APPENDIX C

Background Studies

C-1 – Hydrologic Investigation Technical Memo

C-2 – Embankment Dam Assessment

C-3 – Hydrogeological Assessment Technical Memo

C-4 – Natural Environment Report

C-5 – Stage 1 Archaeological Assessment

C-6 – Cultural Heritage Evaluation Report and Heritage Impact Assessment

C-7 – Bridge Inspection Report

APPENDIX C-1

Hydrologic Investigation Technical Memo

TRITON
ENGINEERING
SERVICES
LIMITED
Consulting Engineers

Technical Memorandum

DATE:	October 3, 2016
TO:	CLASS EA FILE
FROM:	Chris Clark
RE:	Hillsburgh Dam and Bridge Preliminary Hydraulic Analysis/Assessment
FILE:	A4685E

INTRODUCTION

As part of the Hillsburgh Dam and Bridge Class Environmental Assessment (Class EA) Triton Engineering Services Limited (TESL) has completed the following preliminary hydraulic analysis to assess the existing dam and bridge hydraulics for various configurations. This Technical Memorandum is intended to provide a preliminary evaluation of hypothetical configurations for different scenarios. The Memo does not provide sufficient detail to confirm the feasibility of the configurations or identify any potential constraints.

The Hillsburgh Dam and Bridge are located on Station Street in Hillsbugh, Ontario approximately 50 metres west of Trafalgar Road along the Upper West Credit River Watershed. The Credit Valley Conservation Authority (CVC) has provided a hydraulic model (HEC-RAS) of the Upper West Credit River which was utilized in this analysis. This analysis has assessed the hydraulics of the various configurations of the dam and control structure including; the inline stop-log control structure, dam/road height and bridge opening. The HEC-RAS simulations examined the impacts the various configurations on upstream and downstream floodlines under the Regional Storm event. The findings of this analysis were used to evaluate the Class EA's alternative solutions.

BACKGROUND INFORMATION

In 2011 a sink hole formed directly over the Hillsburgh Dam's (Station Street) monk riser structure culvert. Investigation concluded that the culvert had failed causing the sink hole. As a result, the road was deemed unsafe for vehicular travel and was closed until a repair was completed.

Given the potential impact on the watercourse, floodlines and the adjacent natural environment the CVC and the Ministry of Natural Resources and Forestry (MNRF) were consulted.

The portion of Station Street adjacent the Hillsburgh Pond is considered an earthen dam. Therefore, under the Lakes and Rivers Improvement Act (LRIA), in order to perform work on the dam a Hazard Potential Classification (HPC) for the dam must be considered. Based on the Ontario Dam Safety Guidelines (ODSG), published 1999, identifying an appropriate HPC is based on the selection of an Inflow Design Flood (IDF).

The Town of Erin recognized the importance of public access through Station Street. As such, their primary goal was to expedite a project that would see the road (Station Street) repaired and re-opened as quickly as possible. Prior to the Class EA, a temporary repair to the culvert/dam was completed under the LRIA's Non-Application Emergency Repair process with the understanding that a permanent solution for the dam and bridge eventually be implemented.

In March 2012, the Hillsburgh Pond was surveyed by TESL staff to estimate the overall pond shape and depth (bathymetry). Based on the TESL survey the average pond depth was estimated at 1.0 metre with a surface area of 90,000 m^2 which equates to a total estimated volume of 90,000 m^3.

As defined in the LRIA legislation, under "Normal Sunny Day" conditions the Hillsburgh Dam can be considered a small sized dam as it is retaining less than 100,000 m^3 water. Therefore, under the ODSG the appropriate Inflow Design Flood (IDF) for this dam is either the 25 or 100 year flood. Based on this volume, the Hillsburgh Dam would be considered to exhibit a "Low" HPC. Under a consequence (i.e. flooding event) the pond is assumed to be retaining more than 100,000 m^3 behind the Dam, as such considered a medium sized dam. Therefore, during a consequence event the appropriate IDF applied to the dam would then be either the 100 year or the Regional return period, whichever is greater.

It should be noted, a previous report and application under the LRIA was completed for the Ainsworth Pond, located immediately downstream of the Hillsburgh Dam, was submitted July 2007 and approved by the MNRF. The assessed HPC of the Ainsworth earthen berm dam was approved and considered "Significant" based on downstream impacts. Under today's current standards this classification is considered as a "High" HPC.

Due to the proximity of the Ainsworth Dam relative to the Hillsburgh Dam, under theLRIA and ODSG the following is applicable;

> "Where several dams are situated along the same watercourse, consideration must be given to the cascade effect of failures when classifying the structures. Such that if failure of an upstream dam could contribute to the failure of a downstream dam, the HPC of the upstream dam must be the same or greater than that of the downstream structure."

This implies the Hillsburgh Dam demonstrates a "High" HPC and therefore must be evaluated using the Regional Storm event return. Drawing 02 shows a section view of the current dam and bridge.

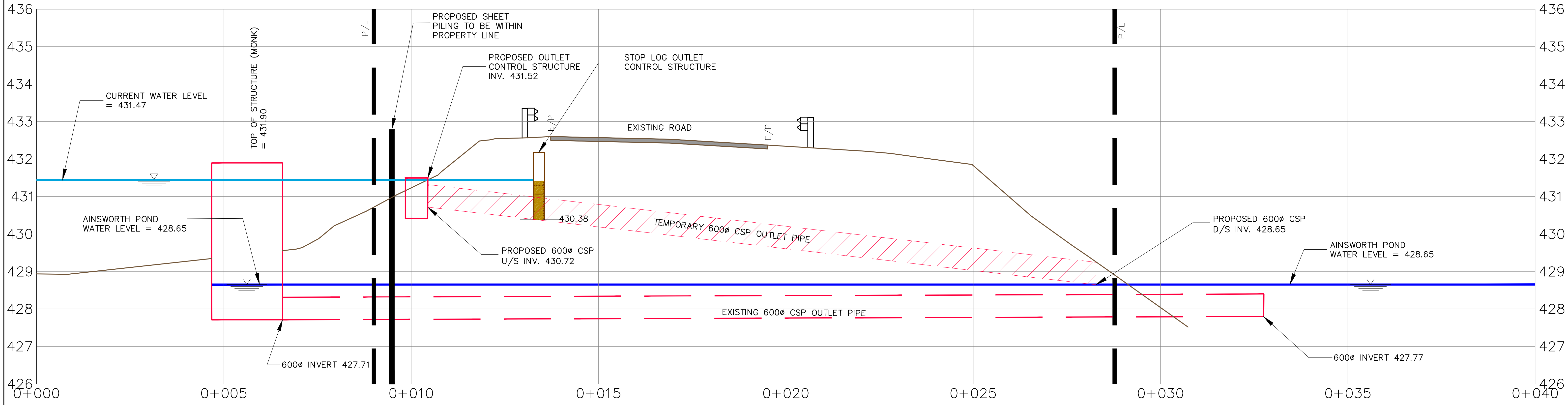
The existing conditions of the dam, bridge and surrounding area are as follows:

- Upstream/downstream watershed is mainly wooded/wetland area and farmland.

- Existing bridge is a narrow double-lane open bottom concrete rigid frame structure with a span of 4.30 metres, height of 2.85 metres and 7.40 metre inside deck width.

- Existing major spill occurs at an elevation of 432.55 m, over the earthen berm dam west of the bridge on Station Street roadway.

SECTION VIEW



NOTES

THE LOCATION OF UTILITIES IS APPROXIMATE ONLY AND SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION AGAINST DAMAGE.

No	DATE	REVISION	INITIAL
1.	<>	<>	<>

PRELIMINARY

REHABILITATION OF
STATION STREET
(HILLSBURGH)

TOWN OF ERIN
5684 WELLINGTON ROAD No. 24
R.R. #2 ERIN NOB 1Z0

EMERGENCY REPAIR WORKS

PROJECT No
A4685

DRAWN BY: K.J.B. (AutoCAD)
CHECKED BY: C.P.C.
APPROVED BY: P.F.Z.
DATE: JUNE, 2012

TRITON ENGINEERING SERVICES LIMITED
Consulting Engineers

SCALES
1:100 HORIZONTAL
1:100 VERTICAL

DRAWING NUMBER **02**

DESIGN FLOWS

Design flows utilized for the hydraulic analysis at the bridge and dam were provided by CVC as part of the HEC RAS model. Flows for various storm events are summarized in Table 1.

TABLE 1: UPPER WEST CREDIT RIVER DESIGN FLOW SUMMARY

EVENT	Q @ STRUCTURE 2064 (cms)
2	11
5	22.3
10	29.5
25	20.4
50	48.4
100	57.3
Regional	117.5

DESIGN CRITERIA

The design criteria for the bridge and dam structure crossing were developed through input from the CVC and MNRF under their associated regulatory policies. It should be noted, the current state of the bridge and dam do not meet the criteria, as follows;

- Due to the “High” HPC and the proximity of the local Fire Station (approximately 50 metres east of the bridge, the bridge must convey the Regional Storm event without overtopping the dam (i.e. roadway).

- Upstream and downstream floodlines must not be increased or decreased.

HYDRAULICS

The existing conditions CVC HEC-RAS model, utilizing original TESL survey information, was used to provide baseline floodlines for the area upstream and downstream of the subject site. These floodlines were used as a benchmark for comparison against the various configurations considered. The HEC-RAS model outputs for all scenarios are found in Appendix A.

The Regional Storm floodlines were evaluated from the upstream section at Trafalgar Road culvert crossing (Section – 19425.62) through to just downstream of the Ainsworth Dam culvert outlet (Section – 18418.73). Table 2 provides a summary and comparison of the HEC-RAS inputs and outputs, respectively.

TABLE 2: SUMMARY & COMPARISON OF HEC-RAS FLOODLINE MODELLING

	Scenario / Section Description	INPUTS					OUTPUTS		
		Inline Structure/ Stop Log Length (m)	Inline Structure/ Invert Elev. (m)	Bridge Span (m)	Bridge Height (m)	Dam Min. Spill Elev. (m)	Section ID	Regional W/S Elev. (m)	Difference From Baseline (m)
1	**Existing Structures**	5.75	431.66*	4.33	2.85	432.55			
							19425.62	435.79	-
	UpstreamTrafalgar Rd Crossing						19324.66	435.01	-
	Hillsburgh Pond						19299.19	434.35	-
							19215.73	433.36	-
	Inside Spillway						18717.64	433.41	-
							18717.14	433.23	-
	Station Street						18702.66	433.23	-
	Downstream Pond						18688.00	431.89	-
							18508.07	430.15	-
							18418.73	428.06	-
2	**Existing Bridge / No Stop Log Control**	5.75	430.38**	4.33	2.85	432.55			
							19425.62	435.79	0
	UpstreamTrafalgar Rd Crossing						19324.66	435.01	0
	Hillsburgh Pond						19299.19	434.35	0
							19215.73	433.36	0
	Inside Spillway						18717.64	433.41	0
							18717.14	433.23	0
	Station Street/Dam						18702.66	433.23	0
	Downstream Pond						18688.00	431.89	0
							18508.07	430.15	0
							18418.73	428.06	0
3	**Increase in Bridge Span / With Stop Log Control**	9	431.66*	8.3	2.85	432.88			
							19425.62	435.79	0
	UpstreamTrafalgar Rd Crossing						19324.66	435.01	0
	Hillsburgh Pond						19299.19	434.35	0
							19215.73	432.93	-0.43
	Inside Spillway						18717.64	432.88	-0.53
							18717.14	432.68	-0.55
	Station Street						18702.66	432.68	-0.55
	Downstream Pond						18688.00	431.64	-0.25
							18508.07	430.15	0
							18418.73	428.06	0
4	**Increase in Bridge Span / No Stop Log Control**	NA	429.38***	8.3	2.85	432.88			
							19425.62	435.79	0
	UpstreamTrafalgar Rd Crossing						19324.66	435.01	0
	Hillsburgh Pond						19299.19	434.35	0
							19215.73	432.93	-0.43
	Inside Spillway						18717.64	432.88	-0.53
							18717.14	432.68	-0.55
	Station Street						18702.66	432.68	-0.55
	Downstream Pond						18688.00	431.64	-0.25
							18508.07	430.15	0
							18418.73	428.06	0

NOTES:

* Original TESL surveyed stop log elevation - Referred to as the Baseline for comparison use.

** Elevation at bottom of stop log control structure - Reflects removal of all stop logs but not entire structure.

*** Elevation at upstream invert of existing bridge - Reflects complete removal of stop log control structure and reconstruction of bridge

As seen in Table 2, the analysis encompassed four hydraulic configurations for different scenarios which are detailed as follows:

Scenario 1

Scenario 1 was used as the baseline for comparison purposes and reflects the state of the current bridge and dam hydraulics. With respect to the Class EA alternatives, Scenario 1 would be equivalent to Alternative *A – Do Nothing* as well as *B2 – Rehabilitate Dam and Rehabilitate Bridge* since the resultant floodlines would be the same.

Scenario 2

Scenario 2 reflects the removal of stop logs to the bottom of the existing structure. Scenario 2 is equivalent to Alternative *C1 – Rehabilitate Bridge and Decommission Dam* and *C2 – Rehabilitate Bridge and Decommission Dam Construct an Offline Pond.* In both cases the bridge will be rehabilitated therefore, the capacity of the bridge will remain the same, however; the stop log removal will drain the pond, decommissioning the dam.

Scenario 3

Scenario 3 reflects an increase to the bridges' hydraulic capacity by increasing the span of the bridge structure. The stop log structure will be reconstructed to with a wider opening and the elevation of the road increased to accommodate the new bridge. The dam capacity will be increased due to increased ponding depth and spill elevation resulting from the higher road. Scenario 3 is equivalent to Alternative *B1 – Rehabilitate Dam and Reconstruct Bridge.* This alternative encompasses the reconfiguration of the bridge and dam/road to accommodate the Regional Storm event. The Dam will be rehabilitated to an acceptable MNRF standard.

Scenario 4

Scenario 4 reflects an increase to the bridges' hydraulic capacity by increasing the span of the structure. The stop log control structure will be completely removed thereby allowing the normal water level upstream of the bridge to fall to the invert of the current bridge. The road elevation will be increased to accommodate the new bridge. The dam capacity will be increased due to the increased ponding depth and spill elevation resulting from the higher road. Scenario 4 is equivalent to Alternative *D1 – Reconstruct Bridge and Decommission Dam* and *D2 – Reconstruct Bridge and Decommission Dam Construct an Offline Pond.* In both situations the bridge will be reconstructed to accommodate the Regional Storm event without overtopping. The stop log control structure removal will drain the pond under normal conditions thereby eliminating the dam.

ANALYSIS AND INTERPRETATION

The HEC-RAS modelling indicates that removal of stop logs does not directly impact the Regional flood elevations. However, Regional flood elevations did change when the bridge span was increased from 4.30 m to 8.30 m as reflected in Scenarios 3 and 4. The 8.30 m bridge opening conveyed the Regional Storm event without overtopping the dam.

Floodlines upstream and downstream of the Hillsburgh Dam were only impacted by Scenario 3 and 4. The increase in the bridges' hydraulic capacity results in decreased floodlines immediately upstream and downstream of the Dam. Under existing conditions (i.e. Scenario 1), the majority of Regional flow is conveyed over the dam. Conversely, with Scenario 3 and 4, the road height and bridge opening was increased resulting in flows being conveyed through the bridge structure.

It is important to note, the upstream Regional floodlines at the Trafalgar Road crossing are not changed under any Scenario due to restrictions at the existing Trafalgar Road culvert crossing. Similarly, floodlines immediately upstream and downstream of the Ainsworth Dam also remained unchanged; indicating that alterations made to the Hillsburgh Dam will not have a floodline impact beyond these sections.
Therefore, unless the Trafalgar road crossing or Ainsworth Dam's hydraulic capacity was to be modified, floodlines upstream or downstream of both structures will not change regardless to scenario implemented at Hillsburgh Dam.

CONCLUSIONS

In order to evaluate the hydraulic characteristics of the Hillsburgh Dam and Bridge for the purposes of the Class EA's comparison of alternatives, the HEC-RAS hydraulic modeling software was utilized. Four scenarios were assessed which represent each Class EA Alternative. Based on this analysis, changes to the configuration of the dam and bridge only impact floodlines immediately upstream and downstream of the bridge and dam. When the bridge span and road/dam height were increased (i.e. Scenario 3 and 4), the Regional flows were conveyed through the bridge structure. Therefore, if measures were taken which would affect changes to the existing conditions (i.e. increase the hydraulic capacity of the bridge and/or rehabilitate the dam) there is potential to meet the regulatory requirements under the MNRF (LRIA) and CVC (Conservation Act).

Respectfully Submitted,

Triton Engineering Services Limited

Chris Clark

Chris Clark, MA.Sc,P.Eng

APPENDIX A

HEC-RAS OUTPUTS

SCENARIO 1

EXISITING STRUCTURES

Plan: WestCredit Credit R. W. Credit R. RS: 19425.62 Profile: Regional

E.G. Elev (m)	435.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.080	0.035	0.054
W.S. Elev (m)	435.79	Reach Len. (m)	45.43	43.82	47.61
Crit W.S. (m)	433.54	Flow Area (m2)	26.62	62.65	64.05
E.G. Slope (m/m)	0.000196	Area (m2)	26.62	62.65	64.05
Q Total (m3/s)	80.70	Flow (m3/s)	4.66	52.42	23.62
Top Width (m)	80.00	Top Width (m)	25.74	17.88	36.38
Vel Total (m/s)	0.53	Avg. Vel. (m/s)	0.18	0.84	0.37
Max Chl Dpth (m)	3.60	Hydr. Depth (m)	1.03	3.50	1.76
Conv. Total (m3/s)	5769.1	Conv. (m3/s)	333.0	3747.7	1688.3
Length Wtd. (m)	44.43	Wetted Per. (m)	26.58	20.68	37.94
Min Ch El (m)	432.19	Shear (N/m2)	1.92	5.81	3.24
Alpha	1.79	Stream Power (N/m s)	0.34	4.86	1.19
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	0.80	4.26	1.63
C & E Loss (m)	0.14	Cum SA (1000 m2)	1815.92	366.63	1400.78

Plan: WestCredit Credit R. W. Credit R. RS: 19324.66 Profile: Regional

E.G. Elev (m)	435.27	Element	Left OB	Channel	Right OB
Vel Head (m)	0.27	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	435.01	Reach Len. (m)	25.82	25.47	25.60
Crit W.S. (m)	434.16	Flow Area (m2)	9.76	32.65	0.12
E.G. Slope (m/m)	0.002392	Area (m2)	9.76	32.65	0.12
Q Total (m3/s)	80.70	Flow (m3/s)	4.20	76.48	0.02
Top Width (m)	30.00	Top Width (m)	15.94	13.93	0.13
Vel Total (m/s)	1.90	Avg. Vel. (m/s)	0.43	2.34	0.14
Max Chl Dpth (m)	3.01	Hydr. Depth (m)	0.61	2.34	0.89
Conv. Total (m3/s)	1650.1	Conv. (m3/s)	85.9	1563.8	0.3
Length Wtd. (m)	25.47	Wetted Per. (m)	16.51	15.05	1.02
Min Ch El (m)	432.00	Shear (N/m2)	13.86	50.91	2.69
Alpha	1.45	Stream Power (N/m s)	5.97	119.24	0.39
Frctn Loss (m)		Cum Volume (1000 m3)		0.77	
C & E Loss (m)		Cum SA (1000 m2)	1814.69	365.14	1399.80

Plan: WestCredit Credit R. W. Credit R. RS: 19299.19 Profile: Regional

E.G. Elev (m)	435.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.79	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	434.35	Reach Len. (m)	80.00	83.46	88.70
Crit W.S. (m)	434.35	Flow Area (m2)	7.48	27.37	0.12
E.G. Slope (m/m)	0.008781	Area (m2)	7.48	27.37	0.12
Q Total (m3/s)	117.50	Flow (m3/s)	6.51	110.94	0.04
Top Width (m)	25.00	Top Width (m)	11.08	13.58	0.34
Vel Total (m/s)	3.36	Avg. Vel. (m/s)	0.87	4.05	0.36
Max Chl Dpth (m)	2.65	Hydr. Depth (m)	0.67	2.02	0.35
Conv. Total (m3/s)	1253.9	Conv. (m3/s)	69.5	1184.0	0.5
Length Wtd. (m)	84.85	Wetted Per. (m)	11.66	14.69	0.70
Min Ch El (m)	431.70	Shear (N/m2)	55.21	160.44	14.97
Alpha	1.38	Stream Power (N/m s)	48.08	650.39	5.46
Frctn Loss (m)	0.55	Cum Volume (1000 m3)	8.75	198.51	29.75
C & E Loss (m)	0.32	Cum SA (1000 m2)	1814.34	364.79	1399.80

Plan: WestCredit   Credit R.   W. Credit R. RS: 19215.73   Profile: Regional

E.G. Elev (m)	433.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	433.36	Reach Len. (m)	115.14	165.08	240.79
Crit W.S. (m)	433.20	Flow Area (m2)	11.16	14.93	94.34
E.G. Slope (m/m)	0.004979	Area (m2)	11.16	14.93	94.34
Q Total (m3/s)	117.50	Flow (m3/s)	6.51	40.09	70.90
Top Width (m)	149.43	Top Width (m)	20.24	9.26	119.93
Vel Total (m/s)	0.98	Avg. Vel. (m/s)	0.58	2.69	0.75
Max Chl Dpth (m)	2.23	Hydr. Depth (m)	0.55	1.61	0.79
Conv. Total (m3/s)	1665.1	Conv. (m3/s)	92.3	568.2	1004.7
Length Wtd. (m)	186.44	Wetted Per. (m)	20.74	9.70	119.97
Min Ch El (m)	431.13	Shear (N/m2)	26.27	75.10	38.40
Alpha	2.96	Stream Power (N/m s)	15.33	201.74	28.86
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	8.00	196.75	25.56
C & E Loss (m)	0.04	Cum SA (1000 m2)	1813.09	363.84	1394.46

Plan: WestCredit   Credit R.   W. Credit R. RS: 18717.64   Profile: Regional

E.G. Elev (m)	433.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	433.41	Reach Len. (m)	0.50	0.50	0.50
Crit W.S. (m)	430.02	Flow Area (m2)	13.85	289.65	5.04
E.G. Slope (m/m)	0.000034	Area (m2)	13.85	289.65	5.04
Q Total (m3/s)	117.50	Flow (m3/s)	0.51	116.78	0.21
Top Width (m)	125.72	Top Width (m)	38.57	75.12	12.02
Vel Total (m/s)	0.38	Avg. Vel. (m/s)	0.04	0.40	0.04
Max Chl Dpth (m)	4.68	Hydr. Depth (m)	0.36	3.86	0.42
Conv. Total (m3/s)	20104.1	Conv. (m3/s)	87.3	19981.5	35.3
Length Wtd. (m)	0.50	Wetted Per. (m)	38.64	77.20	12.06
Min Ch El (m)	428.73	Shear (N/m2)	0.12	1.26	0.14
Alpha	1.11	Stream Power (N/m s)	0.00	0.51	0.01
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	0.01	1.49	0.01
C & E Loss (m)	0.02	Cum SA (1000 m2)	1798.56	283.57	1348.24

Plan: WestCredit   Credit R.   W. Credit R. RS: 18717.14   Profile: Regional

E.G. Elev (m)	433.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.17	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	433.23	Reach Len. (m)	59.18	29.13	59.08
Crit W.S. (m)	432.51	Flow Area (m2)	14.63	52.46	30.67
E.G. Slope (m/m)	0.001363	Area (m2)	14.63	52.46	30.67
Q Total (m3/s)	117.50	Flow (m3/s)	4.69	101.53	11.29
Top Width (m)	88.19	Top Width (m)	25.24	19.91	43.04
Vel Total (m/s)	1.20	Avg. Vel. (m/s)	0.32	1.94	0.37
Max Chl Dpth (m)	3.85	Hydr. Depth (m)	0.58	2.63	0.71
Conv. Total (m3/s)	3182.3	Conv. (m3/s)	126.9	2749.7	305.6
Length Wtd. (m)	29.13	Wetted Per. (m)	25.32	21.11	43.08
Min Ch El (m)	429.38	Shear (N/m2)	7.73	33.22	9.52
Alpha	2.25	Stream Power (N/m s)	2.47	64.29	3.50
Frctn Loss (m)		Cum Volume (1000 m3)		1.40	
C & E Loss (m)		Cum SA (1000 m2)	1798.55	283.54	1348.23

Plan: WestCredit Credit R. W. Credit R. RS: 18688.00 Profile: Regional

E.G. Elev (m)	431.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	431.89	Reach Len. (m)	66.89	42.15	44.64
Crit W.S. (m)	431.89	Flow Area (m2)	64.20	11.78	80.75
E.G. Slope (m/m)	0.001348	Area (m2)	64.20	11.78	80.75
Q Total (m3/s)	117.50	Flow (m3/s)	46.46	21.48	49.56
Top Width (m)	88.47	Top Width (m)	32.11	4.25	52.10
Vel Total (m/s)	0.75	Avg. Vel. (m/s)	0.72	1.82	0.61
Max Chl Dpth (m)	2.77	Hydr. Depth (m)	2.00	2.77	1.55
Conv. Total (m3/s)	3199.9	Conv. (m3/s)	1265.3	584.9	1349.7
Length Wtd. (m)	47.57	Wetted Per. (m)	32.42	5.15	52.23
Min Ch El (m)	429.12	Shear (N/m2)	26.18	30.27	20.44
Alpha	1.73	Stream Power (N/m s)	18.95	55.18	12.55
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	9.28	35.94	3.79
C & E Loss (m)	0.01	Cum SA (1000 m2)	1796.85	283.19	1345.42

Plan: WestCredit Credit R. W. Credit R. RS: 18508.07 Profile: Regional

E.G. Elev (m)	430.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	430.15	Reach Len. (m)	50.53	46.34	47.52
Crit W.S. (m)	428.31	Flow Area (m2)	229.37	37.59	84.22
E.G. Slope (m/m)	0.000169	Area (m2)	229.37	37.59	84.22
Q Total (m3/s)	117.50	Flow (m3/s)	66.52	30.66	20.33
Top Width (m)	153.31	Top Width (m)	95.95	11.05	46.32
Vel Total (m/s)	0.33	Avg. Vel. (m/s)	0.29	0.82	0.24
Max Chl Dpth (m)	4.13	Hydr. Depth (m)	2.39	3.40	1.82
Conv. Total (m3/s)	9025.5	Conv. (m3/s)	5109.5	2354.7	1561.3
Length Wtd. (m)	46.34	Wetted Per. (m)	96.41	11.58	46.64
Min Ch El (m)	426.02	Shear (N/m2)	3.95	5.40	3.00
Alpha	2.07	Stream Power (N/m s)	1.15	4.40	0.72
Frctn Loss (m)		Cum Volume (1000 m3)		10.28	
C & E Loss (m)		Cum SA (1000 m2)	1789.86	271.43	1342.24

Plan: WestCredit Credit R. W. Credit R. RS: 18418.73 Profile: Regional

E.G. Elev (m)	428.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	428.06	Reach Len. (m)	42.23	39.62	38.70
Crit W.S. (m)	427.05	Flow Area (m2)	237.52	35.80	24.23
E.G. Slope (m/m)	0.000384	Area (m2)	237.52	35.80	24.23
Q Total (m3/s)	117.50	Flow (m3/s)	74.12	37.38	6.00
Top Width (m)	202.24	Top Width (m)	165.06	13.39	23.78
Vel Total (m/s)	0.39	Avg. Vel. (m/s)	0.31	1.04	0.25
Max Chl Dpth (m)	3.59	Hydr. Depth (m)	1.44	2.67	1.02
Conv. Total (m3/s)	5997.7	Conv. (m3/s)	3783.5	1908.1	306.1
Length Wtd. (m)	41.00	Wetted Per. (m)	165.11	14.05	23.86
Min Ch El (m)	424.47	Shear (N/m2)	5.41	9.59	3.82
Alpha	2.64	Stream Power (N/m s)	1.69	10.01	0.95
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	33.89	41.64	13.01
C & E Loss (m)	0.00	Cum SA (1000 m2)	1774.54	270.37	1338.38

Plan: WestCredit   Credit R.   W. Credit R. RS: 18702.66   Culv Group: Culvert #2   Profile: Regional

Q Culv Group (m3/s)	46.44	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	4.72
Q Barrel (m3/s)	46.44	Culv Vel DS (m/s)	5.90
E.G. US. (m)	433.40	Culv Inv El Up (m)	429.38
W.S. US. (m)	433.23	Culv Inv El Dn (m)	429.16
E.G. DS (m)	431.94	Culv Frctn Ls (m)	0.04
W.S. DS (m)	431.89	Culv Exit Loss (m)	0.81
Delta EG (m)	1.46	Culv Entr Loss (m)	0.61
Delta WS (m)	1.34	Q Weir (m3/s)	70.05
E.G. IC (m)	433.40	Weir Sta Lft (m)	130.25
E.G. OC (m)	433.36	Weir Sta Rgt (m)	238.38
Culvert Control	Inlet	Weir Submerg	0.00
Culv WS Inlet (m)	431.65	Weir Max Depth (m)	0.85
Culv WS Outlet (m)	430.98	Weir Avg Depth (m)	0.54
Culv Nml Depth (m)	1.04	Weir Flow Area (m2)	58.41
Culv Crt Depth (m)	2.27	Min El Weir Flow (m)	432.55

SCENARIO 2

EXISITING BRIDGE / NO STOP-LOG CONTROL

Plan: WestCredit   Credit R.   W. Credit R. RS: 19425.62   Profile: Regional

E.G. Elev (m)	435.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.080	0.035	0.054
W.S. Elev (m)	435.79	Reach Len. (m)	45.43	43.82	47.61
Crit W.S. (m)	433.54	Flow Area (m2)	26.62	62.65	64.05
E.G. Slope (m/m)	0.000196	Area (m2)	26.62	62.65	64.05
Q Total (m3/s)	80.70	Flow (m3/s)	4.66	52.42	23.62
Top Width (m)	80.00	Top Width (m)	25.74	17.88	36.38
Vel Total (m/s)	0.53	Avg. Vel. (m/s)	0.18	0.84	0.37
Max Chl Dpth (m)	3.60	Hydr. Depth (m)	1.03	3.50	1.76
Conv. Total (m3/s)	5769.1	Conv. (m3/s)	333.0	3747.7	1688.3
Length Wtd. (m)	44.43	Wetted Per. (m)	26.58	20.68	37.94
Min Ch El (m)	432.19	Shear (N/m2)	1.92	5.81	3.24
Alpha	1.79	Stream Power (N/m s)	0.34	4.86	1.19
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	0.80	4.26	1.63
C & E Loss (m)	0.14	Cum SA (1000 m2)	1815.92	366.63	1400.78

Plan: WestCredit   Credit R.   W. Credit R. RS: 19324.66   Profile: Regional

E.G. Elev (m)	435.27	Element	Left OB	Channel	Right OB
Vel Head (m)	0.27	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	435.01	Reach Len. (m)	25.82	25.47	25.60
Crit W.S. (m)	434.16	Flow Area (m2)	9.76	32.65	0.12
E.G. Slope (m/m)	0.002392	Area (m2)	9.76	32.65	0.12
Q Total (m3/s)	80.70	Flow (m3/s)	4.20	76.48	0.02
Top Width (m)	30.00	Top Width (m)	15.94	13.93	0.13
Vel Total (m/s)	1.90	Avg. Vel. (m/s)	0.43	2.34	0.14
Max Chl Dpth (m)	3.01	Hydr. Depth (m)	0.61	2.34	0.89
Conv. Total (m3/s)	1650.1	Conv. (m3/s)	85.9	1563.8	0.3
Length Wtd. (m)	25.47	Wetted Per. (m)	16.51	15.05	1.02
Min Ch El (m)	432.00	Shear (N/m2)	13.86	50.91	2.69
Alpha	1.45	Stream Power (N/m s)	5.97	119.24	0.39
Frctn Loss (m)		Cum Volume (1000 m3)		0.77	
C & E Loss (m)		Cum SA (1000 m2)	1814.69	365.14	1399.80

Plan: WestCredit   Credit R.   W. Credit R. RS: 19299.19   Profile: Regional

E.G. Elev (m)	435.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.79	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	434.35	Reach Len. (m)	80.00	83.46	88.70
Crit W.S. (m)	434.35	Flow Area (m2)	7.48	27.37	0.12
E.G. Slope (m/m)	0.008781	Area (m2)	7.48	27.37	0.12
Q Total (m3/s)	117.50	Flow (m3/s)	6.51	110.94	0.04
Top Width (m)	25.00	Top Width (m)	11.08	13.58	0.34
Vel Total (m/s)	3.36	Avg. Vel. (m/s)	0.87	4.05	0.36
Max Chl Dpth (m)	2.65	Hydr. Depth (m)	0.67	2.02	0.35
Conv. Total (m3/s)	1253.9	Conv. (m3/s)	69.5	1184.0	0.5
Length Wtd. (m)	84.85	Wetted Per. (m)	11.66	14.69	0.70
Min Ch El (m)	431.70	Shear (N/m2)	55.21	160.44	14.97
Alpha	1.38	Stream Power (N/m s)	48.08	650.39	5.46
Frctn Loss (m)	0.55	Cum Volume (1000 m3)	8.75	198.52	29.75
C & E Loss (m)	0.32	Cum SA (1000 m2)	1814.34	364.79	1399.80

Plan: WestCredit Credit R. W. Credit R. RS: 19215.73 Profile: Regional

E.G. Elev (m)	433.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	433.36	Reach Len. (m)	115.14	165.08	240.79
Crit W.S. (m)	433.20	Flow Area (m2)	11.16	14.93	94.34
E.G. Slope (m/m)	0.004979	Area (m2)	11.16	14.93	94.34
Q Total (m3/s)	117.50	Flow (m3/s)	6.51	40.09	70.90
Top Width (m)	149.43	Top Width (m)	20.24	9.26	119.93
Vel Total (m/s)	0.98	Avg. Vel. (m/s)	0.58	2.69	0.75
Max Chl Dpth (m)	2.23	Hydr. Depth (m)	0.55	1.61	0.79
Conv. Total (m3/s)	1665.1	Conv. (m3/s)	92.3	568.2	1004.7
Length Wtd. (m)	186.44	Wetted Per. (m)	20.74	9.70	119.97
Min Ch El (m)	431.13	Shear (N/m2)	26.27	75.10	38.40
Alpha	2.96	Stream Power (N/m s)	15.33	201.74	28.86
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	8.00	196.76	25.56
C & E Loss (m)	0.04	Cum SA (1000 m2)	1813.09	363.84	1394.46

Plan: WestCredit Credit R. W. Credit R. RS: 18717.64 Profile: Regional

E.G. Elev (m)	433.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	433.41	Reach Len. (m)	0.50	0.50	0.50
Crit W.S. (m)	430.02	Flow Area (m2)	13.85	289.65	5.04
E.G. Slope (m/m)	0.000034	Area (m2)	13.85	289.65	5.04
Q Total (m3/s)	117.50	Flow (m3/s)	0.51	116.78	0.21
Top Width (m)	125.72	Top Width (m)	38.57	75.12	12.02
Vel Total (m/s)	0.38	Avg. Vel. (m/s)	0.04	0.40	0.04
Max Chl Dpth (m)	4.68	Hydr. Depth (m)	0.36	3.86	0.42
Conv. Total (m3/s)	20104.1	Conv. (m3/s)	87.3	19981.5	35.3
Length Wtd. (m)	0.50	Wetted Per. (m)	38.64	77.20	12.06
Min Ch El (m)	428.73	Shear (N/m2)	0.12	1.26	0.14
Alpha	1.11	Stream Power (N/m s)	0.00	0.51	0.01
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	0.01	1.49	0.01
C & E Loss (m)	0.02	Cum SA (1000 m2)	1798.56	283.57	1348.24

Plan: WestCredit Credit R. W. Credit R. RS: 18717.14 Profile: Regional

E.G. Elev (m)	433.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.17	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	433.23	Reach Len. (m)	59.18	29.13	59.08
Crit W.S. (m)	432.51	Flow Area (m2)	14.63	52.46	30.67
E.G. Slope (m/m)	0.001363	Area (m2)	14.63	52.46	30.67
Q Total (m3/s)	117.50	Flow (m3/s)	4.69	101.53	11.29
Top Width (m)	88.19	Top Width (m)	25.24	19.91	43.04
Vel Total (m/s)	1.20	Avg. Vel. (m/s)	0.32	1.94	0.37
Max Chl Dpth (m)	3.85	Hydr. Depth (m)	0.58	2.63	0.71
Conv. Total (m3/s)	3182.3	Conv. (m3/s)	126.9	2749.7	305.6
Length Wtd. (m)	29.13	Wetted Per. (m)	25.32	21.11	43.08
Min Ch El (m)	429.38	Shear (N/m2)	7.73	33.22	9.52
Alpha	2.25	Stream Power (N/m s)	2.47	64.29	3.50
Frctn Loss (m)		Cum Volume (1000 m3)		1.40	
C & E Loss (m)		Cum SA (1000 m2)	1798.55	283.54	1348.23

Plan: WestCredit   Credit R.   W. Credit R. RS: 18688.00   Profile: Regional

E.G. Elev (m)	431.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	431.89	Reach Len. (m)	66.89	42.15	44.64
Crit W.S. (m)	431.89	Flow Area (m2)	64.20	11.78	80.75
E.G. Slope (m/m)	0.001348	Area (m2)	64.20	11.78	80.75
Q Total (m3/s)	117.50	Flow (m3/s)	46.46	21.48	49.56
Top Width (m)	88.47	Top Width (m)	32.11	4.25	52.10
Vel Total (m/s)	0.75	Avg. Vel. (m/s)	0.72	1.82	0.61
Max Chl Dpth (m)	2.77	Hydr. Depth (m)	2.00	2.77	1.55
Conv. Total (m3/s)	3199.9	Conv. (m3/s)	1265.3	584.9	1349.7
Length Wtd. (m)	47.57	Wetted Per. (m)	32.42	5.15	52.23
Min Ch El (m)	429.12	Shear (N/m2)	26.18	30.27	20.44
Alpha	1.73	Stream Power (N/m s)	18.95	55.18	12.55
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	9.28	35.94	3.79
C & E Loss (m)	0.01	Cum SA (1000 m2)	1796.85	283.19	1345.42

Plan: WestCredit   Credit R.   W. Credit R. RS: 18508.07   Profile: Regional

E.G. Elev (m)	430.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	430.15	Reach Len. (m)	50.53	46.34	47.52
Crit W.S. (m)	428.31	Flow Area (m2)	229.37	37.59	84.22
E.G. Slope (m/m)	0.000169	Area (m2)	229.37	37.59	84.22
Q Total (m3/s)	117.50	Flow (m3/s)	66.52	30.66	20.33
Top Width (m)	153.31	Top Width (m)	95.95	11.05	46.32
Vel Total (m/s)	0.33	Avg. Vel. (m/s)	0.29	0.82	0.24
Max Chl Dpth (m)	4.13	Hydr. Depth (m)	2.39	3.40	1.82
Conv. Total (m3/s)	9025.5	Conv. (m3/s)	5109.5	2354.7	1561.3
Length Wtd. (m)	46.34	Wetted Per. (m)	96.41	11.58	46.64
Min Ch El (m)	426.02	Shear (N/m2)	3.95	5.40	3.00
Alpha	2.07	Stream Power (N/m s)	1.15	4.40	0.72
Frctn Loss (m)		Cum Volume (1000 m3)		10.28	
C & E Loss (m)		Cum SA (1000 m2)	1789.86	271.43	1342.24

Plan: WestCredit   Credit R.   W. Credit R. RS: 18418.73   Profile: Regional

E.G. Elev (m)	428.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	428.06	Reach Len. (m)	42.23	39.62	38.70
Crit W.S. (m)	427.05	Flow Area (m2)	237.52	35.80	24.23
E.G. Slope (m/m)	0.000384	Area (m2)	237.52	35.80	24.23
Q Total (m3/s)	117.50	Flow (m3/s)	74.12	37.38	6.00
Top Width (m)	202.24	Top Width (m)	165.06	13.39	23.78
Vel Total (m/s)	0.39	Avg. Vel. (m/s)	0.31	1.04	0.25
Max Chl Dpth (m)	3.59	Hydr. Depth (m)	1.44	2.67	1.02
Conv. Total (m3/s)	5997.7	Conv. (m3/s)	3783.5	1908.1	306.1
Length Wtd. (m)	41.00	Wetted Per. (m)	165.11	14.05	23.86
Min Ch El (m)	424.47	Shear (N/m2)	5.41	9.59	3.82
Alpha	2.64	Stream Power (N/m s)	1.69	10.01	0.95
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	33.89	41.64	13.01
C & E Loss (m)	0.00	Cum SA (1000 m2)	1774.54	270.37	1338.38

Plan: WestCredit   Credit R.   W. Credit R. RS: 18702.66   Culv Group: Culvert #2   Profile: Regional

Q Culv Group (m3/s)	46.44	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	4.72
Q Barrel (m3/s)	46.44	Culv Vel DS (m/s)	5.90
E.G. US. (m)	433.40	Culv Inv El Up (m)	429.38
W.S. US. (m)	433.23	Culv Inv El Dn (m)	429.16
E.G. DS (m)	431.94	Culv Frctn Ls (m)	0.04
W.S. DS (m)	431.89	Culv Exit Loss (m)	0.81
Delta EG (m)	1.46	Culv Entr Loss (m)	0.61
Delta WS (m)	1.34	Q Weir (m3/s)	70.05
E.G. IC (m)	433.40	Weir Sta Lft (m)	130.25
E.G. OC (m)	433.36	Weir Sta Rgt (m)	238.38
Culvert Control	Inlet	Weir Submerg	0.00
Culv WS Inlet (m)	431.65	Weir Max Depth (m)	0.85
Culv WS Outlet (m)	430.98	Weir Avg Depth (m)	0.54
Culv Nml Depth (m)	1.04	Weir Flow Area (m2)	58.41
Culv Crt Depth (m)	2.27	Min El Weir Flow (m)	432.55

SCENARIO 3

INCREASE BRIDGE SPAN / WITH STOP-LOG CONTROL

Plan: Plan 06   Credit R.   W. Credit R. RS: 19425.62   Profile: Regional

E.G. Elev (m)	435.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.080	0.035	0.054
W.S. Elev (m)	435.79	Reach Len. (m)	45.43	43.82	47.61
Crit W.S. (m)	433.55	Flow Area (m2)	26.62	62.65	64.05
E.G. Slope (m/m)	0.000196	Area (m2)	26.62	62.65	64.05
Q Total (m3/s)	80.70	Flow (m3/s)	4.66	52.42	23.62
Top Width (m)	80.00	Top Width (m)	25.74	17.88	36.38
Vel Total (m/s)	0.53	Avg. Vel. (m/s)	0.18	0.84	0.37
Max Chl Dpth (m)	3.60	Hydr. Depth (m)	1.03	3.50	1.76
Conv. Total (m3/s)	5769.2	Conv. (m3/s)	333.0	3747.8	1688.4
Length Wtd. (m)	44.43	Wetted Per. (m)	26.58	20.68	37.94
Min Ch El (m)	432.19	Shear (N/m2)	1.92	5.81	3.24
Alpha	1.79	Stream Power (N/m s)	0.34	4.86	1.19
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	0.80	4.26	1.63
C & E Loss (m)	0.14	Cum SA (1000 m2)	1782.94	366.64	1395.44

Plan: Plan 06   Credit R.   W. Credit R. RS: 19324.66   Profile: Regional

E.G. Elev (m)	435.27	Element	Left OB	Channel	Right OB
Vel Head (m)	0.27	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	435.01	Reach Len. (m)	25.82	25.47	25.60
Crit W.S. (m)	434.16	Flow Area (m2)	9.76	32.65	0.12
E.G. Slope (m/m)	0.002392	Area (m2)	9.76	32.65	0.12
Q Total (m3/s)	80.70	Flow (m3/s)	4.20	76.48	0.02
Top Width (m)	30.00	Top Width (m)	15.94	13.93	0.13
Vel Total (m/s)	1.90	Avg. Vel. (m/s)	0.43	2.34	0.14
Max Chl Dpth (m)	3.01	Hydr. Depth (m)	0.61	2.34	0.89
Conv. Total (m3/s)	1650.1	Conv. (m3/s)	85.9	1563.9	0.3
Length Wtd. (m)	25.47	Wetted Per. (m)	16.51	15.05	1.02
Min Ch El (m)	432.00	Shear (N/m2)	13.86	50.90	2.69
Alpha	1.45	Stream Power (N/m s)	5.97	119.23	0.39
Frctn Loss (m)		Cum Volume (1000 m3)		0.77	
C & E Loss (m)		Cum SA (1000 m2)	1781.71	365.15	1394.47

Plan: Plan 06   Credit R.   W. Credit R. RS: 19299.19   Profile: Regional

E.G. Elev (m)	435.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.79	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	434.35	Reach Len. (m)	80.00	83.46	88.70
Crit W.S. (m)	434.35	Flow Area (m2)	7.48	27.37	0.12
E.G. Slope (m/m)	0.008781	Area (m2)	7.48	27.37	0.12
Q Total (m3/s)	117.50	Flow (m3/s)	6.51	110.94	0.04
Top Width (m)	25.00	Top Width (m)	11.08	13.58	0.34
Vel Total (m/s)	3.36	Avg. Vel. (m/s)	0.87	4.05	0.36
Max Chl Dpth (m)	2.65	Hydr. Depth (m)	0.67	2.02	0.35
Conv. Total (m3/s)	1253.9	Conv. (m3/s)	69.5	1184.0	0.5
Length Wtd. (m)	84.55	Wetted Per. (m)	11.66	14.69	0.70
Min Ch El (m)	431.70	Shear (N/m2)	55.21	160.44	14.97
Alpha	1.38	Stream Power (N/m s)	48.08	650.39	5.46
Frctn Loss (m)	0.76	Cum Volume (1000 m3)	2.89	164.05	12.10
C & E Loss (m)	0.27	Cum SA (1000 m2)	1781.36	364.80	1394.46

Plan: Plan 06   Credit R.   W. Credit R. RS: 19215.73   Profile: Regional

E.G. Elev (m)	433.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.89	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	432.93	Reach Len. (m)	115.14	165.08	240.79
Crit W.S. (m)	433.20	Flow Area (m2)	2.57	11.00	44.61
E.G. Slope (m/m)	0.032989	Area (m2)	2.57	11.00	44.61
Q Total (m3/s)	117.50	Flow (m3/s)	1.47	62.03	54.00
Top Width (m)	144.06	Top Width (m)	20.24	9.26	114.55
Vel Total (m/s)	2.02	Avg. Vel. (m/s)	0.57	5.64	1.21
Max Chl Dpth (m)	1.80	Hydr. Depth (m)	0.13	1.19	0.39
Conv. Total (m3/s)	646.9	Conv. (m3/s)	8.1	341.5	297.3
Length Wtd. (m)	185.52	Wetted Per. (m)	20.32	9.70	114.57
Min Ch El (m)	431.13	Shear (N/m2)	40.91	366.60	125.95
Alpha	4.28	Stream Power (N/m s)	23.40	2067.85	152.47
Frctn Loss (m)	1.29	Cum Volume (1000 m3)	2.48	162.45	10.12
C & E Loss (m)	0.03	Cum SA (1000 m2)	1780.11	363.85	1389.37

Plan: Plan 06   Credit R.   W. Credit R. RS: 18717.64   Profile: Regional

E.G. Elev (m)	432.90	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	0.080
W.S. Elev (m)	432.88	Reach Len. (m)	0.50	0.50	0.50
Crit W.S. (m)	430.01	Flow Area (m2)		250.37	0.86
E.G. Slope (m/m)	0.000056	Area (m2)		250.37	0.86
Q Total (m3/s)	117.50	Flow (m3/s)		117.47	0.03
Top Width (m)	79.42	Top Width (m)		74.79	4.64
Vel Total (m/s)	0.47	Avg. Vel. (m/s)		0.47	0.03
Max Chl Dpth (m)	4.15	Hydr. Depth (m)		3.35	0.19
Conv. Total (m3/s)	15736.0	Conv. (m3/s)		15732.5	3.5
Length Wtd. (m)	0.50	Wetted Per. (m)		76.77	4.65
Min Ch El (m)	428.73	Shear (N/m2)		1.78	0.10
Alpha	1.01	Stream Power (N/m s)		0.84	0.00
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	0.00	0.52	0.00
C & E Loss (m)	0.02	Cum SA (1000 m2)	1770.74	283.59	1361.87

Plan: Plan 06   Credit R.   W. Credit R. RS: 18717.14   Profile: Regional

E.G. Elev (m)	432.88	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	432.68	Reach Len. (m)	59.18	29.13	59.08
Crit W.S. (m)	431.26	Flow Area (m2)	3.37	58.06	8.59
E.G. Slope (m/m)	0.001411	Area (m2)	3.37	58.06	8.59
Q Total (m3/s)	117.50	Flow (m3/s)	0.50	115.45	1.54
Top Width (m)	75.07	Top Width (m)	18.92	19.91	36.23
Vel Total (m/s)	1.68	Avg. Vel. (m/s)	0.15	1.99	0.18
Max Chl Dpth (m)	3.29	Hydr. Depth (m)	0.18	2.92	0.24
Conv. Total (m3/s)	3127.9	Conv. (m3/s)	13.3	3073.4	41.1
Length Wtd. (m)	29.13	Wetted Per. (m)	18.94	23.03	36.25
Min Ch El (m)	429.39	Shear (N/m2)	2.46	34.90	3.28
Alpha	1.38	Stream Power (N/m s)	0.37	69.39	0.59
Frctn Loss (m)		Cum Volume (1000 m3)		0.44	
C & E Loss (m)		Cum SA (1000 m2)	1770.73	283.57	1361.86

Plan: Plan 06 Credit R. W. Credit R. RS: 18688.00 Profile: Regional

E.G. Elev (m)	432.68	Element	Left OB	Channel	Right OB
Vel Head (m)	1.04	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	431.64	Reach Len. (m)	66.89	42.15	44.64
Crit W.S. (m)	431.64	Flow Area (m2)	11.09	10.71	11.20
E.G. Slope (m/m)	0.015251	Area (m2)	56.17	10.71	68.00
Q Total (m3/s)	117.50	Flow (m3/s)	27.73	61.57	28.19
Top Width (m)	84.57	Top Width (m)	31.26	4.25	49.06
Vel Total (m/s)	3.56	Avg. Vel. (m/s)	2.50	5.75	2.52
Max Chl Dpth (m)	2.52	Hydr. Depth (m)	2.06	2.52	2.08
Conv. Total (m3/s)	951.4	Conv. (m3/s)	224.6	498.6	228.3
Length Wtd. (m)	45.58	Wetted Per. (m)	5.38	5.15	5.38
Min Ch El (m)	429.12	Shear (N/m2)	308.50	311.16	311.55
Alpha	1.60	Stream Power (N/m s)	771.69	1789.24	784.43
Frctn Loss (m)	0.15	Cum Volume (1000 m3)	9.45	40.93	3.57
C & E Loss (m)	0.47	Cum SA (1000 m2)	1769.25	283.22	1359.34

Plan: Plan 06 Credit R. W. Credit R. RS: 18508.07 Profile: Regional

E.G. Elev (m)	430.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	430.15	Reach Len. (m)	50.53	46.34	47.52
Crit W.S. (m)	428.31	Flow Area (m2)	229.37	37.59	84.22
E.G. Slope (m/m)	0.000169	Area (m2)	229.37	37.59	84.22
Q Total (m3/s)	117.50	Flow (m3/s)	66.52	30.66	20.33
Top Width (m)	153.31	Top Width (m)	95.95	11.05	46.32
Vel Total (m/s)	0.33	Avg. Vel. (m/s)	0.29	0.82	0.24
Max Chl Dpth (m)	4.13	Hydr. Depth (m)	2.39	3.40	1.82
Conv. Total (m3/s)	9025.5	Conv. (m3/s)	5109.5	2354.7	1561.3
Length Wtd. (m)	46.34	Wetted Per. (m)	96.41	11.58	46.64
Min Ch El (m)	426.02	Shear (N/m2)	3.95	5.40	3.00
Alpha	2.07	Stream Power (N/m s)	1.15	4.40	0.72
Frctn Loss (m)		Cum Volume (1000 m3)		10.28	
C & E Loss (m)		Cum SA (1000 m2)	1761.67	270.79	1356.05

Plan: Plan 06 Credit R. W. Credit R. RS: 18418.73 Profile: Regional

E.G. Elev (m)	428.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	428.06	Reach Len. (m)	42.23	39.62	38.70
Crit W.S. (m)	427.06	Flow Area (m2)	237.01	35.76	24.16
E.G. Slope (m/m)	0.000386	Area (m2)	237.01	35.76	24.16
Q Total (m3/s)	117.50	Flow (m3/s)	74.09	37.42	5.99
Top Width (m)	202.17	Top Width (m)	165.02	13.39	23.76
Vel Total (m/s)	0.40	Avg. Vel. (m/s)	0.31	1.05	0.25
Max Chl Dpth (m)	3.59	Hydr. Depth (m)	1.44	2.67	1.02
Conv. Total (m3/s)	5980.1	Conv. (m3/s)	3770.7	1904.5	304.8
Length Wtd. (m)	41.00	Wetted Per. (m)	165.07	14.05	23.83
Min Ch El (m)	424.47	Shear (N/m2)	5.44	9.64	3.84
Alpha	2.64	Stream Power (N/m s)	1.70	10.08	0.95
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	33.80	41.87	13.02
C & E Loss (m)	0.00	Cum SA (1000 m2)	1746.35	269.73	1352.18

Plan: Plan 06   Credit R.   W. Credit R. RS: 18702.66   Culv Group: Culvert #2   Profile: Regional

Q Culv Group (m3/s)	117.12	Culv Full Len (m)	7.58
# Barrels	1	Culv Vel US (m/s)	2.74
Q Barrel (m3/s)	117.12	Culv Vel DS (m/s)	2.74
E.G. US. (m)	432.87	Culv Inv El Up (m)	429.38
W.S. US. (m)	432.68	Culv Inv El Dn (m)	429.16
E.G. DS (m)	432.68	Culv Frctn Ls (m)	0.01
W.S. DS (m)	431.64	Culv Exit Loss (m)	0.00
Delta EG (m)	0.20	Culv Entr Loss (m)	0.19
Delta WS (m)	1.04	Q Weir (m3/s)	
E.G. IC (m)	432.31	Weir Sta Lft (m)	
E.G. OC (m)	432.87	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	432.23	Weir Max Depth (m)	
Culv WS Outlet (m)	432.29	Weir Avg Depth (m)	
Culv Nml Depth (m)		Weir Flow Area (m2)	
Culv Crt Depth (m)	1.84	Min El Weir Flow (m)	432.88

SCENARIO 4

INCREASE BRIDGE SPAN / NO STOP-LOG CONTROL

Plan: Plan 06 Credit R. W. Credit R. RS: 19425.62 Profile: Regional

E.G. Elev (m)	435.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.080	0.035	0.054
W.S. Elev (m)	435.79	Reach Len. (m)	45.43	43.82	47.61
Crit W.S. (m)	433.55	Flow Area (m2)	26.62	62.65	64.05
E.G. Slope (m/m)	0.000196	Area (m2)	26.62	62.65	64.05
Q Total (m3/s)	80.70	Flow (m3/s)	4.66	52.42	23.62
Top Width (m)	80.00	Top Width (m)	25.74	17.88	36.38
Vel Total (m/s)	0.53	Avg. Vel. (m/s)	0.18	0.84	0.37
Max Chl Dpth (m)	3.60	Hydr. Depth (m)	1.03	3.50	1.76
Conv. Total (m3/s)	5769.2	Conv. (m3/s)	333.0	3747.8	1688.4
Length Wtd. (m)	44.43	Wetted Per. (m)	26.58	20.68	37.94
Min Ch El (m)	432.19	Shear (N/m2)	1.92	5.81	3.24
Alpha	1.79	Stream Power (N/m s)	0.34	4.86	1.19
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	0.80	4.26	1.63
C & E Loss (m)	0.14	Cum SA (1000 m2)	1781.83	366.63	1393.30

Plan: Plan 06 Credit R. W. Credit R. RS: 19324.66 Profile: Regional

E.G. Elev (m)	435.27	Element	Left OB	Channel	Right OB
Vel Head (m)	0.27	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	435.01	Reach Len. (m)	25.82	25.47	25.60
Crit W.S. (m)	434.16	Flow Area (m2)	9.76	32.65	0.12
E.G. Slope (m/m)	0.002392	Area (m2)	9.76	32.65	0.12
Q Total (m3/s)	80.70	Flow (m3/s)	4.20	76.48	0.02
Top Width (m)	30.00	Top Width (m)	15.94	13.93	0.13
Vel Total (m/s)	1.90	Avg. Vel. (m/s)	0.43	2.34	0.14
Max Chl Dpth (m)	3.01	Hydr. Depth (m)	0.61	2.34	0.89
Conv. Total (m3/s)	1650.1	Conv. (m3/s)	85.9	1563.9	0.3
Length Wtd. (m)	25.47	Wetted Per. (m)	16.51	15.05	1.02
Min Ch El (m)	432.00	Shear (N/m2)	13.86	50.90	2.69
Alpha	1.45	Stream Power (N/m s)	5.97	119.23	0.39
Frctn Loss (m)		Cum Volume (1000 m3)		0.77	
C & E Loss (m)		Cum SA (1000 m2)	1780.60	365.14	1392.33

Plan: Plan 06 Credit R. W. Credit R. RS: 19299.19 Profile: Regional

E.G. Elev (m)	435.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.79	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	434.35	Reach Len. (m)	80.00	83.46	88.70
Crit W.S. (m)	434.35	Flow Area (m2)	7.48	27.37	0.12
E.G. Slope (m/m)	0.008781	Area (m2)	7.48	27.37	0.12
Q Total (m3/s)	117.50	Flow (m3/s)	6.51	110.94	0.04
Top Width (m)	25.00	Top Width (m)	11.08	13.58	0.34
Vel Total (m/s)	3.36	Avg. Vel. (m/s)	0.87	4.05	0.36
Max Chl Dpth (m)	2.65	Hydr. Depth (m)	0.67	2.02	0.35
Conv. Total (m3/s)	1253.9	Conv. (m3/s)	69.5	1184.0	0.5
Length Wtd. (m)	84.55	Wetted Per. (m)	11.66	14.69	0.70
Min Ch El (m)	431.70	Shear (N/m2)	55.21	160.44	14.97
Alpha	1.38	Stream Power (N/m s)	48.08	650.39	5.46
Frctn Loss (m)	0.76	Cum Volume (1000 m3)	2.11	156.80	10.82
C & E Loss (m)	0.27	Cum SA (1000 m2)	1780.25	364.79	1392.32

Plan: Plan 06   Credit R.   W. Credit R. RS: 19215.73   Profile: Regional

E.G. Elev (m)	433.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.89	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	432.93	Reach Len. (m)	115.14	165.08	240.79
Crit W.S. (m)	433.20	Flow Area (m2)	2.57	11.00	44.61
E.G. Slope (m/m)	0.032989	Area (m2)	2.57	11.00	44.61
Q Total (m3/s)	117.50	Flow (m3/s)	1.47	62.03	54.00
Top Width (m)	144.06	Top Width (m)	20.24	9.26	114.55
Vel Total (m/s)	2.02	Avg. Vel. (m/s)	0.57	5.64	1.21
Max Chl Dpth (m)	1.80	Hydr. Depth (m)	0.13	1.19	0.39
Conv. Total (m3/s)	646.9	Conv. (m3/s)	8.1	341.5	297.3
Length Wtd. (m)	185.54	Wetted Per. (m)	20.32	9.70	114.57
Min Ch El (m)	431.13	Shear (N/m2)	40.91	366.60	125.95
Alpha	4.28	Stream Power (N/m s)	23.40	2067.85	152.47
Frctn Loss (m)	1.29	Cum Volume (1000 m3)	1.71	155.20	8.83
C & E Loss (m)	0.03	Cum SA (1000 m2)	1779.00	363.84	1387.23

Plan: Plan 06   Credit R.   W. Credit R. RS: 18717.64   Profile: Regional

E.G. Elev (m)	432.90	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	0.080
W.S. Elev (m)	432.88	Reach Len. (m)	0.50	0.50	0.50
Crit W.S. (m)	430.01	Flow Area (m2)		250.35	0.86
E.G. Slope (m/m)	0.000056	Area (m2)		250.35	0.86
Q Total (m3/s)	117.50	Flow (m3/s)		117.47	0.03
Top Width (m)	79.42	Top Width (m)		74.79	4.63
Vel Total (m/s)	0.47	Avg. Vel. (m/s)		0.47	0.03
Max Chl Dpth (m)	4.15	Hydr. Depth (m)		3.35	0.19
Conv. Total (m3/s)	15734.0	Conv. (m3/s)		15730.5	3.5
Length Wtd. (m)	0.50	Wetted Per. (m)		76.77	4.65
Min Ch El (m)	428.73	Shear (N/m2)		1.78	0.10
Alpha	1.01	Stream Power (N/m s)		0.84	0.00
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	0.00	0.52	0.00
C & E Loss (m)	0.02	Cum SA (1000 m2)	1770.74	283.59	1361.87

Plan: Plan 06   Credit R.   W. Credit R. RS: 18717.14   Profile: Regional

E.G. Elev (m)	432.88	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	432.68	Reach Len. (m)	59.18	29.13	59.08
Crit W.S. (m)	431.26	Flow Area (m2)	3.41	58.35	8.66
E.G. Slope (m/m)	0.001392	Area (m2)	3.41	58.35	8.66
Q Total (m3/s)	117.50	Flow (m3/s)	0.51	115.44	1.56
Top Width (m)	75.10	Top Width (m)	18.93	19.91	36.26
Vel Total (m/s)	1.67	Avg. Vel. (m/s)	0.15	1.98	0.18
Max Chl Dpth (m)	3.28	Hydr. Depth (m)	0.18	2.93	0.24
Conv. Total (m3/s)	3148.9	Conv. (m3/s)	13.6	3093.6	41.7
Length Wtd. (m)	29.13	Wetted Per. (m)	18.95	23.09	36.27
Min Ch El (m)	429.40	Shear (N/m2)	2.46	34.51	3.26
Alpha	1.38	Stream Power (N/m s)	0.37	68.27	0.59
Frctn Loss (m)		Cum Volume (1000 m3)		0.44	
C & E Loss (m)		Cum SA (1000 m2)	1770.73	283.57	1361.86

Plan: Plan 06   Credit R.   W. Credit R. RS: 18688.00   Profile: Regional

E.G. Elev (m)	432.68	Element	Left OB	Channel	Right OB
Vel Head (m)	1.04	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	431.64	Reach Len. (m)	66.89	42.15	44.64
Crit W.S. (m)	431.64	Flow Area (m2)	11.09	10.71	11.20
E.G. Slope (m/m)	0.015251	Area (m2)	56.17	10.71	68.00
Q Total (m3/s)	117.50	Flow (m3/s)	27.73	61.57	28.19
Top Width (m)	84.57	Top Width (m)	31.26	4.25	49.06
Vel Total (m/s)	3.56	Avg. Vel. (m/s)	2.50	5.75	2.52
Max Chl Dpth (m)	2.52	Hydr. Depth (m)	2.06	2.52	2.08
Conv. Total (m3/s)	951.4	Conv. (m3/s)	224.6	498.6	228.3
Length Wtd. (m)	45.58	Wetted Per. (m)	5.38	5.15	5.38
Min Ch El (m)	429.12	Shear (N/m2)	308.50	311.16	311.55
Alpha	1.60	Stream Power (N/m s)	771.69	1789.24	784.43
Frctn Loss (m)	0.15	Cum Volume (1000 m3)	9.45	40.93	3.57
C & E Loss (m)	0.47	Cum SA (1000 m2)	1769.25	283.22	1359.34

Plan: Plan 06   Credit R.   W. Credit R. RS: 18508.07   Profile: Regional

E.G. Elev (m)	430.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	430.15	Reach Len. (m)	50.53	46.34	47.52
Crit W.S. (m)	428.31	Flow Area (m2)	229.37	37.59	84.22
E.G. Slope (m/m)	0.000169	Area (m2)	229.37	37.59	84.22
Q Total (m3/s)	117.50	Flow (m3/s)	66.52	30.66	20.33
Top Width (m)	153.31	Top Width (m)	95.95	11.05	46.32
Vel Total (m/s)	0.33	Avg. Vel. (m/s)	0.29	0.82	0.24
Max Chl Dpth (m)	4.13	Hydr. Depth (m)	2.39	3.40	1.82
Conv. Total (m3/s)	9025.5	Conv. (m3/s)	5109.5	2354.7	1561.3
Length Wtd. (m)	46.34	Wetted Per. (m)	96.41	11.58	46.64
Min Ch El (m)	426.02	Shear (N/m2)	3.95	5.40	3.00
Alpha	2.07	Stream Power (N/m s)	1.15	4.40	0.72
Frctn Loss (m)		Cum Volume (1000 m3)		10.28	
C & E Loss (m)		Cum SA (1000 m2)	1761.67	270.79	1356.05

Plan: Plan 06   Credit R.   W. Credit R. RS: 18418.73   Profile: Regional

E.G. Elev (m)	428.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.080	0.035	0.080
W.S. Elev (m)	428.06	Reach Len. (m)	42.23	39.62	38.70
Crit W.S. (m)	427.06	Flow Area (m2)	237.01	35.76	24.16
E.G. Slope (m/m)	0.000386	Area (m2)	237.01	35.76	24.16
Q Total (m3/s)	117.50	Flow (m3/s)	74.09	37.42	5.99
Top Width (m)	202.17	Top Width (m)	165.02	13.39	23.76
Vel Total (m/s)	0.40	Avg. Vel. (m/s)	0.31	1.05	0.25
Max Chl Dpth (m)	3.59	Hydr. Depth (m)	1.44	2.67	1.02
Conv. Total (m3/s)	5980.1	Conv. (m3/s)	3770.7	1904.5	304.8
Length Wtd. (m)	41.00	Wetted Per. (m)	165.07	14.05	23.83
Min Ch El (m)	424.47	Shear (N/m2)	5.44	9.64	3.84
Alpha	2.64	Stream Power (N/m s)	1.70	10.08	0.95
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	33.80	41.87	13.02
C & E Loss (m)	0.00	Cum SA (1000 m2)	1746.35	269.73	1352.18

Plan: Plan 06   Credit R.   W. Credit R. RS: 18702.66   Culv Group: Culvert #2   Profile: Regional

Q Culv Group (m3/s)	117.12	Culv Full Len (m)	7.58
# Barrels	1	Culv Vel US (m/s)	2.74
Q Barrel (m3/s)	117.12	Culv Vel DS (m/s)	2.74
E.G. US. (m)	432.87	Culv Inv El Up (m)	429.38
W.S. US. (m)	432.68	Culv Inv El Dn (m)	429.16
E.G. DS (m)	432.68	Culv Frctn Ls (m)	0.01
W.S. DS (m)	431.64	Culv Exit Loss (m)	0.00
Delta EG (m)	0.20	Culv Entr Loss (m)	0.19
Delta WS (m)	1.04	Q Weir (m3/s)	
E.G. IC (m)	432.31	Weir Sta Lft (m)	
E.G. OC (m)	432.87	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	432.23	Weir Max Depth (m)	
Culv WS Outlet (m)	432.29	Weir Avg Depth (m)	
Culv Nml Depth (m)		Weir Flow Area (m2)	
Culv Crt Depth (m)	1.84	Min El Weir Flow (m)	432.88

APPENDIX C-2

Embankment Dam Assessment

July 30, 2012

12-015.R03

Triton Engineering Services Limited
105 Queen Street West, Unit 14
Fergus, Ontario
N1M 1S6

Attention: Mr. Paul Ziegler, C.E.T.

Dear Sir:

Re: Embankment Dam Assessment
Station Street Dam
Hillsburgh, Ontario

Background

CMT Engineering Inc. (CMT) has been requested to assess the embankment dam in its present condition with respect to the 2011 Ontario Ministry of Natural Resources Standards. This investigation and report deals only with the earth fill embankment dam (dam) and not the existing bridge structure. A structural engineer should independently assess the bridge structure. An initial geotechnical investigation was undertaken to assess the reported sinkhole in the roadway of the dam. A report providing the apparent history of the dam, as well as results of a geotechnical investigation and recommendations for repair was prepared by CMT on March 6, 2012. As such, those details will not be repeated in this report.

In January of 2012, CMT undertook a borehole investigation program in order to assess the present condition of the dam. This involved advancing eleven (11) boreholes in four sections (three boreholes in three of the sections and two in the other section) perpendicular to the axis of the dam. The boreholes were advanced to depths of approximately 6.0 m. Drawing 1 shows the locations of the boreholes on the dam.

It should be pointed out that the dam has been operable with a history of good performance for over a hundred years. The original dam is believed to have been built in the 1850's and subsequently widened to allow vehicular traffic to pass over it in the 1920's. The dam was further widened to allow for the installation of guardrails in the 1970's. As such, the dam has experienced and survived every element that nature could offer including storms, waves, high winds, flooding and seismic activity (even though relatively scarce and minimal in this area). Besides the issues relating to the sinkhole, there have been no serious problems reported with respect to the dam.

Subsoil Conditions

In general, the dam is largely composed of an upper pavement structure (asphaltic concrete and road base), overlying fill material and then native sand and gravel. Asphaltic concrete was found in Boreholes 1, 6, 7 and 8 and the thickness was 30 mm at each borehole location. Road base material was found in Boreholes 1, 3, 4, 5, 6, 7 and 8. The thickness of the road base ranged from 250 mm to 300 mm (average: 261 mm). The fill generally comprised sandy silt, silt or clayey silt. The thickness of the fill material ranged from 3.17 m to 5.89 m (average: 4.77 m). The moisture content in the fill ranged from 5.9% to 27.5% (average: 17.6%) and the N-values ranged from 0 to 23 blows per 0.3 m (average: 5 blows per 0.3 m). In general, some organic material was found below the fill. This may indicate the original grade level. Dense to very dense sand and gravel was found below the base of the dam. The moisture contents ranged from 7.4% to 15.3% (average: 9.4%) and the N-values ranged from 16 to 72 blows per 0.3 m (average: 39 blows per 0.3 m). The borehole logs are provided with this report.

It was noted that the soil in the upper 1.2 m of the dam roadway was relatively compact and the moisture contents were also relatively low. Below the upper compact layer, the moisture content increases significantly, and as a result the SPT N-values are also lower than the values obtained in the upper zone. The apparent reason for this is that with time water moves through the dam from the head pond to the tailrace. The top of the water level that is established in the dam is called the phreatic surface. Saturated conditions are generally found below this level. It should also be noted that less dense fill is found on the east side of the dam where loose fill was apparently placed in the 1970's so that guardrails could be placed along the road. With reference to Drawing 1, Drawings 2 to 5 show typical cross-sections through the dam at various locations.

Grain size analyses were conducted on various soil samples taken from the boreholes. The particle size distribution reports are included with this report. The results are provided below:

Borehole Number	Depth (m)	Soil Type	Estimated Hydraulic Conductivity (cm/sec)
2	2.3 – 2.9	Clayey silt, trace sand	1.0×10^{-6}
3	2.3 – 2.9	Silty sand, some gravel, trace clay	1.0×10^{-4}
6	2.3 – 2.9	Silty sand, some gravel, trace clay	8.0×10^{-5}
6	5.3 – 5.9	Sandy gravel, some silt, trace clay	4.0×10^{-4}
7	2.3 – 2.9	Silty sand, trace clay and gravel	4.2×10^{-5}
7	5.3 – 5.9	Sand and gravel, some silt	3.0×10^{-3}
10	2.3 – 2.0	Silty sand, some gravel, trace sand	3.6×10^{-5}
11	2.3 – 2.9	Sand and silt, trace gravel	2.0×10^{-5}

All of the samples obtained from between depths 2.3 m to 2.9 m were taken from the dam fill material. The estimated hydraulic conductivity for the fill material ranged from 1.0 x 10^{-4} cm/sec to 1.0 x 10^{-6} cm/sec (average: 4.6 x 10^{-5} cm/sec). The two samples taken from depths between 5.3 m and 5.9 m were taken from the foundation soils. The estimated hydraulic conductivity ranged from 3.0 x 10^{-3} cm/sec to 4.0 x 10^{-4} cm/sec (average: 3.4 x 10^{-3} cm/sec).

GPR Investigation

A GPR (Ground Penetrating Radar) investigation was undertaken by Global GPR Services on November 28, 2011. The area surveyed was approximately 43 metres along the road on the dam and 6 metres across the dam between the east and west guardrails. Three GPR lines were run along the axis of the dam (parallel to the head pond). Only one void area was identified and that was in the area where the underground pipe from the monk was located. A fourth GPR line was run perpendicular to the dam axis to confirm the presence of the void. No other adverse features were revealed during the course of the investigation.

Dam Foundation

The dam foundation comprises compact to very dense sand and gravel. As indicated previously, the average N-count values were in the order of 45 blows per 0.3 m. As such, the foundation is considered to have very high bearing strength (>300 kPa / 6000 psf) and the potential for settlement is considered to be very low. If any settlement did occur, it would most likely have taken place at the time of dam construction and impounding. In general, soils such as sand and gravel are known to settle almost instantaneously as loads are applied. The foundation soils are classified to be "GM" according to the Unified Soil Classification and have a medium permeability. The foundation is therefore capable of providing a very high bearing capacity and at the same time act as a natural drainage layer to dissipate potential excess pore pressures.

Earth Fill Embankment Dam

Based on the soil investigations conducted, it is apparent that there is an upper layer of compact relatively dry soils, underlain by lower density soils with very high moisture contents or saturated conditions. The fill materials are generally classified to be "SM" to "ML" according to the Unified Soils Classification and have a medium to low permeability. As is typical of earth fill dams, a phreatic water level has been established with time. This level connects the water level in the head pond with the water level in the tailrace. The soil below the phreatic surface is generally very moist to saturated. As such, the N-count values obtained during the investigation are considered to be somewhat deceptive since they are affected by both the high water content and the lack of lateral restraint due to the sloping sides of the dam. Test pits excavated into the core of the dam during the investigation for the underground pipe revealed soils with much higher bearing strength. This stands to reason considering the longevity of the existing dam and years of consolidation activity under its own weight, as well as from surcharge loading (vehicles) on the dam.

Overtopping Potential

The dam presently features a stop log outlet control structure as well as a monk feature, which also has stop logs that can regulate flow. As such, the dam has two overflow control structures to help control the head pond level. The monk facility is in a relatively poor condition and will be abandoned in favour of a new outlet control structure complete with a front mounted sluice gate. The freeboard of the dam is in the order of 550 mm. Based on a reservoir fetch that is in the order of 160 m, a minimum freeboard of 300 mm is required. As such, the present freeboard is adequate. From a historical point of view, there have been no reported failures or distress to the dam as a result of overtopping.

Seepage Considerations

A two-dimensional flow net was prepared to simulate the potential flow of water under the dam. The main purpose of the flow net was to determine the potential seepage exit gradient of flow at the toe of the dam. Generally, a value of 1.0 indicates a zero effective stress condition with a corresponding upward flow that could potentially result in piping or quick conditions. The head pond level used was elevation 432.54 m, which is the top of the bank on the upstream side of the dam. For reference, the top of the monk intake structure is at elevation 431.90 m. The tail pond level used was at elevation 428.65 m. As such, the difference in the head level was 3.89 m. The base width of the dam in a direction perpendicular to the axis of the dam is in the order of 24.0 m.

Based on the flow net, the seepage exit gradient was determined to be 0.23, which would most likely suggest light seepage flow but not enough to create quick conditions. Due to the large difference between the height of the dam and the width of the dam, the head pressure under the dam is largely dissipated by the time it exits at the toe. It is assumed that the head pond will have a natural upstream silt/clay blanket on the bottom as a result of years (100 to 150 years) of inflow and soil particle settlement within the head pond.

Stability of Dam

Obviously, the historical longevity of the dam suggests that it has functioned successfully for a very long time. Regardless, a limit equilibrium method of stability analysis was undertaken. A global stability analysis using Bishop's method was undertaken to assess the potential for any deep-seated failures. This analysis provided a factor of safety of 7.2. This can most likely be attributed to the relative width of the dam and the dense sand and gravel foundation, which provides a suitable high bearing capacity base and high internal friction for the embankment dam. Another stability analysis was undertaken to assess the embankment dam with respect to the underlying foundation. A factor of safety of 1.6 was obtained for this analysis. It is always possible that a shallow failure could occur, but this would most likely be minor in nature and easily fixed. To the best of our knowledge, this type of occurrence has not been reported to date.

Seepage Reduction Recommendation

The presence of seepage reducing techniques with respect to the dam is unknown due to its age. However, it would appear that the dam must have a natural upstream blanket of relatively impermeable soils such as silt and clay. It would also seem reasonable to assume that this upstream blanket would have increased in thickness with time as a result of having fine soils settle out in the head pond. Without such an upstream blanket, significant seepage through the foundation would be expected considering that the foundation comprises sand and gravel and has an estimated hydraulic conductivity of 3.4×10^{-3} cm/sec.

This suggests that if the upstream blanket or a portion of it becomes jeopardized due to human interference or by the forces of nature, undermining (erosion) or piping conditions could occur within the dam structure. This apparently has not occurred to date; however, the installation of a cut-off in the form of a sheet pile wall, installed on the upstream side of the dam, would reduce/eliminate the potential for erosion to occur. The cut-off wall would minimize the potential for seepage and potential erosion beneath the dam and also reduce potential seepage through the embankment. Furthermore, this would also minimize the potential for slope failure in the event of a rapid draw down condition. It should be pointed out, however, that the effects of a potential rapid draw down are expected to be minimal to nil considering that the differential head pressure within this relatively small dam is not very significant.

Leakage from Conduit

The existing dam has a conduit running from the monk in the head pond to the tailrace of the dam. This conduit has been the source of a sinkhole found above the pipe in the dam. It is expected that internal erosion has occurred due to failure of the existing pipe and seepage in a direction parallel to the conduit. It has been proposed to remove this conduit and seal the area where it existed. A new intake structure and conduit will be constructed and the monk feature will be abandoned. The recommended sheet pile cut-off wall will also be helpful in helping to minimize the potential seepage flow along the proposed new conduit once construction has been completed.

Embankment Slopes

Trees and shrubs have been removed from the upstream side of the dam. However, based on exploratory test pits near the upstream face, it appears that some of the roots have penetrated into the dam. It is recommended that the stumps and associated roots be removed from the face since they can create water pathways into the dam. The downstream side of the dam presently has some small trees and bushes, which should also be removed. It is important that the dam is kept free of trees and shrubs on both the upstream and downstream sides. The upstream face is largely covered with durable riprap. However, the upstream slope should be examined to ensure that the slope is entirely covered with riprap.

Pavement Structure

It appears that the roadway on the dam is slightly tilted towards the downstream side of the dam. This may be the result of differential settlement with respect to the three different phases of dam construction that has occurred throughout the history of the dam. As such, it is suggested that the pavement structure on the dam be reconstructed. The following recommendations are provided.

Prior to placement of the granular base, the subgrade for the paved area should be proof-rolled and any soft or unstable areas as well as unsuitable fill materials should be subexcavated and replaced with approved site soil or imported fill materials. The subgrade should be graded smooth and be free of depressions with a minimum grade of 3% towards the downstream side. Considering that drainage is directed towards a free face (downstream slope), subdrains should not be necessary. Considering that the underlying soils are prone to becoming saturated and thereby reduced with respect to bearing capacity, it is recommended that a biaxial geogrid (Tensar BX1200 or equivalent) be installed on the subgrade prior to installation of the pavement structure.

It is assumed that the paved areas will experience light to heavy traffic (cars, dump trucks, fire trucks, etc.). Based on the anticipated loading, the following pavement design is recommended:

Material	Recommended Thickness
Asphaltic Concrete	HL3 - 40 mm (1.5") HL4 or HL8 - 60 mm (2.5")
Granular 'A' Base	150 mm (6.0")
Granular 'B' Subbase	450 mm (18.0")
BX1200 Geogrid	N/A

The granular base and subbase materials must be compacted to 100% SPMDD. Asphaltic concrete should be supplied, placed and compacted to a minimum 92.0% Marshall maximum relative density, in accordance with OPSS 1150 and OPSS 310.

It is important that the soil in the bridge approach areas is free-draining and compacted to 100% SPMDD to avoid potential differential settlement. The pavement should be designed to ensure that water will not pond on the pavement surface.

Summary

At the time of writing, there were plans underway to abandon the existing monk structure in favour of a new outlet control structure complete with a front mounted sluice gate. This undertaking should address the concerns related to the sinkhole issue. It is recommended to extend a sheet pile cut-off wall across the front of the dam since the presence of a cut-off feature appears to be lacking. The sheet piling required for the temporary repair work could be used as part of the permanent cut-off wall.

It is also recommended that all vegetation, including root systems, be removed from both the upstream and downstream sides of the dam. The upstream face of the dam should be inspected to ensure that the face has total coverage with durable riprap material. It is also recommended that a new pavement structure be installed to replace the roadway on the existing structure.

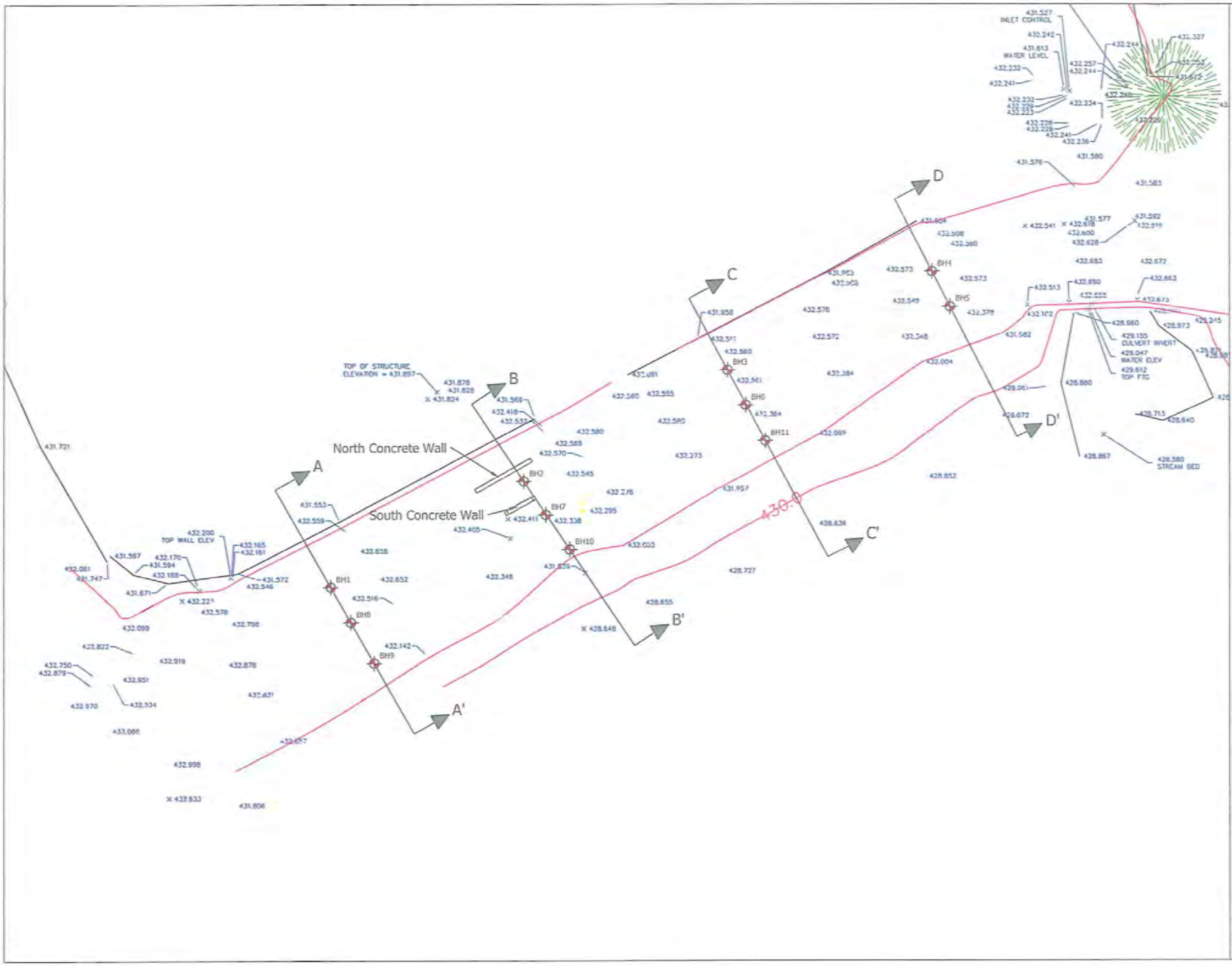
The existing embankment dam has been performing in a satisfactory manner for well over a hundred years with the exception of the existing conduit and associated sinkhole. During this time the dam has experienced and stood up to all of the natural elements including wind, storms, flooding, ice, waves and possible minor seismic activity. As such, it is very difficult to find fault with a structure that has had a history of satisfactory performance. It is our opinion, that by undertaking the recommended procedures indicated in this report and the one issued previously (CMT Report-March 6, 2012), the dam will generally meet the required 2011 standards as set out by the Ontario Ministry of Natural Resources.

If you have any concerns or questions, please contact our office at your convenience.

Yours very truly,

Robert Koopmans, P.Eng.
Designated Consulting Engineer
BCIN: 15464

Enclosures: Drawing 1 - Site Plan
Drawings 2 to 5 - Cross-Sections
Borehole Logs 1 to 11
Grain Size Analyses



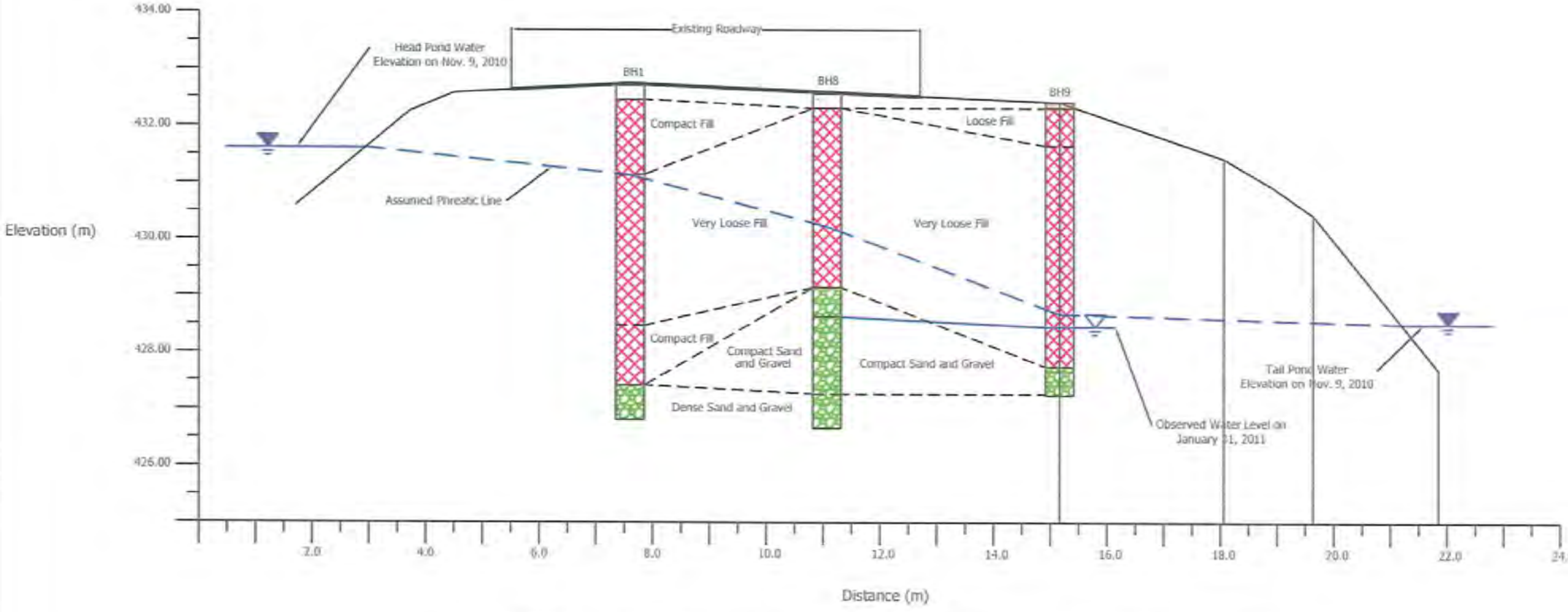
NO.	REVISION	DATE

CMT ENGINEERING INC.

1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

SITE PLAN SHOWING BOREHOLE
AND CROSS SECTION LOCATIONS
Station Street Earthen Dam
Hillsburgh, Ontario

Project: 12-015
Date: February 2012
Scale: N.T.S
Drawing: 1
Sheet: 1



Note: Soil, groundwater, and bearing capacity is interpolated between borehole locations. Actual conditions may vary.

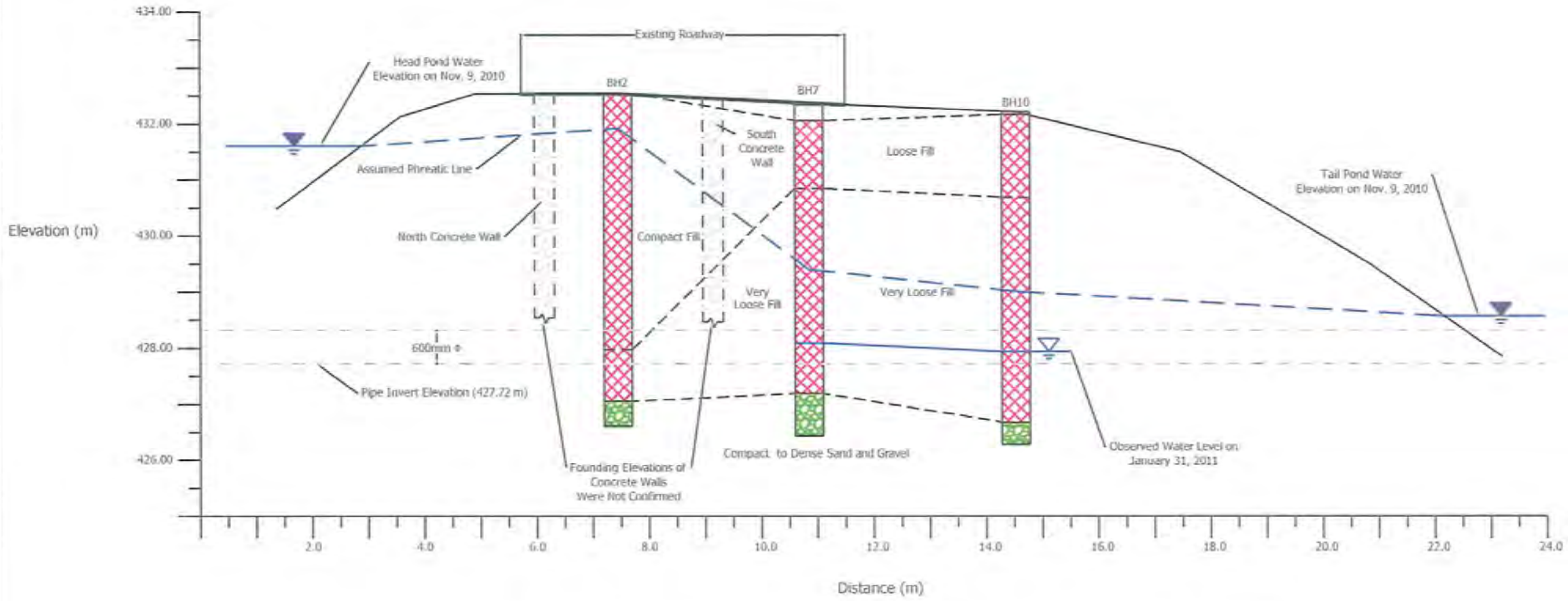
NO.	REVISION	DATE

CMT ENGINEERING INC.

1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

CROSS SECTION A–A'
Station Street Earthen Dam
Hillsburgh, Ontario

Project: 12-015
Date: February 2012
Scale: N.T.S
Drawing: 2
Sheet: 1



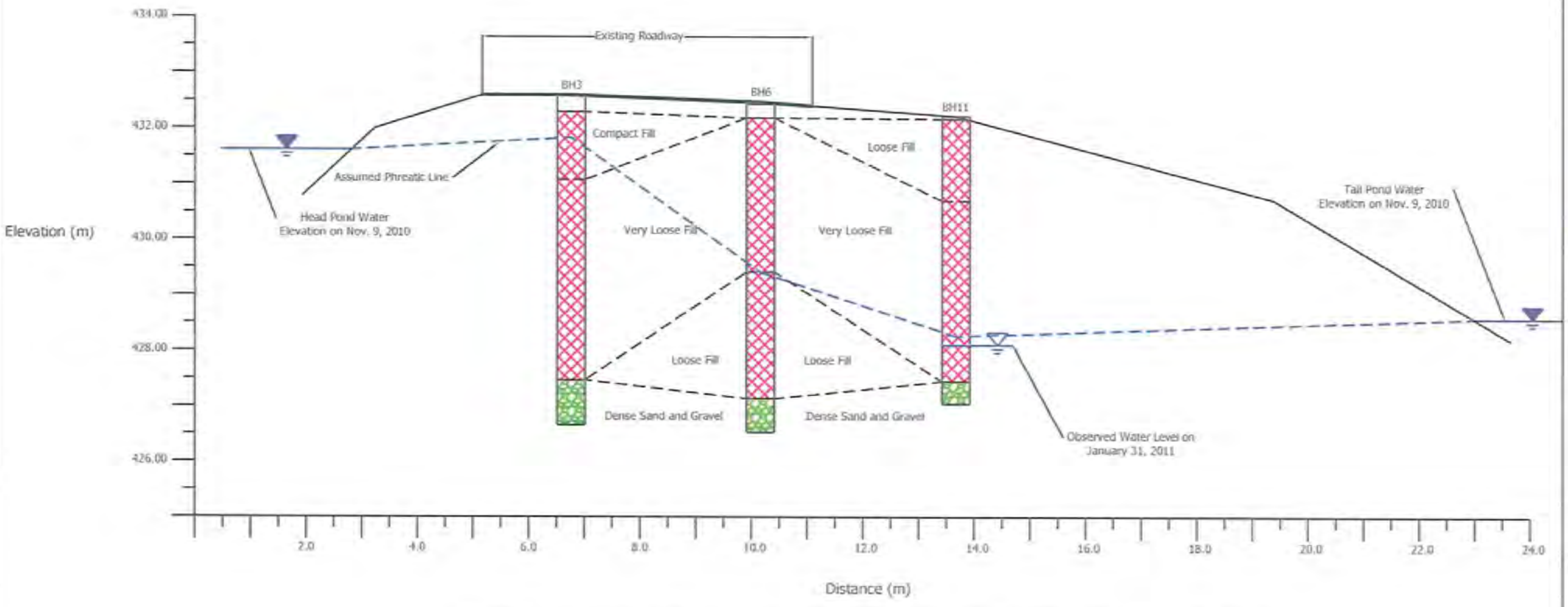
Note: Soil, groundwater, and bearing capacity is interpolated between borehole locations. Actual conditions may vary.

NO.	REVISION	DATE

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

CROSS SECTION B–B'
Station Street Earthen Dam
Hillsburgh, Ontario

Project: 12-015
Date: February 2012
Scale: N.T.S
Drawing: 3
Sheet: 1



Note: Soil, groundwater, and bearing capacity is interpolated between borehole locations. Actual conditions may vary.

NO.	REVISION	DATE

CMT ENGINEERING INC.

