Functional Servicing Review

Pigeon Lake Commercial Cabins
16 Fire Route 94A
Municipality of Trent Lakes, ON

D.M. Wills Project No. 20-85099

D.M. Wills Associates Limited
Partners in Engineering, Planning and
Environmental Services
Peterborough

March 2021

Prepared for:
Stephen Lennox

Summary of Revisions

Revision No.	Revision Title	Date of Release	Summary of Revisions
0		March 11, 2021	1st Submission

This report has been formatted considering the requirements of the Accessibility for Ontarians with Disabilities Act.

Table of Contents

List of Figures

List of Appendices

1.0 Introduction

D.M. Wills Associates Limited (Wills) has been retained by Mr. Stephen Lennox (Owner) to prepare a Functional Servicing Review (FSR) for the property at 16 Fire Route 94A. The Site is located at Point Pleasant, South East of Alpine Village, on Pigeon Lake between Bicelow Bay to the West and Nicholas Cove to the East.

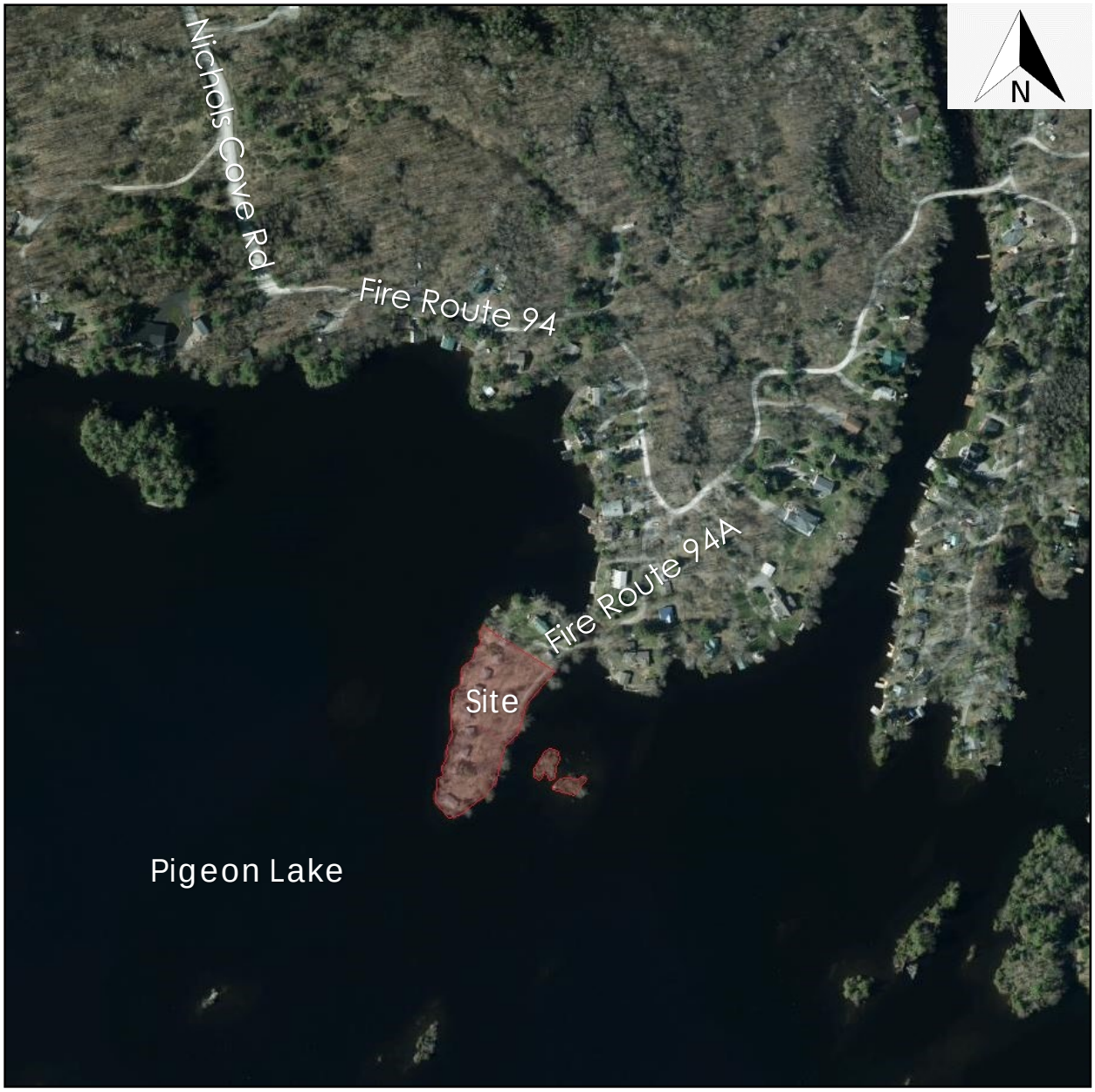
The Site currently has 10 single storey cabins previously used for commercial purposes. The proposed development includes removing all existing structures and constructing five two-bedroom commercial cabins and one private four-bedroom cottage for the Owner. The proposal also includes a dry slip boathouse. The existing access road will be upgraded, and the addition of parking spaces will be required for the commercial cabins.

The FSR is required as part of the zoning by-law amendment (ZBA) application and shall provide sufficient information to determine the feasibility of the proposed development while demonstrating no negative impacts to adjacent lands.

1.1 Site Location / Study Area

The Site is legally defined as Part of the West Half of Lot 16, Concession 13, with two smaller islands to the East legally defined as Part 11 and Part 12, all within the Municipality of Trent Hills. The Site is surrounded by Pigeon Lake to the east, south and west with a neighbouring property and access road (Fire Route 94A) to the north. The Site location is shown in **Figure 1**.

