

Douglas Landing Subdivision Wetland Water Balance Risk Evaluation

Prepared for

Douglas Landing Developments

1 Forillon Crescent
Kanata, ON K2M 2W5

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Prepared by



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1. Introduction

GeoProcess Research Associates Inc. (GeoProcess) was retained by Douglas Landing Developments (1503948 Ontario Inc.) to undertake a Wetland Water Balance Risk Evaluation for the property located at 9243 McArton Road in Beckwith Township, Lanark County (Subject Property). The Subject Property (Map 1), which is legally described as Part of Lot 25, Concession 12, consists of approximately 22.2 ha and is located within the jurisdiction of the Mississippi Valley Conservation Authority (MVCA).

Development of the Subject Property is proposed in the form of 23 privately serviced estate residential lots and approximately 1093 m of paved internal road with a rural cross-section. The purpose of this report is to address comments issued by MVCA (dated April 24, 2025) on the Draft Plan of Subdivision first submission, requesting a Wetland Water Balance Risk Evaluation to evaluate the timing and magnitude of post-development flows relative to pre-development and to demonstrate the maintenance of water balance to the existing wetland identified for protection within the Subject Property.

Specifically, the following tasks were undertaken in support of this study:

- Wetland Risk Evaluation: Referencing the Toronto and Region Conservation Authority (TRCA) *Wetland Water Balance Risk Evaluation* guidance document, determine the level of risk to the wetland based on the following (TRCA 2017):
 - Evaluate the magnitude of potential hydrological change based on relevant information presented in the Tatham Engineering (Tatham) Preliminary Stormwater Management Report and Pinchin Ltd. (Pinchin) Terrain Assessment and Hydrogeological Study (Pinchin 2025a; Tatham 2025).
 - Determine the wetland sensitivity to hydrological change based on information presented in the Pinchin Environmental Impact Study (EIS) and a reconnaissance-level field assessment to confirm existing wetland conditions (Pinchin 2025b).
 - Assign a level of risk to the wetland.
- Wetland Water Balance Assessment to evaluate potential impacts associated with changes to the timing and magnitude of post-development flows relative to pre-development conditions. In accordance with comments provided by MVCA, the Wetland Water Balance Assessment included the following:
 - Consultation with MVCA staff to confirm the Wetland Risk Assessment preliminary findings and Water Balance Assessment study design.
 - Hydrologic impact assessment model using the Environmental Protection Agency (EPA) Storm Water Management Model (SWMM), with results summarized in a monthly format for each of the following scenarios:
 - Existing conditions.
 - Proposed conditions in the absence of mitigation options.
 - Proposed conditions incorporating proposed mitigation measures.

2. Policy Context

2.1. MVCA Regulation Policies

The Subject Property contains wetland and watercourse features that are regulated by MVCA under *Ontario Regulation 41/24: Prohibited Activities, Exemptions and Permits* filed under the *Conservation Authorities Act*. Prior permission through the issuance of a permit is required from MVCA for any development within the regulatory limit. A permit is also required for any alteration to a river, creek, stream, or watercourse or any interference with the hydrological function of a wetland. Specific details are provided in the *MVCA Regulation Policies* document, which was updated pursuant to the requirements of Section 12 of Ontario Regulation 41/24 (MVCA 2024). MVCA may grant permission for development within or adjacent to a regulated feature if it can be demonstrated that the proposed activities will not result in negative impacts on natural features (including adjacent lands) or their ecological or hydrologic functions.

2.1.1. Agency Consultation

A consultation meeting was held with MVCA staff on July 10, 2025, to review the preliminary wetland risk assessment results and discuss the proposed wetland water balance hydrologic modelling scope of work. Comments on the consultation meeting minutes and water balance modelling scope of work were provided by MVCA on August 8, 2025. This report has been prepared in accordance with the meeting summary and incorporates relevant information to address the MVCA August 8, 2025, comments. Copies of the consultation meeting summary and MVCA comments are provided in Appendix A.

3. Background Review

The following sections summarize background information relevant to this study.

3.1. Geotechnical Investigation (Pinchin 2025a)

Pinchin completed a Geotechnical Investigation to delineate the subsurface conditions and soil engineering characteristics by advancing ten (10) sampled boreholes within the Subject Property (Pinchin 2025a). The boreholes were advanced to sampled depths ranging from approximately 0.3 to 0.6 metres below existing ground surface (mbgs), where refusal was encountered on probable bedrock. Groundwater observations and measurements were obtained from the open boreholes during and upon completion of drilling.

In general, the soil stratigraphy at the Site comprises surficial organics overlying glacial till and probable bedrock. Surficial organics were encountered in all boreholes, ranging in thickness from approximately 50 to 150 mm. Glacial till underlying the surficial organics was encountered in all of the boreholes and extended down to the underlying probable bedrock surface located between approximately 0.3 and 0.6 mbgs. Groundwater was not encountered within the open boreholes upon completion of drilling and was not expected to be encountered in the overburden material during construction excavations; however, the report noted the potential to encounter groundwater during bedrock excavations.

3.2. Preliminary Stormwater Management Report (Tatham 2025)

Tatham prepared a Preliminary Stormwater Management Report for the Subject Property (Tatham 2025). The purpose of the report was to demonstrate the feasibility of the proposed development as it relates to stormwater management in the context of relevant policies, regulations, and design guidelines/criteria. Under existing conditions, the Subject Property consists of approximately 22.2 ha of land. The western portion of the Subject Property (Catchment 101 – 6.2 ha) drains to the adjacent agricultural lands west of the property, which convey runoff to the Munro Municipal Drain. The remainder of the Subject Property (Catchment 102 – 16.0 ha) drains to the existing wetland feature that is central to the property (Wetland W1), surrounding the existing watercourse (MMD2-T1) that traverses the Subject Property. The wetland and watercourse drain towards the Munro Municipal Drain Branch 2 drainage ditch located within an unopened road allowance along the southern property boundary. The drainage ditch conveys flows in a westerly direction to the Munro Municipal Drain. The report concluded that there is no external drainage area draining to the Subject Property.

The proposed development plan consists of 23 privately serviced estate residential lots and approximately 1093 m of paved internal road having a rural cross-section. The future land cover will be comprised of impervious areas (residential homes, driveways, and roadways), landscaped areas, and natural heritage features to be protected within the proposed Natural Heritage System (NHS). Access to the subdivision will be provided by an extension to Douglas Side Road, which will require an extension of the Munro Municipal Drain Branch 2 drainage ditch and an internal local road. Along the northern property limit, realignment of watercourse MMD2-T1 is proposed to accommodate the internal road network. The realigned portion of MMD2-T1 will be constructed to replicate the existing watercourse form and dimensions.

The preliminary grading and stormwater management plans developed by Tatham for the Subject Property maintain existing drainage patterns to the greatest extent possible while directing major flows to the proposed stormwater management facilities (SWMF) and existing surface water outlets (Tatham 2025). Runoff from Catchment 201, which consists of rear lot areas, will drain uncontrolled to the adjacent lands to the west and (eventually) to the Munro Municipal Drain. Runoff from Catchment 202, which consists of internal lot areas and roadways, will drain to a dry SWMF (SWMF1). SWMF1 will overcontrol flows from Catchment 202 to account for uncontrolled peak flows draining from Catchment 203 (wetland feature W1 – 11.0 ha) and will outlet to the drainage ditch south of the Subject Property. A small portion of Catchment 203 (11.6 ha) will drain directly to the Munro Municipal Drain Branch 2 drainage ditch south of the Subject Property. Catchment 204, which consists of wetland feature W2, internal lot areas, and internal roadways, will drain to a dry SWMF (SWMF2) that will outlet to wetland feature W1.

The report demonstrated that the proposed stormwater management plan could effectively attenuate the 2-year through 100-year post-development peak flows to match existing conditions. Due to the high bedrock elevations across the Subject Property, conveyance controls such as infiltration trenches and perforated pipes were not recommended as a practical option to reduce runoff volume and promote infiltration. Within each individual lot, roof leaders will direct drainage to pervious front and rear lot areas to promote infiltration.

3.3. Scoped Environmental Impact Study (Pinchin 2025b)

Pinchin completed a scoped EIS to identify natural heritage features present on, or immediately adjacent to, the Subject Property, characterize their ecological functions, evaluate potential adverse impacts to those natural features, and provide recommended measures to avoid or mitigate potential impacts (Pinchin 2025b).

The scoped EIS included a field assessment to characterize vegetation communities using the provincial Ecological Land Classification (ELC) system, as well as a wetland assessment following the Ontario Ministry of Natural Resources (MNR) *Ontario Wetland Evaluation System* (OWES) 3rd Edition (MNR 2014). Significant wildlife habitat was assessed according to the MNR Natural Heritage Reference Manual and the MNR Significant Wildlife Habitat Technical Guide (MNR 2010; MNR 2015).

