

**STORMWATER MANAGEMENT BRIEF
HABITAT FOR HUMANITY
22/24 UNIVERSITY AVENUE
TOWN OF COBOURG**

Dobri Engineering Ltd.
PO Box 441
Port Hope, Ontario
L1A 3Z3
Phone No. 905-885-2881
E-mail dobrieng@bellnet.ca

FEBRUARY 28, 2019

INTRODUCTION

Dobri Engineering Ltd. has been retained to prepare the engineering site servicing and grading plan for the proposed building addition and associated site modifications at 22/24 University Avenue. As part of the application, a Stormwater Management Brief has been prepared.

The property covers a total area of 1,381sq.m and is presently occupied by the residential duplex. The driveway is located on the east side of the property and is shared with the neighbour. The proposed site alterations include a building addition, alterations to the front yard, and additional parking in the rear yard. The building addition will add 2 units to the site.

STORMWATER MANAGEMENT

The analysis completed for the surface water runoff is based on the following:

1. Use Yarnell Equation, $I=a/(T+b)$,
where I=rainfall Intensity (mm/hr) and T=time of concentration (minutes)

<i>Return Period</i>	<i>Regression constants</i>	
	<i>a</i>	<i>b</i>
<i>2-yr</i>	<i>1778</i>	<i>13</i>
<i>5-yr</i>	<i>2464</i>	<i>16</i>
<i>10-yr</i>	<i>2819</i>	<i>16</i>
<i>25-yr</i>	<i>3886</i>	<i>18</i>
<i>50-yr</i>	<i>4750</i>	<i>24</i>
<i>100-yr</i>	<i>5588</i>	<i>28</i>

Please note that the catchment is in the Midtown Creek Drainage area, however the storm sewer in the Town of Cobourg is sized using the Yarnell Equation.

2. Rational Method $Q_p = 0.0028CIA$
3. MTO Drainage Manual
4. MOE – Stormwater Management Planning & Design Manual, 2003
5. Low Impact Development Stormwater Planning And Design Guideline prepared by the Credit Valley Conservation Authority and The Toronto and Region Conservation Authority.
6. Runoff Coefficient of 0.25 for open field and landscaped areas (Pre-Development)
7. Runoff Coefficient of 0.90 for paved surface, concrete and building roof
8. Runoff Coefficient of 0.90 for gravel surface, (allowed C=0.60)
9. Geotechnical Investigation Report prepared by GHD, dated December 11, 2018

EXISTING DEVELOPMENT CONDITIONS

The existing site conditions are illustrated on Drawing No. 18-593-Existing. The total site area is 1,318 sq.m. Surface water runoff is via sheet flow with runoff generally towards University Avenue. The low point on the property is at the SW corner of the site. Surface water runoff from the rear yard will also collect in the NW corner of the site, where it naturally discharges into the neighbouring lot prior to being directed south along the west property line.

The Geotechnical Report concluded that the native soil is till with an estimated percolation rate of 5-10 mm/hr. Although the groundwater elevation was not determined, groundwater seepage was encountered at a depth of 0.8m (estimated elevation of 84.7m) at TP-5 which was located near the NW corner of the property.

The peak runoff flows were calculated for the pre-development and post-development conditions for the 2-yr through the 100-yr storm events.

Calculate C, the runoff coefficient for the site under existing conditions.

Surface material	Area (sq.m)	C	A x C
Building	270	0.9	243
Sidewalk	28	0.9	25.2
Grass	922	0.25	230.5
Gravel	161	0.9	144.9
TOTAL	1381		643.6
Weighted C		0.47	

Calculate the peak discharge from the site for the existing conditions. The Time of concentration is 15 minutes (the minimum).

<i>t</i> =	15.0 min	C= 0.466		A= 0.138ha		
Storm event	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
<i>I</i> (mm/hr)=	63.50	79.48	90.94	117.76	121.79	129.95
<i>Q</i> (cms)=	0.011	0.014	0.016	0.021	0.022	0.023

POST DEVELOPMENT CONDITION

Calculate C, the runoff coefficient for the entire site under Post-Development conditions.

Surface material	Area (sq.m)	C	A x C
Building	348	0.9	313
Sidewalk	27	0.9	24
Grass	498	0.25	125
Gravel	508	0.9	457
Total	1381		919
Weighted C		0.67	

Calculate the peak discharge from the site for Post-Development conditions.

