SUN RETREATS SANDBANKS

37-38 LAKE AVENUE LANE, CHERRY VALLEY, ONTARIO, PRINCE EDWARD COUNTY

STORMWATER MANAGEMENT BRIEF: DRAINAGE SYSTEM ADJACENT TO NEIGHBOURING PROPERTIES

Prepared for:
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June 2024
File No. D2429

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APPENDICES

1 INTRODUCTION

This stormwater management brief has been prepared by Gunnell Engineering Ltd. to support the Site Plan Application and address any current and potential drainage issues at 37-38 Lake Avenue Lane, Cherry Valley, Ontario, in the vicinity of the four (4) neighbouring properties (59, 61, 67/73, 77 Lake Avenue Lane) at Sun Retreats Sandbanks. The proposed solution to managing stormwater runoff will include the construction and implementation of grass swales, storm grates with sumps, storm pipes as well as an earthen road-side berm to prevent ponding of stormwater through means of infiltration and redirection of overland flow away from neighbouring properties and towards East Lake via the Sun Retreats Sandbanks property.

2 WATER BALANCE

The rational method (Q = CIA) was used to calculate runoff volumes. These calculations were completed in order to determine the size and appropriate strategies to mitigate stormwater runoff.

The average surface runoff coefficient of 0.3847 was determined by taking the mean of the calculated runoff coefficients for the total drainage basin area (refer to drawing SPCA-4, and the highlighted blue coloured area) as well as areas broken down into road area, trailer area, drive way and grassed areas (Appendix C).

With an infiltration rate of 0.065 m/hr, based on “Short Duration Rainfall Intensity-Duration-Frequency Data” dated October 31, 2022 for nearby Belleville, Ontario (Appendix D), and a drainage area of 5,630 m² the maximum rate of runoff (Q) for a 10-year storm, was calculated to be approximately 140.8 m³/hr.

$$Q = CIA = 0.3847 \times 0.065 \text{ m/hr} \times 5{,}630 \text{ m}^2 = 140.78 \text{ m}^3/\text{hr}.$$

3 MITIGATION PLAN AND LOW IMPACT DESIGN

Drawings SPCA-4 and SPCA-6 (Appendix A), included in this report detail information on the proposed low impact development (LID) for stormwater infrastructure that will decrease and manage stormwater runoff rates and mitigate current drainage issues reported at two of the neighbouring properties.

Grassed Swales

A total of three (3) grassed swales (0.20 m deep with slopes varying between 0.5 to 1.5%) are to be constructed between Lake Avenue Lane and the adjacent neighbouring property boundary, as detailed on drawing SPCA-4. The swales have been designed to have a trapezoidal shape (with a very low "b" value, making them essentially triangular). The volume of flow in the channels have been calculated to carry a maximum flow of 121.4 L/s, however, the proposed flow rate is 39.1 L/s (Appendix B). The proposed flow from the swales will drain into five (5) storm grates with sumps connected to 250 mm smooth walled PVC storm pipes.

Storm Grates & Piping

Five (5) storm grates are to be constructed allowing water from the swales to discharge into the PVC storm piping. Grates detailed on Drawing SPCA-6 will have a sump to collect and separate any sediment that may be present within the flow. Storm piping to be installed are 250 mm PVC smooth walled pipes with slopes ranging from 0.5% to 1.5%. At a minimum of 0.5%, the carrying capacity is 43.9 L/s. The water within the storm pipes will be carried to the central southwestern part of the property where it will daylight and be diffused through a grassed and/or vegetated portion of the Sun Retreats Sandbanks property which will ultimately flow into East Lake. The outfall construction will consist of rip-rap and filter cloth as well as rodent proof screening.

