COVER)

PROP. 24.2m - 250mmØ PVC STM PIPE @1.0% (1.11m - 2.85m COVER, LESS THAN 1.20m TO BE INSULATED)

EX. 100mmØ WATER SERVICE TO REMAIN

EX. SAN SERVICE AND MH TO REMAIN

CONNECT TO EX.200mmØ D.I. WATERMAIN WITH 200x200x100mmØ TEE

PROP. 200mmØ 45° HORIZONTAL BEND

PROP. 200 x 150mmØ TEE

PROP. 14.2m-150mmØ PVC WATERMAIN

PROP. 69.6m - 200mmØ PVC WATERMAIN (FROM PROP. PLUG #2 TO COURT HOUSE ROAD)

PROP. 10.3m - 200mmØ PVC WATERMAIN

PROP. 200mmØ 45° HORIZONTAL BEND

EX. FIRE HYDRANT TO REMAIN

EX. 200mmØ D.I. WATERMAIN TO BE REMOVED

CROSSING #12
200mmØ WM INV.: 106.22
EX. 150mmØ SAN OBV.: 105.09
CLEARANCE=1.13m

PROP. 200mmØ 22.5° HORIZONTAL BEND

CONNECT TO EX. 200mmØ D.I. WATERMAIN WITH 45° BEND

EX. 200mmØ D.I. WATERMAIN TO REMAIN

PROP. SPEED BUMP (REFER TO SITE PLAN)

EX. 200mmØ D.I. WATERMAIN TO REMAIN

EX. STM TO REMAIN

EX. SAN TO REMAIN

0.6m STRIP UNDISTURBED AREA FROM PROPERTY LINE

REFER TO DWG. C-07

PROPOSED STORM SEWER MANHOLES

NO.	MH SIZE	TOP EL. (m)	INVERT (m) IN	E	W	S	STANDARD NUMBER
MH5	1200mm	106.44	103.59		105.08	103.59	OPSD 701.010 OPSD 401.013
MH6	1200mm	108.43		106.08	106.08		OPSD 701.010 OPSD 401.013
CBMH3	1200mm	108.28		106.37	106.45		OPSD 701.010 OPSD 401.081
CBMH5	1200mm	108.42	107.03	106.88	106.96		OPSD 701.010 OPSD 401.081
CBMH4	1200mm	108.33	106.28			106.38	OPSD 701.010 OPSD 401.081
CBMH6	1200mm	108.52		106.61		106.45	OPSD 701.010 OPSD 401.081
OGS		108.42		105.34	106.06		

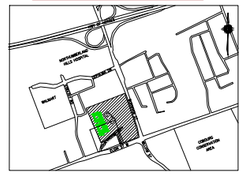
PROPOSED STORM CATCHBASIN

NO.	TOP EL. (m)	INVERT (m) IN	E	W	S	STANDARD NUMBER
CB4	108.39	106.57				OPSD 705.010 OPSD 400.020
DICB5	108.22		107.22			OPSD 705.030 OPSD 400.020
DCB1	108.28			106.81		OPSD 705.020 OPSD 401.081

PROPOSED SANITARY MANHOLES

M.H.	TOP EL. (m)	INVERT (m) IN	E	W	S	DEPTH PLATFORM	DEPTH S.Line	STANDARD NUMBER
MH4A	108.42	101.71			101.68	105.00		OPSD 701.010 OPSD 401.010 OPSD 404.020
MH6A	108.54	101.17	101.11			104.81		OPSD 701.010 OPSD 401.010
MH5A	104.81	100.61		100.67	100.61			OPSD 701.010 OPSD 401.010

KEY PLAN



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1	ISSUED FOR PART A	28/11/2018

Orientation

Seal

LICENSED PROFESSIONAL ENGINEER
Engineer
R MORSHEDI
100210200
23/07/2020
PROVINCE OF ONTARIO

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For Northumberland County

Drawing Title

SITE SERVICING PLAN

Date	Project No	Drawing No
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Drawn by J.W.		
Scale 1: 250		

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