STORMWATER MANAGEMENT REPORT
KWENDILL HOLDINGS
INDUSTRIAL DEVELOPMENT
KERR STREET
TOWN OF COBOURG

Dobri Engineering Ltd.
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FEBRUARY 18, 2021

INTRODUCTION

Kwendill Holdings Ltd. is proposing to develop an Industrial subdivision fronting onto the recent Kerr Street extension in Cobourg. The property was formerly owned by CN and is presently undeveloped. It is approximately 7.3 ha in area, bounded by Kerr Street to the north, Limpact to the east, CPR (formerly CNR) railway to the south, and Home Hardware to the west.

The area west of the rail spur line is proposed to be severed from the property. A total of six (6) industrial lots are proposed east of the rail spur line. The lot lines for lots 1-6 as noted on the site plan may change, depending on the requirements of the purchaser. As noted, the proposed lots range in size from 0.7 ha to 1.4 ha in area.

STORMWATER MANAGEMENT

STORMWATER ANALYSIS

The development of this site will increase the overall runoff coefficient, as a result of the increased impervious surface (roadway, driveways, and buildings). The analysis completed for the surface water runoff is based on the following:

1. IDF data for Cobourg Midtown Creek (stage-storage-discharge)

Return Period (year)	*Regression constants a*	*b*	*c*
2	*425*	*4.3*	*0.744*
5	*530*	*3.3*	*0.741*
10	*620*	*3*	*0.741*
25	*710*	*2.8*	*0.739*
50	*810*	*2.8*	*0.746*
100	*825*	*1.7*	*0.739*

Where I (mm/hr)= a/(t+b)^c

2. Rational Method $Q_p = 0.0028CIA$
3. Airport Formula Tc=(3.26(1.1-C)D^1/2)/S^1/3, when C<=0.40
4. Bransby Williams Tc=0.057(L)/S^0.2*A^0.1, when C>0.40
5. MTO Drainage Management Manual
6. MOE – Stormwater Management Planning & Design Manual, 2003
7. MNR River and Stream Systems Erosion Hazard Limit Technical Guide
8. Construction Greater Golden Horseshoe Area Conservation Authorities - Erosion and Sedimentation Control Guideline for Urban Construction

9. Credit Valley Conservation and Toronto and Region Conservation - Low-Impact Development Stormwater Management Planning and Design Guide
10. Municipal Engineering Standards
11. Runoff Coefficient of 0.25 for open field and landscaped areas (Pre-Development)
12. Runoff Coefficient of 0.90 for paved surface, concrete and building roof
13. Runoff Coefficient of 0.75 for Limpact
14. Runoff Coefficient of 0.80 for Development (Cobourg C=0.60-0.85 for Medium Industrial development, GRCA C=0.75-0.90)
15. Geotechnical Investigation Report, prepared by GHD, January, 2021

QUANTITY CONTROLS

PRE-DEVELOPMENT CONDITIONS

The surface drainage patterns are illustrated on the Existing Drainage Conditions Plan, Drawing No. 20-635-Existing, in the Appendix. The plan illustrates three (3) extraneous drainage areas and two (2) development drainage areas. These are:

Catchment ID	Area (sq.m)	Comment
EXT1	7,275	CPR railway lands to the south. ½ the area is draining onto the development lands.
EXT2	17,922	Limpact (Industrial developed lot to the east of the site).
EXT3	2,547	The rail spur line between the proposed severed parcel and Lot 1.
1	13,719	The land on the west side of the spur line (Proposed severed parcel). Surface runoff is directed towards the existing culvert under the spur line, discharging onto Lot 1.
2	59,560	The land on the east side of the spur line (Lots 1-6).

Surface runoff from the described catchment areas is directed towards the existing box culvert under the railway tracks, near the SW corner of the development area. The box culvert is a cast in place concrete structure (opening 1.7m wide x 0.93m high) with an open (earth) bottom. Stormwater is discharged to the south side of the tracks, and into the municipal storm sewer system through the existing Mall.

The Kerr Street extension was constructed in 2020. Surface runoff from the Industrial Park north of Kerr Street previously discharged onto the subject land. The Kerr Street extension included the construction of a municipal storm sewer system, and now intercepts the surface runoff from the existing Industrial Park, and reduces the flow through the box culvert.

EXTRANEOUS AREAS - Calculate the average runoff coefficient for the Extraneous drainage area.

Surface		Area	C	A x C
SPUR LINE		2547	0.25	636.8
MAIN TRACK		7275	0.25	1818.8
LIMPACT		17922	0.75	13441.5
	TOTAL	27744		15897.0
	Weighted C		0.57	

Calculate the peak discharge using the Rational Method.

Peak Runoff $Q_p = 0.0028CIA$
Where Q_p = peak runoff, cms
C = runoff coefficient
I = rainfall intensity, mm/hr
A = area, hectares

Calculate the time of concentration (t) using the Bransby Williams Equation.

Tc=0.057(L)/S^0.2*A^0.1, where L=200m, S=1.0% and A=2.77ha
Tc= 14.37 minutes

The peak discharge is:

t=min	*14.37*	*C=*	*0.57*	*A=*	*2.774*	
	2-yr	*5-yr*	*10-yr*	*25-yr*	*50-yr*	*100-yr*
I=mm/hr	*48.16*	*63.12*	*74.78*	*86.86*	*97.14*	*105.99*
Q=cms	*0.214*	*0.281*	*0.333*	*0.387*	*0.432*	*0.472*

The discharge from the Extraneous catchment areas will not be controlled.