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St. Clements, Ontario N0B 2M0
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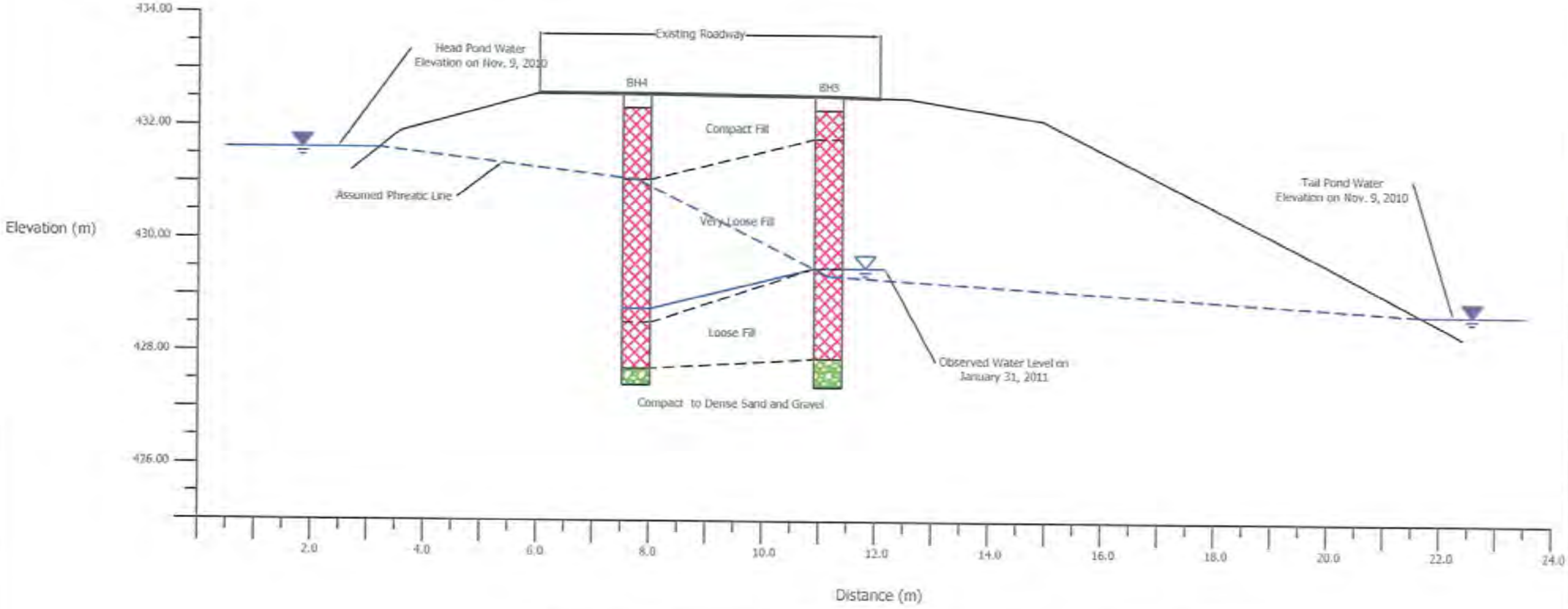
Fax: 519-699-4664
www.cmtinc.net

CROSS SECTION C–C'
Station Street Earthen Dam
Hillsburgh, Ontario

Project: 12-015
Date: February 2012
Scale: N.T.S
Drawing: 4
Sheet: 1



Note: Soil, groundwater, and bearing capacity is interpolated between borehole locations. Actual conditions may vary.

NO.	REVISION	DATE

CMT ENGINEERING INC.

1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

CROSS SECTION D-D'
Station Street Earthen Dam
Hillsburgh, Ontario

Project: 12-015
Date: February 2012
Scale: N.T.S
Drawing: 5
Sheet: 1

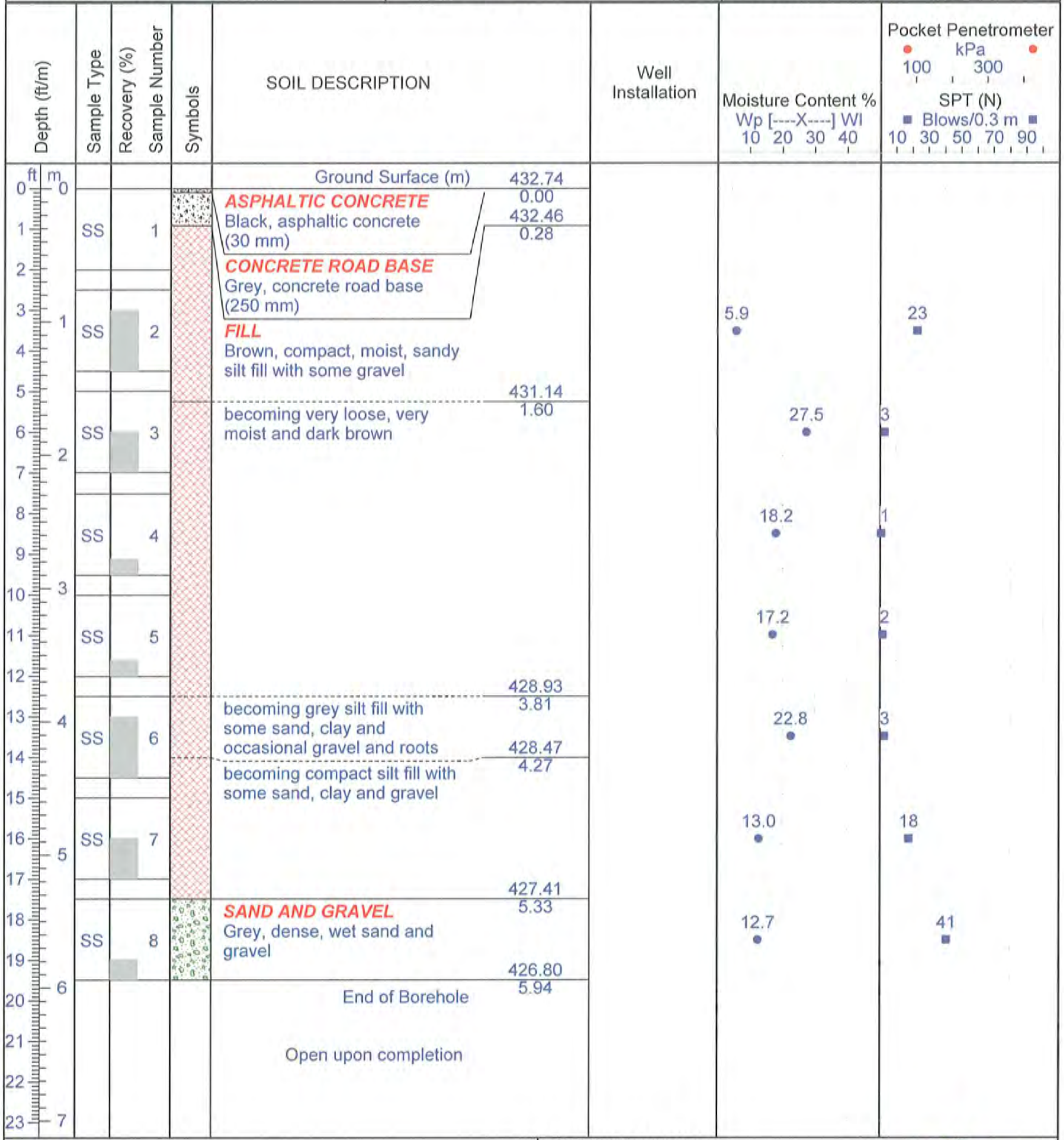
BOREHOLE 1

Page 1 of 1

Date Drilled: January 31, 2012
Rig: Geoprobe 6620DT
Contractor: CMT Engineering Inc.
Drilling Method: SPT

Elevation: 432.74
Logged by: SS

Project No.: 12-015
Project: Station Street Earthen Dam
Location: Hillsburgh, Ontario



SOIL DESCRIPTION	Elevation (m) / Depth (m)
Ground Surface (m)	432.74 0.00
ASPHALTIC CONCRETE Black, asphaltic concrete (30 mm)	432.46 0.28
CONCRETE ROAD BASE Grey, concrete road base (250 mm)	
FILL Brown, compact, moist, sandy silt fill with some gravel	431.14 1.60
becoming very loose, very moist and dark brown	428.93 3.81
becoming grey silt fill with some sand, clay and occasional gravel and roots	428.47 4.27
becoming compact silt fill with some sand, clay and gravel	427.41 5.33
SAND AND GRAVEL Grey, dense, wet sand and gravel	426.80 5.94
End of Borehole Open upon completion	

Sample Type	Sample Number	Moisture Content %	SPT (N)
SS	1		
SS	2	5.9	23
SS	3	27.5	3
SS	4	18.2	1
SS	5	17.2	2
SS	6	22.8	3
SS	7	13.0	18
SS	8	12.7	41

BOREHOLE 2

Page 1 of 1

Date Drilled: January 31, 2012
Rig: Geoprobe 6620DT
Contractor: CMT Engineering Inc.
Drilling Method: SPT / MC5

Elevation: 432.54 m
Logged by: SS

Project No.: 12-015
Project: Station Street Earthen Dam
Location: Hillsburgh, Ontario

Depth (ft/m) | Sample Type | Recovery (%) | Sample Number | Symbols | SOIL DESCRIPTION | Well Installation | Moisture Content % Wp [----X----] Wl 10 20 30 40 | Pocket Penetrometer ● kPa ● 100 300; SPT (N) ■ Blows/0.3 m ■ 10 30 50 70 90

SOIL DESCRIPTION	Elevation (m)	Depth (m)
Ground Surface (m)	432.54	
FILL Brown, compact, moist sand and gravel fill with trace silt (top 250 mm previously excavated)		0.00
becoming very moist, clayey silt fill with trace silt	431.93	0.61
becoming greyish brown with tree roots	430.51	2.03
becoming loose, wet sandy silt fill with some gravel	429.49	3.05
becoming very loose	427.97	4.57
becoming dark brown to black, very loose, moist topsoil fill	427.41	5.13
SAND AND GRAVEL Greyish brown, compact, wet sand and gravel	427.05	5.49
End of Borehole	426.60	5.94

Open upon completion

Sample Type	Sample Number	Moisture Content %	SPT (N)
MC5	1	9.5 16.9	
MC5	2	25.6 24.3	
SS	3	17.9	7
SS	4	12.5	4
SS	5	26.0	0
SS	6	8.4	16

BOREHOLE 3

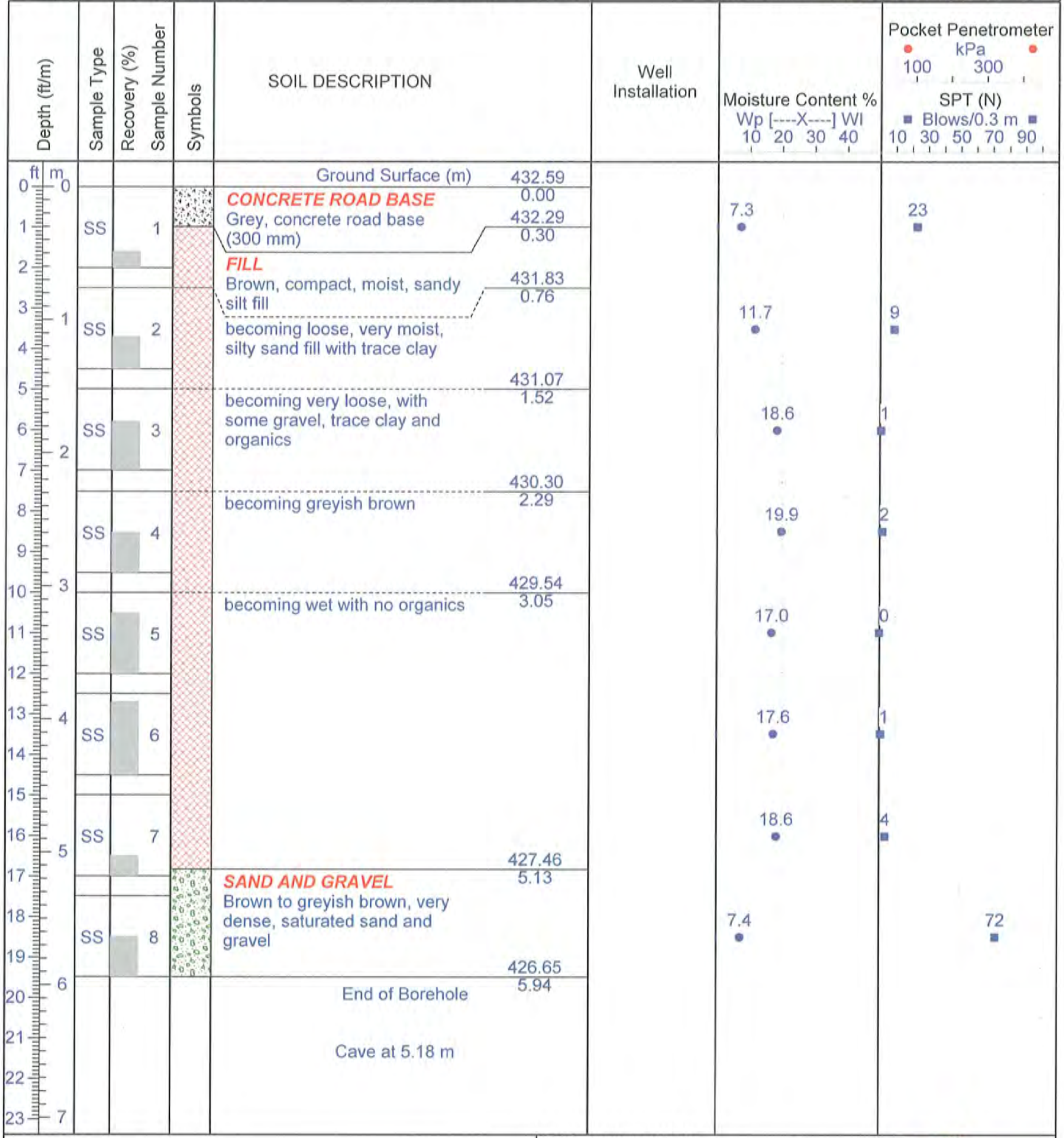
Page 1 of 1

Date Drilled: January 31, 2012
Rig: Geoprobe 6620DT
Contractor: CMT Engineering Inc.
Drilling Method: SPT

Elevation: 432.59 m
Logged by: SS

Project No.: 12-015
Project: Station Street Earthen Dam

Location: Hillsburgh, Ontario



SOIL DESCRIPTION	Elevation (m) / Depth (m)
Ground Surface (m)	432.59
CONCRETE ROAD BASE	0.00
Grey, concrete road base (300 mm)	432.29 0.30
FILL Brown, compact, moist, sandy silt fill	431.83 0.76
becoming loose, very moist, silty sand fill with trace clay	431.07 1.52
becoming very loose, with some gravel, trace clay and organics	430.30 2.29
becoming greyish brown	429.54 3.05
becoming wet with no organics	427.46 5.13
SAND AND GRAVEL Brown to greyish brown, very dense, saturated sand and gravel	426.65 5.94
End of Borehole	
Cave at 5.18 m	

Sample Type	Sample Number	Moisture Content %	SPT (N)
SS	1	7.3	23
SS	2	11.7	9
SS	3	18.6	1
SS	4	19.9	2
SS	5	17.0	0
SS	6	17.6	1
SS	7	18.6	4
SS	8	7.4	72

BOREHOLE 4

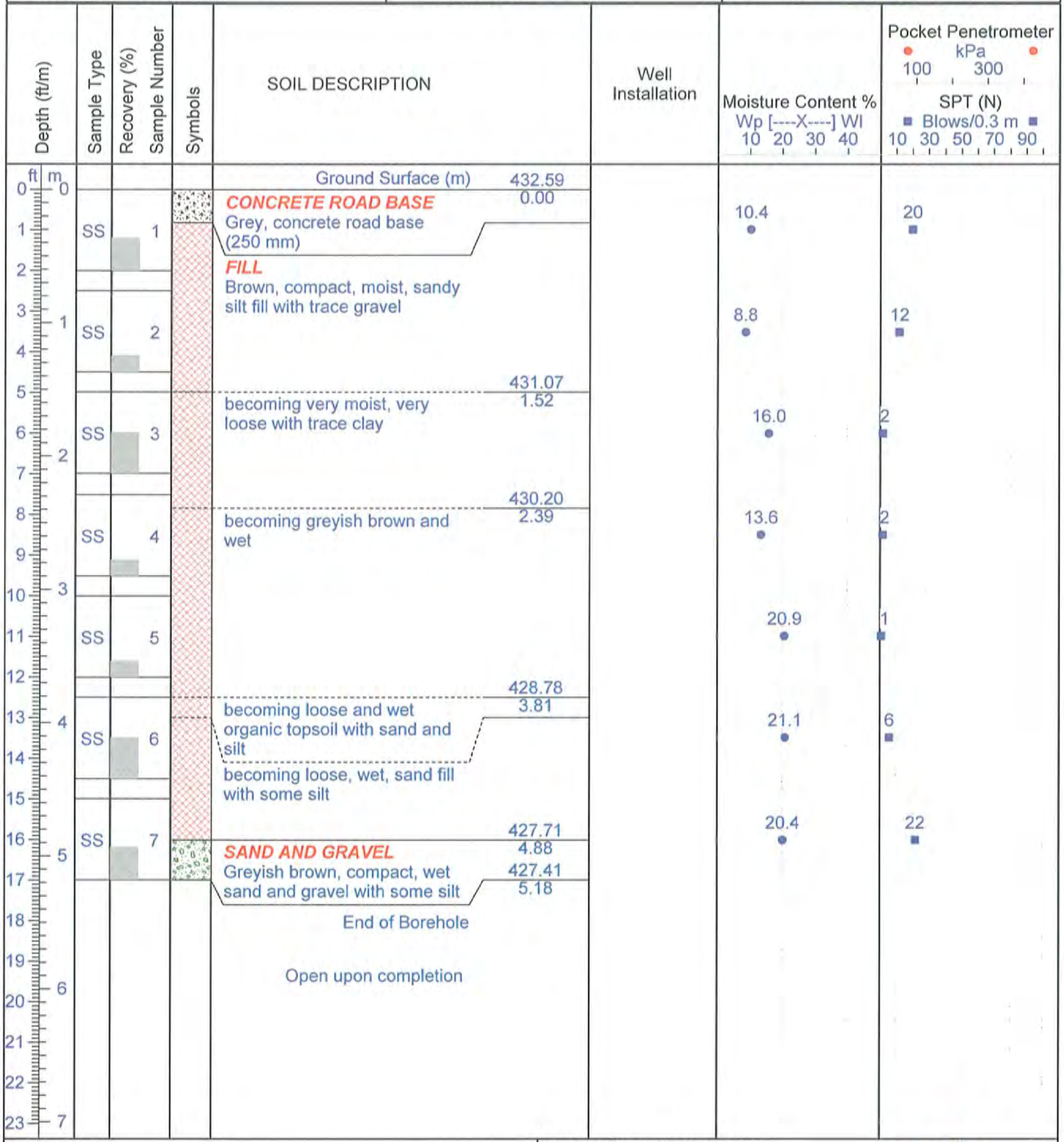
Page 1 of 1

Date Drilled: January 31, 2012
Rig: Geoprobe 6620DT
Contractor: CMT Engineering Inc.
Drilling Method: SPT

Elevation: 432.59 m
Logged by: SS

Project No.: 12-015
Project: Station Street Earthen Dam

Location: Hillsburgh, Ontario



Sample Type	Sample Number	Moisture Content %	SPT (N)
SS	1	10.4	20
SS	2	8.8	12
SS	3	16.0	2
SS	4	13.6	2
SS	5	20.9	1
SS	6	21.1	6
SS	7	20.4	22

SOIL DESCRIPTION

Ground Surface (m) 432.59

0.00
CONCRETE ROAD BASE
Grey, concrete road base (250 mm)

FILL
Brown, compact, moist, sandy silt fill with trace gravel

431.07
1.52
becoming very moist, very loose with trace clay

430.20
2.39
becoming greyish brown and wet

428.78
3.81
becoming loose and wet
organic topsoil with sand and silt
becoming loose, wet, sand fill with some silt

427.71
4.88
SAND AND GRAVEL
Greyish brown, compact, wet sand and gravel with some silt

427.41
5.18
End of Borehole

Open upon completion

BOREHOLE 5

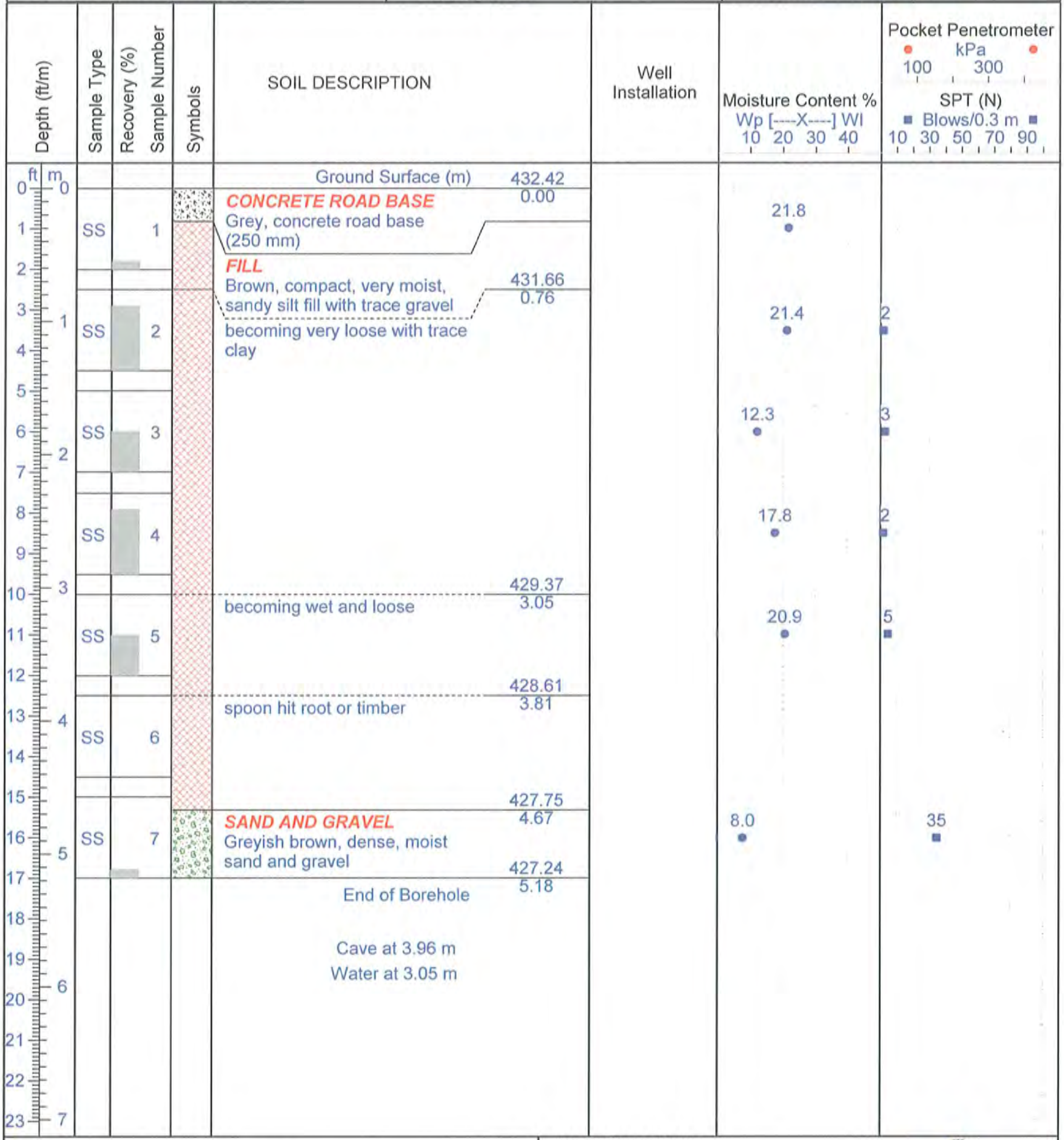
Page 1 of 1

Date Drilled: January 31, 2012
Rig: Geoprobe 6620DT
Contractor: CMT Engineering Inc.
Drilling Method: SPT

Elevation: 432.42 m
Logged by: SS

Project No.: 12-015
Project: Station Street Earthen Dam

Location: Hillsburgh, Ontario



Ground Surface (m) 432.42 / 0.00

CONCRETE ROAD BASE
Grey, concrete road base (250 mm)

FILL 431.66 / 0.76
Brown, compact, very moist, sandy silt fill with trace gravel
becoming very loose with trace clay

429.37 / 3.05
becoming wet and loose

428.61 / 3.81
spoon hit root or timber

427.75 / 4.67
SAND AND GRAVEL
Greyish brown, dense, moist sand and gravel

427.24 / 5.18
End of Borehole

Cave at 3.96 m
Water at 3.05 m

Sample Type	Sample Number	Moisture Content %	SPT (N)
SS	1	21.8	
SS	2	21.4	2
SS	3	12.3	3
SS	4	17.8	2
SS	5	20.9	5
SS	6		
SS	7	8.0	35

BOREHOLE 6

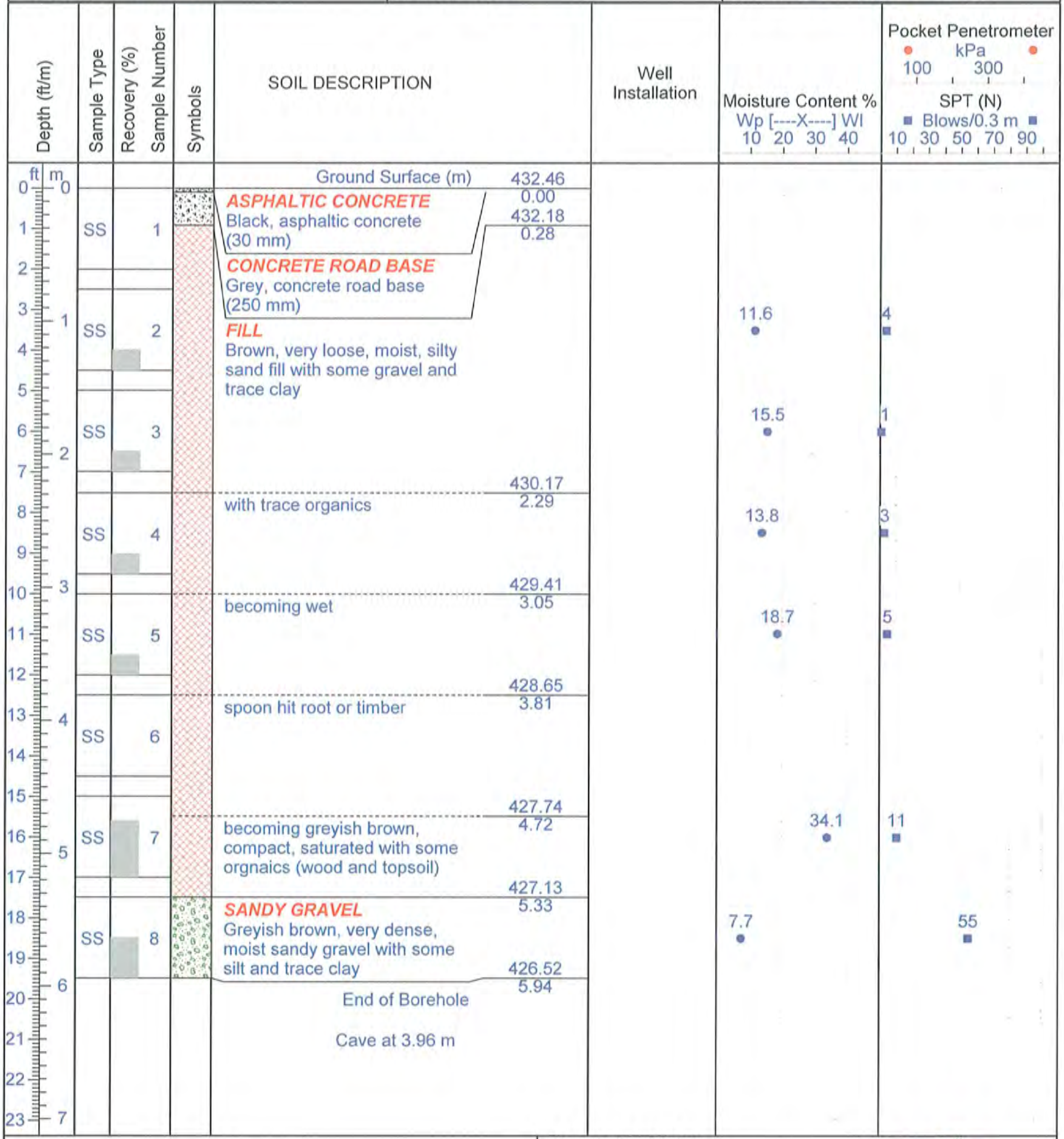
Page 1 of 1

Date Drilled: January 31, 2012
Rig: Geoprobe 6620DT
Contractor: CMT Engineering Inc.
Drilling Method: SPT

Elevation: 432.46 m
Logged by: SS

Project No.: 12-015
Project: Station Street Earthen Dam

Location: Hillsburgh, Ontario



SOIL DESCRIPTION	Elevation (m)	Depth (m)
Ground Surface (m)	432.46	0.00
ASPHALTIC CONCRETE Black, asphaltic concrete (30 mm)		
CONCRETE ROAD BASE Grey, concrete road base (250 mm)	432.18	0.28
FILL Brown, very loose, moist, silty sand fill with some gravel and trace clay		
with trace organics	430.17	2.29
becoming wet	429.41	3.05
spoon hit root or timber	428.65	3.81
becoming greyish brown, compact, saturated with some orgnaics (wood and topsoil)	427.74	4.72
SANDY GRAVEL Greyish brown, very dense, moist sandy gravel with some silt and trace clay	427.13	5.33
End of Borehole	426.52	5.94

Cave at 3.96 m

Sample Type	Sample Number	Moisture Content %	SPT (N)
SS	1		
SS	2	11.6	4
SS	3	15.5	1
SS	4	13.8	3
SS	5	18.7	5
SS	6		
SS	7	34.1	11
SS	8	7.7	55

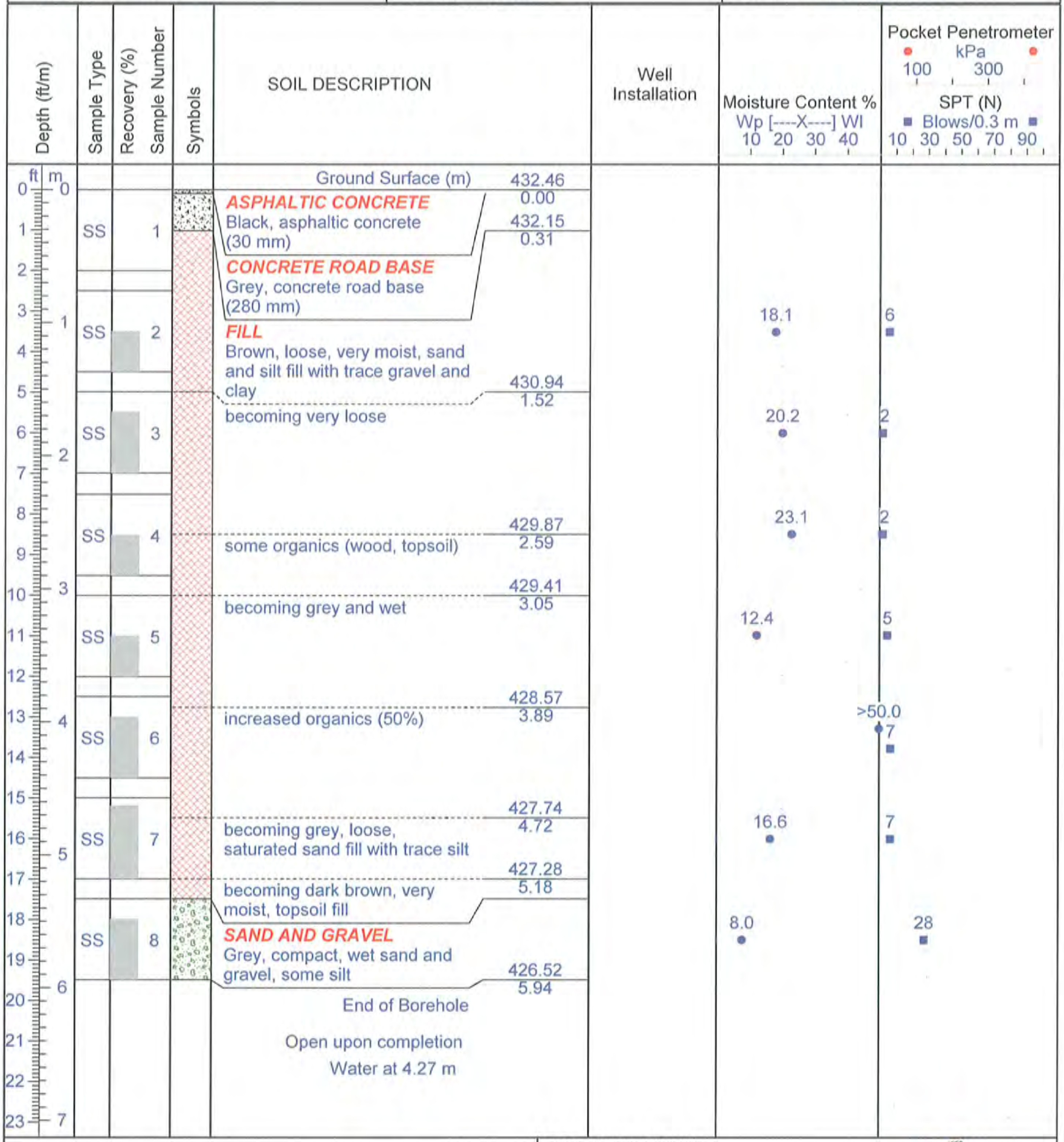
BOREHOLE 7

Page 1 of 1

Date Drilled: January 31, 2012
Rig: Geoprobe 6620DT
Contractor: CMT Engineering Inc.
Drilling Method: SPT

Elevation: 432.37 m
Logged by: SS

Project No.: 12-015
Project: Station Street Earthen Dam
Location: Hillsburgh, Ontario



Sample Type	Sample Number	Moisture Content %	SPT (N)
SS	1		
SS	2	18.1	6
SS	3	20.2	2
SS	4	23.1	2
SS	5	12.4	5
SS	6	>50.0	7
SS	7	16.6	7
SS	8	8.0	28

SOIL DESCRIPTION	
Ground Surface (m)	432.46 0.00
ASPHALTIC CONCRETE Black, asphaltic concrete (30 mm)	432.15 0.31
CONCRETE ROAD BASE Grey, concrete road base (280 mm)	
FILL Brown, loose, very moist, sand and silt fill with trace gravel and clay	430.94 1.52
becoming very loose	429.87 2.59
some organics (wood, topsoil)	429.41 3.05
becoming grey and wet	428.57 3.89
increased organics (50%)	427.74 4.72
becoming grey, loose, saturated sand fill with trace silt	427.28 5.18
becoming dark brown, very moist, topsoil fill	
SAND AND GRAVEL Grey, compact, wet sand and gravel, some silt	426.52 5.94

End of Borehole

Open upon completion

Water at 4.27 m

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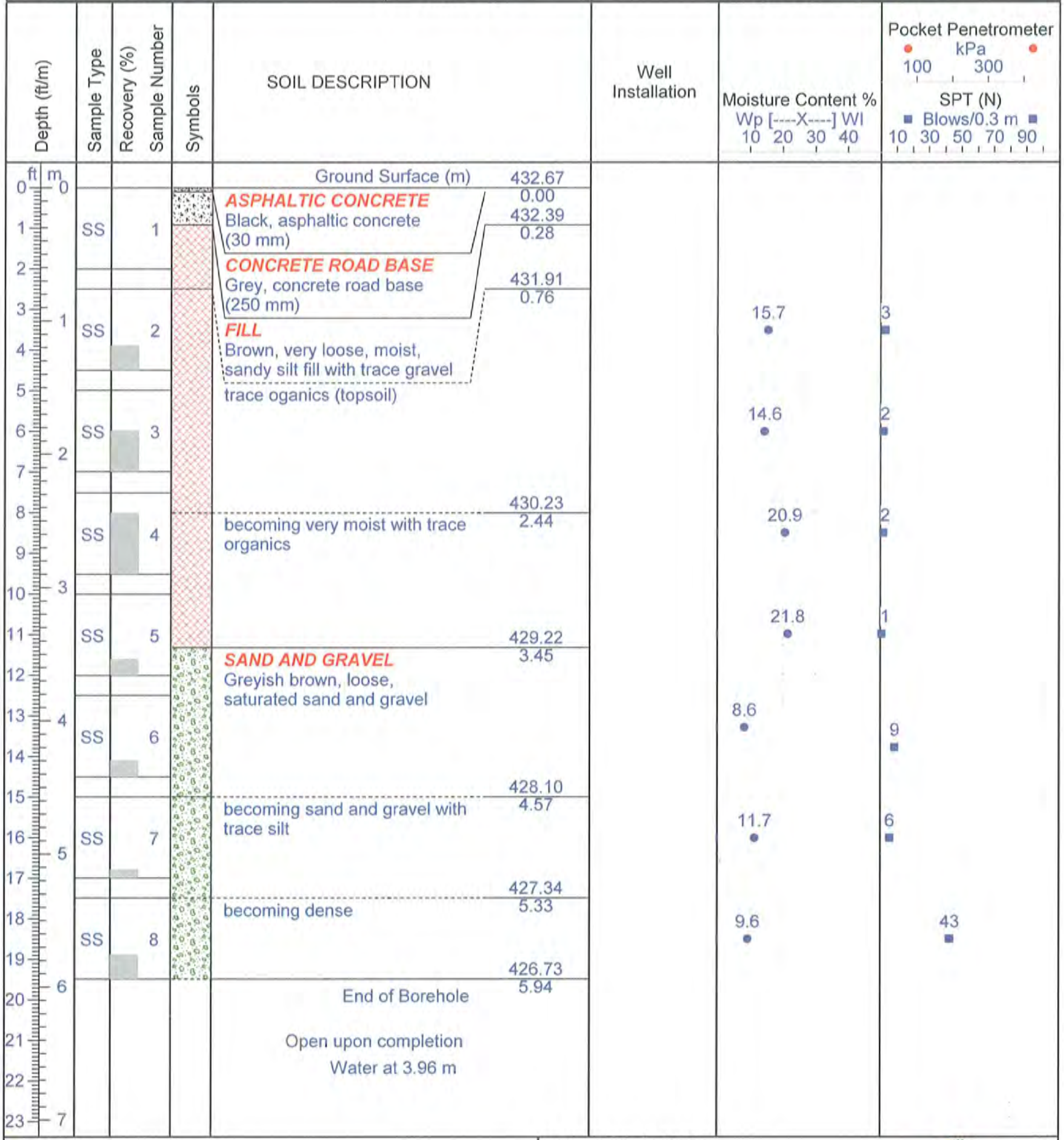
BOREHOLE 8

Page 1 of 1

Date Drilled: January 31, 2012
Rig: Geoprobe 6620DT
Contractor: CMT Engineering Inc.
Drilling Method: SPT

Elevation: 432.67 m
Logged by: SS

Project No.: 12-015
Project: Station Street Earthen Dam
Location: Hillsburgh, Ontario



SOIL DESCRIPTION	
Ground Surface (m)	432.67 0.00
ASPHALTIC CONCRETE Black, asphaltic concrete (30 mm)	432.39 0.28
CONCRETE ROAD BASE Grey, concrete road base (250 mm)	431.91 0.76
FILL Brown, very loose, moist, sandy silt fill with trace gravel trace oganics (topsoil)	
becoming very moist with trace organics	430.23 2.44
SAND AND GRAVEL Greyish brown, loose, saturated sand and gravel	429.22 3.45
becoming sand and gravel with trace silt	428.10 4.57
becoming dense	427.34 5.33
End of Borehole	426.73 5.94

Sample Type	Sample Number	Moisture Content %	SPT (N)
SS	1		
SS	2	15.7	3
SS	3	14.6	2
SS	4	20.9	2
SS	5	21.8	1
SS	6	8.6	9
SS	7	11.7	6
SS	8	9.6	43

Open upon completion

Water at 3.96 m

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St. Clements, Ontario N0B 2M0
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BOREHOLE 9

Page 1 of 1

Date Drilled: January 31, 2012
Rig: Geoprobe 6620DT
Contractor: CMT Engineering Inc.
Drilling Method: SPT

Elevation: 432.49 m
Logged by: SS

Project No.: 12-015
Project: Station Street Earthen Dam

Location: Hillsburgh, Ontario

SOIL DESCRIPTION	
Ground Surface (m)	432.49 0.00
TOPSOIL Dark brown, loose, moist topsoil (100 mm)	
FILL Brown, loose, moist, sandy silt fill with trace gravel	431.73 0.76
becoming very loose with trace oganics	
becoming very moist, silty sand fill with trace clay	430.97 1.52
with trace gravel	429.44 3.05
becoming wet	428.68 3.81
SAND AND GRAVEL Greyish brown, compact, saturated sand and gravel	427.82 4.67
End of Borehole	427.31 5.18

Open upon completion
Water at 3.96 m

Moisture Content %
Wp [----X----] Wl
10 20 30 40

Pocket Penetrometer
● kPa ●
100 300

SPT (N)
■ Blows/0.3 m ■
10 30 50 70 90

Sample Type	Sample Number	Moisture Content %	SPT (N)
SS	1	11.5	6
SS	2	13.6	3
SS	3	16.7	3
SS	4	19.8	1
SS	5	17.4	1
SS	6	19.3	4
SS	7	7.9	20

BOREHOLE 10

Date Drilled: January 31, 2012
Rig: Geoprobe 6620DT
Contractor: CMT Engineering Inc.
Drilling Method: SPT

Elevation: 432.22 m
Logged by: SS

Project No.: 12-015
Project: Station Street Earthen Dam

Location: Hillsburgh, Ontario

Depth (ft/m) | Sample Type | Recovery (%) | Sample Number | Symbols | SOIL DESCRIPTION | Well Installation | Moisture Content % Wp [----X----] Wl 10 20 30 40 | Pocket Penetrometer kPa 100 300 / SPT (N) Blows/0.3 m 10 30 50 70 90

SOIL DESCRIPTION	Elevation / Depth (m)
Ground Surface (m)	432.22 0.00
TOPSOIL Dark brown, loose, moist topsoil (50 mm)	
FILL Brown, loose, moist, sandy silt fill with trace gravel	431.46 0.76
becoming silty sand fill with trace gravel and clay	
becoming very loose	430.70 1.52
becoming greyish brown and wet	429.02 3.20
spoon hit wood or timber	427.65 4.57
becoming saturated	426.89 5.33
SAND AND GRAVEL Greyish brown, dense, saturated sand and gravel	426.28 5.94
End of Borehole	

Sample Type	Sample Number	Moisture Content %	SPT (N)
SS	1	11.5	5
SS	2	13.4	5
SS	3	14.2	3
SS	4	22.8	3
SS	5	22.2	0
SS	6	24.6	4
SS	7		15
SS	8	15.3	37

End of Borehole

Cave at 4.88 m

Water at 4.27m

BOREHOLE 11

Date Drilled: January 31, 2012
Rig: Geoprobe 6620DT
Contractor: CMT Engineering Inc.
Drilling Method: SPT

Elevation: 432.21 m
Logged by: SS

Project No.: 12-015
Project: Station Street Earthen Dam
Location: Hillsburgh, Ontario

Sample Type	Sample Number	SOIL DESCRIPTION		Moisture Content % Wp [----X----] Wl	SPT (N) Blows/0.3 m
		Ground Surface (m)	432.22 0.00		
SS	1	***TOPSOIL*** Dark brown, loose, moist topsoil (50 mm) ***FILL*** Brown, loose, moist, sand and silt fill with trace gravel, clay, and organics	431.46 0.76	22.6	6
SS	2	no organics	430.70 1.52	10.3	4
SS	3	becoming very loose and very moist		14.9	1
SS	4			18.8	0
SS	5	becoming greyish brown	428.87 3.35	18.7	0
		some organics (topsoil and wood)	428.56 3.66		
SS	6	becoming very loose, very wet sand fill with some silt	428.26 3.96	24.4	2
		becoming dark brown to black topsoil	427.65 4.57		
SS	7	***SAND AND GRAVEL*** Greyish brown, dense, wet sand and gravel	427.04 5.18	9.5	30

End of Borehole

Open upon completion
Water at 4.11m

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St. Clements, Ontario N0B 2M0
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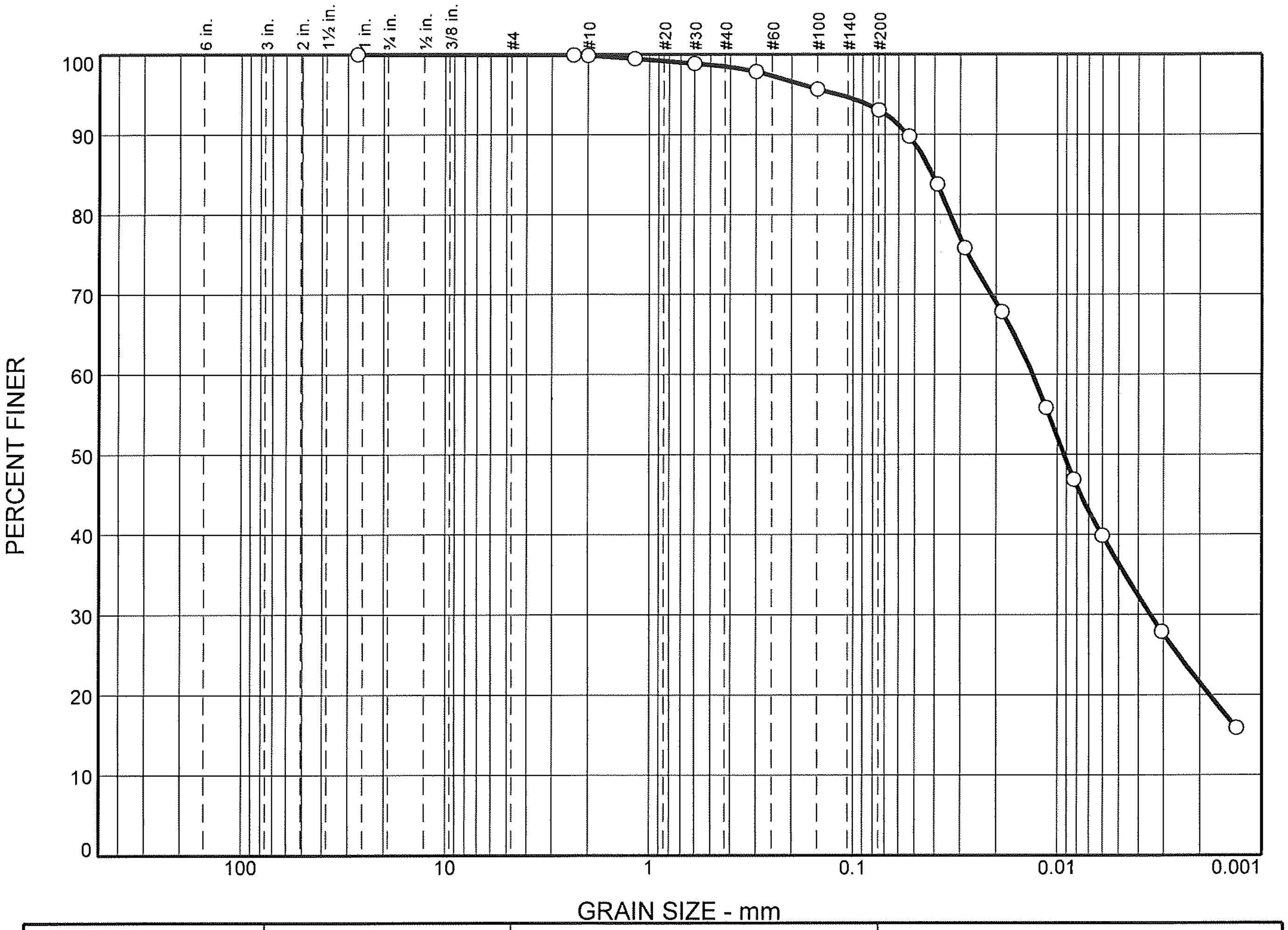
Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.1	0.0	1.4	5.4	71.6	21.5

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH2	4	2.3-2.9 m	clayey silt, trace sand	ML
				Tested by JH of CMT Engineering Inc. February 14, 2012	
				estimated hydraulic conductivity K = $1.0\text{x}10^{-6}$ cm/sec	

CMT Engineering Inc.

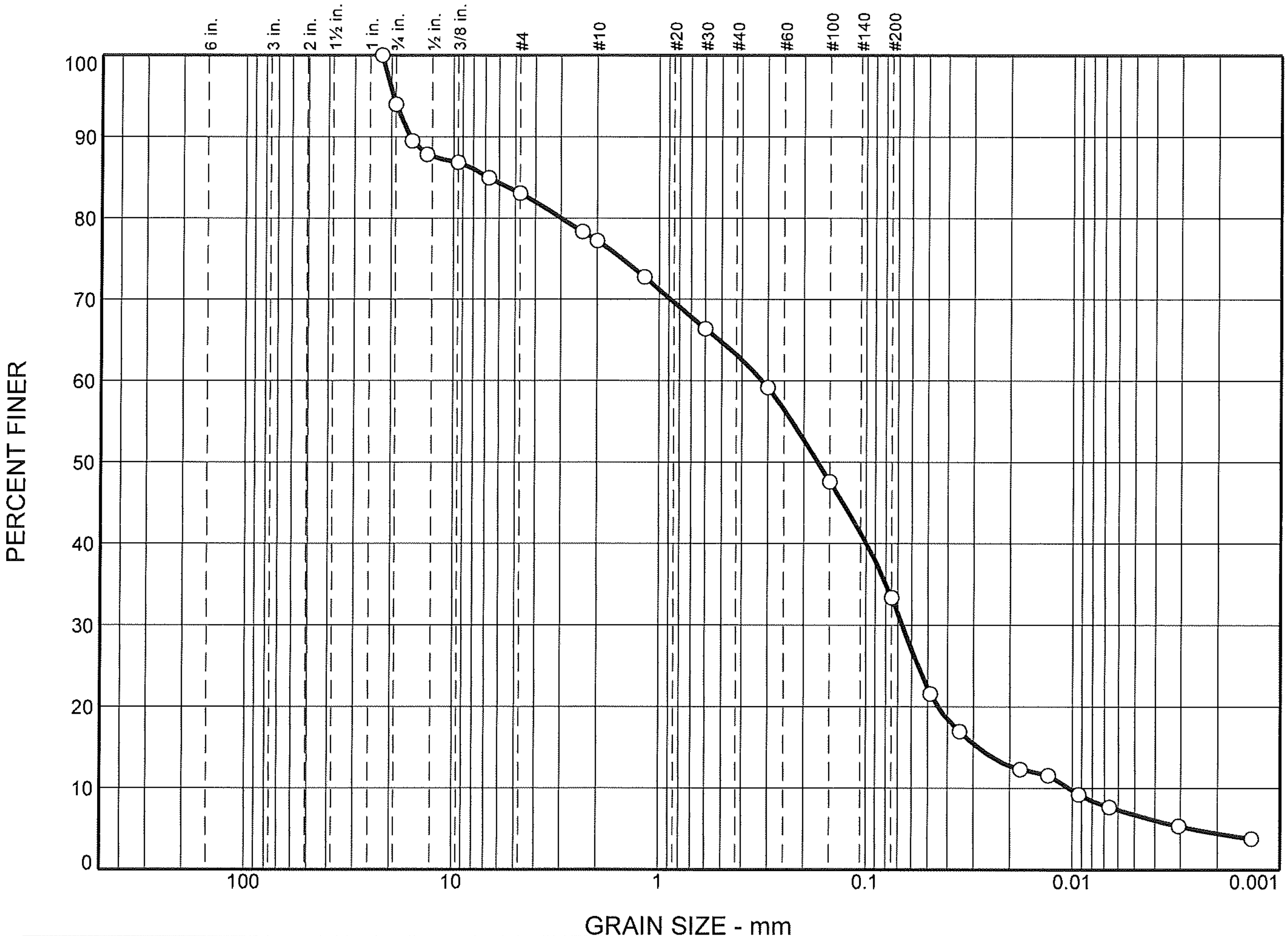
St. Clements, ON

Client: Triton Engineering Services Limited

Project: Station Street Dam
Hillsburgh, Ontario

Project No.: 12-015 **Figure** 1

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	6.0	11.0	5.8	14.0	29.9	28.9	4.4

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH3	4	2.3-2.9 m	silty sand, some gravel, trace clay	SM
				Tested by JH of CMT Engineering Inc. February 14, 2012	
				estimated hydraulic conductivity K = $1.0x10^{-4}$ cm/sec	

CMT Engineering Inc.

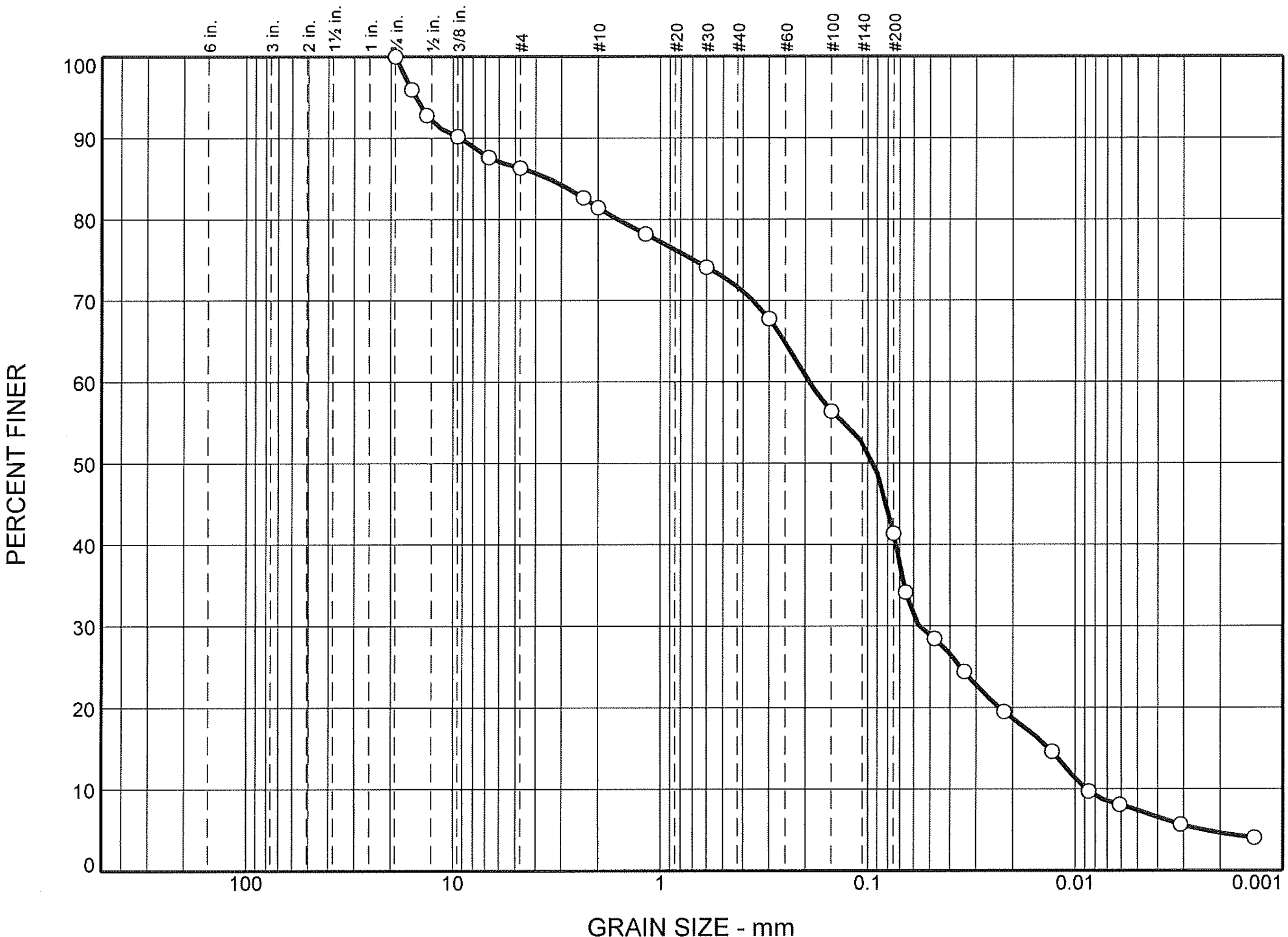
St. Clements, ON

Client: Triton Engineering Services Limited

Project: Station Street Dam
Hillsburgh, Ontario

Project No.: 12-015 **Figure** 2

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	13.7	4.9	9.7	30.3	36.8	4.6

SOIL DATA

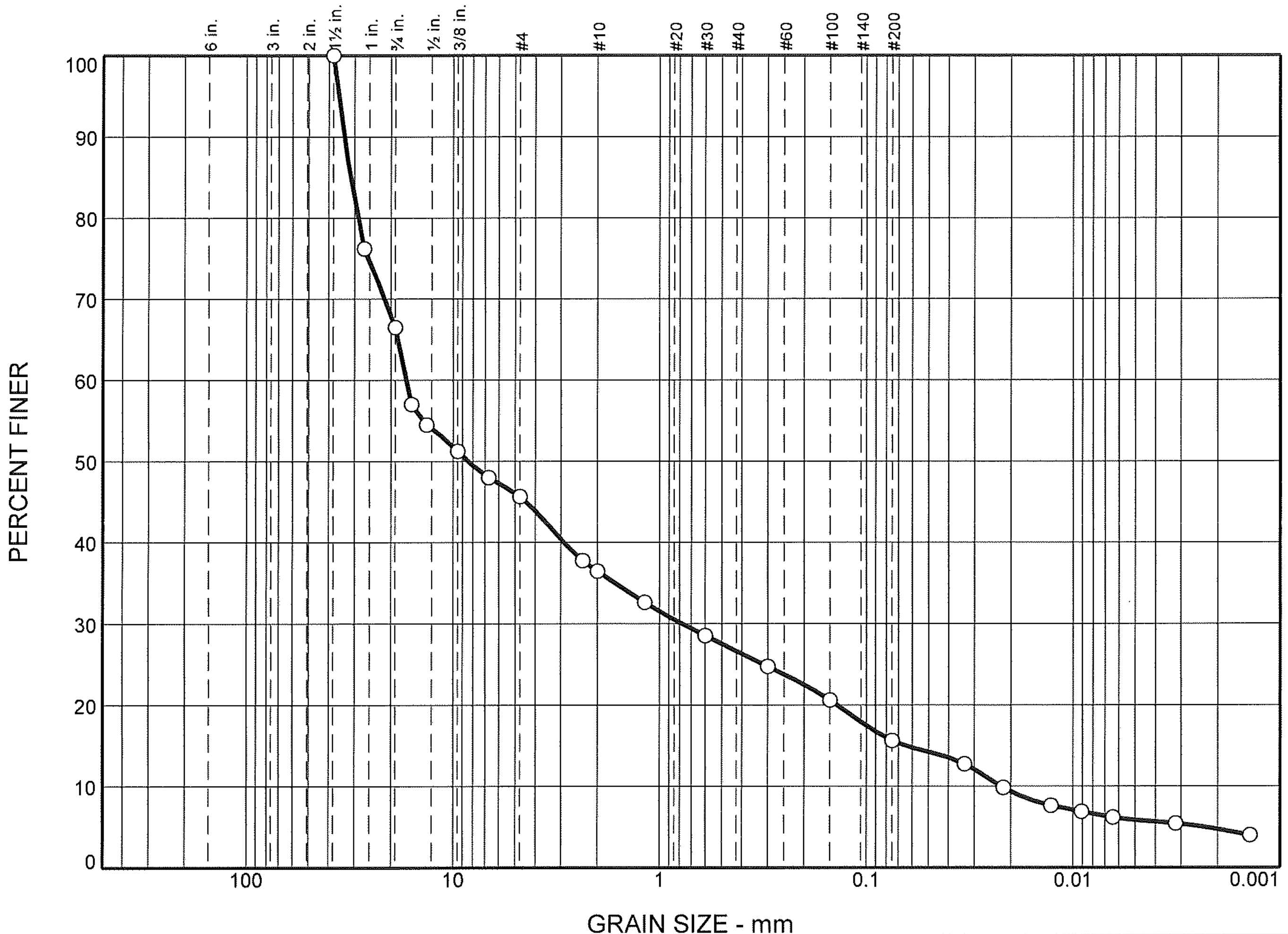
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH6	4	2.3-2.9 m	silty sand, some gravel, trace clay	SM
				Tested by JH of CMT Engineering Inc. February 14, 2012	
				estimated hydraulic conductivity K = 8.0x10^{-5} cm/sec	

CMT Engineering Inc.

St. Clements, ON

Client: Triton Engineering Services Limited
Project: Station Street Dam
Hillsburgh, Ontario
Project No.: 12-015 **Figure** 3

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	33.5	20.9	9.1	9.9	11.0	10.9	4.7

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH6	8	5.3-5.9 m	sandy gravel, some silt, trace clay	GM
				Tested by JH of CMT Engineering Inc. February 14, 2012	
				estimated hydraulic conductivity K = 4.0x10^{-4} cm/sec	

CMT Engineering Inc.

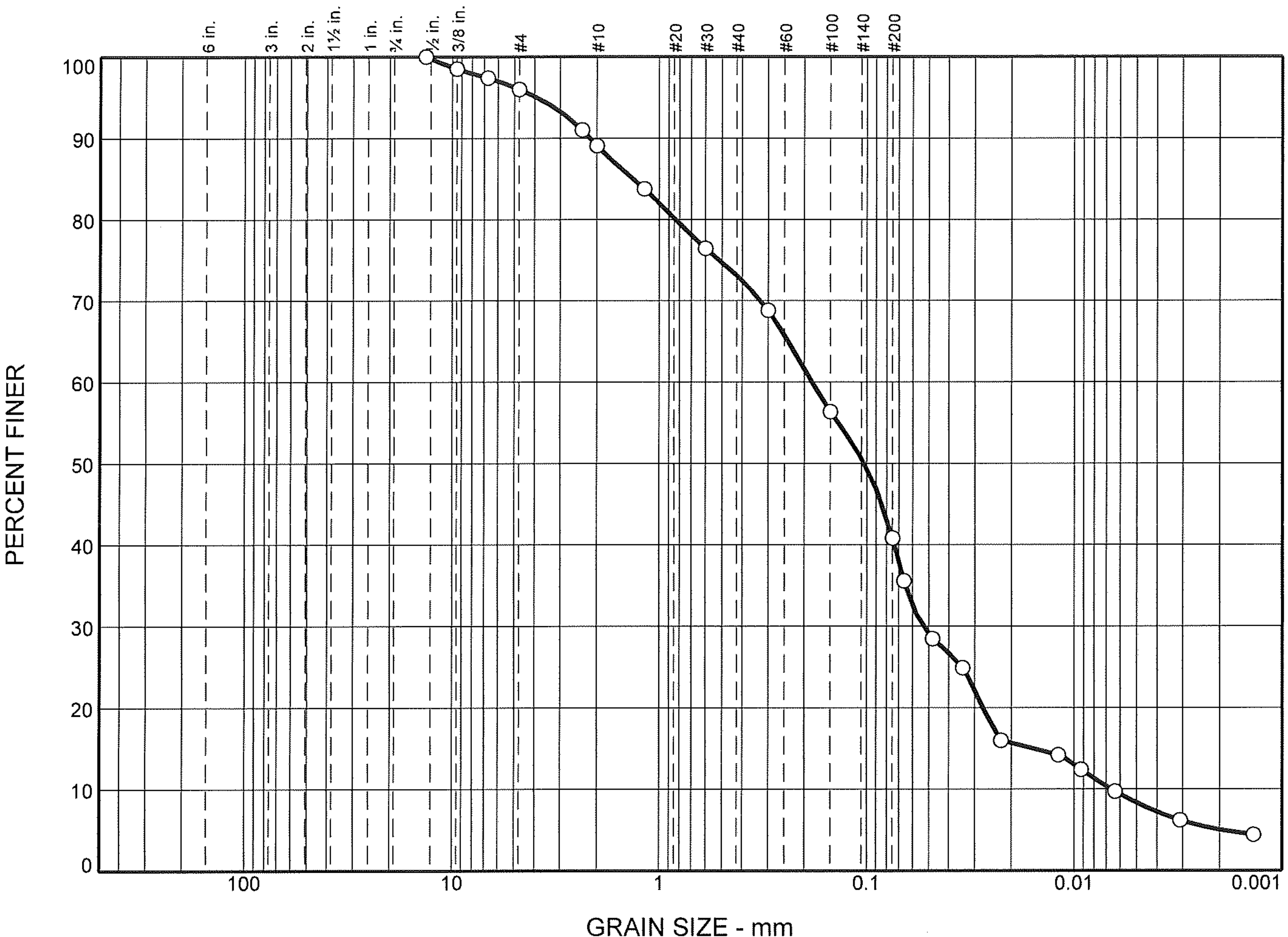
St. Clements, ON

Client: Triton Engineering Services Limited

Project: Station Street Dam
Hillsburgh, Ontario

Project No.: 12-015 **Figure** 4

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	4.0	6.9	16.0	32.3	35.8	5.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH7	4	2.3-2.9 m	silty sand, trace clay, gravel	SM
				Tested by JH of CMT Engineering Inc. July 9, 2012	
				estimated hydraulic conductivity K = $4.2x10^{-5}$ cm/sec	

CMT Engineering Inc.

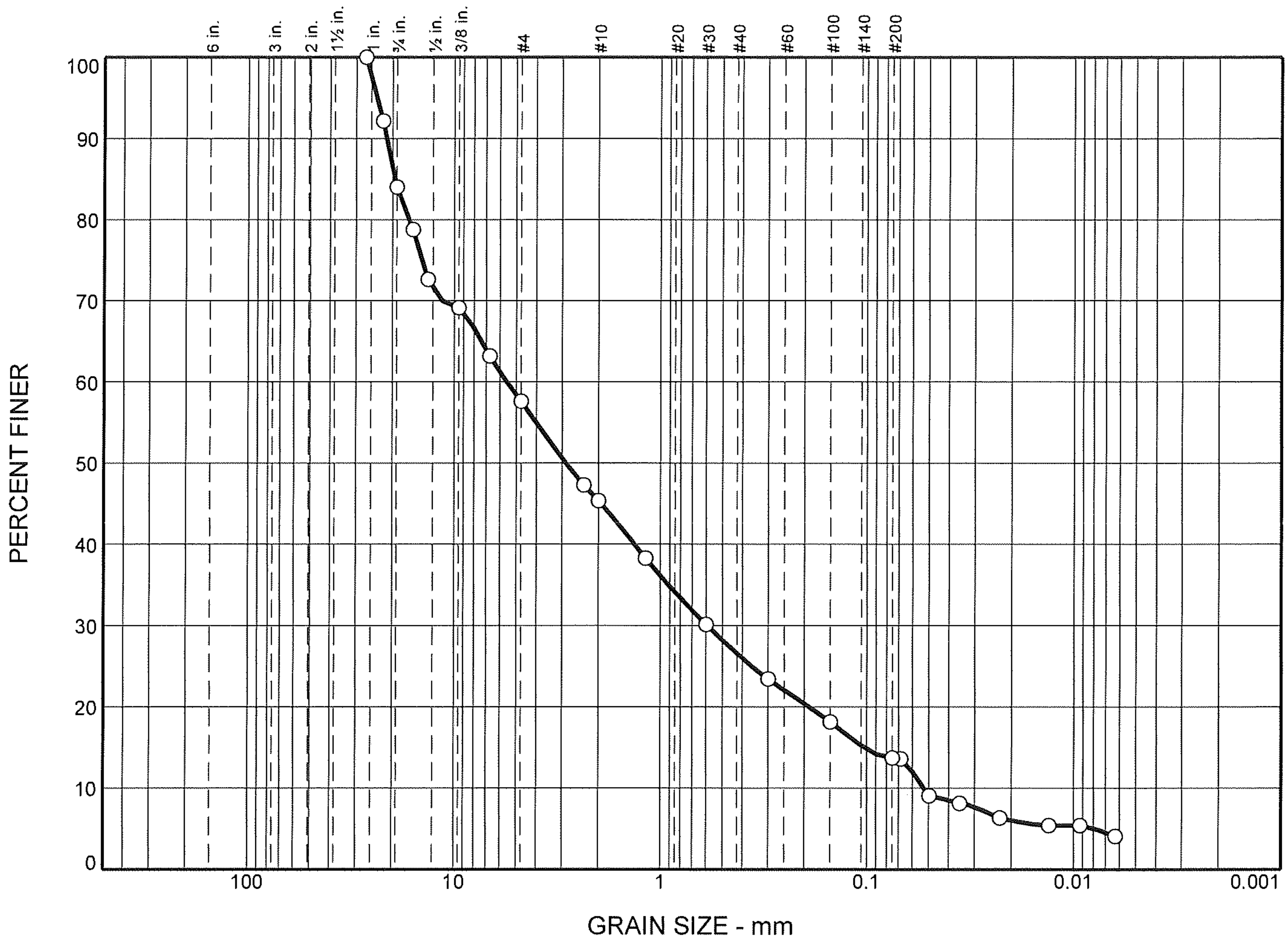
St. Clements, ON

Client: Triton Engineering Services Limited

Project: Station Street Dam
Hillsburgh, Ontario

Project No.: 12-015 **Figure** 5

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	16.0	26.4	12.3	18.8	12.8	13.7	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH7	8	5.3-5.9 m	sand and gravel, some silt	SM
				Tested by JH of CMT Engineering Inc. July 9, 2012	
				estimated hydraulic conductivity K = 3.0x10^{-3} cm/sec	

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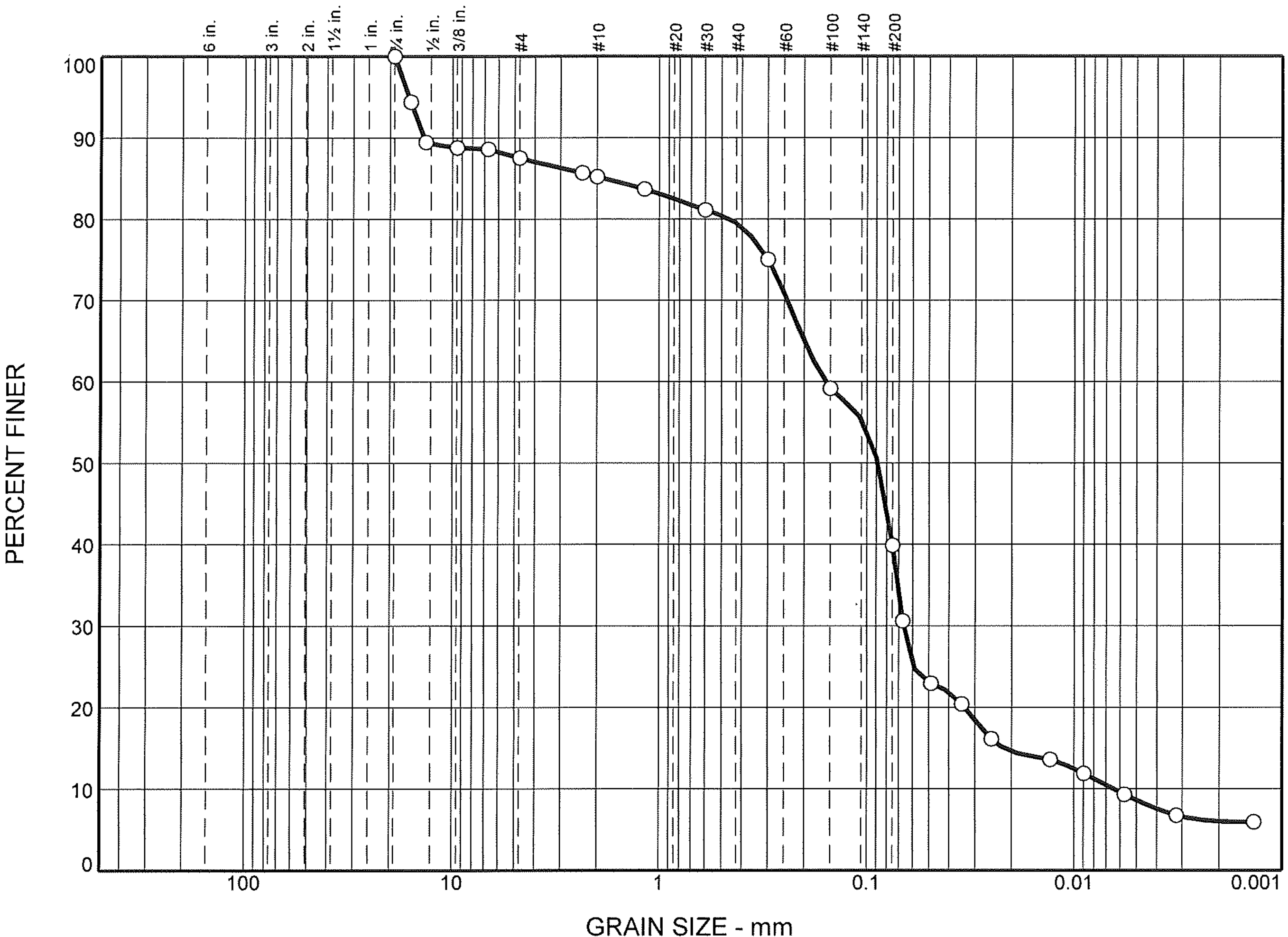
St. Clements, ON

Client: Triton Engineering Services Limited

Project: Station Street Dam
Hillsburgh, Ontario

Project No.: 12-015 **Figure** 6

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	12.5	2.3	5.8	39.5	33.9	6.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH10	4	2.3-2.9 m	silty sand, some gravel, trace clay	SM
				Tested by JH of CMT Engineering Inc. July 9, 2012	
				estimated hydraulic conductivity K = 3.6x10^{-5} cm/sec	

CMT Engineering Inc.

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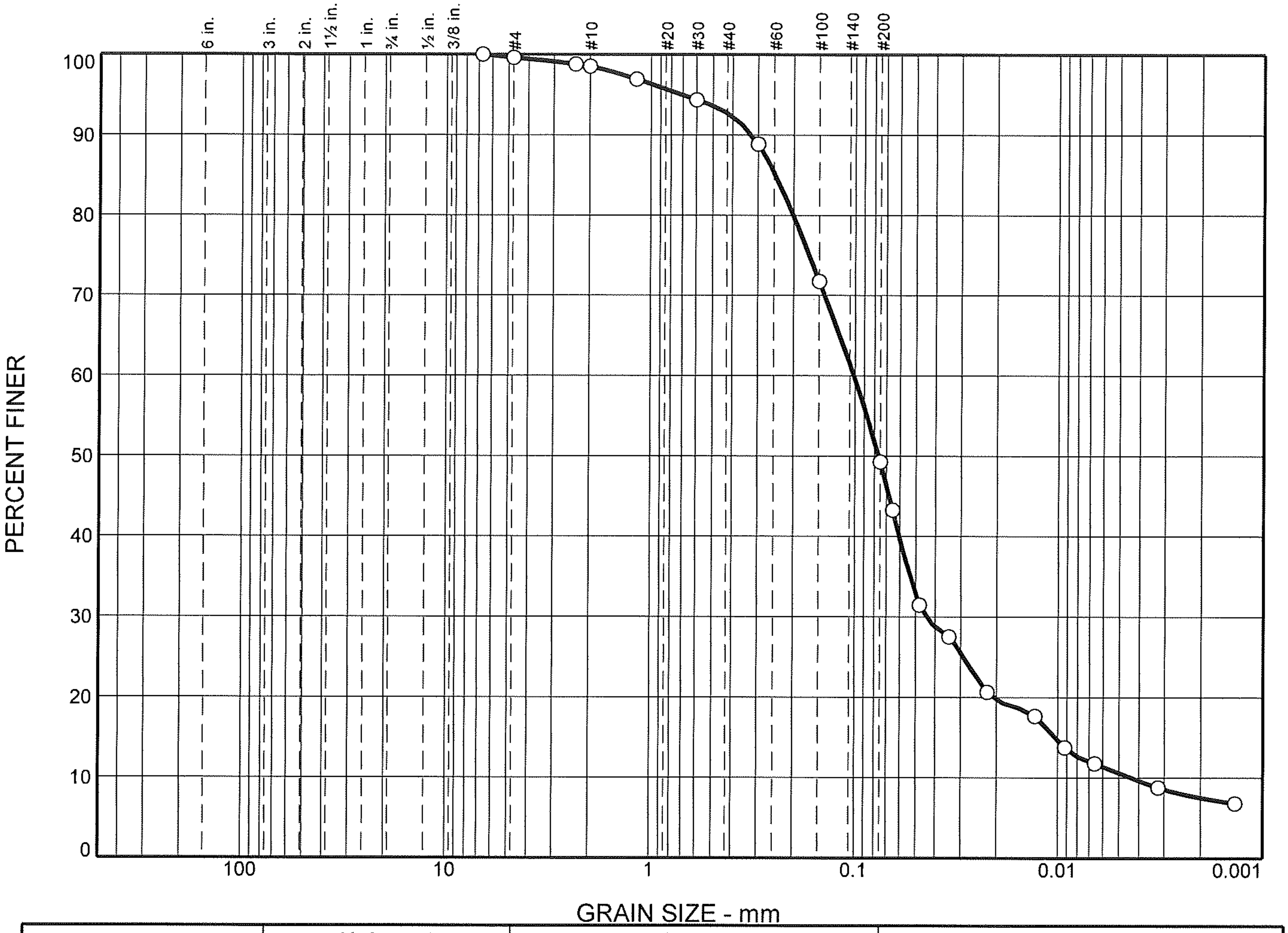
Client: Triton Engineering Services Limited

Project: Station Street Dam
Hillsburgh, Ontario

Project No.: 12-015 **Figure** 7

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.4	1.1	5.8	43.4	41.8	7.5

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH11	4	2.3-2.9 m	sand and silt, trace gravel	SM
				Tested by JH of CMT Engineering Inc. February 14, 2012	
				estimated hydraulic conductivity K = 2.0x10^{-5} cm/sec	

CMT Engineering Inc.

St. Clements, ON

Client: Triton Engineering Services Limited

Project: Station Street Dam
Hillsburgh, Ontario

Project No.: 12-015 **Figure** 8

APPENDIX C-3

Hydrogeological Assessment

Blackport
HYDROGEOLOGY
INC

56 Alexandra Ave.,
Waterloo, Ontario
N2L 1L5

Phone: 519-884-5549
blackport_hydrogeology@rogers.com

September 28, 2016

Mr. Chris Clark, M.A.Sc., P.Eng.,
105 Queen Street West,
Unit 14,
Fergus, ON,
N1M 1S6

Dear Mr. Clark:

Re: Hillsburgh Dam and Bridge Environmental Assessment
Hydrogeology Assessment

As per your request, an assessment of the local hydrogeology conditions in the vicinity of the Hillsburgh Pond and dam was conducted. The following is a summary of the hydrogeology assessment and the potential for groundwater impacts with respect to possible future modifications to the Hillsburgh Pond. The modifications will depend on the findings of the Hillsburgh dam and bridge Environmental Assessment.

Scope of Assessment

A Municipal Class EA is currently being conducted for the Hillsburgh Dam and Pond to assess potential future options for both the dam and pond, and the potential environmental impact any changes to the dam and pond. The primary concern, from a hydrogeological perspective, is the potential for a hydraulic connection between the pond and private water wells in the vicinity of the pond, in particular shallow dug wells, and any impacts that could occur if the pond was modified as a result of the findings of the Environmental Assessment. A desktop review of existing hydrogeological information was conducted to determine the hydrogeologic setting and assess the potential for impacts to the local groundwater and existing private wells. The following is a summary of the hydrogeological review and findings.

Hydraulic Conditions at the Hillsburgh Pond

The water level in the Hillsburgh Pond is regulated by the Hillsburgh Dam, which has a stop log control structure. The water level of the Hillsburgh Pond was measured as 431.21 metres Above Mean Sea Level (mAMSL), determined as part of the EA (personal communication, Triton Engineering Services Limited). Depth soundings taken in the Hillsburgh Pond show the bottom of the pond varies in elevation from a high of 430.85 mAMSL in the north end of the pond to a low of 428.51 mAMSL near the old Monk riser structure, adjacent to the dam.

Hydrogeological Setting

The general hydrogeological setting can be summarized as follows:

- Much of the shallow overburden in the vicinity of the Hillsburgh Pond consists of sand or a mixture of sand and gravel. Figure 1 shows the surficial geology, as mapped by Cowan (1976), shows that much of the area surrounding the Hillsburgh pond is glaciofluvial outwash sand or sand and gravel.

- The shallow sand and gravel is underlain by stony silt till and clayey silt till, often described by well drillers as clay and stones. Figure 2 shows a geologic cross-section through the area near the Hillsburgh Dam (modified from Nestles Waters Canada 2014 Annual Monitoring Report, 2014, Figure 2.3). The cross-section shows typically about 10 m of sand and gravel, overlying 5-10 m of sandy silt to clay till. Below the till is the bedrock of the Guelph Formation, the major water supply aquifer throughout the area.

- Most water wells obtain water from the underlying bedrock aquifer; however, there are some shallow dug wells in Hillsburgh, primarily along Trafalgar Road (Main Street). Water well records from the Ministry of the Environment and Climate Change (MOECC) database show the overburden to be on the order of 15 m thick along George Street, north of the Hillsburgh Pond, and to the east along Trafalgar Road, and on the order of 20 m thick along Station Street to the south of the Hillsburgh Pond.

Potential Impact on Private Wells

Most residences in the area of the Hillsburgh Pond are on private wells. The three main areas closest to the Hillsburgh Pond are: along George Street to the north of the pond; along Station Street to the south of the pond; and, to the east of the pond along Trafalgar Road (Figure 3). Figure 4 shows the location of water wells found in the MOECC water well record database. It is noted that the locations of the wells may not be exact, especially for older well records, where the locations may have been based only on driller's sketches. The well records in the database show that it is likely that all of the residences along George Street and Station Street have drilled wells. Given the lack of water well records in the database for residences along Trafalgar Road, it is likely that there are a number of shallow dug wells in this area. A water well survey was not conducted for this desk top study; however, a water well survey was conducted as part of another Environmental Assessment for a new water supply well for Hillsburgh. There were only a few responses returned, with three (3) residents along Trafalgar Road indicating their well was a dug well.

George Street area (North of the Hillsburgh Pond)

Based on the water well record (WWR) database, the George Street area residences appear to have only drilled water wells. The WWR data base shows that all wells in the data base obtain water from the underlying bedrock aquifer and most wells are typically about 30 m deep or greater. Water levels in the bedrock wells appear to be at an elevation about 434 mAMSL, which is higher than the Hillsburgh Pond water level. Given the depth of the wells in the bedrock and the overlying silt/clay till overburden, it is unlikely there is a strong hydraulic connection between the Hillsburgh Pond and the bedrock aquifer. It is not expected that any changes to the Hillsburgh Pond will impact the private water wells in the George Street area.

Station Street Area (southwest of the Hillsburgh dam)

There are only a few residences along Station Street, and based on the WWRs all of the residences have drilled wells. There is apparently one dug well, further west along Station Street, but there is also a drilled well on the same property. Based on existing water level data, the water levels in the bedrock wells along the area of Station Street, near the Hillsburgh Dam, are typically about 9 m below ground surface or about 426 mMASL to 428 mAMSL, which is lower than the bottom of the Hillsburgh Pond. It is unlikely that the Hillsburgh Pond influences the water levels in the bedrock aquifer in this area and no impact on water levels is expected with any modifications to the Hillsburgh Pond.

It is noted that Nestles Waters Canada (NWC) has a shallow monitoring well nest (P13-07) along Station Road (Figure 3). Water level monitoring in two overburden monitoring wells at this location shows the water levels are slightly higher than the Hillsburgh Pond level, indicating potential shallow groundwater flow towards the pond. The water levels are only about 0.2 m to 0.5 m above the Hillsburgh Pond level, and show a downward gradient. A bedrock monitoring well close to P13-07 shows a water level typically less than 427 mAMSL, which is below the bottom of the Hillsburgh Pond. It is likely that there is some shallow groundwater discharge locally to the Hillsburgh pond in this area, as well as some downward movement of the shallow groundwater to the underlying bedrock aquifer.

Trafalgar Road (East of the Hillsburgh Pond)

There are only a few water well records in the WWR database, for properties along Trafalgar Road, and as previously indicated it is interpreted that there are likely a number of dug wells which are not in the WWR database. Water well records in the data base show that these wells are completed in the bedrock aquifer, and original water levels varied from about 430 mAMSL to 426 mAMSL, with generally decreasing water levels moving southward along Trafalgar Road. Based on the geologic separation of the bedrock aquifer from the shallow groundwater and the Hillsburgh Pond, there will be limited hydraulic connection between the aquifer and the Hillsburgh Pond in this area.

Dug wells along Trafalgar Road are likely completed in the shallow sand and gravel overburden. The potential does exist for the pond level to influence the shallow water table in the vicinity of the Hillsburgh Pond; however, it is expected that the long-term sedimentation in the bottom of the Hillsburgh Pond has decreased the hydraulic connection of the pond to the surrounding shallow water table aquifer. There will be limited leakage into or out of the bottom of the pond. There will be some movement of water into or out of the side of the pond, depending on the local water table elevation. This is not expected to be significant. It is possible that lowering of the pond level, and dredging of the bottom of the pond, may result in a local lowering of the water table but the extent is not known. The impact is more likely to occur to the west, where there is a greater hydraulic connection to the wetland area.

Summary of the Potential Impact of Modifications to the Hillsburgh Pond

Most of the water wells obtain water from the underlying bedrock aquifer. The bedrock aquifer is separated from the shallow groundwater system and Hillsburgh Pond, typically by at least 10 m of overburden, some of which is silt/clay till, so the two groundwater systems should be relatively isolated hydraulically. Based on the existing information no issues are anticipated with the bedrock wells, if the Hillsburgh Pond is altered.

There are some shallow dug wells along Trafalgar Road, which are more susceptible to fluctuations in the water table, depending on the depth of the well. A lowering of the Hillsburgh Pond, and/or dredging of the underlying sediment could locally impact the water table immediately adjacent to the pond. Given that the Hillsburgh Pond has been slowly infilling with sediment, this has likely created a hydraulic seal in the bottom of the pond limiting the hydraulic connection between the pond and the shallow aquifer, including the water levels in the dug wells.

Recommendations

If the Hillsburgh Pond was to be removed and the underlying sediment dredged it is recommended that shallow monitoring wells be installed around the perimeter of the pond prior to any changes in the pond. Water levels should be monitored in these wells prior to and during any modifications to the Hillsburgh Pond to assess determine if there are any impacts to the local water table as a result of changes to the pond.

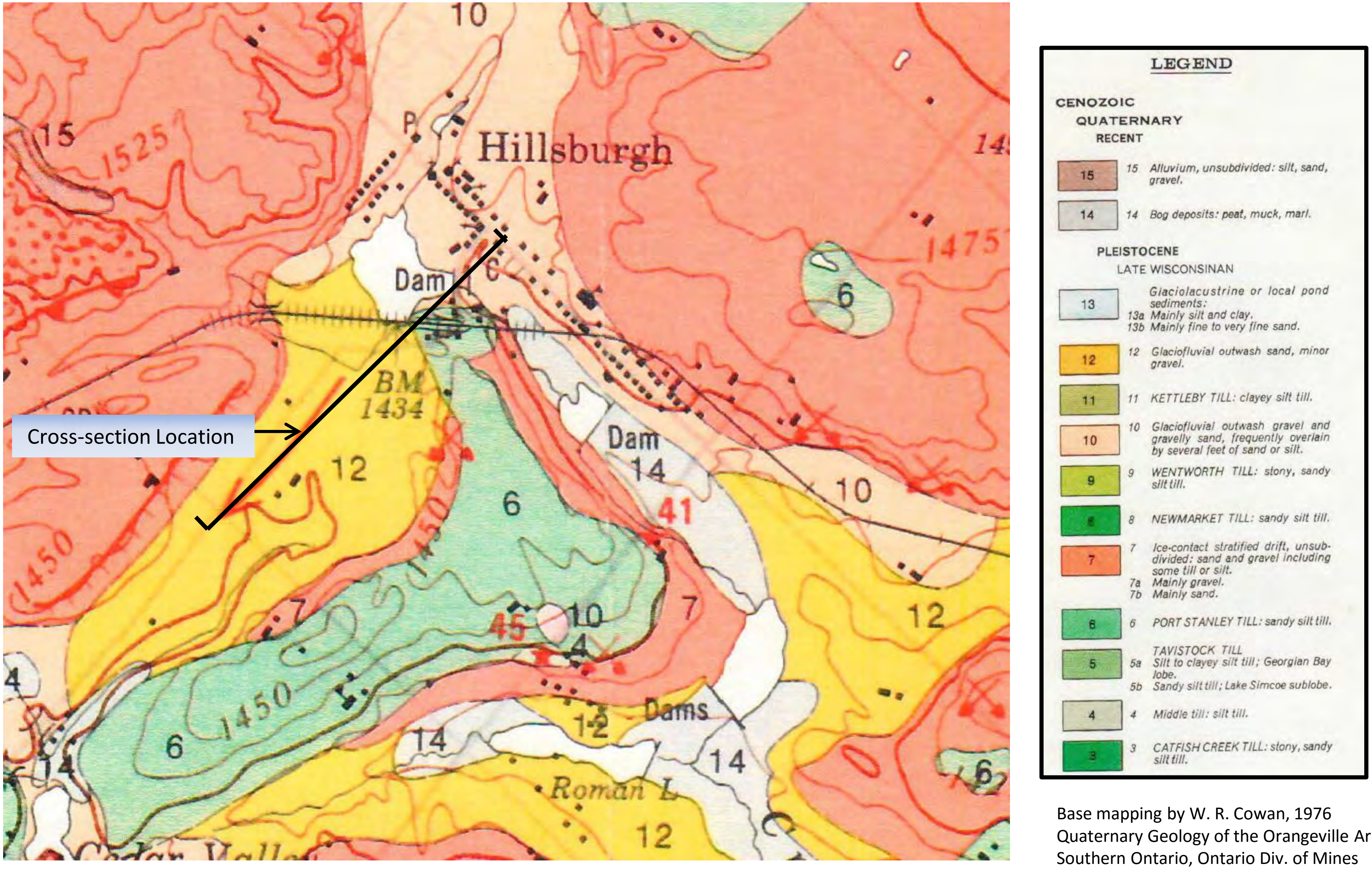
I trust these comments are sufficient for your assessment. If you have any questions please do not hesitate to contact the undersigned.

Sincerely
Blackport Hydrogeology Inc.,

Ray Blackport

Ray Blackport, M.Sc., P. Geo

Attachments: Figures 1-4

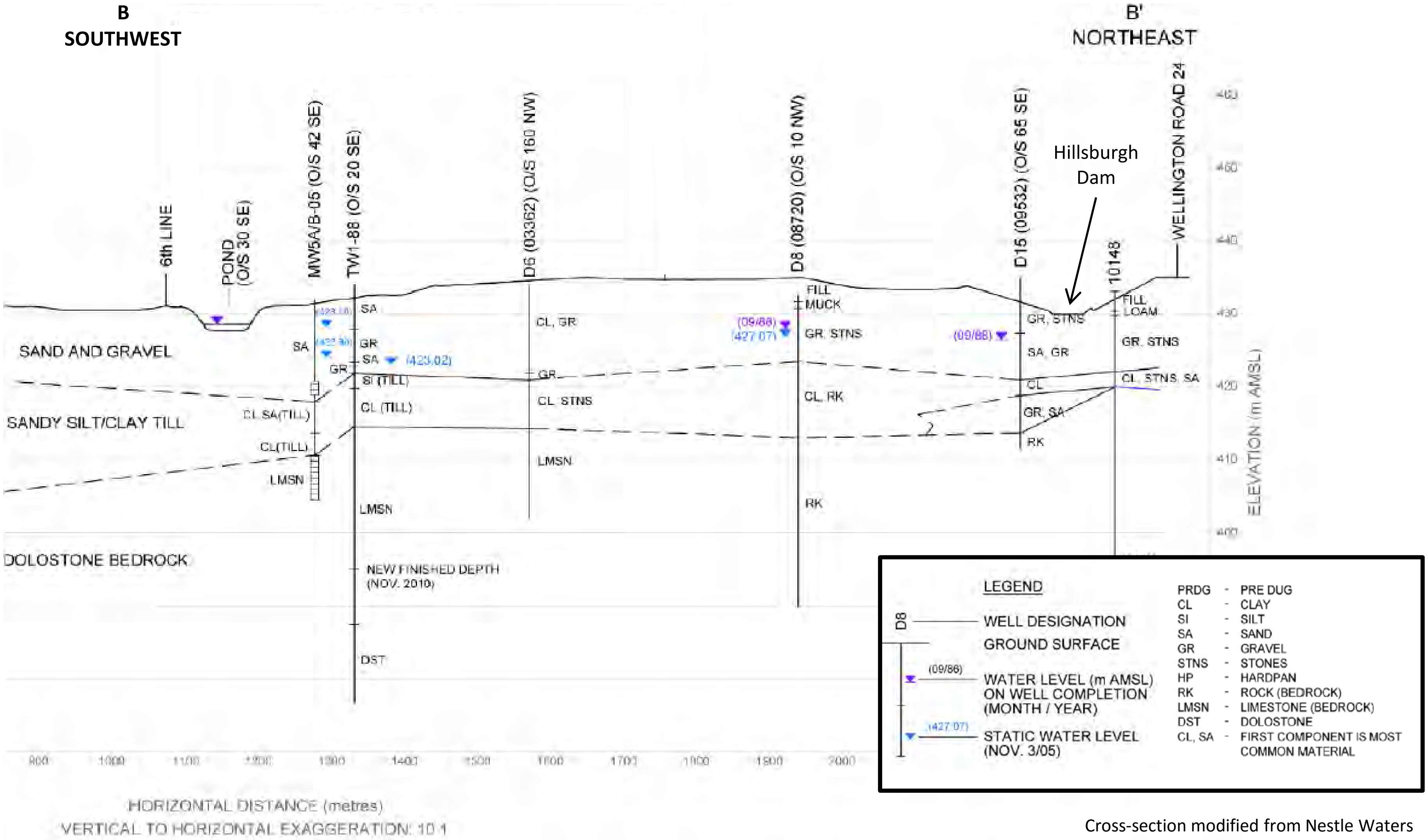


Base mapping by W. R. Cowan, 1976
Quaternary Geology of the Orangeville Area,
Southern Ontario, Ontario Div. of Mines

Blackport
HYDROGEOLOGY
INC

Hydrogeological Assessment, Hillsburgh Dam and Pond Area

Figure 1 – Surficial Geology of the Hillsburgh Area



Cross-section modified from Nestle Waters Canada Annual Monitoring Report, 2014

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Hydrogeological Assessment, Hillsburgh Dam and Pond Area

Figure 2 – Geologic Cross-section near the Hillsburgh Dam

APPENDIX C-4

Natural Environment Report

Hillsburgh Dam

Town of Erin
Environmental Assessment - Natural Environment Report

Prepared for:
Town of Erin

Project Number:
AA12-137A

Date:
October 13, 2016

ABOUD & ASSOCIATES INC.
Consulting Arborists•Ecologists•Landscape Designers
591 Woolwich Street . Guelph . Ontario . N1H 3Y5 . T:519.822.6839 . F:519.822.4052 . info@aboudtng.com . www.aboudtng.com

EXECUTIVE SUMMARY

ENVIRONMENTAL ASSESSMENT - NATURAL ENVIRONMENT REPORT

Aboud & Associates Incorporated (AA) was retained by Triton Engineering Services Limited (Triton) on behalf of the Town of Erin to complete the natural heritage component of a Schedule B Municipal Class Environmental Assessment (EA). The EA is being completed in order to determine the best option to ensure the long term safety of the Hillsburgh Dam, Bridge and Pond.