Earthen Berm

Above the portion of PVC storm pipe travelling north towards the Lake in which the discharge is to be released, a proposed 200 mm (8") high road-side earthen berm is to be constructed adjacent to south-west property boundary of 59 Lake Avenue Lane. This berm will aid as a prevention barrier for overland flow, including the discharged stormwater, from reaching 59 Lake Avenue Lane. Any surface water flowing towards this neighbouring property will reach the berm and either infiltrate into the soils and/or be redirected from the berm.

4 EROSION AND SEDIMENT CONTROL

Sediment and erosion controls include the storm grates that separate larger objects from flowing through grates into the PVC storm pipes, the sump below the grates that separate other undesirable oils and heavier sediments, as well as a filter clothe and riprap at the discharge point

from the PVC pipes to prevent sediment buildup or clogging and allowing the discharged flow to infiltrate and diffuse into grassed or vegetated portion on the Sun Retreats Sandbanks property. A rodent proof barrier will also be constructed to prevent any potential rodent damage and ensure the quality and quantity of stormwater being discharge is maintained per the intended design.

5 CONCLUSION

The proposed stormwater management and LID strategies as described in this brief are consistent with current best management practices, provide a solution to the reported drainage issues affecting neighbouring Lake Avenue Lane properties and will ensure that the proposed development will not have a negative impact on the Site, East Lake as well as any of the neighbouring properties.

Brock Cross, Dipl. ET

Senior Project Manager

Dominic Bauer, P.Eng

Appendix A: Gunnell Engineering Drawings SPCA-4 and SPCA-6, Revision #4, Dated June 27, 2024

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LEGEND

- Existing Contour Interval
- Existing Spot Elevation
- Proposed Contour Interval 0.2m
- Proposed Contour Label
- Surface Water Flow Direction
- Drainage Area

Rev. No.	Date	Description	CAD
Rev. 1	11-FEB-2022	Storm drainage updates from review comments	JR
Rev. 2	30-AUG-2023	Revised Right of Way	JR
Rev. 3	30-OCT-2023	Revised Right of Way (Cottages)	JR
Rev. 4	17-JUN-2024	Revised Right of Way (Cottages)	JR

Engineer's Stamp:

LICENCED PROFESSIONAL ENGINEER
Jul. 15, 2024
D. T. BAUER
100226854
PROVINCE OF ONTARIO

Sun Retreats Sandbanks
37 - 38 Lake Avenue Lane
Cherry Valley, Prince Edward County

Proposed Grading Plan

Scale: 1:750	Designed By: EG
Date: 21-JUN-2021	Drawn By: JR
Project No.:	Checked By: BC
D2429	Drawing No.: **SPCA-4**