Figure 1 – Site Location Map



2.0 Site Servicing

2.1 Site Grading

Proposed grading will be minimized wherever possible in order to maintain existing drainage patterns. The existing private driveway will be expanded to 3.5 m wide but will taper to approximately 3.0 m to match the existing driveway width at the property limit. The driveway will maintain existing drainage patterns. A proposed parking area for the rental cabins is to be constructed at the north end of the Site, as shown in **Appendix A –**

Figure 2. The parking area is graded so that runoff will be directed to the as low impact development (LID) feature for quality control; refer to **Section 3.0** for additional details. Parking and a turnaround for the private cottage is provided at the south end of the Site, matching existing grades as much possible. Proposed grading is shown on **Appendix A – Figure 3.**

2.2 Sanitary Servicing

The Site will be serviced by a new on-site septic system (designed by others). The footprint of the proposed septic system is shown on the Concept Site Plan **Appendix A – Figure 2**.

2.3 Water Servicing

The Site will continue to get its water supply from surface water in Pigeon Lake. Using Ministry of Environment Design Guidelines for Drinking-Water Systems (2008) the domestic water demand is specified as 450 litres/person/day. The proposed development has a maximum occupancy of 28 persons, so the domestic water demand is 12,600 L/day.

A Permit to Take Water (PTTW) under the Water Taking Regulation (O. Reg. 387/04) is not required as the proposed development requires taking less than 50,000 L/day.

Additional details such as the sizing, number, and location of pumps and intake lines, and water treatment systems will be determined by others at the Site Plan Approval or Building Permit stage.

3.0 Stormwater Management

On-site stormwater facilities are typically required to provide both stormwater quantity and quality control for developments in accordance with municipal and provincial guidelines. In order to ensure that the flooding potential to downstream properties is not increased, stormwater quantity controls are typically required to control post-development peak flows to existing condition levels. To ensure that developments do not adversely impact water quality, stormwater quality controls are typically required to remove suspended sediments and other contaminants from stormwater runoff.

3.1 Existing Drainage Characteristics

The Site is located on a peninsula on Pigeon Lake and is accessed by Fire Route #94A. The physical area of the development is 0.64 ha. A high point splits the drainage of the peninsula in two separate directions, with a portion discharging to the west shoreline of the peninsula and a portion discharging to the east shoreline of the peninsula. The western portion contains eight existing cabins and landscape area, and the eastern portion contains the existing gravel access roadway, two sleeping cabins, and landscape area. The entire site discharges directly to Pigeon Lake. Refer to **Appendix**

A – Figure 4 for the existing drainage patterns and **Appendix A – Figure 5** for the proposed drainage patterns.

3.2 Stormwater Quantity

Stormwater quantity controls are typically required for developments to ensure there is no increase in peak flows to downstream receiving areas as a result of the development. The proposed development consists of reconstructing and widening the existing gravel access roadway, the addition of a small gravel parking area, the demolition of all existing cabins, the construction of six new cabins, and the construction of a dry slip boat house. A review of the land use parameters indicates that there is no increase in impervious area in the proposed condition, in comparison to the existing condition. There is an increase in gravel area due to the widening of the existing gravel roadway and construction of the parking lot. Pigeon Lake is a sufficiently large waterbody such that there is a significant lag time between peak rainfall intensity for the watershed and peak water levels within the lake. As such, quantity controls are not recommended for development to ensure that flow from the site is conveyed downstream prior to peak water levels within Pigeon Lake. For this reason, no stormwater quantity controls are proposed for the development.

3.3 Stormwater Quality

Stormwater quality controls are typically required for developments to remove suspended sediments and other contaminants from stormwater runoff. The proposed development is low intensity, with a reconstructed gravel access roadway and small parking lot forming the extent of proposed land use change that may impact stormwater quality. The impervious areas within the development area consist entirely of cabins generating only roof water runoff that can be considered clean water.

Low Impact Development

As the practice of stormwater management has evolved, increasing emphasis has been placed on utilizing a treatment train approach to manage runoff as close to the source as possible. This design philosophy is often referred to as LID, where the ultimate goal is to maintain natural or pre-development hydrologic conditions. LID designs accomplish this by reducing the runoff volume generated by a site and implementing features that infiltrate, filter, evaporate, harvest and detain runoff, while also preventing pollution.

A stone filled infiltration trench can be constructed to provide stormwater quality for the proposed gravel parking lot. The infiltration trench would be located adjacent to the northern edge of the parking lot and will accept overland sheet drainage from the parking lot. Based on the weighted runoff coefficient and contributing area discharging from the gravel parking lot area, the total runoff volume generated by a 25 mm storm event was calculated to be 3.1 m^3 (0.022 ha x 0.57 x 25 mm). The storage volume of the trench was calculated as follows:

Infiltration Trench: Surface area 12.2 m^2 x 0.75 m deep = 9.2 m^3. The clear stone has a 40% void ratio, resulting in a total storage volume of 3.66 m^3, exceeding the amount required.

The infiltration trench has been designed based on the methods described in the Low Impact Development Stormwater Management Planning and Design Guide (CVC/TRCA, 2010). It has been sufficiently sized to capture runoff from a 25 mm storm event and will drawdown in 25 hours, less than the maximum recommended 48 hours. An assumed infiltration rate of 30 mm/hr with safety factor was used in the calculations, supported by the A type classification of the local soils (Balmer Sandy Loam). Soils data for the site was selected from Land Information Ontario (OMAFRA).

A cross-section of the facility and supporting calculations provided in **Appendix B**.

Stormwater quality controls were not investigated for the reconstructed gravel access roadway as the overall roadway area is not substantially increased when compared to the existing condition, and the overland conveyance path to the existing shoreline consists of well-established vegetation that will provide water quality benefits.

4.0 Conclusion

Based on the findings of this FSR there are no servicing or grading constraints identified that would preclude the proposed development of the Site.

This FSR shall be reviewed in conjunction with the proposed on-site septic design (by others) when determining the feasibility of sanitary servicing for the proposed development.