4. Wetland Water Balance Risk Evaluation

The following sections outline methods and results associated with the wetland water balance risk evaluation completed by GeoProcess for the Subject Property.

4.1. Wetland Risk Evaluation

The TRCA *Wetland Water Balance Risk Evaluation* guidance document supports the TRCA *Stormwater Management Criteria* document by describing water balance requirements for wetland features identified for protection as part of a planning or infrastructure review and approval process (TRCA 2012; TRCA 2017). The Risk Evaluation assigns a level of risk to a proposal, considering two main factors:

1. The potential magnitude of hydrological change that would occur in the absence of a mitigation strategy.
2. The sensitivity of the wetland to hydrological change.

The potential magnitude of change and sensitivity of the wetland are evaluated together to determine the overall level of risk to wetland hydrology associated with the proposed activities, following a four-step process:

- Step 1. Determine which retained wetland(s) may be impacted by the proposal.
- Step 2. Determine the magnitude of potential hydrological change.
- Step 3. Determine the sensitivity of the wetland and its associated flora and fauna to hydrological change.
- Step 4. Integrate information from steps 1, 2, and 3 to assign a level of risk to the proposal.

4.1.1. Step 1: Determine the Potentially Impacted Wetland(s)

The Pinchin (2025b) scoped EIS identified two (2) wetland features to be retained within the Subject Property (Map 1). The wetland communities were delineated using ELC data, which characterized wetland feature W1 as a Speckled Alder Mineral Deciduous Swamp (SWTM1-1) with a narrow band of Reed-canary Grass Graminoid Mineral Meadow Marsh (MAMM1-3) delineated along watercourse MMD2-T1 that bisects the Subject Property. A second Speckled Alder Mineral Deciduous Swamp (SWTM1-1) community (wetland feature W2) was identified in the southeast corner of the Subject Property. The report characterized the wetlands as providing good value to the area for both flood control and wildlife habitat and noted that both could be included in the off-property Provincially Significant Manion Corners (Long Swamp) Wetland Complex located off-property, south of the unopened road allowance. For the purposes of this study, the wetland risk evaluation and water balance analysis were limited to wetland feature W1, as wetland W2 does not receive drainage from the Subject Property and will be retained within the proposed NHS.

4.1.2. Step 2: Determine the Magnitude of Potential Hydrologic Change

The TRCA Risk Evaluation requires consideration of the following parameters to evaluate the magnitude of potential hydrologic impact on a wetland feature (TRCA 2017):

- The proportion of impervious cover in the wetland catchment that would result from the proposed activities.
- The degree of change in the wetland catchment size.
- The degree of water taking from, or discharge to, surface water bodies or aquifers directly connected to the wetland.
- The impact on locally significant recharge areas.

Table 1 summarizes the results of the magnitude of potential hydrologic change analysis, which indicate a low probability of potential hydrologic impacts.

Table 1: Step 2: Magnitude and probability of potential hydrological change – Wetland W1.

Parameter	Value	Source	Probability of Hydrologic Change	Notes
Wetland feature limits	4.92 ha	Tatham (2025) and Pinchin (2025b)	--	Excludes the 30 m MVCA regulatory setback to ensure a conservative approach.
Extent and size of pre-development catchment (C)	16.0 ha	Tatham (2025)	--	Contributing drainage area is contained within the Subject Property – Catchment 102.
Total development area of catchment (C _{dev})	11.1 ha	Calculated value	--	
Area of wetland catchment owned by proponent	16.0 ha	Tatham (2025)	--	
Proposed extent and size of post-development catchment	14.9 ha	Tatham (2025)	--	Combined area of post-development Catchments 203 and 204.
Percent of impervious cover planned within the proponent's holdings (IC)	3.69%	Calculated value	Low	Weighted average of Catchment 203 and 204 estimated imperviousness.
Increase or decrease in catchment size	6.88%	Calculated value	Low	
Anticipated magnitude of water taking	< 50,000 L/day	Pinchin (2025a)	Low	Excavations to conventional design depths for the building foundations are not expected to require a Permit to Take Water or a submission to the Environmental Activity and Sector Registry (EASR).
Location and extent of any locally significant recharge areas	N/A	MCVA open data and Pinchin (2025a)	Low	No significant recharge areas present within Subject Property.

While the Pinchin scoped EIS noted that wetland feature W1 could be included in the Provincially Significant Manion Corners (Long Swamp) Wetland Complex south of the Subject Property due to their ecological connectivity, the Tatham Preliminary Stormwater Management Report determined that the wetland catchment area is contained entirely within the Subject Property (Pinchin 2025b; Tatham 2025). The wetland complex south of the unopened road allowance drains to Munro Municipal Drain Branch 2 drainage ditch within the road allowance, creating a drainage divide between the two wetlands and conveying flows in a westerly direction to the Munro Municipal Drain. Based on this information, wetland features and associated catchment areas external to the Subject Property were not considered in the wetland sensitivity and water balance analysis.

4.1.3. Step 3: Determine the Wetland Sensitivity

Wetland sensitivity to hydrological change was assessed using a set of biotic and abiotic indicators as per the TRCA Risk Evaluation (TRCA 2017). Criteria included vegetation community type, presence of hydrologically sensitive flora and fauna, known significant wildlife habitat, and hydrological classification of the wetland. Wetlands containing high-sensitivity species or communities are generally assigned to a higher magnitude category. The criterion with the highest sensitivity ranking governed the overall sensitivity classification. The following sections provide information as presented in the scoped EIS (Pinchin 2025b) and data collected through a site investigation undertaken by GeoProcess on July 17, 2025 (refer to Appendix B).

Vegetation Community

Referencing Appendix 2 of the TRCA Risk Evaluation, the Speckled Alder Mineral Deciduous Swamp (SWMT1-1) community type is classified as a medium sensitivity community (TRCA 2017). The presence of this community results in a Medium Sensitivity vegetation community sensitivity classification.

Fauna Species

No seasonal surveys for fauna were conducted in support of the Pinchin scoped EIS (Pinchin 2025b). Reported incidental wildlife observations from Pinchin Scope EIS and GeoProcess documented one (1) medium sensitivity species: Common Yellowthroat (non-breeding) (*Geothlypis trichas*), resulting in wetland W1 being ranked as Medium Sensitivity.

Flora Species

The Pinchin (2025b) scoped EIS documented three (3) medium-sensitivity flora species: Balsam Fir (*Abies balsamea*), Black Ash (*Fraxinus nigra*), and White Cedar (*Thuja occidentalis*). As the Risk Evaluation was developed for application in TRCA jurisdiction, not all of the flora species documented in the scoped EIS could be ranked using the guidance document. For these species, sensitivity rankings were determined referencing the Ontario Natural Heritage Information Centre (NHIC) species list. Based on the results, wetland feature W1 was ranked as Medium Sensitivity.

Significant Wildlife Habitat

Wetlands have the potential to provide critical habitat for a variety of species, including those that are difficult to detect, locally rare, or used on a seasonal basis. To ensure a conservative approach, any habitats listed as Candidate Significant Wildlife Habitat (SWH) in the Pinchin (2025b) scoped EIS were cross-referenced with the MNR Significant Wildlife Habitat Mitigation Support Tool and the TRCA Risk Evaluation to determine whether Candidate SWH provided habitat for high-sensitivity species (MNR 2015; TRCA 2017; Pinchin 2025b). This analysis identified potential for turtle nesting habitat, waterfowl stopover and staging habitat, and marsh bird breeding habitat within wetland feature W1. During the site investigation conducted by GeoProcess on July 17, 2025, a qualified ecologist evaluated wetland W1 and determined that turtle nesting habitat is not present within the wetland unit; however, it could not be determined whether or not waterfowl stopover and staging habitat and marsh bird breeding habitat are present without seasonal fauna surveys. To ensure a conservative approach, potential SWH were assumed to be present, and wetland feature W1 was ranked as High Sensitivity.

Wetland Sensitivity to Hydrologic Change

Wetland W1 was classified as a palustrine wetland based on the presence of an intermittent channelized surface water inflow (MMD2-T1) and permanent or intermittent channelized surface water outflow (Munro Municipal Drain Branch 2, MMD2). Based on this classification and the presence of a medium-sensitivity vegetation community, wetland feature W1 was ranked as High Sensitivity.

4.1.4. Step 4: Assign a Level of Risk

Referencing the TRCA Risk Evaluation Wetland Risk Assessment Decision Tree, wetland W1 was classified as **Low Risk** (TRCA 2017). Based on this classification, monitoring is not required; however, a wetland water balance assessment using a non-continuous hydrological modeling approach is required to evaluate potential impacts associated with changes to the timing and magnitude of post-development flows relative to pre-development conditions.