SEVERED PARCEL (Catchment 1) - The preliminary SWM calculations for the severed parcel are presented in the Appendix.

In summary, the peak discharge from Lot 1 area is:

	t=min	*21.51*	*C=*	*0.25*	*A=*	*1.372*	
PRE		*2-yr*	*5-yr*	*10-yr*	*25-yr*	*50-yr*	*100-yr*
	I=mm/hr	*37.85*	*49.08*	*57.93*	*67.17*	*74.94*	*80.77*
	Q=cms	*0.036*	*0.047*	*0.056*	*0.065*	*0.072*	*0.078*
Controlled	*Q=cms*	*0.018*	*0.033*				*0.054*

(Mid-Town Creek – Control discharge of 2-yr storm to 50% of Pre-Development discharge, 5-yr storm to 70% of Pre-Development discharge, and the 100-yr storm to 70% of Pre-Development discharge).

The discharge from the severed parcel will be controlled separately, and discharge through the SWM facility for Lot 1-6.

LOT 1-6 (Catchment 2) - Calculate the time of concentration (t) using the Airport Formula.

Tc=(3.26(1.1-C)D^1/2)/S^1/3, where C=0.25, D=200m, S=1%
Tc=39.92 minutes

The peak discharge from Lot 1-6 area is:

	t=min	*39.12*	*C=*	*0.25*	*A=*	*5.956*	
PRE		*2-yr*	*5-yr*	*10-yr*	*25-yr*	*50-yr*	*100-yr*
	I=mm/hr	*25.70*	*32.98*	*38.79*	*44.91*	*49.91*	*53.22*
	Q=cms	*0.107*	*0.138*	*0.162*	*0.187*	*0.208*	*0.222*
Controlled	*Q=cms*	*0.054*	*0.096*				*0.155*

(Mid-Town Creek – Control discharge of 2-yr storm to 50% of Pre-Development discharge, 5-yr storm to 70% of Pre-Development discharge, and the 100-yr storm to 70% of Pre-Development discharge).

POST-DEVELOPMENT CONDITIONS

The Post-Development conditions are illustrated on Drawing No. 20-635-POST. Zoning on the land limits the coverage to 60%. Specific plans for each lot will be prepared by the individual purchaser. Each lot will be developed through site plan approval. For design purposes, the runoff coefficient for the developed property is 0.80.

The storm sewer system on Kerr Street was not designed to accept any runoff from this development. Surface water runoff from the development will be directed to the south and through the existing box culvert under the railway.

For Post-Development conditions, T_c = 15.0 minutes for design purposes. The peak uncontrolled discharge from Lot 1-6 for Post-Development conditions is:

	t=min	*15.00*	*C=*	*0.80*	*A=*	*5.956*	
POST		*2*	*5*	*10*	*25*	*50*	*100*
	I=mm/hr	*46.98*	*61.49*	*72.82*	*84.57*	*94.55*	*103.01*
	Q=cms	*0.627*	*0.820*	*0.971*	*1.128*	*1.261*	*1.374*

Stormwater discharge from lot 1-6 must be controlled to 50% of peak Pre-Development discharge (0.054cms) for the 2-yr storm event and 70% of peak Pre-Development discharge, for the 5-yr (0.096cms) and the 100-yr (0.155cms) storm events. A SWM facility will be constructed along the south property limits of Lot 1-6. The SWM storage requirements for the various storm events are presented in the following tables.

The stormwater storage required for Lots 1-6 during the 2-yr storm event is:

2-YEAR TOTAL FLOW 0.054 cms

AREA ***5.956***

TIME (min)	INT (I) (mm/hr)	Qp (cms)	RUNOFF VOL (m3)	DISCHAR VOL (m3)	STOR VOL (m3)
10	*58.72*	*0.783*	470.1	32.1	437.9
20	*39.58*	*0.528*	633.7	64.3	569.4
30	*30.63*	*0.409*	735.5	96.4	639.1
40	*25.32*	*0.338*	810.7	128.6	682.1
50	*21.76*	*0.290*	871.0	160.7	710.3
60	*19.19*	*0.256*	921.7	192.9	728.8
70	*17.23*	*0.230*	965.7	225.0	740.6
80	*15.69*	*0.209*	1004.7	257.2	747.5
90	*14.43*	*0.193*	1039.8	289.3	750.5
92	*14.21*	*0.190*	1046.4	295.8	750.7
94	*13.99*	*0.187*	1053.0	302.2	**750.8**
96	*13.79*	*0.184*	1059.4	308.6	750.7
98	*13.58*	*0.181*	1065.7	315.0	750.6
100	*13.39*	*0.179*	1071.9	321.5	750.4
110	*12.51*	*0.167*	1101.4	353.6	747.8
120	*11.75*	*0.157*	1128.9	385.8	743.1

The SWM facility must provide a minimum 751 cu.m of runoff storage to control the discharge to 0.054cms.