CHAIN LINK FENCING
N.T.S.
TYP. TOP RAIL CONNECTION AS SHOWN-6.1m [20'] o.c.
9 GA. TIE WIRE-350mm [14"] o.c.
TOP RAIL 1-5/8" GALV.
RAIL END
POST CAP
POST BAND
9 GA. TIE WIRE-610mm [24"] o.c.
DRAW BAR 1/4"x 3/4"
3/8" TRUSS ROD @ ALL CORNERS, INTERSECTIONS
7 GA. BOTTOM TENSION WIRE
TERMINAL POST 2 1/2" o.d. GALV. PIPE (SAME NOTE AS TRUSS ROD)
FINISH GRADE
TYP. LINE POST 50mm [2"] o.d. GALV. PIPE
NOTE:
ALL WIRE FABRIC AND FENCE HARDWARE SHALL BE GALVANIZED.
FABRIC SHALL BE INSTALLED ON THE OUTSIDE.
3500 psi CONCRETE
TYPICAL LINE POST FOOTING
TYPICAL CORNER POST FOOTING
Note:
Typical chain link fence detail for illustration purpose only.
REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS for final construction.
CHAIN LINK GATE FENCING
N.T.S.
GATE POST 2 1/2" o.d. GALV. PIPE
GATE 1-5/8"o.d. PIPE GALV. WELDED FRAME
LATCHES WITH LOCKING CAPABILITY
TOP RAIL 1-5/8" GALV.
9 GA. TIE WIRE-610mm [24"] o.c.
DRAW BAR 1/4"x 3/4"
2"x2"x9 GA. FABRIC KNUCKLED TOP & BOTTOM
GATE HINGE
9 GA. TIE-WIRE TOP & BOTTOM
7 GA. BOTTOM TENSION WIRE
NOTE:
ALL WIRE FABRIC AND FENCE HARDWARE SHALL BE GALVANIZED.
GATE SHALL BE COMPLETE WITH BALL AND SOCKET HINGES OR APPROVED EQUAL.
TYPICAL FOOTING
Emergency Access Gate Detail
Scale 1:25
Hinge (TYP.)
Gate support Post 8" x 8" set in 10" sonotube minimum 4ft below grade.
Wire fence support (TYP.)
2" X 6" Cedar Plank sandwiched between 2" x 6" framing
Gate framing 2" x 6" both sides fastened with #8 4" brass wood screws on both sides
Break Away Latch c/w Lock
Road profile
Gate support posts to be set in 12" Sonotube to a minimum of 4' below grade. Sonotube to be pulled back 1 foot to allow concrete to ball at bottom of post
6 ft Privacy Fence Detail
Scale 1:25
Post 4" x 4" P/T set in 12" sonotube minimum 4ft below grade. (TYP.)
End support P/T Post 6" x 6" set in 18" sonotube minimum 4ft below grade.
Driveway as detailed on Drawing SPCA-4
1/2" overlap of pickets (TYP)
Picket Detail
Support posts to be set in Sonotubes as detailed to a minimum of 4' below grade. Sonotube to be pulled back 1 foot to allow concrete to ball at bottom of post
Picket Detail
N.T.S.
2" x 4" x 8'
1" x 5" x 5' Fence Picket
Electrical Supply Detail (Front)
N.T.S.
150mm X 150mm (6" X 6") Pressure Treated Post Set Plumb
Electrical Access Box Nema 4X
Hydro meter required (Not shown)
Finished Grade
Slope Surface To Drain
Concrete Collar Dia. = 2x Post Thickness, Do Not Encase Bottom Of Post
Undisturbed Subgrade
19mm Ø Clear Stone
*Note:
Hydro connection must be:
within 4.5m from the back of the lot
between 1.5m and 2.1m from the edge of the trailer pad
As per ESA
Water Supply Detail (Back)
N.T.S.
Pressure Treated Wood Post, Set Plumb
19mm (3/4") Tee
19mm (3/4") Anitsyphon Hose Bibb or c/w Anitsyphon Valve attached (TYP)
19mm (3/4") S.S. Ball Valve
Strap (TYP.)
38mm X 38mm X19mm Tee (2" X 2" X 3/4")
38mm (1-1/2") Ø HDPE 160 PSI Pressurized Water Pipe
NOTES:
1. one piece construction PVC Conduit
2. 2 - 120V recepticles Single Phase 30A & 15A
3. Suitable for Campground Trailer Temporary Service
4. Commercial Quality Recepticles
5. Located within 4.5m from the back of the lot
