TATHAM ENGINEERING

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File 121088

July 10, 2026

John Rodgers
Rhemm Properties Ltd.
119 Fieldcrest Court
Clarksburg, Ontario N0H 1J0

Re: 372 Grey Road 21, Town of The Blue Mountains
Hydrogeological Water Balance Assessment

Dear John:

Tatham Engineering (Tatham) is pleased to provide Rhemm Properties Ltd. with the following Technical Letter summarizing the results of our Water Balance Assessment in support of the Official Plan Amendment (OPA) application, Zoning By-Law Amendment, and a Draft Plan of Subdivision for the property located at 372 Grey Road 21, Blue Mountains (the "site") as shown on Figure 1.

This letter was prepared to address the comments regarding the impact to the adjacent wetland complex through a water balance assessment. This assessment includes a scoped site-only feature-based water balance, comparing pre-to-post development conditions.

PRE-DEVELOPMENT SITE CONDITIONS

The total site area is 7.00 ha and bounded by the Georgian Trail to the northwest, the future Eden Oaks and Home Farm developments to the west, and undeveloped wooded lands to the south and east. The site is currently undeveloped, and tree covered, gently sloping from the southwest to the northeast towards an existing watercourse (Watercourse 6) along the Georgian Trail. Watercourse 6 travels along the property limits immediately adjacent to the Georgian trail and is regulated by the Grey Sauble Conservation Authority (GSCA). It is noted the catchment area for Watercourse 6 is considerably large, including at least 489.8 hectares of land upstream of the development site, as illustrated on the Subwatershed Plan prepared by Crozier & Associated and enclosed for reference.

A 1.4 ha wetland complex is located in the northeastern corner of the site, within the catchment area for Watercourse 6. Approximately 3.44 ha of the site drains directly to the wetland complex overland as sheet flow, equivalent to approximately 0.7% of the total drainage area for the wetland complex.

Subsurface and Groundwater Conditions

A geotechnical investigation was conducted for the site by Soil Engineers Ltd. (SEL) in 2022 and a revised Geotechnical Report was issued in May 2026. Field work consisted of advancing seven boreholes to depths of 0.6 to 3.4 m bgs. In general, subsurface conditions consists of a surficial layer of topsoil, underlain by a sand and gravel deposit, overlying probable bedrock at a depth of 0.6 to 3.4 m. The boreholes were checked for groundwater upon completion of drilling. Groundwater was recorded at depths ranging from 0.4 to 2.4 m.

Based on measurements made over April to June 2022, as noted in the Hydrogeological Study prepared by SEL, groundwater levels are high on site and range from 0.44 to 3.01 m bgs across the site. Shallow groundwater is expected to diverge from a central groundwater high in the middle of the site, with flow directed generally northeastward and southwestward, as shown on Soil Engineers Ltd. Drawing No. 9 enclosed for reference.

POST-DEVELOPMENT SITE CONDITIONS

The proposed development includes 47 single family detached homes and 6 semi-detached homes and internal roadways. For more details of the proposed development plan, please refer to the Functional Servicing Report (Tatham, July 2026).

Generally, development can alter drainage patterns through grading and reduce the amount of pervious surface due to the introduction of impervious features such as roads, driveways, and rooftops. This results in an increase in runoff and decline in infiltration.

WATER BALANCE ASSESSMENT

To assess the proposed development's impact to the adjacent wetland complex considering both pre- and post-development conditions, a feature-based water balance assessment was completed and is enclosed for reference. The assessment was limited to the site only; external drainage to wetland was excluded from the assessment.

The primary objective of a feature-based water balance (FBWB) is to reasonably estimate the current annual runoff and infiltration inputs for a specific feature and then minimize the potential impacts to the feature as a result of development.

The site-only FBWB was completed in accordance with the *Hydrogeological Assessment Submissions – Conservation Authority Guidelines for Development Applications (2013)* using the Thornthwaite and Mather simplified engineering method for predicting annual rainfall surplus, as outlined by Steenhuis and Van Der Molen (1986).

Monthly precipitation and temperature normals from 1981 to 2010 were obtained from Environment Canada's Thornbury SLAMA Weather Station, located approximately 17 km west of the site. For this site, the water surplus was calculated to be 406.6 mm/yr. The total water surplus represents the water available for either runoff or infiltration inputs.