$t=$	15.00 min	$C=$	0.67	$A=$	0.138ha	
<i>Storm event</i>	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
$I(mm/hr)=$	63.50	79.48	90.94	117.76	121.79	129.95
$Q(cms)=$	0.016	0.020	0.023	0.030	0.031	0.033

If no stormwater quantity controls are implemented, the re-development will result in a 43% increase in the peak discharge off site.

The site will be graded such that surface water runoff in the rear yard will be directed to an infiltration trench. The trench will include a subdrain which will discharge into the private storm sewer system, and convey storm water to the existing municipal storm sewer system on University Avenue.

The proposed infiltration trench will be 5.4m x 5.4m x 1.2m deep. Using 50mm clear stone (40% void ratio), the infiltration trench will provide 11.7 cu.m of runoff storage (5.4 x 5.4 x 1.0 x 0.4, 1 m is the stone depth below the subdrain). The trench will capture all the runoff in the rear yard during a 25mm rainfall event. This is the majority of rainfall events (80% of rainfall events) occurring in any given year. The depressed area over the infiltration trench will capture approximately an additional 5.8 cu.m (5.4x5.4x0.20=5.8) of runoff. The infiltration trench will capture the runoff from the rear yard during the minor storm event. The net runoff from the rear yard and into the storm sewer or University Avenue will be 0. The discharge offsite during the minor storm event will be runoff from the front yard only.

The site can be further split into 2 drainage areas. The north portion of 722 sq.m directing surface runoff to the infiltration trench, and the south portion of 659 sq.m directing surface runoff into the private storm sewer or onto University Avenue.

NORTH DRAINAGE AREA

Calculate C, the runoff coefficient for the north drainage area under Post-Development conditions.

Surface material	Area (sq.m)	C	A x C
Building	133	0.9	119.7
Sidewalk	11	0.9	9.9
Grass	299	0.25	74.75
Gravel	279	0.9	251.1
Total	722		455.45
Weighted C		0.63	

Calculate the peak discharge from the north drainage area for Post-Development conditions.

<i>t</i> =	15.00 min	<i>C</i> =	0.63	<i>A</i> =	0.172ha	
<i>Storm event</i>	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
<i>I</i> (mm/hr)=	63.50	79.48	90.94	117.76	121.79	129.95
<i>Q</i> (cms)=	0.008	0.010	0.012	0.015	0.016	0.017

The infiltration trench (11.7 cu.m storage capacity) will capture all the runoff during the 5-yr storm event presented (0.010 cms X 15 min X 60 sec = 9.0 cu.m). During the 100-yr storm event, the runoff totals 15.3 cu.m (0.017cms X 15 min X 60 sec = 15.3 cu.m). The infiltration trench will capture 11.7 cu.m, with the remaining 3.6 cu.m discharging into the storm sewer system via the subdrain. The runoff from the rear yard will average 0.004 cms during the 100-yr storm event.

SOUTH DRAINAGE AREA

Calculate C, the runoff coefficient for the south drainage area under Post-Development conditions.

Surface material	Area (sq.m)	<i>C</i>	<i>A x C</i>
Building	215	0.9	193.5
Sidewalk	16	0.9	14.4
Grass	199	0.25	49.75
Gravel	229	0.9	206.1
Total	659		463.75
Weighted C		0.67	

Calculate the peak discharge from the south drainage area for Post-Development conditions.

<i>t</i> =	15.00 min	<i>C</i> =	0.70	<i>A</i> =	0.066ha	
<i>Storm event</i>	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
<i>I</i> (mm/hr)=	63.50	79.48	90.94	117.76	121.79	129.95
<i>Q</i> (cms)=	0.008	0.010	0.012	0.015	0.016	0.017

During the minor storm event, the peak discharge off site either via the storm sewer or surface runoff will be 0.010 cms since all the runoff from the rear yard will be captured by the infiltration trench. The peak discharge off site will be less than the existing peak flow of 0.014cms. During the major storm event, the peak discharge will be 0.021 cms (0.017 + 0.004). This is less than the existing peak flow of 0.023 cms. Stormwater quantity controls will be provided.

STORMWATER QUALITY CONTROLS

Temporary stormwater quality control will be provided by installing a silt fence along the west property plan as noted on the plan and by placing filter fabric c/w clear stone over the grate on the front yard catchbasin/manhole. Permanent stormwater quality control in the rear yard will be provided by the grassed yard and infiltration trench, and in the front yard via the grassed/landscaped area around the catchbasin/manhole.