A review of the land use parameters indicates that there is no increase in impervious area in the proposed condition, when compared to the existing condition. For this reason, no stormwater quantity controls are proposed for the development. Stormwater quality control measures are provided for the proposed gravel parking lot by an infiltration trench.

We trust the above is satisfactory to your purposes. Please feel free to contact our office if you have any questions pertaining to the above.

Respectfully submitted,

Mark Spiers, C. Tech.
Municipal Project Manager

Mark Wilson, A.Sc.T.
Senior Water Resources Designer

MS/jh

5.0 Statement of Limitations

This report has been prepared by D.M. Wills Associates Limited for Stephen Lennox to address the requirements of the Municipality of Trent Lakes.

The conclusions and recommendations in this report are based on available background documentation and discussions with applicable agencies at the time of preparation.

The report is intended to determine the feasibility of the proposed development with respect to servicing, grading, and stormwater management of the subject property. The design information provided in this report is preliminary in nature and should not be used for construction purposes.

Any use that a third party makes of this report other than a functional servicing report for the proposed development is the responsibility of such third parties. D.M. Wills Associates Limited accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or action taken based on using this report for purposes other than a functional servicing report for the property located at 16 Fire Route 94A, Trent Lakes, Ontario.

Appendix A

Figures

PROPOSED BUILDING	AREA	DIMENSIONS	FRONT SETBACK FROM WATER	REAR SETBACK FROM WATER
BLDG 1	92.9m²	12.2m X 7.6m	10.2m	38.9m
BLDG 2	92.9m²	12.2m X 7.6m	12.7m	35.1m
BLDG 3	92.9m²	12.2m X 7.6m	10.4m	32.2m
BLDG 4	92.9m²	12.2m X 7.6m	10.7m	32.9m
BLDG 5	92.9m²	12.2m X 7.6m	12.0m	24.6m
BLDG 6	186.0m²	15.5m X 12.0m	18.0m	–
BLDG 7	73.9m²	15.4m X 4.8m	0.5m	–

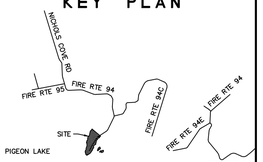
EXISTING BUILDING	AREA	SETBACK FROM WATER
BLDG A	40.8m²	15.9m
BLDG B	41.3m²	12.6m
BLDG C	40.9m²	9.6m
BLDG D	40.9m²	9.4m
BLDG E	51.7m²	6.8m
BLDG F	42.0m²	8.3m
BLDG G	41.7m²	6.0m
BLDG H	46.1m²	3.9m
BLDG I	18.1m²	2.9m
BLDG J	36.9m²	12.2m