Infiltration Input

The infiltration portion of the surplus is estimated using infiltration factors available from the Ministry of Environment and Energy (MOEE) Hydrogeological Technical Information Requirements for Land Development Applications (1995). The factors consider the slope of the site, the soil conditions, and land cover. To determine the site-specific infiltration factor for the site the following was considered:

- The topography on site has rolling land, with an average slope of 1.7% from a west to east direction, and a slope of 3.8% from a south to north direction.
- The native soils consist of coarse-textured deposits of sand, gravel, with minor silt and clay, however, it should be noted that infiltration is limited by outcrops of Paleozoic bedrock and shallow drift cover.
- The existing landcover predominantly consists of woodland.

Based on this information, the pre-development infiltration factor for the site was determined to be 0.55. The existing infiltration catchment area was determined to be 3.06 ha as illustrated on Drawing FBWB.1.

Under pre-development site conditions, the annual infiltration input from the site to the wetland complex is 6,843 m^3.

As previously described, shallow groundwater is expected to diverge from the central high point of approximately 184.5 m, with flow directed both toward and away from the wetland complex. Because groundwater flow direction is controlled by subsurface gradients and cannot be altered through site grading, the infiltration catchment contributing to the wetland will remain the same under proposed conditions.

Based on the available Site Plan (Tatham, 2026), the post-development condition infiltration factor was determined to be 0.53.

Based on the available Site Plan (Tatham, 2026), the post-development annual infiltration input from the site to the wetland complex will be 5,629 m^3.

The annual infiltration deficit of 1,214 m^3 is the result of increased impervious areas including new roads, rooftops and driveways.

Runoff Input

The runoff portion of the surplus is calculated as the remainder of the surplus after infiltration.

The pre-development surface runoff catchment area was determined to be 3.44 ha as illustrated on Drawing FBWB.1. Under pre-development site conditions, the annual runoff input from the site to the wetland complex is 6,294 m^3.

The surface runoff catchment is anticipated to change under proposed conditions as a result of site grading. A localized portion of the site that drains toward the wetland complex under existing conditions will be redirected through grading, thereby reducing the surface runoff contribution to the wetland.

Based on the available Site Plan (Tatham, 2026), the post-development annual runoff input from the site to the wetland complex will be 6,528 m^3.

The annual runoff surplus of 234 m^3 is the result of proposed grading, which increases the impervious area draining to the wetland complex. The combined infiltration deficit and runoff surplus results in a total annual deficit of 980 m^3 contributing to the wetland feature from the site.

MITIGATED POST-DEVELOPMENT CONDITIONS

To address the annual water balance deficit contributing to the wetland complex, a proposed water balance assessment incorporating mitigative strategies was prepared.

Topsoil depths will be increased to 0.60 m throughout the infiltration catchment area through fill management to increase infiltration potential and mitigate the annual deficit. Through the increased topsoil depth strategy, the calculated annual deficit can be mitigated resulting in a net annual increase of 44 m^3 of water contributing to the wetland feature.

As previously noted, the wetland feature has a substantial catchment area of approximately 489.8 hectares upstream of the development area. The subject site is only 0.7% compared with this total area, indicating that any changes on-site will have a negligible influence on the overall hydrologic function of the wetland complex. Detailed water balance and mitigation measures calculations are enclosed for reference.

CLOSURE

This letter summarizes the results of the site-only FBWB assessment and demonstrates that impacts to the wetland water balance can be mitigated through increased topsoil depths within the infiltration catchment to achieve site-only water balance to the wetland complex. Given that the site represents only a small fraction of the overall catchment, the influence of any changes from this development on the wetland complex is expected to be negligible.

