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CONSULTING ENGINEERS • INGENIEURS CONSEILS

GAËTAN H. LASCELLES ING. P.ENG.
MANON C. RODRIGUE ING. P.ENG.

L04-120
March 11, 2005

South Nation Conservation
15 Union Street
Berwick, Ontario K0C 1G0

By Fax: (613) 984-2872
Attention: Sandra Mancini

Dear Ms. Mancini:

Re: Stormwater Management Study
Robert Lafrance Subdivision, St-Eugène
Part of Lot 13, Concession 4, Township of East Hawkesbury

Enclosed please find the site grading and drainage plan and the Stormwater Management Study for the Robert Lafrance Subdivision located on Part of Lot 13, concession 4 in the Township of East Hawkesbury.

The Stormwater Management Study shows that the proposed development of the site with grassed swale results in post-development flows increase of up to 4.8 L/sec for the time of concnetration of 20 minutes or an equivalent of 5700 litres for storms up to the 100-year event. The additional flow of 4.8 L/sec (0.0048 m^3/sec) for the 100 year storm is equivalent to 0.8% of the flow measured on that day in the creek which can accommodate the minimal additional flow. It is recommended that the proposed development be carried out in accordance with the site grading plan with proposed drainage directed away from buildings and towards swale at the rear of the lots and the existing ditches along County Road 14 with the use of sediment and erosion control measures in accordance with best management practices as listed above.

We trust the enclosed is to your satisfaction and we remain,

Yours truly,
L'ingénierie
LASCELLES
engineering limited

per: MRodrigue
Manon C. Rodrigue, P.Eng.
encl.
cc: Robert Lafrance
Louis Prévost, UCPR

870 JAMES ST., HAWKESBURY, ONTARIO K6A 2W8 Tel.: (613) 632-0241 Fax: (613) 632-1669 e-mail: lascelles@bellnet.ca

Stormwater Management Study.

The site is located on the west side of County Road 14 in St-Eugene. County Road 14 is a paved road with gravel shoulders and drainage ditches. There is a 0.46 C.S.P. culvert at entrance to lot 6. The site is located on part of lot 13, Concession 4 in the township of East Hawkesbury, being part 3 of plan 46R-5423. The house at the site is located at civic number 4700 County Road no.14 and the total site frontage is 361.79 m and the depth is 76.215 m a total area of 2.75 ha. The site is relatively flat. The proposed lots 1 to 4 have areas of 4594 m^2 while lot 5 has an area of 4595 m^2 and the retained lot 6 has an area of 4538 m^2. Drainage is overland towards a ditch along County Road 14. There is a house with detached garage located on lot 6, civic number 4700 and gravel driveway. Surrounding land use are residential and agricultural. The site is located across from a strip development. According to the test pits dug on site and to the soil map of Prescott County the soil at the site is a sandy loam over clay described as Uplands fine sandy loam described as reddish brown, loose sandy soils with sorted non-calcareous fine sand parent material with a hydrologic soil group A.

The stormwater management study was prepared using the Rational Method for a 5-year and 10-year storm with the following runoff coefficients for the site.

Rational Method:

$Q = 2.78\ CIA$

Runoff Coefficients: (C)

Roof	0.9
Gravel	0.5
Pasture	0.15
Lawns	0.10

For a 25-year return storm, the runoff coefficients are increased by 10%.
For a 50-year return storm, the runoff coefficients are increased by 20%
For a 100-year return storm, the runoff coefficients are increased by 25%

The time of concentration was calculated using the Airport formula for a drainage coefficient of less than 0.4. The airport formula is:

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

and $$S = \frac{100\ (\Delta h - h_f)}{0.75\ L - L_f}\ \%$$

Thus $$S = \frac{100\ (58.4 - 56.3)}{0.75 \times 200} = 1.4\ \%$$

and

$$T = \frac{\underline{3.26\,(1.1 - 0.15)\,200^{0.5}}}{1.4^{0.33}} = 18.33 \text{ minutes}, \quad \text{Say 20 minutes}$$

The rainstorm intensity was obtained from an intensity-duration-frequency table for the Ottawa Airport. The following intensity were used for the study for a time of concentration of 20 minutes.