0 5 10 15

1:300

TRUE NORTH

KEY PLAN



REVISIONS

No.	Description	Date
2	ISSUED FOR ZBA	03/03/21
1	CLIENT REVIEW	01/10/20

METRIC Dimensions are in METRES and/or MILLIMETRES unless otherwise shown

LEGEND TO BE READ IN CONJUNCTION WITH OPSD 100 SERIES

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Project Name/Location

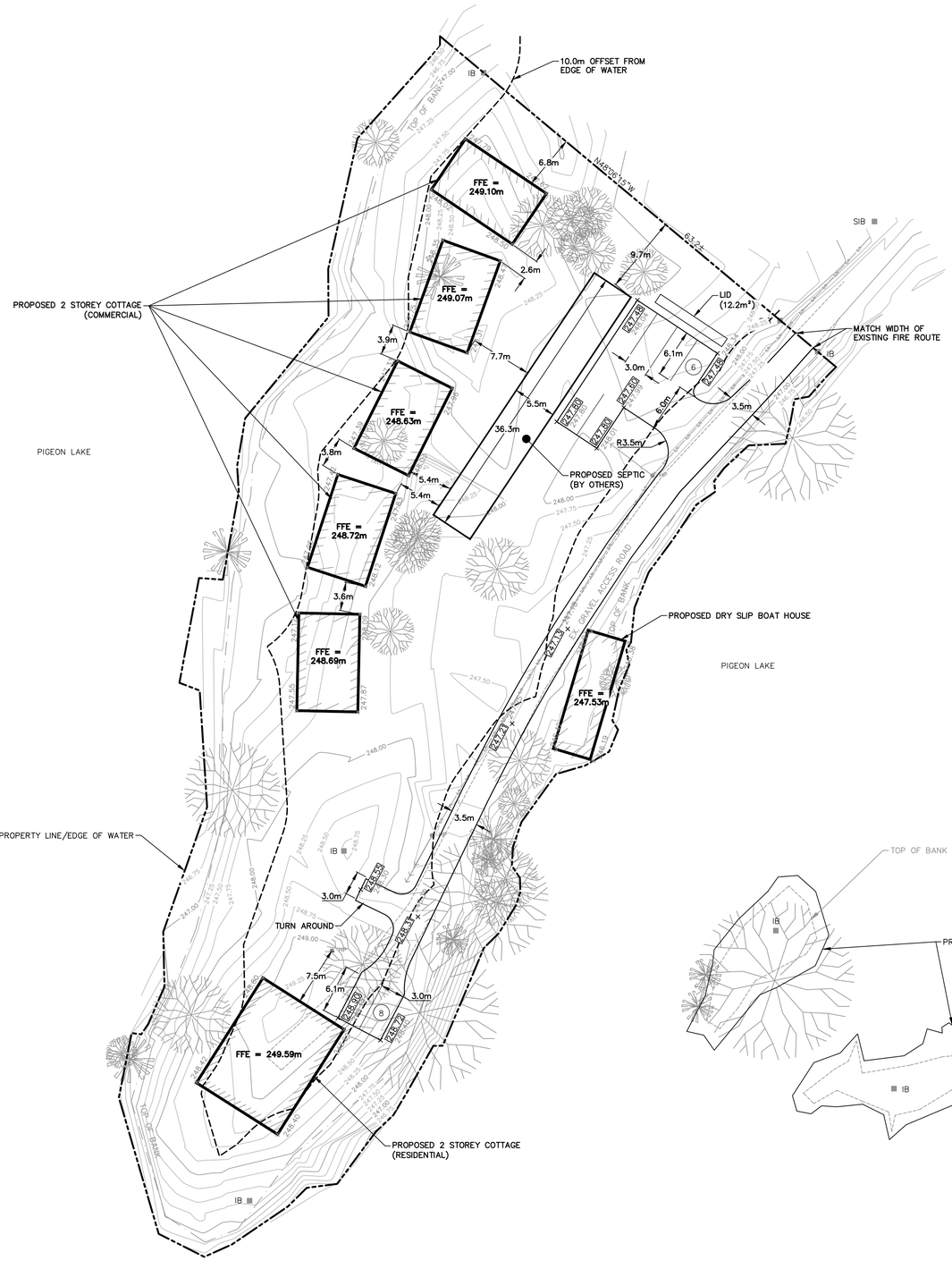
PIGEON LAKE COMMERCIAL CABINS

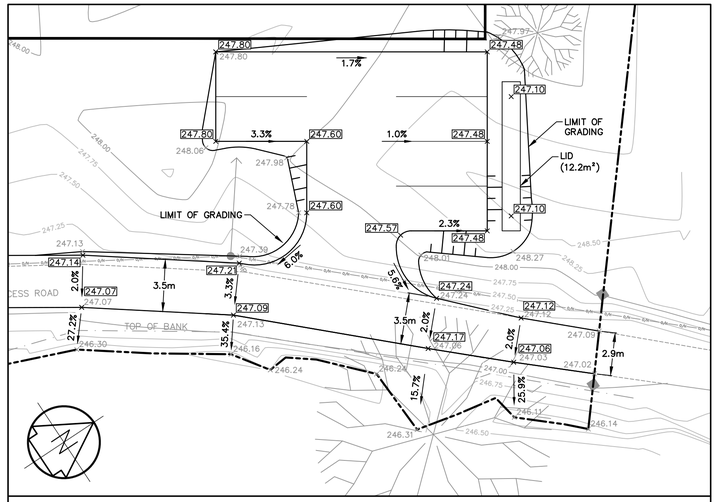
16 FIRE ROUTE 94A, TRENT LAKES

Drawing Title

FIGURE 2 - CONCEPT SITE PLAN

Drawn By: M.B.	SCALE: Horz. 1:300 Vert. –	
Designed By: M.B.	Plot Date: MARCH 3, 2021	
Checked By: M.S.	Project No.: 85099	Sht. No.:
Engineer: –––	Dwg File No.: 85099 – SP	01





100 GRADING DETAIL – NORTH PARKING

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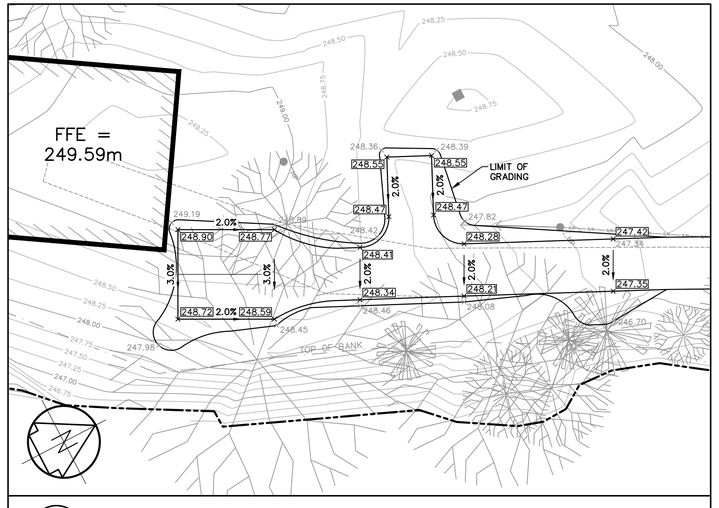
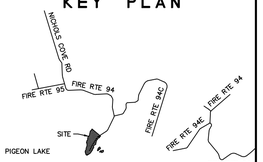


200 GRADING DETAIL – SOUTH PARKING

SCALE = 1:200

TRUE NORTH

KEY PLAN



REVISIONS

No.	Description	Date
2	ISSUED FOR ZBA	03/03/21
1	CLIENT REVIEW	01/10/20

METRIC Dimensions are in METRES and/or MILLIMETRES unless otherwise shown

LEGEND TO BE READ IN CONJUNCTION WITH OPSD 100 SERIES

- EX./PR. BUILDING
- EX./PR. ROAD CENTERLINE
- EX./PR. EDGE OF SHOULDER/GRAVEL
- HP EXISTING HYDRO POLE
- EXISTING POLE ANCHOR
- IRON BAR
- 215.00 x 214.00 EX./PR. ELEVATION
- 1.0% PROPOSED GRADE
- EX. OVERHEAD HYDRO
- PROPERTY LINE
- 100.0 / 100.0 EX./PR. CONTOUR
- EX./PR. SIGN
- EXISTING SHRUB
- EXISTING DECIDUOUS TREE
- EXISTING CONIFEROUS TREE
- BM ELEV BENCHMARK