Yours truly,
Tatham Engineering Limited

Grace Trombino, B.Eng.
Engineering Candidate

Jacob Macdonald, B.A.Sc, P.Eng.
Engineer, Project Manager

JM/GT: rlh

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REFERENCES

- Armstrong and Dodge, 2007. Paleozoic Geology of Southern Ontario.
- Crozier Consulting Engineers, 2020. Eden Oak Servicing & Stormwater Management Implementation Report.
- Lake Simcoe Region Conservation Authority (LSRCA), 2013. Hydrogeological Assessment Submissions – Conservation Authority Guidelines for Development Applications.
- Ministry of Environment and Energy (MOEE), 1995. MOEE Hydrogeological Technical Information Requirements for Land Development Applications.
- Ontario Geological Survey (OGS), 2003. Surficial Geology of Ontario.
- Soil Engineers Ltd., 2026. Geotechnical Investigation for Proposed Residential Development. 372 Grey Road 21 West, Town of Blue Mountain.
- Soil Engineers Ltd., 2026. Hydrogeological Assessment, Proposed Residential Development. 372 Grey Road 21 West, Town of Blue Mountain.
- Steenhuis and Van Der Molen, 1986. The Thornthwaite-Mather Procedure as a Simple Engineering Method to Predict Recharge.
- Tatham, 2026. 372 Grey Road 21 West. Preliminary Stormwater Management Report.