6. And between 1.5m and 2.1m from the edge of the trailer pad on the right side facing the RV / Trailer
Electrical / Water Supply to be mounted Back to Back
Typical Swale Section (2% or more)
N.T.S.
3 strips of red warning tape, denoting entire width of direct buried electrical trench. To be placed 1/2 way between the top of conduit and finished grade.
Primary conduit in 76mm (3") Solid Wall Duct (DB2/ES2)
Bedding: 7mm to 14mm washed peastone or 19mm clearstone
Geotextile Fabric
160 PSI PVC pipe (SDR-26) Pressurized Pipe.
UNDISTURBED SOIL OR 150mm THICK GRAN. 'A'
Shared Hydro Trenching Details
N.T.S.
Trenching Detail
N.T.S.
Existing topsoil to be stored on site during construction and to be replaced after piping and bedding has been installed.
Undisturbed native
Approved screened cobble free (native / Imported) Sand / Gravel backfill to be compacted into place only.
Non-Woven Geotextile Fabric
Minimum 150mm 19mm (3/4") clear stone for drainage
PVC pipe Forcemain or Gravity
Undisturbed Native Soil
Road Crossing Protection Detail
N.T.S.
Fill material to match existing road.
15M Rebar
Provide 300mm concrete cover over pipe, 20MPA, 6 - 8% air entrained, c/w 15M green epoxy coated rebar @ 300mm o/c each way with minimum of 3 rebar lengths along the longitudinal axis
Minimum 200mm (8") below pipe to encase half of pipe as shown with 19mm (3/4") clear stone for drainage
PVC pipe Forcemain or Gravity
Storm Sewer Outfall Detail N.T.S.
Final Effluent outfall into Rip Rap over Filter cloth to protect against erosion
Outlet pipe as detailed on drawing SPCA-4
Rip-Rap set on woven geotextile
Pipe encased in Rip-Rap
SDR 35 PVC Outlet Pipe
Rip Rap to be 50mm minimum cover over pipe crown and 50mm min bedding below pipe bottom.
℄ of Swale
Hydro-seed
Top of Bank
Maximum slope
Native undisturbed
Potable Water / Sewer Crossing (TYP.)
N.T.S.
Existing (final) Grade
Screened Sandy silt cuttings
Sanitary sewer pipe
38mm Potable water pipe
'A' Gravel or course sand (min 200mm)
Screened Cobble Free Native cuttings
'A' Gravel or course sand (minimum 200mm Thick)
Notes:
1. Vertical separation on crossings to be a minimum of 0.5m from crown to bottom of pipe.
2. Watermain to be 160 PSI rated HDPE (NOT PVC)
3. No Joints, connections or repairs within 2.5m of horizontal separation between sanitary sewer and potable water distribution pipe
4. Water and sewer pipe to be bedded with compacted 'A' gravel or coarse sand
5. 1.0m horizontal distance after crossing to be maintained in distribution piping before any pipe deflection is introduced
6. All cuttings used to backfill to be free of cobbles (stone greater than 64mm (2.5 inches)
Curb Stop and Waterline Valves
N.T.S.
Existing Grade
Flush mount cover
Chamber
Curb stop valve 38mm
Curb stop valve 50mm
38mm Ø Watermain
Firmly Compacted backfill
Concrete Block
1. Use 105mm Slide Valve Box on water service valve
2. Valve box shall be centred over the operating nut and rest above the valve on supports
3. Drill a hole through the extension stem and thread in bolt to tighten the extension stem to the operating nut
4. Valve box shall be adequately braced while backfilling and shall remain cantered around operating nut