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Project Name/Location

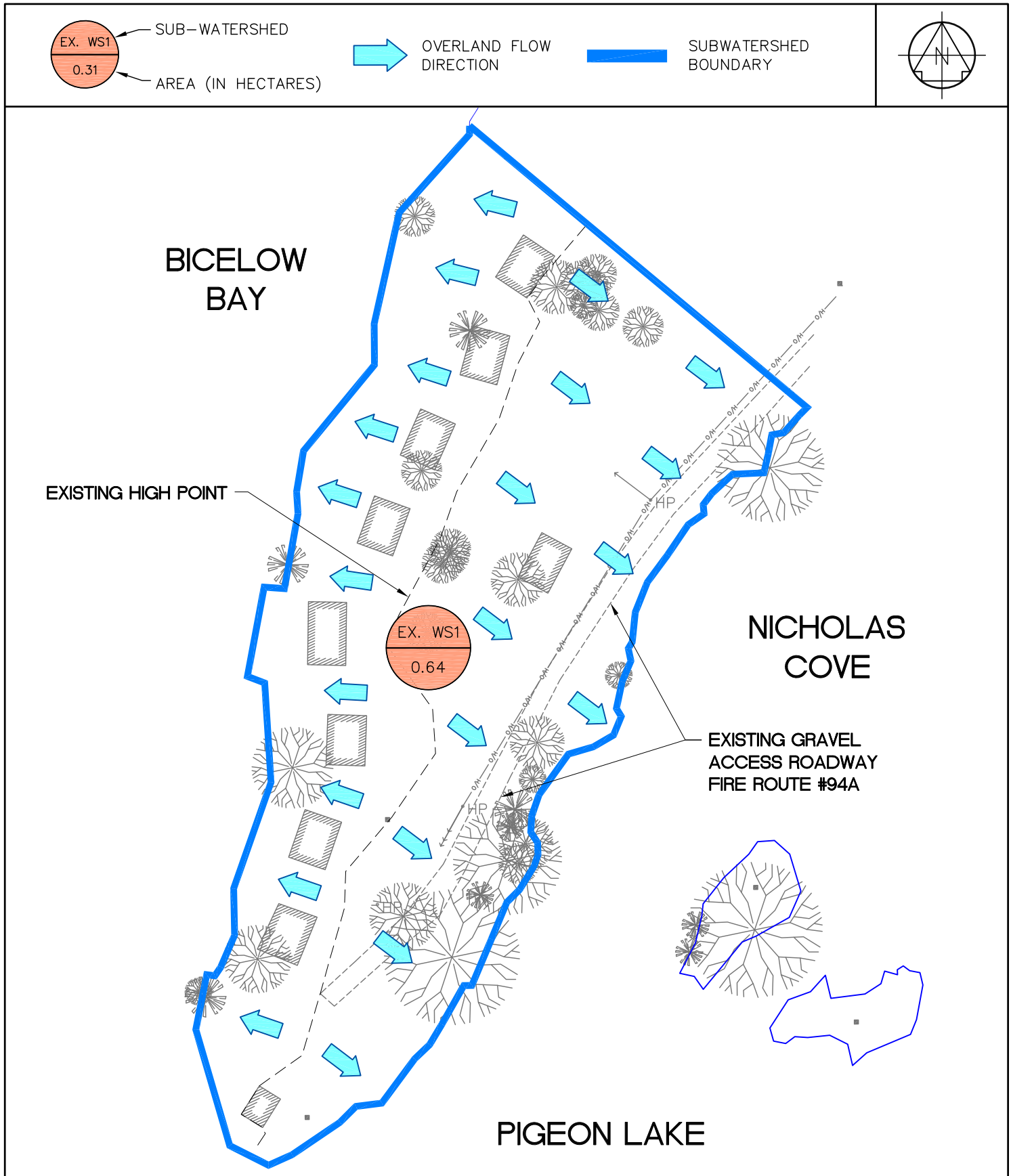
PIGEON LAKE COMMERCIAL CABINS

16 FIRE ROUTE 94A, TRENT LAKES

Drawing Title

FIGURE 3 - PRELIMINARY GRADING PLAN

Drawn By: M.B.	SCALE: Horz. 1:300	Vert. –	
Designed By: M.B.	Plot Date: MARCH 3, 2021		
Checked By: M.S.	Project No.: 85099		Sht. No.:
Engineer: –––	Dwg File No.: 85099 – GP		02



Sketch No.

FIGURE 4: EXISTING DRAINAGE AREA PLAN

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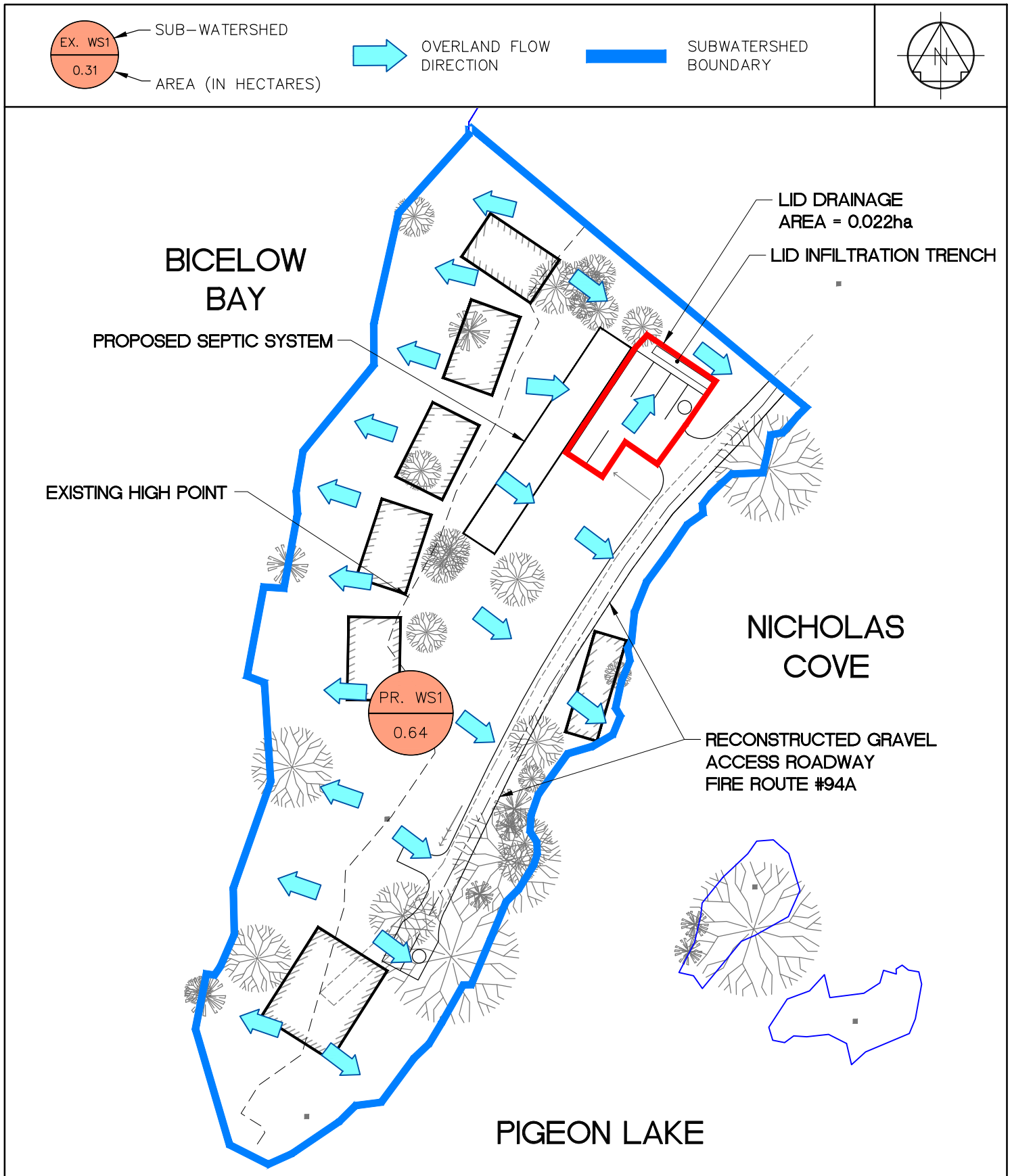
Drawn By: M.W.	Scale: Horz. 1:750, Vert. N/A
Checked: M.W.	
Engineer: C.P.B.	Plot Date: FEB. 25/21
Project No.: 20-85099	Drawing File No.: FIGURE 4