Prepared by: Bruno Dobri, P. Eng.

Dobri Engineering Ltd.
205 Peter Street
PO Box 441
Port Hope, Ontario
L1A 3Z3



LEGEND

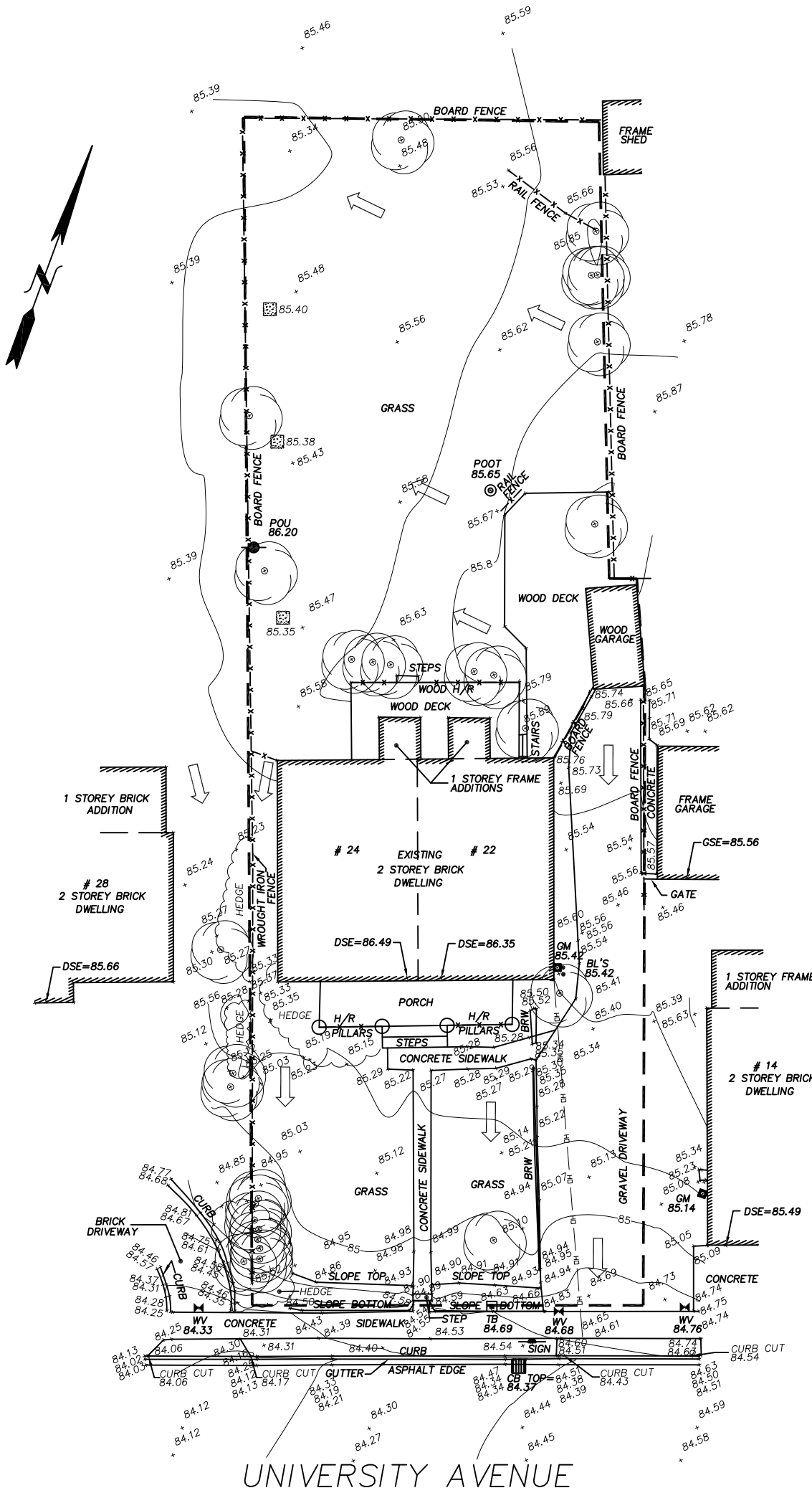
- DSE DENOTES DOOR SILL ELEVATION
- GSE DENOTES GARAGE SILL ELEVATION
- GM DENOTES GAS METER
- WV DENOTES WATER VALVE/KEY
- BL DENOTES BOLLARD
- POU DENOTES UTILITY POLE
- OH- DENOTES OVERHEAD UTILITY WIRES
- CB DENOTES CATCH BASIN ELEVATION AT TOP CENTRE
- TB DENOTES TERMINAL BOX
- SIGN DENOTES SIGN
- DENOTES DECIDUOUS TREE W/TRUNK DIAMETER
- ⋆ DENOTES SPOT ELEVATION
- DENOTES SHRUB
- H/R DENOTES HANDRAIL
- BRW DENOTES BRICK RETAINING WALL
- — — PROPERTY LINE
- ➔ DIRECTION OF OVERLAND FLOW