The stormwater storage required for Lots 1-6 during the 5-yr storm event is:

5-YEAR TOTAL FLOW 0.096 cms

AREA	***5.956***				
TIME	INT (I)	Qp	RUNOFF	DISCHAR	STOR VOL
(min)	(mm/hr)	(cms)	VOL (m3)	VOL (m3)	(m3)
10	*77.89*	*1.039*	623.5	57.8	565.8
20	*51.41*	*0.686*	823.1	115.5	707.6
30	*39.46*	*0.526*	947.6	173.3	774.3
40	*32.48*	*0.433*	1040.0	231.0	809.0
50	*27.85*	*0.372*	1114.5	288.8	825.8
52	*27.10*	*0.362*	1127.9	300.3	827.6
54	*26.39*	*0.352*	1140.9	311.9	829.0
56	*25.73*	*0.343*	1153.4	323.4	830.0
58	*25.11*	*0.335*	1165.6	335.0	830.6
60	*24.52*	*0.327*	1177.4	346.5	**830.9**
62	*23.96*	*0.320*	1189.0	358.1	830.9
64	*23.43*	*0.313*	1200.2	369.6	830.6
66	*22.92*	*0.306*	1211.1	381.2	830.0
68	*22.45*	*0.299*	1221.8	392.7	829.1
70	*21.99*	*0.293*	1232.2	404.3	827.9
80	*20.00*	*0.267*	1280.9	462.0	818.9
90	*18.39*	*0.245*	1324.9	519.8	805.1
100	*17.05*	*0.228*	1365.2	577.5	787.6
110	*15.93*	*0.212*	1402.3	635.3	767.0
120	*14.96*	*0.200*	1436.8	693.0	743.8

The SWM facility must provide a minimum 831 cu.m of runoff storage to control the discharge to 0.096cms.

The stormwater storage required for Lots 1-6 during the 100-yr storm event is:

100-YEAR TOTAL FLOW 0.155 cms

AREA ***5.956***

TIME (min)	INT (I) (mm/hr)	Qp (cms)	RUNOFF VOL (m3)	DISCHAR VOL (m3)	STOR VOL (m3)
10	*133.99*	*2.234*	1340.7	93.2	1247.5
20	*84.88*	*1.416*	1698.7	186.4	1512.3
30	*64.15*	*1.070*	1925.6	279.6	1646.0
40	*52.38*	*0.874*	2096.5	372.7	1723.8
50	*44.69*	*0.745*	2235.7	465.9	1769.8
60	*39.21*	*0.654*	2354.2	559.1	1795.1
62	*38.30*	*0.639*	2376.0	577.8	1798.3
64	*37.43*	*0.624*	2397.3	596.4	1800.9
66	*36.61*	*0.611*	2418.0	615.0	1803.0
68	*35.83*	*0.598*	2438.2	633.7	1804.6
70	*35.09*	*0.585*	2458.0	652.3	1805.7
72	*34.39*	*0.573*	2477.4	670.9	1806.4
74	*33.71*	*0.562*	2496.3	689.6	**1806.7**
76	*33.07*	*0.552*	2514.8	708.2	1806.6
78	*32.45*	*0.541*	2533.0	726.9	1806.1
80	*31.87*	*0.531*	2550.8	745.5	1805.3
90	*29.26*	*0.488*	2634.9	838.7	1796.3
100	*27.10*	*0.452*	2712.1	931.9	1780.2
110	*25.29*	*0.422*	2783.6	1025.1	1758.5
120	*23.74*	*0.396*	2850.2	1118.2	1731.9

The SWM facility must provide a minimum 1,807cu.m of runoff storage to control the discharge to 0.096cms.

The SWM discharge will be controlled by installing a structure outside the existing box culvert, as detailed on the plans. The structure will have a weir control, with the discharge calculated using the Weir Equation Q=1.67*L*H^1.5, where L is the length of the weir and H is the depth of water over the weir.

The peak flow from the Extraneous drainage area will flow through the SWM facility, but will not be controlled. Drainage from the severed parcel will be controlled on its own, and will also flow through the SWM facility. The weir discharge will be:

Catchment	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
EXT1, 2 & 3	*0.214*	*0.281*	*0.333*	*0.387*	*0.432*	*0.472*
1 – Severed parcel	*0.018*	*0.033*	*0.039*	*0.045*	*0.050*	*0.054*
2 - Lot 1-6	*0.054*	*0.096*	*0.113*	*0.131*	*0.146*	*0.155*
Discharge Q(cms)	*0.286*	*0.410*	*0.485*	*0.563*	*0.628*	*0.681*

The weir length will be 0.5m. The pond storage and discharge is presented in the following table.

H (Water depth m)	Discharge (cms)	SWM volume provided (cu.m)	SWM Volume required (cu.m)
0.49	0.286	960.1	751
0.62	0.410	1260	831
0.87	0.678	2670	1,807

The proposed SWM facility will provide the necessary quantity controls.

QUALITY CONTROLS

Drawing No. 20-635-ES illustrates the Erosion and Sediment Controls for the development. The developer will construct the earth berm along the railway line and the SWM facility. Prior to commencing these construction activities, a silt fence is to be installed along the south property line, and rock check dam is to be placed at the box culvert entrance. In order to limit erosion and sediment transport, the earth berm is to be stabilized (topsoil and seed, or erosion control blanket) as soon as practical. The silt fence can be removed once the bank is stabilized.

The Industrial Subdivision will not have a central Stormwater Quality control facility, and as such quality control is to be provided for each individual lot. The individual site plans will need to address both temporary and permanent quality control. Temporary quality control during construction will include the installation of a silt fence along the north bank of the SWM facility, and a rock check dam within any side yard swale. These can be removed once the lot is landscaped and paved.