The Hillsburgh Dam is an earthen berm located within the community of Hillsburgh, part of the Town of Erin, within Wellington County. The water held back by the Dam creates the Hillsburgh Pond, an approximately 9.0 ha open body of water with associated wetland areas. The river system of the Hillsburgh Pond is the West Credit River, a cold water river system.

The study area for the Natural Environment report is 77.05 ha, centered on the Hillsburgh Dam and includes lands upstream and downstream of the dam. Natural features within the study area include Provincially Significant Wetlands, meadows, open water communities and forests.

The natural heritage studies of the EA characterized and mapped the significant natural features within the study area, identified potential constraints and analyzed proposed alternatives. Species at Risk (SAR), Fish Habitat, Significant Wildlife Habitat, Rare Species, Landscape-level Features, and a Provincially Significant Wetland were identified in the study area. These findings were considered as part of the Analysis of Alternatives.

The four alternatives assessed to determine the preferred alternative are:

- Alternative A – Do Nothing
- Alternative B – Rehabilitate Hillsburgh Dam and Reconstruct Station Street Bridge
- Alternative C (Option 1): Rehabilitate Station Street Bridge and Decommission Dam
- Alternative C (Option 2): Rehabilitate Station Street Bridge, Decommission Dam and Construct Offline Pond
- Alternative D (Option 1): Reconstruct Station Street Bridge and Decommission Dam
- Alternative D (Option 2): Reconstruct Station Street Bridge, Decommission Dam and Construct Offline Pond

The Analysis of Alternatives identified the potential and actual impacts of each proposed EA Alternative with respect to the existing natural heritage features in the study area and surrounding landscape. The analysis concluded that there are two preferred alternatives: Alternative C - Option 2 and Alternative D - Option 2. These alternatives have the least negative impacts to the existing natural heritage features. Both of these also provide benefits to cold water Fish and Fish Habitat.

The next preferred alternative is Alternative B. If Alternative B is selected, mitigation measures should be considered to minimize impacts to aquatic habitat through the creation of a fish-bypass to allow fish passage and bottom draw dam design to minimize thermal impacts to the downstream watercourse. The least preferred alternatives are Alternative C -Option 1 and Alternative D - Option 1.

Under Alternative A (Do nothing), no new impacts are anticipated under the current conditions. However, if the failure of the dam and/or bridge occurs, significant negative impacts are anticipated to all natural environment criteria, the extent of which is unknown.

For the selected Alternative, measures should be implemented to protect the natural environment during construction and mitigate short and long-term impacts of the overall ecological integrity of the area.

Opportunities to enhance the natural environment as part of protection and mitigation measures should be considered following selection of the overall preferred Alternative.

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Glossary of Terms

BBS: Breeding Bird Survey

CC: Coefficient of Conservatism

COSSARO: Committee on the Status of Species at Risk Ontario

COSEWIC: Committee on the Status of Endangered Wildlife in Canada

CRFMP: The Credit River Fisheries Management Plan

CVC: Credit Valley Conservation

CVC Species of Conservation Concern: CVC ranking of Species based on Conservation Concern Status, from Tier 1 to Tier 5.

DFO: Department of Fisheries and Oceans Canada

EA: Environmental Assessment

ELC: Ecological Land Classification

END: Endangered Species

ESA: Endangered Species Act

ESSMP: Erin Servicing and Settlement Master Plan

G-Rank: Conservation Status of Species at the Global Level

LIO: Land Information Ontario

MMP: Marsh Monitoring Protocol

MNRF: Ministry of Natural Resources and Forestry

NHIC: Natural Heritage Information Center

NRVIS: Natural Resources and Values Information System

OBBA: Ontario Breeding Bird Atlas

OMA: Ontario Mammal Atlas

ORAA: Ontario Reptile and Amphibian Atlas

OP: Official Plan

OWES: Ontario Wetland Evaluation System

PPS: Provincial Policy Statement

PIF: Partners in Flight

PSW: Provincially Significant Wetland

SAR: Species at Risk

SARA: Species at Risk Act

SC: Special Concern Species

Species with Conservation Designation: All species listed under SARA, COSEWIC, ESA and/or an S1-S3 provincial designation.

S-Rank: Conservation Status of Species at the Provincial Level

SWH: Significant Wildlife Habitat

THR: Threatened Species

VASCAN: Database of Vascular Plants of Canada

WCSS: West Credit Subwatershed Study

1.0 Introduction

Aboud & Associates Incorporated (AA) was retained by Triton Engineering Services Limited (Triton) on behalf of the Town of Erin to complete the natural heritage component of a Schedule B Municipal Class Environmental Assessment (EA). The EA is being completed in order to determine the best option to ensure the long term safety of the Hillsburgh Dam and associated bridge with due consideration for the natural environment, transportation, socio-economic impacts, constructability, and cost. The natural heritage existing condition component of the EA focuses on characterizing the existing natural features within the study area, mapping significant natural features and identifying potential constraints.

1.1 Study Area

The study area is 77.05 ha and located in the community of Hillsburgh - Town of Erin (*Figure 1*). It is centered on the Hillsburgh Dam and includes lands upstream and downstream of the dam, extending south downstream to Wellington Road 22 and upstream along the two upstream tributaries of the West Credit River. The study area is entirely within the jurisdiction of Credit Valley Conservation (CVC), and almost entirely within CVC's Regulation Limit. Natural features within the study area include wetlands, meadows, open water communities and forests.

The Hillsburgh Dam is an earthen berm located within the community of Hillsburgh, part of the Town of Erin, within Wellington County. The water held back by the Dam creates the Hillsburgh Pond, an approximately 9.0 ha, open body of water. The Dam supports a section of Station Street Road, a two lane municipal road that crosses the West Credit River by way of the Dam and associated bridge (Structure #2064); the latter being the main outflow for the Hillsburgh Pond.

1.2 Existing Land Use

The individual properties that comprise the study area are a combination of private property, and public property (Town of Erin, Credit Valley Conservation land and County of Wellington). The majority of the study area is natural or naturalized land, containing a diversity of ecosystems, including the Provincially Significant West Credit River Wetland Complex, the West Credit River, Significant Woodlands, and open water communities. In addition to the Hillsburgh Pond, there are two other aquatic communities resulting from the impoundment of water behind the dams on the West Credit River, and a number of smaller dug offline ponds throughout the study area (*Figure 2*).

The watercourse within the study area is a natural coldwater system, but due to anthropogenic influences is now comprised of a mixture of cold and warm water areas, containing both cold and warm water species of fish. The entire watercourse is managed as a Coldwater Fishery within the limits of the study area (CRFMP 2001; ESSMP 2011; pers. comm., T. Slaght, 2014). The Elora-Cataract Trailway crosses through the study area and is the main access route into the different sections of the study area.

Within or adjacent the study area are a number of private residential properties comprised of dwellings, driveways and associated landscaping and yard maintenance. Residential areas were not included in the Ecological Land Classification (ELC) surveys and flora species within residential gardens and yards are not included in flora species lists.

Access to specific properties within the study area was requested by Triton through letter and door to door communication with landowners. Due to private property restrictions, large sections of the study area were not accessible, and could only be assessed from the edge of property, aerial photo interpretation and through background resources. The extent of lands accessed as part of the current investigation is shown in *Figure 2*.

1.3 Existing Regulations

1.3.1 Provincial Policy Statement

The *Provincial Policy Statement* ([PPS] OMMHA 2014) provides policy direction on matters of provincial interest related to land use planning and development.

The PPS states that:

"Natural features and areas shall be protected for the long term."

And that:

"The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features."

Under the PPS, development and site alteration are not permitted in:

a) significant wetlands;
b) significant woodlands;
c) significant valleylands;
d) significant wildlife habitat;
e) significant areas of natural and scientific interest; and
f) coastal wetlands,

unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

The PPS (2014) also states that:

1. Development and site alteration is not permitted in fish habitat, habitat of endangered species and threatened species except in accordance with provincial and federal requirements.

2. Development and site alteration is not permitted on adjacent lands to the natural heritage features and areas identified above, unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.

3. Development and site alteration is restricted in or near sensitive surface water features and sensitive ground water features in order to protect the hydrologic functions of the feature. Mitigation and/or alternative development approaches may be required in order to protect, improve or restore sensitive surface water features, sensitive ground water features, and their hydrologic functions.

1.3.2 Endangered Species Act, 2007

The provincial Endangered Species Act, 2007 (ESA) provides protection to species designated as Threatened or Endangered on the Species at Risk in Ontario list (MNRF 2015a). The habitat of species at risk is also generally protected under the ESA. Protected habitat is habitat identified as essential for life processes including breeding, rearing, feeding, hibernation, and migration.

The ESA (Subsection 9(1)) states that:

"No person shall,
- *(a) kill, harm, harass, capture or take a living member of a species that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species;*
- *(b) possess, transport, collect, buy, sell, lease, trade or offer to buy, sell, lease or trade,*
  - *(i) a living or dead member of a species that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species,*
  - *(ii) any part of a living or dead member of a species referred to in subclause (i),*
  - *(iii) anything derived from a living or dead member of a species referred to in subclause (i); or*
- *(c) sell, lease, trade or offer to sell, lease or trade anything that the person represents to be a thing described in subclause (b) (i), (ii) or (iii).*

Clause 10(1)(a) of the ESA also states that:

"No person shall damage or destroy the habitat of a species that is listed on the Species at Risk in Ontario list as an endangered or threatened species."

An authorization or permit between the proponent and the Minister of Natural Resources and Forestry is required to authorize activities that would otherwise be prohibited by subsection 9(1) and 10(1) of the ESA.

1.3.3 Fisheries Act, 1985

The study area contains fish bearing waters in the form of open water, rivers, and wetlands. These areas and the fish within are protected under the Federal Fisheries Act, 1985. The Fisheries Act provides protection for the sustainability and ongoing productivity of Canada's recreational, commercial and Aboriginal fisheries.

Section 35 (1) of the Fisheries Act States that:
"No person shall carry on any work, undertake activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or fish that support such a fishery"

The Fisheries Act requires that projects and activities avoid causing serious harm to fish and fish habitat unless authorized to do so by the Department of Fisheries and Oceans Canada (DFO). This applies to work conducted in or near waterbodies that support recreational, commercial and Aboriginal fisheries. Within the context of the Hillsburgh EA, any proposed actions that could impact fish or fish habitat would need to be assessed for compliance with the Fisheries Act. If it is determined that proposed actions will cause serious harm to fish that cannot be mitigated, then a Fisheries Act Authorization would be required.

1.3.4 Credit Valley Conservation

The Study Area is located within the jurisdiction of CVC and contained within the CVC Regulation Limit from two regulated features: the West Credit River Wetland Complex (PSW), and the West Credit River.

CVC's *Policies are regulated under the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation* (Ontario Regulation 160/06).

Interference with a wetland or watercourse; or development within a regulated area is generally not permitted. Interference with a wetland or watercourse, or development may be permitted within a regulated area if, the control of flooding, erosion, dynamic beaches, pollution or the conservation of land will not be affected.

CVC may permit development or site alteration where impacts have been addressed through an environmental assessment, comprehensive environmental study or technical report (CVC 2010a).

1.3.5 Wellington County Official Plan

The *Wellington County Official Plan* (County of Wellington 2013, Section 5.5.4) states that "woodlands over 4 ha and plantations over 10ha are considered to be significant by the County, and are included in the Greenlands System". Section 5.4 of the *Official Plan* (Section 5 – The Greenlands System) specifies that within the Greenlands System, areas with greater sensitivity or significance are identified and protected as '*Core Greenlands*', and include Provincially Significant Wetlands. The *Wellington County Official Plan* (2013) shows that the study area contains '*Greenlands*' and '*Core Greenlands'*.

Section 5.5 of the *Official Plan* states that *Significant Woodlands* "will be protected from development or site alterations which would negatively impact the woodlands or their ecological function".

Section 5.4 of the OP states that *Core Greenlands* include: Provincially Significant Wetlands, all other wetlands; habitat of endangered or threatened species and fish habitat; and hazardous lands.

Development and site alteration is not permitted in Provincially Significant Wetlands, in the habitat of threatened or endangered species, or fish habitat except in accordance with provincial and federal requirements.

1.3.6 Town of Erin Official Plan

The Town of Erin Official Plan (2012) encourages the protection and enhancement of natural heritage features, including the protection, preservation, and enhancement of significant natural features such as rivers, streams, valley lands, wetlands, floodplains, headwaters, environmentally significant features, wildlife and fish habitats and lands with ecological functions. Ponds, lakes, reservoirs and natural links are also afforded protection from development or site alteration which would have negative impacts.
Lands designated under the OP as *Core Greenlands* are protected from any development or site alteration which would have a significant negative impact on the *Core Greenland* or their ecological function.

Fish Habitat is recognized as important under the OP fisheries policies. Fisheries are afforded protection through the maintenance of groundwater and surface water inflows, maintaining or establishing tree cover over rivers and streams, providing public access to fishery resources, and minimizing or eliminating negative thermal impacts to the fishery. The naturalization of watercourse corridors is also encouraged under the OP.

1.4 Credit River Fisheries Management Plan

The Credit River Fisheries Management Plan, 2001 (CRFMP) was a joint project between the MNRF and the CVC, along with other government and non-government partners. The goal of the CRFMP is "*to have a healthy aquatic ecosystem that provides long-term benefits to help satisfy society's need for a high-quality environment, wholesome food, employment and income, recreational activities, and cultural heritage."* The CRFMP guides the protection and enhancement of the Credit River and provides fisheries management objectives for specific species of fish, as well as management objectives for specific management zones within the Credit River.

The Credit River watershed covers 871 km^2, eventually flowing into Lake Ontario. The watershed encompasses portions of nine municipalities, supports a human population of over 500,000 and has a diverse land use of urban, rural, agricultural and natural areas. Land use in the Credit River watershed has intensified with increasing urban growth. Limiting impacts to the watercourse and fish populations from growth and development is a key objective of the CRFMP.

The Credit River system provides high-quality fishing opportunities for anglers, with the cold waters of the upper watershed offering fly fishing opportunities for Brook Trout (*Salvelinus fontinalis*) and Brown Trout (*Salmo trutta*). The systems contain at least 57 fish species, with new legal and illegal introduction continuing to increase the number of species. Biodiversity of the systems has increased with the introduction of sports fishing species such as Brown Trout, Chinook (*Oncorhynchus tshawytscha*) and Coho Salmon (*Oncorhynchus kisutch*). Native sports fish such as Largemouth Bass (*Micropterus salmoides*) and Northern Pike (*Esox Lucius*) have expanded their range within the watershed through introductions and through the alteration and creation of habitats such as ponds and lakes. Undesirable invasive species, such as the Common Carp (*Cyprinus carpio*) and Round Goby (*Neogobius melanostomus*) have been introduced into the watershed (CRFMP 2002).

The CRFMP divides the watershed into three sub-watershed zones, consisting of the upper watershed, middle watershed and lower watershed. The upper watershed is on or above the Niagara Escarpment and is primarily in rural landscapes. The watercourses of the Upper Watershed are of higher quality than the lower watersheds and have been retained in relatively natural conditions, with large riparian buffers and limited alterations to stream morphology. Base flow in these areas is provided through springs and groundwater discharge. Water is generally cold and of high quality.

Fisheries Management zones within the Credit River have been developed based on habitat, thermal conditions and fish community composition for specific stream sections within the watershed. The current EA study area is entirely within the Coldwater Fish Habitat Management Zone. The management zone extends upstream to the headwaters of the tributaries and extends downstream, approximately 20 km beyond the study area to the community of Inglewood. The fish communities in the management zone are comprised primarily of fish species intolerant of water temperatures that exceed 22°C and commonly found only in groundwater-rich areas. Sport fish species common to the cold water communities include Brook Trout and Brown Trout.

Brook Trout are the primary target management species within the Upper Watershed Coldwater Management Zone. Within the management zone, coldwater construction timing windows must be adhered to, even if specific water bodies, such as the Hillsburgh Pond contain warm water fish species.

The CRFMP identifies risks and impacts to fisheries and recognizes online ponds as an ongoing concern within the watershed. Impacts associated with dams and ponds include; thermal warming, siltation, flooding, erosion, nutrient enrichment and pollution, and fish passage barriers. The Hillsburgh Dam and Pond are specifically cited as having known negative impacts to the management of the coldwater fishery of the upper Credit River. The Management Plan recommends dam mitigation or removal in order to alleviate the impacts to fish communities. Removal of the dam would allow the watercourse to re-naturalize over time, permit fish passage, and create additional cold water habitat. In the absence of dam removal, potential dam mitigation measures addressed in the CRFMP include fishways (fish ladders), and bottom draw outlets. Fishways would allow fish passage and mitigate the impact of fish barriers. Bottom draw systems are designed to release water from near the bottom of a pond or body of water behind a dam where the open water community is colder than water drawn from the top, and therefore reducing thermal heating of the downstream watercourses.

The CRFMP guides decision-making and management of the Credit River and associated fisheries. Any actions regarding the Hillsburgh Dam and Pond should be examined with respect to the management objectives and target species of the Management Plan.

1.5 West Credit Subwatershed Study

The West Credit Subwatershed Study, 1998 (WCSS) was coordinated by CVC for the Village of Erin, the Township of Erin and Town of Caledon, and the Region of Peel. The report was initiated to address concerns about the health of the subwatershed's water and related environmental resources and was meant as a management plan to protect, enhance and rehabilitate natural features. Key issues of focus within the WCSS include groundwater, surface water, aquatic habitat and wildlife, terrestrial habitat and wildlife, protection of features, and environmental education. The study area for the WCSS is the 105 km^2 that is drained by the West Credit River, encompassing the headwaters to the northwest of Hillsburgh to the Forks of the Credit.

The West Credit River was identified as having some of the best quality fish habitat in the Credit River system, with the presence of a self-sustaining population of Brook Trout, relatively healthy ecosystem, and high-quality ground and surface water. The main branch of the West Credit, around Hillsburgh, is identified as an important cold water habitat for Brook Trout, as groundwater discharges directly into the streams. These areas provide thermal refuge and appropriate Brook Trout spawning habitat. The series of dams below Hillsburgh are identified as impairments to the highly productive Brook Trout community.

The WCSS identifies that the construction of dams and on-line ponds has contributed to declines in Brook Trout compared to historic populations. Identified impacts of dams include barriers to fish movement, preventing access to areas of thermal refuge and important reproductive zones; negative thermal impacts; changes in sedimentation and nutrient flow; changes to channel forms; and providing opportunities for the colonization and development of warmwater fish communities. As a result, several locations on the West Credit River now contain less desirable warmwater fish communities. Dams within the West Credit system are also identified as negatively affecting the general water quality and the health of the aquatic system through elevated coliform bacteria levels resulting from the increased temperature.

The WCSS recommends removal of on-line pond and barriers to fish movement where feasible as well as the installation of bottom draw structures. Removal of on-line ponds is listed as a '*top priority*' given their known negative influence on water quality and fish communities.

Water temperature monitoring measurement within the report averaged 9.5°C in the main branch of the West Credit, which is above the target of 18°C for a healthy coldwater community. Temperature impacts are attributed to the presence of on-line ponds, impacts to groundwater recharge and discharge areas, land use changes and loss of riparian cover. Temperature is identified as the most important factor affecting the distribution of fish communities.

The importance of forest communities on the water cycle and as wildlife habitat is also highlighted in the report. The existing forest cover is identified as being patchy and often isolated from other natural areas. The need to improve connectivity of the forest habitat and increase the overall amount of forest cover is noted. The area west of Hillsburgh is specifically identified as lacking terrestrial cover. The need to maintain and enhance riparian cover is also identified as important for enhancing water quality, through filtering nutrients and contaminants, moderating flow, reducing erosion, and reducing flood magnitude and velocity. Loss of riparian canopy has also increased water temperatures and can lead to localized loss of Brook Trout.

Overall, the subwatershed is described as being healthy with localized areas of impairment. General recommended rehabilitation strategies presented within the WCSS included the following:

- increasing habitat complexity and diversity;
- improving connectivity between habitats;
- increasing forest cover;
- increasing forest patch size;
- increasing forest patch size;
- increasing forest cover in groundwater recharge areas
- increasing forest cover in riparian zones, especially in coldwater fish habitat reaches, and groundwater discharge zones; and
- increasing the amount of wildlife habitat available on agricultural lands.

Any actions regarding the Hillsburgh Dam and Pond should be examined with respect to the goal and objectives of the WCSS.

1.6 Consultation and Comments

A pre-consultation meeting was held on September 24, 2014 that included representatives from the CVC (T. Slaught, J. Wong, and J. Clayton), MNRF (R. Whalen, D. Ryan), Town of Erin (L. Van Wyck), Triton Engineering Services Limited (C. Clark) and Aboud & Associates Inc. (S. Aboud, R. Hamelin). A summary of the meeting and follow-up minutes relevant to the natural heritage investigation are provided below; detailed meeting minutes are provided in *Appendix 1*.

1. Triton reviewed the project history, from temporary work to the present need, for a permanent solution involving the completion of a Municipal Class Environmental Assessment (Class EA).
2. Aboud & Associates presented the proposed study area with respect to the Natural Heritage investigation. Modifications to the study area were recommended by MNRF and CVC.
3. MNRF and CVC reviewed available data for the project including:

   a. Fish collection records;
   b. Presence of invasive Round Goby;
   c. Water temperature records;
   d. Known Brook Trout spawning upstream and downstream;
   e. Known ground water seeps throughout the system, but no specific location;
   f. CVC considers the Banded Killifish (*Fundulus diaphanous*) and Slimy Sculpin (*Cottus cognatus*) as important species due to the rarity in the watershed.
4. MNRF indicated that there are no known Species at Risk (SAR) in the study area.
5. Triton reminded the group of potential property access limitations due to private property.
6. General discussion on how the potential option could affect the existing PSW wetland complex.

On December 19, 2014, the CVC provided a letter regarding the Class Environmental Assessment Study to Triton Engineering Services (*Appendix 2*). The letter offered preliminary comments and recommendations for the Class EA study.

1.7 Terms of Reference

Based on the above regulations and policies (Section 1.3), the Credit River Fisheries Management Plan (Section 1.4), and communication with regulatory authorities, a proposed Terms of Reference (ToR) for the EA was developed and submitted to the CVC and MNRF on December 8, 2014. Comments regarding the proposed ToR were received from CVC on December 17, 2014, and from the MNRF on January 26, 2015. Follow up comments and request for clarifications was sent to CVC on January 6th, 2015. Response from CVC was received on January 23, 2015.

Based on comments received from the CVC, additional wildlife surveys (e.g. Snakes, Turtles, Salamander, Bat Maternity Roost and West Virginia White Surveys) were added to the EA study requirements. Correspondence with the MNRF was conducted to identify potential SAR within the study area and to determine the appropriate survey protocols. A letter was sent to CVC on April 10, 2015, to outline the SAR surveys and methods that would be completed as part of the EA. The appropriateness of the additional studies was confirmed by CVC on April 13, 2015 (pers. comm., T. Slaught, 2015).

The Terms of Reference, CVC and MNRF comments, and final changes in study requirements, including the SAR surveys and methods are provided in *Appendix 2*.

2.0 Methods

2.1 Background Review

A background information review was conducted of both biological and physical features within the vicinity of the study area. The following resources were consulted as part of this review:

1. Fisheries and Oceans Canada (DFO), Online mapping (accessed: 2015)
2. Ministry of Natural Resources and Forestry (MNRF), Guelph District
3. Ministry of Natural Resources and Forestry (MNRF), Peterborough District
4. Natural Heritage Information Centre (NHIC) database (accessed: 2015)
5. Ontario Reptile and Amphibian Atlas (Ontario Nature 2015a)
6. Ontario Reptile and Amphibian Atlas Interactive map (Ontario Nature 2015b)
7. Ontario Mammal Atlas (1994)
8. Atlas of the Breeding Birds of Ontario, 2001-2005
9. Credit River Fisheries Management Plan (CVC 2002)
10. Credit Valley Conservation Terrestrial Monitoring Program Report 2005-2009
11. Wellington County Official Plan, May 6, 1999 (Last Revision March 9, 2015)
12. Credit Valley Conservation Authority Hillsburgh Dam Terrestrial and Aquatic Monitoring Data (provided by CVC, February 2015)
13. Credit Valley Conservation Authority Regulation Mapping (accessed 2015)
14. Region of Wellington Significant species list (2008)
15. Peel Region Natural Areas Inventory Vol. 1 (2011)
16. County of Wellington Official Plan (2006, last revision 2015)
17. Town of Erin Official Plan (2012b)
18. Town of Erin Servicing and Settlement Master Plan (2015)
19. Town of Erin Servicing and Settlement Master Plan - Phase 1 Environmental Component (2011)

2.2 Vegetation

2.2.1 Ecological Land Classification

Ecological Land Classification (ELC) field investigations were completed from May 13th to September 25th, 2015. Detailed survey dates and weather information are provided in *Appendix 3*. Surveys were completed by qualified ecologists, Ryan Hamelin, OMNRF Certified in Ecological Land Classification and Cheryl-Anne Ross, OMNRF Certified in Ecological Land Classification. Vegetation communities within the study area were characterized and delineated through field investigation, following the Ecological Land Classification (ELC) system for Southern Ontario 1st approximation; community codes used generally follow the 2nd approximation (Lee, et al., 1998, 2008). Boundaries of ELC communities were mapped using aerial images and field observations (*Figure 3*). Detailed descriptions of each ELC community are provided in *Appendix 4*, and digitized ELC data sheets are provided in *Appendix 5*. Identified ELC communities were cross-referenced with the NHIC Ontario Plant Community List (NHIC 2015) to determine the presence of rare plant communities (S1-S3). The Subnational, or Provincial, Ranks (S Rank) are assigned by the Ontario Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information Centre (NHIC) in order to help assign protection priorities.

2.2.2 Botanical Inventory

2.2.2.1 Aboud & Associates

Concurrent with ELC evaluations, the subject lands were systematically searched in order to provide a comprehensive three season botanical inventory. Detailed survey dates and weather information are provided in *Appendix 3*.

Identified vascular plant species were compared to provincial and federal SAR lists (COSSARO, SARA) provincial ranks (NHIC 2015), global ranks, CVC list of Species of Conservation Concern Status (CVC 2010b) and Significant Plants of Wellington County (Dougan & Associates 2009), in order to assess federal, provincial, regional and local conservation status of each species. English colloquial names and scientific binomials of plant species generally follow VASCAN (VASCAN 2015).

Identification of environmentally sensitive plant species was completed based on the assignment of a coefficient of conservatism value (CC) for each native species (Oldham, et al., 1995). The value of CC, ranging from 0 (low) to 10 (high), is based on a species' tolerance of disturbance and fidelity to specific natural habitat parameters. Species with a CC value of 9 or 10 generally exhibit a high degree of fidelity to a narrow range of habitat parameters. These species may be more sensitive to environmental changes (Mortarello et. al., 2010).

A list of all identified plant species is provided in *Appendix 6*. The list provides botanical name, common name, provincial rarity rank (S-rank), global rarity rank (G-rank), provincial SAR status, federal SAR status, CVC Species of Conservation Status (CVC 2010b), Local Rarity/Significance within Wellington County (Dougan & Associates 2009), coefficient of conservatism (CC) and coefficient of wetness (CW). Plant species that could only be identified to genus (*Carex sp., Crataegus sp.*) were not assigned the above information.

2.2.2.2 Credit Valley Conservation Authority

In addition to surveys completed by Aboud & Associates, data from previous botanical surveys conducted by CVC were also compiled and are provided in *Appendix 6*. CVC data was collected within the study area from 2008 to 2013. Much of the data was gathered from properties within the study area that were not accessible during this EA study due to a lack of landowner permission. The current study includes properties not surveyed as part of the CVC botanical studies. As a result of these differences in property access, the combined data from the two different sources provides a more complete inventory of the study area.

2.3 Provincially Significant Wetlands

The Provincially Significant West Credit Wetland Complex is partly within the study area and comprises a large portion of the natural feature upstream and downstream of the Hillsburgh Dam. The wetland was first evaluated under the Ontario Wetland Evaluation System (OWES) in 1995 by the MNRF, with updates in 2005 (NRVIS 2010). A copy of the wetland evaluation data and scoring record was obtained from the Guelph District MNRF office and reviewed in order to determine the presence of potentially significant features.

The mapped wetland boundary was obtained from the Land Information Ontario (LIO) online database. The accuracy of the boundary was confirmed through a combination of desktop analysis and field surveys, conducted concurrent with ELC evaluations by Ryan Hamelin, OMNRF Certified in OWES. Detailed survey dates and weather information are provided in *Appendix 3*. The wetland boundary was established where vegetation was comprised of 50% wetland and 50% upland species, and where soils displayed hydric conditions (e.g. presence of mottles and/or gleys), per the *Ontario Wetland Evaluation System* (2013). Due to property access restrictions, it was not possible to confirm the accuracy of the entire wetland boundary within the study area.

2.4 Wildlife

2.4.1 Amphibians (Anurans)

Evening point count surveys to detect breeding calls of anurans (frog and toad) were conducted by Cheryl-Anne Ross, Wildlife Ecologist and Ryan Hamelin, Terrestrial and Wetland Ecologist, in accordance with the *Marsh Monitoring Program Participants Handbook for Surveying Amphibians* (Bird Studies Canada 2008). Three surveys were completed, in accordance with the recommended windows for the spring and early summer in order to maximize the chances of detecting all potential species. Surveys coincided with optimum weather conditions for anuran breeding activity and detection of calls, i.e. suitable temperature relative to each survey window, humid or damp but not raining, and low wind. Call Level Codes were applied to each species detected per area of suitable habitat, and numbers of individuals were counted or estimated, where applicable. The surveys took place on April 15, May 28 and June 24, 2015. The point count locations are illustrated on *Figure 4*; Survey results and call level dode descriptions are provided in *Appendix 7.* Detailed survey dates and weather information are provided in *Appendix 3*.

2.4.2 Breeding Birds

Breeding Bird Surveys were conducted through 10 minute point counts positioned approximately 250m apart within the study area where access was permitted by Cheryl-Anne Ross, Wildlife Ecologist. The highest observed level of breeding evidence was used to assign breeding status (i.e. confirmed, possible, probable or observed) to each species, as per the *Ontario Breeding Bird Atlas: Guide for Participants* (Bird Studies Canada 2001). Marsh Breeding Bird Surveys were completed following each Breeding Bird Survey, at point count locations where habitat was also conducive to marsh birds; methods followed the Marsh Monitoring

Protocols (Bird Studies Canada 2008). Marsh Breeding Bird Surveys included five minutes of passive listening; five minutes of playing a callback tape of target species, and five further minutes of passive listening, all other bird species observed during the survey were also recorded, including incidental species and aerial foragers.

As per the OBBA and MMP recommendations, two surveys were performed during the peak breeding season for the bulk of species in Southern Ontario (May 24 to July 10), and were spaced at least 10 days apart in order to determine presumed permanent territories through territorial singing males. The two surveys took place on the mornings of June 11 and July 9, 2015. The point Count Locations, including Marsh Breeding Bird Stations are illustrated on *Figure 4*, breeding bird survey results and breeding evidence codes are provided in *Appendix 8*, marsh breeding bird survey results are provided in *Appendix 9*. Detailed survey dates and weather information are provided in *Appendix 3*.

2.4.3 Snakes

Visual encounter and active hand search surveys occurred between April and May 2015 in all candidate habitats identified during initial ELC screening and site visit by Cheryl-Anne Ross, Wildlife Ecologist and Ryan Hamelin, Terrestrial and Wetland Ecologist. Three surveys, completed two weeks apart, were undertaken and included flipping any natural or naturalized cover identified in the project location. Surveys were undertaken on sunny days when air temperatures were between 8°C and 25°C and on overcast days when air temperatures were above 15°C. Surveys followed pre-determined transects, traversing areas of suitable habitat for both Eastern Ribbonsnake (*Thamnophis sauritus*) and Milksnake (*Lampropeltis Triangulum*). Transect locations are illustrated on *Figure 4*, survey results are provided in *Appendix 10*. Surveys generally followed methods outlined in the Milksnake Survey Protocol (MNRF 2013). Detailed survey dates and weather information are provided in *Appendix 3*.

2.4.4 Salamanders

Visual surveys for candidate vernal pools were undertaken in early April by Cheryl-Anne Ross, Wildlife Ecologist, to determine the presence or absence of candidate habitat for salamander species that may occur in the study area. These surveys were conducted to determine the possible presence of Jefferson Salamander (*Ambystoma jeffersonianum*) habitat within the study area. Since no vernal pools were identified, further visual inspections were not required. Detailed survey dates and weather information are provided in *Appendix 3*.

2.4.5 Turtles

Five basking surveys in candidate habitats within the project location were conducted by Cheryl-Anne Ross, Wildlife Ecologist and Ryan Hamelin, Terrestrial and Wetland Ecologist, in 2015 following the MNRF Guelph District Blanding's survey protocol (2012). Basking surveys, including overwintering (late March-early April) and summer habitat (late April-June 15), were conducted at all waterbodies and wetlands with open water. Locations of candidate habitat are illustrated on *Figure 4*.

All shorelines and potential basking sites in the project location were surveyed from the sunlit side using 8x power binoculars and a stationary 50x maximum power spotting scope. Between late March and early May, surveys were conducted between 9am and 5pm (When temperatures were between 6°c and 10°c, surveys occurred on sunny days with no wind. When temperatures were between 10°c and 25°c, surveys were conducted between 9am and noon on sunny days). Between late May and early June, turtles are less reliably found late in the day, as a result surveys occurred between 9am and 12pm. Survey Methods generally followed the MNRF - Guelph District Blanding's Turtle (*Emydoidea blandingii*) Protocol (MNRF 2012). Survey results are provided in *Appendix 11*. Detailed survey dates and weather information are provided in *Appendix 3*.

2.4.6 Winter Wildlife

A Winter Wildlife Survey was undertaken on February 25, 2015, by Ryan Hamelin, Terrestrial and Wetland Ecologist and Matt Isles, Wildlife Ecologist. Detailed survey dates and weather information are provided in *Appendix 3*. Wildlife sightings and evidence such as tracks, scat, vocalizations, and markings were used to determine species presence. Notes and GPS points were taken for each observation. Snow depth in the study area was approximately 0.45m up to 0.75m in snow drifts. There was light snow of less than 1 cm during the survey and in the proceeding 24 hours. Approximately 3-7 cm of fresh snow cover fell in the 48 hours prior to the survey.

Due to property access restrictions, the full study area was not surveyed. Where property access was granted, areas were extensively surveyed on foot and with the aid of snowshoes. A road side survey of the study area was also completed where possible. As part of the Winter Wildlife survey, particular effort was applied to locating and identifying raptors, mammal tracks, stick nests, raptor wintering areas, and deer congregation areas. The path traveled during the winter wildlife survey, including roadside driving route is shown on *Figure 4.* All wildlife observations are presented in *Appendix 12.*

2.4.7 Migratory Birds

An assessment for candidate migratory bird habitat and migratory shorebird habitat was completed within the study area, using criteria and guidance from the SWH EcoRegion Criterion Schedule 6E (2015). An assessment of the habitat in the study area that was identified as candidate shorebird migratory staging and stopover was completed on August 5, 2015, and a migratory bird survey of all accessible lands was conducted on October 8, 2015, to determine if the area had significant numbers of migratory species. Detailed survey dates and weather information are provided in *Appendix 3*. Migratory Bird Survey and Shorebird Habitat Assessment Results are provided in *Appendix 13* and *Appendix 14*, respectively.

2.4.8 Incidental Wildlife Observations

Incidental observations of insects, mammals and reptiles were recorded during all field visits, in addition to incidental observations of birds, turtle, and amphibians made outside of the formal field surveys for these groups of fauna. Detailed survey dates and weather information are provided in *Appendix 3*. A complete list of all incidental wildlife is provided in *Appendix 15.*

2.5 Significant Wildlife Habitat

With guidance from the *Significant Wildlife Habitat Technical Guide* (2000) and the SWH EcoRegion Criterion Schedule 6E (2015), the study area and adjacent lands were considered for the presence of Significant Wildlife Habitat (e.g. specialized habitats for wildlife, habitat for species of conservation concern). Detailed survey dates and weather information are provided in *Appendix 3*. An assessment of the study area for all SWH is provided in *Appendix 16.*

2.6 SAR Habitat Assessment

A thorough review of all background documents was conducted to compile a master list of all Species at Risk, and species with conservation designation that may occur in the study area. A review of the site, along with habitat requirements for each species was conducted; the site was then evaluated for potential habitat using Ecological Land Classification, guidance from MNRF documents, and on-site knowledge acquired through field surveys. Detailed survey dates and weather information are provided in *Appendix 3*. An assessment of the study area of candidate habitat for SAR is provided in *Appendix 17.*

2.7 Aquatic Habitat Assessment

On October 19th, 2015 an Aquatic Habitat Assessment was completed by Ryan Hamelin, Terrestrial and Wetland Ecologist, for all sections of watercourses in the study area, as well as sections of the watercourse directly upstream and downstream of the study area. Detailed survey dates and weather information are provided in *Appendix 3*. The Aquatic Habitat Assessment was completed in order to determine the quality of habitat to fish, barriers to fish movement, and general aquatic habitat characteristics. For the assessment, the watercourse was separated into 16 segments and each characterized with respect to the following criteria:

- mean channel width;
- mean channel depth;
- mean water depth;
- percent stream shading;
- buffer width;
- substrate;
- flow pattern;
- channel morphology;
- instream cover;
- bank characteristics;
- presence of specific site features.

In addition to the field Aquatic Habitat Assessment, data provided by the MNRF and CVC such as fish collection records, CVC water temperature data, and thermal fish community classification information was used to characterize each segment of the watercourse. Locations of specific fish collection records from the MNRF and CVC were used to identify fish species known to be present in each watercourse segment.

Summer water temperatures of the tributaries and open water communities within the study area were collected during 2013 and 2014 by CVC. These data were provided to Aboud & Associates to assist in the assessment of the temperature regimes of aquatic habitat. The data provided did not have complete coverage of the study area and could not be used to determine the temperature regime of all watercourse segments. Where data allowed, water temperature regime was calculated using the definitions provided in *A Guide to Understanding Freshwater Fish Habitat in Ontario* (DFO 2008): where cold water systems are generally below 19°C during summer maximum temperatures, cool water systems are characterized by maximum summer water temperatures between 19 - 25°C and warm water systems are characterized by maximum summer water temperatures above 25°C.

An alternative to the above water temperature regime classification is fish community classification based on thermal preference. A fish community classification was completed for the Erin Servicing and Settlement Master Plan- Phase 1: Environmental Component Report (ESSMP 2011) by CVC that included all watercourses in the study area. This fish community classification was used in the aquatic habitat assessment to classy stream segments as cold, cool or warm water systems.

Areas of potential trout spawning habitat, barriers to fish passage, fish community classification, and other relevant information are presented on *Figure 5.* Survey Results are provided in *Appendix 18.*

2.8 Landscape Evaluation

A landscape level evaluation was completed for the study area and surrounding lands to identify ecologically significant features that extend beyond the boundaries of the study area, and that may be impacted by changes within the study area. The following background resources were reviewed in completing the Landscape Evaluation:

- Erin Servicing and Settlement Master Plan – Phase 1: Environmental Component (2011);
- The Credit River Fisheries Management Plan (2002);
- Natural Heritage Information Center (NHIC);
- West Credit River Wetland Evaluation Score Card;
- The Ecosystems of Ontario, Part 1 : Ecozones and Ecoregions (MNRF 2009);
- Aerial photo interpretation.

3.0 Existing Conditions

Information that characterizes the existing conditions of the study area came from several sources, including but not limited to, background review of existing documents, public information sources, past field studies by others, and extensive field reconnaissance.

3.1 Background Review

3.1.1 Natural Heritage Information Centre - Species at Risk

Preliminary investigation through the Natural Heritage Information Centre (NHIC) identified two provincial Species at Risk (SAR) under the ESA and two species considered rare in the province (S1-S3) recorded within approximately 1km of the study area. These species and their habitat requirements are summarized in *Table 1*.

Table 1. NHIC Species at Risk Records

Scientific Name	Common Name	(COSEWIC) Status[1]	(SARO) Status[2]	Last Observed (NHIC)	S-Rank[3]	Habitat Requirements
Dolichonyx oryzivorus	Bobolink	Threatened	Threatened	June 2, 2001	S4B	Nest in grassland habitats, including hayfields and meadows with a mixture of grasses and broad-leaved forbs with a high litter cover. Area Sensitive, with increased density in grasslands greater than 10ha (Renfrew et. al. 2015)
Sturnella magna	Eastern Meadowlark	Threatened	Threatened	June 2, 2001	S4B	Nest in grassland habitats, including hayfields, pasture, savannahs, and other open areas. Preferential habitat includes areas with good grass and thatch (litter) cover (Jaster et. al. 2012).
Carex careyana	Carey's Sedge	Not listed	Not listed	June 14, 1977	S2	Grows in dry to moist rich deciduous upland forests (NatureServe 2015)
Sceptridium rugulosum	Rugulose Grapefern	Not listed	Not listed	Nov.15, 1977	S2	Grows in sandy to silty soil in open fields, young successional forests or at the edge of forests (Wagner and Wagner 1982).

[1] COSEWIC – Committee on the Status of Endangered Wildlife in Canada
[2] SARO – Species at Risk Act Ontario
[3] S-Rank – Denotes the conservation status of a species at the provincial level
S2: Imperiled
S4: Apparently Secure—Uncommon but not rare
S#B- Breeding status rank

3.1.2 Ontario Breeding Bird Atlas

A list of birds determined to be breeding (Possible, Probable or Confirmed) in the 10km x 10km square containing the study area during the 2001-2005 Ontario Breeding Bird Atlas was compiled. This list includes 107 species; eight are considered Species at Risk under the ESA. Potential breeding habitat was identified in the study area for three of these species (Eastern Wood-pewee (*Contopus virens*), Barn Swallow (*Hirundo rustica*), and Canada Warbler (*Cardellina Canadensis*)). Nine of the species identified in the square are considered Species of Conservation Concern Status by CVC (Tier 1) and 51 are considered significant species in Wellington County (Dougan & Associates 2009). The findings of this review are presented in

Appendix 19. Species with conservation designation identified in the background review and their habitat requirements are presented in *Appendix 17*.

3.1.3 Ontario Reptile and Amphibian Atlas

Review of the Ontario Reptile and Amphibian Atlas identified seven species that are known to occur within the 10km x 10km square containing the study area. This list includes one species at risk under the ESA; Common Snapping Turtle (*Chelydra serpentine*) is listed as Special Concern provincially and federally. Confirmed nesting or overwintering habitat was identified on the subject parcel for this species.

One of the species known to occur in the square is considered a Species of Conservation Concern by CVC (Tier 1) and one is considered a significant species in Wellington County (Dougan & Associates, 2009). The findings of this review are presented in *Appendix 19.* Species with conservation designation identified in the background review and their habitat requirements are presented in *Appendix 17*.

3.1.4 Atlas of the Mammals of Ontario

Review of the Atlas of the Mammals of Ontario (1994) identified twenty-five species that are known to occur within approximately 10km of the study area. This list includes one species at risk under the ESA; Little Brown Myotis (*Myotis lucifugus*) is listed as endangered provincially and federally. Potential habitat was identified in the study area for this species.

One of the species known to occur in the square is considered a CVC Species of Conservation Concern (Tier 1) and one is considered a significant species in Wellington County (Dougan & Associates, 2009). The findings of this review are presented in *Appendix 19*. Species with conservation designation identified in the background review and their habitat requirements are discussed in *Appendix 17*.

3.1.5 Credit Valley Conservation

3.1.5.1 Botanical Surveys

CVC provided a list of plant species identified from within the study area. The majority of the observations are from the southern portion of the study area, with only a few observations from the north side of Station Street Road. The data was collected from 2008 to 2014; specific sampling methods were not provided. A total of 320 plant species or distinct sub-species were included in the list. Georeferenced location data was provided for some observations. None of the species identified by CVC are listed as provincial or federal species at risk. Eight of the species are considered rare in Wellington County (Dougan & Associates, 2009) with 70 species considered Species of Conservation Interest (Tier 2) by CVC.

All but one of the native plants identified are ranked as Secure in Ontario (S5) or Apparently Secure (S4) and globally Very Common (G5) or Common (G4) (NHIC, 2015). The one exception is *Fontinalis sullivantii,* a moss species which is classified as an S1 (Critically Imperiled); location and population detail of the species was not provided. All plant species identified by CVC are included in *Appendix 6*.

Since all observations of plant species identified by CVC are from within the Study and there is a large overlap in identified species between the CVC list and the EA field studies, a further analysis using the combined CVC data and field data collected by AA is provided in section

3.1.5.2 Fish Surveys

CVC provided a georeferenced list of fish species identified within the study area. Fish species data was compiled between 1954 and 2013; specific sampling methods were not provided. Numbers of individual fish observed are provided for some sampling data.

The list contains 16 species, none of which are considered provincial or federal SAR. Three of the species; Slimy Sculpin, Banded Killifish, and Brook Trout are listed as CVC Species of Interest (Tier 2). All species observed are included in *Appendix 20*.

3.1.5.3 Breeding Bird Surveys

A list of birds determined to be breeding (Possible, Probable or Confirmed) in the study area during the 2009 Breeding Bird Surveys, completed by CVC was compiled. This list includes 51 species; none are listed as SAR. None of the species determined to be breeding in the square are considered Species of Conservation Concern by Credit Valley Conservation (Tier 1), eight CVC Species of Interest (Tier 2) were observed, and 12 are considered significant species in Wellington County (Dougan & Associates, 2009). The findings of this review are presented in *Appendix 19*.

3.1.5.4 Incidental Wildlife Observations

A list of all fauna observations made in the area of the Hillsburgh Pond was compiled by CVC and provided as a background source for the study area. All observations occurred between 2003 and 2014 and are provided in *Appendix 19*. This list includes 19 species observed in the study area outside of formal surveys; none of these species are listed as SAR, one CVC Species of Conservation Concern Tier 1 species, Great Egret (*Ardea alba*), was observed, six Tier 2 species were observed, and five are considered significant in Wellington County (Dougan & Associates, 2009).

3.1.5.5 Spring and Fall Migration Surveys

CVC completed spring and fall migration surveys during 2012, 55 species were observed in the study area during investigations. None of the species observed are considered Species of Conservation Concern. Two CVC Tier 1 species were observed, Canvasback (*Aythya valisineria*) and Trumpeter Swan (*Cygnus buccinator*). A further 13 Tier 2 species were observed and are listed in *Appendix 19*.

3.1.5.6 Significant Wildlife Habitat Survey - Waterfowl Staging - Aquatic

CVC completed 13 waterfowl staging surveys in 2011, a total of 45 species were observed during the surveys and included 13 of the SWH listed species. During the surveys, three days met the criteria of having greater than 100 individuals observed; 7 or more days of 100 individual listed species are required to meet the criteria for SWH. All species observed are included in *Appendix 19*.

3.1.6 Ministry of Natural Resources and Forestry

3.1.6.1 Little Brown Myotis Maternity Exit Surveys

The Peterborough district MNRF have been conducting exit surveys and banding Little Brown Myotis (bats) at a property adjacent to the study area since 2012 (pers. comm., Lesley Hale, 2015). Little Brown Myotis is listed as Endangered provincially and federally, as such, they are afforded general habitat protection. Over the course of the surveys, the maternity population has increased. The MNRF identified that the Hillsburgh Pond may provide important foraging habitat for this maternity colony of Little Brown Myotis.

3.1.6.2 Fish Records

Fish data collection records from within the study area were provided by the Guelph District MNRF. The data were collected through a combination of electrofishing, drift nets, minnow traps, and incidental observations during 2013 and 2014. 10 species were identified, all of which were also identified by CVC. All species observed are included in *Appendix 20*. No provincial or federal SAR was identified.

3.1.6.3 Incidental Observations

Incidental observation records from within the study area were provided by Guelph District MNRF. Data were collected during a site visit in 2013. One provincial SAR, Common Snapping Turtle, was observed on the station street berm, and young of the year snapping turtles were observed in the Rudd Pond. An observation of Trumpeter Swans was also recorded on the Rudd Pond.

3.2 Vegetation

3.2.1 Ecological Land Classification

A three season ELC evaluation was completed in 2015 by Aboud & Associates. 31 ELC communities were identified and mapped in the study area. The community polygons identified during the ELC surveys are summarized in *Table 2*. Digitized Field forms are provided in *Appendix 5* with detailed ELC descriptions provided in *Appendix 4*. Comparison with the NHIC Rare Plant Communities did not identify any provincially rare plant communities (S1 – S3) within the study area. ELC communities are shown on *Figure 3*.

Table 2. Ecological Land Classification

ELC Code[1]	**Vegetation Type**	**Map ID**
Mixed Meadow (MEM)		
MEMM3	Dry - Fresh Mixed Meadow Ecosite	12
Coniferous Forest (FOC)		
FOCM2-2	Dry-Fresh White Cedar Coniferous Forest	5
FOCM6	Naturalized Coniferous Plantation	27, 6
Mixed Forest (FOM)		
FOMM7-2	Fresh - Moist White Cedar - Hardwood Mixed Forest	23
Deciduous Forest (FOD)		
FODM5-8	Dry-Fresh Sugar Maple - White Ash Deciduous Forest	4

Table 2. Ecological Land Classification

ELC Code[1]	**Vegetation Type**	**Map ID**
FODM6	Fresh - Moist Sugar Maple Deciduous Forest Ecosite	16
FODM7-7	Fresh - Moist Manitoba Maple Lowland Deciduous Forest	30
FODM8-1	Fresh - Moist Poplar Deciduous Forest	25, 15
Coniferous Forest (FOD)		
SWCM1-2	White Cedar - Conifer Mineral Coniferous Swamp	2, 17, 21
Mixed Swamp (SWM)		
SWMO1-1	White Cedar - Hardwood Organic Mixed Swamp	10
SWMO3-3	White Birch - Conifer Organic Mixed Swamp	3
Deciduous Swamp (SWD)		
SWDM2-1	Black Ash Mineral Deciduous Swamp	26
SWDM4-5	Poplar Mineral Deciduous Swamp	24, 29
Thicket Swamp (SWT)		
SWTO2-3	Meadow Willow Organic Deciduous Thicket Swamp	28
SWTO2-6	Mixed Willow Organic Thicket Swamp Type	22
SWTO3-5	Red-osier Organic Deciduous Swamp	9
Treed Fen (FET)		
FETC1-2	Tamarack - White Cedar Treed Fen	14
Meadow Marsh (MAM)		
MAMM1-1	Cattail Graminoid Mineral Meadow Marsh Type	31
MAMO1-2	Cattail Graminoid Organic Mineral Meadow Marsh	1
Shallow Marsh (MAS)		
MASO1-1	Cattail Organic Shallow Marsh Type	8
Submerged Shallow Aquatic (SAS)		
SAS_1	Submerged Shallow Aquatic Ecosite	7
Mixed Shallow Aquatic		
SAM_1-8	Water Lily - Bullhead lily Mixed Shallow Aquatic	11
SAM_1-8	Water Lily - Bullhead lily Mixed Shallow Aquatic	19
SAM_1-8	Water Lily - Bullhead lily Mixed Shallow Aquatic	18
Open Aquatic (OAO)		
OAW	Open Aquatic	20
Cultural (CU)		
CS	Cultural Savannah	13
Constructed (CV)		
CVR_1	Residential	Res
CVI_1	Transportation	Road

[1] ELC Codes generally follows the ELC Second Approximation (Lee 2008)

3.2.2 Botanical Inventory

A detailed field inventory of accessible properties within the study area was completed and 299 species or distinct sub-species of vascular plants, from 75 families, were identified. All identified plant species are provided in *Appendix 6*. A further 7 species were identified only to the level of genus and have not been designated as native or non-native or included in the overall species count.

The provided CVC plant data was collected from within the study area, much of it from properties where access was restricted for this study, the combined data provides a more complete inventory of the entire study area. Including the CVC data, a further 95 species or distinct sub-species from 11 additional plant families were identified, for a total of 394 species or sub-species from 87 families within the Study Area; of those, 284 species (72%) are native and 110 species (28%) are exotic.

3.2.1.1 Species at Risk, Regional and Local Significance

All but one of the native vascular plants observed in the study area, or identified in CVC data are ranked as Secure in Ontario (S5) or Apparently Secure (S4) and Globally, Very Common (G5) or Common (G4) (NHIC 2015). A moss species (*Fontinalis sullivantii),* one of the species identified by CVC, is classified as an S1 (Critically Imperiled), location and population detail of the species was not provided. One distinct sub-species, Tuberous White Water-lily (*Nymphaea odorata ssp. Tuberosa*) was identified by CVC along with the more common White Water-lily (*Nymphaea odorata ssp. Odorata*). Tuberous White Water-lily is provincially unranked but considered native by CVC (2015).

Ten identified species are considered significant in Wellington County (Dougan & Associates et. al. 2009). 77 of the identified species are classified as Species of Interest (Tier 2) in the CVC Species of Conservation of Concern Project; no Tier 1 species were identified.

Six of the species observed in the study area, or identified in CVC data had a Co-efficient of conservatism of 9 or 10. These species include: Marsh Horsetail (*Equisetum Palustre)* (CC 10); Three-seed Sedge (*Carex trisperma)* (9); Hooded Ladies'-tresses (*Spiranthes romanzoffiana*) (9); Bog Goldenrod (*Solidago uliginosa)* (9); Kalm's Lobelia (*Lobelia kalmia)* (9); Green Keeled Cottongrass (*Eriophorum viridicarinatum)* (9).

3.3 Provincially Significant Wetlands

3.3.1 Boundary Review

The mapped wetland boundary of the West Credit River Wetland Complex was accessed through Land Information Ontario (LIO). The accuracy of the boundary within the study area was reviewed through field survey and ortho-photograph interpretation to determine any discrepancies and update the current boundary.

The boundaries review determined that the provided wetland boundary was generally accurate with only a few minor deviations from the actual boundary in the field. The wetland boundary as provided by LIO showed a total of 44.74ha of wetland within the study area. The boundary verification identified 0.09ha of additional wetland and 1.07ha of area was incorrectly identified as wetland. *Figure 6* shows the wetland boundary as provided by LIO. Inaccuracies in the wetland boundary have not been field verified or confirmed by the CVC or MNRF.

3.3.2 Wetland Characteristics

The LIO wetland file identifies the wetland complex within the study area as containing Swamp, Marsh, and Open Water wetland types. This is consistent with the ELC survey which identified Coniferous Swamp, Mixed Swamp, Deciduous Swamp, Thicket Swamp, Treed Fen, Meadow Marsh, Shallow Marsh, Submerged Shallow Aquatic, Mixed Shallow Aquatic, and Open Aquatic communities within the study area.

Review of the Wetland Evaluation Data and Scoring Record identified that the wetland complex scored the maximum points for flood attenuation, indicating that the wetland is an important feature in reducing the risk of flooding. Flood risk was identified by CVC as an important criterion to consider when identifying the preferred alternatives (pers. comm., T. Slaught, 2014). The wetland also scored the maximum number of points for erosion control, a criterion also identified by CVC as important when considering preferred options (pers. comm., T. Slaught, 2014).

3.4 Wildlife

3.4.1 Amphibians (Anurans)

The results of the Anuran Point Count Surveys are summarized in *Table 3*, and results are discussed below. The Point Count Locations are illustrated on *Figure 4*, and Call Level Code descriptions, along with the complete survey results, are provided in *Appendix 7*.

Table 3. Summary of Amphibian Observations (2015)

SPECIES	AMPHIBIAN HABITAT						
	1 (C1, G, F)	2 (D)	3 (C2)	4 (E)	5 (B1)	6 (B2)	7 (A)
Gray Treefrog	*25*	*4*	*3*		2		1
Spring Peeper	8	Chorus	12	1	19	4	3
Green Frog	8	2	2				6
Northern Leopard Frog			2				
Wood Frog		3	1		10		
Significant Habitat*	***Y***	***Y***	***Y***	***N***	***Y***	***N***	***N***

*Significance: Y-Indicates Amphibian Habitat meets the criteria listed under the Ecoregion 6E SWH Criteria guide (2015). N-Indicates Amphibian Habitat did not meet the criteria listed under the Ecoregion 6E SWH Criteria guide (2015).

Amphibian Habitat 1

Three species of frog were detected calling from within Amphibian Habitat 1.This site targeted the Hillsburgh Pond from three locations (point count locations C1, G and F), at distances of at least 250m apart. One species, Gray Treefrog (*Hyla versicolor*), had greater than 20 individuals. All frog species were heard calling from the edges of the pond, particularly the south and north shoreline, which includes abundant aquatic vegetation. The Hillsburgh Pond meets the criteria for Significant Wildlife Habitat-Amphibian Breeding (woodland), as there were greater than 2 species observed and greater than 20 individuals detected.

Amphibian Habitat 2

Four Species of frog were detected calling from within Amphibian Habitat 2.This site targeted the swamp thicket habitat (point count location D), located in the western portion of the study area, north of the Elora-Cataract Trail. One species, Spring Peeper (*Pseudacris crucifer*), was estimated to have greater than 20 individuals. All frog species were heard calling from within a shallow thicket swamp community. The swamp thicket meets the criteria for Significant Wildlife Habitat-Amphibian Breeding (woodland), as there were greater than 2 species observed and greater than 20 individuals detected.

Amphibian Habitat 3

Five Species of frog were detected calling from within Amphibian Habitat 3.This site targeted the shallow pond (point count location C2), located in the western portion of the study area, south of the Elora-Cataract Trail. None of the species observed had greater than 20 individuals. The shallow pond meets the criteria for Significant Wildlife Habitat-Amphibian Breeding (woodland), as there were greater than 2 listed species observed and 20 individuals detected.

Amphibian Habitat 4

One species of frog was detected calling from within Amphibian Habitat 4.This site targeted the east side of the Hillsburgh Dam (point count location E). One species, Spring Peeper (one individual), was heard calling from the edges of the feature. The east side of the dam does not meet the criteria for Significant Wildlife Habitat-Amphibian Breeding (woodland).

Amphibian Habitat 5

Three species of frog were detected calling from within Amphibian Habitat 5.This site targeted the Cattail marsh, on the east side of the study area (point count location B1), north of the Elora-Cataract Trail. The cattail marsh meets the criteria for Significant Wildlife habitat-Amphibian Breeding (woodland), as there were greater than 2 species observed and greater than 20 individuals detected.

Amphibian Habitat 6

One species of frog was detected calling from within Amphibian Habitat 6. This site targeted the Eastern White Cedar swamp, east of the Hillsburgh Dam (point count location B2), and south of the Elora-Cataract Trail. One species, Spring Peeper (four individuals), was heard calling from the edges of the feature. The Spruce swamp does not meet the criteria for Significant Wildlife Habitat-Amphibian Breeding (woodland).

Amphibian Habitat 7

Three species of frogs were detected calling from within Amphibian Habitat 7.This site targeted the Rudd Pond and the wetland to the north (point count location A). All frog species were heard calling from the North West edge of the pond, where there is abundant aquatic vegetation. The pond does not meet the criteria for Significant Wildlife Habitat-Amphibian Breeding (woodland), as there were less than 20 individuals detected.

3.4.1.1 Amphibian SAR, Regional and Local Significance

No amphibian species observed are considered federal or provincial species at risk.

All species detected calling within the study area are ranked S5 (Secure) in Ontario (NHIC, 2015).

One species, Wood Frog (*Lithobates sylvaticus*), is ranked as CVC Species of Interest (Tier 2), all other species observed are ranked as Tier 3; Species of Urban Interest.

3.4.2 Breeding Birds

The results of the Breeding Bird Survey (BBS) are presented in *Appendix 8*. Locations of significant observations are provided in *Figure 7* and are approximate. They are designed to give a general indication of the area in which the species may be nesting. During BBS visits, a total of 47 species were detected, of which five were assigned ‘confirmed’ breeding evidence, sixteen were assigned ‘probable’, twenty-one were assigned ‘possible’ and four showed no sign of breeding evidence observed. All but one species, Eastern Meadowlark (*Sturnella magna*), were detected within the study area. During Marsh Breeding Bird surveys, no target marsh bird species were detected, a list of secondary species and aerial foragers observed is provided in *Appendix 9*.

Due to the contiguity with natural lands to the south and north, it is important to note that, despite high levels of breeding evidence, a given species may not have been breeding specifically in the area in which it was observed. This is particularly true where species were only detected during one of the two Breeding Bird Surveys. These species may have been foraging in these areas or, may have been wandering during post-breeding dispersal. Therefore, the following 21 species are those that can be presumed to have been breeding in, or within 30m of, the study area, and exhibited confirmed or probable breeding evidence: Mallard (*Anas platyrhynchos*), Belted Kingfisher (*Megaceryle alcyon*), Downy Woodpecker (*Picoides pubescens)*, Northern Flicker (*Colaptes auratus*), Eastern Wood-pewee , Great Crested Flycatcher (*Myiarchus crinitus*), Eastern Kingbird (*Tyrannus tyrannus*), Blue Jay (*Cyanocitta cristata*), American Crow (*Corvus brachyrhynchos*), Black-capped Chickadee (*Poecile atricapillus*), House Wren (*Troglodytes aedon*), American Robin (*Turdus migratorius*), Warbling Vireo (*Vireo gilvus*), Red-eyed Vireo (*Vireo olivaceus*), Yellow Warbler (*Setophaga petechial)*, Common Yellowthroat (*Geothlypis trichas*), Song Sparrow (*Melospiza melodia*), Swamp Sparrow (*Melospiza georgiana*), Red-winged Blackbird (*Agelaius phoeniceus*), Common Grackle (*Quiscalus quiscula*), and Baltimore Oriole (*Icterus galbula*).

Most of the species presumed to be breeding in the study area are considered common and abundant species (S-Rank 4-5, CVC Tier 3-5).

3.4.2.1 Breeding Bird Species at Risk

Two species observed are considered species at risk under the ESA. Eastern Meadowlark is listed as Threatened provincially and federally and Eastern Wood-pewee is listed as Special Concern provincially and federally, locations of observations are shown on *Figure 7*.

Eastern Meadowlark is an area sensitive, grassland species, often nesting in hay fields and pastures, as well as occasionally occurring in other types of grassed areas such as golf courses, and airfields. The grassland habitat requires a moderate thatch cover, low shrub and tree density, and moderate or limited forbs cover. Large tracts of grassland are typically preferred over smaller patches (McCracken et. al. 2013). A single male Eastern Meadowlark was observed singing from adjacent lands outside the study area during one breeding bird survey (*Figure 7*), in habitat that may be sufficient for establishing a territory. No habitat of sufficient size, or matching criteria was observed in the study area.

Eastern Wood-pewee are associated with mid-age mixed and deciduous forest stands, often dominated by Maple (*Acer*), Elm (*Ulmus*) or Oak (*Quercus*), and include areas with clear-cuts, openings or forest edges. Eastern Wood-pewee also prefers forest stands with little to no understory vegetation (COSEWIC 2012). Eastern Wood-pewee was observed singing during both breeding bird surveys in the deciduous forest communities in the south-eastern portion of the study area (*Figure 7*).

3.4.2.2 Breeding Bird Regional and Local Significance

All species detected in the study area are ranked as either S5 (Secure) or S4 (Apparently Secure) or in Ontario. The rank qualifier ‘B’ denotes the status of a migratory species during the breeding season.

Five species ranked Tier 1 or Tier 2 were observed in the study area, two of which showed probable breeding evidence and are described in *Table 4*.

The County of Wellington has identified a number of species considered significant (Dougan & Associates, 2009). Twenty-four regionally significant species were observed in the study area, 11 of which showed probable or confirmed breeding evidence, locations of species observed and their status are described in *Table 4*.

Table 4. Regionally or Locally Significant Breeding Bird Species

COMMON NAME	SCIENTIFIC NAME	WELLINGTON COUNTY[1]	CVC TIER[2]	LOCATION(S) IN STUDY AREA
Eastern Wood-pewee	*Contopus virens*	✓	1	Observed in the deciduous forest communities located in the south-eastern portion of the study area (*Figure* 7).
American Crow	*Corvus brachyrhynchos*	✓	2	Observed at most point counts throughout the study area and is ranked Tier 2.
Mallard	*Anas platyrhynchos*	✓	3	Observed in the shallow pond community, south of the Elora-Cataract Trail.
Belted Kingfisher	*Megaceryle alcyon*	✓	3	A pair was observed foraging over the Rudd Pond in the eastern portion of the study area south of the trail.
Downy Woodpecker	*Picoides pubescens*	✓	3	Observed drumming in the vicinity of the cattail marsh on the edge of the Hillsburgh Pond.
Northern Flicker	*Colaptes auratus*	✓	3	Observed in numerous locations in the study area drumming and calling.

Table 4. Regionally or Locally Significant Breeding Bird Species

COMMON NAME	SCIENTIFIC NAME	WELLINGTON COUNTY[1]	CVC TIER[2]	LOCATION(S) IN STUDY AREA
House Wren	*Troglodytes aedon*	✓	3	Observed along the trail in the eastern portion of the study area.
Red-eyed Vireo	*Vireo olivaceus*	✓	3	Observed in both the deciduous forest communities and the mixed swamp community in the eastern portion of the study area.
Common Yellowthroat	*Geothlypis trichas*	✓	3	Observed along the trail in western portion of the study area, adjacent to the shallow marsh and swamp thicket communities.
Song Sparrow	*Melospiza melodia*	✓	3	Observed singing throughout the study area in most habitats.
Red-winged Blackbird	*Agelaius phoeniceus*	✓	3	Observed exhibiting agitated behavior in the area of the cattail marshes at the Hillsburgh Pond, and the Ainsworth pond, south of the dam.

[1] Wellington County Significant Plants of Wellington County (Dougan & Associates 2009)
[2] CVC Species of Conservation Concern Project (CVC 2010b)

3.4.2.2 Breeding Bird Regional Priority Species

The Ontario Landbird Conservation Plan (OLCP): Lower Great Lakes/St. Lawrence Plain, North American Bird Conservation Region 13 (Ontario Partners in Flight, 2008) has identified a number of species that are considered conservation priorities for the region. Six priority species were observed in the study area, including Belted Kingfisher, Northern Flicker, Eastern Wood-pewee, Rose-breasted Grosbeak, Eastern Meadowlark, and Baltimore Oriole. The OLCP does not provide legislative protection of species or their habitat, but rather identifies species that should be conservation priorities on a regional level that were not designated Species at Risk at the time of writing.

3.4.3 Snakes

During snake transect surveys; one individual Eastern Garter Snake (*Hamnophis sirtalis sirtalis*) was detected sunning along the edge of the Elora-Cataract Trail, east of the Dam. During the three rounds of surveys, no other snakes were detected. Two areas of candidate hibernacula habitat were identified in the study area (*Appendix 10*). These areas included numerous piled stones and rubble in the Naturalized Conifer Plantation in the far eastern portion of the study area (Image 1 and 2). However, no snakes were observed in the general area of the candidate hibernacula habitat during transect surveys.

Image 1. Candidate Snake Hibernacula A.

Image 2. Candidate Snake Hibernacula B.

3.4.3.1 Snake SAR, Regional and Local Significance

No snake species observed is considered federal or provincial species at risk. Eastern garter snake is ranked S5 (Secure) in Ontario (NHIC 2015).

3.4.4 Salamanders

During spring surveys a thorough search of the study area for evidence of habitat that may be suitable for salamanders was conducted. No salamander breeding habitat was observed in the study area, where access was provided. Air photo interpretation and ELC surveys revealed no candidate salamander breeding habitat in the study area. As a result, no further detailed studies were conducted.

3.4.5 Turtles

The results of the turtle basking surveys are presented in *Appendix 11* and summarized in *Table 5.* Locations of significant observations are provided in *Figure 7*. They are designed to give a general indication of the area in which the species was observed. These locations are also the areas where turtles are likely to overwinter and/or use as summer habitat. During turtle surveys, two species were observed, Common Snapping Turtle and Midland Painted Turtle (*Chrysemys picta marginata)*; one unknown species was also observed, an unconfirmed Red-eared Slider (*Trachemys scripta elegans*). An Assessment of Significance is provided in *Table 5*.

One turtle nest, identified as Common Snapping Turtle, was observed in a man-made wood chip berm, along the eastern edge of the Rudd Pond, confirming breeding in this area.

Table 5. Turtle Habitat Results

Species	**Turtle Habitat 1**	**Turtle Habitat 2**	**Turtle Habitat 3**	**Turtle Habitat 4**	**Turtle Habitat 5**
Common Snapping Turtle	9		6		
Midland Painted Turtle	104	1	445	7	1
Unknown Turtle Species				1	
Grand Total*	*113*	*1*	*451*	*8*	*1*

* Total number of turtles observed summed over all survey dates conducted for each habitat.

Turtle Habitat 1

Turtle Habitat 1, the Rudd Pond is located in the south-eastern portion of the study area and was surveyed five times between April and June 2015. Over the course of 5 surveys, a total of 113 turtles were observed, consisting of Midland Painted Turtle and Common Snapping Turtle. Within Turtle Habitat 1, two individual and three individual Common Snapping Turtles were observed during April and May surveys, respectively. The Ecoregion 6E SWH criteria (MNRF 2015b), states that: any area with at least five overwintering (observed between March and May) Midland Painted Turtles or one Common Snapping Turtle is considered SWH. Turtle Habitat 1 meets the criteria for SWH.

Turtle Habitat 2

Turtle Habitat 2, the Ainsworth Pond is located below the Hillsburgh Dam, east of Station Street. The pond was surveyed five times between April and June 2015. One turtle was observed over the course of all surveys, a Midland Painted Turtle. Therefore this pond is not considered SWH for Turtle Overwintering Habitat.

Turtle Habitat 3

Turtle Habitat 3, the Hillsburgh Pond is located above the Hillsburgh Dam and northwest of Station Street. The pond was surveyed five times between April and June 2015. Over the course of surveys, a total of 451 turtles of Midland Painted Turtle and Common Snapping Turtle were observed. Common Snapping Turtle was observed during April and May surveys. The Ecoregion 6E SWH criteria (MNRF 2015b) states that: any area with at least five overwintering (observed between March and May) Midland Painted Turtles or one Common Snapping Turtle is considered SWH. Turtle Habitat 3 meets the criteria for SWH.

Turtle Habitat 4

Turtle Habitat 4, is a small unnamed pond located south of the Hillsburgh Pond. The pond was surveyed five times between April and June 2015. A total of 7 turtles were observed in this feature over the course of surveys. As only four Midland Painted Turtle observations were made during the March-Early May window, this pond is not considered SWH.

Turtle Habitat 5

Turtle Habitat 5, the large meadow marsh is located south of the Elora-Cataract Trail in the western portion of the study area. This pond was surveyed five times between April and June, 2015. Only one turtle was observed over the course of all surveys, a Midland Painted Turtle. Therefore this pond is not considered SWH for Turtle Overwintering Habitat.

3.4.5.1 Turtle SAR, Regional and Local Significance

One turtle species observed is considered a species at risk under the ESA; Common Snapping Turtle is listed as Special Concern provincially (SARO) and federally (SARA).

Common Snapping Turtle inhabit slow-moving waters with soft, mucky bottom and dense aquatic vegetation. Ponds, sloughs and shallow bays are all often used as summering and overwintering habitat (COSEWIC 2008). Snapping Turtles were observed during turtle basking surveys at two of the candidate locations, a further observation in ELC Polygon 9 (SWTO 3-5) identified a Snapping Turtle as an incidental observation. All three locations likely provide either overwintering, or summering habitat or both for Common Snapping Turtle and are indicated on *Figure 7*.

Midland Painted Turtle is ranked S5 (Secure), and Common Snapping Turtle is ranked S3 (Vulnerable) in Ontario (NHIC, 2015).

3.4.6 Winter Wildlife

A total of 18 species were identified during the Winter Wildlife Survey, including nine bird species and nine mammal species. Suspected Red Fox (*Vulpes vulpes)* tracks were identified in a wooded area and crossed a walking trail, these tracks entered the woods and no human footprints were seen in the same location. However, it is possible these tracks were Domestic Dog (*Canis lupus familiaris*) rather than a Red Fox.

Figure 4 illustrates the Winter Wildlife Survey route. All species identified during the survey are listed in *Appendix 12*.

3.4.6.1 SAR, Regional and Local Significance

A single immature Bald Eagle (*Haliaeetus leucocephalus*) was observed flying over the study area. Bald Eagles are listed as Special Concern under the ESA, and have an S-Rank of S2N, S4B and are a Tier 1 Specie of Conservation Concern (CVC 2010b). All other identified species during the winter wildlife survey are considered provincially Secure (S5) or Apparently Secure (S4).

3.4.7 Migratory Birds

The results of the Migratory Bird Survey are presented in *Appendix 13*. Locations of significant observations are provided on *Figure 7*. During the migratory bird survey, a total of 19 species were detected, of these, nine species are common winter residents in Ontario. The remaining 10 are likely migrants, and were observed in numbers inconsistent with significant migratory habitat under the SWH Ecoregion 6E criteria. Most of the species observed in the study area, are also considered common, and/or abundant species, and tolerant to human disturbance.

3.4.7.1 Migratory Bird SAR, Regional and Local Significance

None of the species observed are considered federal or provincial species at risk.

One species, Great Egret, observed foraging in the Hillsburgh Pond is ranked S2B (Imperiled) in Ontario (NHIC, 2015). Great Egret is considered a rare breeder in Ontario, but has no official status. All other species observed are ranked S4 (Apparently Secure) or S5 (Secure).

Six species ranked Tier 1 or Tier 2 were observed in the study area. Great Egret, described above, is ranked Tier 1. Wood Duck, American Black Duck, American Crow, Golden-crowned Kinglet (*Regulus satrapa)*, and Ruby-crowned Kinglet (*Regulus calendula*) are ranked as CVC Species of Conservation Concern Status Tier 2.

3.4.8 Incidental Wildlife Observations

All Incidental wildlife observations made outside of the above formal field surveys are presented in *Appendix 15*. All observations were of single individuals unless otherwise stated. Species with conservation designation are described in *Table 6*, and identified on *Figure 7*.

Table 6. Incidental Species with Conservation Designation Observations

Common Name	Scientific Name	Taxa	Date -Observation	Significance
Common Snapping Turtle	*Chelydra serpentina*	Reptile	April 15 - Adult observed sunning on log in T1 (Rudd Pond) May 14 - Observed in meadow marsh stream between T1 and T2 May 28 - Observed on bank of T2 (Ainsworth Pond)	• Species of Special Concern, provincially and federally • CVC Tier 1 • S-rank S3
Great Egret	*Ardea alba*	Bird	May 28 - Observed foraging in Hillsburgh Pond	• S-Rank S2 • CVC Tier 1
Trumpeter Swan	*Cygnus buccinator*	Bird	April 29 & May 28 - Pair observed foraging in Hillsburgh Pond	• CVC Tier 1

3.4.9 Species Listed under the Endangered Species Act

Observations, habitat requirements, breeding evidence and a habitat assessment of six species at risk, Bald Eagle, Bobolink, Eastern Wood-pewee, Eastern Meadowlark, Little Brown Myotis and Common Snapping Turtle, observed in the study area, are discussed below. No federal or provincially listed plant or fish species were identified within the study area through background research, provided data, or field observations.

3.4.9.1 Bald Eagle

Bald Eagle is listed as Special Concern provincially (ESA 2007) and federally (Species at Risk Public Registry 2014), general habitat protection is not afforded to Special Concern species. However, species listed as Special Concern and their habitat is protected under the PPS (2014), through the protection of Significant Wildlife Habitat. This species prefers deciduous and mixed-deciduous forest habitat close to water bodies including lakes and rivers; nests in super canopy trees including Pine (Armstrong 2014). The individual was only observed during the winter wildlife visit, and would not be breeding at that time.

3.4.9.2 Bobolink

Bobolink (Dolichonyx oryzivorus) is listed as Threatened provincially (ESA 2007) and federally (Species at Risk Public Registry 2014). Bobolink and their general habitat are afforded protection under the ESA. The species typically nests in open grasslands and hay fields. Bobolink are an area-sensitive species, preferring grassland habitat greater than 10ha in area. The individual was observed incidentally in the forb meadow, adjacent the MEMM3 community; one lone male was flushed from the ground, no singing or signs of agitation or nesting were observed. This species is unlikely to be breeding in the study area as a result of low quality, size and availability of preferred habitat.

3.4.9.3 Eastern Wood-pewee

Eastern Wood-pewee is listed as Special Concern provincially (ESA 2007) and federally (Species at Risk Public Registry 2014); general habitat protection is not afforded to Special Concern species under the ESA. However, species listed as Special Concern and their habitat is protected under the PPS (2014), through the protection of Significant Wildlife Habitat. The species typically nests in forest clearings and edges of deciduous and mixed forests with an open understory (MNRF 2014b). Nests are built on top of the horizontal limbs of mature deciduous trees (COSEWIC 2012). Eastern Wood-pewee was observed singing in the Sugar Maple Deciduous Forest, during breeding bird surveys. This species is assumed to be breeding within the deciduous forest of the study area.

3.4.9.4 Eastern Meadowlark

Eastern Meadowlark is listed as threatened provincially (ESA 2007) and federally (COSEWIC 2011a). Eastern Meadowlark and their general habitat are afforded protection under the ESA. The species typically nests in open grasslands and hay fields. Eastern Meadowlark is an area-sensitive species, preferring grassland habitat greater than 10ha in area. Eastern Meadowlark was observed singing from an adjacent agricultural field, south of the study area. This species is unlikely to be breeding in the study area as a result of low quality, size and availability of preferred habitat.

3.4.9.5 Little Brown Myotis

Little Brown Myotis is listed as Endangered provincially (ESA 2007) and federally (Species at Risk Public Registry 2014). Little Brown Myotis and their general habitat are afforded protection under the ESA. Maternal roosts of Little Brown Myotis are usually associated with buildings (attics, barns etc.) and occasionally found in large diameter trees (DBH at least 25-44 cm) (COSEWIC 2013). Little Brown Myotis were observed flying towards the Hillsburgh Pond during attendance at an MNRF survey of a known maternal roost adjacent to the study area (*Figure 7*). Surveys conducted by MNRF (2012-2015) have confirmed an active maternity colony in a building adjacent to the Hillsburgh EA study area. The MNRF (pers. comm., Lesley Hale, 2015) indicated that active foraging occurs over the Hillsburgh and Ainsworth ponds.

3.4.9.6 Common Snapping Turtle

Common Snapping Turtle is listed as Special Concern provincially (ESA 2007) and federally (Species at Risk Public Registry 2014), general habitat protection is not afforded to Special Concern species. However, species listed as Special Concern and their habitat is protected under the PPS (2014), through the protection of Significant Wildlife Habitat. Snapping Turtle is generally found in shallow waters with soft mud bottoms and leaf litter (COSEWIC 2008a). Nesting occurs on gravelly or sandy areas along streams, roadsides or embankments. Observations of Snapping Turtle were made throughout the study area in ponds, wetlands and creeks. This species is confirmed as overwintering, nesting and breeding in the study area.

3.5 Significant Wildlife Habitat

With guidance from the *Significant Wildlife Habitat Technical Guide* (2000) and the SWH EcoRegion Criterion Schedule 6E (2015), four types of Significant Wildlife Habitat (SWH) were confirmed as present within the study area (*Appendix 16*). Confirmed habitat and its location and assessment are presented in *Table 7*. Studies to confirm Bat Maternity Habitat have not been completed in the study area. Following the MNRF Guelph District Protocol (2014), all Candidate Bat Maternity Habitat will be assumed significant. In the event that site activities will affect significant habitat, it is recommended that detailed studies of Candidate Bat Habitat which may be affected, occur pre-construction.

Table 7. Confirmed Significant Wildlife Habitat

SIGNIFICANT WILDLIFE HABITAT TYPE	RATIONALE	LOCATION (FIGURE 7)
Waterfowl Stopover and Staging (Aquatic)	• Large shallow, open water feature, with abundant aquatic vegetation and soft muck bottom. • Surveys completed by CVC did not meet the criteria outlined in the SWH guide. • Aggregate of 100 or more listed bird species for 7 days observed, through a combination of field observations and background resources (e-bird 2015).	SWH 1
Turtle Wintering Area	• Two large shallow ponds in the study area met the criteria for turtle overwintering; both have muck bottoms and had observations of greater than 5 Midland Painted Turtles or 1 Snapping Turtle during spring surveys.	SWH 1, SWH 2
Habitat for Special Concern and Rare Wildlife Species	• Three of the pond feature and one of the stream/meadow marsh features in the study area had observations of Snapping Turtles, either through surveys or incidentally.	SWH 1, SWH 2, SWH 3, SWH4
Habitat for Special Concern and Rare Wildlife Species	• The deciduous woodland feature had probable breeding evidence of Eastern Wood-pewee during breeding bird surveys.	SWH5
Bat Maternity Habitat	• All ELC communities meeting the criteria for bat habitat, as listed in the MNRF Guelph District guidelines, including FOD, FOM, FOC, SWD, SWM, SWC with trees >25cm DBH.	SWH 4, SWH6, SWH7, SWH9, SWH10, SWH11, SWH12
Amphibian Breeding Habitat (Woodland)	• Four areas identified as candidate habitat in the study area met the criteria for significance. • Each feature included at least two of the listed species and greater than 20 individuals.	SWH1, SWH13, SWH14, SWH15

3.6 SAR Habitat Assessment

An assessment of all Species at Risk, and species with conservation designation, that have the potential to occur in the study area based on lists provided by CVC, MNRF and the NHIC was completed, and is provided in *Appendix 17*. Species assessed include all species with Provincial SARO status, Federal SARA status, or an S-rank of S1-S3. Species assessed with the potential to occur in the study area, but that were not observed during field studies are discussed in detail below.

3.6.1 Vegetation

3.6.1.1 American Chestnut

American Chestnut (*Castanea dentata*) is listed as Endangered provincially (ESA 2007) and federally (SARA 2014). They primarily occur in deciduous forest communities with sandy soil. The species was highly impacted by the Chestnut blight in the early 1900's, which killed 99% of individual trees (MNRF 2015a). The study area is outside of the current known species occurrences (MNRF 2015a).

3.6.1.2 American Ginseng

American Ginseng (*Panax quinquefolius*) is listed as Endangered provincially (ESA 2007) and federally (SARA 2014). The species occurs in rich, moist undisturbed deciduous forests (MNRF 2015a). The FODM5-8 community within the study area provides potential habitat, although historic disturbances and small size of the community may limit habitat potential. American Ginseng was not identified in the community during field surveys or through previous CVC surveys.

3.6.1.3 Butternut

Butternut (*Juglans cinerea*) is listed as Endangered provincially (ESA 2007) and federally (Species at Risk Public Registry 2014). Butternut primarily occur in rich, moist well-drained soils, often along streams (MNRF 2015a). Habitat for Butternut is present along the streams throughout the study area, specifically communities SWMO3-3, FODM7-7, SWDM2-1 and FODM8-1. Butternut was not identified in these communities during field surveys or through previous CVC surveys.

3.6.1.4 Hill's Pondweed

Hill's Pondweed (*Potamogeton hillii*) is listed as Special Concern provincially (ESA 2007). The species is found in slow-moving, clear cold stream, ponds, lakes, and wetlands. The ponds within the study area provide potential habitat for this species, although water temperatures are likely too high. Hill's Pondweed is known to occur east of the study area, within the Credit River System (MNRF 2015a). Hill's Pondweed was not identified in the Study Area during field surveys or through previous CVC surveys. Detailed aquatic plant surveys of the ponds were not completed as part of this study.

3.6.1.5 Carey's Sedge

Carey's Sedge (*Carex careyana*) is listed as S2 in Ontario (NHIC). The species grows in dry to moist rich deciduous upland forests (NatureServe 2015). Deciduous forests of FODM5-8 and FOCM6 provide potential habitat. Carey's Sedge was not identified in the study area during field surveys or through previous CVC surveys.

3.6.1.6 Rugulose Grapefen

Rugulose Grapefern (*Sceptridium rugulosum*) is listed as an S2 in Ontario (NHIC). The species grows in sandy to silty soil in open fields, young successional forests or at the edge of forests (Wagner and Wagner 1982). The edges of deciduous forest communities, FODM5-8 and

FOCM6 provide potential habitat. Rugulose Grapefern was not identified in the study area during field surveys or through previous CVC surveys.

3.6.2 Wildlife

3.6.2.1 Monarch Butterfly

Monarch Butterfly (*Danaus plexippus*) is listed as Special Concern provincially (ESA 2007) and federally (Species at Risk Public Registry 2014). They occur primarily where milkweed and wildflowers exist, including abandoned farmland, along roadsides, and other open spaces (COSEWIC 2010). Habitat for Monarch Butterfly occurs on the forb meadow, southwest of, and including the MEMM3 community. Common Milkweed is abundant in this community and would provide excellent habitat for Monarch Butterflies. Monarch Butterfly was not observed incidentally during any surveys in the study area, or previously observed during CVC surveys.

3.6.2.2 West Virginia White

West Virginia White (*Pieris virginiensis*) is listed as Special Concern provincially (ESA 2007) and federally (Species at Risk Public Registry 2014). This species generally prefers moist, deciduous woodlands. The larvae feed only on the leaves of a few host plants, including the Two-leaved Toothwort (*Cardamine diphylla*) and Cut-leaved Toothwort (*Cardamine concatenata*) (Burke 2013). Habitat (including host plants) occurs in the study area in small areas of the SWMCM1-2 and SWMO1-1 communities. West Virginia White was not observed incidentally within the potential habitat communities during spring surveys on the host plant, or during studies completed by CVC.

3.6.2.3 Barn Swallow

Barn Swallow is listed as threatened provincially (ESA 2007) and federally (Species at Risk Public Registry 2014). Barn swallow occurs in farmland, along lake/river shorelines, in wooded clearings and in urban populated areas. Nesting may occur inside or outside buildings, under bridges and in road culverts (COSEWIC 2011b). Habitat for Barn Swallow is present in the study area, including under bridges and dam structures. Barn Swallow was not observed during breeding bird surveys, incidentally in the study area, or during studies completed by CVC.

3.6.2.4 Canada Warbler

Canada Warbler is listed as Special Concern provincially (ESA 2007) and threatened federally (Species at Risk Public Registry, 2014). Canada Warbler prefers wet, coniferous, deciduous and mixed forest types, with a dense shrub layer (COSEWIC 2008b). Habitat for Canada Warbler may occur in the wet mixed forest occurring throughout the study area (SWCM3-2, SWCM1-2). Canada warbler was not observed during breeding bird surveys, or incidentally in the study area, or during studies completed by CVC.

3.6.3 Fish

3.6.3.1 Redside Dace

Redside Dace (*Clinostomus elongatus*) is listed as Endangered provincially (ESA 2007) and, is Under Consideration for listing federally (SARA 2014) and listed as Endangered under COSEWIC (2007). Redside Dace inhabit cool to cold water tributaries, with most Ontario populations occurring in streams flowing to the west basin of Lake Ontario (MNRF 2015a). The stream segments within the study area provide adequate habitat for the species. Redside Dace are known to occur within the Credit River (NHIC), but have not been identified in the study area. This may be due to exclusion from upstream reaches by natural and created barriers to fish passage.

3.7 Aquatic Habitat Assessment

The aquatic habitat assessment used provided background material and field observations to characterize the watercourse and aquatic habitat within the study area. Areas of potential Brook Trout spawning habitat, locations of Banded Killifish and Slimy Sculpin, barriers to fish passage, thermal fish community classification, and other relevant information are presented on *Figure 5. Appendix 18* provides a summary of each watercourse segment assessed.

3.7.1 Thermal Regime

CVC temperature data identified the two stream reaches, upstream of the Hillsburgh Pond, as cold water systems, with maximum summer water temperatures generally below 19° C. The open water communities of the Hillsburgh Pond and Ainsworth Pond and directly downstream section from these communities are warm water, with maximum summer temperatures above 25°C. The CVC temperature data shows that the water outflowing from the Hillsburgh Pond can be up to 17°C warmer than the inflowing water from the smaller tributary to the south (segment 1 and 2, F*igure 1*) and up to 8°C warmer than the inflowing water from the main tributary to the northeast (segment 4, F*igure 1*). This indicates large thermal impacts from the Hillsburgh Pond.

According to CVC temperature data, tributary sections directly downstream of the Ainsworth and Rudd Ponds are warm water, with temperatures above 25°C, but transitioning to cold water further downstream from the ponds. Due to the spatial scale of the data provided by CVC and uncertainty in the exact location of the sampling points, it was not possible to determine the temperature regime for all segments of the watercourse within the study area. The data provides an overall picture, indicating that the tributaries upstream of the Hillsburgh Ponds are coldwater, increases in temperature to warm water systems within the ponds, and gradually cools back down in the tributaries downstream of the Rudd pond. This is consistent with what would be expected based on ground water fed streams, and the known thermal influence of ponds.

CVC has classified the water courses within the study area into thermal fish communities, such as coldwater, coolwater and warmwater systems based on fish collection records (ESSMP 2011 – fig 2.6.1). These classifications are established according to the fish species present and their preferred thermal conditions. This classification characterizes all the tributaries within the study area as cold water fish communities, while the three, online, open water ponds are classified as warm water fish communities. The thermal fish community classification is shown on the Aquatic Habitat Assessment map (*Figure 5*).

It should be noted that the watercourse within the study area, including the online ponds, are considered a coldwater system and managed as such in the CRFMP. The existing online ponds are considered anthropogenically created warmwater environments within a coldwater system. Anything that contributes to the warming of the watercourse is considered as a negative influence on the system.

3.7.2 Fish Barriers

Barriers to fish passage prevent migration within a stream system, creating population isolation and fragmentation of habitats. This can reduce genetic diversity within a system and prevent species from reaching spawning areas or access headwaters as thermal refuges. The CRFMP recommends mitigation or removal of barriers to fish movement that are not used for fish management. The aquatic assessment identified three full barriers to fish passage within the study area that would prevent all upstream passage of fish from downstream reaches. These full barriers occur at the outflows of the three main online ponds (Hillsburgh, Ainsworth, and Rudd). Additionally, two partial barriers were identified within the study area. One partial barrier is located at the secondary (North) outfall of the Ainsworth Pond, where sandbags and plastic lining were placed in 2013 to help contain Round Goby. This partial barrier consists of multiple small drops in elevation, with pools in-between. It may be possible for jumping fish to ascend and pass this barrier during high water conditions. The second partial barrier to fish passage is at the south tributary flowing into the Hillsburgh Pond, connecting segment 2 and segment 3. This partial barrier consists of a presumed trash gate that is likely intended to keep garbage and debris out of the pond. At the same general location, a log jam persists that could make passage difficult for larger and non-jumping fish. Images of identified fish barriers are provided on *page 38*.

Removal of the Hillsburgh Dam and pond and establishment of a coldwater system without barriers would support the goals of the CRFMP.

Image 3. Partial Fish Barrier, upstream reach of segment 3.

Image 4. Full Fish Barrier, upstream reach of segment 5.

Image 5. Partial Fish Barrier, north upstream reach of segment 7.

Image 6. Full Fish Barrier, south upstream reach of segment 7.

Image 7. Full Fish Barrier, upstream reach of segment 11.

Image 8. Full Fish Barrier, upstream reach of segment 11.

3.7.3 CVC Fish Species of Interest (Tier 2)

3.7.3.1 Banded Killifish

Banded Killifish are found within the study area and West Credit River. This is one of only two locations within the CVC watershed that Banded Killifish are known to occur. Banded Killifish are not rare in Ontario and are ranked as S5. The habitat preference of Banded Killifish is shallow water along the edges of lakes and ponds and slow streams in areas with sand and gravel substrates and patches of aquatic plants; spawning water temperature is 21°C to 25°C (OFFLHD 2016). The slow moving, warm water within the anthropogenic ponds and littoral zones along the shorelines provides habitat for this species.

3.7.3.2 Slimy Sculpin

Slimy Sculpin are found within the study area and are considered rare within the CVC watershed. Slimy Sculpin are not rare within Ontario and are ranked as S5 provincially. Their preferred habitat is associated with gravel and rocky riffles of medium to deep coldwater streams, preferred water temperatures range from 9°C to 14°C (OFFLHD 2016). The cold water streams within the study area provide habitat for this species.

3.7.3.3 Brook Trout

Brook Trout are a managed species within the CRFMP 2001. Their preferred habitat is cold, clear well-oxygenated streams, rivers, ponds, and lakes. Preferred water temperature is 13°C to 17°C. Spawning for Brook Trout occurs on coarse sand and gravel beds in areas of groundwater upwelling. Based on the aquatic habitat survey, potential Brook Trout spawning habitat was identified in seven stream segments (4, 5, 7, 8, 11, 13 and 14). These areas generally correspond with areas of fish spawning activity, as identified in the Erin Servicing and Settlement Master Plan – Phase 1: Environmental Component (ESSMP 2011), CVC records and MNRF Records. If used as spawning grounds, these areas would be sensitive to thermal influence and sedimentation from erosion or upstream activities.

3.7.4 Invasive Fish Species

3.7.4.1 Round Goby

Round Goby are an invasive species within Ontario, native to the Black and Caspian seas. Round Goby have been identified within the Hillsburgh Pond, Ainsworth Pond and in the stream section below the Ainsworth Pond. The Round Goby is known to impact native fish species through competition and predation. The Round Goby has spread throughout Ontario and is present in all five Great Lakes (OISAP 2016). It has a wide habitat tolerance, but generally prefers cobble, gravel or sandy substrates within rivers and lakes, with optimal water temperature between 23°C to 26°C. They are able to tolerate low dissolved oxygen condition and high turbidity (OFFLHD 2016). The slow moving, warm water within the anthropogenic ponds and littoral zones along the shorelines provides habitat for this species.

3.8 Landscape Evaluation

3.8.1 Ecoregion

The study area is located within Ecoregion 6E. This is the second most densely populated ecoregion in Ontario (MNRF 2009), containing a number of large urban centers. The climate of the ecoregion is mild and moist with mean annual precipitation between 759 to 1,087 mm. The underlying geology of the ecoregion is dolomite and limestone, with deep glacially deposited surface soils covering the bedrock in most areas.

Forest cover of the ecoregion is approximately 30.1% and composed of a diverse mixture of hardwood forests, lowlands, and floodplain forest. Common tree species within the Ecoregion include; Sugar Maple (*Acer saccharum*), American Beech (*Fagus grandifolia)*, White Ash (*Fraxinus americana*), Eastern Hemlock (*Tsuga canadensis)*, Green Ash (*Fraxinus pennsylvanica)*, Silver Maple (*Acer saccharinum*), Red Maple (*Acer rubrum*), Eastern White Cedar (*Thuja occidentalis*), Yellow Birch (*Betula alleghaniensis*), Balsam Fir (*Abies balsamea*), and Black Ash (*Fraxinus nigra*) (MNRF 2009).

3.8.2 Surficial Geology and Groundwater

The surface geology of the study area and surrounding landscape are part of the Orangeville Moraine and contain silt to clay till, silty sand to sandy silt, ice-contact stratified drift, alluvium, glacial-fluvial outwash gravel, glacial-fluvial outwash sand, and organics (Cowan 1976 as cited in ESSMP 2011). The area generally has a high groundwater recharge rate, which supplies much of the base flow of the West Credit River through groundwater discharge (ESSMP 2011). This discharge of cold ground water into the river systems contributes to the cold water system of the area.

3.8.3 Connectivity and Existing Natural Features

Natural features of the study area, such as the Significant Woodland, the West Credit River, and the Provincially Significant West Credit River Wetland Complex serve as linkage corridors within the broader landscape. The Hillsburgh Pond and surrounding wetland are part of the Provincially Significant West Credit River Wetland Complex and are connected to the upstream Alton-Hillsburgh Provincially Significant Wetland Complex by the West Credit River. The study area also provides a direct corridor between large forest complexes to the southeast and the forests to the north and west of the study area. Many of these forests and natural communities are within or adjacent to watercourses of the West Credit River watershed (*Figure 7*).