5. Valve boxes shall be used on all water valves.
Proposed Berm
Scale 1:150
Road
Berm where shown on Drawing SPCA-4
Profile of Trailer connection, c/w Clean Out Connection
N.T.S.
100mm Clean out access c/w removable threaded cap
50mm from ex. grade (Max)
1 - 45° elbow coupled with 45° T-wye to connect to main sanitary sewer collection line
Direction of flow
Proposed 100 mm (4") Sanitary sewer collection pipe (SDR 35)
Note:
All new sanitary trailer connections to have cleanout access.
All sewage gravity collection pipes less than or equal to 100mm (4") diameter to have a cleanout access locations spaced of no more than 15m (50ft). All gravity sewers greater than 100mm (4") diameter pipes to have access spacing of no more than 30m (100ft)
Where cleanout connections are to be directional the direction will be downstream.
All new cleanout locations to be placed on or near trailer lot lines in compliance with spacing requirements above.
Profile of Typical Flush Mount Clean Out Connection
(Required within 1m of roadside , in road or within 1m of driveway)
N.T.S.
200mm (8") Ø steel flush mount chamber set in cement to 300mm below grade
Clean out access c/w removable threaded cap
Backfill to existing Grade (100 to 200mm)
100mm thick Cement to a minimum depth of 300mm
1 - 45° elbow coupled with 45° or long sweep T-wye to connect to main sanitary sewer collection line
Proposed (diameter as shown on Plan and Profiles drawings) Sanitary sewer collection pipe (SDR 35)
Swale Outlet Storm Drain
N.T.S.
Grate
Seam
Ø254mm [Ø10"] Custom
Sump 600mm MIN
Typical Proposed Site Layout
N.T.S.
Combined Water / Hydro Pedestal connection
Combined 19mm Water / Hydro Pedestal connection*
Sanitary Sewage / Cleanout connection
36" Fire Ring
Area reserved for deck / patio
Trailer on gravel pad
63mm (2.5") CAL Deciduous Tree
Quercus rubra - Red Oak (12 sites)
Acer saccharum - Sugar Maple (12 sites)
Gravel Pad Construction:
All Topsoil to be Removed
150 mm Compacted granular 'A' over a 200 mm compacted granular 'B' base
Includes Trailer Pad: 3.0m X 18.6m (TYP)
Parking Area: Gravel Pad 6.1m X 5.5m long (TYP)
R 9.0m Area clear for trailer turning
R 1.5m
Single lane traffic
℄ of Single lane Roadway
Two Lane 6.0m
Single Lane 4.0m
Hydro-seeded
Edge of Gravel Roadway
Road Profile
Granular 'B' base to be placed on subgrade or 200mm crusher run compacted to 95% proctor
150 mm Granular 'A'
200 mm Granular 'B'
Subgrade Note:
All topsoil to be removed exposing undisturbed soil.
TYPICAL SINGLE LANE ELEVATED SECTION
Scale 1:150
Plan View
Edge of shoulder
Edge of road
Toe of Slope
Breakpoint
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Rev. No. | Date | Description | CAD
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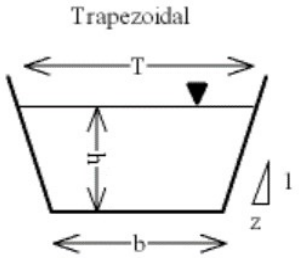
Engineer's Stamp:
LICENSED PROFESSIONAL ENGINEER
Jul. 15, 2024
D. T. BAUER
100226854
PROVINCE OF ONTARIO
Sun Retreats Sandbanks
37 - 38 Lake Avenue Lane
Cherry Valley, Prince Edward County
Miscellaneous Notes & Details
Scale: As Shown
Date: 21-JUN-2021
Project No.: D2429
Designed By: EG
Drawn By: JR
Checked By: BC
Drawing No.: SPCA-6