5-year return period storm: rainfall intensity is 68.0 mm/hr
10-year return period storm: rainfall intensity is 79.0 mm/hr
25-year return period storm: rainfall intensity is 92.1 mm/hr
50-year return period storm: rainfall intensity is 101.8 mm/hr
100-year return period storm: rainfall intensity is 111.6 mm/hr

The area for the pre-development is the totality of the site which drained towards the front yard ditch and towards the rear of the site.

Pre-development Runoff:

The pre-development runoff is directed towards the ditch at the street (Area 1), towards the ditch offsite at the rear (Area 2 and 3).
Area 1 coefficient C = (0.025 x 0.5 + 0.2008 x 0.10 + 0.4265 x 0.15)/ 0.6523 = 0.148

Area 1:

Flow	Volume
Q pre 5-year = 2.78 x 68 x 0.148 x 0.6523 = 18.2 L/sec	18.2 L/sec x 20 min=21.8m^3
Q pre 10-year = 2.78 x 79 x 0.148 x 0.6523= 21.2 L/sec	21.2 L/sec x 20 min=25.4m^3
Q pre 25-year = 2.78 x 92.1 x 0.148 x 1.1 x 0.6523 = 27.2 L/sec	27.2 L/sec x 20 min=32.6m^3
Q pre 50-year = 2.78 x 101.8 x 0.148 x 1.2 x 0.6523 = 32.8 L/sec	32.8 L/sec x 20 min=39.4m^3
Q pre 100-year = 2.78 x 111.6 x 0.148 x1.25 x 0.6523= 37.4 L/sec	37.4 L/sec x 20 min=44.9m^3

Area 2 & 3 coefficient C= (0.0240 x 0.9 + 0.2040 x 0.1 + 1.8706 x 0.15)/ 2.0986= 0.154
Area 2 & 3:

Flow	Volume
Q pre 5-year = 2.78 x 68 x 0.154 x 2.0986 = 61.1 L/sec	61.1 L/sec x 20 min=73.3m^3
Q pre 10-year = 2.78 x 79 x 0.154 x 2.0986= 71.0 L/sec	71.0 L/sec x 20 min=85.2m^3
Q pre 25-year = 2.78 x 92.1 x 0.154 x 1.1 x 2.0986= 91.0L/sec	91.0 L/sec x 20 min=109.2m^3
Q pre 50-year = 2.78 x 101.8 x 0.154 x 1.2 x 2.0986=109.8 L/sec	109.8 L/sec x 20 min=131.8m^3
Q pre 100-year= 2.78 x 111.6 x 0.154 x1.25 x 2.0986= 125.3 L/sec	125.3L/sec x 20 min=150.4m^3

Total offsite is as follows

Q pre 5-year = 18.2L/sec + 61.1 L/sec = 79.3 Lsec	21.8m^3 + 73.3m^3= 95.1m^3
Q pre 10-year =21.2L/sec + 71.0 L/sec = 92.2 Lsec	25.4m^3 + 85.2m^3= 110.6m^3
Q pre 25-year = 27.2L/sec + 91.0 L/sec = 118.2 Lsec	32.6m^3 + 109.2m^3= 141.8m^3
Q pre 50-year = 32.8L/sec + 109.8 L/sec = 142.6 Lsec	39.4m^3 + 131.8m^3= 171.2m^3
Q pre 100-year = 37.4L/sec + 125.3 L/sec = 162.7 Lsec	44.9m^3 + 150.4m^3= 195.3m^3

The proposed site conditions are as follows:
With proposed development and grading and drainage with ditch at back of lots the time of concentration for the developed conditions becomes:

$$S = \frac{100\,(57.2 - 55.6)}{0.75 \times 150} = 1.4\,\%$$

and

$$T = \frac{3.26\,(1.1 - 0.15)\,200^{0.5}}{1.4^{0.33}} = 18.33 \text{ minutes}, \quad \text{Say 20 minutes}$$