3.8.4 Aquatic Habitat

Within the study area and downstream of the study area, there are multiple barriers to fish movement. These have been created through the impoundment of water for the creation of ponds (ESSMP 2011). These barriers limit or stop the upstream migration of fish species and prevent access to spawning areas. Upstream of the study area, the ESSMP identifies no barriers to fish passage, and air photo interpretation identified two potential barriers to fish passage.

3.8.5 Rare Features

The open water aquatic community of the Hillsburgh Pond is considered to be rare in the landscape, with only 2.8% of the subwatershed consisting of open water aquatic communities (ESSMP 2011). The Hillsburgh Pond also provides waterfowl stopover and staging habitat, which is considered rare in the larger landscape. The treed fen community within the study area (FETC1-2) is considered a rare community within the landscape, with only 0.3% coverage of fens identified in the ESSMP (2011). The fen community within the study area was not previously identified as a fen community by CVC.

4.0 Summary of Natural Heritage Constraints

The following is a summary of the existing natural heritage conditions assessed and identified within the study area of the Hillsburgh Dam Environmental Assessment. A summary of significant features is provided in *Table 8*.

4.1 Summary of Existing Conditions

4.1.1 Vegetation

Within the study area, three season ELC and three season botanical inventories were completed, where property access was permitted.

1. Thirty-one natural or naturalized vegetation communities were identified, characterised and mapped. None of the ELC communities are considered provincially rare. The fen community (FETC1-2) and open water communities (SAS_1, SAM_1-8, and OAW) are considered rare in the Town of Erin (ESSMP 2011).

2. Three hundred and ninety-four species or distinct sub-species of plants were identified within the study area through field inventory and background sources. 72% of identified species are native to Ontario, with the remaining 28% of identified species exotic to Ontario.

3. No provincial or federal Species at Risk were identified within the study area. One species identified through background resources, a moss species (*Fontinalis sullivantii),* is ranked as an S1 (Critically Imperiled). Ten identified species are considered significant in Wellington County, and 77 species are classified as CVC Species of Conservation Concern Status Tier 2 on the CVC`s ranking system.

4.1.2 Wetlands

1. The Provincially Significant West Credit Wetland Complex is a core natural feature within the study area and surrounding landscape.

2. The wetland was evaluated under the Ontario Wetland Evaluation System (OWES) by the MNRF in 1995 and updated in 2005.

3. The mapped wetland boundary was field verified using the OWES 2013, and found to be largely accurate within the study area, with only a few minor deviations from the mapped boundary provided by LIO.

4. Within the study area the wetland consists of Coniferous Swamp, Mixed Swamp, Deciduous Swamp, Thicket Swamp, Treed Fen, Meadow Marsh, Shallow Marsh, Submerged Shallow Aquatic, Mixed Shallow Aquatic, and Open Aquatic communities within the study area.

5. The OWES Scoring Record identified the wetland as an important feature in reducing the risk of flooding and erosion; which are identified by CVC as important criteria when considering preferred EA options.

4.1.3 Wildlife

1. Where access was permitted, surveys for Amphibians, Breeding Birds, Snakes, Turtles, Winter Wildlife, and Bird Migration Monitoring were completed in appropriate habitats in the study area.
    a. Three rounds of calling amphibian surveys occurred at seven candidate locations during the months of April, May and June 2015.
    b. Breeding Bird Surveys were conducted twice, once in June and once in early July; a total of 10 point counts and 4 Marsh Bird playback surveys were completed.
    c. Three visual and hand search surveys for snakes were completed in candidate areas between April and early June.
    d. No breeding habitat for Salamanders was identified in the study area; as a result, further surveys were not required.
    e. Turtle surveys were conducted between April and June, for a total of five rounds, five candidate habitats were investigated.
    f. Two migratory bird surveys were completed, one targeted shorebirds and one targeted songbirds, occurring in August and October, respectively.

2. Six frogs, 70 bird, 1 snake, 2 turtles and 11 mammal species were observed in the study area over the course of all field investigations.

3. Five species listed under the ESA were identified during field investigations: Eastern Meadowlark (THR), Bobolink (THR), Eastern Wood-pewee (SC), Bald Eagle (SC) and Common Snapping Turtle (SC).
    a. Eastern Meadowlark was observed outside the study area on adjacent lands to the south. One individual was heard singing during one round of breeding bird surveys.
    b. Bobolink was observed incidentally and showed no signs of breeding; one lone male was flushed from the forb meadow, east of the Elora-Cataract Trail way, ELC Polygon 12 (MEMM3).
    c. Eastern Wood-pewee had probable breeding in the study area, occurring in the deciduous forest community in the eastern portion of the study area, ELC Polygon 4 (FODM5-8).
    d. Bald Eagle was observed during a winter wildlife survey, soaring over the West Credit River in the study area.
    e. Common Snapping Turtle was confirmed as overwintering in the Hillsburgh and Rudd Ponds, one nest was identified along the berm of the Rudd Pond.

4. One species identified, Trumpeter Swan, is ranked as a CVC Species of Conservation Concern Status Tier 1. Trumpeter Swans were identified on the Hillsburgh Pond during surveys conducted during the spring migration season.

5. One species identified is considered rare in Ontario; Great Egret and is ranked S2B. No evidence of breeding occurred in the study area. Individuals were seen during spring and fall migration.

6. Thirty-nine species of wildlife identified in the study area are considered significant in Wellington County.

4.1.4 Significant Wildlife Habitat (SWH)

1. A review of the study area using a combination of methods presented in the Ecoregion criteria guide, air photo interpretation, and field investigations assessed the study area for Significant Wildlife Habitat that may occur in ecoregion 6E.

2. A total of six types of SWH were identified in the study area and confirmed or assumed significant using the results of all surveys completed in the study area and background resources.

3. Waterfowl Stopover and Staging (Aquatic), Turtle Wintering Area, Habitat for Special Concern and Rare Wildlife Species, and Amphibian Breeding Habitat (Woodland) were identified as candidate, confirmed and delineated in the study area.

4. Candidate Bat Maternity Habitat was identified in the study area and assumed significant. Further surveys are proposed pre-construction where impacts to candidate habitat may occur.

4.1.5 Species with Conservation Designation Habitat Assessment

1. A review of the study area was completed, using habitat requirements from reference documents, air photo interpretation, and field investigations, to assess for habitat that may be suitable for species with conservation designation (listed under the ESA or an S-rank of S1-S3). This list included all species identified through background review as occurring in Wellington County (MNRF 2015c), identified by CVC (2008-2014), or identified through NHIC (2015) that may occur in the study area.

2. Potential habitat for 16 species was identified in the study area. Surveys conducted targeted habitat that may be suitable for these species through the completion of breeding bird surveys, vegetation surveys, snake surveys, and turtle surveys.

3. During all surveys completed in the study area, seven of the wildlife species with candidate habitat were identified as occurring in the study area. Of those, four (Eastern Meadowlark, Eastern Wood-pewee, Common Snapping Turtle and Little Brown Myotis) were completing important life stages in the vicinity of the study area, and three were

observed incidentally, outside the breeding season, or showing no signs of breeding evidence (Bobolink, Great Egret, and Bald Eagle).

4.1.6 Aquatic Habitat Assessment

1. An Aquatic Habitat Assessment was completed for all open water communities and stream reaches within the study area. The Aquatic Habitat Assessment was based on a field survey completed on October 19th, 2015 and background resources of CVC temperature data, fish community classification, fish species records and the Credit River Fishery Management Plan.

2. Surveys identified areas of potential Trout spawning habitat throughout the cold water watercourses of study area, as well as immediately upstream and downstream of the study area.

3. Three full and two partial barriers to fish passage were identified within the study area. These barriers reduce or prevent passage of fish to adjacent habitats and isolate populations.

4. The watercourse within the study area is managed as a coldwater system.

5. The West Credit River is a natural, cold water system fed primarily by groundwater; the three online ponds within the study area have a negative thermal influence on the temperature of the watercourse.

6. Cold water fish communities are generally found within the tributary sections, while the online ponds contain primarily warm water fish communities.

7. The invasive Round Goby has been identified within the Upper West Credit River system, including upstream and downstream of the study area. This is an invasive species that is known to impact fish communities.

8. Brook Trout, Banded Killifish, and Slimy Sculpin are identified within the study area and are considered CVC Tier 2 Species of Interest.

4.1.7 Landscape Features

1. The open water community of the Hillsburgh Pond is considered to be rare in the landscape and provides habitat to wildlife.

2. The Treed Fen community is considered rare in the landscape and contains a number of plant species considered Tier 2 Species of Interest by CVC.

4.2 Summary of Significant Features

A summary of existing conditions of natural heritage is provided in Section 4.1. Several existing condition features are significant, including but not limited to, Species at Risk under Ontario's Endangered Species Act and Significant Wildlife Habitat under the Provincial Policy Statement. In addition to the natural heritage present across the study area, significant features are given elevated levels of protection and management. A summary of significant features is provided in *Table 8*.

Table 8. Summary of Significant Features

Significance /Type	Site Assessment and Observations	Legislation, Policy and Management Considerations	Figure
Species at Risk	•Bald Eagle (SC), observed in the study area, no habitat or breeding evidence. •Bobolink (THR), observed in the study area, no habitat or breeding evidence. •Eastern Meadowlark (THR), Breeding Evidence outside study area. •Eastern Wood-pewee (SC), Breeding evidence in the study area. •Little Brown Myotis (END), observed outside study area, Hillsburgh Pond may provide important foraging habitat.* •Common Snapping Turtle (SC), overwintering, nesting and breeding Habitat in the study area.*	*Endangered Species Act, 2007* •Species listed as Special Concern (SC) are not afforded general habitat protection under the ESA. •Threatened (THR) and Endangered (END) species are afforded General Habitat Protection under the ESA. *Provincial Policy Statement, 2014* •The habitat of species listed as Special Concern is protected under the PPS as Significant Wildlife Habitat.	7
Fish Habitat	• All watercourse and open water communities provide fish habitat, with known fish communities.* •Within the study area, 3 full and 2 partial barriers to fish passage exist that may prevent/restrict fish species from reaching appropriate spawning grounds. •All watercourses and bodies of water within the study area are managed as Coldwater fisheries, with a specific focus of Brook Trout.*	*Fisheries Act, 2013* •Protects the productivity of recreational, commercial and Aboriginal fisheries. Fish communities and habitat within the study area are afforded protection. *Credit River Fisheries Management Plan*. •Barriers to fish passage are recommended for removal or mitigation within the Credit River Fisheries Management Plan. • Construction must respect the coldwater fisheries timing window of no in-water work from October 1 – June 30.	5

Table 8. Summary of Significant Features

Significance /Type	**Site Assessment and Observations**	**Legislation, Policy and Management Considerations**	**Figure**
Significant Wildlife Habitat (SWH)	•Waterfowl Stopover and Staging (Aquatic).* •Turtle Overwintering Area.* •Habitat for Special Concern and Rare Wildlife Species.* •Amphibian Breeding Habitat (Woodland).*	*Provincial Policy Statement, 2014* •Under the PPS, development and site alteration are not permitted in Significant Wildlife Habitat unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.	7
Rare Species Habitat	•Great Egret - S2, CVC Tier 1* •Trumpeter Swan - CVC Tier 1*	*Provincial Rarity Rank (S-Rank)* •An S-Rank of S2 indicates that the species is considered imperiled in the province, with few known populations. *CVC's Species of Conservation Concern project* (2010b) •Tier 1 species are those with low abundance, low population density, specialized habitat requirements, and/or a narrow tolerance to disturbance. CVC Tier 1 species should be identified and managed in order to avoid changes to habitat or site alteration.	7
Rare or Important Landscape Features	• The natural lands within the study area create continuous corridors with surrounding natural features such as Provincially Significant Wetlands, fish spawning habitat and Significant Woodlands outside the study area. • The open water communities of the Hillsburgh, Ainsworth and Rudd Ponds are rare communities in the landscape (ESSMP 2011). * • The Treed Fen Community is a rare community within the landscape (ESSMP 2011). * .	*Wellington County Official Plan* •Terrestrial, Wetland, Riparian and Aquatic connecting corridors considered "*Protection Area 1"* and are included in Wellington County's Greenlands System designation. Activities that diminish or degrade the essential function of Greenlands Systems will be prohibited. *Town of Erin Servicing and Settlement Master Plan (2011)* • Rare communities should be considered a high priority for protection in the landscape (ESSMP 2011).	6
Provincially Significant Wetlands	•The West Credit Wetland Complex comprises approximately 44.6 ha of the study area. *	*Credit Valley Conservation* • Interference or alteration to wetlands or watercourses are generally not permitted CVC's *policies are regulated under the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation* (Ontario Regulation 160/06). •CVC and MNRF may permit development or site alteration where impacts have been addressed through an environmental assessment.	6

Carried Forward to Section 5

5.0 Assessment of Alternatives, and Impacts to the Natural Environment

The Assessment of Alternatives was completed by evaluating the potential and actual impacts of each proposed alternative on the identified Significant Natural Heritage Features in the study area and surrounding landscape. The current state of the dam and natural environment were considered to be neutral, and positive or negative impacts were assessed relative to this condition.

5.1 Alternatives Considered for the Hillsburgh Dam and Pond

Four alternatives (A, B, C and D), two of which (C and D) have two options, were considered in the evaluation of impacts to the Natural Environment. The following alternatives and summary descriptions were provided by Triton Engineering.

1). **Alternative A - Do Nothing**
This is the neutral “null” alternative, against which all other alternatives will be measured. If nothing is done to repair and/or replace the dam and bridge, the dam and bridge will continue to deteriorate and eventually fail.

2) Alternative B - Rehabilitate Hillsburgh Dam and Reconstruct the Bridge
Construct a new bridge at the same location or a new location along the dam. Alternative B consists of a larger bridge to contain the Regional Storm event without overtopping the road to comply with the Lakes and Rivers Improvement Act. The dam will be rehabilitated to meet the Ministry of Natural Recourses and Forestry current dam safety standards.

3) Alternative C - Rehabilitate Station Street Bridge

Option 1: Rehabilitate Station Street Bridge, Decommission Dam. This alternative consists of doing only the work necessary to bring the bridge to meet current safety and construction requirements. The dam will be decommissioned, which will alter the pond to a watercourse.

Option 2: Rehabilitate Station Street Bridge, Decommission Dam, and Construct an Offline Pond. This alternative consists of doing only the work necessary to bring the bridge to meet current safety and construction requirements. The dam will be decommissioned, which will alter the pond to a watercourse. An offline pond will be constructed inside the footprint of the existing Hillsburgh Pond.

4) Alternative D - Reconstruct Station Street Bridge

Option 1: Reconstruct Station Street Bridge, Decommission Dam. Construct a new bridge at the same location or a new location along the dam. This alternative consists of decommissioning the dam, which will alter the pond to a watercourse. The bridge will be constructed under the MTO Highway Drainage Design Standards**.**

Option 2: Reconstruct Station Street Bridge, Decommission Dam, and Construct an Offline Pond. Construct a new bridge at the same location or a new location along the dam. This alternative consists of decommissioning the dam, which will alter the pond to a watercourse. The bridge will be constructed under the MTO Highway Drainage Design Standards**.** An offline pond will be constructed inside the footprint of the existing Hillsburgh Pond.

5.2 Evaluation of Impacts

In order to evaluate the EA Alternatives provided, each alternative was assessed with respect to potential impacts to the significant features of the natural environment identified in the study area (Table 9). These are:

- Impacts to Habitat of Species at Risk;
- Impacts to Fish Habitat, (including thermal regime and fish passage);
- Impacts to Significant Wildlife Habitat;
- Impacts to Rare Species Habitat;
- Impacts to Rare or Important Landscape Features, and;
- Impacts to Provincially Significant Wetlands.

TABLE 9: COMPARISON AND RANKING OF ALTERNATIVES

CRITERIA	Summary of Weighted / Measured Criteria	Weighting	ALTERNATIVE A "Do Nothing"	ALTERNATIVE B Rehabilitate Hillsburgh Dam and;		ALTERNATIVE C Rehabilitate Station Street Bridge and;		ALTERNATIVE D Reconstruct Station Street Bridge and;	
				OPTION 1 Reconstruct Station Street Bridge	**OPTION 2 Rehabilitate Station Street Bridge**	**OPTION 1 Decommission Dam**	**OPTION 2 Decommission Dam and Construct Offline Pond**	**OPTION 1 Decommission Dam**	**OPTION 2 Decommission Dam and Construct Offline Pond**
NATURAL ENVIRONMENT									
Species at Risk (SAR) / Rare Species	The effects each alternative has on the native (SAR) within the project study area. The destruction of SWH due to change or alteration can have negative impacts on the natural habitat features and ecological functions of the identified species. This is measured through the desktop and field investigations which assess the types of species present.	HIGH	No impacts are anticipated under current state. Uncontrolled dam failure has the potential to cause significant negative impacts to Species at Risk.	No long term impacts are anticipated following rehabilitation of the dam and reconstruction of the bridge. Current SAR and rare species will continue to thrive within the Pond and study area.	No long term impacts are anticipated following rehabilitation of the dam and bridge. Current SAR and rare species will continue to thrive within the Pond and study area.	Long term impacts to the habitat through permanent removal of overwintering habitat for Common Snapping Turtle, and changes during construction to foraging habitat for Little Brown Myotis (bat). Impacts to Rare species are expected during construction, and long term impacts include permanent changes to potential foraging/stopover habitat for Great Egret and Trumpeter Swan.	If appropriate design and mitigation measures are put in place, no long term impacts are anticipated following construction and restoration.	Long term impacts to the habitat through permanent removal of overwintering habitat for Common Snapping Turtle, and changes during construction to foraging habitat for Little Brown Myotis (bat).Impacts to Rare species are expected during construction, and long term impacts include permanent changes to potential foraging/stopover habitat for Great Egret and Trumpeter Swan.	If appropriate design and mitigation measures are put in place, no long term impacts are anticipated following construction and restoration.
Ranking			**-6**	**3**	**3**	**-6**	**0**	**-6**	**0**
Aquatic/Fish Habitat	The effects each alternative has on the native fish species and their habitat. Fish barriers reduce ability for fish passage and diversity. The West Credit River is managed as a Cold Water Fishery. This is measured through the desktop and field investigations which assess the types of fish species present as well as, the presence of barriers.	HIGH	No impacts are anticipated under current state. Uncontrolled dam failure could cause significant negative impacts to Fish and Fish Habitat	A desired Cold Water Fishery cannot be established and fish barriers are maintained.	A desired Cold Water Fishery cannot be established and fish barriers are maintained.	Positive impacts to the managed Cold Water Fishery are anticipated from removing the dam provided suitable ecological restoration is implemented. Fish barriers will be removed.	Positive impacts to the managed Cold Water Fishery are anticipated from removing the dam provided suitable ecological restoration is implemented. Fish barriers will be removed.	Positive impacts to the managed Cold Water Fishery are anticipated from removing the dam provided suitable ecological restoration is implemented. Fish barriers will be removed.	Positive impacts to the managed Cold Water Fishery are anticipated from removing the dam provided suitable ecological restoration is implemented. Fish barriers will be removed.
Ranking			**-6**	**-6**	**-6**	**6**	**6**	**6**	**6**

TABLE 9: COMPARISON AND RANKING OF ALTERNATIVES

CRITERIA	Summary of Weighted / Measured Criteria	Weighting	ALTERNATIVE A "Do Nothing"	ALTERNATIVE B Rehabilitate Hillsburgh Dam and;		ALTERNATIVE C Rehabilitate Station Street Bridge and;		ALTERNATIVE D Reconstruct Station Street Bridge and;	
				OPTION 1 Reconstruct Station Street Bridge	OPTION 2 Rehabilitate Station Street Bridge	OPTION 1 Decommission Dam	OPTION 2 Decommission Dam and Construct Offline Pond	OPTION 1 Decommission Dam	OPTION 2 Decommission Dam and Construct Offline Pond
NATURAL ENVIRONMENT									
Significant Wildlife Habitat (SWH)	The effects each alternative has on SWH within the project study area. The destruction of SWH due to change or alteration can have negative impacts on the natural habitat features and ecological functions. Measured through desktop and field investigations.	MED	No impacts are anticipated under current state. Uncontrolled dam failure could cause significant negative impacts to SWH.	No long term impacts are anticipated following rehabilitation of the dam and reconstruction of the bridge. Current SWH will continue to thrive within the Pond and study area.	No long term impacts are anticipated following rehabilitation of the dam and bridge. Current SWH will continue to thrive within the Pond and study area.	Long term negative impacts on the features and functions of the following SWH: Waterfowl Stopover and Staging, Turtle overwintering, and Habitat for Special Concern Species and Rare Wildlife Species.	If appropriate mitigation measures are put in place, no long term impacts are anticipated following construction and restoration.	Long term negative impacts on the features and functions of the following SWH: Waterfowl Stopover and Staging, Turtle overwintering, and Habitat for Special Concern Species and Rare Wildlife Species.	If appropriate mitigation measures are put in place, no long term impacts are anticipated following construction and restoration.
Ranking			-4	2	2	-4	0	-4	0
Provincially Significant Wetlands (PSW) /Landscape Features	The effects each alternative has on PSW within the project study area. Changes to the limit and extent of the PSW can cause negative impacts to the local ecologies interdependencies. This is measured through desktop and field investigations which quantify and assess the current limit and extent of PSW.	MED	No impacts are anticipated under current state however, uncontrolled dam failure could cause significant negative impacts to the PSW or landscape features.	Impacts to upstream and downstream hydrology is negligible. No impacts are anticipated.	Impacts to upstream and downstream hydrology is negligible. No impacts are anticipated.	Potential changes to hydrology could impact the upstream and downstream extent and quality of wetland. Pond will naturalize into new wetland. Possible negative impact to the Treed Fen Community if hydrological changes (e.g. lower water table) are associated with the decommissioning of the dam.	Potential changes to hydrology could impact the upstream and downstream extent and quality of wetland. The construction of an offline pond will maintain some open water community within the existing PSW. Possible negative impact to the Treed Fen Community if hydrological changes (e.g. lower water table) are associated with the decommissioning of the dam.	Potential changes to hydrology could impact the upstream and downstream extent and quality of wetland. Pond will naturalize into new wetland. Possible negative impact to the Treed Fen Community if hydrological changes (e.g. lower water table) are associated with the decommissioning of the dam.	Potential changes to hydrology could impact the upstream and downstream extent and quality of wetland. The construction of an offline pond will maintain some open water community within the existing PSW. Possible negative impact to the Treed Fen Community if hydrological changes (e.g. lower water table) are associated with the decommissioning of the dam.
Ranking			-4	0	0	-2	-2	-2	-2
Total Ranking		20	-20	-1	-1	-6	4	-6	4

RANKING MATRIX						
	Multiplier	Negative	Negative-Neutral	Neutral	Positive-Neutral	Positive
WEIGHTING		SCORING				
LOW	1	-2	-1	0	1	2
MED	2	-4	-2	0	2	4
HIGH	3	-6	-3	0	3	6

5.3 Impacts to the Natural Environment

5.3.1 Alternative A - Do Nothing

The Do Nothing Alternative will result in no immediate additional negative impacts to the existing natural features under the current dam configuration. However, the presence of the dam is known to be causing negative impacts to the natural environment, including altering the watercourse and reducing the quality of fish habitat.

The Do Nothing Alternative will likely cause significant and unknown impacts to the natural environment, in the case of an uncontrolled dam failure.

5.3.2 Alternative B - Rehabilitate Hillsburgh Dam, (Option1) Reconstruct Station Street Bridge and (Option 2) Rehabilitate Station Street Bridge

Rehabilitation of the Hillsburgh Dam and reconstruction/rehabilitation of the bridge is not anticipated to result in new long-term negative impacts to the natural environment, relative to the current state. This alternative will continue to negatively impact the aquatic habitat and fish.

Short-term impacts to the natural environment are expected during construction and rehabilitation of the dam and bridge. Longer term, dredging may be required to remove accumulated sediment in order to maintain an open water community within the pond:

Species at Risk/ Rare Species:

Common Snapping Turtle (Special Concern, SARO) – Common Snapping Turtle hibernate in the mud or silt layer at the bottom of large lakes, ponds and rivers. No long-term impacts are anticipated to Common Snapping Turtle by maintaining the existing pond. Draining of the Hillsburgh Pond for construction when turtles are overwintering may cause stress or death to overwintering Common Snapping Turtle, a species of Special Concern. Any eventual dredging of the pond to remove accumulated sediment is also likely to impact overwintering Common Snapping Turtles, through direct disturbance and by removing substrates required for overwintering.

Little Brown Myotis (Endangered, SARO) – A known maternity colony of Little Brown Myotis occur adjacent to the pond. The pond and adjacent wetlands are likely important foraging resources for Little Brown Myotis. Maintaining a pond environment is unlikely to affect the foraging habitat for Little Brown Myotis or the maternal population existing adjacent to the pond. No long-term impacts are anticipated to Little Brown Myotis through the maintenance of the existing pond. Draining of the pond for construction, during the maternal season for Little Brown Myotis could reduce feeding opportunities for the colony adjacent the pond during the critical maternity life stage. Any impacts to the habitat of Little Brown Myotis may require an authorization under the ESA, in consultation with the MNRF.

Rare Species Habitat - No long-term impacts are anticipated to Rare Species through the maintenance of the existing pond. Draining of the Hillsburgh Pond for construction may reduce feeding and staging opportunities for Great Egret and Trumpeter Swan in the short-term, both species are intolerant to changes in habitat.

Significant Wildlife Habitat:

Overwintering Turtles – No long-term impacts are anticipated to overwintering turtles by maintaining the existing pond. Draining of the Hillsburgh Pond for construction when turtles are overwintering may cause stress or death. Any eventual dredging of the pond to remove accumulated sediment is also likely to impact overwintering turtles habitat, by removing substrates required for overwintering.

Amphibian Breeding Significant Wildlife Habitat – No long-term impacts are anticipated to Amphibian Breeding Habitat by maintaining the existing pond. Draining the pond for construction during the amphibian breeding season will lower water levels and may reduce the success rate for breeding, and survival of eggs and tadpoles, in wetland areas adjacent the pond.

Waterfowl Stopover and Staging Significant Wildlife Habitat – No long-term impacts are anticipated to Waterfowl Stopover and Staging by maintaining the existing pond. Draining the pond for construction during the stopover and staging season will affect species of waterfowl reliant on the pond to provide stopover feeding and roosting opportunities during migration.

Aquatic/Fish Habitat:

Aquatic Habitat – In the absence of mitigation measures, rebuilding the dam in a similar configuration to the current state will maintain the negative impacts to the watercourse, through a continued barrier to fish passage, negative thermal influences, and the establishment of invasive and warmwater fish species. The dam also alters flow patterns and disrupts sediment and nutrient transport within the watercourse. This option will continue to negatively impact the managed coldwater system.

Fish Species -

Brook Trout are a managed fish species within the West Credit River and will be negatively impacted through the maintenance of barriers, which prevent migration within the watercourse and create habitat fragmentation. The dam causes negative thermal impacts to Brook Trout and limits habitat suitability.

Banded Killifish are Species of Interest and are rare in the Credit River Watershed. Rehabilitation of the Hillsburgh Pond would benefit this species through the maintenance of an anthropogenic slow moving, warm water system within the pond environment.

Slimy Sculpin are Species of interest and are rare in the Credit River Watershed. They are a coldwater species found in the location of cold groundwater upwelling within streams. Rehabilitation of the Hillsburgh Pond would maintain the negatively impacts of the anthropogenic warm water environment, reduced habitat availability, and barriers to fish passage.

Round Goby are an undesirable invasive species in the West Credit Watershed. Rehabilitation of the Hillsburgh Pond would benefit this species through the maintenance of an anthropogenic slow moving, warm water system within the pond environment.

Provincially Significant Wetland and Landscape Features:

Provincially Significant Wetland – Rehabilitation of the dam and reconstruction or rehabilitation of the bridge is not anticipated to result in significant changes to hydrology or the upstream and downstream extent and quality of the wetland. Any impacts would likely be minor and short term.

Landscape Features – Alternative B will retain the open water community of the Hillsburgh Pond, which is rare in the Town of Erin. No hydrological changes are expected and impacts to the rare treed fen community downstream of the pond are not anticipated.

In general, the anticipated impacts associated with Alternative B are short term, while construction is ongoing. Mitigation measures can be applied to reduce or eliminate short-term negative impacts to the habitats. Existing long-term impacts to the natural environment will be maintained unless mitigated for through detailed design.

5.3.3 Alternative C - Rehabilitate Station Street Bridge and Decommission the Hillsburgh Dam

Option 1 – Without an Offline Pond

Rehabilitation of the Station Street Bridge and decommissioning the Dam will result in both negative and positive impacts to the natural environment, relative to the current state. This alternative will positively impact the watercourse by returning the system to a naturalized stream environment.

Short-term impacts to the natural environment associated with construction are expected during rehabilitation of the bridge. Decommissioning of the dam will cause long-term changes and impacts to the natural environment.

Species at Risk/ Rare Species:

Common Snapping Turtle (Special Concern, SARO) – Common Snapping Turtle hibernate in the mud or silt layer at the bottom of large lakes, ponds and rivers. The decommissioning of the Hillsburgh Pond and establishment of naturalized watercourse will permanently remove overwintering habitat for Common Snapping Turtle and cause negative long-term impacts to the population.

Little Brown Myotis (Endangered, SARO) – A known maternity colony of Little Brown Myotis occur adjacent to the pond. Little Brown Myotis are known to forage over ponds, rivers, woodlands and streams with abundant insect populations. The pond and adjacent wetlands likely provide important foraging resources for Little Brown Myotis. Initial draining of the Hillsburgh Pond may affect populations of aquatic insects in the short term, and result in reduced feeding opportunities for the Little Brown Myotis colony during critical life stages. No long term impacts are anticipated to populations of Little Brown Myotis from the removal of the pond, as it is anticipated that a naturalized watercourse would also provide suitable foraging habitat for the species. Any impacts to the habitat of Little Brown Myotis may require authorization under the ESA, in consultation with the MNRF.

Rare Species Habitat - Draining of the Hillsburgh Pond and loss of an open water community will reduce feeding and staging opportunities for Great Egret and Trumpeter Swan, in the long term. Both species are intolerant to changes in habitat.

Significant Wildlife Habitat:

Overwintering Turtles – Draining of the Hillsburgh Pond for construction when turtles are overwintering may cause stress or death to turtles. The decommissioning of the Hillsburgh Pond and establishment of a naturalized watercourse will permanently remove this Significant Wildlife Habitat and cause negative impacts to the resident turtle populations.

Amphibian Breeding – Draining the pond during the amphibian breeding season will lower water levels and may reduce the success rate for breeding, and survival of eggs and tadpoles, in wetland areas adjacent the pond. Permanently changing the Hillsburgh Pond to a naturalized watercourse may reduce the success rate for breeding amphibians in the short and possibly long term, with the potential to affect the hydrology of the wetlands both upstream and downstream of the pond, and reducing or eliminating a number of Significant Amphibian Breeding Areas.

Waterfowl Stopover and Staging – Draining the Hillsburgh Pond will have long term effects on species of waterfowl reliant on the pond to provide stopover feeding and roosting opportunities during migration. It is considered a rare landscape feature in the area and provides an important function for the successful migration of waterfowl species.

Aquatic/Fish Habitat:

Aquatic Habitat – Decommissioning of the Hillsburgh Pond and establishment of a naturalized watercourse will have positive impacts on the managed cold water fish species, including Brook Trout and sports fish species such as Brown Trout. Removal of the dam will decrease barriers to fish passage and reduce thermal impacts to the watercourse. General water quality will be improved through reduced coliform bacteria levels resulting from the decreased temperatures. Sediment and nutrient transport and naturalized flow patterns will be restored to the downstream section of the watercourse. Warm water fish species, which are not managed, will be negatively impacted through the loss of habitat with the removal of the Hillsburgh Pond. However, Alternative C – Option 1 provides an overall positive benefit for the more desirable, managed cold water fish species.

Fish Species -
Brook Trout are a managed fish species within the West Credit River and will be positively impacted by the decommissioning of the Hillsburgh Pond and creation of naturalized watercourse. Decommissioning of the dam will remove barriers, which prevent migration within the watercourse, will decrease habitat fragmentation and will result in more suitable thermal conditions for Brook Trout.

Banded Killifish are Species of Interest and are rare in the Credit River Watershed. Decommissioning of the Hillsburgh Pond will negatively impact this species through the loss of the anthropogenic slow moving, warm water system within the pond environment.

Slimy Sculpin are Species of Interest and are rare in the Credit River Watershed. They are a cold water species found in areas of cold groundwater upwelling within streams. Decommissioning of the Hillsburgh Pond would benefit this species through increased habitat availability, removal of barriers and establishment of a more favorable coldwater environment.

Round Goby are an undesirable invasive species within the West Credit Watershed. Decommissioning of the Hillsburgh Pond would reduce habitat available and suitability through the removal of the anthropogenic slow moving, warm water system with the pond environment. This would likely lead to reduced population size and impacts from the Round Goby.

Provincially Significant Wetland and Landscape Features:

Provincially Significant Wetland – Changes to hydrology from the decommissioning of the dam could impact the upstream and downstream extent and quality of the wetland. Since Alternative C - Option 1 will decommission the dam and drain the pond, it is possible that this will result in a lower water table and may reduce the upstream extent and quality of the Provincially Significant Wetland; detailed hydrological changes are unknown at this time. It is anticipated that the current extent of the pond will be maintained as wetland, but will become established as a marsh or swamp community rather that the existing open water community.

Landscape Features – Draining of the Hillsburgh Pond and establishment of a watercourse will result in the loss of an open water community, which is described as rare in the Town of Erin Servicing and Settlement Master Plan.

Impacts to the rare treed fen community downstream of the pond could occur from changes in the sedimentation, flow rate, flood frequency, or groundwater level; specific hydrological changes are unknown.

Option 2 – With an Offline Pond
The rehabilitation of the Station Street Bridge, decommissioning the Dam, establishment of a watercourse and construction of a new offline pond will result in short-term impacts to the natural environment during construction. Long-term positive impacts and minor negative impacts to natural features are expected. Existing ecological function of the open water community will be maintained through the creation of the offline pond. Detailed designs of the offline pond, including depth and size, are not yet available; however, for the purpose of the analysis, it was assumed that the pond would be of sufficient size and depth to provide similar ecological functions of the existing pond. Within the ranking matrix (*Table 9*) impacts to the natural environment associated with the offline pond are ranked as more negative compared to maintaining the existing pond, reflecting an element of uncertainty and the decreased size of an offline pond relative to the existing pond.

Species at Risk/ Rare Species:

Common Snapping Turtle (Special Concern, SARO) – Common Snapping Turtle hibernate in the mud or silt layer at the bottom of large lakes, ponds, and rivers. Draining of the Hillsburgh Pond for construction when turtles are overwintering may cause stress or death to overwintering Common Snapping Turtle, a species of Special Concern. Creation of a new offline pond will provide adequate habitat for Snapping Turtles. No long-term impacts are anticipated to Common Snapping Turtle if a suitable offline pond were established.

Little Brown Myotis – A known maternity colony of Little Brown Myotis, an Endangered Species, occur adjacent to the pond. The pond and adjacent wetlands are likely important foraging resources for Little Brown Myotis. Draining of the pond for construction, during the maternal season for Little Brown Myotis, could reduce feeding opportunities for the colony adjacent to the pond during the critical maternity life stage. It is expected that the offline pond and naturalized watercourse would continue to provide foraging habitat and these changes are unlikely to affect the Little Brown Myotis or the maternal population existing adjacent to the pond. Any impacts to the habitat of Little Brown Myotis may require an authorization under the ESA, in consultation with the MNRF. No long-term impacts are anticipated to Little Brown Myotis through the decommissioning of the Hillsburgh Pond and creation of an offline pond.

Rare Species Habitat - No long-term impacts are anticipated to rare species through the decommissioning of the Hillsburgh Pond and creation of a suitable offline pond. Draining of the Hillsburgh Pond for construction may reduce feeding and staging opportunities for Great Egret and Trumpeter Swan in the short-term. Both species are intolerant to changes in habitat.

Significant Wildlife Habitat:

Overwintering Turtles – Draining of the Hillsburgh Pond for construction when turtles are overwintering may cause stress or death to turtles. The loss of the Hillsburgh Pond and return to a naturalized watercourse will permanently affect the existing Significant Wildlife Habitat. Through the creation of an offline pond, the overwintering Turtle Significant Wildlife Habitat would be maintained, resulting in no long term impacts to turtle populations.

Amphibian Breeding Significant Wildlife Habitat – Draining of the Hillsburgh Pond during the amphibian breeding season will lower water levels and may reduce the success rate for breeding, and survival of eggs and tadpoles, in wetland areas adjacent the pond. Through the creation of an offline pond, the Amphibian Breeding Significant Wildlife Habitat would be maintained. No long-term impacts are anticipated as it is expected that the offline pond would continue to provide amphibian breeding SWH.

Waterfowl Stopover and Staging Significant Wildlife Habitat – Draining the pond during the stopover and staging season will affect species of waterfowl reliant on the pond to provide stopover feeding and roosting opportunities during migration. Through the creation of an offline pond, the Waterfowl Stopover and Staging Significant Wildlife Habitat would be maintained, resulting in no long term impacts to waterfowl populations.

Aquatic/Fish Habitat:

Aquatic Habitat – Removal of the Hillsburgh Pond and establishment of a naturalized watercourse will have positive impacts on the managed cold water fish species, including Brook Trout and sports fish species such as Brown Trout. Removal of the dam will decrease barriers to fish passage and reduce thermal impacts to the watercourse. General water quality will be improved through reduced coliform bacteria levels resulting from the decreased temperatures. Sediment and nutrient transport and naturalized flow patterns will be restored to the downstream section of the watercourse. Depending on the design, warm water fish species, which are not managed, may persist within the offline pond.

Fish Species -
Brook Trout are a managed fish species within the West Credit River and will be positively impacted by the decommissioning of the Hillsburgh Pond and creation of naturalized watercourse. Decommissioning of the dam will remove barriers, which prevent migration within the watercourse, will decrease habitat fragmentation and will result in more suitable thermal conditions.

Banded Killifish are Species of Interest and are rare in the Credit River Watershed. Decommissioning of the Hillsburgh Pond will negatively impact this species through the loss of the anthropogenic slow moving, warm water system within the pond environment. The constructed offline pond may be suitable for Banded Killifish if they are intentionally or inadvertently introduced.

Slimy Sculpin are Species of Interest and are rare in the Credit River Watershed. They are a cold water species found in areas of cold groundwater upwelling within streams.

Decommissioning of the Hillsburgh Pond would benefit this species through increased habitat availability, removal of barriers and establishment of a more favorable coldwater environment.

Round Goby are an undesirable invasive species within the West Credit Watershed. Decommissioning of the Hillsburgh Pond would reduce habitat available and suitability through the removal of the anthropogenic slow moving, warm water system with the pond environment. This would likely lead to reduced population size and impacts from the Round Goby. The constructed offline pond may provide suitable habitat for Round Goby if they are inadvertently introduced. Measures should be taken to prevent Round Goby from establishing within the constructed offline pond.

Provincially Significant Wetland and Landscape Features:

Provincially Significant Wetland – Changes to hydrology from the decommissioning of the dam could impact the upstream and downstream extent and quality of the wetland. Since Alternative C - Option 2 will decommission the dam and drain the pond, it is possible that this will result in a lower water table and may reduce the upstream extent and quality of the Provincially Significant Wetland; detailed hydrological changes are unknown at this time. It is anticipated that the current extent of the pond will be maintained as wetland. The offline pond would be part of the Provincially Significant Wetland.

Landscape Features – Draining of the Hillsburgh Pond and establishment of a watercourse will result in the loss of an open water community, which is identified as rare in the Town of Erin Servicing and Settlement Master Plan. Creation of an offline pond will compensate for the loss of the Hillsburgh Pond and maintain the rare open water community within the landscape.

Impacts to the rare treed fen community downstream of the pond could occur from changes in the sedimentation, flow rate, flood frequency, or groundwater level; specific hydrological changes are unknown.

5.3.4 Alternative D - Reconstruct Station Street Bridge, Decommission Dam

Option 1 – Without an Offline Pond

Reconstruction of the Station Street Bridge and decommission of the dam will result in both negative and positive impacts to the natural environment relative to the current state. This alternative will positively impact the watercourse by returning the system to a naturalized coldwater stream environment.

Short-term impacts to the natural environment associated with construction are expected during the reconstruction of the bridge. Decommissioning of the dam will cause long-term changes and impacts to the natural environment.

Species at Risk/ Rare Species:

Common Snapping Turtle (Special Concern, SARO) – Common Snapping Turtle hibernate in the mud or silt layer at the bottom of large lakes, ponds, and rivers. The change of the Hillsburgh Pond to a naturalized watercourse will permanently remove overwintering habitat for Common Snapping Turtle and cause negative long-term impacts to the population.

Little Brown Myotis (Endangered, SARO) – A known maternity colony of Little Brown Myotis occur adjacent to the pond. Little Brown Myotis are known to forage over ponds, rivers, woodlands and streams with abundant insect populations. The pond and adjacent wetlands likely provide important foraging resources for Little Brown Myotis. Initial draining of the Hillsburgh Pond may affect populations of aquatic insects in the short term, and result in reduced feeding opportunities for the Little Brown Myotis colony during critical life stages. No long term impacts are anticipated to populations of Little Brown Myotis from the removal of the pond, as it is anticipated that a naturalized watercourse would also provide suitable foraging habitat for the species. Any impacts to the habitat of Little Brown Myotis may require authorization under the ESA, in consultation with the MNRF.

Rare Species Habitat - Draining of the Hillsburgh Pond and loss of an open water community will reduce feeding and staging opportunities for Great Egret and Trumpeter Swan in the long term. Both species are intolerant to changes in habitat.

Significant Wildlife Habitat:

Overwintering Turtles – Draining of the Hillsburgh Pond for construction when turtles are overwintering may cause stress or death to turtles. The decommissioning of the Hillsburgh Pond and establishment of a naturalized watercourse will permanently remove this Significant Wildlife Habitat and cause negative impacts to the resident turtle populations.

Amphibian Breeding – Draining the pond during the amphibian breeding season will lower water levels and may reduce the success rate for breeding, and survival of eggs and tadpoles in wetland areas adjacent the pond. Permanently changing the Hillsburgh Pond to a naturalized watercourse may reduce the success rate for breeding amphibians in the short and possibly long term, with the potential to affect the hydrology of the wetlands both upstream and downstream of the pond, and reducing or eliminating a number of Significant Amphibian Breeding Areas.

Waterfowl Stopover and Staging – Draining the Hillsburgh Pond will have long term effects on species of waterfowl reliant on the pond to provide stopover feeding and roosting opportunities during migration. It is considered a rare landscape feature in the area and provides an important function for the successful migration of waterfowl species.

Aquatic/Fish Habitat:

Aquatic Habitat – Removal of the Hillsburgh Pond and establishment of a naturalized watercourse will have positive impacts on the managed cold water fish species, including Brook Trout and sports fish species such as Brown Trout. Removal of the dam will decrease barriers to fish passage and reduce thermal impacts to the watercourse. General water quality will be improved through reduced coliform bacteria levels resulting from the decreased temperatures. Sediment and nutrient transport and naturalized flow patterns will be restored to the downstream section of the watercourse. Warm water fish species, which are not managed, will be negatively impacted through the loss of habitat with the removal of the Hillsburgh Pond. However, Alternative D – Option 1 provides an overall positive benefit for the more desirable, managed cold water fish species.

Fish Species -

Brook Trout are a managed fish species within the West Credit River and will be positively impacted by the decommissioning of the Hillsburgh Pond and creation of naturalized watercourse. Decommissioning of the dam will remove barriers, which prevent migration within the watercourse, will decrease habitat fragmentation and will result in more suitable thermal conditions for Brook Trout.

Banded Killifish are Species of Interest and are rare in the Credit River Watershed. Decommissioning of the Hillsburgh Pond will negatively impact this species through the loss of the anthropogenic slow moving, warm water system within the pond environment.

Slimy Sculpin are Species of Interest and are rare in the Credit River Watershed. They are a cold water species found in areas of cold groundwater upwelling within streams. Decommissioning of the Hillsburgh Pond would benefit this species through increased habitat availability, removal of barriers and establishment of a more favorable coldwater environment.

Round Goby are an undesirable invasive species within the West Credit Watershed. Decommissioning of the Hillsburgh Pond would reduce habitat available and suitability through the removal of the anthropogenic slow moving, warm water system with the pond environment. This would likely lead to reduced population size and impacts from the Round Goby.

Provincially Significant Wetland and Landscape Features:

Provincially Significant Wetland – Changes to hydrology from the decommissioning of the dam could impact the upstream and downstream extent and quality of the wetland. Since Alternative D - Option 1 will decommission the dam and drain the pond, it is possible that this will result in a lower water table and may reduce the upstream extent and quality of the Provincially Significant Wetland; detailed hydrological changes are unknown at this time. It is anticipated that the current extent of the pond will be maintained as wetland, but will be established as a marsh or swamp community rather that the existing open water community.

Landscape Features – Draining of the Hillsburgh Pond and establishment of a watercourse will result in the loss of an open water community, which is described as rare in the Town of Erin Servicing and Settlement Master Plan.

Impacts to the rare treed fen community downstream of the pond could occur from changes in the sedimentation, flow rate, flood frequency, or groundwater level; specific hydrological changes are unknown.

Option 2 – With an Offline Pond
The reconstruction of the Station Street Bridge, decommissioning the Dam, establishment of a watercourse and construction of a new offline pond will result in short-term impacts to the natural environment during construction. Long-term positive and impacts and minor negative impacts to natural features are expected. Existing ecological function of the open water community will be maintained through the creation of the offline pond. Detailed designs of the offline pond, including depth and size, are not yet available, however, for the purpose of the analysis, it was assumed that the pond would be of sufficient size and depth to provide similar ecological functions of the existing pond. Within the ranking matrix (*Table 9*) impacts to the natural environment associated with the offline pond are ranked as more negative compared to maintaining the existing pond, reflecting an element of uncertainty and the decreased size of an offline pond relative to the existing pond.

Species at Risk/ Rare Species:

Common Snapping Turtle (Special Concern, SARO) – Common Snapping Turtle hibernate in the mud or silt layer at the bottom of large lakes, ponds, and rivers. Draining of the Hillsburgh Pond for construction when turtles are overwintering may cause stress or death to overwintering Common Snapping Turtle, a species of Special Concern. Creation of a new offline pond will provide adequate habitat for Snapping Turtles. No long-term impacts are anticipated to Common Snapping Turtle if a suitable offline pond were established.

Little Brown Myotis (Endangered, SARO) – A known maternity colony of Little Brown Myotis, an Endangered Species, occur adjacent to the pond. The pond and adjacent wetlands are likely important foraging resources for Little Brown Myotis. Draining of the pond for construction, during the maternal season for Little Brown Myotis could reduce feeding opportunities for the colony adjacent to the pond during the critical maternity life stage. It is expected that the offline pond and naturalized watercourse would continue to provide foraging habitat and these changes are unlikely to affect the Little Brown Myotis or the maternal population existing adjacent to the pond. Any impacts to the habitat of Little Brown Myotis may require an authorization under the ESA, in consultation with the MNRF. No long-term impacts are anticipated to Little Brown Myotis through the decommissioning of the Hillsburgh Pond and creation of an offline pond.

Rare Species Habitat - No long-term impacts are anticipated to Rare Species through the decommissioning of the Hillsburgh Pond and creation of a suitable offline pond. Draining of the Hillsburgh Pond for construction may reduce feeding and staging opportunities for Great Egret and Trumpeter Swan in the short-term. Both species are intolerant to changes in habitat.

Significant Wildlife Habitat:

Overwintering Turtles – Draining of the Hillsburgh Pond for construction when turtles are overwintering may cause stress or death to turtles. The loss of the Hillsburgh Pond and return to a naturalized watercourse will permanently affect the existing Significant Wildlife Habitat. Through the creation of an offline pond, the overwintering Turtle Significant Wildlife Habitat would be maintained, resulting in no long term impacts to turtle populations.

Amphibian Breeding Significant Wildlife Habitat – Draining of the Hillsburgh Pond during the amphibian breeding season will lower water levels and may reduce the success rate for breeding, and survival of eggs and tadpoles, in wetland areas adjacent the pond. Through the creation of an offline pond, the Amphibian Breeding Significant Wildlife Habitat would be maintained. No long-term impacts are anticipated as it is expected that the offline pond would continue to provide amphibian breeding SWH.

Waterfowl Stopover and Staging Significant Wildlife Habitat – Draining the pond during the stopover and staging season will affect species of waterfowl reliant on the pond to provide stopover feeding and roosting opportunities during migration. Through the creation of an offline pond, the Waterfowl Stopover and Staging Significant Wildlife Habitat would be maintained, resulting in no long term impacts to waterfowl populations.

Aquatic/Fish Habitat:

Aquatic Habitat – Removal of the Hillsburgh Pond and establishment of a naturalized watercourse will have positive impacts on the managed cold water fish species, including Brook Trout and sports fish species such as Brown Trout. Removal of the dam will decrease barriers to fish passage and reduce thermal impacts to the watercourse. General water quality will be improved through reduced coliform bacteria levels resulting from the decreased temperatures. Sediment and nutrient transport and naturalized flow patterns will be restored to the downstream section of the watercourse. Depending on the design, warm water fish species, which are not managed, may persist within the offline pond.

Fish Species -

Brook Trout are a managed fish species within the West Credit River and will be positively impacted by the decommissioning of the Hillsburgh Pond and creation of naturalized watercourse. Decommissioning of the dam will remove barriers, which prevent migration within the watercourse, will decrease habitat fragmentation and will result in more suitable thermal conditions.

Banded Killifish are Species of Interest and are rare in the Credit River Watershed. Decommissioning of the Hillsburgh Pond will negatively impact this species through the loss of the anthropogenic slow moving, warm water system within the pond environment. The constructed offline pond may be suitable for Banded Killifish if they are intentionally or inadvertently introduced.

Slimy Sculpin are Species of Interest and are rare in the Credit River Watershed. They are a cold water species found in areas of cold groundwater upwelling within streams. Decommissioning of the Hillsburgh Pond would benefit this species through increased habitat availability, removal of barriers and establishment of a more favorable coldwater environment.

Round Goby are an undesirable invasive species within the West Credit Watershed. Decommissioning of the Hillsburgh Pond would reduce habitat available and suitability through the removal of the anthropogenic slow moving, warm water system with the pond environment. This would likely lead to reduced population size and impacts from the Round Goby. The constructed offline pond may provide suitable habitat for Round Goby if they are inadvertently introduced. Measures should be taken to prevent Round Goby from establishing within the constructed offline pond.

Provincially Significant Wetland and Landscape Features:

Provincially Significant Wetland – Changes to hydrology from the decommissioning of the dam could impact the upstream and downstream extent and quality of the wetland. Since Alternative C - Option 2 will decommission the dam and drain the pond, it is possible that this will result in a lower water table and may reduce the upstream extent and quality of the Provincially Significant Wetland; detailed hydrological changes are unknown at this time. It is anticipated that the current extent of the pond will be maintained as wetland. The offline pond would be part of the Provincially Significant Wetland.

Landscape Features – Draining of the Hillsburgh Pond and establishment of a watercourse will result in the loss of an open water community, which is identified as rare in the Town of Erin Servicing and Settlement Master Plan. Creation of an offline pond will compensate for the loss of the Hillsburgh Pond and maintain the rare open water community within the landscape.

Impacts to the rare treed fen community downstream of the pond could occur from changes in the sedimentation, flow rate, flood frequency, or groundwater level; specific hydrological changes are unknown.

6.0 Conclusion

The Natural Environment Report was completed as part of the Schedule B Municipal Class Environmental Assessment. The EA is being completed in order to determine the best option to ensure the long term safety of the Hillsburgh Dam, while considering the natural environment, transportation, socio-economic impacts and construction costs. The Natural Environment Report has identified significant species, features, and ecological functions within the study area, which were considered while developing and ranking EA options.

The Assessment of Alternatives and Impacts to the Natural Environment identified potential and actual impacts of each proposed EA Alternative with respect to the identified existing natural heritage features in the study area and surrounding landscape. The analysis concluded that either Alternative C - Option 2 or Alternative D - Option 2, which includes the construction of an offline pond, are the preferred alternatives from a natural heritage perspective. These alternatives have the least negative impacts to the natural heritage features and provide positive benefits to the Natural Environment in the long term.

Should it be determined that the preferred alternatives listed above are not feasible, Alternative B is the next preferred alternative. If Alternative B is selected, the design should include measures to improve fish habitat long term through the installation of a fish bypass and bottom draw system.

Alternative C - Option 1 and Alternative D - Option 1 are the least preferred alternatives. These options would result in long term negative impacts to the existing natural environment through the complete loss of the open water community of the Hillsburgh Pond. This would have substantial negative impacts to SAR habitat, Significant Wildlife Habitat, Rare Species habitat, and to the overall ecological value of the study area.

Mitigation measures should be developed for any selected alternative to minimize impacts to protected natural heritage features during construction and retain and enhance the overall ecological integrity of the area.

Prepared By:

ABOUD & ASSOCIATES INC.

Ryan Hamelin

Ryan Hamelin, M.Sc.
Terrestrial and Wetland Ecologist

Cheryl-Anne Ross, B.Sc.
Ecology Lead & Wildlife Ecologist
ISA Certified Arborist ON-2017A

Reviewed By:

Steven Aboud

Steven Aboud, B.Sc. Principal.

ISA Certified Arborist No. ON-0323A
ISA Tree Risk Assessment Qualified
Butternut Health Assessor No. 497
Senior Ecologist

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Thompson, Melinda. Management Biologist. Ministry of Natural Resources and Forestry, Guelph District. Email Correspondence.

Timmerman, Art. Management Biologist. Ministry of Natural Resources and Forestry, Guelph District. Email Correspondence

Whalen, Rose. Lands and Waters Technical Specialist. Ministry of Natural Resources and Forestry, Guelph District. Email Correspondence and in-person.

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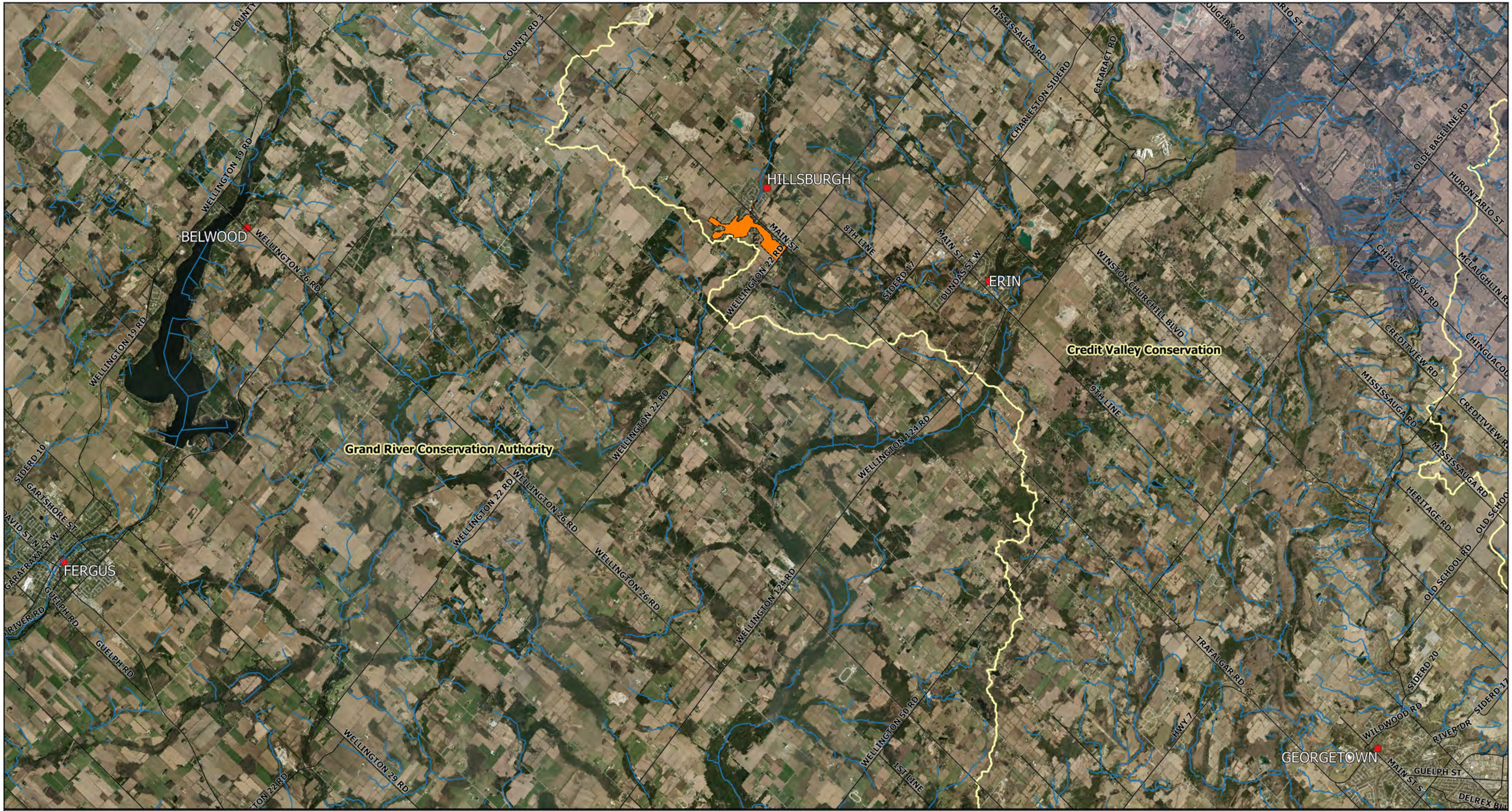

LEGEND

🟧 STUDY AREA

— WATERCOURSES

▭ CONSERVATION AUTHORITY BOUNDARY

Information Sources:

1. Conservation Authority Boundaries: Provided by Land Information Ontario (LIO). Accessed 2015.
2. Watercourse: Provided by Land Information Ontario (LIO). Accessed 2015.
3. Roads: Provided by Land Information Ontario (LIO). Accessed 2015.
4. Ortho Image: Provided by First Base Solutions Web Mapping Service 2015.

TOWN OF ERIN
PROGRESS IN UNITY

TRITON ENGINEERING SERVICES LIMITED
Consulting Engineers

Title: SITE LOCATION

Project: HILLSBURGH DAM
MUNICIPAL CLASS EA

Date: Dec, 2015
Project: AA12-137A
Scale: 1 : 100000

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Figure No: 1

LEGEND

- ━ WATERCOURSE
- ━ ELORA CATARACT TRAILWAY
- ▭ STUDY AREA
- ▨ CVC BOTANICAL STUDY AREA
- ■ OPEN WATER COMMUNITIES
- ▨ PROPERTY ACCESS
- ☆ HILLSBURGH DAM

Information Sources:

1. Property Access: Based on Erin Parcels. Provided Wellington County under data sharing agreement. Accessed 2015. Modified by AA based on Property Access provided.
2. CVC Botany Study Area: Based on Peel Region Natural Areas Inventory Accessed 2015.
3. Open Water Communities. Provided by Wellington County under data sharing agreement. Accessed 2015.
4. Watercourse: Provided by Land Information Ontario (LIO) Accessed 2015.
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6. Ortho Image. Wellington County 2010. Provided by First Base Solutions Web Mapping Service 2015.

TOWN OF ERIN
PROGRESS IN UNITY

TRITON ENGINEERING SERVICES LIMITED
Consulting Engineers

Title: PROPERTY ACCESS & CVC BOTANICAL SURVEY AREA

Project: HILLSBURGH DAM MUNICIPAL CLASS EA

Date: Dec, 2015
Project: AA12-137A
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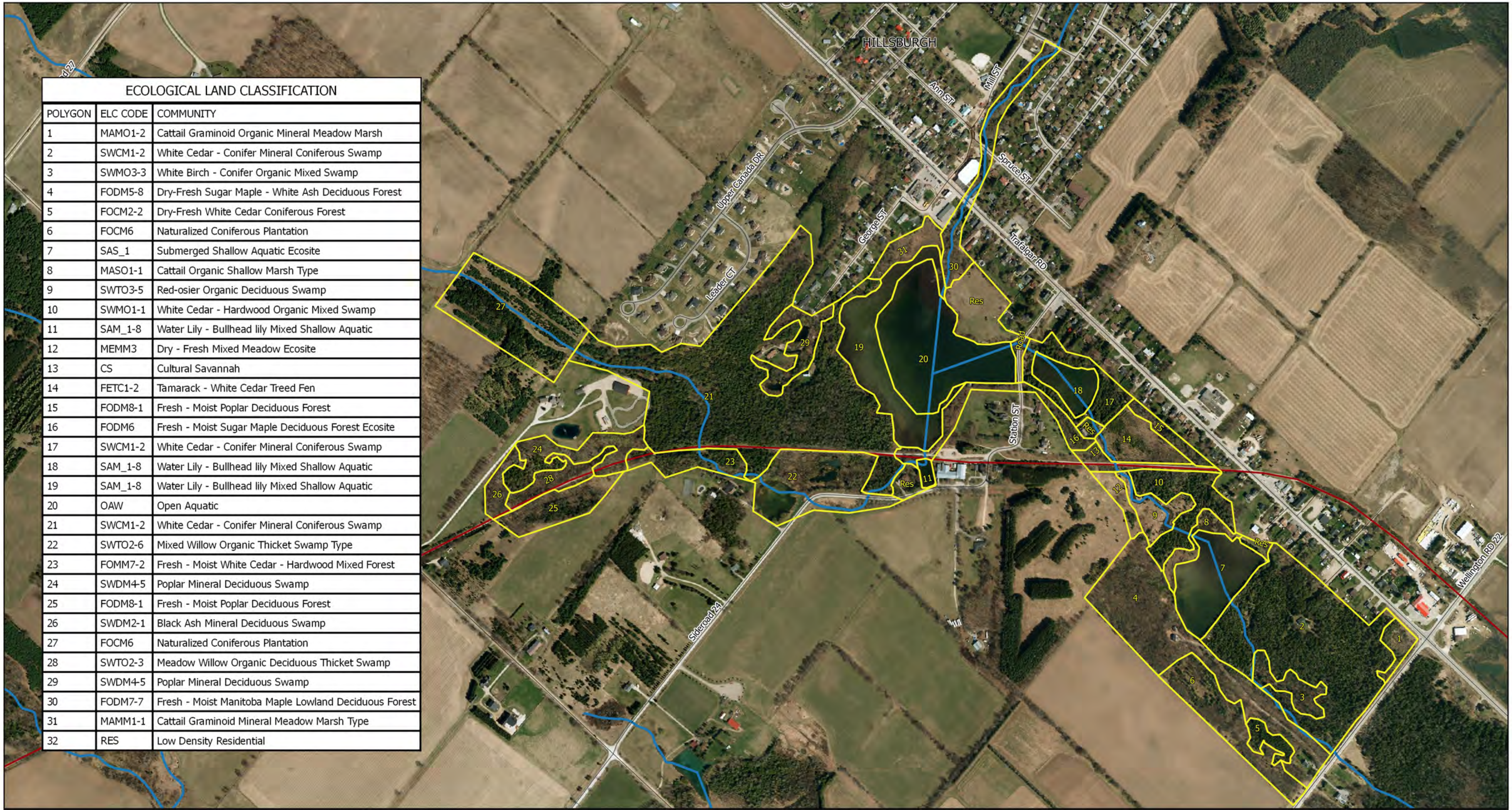
Figure No: 2



ECOLOGICAL LAND CLASSIFICATION

POLYGON	ELC CODE	COMMUNITY
1	MAMO1-2	Cattail Graminoid Organic Mineral Meadow Marsh
2	SWCM1-2	White Cedar - Conifer Mineral Coniferous Swamp
3	SWMO3-3	White Birch - Conifer Organic Mixed Swamp
4	FODM5-8	Dry-Fresh Sugar Maple - White Ash Deciduous Forest
5	FOCM2-2	Dry-Fresh White Cedar Coniferous Forest
6	FOCM6	Naturalized Coniferous Plantation
7	SAS_1	Submerged Shallow Aquatic Ecosite
8	MASO1-1	Cattail Organic Shallow Marsh Type
9	SWTO3-5	Red-osier Organic Deciduous Swamp
10	SWMO1-1	White Cedar - Hardwood Organic Mixed Swamp
11	SAM_1-8	Water Lily - Bullhead lily Mixed Shallow Aquatic
12	MEMM3	Dry - Fresh Mixed Meadow Ecosite
13	CS	Cultural Savannah
14	FETC1-2	Tamarack - White Cedar Treed Fen
15	FODM8-1	Fresh - Moist Poplar Deciduous Forest
16	FODM6	Fresh - Moist Sugar Maple Deciduous Forest Ecosite
17	SWCM1-2	White Cedar - Conifer Mineral Coniferous Swamp
18	SAM_1-8	Water Lily - Bullhead lily Mixed Shallow Aquatic
19	SAM_1-8	Water Lily - Bullhead lily Mixed Shallow Aquatic
20	OAW	Open Aquatic
21	SWCM1-2	White Cedar - Conifer Mineral Coniferous Swamp
22	SWTO2-6	Mixed Willow Organic Thicket Swamp Type
23	FOMM7-2	Fresh - Moist White Cedar - Hardwood Mixed Forest
24	SWDM4-5	Poplar Mineral Deciduous Swamp
25	FODM8-1	Fresh - Moist Poplar Deciduous Forest
26	SWDM2-1	Black Ash Mineral Deciduous Swamp
27	FOCM6	Naturalized Coniferous Plantation
28	SWTO2-3	Meadow Willow Organic Deciduous Thicket Swamp
29	SWDM4-5	Poplar Mineral Deciduous Swamp
30	FODM7-7	Fresh - Moist Manitoba Maple Lowland Deciduous Forest
31	MAMM1-1	Cattail Graminoid Mineral Meadow Marsh Type
32	RES	Low Density Residential

LEGEND

☐ ECOLOGICAL LAND CLASSIFICATION COMMUNITIES

— WATERCOURSE (West Credit River)

— ELORA CATARACT TRAILWAY

Information Sources:

1. Ecological Land Classification Communities Assessed and Mapped by Aboud & Associates Inc. 2015
2. Roads. Provided by Wellington County under data sharing agreement. Accessed 2015.
3. Watercourse: Provided by Land Information Ontario (LIO) Accessed 2015.
4. Ortho Image. Wellington County 2010. Provided by First Base Solutions Web Mapping Service 2015.

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PROGRESS IN UNITY

TRITON ENGINEERING SERVICES LIMITED
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Title: ECOLOGICAL LAND CLASSIFICATION

Project: HILLSBURGH DAM MUNICIPAL CLASS EA

Date: Dec, 2015
Project: AA12-137A
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Figure No: 3

Legend

- ▭ STUDY AREA
- ┅ WINTER WILDLIFE SURVEY TRANSECT
- ┅ BIRD MIGRATION TRANSECT (1-5)
- ◆ BREEDING BIRD POINT COUNT (1-10)
- ● AMPHIBIAN SURVEY (A-H)

CANDIDATE WILDLIFE HABITAT

- 🟨 SNAKES (S1-S4)
- 🟦 TURTLES (T1-T5)
- 🟪 MARSH BIRDS (MB1-MB4)

Information Sources:
1. Roads. Provided by Wellington County under data sharing agreement. Accessed 2015.
2. Ortho Image. Wellington County 2010. Provided by First Base Solutions Web Mapping Service 2015.

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TRITON ENGINEERING SERVICES LIMITED
Consulting Engineers

Title: WILDLIFE HABITAT TARGETS & SURVEY LOCATIONS

Project: HILLSBURGH DAM MUNICIPAL CLASS EA

Date: Dec, 2015
Project: AA12-137A
Scale: 1 : 8000

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Figure No: 4

LEGEND

🟧 STUDY AREA
— ELORA CATARACT TRAILWAY

FISH PASSAGE
- 🔴 FULL BARRIER
- 🟡 PARTIAL BARRIER

FISH COMMUNITY
- 🟦 COLD WATER
- 🟧 COOL WATER
- 🟥 WARM WATER
- |#| AQUATIC HABITAT SEGMENTS

Information Sources:

1. Fish Passage Barriers
Assessed and Mapped by Aboud & Associates Inc. 2015
2. Trout Spawning Habitat
Assessed and Mapped by Aboud & Associates Inc. 2015
3. Fish Communities: Assessed and Mapped by CVC
as shown in Erin Service and Settlement Master Plan, 2011.
4. Watercourse: Provided by Land Information Ontario (LIO)
Accessed 2015.
5. Roads. Provided by Wellington County under data sharing agreement.
Accessed 2015.
6. Ortho Image. Wellington County 2010. Provided by First Base Solutions
Web Mapping Service 2015.

TOWN OF ERIN
PROGRESS IN UNITY

TRITON
ENGINEERING
SERVICES
LIMITED
Consulting Engineers

Title: AQUATIC HABITAT ASSESSMENT

Project: HILLSBURGH DAM MUNICIPAL CLASS EA

Date:	Oct, 2016
Project:	AA12-137A
Scale:	1 : 8000

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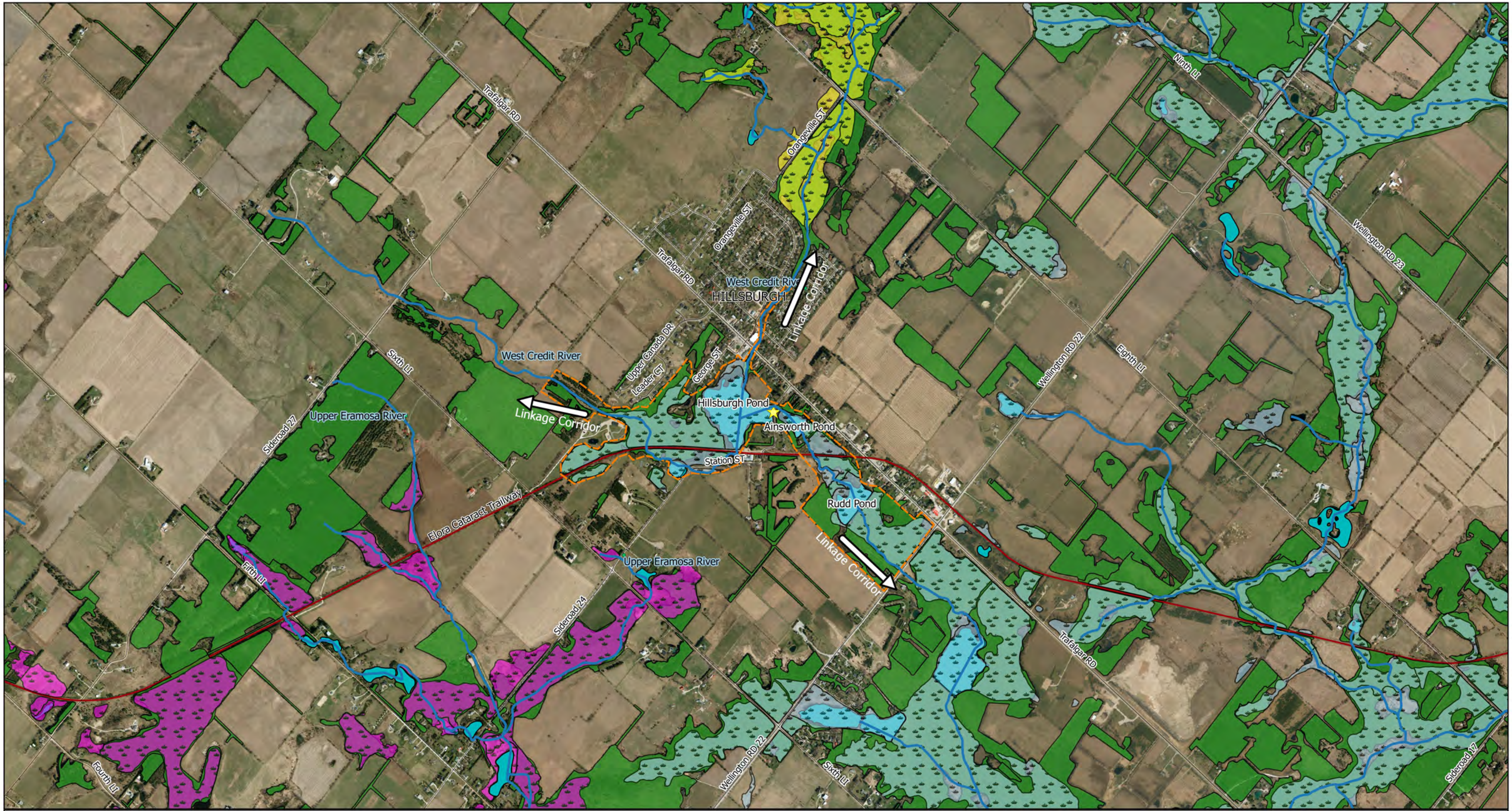
591 Woolwich Street . Guelph . Ontario . Canada . N1H 3Y5
T:519.822.6839 . F:519.822.4052 . info@aboudtng.com . www.aboudtng.com

Figure No: 5



LEGEND

▭ STUDY AREA	🟦 OPEN WATER COMMUNITIES
— WATERCOURSES	WETLANDS (PSW)
— ELORA CATARACT TRAILWAY	▨ West Credit River Wetland Complex
🟩 WOODED AREAS	🟨 Alton Hillsburgh Wetland Complex
☆ HILLSBURGH DAM	🟪 Speed Lutteral Swan Creek Wetland Complex

Information Sources:

1. Wooded Areas: Provided by Land Information Ontario (LIO) Accessed 2015.
2. Wetland: Provided by Land Information Ontario (LIO) Accessed 2015.
3. Open Water Communities. Provided by Wellington County under data sharing agreement. Accessed 2015.
4. Watercourse: Provided by Land Information Ontario (LIO) Accessed 2015.
5. Roads. Provided by Wellington County under data sharing agreement. Accessed 2015.
6. Ortho Image. Wellington County 2010. Provided by First Base Solutions Web Mapping Service 2015.

TOWN OF ERIN
PROGRESS IN UNITY

TRITON ENGINEERING SERVICES LIMITED
Consulting Engineers

Title: LANDSCAPE EVALUATION

Project: HILLSBURGH DAM MUNICIPAL CLASS EA

Date: Dec, 2015
Project: AA12-137A
Scale: 1 : 20000

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Consulting Arborists•Ecologists•Landscape Designers
591 Woolwich Street . Guelph . Ontario . Canada . N1H 3Y5
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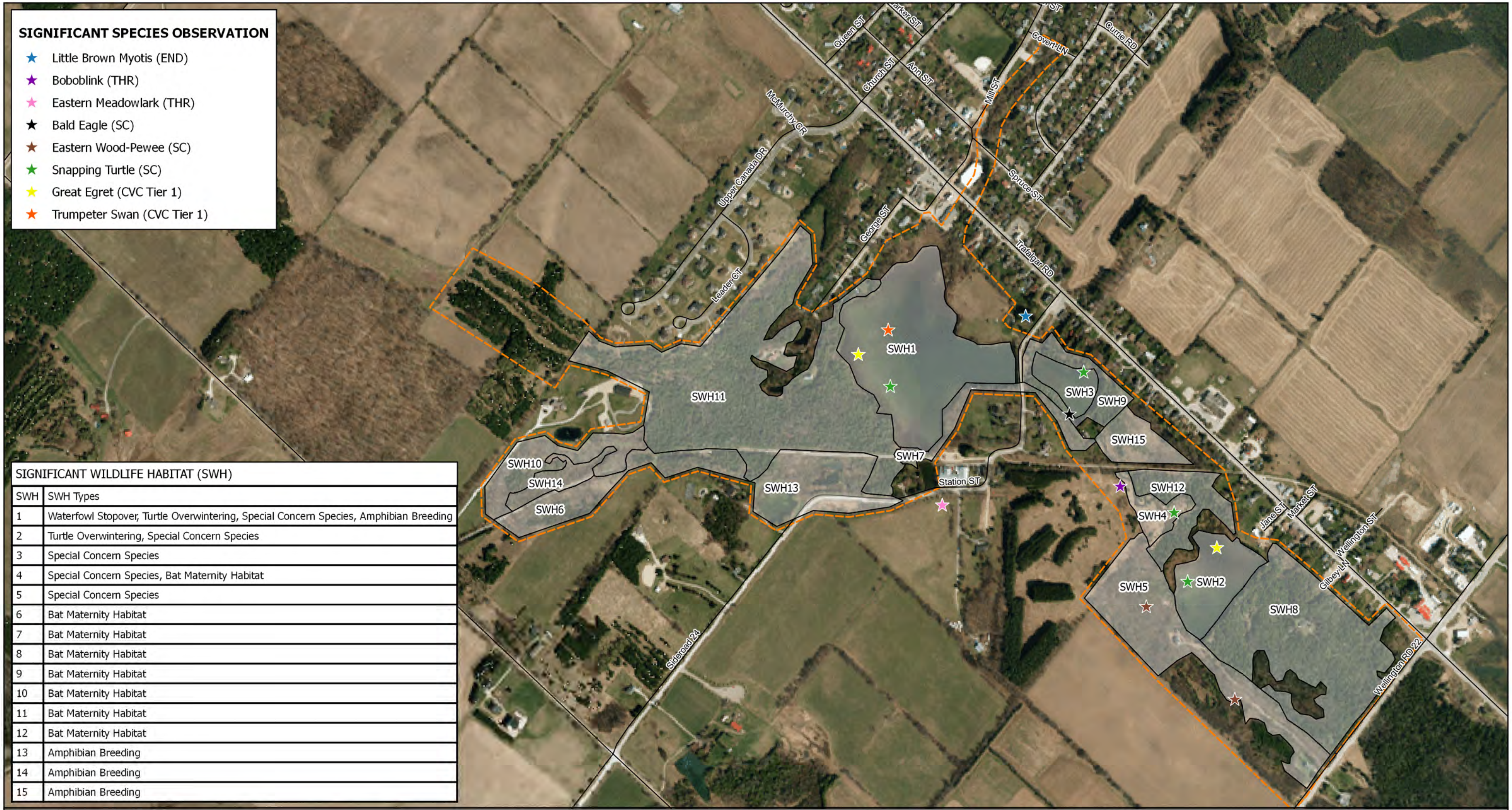
Figure No: 6



SIGNIFICANT SPECIES OBSERVATION

★	Little Brown Myotis (END)
★	Boboblink (THR)
★	Eastern Meadowlark (THR)
★	Bald Eagle (SC)
★	Eastern Wood-Pewee (SC)
★	Snapping Turtle (SC)
★	Great Egret (CVC Tier 1)
★	Trumpeter Swan (CVC Tier 1)

SIGNIFICANT WILDLIFE HABITAT (SWH)

SWH	SWH Types
1	Waterfowl Stopover, Turtle Overwintering, Special Concern Species, Amphibian Breeding
2	Turtle Overwintering, Special Concern Species
3	Special Concern Species
4	Special Concern Species, Bat Maternity Habitat
5	Special Concern Species
6	Bat Maternity Habitat
7	Bat Maternity Habitat
8	Bat Maternity Habitat
9	Bat Maternity Habitat
10	Bat Maternity Habitat
11	Bat Maternity Habitat
12	Bat Maternity Habitat
13	Amphibian Breeding
14	Amphibian Breeding
15	Amphibian Breeding

LEGEND

▭	STUDY AREA
▭	SIGNIFICANT WILDLIFE HABITAT (SWH)

Information Sources:

1. Significant wildlife Habitat and Significant Species Observations Assessed and Mapped by Aboud & Associates Inc. 2015
2. Roads. Provided by Wellington County under data sharing agreement. Accessed 2015.
3. Ortho Image. Wellington County 2010. Provided by First Base Solutions Web Mapping Service 2015.
4. Significant Species Status from SARO (2015) and CVC Species of Special Concern Project (2015).

TOWN OF ERIN
PROGRESS IN UNITY

TRITON ENGINEERING SERVICES LIMITED
Consulting Engineers

Title: SIGNIFICANT WILDLIFE OBSERVATIONS & SIGNIFICANT WILDLIFE HABITAT

Project: HILLSBURGH DAM MUNICIPAL CLASS EA

Date: Dec, 2015
Project: AA12-137A
Scale: 1 : 8000

ABOUD & ASSOCIATES INC.
Consulting Arborists•Ecologists•Landscape Designers
591 Woolwich Street . Guelph . Ontario . Canada . N1H 3Y5
T:519.822.6839 . F:519.822.4052 . info@aboudtng.com . www.aboudtng.com

Figure No: 7

Appendix 1

Notice of Study Commencement

CVC
CREDIT VALLEY CONSERVATION

December 19, 2014

Dear Mr. Ziegler:

Re: **Class Environmental Assessment Study – Schedule B**
Proposal for the improved safety of the Hillsburgh Dam and Bridge
Town of Erin

Further to receipt of the Notice of Commencement, November 27, 2014, CVC staff offer the following preliminary comments:

It is the understanding of CVC staff that the Town of Erin is undertaking a Class Environmental Assessment (EA) for the purpose of improving safety of the Hillsburgh Dam and bridge.

Site Characteristics:

The study area is traversed by the West Credit River and a tributary of the West Credit River, associated hazards (flooding and erosion). In addition, the area contains wetlands and associated adjacent lands. As a result portions of the study area are subject to the Authority's Development, Interference with Wetlands, and Alterations to Shorelines & Watercourses Regulation (Ontario Regulation 160/06). This regulation prohibits altering a watercourse or wetland and prohibits development within the regulated area without the prior written approval of CVC (i.e. a permit).

Permit Approval Requirements:

In accordance with Ontario Regulation 160/06 (our Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation), a permit would be required from the CVC prior to commencement of the works involving development, interference with a wetland and/or alterations to a watercourse or shoreline.

Fish Habitat and Department of Fisheries and Oceans (DFO):

Please note that CVC is no longer administering the *Fisheries Act* on behalf of Fisheries and Oceans Canada (DFO). As a result, it is up to the proponent to ensure that his/her project meets the DFO requirements under the self-assessment process. See the link below for a description of the self assessment process and a list of projects/activities where DFO review is not required: http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html. Measures to avoid causing harm are noted here: http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html

EA Study Objectives:

The EA Study must clearly identify and quantify the environmental constraints and enhancement opportunities within the study area, including the following:

Aquatic Habitat and Valleylands:
The project needs to evaluate alternatives that minimize impacts to the form and function of the West Credit River and Hillsburgh Pond and if possible include opportunities for enhancement. The EA should list and describe the natural features (fish habitat, etc.) and site characteristics (e.g. Rolling topography, high water table, buffering vegetation, etc.) in the study area that may pose constraints to the project.

Credit Valley Conservation 1255 Old Derry Road, Mississauga, Ontario L5N 6R4
Phone (905) 670-1615 Fax (905) 670-2210

Stormwater Management:

The project should include quality and quantity control measures to treat stormwater runoff in accordance with Ministry of Environment and CVC guidelines. Typically we request that the proponent provide treatment for all new proposed impervious areas and where possible existing road surfaces.

Hydraulics and Meander Belt

Any alterations to any watercourse crossings may require a hydraulic analysis to ensure that there are no negative up or down stream impacts. In addition, the road improvements or reconstruction at a minimum should maintain existing depth flooding on the road or improve the road such that it is flood free under Regional Storm conditions. In addition, CVC requests that new bridges and where possible replacement bridges span the calculated meander belt of the watercourse.

Subwatershed Study:

The EA should ensure that the subwatershed study environmental targets and objectives are identified and identify proposed measures that implemented these targets and objectives.

Erosion and Sediment Controls

During the detailed design period of this project, all proposed methods to control sedimentation during construction and potential erosion following the completion of the project must be detailed. Furthermore, as means of minimizing impacts to aquatic habitat all works must be completed in the dry.

Restoration

All disturbed areas will need to be stabilized and restored with native/non-invasive seed mixes and woody species.

Given CVC's interest staff would like to be kept informed of future meetings and proceedings through the Environmental Assessment process. Please forward any information or reports when available to ensure that this Authority's policy and program interest are reflected in the planning and design components for this project.

Should you have any further questions please contact the undersigned at (905) 670-1615 extension 406

Regards,

Tyler Slaght
Regulations Officer

cc: **Town of Erin**
Attention: Larry Van Wyck (via email)

Ministry of Natural Resources and Forestry Guelph District
Attention: Rose Whalen (via email)

Ministry of Natural Resources and Forestry Peterborough District
Attention: Doug Ryan (via email)

Ryan Hamelin

From:	Buck, Graham (MNRF) <Graham.Buck@ontario.ca>
Sent:	April-02-15 1:45 PM
To:	Ryan Hamelin
Cc:	Whalen, Rose (MNRF)
Subject:	RE: Hillsburgh SAR

Hi Ryan,

With respect to bats we generally only recommend surveys if there is the potential for impacts to the hibernation or roost habitats. If the impact is only to foraging habitat I do not think the activity will damage or destroy habitat.

With respect to Rusty-patched Bumblebee I agree the likelihood is extremely low, given the number of hours of survey completed for this species with very few individuals seen (3, all at Pinery). I would accept incidental observations during plant surveys. Staff can always take pictures of Bumblebees and submit them to http://bumblebeewatch.org/ if they are not confident if identification.

The 20102 protocol for Blanding's is still acceptable.

I will follow up with the survey protocols in another email.

Graham

Graham Buck
Management Biologist
Ministry of Natural Resources and Forestry
1 Stone Road West
Guelph ON
N1G 4Y2
519 826 4505
graham.buck@ontario.ca

From: Ryan Hamelin [mailto:ryan@aboudtng.com]
Sent: March-25-15 3:59 PM
To: Whalen, Rose (MNRF); Buck, Graham (MNRF)
Cc: Chris Clark; Paul Ziegler
Subject: RE: Hillsburgh SAR

Hi Rose and Graham,

As part of the Hillsburgh Dam EA the CVC has requested Targeted Surveys of all SAR with potential habitat within the Study Area.

Based on some winter field work and orthophotography interpretations, I have developed a proposed list of SAR to be surveyed for based on the identified habitat features. Attached is an Excel file with a comprehensive explanation of the proposed species be surveyed for, and what methods will be used.

Would the MNRF be able to provide the survey protocols for the following species? Do any of the survey protocols require handling permits or specific permission?

- Jefferson Salamander
- Eastern Small Footed Myotis
- Little Brown Myotis
- Northern Myotis
- Butlers Garter Snake
- Eastern Ribbon Snake
- Massasauga Rattlesnake
- Milk Snake
- Rusty-patched Bumble Bee

If possible could you comment on the need or benefit of surveying for the three SAR bat species? It would be expected that bats would use the study area for feeding, but there are no known caves, abandoned mines, cliffs or rock outcrops that could be used as over wintering habitat within the study area. Due to the lack of these Key Habitat features it is felt that targeted bat survey may not be necessary. The habitat is also not ideal for rusty-patched bumble bees and potential EA options would be unlikely to impact their habitat, could you also on the need for Rusty-patched Bumble Bee surveys ?

Could you confirm the appropriateness of using the 2012 Blanding's Turtle Survey Protocol to survey for the presence of Snapping Turtles and Spotted Turtles?

If it would be easier to discuss any of this information over the phone please feel free to call me.

Thanks for the assistance,

Ryan Hamelin

Ryan Hamelin, B.S.c (Env). M.Sc. Terrestrial and Wetland Ecologist
ABOUD & ASSOCIATES INC. 591 Woolwich Street . Guelph . Ontario . N1H 3Y5
T:519.822.6839 x 2 . F:519.822.4052 www.aboudtng.com . ryan@aboudtng.com

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From: Buck, Graham (MNRF) [mailto:Graham.Buck@ontario.ca]
Sent: February-10-15 11:48 AM
To: Ryan Hamelin
Subject: RE: SAR List

I have attached the most recent version of the Wellington County list.
It is always best to use the Guelph District list over the lists available online because the Guelph District list is more comprehensive and up to date.
The online lists should only be used in instances where the district does not maintain a species at risk by municipality list.

Graham Buck
Management Biologist
Ministry of Natural Resources and Forestry
1 Stone Road West
Guelph ON
N1G 4Y2

519 826 4505
graham.buck@ontario.ca

From: Ryan Hamelin [mailto:ryan@aboudtng.com]
Sent: February-10-15 11:11 AM
To: Buck, Graham (MNRF)
Subject: SAR List

Hi Graham,

I am developing a list of SAR that have the potential to be present at the Hillsburgh Dam Study Area. We have a list of SAR Know to occur in Wellington County that was supplied by the MNRF in the summer of 2013. I have also consulted the MNRF online – SAR by Area web-mapper for Wellington County (http://www.ontario.ca/environment-and-energy/species-risk-area). I have noticed that the two lists have some inconsistence in species. Could you confirm what SAR list should be used when assessing for potential SAR within Wellington County ?

I have attached a copy of the original SAR list supplied by the MNRF, with an additional column indicating what species are also listed on the MNRF website for Wellington County.

Thanks,

Ryan Hamelin

From: Buck, Graham (MNRF) [mailto:Graham.Buck@ontario.ca]
Sent: January-19-15 11:18 AM
To: Ryan Hamelin
Subject: RE: SAR / Turtle Survey

Hello Ryan,

I have attached the survey protocol for Blanding's Turtle. It has been finalized and can be used for this species. You may also be able to adapt it for other species.
MNRF Guelph also has draft survey protocols for Stinkpot, Spotted and Wood Turtle but they are not finalized and not applicable to Hillsburgh Dam EA. They are also very species specific and likely not as transferable to other turtles.

Graham Buck
Management Biologist
Ministry of Natural Resources and Forestry
1 Stone Road West
Guelph ON
N1G 4Y2
519 826 4505
graham.buck@ontario.ca

From: Ryan Hamelin [mailto:ryan@aboudtng.com]
Sent: December-23-14 4:39 PM
To: Buck, Graham (MNRF)
Cc: Whalen, Rose (MNRF)
Subject: SAR / Turtle Survey

Hello Graham Buck,

I hope you are doing well.

We are in the process of developing a work plan for a Municipal Class Environmental Assessment and are interested in Species at Risk and Turtle Surveys. Would you be able to provide any information on typical requirements for Species at Risk surveys and Turtle Surveys as part of Municipal Class Environmental Assessments, Schedule C ? Also, are there specific protocols or techniques that the MNRF endorses for Species at Risk and Turtle Surveys ?

The specific project and site of interest is the Hillsburgh Dam Environmental Assessment in the Township of Erin. Rose Whalen is the primary MNRF contact for the project. The subject property falls within CVC's watershed and they have asked about surveys for 'all' Species at Risk that could possibly be present.

Thanks,

Ryan Hamelin

Ryan Hamelin, B.S.c (Env). M.Sc. Terrestrial and Wetland Ecologist
ABOUD & ASSOCIATES INC. 591 Woolwich Street . Guelph . Ontario . N1H 3Y5
T:519.822.6839 x 2 . F:519.822.4052 www.aboudtng.com . ryan@aboudtng.com

Archived: December-04-15 1:46:29 PM
From: Hale, Lesley (MNRF)
Sent: June-30-15 11:00:38 AM
To: Cheryl-Anne Ross
Subject: RE: Hillsburgh mill Pond Bat study
Importance: Normal

Hi Cheryl
Here is a summary of the data from the last few years for the Hillsburgh church bat roost (please note the 2015 data has not been input yet):

Site Name	Primary Surveyor	Date	Sky Code	Wind Code	Temp	Start Time	End Time	Total Bats	Technique	Other Surveyors	Comments
Hillsburgh Church	Lesley Hale	June 20, 2012	1	1	26	21:34	22:23	113	visual	Paul Faure, Les Misch, John (Ryan) Caldwell, Lucas Greville	Mist nets set; 3 MYLU captured and banded 002453-002455
Hillsburgh Church	Lesley Hale	July 12, 2012	1	1	24	21:20	22:20	174	visual	Heather Riddell, Iga Stasiak, Ryan Caldwell	Mist nets set; 10 MYLU captured and banded; 002457-58, 002494-002498, 002500, 002483-84
Hillsburgh Church	Heather Riddell	July 4, 2013	1	1	22	21:20	22:08	125	visual	Iga Stasiak, Catherine Jong, Ryan Morin	5 MYLU captured in the mist net (2 mist nets set). 17 bats observed at the front; 108 observed at the back. Not enough surveyors for the side walls of the building.
Hillsburgh Church	Heather Riddell	July 23, 2013	3	4	15	21:01	22:00	106	visual	Les Misch, Dan Bourassa, Alejandra	7 MYLU captured, 2 released accidentally. All male bats. 1 mist net set.
Hillsburgh Church	Lesley Hale	June 9, 2014	1	1	18	21:30	22:15	110	visual	Benoit Talbot, Christy Humphrey	25 exited from south side near centre apex; 85 exited from west side from apex triangle; 6 returned after 22:00; 2 nets set along west line of trees; 17 MYLU and 1 EPFU captured and banded
Hillsburgh Church	Lesley Hale	July 10, 2014	2	1	15	21:15	22:23	219	visual	Christy Humphrey, Christina Smyth	200 bats exited from west wall near peak and 19 exited from south wall; 2 nets erected 37 MYLU captured and banded - no recaptures

As I mentioned, please feel free to join us for the next survey on July 20 (July 21 if it rains on 20th) at 8pm at the church. Bring a headlamp and a folding camp chair (it's a long night otherwise!) and be ready for lots of bugs. My cell number is 705-917-0373 in case you need to reach me.

Cheers

Lesley Hale

From: Cheryl-Anne Ross [mailto:Cheryl@aboudtng.com]
Sent: June-19-15 11:53 AM
To: Hale, Lesley (MNRF)
Cc: Ryan Hamelin
Subject: Hillsburgh mill Pond Bat study

Hi Lesley,

We've received your contact information from one of the councillors in the town of Erin (Jeff Duncan), regarding an ongoing study of a little brown bat population at the century Theater, near the station Street Dam. As your voicemail indicated you are out of the office quite a bit this week, I thought I would send an email to follow up on some of the information that we were provided.

Aboud & Associates is currently gathering Existing Information for a municipal class EA for the Station Street Dam, examining alternatives for the failing Dam, working closely with the Local MNRF branch, and the Credit Valley Conservation authority. It's recently come to our attention that the MNRF has been conducting bat assessment work in the vicinity of the station street Dam, and we would really appreciate any further information you could provide to us about the population. Particularly if any known maternity colonies may exist in the forested landscape in the vicinity of the Dam, as well as a discussion about protection of foraging habitat, and if there are any guidelines regarding foraging habitat or regulated habitat that might be in place. I am available until 4:00 pm today, and should be in the office all day Monday, if you would like to give me a call at the number below, my extension is 7.

Thank you,

TRITON ENGINEERING SERVICES LIMITED
Consulting Engineers

MEETING MINUTES

DATE: Wednesday, September 24, 2014

TIME: 10:00 a.m.

LOCATION: Credit Valley Conservation Authority Headquarters – 1255 Old Derry Road, Mississauga

OUR FILE: A4685E

RE: HILLSBURGH DAM, MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT, TOWN OF ERIN

Attendees:

T. Slaght, J. Wong, J. Clayton; Credit Valley Conservation Authority (CVC)

R. Whalen, D. Ryan; Ministry of Natural Resources and Forestry (MNRF)

L. Van Wyck; Town of Erin (Town)

S. Aboud, R. Hamelin; Aboud & Associates Inc. (Aboud)

C. Clark; Triton Engineering Services Limited (TESL)

1. C. Clark reviewed the projects history, from temporary works completed to repair the Dam/Road in 2011/2012 to the present permanent solution involving the completion of a Municipal Class Environmental Assessment (Class EA) to fulfill the requirements of the MNRF's Non-Application Emergency Works under the Lakes and Rivers Improvement Act.

2. D. Ryan asked if project Problem Statement has been formed. C. Clark to detail Problem Statement and circulate to project team. To be included as part of the Class EA Notice of Project Commencement, to be released shortly.