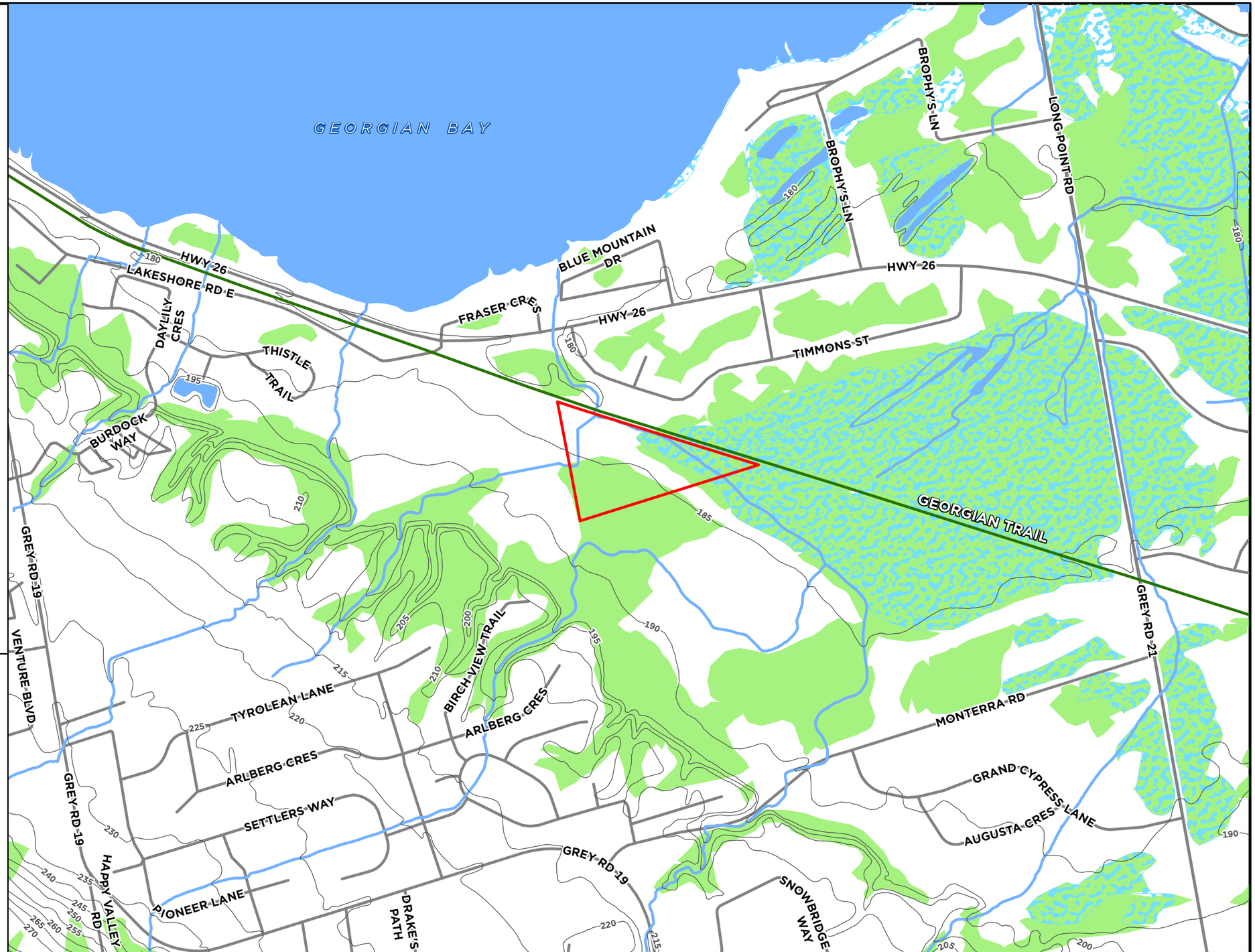
Attachments

N

NOTES:
1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
2. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – ONTARIO.

LEGEND

- SITE
- CONTOUR
- GEORGIAN TRAIL
- WETLAND
- ROADS
- WATERCOURSE
- WOODED AREA
- WATERBODY



0 200 400 800 METERS

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372 GREY ROAD 21
WATER BALANCE
SITE LOCATION PLAN

DWG. No. **FIG-1**

SCALE: 1:10,000 | DRAWN: AO | DATE: MAY. 2025 | JOB NO. 121088

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LEGEND

- EX. 5.0m CONTOUR
- EX. DRAINAGE FEATURE
- EX. ROAD
- DRAINAGE CATCHMENT
- 701 / 146.7 — CATCHMENT I.D. / AREA (ha)
- SUBJECT PROPERTY

372 GREY RD. 21

GEORGIAN BAY

CRAIGLEITH

NODE 1 (SWMF INLET)

NODE 2

NODE 3

HWY 26

GEORGIAN TRAIL

WATERCOURSE 7 (REGIONAL EVENT) 9.7m³/s

WATERCOURSE 6

WATERCOURSE 7

ROAD 19

6071	25.8
6062	11.7
6065	5.6
6064	7.5
6063	26.3
7021	34.5
6061	23.5
605	63.0
701	146.7
602	123.0
603	136.0
601	144.3

N

NOTES:

1. 5.0m CONTOURS (2.5m CONTOURS ARE INTERPOLATED)
2. CFCA UPDATED SUBWATERSHED DELINEATIONS

Project: EDEN OAK
TOWN of THE BLUE MOUNTAINS

Drawing: CFCA REVISED DELINEATION OF SUBWATERSHEDS 6 & 7
POST-DEVELOPMENT – CONTROLLED

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Drawn By	J.R.S.	Design By	K.M.	Project	218-2659
Scale	1: 15 000	Date	07/28/2020	Check By	K.M.
				Drawing	FIG. 5

J:\200\218 - Eden Oak\2659\CAD_Sheets\2659_203, 207.dwg, 207 - FIG. 5, 2020-09-25 8:59:41 AM, jpereira

555000
555200
555400
4929800
4929600

TIMMONS STREET

180
180
185
185
190

181.5
182.5
183.5
184.5
183.5
182.5
181.5
180.5
179.5
178.5

BH/MW 5
(183.22)

BH/MW 7
(183.73)

BH/MW 10
(184.6)

BH/MW 12
(182.05)

BH/MW 9
(184.59)

D:\Previous gis\GIS 2220\1-W051B\

N

References: Ontario Ministry of Natural Resources and Forestry

Key Map

Legend

- Approximate Boundary of Subject Site
- Borehole with Monitoring Well
- Local Road
- Ontario - 5 m
- Watercourse
- Highest Interpreted Shallow Groundwater Elevation Contour
- Highest Inferred Shallow Groundwater Elevation Contour
- Interpreted Shallow Groundwater Flow Direction
- (184.59) Highest Shallow Groundwater Level Measured on April 27, 2022

Soil Engineers Ltd.