Total of five new developed suburban residential site and one existing residential lot.
Roof Area = 0.0240 ha per lot
Grass Area = 0.4194 ha per lot, lot 5 has 0.4195 ha, lot 6 has 0.4048 ha
Gravel Area = 0.0160 ha per lot, lot 6 has 0.025 ha
Therefore equivalent C= (6 x 0.0240 x 0.9 + (4 x 0.4194 + 0.4195 + 0.4048) x 0.1
+ (5 x 0.016 + 0.025) x 0.5)/ 2.7509 = 0.157

Flow	Volume
Q post 5-year = 2.78 x 68 x 0.157 x 2.7509 = 81.6 L/sec	81.6 L/sec x 20 min=97.9m^3
Q post 10-year = 2.78 x 79 x 0.157 x 2.7509= 94.9 L/sec	94.9 L/sec x 20 min=113.9m^3
Q post 25-year = 2.78 x 92.1 x 0.157 x1.1 x 2.7509 =121.6 L/sec	121.6L/sec x 20 min=145.9m^3
Q post 50-year = 2.78 x 101.8 x 0.157 x1.2 x 2.7509 =146.7L/sec	146.7L/sec x 20 min=176.0m^3
Q post 100-year=2.78 x111.6 x0.157 x1.25 x 2.7509= 167.5L/sec	167.5L/sec x 20 min=201.0m^3

Therefore the difference between the pre and post development for the different return period are as follows:

Flow	Volume
5- year = 81.6 L/sec- 79.3 L/sec = 2.3 L/sec	97.9 m^3 - 95.1 m^3 = 2.8 m^3
10-year= 94.9 L/sec - 92.2 L/sec = 2.7 L/sec	113.9 m^3- 110.6 m^3 = 3.3 m^3
25-year = 121.6 L/sec -118.2 L/sec = 3.4 L/sec	145.9 m^3- 141.8 m^3 = 4.1 m^3
50-year = 146.7 L/sec - 142.6 L/sec = 4.1 L/sec	176.0 m^3- 171.2 m^3 = 4.8 m^3
100-year = 167.5 L/sec - 162.7 L/sec = 4.8 L/sec	201.0 m^3- 195.3 m^3 = 5.7 m^3

The proposed lot grading with shallow ditch at the rear and drainage directed away from house and towards the rear and front of the house results in a volume of 5700 litres above the pre-development runoff volumes for the 100 year storm. This increase in volume is directed towards the creek at the north of the site. The creek crosses county road 14 through a 16 feet wide concrete box culvert. At the time of soil testing the flow rate was calculated at 0.6 m^3/sec at the culvert. The additional flow of 4.8 L/sec (0.0048 m^3/sec) for the 100 year storm is equivalent to 0.8% of the flow measured on that day. The creek can accommodate the additional flow.

Sediment and Erosion Control Measures

The following best management practices shall be implemented at various stages of construction.

Prior to construction
1) Install sediment retention control measures such as silt fence and / or straw bales between the work areas and any drainage ditch or surface water drainage areas. Perform regular maintenance of drainage ditches during construction.
During construction
1) Equipment maintenance shall be performed at the entrance to the site. No refuelling to take place within 5 metres from a watercourse or drainage ditch. Equipment cannot be cleaned in the watercourse. Excess fuels, lubricants, pesticides and other supplies to be removed from the site and disposed of in an approved manner.
2) Minimise the spread of the work area and the duration of the construction.
3) Surplus material must adequately be deposited at pre-approved sites.
4) Perform regular maintenance of drainage ditches during construction.
5) Upon completion of work, all accumulated sediment, debris and work related material shall be removed and properly disposed of.
6) Site grading for each lot to be sloped in order to shed water away from the foundation.