Permanent quality control may be achieved with the side yard grassed swale and the construction of a grassed filter strip along the south lot development limit. Additional controls such as the installation of a quality control structure may be required if the site development requires the installation of a private storm sewer system. It may also be possible to install an infiltration system. The options will need to be evaluated during site plan approval.

CONCLUSIONS AND RECOMMENDATIONS

Based on this evaluation, we make the following conclusions and recommendations:

1. The development area is within the Mid-Town Creek catchment area.

2. Erosion and sedimentation control measures, both before and during construction, should be carried out as detailed herein. All controls need to be maintained and repaired for the duration of construction.

3. Permanent stormwater quantity control will be provided by constructing the SWM facility noted, and controlling the discharge via a weir structure.

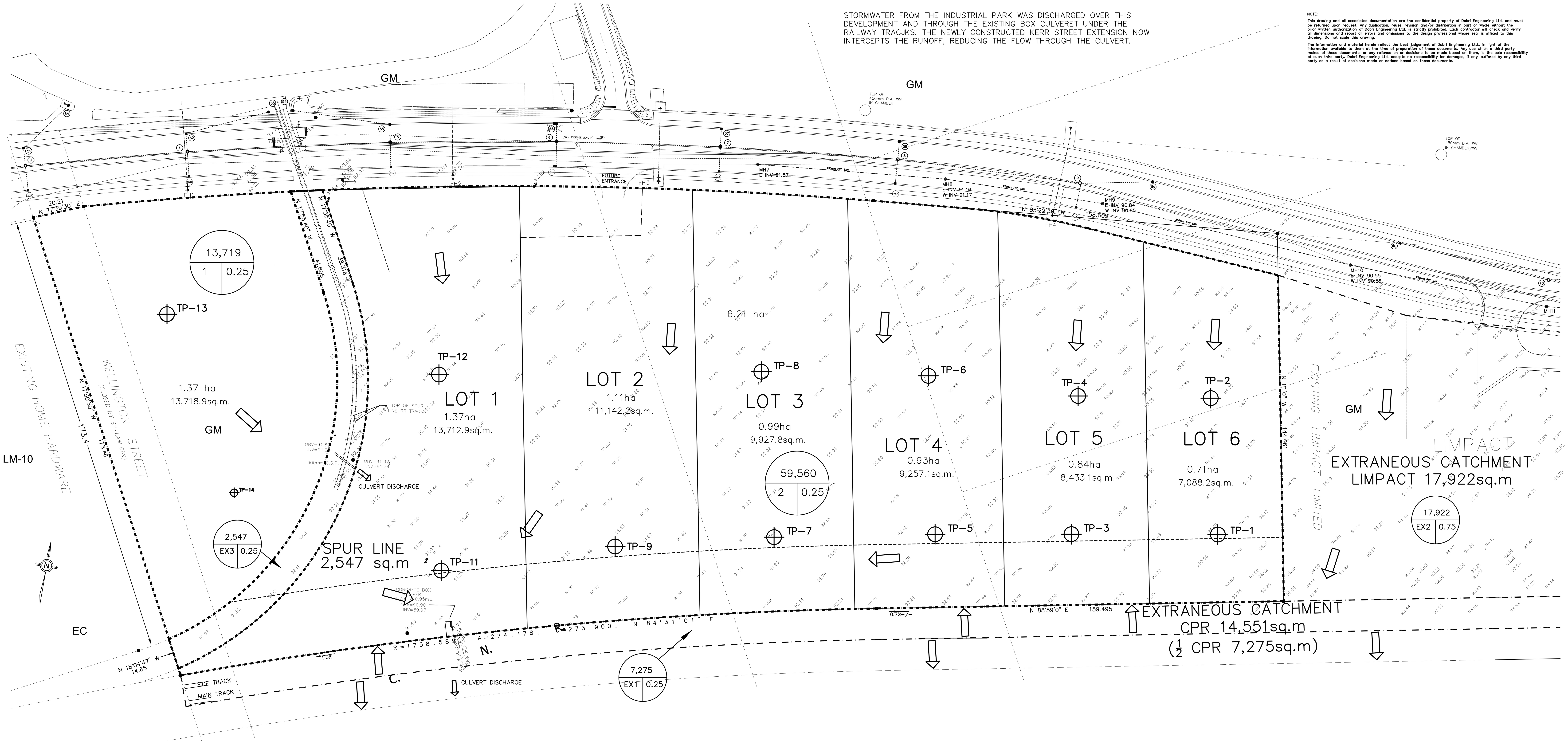
4. Permanent stormwater quality control will be provided on a lot per lot basis. The design will be completed as part of the site plan application.

5. Stormwater quality and quantity controls for the severed parcel must be provided on the severed property, prior to discharging onto Lot 1.

Prepared by: Bruno Dobri, P. Eng.
Dobri Engineering Ltd.

APPENDIX

STORMWATER FROM THE INDUSTRIAL PARK WAS DISCHARGED OVER THIS DEVELOPMENT AND THROUGH THE EXISTING BOX CULVERET UNDER THE RAILWAY TRACJKS. THE NEWLY CONSTRUCTED KERR STREET EXTENSION NOW INTERCEPTS THE RUNOFF, REDUCING THE FLOW THROUGH THE CULVERT.