3. Aboud presented the proposed project Study Area with respect to the Natural Heritage investigations. MNRF and CVC recommended extension to Wellington Road 22 east to Trafalgar Rd. Logic behind Study Area was connectivity and impact to Provincially Significant Wetlands (PSW).

4. Aboud overviewed the required Natural Heritage information that is still outstanding for "desktop investigations".

    a. All data requests to go through T. Slaght (CVC) and R. Whalen (MNRF)
    b. All Natural Heritage data requests are to come from Aboud
    c. Aboud to submit revised Study Area to MNRF/CVC as part of formal data requests
    d. R. Whalen to provide mapping of wetland evaluations, if available

5. Aboud will be utilizing the services of Aquafor Beech for fish habitat investigations. Data required for this portion of investigations are as follows; fish community data (presence/absence, biomass), thermal regimes and temp data, spawning survey, benthic macroinverts, geomorphology, invasive species info (Round Goby) and fish habitat assessment.

6. J. Clayton overviewed available fish related data. This includes periodic fish inventories from 1954 to present, fish biomass collection, thermal records, presence of invasive Round Goby, spawning data (2010 - 2014).

    a. Temperature loggers currently on-site and logging and could be left longer into the fall/winter season if required.
    b. Groundwater seeps throughout system, but no specific locations identified in study area.
    c. Area is historically Brook Trout habitat, with population currently upstream and downstream of the pond.
    d. CVC considers the Banded Killifish and the Slimy Sculpin as important species due to the rarity in the watershed.

7. J. Clayton added that Round Goby control methods may be implemented this fall or next spring within the Hillsburgh Pond and other affected ponds along the watercourse. This would involve lowering the water levels and removing desirable fish species.

    a. May be an opportunity to inventory fish species at this time
    b. During previous public contact related to Goby eradication, public was opposed temporary water drawdowns

8. According to MNRF, there is no known presence of Species at Risk (SAR) within the Study Area. This will be confirmed through Aboud’s desktop/field investigations.

9. C. Clark reviewed existing hydraulic data completed as part of the temporary works, as well as, the Dam’s “High” Hazard Potential Classification (HPC). CVC agreed to share any relevant data/information completed or acquired post temporary dam repair works in order to perform any additional analysis.

    a. T. Slaght - CVC main criteria when evaluating EA options will be; 1) Flood hazard reduction 2) Sediment/Erosion impact reduction. There must be no negative impacts to flooding or erosion. The options reviewed should seek to improve these conditions, as well as; improve natural heritage features present. Flooding and erosion must be demonstrated as part of the Project File Report while sediment control can be established during the detailed design stage.

10. It was agreed that Geomorphology and Hydrogeology investigations be completed as part of the Class EA to cover all areas for the potential alternative outcomes.

    a. CVC has 2005 fluvial geomorphology data completed by PEIL for West Credit Watershed, which can be provided.
    b. Provincial Groundwater Monitoring Network and Source Water Protection data may help to provide background. Local water bottling company may also be a source of groundwater data.

11. C. Clark and L. Van Wyck reminded the group of the potential restrictions affecting the Class EA due to Town's property limitations. The Town owns the Station Street road right-of-way but not the north and south adjacent properties. A number of field investigations will need to be performed at these locations. The north landowner also owns the Hillsburgh Pond's stop-log control structure.

    a. D. Ryan reminded everyone of the adjacent landowners "riparian interests" to the Dam. This involves holding their concerns/interests at stake. Further, the Town can perform the Class EA to uphold their responsibilities to the Dam. Adjacent landowner has legislative responsibilities if dam were to fail.
    b. As the north adjacent landowner and the Town are affiliated "dam owners" and the requirements for land access to south pond (Ainsworth Pond), it was suggested and agreed that a personal letter be distributed to these parties to request their involvement in the Class EA process. This could eliminate any property access restrictions.

12. General discussion of how potential options could affect the existing PSW wetland complex. Due to the overall size of the Provincially Significant West Credit Wetland Complex it would be expected that a local reduction in extent around the Station Street Dam site would not affect the PSW status of the complex as a whole. However, specific areas that transition from wetland to upland due to changes in hydrology would no longer be included in the wetland complex and would therefore not have PSW status. However, this is to be determined as part of the Class EA process.

13. Those parties and members present at this meeting will be the main Project Team moving forward.

    a. Technical reporting and any project status updates to be provided approximately every three months.
    b. All documents will be reviewed by the Committee before release to the Public.
    c. Meetings will be scheduled as needed.

Project Next Steps/Actions Items:

1. Natural Heritage Study Area and project Terms of Reference to be completed and circulated to Committee for data requisitions.
2. Draft a letter to send to adjacent landowners requesting their personal involvement in the Class EA process.
3. Problem/Opportunity Statement to be developed and included in the Notice of Project Commencement to be released to public.
4. Next Status Up-date Mid-December 2014

Archived: December-04-15 1:49:37 PM
From: Thompson, Melinda (MNRF)
Sent: December-04-15 12:29:01 PM
To: Cheryl-Anne Ross
Cc: Buck, Graham (MNRF); Whalen, Rose (MNRF)
Subject: RE: hillsburgh dam EA project - Ecoregion Criteria clarification
Importance: Normal

Hi Cheryl

I believe our interpretation is that you need to have an amphibian breeding population of at least 20 individuals (this can be combined across species).

Melinda

MELINDA J. THOMPSON ❀ ❀ ❀ ❀ ❀

MANAGEMENT BIOLOGIST | ONTARIO MINISTRY of NATURAL RESOURCES and FORESTRY | GUELPH DISTRICT OFFICE
1 Stone Road West, Guelph, Ontario, N1G 4Y2 | ☎ 519.826.6543 | melinda.thompson@ontario.ca
Learn more about Ontario's Species at Risk

From: Cheryl-Anne Ross [mailto:Cheryl@aboudtng.com]
Sent: November 24, 2015 11:57 AM
To: Whalen, Rose (MNRF)
Cc: Buck, Graham (MNRF); Ryan Hamelin
Subject: hillsburgh dam EA project - Ecoregion Criteria clarification

Hi Rose,

We are working on completing the existing conditions report for the Hillsburgh Dam project, and I've run into some confusion in interpreting the defining criteria for confirmed SWH.

For Amphibian Breeding Habitat (Woodland), it states that:

'a population of 2 or more of the listed frog species with at least 20 individuals or 2 or more of the listed frog species with call level codes of 3'
are to be considered significant.

Does this indicate that if a station had, for example, 5 species of frogs, but did not have greater than 20 individuals of any two species, that the site would not be considered significant? Despite the fact that the site may have had greater than 20 individual frogs combined across species?

Any help with interpreting this criteria would be greatly appreciated!

Thank you,

Regards,
Cheryl-Anne Ross B.Sc. .

Appendix 2

Terms of Reference and Approval

ABOUD & ASSOCIATES INC.
Consulting Arborists • Ecologists • Landscape Designers

591 Woolwich Street
Guelph . Ontario
N1H 3Y5

T: 519.822.6839
F: 519.822.4052
info@aboudtng.com
www.aboudtng.com

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NATURAL SYSTEMS DESIGN
HABITAT RESTORATION
EDGE MANAGEMENT PLANS
RAVINE STEWARDSHIP PLANS
NATURALIZATION PLANS
INTERPRETIVE DESIGN
MONITORING
CONTRACT ADMINISTRATION

ENVIRONMENTAL STUDIES
SUBWATERSHED STUDIES
ENVIRONMENTAL IMPACT STATEMENTS
ECOLOGICAL LAND CLASSIFICATION
WETLAND EVALUATION
VEGETATION ASSESSMENT
BOTANICAL INVENTORIES
WILDLIFE SURVEYS
MONITORING

LANDSCAPE ARCHITECTURE
MASTER PLANNING
RESIDENTIAL COMMUNITIES
COMMERCIAL/INDUSTRIAL
HEALTHCARE AND EDUCATION
STREETSCAPES
PARKS AND OPEN SPACES
TRAIL SYSTEMS
GREEN ROOFS
CONTRACT ADMINISTRATION

EXPERT OPINION
OMB TESTIMONY
LEGAL PROCEEDINGS
PEER REVIEW
RESEARCH
EDUCATION

December 8, 2014

Our Project No: AA12-137A
Sent by email: cclark@trotoneng.on.ca

Tyler Slaght
Credit Valley Conservation
1255 Old Derry Road
Mississauga, Ontario
L5N 6R4

Care of:

Chris Clark
Triton Engineering Services Limited
105 Queen Street West, Unit 14
Fergus, Ontario
N1M 1S6

Re: Terms of Reference for Hillsburgh Dam Natural Heritage Existing Conditions Report as part of the Municipal Class Environmental Assessment

Dear Tyler,

This letter outlines the draft Terms of Reference (ToR) of the Hillsburgh Dam Natural Heritage Existing Conditions Report. This report is part of the Municipal Class Environmental Assessment (EA) to address the structural state of the existing earthen berm and dam.

Background and Context

The proposed study area for the project is a total of 78.5 hectares, centered on the Hillsburgh Dam and extending up stream to include the Hillsburgh pond, surrounding wetland and associated tributary sections. The study area also extends downstream from the dam to Wellington Road 22 and includes the associated wetlands and woodlands (see Natural Heritage Study Area Map). The larger landscape level context of the area will also be examined to evaluate the significance of the natural heritage features within the broader region.

The study area is contained entirely within the Town of Erin's municipal boundaries and the Credit Valley Conservation's (CVC) jurisdiction. The majority of the study area contains naturalized environments and hosts a wide variety of flora and fauna. Large sections of the study area contain part of the Provincially Significant West Credit Wetland Complex. The open water community of the Hillsburgh pond, created by the Hillsburgh dam is considered a 'rare community' within the region

ABOUD & ASSOCIATES INC.
Consulting Arborists•Ecologists•Landscape Designers

591 Woolwich Street
Guelph . Ontario
N1H 3Y5

T: 519.822.6839
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EDUCATION

according to Phase 1 Erin Service and Settlement Master Plan - Environmental Component. The tributaries above and below the dam are classified as cold water tributaries with associated cold water fish communities, whereas the on-line ponds and adjoining sections of tributaries are classified as warm water systems and fish communities. According to the Credit River Fisheries Management Plan, the Hillsburgh Dam is known to have negative fish community impacts through changes to the thermal regimes and imposed barriers to movement (CVC & MNR. 2002).

Proposed Terms of Reference

The ToR, provided below will be based on background natural heritage information (where available) and site visits by Aboud & Associates to collect detailed natural heritage information related to Ecological Land Classification (ELC) communities, flora, fauna, habitat, watercourses and fish. A description of these existing natural heritage features will be detailed. A preliminary assessment will be provided to determine potential impacts and opportunities to natural heritage features from potential design options to address the structural state of the dam.

ToR for the Natural Heritage Existing Conditions Report are listed below.

1. Conduct background screening of relevant documents, material and online mapping sources (e.g. NHIC, CVC, MNR-Guelph District, and Wellington County).
2. Conduct ELC evaluation and prepare ELC community mapping using available background resources, supplemented with 3 season ELC field evaluations and desktop analysis.
3. Complete a 3 season botanical inventory and review of past available inventories to develop a comprehensive list of flora species present. Review and update status of all identified species (SRank; GRank; COSEWIC; COSSARO; Local significance, as listed in Dougan & Associates and Snell & Cecile. 2009).
4. Provincially Significant Wetland:
    a. Review Wetland Evaluation file to determine presence of potentially significant features.
    b. Confirm accuracy of current wetland boundaries through desktop analysis and consultation with Ontario Ministry of Natural Resources and Forestry(MNRF).
    c. (Provisional): Confirm and re-stake wetland boundary of areas that are not current and that may be altered through changes to the dam structure. Work with MNRF to have new boundaries approved.
5. Bird Surveys:
    a. Complete breeding bird survey of study area, following the protocol of the Breeding Bird Atlas (Bird Studies Canada. 2001). Confirm the presence or absence of Eastern Meadowlark and Bobolink.
    b. Assess for the presence of the following Significant Wildlife habitat (MNR. 2000):
        i. Waterfowl Stopover and Staging areas
        ii. Shorebird migratory stopover area
        iii. Song bird migratory area
        iv. Raptor Wintering area

6. Winter Wildlife Survey:
    a. Conduct a survey for signs or sightings of winter wildlife and their associated habitat. Location of observed species will be recorded and mapped.
    b. Assess for the presence of the following Significant Wildlife habitats (MNR. 2000):
        i. Deer wintering yards
        ii. Deer Movement Corridors

7. Anuran Survey: Complete three evening anuran (frog and toad) call counts surveys for all potentially suitable habitat locations. Protocols described in the Marsh Monitoring Program will be followed (Marsh Monitoring Program. 2003).
8. Record incidental wildlife observations made during field investigations and combine data with existing wildlife inventories to create a comprehensive wildlife species list. Review and update status of all identified species (SRank; GRank; COSEWIC; COSSARO; Local significance, as listed in Dougan & Associates and Snell & Cecile. 2009).
9. Identify, describe and map wildlife habitat areas and assess for significance using Significant Wildlife Technical Guide (MNR. 2000) and MNRF input.
10. Identify specialized habitat or potential SAR habitat for SAR's known to occur in Wellington County. Will be completed using MNRF Wellington County SAR and Habitat Requirements Table along with ELC community maps, field investigation and aerial photo interpretation.
11. Fish:
    a. Compile fish community records from MNRF and CVC to create a comprehensive fish species list; supplement existing data with additional field sampling if necessary.
    b. Characterise fish habitat within the study area based on thermal regime, vegetation, barriers to movement, depth, pools and riffles, and substrate.
12. Assess the landscape level context of the study area within the broader region, including drainage line, migratory corridors, extended ELC communities, wetlands, and adjacent habitat and wildlife linkages. Specific focus of the landscape level context will be on fish communities and their movement within the West Credit River System.
13. Prepare an interim summary report of existing natural heritage conditions and a preliminary assessment of potential impacts and opportunities to natural heritage features. Detailed project information of species lists, maps, photographs and GIS files will be provided.

Yours truly,

ABOUD & ASSOCIATES INC.

Ryan Hamelin
Terrestrial and Wetland Ecologist

S:\A+A Projects\2012\12-137A Station Street Dam\Proposal

REFERENCES

Bird Studies Canada. 2001. *Ontario Breeding Bird Atlas Guide for Participants*. Environment Canada, Ministry of Natural Resources, Bird Studies Canada, Federation of Ontario Naturalists, and Ontario Field Ornithologists. 43 pp

CVC & MNR. 2002. Credit River Fisheries Management Plan. Credit Valley Conservation Authority and Ministry of Natural Resources. 5-36 pp

Dougan & Associates and Snell & Cecile. 2009. *Guelph Natural Heritage Strategy. Appendix A: Significant Plant List for Wellington County & Appendix B2: List of Significant Wildlife in Wellington County*. Guelph, Ontario.

Marsh Monitoring Program. 2003 Edition. *Training Kit and Instructions for Surveying Marsh Birds, Amphibians, and Their Habitats.* Published by Bird Studies Canada in cooperation with Environment Canada and the U.S. Environmental Protection Agency. 44 pp

MNR. 2000. Significant Wildlife Habitat: Technical Guide. Ministry of Natural Resources.

From: Slaght, Tyler <TSlaght@creditvalleyca.ca>
Sent: December-17-14 2:43 PM
To: 'Chris Clark'; 'rose.whalen@ontario.ca'
Cc: Steven Aboud; Ryan Hamelin; Paul Ziegler
Subject: RE: Hillsburgh Dam and Bridge Class EA - Natural Heritage Component - Project Terms of Reference

Hi Chris,

CVC has reviewed the terms of reference for the natural heritage component and provide the following comments:

1. CVC recommends the limits of the study area on the eastern tributary upstream of the pond be a formal reach break (e.g. road crossing, feature boundary) rather than an arbitrary break.

2. List and describe the natural areas on site, including any natural area designations as defined by CVC, the Town of Erin, Wellington County and/or the Ministry of Natural Resources.

3. Outline relevant federal, provincial, municipal and agency legislation and policies related to the natural area/s and designations that will be applied to options associated with the dam.

4. Please note that while the fish community in the Hillsburgh Pond is characterized by warm water species, the pond is managed as coldwater due to the presence of Brook Trout upstream and downstream of the pond. Mapping in the EA and mitigation measures (e.g. timing windows) should reflect this.

5. Review CVC's available water temperature data (to be provided) and fill data gaps as required. A thermal profile of the pond over as long a period as possible should be considered to assess stratification and the dissolved oxygen profile.

6. Please note that Round Goby, an invasive aquatic species, have been found upstream and downstream of Hillsburgh Dam. The presence and potential spread of this species should be considered in the EA.

7. Breeding bird surveys are to be completed in accordance with the Marsh Monitoring Program (CWS and Bird Studies Canada). That is, two surveys must be conducted at least 10 days apart between late May and July 5th. The surveys must be conducted in either the early morning and/or early evening depending on habitat and potential species present, as per the protocol.

8. In addition to the Significant Wildlife Habitat Technical Guide (MNR 2000), the assessment of Significant Wildlife habitat should follow the MNRF's SWH Ecoregion 6E Criterion Schedule. Based on criteria for Ecoregion 6E, data collected by CVC in 2011 and 2012 indicates that the Hillsburgh Pond is Significant Wildlife Habitat for Waterfowl Stopover and Staging Areas (Aquatic).
9. Surveys for Species at Risk should target all possible Species at Risk based on the presence of suitable habitat, and not just Meadowlark and Bobolink. Based on the habitat features present CVC questions whether surveys for Meadowlark and Bobolink are warranted. Target species may include, but are not limited to: Blanding's Turtle, Snapping Turtle, Least Bittern, Butternut, Chorus Frog, Barn Swallow, and Species-at-Risk bats. MNRF should be contacted for Species at Risk screening.

10. Complete turtle surveys and provide discussion on the suitability of features within the study area for overwintering, nesting and movement habitat.

11. In addition to assessing local rarity based on *Guelph Natural Heritage Strategy* (Dougan & Associates and Snell & Cecile, 2009), GPS the location and describe the distribution of all rare or uncommon species based upon *Vascular Plant Flora of the Region of Peel and the Credit River Watershed* (Kaiser, 2001 and amendments). CVC may request detailed mapping of the species occurrence at a later date.

12. CVC requests an invitation to be present for the staking of the PSW with the MNRF.

13. Identify mitigation measures/restoration opportunities to eliminate and/or minimize negative impacts associated with the preferred option.

Please let me know if you have any questions. Please note I will be out of the office between December 24 returning January 19.

Regards,

Tyler Slaght
Regulations Officer
Credit Valley Conservation
tslaght@creditvalleyca.ca | 905.670.1615 ext 406

From: Chris Clark [mailto:cclark@tritoneng.on.ca]
Sent: December 8, 2014 2:40 PM
To: Slaght, Tyler; 'rose.whalen@ontario.ca'
Cc: Steven Aboud; Ryan Hamelin (ryan@aboudtng.com); Paul Ziegler
Subject: Hillsburgh Dam and Bridge Class EA - Natural Heritage Component - Project Terms of Reference

Hi Tyler/Rose,

I have attached the Natural Heritage portion of the project's Terms of Reference for CVC and MNR review and comment. The Fluvial Geomorpholgy and Hydro technical Terms of Reference will follow under separate cover.

Let us know if you have any questions or require clarification on anything.

Thanks,

Chris Clark, M.A.Sc. E.I.T.

Triton Engineering Services Limited
105 Queen Street West, Unit 14 Fergus, ON N1M 1S6
Tel - (519) 843-3920 • Fax - (519) 843-1943 • www.tritoneng.on.ca

Ryan Hamelin

From: Ryan Hamelin
Sent: January-06-15 10:34 AM
To: 'Slaght, Tyler'
Cc: Chris Clark; Steven Aboud; Larry Van Wyck
Subject: RE: Hillsburgh Dam and Bridge Class EA - Natural Heritage Component - Project Terms of Reference

Hello Tyler,

Thank you for your comments on our proposed Terms of Reference (ToR) for the Hillsburgh Dam EA.

Throughout this process we want to be as efficient as possible in our project, and to make sure we are not completing any unnecessary work or analyses. Based on that, is there any proposed actions in our initial ToR that the CVC feels would not need to be included as part of the EA process?

Based on your provided comments there are a few points that we would like some clarification on before finalizing our ToR. I have addressed each of your comments below and where applicable requested additional information or clarification on a few of the points (4,5,7,8,9).

CVC Comments and Aboud & Associates Notes:

1. CVC recommends the limits of the study area on the eastern tributary upstream of the pond be a formal reach break (e.g. road crossing, feature boundary) rather than an arbitrary break.
    - This can be accommodated by moving the study boundary downstream approximately 100 m to Covert Lane in Hillsburgh. The further upstream reaches will still be included in the landscape level analysis already proposed. An updated study area map has been provided to show the new limits of the study area.

2. List and describe the natural areas on site, including any natural area designations as defined by CVC, the Town of Erin, Wellington County and/or the Ministry of Natural Resources.
    - This is already accounted for as part of the background screening outlined in Term 1 of the proposed Terms of Reference. We will re-write the Term to more directly address your comment in the final ToR.

3. Outline relevant federal, provincial, municipal and agency legislation and policies related to the natural areas and designations that will be applied to options associated with the dam.
    - This is already accounted for as part of the background screening outlined in Term 1 of the proposed Terms of Reference. We will re-write the Term to more directly address your comment in the final ToR.

4. Please note that while the fish community in the Hillsburgh Pond is characterized by warm water species, the pond is managed as coldwater due to the presence of Brook Trout upstream and downstream of the pond. Mapping in the EA and mitigation measures (e.g. timing windows) should reflect this.
    - This difference between the actual thermal regime and associated fish species vs. how the Hillsburgh Pond is managed will be noted and may have implications around recommended mitigation measures. Are the two ponds directly downstream from the Hillsburgh Pond also managed in the same way (i.e. Cold water)? Besides timing windows, are there other CVC active fish management decisions or actions associated with cold water management?

5. Review CVC's available water temperature data (to be provided) and fill data gaps as required. A thermal profile of the pond over as long a period as possible should be considered to assess stratification and the dissolved oxygen profile.
    - We have already received temperature Data from CVC that has continuous monitoring from June 3rd to November 15th for 2013. From this data we can assess temperature profiles of the distinct tributary reaches and comment on the seasonal fluctuations. Does CVC have Temperature data for additional years? The data we have already received appears to be a complete and accurate temperature profile for the study area and I would not anticipate collecting additional temperature data.

    - Does CVC already have the data on lake stratification and dissolved oxygen profile, or would this be something that has to be collected? If the data has not been collected could you expand on the expectation of the study as well as the relevance to the Dam EA and how it should be used to assess impacts or determine best options?

6. Please note that Round Goby, an invasive aquatic species, have been found upstream and downstream of Hillsburgh Dam. The presence and potential spread of this species should be considered in the EA.
    - We can specifically assess the potential impact of Round Goby movement and habitat as part of our already proposed background fish screening studies to be completed. Since the CVC and MNRF already have records of the Goby upstream and downstream of the Dam I wouldn't expect any additional sampling to be required.

7. Breeding bird surveys are to be completed in accordance with the Marsh Monitoring Program (CWS and Bird Studies Canada). That is, two surveys must be conducted at least 10 days apart between late May and July 5th. The surveys must be conducted in either the early morning and/or early evening depending on habitat and potential species present, as per the protocol.
    - This was part of our initial ToR, but was under a different protocol reference. The actual study methodology is the same between the ToR and CVC comments and will be completed in accordance to the Marsh Monitoring Program.

    - Part of the data already received from the CVC includes a two visit Breeding Bird Survey Completed by Bob Curry in June and July 2009. Can this data be used to fulfil the Breeding Bird Survey Requirements of the EA, or does a new full Breeding Bird Survey need to be completed? If the CVC survey suffices, could the meta data such as study area maps be provided ?

8. In addition to the Significant Wildlife Habitat Technical Guide (MNR 2000), the assessment of Significant Wildlife habitat should follow the MNRF's SWH Ecoregion 6E Criterion Schedule. Based on criteria for Ecoregion 6E, data collected by CVC in 2011 and 2012 indicates that the Hillsburgh Pond is Significant Wildlife Habitat for Waterfowl Stopover and Staging Areas (Aquatic).
    - The SWH Ecoregion 6E Criterion Schedule will be used in conjunction with the Significant Wildlife Habitat Technical Guide.

    - Can the detailed data from the past CVC SWH studies be provided?

9. Surveys for Species at Risk should target all possible Species at Risk based on the presence of suitable habitat, and not just Meadowlark and Bobolink. Based on the habitat features present CVC questions whether surveys for Meadowlark and Bobolink are warranted. Target species may include, but are not limited to: Blanding's Turtle, Snapping Turtle, Least Bittern, Butternut, Chorus Frog, Barn Swallow, and Species-at-Risk bats. MNRF should be contacted for Species at Risk screening.
    - Our initial Terms of Reference proposed a background Species at Risk Habitat Screening using the Wellington MNRF SAR list. Consultation with MNRF has started regarding their requirements for

Specie at Risk surveys, techniques and to identify specific target species. The CVC will be provided a list of proposed species at risk to be surveyed for based on consultation with MNRF.

10. Complete turtle surveys and provide discussion on the suitability of features within the study area for overwintering, nesting and movement habitat.
    - Will be added to our terms of reference. Consultation with MNRF has started regarding requirements and methodology for Turtle surveys.

11. In addition to assessing local rarity based on *Guelph Natural Heritage Strategy* (Dougan & Associates and Snell & Cecile, 2009), GPS the location and describe the distribution of all rare or uncommon species based upon *Vascular Plant Flora of the Region of Peel and the Credit River Watershed* (Kaiser, 2001 and amendments). CVC may request detailed mapping of the species occurrence at a later date.
    - This component will be added to our ELC surveys and plant inventories field surveys and mapped.

12. CVC requests an invitation to be present for the staking of the PSW with the MNRF.
    - Wetland boundary delineation was included as a provisional item in the ToR if the existing wetland boundary was found to be inaccurate and needed to be refined. If boundaries are staked and re-delineated for any portions of the study area CVC would be informed and invited to participate in the approval of the new boundary delineation. Based on preliminary interpretation of the current wetland boundary and ortho images it appears the delineated boundary may be a reasonably accurate representation of the actual wetland feature. It is our opinion that the wetland boundary would only need to be re-delineated if found to be inaccurate and unsuitable for identifying preferred EA options.

    - Could you please comment as to CVC's position regarding if portions of the wetland boundary need to be re-delineated as part of the existing features study, or if the 2005 MNRF updated boundary should suffice.

13. Identify mitigation measures/restoration opportunities to eliminate and/or minimize negative impacts associated with the preferred option.
    - As part of the EA, opportunities for mitigation / restoration of the preferred options will be provided.

It should also be noted that the majority of the study area is on private property and access has not yet been granted for large sections of the Natural Heritage study area. Communication with landowners is ongoing and permission to access properties has been requested. However, it is still likely that much of the proposed study area will not be accessible. In these instances, where access to portions of the study area are not granted, alternative study methods such as observation from adjacent lands, orthophotography analysis, and background materials will be used to characterise the existing conditions of the property.

Thank you Tyler for reviewing the ToR and providing detailed comments. Perhaps it would be best to have a phone conversation to clarify the above points and to better understand the CVC's positions. If you could let me know if there is a time we could talk that would be appreciated.

We look forward to hearing back from you.

Ryan Hamelin

Ryan Hamelin, B.S.c (Env). M.Sc. Terrestrial and Wetland Ecologist

Ryan Hamelin

From: Slaght, Tyler <TSlaght@creditvalleyca.ca>
Sent: January-23-15 10:13 AM
To: Ryan Hamelin
Cc: 'Chris Clark'
Subject: RE: Hillsburgh Dam and Bridge Class EA - Natural Heritage Component - Project Terms of Reference

Hi Ryan,

We've put together some responses to your questions, see below. If have you any further questions, perhaps our ecology staff can chat with you, it probably makes more sense for something like this. Let me know which points you still have questions about and I'll arrange to have them call you.

#4. The 2 ponds downstream of the Station Street pond are also managed the same way (i.e. warmwater species present but managed for the coldwater species that are up and downstream). The only other "formal" management action that was in the Credit River Fisheries Management Plan would be requesting a 30m buffer rather than a 15m buffer.

#5. Continuous Temperature logging data for six sites in the summer of 2014 is available. CVC has no data on water temperatures or dissolved oxygen levels in the pond. This would be useful for assessing the existing impacts of the pond (e.g. does it stratify, do anoxic conditions exist) and benefits of some mitigation options (e.g. installation of a bottom draw and determining discharge volumes).

#6. No additional surveys for Round Goby are needed.

#7: Additional surveys are required as Bob Curry's surveys were completed over a smaller study area and did not include the pond. The meta data can be provided.

#8: As above, no concerns with providing the data.

#12: As indicated in the ToR, CVC is of the understanding that staking of the wetland boundary is provisional and dependent upon consultation with MNRF.   If MNRF determines that the PSW boundary requires staking, CVC requests an invitation to be present.

For the additional information above we will put that together and send it to you as soon as possible.

Regards,

Tyler Slaght
Regulations Officer
Credit Valley Conservation
tslaght@creditvalleyca.ca | 905.670.1615 ext 406

From: Ryan Hamelin [mailto:ryan@aboudtng.com]
Sent: January 21, 2015 11:01 AM
To: Slaght, Tyler

Ministry of Natural Resources and Forestry

Ministère des Richesses naturelles et des Forêts

Ontario

Guelph District
1 Stone Road West
Guelph, Ontario
N1G 4Y2

Telephone: (519) 826-4955
Facsimile: (519) 826-4929

January 26, 2015

Ryan Hamelin
Aboud & Associates Inc.
591 Woolwich Street
Guelph, ON
N1H 3Y5

Dear Mr. Hamelin

Re: Terms of Reference for Hillsburgh Dam, Natural Heritage Existing Conditions Report As Part of the Municipal Class Environmental Assessment

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The Ministry of Natural Resources and Forestry Guelph District Office (MNRF) had a chance to review the attached terms of reference (ToR) for the Hillsburgh dam regarding the existing natural heritage conditions report as part of the Municipal Class Environmental Assessment and offer the following comments:

- If the order in which the surveys/screening presented in the ToR is in chronological order, it may be beneficial for the survey to identify specialized habitat or potential SAR habitat for SAR to occur immediately after the Ecological Land Classification (ELC) evaluation.
  This may inform the types of surveys required for the subject properties.
- Some of the described surveys may be limited due to property access. How does Aboud & Associates plan to resolve this?
- A proposed clarification in the Background and Context section, regarding the comment "whereas the on-line ponds and adjoining sections of tributaries are classified as warm water systems and fish communities". This should be amended to reflect that the stream sections between the Hillsburgh and Ainsworth pond and between Ainsworth and Rudd pond have coldwater fish communities.
- Regarding 5 a. Bird surveys, confirm the presence of other SAR along with Eastern Meadowlark and Bobolink.
- Regarding 6 b. i, Deer wintering yards are referred to as Deer Winter Congregation Areas in this area.

Thank you for giving us the opportunity to review. If you have any questions, please do not hesitate to contact me

Sincerely,

Rose Whalen
T: 519-826-4910

ABOUD & ASSOCIATES INC.
Consulting Arborists•Ecologists•Landscape Designers

591 Woolwich Street
Guelph . Ontario
N1H 3Y5

T: 519.822.6839
F: 519.822.4052
info@aboudtng.com
www.aboudtng.com

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SUBWATERSHED STUDIES
ENVIRONMENTAL IMPACT STATEMENTS
ECOLOGICAL LAND CLASSIFICATION
WETLAND EVALUATION
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BOTANICAL INVENTORIES
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PARKS AND OPEN SPACES
TRAIL SYSTEMS
GREEN ROOFS
CONTRACT ADMINISTRATION

EXPERT OPINION
OMB TESTIMONY
LEGAL PROCEEDINGS
PEER REVIEW
RESEARCH
EDUCATION

April 10, 2015

Our Project No: AA12-137A
Sent by email: cclark@trotoneng.on.ca

Tyler Slaght
Credit Valley Conservation
1255 Old Derry Road
Mississauga, Ontario
L5N 6R4

c/o:

Chris Clark
Triton Engineering Services Limited
105 Queen Street West, Unit 14
Fergus, Ontario
N1M 1S6

Re: Proposed Targeted Species at Risk Survey

Dear Tyler,

As requested, Aboud & Associates Inc. have undertaken a review of all Species at Risk (SAR) which may occur in the project location using the Wellington County MNRF species at risk list.

The following targeted surveys for SAR are proposed for the Hillsburgh dam, existing conditions report. Species which were not considered likely in the project location are discussed in brief, following the recommended surveys, and the specifics of their exclusion. The accompanied summary table includes proposed surveys for all SAR within Wellington County, including SAR surveys which follow general survey protocols (e.g. Breeding Bird Protocol).

Jefferson Salamander Surveys
Likelihood of occurrence: Possible, populations located north-east of project location in Orangeville area and east of project location, south of Caledon.

Proposed field work:

1. In 2015, Visual surveys for *Ambystoma* egg masses in candidate ponds identified during initial site visit will be inspected in early April by a qualified wildlife ecologist to determine the presence or absence of any *Ambystoma* species occurring in the project location. Jefferson Salamanders are one of three *Ambystoma* species in Ontario, these survey will help to determine the possible presence of Jefferson Salamander within the Study area. Site visit timings will occur within less than 15 days of approximate salamander movement windows, in order to ensure salamander egg hatches have not yet occurred.

   Survey Methods: Visual inspection of any candidate pools will be performed on sunny cloudless days in April, using polarized lenses, with no entry into candidate pools. All egg masses will be identified based on characteristics as frog, toad or salamander, with no effort to determine salamander species in order to avoid disturbance of egg masses and entry into ponds.

2. Should *Ambystoma* egg masses occur in candidate habitat during 2015 visual surveys, application for permits and subsequent field planning for salamander trapping surveys would be expected to occur in late March-early April 2016, after acquiring all permits and training personnel. Survey methods will follow the Jefferson Salamander sampling protocol as provided by the Guelph MNR (2013).

Bat Maternity Roost Surveys
Likelihood of occurrence: probable, all three species are found throughout Ontario.

Target Species: Eastern small-footed Myotis (*Myotis Leibii*), Little Brown Myotis (*Myotis lucifugus*), and Northern Myotis (*Myotis septentrionalis*)

Proposed Desktop work:

1. Identification of all ELC communities (FOD, FOM, FOC, SWD, SWM, SWC) which may be considered candidate bat maternity habitat, following guidelines provided in the bat and bat habitat: guidelines for wind projects (2011), will be treated as confirmed habitat and appropriate mitigation will be applied as outlined below. This proposed methodology is based on communication with Guelph District MNRF, which “only recommend surveys if there is potential for impacts to the hibernation or roost habitat.” (pers. comm. Graham. Buck 2015)

Mitigation recommendations- tree removal must occur outside bat maternity season, from September-April, in all habitats considered candidate bat maternity habitat based on ELC results.

Turtle Basking Surveys
Likelihood of occurrence: Blanding's turtle-Possible, populations occur in the vicinity of Guelph and Luther Marsh. Snapping turtle-Probable, populations occur throughout southern Ontario. Spotted turtle-unlikely, populations of spotted turtle are generally found in the vicinity of Georgian Bay and along the Lake Erie shoreline.

Target species: Blanding's turtle (Emydonidea Blandingii), snapping turtle (chelydra serpentine), spotted turtle (Clemmys guttata)

Proposed field work:
A total of 5 Basking surveys in all candidate habitats within the project location will be conducted in 2015 following the MNR Guelph district Blanding's survey protocol (2012). Basking surveys, including overwintering (late march-early April) and summer habitat (late April-June 15), will be conducted in all waterbodies and wetlands.
Methods: All shorelines and potential basking sites in the project location will be surveyed from the sunlit side using high power binoculars or a spotting scope. If shorelines are obstructed by vegetation, surveys will be conducted from canoe or while wearing waders in water as required; provided that access is granted. Between late March and early May, surveys will be conducted between 9am and 5pm. between late May and early June turtles are less reliably found late in the day, as a result surveys will occur between 9am and 12pm. When temperatures fall between 6c and 10c, surveys may only occur on sunny days with no wind between 10am and 5pm, at full sunlight basking sites. When temperatures fall between 10c and 25c, surveys will be conducted between 9am and noon on sunny days.

Snake Visual Encounter and Active Hand Search Surveys
Target Species: Eastern ribbonsnake (*Thamnophis sauritus*), milksnake (*Lamptropeltis Triangulum*)

Proposed field work:
Visual encounter and active hand search surveys will occur from late April through late June in all candidate habitats identified during initial ELC screening and site visit. A minimum of 3 surveys, two weeks apart, searching all suitable habitats and flipping any natural or naturalized cover, will occur in all suitable habitat identified in the project location.

Methods: surveys will occur on sunny days when air temperatures are between 8c and 25c, and on overcast day's air temperatures must be above 15c. Surveys will follow pre-determined transects, traversing all areas of suitable habitat for both eastern ribbonsnake and milksnake.

West Virginia White Visual Survey
Likelihood of occurrence: possible, species host plant occurs in the project location.

Proposed field work:
Visual surveys for adults and caterpillars will occur within moist, deciduous woodlands in areas where two-leaved toothwort has been previously identified by the CVC. Surveys will be conducted during spring botanical surveys. Caterpillars feed on the two-leaved toothwort which blooms from April to June. Caterpillars will be looked for carefully on the host plant.

Species that are unlikely to occur in the project location for which targeted surveys exist:

Barn Owl- No habitat is present within the project location, barn owl have not been identified as occurring in the vicinity of the project location. During the second breeding bird Atlas, a single Barn owl was identified in Wellington County with no confirmation on breeding status. This species is unlikely to occur in the project location.

Bobolink and Eastern meadowlark- these grassland bird species are unlikely to occur in the project location, no grassland habitat, pasture or fallow fields were identified through air photo interpretation or initial site visits. Presence/absence will be confirmed through Breeding bird Surveys.

Nightjar survey (Common nighthawk and Whip-poor-will) – habitat for these species was not identified in the project location based on air photo interpretation and initial site visit. As a result, no additional targeted surveys are recommended.

Least bittern – No suitable habitat was identified in the project location. Targeted surveys are not recommended. General Marsh monitoring playback surveys for marsh birds will occur in appropriate habitat in the project location.

Short-eared owl - No suitable habitat was identified in the project location. Targeted surveys are not recommended.

Fish Species at Risk- Black redhorse, Redside Dace and Silver Shiner were not documented in past fish surveys conducted by MNRF or CVC. Ideal habitat is not present. No surveys to be conducted.

Rusty-patched bumble- Not documented in project location. No suitable habitat was identified in the project location. Discussion with Graham Buck at the MNRF indicates that there is no requirement to complete targeted surveys for this species in the project location, if a bee is identified as suspect, photos and UTM will be recorded during botanical surveys.

Mollusc Species at Risk –Rainbow mussel and Wavy-rayed lampmussel have not been identified in the Upper Credit River, Ideal habitat is not present in project location, not detected during previous aquatic sampling.

Butler's gartersnake- Ideal habitat for this species is unlikely to occur in the project location based on air photo interpretation and initial site visit. Butler's gartersnake occur in fragmented populations in Ontario, the nearest population is located in Luther marsh, which is ~30km from the project location. One home range study in Michigan indicated that Butler's gartersnake occupy a very small home range, with a maximum distance of 300m. It is unlikely that Butler's gartersnake would occur in the Project location as a result of the distance to the nearest known population.

Massasauga rattlesnake- Ideal habitat is unlikely to occur in the project location. This species is only known to occur historically in Wellington County; as a result, it is unlikely to occur in the project location.

Yours truly,

ABOUD & ASSOCIATES INC.

Cheryl-Anne Ross, B.Sc., Wildlife Ecologist

Ryan Hamelin, M.Sc, Terrestrial and Wetland Ecologist

cc. P. Ziegler, Triton Engineering Services Ltd
C. Clark, Triton Engineering Services Ltd
R. Whalen, Ministry of Natural Resources and Forestry

WELLINGTON - Upper Tier - MNRF SAR List

Species At Risk Designations	
ENDANGERED	🟥
THREATENED	🟨
SPECIAL CONCERN	🟩
EXTIRPATED	⬜

AMPHIBIANS		**ESA Protection**	**Proposed Survey Action**
Jefferson Salamander (*Ambystoma jeffersonianum*)	🟥 Known to Occur	*Species Protection and* ***Habitat Regulation***	Targeted Survey - Egg Survey
BIRDS		**ESA Protection**	**Proposed Survey Action**
Acadian Flycatcher (*Empidonax virescens*)	🟥 Suspected to Occur	*Species and General Habitat Protection*	Breeding Bird Survey
Bald Eagle (*Haliaeetus leucocephalus*)	🟩 Known to Occur	*N/A*	Breeding Bird Survey
Bank Swallow (Riparia riparia)	🟨 Known to Occur	*Species and General Habitat Protection June 27, 2014*	Breeding Bird Survey
Barn Owl (*Tyto alba*)	🟥 Known to Occur	*Species Protection and* ***Habitat Regulation***	Breeding Bird Survey - No targeted night survey based on lack of suitable habitat
Barn Swallow (Hirundo rustica)	🟨 Known to Occur	*Species and General Habitat Protection*	Breeding Bird Survey
Black Tern (*Childonias niger*)	🟩 Known to Occur	*N/A*	Breeding Bird Survey
Bobolink (*Dolichonyx oryzivorus*)	🟨 Known to Occur	*Species and General Habitat Protection*	Breeding Bird Survey
Canada Warbler (*Cardellina canadensis*)	🟩 Suspected to Occur	*N/A*	Breeding Bird Survey
Cerulean Warbler (*Setophaga cerulea*)	🟨 Known to Occur	*Species and General Habitat Protection*	Breeding Bird Survey
Chimney Swift (*Chaetura pelagica*)	🟨 Known to Occur	*Species and General Habitat Protection*	Breeding Bird Survey
Common Nighthawk (*Chordeiles minor*)	🟩 Known to Occur	*N/A*	Breeding Bird Survey- No additional targeted survey based on lack of appropriate habitat.
Eastern Meadowlark (*Sturnella Magna*)	🟨 Known to Occur	*Species and General Habitat Protection*	Breeding Bird Survey - Three survey days to confirm absence
Eastern Wood-Pewee (*Contopus virens*)	🟩 Known to Occur	*N/A*	Breeding Bird Survey
Eastern Whip-poor-will (*Caprimlugus vociferus)*	🟨 Known to Occur	*Species and General Habitat Protection*	Breeding Bird Survey- No additional survey based on lack of appropriate habitat.
Golden-winged Warbler (Vermivora chrysoptera)	🟩 Known to Occur	*N/A*	Breeding Bird Survey
Henslow's Sparrow (*Ammodramus henslowii)*	🟥 Known to Occur	*Species and General Habitat Protection*	Breeding Bird Survey
Least Bittern (*Ixobrychus exilis)*	🟨 Known to Occur	*Species and General Habitat Protection*	Breeding Bird Survey- No additional survey based on lack of appropriate habitat.
Loggerhead Shrike (Lanius ludovicianus)	🟥 Historically Known to Occur	*Species and General Habitat Protection*	Breeding Bird Survey

Hillsburgh Dam EA: SAR Summary Table
Proposed Targeted Species at Risk Surveys

April 9, 2015

BIRDS		ESA Protection	Proposed Survey Action
Louisiana Waterthrush *(Seiurus motacilla)*	Suspected to Occur	*N/A*	Breeding Bird Survey
Northern Bobwhite (Colinus virginianus)	Known to Occur	*Species and General Habitat Protection*	Breeding Bird Survey
Olive-sided Flycatcher (Contopus cooperi)	Suspected to Occur	*N/A*	Breeding Bird Survey
Red-Headed Woodpecker *(Melanerpes erythrocephalus)*	Known to Occur	*N/A*	Breeding Bird Survey
Short-eared Owl *(Asio flammeus)*	Known to Occur	*N/A*	Breeding Bird Survey - No targeted night survey based on lack of habitat
Wood Thrush (Hylocichla mustelina)	Known to Occur	*N/A*	Breeding Bird Survey
Yellow-breasted Chat *(Icteria virens)*	Historically Known to Occur	*Species and General Habitat Protection*	Breeding Bird Survey

FISH		ESA Protection	Proposed Survey Action
Black Redhorse *(Moxostoma duquesnei)*	Known to Occur	*Species and General Habitat Protection*	Not identified in past MNRF or CVC sampling. No targeted survey to be conducted.
Redside Dace *(Clinostomus elongatus)*	Known to Occur	*Species Protection and **Habitat Regulation***	Not identified in past MNRF or CVC sampling. No targeted survey to be conducted.
Silver Shiner *(Notropis photogenis)*	Known to Occur	*Species and General Habitat Protection*	Not identified in past MNRF or CVC sampling. No targeted survey to be conducted.

INSECTS		ESA Protection	Proposed Survey Action
Monarch Butterfly *(Danaus plexippus)*	Known to Occur	*N/A*	Survey following MNRF survey protocol
Rusty-patched Bumble Bee (Bombus affinis)	Formerly Occurred and May Still Occur	*Species and General Habitat Protection*	Incidental observation during plant surveys. (pers. Comm. Graham Buck 2015)
West Virginia White (Pieris virginiensis)	Known to Occur	*N/A*	Survey following MNRF survey protocol

MAMMALS		ESA Protection	Proposed Survey Action
Eastern Small-footed Myotis (Myotis leibii)	Suspected to Occur	*Species and General Habitat Protection as of June 27, 2014*	Desktop habitat identification, following Guideline for Wind Projects (2011)
Grey Fox *(Urocyon cineroargenteus)*	Known to Occur	*Species and General Habitat Protection*	Winter Wildlife survey and incidental wildlife. No targeted survey based on habitat and past observations.
Little Brown Myotis (Myotis lucifugus)	Known to Occur	*Species and General Habitat Protection*	Desktop habitat identification, following Guideline for Wind Projects (2011)
Northern Myotis (Myotis septentrionalis)	Known to Occur	*Species and General Habitat Protection*	Desktop habitat identification, following Guideline for Wind Projects (2011)

MOLLUSCS		ESA Protection	Proposed Survey Action
Rainbow Mussel *(Villosa iris)*	Known to Occur	*Species and General Habitat Protection*	No Targeted Survey - Not identified in the Upper Credit River
Wavy-rayed lampmussel *(Lampsilis fasciola)*	Known to Occur	*Species and General Habitat Protection*	No Targeted Survey - Not identified in the Upper Credit River

Hillsburgh Dam EA: SAR Summary Table

Proposed Targeted Species at Risk Surveys

April 9, 2015

PLANTS		ESA Protection	Proposed Survey Action
American Chestnut *(Castanea dentata)*	Known to Occur	*Species and General Habitat Protection*	Plant Inventory
American Ginseng *(Panax quinquefolius)*	Known to Occur	*Species and General Habitat Protection*	Plant Inventory
Butternut *(Juglans cinerea)*	Known to Occur	*Species and General Habitat Protection*	Plant Inventory
Hill's Pondweed *(Potamogeton hillii)*	Known to Occur	*N/A*	Plant Inventory

REPTILES		ESA Protection	Proposed Survey Action
Blanding's Turtle *(Emydonidea blandingii)*	Known to Occur	*Species and General Habitat Protection*	Turtle Survey - Blanding's Turtle Protocol
Butler's Gartersnake *(Thamnophis butleri)*	Known to Occur	*Species and General Habitat Protection*	No Targeted Survey - Unlikely to occur in project study area based on habitat
Eastern Ribbonsnake *(Thamnophis sauritus)*	Known to Occur	*N/A*	Visual Encounter and Active Hand Search Surveys
Massassauga Rattlesnake *(Sistrurus catenatus)*	Historically Known to Occur	*Species and General Habitat Protection*	No Targeted Survey - Unlikely to occur in project study area based on habitat
Milksnake *(Lampropeltis triangulum)*	Known to Occur	*N/A*	Visual Encounter and Active Hand Search Surveys
Snapping Turtle *(Chelydra serpentina)*	Known to Occur	*N/A*	Turtle Survey - Blanding's Turtle Protocol
Spotted Turtle *(Clemmys guttata)*	Known to Occur	*Species and General Habitat Protection*	Turtle Survey - Blanding's Turtle Protocol

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From: Slaght, Tyler <TSlaght@creditvalleyca.ca>
Sent: April-13-15 1:06 PM
To: Ryan Hamelin
Cc: Cheryl-Anne Ross; Chris Clark; Paul Ziegler; Whalen, Rose (MNRF)
Subject: RE: Hillsburgh Dam and Bridge Class EA - Natural Heritage Component - Project Terms of Reference

Hi Ryan,

This looks good to us.

Regards,

Tyler Slaght
Regulations Officer
Credit Valley Conservation
tslaght@creditvalleyca.ca | 905.670.1615 ext 406

From: Ryan Hamelin [mailto:ryan@aboudtng.com]
Sent: April 10, 2015 2:41 PM
To: Slaght, Tyler
Cc: Cheryl-Anne Ross; Chris Clark; Paul Ziegler; Whalen, Rose (MNRF)
Subject: FW: Hillsburgh Dam and Bridge Class EA - Natural Heritage Component - Project Terms of Reference

Hi Tyler,

I hope you are doing well.

In response to Comment 9. of CVC's earlier Terms of Reference review, Aboud & Associates have completed a SAR Targeted Survey proposal for all SAR possibly present within the Hillsburgh Dam Study Area, based on available habitat. A SAR habitat assessment was completed based on winter field observations, background resources and orthophotography interpretation. A proposed list of possible SAR was circulated to MNRF Guelph District for comments and recommendation on survey protocol.

The attached letter details our proposed survey protocol for specie specific targeted surveys or desk top analysis's. The accompanying table outlines the proposed action for all Wellington County SAR. Please let us know if you have any comments or recommendation regarding our proposed SAR Survey approach.

Also, I would like to introduce you to Aboud & Associates newest staff Member, Cheryl-Anne Ross. Cheryl-Anne is our new Wildlife Ecologist and will be leading the wildlife portion of the Hillsburgh Dam EA.

Thanks,

Ryan Hamelin

Ryan Hamelin, B.S.c (Env). M.Sc. Terrestrial and Wetland Ecologist
ABOUD & ASSOCIATES INC. 591 Woolwich Street . Guelph . Ontario . N1H 3Y5
T:519.822.6839 x 2 . F:519.822.4052 www.aboudtng.com . ryan@aboudtng.com

APPENDIX 3. SITE INVESTIGATION DETAILS

Hillsburgh Dam Environmental Assessment, Natural Heritage - Existing Conditions

SURVEY	DATE	TIME	OBSERVER(S)	TEMP	WIND	CLOUD COVER	PRECIPITATION	PRECIPITATION - PAST 24h
Winter Wildlife	25/02/2015	10:00-16:35	R. Hamelin, M. Iles	-10	2	20	none	snow-1cm
Anuran	15/04/2015	20:31-22:04	C.A. Ross, R.Hamelin	7	1	10	none	none
Salamander Egg Mass Survey	15/04/2015	13:30-17:45	C.A., Ross, R. Hamelin	12	2	5	none	none
Snake Basking	15/04/2015	13:30-17:45	C.A., Ross, R. Hamelin	12	2	5	none	none
Wildlife Habitat Assessment-spring	15/04/2015	13:30-17:45	C.A., Ross, R. Hamelin	12	2	5	none	none
Snake Basking	29/04/2015	9:00-13:00	C.A. Ross, R. Hamelin	10	2	15	none	none
Turtle Basking	29/04/2015	9:25-11:30	C.A. Ross, R.Hamelin	10	1	10	none	none
Turtle Basking	08/05/2015	9:20-11:00	C.A. Ross	19	1	10	none	none
ELC Spring	13/05/2015	9:30 -16:45	R. Hamelin	8	3		none	rain
Snake Basking	14/05/2015	11:30- 12:30	R. Hamelin	16	2	10	none	none
ELC Spring	14/05/2015	12:30- 17:00	R. Hamelin	17	2		none	none
Turtle Basking	15/05/2015	10:10-11:31	R. Hamelin	11	2	10	none	none
ELC Spring	22/05/2015	9:00-16:45	R. Hamelin	12	3		none	none
Anuran	28/05/2015	21:25-22:55	C.A. Ross, R.Hamelin	19	1	0	none	none
Turtle Basking	28/05/2015	10:27-11:45	C.A. Ross	18	2	0	none	rain
Breeding Bird	11/06/2015	7:00-10:53	C.A. Ross	17	3	10	none	rain
Marsh Breeding Birds	11/06/2015	7:00-11:01	C.A. Ross	17	3	10	none	rain
Turtle Basking	11/06/2015	9:10-10:47	R. Hamelin	17	2	20	none	rain
ELC Spring	11/06/2015	12:30- 16:30	R. Hamelin	22	2		rain	rain
Anuran	24/06/2015	21:37-22:54	C.A. Ross, R.Hamelin	16	1	0	none	none
Breeding Bird	09/07/2015	6:22-10:23	C.A. Ross	14	0	80	none	none
Marsh Breeding Birds	09/07/2015	6:22-10:30	C.A. Ross	14	0	80	none	none
ELC Summer	30/07/2015	9:00-16:45	R. Hamelin	27	2		none	none
Shorebird Habitat Assessment	05/08/2015	9:30-10:15	C.A. Ross	17	3	10	none	none
Shorebird Survey	05/08/2015	9:30-10:15	C.A. Ross	17	3	10	none	none
Wetland Boundary Verification	05/08/2015	9:00-14:45	R. Hamelin	23	2		none	rain
ELC Summer	05/08/2015	10:00- 17:00	R. Hamelin	23	2		none	rain
ELC Summer	10/08/2015	9:00-14:45	R. Hamelin	22	1		rain	none
ELC Fall	24/09/2015	10:00- 17:00	R. Hamelin	24	1		none	none
ELC Fall	25/09/2015	9:30 -16:45	R. Hamelin	22	2		none	none
Songbird Migration	08/10/2015	7:20-9:40	C.A. Ross	5	1	0	none	none
Wildlife Habitat Assessment-fall	08/10/2015	9:40-11:00	C.A. Ross	5	1	0	none	none
Aquatic Habitat Assesment	19/10/2015	9:00-14:00	R. Hamelin	13.5	2	5	rain	none

ELC Code	Map ID	Vegetation Type	Community Description
Mixed Meadow (MEM)			
MEMM3	12	Dry - Fresh Mixed Meadow Ecosite	This community is of cultural influence with evidence of past disturbance and clearing. The community is dominated by a mixture of Fringed Brome (*Bromus ciliates*), Common Milk Weed (*Asclepias syriaca*), Tall Goldenrod (*Solidago altissima*), Canada Goldenrod (*Solidago canadensis*) and a variety of Aster species. A mixture of small shrub and trees are present along the edge of the community where vegetation clearing has not occurred recently.
Coniferous Forest (FOC)			
FOCM2-2	5	Dry-Fresh White Cedar Coniferous Forest	This community is composed almost entirely of Eastern White Cedar (*Thuja occidentalis*) with little to no understory or ground cover. The Cedar community is dense with some individuals in poor condition due to overcrowding. Soil is a well-drained mineral soil on a moderate slope.
FOCM6	27	Naturalized Coniferous Plantation	Access was not available for this community. ELC is based on observations from a distance and through air photo interpretation. The community is a Naturalized Coniferous Plantation containing approximately equal amounts of mature Norway Spruce (*Acer platanoides*), White Spruce (*Picea glauca*), Eastern White Pine (*Eastern White Pine*) and White Cedar. Understory and ground cover communities are unknown, as well as soil and moisture properties.
FOCM6	6	Naturalized Coniferous Plantation	This community is of cultural influences, with evidence of past disturbance and plantings. The canopy is comprised of a mixture of primarily planted species with some volunteer establishment of native tree species from surrounding communities. Dominant canopy species include; European Larch (*Larix decidua*) and White Pine, with White Ash (*Fraxinus americana*), Red Oak (*Quercus rubra*), Sugar Maple (*Acer saccharum ssp. saccharum*), Black Cherry (*Prunus serotina*), Balsam Fir (*Abies balsamea*) and White Cedar associates. Sub-canopy and understory is dense in areas, with Choke Cherry (*Prunus virginiana*), Domestic Apple (*Malus pumila*), European Buckthorn (*Rhamnus cathartica*), and Tartarian Honeysuckle (*Lonicera tatarica*). The Community contains an inclusion of Dry-Fresh Forb Meadow Ecosite (MEFM1) composed primarily of Tall Goldenrod, Canada Goldenrod, New England Aster (*Symphyotrichum novae-angliae*) and White Heath Aster (*Symphyotrichum ericoides var. ericoides*).
Mixed Forest (FOM)			
FOMM7-2	23	Fresh - Moist White Cedar - Hardwood Mixed Forest	This narrow community occurs between the Elora-Cataract Trail way and residential properties. Co-dominant species within the community are Eastern White Cedar and White Birch (*Betula papyrifera*); other canopy tree species include Balsam Poplar (*Populus balsamifera*), Trembling Aspen (*Populus tremuloides*), Domestic Apple, American Elm (*Ulmus americana*), Black Cherry, Sugar Maple and White Ash. The understory contains a variety of woody species, with Alternate-leaf Dogwood (*Cornus alternifolia*) and White Ash saplings as the most abundant species. Ground layer varies inversely with the abundance of White Cedar and includes Red Trillium (*Trillium erectum*), Smooth Yellow Violet (*Viola macloskeyi*), Labrador Violet (*Viola labradorica*), Wild Leek (*Allium tricoccum var. tricoccum*) and Sensitive Fern (*Onoclea sensibilis*). Canopy composition varies and includes a complex of Fresh - Moist White Cedar Coniferous Forest Type, that is almost entirely White Cedar, with little understory of ground cover.
Deciduous Forest (FOD)			
FODM5-8	4	Dry-Fresh Sugar Maple - White Ash Deciduous Forest	This large upland community is dominated by Sugar Maple, with White Ash as sub-dominant. Associates include; Black Cherry, Red Oak, White Cedar, Balsam Fir, American Elm, Trembling Aspen, Eastern Hop-hornbeam (*Ostrya virginiana*), Basswood (*Tilia americana*) and Birch species. The community is mature containing a number of large trees with a DBH of 50 cm or greater. Understory and ground layer cover is diverse, and includes; Yellow Trout-lily (*Erythronium americanum*), Smooth Yellow Violet (*Viola pubescens var. scabriuscul*), Blood Root (*Sanguinaria canadensis*), Red Baneberry (*Actaea rubra*), and Giant Blue Cohosh (*Caulophyllum giganteum*), as well as a number of upland grass and sedge species.
FODM6	16	Fresh - Moist Sugar Maple Deciduous Forest Ecosite	This long narrow community borders residential properties and has a high edge to area ratio. Cultural influences include plantings within the community and property maintenance along the edge of the community. Sugar Maple is the dominant canopy species in the community with an abundance of Manitoba Maple (*Acer negundo*) and Green Ash (*Fraxinus pennsylvanica*) in the wetter areas. Other canopy species include Black Walnut (*Juglans nigra*), Balsam Poplar, White Ash and planted White Pine, European Alder (*Alnus glutinosa*), and Freeman's Maple (*Acer x freemanii*). The sub-canopy and understory is dense with immature canopy species, and a variety of native and non-native shrub and herbaceous species. Low trees and shrubs are often covered with Riverbank Grape (*Vitis riparia*) and Wild Mock-cucumber (*Echinocystis lobata*).
FODM7-7	30	Fresh - Moist Manitoba Maple Lowland Deciduous Forest	This culturally influenced riverine community occurs along the tributary within the town of Hillsburgh, upstream of the main pond. The canopy is dominated by Manitoba Maple and Crack Willow (*Salix fagilis*), with occurrences of American Elm, Sugar Maple, and Black Cherry, White Willow (*Salix alba*), Black Walnut and Scots Pine (*Pinus sylvestris*). The understory is a mix of native and non-native shrub and herbaceous species. Soil moisture varies with proximity from the watercourse, with more wetland characteristics directly adjacent to the tributary.

ELC Code	Map ID	Vegetation Type	Community Description
FODM8-1	25	Fresh - Moist Poplar Deciduous Forest	This upland community is located between the Elora-Cataract Trail way and agricultural lands. The co-dominant tree species in the community are Trembling Aspen and Sugar Maple, the two trees species are generally separated within the community, with the Sugar Maple dominant along the trail edge. Associate canopy tree species include Bass Wood, White Ash, and White Cedar. The understory includes young White Ash along with Alternate-leaf Dogwood, Wild Red Raspberry (Rubus idaeus ssp. strigosus) and Staghorn Sumac (*Rhus typhina*) along the community edge.
FODM8-1	15	Fresh - Moist Poplar Deciduous Forest	This is a narrow culturally influenced community behind residential properties. The community is dominated by Trembling Aspen and Balsam Poplar with occurrences of Norway Maple, Manitoba Maple, Black Cherry, and White Cedar. Understory species are a mixture of native species and exotic weedy species such as Goutweed (*Aegopodium podagraria*) and Colt's Foot (*Tussilago farfara*). Soil is mineral with moisture varying from Fresh to Moist.
Coniferous Swamp (SWC)			
SWCM1-2	17	White Cedar - Conifer Mineral Coniferous Swamp	This community surrounds the Ainsworth Pond and the lands directly south of the Pond. The community is dominated by Eastern White Cedar, with occurrences of a variety of other deciduous and coniferous species as minor canopy components. The understory is a diverse variety of mostly native plants, which includes Downy Serviceberry (*Amelanchier arborea*) and Alderleaf buckthorn (*Rhamnus alnifolia*) , with Dwarf Scouring Rush (*Equisetum scirpoides*) among the ground layer species. Surface water and organic soil is present throughout much of the community with some areas of dry mineral soil. The community is complexed with Fresh - Moist White Cedar Coniferous Forest Types around the upland edge of much of the community.
SWCM1-2	21	White Cedar - Conifer Mineral Coniferous Swamp	This large community is comprised predominantly of White Cedar - Conifer Mineral Coniferous Swamp, with a complex of Fresh - Moist White Cedar - Hardwood Mixed forest Type (FOMM7-2) in the drier, more upland areas. Soil within the community varies from organic in areas to primarily mineral. The community is mature and includes a variety of canopy tree species. Canopy cover is greater than 60% throughout most of the community, with areas of reduced canopy providing a diversity of light conditions and ground cover. The dominant canopy species is Eastern White Cedar and Balsam Fir as the subdominant species. Associates include White Spruce, Black Spruce, American Larch (*Larix laricina*), Eastern Hemlock (*Tsuga Canadensis*), White Birch, Yellow Birch (*Betula alleghaniensis*), Red Maple (*Acer rubrum*), Trembling Aspen and Green Ash, among other less frequent species. Sub-canopy has lower coverage of between 10% and 25% and is comprised of immature canopy species along with occurrences of Red-osier Dogwood (*Cornus sericea*), Alternate-leaf Dogwood and Tartarian Honeysuckle. The understory and ground layer includes a variety of mostly native forbs, graminoids and ferns. Understory cover varied with light exposure and soil moisture.
SWCM3-2	2	White Cedar – Conifer Organic Coniferous Swamp	This large community extends from Wellington Road 22 to the berm of the Rubb pond. The community is dominated by White Cedar, with White Spruce, Black Spruce (*Picea mariana*), Balsam Fir, American Larch, White Ash, Green Ash, American Elm, Wild Black Cherry, Trembling Aspen, Balsam Poplar, White Birch and Yellow Birch. Canopy cover is greater than 60 % throughout most of the community with small patches of opening. Understory is composed of immature canopy species, as well as Alternate-leaf Dogwood, Red-osier Dogwood, Choke Cherry, February Daphne (*Daphne mezereum*) and Tartarian Honeysuckle. Understory and ground cover is a mixture of graminoids and forbs that varied greatly in cover and composition depending on moisture and canopy cover. The community contains an inclusion of Cattail Organic Meadow Marsh and is complexed with a Fresh - Moist White Cedar - Hardwood Mixed Forest Type (FOMM7-2), which is of similar species composition, but with dry mineral soils.
Mixed Swamp (SWM)			
SWMO1-1	10	White Cedar - Hardwood Organic Mixed Swamp	This community is primarily White Cedar - Hardwood Organic Mixed Swamp, complexed with Fresh - Moist White Cedar - Hardwood Mixed Forest Type (FOMM7-2), which is of similar species composition, but dry and with mineral soil. Dominant canopy species within the community are White Cedar and Balsam Fir with a variety of deciduous species throughout the community. Understory and groundcover varied inversely with canopy cover, species composition varyies based on moisture. The community is primarily organic soil with a complex of mineral soils.
SWMO3-3	3	White Birch - Conifer Organic Mixed Swamp	This riverine community is similar in species composition to the adjacent White Cedar – Conifer Organic Coniferous Swamp community, with a lower component of conifers and high proportion of White Birch, Yellow Birch and Poplar species. The community is located along the tributary and is bordered by a driveway that allows greater light penetration to the understory and ground layer. Soil composition is mixed, with organic soil in the lower areas and mineral soil on the slopes. Canopy cover is greater than 60 %, with sub canopy, understory and ground layer cover between 25% and 60%.
Deciduous Swamp (SWD)			
SWDM2-1	26	Black Ash Mineral Deciduous Swamp	This community is dominated by Black Ash (*Fraxinus nigra*), with American Elm, and Trembling Aspen associates; and Sugar Maple occurs in the more upland areas along the trail way. The community has a sparse understory of Common Elderberry (*Sambucus Canadensis*), Inserted Virginia Creeper (*Parthenocissus inserta*), Smooth Gooseberry (*Ribes hirtellum*) and Wild Black Currant (*Ribes americanum*). Herbaceous ground cover is sparse with Sensitive Fern, Downy Yellow Violet (*Viola pubescens var. pubescens*) and Garlic Mustard (*Alliaria petiolate*) as the most common species, along with various grasses and sedges.

ELC Code	Map ID	Vegetation Type	Community Description
SWDM4-5	24	Poplar Mineral Deciduous Swamp	This community is dominated by Trembling Aspen, with White Birch as the sub-dominant canopy species. Other tree species include; White Cedar, Black Spruce and Green Ash, with Black Cherry and Sugar Maple in the more upland areas. The understory contains immature canopy species, and a mix of Willow and Dogwood species.
SWDM4-5	29	Poplar Mineral Deciduous Swamp	This is a culturally influenced community with a residential property occupying a large portion of the community. Trembling Aspen is the dominant species in the community, with Green Ash, Manitoba Maple, White Birch, and White Cedar as associate species. Sugar Maple occurs in the more upland locations. Planted Norway Maple and White Willow are also present. Understory species consist of Inserted Virginia Creeper, Alternate-leaf Dogwood and Riverbank Grape. Pale Jewel Weed (*Impatiens pallida*) is present in the understory, but may be from anthropogenic origins based on its location along the disturbed edge of a residential property.
Thicket Swamp (SWT)			
SWTO2-3	28	Meadow Willow Organic Deciduous Thicket Swamp	This shrub thicket community contained a mixture of willow species, with Meadow Willow as the most dominant, other shrub species present include; Choke Cherry, Red-osier Dogwood, Wild Red Raspberry, Dwarf Raspberry, Wild Black Currant. Open areas will little low shrub cover contained a variety of herbaceous species, including Common Woolly Bulrush (*Scirpus cyperinus*), Dark-green Bulrush (*Scirpus atrovirens*), Spotted Joe-pye Weed (*Eutrochium maculatum var. maculatum*) and Spotted Jewel-weed (*Impatiens capensis*). Tree Canopy cover is sparse with Trembling Aspen as the most abundant canopy species.
SWTO2-6	22	Mixed Willow Organic Thicket Swamp Type	This is a diverse community comprised primarily of Mixed Willow Organic Thicket Swamp Type with complexes of Mixed Shallow Water (SAM), Mixed Mineral Meadow Marsh. The community canopy cover is between 10% - 25%, containing White Spruce, Black Spruce, White Cedar, Balsam Poplar, Green Ash and planted White Willow. The understory shrubs are dominated by an assortment of willow species, with abundant Red-osier Dogwood. There is a dense understory and ground layer of herbaceous species, including; Cattail, Marsh Marigold (*Caltha palustris*) , Common Woolly Bulrush, Dark Green Bulrush, Lake Bank Sedge (*Carex lacustris*), Water Horsetail (*Equisetum fluviatile*), Broadleaf Arrowhead (*Sagittaria latifolia*) and various species of Asters and Goldenrods.
SWTO3-5	9	Red-osier Organic Deciduous Swamp	This riverine thicket swamp community is species rich with a variety of native wetland trees, shrubs, and herbaceous species. Red-osier Dogwood is the dominant species within the community, with Narrow-leaved Meadow-sweet (*Spiraea alba*), Willow Species and Reed Canary Grass (*Phalaris arundinacea*) as sub-dominant. Greenfruit Bur-reed (*Sparganium emersum*), Marsh Fern (*Thelypteris palustris*) and Lake Bank Sedge are among the herbaceous species in the community.
Treed Fen (FET)			
FETC1-2	14	Tamarack - White Cedar Treed Fen	This community is composed primarily of Tamarack - White Cedar Treed Fen vegetation type, with complexes of Tamarack Organic Coniferous Swamp Type (SWOC2-2), Mixed Willow Organic Deciduous Thicket Swamp Type (SWTO2-6); and Cattail Graminoid Organic Meadow Marsh Type (MAMO1-2). Canopy cover within the community varies from less than 10 % to greater than 60% coverage. The community includes a high number of regionally rare species including; Loesel's Twayblade (*Liparis loeselii*), Hooded Ladies'-tresses (*Spiranthes romanzoffiana*), Marsh Blue Violet (*Viola cucullata*), Tussock Sedge (*Carex stricta*), Kalm's Lobelia (*Lobelia kalmii*), Marsh Bellflower (*Campanula aparinoides*), Linear-leaved Willow-herb (*Epilobium leptophyllum*) and Common St. John's-wort (*Hypericum punctatum*). Water is present at or just below the surface throughout most of the community. Soil ranged from saturated calcareous mineral soil to greater that 40 cm deep organic soil.
Meadow Marsh (MAM)			
MAMM1-1	31	Cattail Graminoid Mineral Meadow Marsh Type	This community in dominated by Narrow-leaved Cattail (*Typha angustifolia*) with associates of Redtop (*Agrostis gigantea*), Reed Canary Grass, Orchard Grass (*Dactylis glomerata*), Spotted Jewel-weed and Purple-stemmed Aster (*Symphyotrichum puniceum*). Tree and shrub species on the edge of the community include Manitoba Maple, American Elm, Red-osier Dogwood, and Wild Red Raspberry.
MAMO1-2	1	Cattail Graminoid Organic Mineral Meadow Marsh	This small Community is at the corner of Trafalgar Road and Wellington Road 22. The community has evidence of past cultural influence and clearing, as indicated by the absence of mature trees. The community is dominated by Cattails with an abundance of European Reed (*Phragmites australis ssp. australis*) and Reed Canary Grass. The edges of the community contain a mixture of Cattail Graminoid Organic Mineral Meadow Marsh and the adjacent White Cedar – Conifer Organic Coniferous Swamp community. A low tree and shrub layer of between 2m - 10m, composed of primarily of White Cedar, Trembling Aspen and Tamarack is starting to grow throughout the community.
Shallow Marsh (MAS)			
MASO1-1	8	Cattail Organic Shallow Marsh Type	This riverine community borders the Submerged Shallow Aquatic Ecosite and the associated tributary. The community is dominated by Cattails, with a groundcover of sphagnum moss. Other associated species include; Red-osier Dogwood, Black Currant, Reed Canary Grass, Lake Bank Sedge, and Tussock Sedge. Occasional occurrences of American Larch and White Cedar are present along the upland edge of the community.

ELC Code	Map ID	Vegetation Type	Community Description
Submerged Shallow Aquatic (SAS)			
SAS_1	7	Submerged Shallow Aquatic Ecosite	This aquatic community is of unknown maximum depth, but appears to be less than 2m throughout most of the community. The aquatic community is anthropogenic in origin through the building of a berm to dam the West Credit River. Submergent aquatic species are visible below the surface, with White Water-lily (*Nymphaea odorata ssp. odorata*) as the associated floating species. Cattail and Dark Green Bulrush are present along the community edge. Occasional standing snags and deadfall are present throughout the community.
Mixed Shallow Aquatic			
SAM_1-8	11	Water Lily - Bullhead lily Mixed Shallow Aquatic	This aquatic community is of unknown maximum depth, but appears to be less than 2m throughout most of the community. The aquatic community is of anthropogenic origin, through creation of a dug offline pond, feed by the adjacent watercourse. Submergent aquatic species are visible below the surface, with Yellow Cowlily (*Nuphar variegata*) as the dominant floating species. Cattail, Dark Green Bulrush, Spotted Joe-pye Weed, Broadleaf Arrowhead are present along the community edge along with shrub species, such as willow and Red-osier Dogwood.
SAM_1-8	19	Water Lily - Bullhead lily Mixed Shallow Aquatic	This open water community comprises the shallow portions of the Hillsburgh Pond. The aquatic community is of unknown maximum depth, but appeared to be less than 2m throughout most of the community. The aquatic community is of anthropogenic origin, occurring as a result of the Hillsburgh dam at Station Street. Submergent aquatic species are visible below the surface, with White Water-lily as the dominant floating species. Cattail, and Dark Green Bulrush, Spotted Joe-pye Weed, Broadleaf Arrowhead, Jewel Weed, Bulb-bearing Water-hemlock (*Cicuta bulbifera*), Blueflag Iris (*Iris versicolor*) and Yellow Iris (*Iris pseudacorus*) are present along the community edge, along with shrub species, such as Willow species and Red-osier Dogwood. Abundant to occasional standing snags and deadfall are present throughout the community.
SAM_1-8	18	Water Lily - Bullhead lily Mixed Shallow Aquatic	This aquatic community is of unknown maximum depth, but appeared to be less than 2m throughout most of the community. The aquatic community is of anthropogenic origin, resulting from the dam. Submergent aquatic species are visible below the surface, with White Water-lily as the dominant floating species. Cattail, Dark Green Bulrush, Spotted Joe-pye Weed, Broadleaf Arrowhead and Bulb-bearing Water-hemlock are present along the community edge. Abundant to occasional standing snags and deadfall are present throughout the community.
Open Aquatic (OAO)			
OAW	20	Open Aquatic	This is an open water community with depth greater than 2m. No floating or emergent aquatic species are present, but submerged aquatic species are suspected.
Cultural (CU)			
CS	13	Cultural Savannah	This community runs along the Elora-Cataract Trail way, south of the Ainsworth Pond and is highly culturally influenced. The community has a mixture of predominantly non-native tree, shrub and herbaceous species. Canopy cover varies along the length of the community from less than 10% cover to approximately 60% cover. The most abundant canopy and sub-canopy species include; Manitoba Maple, Scots Pine, White Willow, Colorado Blue Spruce (*Picea pungens*), Norway Maple, Staghorn Sumac and Common Lilac (*Syringa vulgaris*). Understory and ground cover is primarily non-native weedy species with few native herbaceous species, such as Canada Anemone (*Anemone canadensis*).
Constructed (CV)			
CVR_1	Res	Residential	Residential properties, including building, driveways and yards.
CVI_1	Road	Transportation	Roadway

Appendix 5

Ecological Land Classification Data Sheets

ELC Community Description & Classification

Polygon: P1

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25 2015**

Polygon Description P1	**Community Series: MA**	**Ecosite: MAM**	**Vegetation Type: MAMO1-2** **Cattail Graminoid Organic Mineral Meadow Marsh**

System

Terrestrial [✓ Wetland] Aquatic

Topographic Feature

Lacustrine Riverine [✓ Bottomland] Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form

Plankton Submerged Floating-lvd. Graminoid [✓ Forb] Lichen Bryophyte Deciduous Coniferous Mixed

Cover

Open Shrub [✓ Treed]

History

[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural [✓ Swamp] Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age

Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m²/ha)

Standing Snags

[✓ Rare] Occasional Abundant Dominant

Deadfall Logs

Rare [✓ Occasional] Abundant Dominant

Health

Low [✓ Medium] High

Sensitivity

Low Medium High

Botanical Quality

Low [✓ Medium] High

Slope

[✓ none] gentle moderate steep (simple or complex)

Soil Analysis:

Soil Drainage

Very Rapid Rapid Well Moderately Well Imperfect [✓ Poor] Very Poor

Soil Moisture Regime

Dry Fresh [✓ Moist] Wet

Effective Soil Texture

Organic

Depth to Mottles / Gley

Sample: M - cm / G - cm

Depth to Groundwater metres

at surface [✓ less than 1m] more than 1 m

Depth to Bedrock metres

at surface less than 1m more than 1 m

Vegetation Layer		**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy	2	1	Larix laricina > Picea mariana = Thuja occidentalis
2	Subcanopy	3	2	Larix laricina = Thuja occidentalis = Populus tremuloides
3	Understorey	4	4	Typha angustifolia >> Thuja occidentalis = Phalaris arundinacea
4	Ground Layer	6	2	Juncus tenuis = Thelypteris palustris = Carex sp.

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	A	O	R	NA
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance: Mowed grass around edges

Wildlife / Habitat Observations:
NA

Comments:
Road side observation due to private property restrictions.

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification **Polygon: P1**

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Thuja occidentalis	O	A	O	
Populus tremuloides		A		
Larix laricina	A	A		
Picea mariana	O			
Shrubs and Woody Vines				
Salix discolor			O	
Sorbus aucuparia			R	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Typha angustifolia			D	
Phalaris arundinacea			A	
Phragmites australis ssp. australis			A	
Tussilago farfara				A
Eutrochium maculatum			O	
Eupatorium perfoliatum			R	
Solidago canadensis			O	
Juncus tenuis				A
Hypericum punctatum			O	
Thelypteris palustris				A
Carex flava				O
Carex stipata				O
Carex hystericina				O
Eriophorum viridicarinatum				O
Grass sp.				
Sedge sp.				

ELC Community Description & Classification

Polygon: P2

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Polygon Description P2	**Community Series: SW**	**Ecosite: SWC**	**Vegetation Type: SWCM1-2** **White Cedar – Conifer Mineral Coniferous Swamp**

System Terrestrial [✓ Wetland] Aquatic	**Topographic Feature** Lacustrine [✓ Riverine] Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff	**Dominant Plant Form** Plankton Submerged Floating-lvd. [✓ Graminoid] Forb Lichen Bryophyte Deciduous Coniferous Mixed

Cover Open Shrub [✓ Treed]	**History** [✓ Natural] Cultural	**Community Class** Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural [✓ Swamp] Fen Bog Marsh Open Water Shallow Water

Stand Description:		**Soil Analysis:**
Community Age Pioneer Young Mid-Aged [✓ Mature] Old Growth	**Basal Area (m^2/ha)**	**Soil Drainage** Very Rapid Rapid Well Moderately Well [✓ Imperfect] Poor Very Poor
Standing Snags Rare Occasional [✓ Abundant] Dominant		**Soil Moisture Regime** Dry Fresh [✓ Moist] Wet
Deadfall Logs Rare Occasional [✓ Abundant] Dominant		**Effective Soil Texture** **Organic**

Health Low [✓ Medium] High	**Sensitivity** Low [✓ Medium] High	**Botanical Quality** Low Medium High	**Depth to Mottles / Gley** **Sample:** M - cm / G - cm

Slope none [✓ gentle] moderate steep (simple or complex)	**Depth to Groundwater** metres at surface [✓ less than 1m] more than 1 m	**Depth to Bedrock** metres at surface less than 1m more than 1 m

Vegetation Layer		**Height**[1]	**Cover**[2]	**Dominant Species per Vegetation Layer**
1	Canopy	2	4	Thuja occidentalis = Abies balsamea > Larix laricina = Picea glauca
2	Subcanopy	3	3	Cornus alternifolia > Prunus virginiana
3	Understorey	4	3	Typha angustifolia = Impatiens capensis
4	Ground Layer	6	3	Equisetum arvense = Caltha palustris > Fern sp. = Carex sp.

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis[3]	O	A	D	O
[3] *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	**< 10 cm DBH**	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:
Assessed from property edge due to private property restrictions.

				Community Name	**Code**	**% Coverage**
Inclusion	**X**	**Complex**		**Cattail Organic Meadow Marsh**	**MAM01-2**	**10 %**
Inclusion		**Complex**	**X**	**Fresh – Moist White Cedar – Hardwood Mixed Forest Type**	**FOMM7-2**	**20 %**

ELC Community Description & Classification

Polygon: P2

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Thuja occidentalis	D	A	A	
Picea glauca	A			
Fraxinus americana		O		
Ulmus americana	O	O		
Malus pumila		R		
Populus tremuloides	O			
Prunus serotina	A	A		
Populus balsamifera	O			
Betula papyrifera	A	O		
Abies balsamea	D	A	A	
Betula alleghaniensis	O			
Larix laricina	D	O	O	
Fraxinus pennsylvanica	R	O		
Shrubs and Woody Vines				
Cornus alternifolia			A	O
Prunus virginiana			A	
Daphne mezereum			R	
Lonicera tartarian			R	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Taraxacum officinale				A
Equisetum arvense				A
Fragaria vesca				O
Caltha palustris				A
Impatiens capensis			O	
Ranunculus abortivus				R
Typha angustifolia			A	
Athyrium filix-femina var. angustum				O
Solanum dulcamara				O
Thelypteris palustris				O
Sisyrinchium montanum				O
Cerastium fontanum				O
Cornus canadensis				O
Fern sp.				A
Moss sp				O
Carex sp.				A

ELC Community Description & Classification

Polygon: P2

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P3

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Polygon Description P3

Community Series: SW

Ecosite: SWM

Vegetation Type: SWMO3-3
White Birch – Conifer Organic Mixed Swamp

System
Terrestrial [✓ Wetland] Aquatic

Topographic Feature
Lacustrine [✓ Riverine] Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte Deciduous Coniferous [✓ Mixed]

Cover
Open Shrub [✓ Treed]

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural [✓ Swamp] Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young Mid-Aged [✓ Mature] Old Growth

Basal Area (m²/ha)

Standing Snags
Rare Occasional [✓ Abundant] Dominant

Deadfall Logs
Rare Occasional [✓ Abundant] Dominant

Health
Low [✓ Medium] High

Sensitivity
Low [✓ Medium] High

Botanical Quality
Low Medium High

Slope
none gentle moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well [✓ Imperfect] Poor Very Poor

Soil Moisture Regime
Dry Fresh [✓ Moist] Wet

Effective Soil Texture
Organic

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		Height ¹	Cover ²	Dominant Species per Vegetation Layer
1	Canopy	2	4	Betula papyrifera > Thuja occidentalis > Betula alleghaniensis
2	Subcanopy	3	3	Cornus alternifolia
3	Understorey	4	3	Impatiens capensis > Ranunculus abortivus
4	Ground Layer	6	3	Caltha palustris

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis [3]	O	A	D	O
[3] *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	**< 10 cm DBH**	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:
Assessed from property edge due to private property restrictions.

				Community Name	Code	% Coverage
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P3

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Betula papyrifera	D	A	A	
Betula alleghaniensis	A			
Populus tremuloides	O			
Prunus serotina	A	A		
Populus balsamifera	O			
Thuja occidentalis	D	A		
Picea glauca	A			
Shrubs and Woody Vines				
Cornus alternifolia			A	O
Prunus virginiana			A	
Lonicera tartarian			R	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Taraxacum officinale				A
Equisetum arvense				A
Fragaria vesca				O
Caltha palustris				A
Impatiens capensis			O	O
Ranunculus abortivus			R	
Thelypteris palustris				A
Coptis trifolia				R
Epilobium leptophyllum				O
Ranunculus recurvatus				O
Fern sp.				A
Moss sp				O

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P4

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Polygon Description
P4

Community Series: FO

Ecosite: FOD

Vegetation Type: FODM5-8
Dry-Fresh Sugar Maple – White Ash Deciduous Forest

System
[✓ Terrestrial] Wetland Aquatic

Topographic Feature
Lacustrine Riverine Bottomland Terrace Valley slope Tableland [✓ Rolling upland] Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte [✓ Deciduous] Coniferous Mixed

Cover
Open Shrub [✓ Treed]

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland [✓ Forest] Thicket Cultural Swamp Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young Mid-Aged [✓ Mature] Old Growth

Basal Area (m^2/ha)

Standing Snags
Rare [✓ Occasional] Abundant Dominant

Deadfall Logs
Rare Occasional [✓ Abundant] Dominant

Health
Low [✓ Medium] High

Sensitivity
Low [✓ Medium] High

Botanical Quality
Low [✓ Medium] High

Slope
none gentle [✓ moderate] steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid [✓ Well] [✓ Moderately Well] Imperfect Poor Very Poor

Soil Moisture Regime
Dry [✓ Fresh] Moist Wet

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface less than 1m [✓ more than 1 m]

Depth to Bedrock metres
at surface less than 1m [✓ more than 1 m]

	Vegetation Layer	Height [1]	Cover [2]	Dominant Species per Vegetation Layer
1	Canopy	1	3	Sugar Maple > Black Cherry = White Ash = White Pine
2	Subcanopy	3	4	Sugar Maple > White Ash > Black Cherry
3	Understorey	4	3	Sugar Maple > Alt Lve Dogwood > Black Cherry = Chock Cherry
4	Ground Layer	6	3	Yellow Trout Lily > Coltsfoot > Smooth Yellow Violet

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis [3] [3] *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	O	A	D	R
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance: Trails, garden waist

Wildlife / Habitat Observations:

Comments:

				Community Name	Code	% Coverage
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P4

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Acer saccharum ssp. saccharum	D	D	D	A
Prunus serotina	D	A	A	
Pinus strobus	A	R		
Quercus rubra	O			
Malus pumila		O		
Acer negundo		R		
Fraxinus americana	A	O	O	
Thuja occidentalis	O	O	O	
Abies balsamea	A	O	O	
Larix laricina	O	R	R	
Ulmus americana		O	O	
Sorbus aucuparia			R	
Populus tremuloides		R	R	
Betula papyrifera		R	R	
Tilia americana		R		
Fagus grandifolia	O	O		
Betula alleghaniensis		R		
Ostrya virginiana		R		
Shrubs and Woody Vines				
Cornus alternifolia			D	D
Ribes americanum			A	
Lonicera tartarian			R	
Toxicodendron rydbergii			R	
Sambucus canadensis			R	
Prunus virginiana			A	A
Ribies sp.			O	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Narcissus pseudonarcissus				A
Tussilago farfara				D
Taraxacum officinale				D
Erythronium americanum				A
Viola pubescens var. scabriuscula				A
Maianthemum racemosum				O
Fragaria vesca				A
Arctium minus				O
Alliaria petiolata				O
Maianthemum canadense				A
Maianthemum stellatum				O
Asarum canadense				O
Sanguinaria canadensis				R
Actaea rubra				R
Geranium robertianum				R
Ranunculus acris				R
Carex gracillima				O
Carex pensylvanica				O
Agrimonia gryposepala				R
Epipactis helleborine				O
Hypericum punctatum			R	
Prunella vulgaris ssp. lanceolata				R
Symphyotrichum ericoides			O	
Solidago altissima			O	
Dryopteris marginalis				R
Caulophyllum giganteum			R	
Trientalis borealis				R

ELC Community Description & Classification

Polygon: P4

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P5

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Polygon Description
P5

Community Series: FO

Ecosite: FOC

Vegetation Type: FOCM2-2
Dry-Fresh White Cedar Coniferous Forest

System
[✓ Terrestrial] Wetland Aquatic

Topographic Feature
Lacustrine Riverine Bottomland Terrace [✓ Valley slope] Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte Deciduous [✓ Coniferous] Mixed

Cover
Open Shrub [✓ Treed]

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland [✓ Forest] Thicket Cultural Swamp Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young Mid-Aged [✓ Mature] Old Growth

Basal Area (m²/ha)

Standing Snags
Rare [✓ Occasional] Abundant Dominant

Deadfall Logs
Rare [✓ Occasional] Abundant Dominant

Health
[✓ Low] Medium High

Sensitivity
[✓ Low] Medium High

Botanical Quality
[✓ Low] Medium High

Slope
none gentle [✓ moderate] steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid [✓ Well] Moderately Well Imperfect Poor Very Poor

Soil Moisture Regime
Dry [✓ Fresh] Moist Wet

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		Height ¹	Cover ²	Dominant Species per Vegetation Layer
1	Canopy	2	4	Thuja occidentalis
2	Subcanopy	3	2	Thuja occidentalis
3	Understorey			
4	Ground Layer			

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	A	A	O	NA
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

				Community Name	Code	% Coverage
Inclusion		Complex				
Inclusion		Complex				

ELC Community Description & Classification

Polygon: P5

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Thuja occidentalis	D	D		
Shrubs and Woody Vines				

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				

ELC Community Description & Classification

Polygon: P6

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Polygon Description P6	**Community Series: FO**	**Ecosite: FOC**	**Vegetation Type: FOCM6** **Naturalized Coniferous Plantation**

System
[✓ Terrestrial] Wetland Aquatic

Topographic Feature
Lacustrine Riverine Bottomland Terrace Valley slope [✓ Tableland] Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte Deciduous Coniferous [✓ Mixed]

Cover
Open Shrub [✓ Treed]

History
Natural [✓ Cultural]

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland [✓ Forest] Thicket Cultural Swamp Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare Occasional [✓ Abundant] Dominant

Deadfall Logs
Rare [✓ Occasional] Abundant Dominant

Health
[✓ Low] Medium High

Sensitivity
[✓ Low] Medium High

Botanical Quality
[✓ Low] Medium High

Slope
none gentle moderate [✓ steep] ([✓ simple] or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid [✓ Well] Moderately Well Imperfect Poor Very Poor

Soil Moisture Regime
Dry [✓ Fresh] Moist Wet

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface less than 1m [✓ more than 1 m]

Depth to Bedrock metres
at surface less than 1m [✓ more than 1 m]

	Vegetation Layer	**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy	1	3	Larix decidua > Pinus strobus = Fraxinus americana
2	Subcanopy	3	4	Pinus strobus > Malus pumila > Thuja occidentalis
3	Understorey	4	3	Rhamnus cathartica >Thuja occidentalis > Prunus virginiana = Lonicera tartarian = Solidago altissima
4	Ground Layer	6	1	Fragaria vesca > Tussilago farfara > Epipactis helleborine

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	O	A	D	R
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance: Non-native planting, trail, clearing.