Appendix B: Swale Calculations

Trapezoidal Channel

Flow Area

A = h(b+T)/2



h =	0.2	m	depth of water
b =	0.01	m	width of base
T =	1.4	m	width of to water level
A =	0.141	m²	Cross Sectional Area

Wetted Perimeter

P = b + 2(((T - b)/2)^2 +h^2)^(1/2)

P =	1.456409	m

Hydraulic Radius

Rh = (h(b+T)/2/(b+2(((T-b)/2)^2+h^2)^(1/2))

Rh =	0.096813	m

Manning's Formula and Gravity Flow

(Calculate Cross Sectional Average Velocity Flow in Open Channels

v = (kn/n)*Rh^(2/3)S^(1/2)

kn =	1.0		For SI Units (1.486 for Imperial Units)
n =	0.030		Manning's Roughness Coefficient (Use Table Below)
Rh =	0.096813	m	Hydraulic Radius (Use based on type of channel you have, calculated above ↑)
S =	0.015	m/m	Slope or gradient
v =	0.860759	m/s	Cross-Sectional Mean Velocity

Volume of Flow in the Channel can be Calculated as Follows:

q = A*v

q =	0.121367	m³/s	Channel Flow Volume
	121.367	L/s	

Manning's Roughness Coefficients vs. Channel Type	
Surface Material	**Manning's Roughness Coefficient *-n-***
Asbestos cement	0.011
Asphalt	0.016
Brass	0.011
Brick and cement mortar sewers	0.015
Canvas	0.012
Cast or Ductile iron, new	0.012
Clay tile	0.014
Concrete - steel forms	0.011
Concrete (Cement) - finished	0.012
Concrete - wooden forms	0.015
Concrete - centrifugally spun	0.013
Copper	0.011
Corrugated metal	0.022
Earth, smooth	0.018
Earth channel - clean	0.022
Earth channel - gravelly	0.025
Earth channel - weedy	0.03
Earth channel - stony, cobbles	0.035
Floodplains - pasture, farmland	0.035
Floodplains - light brush	0.05
Floodplains - heavy brush	0.075
Floodplains - trees	0.15
Galvanized iron	0.016
Glass	0.01
Gravel, firm	0.023
Lead	0.011
Masonry	0.025
Metal - corrugated	0.022
Natural streams - clean and straight	0.03
Natural streams - major rivers	0.035
Natural streams - sluggish with deep pools	0.04
Natural channels, very poor condition	0.06
Plastic	0.009
Polyethylene PE - Corrugated with smooth inner walls	0.009 - 0.015
Polyethylene PE - Corrugated with corrugated inner walls	0.018 - 0.025
Polyvinyl Chloride PVC - with smooth inner walls	0.009 - 0.011
Rubble Masonry	0.017 - 0.022
Steel - Coal-tar enamel	0.01
Steel - smooth	0.012
Steel - New unlined	0.011
Steel - Riveted	0.019
Vitrified clay sewer pipe	0.013 - 0.015
Wood - planed	0.012
Wood - unplaned	0.013
Wood stave pipe, small diameter	0.011 - 0.012
Wood stave pipe, large diameter	0.012 - 0.013

Appendix C: RUNOFF COEFFICIENT CALCULATION

Areas		m²	C	Ac	%	
Total Drainage Basin Area		5630	Various	#N/A	1	
Road Area		747	0.8	597.6	0.132682	
Trailer Unit Area		371.6	0.95	353.02	0.066004	
Gravel Driveway + Trailer Pad		723	0.5	361.5	0.128419	
Gravel Driveway + Trailer Pad less Trailer		351.4	0.5	175.7	0.062416	
Grassed Area		4160	0.25	1040	0.738899	
						Average C
	Check	5630				0.384782

time of concentration (tc)
tc = 0.0078(L/(S^0.5))0.077
tc = time of concentration, min
L = length of travel (ft)
S = slope of the flow path from the most remote part of the basin to the calculation point divided by the horizontal distance between the two points, ft/ft

	m	ft
Length	100	328.084
	%	
Slope	3.8	
tc =	0.011575	

*Note tc cannot be less than 5 minutes.
There is also a chart which was used based on the average C, distance, and slope.
tc = 20mins estimated based on chart using C = 0.38, distance = 328ft, and slope of 3.8%

Rational Formula
Q = CIA
Q = Max rate of runoff, (m3/hr or cfs)
C = runoff coefficient
I = avg rainfall intensity for a duration equal to the time of concentration, in (m/hr or in./hr)
A = Drainage area contributing to the design location, (m2 or acres)