Sketch No.

FIGURE 5: PROPOSED DRAINAGE AREA PLAN

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Drawn By: M.W.	Scale: Horz. 1:750, Vert. N/A
Checked: M.W.	
Engineer: C.P.B.	Plot Date: FEB. 25/21
Project No.: 20-85099	Drawing File No.: FIGURE 5

Appendix B

Stormwater Management

Hydrologic Parameters for Ex. WS1

Sheet 1 of 1

Project No: 20-85099
Project Name: Pigeon Lake Commercial Cabins
Designed/Checked By: M.W. / C.P-B.
Date: 1-Mar-21

Land Use

Agriculture	0.00	ha
Range	0.00	ha
Grass	0.29	ha
Woods	0.28	ha
Wetland	0.00	ha
Gravel	0.03	ha
Impervious	0.04	ha
SUM	**0.64**	

Hydrologic Soil Group[1]	A
Soil Type	Balmy Sandy Loam
C	0.16
CN (Nashyd)	40.5

Rainfall Data

Gauging Station = Kawartha Lakes
12 hr, 100 Yr Rainfall = 89.8 mm

Drainage Area	**0.64**	ha
Impervious Area	**0.04**	ha
Percent Impervious	**6.3%**	
Connected Impervious	6.3%	

Pervious		
Length	30	m
US Elev	248.0	m
DS Elev	246.3	m
Slope	5.7	%
	Rolling	

Parameter	Soil Group	Land Use							Weighted Value	
		Agriculture	Range	Grass	Woods	Wetland	Gravel	Imperv.	Incl. Imperv. NASHYD	Not Incl. Imperv. STANDHYD
Runoff Coefficient[2], C	**A**	0.22	0.16	0.10	0.08	0.05	0.57	0.90	0.16	n.a.
SCS Curve No.[3], CN	**A**	66	38	39	30	50	76	98	40.5	36.7
Initial Abstraction[5], mm		6.0	8.0	5.0	10.0	10.0	2.5	2.0	6.9	7.2

Time of Concentration[6]

Total Length	30	m	
Average Slope	5.7	%	
Airport	9.4	min.	Flat: 0-2% Slopes Rolling: 2-6% Slopes Hilly: >6% Slopes
Bransby - Williams	1.3	min.	
Applicable Minimum[7]	**10.0**	min.	
Time to Peak	6.7	min.	
	0.11	**hr.**	

Composite Parameters

Drainage Area	0.64 ha	
Runoff Coefficient	0.16	
SCS Curve No.	40.5	36.7
Modified Curve No.[4], CN*	**36.4**	31.2
Initial Abstraction.	**6.9**	7.2

Notes:

1. Hydrologic Soil Group obtained from Design Chart H2-6A, M.T.O. Drainage Manual, 1980.
2. Runoff coefficient obtained from M.T.O. Design Chart 1.07, M.T.O. Drainage Management Manual, 1997, Hydrologic Analysis and Design, McCuen 2004 and New Jersey Technical Manual for Stream Encroachment, 1984.
3. SCS Curve No. obtained from M.T.O. Design Chart 1.09, M.T.O. Drainage Management Manual, 1997, and Table 2-2a, TR-55, page 2-5.
4. The modified curve number is adjusted as per Paul Wisner & Associates (1982) and represents anticedent moisture conditions Type II
5. Initial Abstraction values taken from the Environmental and Engineering Services Department, The Corporation of the City of London, Dec 2005
6. Use Airport Equation to calculate time of concentration for C <= 0.4, and Bransby-Williams for C > 0.4.
7. Minimum Time of Concentration for use in the Rational Method and Hydrologic Model has been set to 10 minutes
8. All impervious areas have been assumed to be directly connected.