Wildlife / Habitat Observations:

Comments:

				Community Name	**Code**	**% Coverage**
Inclusion	X	**Complex**		**Goldenrod Forb Meadow Type**	**MEFM1-1**	**15**
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P6

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Fraxinus americana	A	A		
Quercus rubra	O	R		
Larix decidua	A			
Thuja occidentalis		O	A	
Malus pumila		O-A		
Abies balsamea	O	O		
Pinus strobus	A	O		
Acer saccharum ssp. saccharum	R			
Prunus serotina		R		
Shrubs and Woody Vines				
Prunus virginiana			A	
Rhamnus cathartica		A	A	
Lonicera tartarian			A	

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Solidago altissima			O	
Symphyotrichum novae-angliae			O	
Pilosella caespitosa				R
Symphyotrichum ericoides			O	
Fragaria vesca				O
Epipactis helleborine				R
Tussilago farfara				O

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 25, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P7

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 24, 2015**

Polygon Description P7

Community Series:SA

Ecosite:SAS_1
Submerged Shallow Aquatic Ecosite

Vegetation Type:

System
Terrestrial Wetland [✓ Aquatic]

Topographic Feature
Lacustrine Riverine Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton [✓ Submerged] Floating-lvd. Graminoid Forb Lichen Bryophyte Deciduous Coniferous Mixed

Cover
[✓ Open] Shrub Treed

History
Natural Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural Swamp Fen Bog Marsh [✓ Open Water] Shallow Water

Stand Description:

Community Age
Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare [✓ Occasional] Abundant Dominant

Deadfall Logs
Rare [✓ Occasional] Abundant Dominant

Health
Low Medium High

Sensitivity
Low Medium High

Botanical Quality
Low Medium High

Slope
[✓ none] gentle moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect Poor Very Poor

Soil Moisture Regime
Dry Fresh Moist Wet

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
[✓ at surface] less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy			
2	Subcanopy			
3	Understorey			
4	Ground Layer		2	Nymphaea odorata ssp. odorata > Typha latifolia > Potamogeton

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	**< 10 cm DBH**	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance: Earthen Dam creating pond. No fish passage into community from downstream

Wildlife / Habitat Observations: Large Mouth Bass, Mallard Duck, King Fisher, Canada Goose, Erget

Comments: Greater than 2 meters at south end, becoming shallow in the middle and towards the north. Mud flats at the north end. Little to no vegetation

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**				
Inclusion		**Complex**				

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ELC Community Description & Classification **Polygon: P7**

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Shrubs and Woody Vines				

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Nymphaea odorata ssp. odorata				A
Scirpus atrovirens				R
Typha latifolia				O
Potamogeton sp.				O
Algea sp.				O

ELC Community Description & Classification

Polygon: P7

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P8

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 24, 2015**

Polygon Description
P8

Community Series: MA

Ecosite: MAS

Vegetation Type: MASO1-1
Cattail Organic Shallow Marsh Type

System
Terrestrial [✓ Wetland] Aquatic

Topographic Feature
Lacustrine [✓ Riverine] Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. [✓ Graminoid] Forb Lichen Bryophyte Deciduous Coniferous Mixed

Cover
[✓ Open] Shrub Treed

History
Natural Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural Swamp Fen Bog [✓ Marsh] Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare [✓ Occasional] Abundant Dominant

Deadfall Logs
Rare [✓ Occasional] Abundant Dominant

Health
Low [✓ Medium] High

Sensitivity
Low Medium [✓ High]

Botanical Quality
Low [✓ Medium] High

Slope
none gentle moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect Poor [✓ Very Poor]

Soil Moisture Regime
Dry Fresh Moist [✓ Wet]

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
[✓ at surface] less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m [✓ more than 1 m]

	Vegetation Layer	Height ¹	Cover ²	Dominant Species per Vegetation Layer
1	Canopy	2	1	Thuja occidentalis = Betula papyrifera > Larix laricina
2	Subcanopy	3	1	Thuja occidentalis = Betula papyrifera
3	Understorey	4	4	Typha latifolia >> Phalaris arundinacea
4	Ground Layer	6	2	Sphagnum sp.>> Caltha palustris > Carex lacustris

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	O	R	NA	NA
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

				Community Name	Code	% Coverage
Inclusion		Complex				
Inclusion		Complex				

ELC Community Description & Classification

Polygon: P8

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Thuja occidentalis	O	R		
Betula papyrifera	O	R		
Larix laricina	R			
Shrubs and Woody Vines				
Ribes americanum			O	
Cornus stolonifera			A	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Typha latifolia			A	
Phalaris arundinacea			O	
Carex lacustris				A
Carex stricta				O
Equisetum fluviatile				O
Caltha palustris				A
Sphagnum sp.				D-A
Carex sp.				A
Grass sp.				A

ELC Community Description & Classification

Polygon: P9

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 24, 2015**

Polygon Description P9

Community Series: SW

Ecosite: SWT

Vegetation Type: SWTO3-5
Red-osier Organic Deciduous Swamp

System
Terrestrial [✓ Wetland] Aquatic

Topographic Feature
Lacustrine [✓ Riverine] Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte [✓ Deciduous] Coniferous Mixed

Cover
Open [✓ Shrub] Treed

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest [✓ Thicket] Cultural [✓ Swamp] Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer [✓ Young] Mid-Aged Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare [✓ Occasional] Abundant Dominant

Deadfall Logs
Rare [✓ Occasional] Abundant Dominant

Health
Low [✓ Medium] High

Sensitivity
Low [✓ Medium] High

Botanical Quality
Low Medium [✓ High]

Slope
[✓ none] gentle moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect [✓ Poor] Very Poor

Soil Moisture Regime
Dry Fresh Moist [✓ Wet]

Effective Soil Texture
Organic

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
[✓ at surface] less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy	3	1	Thuja occidentalis > Acer saccharinum
2	Subcanopy	4	1	Thuja occidentalis = Salix discolor
3	Understory	5	4	Cornus stolonifera >> Salix discolor = Spirea alba
4	Ground Layer	6	3	Phalaris arundinacea > Typha latifolia > Caltha palustris

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	0	R	NA	NA
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P9

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 24, 2015**

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Thuja occidentalis	O	O		
Betula papyrifera	R			
Larix laricina	R			
Acer saccharinum	O			
Ulmus americana	R	R		
Shrubs and Woody Vines				
Ribes americanum			O	
Cornus stolonifera			D	
Salix discolor		O	A	
Viburnum opulus			R	
Spirea alba			A	
Salix petiolaris			O	
Salix eriocephala			A	
Salix lucida			O	

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Phalaris arundinacea				A
Typha latifolia				A
Caltha palustris				A
Actaea rubra				R
Onoclea sensibilis				R
Carex lacustris				O
Eupatorium perfoliatum			O	
Impatiens capensis			O	
Eutrochium maculatum			D-A	
Chelone glabra			A	
Sparganium emersum				R
Solidago altissima			O	
Euthamia graminifolia			O	
Symphyotrichum puniceum			O	
Solidago rugosa var. rugosa			R	
Bidens tripartita				R
Thelypteris palustris				R
Athyrium filix-femina var. angustum				O
Grass sp.				D
Sedge sp.				A

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P10

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 24, 2015**

Polygon Description **P10**	**Community Series: SW**	**Ecosite: SWM**	**Vegetation Type: SWMO1-1** **White Cedar – Hardwood Organic Mixed Swamp**

System
Terrestrial [✓ Wetland] Aquatic

Topographic Feature
Lacustrine [✓ Riverine] Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte Deciduous [✓ Coniferous] Mixed

Cover
Open Shrub [✓ Treed]

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural [✓ Swamp] Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare Occasional [✓ Abundant] Dominant

Deadfall Logs
Rare Occasional [✓ Abundant] Dominant

Health
Low [✓ Medium] High

Sensitivity
Low [✓ Medium] High

Botanical Quality
Low [✓ Medium] High

Slope
none [✓ gentle] moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect [✓ Poor] Very Poor

Soil Moisture Regime
Dry Fresh Moist [✓ Wet]

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface [✓ less than 1m] more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		Height ¹	Cover ²	Dominant Species per Vegetation Layer
1	Canopy	2	4	White Cedar > Balsam Fir > White Birch
2	Subcanopy	3	3	White Cedar > Balsam Fir > White Birch
3	Understorey	4	3	White Cedar > Red osier dogwood
4	Ground Layer	6	2	Sensitive Fern > Sedge sp. > Sphagnum

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	A	A	O	NA
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

				Community Name	Code	% Coverage
Inclusion		**Complex**				
Inclusion		**Complex**				

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ELC Community Description & Classification

Polygon: P10

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Thuja occidentalis	D	D		
Abies balsamea	D	A		
Betula alleghaniensis	O			
Betula papyrifera	A			
Ulmus americana		O		
Acer rubrum		O		
Populus grandidentata	O			
Picea mariana	O			
Prunus serotina	O	O		
Larix laricina		R		
Fraxinus pennsylvanica		O		
Shrubs and Woody Vines				
Cornus stolonifera			A	
Spiraea alba			O	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Onoclea sensibilis				A
Cardamine diphylla				R
Epipactis helleborine				R
Thelypteris palustris				O
Gymnocarpium dryopteris				R
Monotropa uniflora				R
Equisetum palustre				R
Rubus pubescens				O
Caltha palustris				O
Prunella vulgaris				R
Equisetum scirpoides				R
Eutrochium maculatum			O	
Geum aleppicum			R	
Solanum dulcamara			A	
Symphyotrichum puniceum			A	
Carex lacustris				O
Ranunculus acris				A
Solidago canadensis			R	
Scirpus atrovirens			R	
Typha angustifolia			R	
Carex stipata				R
Achillea millefolium				R
Lycopus americanus				O
Iris versicolor				R
Carex lacustris				O
Osmundastrum cinnamomeum				R
Hypericum punctatum				R
Mitchella repens				R
Epilobium sp.				O
Sedge Sp.				A
Sphagnum				A

ELC Community Description & Classification

Polygon: P10

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 14; Aug 10; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P11

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Polygon Description P11	**Community Series: SA**	**Ecosite: SAM**	**Vegetation Type: SAM_1-8** **Water Lily – Bullhead Lily Mixed Shallow Aquatic**

System
Terrestrial Wetland [✓ Aquatic]

Topographic Feature
Lacustrine Riverine Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged [✓ Floating-lvd.] Graminoid Forb Lichen Bryophyte Deciduous Coniferous Mixed

Cover
[✓ Open] Shrub Treed

History
Natural Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural Swamp Fen Bog Marsh Open Water [✓ Shallow Water]

Stand Description:

Community Age
Pioneer [✓ Young] Mid-Aged Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare Occasional Abundant Dominant

Deadfall Logs
Rare Occasional Abundant Dominant

Health
Low [✓ Medium] High

Sensitivity
Low Medium High

Botanical Quality
Low Medium High

Slope
none gentle moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect Poor Very Poor

Soil Moisture Regime
Dry Fresh Moist [✓ Wet]

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
[✓ at surface] less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		**Height** [1]	**Cover** [2]	**Dominant Species per Vegetation Layer**
1	Canopy			
2	Subcanopy			
3	Understorey			
4	Ground Layer	6	2	Nuphar variegate > Sagittaria latifolia = Typha latifolia

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis [3]	NA	NA	NA	NA
[3] *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	**< 10 cm DBH**	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P11

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Shrubs and Woody Vines				
Cornus stolonifera			O	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Nuphar variegata				D-A
Sagittaria latifolia				O
Typha latifolia				O
Phalaris arundinacea				O
Eutrochium maculatum				O
Scirpus atrovirens				R

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P12

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22 ; Aug 10; Sept 24, 2015**

Polygon Description P12

Community Series: ME

Ecosite: MEM

Vegetation Type: MEMM3
Dry – Fresh Mixed Meadow

System
[✓ Terrestrial] Wetland Aquatic

Topographic Feature
Lacustrine Riverine Bottomland Terrace [✓ Valley slope] Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. [✓ Graminoid] Forb Lichen Bryophyte Deciduous Coniferous Mixed

Cover
[✓ Open] Shrub Treed

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave [✓ Meadow] Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural Swamp Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer [✓ Young] Mid-Aged Mature Old Growth

Basal Area (m²/ha)

Standing Snags
[✓ Rare] Occasional Abundant Dominant

Deadfall Logs
[✓ Rare] Occasional Abundant Dominant

Health
Low [✓ Medium] High

Sensitivity
[✓ Low] Medium High

Botanical Quality
Low [✓ Medium] High

Slope
none gentle [✓ moderate] steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid [✓ Well] Moderately Well Imperfect Poor Very Poor

Soil Moisture Regime
[✓ Dry] Fresh Moist Wet

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface less than 1m [✓ more than 1 m]

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		Height ¹	Cover ²	Dominant Species per Vegetation Layer
1	Canopy	3	2	Populus balsamifera = Pinus sylvestris
2	Subcanopy	4	2	Populus balsamifera = Pinus sylvestris > Prunus virginiana
3	Understorey	5	4	Phalaris arundinacea = Solidago Canadensis > Bromus inermis = Asclepias syriaca
4	Ground Layer	6	4	Vicia cracca > Linaria vulgaris = Anemone canadensis

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	O	O	Na	Na
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

				Community Name	Code	% Coverage
Inclusion		Complex				
Inclusion		Complex				

ELC Community Description & Classification

Polygon: P12

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22 ; Aug 10; Sept 24, 2015**

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Acer saccharum ssp. saccharum	O	O		
Pinus sylvestris	A	A		
Populus balsamifera	A	A		
Thuja occidentalis	O	O		
Populus tremuloides		O		
Malus pumila		O		
Shrubs and Woody Vines				
Amelanchier arborea		O		
Prunus virginiana		O	O	
Syringa vulgaris		O		
Alnus glutinosa		R		
Lonicera tatarica			O	
Sambucus racemosa			R	

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Fragaria vesca				A
Arctium lappa				R
Asclepias syriaca			A	O
Alliaria petiolata				O
Taraxacum officinale				O
Phalaris arundinacea			D-A	D
Solidago canadensis			D	
Vicia cracca				A
Bromus inermis			D-A	
Cirsium arvense			A	
Anemone canadensis				A
Eutrochium maculatum			O	
Carex vulpinoidea				R
Rudbeckia hirta			O	
Achillea millefolium				O
Solidago altissima			A	
Symphyotrichum novae-angliae			A	
Pilosella caespitosa				R
Linaria vulgaris				A
Symphyotrichum ericoides			O	
Euthamia graminifolia			A	
Symphyotrichum lateriflorum			O	
Symphyotrichum puniceum			R	
Symphyotrichum novae-angliae			A	

ELC Community Description & Classification

Polygon: P13

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; July 30; Sept 24, 2015**

Polygon Description
P13

Community Series

Ecosite: CS
Cultural Savannah

Vegetation Type

System
[✓ Terrestrial] Wetland Aquatic

Topographic Feature
Lacustrine Riverine Bottomland Terrace Valley slope [✓ Tableland] Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte [✓ Deciduous] Coniferous Mixed

Cover
Open [✓ Shrub] Treed

History
Natural Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest [✓ Thicket] Cultural Swamp Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer [✓ Young] Mid-Aged Mature Old Growth

Basal Area (m²/ha)

Standing Snags
[✓ Rare] Occasional Abundant Dominant

Deadfall Logs
[✓ Rare] Occasional Abundant Dominant

Health
[✓ Low] Medium High

Sensitivity
[✓ Low] Medium High

Botanical Quality
[✓ Low] Medium High

Slope
none gentle [✓ moderate] steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid [✓ Well] Moderately Well Imperfect Poor Very Poor

Soil Moisture Regime
Dry [✓ Fresh] Moist Wet

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface less than 1m [✓ more than 1 m]

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		**Height**[1]	**Cover**[2]	**Dominant Species per Vegetation Layer**
1	Canopy	2	2	Acer negundo > Malus pumila > Pinus sylvestris = Populus tremuloides
2	Subcanopy	3	3	Malus pumila > Pinus sylvestris = Syringa vulgaris = Rhus typhina
3	Understorey	4	2	Lonicera tatarica > Solidago Canadensis = Lathyrus latifolius = Vitis Riparia
4	Ground Layer	6	3	Alliaria petiolate > Galium triflorum > Anemone canadensis

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis[3] [3] *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	O	A	R	NA
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance: Trail, invasive species, cut grass

Wildlife / Habitat Observations:

Comments:

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P13

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; July 30; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Malus pumila	O	A		
Acer negundo	A			
Picea glauca	R			
Acer saccharum ssp. saccharum	R			
Thuja occidentalis		O		
Fraxinus americana		O		
Acer platanoides	R	O		
Picea pungens		R		
Prunus serotina	R			
Pinus sylvestris	O	O		
Salix alba		O		
Populus balsamifera	O	O		
Populus tremuloides	O	O		
Shrubs and Woody Vines				
Rhus typhina		O		
Cornus stolonifera			R	
Lonicera tatarica			A	
Cornus alternifolia			R	
Syringa vulgaris		O	O	
Prunus virginiana			R	
Vitis Riparia			O	
Parthenocissus inserta			R	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Taraxacum officinale				O
Alliaria petiolata				A
Cichorium intybus			A	
Lathyrus latifolius			A	A
Achillea millefolium				R
Ambrosia artemisiifolia				O
Phleum pratense				O
Erigeron annuus				O
Silene vulgaris				O
Asclepias syriaca			O	
Galium triflorum				A
Asparagus officinalis			R	
Dactylis glomerata			O	
Solidago canadensis			A	
Melilotus albus			O	
Daucus carota			A	
Potentilla simplex			R	
Echium vulgare			A	
Anemone canadensis				A
Fragaria virginiana				O
Symphyotrichum novae-angliae			O	
Sonchus arvensis			O	
Verbascum thapsus			R	
Trifolium pratense				O
Bromus inermis			A	
Symphyotrichum ericoides ericoides			R	
Pteridium aquilinum			R	
Apocynum androsaemifolium			R	

ELC Community Description & Classification

Polygon: P13

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; July 30; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P14

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Polygon Description P14	**Community Series: FE**	**Ecosite: FET**	**Vegetation Type: FETC1-2** **Tamarack – White Cedar Treed Fen**

System
Terrestrial [✓ Wetland] Aquatic

Topographic Feature
Lacustrine [✓ Riverine] Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. [✓ Graminoid] Forb Lichen Bryophyte Deciduous Coniferous [✓ Mixed]

Cover
[✓ Open] Shrub Treed

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural Swamp [✓ Fen] Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer [✓ Young] Mid-Aged Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare Occasional [✓ Abundant] Dominant

Deadfall Logs
Rare Occasional [✓ Abundant] Dominant

Health
Low Medium [✓ High]

Sensitivity
Low Medium [✓ High]

Botanical Quality
Low Medium [✓ High]

Slope
[✓ none] gentle moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect Poor [✓ Very Poor]

Soil Moisture Regime
Dry Fresh Moist [✓ Wet]

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
[✓ at surface] less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy	3	2	Thuja occidentalis = Larix laricina
2	Subcanopy	4	2	Thuja occidentalis > Larix laricina
3	Understorey	5	3	Salix sp. > Cornus stolonifera = Typha angustifolia
4	Ground Layer	6	3	Carex sp. > Caltha palustris > Liparis loeselii > Impatiens capensis

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	D	A	O	NA
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations: Leopard frog, muskrat den

Comments: Soil primarily organic > 50 cm with areas of calcareous mineral soil.

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**	**X**	**Tamarack Organic Coniferous Swamp Type**	**SWOC2-2**	**15**
Inclusion		**Complex**	**X**	**Mixed Willow Organic Deciduous Thicket Swamp Type**	**SWTO2-6**	**10**
		Complex	**X**	**Cattail Graminoid Organic Meadow Marsh Type**	**MAMO1-2**	**20**

ELC Community Description & Classification

Polygon: P14

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Larix laricina	A			
Thuja occidentalis	A	D - A	O	
Populus tremuloides	O			
Populus balsamifera		R		
Betula papyrifera		R	O	
Acer negundo		R		
Fraxinus pennsylvanica		R		
Shrubs and Woody Vines				
Cornus stolonifera			A	
Ribes americanum			O	
Lonicera tatarica			R	
Viburnum opulus			R	
Rhamnus alnifolia			R	
Salix eriocephala			A	
Salix lucida			A	
Salix discolor			A	
Salix petiolaris			O	

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Caltha palustris				A
Fragaria vesca				O
Taraxacum officinale				R
Typha angustifolia			D-A	
Geum canadense				O
Tussilago farfara				R
Impatiens capensis			A	A
Myosotis laxa				O
Equisetum palustre				O
Eutrochium maculatum			A-O	
Leucanthemum vulgare				R
Iris versicolor				O
Eupatorium perfoliatum				O
Leonurus cardiaca				O
Spiranthes romanzoffiana				O-R
Chelone glabra			O	
Carex aurea				R
Carex lacustris				O
Carex stricta				A
Nasturtium microphyllum				O
Miscanthus x giganteus			R	
Geranium robertianum				O
Onoclea sensibilis				O
Sagittaria latifolia				R
Bidens cernua			O	
Equisetum fluviatile				O
Epilobium leptophyllum				R
Epilobium coloratum			O	
Lobelia kalmii				O
Liparis loeselii				A-O
Solidago uliginosa			O	
Viola cucullata				O
Rumex orbiculatus			R	
Solidago rugosa var. rugosa			A-O	
Symphyotrichum ericoides			R	
Euthamia graminifolia			A	
Symphyotrichum puniceum			A	
Campanula aparinoides				R
Scutellaria galericulata				O
Solidago uliginosa			A-O	
Carex interior				O

ELC Community Description & Classification

Polygon: P14

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P15

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Polygon Description P15	**Community Series: FO**	**Ecosite: FOD**	**Vegetation Type: FODM8-1** **Fresh – Moist Poplar Deciduous Forest**

System [✓ Terrestrial] Wetland Aquatic	**Topographic Feature** Lacustrine Riverine Bottomland Terrace [✓ Valley slope] Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff	**Dominant Plant Form** Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte [✓ Deciduous] Coniferous Mixed

Cover Open Shrub [✓ Treed]	**History** [✓ Natural] Cultural	**Community Class** Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland [✓ Forest] Thicket Cultural Swamp Fen Bog Marsh Open Water Shallow Water

Stand Description:	**Soil Analysis:**
Community Age Pioneer Young [✓ Mid-Aged] Mature Old Growth **Basal Area (m²/ha)**	**Soil Drainage** Very Rapid Rapid Well [✓ Moderately Well] Imperfect Poor Very Poor
Standing Snags Rare [✓ Occasional] Abundant Dominant	**Soil Moisture Regime** Dry [✓ Fresh] Moist Wet
Deadfall Logs Rare Occasional [✓ Abundant] Dominant	**Effective Soil Texture** **Mineral**
Health Low [✓ Medium] High **Sensitivity** Low [✓ Medium] High **Botanical Quality** [✓ Low] Medium High	**Depth to Mottles / Gley** **Sample:** M - cm / G - cm
Slope none gentle [✓ moderate] steep (simple or complex)	**Depth to Groundwater** metres at surface less than 1m [✓ more than 1 m] **Depth to Bedrock** metres at surface less than 1m [✓ more than 1 m]

	Vegetation Layer	**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy	4	4	Populus tremuloides > Populus balsamifera > Acer platanoides
2	Subcanopy	3	3	Populus tremuloides > Populus balsamifera > Acer platanoides = Acer negundo
3	Understorey	2	3	Cornus alternifolia > Thuja occidentalis = Prunus virginiana > Symphyotrichum novae-angliae
4	Ground Layer	1	2	Tussilago farfara > Aegopodium podagraria > Myosotis scorpioides = Fragaria vesca

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	O	A	A	NA
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P15

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Populus tremuloides	D	A		
Populus balsamifera	A	A		
Picea abies	R			
Acer platanoides	O	O		
Acer negundo		O		
Prunus serotina	R			
Thuja occidentalis		O	O	
Shrubs and Woody Vines				
Cornus alternifolia			A	
Prunus virginiana			O	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Fragaria vesca				O
Taraxacum officinale				R
Tussilago farfara				A
Aegopodium podagraria				A-O
Myosotis scorpioides				O
Glechoma hederacea				O-R
Solidago altissima			O	
Symphyotrichum novae-angliae			A	

ELC Community Description & Classification

Polygon: P16

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Polygon Description **P16**	**Community Series: FO**	**Ecosite: FOD**	**Vegetation Type: FODM6** **Fresh – Moist Sugar Maple Deciduous Forest Ecosite**

System [✓ Terrestrial] Wetland Aquatic	**Topographic Feature** [✓ Lacustrine] Riverine Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff	**Dominant Plant Form** Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte [✓ Deciduous] Coniferous Mixed

Cover Open Shrub [✓ Treed]	**History** [✓ Natural] Cultural	**Community Class** Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland [✓ Forest] Thicket Cultural Swamp Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare [✓ Occasional] Abundant Dominant

Deadfall Logs
Rare Occasional [✓ Abundant] Dominant

Health
Low [✓ Medium] High

Sensitivity
Low [✓ Medium] High

Botanical Quality
[✓ Low] Medium High

Slope
none gentle [✓ moderate] steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well [✓ Moderately Well] Imperfect Poor Very Poor

Soil Moisture Regime
Dry [✓ Fresh] Moist Wet

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

	Vegetation Layer	Height ¹	Cover ²	Dominant Species per Vegetation Layer
1	Canopy	2	3	Acer saccharum ssp. saccharum > Acer negundo > Fraxinus pennsylvanica > Juglans nigra
2	Subcanopy	3	4	Acer negundo > Fraxinus pennsylvanica > Vitis riparia
3	Understorey	4	4	Lonicera tatarica > Rubus allegheniensis > Vitis riparia = Echinocystis lobata
4	Ground Layer	6	4	Alliaria petiolate >> Anemone Canadensis = Vicia cracca = Equisetum arvense

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	A	A	O	NA
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments: Cut-grass, planted non-native plants, occupied residence.
ELC done from property edge.

				Community Name	Code	% Coverage
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P16

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Juglans nigra	O	O		
Acer saccharum ssp. saccharum	A	O	O	O
Acer negundo	A	A		
Fraxinus pennsylvanica	A	A		
Pinus strobus (Planted)				
Alnus glutinosa (Planted)	O	O		
Thuja occidentalis	O	O	O	
Picea glauca		O		
Populus balsamifera				
Prunus serotina		R		
Acer x freemanii (Planted)	R			
Salix alba	R			
Shrubs and Woody Vines				
Vitis riparia		A	A	
Cornus alternifolia		O	O	
Prunus virginiana			O	
Lonicera tatarica			A	
Rubus idaeus ssp. strigosus			A	
Viburnum opulus			O	
Ribes americanum			A	
Cornus stolonifera			O	
Ribes cynosbati			O	
Parthenocissus inserta			O	
Salix discolor			R	
Rhamnus cathartica		O	O	
Echinocystis lobata		O	O	
Prunus virginiana			O	
Sorbus aucuparia		R		
Rubus allegheniensis			A-O	
Rhus typhina		O-R		
Lonicera Sp.			O	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Equisetum arvense				O
Taraxacum officinale				A - O
Arctium lappa			O	
Alliaria petiolata				A
Onoclea sensibilis				R
Asparagus officinalis				R
Geranium robertianum				R
Anemone canadensis				O
Hemerocallis fulva			A	
Circaea canadensis				O
Chelidonium majus				R
Matteuccia struthiopteris (Planted)				O-R
Oenothera biennis			O	O
Erigeron philadelphicus			O	
Leonurus cardiaca				R
Dactylis glomerata			A	
Solidago altissima			O	
Nepeta cataria				R
Euthamia graminifolia				R
Bromus inermis			O	
Melilotus albus			R	
Silene vulgaris				R
Asclepias syriaca			O	
Daucus carota			O	
Tragopogon dubius			R	
Achillea millefolium				R
Malva moschata				R
Chenopodium album				O-R
Abutilon theophrasti			R	
Phalaris arundinacea			O	
Lactuca canadensis			O	
Vicia cracca				O
Hypericum perforatum			R	

ELC Community Description & Classification

Polygon: P16

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P17

Project No: 12-137A
Project Name: Hillsburgh Dam EA
Surveyor(s): RH
Date: May 22; Aug 5; Sept 24, 2015

Polygon Description P17	**Community Series: SW**	**Ecosite: SWC**	**Vegetation Type: SWCM1-2** **White Cedar – Conifer Mineral Coniferous Swamp**

System
Terrestrial [✓ Wetland] Aquatic

Topographic Feature
[✓ Lacustrine] Riverine Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte Deciduous [✓ Coniferous] Mixed

Cover
Open Shrub [✓ Treed]

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural [✓ Swamp] Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young Mid-Aged [✓ Mature] Old Growth

Basal Area (m²/ha)

Standing Snags
Rare Occasional [✓ Abundant] Dominant

Deadfall Logs
Rare Occasional [✓ Abundant] Dominant

Health
Low Medium [✓ High]

Sensitivity
Low Medium [✓ High]

Botanical Quality
Low Medium [✓ High]

Slope
none [✓ gentle] moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well [✓ Imperfect] Poor Very Poor

Soil Moisture Regime
Dry Fresh [✓ Moist] Wet

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface [✓ less than 1m] more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy	2	4	Thuja occidentalis >> Fraxinus pennsylvanica > Populus tremuloides
2	Subcanopy	3	2	Thuja occidentalis >> Abies balsamea > Fraxinus pennsylvanica
3	Understorey	4	2	Ribes americanum = Cornus alternifolia > Cornus stolonifera
4	Ground Layer	6	3	Caltha palustris > Equisetum palustre > Impatiens capensis

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant				
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance: Trails, sand bags, water control structures.

Wildlife / Habitat Observations: Canada goose nest, snapping turtle along edge of pond.

Comments: Mostly Wetland, with areas of upland cedar forest on slopes around pond.

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**	X	**Fresh – Moist White Cedar Coniferous Forest Type**	**FOCM4-1**	**20**
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P17

Project No: 12-137A

Project Name: Hillsburgh Dam EA

Surveyor(s): RH

Date: May 22; Aug 5; Sept 24, 2015

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Larix laricina	R			
Thuja occidentalis	D	D		
Populus tremuloides	O	O		
Acer negundo	R			
Picea glauca	R			
Fraxinus pennsylvanica	O-A	O		
Ulmus americana	R	R		
Prunus serotina	O-R	R		
Abies balsamea	O	A		
Shrubs and Woody Vines				
Cornus stolonifera			A	
Lonicera tatarica			O	
Prunus virginiana			O	
Viburnum lentago			O	
Rhamnus alnifolia			R	
Cornus alternifolia			A	O
Ribes americanum			A	
Sambucus canadensis			R	
Amelanchier arborea			R	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Typha sp.				O
Myosotis laxa				O
Caltha palustris				A
Asparagus officinalis				R
Impatiens capensis				A
Tussilago farfara				A
Taraxacum officinale				A
Vinca minor				R
Onoclea sensibilis				O
Solanum dulcamara				O
Equisetum scirpoides				O
Equisetum palustre				A
Lemna minor				O
Clematis virginiana			O	
Hypericum punctatum				R
Cystopteris bulbifera			O-R	
Vitis riparia			O	
Circaea alpina				O
Rumex orbiculatus			R	
Lythrum salicaria			O	
Symphyotrichum puniceum			O	
Phalaris arundinacea			O	
Carex vulpinoidea				O
Eutrochium maculatum var. maculatum			O-A	
Aegopodium podagraria				R
Geranium robertianum				R
Rubus pubescens			O-R	
Thelypteris noveboracensis				R
Ranunculus recurvatus				O

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P18

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Polygon Description P18	**Community Series: SA**	**Ecosite: SAM**	**Vegetation Type: SAM_1-8** **Water Lily – Bullhead Lily Mixed Shallow Aquatic**

System
Terrestrial Wetland [✓ Aquatic]

Topographic Feature
Lacustrine Riverine Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged [✓ Floating-lvd.] Graminoid Forb Lichen Bryophyte Deciduous Coniferous Mixed

Cover
[✓ Open] Shrub Treed

History
Natural Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural Swamp Fen Bog Marsh Open Water [✓ Shallow Water]

Stand Description:

Community Age
Pioneer [✓ Young] Mid-Aged Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare Occasional Abundant Dominant

Deadfall Logs
Rare Occasional Abundant Dominant

Health
Low [✓ Medium] High

Sensitivity
Low Medium High

Botanical Quality
Low Medium High

Slope
none gentle moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect Poor Very Poor

Soil Moisture Regime
Dry Fresh Moist [✓ Wet]

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
[✓ at surface] less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy			
2	Subcanopy			
3	Understorey			
4	Ground Layer	6	2	Nymphaea odorata ssp. odorata > Typha latifolia > Sagittaria latifolia

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	NA	NA	NA	NA
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P18

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Inclusion		**Complex**				

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant 1	2	3	4
Trees				
Shrubs and Woody Vines				

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant 1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Nymphaea odorata ssp. odorata				A
Typha latifolia				O
Phalaris arundinacea				O
Sagittaria latifolia				O
Eutrochium maculatum				O
Scirpus atrovirens				R
Cystopteris bulbifera				R
Potamogeton sp.				O

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P19

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Polygon Description P19

Community Series: SA

Ecosite: SAM

Vegetation Type: SAM_1-8
Water Lily – Bullhead Lily Mixed Shallow Aquatic

System
Terrestrial Wetland [✓ Aquatic]

Topographic Feature
Lacustrine Riverine Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged [✓ Floating-lvd.] Graminoid Forb Lichen Bryophyte Deciduous Coniferous Mixed

Cover
[✓ Open] Shrub Treed

History
Natural Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural Swamp Fen Bog Marsh Open Water [✓ Shallow Water]

Stand Description:

Community Age
Pioneer [✓ Young] Mid-Aged Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare Occasional Abundant Dominant

Deadfall Logs
Rare Occasional Abundant Dominant

Health
Low [✓ Medium] High

Sensitivity
Low Medium High

Botanical Quality
Low Medium High

Slope
none gentle moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect Poor Very Poor

Soil Moisture Regime
Dry Fresh Moist [✓ Wet]

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
[✓ at surface] less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy			
2	Subcanopy			
3	Understorey			
4	Ground Layer	6	2	Nymphaea odorata ssp. odorata > Typha latifolia > Sagittaria latifolia

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	NA	NA	NA	NA
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P19

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Shrubs and Woody Vines				
Cornus stolonifera			O	

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Nymphaea odorata ssp. odorata				A
Sagittaria latifolia				O
Typha latifolia				O
Cystopteris bulbifera			R	
Phalaris arundinacea			O	
Carex lacustris				O
Bidens frondosa				R
Eutrochium maculatum				O
Scirpus atrovirens				R
Typha angustifolia				R
Iris pseudacorus				R
Iris versicolor				R

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P20

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Polygon Description P20

Community Series:

Ecosite: OAW
Open Aquatic

Vegetation Type:

System
Terrestrial Wetland [✓ Aquatic]

Topographic Feature
Lacustrine Riverine Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged [✓ Floating-lvd.] Graminoid Forb Lichen Bryophyte Deciduous Coniferous Mixed

Cover
[✓ Open] Shrub Treed

History
Natural Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural Swamp Fen Bog Marsh [✓ Open Water] Shallow Water

Stand Description:

Community Age
Pioneer [✓ Young] Mid-Aged Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare Occasional Abundant Dominant

Deadfall Logs
Rare Occasional Abundant Dominant

Health
Low [✓ Medium] High

Sensitivity
Low Medium High

Botanical Quality
Low Medium High

Slope
none gentle moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect Poor Very Poor

Soil Moisture Regime
Dry Fresh Moist [✓ Wet]

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
[✓ at surface] less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		Height [1]	Cover [2]	Dominant Species per Vegetation Layer
1	Canopy			
2	Subcanopy			
3	Understorey			
4	Ground Layer	6	2	Nymphaea odorata ssp. odorata

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis [3]	NA	NA	NA	NA
[3] *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	**< 10 cm DBH**	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

Deep open water portion of main pond.

				Community Name	Code	% Coverage
Inclusion		Complex				
Inclusion		Complex				

ELC Community Description & Classification

Polygon: P20

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Shrubs and Woody Vines				

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Nymphaea odorata ssp. odorata				R

ELC Community Description & Classification **Polygon: P20**

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 22; Aug 5; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P21

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date**:

Polygon Description P21	**Community Series: SW**	**Ecosite: SWC**	**Vegetation Type: SWCM1-2** **White Cedar – Conifer Mineral Coniferous Swamp**

System
Terrestrial [✓ Wetland] Aquatic

Topographic Feature
Lacustrine Riverine [✓ Bottomland] Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte Deciduous [✓ Coniferous] Mixed

Cover
Open Shrub [✓ Treed]

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural [✓ Swamp] Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare [✓ Occasional] Abundant Dominant

Deadfall Logs
Rare Occasional [✓ Abundant] Dominant

Health
Low Medium [✓ High]

Sensitivity
Low [✓ Medium] High

Botanical Quality
Low Medium [✓ High]

Slope
none [✓ gentle] moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well [✓ Imperfect] Poor Very Poor

Soil Moisture Regime
Dry Fresh [✓ Moist] Wet

Effective Soil Texture
Organic (D) / Mineral (O)

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface [✓ less than 1m] more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy	2	3	Thuja occidentalis > Abies balsamea = Picea mariana = Picea glauca
2	Subcanopy	3	2	Thuja occidentalis > Abies balsamea = Populus balsamifera > Betula papyrifera
3	Understorey	4	2	Abies balsamea = Thuja occidentalis > Cornus alternifolia
4	Ground Layer	6	2	Caltha palustris > Onoclea sensibilis > Anemone canadensis

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	A	A	A	R
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments: Most of the community is on private land without access. Evaluation from trail edge.

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**	X	**Fresh – Moist White Cedar – Hardwood Mixed forest Type**	**FOMM7-2**	**20**
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P21

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date:**

	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
Plant Species List	1	2	3	4
Trees				
Thuja occidentalis	D	D	A	
Acer saccharinum	R			
Betula papyrifera	A	A	A	
Acer negundo	R			
Picea mariana				
Prunus serotina	O	A		
Populus balsamifera	A	A	A	
Abies balsamea	D	A	A	
Populus tremuloides		O		
Crataegus sp.	R	R		
Tilia americana		O	O	
Acer platanoides	D	A	A	
Picea glauca			R	
Fraxinus americana	O			
Larix laricina		O	O	
Fraxinus pennsylvanica	O	O		
Acer rubrum		O		
Shrubs and Woody Vines				
Lonicera tatarica			O	
Cornus stolonifera			A	
Vitis riparia			O	
Ribes americanum			O	
Prunus virginiana			R	
Ribes triste			O	
Cornus alternifolia			R	
Aralia nudicaulis				R
Sambucus canadensis			O	

	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
Plant Species List	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Alliaria petiolata			O	O
Taraxacum officinale			O	O
Fragaria virginiana				A
Anemone canadensis				A
Caltha palustris				D
Onoclea sensibilis				A
Maianthemum canadense				O
Viola cucullata				O
Cardamine diphylla				R
Asarum canadense				O
Tussilago farfara				A
Nasturtium microphyllum				O
Actaea rubra				O-R
Actaea pachypoda				R
Eutrochium maculatum			O	
Typha latifolia			O-R	
Asarum canadense				R
Carex intumescens			O	
Dryopteris cristata				R
Arisaema triphyllum				R
Equisetum scirpoides				R
Rumex obtusifolius				R
Geranium robertianum				O
Cystopteris bulbifera				R
Equisetum fluviatile				O-R
Cystopteris bulbifera				O
Dryopteris carthusiana				O
Equisetum fluviatile				O
Equisetum palustre				O
Cornus canadensis				O
Moss sp.				A
Carex sp.				A

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date:**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P22

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Polygon Description P22	**Community Series: SW**	**Ecosite: SWT**	**Vegetation Type: SWTO2-6** **Mixed Willow Organic Thicket Swamp Type**
System Terrestrial [✓ Wetland] Aquatic	**Topographic Feature** Lacustrine Riverine [✓ Bottomland] Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff		**Dominant Plant Form** Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte Deciduous [✓ Coniferous] Mixed
Cover [✓ Open] Shrub Treed	**History** [✓ Natural] Cultural	**Community Class** Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest [✓ Thicket] Cultural [✓ Swamp] Fen Bog Marsh Open Water Shallow Water	

Stand Description:	**Soil Analysis:**
Community Age Pioneer [✓ Young] Mid-Aged Mature Old Growth **Basal Area (m²/ha)**	**Soil Drainage** Very Rapid Rapid Well Moderately Well Imperfect [✓ Poor] [✓ Very Poor]
Standing Snags Rare Occasional [✓ Abundant] Dominant	**Soil Moisture Regime** Dry Fresh Moist [✓ Wet]
Deadfall Logs Rare Occasional [✓ Abundant] Dominant	**Effective Soil Texture**
Health Low [✓ Medium] High **Sensitivity** Low [✓ Medium] High **Botanical Quality** Low [✓ Medium] High	**Depth to Mottles / Gley** **Sample:** M - cm / G - cm
Slope [✓ none] gentle moderate steep (simple or complex)	**Depth to Groundwater** metres at surface less than 1m more than 1 m **Depth to Bedrock** metres at surface less than 1m more than 1 m

Vegetation Layer		**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy	2	2	Picea glauca > Betula papyrifera = Populus tremuloides
2	Subcanopy	3	1	Picea glauca > Thuja occidentalis = Picea mariana
3	Understorey	4	3	Salix sp. > Cornus stolonifera > Typha latifolia > Phalaris arundinacea
4	Ground Layer	6	4	Caltha palustris > Impatiens capensis > Sedge sp.

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis [3]	O	O	O	NA
[3] *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	**< 10 cm DBH**	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments: No access. Evaluation from edge.

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**	**X**	**Mixed Shallow Water**	**SAM**	**15**
Inclusion		**Complex**	**X**	**Mixed Mineral Meadow Marsh**	**MAMM3-1**	**15**

ELC Community Description & Classification

Polygon: P22

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Picea glauca	O	A	A	
Thuja occidentalis	O	A	A	
Populus balsamifera	O	A	A	
Betula papyrifera	O	O		
Salix alba	R	A	D	
Prunus serotina		R	R	
Ulmus americana		R		
Picea mariana		A		
Fraxinus pennsylvanica	R			
Populus tremuloides	O			
Shrubs and Woody Vines				
Cornus stolonifera			A	
Cornus alternifolia			O	
Sambucus canadensis			R	
Salix petiolaris			A	
Salix lucida			O	
Salix discolor			O	
Salix purpurea			D-A	
Lonicera sp.			R	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Caltha palustris				A
Typha latifolia			A	A
Eutrochium maculatum			A	
Scirpus cyperinus			A	
Phalaris arundinacea			A	
Eupatorium perfoliatum				O
Impatiens capensis			A	
Oenothera biennis			R	
Sagittaria latifolia				O-R
Scirpus atrovirens			O	
Onoclea sensibilis				O
Circaea alpina				O
Lythrum salicaria			O	
Symphyotrichum puniceum			O-R	
Bidens tripartita				O
Ranunculus aquatilis				O
Symphyotrichum novae-angliae			A-O	
Euthamia graminifolia			O	
Epilobium leptophyllum			R	
Epilobium coloratum			R	
Carex interior				R
				Epilo
Rumex sp.				R
Grass sp.			A	A
Sedge sp.			A	A
Algae				A

ELC Community Description & Classification

Polygon: P22

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P23

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Polygon Description P23

Community Series: FO

Ecosite: FOM

Vegetation Type: FOMM7-2
Fresh – Moist White Cedar – Hardwood Mixed Forest

System
[✓ Terrestrial] Wetland Aquatic

Topographic Feature
Lacustrine Riverine Bottomland Terrace Valley slope Tableland [✓ Rolling upland] Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte [✓ Deciduous] Coniferous Mixed

Cover
Open Shrub [✓ Treed]

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland [✓ Forest] Thicket Cultural Swamp Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare [✓ Occasional] Abundant Dominant

Deadfall Logs
Rare [✓ Occasional] Abundant Dominant

Health
Low Medium [✓ High]

Sensitivity
Low [✓ Medium] High

Botanical Quality
Low Medium [✓ High]

Slope
none gentle [✓ moderate] steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well [✓ Moderately Well] Imperfect Poor Very Poor

Soil Moisture Regime
Dry [✓ Fresh] Moist Wet

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

	Vegetation Layer	Height ¹	Cover ²	Dominant Species per Vegetation Layer
1	Canopy	2	3	White birch > white cedar > black cherry = trembling aspen
2	Subcanopy	3	3	Tremblin aspen = black cherry = white birch > alt leave dogwood
3	Understorey	4	3	Alt leave dogwood = Ash sp.
4	Ground Layer	6	3	Yellow trout lilly = Smooth yellow violet

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	A	A	A	R
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments: Small area of pure White Cedar Stand.

				Community Name	Code	% Coverage
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P23

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Thuja occidentalis	D	A		
Betula papyrifera	D	O		
Populus balsamifera	A	A		
Malus pumila		R		
Ulmus americana		O	R	
Prunus serotina	A	O	O	
Acer saccharinum	O-R		O	
Populus tremuloides	A	O	O	
Fraxinus americana		O	O	
Shrubs and Woody Vines				
Lonicera tatarica			O	
Ribes americanum			O	
Cornus alternifolia		O	A	
Prunus virginiana			R	
Salix eriocephala			O	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Trillium erectum			R	
Smooth yellow violet				A
Yellow trout lily				O
Dog blue violet				O
Woodland strewberry				A
Dandelion				A
Sensitive fern				R
Wild leak				R
Rubus pubescens				A
Equisetum arvense				O
Agrimonia gryposepala				R
Erythronium americanum				R
Cornus canadensis				O

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P24

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Polygon Description P24	**Community Series: SW**	**Ecosite: SWD**	**Vegetation Type: SWDM4-5** **Poplar Mineral Deciduous Swamp**

System
Terrestrial [✓ Wetland] Aquatic

Topographic Feature
Lacustrine Riverine [✓ Bottomland] Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte [✓ Deciduous] Coniferous Mixed

Cover
Open Shrub [✓ Treed]

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland [✓ Forest] Thicket Cultural Swamp Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m^2/ha)

Standing Snags
[✓ Rare] Occasional Abundant Dominant

Deadfall Logs
Rare [✓ Occasional] Abundant Dominant

Health
Low [✓ Medium] High

Sensitivity
Low [✓ Medium] High

Botanical Quality
Low [✓ Medium] High

Slope
none [✓ gentle] moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well [✓ Imperfect] Poor Very Poor

Soil Moisture Regime
Dry Fresh [✓ Moist] Wet

Effective Soil Texture
Mineral

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		**Height** [1]	**Cover** [2]	**Dominant Species per Vegetation Layer**
1	Canopy	2	3	Populus tremuloides > Betula papyrifera > Thuja occidentalis
2	Subcanopy	4	3	Populus tremuloides > Betula papyrifera > Thuja occidentalis
3	Understorey	3	3	Salix sp. > Cornus alternifolia > Eutrochium maculatum
4	Ground Layer	6	3	Onoclea sensibilis > Equisetum sp. = Carex sp. > Fragaria vesca

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis [3] [3] *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	A	A	O	R
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P24

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Betula papyrifera	A	A		
Prunus serotina	R	O		
Acer saccharum ssp. saccharum	R	O	O	
Populus tremuloides	D	A		
Thuja occidentalis	O	O		
Fraxinus pennsylvanica		O	O	
Picea mariana	O			
Populus balsamifera		O	O	O
Shrubs and Woody Vines				
Cornus alternifolia			A	
Salix discolor			O	
Salix eriocephala			O	
Prunus virginiana			A	
Spiraea alba			O	
Cornus stolonifera			A	
Daphne mezereum			R	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Onoclea sensibilis				A
Equisetum sp.				A
Fragaria vesca				O
Eutrochium maculatum			A	
Actaea pachypoda				O
Carex sp.				A

ELC Community Description & Classification

Polygon: P24

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P25

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Polygon Description **P25**	**Community Series: FO**	**Ecosite: FOD**	**Vegetation Type: FODM8-1** **Fresh – Moist Poplar Deciduous Forest**

System
[✓ Terrestrial] Wetland Aquatic

Topographic Feature
Lacustrine Riverine Bottomland Terrace [✓ Valley slope] Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte [✓ Deciduous] Coniferous Mixed

Cover
Open Shrub [✓ Treed]

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland [✓ Forest] Thicket Cultural Swamp Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young Mid-Aged [✓ Mature] Old Growth

Basal Area (m²/ha)

Standing Snags
Rare [✓ Occasional] Abundant Dominant

Deadfall Logs
Rare Occasional [✓ Abundant] Dominant

Health
Low [✓ Medium] High

Sensitivity
Low [✓ Medium] High

Botanical Quality
Low [✓ Medium] High

Slope
none gentle [✓ moderate] steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well [✓ Moderately Well] Imperfect Poor Very Poor

Soil Moisture Regime
Dry [✓ Fresh] Moist Wet

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy	2	3	Populus tremuloides = Acer saccharum ssp. saccharum > Thuja occidentalis = Fraxinus americana
2	Subcanopy	3	3	Populus tremuloides = Acer saccharum ssp. saccharum > Fraxinus americana = Cornus alternifolia > Rhus typhina
3	Understorey	4	3	Rubus idaeus ssp. strigosus > Ribes americanum = Inserted Virginia Creeper
4	Ground Layer	6	3	Alliaria petiolate > Fragaria vesca > Erythronium americanum

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ *³ Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	O	A	O	
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**				
Inclusion		**Complex**				

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ELC Community Description & Classification

Polygon: P25

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Populus tremuloides	A	O	O	
Malus pumila	R			
Acer saccharum ssp. saccharum	A	O	A	
Larix laricina	R			
Picea abies	O			
Fraxinus pennsylvanica	O	O		
Acer negundo	O	O		
Prunus serotina	O	O		
Tilia americana	O	O		
Thuja occidentalis	A	O		
Abies balsamea		O	O	
Fraxinus americana	A	O	O	
Shrubs and Woody Vines				
Rubus idaeus ssp. strigosus			A	
Cornus alternifolia		A		
Inserted Virginia Creeper			A	
Cichorium intybus			O	
Vitis riparia			R	
Lonicera tatarian			R	
Ribes americanum			A	
Rhus typhina		O	O	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Taraxacum officinale				A
Asarum canadense				O
Erythronium americanum				A
Viola pubescens var. pubescens				O
Alliaria petiolata				D
Equisetum arvense				O
Arctium lappa				R
Fragaria vesca				A
Tiarella cordifolia				R
Circaea canadensis				R
Maianthemum racemosum				O
Grass sp.				A

ELC Community Description & Classification

Polygon: P25

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P26

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Polygon Description **P26**	**Community Series: SW**	**Ecosite: SWD**	**Vegetation Type: SWDM2-1** **Black Ash Mineral Deciduous Swamp**

System
Terrestrial [✓ Wetland] Aquatic

Topographic Feature
Lacustrine Riverine [✓ Bottomland] Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte [✓ Deciduous] Coniferous Mixed

Cover
Open Shrub [✓ Treed]

History
Natural Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah [✓ Woodland] Forest Thicket Cultural Swamp Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m²/ha)

Standing Snags
[✓ Rare] Occasional Abundant Dominant

Deadfall Logs
Rare [✓ Occasional] Abundant Dominant

Health
Low [✓ Medium] High

Sensitivity
Low [✓ Medium] High

Botanical Quality
Low [✓ Medium] High

Slope
none [✓ gentle] moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect Poor Very Poor

Soil Moisture Regime
Dry Fresh Moist [✓ Wet]

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

	Vegetation Layer	**Height** [1]	**Cover** [2]	**Dominant Species per Vegetation Layer**
1	Canopy	2	3	Fraxinus nigra > Populus tremuloides > Acer saccharum ssp. saccharum
2	Subcanopy	3	2	Fraxinus nigra > Populus tremuloides > Ulmus americana > Parthenocissus inserta
3	Understorey	4	2	Ribes americanum > Parthenocissus inserta > Ribes hirtellum
4	Ground Layer	6	2	Onoclea sensibilis > Impatiens capensis = Alliaria petiolate > Anemone canadensis

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis [3]	O	D	O	
[3] *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	**< 10 cm DBH**	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P26

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Fraxinus nigra	D	A	A	
Acer saccharum ssp. saccharum	A	O	O	
Ulmus americana		O	O	
Populus tremuloides	A	A		
Shrubs and Woody Vines				
Ribes americanum			A	
Prunus virginiana		O		
Parthenocissus inserta		A	O	
Ribes hirtellum			O	
Sambucus canadensis		R		
Ribes triste			O	

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Onoclea sensibilis				A
Viola pubescens var. pubescens				A
Anemone canadensis				O
Impatiens capensis				A
Taraxacum officinale				O
Alliaria petiolata				A
Carex intumescens				O
Tiarella cordifolia				O
Equisetum sp.				O
Sedge sp.				A
Grass sp.				A

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P27

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: July 30; Sept 24, 2015**

Polygon Description P27	**Community Series: Fo**	**Ecosite: FOC**	**Vegetation Type: FOCM6**

System
[✓ Terrestrial] Wetland Aquatic

Topographic Feature
Lacustrine [✓ Riverine] Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte Deciduous [✓ Coniferous] Mixed

Cover
Open Shrub [✓ Treed]

History
Natural [✓ Cultural]

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland [✓ Forest] Thicket Cultural Swamp Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare Occasional Abundant Dominant

Deadfall Logs
Rare Occasional Abundant Dominant

Health
Low Medium High

Sensitivity
Low Medium High

Botanical Quality
[✓ Low] Medium High

Slope
none gentle moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect Poor Very Poor

Soil Moisture Regime
Dry Fresh Moist Wet

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		Height ¹	Cover ²	Dominant Species per Vegetation Layer
1	Canopy	2	4	Larix sp. = Picea abies = Picea glauca = Pinus strobus =Thuja occidentalis
2	Subcanopy			
3	Understorey			
4	Ground Layer			

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	**< 10 cm DBH**	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments: Surveyed from a distance, from road side.

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification **Polygon: P27**

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: July 30; Sept 24, 2015**

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Thuja occidentalis	A			
Pinus strobus	A			
Picea glauca	A			
Picea abies	A			
Larix sp.	A			
Shrubs and Woody Vines				

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				

ELC Community Description & Classification

Polygon: P27

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: July 30; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P28

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Polygon Description P28	**Community Series: SW**	**Ecosite: SWT**	**Vegetation Type: SWTO2-3** **Meadow Willow Organic Deciduous Thicket Swamp**

System
Terrestrial [✓ Wetland] Aquatic

Topographic Feature
Lacustrine Riverine [✓ Bottomland] Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte [✓ Deciduous] Coniferous Mixed

Cover
Open [✓ Shrub] Treed

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest [✓ Thicket] Cultural [✓ Swamp] Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare [✓ Occasional] Abundant Dominant

Deadfall Logs
Rare Occasional [✓ Abundant] Dominant

Health
Low [✓ Medium] High

Sensitivity
Low [✓ Medium] High

Botanical Quality
Low [✓ Medium] High

Slope
none [✓ gentle] moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect [✓ Poor] Very Poor

Soil Moisture Regime
Dry Fresh [✓ Moist] Wet

Effective Soil Texture
Orgnic

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface [✓ less than 1m] more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy	3	2	Betula papyrifera > Populus tremuloides = Populus balsamifera
2	Subcanopy	4	4	Cornus stolonifera = Salix discolor = Salix petiolaris
3	Understorey	5	3	Cornus stolonifera = Salix sp. > Rubus idaeus ssp. strigosus > Scirpus cyperinus
4	Ground Layer	6	3	Carex lacustris > Onoclea sensibilis = Sedge sp.

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³	D	O	O	NA
³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	**< 10 cm DBH**	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments: Salix petiolaris dominated community

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P28

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Populus balsamifera		A		
Betula papyrifera		A		
Picea mariana		O	R	
Ulmus americana		O		
Populus tremuloides	O			
Fraxinus pennsylvanica		O		
Shrubs and Woody Vines				
Prunus serotina		O		
Cornus stolonifera		A		
Salix discolor		A		
Rubus idaeus ssp. strigosus		A		
Ribes americanum		O		
Salix lucida		R		
Spirea alba		R		
Salix petiolaris		D-A		
Ribes triste		O		
Salix eriocephala		A		
Viburnum opulus		R		

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Rudbeckia hirta				R
Onoclea sensibilis				A-O
Typha latifolia			O	
Scirpus cyperinus			O	
Carex lacustris				A
Euthamia graminifolia				O
Eutrochium maculatum			A	
Clematis virginiana			O	
Impatiens capensis			A	
Bidens tripartita				R
Grass sp.				O
Sedge sp.				A
Equisetum sp.				A

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P29

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Polygon Description P29	**Community Series: SW**	**Ecosite: SWD**	**Vegetation Type: SWDM4-5** **Poplar Mineral Deciduous Swamp**

System
[✓ Terrestrial] [✓ Wetland] Aquatic

Topographic Feature
Lacustrine Riverine Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte [✓ Deciduous] Coniferous Mixed

Cover
Open Shrub [✓ Treed]

History
[✓ Natural] [✓ Cultural]

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland [✓ Forest] Thicket Cultural [✓ Swamp] Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare Occasional Abundant Dominant

Deadfall Logs
Rare Occasional Abundant Dominant

Health
Low Medium High

Sensitivity
Low Medium High

Botanical Quality
Low Medium High

Slope
none gentle moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect Poor Very Poor

Soil Moisture Regime
Dry Fresh Moist Wet

Effective Soil Texture

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
at surface less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		**Height ¹**	**Cover ²**	**Dominant Species per Vegetation Layer**
1	Canopy	2	3	Populus tremuloides > Acer saccharum ssp. saccharum >Fraxinus pennsylvanica
2	Subcanopy	3	2	Populus tremuloides > Acer saccharum ssp. saccharum >Fraxinus pennsylvanica > Thuja occidentalis
3	Understorey	4	2	Acer negundo > Cornus alternifolia > Rubus idaeus ssp. strigosus > Vitis riparia
4	Ground Layer	5	2	Impatiens capensis > Alliaria petiolate > Solidago canadensis

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³	O	A	R	R
³ *Abundance Code:* RS=Rare, O=Occasional, A=Abundant, D=Dominant	**< 10 cm DBH**	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance: Residence, driveway, lawn, planted species.

Wildlife / Habitat Observations:

Comments: Road side survey.
Complex of Poplar Mineral Deciduous Swamp and Fresh – Moist Sugar Maple Deciduous Forest. Boundary between community and surrounding communitie(s) is unclear.

				Community Name	**Code**	**% Coverage**
Inclusion		**Complex**	X	**Fresh – Moist Sugar Maple Deciduous Forest**	**FODM6**	**40**
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P29

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 24, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Acer negundo	O	O	A	
Salix alba	O			
Populus tremuloides	D-A	A		
Fraxinus pennsylvanica	O-A	O-A		
Thuja occidentalis	O	O		
Betula papyrifera	O	R		
Acer saccharum ssp. saccharum	A	O		
Acer platanoides	O			
Shrubs and Woody Vines				
Parthenocissus inserta			O	
Cornus alternifolia			O	
Vitis riparia			O	
Rubus idaeus ssp. strigosus			O	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Impatiens capensis				A
Impatiens pallida				R
Aegopodium podagraria				O
Alliaria petiolata				A
Solidago canadensis				A
Oxalis montana				O

ELC Community Description & Classification

Polygon: P30

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 25, 2015**

Polygon Description P30	**Community Series: FO**	**Ecosite: FOD**	**Vegetation Type: FODM7-7** **Fresh – Moist Manitoba Maple Lowland Deciduous Forest**

System: [✓ Terrestrial] Wetland Aquatic

Topographic Feature: Lacustrine [✓ Riverine] Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form: Plankton Submerged Floating-lvd. Graminoid Forb Lichen Bryophyte [✓ Deciduous] Coniferous Mixed

Cover: Open Shrub [✓ Treed]

History: [✓ Natural] Cultural

Community Class: Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland [✓ Forest] Thicket Cultural Swamp Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age: Pioneer Young [✓ Mid-Aged] Mature Old Growth

Basal Area (m²/ha):

Standing Snags: [✓ Rare] Occasional Abundant Dominant

Deadfall Logs: Rare Occasional [✓ Abundant] Dominant

Health: [✓ Low] Medium High

Sensitivity: Low [✓ Medium] High

Botanical Quality: [✓ Low] Medium High

Slope: none [✓ gentle] moderate steep (simple or complex)

Soil Analysis:

Soil Drainage: Very Rapid Rapid Well Moderately Well [✓ Imperfect] Poor Very Poor

Soil Moisture Regime: Dry Fresh Moist Wet

Effective Soil Texture

Mineral

Depth to Mottles / Gley

Sample: M - cm / G - cm

Depth to Groundwater metres: at surface less than 1m more than 1 m

Depth to Bedrock metres: at surface less than 1m more than 1 m

Vegetation Layer		Height ¹	Cover ²	Dominant Species per Vegetation Layer
1	Canopy	3	3	Acer negundo > Salix fagilis
2	Subcanopy	4	2	Acer negundo > Salix fagilis
3	Understorey	5	3	Prunus virginiana > Cornus stolonifera
4	Ground Layer	6-7	4	Impatiens capensis > Alliaria petiolate > Dactylis glomerata > Solidago canadensis

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³	A	O	R	NA
³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	**< 10 cm DBH**	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance: Garbage and trash in community and in river. Trails along river and creek.

Wildlife / Habitat Observations:

Comments: Highly disturbed, cultural origin community.

				Community Name	Code	% Coverage
Inclusion		**Complex**				
Inclusion		**Complex**				

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ELC Community Description & Classification

Polygon: P30

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 25, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Ulmus americana			R	
Acer negundo	A	A		
Acer saccharum ssp. saccharum	O	O		
Pinus sylvestris	R			
Prunus serotina	O			
Salix fagilis	A	O		
Populus balsamifera	O			
Acer platanoides	O	O		
Juglans nigra	R			
Salix alba	R			
Shrubs and Woody Vines				
Prunus virginiana			O	
Cornus stolonifera			O	
Syringa vulgaris			O	
Rubus idaeus ssp. strigosus			A	
Vitis riparia			A	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Taraxacum officinale				O
Arctium minus				O
Hesperis matronalis				O
Impatiens capensis				A
Galium asprellum				O
Myosotis scorpioides				O
Glechoma hederacea				O
Alliaria petiolata				A
Barbarea vulgaris				O
Echinocystis lobata				O
Fragaria virginiana				O
Chelidonium majus				R
Eutrochium maculatum				R
Solanum dulcamara				O
Anemone canadensis				A
Carix stricta				O
Dactylis glomerata				A
Cichorium intybus				O
Geum aleppicum				O
Urtica dioica ssp. gracilis				O
Daucus carota				R
Solidago canadensis				A-O
Bidens tripartita				R
Tragopogon dubius				
Viola sp.				O

ELC Community Description & Classification

Polygon: P30

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 25, 2015**

Representative Photographs of Vegetation Community:

ELC Community Description & Classification

Polygon: P31

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 25, 2015**

Polygon Description **P31**	**Community Series: MA**	**Ecosite: MAM**	**Vegetation Type: MAMM1-1** **Cattail Graminoid Mineral Meadow Marsh Type**

System
Terrestrial [✓ Wetland] Aquatic

Topographic Feature
[✓ Lacustrine] Riverine Bottomland Terrace Valley slope Tableland Rolling upland Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid [✓ Forb] Lichen Bryophyte Deciduous Coniferous Mixed

Cover
[✓ Open] Shrub Treed

History
[✓ Natural] Cultural

Community Class Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Tallgrass Prairie Savannah Woodland Forest Thicket Cultural Swamp Fen Bog [✓ Marsh] Open Water Shallow Water

Stand Description:

Community Age
Pioneer [✓ Young] Mid-Aged Mature Old Growth

Basal Area (m²/ha)

Standing Snags
[✓ Rare] Occasional Abundant Dominant

Deadfall Logs
Rare [✓ Occasional] Abundant Dominant

Health
Low [✓ Medium] High

Sensitivity
Low [✓ Medium] High

Botanical Quality
[✓ Low] Medium High

Slope
[✓ none] gentle moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect [✓ Poor] Very Poor

Soil Moisture Regime
Dry Fresh Moist [✓ Wet]

Effective Soil Texture
Mineral

Depth to Mottles / Gley
Sample: M - cm / G - cm

Depth to Groundwater metres
[✓ at surface] less than 1m more than 1 m

Depth to Bedrock metres
at surface less than 1m more than 1 m

Vegetation Layer		Height ¹	Cover ²	Dominant Species per Vegetation Layer
1	Canopy	2	1	Ulmus americana
2	Subcanopy	3	2	Acer negundo > Ulmus americana > Cornus stolonifera
3	Understorey	4	4	Typha angustifolia > Phalaris arundinacea = Agrostis gigantean > Symphyotrichum puniceum
4	Ground Layer	5 - 6	4	Impatiens capensis > Verbena hastata

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³ ³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	O	O	NA	NA
	< 10 cm DBH	**10 to 24 cm DBH**	**25 to 50 cm DBH**	**> 50 cm DBH**

Evidence of Disturbance:

Wildlife / Habitat Observations:

Comments:

				Community Name	Code	% Coverage
Inclusion		**Complex**				
Inclusion		**Complex**				

ELC Community Description & Classification

Polygon: P31

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 25, 2015**

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
Ulmus americana	O	O		
Acer negundo		A		
Shrubs and Woody Vines				
Cornus stolonifera		A	O	
Syringa vulgaris		R		
Cornus alternifolia		R	R	
Rubus idaeus ssp. idaeus			O	

Plant Species List	**Layer / Abundance** *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
Typha angustifolia			D	
Agrostis gigantea			A	
Phalaris arundinacea			A	
Melilotus officinalis			O	
Urtica dioica ssp. gracilis			O	O
Impatiens capensis				D
Alliaria petiolata			O	O
Solanum dulcamara			O	
Myosotis laxa				O
Ranunculus acris			O	
Dactylis glomerata			A	
Matteuccia struthiopteris			O	
Symphyotrichum puniceum			A	
Daucus carota				R
Cichorium intybus				R
Verbena hastata				O
Rumex crispus				R
Echinocystis lobata			O	
Urtica dioica ssp. gracilis			O	
Typha latifolia			O	
Epilobium ciliatum			R	
Bidens cernua				R

ELC Community Description & Classification

Polygon: P31

Project No: 12-137A **Project Name**: Hillsburgh Dam EA **Surveyor(s)**: RH **Date: May 21; July 30; Sept 25, 2015**

Representative Photographs of Vegetation Community:

AA[1]	CVC[2]	PLANT TYPE[3]	COMMON NAME	SCIENTIFIC NAME	FAMILY	CC[4]	CW[5]	SARO[6]	SARA[7]	S-Rank[8]	G-Rank[9]	CVC 2010[10]	Wellington County[11]
X		FE	Bracken Fern	*Pteridium aquilinum*	Dennstaedtiaceae	0	3	NL	NL	S5	G5T	4	
X	X	FE	Lady Fern	*Athyrium filix-femina var. angustum*	Dryopteridaceae	4	0	NL	NL	S5	G5	4	
X	X	FE	Bulblet Fern	*Cystopteris bulbifera*	Dryopteridaceae	5	-2	NL	NL	S5	G5	4	
X	X	FE	Spinulose Shield Fern	*Dryopteris carthusiana*	Dryopteridaceae	5	-2	NL	NL	S5	G5	4	
X	X	FE	Crested Shield-fern	*Dryopteris cristata*	Dryopteridaceae	7	-5	NL	NL	S5	G5	3	
X	X	FE	Evergreen Woodfern	*Dryopteris intermedia*	Dryopteridaceae	5	0	NL	NL	S5	G5	4	
X	X	FE	Marginal Wood-fern	*Dryopteris marginalis*	Dryopteridaceae	5	3	NL	NL	S5	G5	4	
X	X	FE	Oak Fern	*Gymnocarpium dryopteris*	Dryopteridaceae	7	0	NL	NL	S5	G5	3	
X		FE	Ostrich Fern	*Matteuccia struthiopteris*	Dryopteridaceae	3	0	NL	NL	S5	G5	4	
X	X	FE	Sensitive Fern	*Onoclea sensibilis*	Dryopteridaceae	4	-3	NL	NL	S5	G5	4	
X	X	FE	Field Horsetail	*Equisetum arvense*	Equisetaceae	0	0	NL	NL	S5	G5	4	
X	X	FE	Water Horsetail	*Equisetum fluviatile*	Equisetaceae	7	-5	NL	NL	S5	G5	2	
X	X	FE	Marsh Horsetail	*Equisetum palustre*	Equisetaceae	10	-3	NL	NL	S5	G5	2	✓
X	X	FE	Dwarf Scouring Rush	*Equisetum scirpoides*	Equisetaceae	7	-1	NL	NL	S5	G5	2	
	X	FE	Variegated Horsetail	*Equisetum variegatum*	Equisetaceae	6	-3	NL	NL	S5	G5T	2	✓
X	X	FE	Cinnamon Fern	*Osmundastrum cinnamomeum*	Osmundaceae	7	-3	NL	NL	S5	G5	3	
	X	FE	Hidden Spike-moss	*Selaginella eclipes*	Selaginellaceae	7	-4	NL	NL	S4	G4	2	
	X	FE	Northern Beech Fern	*Phegopteris connectilis*	Thelypteridaceae	8	5	NL	NL	S5	G5	2	
X		FE	New York Fern	*Thelypteris noveboracensis*	Thelypteridaceae	7	-1	NL	NL	S4S5	G5	2	
X	X	FE	Marsh Fern	*Thelypteris palustris*	Thelypteridaceae	2	-4	NL	NL	S5	G5T?	4	
X		FO	American Water-plantain	*Alisma subcordatum*	Alismataceae	1	-5	NL	NL	S4?	G4G5	4	
X	X	FO	Broadleaf Arrowhead	*Sagittaria latifolia*	Alismataceae	4	-5	NL	NL	S5	G5	3	
X		FO	Goutweed	*Aegopodium podagraria*	Apiaceae	0	0	NL	NL	SE5	G?	5	
X	X	FO	Bulb-bearing Water-hemlock	*Cicuta bulbifera*	Apiaceae	5	-5	NL	NL	S5	G5	3	
X	X	FO	Wild Carrot	*Daucus carota*	Apiaceae	0	5	NL	NL	SE5	G?	5	
	X	FO	American Water-pennywort	*Hydrocotyle americana*	Apiaceae	7	-5	NL	NL	S5	G5	2	
X		FO	Spreading Dogbane	*Apocynum androsaemifolium*	Apocynaceae	3	5	NL	NL	S5	G5T?	4	
X	X	FO	Periwinkle	*Vinca minor*	Apocynaceae	0	5	NL	NL	SE5	G?	5	
X	X	FO	Jack-in-the-pulpit	*Arisaema triphyllum*	Araceae	5	-2	NL	NL	S5	G5T5	4	
	X	FO	Wild Calla	*Calla palustris*	Araceae	8	-5	NL	NL	S5	G5	2	
X	X	FO	Wild Sarsaparilla	*Aralia nudicaulis*	Araliaceae	4	3	NL	NL	S5	G5	4	
	X	FO	American Spikenard	*Aralia racemosa*	Araliaceae	8	3	NL	NL	S5	G5T?	2	
X	X	FO	Canada Wild-ginger	*Asarum canadense*	Aristolochiaceae	6	5	NL	NL	S5	G5	4	
X	X	FO	Common Milkweed	*Asclepias syriaca*	Asclepiadaceae	0	5	NL	NL	S5	G5	4	
X	X	FO	Yarrow	*Achillea millefolium*	Asteraceae	1	3	NL	NL	SE?	G5T?	5	
	X	FO	White Snakeroot	*Ageratina altissima*	Asteraceae	4	3	NL	NL	S5	G5	4	
X	X	FO	Annual Ragweed	*Ambrosia artemisiifolia*	Asteraceae	0	3	NL	NL	S5	G5	4	
X		FO	Great Ragweed	*Ambrosia trifida*	Asteraceae	0	-1	NL	NL	S5	G5	4	
	X	FO	Pearly Everlasting	*Anaphalis margaritacea*	Asteraceae	3	5	NL	NL	S5	G5	3	
X		FO	Greater Burdock	*Arctium lappa*	Asteraceae	0	5	NL	NL	SE5	G?	5	
X	X	FO	Lesser Burdock	*Arctium minus*	Asteraceae	0	5	NL	NL	SE5	G?T?	5	
X	X	FO	Nodding Beggar-ticks	*Bidens cernua*	Asteraceae	2	-5	NL	NL	S5	G5	4	
X		FO	Devil's Beggar-ticks	*Bidens frondosa*	Asteraceae	3	-3	NL	NL	S5	G5	4	
X	X	FO	Beggar-ticks	*Bidens tripartita*	Asteraceae	4	-3	NL	NL	S5	G5	3	
X		FO	Chicory	*Cichorium intybus*	Asteraceae	0	5	NL	NL	SE5	G?	5	
X	X	FO	Canada Thistle	*Cirsium arvense*	Asteraceae	0	3	NL	NL	SE5	G?	5	
	X	FO	Bull Thistle	*Cirsium vulgare*	Asteraceae	0	4	NL	NL	SE5	G5	5	

AA[1]	CVC[2]	PLANT TYPE[3]	COMMON NAME	SCIENTIFIC NAME	FAMILY	CC[4]	CW[5]	SARO[6]	SARA[7]	S-Rank[8]	G-Rank[9]	CVC 2010[10]	Wellington County[11]
X	X	FO	Annual Fleabane	*Erigeron annuus*	Asteraceae	0	1	NL	NL	S5	G5	4	
X	X	FO	Philadelphia Fleabane	*Erigeron philadelphicus*	Asteraceae	2	-3	NL	NL	S5	G5T?	4	
X	X	FO	Common Boneset	*Eupatorium perfoliatum*	Asteraceae	2	-4	NL	NL	S5	G5	4	
X		FO	Large-leaf Wood-aster	*Eurybia macrophylla*	Asteraceae	5	5	NL	NL	S5	G5	4	
X	X	FO	Grass-leaved goldenrod	*Euthamia graminifolia*	Asteraceae	2	-2	NL	NL	S5	G5	4	
	X	FO	Spotted Joe-pye Weed	*Eutrochium maculatum var. foliosum*	Asteraceae			NL	NL	S5		4	
X		FO	Spotted Joe-pye Weed	*Eutrochium maculatum var. maculatum*	Asteraceae	4	-5	NL	NL	S5	G5T5	4	
	X	FO	Elecampane Flower	*Inula helenium*	Asteraceae	0	5	NL	NL	SE5	G?	5	
X		FO	Canada Lettuce	*Lactuca canadensis*	Asteraceae	3	2	NL	NL	S5	G5	4	
	X	FO	Common Nipplewort	*Lapsana communis*	Asteraceae	0	5	NL	NL	SE5	G?	5	
X	X	FO	Oxeye Daisy	*Leucanthemum vulgare*	Asteraceae	0	5	NL	NL	SE5	G?	5	
	X	FO	Tall Rattlesnake-root	*Nabalus altissimus*	Asteraceae	5	3	NL	NL	S5	G5?	3	
	X	FO	Golden Ragwort	*Packera aurea*	Asteraceae	7	-3	NL	NL	S5	G5	2	
	X	FO	Hawkweed Oxtongue	*Picris hieracioides*	Asteraceae	0	5	NL	NL	SE5	G5T?	5	
X		FO	Meadow Hawkweed	*Pilosella caespitosa*	Asteraceae	0	5	NL	NL	SE		5	
X	X	FO	Black-eyed Susan	*Rudbeckia hirta var. hirta*	Asteraceae	1	3	NL	NL	S5	G5	4	
X	X	FO	Tall Goldenrod	*Solidago altissima*	Asteraceae	1	3	NL	NL	S5	G5T5	4	
X	X	FO	Canada Goldenrod	*Solidago canadensis var. canadensis*	Asteraceae	1	3	NL	NL	S5		4	
X	X	FO	Broad-leaved Goldenrod	*Solidago flexicaulis*	Asteraceae	6	3	NL	NL	S5	G5	4	
X	X	FO	Roughleaf Goldenrod	*Solidago rugosa var. rugosa*	Asteraceae	3	-1	NL	NL	S5	G5T?	3	
X	X	FO	Bog Goldenrod	*Solidago uliginosa*	Asteraceae	9	-5	NL	NL	S5	G4G5	2	
X	X	FO	Field Sow-thistle	*Sonchus arvensis ssp. arvensis*	Asteraceae	0	1	NL	NL	SE5	G?	5	
X		FO	White Heath Aster	*Symphyotrichum ericoides var. ericoides*	Asteraceae	4	4	NL	NL	S5	G5	4	
X	X	FO	Panicled Aster	*Symphyotrichum lanceolatum ssp. lanceolatum*	Asteraceae	3	-3	NL	NL	S5	G5	4	
X	X	FO	Calico Aster	*Symphyotrichum lateriflorum*	Asteraceae	2	0	NL	NL	S5		3	
X	X	FO	New England Aster	*Symphyotrichum novae-angliae*	Asteraceae	2	-3	NL	NL	S5	G5	4	
X	X	FO	Purple-stemmed Aster	*Symphyotrichum puniceum*	Asteraceae	5	-5	NL	NL	S5		4	
X		FO	Common Tansy	*Tanacetum vulgare*	Asteraceae	0	5	NL	NL	SE5	G?	5	
X	X	FO	Brown-seed Dandelion	*Taraxacum officinale*	Asteraceae	0	3	NL	NL	SE5	G5	5	
X		FO	Meadow Goat's-beard	*Tragopogon dubius*	Asteraceae	0	5	NL	NL	SE5	G?	5	
X	X	FO	Colt's Foot	*Tussilago farfara*	Asteraceae	0	3	NL	NL	SE5	G?	5	
X	X	FO	Spotted Jewel-weed	*Impatiens capensis*	Balsaminaceae	4	-3	NL	NL	S5	G5	4	
X		FO	Pale Jewel-weed	*Impatiens pallida*	Balsaminaceae	7	-3	NL	NL	S5	G5	2	✓
X	X	FO	Giant Blue Cohosh	*Caulophyllum giganteum*	Berberidaceae	6	5	NL	NL	S4?	G?	3	
X	X	FO	May Apple	*Podophyllum peltatum*	Berberidaceae	5	3	NL	NL	S5	G5	4	
X		FO	Common Viper's-bugloss	*Echium vulgare*	Boraginaceae	0	5	NL	NL	SE5	G?	5	
X	X	FO	Small Forget-me-not	*Myosotis laxa*	Boraginaceae	6	-5	NL	NL	S5	G5	3	
X		FO	True Forget-me-not	*Myosotis scorpioides*	Boraginaceae	0	-5	NL	NL	SE5	G5	5	
X	X	FO	Garlic Mustard	*Alliaria petiolata*	Brassicaceae	0	0	NL	NL	SE5	G?	5	
X		FO	Yellow Rocket	*Barbarea vulgaris*	Brassicaceae	0	0	NL	NL	SE5	G?	5	
X	X	FO	Two-leaf Toothwort	*Cardamine diphylla*	Brassicaceae	7	5	NL	NL	S5	G5	3	
X		FO	Dame's Rocket	*Hesperis matronalis*	Brassicaceae	0	5	NL	NL	SE5	G4G5	5	
X	X	FO	Small-leaved Watercress	*Nasturtium microphyllum*	Brassicaceae	0	-5	NL	NL	SE5	G?	5	

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X	X	FO	Marsh Bellflower	*Campanula aparinoides*	Campanulaceae	7	-5	NL	NL	S5	G5	2	
X	X	FO	Kalm's Lobelia	*Lobelia kalmii*	Campanulaceae	9	-5	NL	NL	S5	G5	2	✓
X		FO	Common Mouse-ear Chickweed	*Cerastium fontanum*	Caryophyllaceae	0	3	NL	NL	SE5	G?	5	
X		FO	Bouncing-bet	*Saponaria officinalis*	Caryophyllaceae	0	3	NL	NL	SE5	G?	5	
X		FO	A Catchfly	*Silene latifolia*	Caryophyllaceae	0	5	NL	NL	SE5	G?	5	
X		FO	Maiden's Tears	*Silene vulgaris*	Caryophyllaceae	0	5	NL	NL	SE5	G?	5	
X		FO	Common Lamb's-quarters	*Chenopodium album*	Chenopodiaceae	0	1	NL	NL	SE5	G5	5	
X	X	FO	St. John's-wort	*Hypericum perforatum*	Clusiaceae	0	5	NL	NL	SE5	G?	5	
X	X	FO	Common St. John's-wort	*Hypericum punctatum*	Clusiaceae	5	-1	NL	NL	S5	G5	2	
	X	FO	Marsh St. John's-wort	*Triadenum fraseri*	Clusiaceae	7	-5	NL	NL	S5	G4G5	2	
X		FO	Teasel	*Dipsacus fullonum*	Dipsacaceae	0	3	NL	NL	SE5	G?T?	5	
	X	FO	Roundleaf Sundew	*Drosera rotundifolia*	Droseraceae	7	-5	NL	NL	S5	G5	2	
X		FO	Birds-foot Trefoil	*Lotus corniculatus*	Fabaceae	0	1	NL	NL	SE5	G?	5	
X	X	FO	Black Medic	*Medicago lupulina*	Fabaceae	0	1	NL	NL	SE5	G?	5	
X		FO	White Sweet Clover	*Melilotus albus*	Fabaceae	0	3	NL	NL	SE5	G5	5	
X		FO	Yellow Sweetclover	*Melilotus officinalis*	Fabaceae	0	3	NL	NL	SE5	G?	5	
X	X	FO	Rabbit-foot Clover	*Trifolium arvense*	Fabaceae	0	5	NL	NL	SE4	G?	5	
X		FO	Red Clover	*Trifolium pratense*	Fabaceae	0	2	NL	NL	SE5	G?	5	
X	X	FO	White Clover	*Trifolium repens*	Fabaceae	0	2	NL	NL	SE5	G?	5	
X	X	FO	Herb-robert	*Geranium robertianum*	Geraniaceae	0	5	NL	NL	SE5	G5	5	
X		FO	Eel-grass	*Vallisneria americana*	Hydrocharitaceae	6	-5	NL	NL	S5	G5	2	
X	X	FO	Virginia waterleaf	*Hydrophyllum virginianum*	Hydrophyllaceae	6	-2	NL	NL	S5	G5	4	
X		FO	Yellow Iris	*Iris pseudacorus*	Iridaceae	0	-5	NL	NL	SE3	G?	5	
X	X	FO	Blueflag	*Iris versicolor*	Iridaceae	5	-5	NL	NL	S5	G5	3	
X		FO	Strict Blue-eyed-grass	*Sisyrinchium montanum*	Iridaceae	4	-1	NL	NL	S5	G5	2	
	X	FO	Field Basil	*Clinopodium vulgare*	Lamiaceae	4	5	NL	NL	S5	G?	4	
X	X	FO	Ground Ivy	*Glechoma hederacea*	Lamiaceae	0	3	NL	NL	SE5	G?	5	
X		FO	Common Mother-wort	*Leonurus cardiaca*	Lamiaceae	0	5	NL	NL	SE5	G?T?	5	
X	X	FO	American Bugleweed	*Lycopus americanus*	Lamiaceae	4	-5	NL	NL	S5	G5	3	
X	X	FO	Northern Bugleweed	*Lycopus uniflorus*	Lamiaceae	5	-5	NL	NL	S5	G5	4	
	X	FO	Corn Mint	*Mentha canadensis*	Lamiaceae	3	-3	NL	NL	S5		4	
	X	FO	Spearmint	*Mentha spicata*	Lamiaceae	0	-4	NL	NL	SE4	G?	5	
X	X	FO	Peppermint	*Mentha x piperita*	Lamiaceae	0	-5	NL	NL	SE4	G?	5	
X		FO	Catnip	*Nepeta cataria*	Lamiaceae	0	1	NL	NL	SE5	G?	5	
X	X	FO	Self-heal	*Prunella vulgaris ssp. lanceolata*	Lamiaceae	5	5	NL	NL	S5	G5	4	
X	X	FO	Hooded Skullcap	*Scutellaria galericulata*	Lamiaceae	6	-5	NL	NL	S5	G5	3	
	X	FO	Mad Dog Skullcap	*Scutellaria lateriflora*	Lamiaceae	5	-5	NL	NL	S5	G5	3	
X	X	FO	Lesser Duckweed	*Lemna minor*	Lemnaceae	2	-5	NL	NL	S5	G5	4	
	X	FO	Lesser Bladderwort	*Utricularia minor*	Lentibulariaceae	8	-5	NL	NL	S5	G5	2	
X		FO	Wild Leek	*Allium tricoccum var. tricoccum*	Liliaceae	5	2	NL	NL	S4	G5	3	
X		FO	Garden Asparagus-fern	*Asparagus officinalis*	Liliaceae	0	3	NL	NL	SE5	G5?	5	
X	X	FO	Blue Bead-lily	*Clintonia borealis*	Liliaceae	7	-1	NL	NL	S5	G5	3	
	X	FO	European Lily-of-the-valley	*Convallaria majalis*	Liliaceae	0	5	NL	NL	SE5	G5	5	
X	X	FO	Yellow Trout-lily	*Erythronium americanum*	Liliaceae	5	5	NL	NL	S5	G5T5	4	
X		FO	Orange Daylily	*Hemerocallis fulva*	Liliaceae	0	5	NL	NL	SE5	G?	5	
X	X	FO	Wild-lily-of-the-valley	*Maianthemum canadense*	Liliaceae	5	0	NL	NL	S5	G5	3	

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X	X	FO	False Solomon's-seal	*Maianthemum racemosum*	Liliaceae	5	3	NL	NL	S5	G5T	3	
X	X	FO	Starflower False Solomon's-seal	*Maianthemum stellatum*	Liliaceae	6	1	NL	NL	S5	G5	4	
X		FO	Commom Daffodil	*Narcissus pseudonarcissus*	Liliaceae	0	0	NL	NL	SE2	G?	5	
	X	FO	Downy Solomon's-seal	*Polygonatum pubescens*	Liliaceae	5	5	NL	NL	S5	G5	4	
	X	FO	Rose Twisted-stalk	*Streptopus lanceolatus*	Liliaceae	7	0	NL	NL	S5	G5	2	
X	X	FO	Red Trillium	*Trillium erectum*	Liliaceae	6	1	NL	NL	S5	G5	3	
X	X	FO	White Trillium	*Trillium grandiflorum*	Liliaceae	5	5	NL	NL	S5	G5	4	
X	X	FO	Purple Loosestrife	*Lythrum salicaria*	Lythraceae	0	-5	NL	NL	SE5	G5	5	
X		FO	Velvet-leaf	*Abutilon theophrasti*	Malvaceae	0	4	NL	NL	SE5	G?	5	
X		FO	Musk Mallow	*Malva moschata*	Malvaceae	0	5	NL	NL	SE5	G?	5	
X		FO	Indian-pipe	*Monotropa uniflora*	Monotropaceae	6	3	NL	NL	S5	G5	3	
	X	FO	Slender Naiad	*Najas flexilis*	Najadaceae	5	-5	NL	NL	S5	G5	2	✓
X		FO	Yellow Cowlily	*Nuphar variegata*	Nymphaeaceae	4	-5	NL	NL	S5	G5	2	
X	X	FO	White Water-lily	*Nymphaea odorata ssp.*	Nymphaeaceae	5	-5	NL	NL	S5?	G5	2	
	X	FO	Tuberous White Water-lily	*Nymphaea odorata ssp. tuberosa*	Nymphaeaceae	5	-5	NL	NL	SU	G5	2	
X		FO	Fireweed	*Chamerion angustifolium*	Onagraceae	3	0	NL	NL	S5	G5	2	✓
X	X	FO	Small Enchanter's Nightshade	*Circaea alpina*	Onagraceae	6	-3	NL	NL	S5	G5	3	
X	X	FO	Broad-leaved Enchanter's Nightshade	*Circaea canadensis*	Onagraceae	3	3	NL	NL	S5	G5	4	
X		FO	Hairy Willow-herb	*Epilobium ciliatum*	Onagraceae	3	-3	NL	NL	S5	G5T?	4	
X	X	FO	Purple-leaf Willow-herb	*Epilobium coloratum*	Onagraceae	3	-5	NL	NL	S5	G5	2	
X	X	FO	Great-hairy Willow-herb	*Epilobium hirsutum*	Onagraceae	0	-4	NL	NL	SE5	G?	5	
X	X	FO	Linear-leaved Willow-herb	*Epilobium leptophyllum*	Onagraceae	7	-5	NL	NL	S5	G5	2	
X	X	FO	Small-flower Willow-herb	*Epilobium parviflorum*	Onagraceae	0	3	NL	NL	SE4	G?	5	
X	X	FO	Common Evening-primrose	*Oenothera biennis*	Onagraceae	0	3	NL	NL	S5	G5	4	
	X	FO	Small Yellow Lady's-slipper	*Cypripedium parviflorum var. makasin*	Orchidaceae	5	0	NL	NL	S5	G5T	2	
	X	FO	Large Yellow Lady's-slipper	*Cypripedium parviflorum var. pubescens*	Orchidaceae	5	-1	NL	NL	S5	G5	2	
	X	FO	Showy Lady's-slipper	*Cypripedium reginae*	Orchidaceae	7	-4	NL	NL	S4	G4	2	
X	X	FO	Eastern Helleborine	*Epipactis helleborine*	Orchidaceae	0	5	NL	NL	SE5	G?	5	
X	X	FO	Loesel's Twayblade	*Liparis loeselii*	Orchidaceae	5	-4	NL	NL	S4S5	G5	2	
	X	FO	Leafy Northern Green Orchid	*Platanthera aquilonis*	Orchidaceae	5	-4	NL	NL	S5	G5	2	
X	X	FO	Hooded Ladies'-tresses	*Spiranthes romanzoffiana*	Orchidaceae	9	-4	NL	NL	S5	G5	2	✓
X	X	FO	Common Wood-sorrell	*Oxalis montana*	Oxalidaceae	8	3	NL	NL	S5	G5	2	
X	X	FO	Upright Yellow Wood-sorrel	*Oxalis stricta*	Oxalidaceae	0	3	NL	NL	S5	G5	5	
X	X	FO	Greater Celadine	*Chelidonium majus*	Papaveraceae	0	5	NL	NL	SE5	G?	5	
X		FO	Bloodroot	*Sanguinaria canadensis*	Papaveraceae	5	4	NL	NL	S5	G5	4	
X	X	FO	English Plantain	*Plantago lanceolata*	Plantaginaceae	0	0	NL	NL	SE5	G5	5	
X	X	FO	Common Plantain	*Plantago major*	Plantaginaceae	0	-1	NL	NL	SE5	G5	5	
X		FO	Fall Phlox	*Phlox paniculata*	Polemoniaceae	0	3	NL	NL	SE3	G5	5	
	X	FO	Water Smartweed	*Persicaria amphibia*	Polygonaceae	5	-5	NL	NL	S5	G5	2	
X	X	FO	Marshpepper Smartweed	*Persicaria hydropiper*	Polygonaceae	0	-5	NL	NL	SE5	G5	5	
X	X	FO	Lady's Thumb	*Persicaria maculosa*	Polygonaceae	0	-3	NL	NL	SE5	G?	5	
	X	FO	Pennsylvania Smartweed	*Persicaria pensylvanica*	Polygonaceae	3	-4	NL	NL	S5	G5	2	
X	X	FO	Curly Dock	*Rumex crispus*	Polygonaceae	0	-1	NL	NL	SE5	G?	5	

AA[1]	CVC[2]	PLANT TYPE[3]	COMMON NAME	SCIENTIFIC NAME	FAMILY	CC[4]	CW[5]	SARO[6]	SARA[7]	S-Rank[8]	G-Rank[9]	CVC 2010[10]	Wellington County[11]
X	X	FO	Bitter Dock	*Rumex obtusifolius*	Polygonaceae	0	-3	NL	NL	SE5	G5	5	
X	X	FO	Water Dock	*Rumex orbiculatus*	Polygonaceae	6	-5	NL	NL	S4S5	G5	2	
	X	FO	Curly Pondweed	*Potamogeton crispus*	Potamogetonaceae	0	-5	NL	NL	SE5	G5	5	
	X	FO	Leafy Pondweed	*Potamogeton foliosus*	Potamogetonaceae	4	-5	NL	NL	S5	G5	2	
	X	FO	Berchtold's Pondweed	*Potamogeton pusillus ssp. tenuissimus*	Potamogetonaceae	4	-5	NL	NL	S4S5	G?	2	
X		FO	Pondweed sp.	*Potamogeton sp.*	Potamogetonaceae								
	X	FO	Sago Pondweed	*Stuckenia pectinata*	Potamogetonaceae	4	-5	NL	NL	S5	G5	4	
	X	FO	Fringed Loosestrife	*Lysimachia ciliata*	Primulaceae	4	-3	NL	NL	S5	G5	4	
X	X	FO	Northern Starflower	*Trientalis borealis*	Primulaceae	5	-1	NL	NL	S5	G5T?	3	
	X	FO	One-side Wintergreen	*Orthilia secunda*	Pyrolaceae	5	-1	NL	NL	S5	G5	2	
	X	FO	Pink Wintergreen	*Pyrola asarifolia*	Pyrolaceae	7	-3	NL	NL	S5	G5	2	
	X	FO	Shinleaf	*Pyrola elliptica*	Pyrolaceae	5	5	NL	NL	S5	G5	3	
X	X	FO	White Baneberry	*Actaea pachypoda*	Ranunculaceae	6	5	NL	NL	S5	G5	4	
X	X	FO	Red Baneberry	*Actaea rubra*	Ranunculaceae	5	5	NL	NL	S5	G5	4	
X	X	FO	Canada Anemone	*Anemone canadensis*	Ranunculaceae	3	-3	NL	NL	S5	G5	4	
X		FO	Marsh Marigold	*Caltha palustris*	Ranunculaceae	5	-5	NL	NL	S5	G5	3	
X	X	FO	Goldthread	*Coptis trifolia*	Ranunculaceae	5	-3	NL	NL	S5	G5T5	3	
X	X	FO	Kidney-leaved Buttercup	*Ranunculus abortivus*	Ranunculaceae	2	-2	NL	NL	S5	G5	4	
X	X	FO	Tall Butter-cup	*Ranunculus acris*	Ranunculaceae	0	-2	NL	NL	SE5	G5	5	
X	X	FO	White Water Buttercup	*Ranunculus aquatilis*	Ranunculaceae		-5	NL	NL	S5	G5T	2	
	X	FO	Bristly Buttercup	*Ranunculus hispidus var. caricetorum*	Ranunculaceae	5	-5	NL	NL	S5	G5T5	3	
X	X	FO	Hooked Crowfoot	*Ranunculus recurvatus*	Ranunculaceae	4	-3	NL	NL	S5	G5	3	
	X	FO	Creeping Butter-cup	*Ranunculus repens*	Ranunculaceae	0	-1	NL	NL	SE5	G?	5	
X	X	FO	Hooked Agrimony	*Agrimonia gryposepala*	Rosaceae	2	2	NL	NL	S5	G5	4	
X	X	FO	Woodland Strawberry	*Fragaria vesca*	Rosaceae	2	4	NL	NL	S5	G5T?	3	
X	X	FO	Virginia Strawberry	*Fragaria virginiana*	Rosaceae	2	1	NL	NL	S5	G5T?	4	
X	X	FO	Yellow Avens	*Geum aleppicum*	Rosaceae	2	-1	NL	NL	S5	G5	4	
X		FO	White Avens	*Geum canadense*	Rosaceae	3	0	NL	NL	S5	G5	4	
	X	FO	Purple Avens	*Geum rivale*	Rosaceae	7	-5	NL	NL	S5	G5	2	
X		FO	Old-field Cinquefoil	*Potentilla simplex*	Rosaceae	3	4	NL	NL	S5	G5	2	
X	X	FO	Rough Bedstraw	*Galium asprellum*	Rubiaceae	6	-5	NL	NL	S5	G5	4	
X		FO	Great Hedge Bedstraw	*Galium mollugo*	Rubiaceae	0	5	NL	NL	SE5	G?	5	
X	X	FO	Marsh Bedstraw	*Galium palustre*	Rubiaceae	5	-5	NL	NL	S5	G5	3	
	X	FO	Rough-fruit Corn Bedstraw	*Galium tricornutum*	Rubiaceae			NL	NL	SEH	G?	2	
X	X	FO	Sweet-scent Bedstraw	*Galium triflorum*	Rubiaceae	4	2	NL	NL	S5	G5	4	
X	X	FO	Partridge-berry	*Mitchella repens*	Rubiaceae	6	2	NL	NL	S5	G5	2	
	X	FO	American Golden-saxifrage	*Chrysosplenium americanum*	Saxifragaceae	8	-5	NL	NL	S5	G5	2	✓
	X	FO	Two-leaf Bishop's-cap	*Mitella diphylla*	Saxifragaceae	5	2	NL	NL	S5	G5	3	
	X	FO	Naked Bishop's-cap	*Mitella nuda*	Saxifragaceae	6	-3	NL	NL	S5	G5	3	
X	X	FO	Heart-leaved Foam-flower	*Tiarella cordifolia*	Saxifragaceae	6	1	NL	NL	S5	G5	3	
X	X	FO	White Turtlehead	*Chelone glabra*	Scrophulariaceae	7	-5	NL	NL	S5	G5	3	
X		FO	Butter-and-eggs	*Linaria vulgaris*	Scrophulariaceae	0	5	NL	NL	SE5	G?	5	
X		FO	Great Mullein	*Verbascum thapsus*	Scrophulariaceae	0	5	NL	NL	SE5	G?	5	
	X	FO	American Speedwell	*Veronica americana*	Scrophulariaceae	6	-5	NL	NL	S5	G5	2	
	X	FO	Brook-pimpernell	*Veronica anagallis-aquatica*	Scrophulariaceae	0	-5	NL	NL	SE5	G5	5	
	X	FO	Gypsy-weed	*Veronica officinalis*	Scrophulariaceae	0	5	NL	NL	SE5	G5	5	

AA[1]	CVC[2]	PLANT TYPE[3]	COMMON NAME	SCIENTIFIC NAME	FAMILY	CC[4]	CW[5]	SARO[6]	SARA[7]	S-Rank[8]	G-Rank[9]	CVC 2010[10]	Wellington County[11]
X	X	FO	Green-fruited Burreed	*Sparganium emersum*	Sparganiaceae	6	-5	NL	NL	S5		2	
	X	FO	Small Bur-reed	*Sparganium natans*	Sparganiaceae	8	-5	NL	NL	S5	G5	2	
X	X	FO	Narrow-leaved Cattail	*Typha angustifolia*	Typhaceae	3	-5	NL	NL	SE5	G5	5	
X	X	FO	Broad-leaf Cattail	*Typha latifolia*	Typhaceae	3	-5	NL	NL	S5	G5	4	
X		FO	(Typha angustifolia X Typha latifolia)	*Typha x glauca*	Typhaceae	3	-5	NL	NL	SE5	G?	5	
	X	FO	Springs Clearweed	*Pilea fontana*	Urticaceae	5	-3	NL	NL	S4	G5	2	
X		FO	Stinging Nettle	*Urtica dioica ssp. gracilis*	Urticaceae	2	-1	NL	NL	S5	G5T?	4	
	X	FO	Lopseed	*Phryma leptostachya*	Verbenaceae	6	5	NL	NL	S4S5	G5	5	
X	X	FO	Blue Vervain	*Verbena hastata*	Verbenaceae	4	-4	NL	NL	S5	G5	4	
	X	FO	White Vervain	*Verbena urticifolia*	Verbenaceae	4	-1	NL	NL	S5	G5	3	
X	X	FO	Marsh Blue Violet	*Viola cucullata*	Violaceae	5	-5	NL	NL	S5	G4G5	2	
X	X	FO	Labrador Violet	*Viola labradorica*	Violaceae	3	0	NL	NL	S4S5	G5	4	
X	X	FO	Smooth White Violet	*Viola macloskeyi*	Violaceae	6	-5	NL	NL	S5	G5T5	2	
X	X	FO	Downy Yellow Violet	*Viola pubescens var. pubescens*	Violaceae	4	3	NL	NL	S5		4	
X		FO	Smooth Yellow Violet	*Viola pubescens var. scabriuscula*	Violaceae	4	3	NL	NL	S5		4	
X	X	GR	Redtop	*Agrostis gigantea*	Poaceae	0	0	NL	NL	SE5	G4G5	5	
	X	GR	Rough Bentgrass	*Agrostis scabra*	Poaceae	6	0	NL	NL	S5	G5	2	
X	X	GR	Fringed Brome	*Bromus ciliatus*	Poaceae	6	-3	NL	NL	S5	G5	2	
X		GR	Awnless Brome	*Bromus inermis*	Poaceae	0	5	NL	NL	SE5	G4G5	5	
X		GR	Brome sp.	*Bromus sp.*	Poaceae								
X	X	GR	Canada Blue-joint	*Calamagrostis canadensis*	Poaceae	4	-5	NL	NL	S5	G5	3	
	X	GR	Slender Wood Reedgrass	*Cinna latifolia*	Poaceae	7	-4	NL	NL	S5	G5	3	
X	X	GR	Orchard Grass	*Dactylis glomerata*	Poaceae	0	3	NL	NL	SE5	G?	5	
X	X	GR	American Mannagrass	*Glyceria grandis*	Poaceae	5	-5	NL	NL	S4S5	G5	4	
	X	GR	Reed Meadowgrass	*Glyceria maxima*	Poaceae	0	-5	NL	NL	SE4	G?	5	
X	X	GR	Fowl Manna-grass	*Glyceria striata*	Poaceae	3	-5	NL	NL	S4S5	G5	4	
X	X	GR	Rice Cutgrass	*Leersia oryzoides*	Poaceae	3	-5	NL	NL	S5	G5	4	
X		GR	Giant miscanthus	*Miscanthus x giganteus*	Poaceae	0		NL	NL	SE		5	
	X	GR	Mexican Muhly	*Muhlenbergia mexicana*	Poaceae	3	-3	NL	NL	S5	G5T?	2	
X	X	GR	Reed Canary Grass	*Phalaris arundinacea*	Poaceae	0	-4	NL	NL	S5	G5	4	
X	X	GR	Meadow Timothy	*Phleum pratense*	Poaceae	0	3	NL	NL	SE5	G?	5	
X	X	GR	European Reed	*Phragmites australis ssp. australis*	Poaceae	0	-3	NL	NL	S5	G5	5	
	X	GR	Canada Bluegrass	*Poa compressa*	Poaceae	0	2	NL	NL	SE5	G?	5	
	X	GR	Woods Bluegrass	*Poa nemoralis*	Poaceae	0	0	NL	NL	SE3	G5	5	
	X	GR	Fowl Bluegrass	*Poa palustris*	Poaceae	5	-4	NL	NL	S5	G5	3	
	X	GR	Kentucky Bluegrass	*Poa pratensis ssp. pratensis*	Poaceae	0	1	NL	NL	S5	G?	4	
X		GR	Grass sp.	*Poaceae sp.*	Poaceae								
	X	GR	Meadow Fescue	*Schedonorus pratensis*	Poaceae	0	4	NL	NL	SE5	G5	5	
	X	GR	Purple Oat	*Schizachne purpurascens*	Poaceae	5	3	NL	NL	S5	G5T?	3	
	X	GR	Slender Wedge Grass	*Sphenopholis intermedia*	Poaceae	6	0	NL	NL	S4S5	G5	3	
	X	MO	A Moss	*Fontinalis sullivantii*	Fontinalaceae			NL	NL	S1	G3G5		
X		MO	A Moss	*Sphagnum sp.*	Sphagnaceae			NL	NL				
	X	MO	A Moss	*Abietinella abietina*	Thuidiaceae			NL	NL	S4S5	G4G5		
	X	RU	Richardson Rush	*Juncus alpinoarticulatus*	Juncaceae	5	-5	NL	NL	S5	G5	2	