4.2. Wetland Water Balance Assessment

A wetland water balance was undertaken to quantify potential hydrologic impacts to wetland feature W1 within the Subject Property. A water balance can be used to quantify the site-scale water budget at a basic level by summing up the water contributed by each of the components of the hydrologic cycle. As recommended by MVCA, a Class A assessment was undertaken, as outlined in Appendix 5 of the Ministry of the Environment, Conservation and Parks (MECP) guidelines (2022). The EPA SWMM software was used to simulate the precipitation, evaporation, infiltration, and runoff for a range of conditions under the existing and proposed conditions. The analysis was run over an entire year, using average daily values. The output was summarized into a monthly average format, allowing for easy comparison of the existing and proposed conditions. The sections below outline model input data, parameters, and assumptions, and the associated results.

4.2.1. Model Input Data and Parameters

The catchments used in the analysis were previously delineated in the Douglas Landing Subdivision Preliminary Stormwater Management Report (Tatham 2025). It is noted that the previous analysis confirmed that there was no overland flow entering the Subject Property, resulting from the topography and the drainage ditch along Douglas Side Road (Tatham 2025). Topographic survey data (2025) was reviewed, and it was determined that there were no significant impacts to the previously delineated catchments. Using these conditions, runoff from each catchment was calculated using the Dynamic Wave equation (section 3.4.5 of Rossman and Simon 2022). Catchment data that was incorporated into the water balance model is summarized in Table 2 and shown in Map 2.

Table 2: Summary of catchment data for the water balance model.

Condition	Catchment ID	Land Use ¹	Manning's Roughness ²	Area (ha) ³	Longest Flow Path (m) ⁴	Width (m) ⁵	Slope (%) ⁴	Percent Impervious ⁴
Existing	101	Pasture	0.3	5.25	282	185	1.4	0
		Woodland	0.6	0.95	57	124	5.0	0
	102	Woodland	0.6	13.08	314	360	0.8	0
		Pasture-S	0.3	1.34	102	154	1.0	0
		Pasture-N	0.3	1.58	58	419	0.5	0
Proposed	201	Residential Lots	0.25	2.7	225	120	1.2	5.2
	202	Residential Lots	0.25	4.6	376	122	0.5	15.6
	203	Forested-Wetland	0.6	11.6	502	219	0.6	3.7
	204	Residential Lots	0.25	3.3	102	382	2.1	9.7

The infiltration was modelled using the Curve Number method (section 3.4.2 of Rossman and Simon 2022). The Curve Numbers were previously calculated for each of the catchments (Tatham 2025), and are summarized in Table 3. An average drying time of 7 days was assumed for all the catchments.

Table 3: Summary of Curve Numbers used to categorize the infiltration in the water balance model.

Condition	Catchment ID	Curve Number
Existing	101-Pasture	60
	101-Woodland	69
	102-Woodland	69
	102-Pasture-S	60
	102-Pasture-N	60
Proposed	201	69.6
	202	73.0
	203	64.0
	204	66.8

¹ The land use was characterized using aerial imagery and the Southern Ontario Land Resource Information System (SOLRIS) version 3 (MNR 2019).

² Manning's roughness values were referenced from Table 3.2.9 (overland) from the Technical Guidelines for Flood Hazard Mapping (EWRG 2017) for lawns, cultivated and woodlands.

³ The areas for the existing catchments were calculated using QGIS. The areas for the proposed catchments were taken from the Douglas Landing Subdivision Preliminary Stormwater Management Report (Tatham 2025).

⁴ The flow paths and slope for the existing conditions were estimated based on the contours provided (Fairhall, Moffatt & Woodland Limited). The proposed flow paths, slopes, and percent impervious were provided (Tatham 2025).

⁵ The existing catchment widths were calculated by dividing the area by the longest flow path. The proposed widths were provided (Tatham 2025).

Precipitation and temperature data were taken from the Environment Canada Historical Climate Data records. Average daily climate data from two weather stations were reviewed: Ashton (station ID 6100363, with a period of record from 1959 to 1973) and Appleton (station ID 6100285, with an ongoing period of record from 1992), located approximately 1.5 km and 3 km from the Subject Property, respectively. The monthly data from both stations were reviewed to ensure that sufficient data were present to provide representative conditions. Therefore, if data were missing for more than 3 days of a given month, the data were deemed insufficiently continuous. This resulted in 37 years of adequate precipitation data and 25 years of adequate temperature data.

To gain an understanding of a range of climatic conditions, the water balance was assessed for multiple years. Highly saturated and unsaturated conditions (i.e., the wet and dry years) were included to understand the extremes associated with the climate conditions at the Subject Property. Additionally, a moderate and more frequently occurring conditions (i.e., the average year) were modelled to understand the anticipated annual performance. The climate data was further reviewed to identify the years with the most and least cumulative precipitation (i.e., the wet and dry years). An “average year” was recognized as the year with annual cumulative precipitation closest to the average for the period of record (i.e., 892 mm). Following this quality control, the years 2017, 2023, and 2001 were identified as wet, average, and dry years. Climate data taken from the Appleton weather station for each of these years, as integrated in the water balance analysis, are summarized in Table 4.

Wind speed was used within the model to compute snowmelt rates under rainfall conditions. Melt rates increase with increasing wind speed. The monthly average wind speed was determined from the historical data from The Weather Network for the Town of Ashton (The Weather Network 2025) and is included in Table 4.

It is noted that groundwater was not included in the water balance assessment. The geological assessments identified that groundwater was not encountered above the bedrock in any of the boreholes investigated (Pinchin 2025c). Therefore, the aquifers were assumed to be isolated and the contributions were insignificant to the water balance.

Table 4: Monthly temperature and precipitation data used in the water balance analysis.

Parameter	Scenario	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Annual Avg/Total
Temperature (°C)	Wet Year (2017)	-5.3	-4.8	-5.2	7.5	12.0	17.9	19.9	18.9	17.2	12.0	0.4	-9.7	6.7
	Avg. Year (2023)	-5.0	-7.0	-1.4	8.0	12.6	18.7	21.6	18.7	16.9	11.3	1.2	-1.9	7.8
	Dry Year (2001)	-9.2	-8.8	-3.4	6.7	14.1	18.9	19.7	21.6	15.5	9.5	4.7	-1.1	7.3
Cumulative Precipitation (mm)	Wet Year (2017)	55	83	76	126	165	141	261	86	44	152	92	50	1331
	Avg. Year (2023)	87.4	55.8	60.0	102.0	56.0	89.4	150.8	89.4	28.8	62.2	22.0	86.8	891
	Dry Year (2001)	57	45	44	10	44	75	14	85	79	93	78	77	701
Wind Speed (km/hr)	all	13	13	14	14	12	11	10	10	11	12	12	13	12.1

NOTE: Precipitation is cumulative. All data from the Appleton Environment Canada weather station (ID 6100285). Wind speed taken from The Weather Network (2025).

Storage within the proposed stormwater management facilities (SWMF) was modelled in the proposed conditions using Storage Unit nodes. The proposed conditions include two SWMFs; SWMF #1 in the southern corner of the Subject Property receives flows from Catchment 202, and SWMF #2 is located north of the central wetland and receives flow from Catchment 204. SWMF #1 is proposed to discharge to the ditch along Douglas Side Road, and SWMF #2 is proposed to discharge to the central wetland. It was assumed that the discharge pipe was a 200 mm circular corrugated steel pipe for this assessment. SWMF locations and subcatchment land cover parameters as defined in the Tatham (2025) Preliminary Stormwater Management report are shown in Map 2.

SWMF invert elevation, storage curve, maximum depth, and surcharge depth were all taken from the Tatham (2025) Preliminary Stormwater Management report and drawings are summarized in Table 5. The SWMF were assumed to have seepage loss with a suction head of 166.8 mm and hydraulic conductivity of 6.8 mm/hr, corresponding to values for silty loam (Table 3.2.5, EWRG 2017). To facilitate the discharge of SWMF 2 to wetland W1, the northern part of the wetland was modelled as a Storage Unit within the proposed model. The invert elevation and depth were determined from the LiDAR and topographic survey data. The storage curve was developed using the AutoCAD Stage-Storage function. Seepage was allowed for the wetland storage unit, and the parameters were selected for a loam material (Table 3.2.5, EWRG 2017). The parameters for each of the Storage Units are provided in Table 5 and the storage curves are proposed in Table 6.

Table 5: Storage unit parameters for the proposed condition water balance model.