Shallow Groundwater Flow Pattern Plan

Hydrogeological Assessment
Proposed Residential Development
372 Grey Road 21 West
Town of The Blue Mountains

Reference No. 2201-W051B

Date: April 24, 2026

Scale:

0 5 10 20 30 40 50
Metres

Drawing No. 9

EDEN OAK DEVELOPMENT

HOME FARM DEVELOPMENT

GEORGIAN TRAIL

WETLAND SETBACK

WETLAND LIMITS

TBM2
181.80

186.00

184.00

185.00

187.00

186.00

185.00

183.00

184.00

186.00

187.00

184.00

3.06
0.55 | 0%

3.44
0.55 | 0%

LEGEND

EX. MAJOR OVERLAND FLOW DIRECTION

WATERCOURSE 6

INFILTRATION DRAINAGE BOUNDARY

RUNOFF DRAINAGE BOUNDARY

AREA (HA)
I.F. | IMP%

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372 GREY ROAD 21
TOWN OF THE BLUE MOUNTAINS
FEATURE BASED WATER BALANCE
PRE-DEVELOPMENT CONDITIONS

DWG. No. **FBWB.1**

SCALE: 1:1750 | DRAWN: ARO | DATE: JUN2026 | JOB NO. 121088

Drawing Name: 121088-FBWB01.dwg, Plotted: Jun 30, 2026

EDEN OAK DEVELOPMENT

HOME FARM DEVELOPMENT

GEORGIAN TRAIL

WETLAND SETBACK

WETLAND LIMITS

180.50

181.00

181.50

182.50

183.00

183.50

184.00

185.50

186.00

187.00

3.06
0.53 | 14%

3.09
0.53 | 9%

LEGEND

PROP. MAJOR OVERLAND FLOW DIRECTION

WATERCOURSE 6

INFILTRATION DRAINAGE BOUNDARY

RUNOFF DRAINAGE BOUNDARY

AREA (HA)
I.F. | IMP%

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372 GREY ROAD 21
TOWN OF THE BLUE MOUNTAINS
FEATURE BASED WATER BALANCE
POST-DEVELOPMENT CONDITIONS

SCALE: 1:1750 | DRAWN: ARO | DATE: JUN2026 | JOB NO. 121088

DWG. No.
FBWB.2

Drawing Name: 121088-FBWB01.dwg, Plotted: Jun 30, 2026

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Water Budget
Climate Normal Data

Project Details

372 Grey Road 21	121088

Prepared By

GT	June, 2026

Water Budget Details

Methodology	Thornthwaite Method
Climate Data & Source	Thornbury SLAMA
	Climate Normal Data for 1984 to 2003 (Environment Canada)
Thornthwaite Coefficient	1.056

Month	Temp (°C)	Precip (mm)	Heat Index	PET (mm)	Daylight Factor	Days	Average Day Length	Adjusted PET (mm)	AET (mm)	Surplus (mm)	Deficit (mm)
Jan.	-6.3	100	0.0	0.0	0.77	31	9.290	0.0	0.0	100.0	0.0
Feb.	-5.4	68.4	0.0	0.0	0.87	28	10.464	0.0	0.0	68.4	0.0
Mar.	-1.5	64	0.0	0.0	1.00	31	11.941	0.0	0.0	64.0	0.0
Apr.	5.5	65.3	1.2	25.7	1.12	30	13.483	28.9	28.9	36.4	0.0
May	11.5	82.7	3.5	56.0	1.23	31	14.800	71.4	71.4	11.3	0.0
Jun.	16.7	79.1	6.2	83.0	1.29	30	15.477	107.1	79.1	0.0	28.0
Jul.	19.8	72.1	8.0	99.4	1.26	31	15.144	129.6	72.1	0.0	57.5
Aug.	19.2	78.2	7.7	96.2	1.17	31	13.989	115.9	78.2	0.0	37.7
Sep.	15.5	95.9	5.5	76.7	1.04	30	12.513	80.0	80.0	15.9	0.0
Oct.	9.1	87.3	2.5	43.7	0.92	31	10.983	41.4	41.4	45.9	0.0
Nov.	3.1	99.6	0.5	14.0	0.80	30	9.625	11.3	11.3	88.3	0.0
Dec.	-2.7	99.4	0.0	0.0	0.74	31	8.909	0.0	0.0	99.4	0.0
Total	**-**	**992**	**35.1**	**494.8**	**-**	**365**	**-**	**585.4**	**462.3**	**529.7**	**123.1**
Total Water Surplus											**406.6**