LEGEND

- - - - - EXTRANEOUS CATCHMENT BOUNDARY
······· CATCHMENT BOUNDARY
(1,072 / 1 | 0.25) AREA sq.m UNLESS NOTED; CATCHMENT # AND RUNOFF COEFFICIENT
ELEVATION 1999
ELEVATION 2021
PROPOSED LOT LINE
PROPERTY LINES
TP-11 SOILS TEST PIT (GHD)
MAJOR OVERLAND FLOW
1.0% SURFACE DRAINAGE

NOTES:

TOPOGRAPHICAL SURVEY COMPLETED BY CULHAM SURVEYING LTD. IN JUNE 1999
ADDITIONAL PARTIAL TOPOGRAPHICAL SURVEY COMPLETED BY A.R. (SANDY) WAKELING SURVEYING TECHNICAL SERVICES IN JANUARY 2021.
WITH THE EXCEPTION OF LOT 1, ALL OTHER INTERNAL LOT BOUNDARIES MAY CHANGE.
KERR STREET INFORMATION TAKEN FROM CONSTRUCTION CONTRACT DRAWINGS PREPARED BY CIMA, 2020

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

REV	COMMENT	DATE
2		
1		

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205 PETER ST. P.O. BOX 441,
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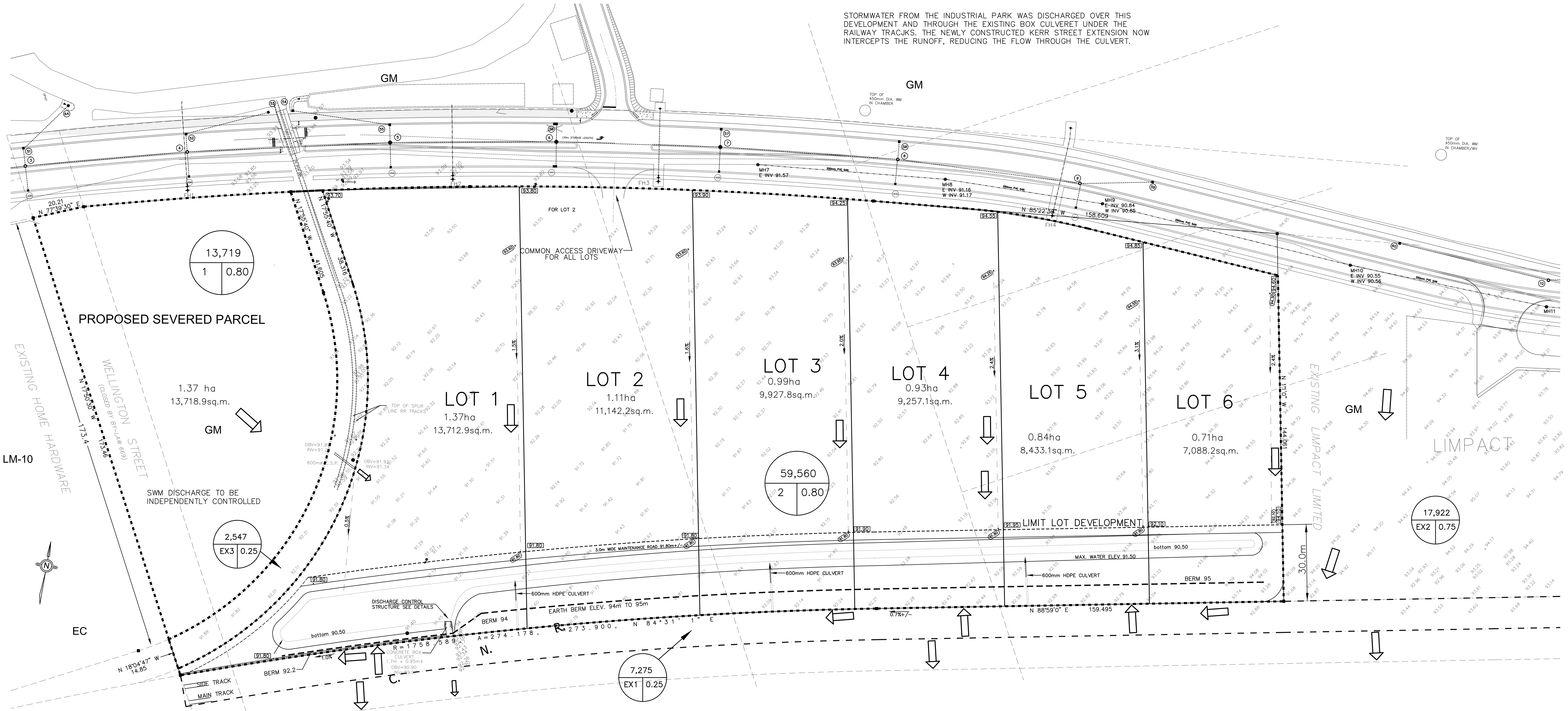
TEL. 905-885-2881 email – dobrieng@bellnet.ca