BOUNDARY NOTE;
BOUNDARY INFORMATION SHOWN HEREON IS IN ACCORDANCE WITH PLAN OF SURVEY BY IVAN B. WALLACE O.L.S. LTD.,

CONTOURS
CONTOURS SHOWN HEREON ARE DRAWN AT 0.20 METRE INTERVALS.


ELEVATIONS
ELEVATIONS ARE GEODETIC AND REFERRED TO TOWN OF COBourg BENCHMARK 5 AND HAVING A GEODETIC ELEVATION OF 85.331 METRES.

DISTANCE NOTES – METRIC
DISTANCES ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.
DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 1.000227.



SURFACE AREA SUMMARY

BUILDING	270sq.m
GRAVEL	161sq.m
CONCRETE	28sq.m
LANDSCAPING	922sq.m
TOTAL	1,381sq.m

	DOBRI ENGINEERING LTD.		
	205 PETER ST. P.O. BOX 441, PORT HOPE, ONTARIO L1A 3Z3 TEL. 905-885-2881 email - dobrieng@bellnet.ca		
HABITAT FOR HUMANITY EXISTING CONDITIONS PLAN 22 & 24 UNIVERSITY AVENUE TOWN OF COBourg			
SCALE: 1:300	DATE: FEB. 28/19	BY: BD	
DWG. NO.: 18-593-EXISTING			