Additional Notes

PET = Potential Evapotranspiration; AET = Actual Evapotranspiration

Equations

$PET = 16\left(\frac{L}{12}\right)\left(\frac{N}{30}\right)\left(\frac{10T_d}{I}\right)^{\alpha}$ Where

PET is the estimated potential evapotranspiration (mm/month)

T_d is the average daily temperature (degrees Celsius; if this is negative, use 0) of the month being calculated

N is the number of days in the month being calculated

L is the average day length (hours) of the month being calculated

$\alpha = (6.75 \times 10^{-7})I^3 - (7.71 \times 10^{-5})I^2 + (1.792 \times 10^{-2})I + 0.49239$

$I = \sum_{i=1}^{12}\left(\frac{T_{m_i}}{5}\right)^{1.514}$ is a heat index which depends on the 12 monthly mean temperatures T_{m_i}.[1]

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Feature Base Water Budget

Pre and Post Development Comparison

Project Details

372 Grey Road 21	121088

Prepared By

GT	June, 2026

Pre-Development Catchment Details

	Infiltration	Runoff
Area (ha)	3.06	3.44
Pervious Area (ha)	3.06	3.44
Impervious Area (ha)	0.00	0.00

Post Development Catchment Details

	Infiltration	Runoff
Area (ha)	3.06	3.09
Pervious Area (ha)	2.63	2.82
Impervious Area (ha)	0.43	0.27

Infiltration Factor

Infiltration Factor	Pre-Development		Post Development	
	Pervious	Impervious	Pervious	Impervious
Topography	0.150	0.0	0.150	0.0
Soil	0.200	0.0	0.200	0.0
Land Cover	0.200	0.0	0.176	0.0
Infiltration Factor	0.550	0.0	0.526	0.0

Water Budget	Pre-Development					Post-Development				
	Infiltration		Runoff			Infiltration		Runoff		
Water Budget	Pervious	Impervious	Pervious	Impervious	Total	Pervious	Impervious	Pervious	Impervious	Total
Water Surplus (m^3)	12,442	0	13,987	0		10,693	1,748	11,466	1,098	
Infiltration (m^3)	6,843	0			6,843	5,629	0			5,629
Runoff (m^3)			6,294	0	6,294			5,430	1,098	6,528
Reduction in Volume to Wetland (m^3)										**980**

Additional Notes

Assessment limited to development site, external drainage to wetland not accounted for.

Infiltration Factors

Topography	Flat Land, average slope < 0.6 m/km	0.3
	Rolling Land, average slope 2.8 m to 3.8 m/km	0.2
	Hilly Land, average slope 28 m to 47 m/km	0.1
Soils	Tight impervious clay	0.1
	Medium combinations of clay and loam	0.2
	Open Sandy loam	0.4
Cover	Cultivated Land	0.1
	Woodland	0.2

(Stormwater Planning and Design Manual. MOE, 2003.)

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Water Budget

Mitigation Measures - Increase Topsoil Depth

Project Details

372 Grey Road 21	121088

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GT	June, 2026

Increase Topsoil Depth Design

Existing Topsoil Depth (m)	0.28
Proposed Lawn Area (ha)	0.98
Proposed Topsoil Depth (m)	0.60
Percentage of Pervious Area	33%
Percent Reduction in Runoff	53%
Reduction in Pervious Runoff	18%
Reduction in Pervious Runoff (m^3)	1,024

Additional Notes

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Water Budget
Summary

Project Details

372 Grey Road 21	121088

Prepared By

GT	June, 2026

Summary

	Pre-Development	Post-Development	Change
Infiltration (m^3)	6,843	5,629	-1,214
Runoff (m^3)	6,294	6,528	234
Total (m^3)	13,137	12,157	-980

Proposed Infiltration Measures

	Mitigative Grading
x	Increase Topsoil Depth

Mitigation - Increase Topsoil Reduction in Pervious Runoff (m^3)	1,024
Proposed Runoff (m^3)	6,528
Runoff Change after Mitigation (m^3)	234
Proposed Infiltration (m^3)	6,654
Infiltration Change after Mitigation (m^3)	-189
Total Change after Mitigation (m^3)	44

Additional Notes