KWENDILL HOLDINGS LTD.
EXISTING DRAINAGE CONDITIONS
KERR STREET INDUSTRIAL PARK
TOWN OF COBOURG

SCALE:	1:750	DATE: FEB. 18/21	BY: BD
		DWG. NO.:	20-635-EXISTING



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GM
PROPOSED SEVERED PARCEL
13,719
1 0.80
1.37 ha
13,718.9sq.m.
GM
WELLINGTON STREET
(CLOSED BY BY-LAW 669)
EXISTING HOME HARDWARE
LM-10
SWM DISCHARGE TO BE INDEPENDENTLY CONTROLLED
2,547
EX3 0.25
EC
COMMON ACCESS DRIVEWAY FOR ALL LOTS
FOR LOT 2
LOT 1
1.37ha
13,712.9sq.m.
LOT 2
1.11ha
11,142.2sq.m.
LOT 3
0.99ha
9,927.8sq.m.
59,560
2 0.80
LOT 4
0.93ha
9,257.1sq.m.
LOT 5
0.84ha
8,433.1sq.m.
LOT 6
0.71ha
7,088.2sq.m.
LIMIT LOT DEVELOPMENT
EXISTING LIMPACT LIMITED
LIMPACT
GM
17,922
EX2 0.75
30.0m
MAX. WATER ELEV 91.50
bottom 90.50
600mm HDPE CULVERT
BERM 95
BERM 94
BERM 92.2
EARTH BERM ELEV. 94m TO 95m
DISCHARGE CONTROL STRUCTURE SEE DETAILS
7,275
EX1 0.25
SIDE TRACK
MAIN TRACK
N 85°22'38" W 158.609
N 88°59'0" E 159.495
N 18°04'47" W 14.85
N 17°50'30" W 173.46
173.4
20.21
MH7 E INV 91.57
MH8 E INV 91.16 W INV 91.17
MH9 E INV 90.84 W INV 90.85
MH10 E INV 90.55 W INV 90.56
MH11

LEGEND

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KWENDILL HOLDINGS LTD.
POST DEVELOPMENT DRAINAGE
KERR STREET INDUSTRIAL PARK
TOWN OF COBOURG

SCALE:	1:750	DATE: FEB. 18/21	BY: BD
		DWG. NO.: 20-635-POST	

SEVERED PARCEL - STORMWATER MANAGEMENT

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PRE-DEVELOPMENT CONDITIONS

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SEVERED PARCEL (Catchment 1)

Catchment ID	Area (sq.m)	Comment
1	13,719	The land on the west side of the spur line (Proposed severed parcel). Surface runoff is directed towards the existing culvert under the spur line, discharging onto Lot 1.

- Calculate the time of concentration (t) using the Airport Formula.

Tc=(3.26(1.1-C)D^1/2)/S^1/3, where C=0.25, D=96m, S=2%
Tc=21.51 minutes

The peak discharge from Catchment 1 area is:

	t=min	*21.51*	*C=*	*0.25*	*A=*	*1.372*	
PRE		*2-yr*	*5-yr*	*10-yr*	*25-yr*	*50-yr*	*100-yr*
	I=mm/hr	*37.85*	*49.08*	*57.93*	*67.17*	*74.94*	*80.77*
	Q=cms	*0.036*	*0.047*	*0.056*	*0.065*	*0.072*	*0.078*
Controlled	*Q=cms*	*0.018*	*0.033*				*0.054*

(Mid-Town Creek – Control discharge of 2-yr storm to 50% of Pre-Development discharge, 5-yr storm to 70% of Pre-Development discharge, and the 100-yr storm to 70% of Pre-Development discharge).

POST-DEVELOPMENT CONDITIONS

The Post-Development conditions are illustrated on Drawing No. 20-635-POST. Zoning on the land limits the coverage to 60%. Specific plans for each lot will be prepared by the individual purchaser. Each lot will be developed through site plan approval. For design purposes, the runoff coefficient for the developed property is 0.80.

The storm sewer system on Kerr Street was not designed to accept any runoff from this development. Surface water runoff from the development will be directed to the south and through the existing box culvert under the railway.

For Post-Development conditions, T_c = 15.0 minutes for design purposes. The peak uncontrolled discharge from the severed parcel under the Post-Development conditions is:

	t=min	*15.00*	*C=*	*0.80*	*A=*	*5.956*	
POST		*2*	*5*	*10*	*25*	*50*	*100*
	I=mm/hr	*46.98*	*61.49*	*72.82*	*84.57*	*94.55*	*103.01*
	Q=cms	*0.627*	*0.820*	*0.971*	*1.128*	*1.261*	*1.374*

Stormwater discharge from the severed parcel must be controlled to 50% of peak Pre-Development discharge (0.018cms) for the 2-yr storm event and 70% of peak Pre-Development discharge, for the 5-yr (0.033cms) and the 100-yr (0.053cms) storm events. A SWM facility will be constructed along the south property limits of the property. The SWM storage requirements for the various storm events are presented in the following tables.

The stormwater storage required for the severed parcel during the 2-yr storm event is:

2-YEAR TOTAL FLOW 0.018 cms

AREA ***1.372***

TIME (min)	INT (I) (mm/hr)	Qp (cms)	RUNOFF VOL (m3)	DISCHAR VOL (m3)	STOR VOL (m3)
10	*58.72*	*0.180*	108.3	10.9	97.4
20	*39.58*	*0.122*	146.0	21.8	124.2
30	*30.63*	*0.094*	169.4	32.7	136.7
40	*25.32*	*0.078*	186.7	43.6	143.1
50	*21.76*	*0.067*	200.6	54.5	146.1
52	*21.18*	*0.065*	203.1	56.7	146.4
54	*20.64*	*0.063*	205.5	58.9	146.6
56	*20.13*	*0.062*	207.8	61.1	146.8
58	*19.65*	*0.060*	210.1	63.2	146.9
60	*19.19*	*0.059*	212.3	65.4	**146.9**
62	*18.76*	*0.058*	214.4	67.6	146.8
64	*18.35*	*0.056*	216.5	69.8	146.7
70	*17.23*	*0.053*	222.4	76.3	146.1
80	*15.69*	*0.048*	231.4	87.2	144.2
90	*14.43*	*0.044*	239.5	98.1	141.4
100	*13.39*	*0.041*	246.9	109.0	137.9

The SWM facility must provide a minimum 146.9 cu.m of runoff storage to control the discharge to 0.018cms.