LEGEND

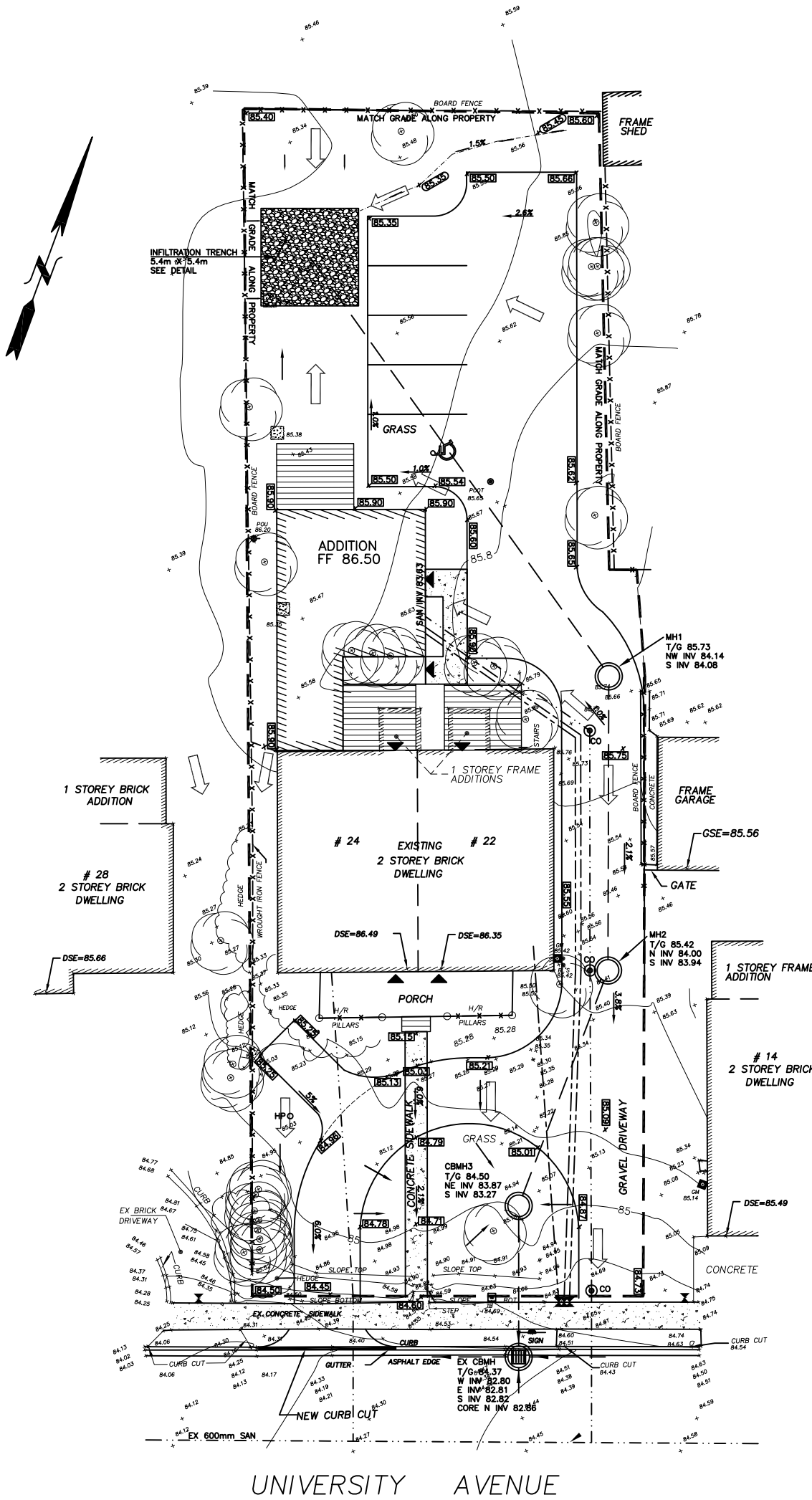
- DSE DENOTES DOOR SILL ELEVATION
- GSE DENOTES GARAGE SILL ELEVATION
- GM DENOTES GAS METER
- WV DENOTES WATER VALVE/KEY
- BL DENOTES BOLLARD
- POU DENOTES UTILITY POLE
- OH- DENOTES OVERHEAD UTILITY WIRES
- CB DENOTES CATCH BASIN ELEVATION AT TOP CENTRE
- TB DENOTES TERMINAL BOX
- SIGN DENOTES SIGN
- DENOTES DECIDUOUS TREE W/TRUNK DIAMETER
- ⊙ DENOTES SPOT ELEVATION
- ⊞ DENOTES SHRUB
- H/R DENOTES HANDRAIL
- BRW DENOTES BRICK RETAINING WALL
- — — PROPERTY LINE
- ➔ DIRECTION OF OVERLAND FLOW

BOUNDARY NOTE;
BOUNDARY INFORMATION SHOWN HEREON IS IN ACCORDANCE WITH PLAN OF SURVEY BY IVAN B. WALLACE O.L.S. LTD.,

CONTOURS
CONTOURS SHOWN HEREON ARE DRAWN AT 0.20 METRE INTERVALS.

ELEVATIONS
ELEVATIONS ARE GEODETIC AND REFERRED TO TOWN OF COBOURG BENCHMARK 5 AND HAVING A GEODETIC ELEVATION OF 85.331 METRES.

DISTANCE NOTES – METRIC
DISTANCES ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.
DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 1.000227.



UNIVERSITY AVENUE

**SURFACE AREA SUMMARY
DRAINAGE TO INFILTRATION**

BUILDING	133sq.m
GRAVEL/PAVED	279sq.m
CONCRETE	11sq.m
LANDSCAPING	299sq.m
TOTAL	722sq.m

**SURFACE AREA SUMMARY
DRAINAGE SOUTH**

BUILDING	215sq.m
GRAVEL/PAVED	229sq.m
CONCRETE	16sq.m
LANDSCAPING	199sq.m
TOTAL	659sq.m

	DOBRI ENGINEERING LTD.		
	205 PETER ST. P.O. BOX 441, PORT HOPE, ONTARIO L1A 3Z3 TEL. 905-885-2881 email - dobrieng@bellnet.ca		
HABITAT FOR HUMANITY POST DEVELOPMENT PLAN 22 & 24 UNIVERSITY AVENUE TOWN OF COBOURG			
SCALE: 1:300	DATE: FEB. 28/19	BY: BD	
DWG. NO.: 18-593-POST			