Parameter		SWMF #1	SWMF #2	Central Wetland
Invert Elevation (m)		133.65	135.75	135.2
Maximum Depth (m)		0.7	0.95	1.3
Surcharge Depth (m)		0.3	0.3	0
Seepage Loss Conditions	Suction Head (mm)	166.8		88.9
	Hydraulic Conductivity (mm/hr)	6.8		13.2

Table 6: Storage curves for the storage units in the proposed condition model.

Depth (m)	Cumulative Area (m2)		
	SWMF #1	SWMF #2	Central Wetland
0	2623	1307	1
0.05	2686	1335.02	-
0.1	2750	1363.33	44
0.15	2814	1391.94	-
0.2	2879	1420.85	122
0.25	2945	1450.05	-
0.3	3012	1479.56	289
0.35	3079	1509.36	-
0.4	3147	1539.45	1432
0.45	3216	1569.85	-
0.5	3286	1600.54	4003
0.55	3356	1631.53	-
0.6	3427	1662.81	6974
0.65	3499	1694.39	-
0.7	3572	1726.27	8504
0.75	3645	1758.45	-
0.8	3719	1790.92	9908
0.85	3794	1823.69	-
0.9	3870	1856.76	11034
0.95	3946	1890.12	-
1	4023	1923.79	11979
1.05	-	1957.74	-
1.1	-	1992	12770
1.15	-	-	-
1.2	-	-	12942
1.25	-	-	-
1.3	-	-	13011

4.2.2. Results

The daily results for each of the scenarios (i.e., wet, average, and dry years) were exported from the “System” object in EPA SWMM. To ensure direct comparison of the different variables, the output was converted into volume. The equations used for each of the conversions are provided in Table 7.

Table 7: Equations for converting output into volume.

Variable	Daily Output Units	Equation to Convert to Daily Volume
Precipitation (P)	mm/hr	$\frac{P \times 24 \text{ (hr/day)}}{1000 \text{ (mm/m)}} \times \text{Area}$
Infiltration (I)	mm/hr	$\frac{I \times 24 \text{ (hr/day)}}{1000 \text{ (mm/m)}} \times \text{Area}$
Runoff (R)	m ³ /s	$R \times 86,400 \text{ (sec/day)}$
Storage (S)	m ³	$\sum S_{\text{storage units}} - \sum S_{\text{conduits}}$
Evaporation (E)	mm/day	$\frac{E}{1000 \text{ (mm/m)}} \times \text{Area}$

NOTE: The area was rounded to 22,000 m² for all calculations.

Once the data was converted to volume, monthly summaries were tabulated for each of the scenarios. This provided insight into how each parameter varied between the existing and proposed conditions under each of the scenarios. Further, the results were tabulated into annual summaries to understand the cumulative impacts of the proposed conditions. The monthly and yearly results are summarized in Table 8 and Table 9, respectively, and graphed in Figure 1.

The volume of infiltration varies between the existing and proposed conditions, where the proposed conditions have more infiltration at the start of the year, and the existing conditions have more infiltration at the end of the year. However, under all the scenarios, the existing conditions have more cumulative infiltration within the year. In contrast, the runoff and storage within the proposed conditions are higher in most months, and cumulatively. It is noted that there is no storage modelled in the existing conditions, as depression storage was not included in the model. The evaporation between the two scenarios is very similar.

The cumulative results show that the differences between the existing and proposed conditions are less than 6% for each scenario. This means that the decrease in the total volume of infiltration and the increase in the total volume of runoff (caused by the proposed roads and buildings) will be captured by the proposed storage. This suggests that the existing and proposed conditions have a very similar balance of water within the Subject Property.

Additionally, under the wet and average scenarios, the existing and proposed cumulative results differed by less than 3%. It is noted that the EPA SWMM model reported an average runoff continuity and flow routing errors of approximately 6% of the total annual volume. This suggests that the difference between the existing and proposed conditions is within the model tolerance and can be considered negligible.

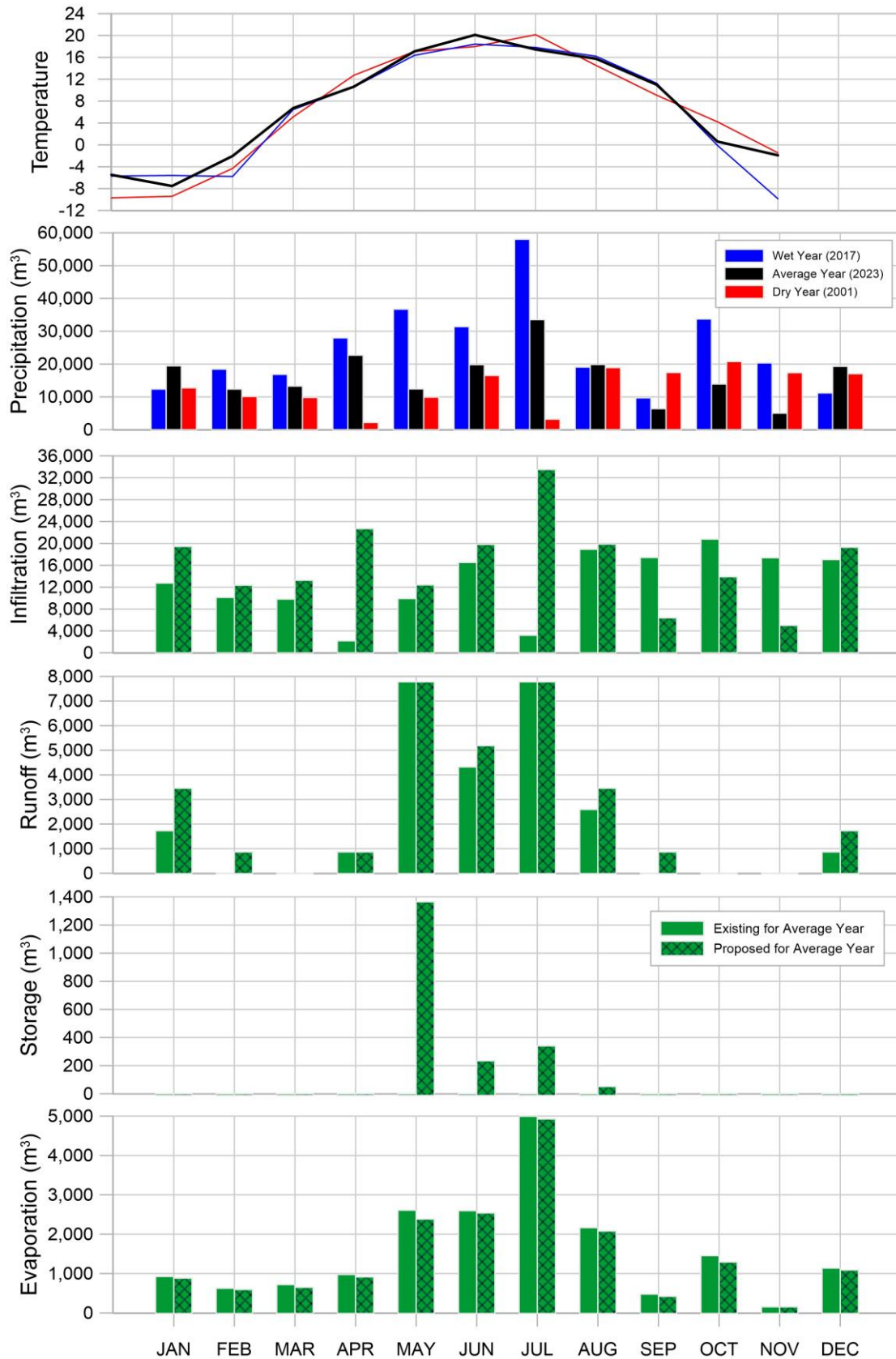


Figure 1: Monthly output from water balance analysis.

Table 8: Monthly output from water balance analysis.