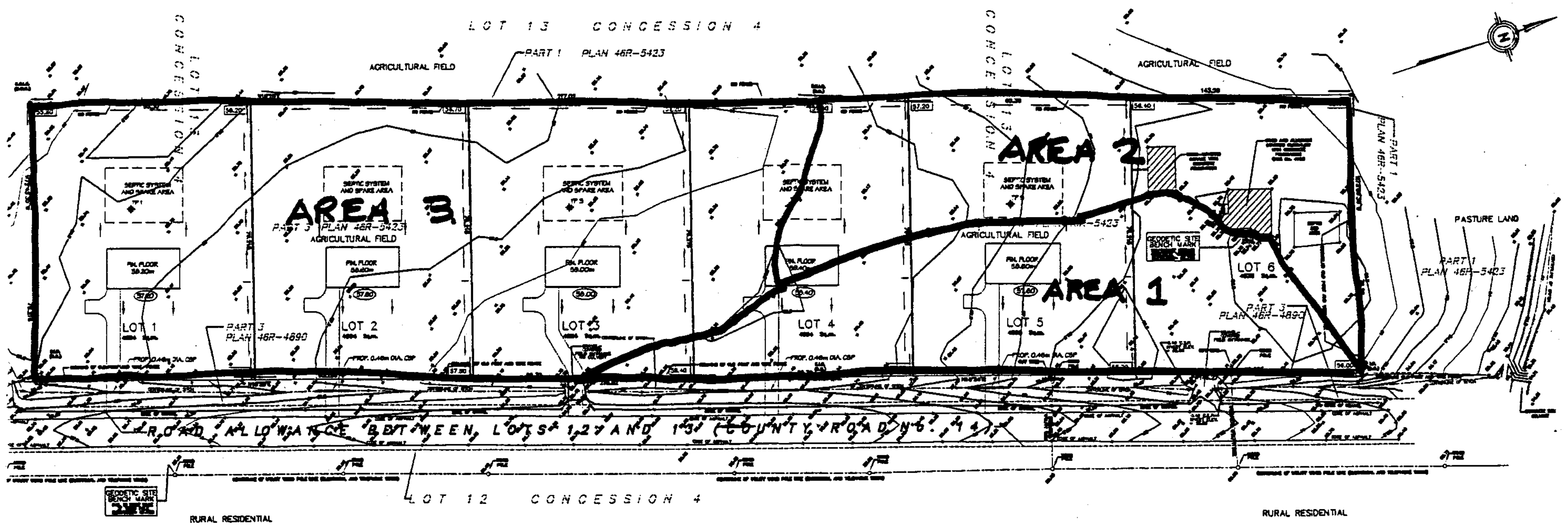
It is recommended that the proposed development be carried out in accordance with the site grading plan with proposed drainage directed away from buildings and towards swale at the rear of the lots and the existing ditches along County Road 14 with the use of sediment and erosion control measures in accordance with best management practices as listed above. We trust the above is to your satisfaction and we remain,

Yours truly,

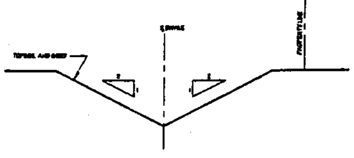
L'ingénierie
LASCELLES
engineering limited

per: MRodrigue
Manon C. Rodrigue, P.Eng.

LICENSED PROFESSIONAL ENGINEER
M.C.M. RODRIGUE
Nov 05
PROVINCE OF ONTARIO



PLAN 1:500



TYPICAL DITCH CROSS-SECTION "A-A"

NOTES:

EROSION AND SEDIMENT CONTROL MEASURES.