AA[1]	CVC[2]	PLANT TYPE[3]	COMMON NAME	SCIENTIFIC NAME	FAMILY	CC[4]	CW[5]	SARO[6]	SARA[7]	S-Rank[8]	G-Rank[9]	CVC 2010[10]	Wellington County[11]
	X	RU	Jointed Rush	*Juncus articulatus*	Juncaceae	5	-5	NL	NL	S5	G5	4	
	X	RU	Narrow-panicled Rush	*Juncus brevicaudatus*	Juncaceae	6	-5	NL	NL	S5	G5	2	
	X	RU	Toad Rush	*Juncus bufonius*	Juncaceae	1	-4	NL	NL	S5	G5	3	
X	X	RU	Dudley's Rush	*Juncus dudleyi*	Juncaceae	1	0	NL	NL	S5	G5	4	
X	X	RU	Soft Rush	*Juncus effusus*	Juncaceae	3	-5	NL	NL	S5	G5T?	4	
	X	RU	Knotted Rush	*Juncus nodosus*	Juncaceae	5	-5	NL	NL	S5	G5	4	
X	X	RU	Path Rush	*Juncus tenuis*	Juncaceae	0	0	NL	NL	S5	G5	4	
	X	SE	Black Sedge	*Carex arctata*	Cyperaceae	5	5	NL	NL	S5	G5?	3	
X	X	SE	Golden-fruited Sedge	*Carex aurea*	Cyperaceae	4	-4	NL	NL	S5	G5	3	
X	X	SE	Bebb's Sedge	*Carex bebbii*	Cyperaceae	3	-5	NL	NL	S5	G5	4	
	X	SE	Woodland Sedge	*Carex blanda*	Cyperaceae	3	0	NL	NL	S5	G5?	4	
	X	SE	Crested Sedge	*Carex cristatella*	Cyperaceae	3	-4	NL	NL	S5	G5	4	
	X	SE	Softleaf Sedge	*Carex disperma*	Cyperaceae	8	-5	NL	NL	S5	G5	3	
X	X	SE	Yellow Sedge	*Carex flava*	Cyperaceae	5	-5	NL	NL	S5	G5	3	
X	X	SE	Graceful Sedge	*Carex gracillima*	Cyperaceae	4	3	NL	NL	S5	G5	4	
X	X	SE	Porcupine Sedge	*Carex hystericina*	Cyperaceae	5	-5	NL	NL	S5	G5	4	
X	X	SE	Inland Sedge	*Carex interior*	Cyperaceae	6	-5	NL	NL	S5	G5	3	
X	X	SE	Bladder Sedge	*Carex intumescens*	Cyperaceae	6	-4	NL	NL	S5	G5	3	
X	X	SE	Lake-bank Sedge	*Carex lacustris*	Cyperaceae	5	-5	NL	NL	S5	G5	4	
	X	SE	Smooth-sheath Sedge	*Carex laevivaginata*	Cyperaceae	8	-5	NL	NL	S4	G5	2	
	X	SE	Bristly-stalk Sedge	*Carex leptalea*	Cyperaceae	8	-5	NL	NL	S5	G5	2	
	X	SE	Finely-nerved Sedge	*Carex leptonervia*	Cyperaceae	5	0	NL	NL	S4	G4	2	✓
X	X	SE	White-tinged Sedge	*Carex peckii*	Cyperaceae	6	5	NL	NL	S5	G4G5	3	
	X	SE	Longstalk Sedge	*Carex pedunculata*	Cyperaceae	5	5	NL	NL	S5	G5	4	
X	X	SE	Pennsylvania Sedge	*Carex pensylvanica*	Cyperaceae	5	5	NL	NL	S5	G5	4	
	X	SE	Prairie Sedge	*Carex prairea*	Cyperaceae	7	-4	NL	NL	S5	G5?	2	
	X	SE	Cyperus-like Sedge	*Carex pseudocyperus*	Cyperaceae	6	-5	NL	NL	S5	G5	4	
X	X	SE	Retrorse Sedge	*Carex retrorsa*	Cyperaceae	5	-5	NL	NL	S5	G5	4	
	X	SE	Rough Sedge	*Carex scabrata*	Cyperaceae	8	-5	NL	NL	S5	G5	2	
X		SE	Sedge sp.	*Carex sp.*	Cyperaceae								
X	X	SE	Stalk-grain Sedge	*Carex stipata*	Cyperaceae	3	-5	NL	NL	S5	G5	4	
X	X	SE	Tussock Sedge	*Carex stricta*	Cyperaceae	4	-5	NL	NL	S5	G5	2	
	X	SE	Three-seed Sedge	*Carex trisperma*	Cyperaceae	9	-5	NL	NL	S5	G5	2	
X	X	SE	Bladder Sedge	*Carex utriculata*	Cyperaceae	7	-5	NL	NL	S5	G5	3	
X	X	SE	Fox Sedge	*Carex vulpinoidea*	Cyperaceae	3	-5	NL	NL	S5	G5	4	
	X	SE	Bald Spikerush	*Eleocharis erythropoda*	Cyperaceae	4	-5	NL	NL	S5	G5	4	
X	X	SE	Green Keeled Cottongrass	*Eriophorum viridicarinatum*	Cyperaceae	9	-5	NL	NL	S5	G5	2	
X	X	SE	Soft-stem Club-rush	*Schoenoplectus tabernaemontani*	Cyperaceae	5	-5	NL	NL	S5	G?	3	
X	X	SE	Dark-green Bulrush	*Scirpus atrovirens*	Cyperaceae	3	-5	NL	NL	S5	G5?	4	
X	X	SE	Common Woolly Bulrush	*Scirpus cyperinus*	Cyperaceae	4	-5	NL	NL	S5	G5	3	
X	X	SE	Red-tinge Bulrush	*Scirpus microcarpus*	Cyperaceae	4	-5	NL	NL	S5	G5	3	
	X	SH	Mountain Maple	*Acer spicatum*	Aceraceae	6	3	NL	NL	S5	G5	3	
X		SH	Staghorn Sumac	*Rhus typhina*	Anacardiaceae	1	5	NL	NL	S5	G5	4	
X	X	SH	Rydberg's Poison Ivy	*Toxicodendron rydbergii*	Anacardiaceae	0	0	NL	NL	S5	G5	4	
	X	SH	Black Holly	*Ilex verticillata*	Aquifoliaceae	5	-4	NL	NL	S5	G5	2	
X	X	SH	European Alder	*Alnus glutinosa*	Betulaceae	0	-2	NL	NL	SE4	G?	5	
	X	SH	Twinflower	*Linnaea borealis*	Caprifoliaceae	6	0	NL	NL	S5	G5T?	2	

AA[1]	CVC[2]	PLANT TYPE[3]	COMMON NAME	SCIENTIFIC NAME	FAMILY	CC[4]	CW[5]	SARO[6]	SARA[7]	S-Rank[8]	G-Rank[9]	CVC 2010[10]	Wellington County[11]
X	X	SH	American Fly-honeysuckle	*Lonicera canadensis*	Caprifoliaceae	6	3	NL	NL	S5	G5	3	
X		SH	Morrow Honeysuckle	*Lonicera morrowii*	Caprifoliaceae	0	5	NL	NL	SE3	G?	5	
	X	SH	Swamp Fly-honeysuckle	*Lonicera oblongifolia*	Caprifoliaceae	8	-5	NL	NL	S4S5	G4	2	
X	X	SH	Tartarian Honeysuckle	*Lonicera tatarica*	Caprifoliaceae	0	3	NL	NL	SE5	G?	5	
X	X	SH	Common Elderberry	*Sambucus canadensis*	Caprifoliaceae	5	-2	NL	NL	S5	G5	4	
X	X	SH	Red Elderberry	*Sambucus racemosa*	Caprifoliaceae	3	3	NL	NL	S5		4	
X	X	SH	Nannyberry	*Viburnum lentago*	Caprifoliaceae	4	-1	NL	NL	S5	G5	4	
X	X	SH	European Highbush-cranberry	*Viburnum opulus*	Caprifoliaceae	0	-3	NL	NL	SE4	G5	5	
X	X	SH	Alternate-leaf Dogwood	*Cornus alternifolia*	Cornaceae	6	5	NL	NL	S5	G5	4	
X	X	SH	Bunchberry	*Cornus canadensis*	Cornaceae	7	0	NL	NL	S5	G5	2	
X	X	SH	Red-osier Dogwood	*Cornus stolonifera*	Cornaceae	2	-3	NL	NL	S5	G5	4	
	X	SH	Autum Olive	*Elaeagnus umbellata*	Elaeagnaceae	0	3	NL	NL	SE3	G?	5	
	X	SH	Creeping Snowberry	*Gaultheria hispidula*	Ericaceae	8	-3	NL	NL	S5	G5	2	
X	X	SH	Wild Black Currant	*Ribes americanum*	Grossulariaceae	4	-3	NL	NL	S5	G5	4	
X	X	SH	Prickly Gooseberry	*Ribes cynosbati*	Grossulariaceae	4	5	NL	NL	S5	G5	4	
X	X	SH	Smooth Gooseberry	*Ribes hirtellum*	Grossulariaceae	6	-3	NL	NL	S5	G5	2	✓
	X	SH	Northern Red Currant	*Ribes rubrum*	Grossulariaceae	0	5	NL	NL	SE5	G4G5	5	
X		SH	Current sp.	*Ribes sp.*	Grossulariaceae								
X	X	SH	Swamp Red Currant	*Ribes triste*	Grossulariaceae	6	-5	NL	NL	S5	G5	3	
X	X	SH	Common Lilac	*Syringa vulgaris*	Oleaceae	0	5	NL	NL	SE5	G?	5	
X	X	SH	Alderleaf Buckthorn	*Rhamnus alnifolia*	Rhamnaceae	7	-5	NL	NL	S5	G5	2	
X	X	SH	Buckthorn	*Rhamnus cathartica*	Rhamnaceae	0	3	NL	NL	SE5	G?	5	
X	X	SH	Downy Serviceberry	*Amelanchier arborea*	Rosaceae	5	3	NL	NL	S5	G5	3	
X		SH	Hawthorn sp.	*Crataegus sp.*	Rosaceae								
X	X	SH	Common Apple	*Malus pumila*	Rosaceae	0	5	NL	NL	SE5	G5	5	
X	X	SH	Choke Cherry	*Prunus virginiana*	Rosaceae	2	3	NL	NL	S5	G5T?	4	
X	X	SH	Multiflora Rose	*Rosa multiflora*	Rosaceae	0	3	NL	NL	SE4	G?	5	
X		SH	Common Blackberry	*Rubus allegheniensis*	Rosaceae	2	2	NL	NL	S5	G5	4	
X	X	SH	Common Red Raspberry	*Rubus idaeus ssp. idaeus*	Rosaceae			NL	NL	SE1	G5T5	5	
X	X	SH	Wild Red Raspberry	*Rubus idaeus ssp. strigosus*	Rosaceae	0	-2	NL	NL	S5	G5	4	
X	X	SH	Dwarf Raspberry	*Rubus pubescens*	Rosaceae	4	-4	NL	NL	S5	G5	3	
X	X	SH	European Mountain-ash	*Sorbus aucuparia*	Rosaceae	0	5	NL	NL	SE4	G5	5	
X	X	SH	Narrow-leaved Meadow-sweet	*Spiraea alba*	Rosaceae	3	-4	NL	NL	S5	G5	3	
X	X	SH	Bebb's Willow	*Salix bebbiana*	Salicaceae	4	-4	NL	NL	S5	G5	3	
X	X	SH	Pussy Willow	*Salix discolor*	Salicaceae	3	-3	NL	NL	S5	G5	4	
X	X	SH	Heart-leaved Willow	*Salix eriocephala*	Salicaceae	4	-3	NL	NL	S5	G5	4	
X	X	SH	Shining Willow	*Salix lucida*	Salicaceae	5	-4	NL	NL	S5	G5	3	
X	X	SH	Meadow Willow	*Salix petiolaris*	Salicaceae	3	-4	NL	NL	S5	G5	3	

AA[1]	CVC[2]	PLANT TYPE[3]	COMMON NAME	SCIENTIFIC NAME	FAMILY	CC[4]	CW[5]	SARO[6]	SARA[7]	S-Rank[8]	G-Rank[9]	CVC 2010[10]	Wellington County[11]
X		SH	Purple Willow	*Salix purpurea*	Salicaceae	0	-3	NL	NL	SE4	G5	5	
X	X	SH	Canadian Yew	*Taxus canadensis*	Taxaceae	7	3	NL	NL	S4	G5	3	
X	X	SH	February Daphne	*Daphne mezereum*	Thymelaeaceae	0	0	NL	NL	SE2	G?	5	
X	X	TR	Manitoba Maple	*Acer negundo*	Aceraceae	0	-2	NL	NL	S5	G5	5	
X	X	TR	Norway Maple	*Acer platanoides*	Aceraceae	0	5	NL	NL	SE5	G?	5	
X	X	TR	Red Maple	*Acer rubrum*	Aceraceae	4	0	NL	NL	S5	G5	4	
X		TR	Silver Maple	*Acer saccharinum*	Aceraceae	5	-3	NL	NL	S5	G5	3	
X	X	TR	Sugar Maple	*Acer saccharum ssp. saccharum*	Aceraceae	4	3	NL	NL	S5	G5	4	
X		TR	Freeman's Maple	*Acer x freemanii*	Aceraceae			NL	NL	S4	G?	4	
X	X	TR	Yellow Birch	*Betula alleghaniensis*	Betulaceae	6	0	NL	NL	S5	G5	3	
X	X	TR	White Birch	*Betula papyrifera*	Betulaceae	2	2	NL	NL	S5	G5	4	
X	X	TR	Eastern Hop-hornbeam	*Ostrya virginiana*	Betulaceae	4	4	NL	NL	S5	G5	4	
X	X	TR	Eastern White Cedar	*Thuja occidentalis*	Cupressaceae	4	-3	NL	NL	S5	G5	4	
X	X	TR	American Beech	*Fagus grandifolia*	Fagaceae	6	3	NL	NL	S4	G5	3	
X		TR	Northern Red Oak	*Quercus rubra*	Fagaceae	6	3	NL	NL	S5	G5	4	
X		TR	Black Walnut	*Juglans nigra*	Juglandaceae	5	3	NL	NL	S4	G5	4	
X	X	TR	White Ash	*Fraxinus americana*	Oleaceae	4	3	NL	NL	S5	G5	4	
X		TR	Black Ash	*Fraxinus nigra*	Oleaceae	7	-4	NL	NL	S5	G5	3	
X	X	TR	Green Ash	*Fraxinus pennsylvanica*	Oleaceae	3	-3	NL	NL	S5	G5	4	
X	X	TR	Balsam Fir	*Abies balsamea*	Pinaceae	5	-3	NL	NL	S5	G5	3	
X		TR	European Larch	*Larix decidua*	Pinaceae	0	5	NL	NL	SE2	G?	5	
X	X	TR	Tamarack	*Larix laricina*	Pinaceae	7	-3	NL	NL	S5	G5	3	
X		TR	Norway Spruce	*Picea abies*	Pinaceae	0	5	NL	NL	SE3	G?	5	
X	X	TR	White Spruce	*Picea glauca*	Pinaceae	6	3	NL	NL	S5	G5	2	
X	X	TR	Black Spruce	*Picea mariana*	Pinaceae	8	-3	NL	NL	S5	G5	2	
X	X	TR	Blue Spruce	*Picea pungens*	Pinaceae	0	3	NL	NL	SE1	G5	5	
X	X	TR	Eastern White Pine	*Pinus strobus*	Pinaceae	4	3	NL	NL	S5	G5	4	
X		TR	Scots Pine	*Pinus sylvestris*	Pinaceae	0	5	NL	NL	SE5	G?	5	
X	X	TR	Eastern Hemlock	*Tsuga canadensis*	Pinaceae	7	3	NL	NL	S5	G5	4	
X	X	TR	Wild Black Cherry	*Prunus serotina*	Rosaceae	3	3	NL	NL	S5	G5	4	
X	X	TR	Balsam Poplar	*Populus balsamifera*	Salicaceae	2	-3	NL	NL	S5	G5T?	4	
X	X	TR	Large-tooth Aspen	*Populus grandidentata*	Salicaceae	5	3	NL	NL	S5	G5	3	
X	X	TR	Trembling Aspen	*Populus tremuloides*	Salicaceae	2	0	NL	NL	S5	G5	4	
X	X	TR	White Willow	*Salix alba*	Salicaceae	0	-3	NL	NL	SE4	G5	5	
X		TR	Crack Willow	*Salix fagilis*	Salicaceae	0	0	NL	NL	SE	G5	5	
X	X	TR	American Basswood	*Tilia americana*	Tiliaceae	4	3	NL	NL	S5	G5	4	
X	X	TR	American Elm	*Ulmus americana*	Ulmaceae	3	-2	NL	NL	S5	G5?	4	
X	X	VI	Wild Mock-cucumber	*Echinocystis lobata*	Cucurbitaceae	3	-2	NL	NL	S5	G5	4	
X		VI	Broad-leaf Peavine	*Lathyrus latifolius*	Fabaceae	0	5	NL	NL	SE4	G?	5	
X	X	VI	Tufted Vetch	*Vicia cracca*	Fabaceae	0	5	NL	NL	SE5	G?	5	
	X	VI	Spring Vetch	*Vicia sativa*	Fabaceae	0	3	NL	NL	SE5	G?T?	5	
X	X	VI	Black Bindweed	*Fallopia convolvulus*	Polygonaceae	0	1	NL	NL	SE5	G?	5	
X	X	VI	Virginia Clematis	*Clematis virginiana*	Ranunculaceae	3	0	NL	NL	S5	G5	4	
	X	VW	Mountain Honeysuckle	*Lonicera dioica*	Caprifoliaceae	5	3	NL	NL	S5	G5	3	
X	X	VW	Climbing Nightshade	*Solanum dulcamara*	Solanaceae	0	0	NL	NL	SE5	G?	5	
X	X	VW	Inserted Virginia Creeper	*Parthenocissus inserta*	Vitaceae	3	3	NL	NL	S5	G5	4	
X	X	VW	Riverbank Grape	*Vitis riparia*	Vitaceae	0	-2	NL	NL	S5	G5	4	

1	**AA:** Botanical data collected by Aboud & Associates Inc. during 2014
2	**CVC:** Botanical data collected by Credit River Conservation from 2008 to 2009
3	**Plant Types:** AL = Algae; FE = Fern; FO = Forb; GR = Grass; LC = Lichen; LV = Liverwort; MO = Moss; RU = Rush; SE = Sedge; SH = Shrub; TR = Tree; VI = Herbaceous vine; VW =
4	**CC:** Coefficient of Conservatism reflects a species' fidelity to a specific habitat. Range from 0 to 10; 10 = very conservative, not likely in disturbed habitats, 1 = least conservative, likely
5	**CW:** Coefficient of Wetness reflects a species' affinity for wet soil conditions. Range from -5 to 5; -5 = obligate wetland species, 5 = obligate upland species.
6	**SARO:** Status under the Provincial Endangered Species Act, listed on the Species at Risk in Ontario (SARO) list. In order of severity, statuses include: EXP = Extirpated; END =
7	**SARA:** Status under the National Species at Risk Act (SARA), assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). In order of severity, statuses
8	**S-Rank:** Provincial rarity rank. Range from S1 to S5; S1 = Extremely rare, S5 = Very common. NR = Unranked; U = Unrankable.
9	questionable; T = Applies to subspecies or variety; Nothing = Rank not yet obtained.
10	**CVC 2010:** Species of Conservation Concern Teir Ranking. Range from 1 to 5; 1 = Species of Conservation Concern, 2 = Species of Interest, 3 = Urban Interest, 4 = Secure Species, 5 = Non-native & Non-native Hybrid Species.
11	**Wellington County:** Significant Flora Species within Wellington County as identified by Dougan & Associates, with Sneil & Cecile. 2009. Guelph Natural Heritage Strategy. Phase 2, Volume 2 (Significant Plant List for Wellington County). Guelph, Ontario.

APPENDIX 7. ANURAN CALL SURVEY

Project: AA12-137A

Hillsburgh Dam Environmental Assessment, Natural Heritage - Existing Conditions

STATION	DATE	SPECIES				
		Gray Treefrog	Spring Peeper	Green Frog	Northern Leopard Frog	Wood Frog
A	15-Apr-15					
	28-May-15		1-3	1-2		
	24-Jun-15	1-1		1-4		
B1	15-Apr-15		2-17			2-10
	28-May-15		1-2			
	24-Jun-15	1-2				
B2	15-Apr-15		1-2			
	28-May-15		1-2			
	24-Jun-15					
C1	15-Apr-15		1-4*			
	28-May-15	2-7	1-3			
	24-Jun-15	2-5*		1-2*		
C2	15-Apr-15		2-8			
	28-May-15	1-2	1-4		1-2	1-1
	24-Jun-15	1-1		1-2		
D	15-Apr-15		3			1-3
	28-May-15	1-4	1-1	1-1		
	24-Jun-15			1-1		
E	15-Apr-15					
	28-May-15		1-1			
	24-Jun-15					
F	15-Apr-15					
	28-May-15	2-11	1-2			
	24-Jun-15	1-6		1-1		
G	15-Apr-15					
	28-May-15	2-9	1-1	1-3		
	24-Jun-15	1-3		1-3		
H	15-Apr-15					
	28-May-15	1-1				
	24-Jun-15					

* indicates call heard outside of survey area.

Amphibian Call Level codes:

1 - # :Calls not simultaneous, number of individuals can be accurately counted

2 - # :Some calls simultaneous, number of individuals can be reliably estimated

3 :Full chorus, calls continuous and overlapping, number of individuals cannot reliably be estimated

APPENDIX 8. BREEDING BIRD SURVEY RESULTS

Hillsburgh Dam Environmental Assessment, Natural Heritage - Existing Conditions

COMMON_NAME	SCIENTIFIC_NAME	COSARO	COSEWIC	SARA	S-RANK	G-RANK	Wellington	CVC	PIF	PC1 Deciduous forest		PC2 OA, Coniferous Swamp		PC3 Deciduous forest		PC4 Meadow Marsh, Mixed Swamp		PC5 Shallow Marsh, Mixed Swamp		PC6 Mixed Swamp, Coniferous Forest		PC7 Woodland, Deciduous Forest		PC8 Hillsburgh Pond and Dam		PC9 Cattail Meadow Marsh		PC10 Creek and Riparian		**Site Totals**	**Overall Highest Breeding Evidence**
										#	HBE	#	HBE	#	HBE	#	HBE	#	HBE	#	HBE	#	HBE	#	HBE	#	HBE	#	HBE	**#**	
Great Blue Heron	*Ardea herodias*				S4	G5	✓	3		0		1	X	0		0		0		0		0		0		0		0		1	Observed
Green Heron	*Butorides virescens*				S4B	G5	✓	2		0		1	H	0		0		0		0		0		0		0		0		1	Possible
Canada Goose	*Branta canadensis*				S5	G5		4		0		0		0		0		0		0		0		0		0		0	FO	0	Observed
Mallard	*Anas platyrhynchos*				S5	G5	✓	4		0		0		0		0		13	P	0		0	FO	0		0		0		13	Probable
Killdeer	*Charadrius vociferus*				S5B,S5N	G5		3		0		0		0		0		0		0		0		0		0		0	FO	0	Observed
Ring-billed Gull	*Larus delawarensis*				S5B,S4N	G5	✓	2		0		0		0		0		0		0		0		0		0	FO	0		0	Observed
Mourning Dove	*Zenaida macroura*				S5	G5	✓	4		0		0		0		1	S	0		0		0		0		0		1	S	2	Possible
Belted Kingfisher	*Megaceryle alcyon*				S4B	G5	✓	3	✓	0		2	P	0		0		1	H	0		0		1	H	1	H	0		5	Probable
Downy Woodpecker	*Picoides pubescens*				S5	G5	✓	4		0		0		0		0		0		0		0		0		1	T	0		1	Probable
Northern Flicker	*Colaptes auratus*				S4B	G5	✓	3	✓	0		1	S	0		1	T	1	S	1	S	2	T	1	T	0	S	0		7	Probable
Eastern Wood-pewee	*Contopus virens*	SC	SC		S4B	G5	✓	1	✓	1	S	1	T	1	S	0		0		0		0		0		0		0		3	Probable
Alder Flycatcher	*Empidonax alnorum*				S5B	G5	✓			0		0		0		0		1	S	0		0		0		0		0		1	Possible
Eastern Phoebe	*Sayornis phoebe*				S5B	G5		3		0		0		0		0		0		1	S	0		0		0		0		1	Possible
Great Crested Flycatcher	*Myiarchus crinitus*				S4B	G5		3		0		0		0		1	S	1	T	0		1	S	0		0		0		3	Probable
Eastern Kingbird	*Tyrannus tyrannus*				S4B	G5		3		0		0		0		2	S	1	A	0		0		0		0		0		3	Probable
Tree Swallow	*Tachycineta bicolor*				S4B	G5		3		0		2	H	0		0		1	H	0		0		1	H	1	H	0		5	Possible
Blue Jay	*Cyanocitta cristata*				S5	G5		4		1	FY	2	A	0		0		0		1	H	1	S	0		0		1	H	6	confirmed
American Crow	*Corvus brachyrhynchos*				S5B	G5	✓	2		1	A	1	A	0		0		2	A	1		2	H	0	H	3	A	2	H	12	Probable
Black-capped Chickadee	*Poecile atricapillus*				S5	G5		4		1	S	1	S	2	A	0		2	S	2	T	2	S	3	FY	0		1	S	14	confirmed
Red-breasted Nuthatch	*Sitta canadensis*				S5	G5		3		0		0		0		0		0		1	S	0		0		0		0		1	Possible
House Wren	*Troglodytes aedon*				S5B	G5	✓	4		0		0		0		1	A	1	S	0		0	S	0		0		1	S	3	Probable
Winter Wren	*Troglodytes troglodytes*				S5B	G5	✓	3		0		0		0		0		0		1	S	0		0		0		0		1	Possible
American Robin	*Turdus migratorius*				S5B	G5		4		1	T	1	T	1	A	5	A	4	T	1	A	2	A	1	A	0		5	A	21	Probable
Gray Catbird	*Dumetella carolinensis*				S4B	G5	✓	3		0		0		1	S	0		1	S	0		1	S	0		1	S	0		4	Possible
Cedar Waxwing	*Bombycilla cedrorum*				S5B	G5	✓	3		0		1	H	0		3	H	2	H	0		2	H	2	H	1	H	1	H	12	Possible
European Starling	*Sturnus vulgaris*				SNA	G5				0		0		0		0		0		0		0		3	S	1	H	1	H	5	Possible
Warbling Vireo	*Vireo gilvus*				S5B	G5		5		0		0		0		1	T	1	S	0		0		1	T	1	S	0		4	Probable
Red-eyed Vireo	*Vireo olivaceus*				S5B	G5	✓	4		1	T	1	T	1	S	1	S	2	S	0		0		0		1	S	0		7	Probable
Yellow Warbler	*Dendroica petechia*				S5B	G5		4		0		0		0		1	T	2	S	0		1	T	0		1	T	0		5	Probable
Chestnut-sided Warbler	*Dendroica pensylvanica*				S5B	G5	✓	2		0		0		0		0		0		0		1	S	0		0		0		1	Possible
Northern Waterthrush	*Seiurus noveboracensis*				S5B	G5	✓	3		0		1	S	0		0		1	S	0		0		0		0		0		2	Possible
Common Yellowthroat	*Geothlypis trichas*				S5B	G5	✓	4		0		1	S	0		2	S	2	T	0		2	T	0		0		0		7	Probable
Northern Cardinal	*Cardinalis cardinalis*				S5	G5	✓	4		0		0		0		0		1	S	1	S	0		1	S	0		0		3	Possible
Rose-breasted Grosbeak	*Pheucticus ludovicianus*				S4B	G5		3	✓	0		0		0		1	S	1	H	1	S	0		0		0		0		3	Possible
Indigo Bunting	*Passerina cyanea*				S4B	G5				0		1	S	0		0		0		0		1	S	0		0		0		2	Possible
Chipping Sparrow	*Spizella passerina*				S5B	G5	✓	4		0		0		0		0		0		0		1	S	0		0		0		1	Possible
Song Sparrow	*Melospiza melodia*				S5B	G5	✓	4		0		0		0		2	S	2	S	0		2	T	2	N	2	T	1	S	11	confirmed
Swamp Sparrow	*Melospiza georgiana*				S5B	G5		4		0		1	S	0		1	S	2	S	0		2	T	0		0		0		6	Probable
White-throated Sparrow	*Zonotrichia albicollis*				S5B	G5		3		0		0		0		0		1	S	0	S	0		0		0		0		1	Possible
Red-winged Blackbird	*Agelaius phoeniceus*				S4	G5	✓	4		0		2	A	0		4	T	4	S	0		0		6	CF	12	FY	0		28	confirmed
Eastern Meadowlark	*Sturnella magna*	THR	THR		S4B	G5	✓	1	✓	0		0		0		0		0	S	0		0		0		0		0		0	Possible
Common Grackle	*Quiscalus quiscula*				S5B	G5		4		0		0		1	A	6	FY	0		0		0		2	H	1	H	0		10	confirmed
Brown-headed Cowbird	*Molothrus ater*				S4B	G5	✓	4		0		0		0		0		0		0		1	S	1	H	0		0		2	Possible
Baltimore Oriole	*Icterus galbula*				S4B	G5		3	✓	0		1	S	1	S	2	S	0		0		0		1	A	1	H	0		6	Probable
American Goldfinch	*Carduelis tristis*				S5B	G5		4		0		1	H	0		0		1	H	0	FO	1	H	7	H	3	H	2	H	15	Possible
House Sparrow	*Passer domesticus*				SNA	G5		5		0		0		0		0		0		0		0		0		1	S	0		1	Possible

Legend:
SARO: Species at Risk Ontario
COSEWIC: Committee on the Status of Endangered wildlife in Canada
SARA: Species at Risk Act
ESA: Endangered Species Act
END: Endangered
THR: Threatened
SC: special Concern
NAR: Not At Risk
NL: Not listed
DD: Data Deficient
HBE: Highest Breeding Evidence over 2 surveys
PIF: Priority species in BCR13

G-Rank:
G1: Extremely rare globally
G1G2: Extremely rare to very rare globally
G2: Very rare globally
G2G3: Very rare to uncommon globally
G3: Rare to uncommon globally
G3G4: Rare to common globally
G4: Common globally
G4G5: Common to very common globally
G5: Very common globally; demonstrably secure
T: rank applies to a subspecies or variety

S-Rank:
S1: Critically Imperiled—Critically imperiled in the province
S2: Imperiled—Imperiled in the province
S3: Vulnerable—Vulnerable in the province
S4: Apparently Secure—Uncommon but not rare
S5: Secure—Common, widespread, and abundant
SX: Presumed extirpated
SH: Possibly Extirpated (Historical)
SNR: Unranked
SU: Unrankable—Currently unrankable
SNA: Not applicable—A conservation status rank is not applicable
S#S#: Range Rank— indicates range of uncertainty about the status
S#B- Breeding status rank
S#N- Non Breeding status rank
?: Indicates uncertainty in the assigned rank

CVC Tiers:
1 - Species of Conservation Concern
2 - Species of Interest
3 - Species of Urban Interest
4 - Secure Species
5 - Non-native & Non-native Hybrid Species

Breeding Evidence Codes
Observed
X-no breeding evidence
FO-flyover
Possible
H-Suitable habitat
S-Singing male
probable
P-PairD-Display
T-Territory (2 visits)
D-Display
V-Visiting nest
A-Agitated
B-Broodpatch
N-Nest building or excavation

Confirmed
DD-Distraction display
NU-Used nest
FY-Fledged young
AE-Adult entering/leaving nest
FS-Adult carrying fecal sac
CF-Adult carrying food
NE-Nest with eggs
NY-Nest with young

Wellington County:
✓ Significant Species

APPENDIX 9. MARSH BREEDING BIRD RESULTS

Hillsburgh Dam Environmental Assessment, Natural Heritage - Existing Conditions

COMMON NAME	SCIENTIFIC NAME	STATION	ROUND	BE	in/out	tally
American Redstart	*Setophaga ruticilla*	MBB1	2	s	in	1
American Robin	*Turdus migratorius*	MBB1	1	H	in	2
Blue Jay	*Cyanocitta cristata*	MBB1	2	a	in	1
Common Grackle	*Quiscalus quiscula*	MBB1	2	h	in	1
Downy Woodpecker	*Picoides pubescens*	MBB1	2	t	in	1
Gray Catbird	*Dumetella carolinensis*	MBB1	1	S	in	1
Green Heron	*Butorides virescens*	MBB1	1	H	out	1
Mallard	*Anas platyrhynchos*	MBB1	2	h	in	3
Red-eyed Vireo	*Vireo olivaceus*	MBB1	1	S	in	1
Red-winged Blackbird	*Agelaius phoeniceus*	MBB1	1	P	in	8
Song Sparrow	*Melospiza melodia*	MBB1	1	S	in	1
Tree Swallow	*Tachycineta bicolor*	MBB1	1	fo	n/a	6
Yellow Warbler	*Dendroica petechia*	MBB1	1	S	in	1
American Black Duck	*Anas rubripes*	MBB2	2	h	in	1
Baltimore Oriole	*Icterus galbula*	MBB2	2	s	in	1
Black-and-white Warbler	*Mniotilta varia*	MBB2	1	s	in	2
Cliff Swallow	*Petrochelidon pyrrhonota*	MBB2	1	fo	n/a	2
Common Grackle	*Quiscalus quiscula*	MBB2	2	a	in	3
Great Crested Flycatcher	*Myiarchus crinitus*	MBB2	1	S	in	2
Northern Flicker	*Colaptes auratus*	MBB2	2	t	in	2
Red-breasted Nuthatch	*Sitta canadensis*	MBB2	2	s	in	1
White-throated Sparrow	*Zonotrichia albicollis*	MBB2	1	s	in	2
American Goldfinch	*Carduelis tristis*	MBB3	1	H	in	1
American Robin	*Turdus migratorius*	MBB3	1	A	in	2
American Robin	*Turdus migratorius*	MBB3	2	fy	in	1
Baltimore Oriole	*Icterus galbula*	MBB3	1	H	in	1
Belted Kingfisher	*Megaceryle alcyon*	MBB3	2	h	in	1
Brown-headed Cowbird	*Molothrus ater*	MBB3	2	s	in	1
Cedar Waxwing	*Bombycilla cedrorum*	MBB3	2	h	in	4
House Wren	*Troglodytes aedon*	MBB3	2	s	in	1
Northern Flicker	*Colaptes auratus*	MBB3	1	T	in	1
Red-winged Blackbird	*Agelaius phoeniceus*	MBB3	1	A	in	4
Song Sparrow	*Melospiza melodia*	MBB3	2	a	in	1
Warbling Vireo	*Vireo gilvus*	MBB3	1	S	in	1
Alder Flycatcher	*Empidonax alnorum*	MBB4	2	h	in	1
American Crow	*Corvus brachyrhynchos*	MBB4	1	h	in	2
American Crow	*Corvus brachyrhynchos*	MBB4	2	h	in	1
American Goldfinch	*Carduelis tristis*	MBB4	1	h	in	1
American Goldfinch	*Carduelis tristis*	MBB4	2	h	in	2
American Robin	*Turdus migratorius*	MBB4	2	a	in	2
Baltimore Oriole	*Icterus galbula*	MBB4	1	s	in	1
Belted Kingfisher	*Megaceryle alcyon*	MBB4	1	h	in	1
Belted Kingfisher	*Megaceryle alcyon*	MBB4	2	h	out	1
Black-capped Chickadee	*Poecile atricapillus*	MBB4	1	s	in	1
Black-capped Chickadee	*Poecile atricapillus*	MBB4	2	s	in	3
Blue Jay	*Cyanocitta cristata*	MBB4	2	fy	in	1
Chipping Sparrow	*Spizella passerina*	MBB4	1	s	in	1
Common Yellowthroat	*Geothlypis trichas*	MBB4	2	s	in	1
Downy Woodpecker	*Picoides pubescens*	MBB4	2	t	in	1
Eastern Kingbird	*Tyrannus tyrannus*	MBB4	1	a	in	1
Great Crested Flycatcher	*Myiarchus crinitus*	MBB4	1	s	in	1
Marsh Wren	*Cistothorus palustris*	MBB4	1	s	in	1
Mourning Dove	*Zenaida macroura*	MBB4	2	fo	in	1
Northern Waterthrush	*Seiurus noveboracensis*	MBB4	1	s	in	1
Red-eyed Vireo	*Vireo olivaceus*	MBB4	2	s	in	1
Red-winged Blackbird	*Agelaius phoeniceus*	MBB4	1	a	in	3
Red-winged Blackbird	*Agelaius phoeniceus*	MBB4	2	s	in	1
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	MBB4	2	s	in	1
Song Sparrow	*Melospiza melodia*	MBB4	2	a	in	1
Yellow Warbler	*Dendroica petechia*	MBB4	1	s	in	1
Yellow Warbler	*Dendroica petechia*	MBB4	2	s	in	1

Breeding Evidence Codes

Observed
X-no breeding evidence
FO-flyover

Possible
H-Suitable habitat
S-Singing male

Probable
P-Pair
T-Territory (2 visits)
D-Display
V-Visiting nest
A-Agitated
B-Broodpatch
N-Nest building

Confirmed
DD-Distraction display
NU-Used nest
FY-Fledged young
AE-Adult entering/leaving nest
FS-Adult carrying fecal sac
CF-Adult carrying food
NE-Nest with eggs
NY-Nest with young

ROUND	TRANSECT	SPECIES or FEATURE	APPROX. LENGTH	COVER	COUNT	PHOTO	NOTES	HABITAT
1	none/scoping	Candidate Hibernacula	20m* 2m	Rock birm		yes	Linear rock feature, many crevices openings	open woodland
1	none/scoping	Candidate Hibernacula	5m* 5m	Rock birm		yes	circular rock pile, overgrown with many cracks.crevices	open woodland
1	none/scoping	Common gartersnake	30cm	long grass	1	yes	sunning on trail	open gravel and meadow
2	S1	none	-	-	-	-	-	-
2	S2	none	-	-	-	-	-	-
2	S3	none	-	-	-	-	-	-
2	S4	none	-	-	-	-	-	-
2	S5	none	-	-	-	-	-	-
3	S1	none	-	-	-	-	-	-
3	S2	none	-	-	-	-	-	-
3	S3	none	-	-	-	-	-	-
3	S4	none	-	-	-	-	-	-
3	S5	none	-	-	-	-	-	-

APPENDIX 11. TURTLE BASKING SURVEY RESULTS

AA12-137A

Hillsburgh Dam Environmental Assessment, Natural Heritage - Existing Conditions

STATION	DATE	SPECIES		
		Common Snapping Turtle	Midland Painted Turtle	Unknown Turtle Species
Turtle Habitat 1	29-Apr-15	2	26	
	08-May-15	3	25	
	14-May-15	2	19	
	28-May-15	2	12	
	11-Jun-15		22	
Turtle Habitat 1 total		**9**	**104**	**0**
Turtle Habitat 2	29-Apr-15			
	08-May-15			
	14-May-15			
	28-May-15			
	11-Jun-15		1	
Turtle Habitat 2 Total		**0**	**1**	**0**
Turtle Habitat 3	29-Apr-15		64	
	08-May-15	2	132	
	14-May-15		109	
	28-May-15	3	77	
	11-Jun-15	1	63	
Turtle Habitat 3 Total		**6**	**445**	**0**
Turtle Habitat 4	29-Apr-15		2	
	08-May-15		1	1
	14-May-15		2	
	28-May-15			
	11-Jun-15		2	
Turtle Habitat 4 Total		**0**	**7**	**1**
Turtle Habitat 5	29-Apr-15			
	08-May-15			
	14-May-15			
	28-May-15			
	11-Jun-15		1	
Turtle Habitat 5 total		**0**	**1**	**0**

APPENDIX 12. WINTER WILDLIFE SURVEY

Project: AA12-137A

Hillsburgh Dam Environmental Assessment, Natural Heritage - Existing Conditions

COMMON NAME	SCIENTIFIC NAME	SARO	COSEWIC	SARA	S-Rank	G-Rank	CVC (2010)
BIRDS							
Canada Goose	*Branta canadensis*				S5	G5	4
American Black Duck	*Anas rubripes*				S4	G5	2
Bald Eagle	*Haliaeetus leucocephalus*	SC			S2N,S4B	G5	1
Ruffed Grouse	*Bonasa umbellus*				S4	G5	2
Downy Woodpecker	*Picoides pubescens*				S5	G5	4
Pileated Woodpecker	*Dryocopus pileatus*				S5	G5	2
American Crow	*Corvus brachyrhynchos*				S5B	G5	2
Black-capped Chickadee	*Poecile atricapillus*				S5	G5	4
Pine Siskin	*Carduelis pinus*				S4B	G5	2
MAMMALS							
Eastern Cottontail	*Sylvilagus floridanus*				S5	G5	4
Eastern Gray Squirrel	*Sciurus carolinensis*				S5	G5	4
Red Squirrel	*Tamiasciurus hudsonicus*				S5	G5	3
Beaver	*Castor canadensis*				S5	G5	3
Meadow Vole	*Microtus pennsylvanicus*				S5	G5	3
Coyote	*Canis latrans*				S5	G5	3
American Mink	*Mustela vison*				S4	G5	2
White-tailed Deer	*Odocoileus virginianus*				S5	G5	3
Red Fox (cf.)	*Vulpes vulpes*				S5	G5	3

Legend:
SARO: Species at Risk Ontario
COSEWIC: Committee on the status of endangered wildlife in canac
SARA: Species at Risk Act
SC: Special Concern

Global Rank:
G1: Extremely rare globally
G1G2: Extremely rare to very rare globally
G2: Very rare globally
G2G3: Very rare to uncommon globally
G3: Rare to uncommon globally
G3G4: Rare to common globally
G4: Common globally
G4G5: Common to very common globally
G5: Very common globally; demonstrably secure

CVC Tiers:
1 - Species of Conservation Concern
2 - Species of Interest
3 - Species of Urban Interest
4 - Secure Species
5 - Non-native & Non-native Hybrid Species

Provincial Rank:
S1: Critically Imperiled—Critically imperiled in the province
S2: Imperiled—Imperiled in the province, very few populations
S3: Vulnerable—Vulnerable in the province, relatively few populations
S4: Apparently Secure—Uncommon but not rare
S5: Secure—Common, widespread, and abundant in the province
S#B- Breeding status rank
S#N- Non Breeding status rank

COMMON NAME	SCIENTIFIC NAME	SARO	COSEWIC	SARA	S-Rank	G-Rank	CVC (2010)
Great Egret	*Ardea alba*				S2B	G5	1
Canada Goose	*Branta canadensis*				S5	G5	4
Wood Duck	*Aix sponsa*				S5	G5	2
American Black Duck	*Anas rubripes*				S4	G5	2
Mallard	*Anas platyrhynchos*				S5	G5	4
Belted Kingfisher	*Megaceryle alcyon*				S4B	G5	3
Northern Flicker	*Colaptes auratus*				S4B	G5	3
Blue Jay	*Cyanocitta cristata*				S5	G5	4
American Crow	*Corvus brachyrhynchos*				S5B	G5	2
Black-capped Chickadee	*Poecile atricapillus*				S5	G5	4
Red-breasted Nuthatch	*Sitta canadensis*				S5	G5	3
House Wren	*Troglodytes aedon*				S5B	G5	4
Golden-crowned Kinglet	*Regulus satrapa*				S5B	G5	2
Ruby-crowned Kinglet	*Regulus calendula*				S4B	G5	2
American Robin	*Turdus migratorius*				S5B	G5	4
European Starling	*Sturnus vulgaris*				SNA	G5	5
Song Sparrow	*Melospiza melodia*				S5B	G5	4
White-throated Sparrow	*Zonotrichia albicollis*				S5B	G5	3
American Goldfinch	*Carduelis tristis*				S5B	G5	4
Black bird species (mixed flock)							

<u>Legend:</u>

SARO: Species at Risk Ontario
COSEWIC: Committee on the Status of Endangered wildlife in Canad
SARA: Species at Risk Act
ESA: Endangered Species Act
END: Endangered
THR: Threatened
SC: special Concern
NAR: Not At Risk
NL: Not listed
DD: Data Deficient

<u>Global Rank:</u>

G1: Extremely rare globally
G1G2: Extremely rare to very rare globally
G2: Very rare globally
G2G3: Very rare to uncommon globally
G3: Rare to uncommon globally
G3G4: Rare to common globally
G4: Common globally
G4G5: Common to very common globally
G5: Very common globally; demonstrably secure
T: rank applies to a subspecies or variety

<u>CVC Tiers:</u>

1 - Species of Conservation Concern
2 - Species of Interest
3 - Species of Urban Interest
4 - Secure Species
5 - Non-native & Non-native Hybrid Species

<u>Provincial Rank:</u>

S1: Critically Imperiled—Critically imperiled in the province
S2: Imperiled—Imperiled in the province, very few populations
S3: Vulnerable—Vulnerable in the province, few populations
S4: Apparently Secure—Uncommon but not rare
S5: Secure—Common, widespread, and abundant in the province
SX: Presumed extirpated
SH: Possibly Extirpated (Historical)
SNR: Unranked
SU: Unrankable—Currently unrankable due to lack of information
SNA: Not applicable—conservation status rank is not applicable
S#S#: Range Rank—range of uncertainty about the status
S#B- Breeding status rank
S#N- Non Breeding status rank
?: Indicates uncertainty in the assigned rank

Appendix 14

Shorebird Habitat Assessment

Shorebird Habitat Assessment

ABOUD & ASSOCIATES INC.
Consulting Arborists•Ecologists•Landscape Designers
591 Woolwich Street . Guelph . Ontario . Canada . N1H 3Y5
T:519.822.6839 . F:519.822.4052 . info@aboudtng.com . www.aboudtng.com

Project: Hillsburgh Dam Project number: AA12-137A Observer(s):C.A. Ross Date: 05/08/2015

Location: Hillsburgh Dam Approximate Size of Census Area (X *X km): 0.5 x 0.1

Weather Conditions:

Temp (°C)	Wind*	Cloud Cover	Precipitation	Precipitation(24hrs)
17	3	19	None	none

*Beaufort Scale: 0-Calm (0 km/hr), 1-light Air (1-5km/hr), 2-Light Breeze (6-11km/hr), 3-gentle Breeze (12-19km/hr), 4-moderate Breeze (20-28km/hr), 5-fresh breeze (29-38km/hr), 6-strong breeze (39-49km/hr)

1. Habitat Availability (rank by area (ha) the habitats that are available to be used):

Sand Beach		Salt Marsh		Sewage Plant	
Sand Flat		Field		Mangrove	
Sand & Mud Flat		Brackish Pond		Other:	
Mud Flat	2	Temporary Pond		Other:	
Rocky Beach		Fresh Pond Or Lake	1	Other:	
Rocky Point		River		Other:	

2. Site is (rank by area (ha) if more than one):

On A Bay Or Estuary		An Inland Salt Lake Or Sea		Other:	
A Coastal Bay		On The Ocean Front			
A Lagoon		Principally An Inland Area	1		

3. Raptors observed:

Frequently		Infrequently		Never	x
Species observed:					

4. Disturbance by Humans:

>10 per day	x	5-10 per day		1-5 per day	
< 1 per day		Variable		unknown	

5. Rank major causes of disturbance:

People on foot	x	Vehicle Traffic	x	Pets	x
Boats		Hunting		Other	

6. Comments:

Very little mud or sand exposed, vegetated with pond lilies, cattails, No shorebirds observed during August survey.

COMMON NAME	SCIENTIFIC NAME	SARO	COSEWIC	SARA	S-Rank	G-Rank	CVC (2010)	Wellington County (2008)	Date(s) observed (2015)
BUTTERFLIES									
Canadian Tiger Swallowtail	*papilo canadensis*								May 28
AMPHIBANS								✓	
American Toad	*Anaxyrus americanus*				S5	G5	3		May 8
Spring Peeper	*Pseudacris crucifer*				S5	G5	3		April 15, april 29, May 8
Green Frog	*Lithobates clamitans*				S5	G5	3	✓	May 28
Northern Leopard Frog	*Lithobates pipiens*	NAR	NAR		S5	G5	3	✓	April 15, April 29, May 8, May 14, May 28
TURTLES									
Snapping Turtle	*Chelydra serpentina*	SC	SC	SC	S3	G5T5	1	✓	April 15, May 28
Midland Painted Turtle	*Chrysemys picta marginata*				S5	G5T5	3	✓	April 15
BIRDS									
Common Loon	*Gavia immer*	NAR	NAR		S5B,S5N	G5	2	✓	May 8
Great Blue Heron	*Ardea herodias*				S4	G5	3	✓	May 28
Great Egret	*Ardea alba*				S2B	G5	1	✓	May 28
Green Heron	*Butorides virescens*				S4B	G5	2	✓	May 28, August 5
Trumpeter Swan	*Cygnus buccinator*	NAR	NAR		S4	G4	1		April 29, May 28
Canada Goose	*Branta canadensis*				S5	G5	4		April 15, April 29, May 8, May 14, May 28
Wood Duck	*Aix sponsa*				S5	G5	2	✓	April 29, August 8
Mallard	*Anas platyrhynchos*				S5	G5	4	✓	April 29, May 8, May 28. Aug. 5, Sept. 25
Ring-necked Duck	*Aythya collaris*				S5	G5	3		April 15
Bufflehead	*Bucephala albeola*				S4	G5		✓	April 15
Common Merganser	*Mergus merganser*				S5B,S5N	G5	2	✓	April 15
Killdeer	*Charadrius vociferus*				S5B,S5N	G5	3		
Spotted Sandpiper	*Actitis macularius*				S5	G5	3	✓	
Ring-billed Gull	*Larus delawarensis*				S5B,S4N	G5	2	✓	August 5
Barred Owl	*Strix varia*				S5	G5	2		April 29
Belted Kingfisher	*Megaceryle alcyon*				S4B	G5	3	✓	April 15, April 29, August 5, September 29
Downy Woodpecker	*Picoides pubescens*				S5	G5	4	✓	April 15, May 8. May 28
Northern Flicker	*Colaptes auratus*				S4B	G5	3	✓	April 15
Alder Flycatcher	*Empidonax alnorum*				S5B	G5		✓	May 28
Eastern Phoebe	*Sayornis phoebe*				S5B	G5	3		April 15, May 8. May 28
Great Crested Flycatcher	*Myiarchus crinitus*				S4B	G5	3		May 28
Eastern Kingbird	*Tyrannus tyrannus*				S4B	G5	3		May 8, may 28, august 5
Tree Swallow	*Tachycineta bicolor*				S4B	G5	3		may 8, august 5
Blue Jay	*Cyanocitta cristata*				S5	G5	4		April 29, May 28
American Crow	*Corvus brachyrhynchos*				S5B	G5	2	✓	April 15, May 8, May 28
Black-capped Chickadee	*Poecile atricapillus*				S5	G5	4		April 15, April 29, May 8, May 28
White-breasted Nuthatch	*Sitta carolinensis*				S5	G5	3	✓	april 15

COMMON NAME	SCIENTIFIC NAME	SARO	COSEWIC	SARA	S-Rank	G-Rank	CVC (2010)	Wellington County (2008)	Date(s) observed (2015)
House Wren	*Troglodytes aedon*				S5B	G5	4	✓	May 8, may 28
Golden-crowned Kinglet	*Regulus satrapa*				S5B	G5	2	✓	April 15, April 29
Ruby-crowned Kinglet	*Regulus calendula*				S4B	G5	2	✓	April 15, April 29
Hermit Thrush	*Catharus guttatus*				S5B	G5	2		May 28
American Robin	*Turdus migratorius*				S5B	G5	4		April 15, April 29, May 8, May 28
Cedar Waxwing	*Bombycilla cedrorum*				S5B	G5	3	✓	May 28
Warbling Vireo	*Vireo gilvus*				S5B	G5	4		May 29
Red-eyed Vireo	*Vireo olivaceus*				S5B	G5	4	✓	May 30
Nashville Warbler	*Vermivora ruficapilla*				S5B	G5	2	✓	May 8
Yellow Warbler	*Dendroica petechia*				S5B	G5	4		May 8, May 25
Yellow-rumped Warbler	*Dendroica coronata*				S5B	G5	2	✓	May 8
Black-and-white Warbler	*Mniotilta varia*				S5B	G5	3	✓	May 8
American Redstart	*Setophaga ruticilla*				S5B	G5	3	✓	May 28
Northern Waterthrush	*Seiurus noveboracensis*				S5B	G5	3	✓	May 28
Common Yellowthroat	*Geothlypis trichas*				S5B	G5	4	✓	May 8, May 25
Northern Cardinal	*Cardinalis cardinalis*				S5	G5	4	✓	April 15, April 29, May 8, May 28
Rose-breasted Grosbeak	*Pheucticus ludovicianus*				S4B	G5	3		May 8
Indigo Bunting	*Passerina cyanea*				S4B	G5			May 28
Chipping Sparrow	*Spizella passerina*				S5B	G5	4	✓	April 15, May 8, May 28
Song Sparrow	*Melospiza melodia*				S5B	G5	4	✓	April 15, May 8, May 28
Swamp Sparrow	*Melospiza georgiana*				S5B	G5	4		April 29, May 8
White-throated Sparrow	*Zonotrichia albicollis*				S5B	G5	3		April 29, May 8, May 28
Red-winged Blackbird	*Agelaius phoeniceus*				S4	G5	4	✓	April 15, April 29, May 8, May 28
Common Grackle	*Quiscalus quiscula*				S5B	G5	4		April 15, April 29, May 28
Baltimore Oriole	*Icterus galbula*				S4B	G5	3		May 8, May 28
American Goldfinch	*Carduelis tristis*				S5B	G5	4		April 15, April 29, May 8
MAMMALS									
Eastern Chipmunk	*Tamias striatus*				S5	G5	3		May 8
Red Squirrel	*Tamiasciurus hudsonicus*				S5	G5	3	✓	April 15, May 8
Beaver	*Castor canadensis*				S5	G5	3		Apri 29, May 8, May 14
Muskrat	*Ondatra zibethicus*				S5	G5	3	✓	April 8
American Mink	Mustela vison				S4	G5	2		May 14

Legend:
SARO: Species at Risk Ontario
COSEWIC: Committee on the Status of Endangered wildlife in Canada
SARA: Species at Risk Act
ESA: Endangered Species Act
END: Endangered
THR: Threatened
SC: special Concern
NAR: Not At Risk
NL: Not listed
DD: Data Deficient

Wellington County:
√ : Significant Species

PIF:
√: Priority Species

CVC Tiers:
1 - Species of Conservation Concern
2 - Species of Interest
3 - Species of Urban Interest
4 - Secure Species
5 - Non-native & Non-native Hybrid Species

Global Rank:
G1: Extremely rare globally
G1G2: Extremely rare to very rare globally
G2: Very rare globally
G2G3: Very rare to uncommon globally
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G4: Common globally
G4G5: Common to very common globally
G5: Very common globally; demonstrably secure
T: rank applies to a subspecies or variety

Provincial Rank:
S1: Critically Imperiled—Critically imperiled in the province
S2: Imperiled—Imperiled in the province, very few populations
S3: Vulnerable—Vulnerable in the province, relatively few populations
S4: Apparently Secure—Uncommon but not rare
S5: Secure—Common, widespread, and abundant in the province
SX: Presumed extirpated
SH: Possibly Extirpated (Historical)
SNR: Unranked
SU: Unrankable—Currently unrankable due to lack of information
SNA: Not applicable—A conservation status rank is not applicable
S#S#: Range Rank— indicates range of uncertainty about the status
S#B- Breeding status rank
S#N- Non Breeding status rank
?: Indicates uncertainty in the assigned rank

#	SIGNIFICANT WILDLIFE HABITAT (SWH)	CANDIDATE SWH CRITERIA	CRITERIA FOR SWH CONFIRMATION	SWH PROTECTED AREA	SITE ASSESSMENT DETAILS	CANDIDATE SWH	FIELD STUDIES REQUIRED/ COMPLETED	CONFIRMED SWH
SEASONAL CONCENTRATION AREAS OF ANIMALS								
1	Waterfowl stopover and Staging Areas (terrestrial)	- Fields with Sheet water in spring (incl. agricultural)	- Mixed species aggregations of 100 or more individuals confirms SWH	flooded field ecosite and 100-300m radius is the SWH	No Habitat matching Criteria identified in Study Area	No	None required.	No
2	Waterfowl Stopover and Staging (Aquatic)	- Ponds, marshes, lakes, bays, coastal inlets and watercourses and reservoirs - SWTP & SWMP are not SWH	- Aggregations of 100 or more listed species for 7 days (ie. >700 waterfowl use days) confirms SWH	Aquatic ecosite and 100m radius is the SWH	Hillsburgh pond is of sufficient size, shallow depth, and abundant aquatic vegetation.	Yes	Identified by CVC as SWH through spring surveys	Yes
3	Shorebird Migratory stopover	- Shorelines of Lakes, rivers, wetlands, beaches, bars; seasonally flooded, muddy and un-vegetated shoreline habitat	- 3 or more listed species and >1000 shorebird use days, or >100 whimbrel, confirms SWH	Shoreline ecosite and 100m radius is the SWH	No Habitat matching Criteria identified in Study Area, >5km from any Great Lake	No	Fall migration survey completed.	No
4	Raptor Wintering Area	- Combination of upland field and woodland habitat >20ha total (includes,>15ha upland field) - least disturbed sites, idle, fallow or lightly grazed field/meadow best	- 1 or more Short-eared Owl, or, at least 10 individuals and 2 listed species for a minimum of 20 days, and 3 of 5 years, confirms SWH	Ecosite communities (field and woodland) is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No
5	Bat Hibernacula	- Caves, mine shafts, underground foundations, karsts - buildings are not SWH	- All sites with confirmed hibernating bats, confirms SWH	Ecosite and 200m radius is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No
6	Bat Maternity Colony	- All forested ecosites, FOD, FOC, FOM, SWD, SWM, SWC with >10/ha trees (>25cm DBH) in early stages of decay (class 1-3) - buildings are not SWH	- >10 Big Brown Bats, >20 Little Brown Myotis, >5 adult female Silver-haired Bats confirms SWH	Entire woodland or forest stand ELC ecosite containing colony is the SWH	Forested ecosites present in Study area with trees >25cm DBH.	Yes	Studies to be completed pre-construction if tree removal/damage to occur.	unknown
7	Turtle Wintering Area	- Areas with permanent water deep enough not to freeze, with mud/soft substrates	- 5 over-wintering Midland Painted Turtles, 1 or more Northern Map Turtle or Snapping Turtle confirms SWH	Mapped ELC ecosite, or deep pool element where turtles overwinter is the SWH	5 Candidate ponds identified in study area.	Yes	Basking surveys complete	Yes
8	Reptile Hibernaculum	- Sites below the frost line; rock barren, crevice and cave, talus, alvar, rock piles, slopes, stone fences and crumbling foundations	- Presence of hibernacula with minimum 5 individuals of 1 snake species/ individuals of 2 or more species confirms SWH - Congregations of a minimum of 5 snakes of 1 species/ individuals of 2 or more snake species, near potential hibernacula on sunny warm days in spring and fall confirms SWH	Feature hibernacula is located in, and 30m radius is the SWH	2 candidate hibernacula features identified in study are (rock piles in meadow openings-unknown depth)	yes	Snake basking transect surveys complete	No

#	SIGNIFICANT WILDLIFE HABITAT (SWH)	CANDIDATE SWH CRITERIA	CRITERIA FOR SWH CONFIRMATION	SWH PROTECTED AREA	SITE ASSESSMENT DETAILS	CANDIDATE SWH	FIELD STUDIES REQUIRED/ COMPLETED	CONFIRMED SWH
9	Colonially-nesting Bird Habitat (cliff/bank)	- Eroding banks, sandy hills, borrow pits, steep slopes, sand piles, cliff faces, bridge abutments, silos, barns	- 1 or more nest sites with 8 or more Cliff Swallow or, 50 Bank Swallow and Rough-winged Swallow pairs during the breeding season.	Colony and 50m radius around peripheral nest is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No
10	Colonially-nesting Bird Habitat (Tree/shrub)	- Live or dead standing trees in wetlands, lakes, islands and peninsulas, occasionally shrubby and emergent vegetation	- 5 or more active Great-blue Heron or other listed species nests	Edge of the colony plus minimum 300m radius, or extent of the forest ecosite, or entire island <15ha is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No
11	Colonially-nesting Bird Habitat (Ground)	- Rocky islands or peninsulas within a lake or large river(natural or artificial)	- >25 active nests of Herring Gull, Ring-billed Gull, >5 active nests of Common Tern, or >2 active nests of Caspian Tern. 5 or more pairs of Brewer's Blackbird. Any active nesting colony of Little Gull, Great Black-backed Gull.	Edge of colony plus min 150m radius or extent of ELC ecosite, or island <3ha is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No
12	Migratory Butterfly Stopover Area	- At least 10ha, with undisturbed field/meadow and forest or woodland edge habitat present, within 5km of Lake Ontario.	- Presence of Monarch use days >5000 or >3000 where there is a mix of Monarch with Painted Ladies or White Admirals	Field/meadow and forest/woodland is the SWH	No Habitat matching Criteria identified in Study Area, >5km from any Great Lake	No	Fall migration survey completed.	No
13	Land bird Migratory Stopover Area	- Woodlots >5ha in size - within 5km of lake Ontario	- Use by >200 birds/day, with >35species, with at least 10sp recorded on 5 different survey dates.	Woodlot is the SWH	No Habitat matching Criteria identified in Study Area, >5km from any Great Lake	No	Fall migration survey completed.	No
14	Deer Yarding Areas	- ELC communities providing Thermal cover (FOM,FOC,SWM,SWC, CUP2, CUP3, FOD3, CUT)	- Deer yards are managed by MNRF, available through district offices and LIO.	LIO mapping	No Deer yarding areas identified on LIO Mapping	No	None required.	No
15	Deer Winter Congregation Areas	- All forested ecosites >100ha - Conifer Plantations <50ha may be used	- Deer management is the responsibility of the MNRF - Contact MNRF or LIO for known deer winter areas.	LIO mapping	No Deer Winter Congregation areas identified on LIO Mapping	No	None required.	No
RARE VEGETATION COMMUNITIES								
16	Cliffs & Talus Slopes	- Cliff: vertical to near vertical bedrock >3m in height - Talus slope: rock rubble at the base of a cliff made up of coarse rocky debris	- Confirm any ELC Vegetation Type for Cliffs or Talus Slopes	Area of ELC sites: TAO, TAS, TAT, CLO, CLS, CLT	No Habitat matching Criteria identified in Study Area	No	None required	No
17	Sand Barren	- Exposed, sparsely vegetated & caused by lack of moisture, fires and erosion.	- area >0.5ha in size - Confirm any ELC vegetation Type for Sand Barren - Not dominated by exotic or introduced species	Area of ELC ecosite is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No

#	SIGNIFICANT WILDLIFE HABITAT (SWH)	CANDIDATE SWH CRITERIA	CRITERIA FOR SWH CONFIRMATION	SWH PROTECTED AREA	SITE ASSESSMENT DETAILS	CANDIDATE SWH	FIELD STUDIES REQUIRED/ COMPLETED	CONFIRMED SWH
18	Alvar	- Level, mostly un-fractured calcareous bedrock feature, overlain by a thin veneer or soil	- area >0.5ha in size - Field Studies that identify four of the five Alvar Indicator Species - Not dominated by exotic or introduced species	Area of ELC ecosite is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No
19	Old Growth Forest	- >30ha forests with at least 10ha interior habitat and multi-layered canopy	- Dominant Tree Species >140 years old - No recognizable signs forestry practices (old stumps)	Area of ELC ecosite is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No
20	Savannah	- Tall Grass Prairie Habitat with 25%-60% Tree cover - Remnant sites such as Railway Right of ways are not SWH	- No minimum size, and must be restored to a natural state. - Confirm one or more savannah indicator species - Not dominated by exotic or introduced species	Area of ELC ecosite is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No
21	Tallgrass Prairie	- Ground cover dominated by prairie grasses with <25% tree cover - Remnant sites such as Railway Right of ways are not SWH	- No minimum size, and must be restored to a natural state. - Confirm one or more prairie indicator species - Not dominated by exotic or introduced species	Area of ELC ecosite is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No
22	Other Rare Vegetation Communities	- All Provincially Rare S1, S2, S3 Vegetation Communities (Appendix M of SWHTG)	- Field Studies Confirming ELC vegetation type is a rare vegetation community	Area of ELC ecosite is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No
SPECIALIZED HABITAT FOR WILDLIFE								
23	Waterfowl Nesting Areas	- Upland Habitat, adjacent to Wetland ELC ecosites (except SWC, SWM) - Extends 120m from a wetland (>0.5ha) and any small wetlands (<0.5ha) within a cluster of at least 3 - Upland area at least 120m wide	- Presence of 3 or more nesting pairs of listed species excluding Mallards - Presence of 10 or more nesting pairs including mallards - Any active Black Duck nesting site	SWH may be greater than or less than 120m from the wetland edge and must provide enough habitat for waterfowl to successfully nest	Treed communities adjacent all wetlands/ponds, may provide nesting habitat	Yes	Breeding bird surveys completed	No
24	Bald Eagle or Osprey Nesting, Foraging and Perching Habitat	- Forest communities, adjacent to riparian areas - Osprey nests usually at top of tree - Bald Eagle nest usually in super canopy tree in a notch within canopy	- Studies confirm one or more active Bald Eagle or Osprey nest - Alternate nests included in SWH - Nests must be used annually, if found inactive, must be known inactive at least 3 years, or suspected unused for 5 years if unknown	Active nest plus 300m for Osprey Active nest plus 400-800m for Bald Eagle	Forested Habitat adjacent Hillsburgh pond may provide nesting opportunities for Osprey	Yes	Breeding Bird Surveys completed	No

#	SIGNIFICANT WILDLIFE HABITAT (SWH)	CANDIDATE SWH CRITERIA	CRITERIA FOR SWH CONFIRMATION	SWH PROTECTED AREA	SITE ASSESSMENT DETAILS	CANDIDATE SWH	FIELD STUDIES REQUIRED/ COMPLETED	CONFIRMED SWH
25	Woodland Raptor Nesting Habitat	- Forested communities, forested swamp communities and cultural Plantations - Natural Forested/conifer plantations >30ha with >10ha interior habitat (200m buffer)	- One or more active nest of listed species	Nest protection radius: - Red-Shouldered Hawk, Northern Goshawk 400m - Barred Owl 200m - Broad-winged Hawk, Coopers Hawk 100m - Sharp-shinned Hawk 50	Forested habitat may provide opportunities for woodland raptor nesting	Yes	No stick nests observed during SWH or Winter Wildlife Surveys	No
26	Turtle Nesting Areas	- Exposed Mineral soil (sand or gravel) adjacent (<100m) or within shallow marsh, shallow submerged, shallow floating, bog or fen communities - Located in open sunny areas, away from roads and less prone to predation - Municipal and provincial road shoulders are not SWH.	- Confirm 5 or more nesting Midland Painted Turtles, 1 or more nesting Northern Map Turtle or Snapping Turtle	Area or sites with exposed mineral soils, plus a radius of 30-100m around the nesting area is the SWH.	No Habitat matching Criteria identified in Study Area	No	None required	No
27	Seeps and Springs	- Areas where ground water comes to the surface - Any forested area within the headwaters of a stream or river system	- Confirm site with 2 or more seeps/springs. -	Area of ELC forest ecosite containing seep/spring is the SWH	Seeps and springs possible within forested and wetland communities	Yes	ELC complete	No seeps or springs identified
28	Amphibian Breeding Habitat (woodland)	- Breeding pools within woodlands - Wetland, pond or pool >500m^2 within or adjacent (<120m) to a woodland. - Woodlands with permanent ponds, or those with water until mid-July more likely to be used.	- Confirm Breeding population of 1 or more listed newt/salamander species, 2 or more of the listed frog species with at least 20 individuals (adults or egg masses), 2 or more of the listed frog species with call code levels of 3. - Wetland adjacent to woodlands includes travel corridor connecting features as SWH.	Wetland area, plus 230m radius of woodland is the SWH.	Candidate habitat throughout study area, shallow ponds, woodland pools, marshes	yes	Amphibian Surveys complete	None confirmed as significant
29	Amphibian Breeding Habitat (Wetland)	- Swamp, marsh, fen, bog, open aquatic and shallow aquatic ELC communities. - Typically isolated from woodlands (>120m), but includes larger wetlands with primarily aquatic species (bull frogs) that are adjacent to woodlands. - Wetlands >500m2 - Presence of shrubs & logs - Bullfrogs require permanent water bodies and abundant emergent vegetation.	- Confirm Breeding populations of 1 or more listed newt/salamander species, or 2 or more listed frog/toad species with at least 20 individuals (adults or egg masses), or 2 or more listed frog/toad species with a call code level of 3 - Or any wetland with confirmed breeding Bullfrog.	ELC ecosite and shoreline is the SWH Movement corridors (SWH) must be considered if this habitat is significant	No wetlands >120m from woodland habitat	No	Amphibian surveys complete	No

#	SIGNIFICANT WILDLIFE HABITAT (SWH)	CANDIDATE SWH CRITERIA	CRITERIA FOR SWH CONFIRMATION	SWH PROTECTED AREA	SITE ASSESSMENT DETAILS	CANDIDATE SWH	FIELD STUDIES REQUIRED/ COMPLETED	CONFIRMED SWH
30	Area-sensitive Breeding Bird Habitat	- Habitats where interior breeding birds are breeding - Large mature(>60 years) forest stands or woodlots >30ha - Forest and swamp ELC communities - Interior habitat at least 200m from edge	- Presence of nesting or breeding pairs of 3 or more of the listed species - Any site with Cerulean Warbler or Canada Warbler is SWH -	ELC ecosite is the SWH	No interior habitat identified in study area	no	None required	No
HABITATS OF SPECIES OF CONSERVATION CONCERN CONSIDERED SWH								
31	Marsh Bird Breeding Habitat	- Some meadow marsh, shallows submerged, shallow floating, mixed shallow floating, fen and bog communities (see SWH Ecoregion guide for specifics) - Nesting occurs in wetlands, all wetland habitat is considered with presence of shallow water with emergent aquatic vegetation - Green heron at edge of water sheltered by shrubs and trees.	- 5 or more nesting pairs of Sedge Wren or Marsh Wren, 1 pair of Sandhill Crane, or breeding by any combination of 5 or more of the listed species - Any Wetland with 1 or more breeding pair Black Tern, Trumpeter Swan, Green Heron or Yellow Rail	ELC ecosite is the SWH	Candidate habitat identified in study area.	Yes	Marsh Breeding Bird Surveys complete	No
32	Open Country Bird Breeding Habitat	- Grassland area >30ha (natural & cultural fields and meadows) - Grasslands not class 1 or 2 agriculture (no row crops or intensive hay or livestock pasturing) - Mature hayfields or pasture at least 5 years old	- Nesting or breeding of 2 or more of the listed species - Field with 1 or more Short-eared Owls	Contiguous ELC ecosite is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No
33	Shrub/Early Successional Bird Breeding Habitat	- Cultural thickets, savannah and woodland habitat - Large field area succeeding to shrub and thicket habitat >10ha in size - Patches of shrub ecosite may be complexed into larger old field ecosites for some species	- Confirm nesting or breeding of 1 of the listed indicator species and at least 2 of the common species - Habitat with Yellow-breasted Chat Or Golden-winged Warbler is SWH	SWH is contiguous ELC ecosite field/thicket area	No Habitat matching Criteria identified in Study Area	No	None required	No

#	SIGNIFICANT WILDLIFE HABITAT (SWH)	CANDIDATE SWH CRITERIA	CRITERIA FOR SWH CONFIRMATION	SWH PROTECTED AREA	SITE ASSESSMENT DETAILS	CANDIDATE SWH	FIELD STUDIES REQUIRED/ COMPLETED	CONFIRMED SWH
34	Terrestrial Crayfish	- Meadow marsh, shallow marsh, swamp thicket, deciduous swamp and mixed swamp communities - Cultural meadow with inclusions of meadow marsh may be used - Wet edges of marshes and wet meadows should be surveyed for crayfish	- Presence of 1 or more individuals of listed species or their chimneys in suitable habitat	Area of ELC ecosite or Eco element area of meadow marsh or swamp within the larger ecosite area is the SWH	Candidate habitat identified in study area.	Yes	Incidental during ELC	No
35	Special Concern & Rare Wildlife Species	- All Special concern and Provincially Rare plant and animal species - Where an element occurrence is identified within a 1 or 10km grid for a species listed, linking candidate habitat on the site must be completed to ELC ecosites	- Assessment/inventory of site for identified special concern or rare species completed during time of year when species is present or easily identifiable - Habitat must be easily mapped and cover an important life stage component (specific nesting habitat, foraging)	SWH is the finest ELC scale that protects the form and function of the habitat	NHIC identified Carey's Sedge (*Carex careyana* S2) and Rugulose Grapefern (*Sceptridium rugulosum* S2) as occurring in the 1km square containing the study area.Hsbitat occurs in study area	Yes	Three season Botanical Survey	No
ANIMAL MOVEMENT CORRIDORS								
36	Amphibian Movement Corridor	- Corridors may occur in all ecosites associated with water - Presence of significant amphibian breeding indicates the requirement for identifying corridors - Movement corridors between breeding habitat and summer habitat	- Corridors typically include areas with native vegetation, with several layers of vegetation, unbroken by roads, waterways or waterbodies are most significant - At least 15 of vegetation on both sides of the waterway or up to 200m wide of woodland habitat with gaps of <20m - Shorter corridors are more significant than longer, but amphibians must be able to get to and from their summer breeding habitat	Corridor is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No
37	Deer Movement Corridor	- May occur in all forested ecosites - Determined when deer wintering habitat is confirmed as SWH	- Corridors at least 200m wide with gaps <20m leading to wintering habitat - Unbroken by roads and residential areas - Shorter corridors are more significant	Corridor is the SWH	No Habitat matching Criteria identified in Study Area	No	None required	No

COMMON NAME	SCIENTIFIC NAME	SARO	COSEWIC	SARA	S-RANK	BACKGROUND SOURCE	HABITAT REQUIREMENTS	SUITABLE HABITAT IN STUDY AREA	OBSERVED BY A & A
BUTTERFLIES									
Monarch	*Danaus plexippus*	SC	SC	SC	S2N,S4B	OBAO (2012)	Primarily found where milkweed and wildflowers exist; including abandoned farmland, along roadsides, and other open spaces (MNRF 2015).	Yes, large area of abundant milkweed occurs in the MEMM3 community	None observed during any surveys
West Virginia White	*Pieris virginiensis*	SC			S3	MNRF (Wellington list)	Generally prefer moist, deciduous woodlands. The larvae feed primarily on the leaves of the two-leaved toothwort (Cardamine diphylla), which is a small, spring-blooming plant of the forest floor (MNRF 2015).	Yes, host plant occurs in study area, in very small numbers in the SWMCM1-2 and SWMO1-1 communities	None observed during spring vegetation surveys
BIRDS									
Bald Eagle	*Haliaeetus leucocephalus*	SC	NAR		S2N,S4B	CVC (2013)[1]	Prefer deciduous and mixed-deciduous forest habitat close to large water bodies, including lakes and rivers; Nests in super canopy trees including Pine (MNRF 2015).	No, trees of sufficient size and species do not occur in study area. No suitably sized rivers or lakes in study area.	Observed during Winter Wildlife Survey
Bank Swallow	*Riparia riparia*	THR	THR		S4B	OBBA (2005)	Nesting occurs in a variety of natural and anthropogenic vertical banks, which often erode and change over time, including aggregate pits and the shores of large lakes and rivers	No, banks or aggregate pits of sufficient size, depth or texture, were not observed in the study area.	None observed during Breeding Bird season or incidentally
Barn Swallow	*Hirundo rustica*	THR	THR		S4B	OBBA (2005)	Farmland; lake/river shorelines; wooded clearings; urban populated areas; rocky cliffs; and wetlands. Nest inside or outside buildings; under bridges and in road culverts; on rock faces and in caves (MNRF 2015).	Yes, Bridges and dams in study area may provide suitable nesting habitat.	None observed during Breeding Bird season or incidentally
Bobolink	*Dolichonyx oryzivorus*	THR	THR		S4B	OBBA (2005)	Prefers open grasslands and hay fields. In migration and in winter uses freshwater marshes and grasslands (MNRF 2015).	No habitat of sufficient size or species composition occurs in the study area, habitat occurs outside the study area in agricultural fields	One male observed incidentally, not singing, flushed from MEMM3 community
Canada Warbler	*Wilsonia canadensis*	SC	THR	THR	S4B	OBBA (2005)	Prefers wet coniferous, deciduous and mixed forest types, with a dense shrub layer. Nests on the ground, on logs or hummocks, and uses dense shrub layer to conceal the nest (MNRF 2015).	Possible, areas of wet mixed coniferous occur throughout study area (SWCM3-2, SWCM1-2), no site access provided to suitable communities for further habitat suitability examination.	None observed during Breeding Bird season or incidentally
Canvasback	*Aythya valisineria*				S1B,S4N	CVC (2013)[1]	Canvasbacks are not known to breed in Ontario, occurring during spring and fall migration (MNRF 2015).	None	None observed incidentally

COMMON NAME	SCIENTIFIC NAME	SARO	COSEWIC	SARA	S-RANK	BACKGROUND SOURCE	HABITAT REQUIREMENTS	SUITABLE HABITAT IN STUDY AREA	OBSERVED BY A & A
Eastern Meadowlark	*Sturnella magna*	THR	THR		S4B	MNRF (Wellington List)	Generally prefers grassy pastures, meadows and hay fields. Nests are always on the ground and usually hidden in or under grass clumps (MNRF 2015).	No habitat of sufficient size or species composition occurs in the study area, habitat occurs outside the study area in agricultural fields	Observed singing outside study area during breeding bird surveys
Eastern Wood-pewee	*Contopus virens*	SC	SC		S4B	OBBA (2005)	Associated with deciduous and mixed forests. Within mature and intermediate age stands, prefers areas with little understory vegetation as well as forest clearings and edges (MNRF 2015).	Yes, Deciduous forest communities (FODM5-8) within study area provide breeding habitat for Eastern wood-pewee	Yes, at least two territories observed during Breeding Bird Surveys
Grasshopper Sparrow	*Ammodramus savannarum*		SC		S4B	OBBA (2005)	Prefers moderately open grasslands and prairies with patchy bare ground; avoids grasslands with extensive shrub cover (MNRF 2015).	No, grassland habitat in the study area has a high thatch cover, and abundant woody shrubs and forb cover.	None observed during Breeding Bird season or incidentally
Great Egret	*Ardea alba*				S2B	CVC (2013)[1]	Nests in woody vegetation, shrubs and trees; over water or on islands. Colony nester often mixed species aggregations, in lakes, ponds, marshes and estuaries (MNRF 2015).	Habitat observed is of insufficient size and low quality, no stick nests of wading birds observed in study area.	Observed incidentally during spring and fall migration period
Long-tailed Duck	*Clangula hyemalis*				S3B	CVC (2013)[1]	Breeds in subarctic and arctic wetlands. Nests adjacent to freshwater. Winters in coastal marine water and large freshwater lakes (MNRF 2015).	None	None observed incidentally
Wood Thrush	*Hylocichla mustelina*	SC	THR		S4B	OBBA (2005)	Nests in second-growth and mature deciduous and mixed forests, with saplings and well-developed understory layers. Prefers large forest mosaics, occasionally nests in small forest fragments (MNRF 2015).	Habitat observed is of insufficient size and low quality, with very low shrub cover	None observed during Breeding Bird season or incidentally
FISH									
Black Redhorse	*Moxostoma duquesnei*	THR	THR		S2	MNRF (Wellington List)	Generally lives in moderately sized rivers and streams, with generally moderate to fast currents (MNRF 2015).	No probable habitat in the study area, not known to occur in the Credit River.	None observed within the Study Area or identified through background review.
Redside Dace	*Clinostomus elongatus*	END	END		S2	MNRF (Wellington List)	Generally found in pools and slow-moving areas of small headwater streams with a moderate to high gradients (MNRF 2015).	Possible habitat in shaded areas of streams throughout study area.	None observed within the Study Area or identified through background review.

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Silver Shiner	*Notropis photogenis*	THR	TH	SC	S2S3	MNRF (Wellington List)	Generally prefer moderate to large, deep, relatively clear streams with swift currents, and moderate to high gradients (MNRF 2015).	No probable habitat in the study area, not known to occur in the Credit River.	None observed within the Study Area or identified through background review.
MAMMALS									
Eastern Small-footed Myotis	*Myotis leibii*	END	END	END		MNRF (Wellington list)	Overwinter in caves and mines that remain above 0 Maternity Roost primarily under loose rocks on exposed rock outcrops, crevices and cliffs, and occasionally in buildings, under bridges and highway overpasses and under tree bark (MNRF 2015).	Possible habitat in study area, FODM5-8 and FODM6 communities includes trees of sufficient size	None observed, no studies completed
Little Brown Myotis	*Myotis lucifugus*	END	END	END	S4	OMA (1994)	Overwinter in caves and mines that remain above 0 Maternal Roosts Often associated with buildings (attics, barns etc.). Occasionally found in trees (25-44 cm dbh) (MNRF 2015).	Possible habitat in study area, FODM5-8 and FODM6 communities includes trees of sufficient size	bats observed flying towards pond during evening bat banding observation conducted by MNRF
Northern Myotis	*Myotis septentrionalis*	END	END	END		MNRF (Wellington list)	Overwinter in caves and mines that remain above 0 Maternal Roosts: Often associated with cavities of large diameter trees (25-44 cm dbh). Occasionally found in structures (attics, barns etc.) (MNRF 2015).	Possible habitat in study area, FODM5-8 and FODM6 communities includes trees of sufficient size	None observed, no studies completed
MUSSELS									
Rainbow Mussel	*Villosa iris*	THR	END	END	S2S3	MNRF (Wellington List)	Abundant in shallow, well- oxygenated reaches of small- to medium-sized rivers and sometimes lakes, on substrates of cobble, gravel, sand and occasionally mud (MNRF 2015).	Possible habitat within streams throughout study area. Not known to occur in the Credit River Watershed.	None observed within the Study Area or identified through background review.
Wavy-rayed lampmussel	*Lampsilis fasciola*	THR	SC	SC	S1	MNRF (Wellington List)	Generally inhabit clear rivers and streams of a variety of sizes, where the water flow is steady and the substrate is stable (MNRF 2015).	Possible habitat within streams throughout study area. Not known to occur in the Credit River Watershed.	None observed within the Study Area or identified through background review.

COMMON NAME	SCIENTIFIC NAME	SARO	COSEWIC	SARA	S-RANK	BACKGROUND SOURCE	HABITAT REQUIREMENTS	SUITABLE HABITAT IN STUDY AREA	OBSERVED BY A & A
REPTILES									
Snapping Turtle	*Chelydra serpentina*	SC	SC	SC	S3	ORAA (2014)	Generally found in shallow waters with soft mud and leaf litter. Nesting occurs on gravely or sandy areas along streams. Snapping Turtles often use man-made structures for nest sites, including roads (especially gravel shoulders), dams and aggregate pits (MNRF 2015).	All ponds in study area provide ideal habitat for snapping turtle, including MASO1-1, SAS1, and SAM1-8 communities	Yes, observed during turtle surveys, and incidentally.
Blanding's Turtle	*Emydonidea blandingii*	THR	THR	THR	S3	MNRF (Wellington List)	Found in freshwater lakes, permanent or temporary pools, slow-flowing streams, marshes and swamps. Preference for shallow water that is rich in nutrients, organic soil and dense vegetation (MNRF 2015).	Ponds, wetlands and streams in study area may provide habitat for Blanding's turtle.	None observed within study area during turtle surveys or incidentally.
Milksnake	*Lampropeltis triangulum*	SC	SC	SC	S3	MNRF (Wellington List)	Found in rural areas, frequently reported in and around buildings, especially old structures. Proximity to water, basking and nesting sites, and overwintering habitat is required (MNRF 2015).	May occur along farm field edges, and near older buildings in study area. Building foundations may provide overwintering habitat.	None observed within study area during snake surveys or incidentally.
Eastern Ribbonsnake	*Thamnophis sauritus*	SC	SC	SC	S3	MNRF (Wellington List)	Found along the edges of shallow ponds, streams, marshes, swamps, or bogs bordered by dense vegetation that provides cover (MNRF 2015).	Meadow marshes, and edges of ponds and streams may provide habitat,	None observed within study area during snake surveys or incidentally.
VASCULAR PLANTS									
American Chestnut	*Castanea dentata*	END	END	END	S2	MNRF (Wellington List)	Deciduous forest communities; this tree prefers arid forests with acid and sandy soils (MNRF 2015).	Deciduous forests of FODM5-8 and FOCM6 provide potential habitat for American Chestnut.	None observed during Botanical Survey.
American Ginseng	*Panax quinquefolius*	END	END	END	S2	MNRF (Wellington List)	Rich, moist, undisturbed and relatively mature deciduous woods in areas of neutral soil (such as over limestone or marble bedrock) (MNRF 2015).	Deciduous forests of FODM5-8 provide potential habitat for American Ginseng.	None observed during Botanical Survey.
Butternut	*Juglans cinerea*	END	END	END	S3?	MNRF (Wellington List)	Rich, moist, and well-drained soils often found along streams. May also occur on well-drained gravel sites, especially those made up of limestone. Seldom found on dry, rocky and sterile soils. In Ontario, the Butternut generally grows alone or in small groups in deciduous forests as well as in hedgerows (MNRF 2015).	Habitat present along mineral soil edge of stream communities SWMO3-3 and FODM7-7, as well as within communities SWDM2-1 and FODM8-1.	None observed during Botanical Survey.

COMMON NAME	SCIENTIFIC NAME	SARO	COSEWIC	SARA	S-RANK	BACKGROUND SOURCE	HABITAT REQUIREMENTS	SUITABLE HABITAT IN STUDY AREA	OBSERVED BY A & A
Hill's Pondweed	*Potamogeton hillii*	SC	SC		S2	MNRF (Wellington List)	Generally grows in clear, cold ponds and slow- moving streams where the water is alkaline (MNRF 2015).	All ponds in study area provide possible habitat, including SAS1, and SAM1-8, although temperature are likely too warm.	None observed during Botanical Survey.
Carey's Sedge	*Carex careyana*				S2	NHIC	Grows in dry to moist rich deciduous upland forests (NatureServe 2015).	Deciduous forests of FODM5-8 and FOCM6 provide potential habitat.	None observed during Botanical Survey.
Rugulose Grapefern	*Sceptridium rugulosum*				S2	NHIC	Grows in sandy to silty soil in open fields, young successional forests or at the edge of forests (Wagner and Wagner 1982).	The edge of deciduous forests of FODM5-8 and FOCM6 provide potential habitat.	None observed during Botanical Survey.

1-observed outside the breeding season

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SEGMENT 1		DESCRIPTION
Fish Community Classification[1]:	Cold Water	The stream reach runs through a White Cedar Conifer Mineral Coniferous Swamp and has a natural meander pattern with areas of flat water, gentle runs, and small riffles. The substrate is mostly sand with a lesser component of fines and small amounts of gravel, cobble, and boulders. The instream cover consists of aquatic vegetation and woody debris, but is predominantly open. The stream bank is mostly stable and vegetated, with some minor areas of undercut bank or bare soil. Small fish of approximately 7cm were seen within this stream segment on two occasions, species unknown. Minor log jams were observed.
Mean Channel Width[2] (m):	2m	
Mean Channel Depth[3] (m):	0.7m	
Mean Water Depth[4] (m):	0.4m	FISH SPECIES
Stream Shading %:	90%	Brook Trout, Central Mudminnow, White Sucker, Creek Chub, Brook Stickleback, Mottled Sculpin, Slimy Sculpin,

SEGMENT 2		DESCRIPTION
Fish Community Classification[1]:	Cold Water	The stream reach runs through a Mixed Willow Organic Thicket Swamp Type in a braided flow pattern, with a poorly defined channel throughout much of the segment length. The substrate is mostly fines (silt and organic) with minor components of sand, gravel, cobble and boulders. The flow pattern is flat with areas of deeper pools. In stream cover is high, consisting of emergent vegetation, submergent vegetation, woody debris and algae. There are minor areas of channel hardening at the outflow into the Hillsburgh Pond. There are also potential barriers to fish passage at the outflow into the Hillsburgh Pond. Barriers consist of a presumed fish gate that is likely intended to keep common carp out of the upstream reach, log jams and poor culvert design could also make passage difficult for non-jumping fish.
Mean Channel Width[2] (m):	Variable	
Mean Channel Depth[3] (m):	Variable	
Mean Water Depth[4] (m):	0.5m	FISH SPECIES
Stream Shading %:	60%	Cyprinid sp., Rock Bass, Large Mouth Bass, Brook Trout, Slimy Sculpin, Central Mudminnow, White Sucker, Creek Chub, Brook Stickleback, Bluntnose Minnow, Pumpkinseed, Round Goby,

SEGMENT 3		DESCRIPTION
Fish Community Classification[1]:	Warm Water	This segment is the open water community of the Hillsburgh Pond. The Pond is fed by two upstream tributaries and flows out at the Hillsburgh dam, under the Station Street bridge. The substrate composition of the pond is unknown. A variety of emergent, submergent and floating plants are present within the segment, particularly around the edges of the pond.
Mean Channel Width[2] (m):	Open Water	
Mean Channel Depth[3] (m):	Unknown	
Mean Water Depth[4] (m):	Unknown	FISH SPECIES
Stream Shading %:	5%	Rock Bass, Large Mouth Bass, Bluntnose Minnow, Pumpkinseed, Round Goby.

SEGMENT 4		DESCRIPTION
Fish Community Classification[1]:	Cold Water	Segment 4 runs through a Fresh-Moist Manitoba Maple Lowland Deciduous Forest, within the Downtown area of Hillsburgh. The flow pattern within the segment is mostly flat, with areas of pools riffles and runs. The channel has a gentle meander with some channelization and channel hardening. The substrate is a mixture of primarily sand, cobble and boulders, with a lesser component of fines and gravel, and may provide trout spawning habitat. In stream cover consists of 20% woody debris 10% aquatic vegetation and 70% open. The bank is mostly stable and vegetated, with some areas of erosion evident. A single 8cm fish of unknown species was observed in the segment. There are numerous culverts and stream crossings within the segment, but none appear to be barriers to fish passage. CVC has confirmed spawning Brook Trout within this segment
Mean Channel Width[2] (m):	2.5m	
Mean Channel Depth[3] (m):	0.75m	
Mean Water Depth[4] (m):	0.4m	FISH SPECIES
Stream Shading %:	80%	Brook Trout, Brown Trout, Creek Chub, White Sucker, Eastern Blacknose Dace, Bluntnose Minnow, Brook Stickleback, Central Mudminnow, Longnose Dace, Rock Bass, Round Goby.

SEGMENT 5		DESCRIPTION
Fish Community Classification[1]:	Warm Water	This is a small segment between the Hillsburgh Pond and the Ainsworth Pond, including the Station Street bridge and outflow structure from the Hillsburgh Pond. The segment is 30% channelized with a concrete wall and a sloped concrete pad as substrate. The flow pattern in the segment consists of a 1m fall from the Hillsburgh Pond and two smaller 0.3m falls, as well as a series of riffles and runs. The substrate is primarily the concrete slab, as well as gravel, cobble and boulder further downstream. MNRF records have recorded trout spawning redds and spawning Brown Trout within this location. The outflow structure from the Hillsburgh Pond creates a barrier to fish passage.
Mean Channel Width[2] (m):	3.5m	
Mean Channel Depth[3] (m):	0.45m	
Mean Water Depth[4] (m):	0.4m	FISH SPECIES
Stream Shading %:	65%	Bluntnose Minnow, Brook Trout, Creek Chub, Eastern Blacknose Dace, Golden Shiner, Largemouth Bass, Pumpkinseed, Rock Bass, Round Goby.

SEGMENT 6		DESCRIPTION
Fish Community Classification[1]:	Warm Water	This segment is the shallow open water community of the Ainsworth Pond. The substrate of the community is unknown; aquatic cover includes emergent vegetation, floating vegetation, submergent vegetation and woody debris. The banks around the pond appear stable.
Mean Channel Width[2] (m):	Open Water	
Mean Channel Depth[3] (m):	Unknown	
Mean Water Depth[4] (m):	Unknown	FISH SPECIES
Stream Shading %:	15%	Bluntnose Minnow, Brook Trout, Creek Chub, Eastern Blacknose Dace, Largemouth Bass, Rock Bass, White Sucker.

SEGMENT 7		DESCRIPTION
Fish Community Classification[1]:	Cold Water	This segment consists of the two outflows from the Ainsworth Pond, which reconnect in the downstream portion of the segment. The main outfall from the pond consists of a series of two 0.6m fall and represents a complete barrier to fish passage. The second outfall appears to be temporary in nature and is constructed or reinforced by sandbags and plastic lining. This outfall consists of a series of smaller drops of 0.2m or less and may be passable by jumping fish under certain water levels. The flow pattern below the outfalls consist of pools, riffles and runs and the channel morphology is a gentle meander with straight sections. Substrate is a mixture of sand, gravel, cobble and boulders and may represent possible spawning habitat for trout.
Mean Channel Width[2] (m):	2.5m	
Mean Channel Depth[3] (m):	0.5m	
Mean Water Depth[4] (m):	0.35m	FISH SPECIES
Stream Shading %:	65%	Banded Killifish, Brook Trout, Common Shiner, Creek Chub, Central Mudminnow, Eastern Blacknose Dace, Golden Shiner, Largemouth Bass, Pumpkinseed, Rock Bass, Round Goby, White Sucker.