Scenario	Condition	Parameter	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wet Year (2017)	Existing	Precipitation	12,361	18,435	16,890	28,079	36,763	31,488	58,075	19,074	9,697	33,726	20,513	11,295
		Infiltration	11,295	16,037	15,025	21,685	24,029	21,205	30,583	17,209	8,152	25,042	12,201	10,496
		Runoff	0	864	0	5,184	10,368	7,776	31,968	864	864	8,640	7,776	0
		Storage	38	78	77	127	258	162	531	53	32	159	194	30
		Evaporation	524	819	1,541	2,145	4,385	3,934	8,454	1,827	1,017	1,687	1,734	593
	Proposed	Precipitation	12,361	18,435	16,836	27,972	36,710	31,382	58,022	19,074	9,697	33,726	20,353	11,189
		Infiltration	10,336	14,705	13,586	20,033	22,111	19,074	26,693	15,824	7,619	22,964	10,709	9,804
		Runoff	864	1,728	864	4,320	11,232	7,776	31,968	1,728	864	8,640	7,776	0
		Storage	0	1	0	451	930	488	14,146	0	0	2,051	4,331	0
		Evaporation	517	806	1,585	1,985	4,000	3,605	7,446	1,663	937	1,570	1,776	559
Average Year (2023)	Existing	Precipitation	19,447	12,414	13,320	22,697	12,414	19,820	33,513	19,873	6,447	13,906	5,008	19,447
		Infiltration	16,836	11,508	12,308	18,062	7,459	16,890	24,722	16,836	5,808	11,988	4,689	16,943
		Runoff	1,728	0	0	864	7,776	4,320	7,776	2,592	0	0	0	864
		Storage	0	0	0	0	0	0	0	0	0	0	0	0
		Evaporation	926	626	719	975	2,609	2,597	4,995	2,165	477	1,454	155	1,139
	Proposed	Precipitation	19,447	12,361	13,267	22,697	12,414	19,820	33,513	19,873	6,394	13,906	5,008	19,287
		Infiltration	15,398	10,656	11,349	16,517	6,873	15,025	22,697	15,451	5,381	11,029	4,316	15,611
		Runoff	3,456	864	0	864	7,776	5,184	7,776	3,456	864	0	0	1,728
		Storage	1	0	0	0	1,365	234	340	52	0	0	0	1
		Evaporation	884	595	650	915	2,384	2,537	4,926	2,080	422	1,292	155	1,090
Existing	Precipitation	12,734	10,176	9,804	2,238	9,910	16,623	3,197	18,968	17,476	20,779	17,369	17,103	

Scenario	Condition	Parameter	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Dry Year (2001)		Infiltration	11,722	9,484	8,898	2,078	9,058	14,492	2,984	17,263	14,279	17,209	15,291	17,689
		Runoff	0	0	0	0	0	864	0	1,728	1,728	1,728	0	864
		Storage	0	0	0	0	0	0	0	0	0	0	0	0
		Evaporation	553	606	657	80	648	1,325	533	1,945	1,789	1,911	886	910
	Proposed	Precipitation	12,734	10,123	9,804	2,184	9,910	16,517	3,197	18,914	17,423	20,779	17,369	17,050
		Infiltration	10,976	8,791	8,258	2,025	8,418	13,213	2,504	15,664	12,947	16,357	14,066	16,197
		Runoff	0	864	0	0	0	864	0	2,592	1,728	1,728	864	2,592
		Storage	0	0	0	0	0	1	0	3	72	43	0	0
		Evaporation	491	562	577	87	608	1,181	486	1,829	1,616	1,374	824	848

NOTE: All units are in metres cubed.

Table 9: Annual, cumulative output from water balance analysis.

Parameter	Unit	ANNUAL											
		WET YEAR				AVERAGE YEAR				DRY YEAR			
		EX	PROP	% Change	Vol. Change	EX	PROP	% Change	Vol. Change	EX	PROP	% Change	Vol. Change
Precipitation	m³	296,397	295,757	0%	-	198,308	197,988	0%	-	156,377	156,004	0%	-
Infiltration	m³	212,960	193,460	10%	-19,500	164,049	150,303	-8%	-13,746	140,446	129,417	-8%	-11,029
Runoff	m³	74,304	77,760	-4%	3,456	25,920	31,968	23%	6,048	6,912	11,232	63%	4,320
Storage	m³	1,738	22,399	92%	20,661	0	1,994	N/A	1,994	0	121	N/A	121
Evaporation	m³	28,658	26,449	-8%	-	18,837	17,931	5%	-	11,844	10,483	11%	-
TOTAL					4,617	TOTAL			-5,704	TOTAL			-6,588
% of Total Precipitation:					1.6%	% of Total Precipitation:			-2.9%	% of Total Precipitation:			-4.2%

NOTE: All units are in metres cubed.

4.2.3. Water Balance Conclusion

A comprehensive monthly water balance analysis was completed for the Subject Property, considering precipitation, infiltration, runoff, storage, and evaporation. The study was completed using historic climate data from the Appleton weather station, managed by Environment Canada. Proposed SWMFs were integrated into the model, ensuring that the proposed storage was captured. The results indicated that the difference between the existing and proposed conditions is limited and within the model tolerance. Therefore, the proposed conditions emulate hydrologic conditions very similar to the existing conditions.

5. Closing

In response to comments issued by MVCA regarding the Draft Plan of Subdivision for 9243 McArton Road in Beckwith Township, Lanark County, a Wetland Water Balance Risk Evaluation was conducted for an existing wetland (wetland feature W1) identified for protection within the Subject Property. The proposed development was determined to be 'low' risk to wetland W1 due to the low magnitude of hydrological change imposed on the wetland. Results of the wetland water balance analysis modelling required for a low-risk project demonstrated that the existing condition water balance to the protected wetland will be maintained under the proposed conditions.

6. References

- Toronto and Region Conservation Authority. (TRCA). 2017. Wetland Water Balance Risk Evaluation. https://trca.ca/app/uploads/2017/12/WetlandWaterBalanceRiskEvaluation_Nov2017.pdf
- Pinchin Ltd. (Pinchin). 2025a. Servicing Options Statement, Terrain and Hydrogeological Study in Support of Development. p 1–25.
- Tatham Engineering (Tatham). 2025. Douglas Landing Subdivision - Preliminary Stormwater Management Report. p 1–20.
- Pinchin Ltd. (Pinchin). 2025b. Environmental Impact Study - 9243 McArton Road, Beckwith Township, Ontario. p 1–23.
- Mississippi Valley Conservation Authority (MVCA). 2024. Regulation Policies - Adopted by MVCA Board of Directors. p 1–96.
- Ministry of Natural Resources and Forestry (MNR). 2014. Ontario Wetland Evaluation System. p 296. Report No.: 3rd Edition, Version 3.3.
- Ministry of Natural Resources and Forestry (MNR). 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Section Edition. Toronto: Queen’s Printer for Ontario. 248 pp. Report No.: 2.
- Ministry of Natural Resources and Forestry (MNR). 2015. Significant Wildlife Habitat Criteria Schedules For Ecoregion 7E. <https://dr6j45jk9xcmk.cloudfront.net/documents/4776/schedule-7e-jan-2015-access-vers-final-s.pdf>
- Toronto and Region Conservation Authority (TRCA). 2012. Stormwater Management Criteria. p 1–35. [accessed 2024 Mar 8]. <https://trca.ca/conservation/stormwater-management/understand/swm-criteria-2012/download>
- Ministry of the Environment, Conservation, and Parks (MECP). 2022. Low Impact Development Stormwater Management Guidance Manual. Report No.: Southern Ontario Land Resource Information System. <https://prod-environmental-registry.s3.amazonaws.com/2022-01/Draft%20LID%20Stormwater%20Management%20Guidance%20Manual%202022.pdf>
- Rossman LA, Simon MA. 2022. Storm Water Management Model User’s Manual Version 5.2. p 1–422. Report No.: EPA-600/R-22/030. <https://www.epa.gov/system/files/documents/2022-04/swmm-users-manual-version-5.2.pdf>
- Ministry of Natural Resources and Forestry (MNR). 2019. Southern Ontario Land Resource Information System (SOLRIS). <https://geohub.lio.gov.on.ca/documents/0279f65b82314121b5b5ec93d76bc6ba/about>
- Environmental Water Resources Group (EWRG). 2017. Technical Guidelines for Flood Hazard Mapping. prepared by EWRG in association with Adams, F., and Haley, D., on behalf of Toronto and Region Conservation Authority, Nottawasaga Valley Conservation Authority, Ganaraska Conservation Authority, Grande River Conservation Authority, Credit Valley Conservation Authority, and the Central Lake Ontario Conservation Authority p 137. [accessed 2022 Nov 23]. <https://s3-ca-central-1.amazonaws.com/trcaca/app/uploads/2016/02/17161112/Technical-Guidelines-For-Flood-Hazard-Mapping-March-2017-Final.pdf>
- Fairhall, Moffatt & Woodland Limited. Topographic Plan of Part of Lot 25, Concession 12 Township of Beckwith.
- The Weather Network. 2025. Historical Monthly Averages in Ashton, ON. <https://www.theweathernetwork.com/ca/historical/ontario/ashton>
- Pinchin Ltd, (Pinchin). 2025c. Geotechnical Investigation – Proposed Residential Development - 9243 McArton Road, Beckwith Township, Ontario. p 1–15.

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Douglas Landing Subdivision Wetland Water Balance Risk Evaluation

Prepared for Douglas Landing Developments

Version	Date	Issue	Description
1	August 2025	1	Draft for client review.
2	September 2025	2	Final report for submission.