1. PRIOR TO THE START OF CONSTRUCTION, PRIOR TO THE REMOVAL OF ANY VEGETATIVE COVER, MOVING OF SOIL AND CONSTRUCTION:
   - -INSTALL STAKED HAY BALE FENCE OR SILT FENCE ALONG DITCHES IMMEDIATELY DOWNSTREAM FROM AREAS TO BE DISTURBED.
   - -INSPECT MEASURES IMMEDIATELY AFTER INSTALLATION.
2. DURING CONSTRUCTION:
   - -MINIMIZE THE EXTENT OF DISTURBED AREAS AND THE DURATION OF EXPOSURE.
   - -PROTECT DISTURBED AREAS FROM RUNOFF.
   - -PROVIDE TEMPORARY COVER SUCH AS SEEDING OR MULCHING IF DISTURBED AREA WILL NOT BE REHABILITATED SHORTLY.
   - -INSPECT STAKED HAY BALE FENCES, SILT FENCES REGULARLY AND AFTER EVERY MAJOR STORM EVENT AND CLEAN AND REPAIR WHEN NECESSARY.
   - -CONSTRUCT SWALES AND SUBDRAIN AS PER DETAILS ON THIS PLAN.
3. AFTER CONSTRUCTION:
   - -PROVIDE PERMANENT COVER CONSISTING OF TOPSOIL AND SEED TO DISTURBED AREAS.
   - -REMOVE STAKED HAY BALE FENCES, SILT FENCES AFTER DISTURBED AREAS HAVE BEEN REHABILITATED AND STABILIZED.

LEGEND

———	EXISTING ROAD
———	PROPOSED ENTRANCE
- - -	EDGE OF GRAVEL
▭	PROPOSED GROUND ELEVATION
→	PROPOSED DRAINAGE FLOW PATH
⬭	PROP. GROUND ELEV. AROUND BLDG
→	SURFACE WATER RUN-OFF