Hydrologic Parameters for Pr. WS1

Sheet 1 of 1

Project No: 20-85099
Project Name: Pigeon Lake Commercial Cabins
Designed/Checked By: M.W. / C.P-B.
Date: 1-Mar-21

Land Use

Agriculture	0.00	ha
Range	0.00	ha
Grass	0.27	ha
Woods	0.27	ha
Wetland	0.00	ha
Gravel	0.06	ha
Impervious	0.04	ha
SUM	**0.64**	

Hydrologic Soil Group[1]	A
Soil Type	Balmy Sandy Loam
C	0.19
CN (Nashyd)	42.4

Rainfall Data

Gauging Station = Kawartha Lakes
12 hr, 100 Yr Rainfall = 89.8 mm

Drainage Area	**0.64**	ha
Impervious Area	**0.04**	ha
Percent Impervious	**6.3%**	
Connected Impervious	6.3%	

Pervious		
Length	30	m
US Elev	248.0	m
DS Elev	246.3	m
Slope	5.7	%
	Rolling	

Parameter	Soil Group	Land Use							Weighted Value	
		Agriculture	Range	Grass	Woods	Wetland	Gravel	Imperv.	Incl. Imperv. NASHYD	Not Incl. Imperv. STANDHYD
Runoff Coefficient[2]**, C**	**A**	0.22	0.16	0.10	0.08	0.05	0.57	0.90	0.19	n.a.
SCS Curve No.[3]**, CN**	**A**	66	38	39	30	50	76	98	42.4	38.7
Initial Abstraction[5]**, mm**		6.0	8.0	5.0	10.0	10.0	2.5	2.0	6.7	7.0

Time of Concentration[6]

Total Length	30	m	
Average Slope	5.7	%	
Airport	9.2	min.	Flat: 0-2% Slopes Rolling: 2-6% Slopes Hilly: >6% Slopes
Bransby - Williams	1.3	min.	
Applicable Minimum[7]	**10.0**	min.	
Time to Peak	6.7	min.	
	0.11	**hr.**	

Composite Parameters

Drainage Area	0.64 ha	
Runoff Coefficient	0.19	
SCS Curve No.	42.4	38.7
Modified Curve No.[4]**, CN***	**38.8**	33.9
Initial Abstraction.	**6.7**	7.0

Notes:

1. Hydrologic Soil Group obtained from Design Chart H2-6A, M.T.O. Drainage Manual, 1980.
2. Runoff coefficient obtained from M.T.O. Design Chart 1.07, M.T.O. Drainage Management Manual, 1997, Hydrologic Analysis and Design, McCuen 2004 and New Jersey Technical Manual for Stream Encroachment, 1984.
3. SCS Curve No. obtained from M.T.O. Design Chart 1.09, M.T.O. Drainage Management Manual, 1997, and Table 2-2a, TR-55, page 2-5.
4. The modified curve number is adjusted as per Paul Wisner & Associates (1982) and represents anticedent moisture conditions Type II
5. Initial Abstraction values taken from the Environmental and Engineering Services Department, The Corporation of the City of London, Dec 2005
6. Use Airport Equation to calculate time of concentration for C <= 0.4, and Bransby-Williams for C > 0.4.
7. Minimum Time of Concentration for use in the Rational Method and Hydrologic Model has been set to 10 minutes
8. All impervious areas have been assumed to be directly connected.

Hydrologic Parameters for LID Trench

Sheet 1 of 1

Project No: 20-85099
Project Name: Pigeon Lake Commercial Cabins
Designed/Checked By: M.W. / C.P-B.
Date: 1-Mar-21

Land Use

Agriculture	0.00	ha
Range	0.00	ha
Grass	0.00	ha
Woods	0.00	ha
Wetland	0.00	ha
Gravel	0.02	ha
Impervious	0.00	ha
SUM	**0.02**	

Hydrologic Soil Group[1]	A
Soil Type	Balmy Sandy Loam
C	0.57
CN (Nashyd)	76.0

Rainfall Data

Gauging Station = Kawartha Lakes
12 hr, 100 Yr Rainfall = 89.8 mm

Drainage Area	**0.02**	ha
Impervious Area	**0.00**	ha
Percent Impervious	**0.0%**	
Connected Impervious	0.0%	

Pervious		
Length	19	m
US Elev	247.8	m
DS Elev	247.5	m
Slope	1.7	%
	Flat	

Parameter	Soil Group	Land Use							Weighted Value	
		Agriculture	Range	Grass	Woods	Wetland	Gravel	Imperv.	Incl. Imperv. NASHYD	Not Incl. Imperv. STANDHYD
Runoff Coefficient[2]**, C**	**A**	0.19	0.10	0.05	0.05	0.05	0.57	0.90	0.57	n.a.
SCS Curve No.[3]**, CN**	**A**	66	38	39	30	50	76	98	76.0	76.0
Initial Abstraction[5]**, mm**		6.0	8.0	5.0	10.0	10.0	2.5	2.0	2.5	2.5

Time of Concentration[6]

Total Length	19	m	
Average Slope	1.7	%	
Airport	6.3	min.	Flat: 0-2% Slopes Rolling: 2-6% Slopes Hilly: >6% Slopes
Bransby - Williams	1.4	min.	
Applicable Minimum[7]	**10.0**	min.	
Time to Peak	6.7	min.	
	0.11	**hr.**	

Composite Parameters

Drainage Area	0.02 ha	
Runoff Coefficient	0.57	
SCS Curve No.	76.0	76.0
Modified Curve No.[4]**, CN***	**74.9**	74.9
Initial Abstraction.	**2.5**	2.5

Notes:

1. Hydrologic Soil Group obtained from Design Chart H2-6A, M.T.O. Drainage Manual, 1980.
2. Runoff coefficient obtained from M.T.O. Design Chart 1.07, M.T.O. Drainage Management Manual, 1997, Hydrologic Analysis and Design, McCuen 2004 and New Jersey Technical Manual for Stream Encroachment, 1984.
3. SCS Curve No. obtained from M.T.O. Design Chart 1.09, M.T.O. Drainage Management Manual, 1997, and Table 2-2a, TR-55, page 2-5.
4. The modified curve number is adjusted as per Paul Wisner & Associates (1982) and represents anticedent moisture conditions Type II
5. Initial Abstraction values taken from the Environmental and Engineering Services Department, The Corporation of the City of London, Dec 2005
6. Use Airport Equation to calculate time of concentration for C <= 0.4, and Bransby-Williams for C > 0.4.
7. Minimum Time of Concentration for use in the Rational Method and Hydrologic Model has been set to 10 minutes
8. All impervious areas have been assumed to be directly connected.