Prepared by:



Alex Scott, M.Sc.
Fluvial Processes Specialist

Cailey McCutcheon, MASc PEng (ON/AB/BC)
Senior River Engineer

Reviewed by:



Shelley Gorenc M.Sc. P.Geo. (ON, AB, BC)
Senior Geomorphologist



Ian Roul, M.Sc.
Senior Ecologist

Disclaimer

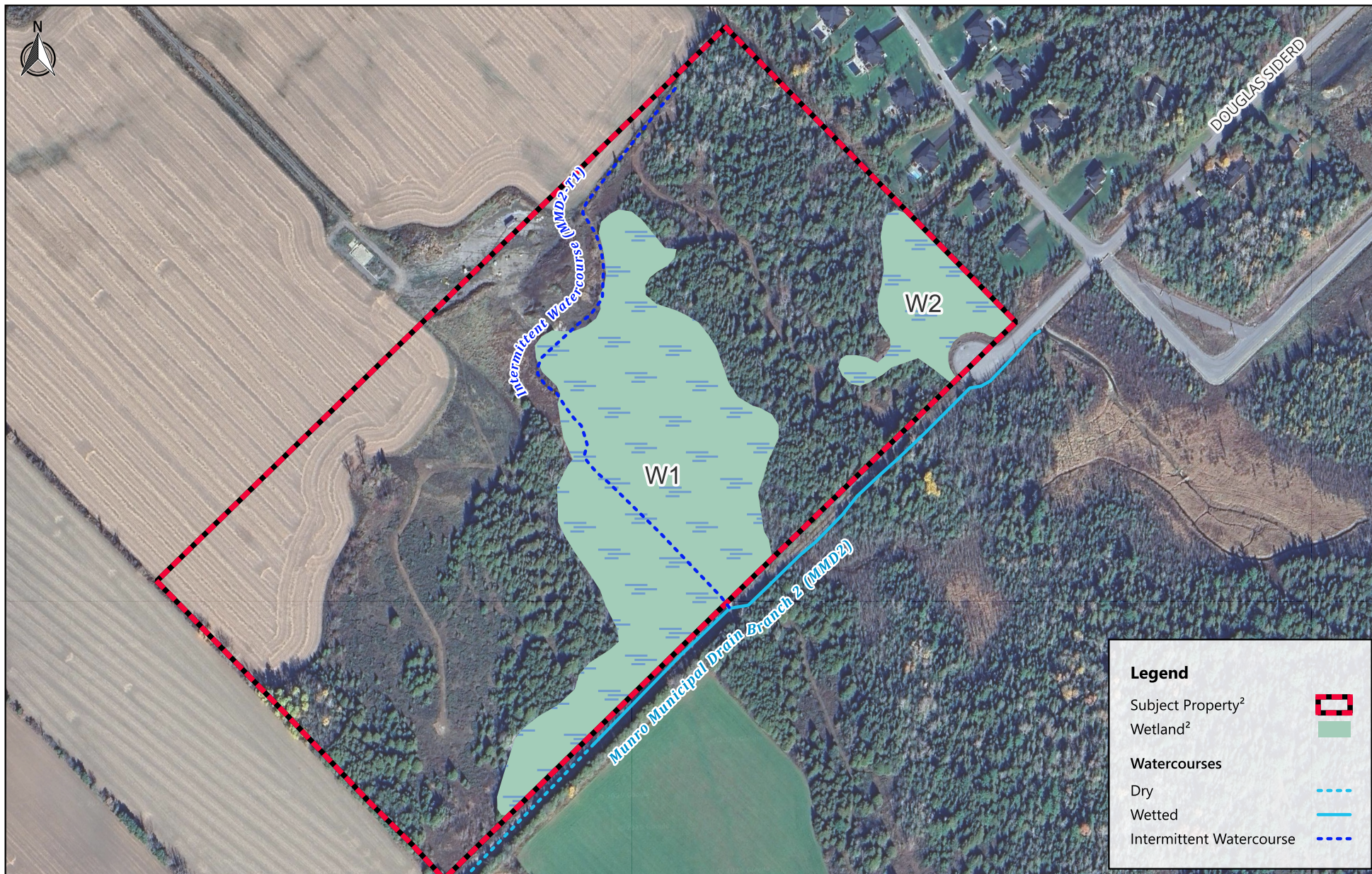
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Project Number P2025-1008

Maps



GeoProcess
RESEARCH ASSOCIATES

CREATED BY: AS PROJECT NO.: P2025-1008
CHECKED BY: SG DATE: Aug 14, 2025

0 100 200 300 400 m

NAD83 / UTM zone 17N (EPSG:26917)

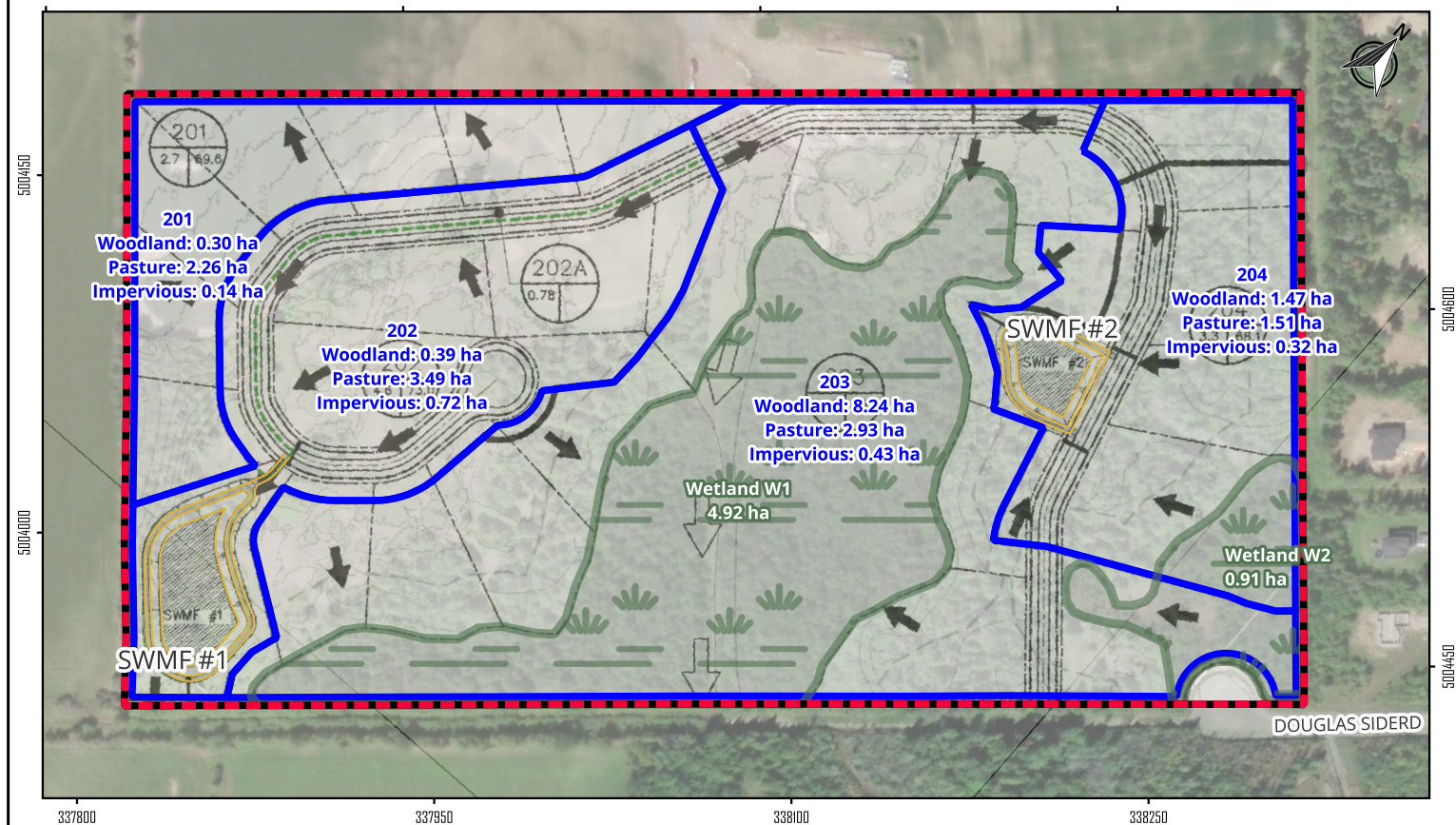
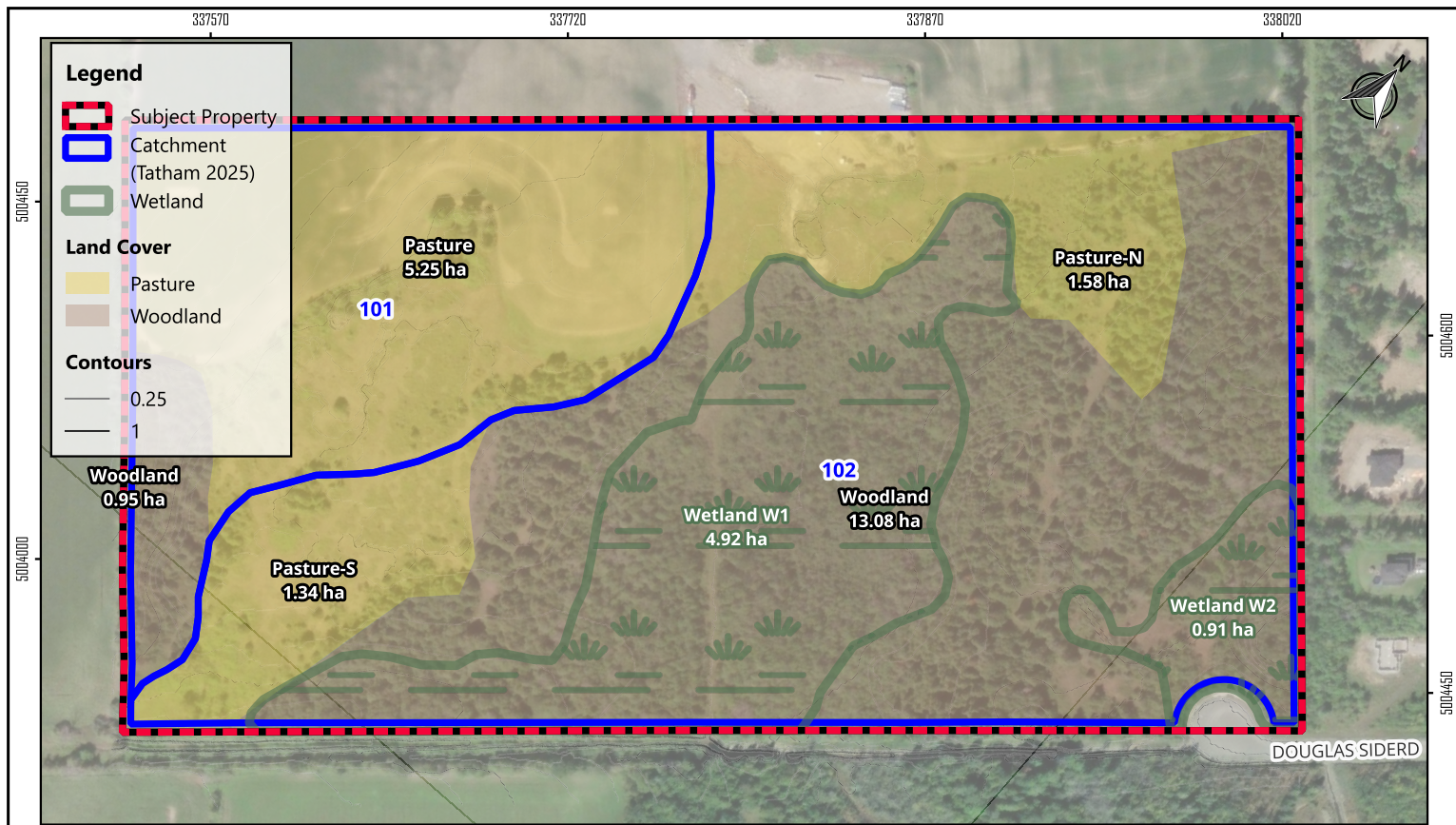
Notes:
[1] Imagery from Google Earth.
[2] Provided by Tatham (2025)