DRAINAGE AREAS
PRE-DEVELOPMENT

No.	REVISIONS	DATE

ROBERT LAFRANCE

LOT GRADING PLAN

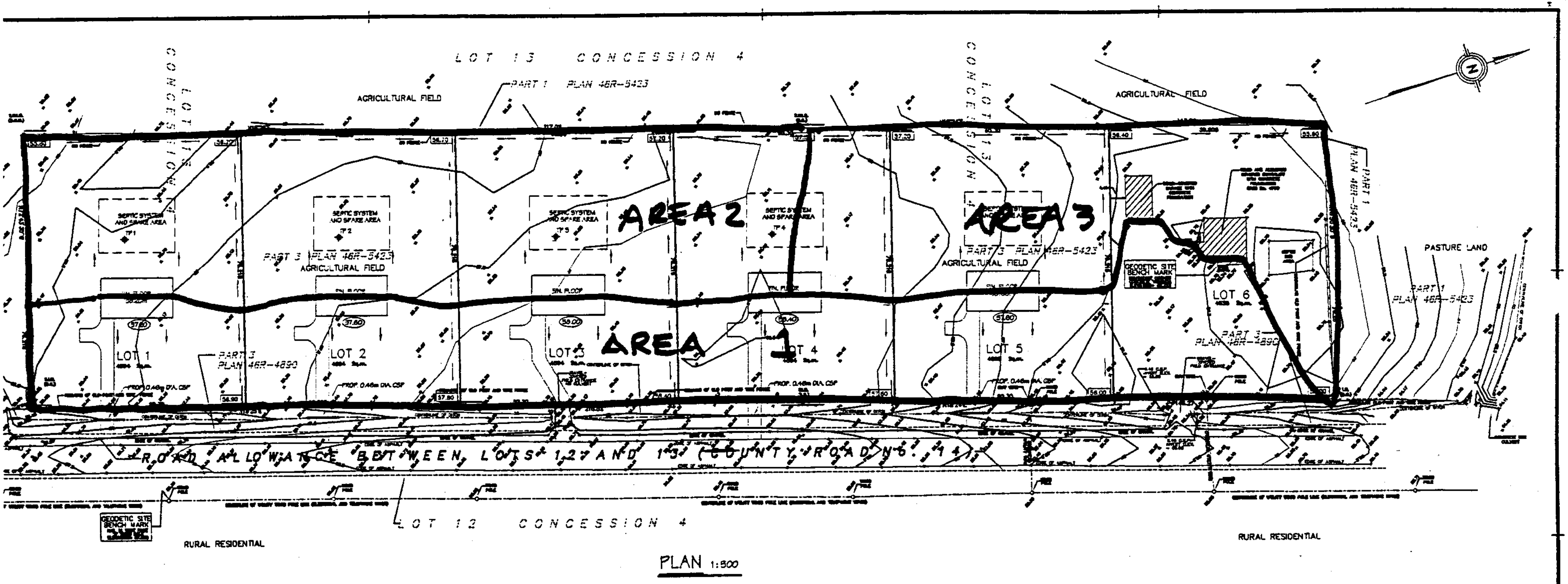
PROPOSED SUBDIVISION
COUNTY ROAD No.14
ST-EUGÈNE, ONTARIO

LASCELLES ENGINEERING LIMITED

L807

DESIGN:	M.C.R.	DRAWN:	G.E.L.
DATE:	MARCH, 2005	CHECKED:	M.C.R.

L04-120



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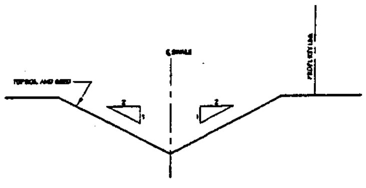

TYPICAL DITCH CROSS-SECTION 'A-A'

NOTES:

EROSION AND SEDIMENT CONTROL MEASURES.

1. PRIOR TO THE START OF CONSTRUCTION, PRIOR TO THE REMOVAL OF ANY VEGETATIVE COVER, MOVING OF SOIL AND CONSTRUCTION:
   - -INSTALL STAKED HAY BALE FENCE OR SILT FENCE ALONG DITCHES IMMEDIATELY DOWNSTREAM FROM AREAS TO BE DISTURBED.
   - -INSPECT MEASURES IMMEDIATELY AFTER INSTALLATION.

2. DURING CONSTRUCTION:
   - -MINIMIZE THE EXTENT OF DISTURBED AREAS AND THE DURATION OF EXPOSURE.
   - -PROTECT DISTURBED AREAS FROM RUNOFF.
   - -PROVIDE TEMPORARY COVER SUCH AS SEEDING OR MULCHING IF DISTURBED AREA WILL NOT BE REHABILITATED SHORTLY.
   - -INSPECT STAKED HAY BALE FENCES, SILT FENCES REGULARLY AND AFTER EVERY MAJOR STORM EVENT AND CLEAN AND REPAIR WHEN NECESSARY.
   - -CONSTRUCT SWALES AND SUBDRAIN AS PER DETAILS ON THIS PLAN.

3. AFTER CONSTRUCTION:
   - -PROVIDE PERMANENT COVER CONSISTING OF TOPSOIL AND SEED TO DISTURBED AREAS.
   - -REMOVE STAKED HAY BALE FENCES, SILT FENCES AFTER DISTURBED AREAS HAVE BEEN REHABILITATED AND STABILIZED.

LEGEND

———	EXISTING ROAD
- - - - - - -	PROPOSED ENTRANCE
— — —	EDGE OF GRAVEL
46.50	PROPOSED GROUND ELEVATION
——	PROPOSED DRAINAGE FLOW PATH
(47.35)	PROF. GROUND ELEV. AROUND BLDG
━━	SURFACE WATER RUN-OFF