The stormwater storage required for the severed parcel during the 5-yr storm event is:

5-YEAR TOTAL FLOW 0.033 cms

AREA	***1.372***				
TIME	INT (I)	Qp	RUNOFF	DISCHAR	STOR VOL
(min)	(mm/hr)	(cms)	VOL (m3)	VOL (m3)	(m3)
10	*77.89*	*0.239*	143.6	19.8	123.8
20	*51.41*	*0.158*	189.6	39.6	150.0
30	*39.46*	*0.121*	218.3	59.4	158.9
32	*37.79*	*0.116*	223.0	63.3	159.6
34	*36.28*	*0.111*	227.4	67.3	160.1
36	*34.90*	*0.107*	231.7	71.3	160.4
38	*33.64*	*0.103*	235.7	75.2	**160.5**
40	*32.48*	*0.100*	239.6	79.2	160.4
42	*31.41*	*0.097*	243.3	83.1	160.1
44	*30.42*	*0.093*	246.8	87.1	159.7
46	*29.50*	*0.091*	250.2	91.1	159.2
48	*28.65*	*0.088*	253.5	95.0	158.5
50	*27.85*	*0.086*	256.7	99.0	157.7
60	*24.52*	*0.075*	271.2	118.8	152.4
70	*21.99*	*0.068*	283.8	138.6	145.3
80	*20.00*	*0.061*	295.0	158.4	136.7
90	*18.39*	*0.057*	305.2	178.2	127.0
100	*17.05*	*0.052*	314.4	197.9	116.5
110	*15.93*	*0.049*	323.0	217.7	105.3
120	*14.96*	*0.046*	331.0	237.5	93.4

The SWM facility must provide a minimum 160.5 cu.m of runoff storage to control the discharge to 0.033cms.

The stormwater storage required for the severed parcel during the 100-yr storm event is:

100-YEAR TOTAL FLOW 0.054 cms

AREA ***1.372***

TIME (min)	INT (I) (mm/hr)	Qp (cms)	RUNOFF VOL (m3)	DISCHAR VOL (m3)	STOR VOL (m3)
10	*133.99*	*0.515*	308.8	32.6	276.2
20	*84.88*	*0.326*	391.3	65.2	326.1
30	*64.15*	*0.246*	443.5	97.7	345.8
40	*52.38*	*0.201*	482.9	130.3	352.6
42	*50.60*	*0.194*	489.8	136.8	353.0
44	*48.95*	*0.188*	496.4	143.3	**353.1**
46	*47.43*	*0.182*	502.8	149.9	353.0
48	*46.01*	*0.177*	509.0	156.4	352.6
50	*44.69*	*0.172*	515.0	162.9	352.1
52	*43.45*	*0.167*	520.8	169.4	351.4
54	*42.29*	*0.162*	526.4	175.9	350.5
56	*41.20*	*0.158*	531.8	182.4	349.4
58	*40.18*	*0.154*	537.1	188.9	348.2
60	*39.21*	*0.151*	542.3	195.5	346.8
70	*35.09*	*0.135*	566.2	228.0	338.1
80	*31.87*	*0.122*	587.5	260.6	326.9
90	*29.26*	*0.112*	606.9	293.2	313.7
100	*27.10*	*0.104*	624.7	325.8	298.9
110	*25.29*	*0.097*	641.2	358.4	282.8
120	*23.74*	*0.091*	656.5	390.9	265.6

The SWM facility must provide a minimum 353.1cu.m of runoff storage to control the discharge to 0.054cms.

The SWM discharge will be controlled by installing an outlet culvert with an orifice plate. The orifice opening will be a slot, 0.04m wide, full height of the outlet culvert (600mm). The orifice equation was used to determine the controlled outlet flow.

$Q = CA*SQRT(2gH)$

Where
Q= discharge (cms)
C= 0.6
g= 9.81 m/sec/sec
H= water head (water elevation – centre of orifice elevation)

The pond storage and discharge is presented in the following table.