Map 1.

Site location.

Wetland Water Balance Risk Assessment

Douglas Landing Developments



GeoProcess
RESEARCH ASSOCIATES

0 100 200 m
NAD83(CSRS) / MTM zone 9 (EPSG:2951)

Notes:
[1] Existing conditions imagery from Bing Satellite.
[2] Proposed conditions imagery from Bing Satellite and the Douglas Landing Subdivision Preliminary Stormwater Management Report, Drawing DP-2 (Tatham, 2025).

Map 2.

Existing and proposed catchments within the Subject Property.

Wetland Water Balance Risk Assessment

Douglas Landing Developments

CREATED BY: AS PROJECT NO.: P2025-1008
CHECKED BY: CM DATE: Sep 10, 2025



Appendix A

Consultation Meeting Summary and MVCA Comments



DOUGLAS LANDING WETLAND WATER BALANCE EVALUATION MVCA MEETING

Date/Time: July 10, 2025, 10:00-11:00 am EST

Location: Virtual

In Attendance:

- Shelley Gorenc (GeoProcess)
- Cailey McCutcheon (GeoProcess)
- Diane Reid (MVCA)
- Rikke Brown (MVCA)
- Shabab Islam (MVCA)
- Zeyad Hassan (Z Developments)

Meeting Discussion Items:

Item	Minutes
Wetland Risk Assessment	GeoProcess presented preliminary risk assessment results (based on draft plan first submission reports) referencing the TRCA (2017) guideline: Preliminary Wetland Risk Assignment: Low • Magnitude of Hydrological Change – Low ○ Minimal change in percent impervious cover and diversion of drainage area under proposed conditions. ○ No proposed water taking during or post-construction and no significant recharge areas present. • Sensitivity of Wetland – High ○ Vegetation community type – Medium ○ High sensitivity fauna species – Low ○ High sensitivity flora species – Medium ○ Significant wildlife habitat – High** (conservative approach based on the potential for turtle nesting habitat) ○ Hydrological classification – High (MVCA provided direction that the existing wetland meets definition of palustrine wetland under OWES methodology)

Items for Further Discussion	MVCA Comment: Contributing Drainage Area/Wetland Area - MVCA provided direction that the existing wetland features on the property are considered to be part of the Wetland unit south of Douglas Side Road and requested that the entire contributing drainage area be included in the magnitude of hydrological change analysis. Response: Based on coordination with the project team, the following additional information is provided regarding consideration of the wetland feature south of the property: - Ecological Connectivity - Pinchin (2025) EIS noted that the wetlands could be included in the Provincially Significant Manion Corners (Long Swamp) Wetland Complex following OWES methodology. - Hydrologic Connectivity - Tatham have confirmed that contributing drainage areas to the existing wetland features within the property are contained within the site. The wetland feature south of Douglas Side Road drains toward the drainage ditch located within the road allowance south of the property. The drainage ditch conveys flows in a westerly direction to the Munro Municipal Drain. As contributing drainage area is contained within the property, and calculating drainage diversion/impervious cover values including only wetland area contained within the subject property ensures a conservative approach, it is our opinion that inclusion of wetland units (and associated external drainage areas) south of the property is not required to inform the wetland risk assessment. Reporting prepared for the Wetland Water Balance Risk Evaluation will outline methodologies utilized in the wetland risk assessment and rationale for the proposed approach. Action Item: MVCA to confirm whether proposed approach to wetland catchment delineation approach is acceptable.
Wetland Water Balance Analysis	Based on the preliminary wetland risk assessment results, GeoProcess will undertake the following tasks in support of the Wetland Water Balance Hydrologic Impact Analysis: - Develop a continuous hydrologic model using the EPA Storm Water Management Model (SWMM). Model input data will include: - Publicly available climate data (i.e., temperature and rainfall) for representative dry, wet and average years, based on the period of record (POR). Climate data from the Ashton Station Sesia Farm (ID 6100363, POR 1959-1973, ~1.5 km from the subject property) and Appleton (ID 6100285, POR 1992-2025, ~3 km from the subject property) stations will be used. - Updated topographic base plan for the property. - Catchment areas as defined in the Tatham Engineering (2025) Preliminary Stormwater Management Report.

- Infiltration will be modelled using the Modified Green-Ampt method referencing information and parameters provided in the "Geotechnical Investigation – Proposed Residential Development" (Pinchin 2025).
- Develop storage rating curves.
- Mitigation measures as identified in the Tatham Engineering (2025) Preliminary Stormwater Management Report.
- Modelling output will be summarized in a monthly format for each of the following scenarios:
 - Existing conditions.
 - Proposed conditions in the absence of mitigation options.
 - Proposed conditions incorporating proposed mitigation measures.
- Impact assessment of the proposed condition (including mitigation measures) on the wetland hydroperiod.

Assumptions and Limitations:

Tatham have confirmed that contributing drainage areas to the existing wetland features on the property are contained within the site. These conditions will be assumed for the wetland balance.