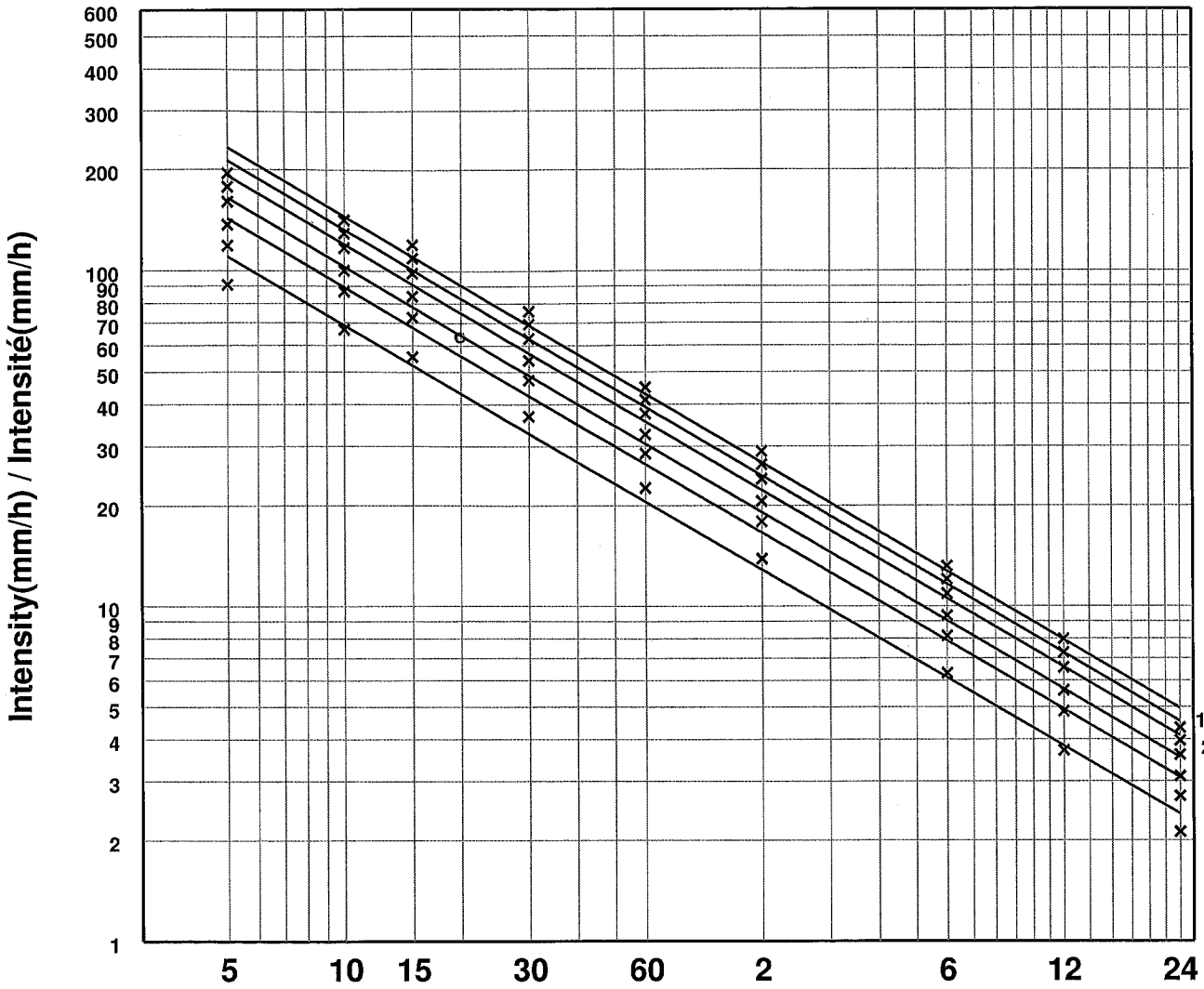
C =	0.384782		
	mm/hr	m/hr	in./hr
I =	65	0.065	2.559057
		m²	acres
A =		5630	1.391201
		m³/hr	cfs
Q =		140.8108	1.369885
		m³/s	check
		0.039114	0.038791

Appendix D: Short Duration Rainfall Intensity – Duration – Frequency Data for Belleville Ontario, Dated October 31, 2022

Short Duration Rainfall Intensity–Duration–Frequency Data

2022/10/31

Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée



Environment Canada Environnement Canada

Canada