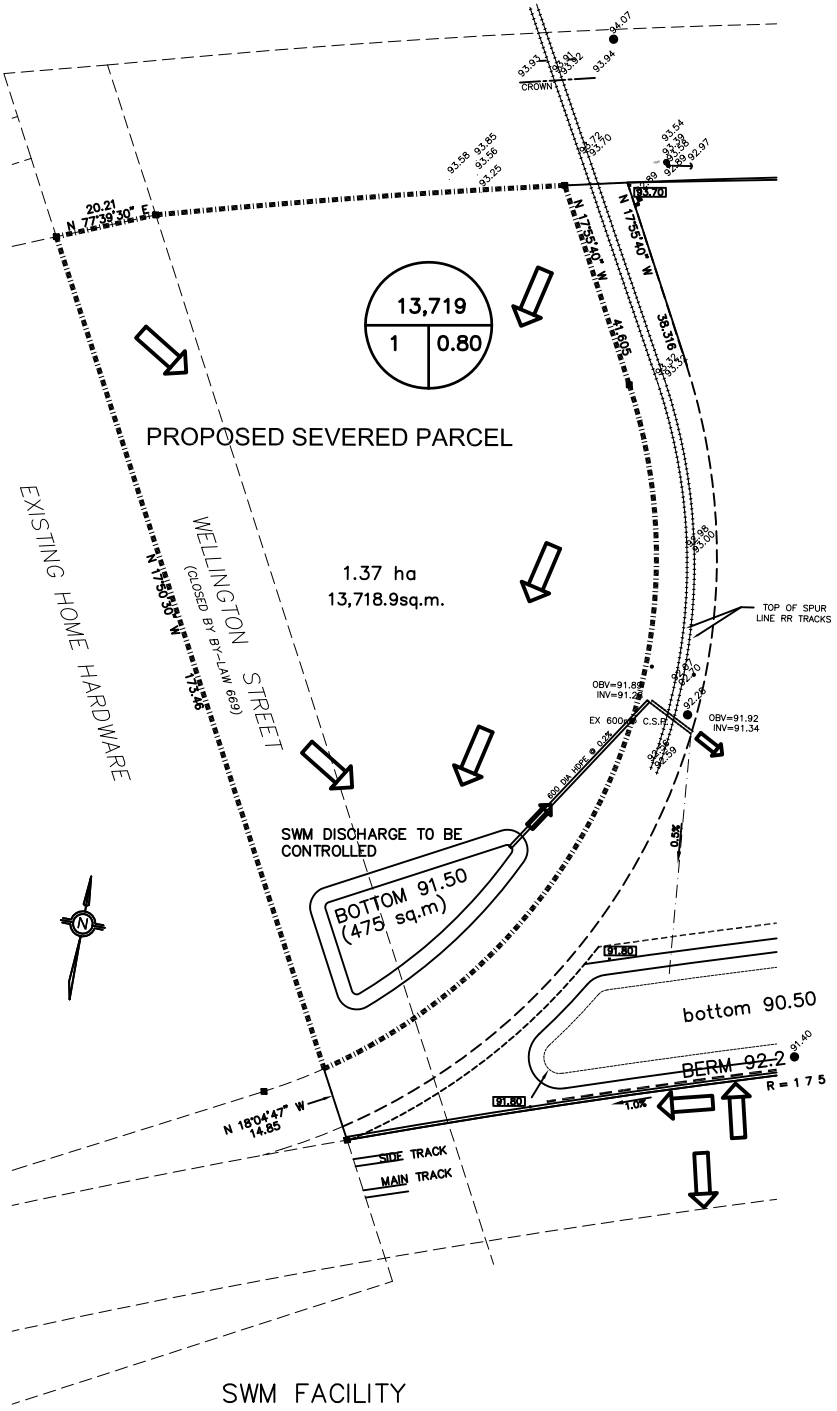
H (Water depth m)	Discharge (cms)	SWM volume provided (cu.m)	SWM Volume required (cu.m)
0.10 (0.4m)	0.018	214	147
0.26 (0.56m)	0.033	314	161
0.70 (1.0m)	0.054	634	353

The proposed preliminary SWM facility will provide the necessary quantity controls.

QUALITY CONTROLS

The site plan will need to address both temporary and permanent quality control. Temporary quality control during construction will typically include the installation of a silt fence along the property lines and any material stockpiles, and the installation of rock check dams or strawbales within any side yard swale. These can be removed once the lot is landscaped and paved.

Permanent quality control may be achieved with the side yard grassed swale and the construction of a grassed filter strip along the south lot development limit. Additional controls such as the installation of a quality control structure may be required if the site development requires the installation of a private storm sewer system. It may also be possible to install an infiltration system. The options will need to be evaluated during site plan approval.



LEGEND

EXTRANEOUS CATCHMENT BOUNDARY

CATCHMENT BOUNDARY

1,072 / 1 | 0.25 — AREA sq.m UNLESS NOTED; CATCHMENT # AND RUNOFF COEFFICIENT

93.29 ELEVATION 1999

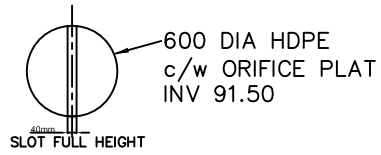
92.82 ELEVATION 2021

PROPOSED LOT LINE

PROPERTY LINES

MAJOR OVERLAND FLOW

DISCHARGE



OUTLET CONTROL
NTS

SWM FACILITY
MAXIMUM RECOMMENDED WATER DEPTH 1.0m
MAXIMUM 3:1 SIDE SLOPES
DISCHARGE TO INDUSTRIAL LOTS CONTROLLED

PRELIMINARY

REV	COMMENT	DATE
2		
1		

DOBRI ENGINEERING LTD.
205 PETER ST. P.O. BOX 441,
PORT HOPE, ONTARIO L1A 3Z3
TEL. 905-885-2881 email - dobrieng@bellnet.ca

KWENDILL HOLDINGS LTD.
PRELIMINARY SWM PLAN
SEVERED PARCEL
TOWN OF COBOURG

SCALE:	1:1500	DATE:	FEB. 18/20	BY:	BD
		DWG. NO.:	20-635-POST (A)		