Proposed SWM pond storage will be characterized using rating depth-volumetric rating curves. These curves will be developed within AutoCAD using the existing and proposed terrain surfaces.

Groundwater will not be included in the water balance. The "Geotechnical Investigation – Proposed Residential Development" (Pinchin 2025) identified that groundwater was not encountered within any of the boreholes and is not expected to be encountered in the overburden material. For this reason, groundwater is not expected to have a significant impact on the site water balance and will not be included as a variable.

Borehole data from the "Geotechnical Investigation – Proposed Residential Development" report (Pinchin 2025) will be used to characterize subsurface conditions and the impacts of the shallow bedrock are reflected in the infiltration calculations.

MECP (2022) Low Impact Development Stormwater Management Guidance Manual (as provided by MVCA) will be reviewed and referenced, as appropriate, for the hydrologic modelling approach.

Note: While it is understood that the Thornthwaite-Mather Monthly Water Balance is often used for low-risk water balance analyses, this approach does not account for surface water storage and is expected to overestimate runoff. For this reason, the EPA SWMM model has been proposed; however, the results will be formatted to a monthly summary, matching the Thornthwaite-Mather format.

Action Item: MVCA to confirm agreement in principle to proposed modelling approach and recommend representative wet, dry and average years for climate data.

Additional Discussion Points	• MVCA indicated that overburden depths are shallow across the property, which may limit opportunities for water balance infiltration mitigation. ○ Zeyad acknowledged site conditions and noted that additional fill has been proposed in the updated development plan to ensure positive surface drainage and promote infiltration. • GeoProcess noted that additional topographic data is being collected to support the wetland water balance, as well as the development and servicing plan for the property. This information will be reflected in the pending second submission.
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To:	Diane Reid, Senior Planner
From:	Shabab Islam, Water Resources Engineering Assistant Rikke Brown, Water Resources Engineer
RE:	Response to Wetland Water Balance Approach for Draft Plan of Subdivision Douglas Landing
MVCA File No.:	
Munic. Ref. ID.:	09-T-25001
Date:	August 1, 2025

Mississippi Valley Conservation Authority (MVCA) was circulated the following correspondence regarding the above Draft Plan of Subdivision:

- Douglas Landing Wetland Water Balance Evaluation MVCA Meeting July 10, 2025, minutes prepared by GeoProcess, received July 18, 2025.

The meeting minutes outlining the wetland water balance approach have been reviewed. This memorandum provides comments and observations for your consideration.

1. The meeting minutes state that the wetland would have a low magnitude of hydrologic change resulting from the proposed development. The rationale, including values, were presented during the meeting, however the meeting minutes do not document the same level of detail. Please provide calculations and supporting figures to illustrate the low magnitude of hydrologic change finding prior to commencement of the water balance analysis and reporting.
2. Before initiating the water balance analysis and reporting, please submit the rationale and any supporting documentation justifying the decision to consider only the wetland area located within the subject site for the wetland water balance risk assessment.
3. Assuming the low magnitude of hydrological change remains as noted in the meeting minutes, a spreadsheet calculation for the water balance analysis using an approach such as Thornthwaite and Mather would be acceptable. We understand that the calculation does not necessarily account for surface storage available in the stormwater ponds when assessing post-development water balance conditions. If the proponent wishes to use a continuous model to allow for the accounting of surface storage, we request that the input information to the model be summarized in tabular format and included in the water balance report and the model files be provided for review.
4. For the representative wet, dry and average years of climate data for the area, we recommend obtaining the monthly and annual data from the closest Environment Canada

climate station and review the 30 years of data to assess the wet, dry and average years of climate data and provide methodology and rationale in the accompanying water balance report for the choice.

For the information requested in comments 1 and 2, we would like to review the section or appendices of the future water balance report where the assumptions of the risk assessment are supported including figures, calculations, etc. We would like to review this before the water balance modeling is undertaken.

This memorandum was prepared and submitted in accordance with Section 21.1 of the *Conservation Authorities Act*.

Please address any questions to the undersigned.

Rikke Brown, P.Eng.
Water Resources Engineer

20250801-DouglasLanding-WetlandWB-EngTechMemo.docx



Appendix B

Wetland Sensitivity Criteria and Supplementary Data

Wetland Sensitivity

Criteria	Sensitivity
Vegetation community type (ELC)	Medium
High sensitivity fauna species	Medium
High sensitivity flora species	Medium
Significant Wildlife Habitat	High
Hydrological Classification Considering Ecology	Medium

Wetland Sensitivity Supplementary Data

Criteria	Species or Community	Sensitivity
Vegetation community type (ELC)	Moist White Cedar Coniferous Forest (FOCM4-1)	Low
	Moist Mixed Meadow (MEMM4)	Low
	Annual Row Crops (OAGM1)	Low
	Naturalized Deciduous Hedgerow (FODM11)	Low
	Speckled Alder Mineral Deciduous Swamp (SWTM1-1)	Medium
	Reed-canary Grass Graminoid Mineral Meadow March (MAMM1-3)	Low
	Dry - Fresh Mixed Meadow (MEMM3)	Low
High sensitivity fauna species	Black-capped Chickadee	Low
	White-tailed Deer	Low
	Raccoon	Low
	Blue Jay	Low
	Red-breasted Nuthatch	Low
	American Crow	Low
	American Toad	Low
	Common Yellowthroat	Medium
	Green Frog	Low
	Northern Flicker	Low
	Song Sparrow	Low
	White-throated Sparrow	Low
	Yellow Warbler	Low
High sensitivity flora species	Balsam Fir	Medium
	Sugar Maple	Low
	Grey Alder	Low
	Common Ragweed	Low
	Common Burdock	Low
	Common Milkweed	Low
	Bitter Wintercress	Low
	White Birch	Low
	Devil's Beggarticks	Low
	Smooth Brome	Low
	Crested Sedge	Low
	Canada Thistle	Low
	Red Osier Dogwood	Low
	Queen Anne's Lace	Low
	Evergreen Wood Fern	Low
	Woodland Strawberry	Low
	Black Ash	Medium
	Fowl Mannagrass	Low
	Common Juniper	Low

High sensitivity flora species	White Sweet-clover	Low
	White Rattlesnakeroot	Low
	Ironwood	Low
	Reed Canary Grass	Low
	Common Timothy	Low
	White Spruce	Low
	Blue Spruce	Low
	White Pine	Medium
	Kentucky Bluegrass	Low
	Balsam Poplar	Low
	Large-toothed Aspen	Low
	Trembling Aspen	Low
	Old-field Cinquefoil	Low
	Choke Cherry	Low
	Common Buckthorn	Low
	Black Locust	Low
	Common Red Raspberry	Low
	Yellow Foxtail	Low
	Bittersweet Nightshade	Low
	Common Tansy	Low
	Common Dandelion	Low
	Eastern White Cedar	Medium
	American Basswood	Low
	Red Clover	Low
	White Clover	Low
	Broad-leaved Cattail	Low
	Common Mullein	Low
	Tufted Vetch	Low
	Riverbank Grape	Low
	Common Boneset	Low
	Wild Carrot	Low
	Oxeye Daisy	Low
	Purple-flowering Raspberry	Low
	Tufted Vetch	Low
	Black-eyed Susan	Low
	Butter-and-eggs	Low
	Giant Goldenrod	Low
	Purple Loosestrife	Low
	Common Evening-primrose	Low
	Philadelphia Fleabane	Low
	Wild Strawberry	Low
	Water Horsetail	Low
	Bur Oak	Low

High sensitivity flora species	European Buckthorn	Low
	Red Ash	Medium
	Silver Maple	Low
	Poison Ivy	Low
	Sensitive Fern	Low
	Common Self-heal	Low
	Canada Mint	Low
	Meadow Willow	Low
	Glossy Buckthorn	Low
	Bebb's Willow	Low
	Thicket Creeper	Low
	White Elm	Low
	Swamp White Oak	Medium
	Tall Goldenrod	Low
	Foxglove Beardtongue	Medium
	Small Beggarticks	Medium
	Marsh Fern	Low
	Hanging Bulrush	Low
	Common St. John's-wort	Low
	Common Prickly-ash	Low
	Wild Lily-of-the-valley	Low
	Eastern Prickly Gooseberry	Low
	Common Lady Fern	Low
	White Meadowsweet	Low
	Rough Fleabane	Low
	Spotted Lady's-thumb	Low
Significant Wildlife Habitat	Waterfowl Stopover and Staging Areas (Aquatic)	High
	Bat Maternity Colonies	Low
	Colonially - Nesting Bird Breeding Habitat (Tree/Shrubs)	Low
	Turtle Nesting Areas	Low
	Special Concern and Rare Wildlife Species	Low
	Marsh Bird Breeding Habitat	High