Infiltration Facility Design - LID 1

Project No: 20-85099
Project Name: Pigeon Lake Cabins
Designed/Checked By: MW / CPB
Date: 1-Mar-21

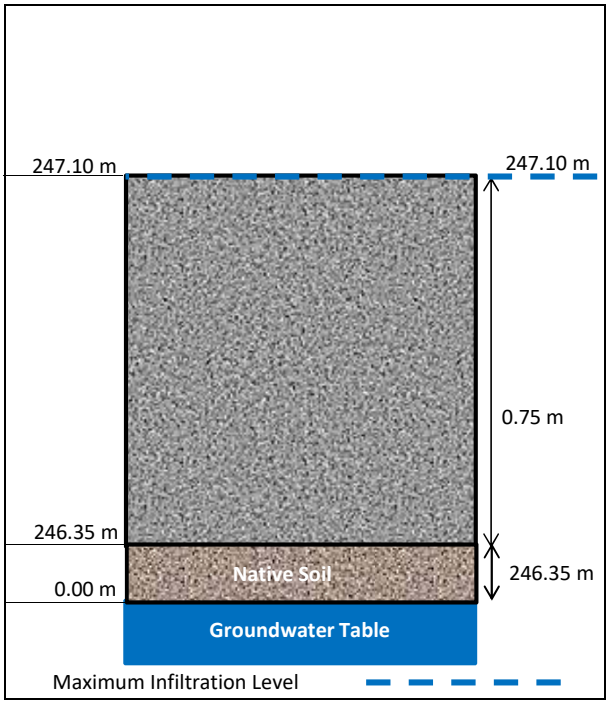
Site Characteristics		
Contributing Area	0.02	ha
Water Quality Storm	25	mm
Runoff Coefficient	0.57	
Groundwater Elevation	N/A	
Bedrock Elevation	N/A	
Infiltration Characteristics		
Native Soil Infiltration Rate[1]	30.0	mm/hr
Safety Correction Factor	2.5	
Adjusted Infiltration Rate	12.0	mm/hr

Design Constraints & Assumptions		
Water Quality Control Volume	3.1	m^3
Quantity Control Volume	3.2	m^3
Quantity Control Volume Includes Infiltration Storage?	No	
Max Allowable Drawdown Time	48	hours
Seperation to Groundwater	1.00	m
Stone Void Ratio	0.40	

Surface Storage	
Surface Storage Type	None

Underground Storage		
Underground Storage Type	Stone Trench	
Pretreatment	None	
Underground Storage Footprint	12.2	m^2
Bottom Elevation	246.35	m
Inlet Elevation	247.10	m
Outlet Elevation	247.10	m
Top Elevation	247.10	m
Underground Storage Volume	3.7	m^3
Infiltration Design		
Infiltration Footprint	12.2	m^2
Max Infiltration Storage Depth	0.75	m
Estimated Drawdown Time	25.0	hours
Infiltration Storage Volume	3.7	m^3
Provided Storage Summary		
Total Storage Depth	0.75	m
Groundwater Separation	246.35	m
Quality Control Volume	3.7	m^3
Quantity Control Volume	0.0	m^3
Total Storage Volume	3.7	m^3

Infiltration Facility Typical Section



Notes:

1. Runoff Coefficient determined based on the Hydrologic Parameters of the contributing drainage areaFALSE

2. Native soil infiltration rate incorporates a safety correction factor in accordance with the method outlined in the LID Design Manual Appendix C, Table C2

3. Infiltration Storage Drawdown Time calculated using the following equation:

$$t_d = \frac{d_i}{i}$$

t_d = Drawdown Time (hours)
d_i = Max infiltration storage depth (m)
i = Adjusted Infiltration Rate (mm/hr)

3.3.2 Water Quality Sizing Criteria

The volumetric water quality criteria are presented in Table 3.2. The values are based on a 24 hour drawdown time and a design which conforms to the guidance provided in this manual. Requirements differ with SWMP type to reflect differences in removal efficiencies. Of the specified storage volume for wet facilities, 40 m³/ha is extended detention, while the remainder represents the permanent pool.

Table 3.2 Water Quality Storage Requirements based on Receiving Waters[1, 2]

Protection Level	SWMP Type	Storage Volume (m³/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250
Normal 70% long-term S.S. removal	Infiltration	20	20	25	30
	Wetlands	60	70	80	90
	Hybrid Wet Pond/Wetland	75	90	105	120
	Wet Pond	90	110	130	150
Basic 60% long-term S.S. removal	Infiltration	20	20	20	20
	Wetlands	60	60	60	60
	Hybrid Wet Pond/Wetland	60	70	75	80
	Wet Pond	60	75	85	95
	Dry Pond (Continuous Flow)	90	150	200	240

[1]Table 3.2 does not include every available SWMP type. Any SWMP type that can be demonstrated to the approval agencies to meet the required long-term suspended solids removal for the selected protection levels under the conditions of the site is acceptable for water quality objectives. The sizing for these SWMP types is to be determined based on performance results that have been peer-reviewed. The designer and those who review the design should be fully aware of the assumptions and sampling methodologies used in formulating performance predictions and their implications for the design.

[2]Hybrid Wet Pond/Wetland systems have 50-60% of their permanent pool volume in deeper portions of the facility (e.g., forebay, wet pond).