No.	REVISIONS	DATE	BY-PAR

ROBERT LAFRANCE

NOT AUTHENTIC UNLESS SIGNED AND DATED
PAS AUTHENTIQUE SI NON SIGNÉ ET DATÉ

LOT GRADING PLAN

PROPOSED SUBDIVISION
COUNTY ROAD No.14
ST-EUGÈNE, ONTARIO

DRAINAGE AREAS
POST·DEVELOPMENT

L'INGÉNIERIE LASCELLES ENGINEERING LIMITED

DRAWING No.
No. DE DESSIN
L807

Prescott Russell

Canton de Township of

EAST HAWKESBURY EST

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Kilomètres - Kilometres

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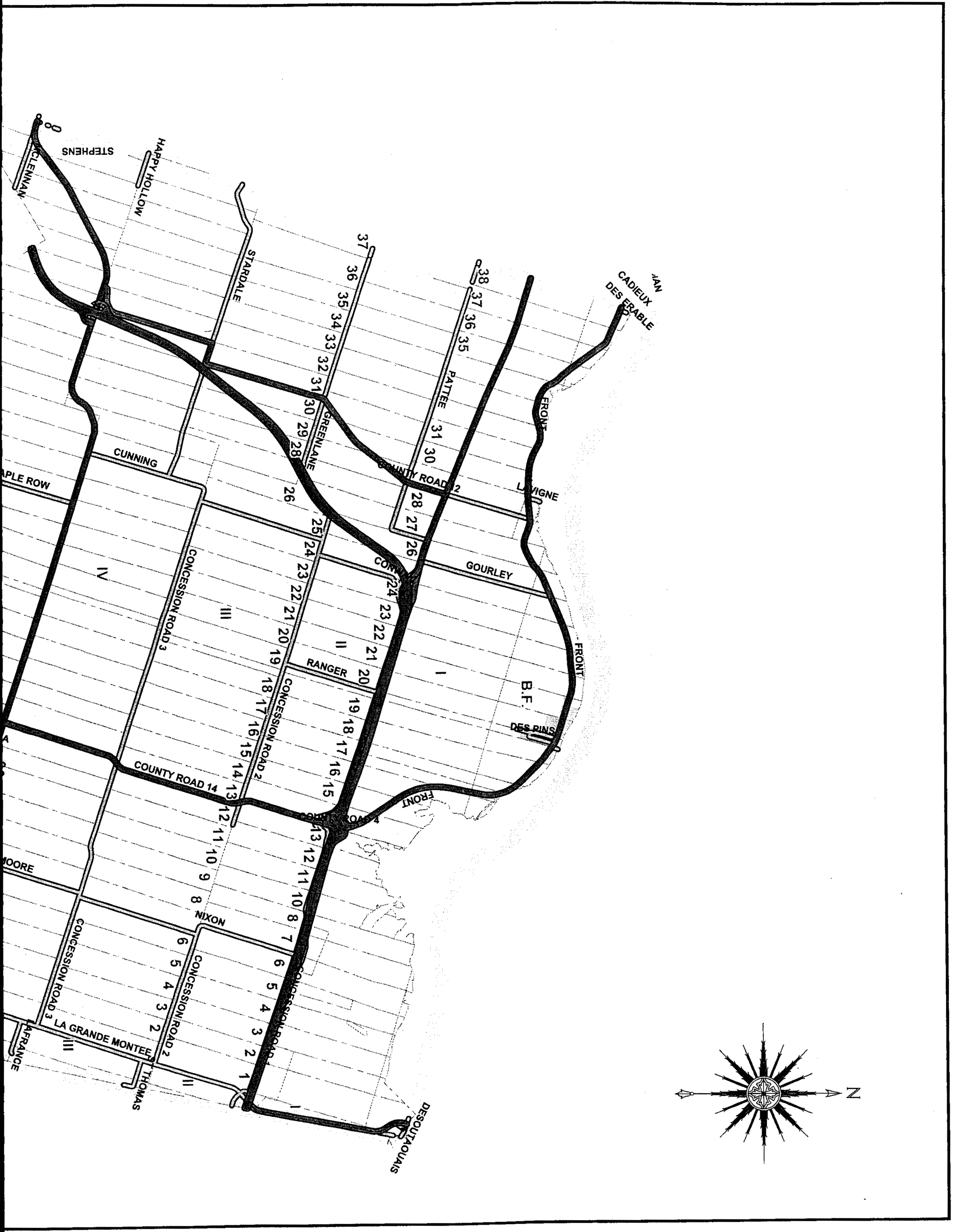
STEPHENS
CLENNAN
HAPPY HOLLOW
STARDALE
GREENLANE
PATTEE
CADIEUX
DES ERABLE
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FRONT
CUNNING
APLE ROW
COUNTY ROAD 12
LAVIGNE
GOURLEY
CONCESSION ROAD 3
CONCESSION ROAD 2
CONCESSION ROAD 1
RANGER
B.F.
DES PINS
COUNTY ROAD 14
COUNTY ROAD 4
MOORE
NIXON
LA GRANDE MONTEE
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