SEGMENT 8		DESCRIPTION
Fish Community Classification[1]:	Cold Water	This segment runs along the edge of a Tamarack White Cedar Treed Fen. The segment has a gentle meander with minor amounts of in-stream cover consisting of emergent plants, submergent plants and woody debris. Substrate is a mixture of sand, gravel, cobble and boulders and may represent possible spawning habitat for trout.
Mean Channel Width[2] (m):	2m	
Mean Channel Depth[3] (m):	0.5m	
Mean Water Depth[4] (m):	0.3m	FISH SPECIES
Stream Shading %:	40%	Bluntnose Minnow, Brook Trout, Central Mudminnow, Common Shiner, Creek Chub, Eastern Blacknose Dace, Golden Shiner, Largemouth Bass, Pumpkinseed, Rock Bass, Round Goby, White Sucker.

SEGMENT 9		DESCRIPTION
Fish Community Classification[1]:	Cold Water	This segment is a wide stream section leading to the Rudd Pond. The channel morphology is meandering with a flow pattern of riffles and runs upstream, and flat in the downstream portion. There is a high coverage of submergent vegetation consisting of watercress and *Vallisneria americana*. Substrate is a mixture of sand, gravel, cobble and boulders in the upstream portion, transitioning to mostly sand and fines in the downstream portion.
Mean Channel Width[2] (m):	4m	
Mean Channel Depth[3] (m):	0.7m	
Mean Water Depth[4] (m):	0.5m	FISH SPECIES
Stream Shading %:	60%	Central Mudminnow, Common Shiner, Creek Chub, Rock Bass.

SEGMENT 10		DESCRIPTION
Fish Community Classification[1]:	Cold Water	This segment is the shallow open water community of the Rudd Pond. Substrate of the community is unknown; aquatic cover includes emergent vegetation, floating vegetation, submergent vegetation and woody debris. The banks around the pond appear stable.
Mean Channel Width[2] (m):	Open Water	
Mean Channel Depth[3] (m):	Unknown	
Mean Water Depth[4] (m):	Unknown	FISH SPECIES
Stream Shading %:	5%	Bluntnose Minnow, Largemouth Bass, Pumpkinseed, Rock Bass, White Sucker.

SEGMENT 11		DESCRIPTION
Fish Community Classification[1]:	Cold Water	This segment consists of the outflows from the Rudd Pond, and the downstream watercourse to Wellington Rd. 22. The outfall from the pond consists of a series of two 0.30m falls and a sloped section of concrete slab. This outfall likely represents a complete barrier to fish passage, although jumping fish may be able to pass under certain water level. The flow pattern below the outfalls consists of pools, riffles and runs and the channel morphology is a gentle meander with straight sections. Substrate is a mixture of sand, gravel, cobble and boulders and may represent possible spawning habitat for trout.
Mean Channel Width[2] (m):	2.5m	
Mean Channel Depth[3] (m):	0.8m	
Mean Water Depth[4] (m):	0.4m	FISH SPECIES
Stream Shading %:	85%	Bluntnose Minnow, Brook Trout, Common Shiner, Eastern Blacknose Dace, Golden Shiner, Largemouth Bass, Pumpkinseed, Rock Bass, White Sucker.

SEGMENT 12		DESCRIPTION
Fish Community Classification[1]:	Cold Water	This segment is primarily outside the study area, upstream on the southwest tributary. The section of the watercourse is ephemeral, drying during periods of the summer. The channel morphology is straight with stable vegetated banks.
Mean Channel Width[2] (m):	1.5m	
Mean Channel Depth[3] (m):	0.25m	
Mean Water Depth[4] (m):	Dry	FISH SPECIES
Stream Shading %:	75%	- No Records

SEGMENT 13		DESCRIPTION
Fish Community Classification[1]:	Cold Water	This segment is outside the study area, upstream on the northeast tributary. The section is mostly within a large forested area. The substrate is a mixture of fines, sand, and gravel with minor components of cobble and boulder and may represent possible spawning habitat for trout.
Mean Channel Width[2] (m):	2.5m	
Mean Channel Depth[3] (m):	0.75m	
Mean Water Depth[4] (m):	0.45m	FISH SPECIES
Stream Shading %:	90%	Banded Killifish, Bluntnose Minnow, Brook Stickleback, Brook Trout, Central Mudminnow, Creek Chub, Eastern Blacknose Dace, Fathead Minnow, Longnose Dace, Northern Redbelly Dace, Pumpkinseed, White Sucker.

SEGMENT 14		DESCRIPTION
Fish Community Classification[1]:	Cold Water	This segment is outside the study area, downstream of the main tributary. The section is mostly within a large forested area, leading to a dammed pond. The substrate is a mixture of sand, gravel, cobble and boulder and may represent possible spawning habitat for trout. The banks are vegetated and stable. The culvert crossing at Wellington 22 has a concrete slab bottom and would allow fish passage under normal levels.
Mean Channel Width[2] (m):	2.5m	
Mean Channel Depth[3] (m):	0.75m	
Mean Water Depth[4] (m):	0.4m	FISH SPECIES
Stream Shading %:	80%	Rock Bass, White Sucker

SEGMENT 15		DESCRIPTION
Fish Community Classification[1]:	Unknown	This segment is outside the study area, upstream on the northeast tributary. The section is mostly within a large forested area. The substrate is a mixture of fines, sand, and gravel with minor components of cobble and boulder and may represent possible spawning habitat for trout.
Mean Channel Width[2] (m):	Unknown	
Mean Channel Depth[3] (m):	Unknown	
Mean Water Depth[4] (m):	Unknown	FISH SPECIES
Stream Shading %:	70%	Unknown

SEGMENT 16		DESCRIPTION
Fish Community Classification[1]:	Unknown	This segment is within the study area, but on private property and was inaccessible for direct observations. Alignment of the segment was orthophotography interpreted and may not be accurate. The water temperature is likely coldwater based on the general location within the wetland and known groundwater upwelling in the area. No fish sampling records are available for the segment.
Mean Channel Width[2] (m):	Unknown	
Mean Channel Depth[3] (m):	Unknown	
Mean Water Depth[4] (m):	Unknown	FISH SPECIES
Stream Shading %:	90%	Unknown

1. Fish Community Classification based on Erin Service and Settlement Master Plan: Phase 1 - Environmental Component (Erin SSMP 2011).
2. Mean Channel width measured as the width of the wetted bank.
3. Mean Channel Depth is the depth of the channel from the low point to the top of the wetted bank.
4. Mean Water Depth is the depth of the water at the time of observation (October 19th, 2015).
5. Fish Species is compiled from data provided by MNRF and CVC.

APPENDIX 19. BACKGROUND WILDLIFE LIST

Hillsburgh Dam Environmental Assessment, Natural Heritage - Existing Conditions

SOURCE	CVC (most recent observation indicated)	COMMON NAME	SCIENTIFIC NAME	SARO	COSEWIC	SARA	S-Rank	G-Rank	PIF (BCR 13)	CVC Tier (2010)	Wellington County (2008)
		INSECTS AT RISK									
OBAO (2012)		Monarch	*Danaus plexippus*	SC	SC	SC	S2N,S4B	G4T3			
		AMPHIBANS									
ORAA (2009)	I (2012)	American Toad	*Anaxyrus americanus*				S5	G5		3	
ORAA (2009)	I (2003)	Gray Treefrog	*Hyla versicolor*				S5	G5			
ORAA (1994)		Spring Peeper	*Pseudacris crucifer*				S5	G5		3	
ORAA (1990)	I (2014)	Green Frog	*Lithobates clamitans*				S5	G5		3	
	I (2008)	Northern Leopard Frog	*Lithobates pipiens*	NAR	NAR		S5	G5		3	
		SNAKES AND LIZARDS									
ORAA (1999)		Eastern Gartersnake	*Thamnophis sirtalis sirtalis*				S5	G5T5		4	
		TURTLES									
ORAA (2014)		Snapping Turtle	*Chelydra serpentina*	SC	SC	SC	S3	G5T5		1	✓
ORAA (2013)	I (2014)	Midland Painted Turtle	*Chrysemys picta marginata*				S5	G5T5		3	
		BIRDS									
	FM (2012)	Pied-billed Grebe	*Podilymbus podiceps*				S4B,S4N	G5		2	✓
	FM (2012)	Double-crested Cormorant	*Phalacrocorax auritus*	NAR	NAR		S5B	G5		2	✓
OBBA (2005)	I (2014)	Great Blue Heron	*Ardea herodias*				S4	G5		3	✓
	I (2014)	Great Egret	*Ardea alba*				S2B	G5		1	✓
OBBA (2005)	FM (2012)	Green Heron	*Butorides virescens*				S4B	G5		2	✓
	SWH (2011)	Tundra Swan	*Cygnus columbianus*				S4	G5		1	
OBBA (2005)	FM (2012)	Trumpeter Swan	*Cygnus buccinator*	NAR	NAR		S4	G4		1	✓
OBBA (2005)	BB (2009)	Canada Goose	*Branta canadensis*				S5	G5		4	
OBBA (2005)	FM (2012)	Wood Duck	*Aix sponsa*				S5	G5		2	✓
OBBA (2005)	FM (2012)	Green-winged Teal	*Anas crecca*				S4	G5		2	✓
	FM (2012)	American Black Duck	*Anas rubripes*				S4	G5		2	✓
OBBA (2005)	NB (2014)	Mallard	*Anas platyrhynchos*				S5	G5		4	
	FM (2012)	Blue-winged Teal	*Anas discors*				S4	G5		2	✓
	FM (2012)	Gadwall	*Anas strepera*				S4	G5		2	✓
	SM (2012)	Canvasback	*Aythya valisineria*				S1B,S4N	G5		1	✓
	SM (2012)	Ring-necked Duck	*Aythya collaris*				S5	G5		3	✓
	SWH (2011)	Long-tailed Duck	*Clangula hyemalis*				S3B	G5		1	
	SWH (2011)	Bufflehead	*Bucephala albeola*				S4	G5			
	FM (2012)	Hooded Merganser	*Lophodytes cucullatus*				S5B,S5N	G5		2	✓
	FM (2012)	Common Merganser	*Mergus merganser*				S5B,S5N	G5		2	✓
	FM (2012)	Red-breasted Merganser	*Mergus serrator*				S4B,S5N	G5		2	✓
OBBA (2005)	BB 2009	Turkey Vulture	*Cathartes aura*				S5B	G5		3	✓
	SWH (2011)	Osprey	*Pandion haliaetus*				S5B	G5		2	✓
		Bald Eagle	*Haliaeetus leucocephalus*	SC	NAR		S2N,S4B	G5	✓	1	✓
OBBA (2005)	SWH (2011)	Northern Harrier	*Circus cyaneus*	NAR	NAR		S4B	G5	✓	2	✓
OBBA (2005)		Sharp-shinned Hawk	*Accipiter striatus*	NAR			S5	G5		3	✓
	SWH (2011)	Cooper's Hawk	*Accipiter cooperii*	NAR	NAR		S4	G5		2	✓
OBBA (2005)		Northern Goshawk	*Accipiter gentilis*	NAR	NAR		S4	G5T5		2	✓

SOURCE	CVC (most recent observation indicated)	COMMON NAME	SCIENTIFIC NAME	SARO	COSEWIC	SARA	S-Rank	G-Rank	PIF (BCR 13)	CVC Tier (2010)	Wellington County (2008)
OBBA (2005)		Broad-winged Hawk	*Buteo platypterus*				S5B	G5		2	✓
OBBA (2005)		Red-tailed Hawk	*Buteo jamaicensis*	NAR	NAR		S5	G5		4	
OBBA (2005)		American Kestrel	*Falco sparverius*				S4	G5	✓	3	✓
OBBA (2005)	NB (2009)	Ruffed Grouse	*Bonasa umbellus*				S4	G5		2	
OBBA (2005)	BB (2009)	Wild Turkey	*Meleagris gallopavo*				S5	G5		3	
OBBA (2005)		Virginia Rail	*Rallus limicola*				S5B	G5		2	
	BB (2009)	Semipalmated Plover	*Charadrius semipalmatus*				S4B,S4N	G5		4	
OBBA (2005)	FM (2012)	Killdeer	*Charadrius vociferus*				S5B,S5N	G5		3	
	SM (2012)	Greater Yellowlegs	*Tringa melanoleuca*				S4B,S4N	G5		4	
	SM (2012)	Lesser Yellowlegs	*Tringa flavipes*				S4B,S4N	G5		4	
	BB (2009)	Solitary Sandpiper	*Tringa solitaria*				S4B	G5			
OBBA (2005)	I (2013)	Spotted Sandpiper	*Actitis macularius*				S5	G5		3	
	SWH (2011)	Least Sandpiper	*Calidris minutilla*				S4B,S5N	G5		4	
OBBA (2005)	FM (2012)	Wilson's Snipe	*Gallinago delicata*				S5B	G5		2	
OBBA (2005)	I (2011)	American Woodcock	*Scolopax minor*				S4B	G5		2	
	I (2012)	Ring-billed Gull	*Larus delawarensis*				S5B,S4N	G5		2	✓
	SM (2012)	Herring Gull	*Larus argentatus*				S5B,S5N	G5		2	✓
OBBA (2005)		Rock Pigeon	*Columba livia*				SNA	G5		5	
OBBA (2005)	BB (2009)	Mourning Dove	*Zenaida macroura*				S5	G5		4	
OBBA (2005)		Black-billed Cuckoo	*Coccyzus erythropthalmus*				S5B	G5	✓	2	✓
OBBA (2005)		Yellow-billed Cuckoo	*Coccyzus americanus*				S4B	G5		2	✓
OBBA (2005)		Eastern Screech-Owl	*Megascops asio*	NAR	NAR		S4	G5		3	
OBBA (2005)		Great Horned Owl	*Bubo virginianus*				S4	G5		3	
OBBA (2005)		Long-eared Owl	*Asio otus*				S4	G5		2	✓
OBBA (2005)		Ruby-throated Hummingbird	*Archilochus colubris*				S5B	G5		3	
OBBA (2005)	NB (2009)	Belted Kingfisher	*Megaceryle alcyon*				S4B	G5	✓	3	
OBBA (2005)		Yellow-bellied Sapsucker	*Sphyrapicus varius*				S5B	G5		2	✓
OBBA (2005)	BB (2009)	Downy Woodpecker	*Picoides pubescens*				S5	G5		4	
OBBA (2005)	BB (2009)	Hairy Woodpecker	*Picoides villosus*				S5	G5		3	✓
OBBA (2005)	BB (2009)	Northern Flicker	*Colaptes auratus*				S4B	G5	✓	3	
OBBA (2005)	BB (2009)	Pileated Woodpecker	*Dryocopus pileatus*				S5	G5		2	✓
OBBA (2005)		Eastern Wood-pewee	*Contopus virens*	SC	SC		S4B	G5	✓	1	✓
OBBA (2005)	BB (2009)	Alder Flycatcher	*Empidonax alnorum*				S5B	G5			
OBBA (2005)		Willow Flycatcher	*Empidonax traillii*				S5B	G5	✓	3	✓
OBBA (2005)		Least Flycatcher	*Empidonax minimus*				S4B	G5		3	✓
OBBA (2005)	BB (2009)	Eastern Phoebe	*Sayornis phoebe*				S5B	G5		3	
OBBA (2005)	BB (2009)	Great Crested Flycatcher	*Myiarchus crinitus*				S4B	G5		3	
OBBA (2005)	BB (2009)	Eastern Kingbird	*Tyrannus tyrannus*				S4B	G5	✓	3	✓
OBBA (2005)		Horned Lark	*Eremophila alpestris*				S5B	G5		3	
		Purple Martin	*Progne subis*				S4B	G5		2	
OBBA (2005)	BB (2009)	Tree Swallow	*Tachycineta bicolor*				S4B	G5		3	
OBBA (2005)	BB (2009)	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*				S4B	G5		3	
OBBA (2005)		Bank Swallow	*Riparia riparia*	THR	THR		S4B	G5	✓	1	✓
OBBA (2005)		Cliff Swallow	*Petrochelidon pyrrhonota*				S4B	G5		3	✓
OBBA (2005)		Barn Swallow	*Hirundo rustica*	THR	THR		S4B	G5		1	✓
OBBA (2005)	BB (2009)	Blue Jay	*Cyanocitta cristata*				S5	G5		4	

SOURCE	CVC (most recent observation indicated)	COMMON NAME	SCIENTIFIC NAME	SARO	COSEWIC	SARA	S-Rank	G-Rank	PIF (BCR 13)	CVC Tier (2010)	Wellington County (2008)
OBBA (2005)	BB (2009)	American Crow	*Corvus brachyrhynchos*				S5B	G5		2	
OBBA (2005)		Common Raven	*Corvus corax*				S5	G5			✓
OBBA (2005)	BB (2009)	Black-capped Chickadee	*Poecile atricapillus*				S5	G5		4	
OBBA (2005)	BB (2009)	Red-breasted Nuthatch	*Sitta canadensis*				S5	G5		3	✓
OBBA (2005)	BB (2009)	White-breasted Nuthatch	*Sitta carolinensis*				S5	G5		3	
OBBA (2005)		Brown Creeper	*Certhia americana*				S5B	G5		2	✓
OBBA (2005)	BB (2009)	House Wren	*Troglodytes aedon*				S5B	G5		4	
OBBA (2005)		Winter Wren	*Troglodytes troglodytes*				S5B	G5		3	✓
OBBA (2005)		Sedge Wren	*Cistothorus platensis*	NAR	NAR		S4B	G5		2	✓
OBBA (2005)		Marsh Wren	*Cistothorus palustris*				S4B	G5		2	✓
OBBA (2005)	I (2012)	Golden-crowned Kinglet	*Regulus satrapa*				S5B	G5		2	✓
	I (2012)	Ruby-crowned Kinglet	*Regulus calendula*				S4B	G5		2	✓
OBBA (2005)		Eastern Bluebird	*Sialia sialis*	NAR	NAR		S5B	G5		3	
OBBA (2005)		Veery	*Catharus fuscescens*				S4B	G5		3	✓
OBBA (2005)		Wood Thrush	*Hylocichla mustelina*	SC	THR		S4B	G5	✓	1	
OBBA (2005)	BB (2009)	American Robin	*Turdus migratorius*				S5B	G5		4	
OBBA (2005)	BB (2009)	Gray Catbird	*Dumetella carolinensis*				S4B	G5		3	
OBBA (2005)		Brown Thrasher	*Toxostoma rufum*				S4B	G5	✓	2	✓
OBBA (2005)	BB (2009)	Cedar Waxwing	*Bombycilla cedrorum*				S5B	G5		3	
OBBA (2005)	BB (2009)	European Starling	*Sturnus vulgaris*				SNA	G5		5	
	BB (2009)	Blue-headed Vireo	*Vireo solitarius*				S5B	G5		2	✓
OBBA (2005)	BB (2009)	Warbling Vireo	*Vireo gilvus*				S5B	G5		4	
OBBA (2005)	BB (2009)	Red-eyed Vireo	*Vireo olivaceus*				S5B	G5		4	
OBBA (2005)	BB (2009)	Nashville Warbler	*Vermivora ruficapilla*				S5B	G5		2	
OBBA (2005)	BB (2009)	Yellow Warbler	*Dendroica petechia*				S5B	G5		4	
OBBA (2005)		Chestnut-sided Warbler	*Dendroica pensylvanica*				S5B	G5		2	
OBBA (2005)		Magnolia Warbler	*Dendroica magnolia*				S5B	G5		2	✓
OBBA (2005)	BB (2009)	Yellow-rumped Warbler	*Dendroica coronata*				S5B	G5		2	
OBBA (2005)	BB (2009)	Black-throated Green Warbler	*Dendroica virens*				S5B	G5		2	✓
OBBA (2005)	BB (2009)	Pine Warbler	*Dendroica pinus*				S5B	G5		3	✓
OBBA (2005)		Black-and-white Warbler	*Mniotilta varia*				S5B	G5		3	✓
OBBA (2005)	BB (2009)	American Redstart	*Setophaga ruticilla*				S5B	G5		3	✓
OBBA (2005)		Ovenbird	*Seiurus aurocapilla*				S4B	G5		3	✓
OBBA (2005)	BB (2009)	Northern Waterthrush	*Seiurus noveboracensis*				S5B	G5		3	
OBBA (2005)		Mourning Warbler	*Oporornis philadelphia*				S4B	G5		3	
OBBA (2005)	BB (2009)	Common Yellowthroat	*Geothlypis trichas*				S5B	G5		4	
OBBA (2005)		Canada Warbler	*Wilsonia canadensis*	SC	THR	THR	S4B	G5		1	✓
OBBA (2005)		Scarlet Tanager	*Piranga olivacea*				S4B	G5		3	✓
OBBA (2005)	BB (2009)	Northern Cardinal	*Cardinalis cardinalis*				S5	G5		4	✓
OBBA (2005)	BB (2009)	Rose-breasted Grosbeak	*Pheucticus ludovicianus*				S4B	G5	✓	3	✓
OBBA (2005)	BB (2009)	Indigo Bunting	*Passerina cyanea*				S4B	G5			
OBBA (2005)		Eastern Towhee	*Pipilo erythrophthalmus*				S4B	G5	✓	3	✓
OBBA (2005)	BB (2009)	Chipping Sparrow	*Spizella passerina*				S5B	G5		4	
OBBA (2005)	BB (2009)	Field Sparrow	*Spizella pusilla*				S4B	G5	✓		✓
OBBA (2005)		Vesper Sparrow	*Pooecetes gramineus*				S4B	G5	✓	2	✓
OBBA (2005)		Savannah Sparrow	*Passerculus sandwichensis*				S4B	G5	✓	4	✓

SOURCE	CVC (most recent observation indicated)	COMMON NAME	SCIENTIFIC NAME	SARO	COSEWIC	SARA	S-Rank	G-Rank	PIF (BCR 13)	CVC Tier (2010)	Wellington County (2008)
OBBA (2005)		Grasshopper Sparrow	*Ammodramus savannarum*		SC		S4B	G5TU	✓	1	✓
OBBA (2005)	BB (2009)	Song Sparrow	*Melospiza melodia*				S5B	G5		4	
OBBA (2005)	BB (2009)	Swamp Sparrow	*Melospiza georgiana*				S5B	G5		4	
OBBA (2005)	BB (2009)	White-throated Sparrow	*Zonotrichia albicollis*				S5B	G5		3	
	SWH (2011)	Dark-eyed Junco	*Junco hyemalis*				S5B	G5		2	✓
OBBA (2005)		Bobolink	*Dolichonyx oryzivorus*	THR	THR		S4B	G5	✓	1	✓
OBBA (2005)	BB (2009)	Red-winged Blackbird	*Agelaius phoeniceus*				S4	G5		4	
OBBA (2005)		Eastern Meadowlark	*Sturnella magna*		THR		S4B	G5	✓	1	✓
OBBA (2005)	BB (2009)	Common Grackle	*Quiscalus quiscula*				S5B	G5		4	
OBBA (2005)	BB (2009)	Brown-headed Cowbird	*Molothrus ater*				S4B	G5		4	
OBBA (2005)	BB (2009)	Baltimore Oriole	*Icterus galbula*				S4B	G5	✓	3	✓
OBBA (2005)	BB (2009)	Purple Finch	*Carpodacus purpureus*				S4B	G5		2	
OBBA (2005)	BB (2009)	House Finch	*Carpodacus mexicanus*				SNA	G5		5	
OBBA (2005)		Pine Siskin	*Carduelis pinus*				S4B	G5		2	
OBBA (2005)	BB (2009)	American Goldfinch	*Carduelis tristis*				S5B	G5		4	
OBBA (2005)	BB (2009)	House Sparrow	*Passer domesticus*				SNA	G5		5	
		MAMMALS									
OMA (1994)		Virginia Opossum	*Didelphis virginiana*				S4	G5		4	
OMA (1994)		Star-nosed Mole	*Condylura cristata*				S5	G5		2	
OMA (1994)		Little Brown Myotis	*Myotis lucifugus*	END	END	END	S4	G3G4		1	
OMA (1994)		Big Brown Bat	*Eptesicus fuscus*				S5	G5		3	
OMA (1994)		Hoary Bat	*Lasiurus cinereus*				S4	G4		3	
OMA (1994)		Eastern Cottontail	*Sylvilagus floridanus*				S5	G5		4	
OMA (1994)		Snowshoe Hare	*Lepus americanus*				S5	G5		2	
OMA (1994)		European Hare	*Lepus europaeus*				SNA	G5		5	
OMA (1994)	I (2009)	Eastern Chipmunk	*Tamias striatus*				S5	G5		3	
OMA (1994)		Woodchuck	*Marmota monax*				S5	G5		3	
OMA (1994)		Eastern Gray Squirrel	*Sciurus carolinensis*				S5	G5		4	
OMA (1994)	I (2002)	Red Squirrel	*Tamiasciurus hudsonicus*				S5	G5		3	
OMA (1994)	I (2014)	Beaver	*Castor canadensis*				S5	G5		3	
OMA (1994)		Meadow Vole	*Microtus pennsylvanicus*				S5	G5		3	
OMA (1994)		Muskrat	*Ondatra zibethicus*				S5	G5		3	
OMA (1994)		Norway Rat	*Rattus norvegicus*				SNA	G5		5	
OMA (1994)	I (2003)	Porcupine	*Erethizon dorsatum*				S5	G5		2	
OMA (1994)		Coyote	*Canis latrans*				S5	G5		3	
OMA (1994)		Red Fox	*Vulpes vulpes*				S5	G5		3	
OMA (1994)		Northern Raccoon	*Procyon lotor*				S5	G5		4	
OMA (1994)		Ermine	*Mustela erminea*				S5	G5		2	
OMA (1994)		Long-tailed Weasel	*Mustela frenata*				S4	G5		3	✓
OMA (1994)	I (2012)	American Mink	*Mustela vison*				S4	G5		2	
OMA (1994)	I (2009)	Striped Skunk	*Mephitis mephitis*				S5	G5		4	
OMA (1994)	I (2008)	White-tailed Deer	*Odocoileus virginianus*				S5	G5		3	

Legend:

SARO: Species at Risk Ontario
COSEWIC: Committee on the Status of Endangered wildlife in Canada
SARA: Species at Risk Act
ESA: Endangered Species Act
END: Endangered
THR: Threatened
SC: special Concern
NAR: Not At Risk
NL: Not listed
DD: Data Deficient
I: Incidental Observation
BB: Breeding Bird Survey Observation-Breeding Evidence noted
NB: Breeding Bird Survey Observation-No Breeding evidence noted
SWH: Significant Wildlife Habitat survey
FM: Fall migration Survey
SM: Spring Migration Survey

Source codes

OBAO: Ontario butterfly Atlas Online
ORAA: Ontario Reptile and Amphibian Atlas
OMA: Ontario Mammal Atlas
OBBA: Ontario Breeding Bird Atlas
CVC: Credit Valley Conservation Data, provided 2014

CVC Tiers:

1 - Species of Conservation Concern
2 - Species of Interest
3 - Species of Urban Interest
4 - Secure Species
5 - Non-native & Non-native Hybrid Species

Global Rank:

G1: Extremely rare globally
G1G2: Extremely rare to very rare globally
G2: Very rare globally
G2G3: Very rare to uncommon globally
G3: Rare to uncommon globally
G3G4: Rare to common globally
G4: Common globally
G4G5: Common to very common globally
G5: Very common globally; demonstrably secure
T: rank applies to a subspecies or variety

Provincial Rank:

S1: Critically Imperiled—Critically imperiled in the province
S2: Imperiled—Imperiled in the province, very few populations
S3: Vulnerable—Vulnerable in the province, relatively few populations
S4: Apparently Secure—Uncommon but not rare
S5: Secure—Common, widespread, and abundant in the province
SX: Presumed extirpated
SH: Possibly Extirpated (Historical)
SNR: Unranked
SU: Unrankable—Currently unrankable due to lack of information
SNA: Not applicable—A conservation status rank is not applicable
S#S#: Range Rank— indicates range of uncertainty about the status
S#B- Breeding status rank
S#N- Non Breeding status rank
?: Indicates uncertainty in the assigned rank

Wellington County:

✓ Significant Species

PIF:

✓ Priority Species

APPENDIX 20. FISH COLLECTION RECORDS (Provided by CVC and MNRF)

Hillsburgh Dam Environmental Assessment, Natural Heritage - Existing Conditions

CVC	MNRF	COMMON NAME	SCIENTIFIC NAME	COSARO	COSEWIC	SARA	S-Rank	G-Rank	CVC (2010)
✓		Slimy Sculpin	*Cottus cognatus*				S5	G5	2
✓		Banded Killifish	*Fundulus diaphanus*				S5	G5	2
✓	✓	Brook Trout	*Salvelinus fontinalis*				S5	G5	2
✓		Golden Shiner	*Notemigonus crysoleucas*				S5	G5	3
✓		Central Mudminnow	*Umbra limi*				S5	G5	3
✓	✓	Rock Bass	*Ambloplites rupestris*				S5	G5	4
✓	✓	White Sucker	*Catostomus commersonii*				S5	G5	4
✓		Brook Stickleback	*Culaea inconstans*				S5	G5	4
✓	✓	Pumpkinseed	*Lepomis gibbosus*				S5	G5	4
✓	✓	Common Shiner	*Luxilus cornutus*				S5	G5	4
✓	✓	Largemouth Bass	*Micropterus salmoides*				S5	G5	4
✓	✓	Bluntnose Minnow	*Pimephales notatus*				S5	G5	4
✓	✓	Eastern Blacknose Dace	*Rhinichthys atratulus*				S5	G5	4
✓		Creek Chub	*Semotilus atromaculatus*				S5	G5	4
✓	✓	Round Goby	*Neogobius melanostomus*				SNA	G5	5
✓	✓	Brown Trout	*Salmo trutta*				SNA	G5	5

Data Sourse:

CVC: Data collected within the study area between 1954 and 2013; method of collection unknown.

MNRF: Data collected within the study area between 2013 and 2014; Data collected through electrofishing, drift nets, minnow traps and incidental observations.

Legend:
COSARO: Committee on Species at Risk Ontario
COSEWIC: Committee on the Status of Endangered Wildlife in Canada
SARA: Species at Risk Act
ESA: Endangered Species Act
END: Endangered
THR: Threatened
SC: special Concern
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NL: Not listed
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CVC Tiers:
1 - Species of Conservation Concern
2 - Species of Interest
3 - Species of Urban Interest
4 - Secure Species
5 - Non-native & Non-native Hybrid Species

G-Rank:
G1: Extremely rare globally
G1G2: Extremely rare to very rare globally
G2: Very rare globally
G2G3: Very rare to uncommon globally
G3: Rare to uncommon globally
G3G4: Rare to common globally
G4: Common globally
G4G5: Common to very common globally
G5: Very common globally; demonstrably secure
T: rank applies to a subspecies or variety

S-Rank:
S1: Critically Imperiled—Critically imperiled in the province
S2: Imperiled—Imperiled in the province, very few populations
S3: Vulnerable—Vulnerable in the province, few populations
S4: Apparently Secure—Uncommon but not rare
S5: Secure—Common, widespread, and abundant in the province
SX: Presumed extirpated
SH: Possibly Extirpated (Historical)
SNR: Unranked
SU: Unrankable—Currently unrankable due to lack of information
SNA: Not applicable—conservation status rank is not applicable
S#S#: Range Rank—range of uncertainty about the status
S#B- Breeding status rank
S#N- Non Breeding status rank
?: Indicates uncertainty in the assigned rank

Appendix 21

Curriculum Vitae

Aboud & Associate Inc. - Project staff.

Steven Aboud: Principal. Senior Ecologist

Ryan Hamelin: Terrestrial and Wetland Ecologist

Cheryl-Anne Ross: Wildlife Ecologist

Matt Iles: Biologist (No longer with Aboud & Associates Inc.)

Steven Aboud

B.Sc. (Botany)

Principal . Senior Ecologist . ISA Certified Arborist

BIO

Steven has thirty five years of public and private sector experience in the disciplines of arboriculture and ecology. His considerable experience includes testifying as an expert witness before the Ontario Municipal Board, expert testimony on legal matters related to trees, urban forestry policy development and assessment of natural heritage features across southern Ontario. Steven is the author of several publications and documents related to woodland restoration, schoolyard naturalization and the status of rare tree species. He continues to lead a team of skilled and creative individuals developing practical and cost-effective solutions to urban forestry, ecology and landscape design issues using natural systems models.

RELEVANT PROJECT EXPERIENCE

URBAN FORESTRY

- Heritage (Bronte) White Oak Monitoring (Oakville)
- Downtown Brampton Street Tree Inventory (Brampton)
- Milton Urban Area Public Lands Tree Inventory (Milton)
- Whitby Tree Inventory Asset Management Project (Whitby)
- Allan Gardens Revitalization (Toronto)
- Graham Arboretum Renewal Master Plan (London)
- Aurthur Street Sanitary EA (Guelph)
- Gordon/Woolwich Streets (Guelph)
- Watson Parkway (Guelph)
- James Mountain Road (Hamilton)
- Red Hill Valley Parkway (Hamilton)
- Glen Abby Golf Club (Oakville)
- Lambton Golf Club (Toronto)
- Wrigley Canada Headquarters (Toronto)
- Canadian National Institute for the Blind Headquarters (Toronto)
- Parc Downsview Park (Toronto)
- Sanofi-Pasteur Pharmaceuticals Connaught Campus (Toronto)

EXPERT & WRITTEN TESTIMONY AND PEER REVIEW

- Residential Development OMB Hearings (Hamilton . Pickering . Toronto)
- Woodland Policy OMB (London)
- Hurontario Street Expropriation (Caledon)
- Tree Failure Assessment/Testimony (London . Stoney Creek)
- Street Tree Planting Deficiencies Review (Guelph)
- Township of Centre Wellington Tree Policy (Centre Wellington)
- Natural Environment Level 1 and 2 Report Reviews (Centre Wellington)
- Environmental Impact Study Report Reviews (Centre Wellington)

EDUCATION

1978
Bachelor of Science (Botany)
University of Guelph

PROFESSIONAL AFFILIATIONS

International Society of Arboriculture

Society for Ecological Restoration

Tallgrass Ontario

Ontario Urban Forest Council

PROFESSIONAL CERTIFICATIONS

ISA Certified Arborist ON-0323A
International Society of Arboriculture

Butternut Health Assessor No. 497
Ontario Ministry of Natural Resources

ISA Tree Risk Assessment Qualified
International Society of Arboriculture

Ontario Wetland Evaluator (OWES)
Ontario Ministry of Natural Resources

PROFESSIONAL EXPERIENCE

1991-1996
University of Guelph - The Arboretum
Coordinator of Interpretive Programs

1991-1996
The Seed to Seed (Guelph) . *Proprietor*

1978-1991
University of Guelph - The Arboretum
Manager of Tree and Shrub Collections and Plant Data

ABOUD & ASSOCIATES INC.
Consulting Arborists•Ecologists•Landscape Designers

PROFESSIONAL DEVELOPMENT

2012
IML Resistograph Technical Workshop
Town of Oakville

2012
Tree Planting BMP's and Changes to Development Manual Workshop
City of Kitchener

2012
Ottawa Heritage Tree Workshop
Ontario Urban Forest Council

2011
Erosion and Sediment Control Workshop
Toronto and Region Conservation Authority

2011
Soils and Urban Trees Conference
Toronto Botanical Gardens

2007
Structural Soil and Care, Selection and Management of Urban Street Trees
Cornell University & City of Ithaca

2004
Statistics Intergrating Estimation Method of Tree Risk Assessment
Arbormaster Training Canada

TEACHING

1999
Certified Arborist Program . Instructor
International Society of Arboriculture

1997
Resource Management Field Camp
Sessional Lecturer . *University of Guelph*

1997
Ecosystem Restoration Post Graduate Program . Guest Lecturer
Niagara College

1995-1996
A Life Zone Approach to Schoolyard Naturalization Series Workshops
University of Guelph

1978-1996
Natural Interpretation Workshops
University of Guelph

COMMUNITY SERVICE

1990-1991
Trees For Guelph

ECOLGICAL RESTORATION

- Creditview Crossing Community Woodlot Management Plans (Brampton)
- Jefferson Forest Community Edge Management Plans (Richmond Hill)
- Wrigley Canada Ravine Stewardship Plan (Toronto)
- Private Residential Stewardship Plans (Toronto)
- The Rosewood Condominium Stewardship Plan (Toronto)
- Environment Canada - Downsview Campus Naturalization Master Plan (Toronto)
- Health Canada - Campus Naturalization Master Plan (Toronto)
- Canada Centre for Inland Waters - Campus Naturalization Master Plan (Burlington)
- Wellington Terrace Wetland Enhancement (Elora)
- A.M. Cunningham Public School Naturalization (Hamilton)
- Victory Public School Naturalization (Milton)
- Thornhill Woods Community Woodlot Edge Management Plans (Vaughan)
- Thornhill Ravines Community Valley Features Edge Management Plan (Vaughan)
- Upper Thornhill Estates Community Natural Systems Edge Management Plans (Vaughan)
- Vellore Village Woodlot Edge Management Plans (Vaughan)

ENVIRONMENTAL STUDIES

- Jefferson Forest Community EIS (Richmond Hill)
- Community Planning Area Subwatershed Study (Centre Wellington)
- Wetland Boundary Delineation (Erin)
- Sunset Hills Estates EIS (Woolwich)
- Valley Road Estates EIS (Guelph)
- Bird Landing EIS (Guelph)
- River Systems Assessment Study (Guelph)
- Sawmill Valley EIS (Mississauga)
- Blue Heron Ridge EIS (Cambridge)
- Mount Pleasant GO Station EA (Brampton)
- ASECO Intergrated Systems EIS (Oakville)
- Functional Servicing Development Area Study (King)
- King City East Buffer Strategy (King)
- MTRCA Woody Plant Selection Guidelines (Greater Toronto Bio-Region)
- West Humber River Naturalization Plan (Toronto)
- Highway 407 ETR (Toronto)
- E.T. Seton Park Naturalization Plan (Toronto)
- Brampton Sports Parks (Brampton)
- Brampton Vegetation Assessment (Brampton)

PUBLICATIONS

- Aboud, S. W. and H. Kock. 1994 (1996 Rev. ed.) A life zone approach to school yard naturalization: the Carolilian life zone. University of Guelph. Guelph, Ontario. 86 pp.
- Waldron, G.E., S. W. Aboud, J. D. Ambrose and G.A. Meyers. 1987. Shumard Oak (Quercus shumardii) in Canada. Can. Field Naturalist 101: 532 538.
- Ambrose, J.D. and S. W. Aboud. 1985. Status report on Castanea dentata. COSEWIC, Ottawa.
- Ambrose, J.D. and S. W. Aboud. 1983. Status report on Magnolia acuminata. COSEWIC, Ottawa.
- Ambrose, J.D. and S. W. Aboud. 1982a. Status report on Fraxinus quadrangulata COSEWIC, Ottawa
- Ambrose, J.D. and S. W. Aboud. 1982b. Status report on Ptelea trifoliata. COSEWIC, Ottawa.

Ryan Hamelin

M.Sc., B.Sc.(Env)
Terrestrial and Wetland Ecologist

BIO

Ryan is an experienced ecologist with a diverse background in the public and private sectors. He has a proven track record of liaising with government agencies, engineers, landowners, and contractors to manage and complete multifaceted, complex projects. Ryan's strong project management and field ecology skills are successfully applied to wetland restoration, wetland evaluations, vegetation surveys, habitat surveys and water quality monitoring projects across southern Ontario.

EDUCATION

2012
M.Sc. Integrative Biology
University of Guelph

2008
B.Sc. Environmental Science
University of Guelph

PROFESSIONAL EXPERIENCE

2014-present
Aboud & Associates
Terrestrial and Wetland Ecologist

2013-2014
Ontario Ministry of Natural Resources
Coastal Wetland Biologist

2013
Toronto & Region Conservation Authority
Environmental Field Labourer

2006-2010
Severn Sound Environmental Association
Environmental Technician

SELECTED PROJECT EXPERIENCE

ECOLOGICAL RESTORATION

- Rondeau Wetland Restoration and Watershed Buffer Program (Chatham-Kent)
  *with Ontario Ministry of Natural Resources
- Carolinian Forest Tree Planting Project (Chatham-Kent)
  *with Ontario Ministry of Natural Resources

ENVIRONMENTAL STUDIES

- Rondeau Vegetation Monitoring Surveys (Chatham-Kent)
  *with Ontario Ministry of Natural Resources
- Near Shore Fish Habitat Evaluation (Simcoe County) *with Severn Sound Environmental Association
- Loon Surveys (Killarney) *with Ontario Ministry of Natural Resources
- Fish Habitat/Population Electrofishing surveys (Toronto Harour)
  *with Toronto and Region Conservation Authority
- Benthic Biomonitroing Surveys (Simcoe County)
  *with Severn Sound Environmental Association
- Ladysmith Wetland Evaluation (Lambton County)
  *with Ontario Ministry of Natural Resources

WATER QUALITY MONITORING

- Talbot Tract Water Quality Monitoring (Chatham-Kent) *with Ontario Ministry of Natural Resources
- Environ Property Water Quality Monitoring (St. Williams) *with Ontario Ministry of Natural Resources
- Provincial Water Quality Monitoring Network (Simcoe County)
  *with Severn Sound Environmental Association
- Provincial Ground Water Monitoring Network (Simcoe County)
  *with Severn Sound Environmental Association

ABOUD & ASSOCIATES INC.
Consulting Arborists•Ecologists•Landscape Designers

PROFESSIONAL CERTIFICATIONS

2013
Wetland Evaluation Training Course
Ontario Ministry of Natural Resources

2013
Ecological Land Classification Training Course (ELC)
Ontario Ministry of Natural Resources

ABOUD & ASSOCIATES INC.
Consulting Arborists•Ecologists•Landscape Designers

PROFESSIONAL DEVELOPMENT

- 2014 - Great Lakes Wetland Day
- 2013 - Wetland Graminoid Identification Workshop (Royal Botanical Gardens)
- 2013 - Ontario Fish Identification Workshop (Royal Ontario Museaum)
- 2013 - Introduction to the Canadian Environmental Assessment Act
  (Canadian Environmental Assessment Agency)
- 2012 - Water Management & Wetland Restoration Training Course (OMNR)

Cheryl-Anne Ross

Fish and Wildlife Technologist Dip., B.Sc.

Wildlife Ecologist

BIO

Cheryl-Anne Ross has a comprehensive understanding of the natural environment and the tools that are used to evaluate it. Cheryl-Anne completed her Undergraduate degree in NREM-Wildlife and Fisheries Biology at the University of Northern British Columbia, has a Technical Diploma in Fish and Wildlife Technology from Sir Sandford Fleming College and a decade of experience in the public and private sectors. In addition to working as a Natural Heritage Educator at provincial parks, her professional experience includes working on residential and industrial development and renewable energy projects throughout Ontario. Cheryl-Anne conducts a broad range of natural heritage inventory and assessments including botanical inventories, ELC, species at risk reports, environmental assessments, environmental impact statements, and monitoring for wildlife (avian, herptiles and mammals) and wildlife habitat.

SELECTED PROJECT EXPERIENCE

OIL AND GAS DEVELOPMENT

- TransCanada Energy East Pipeline (Ontario) *with Stantec
- Payne Sarnia Pipeline (Sarnia) *with Stantec
- Natural Gas Development Project (Burlington.Oakville) *with Stantec
- Brantford Kirkwall Pipeline (Kirkwall) *with Stantec
- NOVA Genesis Pipeline Extension (Corunna) *with Stantec

RENEWABLE ENERGY

- Amherst Island Wind Farm (Amherst Island) *with Stantec
- Cedar Point Wind Farm (Forest) *with Stantec
- Bow Lake Wind Farm (Montreal River Harbour) *with Stantec
- Niagara Region Wind Centre (Niagara Region) *with Stantec

INDUSTRIAL DEVELOPMENT

- Dundalk Industrial Park Municipal Class Environmental Assessment (Southgate)
- Erin Pit Extension (Orangeville) *with Stantec
- Industrial Development Project (Milton) *with Stantec
- NOVA 2020 Plant Expansion (Corunna) *with Stantec

RESIDENTIAL DEVELOPMENT

- Westside, Vista Hills, Clair Creek Meadows Developments (Waterloo) *with Stantec

MUNICIPAL INFRASTRUCTURE

- Hillsburgh Dam Municipal Class Environmental Assessment (Erin)

EDUCATION

2007
B.Sc. Natural Resource Management
University of Northern British Columbia

2004
Fish and Wildlife Technologist Diploma
Sir Sanford Fleming College

PROFESSIONAL EXPERIENCE

2011-2014
Stantec
Terrestrial Ecologist

2008.2010
Natural Resources Solutions Inc.
Terrestrial and Wetland Ecologist

2006
Earl Rowe Provincial Park
Natural Heritage Educator

2004
Ministry of Natural Resources
Field Ecologist

2003
Wye Marsh Wildlife Centre
Outdoor Education/Naturalist

PROFESSIONAL CERTIFICATIONS

Ecological Land Classification (ELC)
Ontario Ministry of Natural Resources

ISA Certified Arborist
International Society of Arboriculture

ABOUD & ASSOCIATES INC.
Consulting Arborists•Ecologists•Landscape Designers

COMMUNITY SERVICE

2009
Ontario Streams
Spawning Survey

2009
Ontario Public Interest Research Group
Tree Planter

2004
Florida Panther National Wildlife Refuge
Invasive Plant Species Control

ENVIRONMENTAL IMPACT STUDIES . WILDLIFE STUDIES

- Sunset Hills Estates Wildlife Studies (Maryhill)
- Martin Street School Environmental Impact Study (Milton)
- Wellington Street Improvements Active Bird Nest Inventory (Guelph)
- Listowel Environmental Impact Study (North Perth)
- Private Property Severance, Environmental Impact Study (Puslinch)
- Block 18 Woodlot Active Bird Nest Inventory (Vaughan)
- Elora Development Active Bird Nest Inventory (Centre Wellington)
- Rockwood Commercial Development Amphibian Habitat Assessment (Guelph/Eramosa)

Matthew Iles

M.Sc., B.Sc.

Biologist

BIO

Matthew is a well-rounded biologist with diverse experiences studying aquatic and terrestrial ecosystems in Europe, South America and Ontario. He has demonstrated an ability to design and implement research projects, in addition to working closely with indigenous communities, volunteers, landowners and other vested stakeholders, on conservation and ecology projects. An avid field ornithologist, Matthew has held positions and volunteered with the Canadian Wildlife Service, Bird Studies Canada and Long Point Bird Observatory.

EDUCATION

2007
M.Sc. of Restoration Ecology of Terrestrial and Aquatic Environment
University of Liverpool

2006
B.Sc. Zoology (with honours)
University of Liverpool

PROFESSIONAL EXPERIENCE

2012
Long Point Waterfowl
Research Technician

2012
Bird Studies Canada
Research Technician

2012
Innis Point Bird Observatory
Bander-in-charge

2008-2009
Global Vision International, Rainforest Conservation and Community Development Expedition
Field Staff and Biologist

2007-2008
The Environment Partnership
Ecologist

SELECTED PROJECT EXPERIENCE

ORNITHOLOGY

- Nanaksar Gurdwara Gursikh Temple Breeding Bird Survey (Brampton)
- Caledon Structure (Bridge/Culvert) Program Nest Searches (Caledon)
- Bird Landing, breeding bird monitoring and protection measures (Guelph)
- Caledon East Reservoir Nest Searches (Caledon)
- Courtice Road Breeding Bird Survey (Clarington)
- Stone Road Reconstruction Nest Search (Guelph)
- Britannia Rd. Woodlot, forest bird breeding survey (Halton Region)
- French's Bridge Rehabilitation Nest Search (Puslinch)
- Perth County Rd. 313 Bridge, nesting swallow inventory (Perth County)
- Private Property Severance, 87 acre breeding bird survey (Bowmanville)
- Waterfowl capture, observation and study (Prince Edward County, Toronto, Hamilton, Wolfe Island, Lake St. Clair) *with Long Point Waterfowl and Canadian Wildlife Service
- Population counts and behavioral observations (Manitoulin Island) *with Long Point Waterfowl
- Golden-winged Warbler (SAR - Thr.) capture, blood sampling, territory assessments (Elgin County) *with Bird Studies Canada
- Eastern Whip-poor-will (SAR – Thr.) point count surveys (Elgin County) *with Bird Studies Canada
- Migration monitoring, including capture, banding, daily census (Kanata, Long Point) *with Innis Point Bird Observatory and Long Point Bird Observatory
- Grey Jay nest searching (Algonquin Provincial Park) *with University of Guelph
- Breeding ecology of Tree Swallows (Long Point) *with Long Point Bird Observatory/University of Guelph
- Inventorying rainforest birds (Ecuador) *with Global Vision International
- Hen Harrier nest searching (Isle of Man, UK) *with The Environmental Partnership

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Consulting Arborists•Ecologists•Landscape Designers

COMMUNITY SERVICE

2011-2012
Canadian Wildlife Service
Waterfowl Research Technician

2012
Norris Lab University of Guelph
Avian Technician

2012
Carleton University
Entomology Lab Technician

2011-2012
Long Point Bird Observatory
Avian Biologist

2010
Halton Region Conservation Authority
Casual Volunteer

2009
Nazca Institute for Marine Research
Marine Biologist

ENVIRONMENTAL IMPACT STUDIES (EIS)

- Sunset Hills Estates, Anuran call survey and Breeding bird survey, GIS, report (Maryhill)
- Lakeshore Boulevard West Development Natural Heritage Impact Study (Toronto)
- Hill Street Bridge Environmental Impact Study (Woolwich)
- Wellington Terrace Service Road Environmental Impact Statement (Centre Wellington)
- Private Property Severance, Anuran Call Survey, breeding bird survey, GIS, report (Puslinch)
- Woodlawn Road Development Environmental Impact Study (Guelph)
- Brock Road Development Environmental Impact Study (Puslinch)
- Longyards Community Trail Impact Study (Vaughan)
- Gordon Street Development Natural Heritage Peer Review (Guelph)

BOTANY, STEWARDSHIP, HERPETOLOGY, MAMMALS

- Eden Park Butternut Restoration Monitoring Program (Hamilton)
- Woodlawn Road Development Environmental Impact Study (Guelph)
- Elmira Road Industrial Expansion Vegetation Inventory (Guelph)
- 11th Concession Road Development Vegetation Inventory (Hamilton)
- Habitat and vegetation assessments for Golden-winged Warbler and Blue-winged Warbler (Elgin County, Norfolk County) *with Bird Studies Canada
- Habitat stewardship and restoration, including tree sapling planting and invasive species control *with Long Point Bird Observatory
- Reptile and Amphibian Inventory (Ecuador) *with Global Vision International
- Surveying and stewardship for protected amphibian species, including great-crested newt (UK) *with The Environmental Partnership
- Surveying protected mammal species, including bats and water vole (UK) *with The Environmental Partnership

ENTOMOLOGY

- Dung beetle and benthic invertebrate communities in fragmented rainforest habitats (Ecuador) *with Global Vision International
- Butterfly Inventory (Ecuador) *with Global Vision International
- Effect of species-rich grassland translocation on invertebrate communities, with particular reference to Carabid beetles (Manchester, UK) *M.Sc. Research, University of Liverpool

MARINE BIOLOGY

- Willoughby Road Bridge Fish Rescue (Caledon)
- Arkell Dam Fish Rescue (Guelph)
- Artisanal lobster fisheries and by-catch (Ecuador) *with Nazca Institute for Marine Research
- Colonization of man-made substrates by an invasive barnacle species (Liverpool, UK) *with University of Liverpool
- Transition rates in sessile inter-tidal organisms (Liverpool, UK) *with University of Liverpool

PUBLICATIONS

Bracewell SA, Spencer M, Marrs RH, Iles M, Robinson LA (2012). Cleft, Crevice, or the Inner Thigh: 'Another Place' for the Establishment of the Invasive Barnacle Austrominius modestus (Darwin, 1854). PLoS ONE 7(11)

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APPENDIX C-5

Stage 1 Archaeological Assessment

Stage 1 Archaeological Assessment
(Background Study and Property Inspection)

Hillsburgh Dam Bridge
Municipal Class Environmental Assessment Study
Part of Lot 24, Concession 7, Former Township of Erin
Town of Erin, County of Wellington, Ontario

ORIGINAL

Prepared for:

Triton Engineering Services Limited
105 Queen Street West, Unit 14
Fergus, Ontario, N1M 1S6
Tel: 519-843-3920
Fax: 519-843-1943
http://www.tritoneng.on.ca

Archaeological Licence P392 (Paul David Ritchie)
MTCS PIF P392-0117-2014
ASI File 14EA-189

November 3, 2014

Archaeological Services Inc.
528 Bathurst St.
Toronto, Ontario
Canada, M5S 2P9
T 416-966-1069
F 416-966-9723
info@iASI.to/www.iASI.to

Stage 1 Archaeological Assessment
(Background Study and Property Inspection)

Hillsburgh Dam Bridge
Municipal Class Environmental Assessment Study
Part of Lot 24, Concession 7, Former Township of Erin
Town of Erin, County of Wellington, Ontario

EXECUTIVE SUMMARY

Archaeological Services Inc (ASI) was contracted by Triton Engineering Services Limited on behalf of the Town of Erin to conduct a Stage 1 Archaeological Assessment (Background Study and Property Inspection) as part of the Hillsburgh Dam Bridge Municipal Class Environmental Assessment in the Town of Erin, Ontario. The dam bridge is located on Station Street in the Community of Hillsburgh, Town of Erin. The structure was constructed in 1917 and is in need of updating.

The Stage 1 background study determined that no previously registered archaeological sites are located within one kilometre of the study area. A review of the geography and history of the study area suggested that the study area has potential for the identification of Aboriginal and Euro-Canadian archaeological resources, depending on the degree to which soils have been disturbed.

The Stage 1 property inspection determined that the majority of the study area has been disturbed by previous dam construction and grading within the right-of-way (ROW). Small parts of the study area were documented to possess archaeological potential.

In light of these results, ASI makes the following recommendations:

1. Archaeological potential exists in small parts of the study area. These lands require Stage 2 archaeological assessment by test-pit survey at five metre intervals prior to any proposed disturbance;

2. A large part of the study area has been documented to have been disturbed by the previous dam construction and grading within the ROW. These areas do not have archaeological potential and do not require further archaeological assessment; and,

3. Should the proposed work extend beyond the current study area, then further Stage 1 assessment must be conducted to determine the archaeological potential of the surrounding lands.

ARCHAEOLOGICAL SERVICES INC.
ENVIRONMENTAL ASSESSMENT DIVISION

PROJECT PERSONNEL

Senior Project Manager:	Dr. Andrew Riddle, PhD [MTCS license P347] *Senior Archaeologist, Manager, EA West* *Environmental Assessment Division*
Project Coordinator:	Sarah Jagelewski, Hon. BA [MTCS license R405] *Staff Archaeologist, Assistant Manager* *Environmental Assessment Division*
Project Manager (licensee):	Paul David Ritchie, MA [MTCS licence P392] *Staff Archaeologist*
Field Director:	Paul David Ritchie
Field Advisor:	Peter Carruthers, MA [MTCS licence P163] *Senior Associate*
Report Preparation:	Paul David Ritchie
Graphics:	Blake Williams, MLitt [MTCS licence P383] *Geomatics Specialist, Staff Archaeologist*
	Paul David Ritchie
Report Reviewer:	Andrew Riddle
	Robert Pihl, MA, CAHP [MTCS licence P057] *Partner and Senior Archaeologist,* *Manager, Environmental Assessment Division*

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1.0 PROJECT CONTEXT

Archaeological Services Inc (ASI) was contracted by Triton Engineering Services Limited on behalf of the Town of Erin to conduct a Stage 1 Archaeological Assessment (Background Study and Property Inspection) as part of the Hillsburgh Dam Bridge Municipal Class Environmental Assessment in the Town of Erin, Ontario. The dam bridge is located on Station Street in the Community of Hillsburgh, Town of Erin (Figure 1). The structure was constructed in 1917 and is in need of updating.

The 2011 *Standards and Guidelines for Consultant Archaeologists (*S & G*)*, Section 1, administered by the Ministry of Tourism, Culture and Sport (MTCS) discusses the objectives of a Stage 1 archaeological assessment as follows:

- To provide information about the geography, history, previous archaeological fieldwork and current land condition of the study area;
- To evaluate in detail the archaeological potential of the study area which can be used, if necessary, to support recommendations for Stage 2 archaeological assessment for all or parts of the property; and,
- To recommend appropriate strategies for Stage 2 archaeological assessment, if necessary.

This report describes the Stage 1 archaeological assessment that was conducted for this project and is organized as follows: Section 1.0 summarizes the background study that was conducted to provide the archaeological and historical context for the project study area; Section 2.0 addresses the field methods used for the property inspection that was undertaken to document its general environment, current land use history and conditions of the study area; Section 3.0 analyses the characteristics of the project study area and evaluates its archaeological potential; Section 4.0 provides recommendations for the next assessment steps; and the remaining sections contain other report information that is required by the S & G, e.g., advice on compliance with legislation, works cited, mapping and photo-documentation.

1.1 Development Context

All activities carried out during this assessment were completed in accordance with the *Environmental Assessment Act*, the Municipal Engineers' Association document *Municipal Class Environmental Assessment* (2000, as amended in 2007 and 2011), the *Ontario Heritage Act* and the S & G.

Authorization to carry out the activities necessary to complete this Stage 1 archaeological assessment was granted to ASI by Triton Engineering Services Limited on August 19, 2014.

1.2 Historical Context

The purpose of this section, according to the S & G, Section 7.5.7, Standard 1, is to describe the past and present land use and the settlement history and any other relevant historical information gathered through the Stage 1 background research. First, a summary is presented of the current understanding of the Aboriginal land use of the study area. This is followed by a review of the historical Euro-Canadian settlement history.

1.2.1 Aboriginal Land Use and Settlement

Southern Ontario has been occupied by human populations since the retreat of the Laurentide glacier, approximately 13,000 before present (BP) (Ferris 2013: 13). Populations at this time would have been highly mobile, inhabiting a boreal-parkland similar to the modern sub-arctic. By approximately 10,000 BP, the environment had progressively warmed (Edwards and Fritz 1988) and populations now occupied less extensive territories (Ellis and Deller 1990: 62-63).

Between approximately 10,000-5,500 BP, the Great Lakes basins experienced low-water levels and many sites which would have been located on those former shorelines were then submerged. This period produces the earliest evidence of heavy wood working tools and is indicative of greater investment of labour in felling trees for fuel, to build shelter, or to produce tools and is ultimately indicative of prolonged seasonal residency at sites. By approximately 8,000 BP, evidence exists for polished stone implements and worked native copper. The latter's source from the north shore of Lake Superior is evidence of extensive exchange networks. Between approximately 4,500-3,000 BP, there is evidence for investment of labour into social infrastructure and the establishment of band territories (Ellis *et al.* 1990; Ellis *et al.* 2009; *cf.* Brown 1995: 13).

Between 3,000-2,500 BP, populations continued with residential mobility harvesting seasonally available resources, including spawning fish. Exchange and interaction networks broaden at this time (Spence *et al.* 1990: 136, 138) and by approximately 2,000 BP, evidence exists for macro-band camps, focusing on the seasonal harvesting of resources (Spence *et al.* 1990: 155, 164). It is also during this period that maize was first introduced into southern Ontario, though it would have only supplemented people's diet (Birch and Williamson 2013: 13-15). Bands likely retreated to interior camps during the winter.

From approximately 1,000 BP until approximately 300 BP, lifeways became more similar to that described in early historical documents. Populations in the study area would have been Iroquoian speaking though full expression of Iroquoian culture is not recognised archaeologically until the fourteenth century AD. During the Early Iroquoian phase (AD 1000-AD 1300), the communal site is replaced by the village focussed on horticulture. Seasonal disintegration of the community for the exploitation of a wider territory and more varied resource base was still practised (Williamson 1990: 317). By the second quarter of the first millennium BP, during the Middle Iroquoian phase (AD 1300-AD 1450), this episodic community disintegration was no longer practised and populations now communally occupied sites throughout the year (Dodd *et al.* 1990: 343). In the Late Iroquoian phase (AD 1450-AD 1649) this process continued with the coalescence of these small villages into larger communities (Birch and Williamson 2013). Through this process, the socio-political organization of the Aboriginal Nations, as described historically by the French and English explorers who first visited southern Ontario, was developed.

The Credit River watershed was used intensively by Woodland period populations and this is demonstrated in the archaeological record for the area. These sites include those from more recent ancestral Huron-Wendat settlements dating from at least the beginning of the fourteenth century (Antrex site – ASI 2010) until the mid-sixteenth century (Emerson Springs site – Hawkins 2004; Wallace site – Crawford 2003). By the turn of the seventeenth century the north shore of Lake Ontario was devoid of permanent settlement and the Credit River and Etobicoke-Mimico Creeks populations are believed to have relocated to join either the Huron-Wendat Nation or perhaps more likely the Tionontaté (Petun) Nation (Birch and Williamson 2013).

By 1600, the Five Nations Iroquois, in particular the Seneca, were the principle group using the central north shore of Lake Ontario, in particular for hunting, fishing, and for participation in the fur trade. One of the main settlements was located near the mouth of the Rouge River, one of the two branches of the Toronto Carrying Place, which was the route that linked Lake Ontario to the upper Great Lakes through Lake Simcoe. The Huron-Wendat and Petun were eventually dispersed by the Five Nations Iroquois in 1649 at which point the Seneca mainly took over control of the region (Heidenreich 1990: 489; Ramsden 1990).

Compared to settlements of the New York Iroquois, the “Iroquois du Nord” occupation of the landscape was less intensive. Only seven villages are identified by the early historic cartographers on the north shore of Lake Ontario and they are documented as considerably smaller than those in New York State. The populations were agriculturalists, growing maize, pumpkins and squash. These settlements also played the important alternate role of serving as stopovers and bases for New York Iroquois travelling to the north shore of Lake Ontario for the annual beaver hunt (Konrad 1974).

Beginning in the mid-late seventeenth century, the Mississaugas began to replace the Seneca as the controlling Aboriginal group along the north shore of Lake Ontario since the Iroquois confederacy had overstretched their territory between the 1650s and 1670s (Williamson 2008). The Iroquois could not hold the region and agreed to form an alliance with the Mississauga peoples and share hunting territories with them (Williamson 2008). The Mississaugas traded with both the British and the French in order to have wider access to European materials at better prices, and acted as trade intermediaries between the British and tribes in the north. By 1805, the lands from Burlington Bay to the Etobicoke River north of Eglinton Avenue were known as the ‘Mississague Tract’ (Boulton 1805: 48; Heritage Mississauga 2012: 18). The Mississaugas were also granted one mile (approximately 1.6 kilometres) on either side of the Credit River, Twelve Mile Creek and Sixteen Mile Creek. In 1818, the remainder of the Mississauga Tract was acquired by the Crown excluding the lands tracts flanking the Credit River, Twelve Mile Creek and Sixteen Mile Creek. In 1820, the remainder of Mississauga land was surrendered except approximately 81 hectares (ha) along the Credit River (Heritage Mississauga 2012: 18).

1.2.2 Historic Euro-Canadian Land Use: Township Survey and Settlement

The first Europeans to arrive in the area were transient merchants and traders from France and England, who followed Aboriginal pathways and set up trading posts at strategic locations along the well-traveled river routes. All of these occupations occurred at sites that afforded both natural landfalls for Great Lakes traffic and convenient access, by means of the various waterways and overland trails, into the hinterlands. Early transportation routes followed existing Aboriginal trails, both along the lakeshore and adjacent to various creeks and rivers (ASI 2006).

Historically, the study area is located in the Former Township of Erin, County of Wellington in part of Lot 24, Concession 7.

The S & G stipulates that areas of early Euro-Canadian settlement (pioneer homesteads, isolated cabins, farmstead complexes), early wharf or dock complexes, pioneer churches and early cemeteries, are considered to have archaeological potential. Early historical transportation routes (trails, passes, roads, railways, portage routes), properties listed on a municipal register or designated under the *Ontario Heritage Act* or a federal, provincial, or municipal historic landmark or site are also considered to have archaeological potential.

For the Euro-Canadian period, the majority of early nineteenth century farmsteads (i.e., those which are arguably the most potentially significant resources and whose locations are rarely recorded on nineteenth century maps) are likely to be located in proximity to water. The development of the network of concession roads and railroads through the course of the nineteenth century frequently influenced the siting of farmsteads and businesses. Accordingly, undisturbed lands within 100 metres of an early settlement road are also considered to have potential for the presence of Euro-Canadian archaeological sites.

Erin Township.

The land within Erin Township was acquired by the British from the Mississaugas in 1818. The first township survey was undertaken in 1819, and the first legal settlers occupied their land holdings in the following year. The township was first named after a poetic name for Ireland, *Ierne*, mentioned by the Greek geographer Strabo. Erin was initially settled by the children of Loyalists, soldiers who had served during the War of 1812, and by immigrants from England, Scotland and Ireland (Armstrong 1985: 143; Erin Centennial Committee 1967; McMillan 1974; Rayburn 1997: 113; Smith 1846: 55-56).

Hillsburgh

This post office village was situated on the Grand River on part Lots 22 to 25 Concessions 7 and 8, Erin Township. The village was founded in the 1840s, when a tavern and sawmill were constructed by Hiram and Nazareth Hill. It became a post office village in 1851. Registered plans of subdivision for this village date from 1857-1862. It contained two grist mills, a woollen factory, a foundry and tannery. The village also contained four churches, four stores, three hotels, and a telegraph office. It was a station on the Canadan Pacific Railway, and the population was approximately 400 in 1873 (Crossby 1873: 145; Rayburn 1997: 158; Scott 1997: 102; Winearls 1991: 697)

Credit Valley Railway

The Credit Valley Railway was constructed in between 1877 and 1879. The project was backed by George Laidlaw and was intended to connect Toronto with Orangeville via Streetsville. Construction began in 1874, and over several subsequent years several branches were added to the proposed line. The first section of track from Parkdale (Toronto) to Milton was opened in 1877. The line was completed in 1881 but nearly bankrupted the company. In 1883, the line was taken over by the Canadian Pacific Railway (Heritage Mississauga 2009).

1.2.3 Historic Map Review

The 1881 *Illustrated Historical Atlas of Waterloo & Wellington Counties, Ontario* was reviewed to determine the potential for the presence of historic archaeological resources within the study area during the nineteenth century (Figure 2). It should be noted, however, that not all features of interest were mapped systematically in the Ontario series of historical atlases, given that they were financed by subscription, and subscribers were given preference with regard to the level of detail provided on the maps. Moreover, not every feature of interest would have been within the scope of the atlases. Details of nineteenth century property owners are provided in Table 1.

Table 1: Nineteenth-century property owner(s) and historical features(s)

1881 Illustrated Historical Atlas of the Waterloo & Wellington Counties, Ontario

Lot #	**Concession #**	**Property Owner**	**Historical Feature(s)**
24	7	Gooderham & Worts	

The historic mapping also indicates that the study area is located in proximity to the historic village of Hillsburgh and was historically owned by Gooderham and Worts.

1.2.4 Summary of Historical Context

The background research determined that the study area has been occupied by Aboriginal peoples for millennia. The study area is located within the traditional territory of the ancestral Huron-Wendat and was subsequently utilised by the Five Nations Iroquois during the mid-late seventeenth century and then by Mississauga peoples until 1818.

The background research and historic mapping also demonstrates that the study area is situated within the Former Township of Erin and is in proximity to the historic village of Hillsburgh. The parcel of the study area was historically owned by Gooderham and Worts.

1.3 Archaeological Context

This section provides background research pertaining to previous archaeological fieldwork conducted within and in the vicinity of the study area, its environmental characteristics (including drainage, soils or surficial geology and topography, etc.), and current land use and field conditions. Three sources of information were consulted to provide information about previous archaeological research in the study area; the site record forms for registered sites housed at the MTCS; published and unpublished documentary sources; and the files of ASI.

1.3.1 Current Land Use and Field Conditions

The study area is predominantly existing right-of-way (ROW) however part of the dam structure extends beyond ROW property. The study area is situated upon a dam bridge between two ponds, and is located adjacent to the southwest of the historic village of Hillsburgh which is predominantly residences. The surrounding landscape of the study area is rural.

1.3.2 Geography

In addition to the known archaeological sites and historic features, the state of the natural environment is an important indicator of archaeological potential. Accordingly, a description of the study area geography, physiography and soils is provided below.

The S & G, Section 1.3.1, stipulates that primary water sources (lakes, rivers, streams, creeks, etc.), secondary water sources (intermittent streams and creeks, springs, marshes, swamps, etc.), ancient water sources (glacial lake shorelines indicated by the presence of raised sand or gravel beach ridges, relic river or stream channels indicated by clear dip or swale in the topography, shorelines of drained lakes or marshes, cobble beaches, etc.), as well as accessible or inaccessible shorelines (high bluffs, swamp or marsh fields by the edge of a lake, sandbars stretching into marsh, etc.) are characteristics that indicate archaeological potential.

Water has been identified as the major determinant of site selection and the presence of potable water is the single most important resource necessary for any extended human occupation or settlement. Since water sources have remained relatively stable in Ontario since 5,000 BP (Karrow and Warner 1990: Figure 2.16), proximity to water can be regarded as a useful index for the evaluation of archaeological site potential. Indeed, distance from water has been one of the most commonly used variables for predictive modeling of site location.

The S & G, Section 1.3.1, lists other geographic characteristics that can indicate archaeological potential including: elevated topography (eskers, drumlins, large knolls, plateaux), pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground, distinctive land formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases. Physical indicators of use may be present, such as burials, structures, offerings, rock paintings or carvings. Resource areas, including; food or medicinal plants (migratory routes, spawning areas) are also considered characteristics that indicate archaeological potential.

The study area is situated within the Hillsburgh Sandhills physiographic region of southern Ontario within a former spillway (Chapman and Putnam 1984). The Hillsburgh sandhills are a natural boundary on the southeastern flank of the Dundalk till plain and covers an area of approximately 16,576 hectares. This region was the first land exposed by the recession of the Laurentide glacier. The region has an elevation of between 427-488 metres above sea level and is characterised by rough topography, sandy materials and a flat-bottomed swampy valley intersection the moraine. Fine sand is the prevalent soil type (Chapman and Putnam 1984: 135-136).

Spillways are the former glacial meltwater channels. They are often found in association with moraines but in opposition are entrenched rather than elevated landforms. They are often, though not always, occupied by stream courses, the fact of which raises the debate of their glacial origin. Spillways are typically broad troughs floored wholly or in part by gravel beds and are typically vegetated by cedar swamps in the lowest beds (Chapman and Putnam 1984: 15).

Soils within the study area include Caledon fine sandy loam (Dept. of Agriculture 1962). Caledon fine sandy loam is a well-drained soil developed on gravelly material but are stonefree. This soil occurs on undulating topography with long smooth slopes. The soil profile has been documented to have very dark grayish brown (10YR 3/2) fine sandy loam Ah horizon with fine crumb structure, very friable consistency, stonefree at a depth of between 0-8 centimetres. This horizon overlies a yellowish brown

(10YR 5/4) fine sandy loam Ae1 horizon with weak fine subangular blocky texture, very friable and stone free at a depth of between 8-38 centimetres. This overlies a light yellowish brown (10YR 6/4) fine loamy sand Ae2 horizon with singe grain texture, loose, stonefree at a depth of between 38-66 centimetres. This overlies a dark yellowish brown (10YR 4/4) fine sandy loam Bt horizon with medium subangular blocky texture, friable at a depth of between 66-89 centimetres. This overlies a pale brown (10YR 6/3) gravel IIC horizon, single grain, loose texture, calcareous at a depth of 89+ centimeters (Hoffman *et al.* 1963: 36, 53).

Surficial geology information is presented in Figure 3. Soil drainage information for the study area is incomplete, however the available information is presented in Figure 4. The study area is underlain by areas of gravel. The study area includes areas of well-drained soil.

The study area is intersected by a tributary of the Credit River. The Credit River is approximately 90 kilometres long and its watershed features both Carolinian and Deciduous forests (CVCA n.d.). The watershed drains approximately 1000 square kilometres (CVCA 2006). The Credit River’s headwaters originate at the Niagara Escarpment. The river transits the South Slope and Peel Plain physiographic regions until meeting its confluence with Lake Ontario at Port Credit in the Iroquois Plain physiographic region.

1.3.3 Previous Archaeological Research

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database (OASD) maintained by the MTCS. This database contains archaeological sites registered within the Borden system. Under the Borden system, Canada has been divided into grid blocks based on latitude and longitude. A Borden block is approximately 13 kilometres east to west, and approximately 18.5 kilometres north to south. Each Borden block is referenced by a four-letter designator, and sites within a block are numbered sequentially as they are found. The study area under review is located in Borden block *AkHa*.

According to the OASD (MTCS 2014), no previously registered archaeological site is located within one kilometre of the study area.

According to the background research, no previous archaeological assessment has been conducted within 50 metres of the study area.

1.3.4 Summary of Archaeological Context

The study area is located in proximity to the historic village of Hillsburgh. A review of geography indicates that the study area includes a tributary of the Credit River and contains well-drained sandy soil. All these criteria indicate that the study area possesses potential for the recovery of Aboriginal and Euro-Canadian archaeological resources, depending on the degree to which the natural topography and soils in the study area have been disturbed by historic and modern development.

2.0 FIELD METHODS (PROPERTY INSPECTION)

The Stage 1 property inspection was conducted by Paul David Ritchie (P392) and Peter Carruthers (P163), both of ASI, on October 23, 2014, in order to gain first-hand knowledge of the geography, topography, and current conditions and to evaluate and map archaeological potential of the study area. It was a visual inspection only and did not include excavation or collection of archaeological resources.

Weather conditions for the inspection were clear skies with a temperature of approximately 17 degrees Celsius and were deemed acceptable. Previously identified features of archaeological potential were examined, additional features of archaeological potential not visible on mapping were identified and documented as well as any features that could affect assessment strategies. Field observations are compiled onto the maps of the study area in Section 7.0 (Figure 5), and associated photography is presented in Section 8.0 (Plates 1-5).

3.0 ANALYSIS AND CONCLUSIONS

The historical and archaeological contexts were analyzed to help determine the archaeological potential of the study area. A summary of the archaeological potential of the study area is presented in Section 3.1 of this report, and an evaluation of the property inspection results is presented in Section 3.2.

3.1 Analysis of Archaeological Potential

The S & G, Section 1.3.1, lists characteristics that indicate where archaeological resources are most likely to be found, and archaeological potential is confirmed when one or more features of archaeological potential are present. Accordingly, the study area meets the following criteria used for determining archaeological potential:

- Water source: primary, secondary, or past water source (e.g. tributary of Credit River; spillway);
- Well-drained sandy soil (e.g. Caledon fine sandy loam); and,
- Historic settlement (e.g. village of Hillsburgh)

These criteria characterize the study area as having potential for the identification of Aboriginal and Euro-Canadian archaeological resources, depending on the degree of disturbance.

3.2 Analysis of Property Inspection Results

A majority of the study area has been previously disturbed by construction of the existing dam as well as grading associated with the ROW (Figure 5: areas marked in yellow). To the north and south of the dam along the edges of the ROW property, lands were identified that possess archaeological potential (Figure 5: areas marked in green). These lands will require Stage 2 archaeological assessment by test-pit survey prior to any proposed disturbance.

3.3 Conclusions

The Stage 1 background study determined that no previously registered archaeological sites are located within one kilometre of the study area. A review of the geography and history of the study area suggested that the study area has potential for the identification of Aboriginal and Euro-Canadian archaeological resources, depending on the degree to which soils have been disturbed.

The Stage 1 property inspection determined that the majority of the study area has been disturbed by previous dam construction and grading within the ROW. Small parts of the study area were documented to possess archaeological potential.

4.0 RECOMMENDATIONS

In light of the results of this assessment, ASI makes the following recommendations:

1. Archaeological potential exists in small parts of the study area (Figure 5: areas marked in green). These lands require Stage 2 archaeological assessment by test-pit survey at five metre intervals prior to any proposed disturbance;

2. A large part of the study area has been documented to have been disturbed by the previous dam construction and grading within the ROW (Figure 5: areas marked in yellow). These areas do not have archaeological potential and do not require further archaeological assessment; and,

3. Should the proposed work extend beyond the current study area then further Stage 1 assessment must be conducted to determine the archaeological potential of the surrounding lands.

Notwithstanding the results and recommendations presented in this study, ASI notes that no archaeological assessment, no matter how thorough or carefully completed, can necessarily predict, account for, or identify every form of isolated or deeply buried archaeological deposit. In the event that archaeological remains are found during subsequent construction activities, the consultant archaeologist, approval authority, and the Cultural Programs Unit of the MTCS should be immediately notified.

5.0 ADVICE ON COMPLIANCE WITH LEGISLATION

ASI advises compliance with the following legislation:

- This report is submitted to the Minister of Tourism, Culture and Sport as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the MTCS, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development;

- It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest , and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

- Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the *Ontario Heritage Act*; and

- The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must notify the police or coroner.

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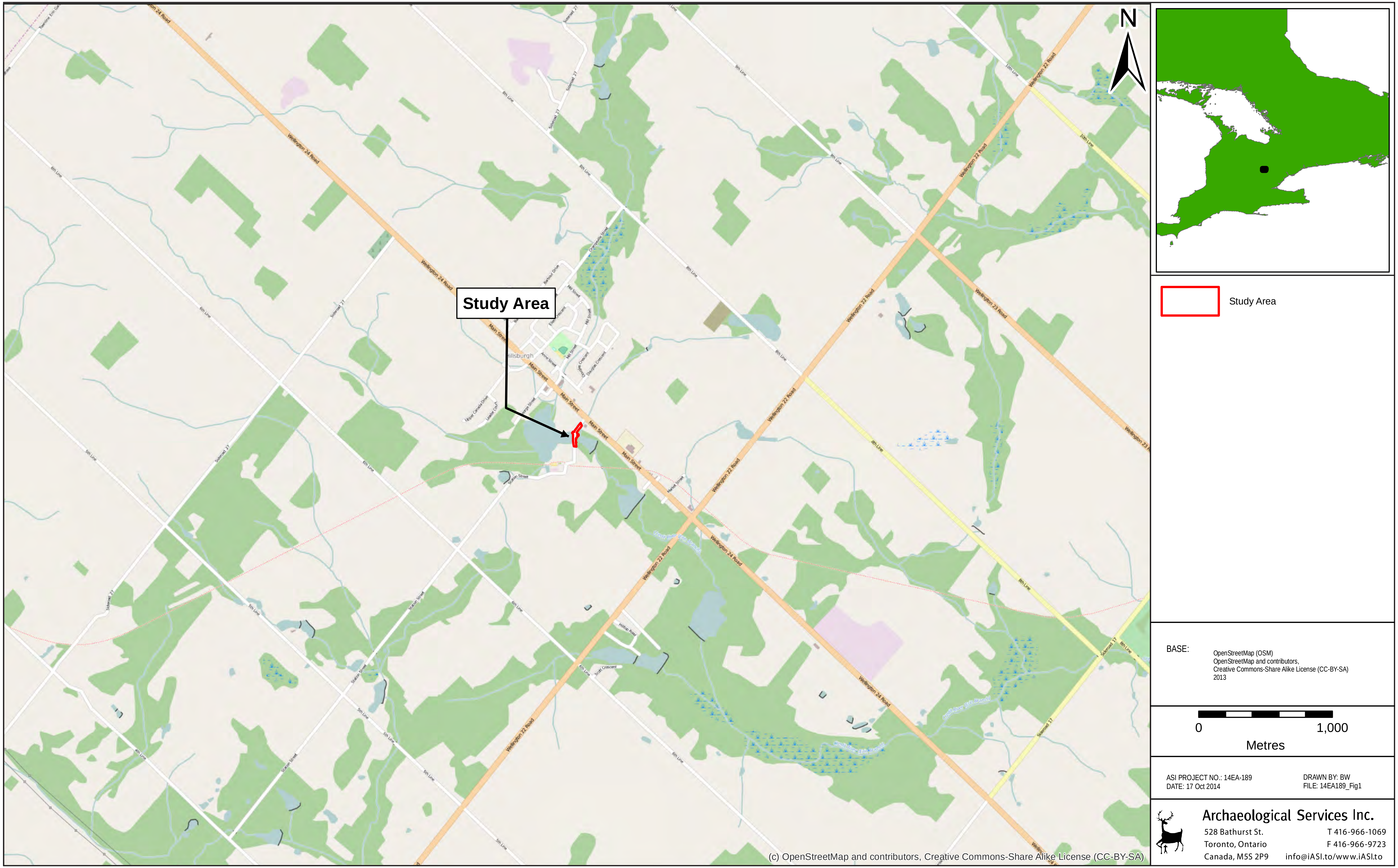
7.0 MAPS



🟥 Study Area

BASE:
OpenStreetMap (OSM)
OpenStreetMap and contributors,
Creative Commons-Share Alike License (CC-BY-SA)
2013

0 1,000
Metres

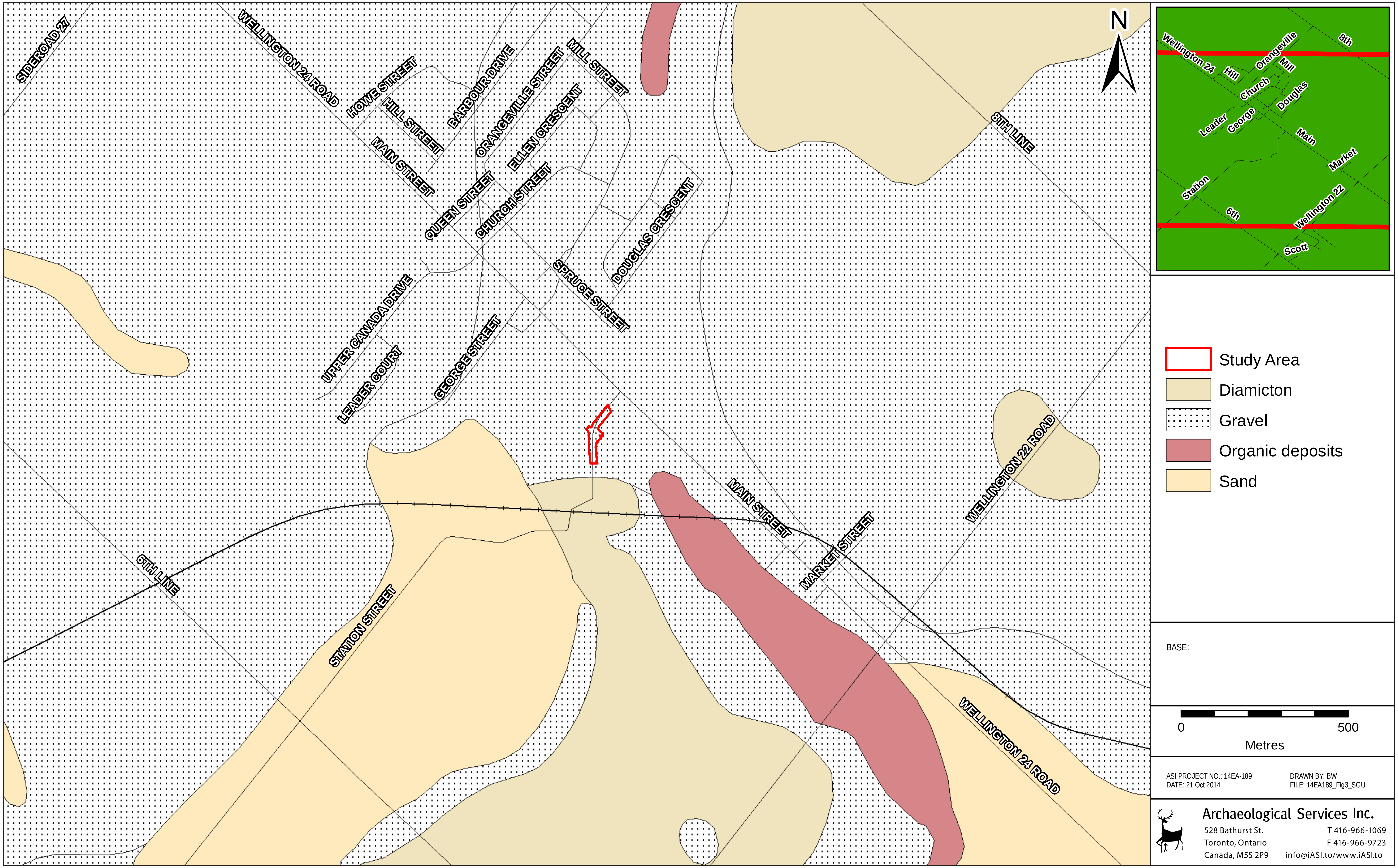
ASI PROJECT NO.: 14EA-189
DATE: 17 Oct 2014
DRAWN BY: BW
FILE: 14EA189_Fig1

Archaeological Services Inc.
528 Bathurst St.
Toronto, Ontario
Canada, M5S 2P9
T 416-966-1069
F 416-966-9723
info@iASI.to/www.iASI.to

Figure 1: Hillsburgh Dam Bridge Stage 1 Study Area Location

Path: X:\2014 Projects\EA\14EA-189_190 Hillsburgh Dam\View\14EA189_workspace.mxd

Figure 2: Hillsburgh Dam Bridge Stage 1 Study Area (Approximate Location) overlaid on 1881 map of the Township of Erin



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DATE: 21 Oct 2014

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Archaeological Services Inc.
528 Bathurst St.
Toronto, Ontario
Canada, M5S 2P9
T 416-966-1069
F 416-966-9723
info@iASI.to/www.iASI.to

Figure 3: Hillsburgh Dam Bridge Stage 1 Study Area - Surficial Geology

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ASI PROJECT NO.: 14EA-189
DATE: 21 Oct 2014

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Archaeological Services Inc.
528 Bathurst St.
Toronto, Ontario
Canada, M5S 2P9
T 416-966-1069
F 416-966-9723
info@iASI.to/www.iASI.to

Figure 4: Hillsburgh Dam Bridge Stage 1 Study Area - Soil Drainage

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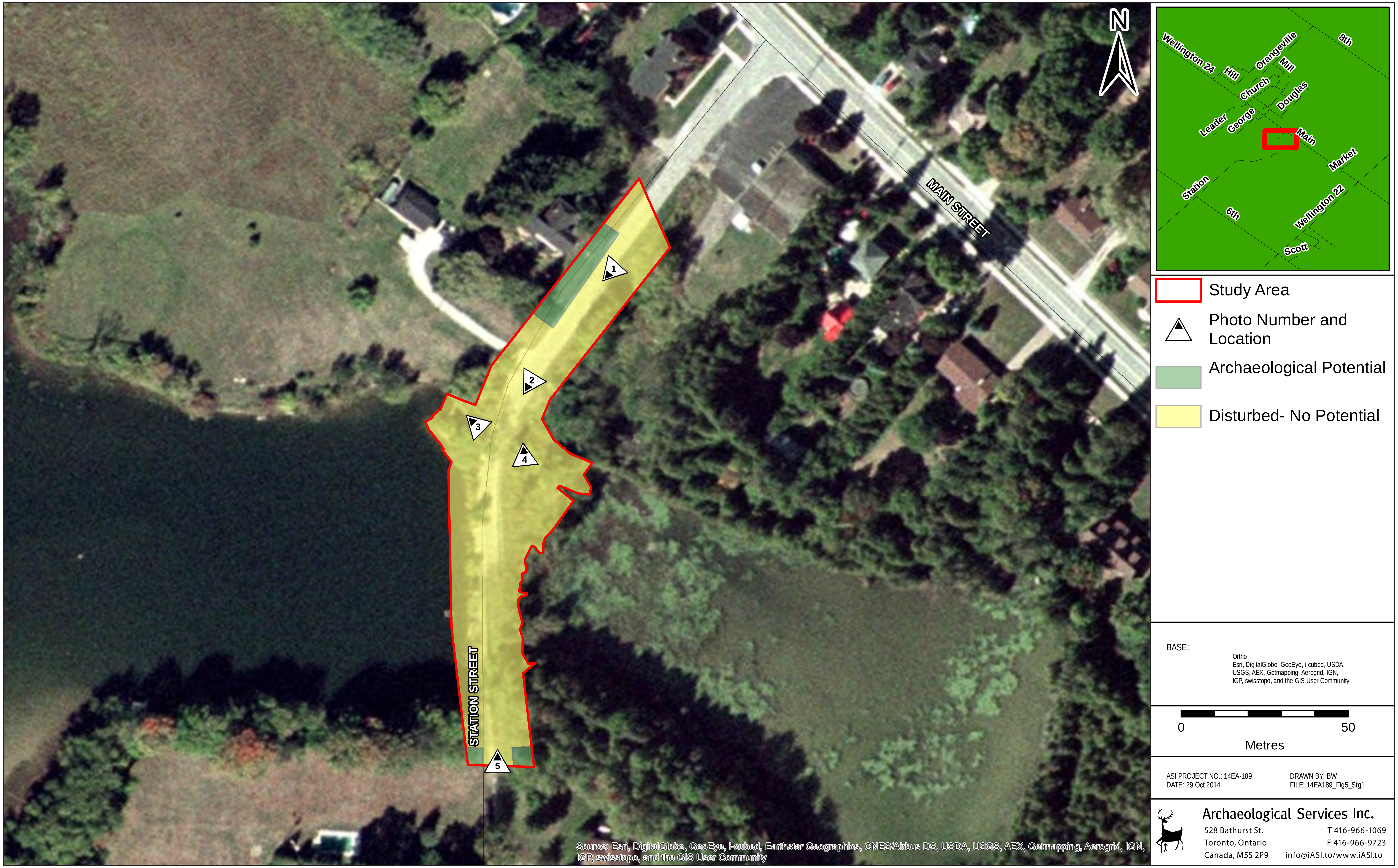

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

BASE:
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Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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DATE: 29 Oct 2014
DRAWN BY: BW
FILE: 14EA189_Fig5_Stg1

Archaeological Services Inc.
528 Bathurst St.
Toronto, Ontario
Canada, M5S 2P9
T 416-966-1069
F 416-966-9723
info@iASI.to/www.iASI.to

Figure 5: Hillsbugh Dam Bridge Stage 1 Study Area - Property Inspection Results

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8.0 IMAGES

Plate 1: View southwest of study area. ROW is disturbed with exception of lands to the northwest of view. Disturbed ROW has no potential. Lands with potential require test-pit survey at five metre intervals.

Plate 2: View SSE of study area. ROW is disturbed from dam construction. No potential.

Plate 3: View northwest of dam spillway. Area is disturbed. No potential.

Plate 4: View NNE of study area. Area is disturbed by dam construction and ROW grading. No potential.

Plate 5: View north of study area. ROW is disturbed. No potential.

APPENDIX C-6

Cultural Heritage Evaluation Report and Heritage Impact Assessment

Cultural Heritage Evaluation and Heritage Impact Assessment: Hillsburgh Dam Bridge

Station Street over the Spillway Separating
Hillsburgh Pond and Ainsworth Pond
Lot 24, Concession VII
Town of Erin, Wellington County, Ontario
Structure No. 2064

Prepared for:

Triton Engineering Services Limited
105 Queen Street West, Unit 14
Fergus, ON N1N 1S6
Tel. (519) 843-3920
Fax (519) 843-1943

ASI File 14EA-190

November 2014

Archaeological Services Inc.
528 Bathurst St.
Toronto, Ontario
Canada, M5S 2P9
T 416-966-1069
F 416-966-9723
info@iASI.to/www.iASI.to

Cultural Heritage Evaluation and
Heritage Impact Assessment:
Hillsburgh Dam Bridge

Station Street over the Spillway Separating
Hillsburgh Pond and Ainsworth Pond
Lot 24, Concession VII
Town of Erin, Wellington County, Ontario
Structure No. 2064

EXECUTIVE SUMMARY

Archaeological Services Inc. (ASI) was contracted by Triton Engineering Services Limited to conduct a Cultural Heritage Evaluation and Heritage Impact Assessment of the Hillsburgh Dam Bridge. This report will establish the cultural heritage significance of the structure and assess impacts of the proposed undertaking in consideration of its determined cultural heritage value. This assessment is being conducted under the Municipal Class Environment Process. The bridge carries one lane each of eastbound and westbound Station Street traffic over the spillway separating Hillsburgh Pond and Ainsworth Pond in the Town of Erin, Ontario (Figure 1). According to available bridge documentation, the Hillsburgh Dam Bridge was built in 1917 (Town of Erin Bridge Inventory 2013).

Based on the results of archival research, an analysis of bridge design and construction in Ontario, field investigations and heritage evaluation, the Hillsburgh Dam Bridge was determined to retain cultural heritage value following application of Regulation 9/06 of the *Ontario Heritage Act*. Its heritage significance centres on its artistic merit, historical and contextual value, location on the Hillsburgh Dam, its early construction date and associations with Gooderham and Worts as well as general historic settlement in the region. As such, the structure was found to meet at least one of the criteria of Regulation 9/06 under the *Ontario Heritage Act* and may therefore be considered for municipal designation under the *Ontario Heritage Act.*

Following the evaluation of potential impacts on the heritage resource (see Table 3), it was determined that Conservation Alternatives 1 – 3 are the preferred alternatives, given that no impacts are expected to the heritage resource and its identified heritage attributes, with Alternative 1 being the most preferred. The remaining conservation alternatives (4 – 9) have a range of impacts, with Alternatives 8 and 9 being the least preferred options given the level and nature of the impacts resulting from the removal of the bridge.

Given the identified heritage value of the Hillsburgh Dam Bridge, the following recommendations and mitigation measures should be considered and implemented:

1. Conservation Alternatives 1 -3 are the preferred alternatives, with Alternative 1 being the most preferred. As part of the selection of the preferred alternatives as part of the Environmental Assessment, a clear rationale for the proposed course of action should be documented.

2. This report should be filed with the heritage staff at the Town of Erin, Wellington County Museum and Archives, the Archives of Ontario, and other local heritage stakeholders that may have and interest in this project.

3. This report should be filed with the Ministry of Tourism, Culture and Sport for review and comment.

4. Should retention of the bridge be chosen as the preferred alternative (one of Conservation Alternatives 1 – 7), the character-defining elements identified in Section 8.1 should be retained and treated sympathetically.

5. Should replacement of the bridge be chosen as the preferred alternative (Conservation Alternative 8 or 9), three mitigation options should be considered:

    a. Replacement/removal of existing bridge and construction of a new bridge with replication of the appearance of the heritage bridge in the new design, with allowances for the use of modern materials. The character-defining elements identified in Section 8.1 should be considered for replication.

    b. Replacement/removal of existing bridge and construction of a new bridge with historically sympathetic design qualities to the heritage bridge, with allowances for the use of new technologies and materials.

    c. In addition to (a) and (b), development of a commemorative strategy, such as plaquing, may be appropriate.

6. Should replacement of the bridge be chosen a documentation report should be completed by a Cultural Heritage Specialist and filed with the Town of Erin, the Archives of Ontario, and any other local heritage stakeholders that may have an interest in this project.

ARCHAEOLOGICAL SERVICES INC.
CULTURAL HERITAGE DIVISION

PROJECT PERSONNEL

Senior Project Manager:	Annie Veilleux, MA *Cultural Heritage Specialist* *and Manager of the Cultural Heritage Division*
Project Manager:	Joel Konrad, Ph.D. *Cultural Heritage Specialist*
Cultural Heritage Specialist:	Joel Konrad
Project Coordinator:	Sarah Jagelewski, Hon. BA *Staff Archaeologist and* *Assistant Manager of the Environmental* *Assessment Division*
Project Administrator:	Carol Bella, Hon. BA *Research Archaeologist*
Archival Research:	Joel Konrad
Report Preparation:	Joel Konrad
Graphics Preparation:	Blake Williams, MLitt *Geomatics Specialist*
	Joel Konrad
Report Reviewer:	Annie Veilleux

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1.0 INTRODUCTION

Archaeological Services Inc. (ASI) was contracted by Triton Engineering Services Limited to conduct a Cultural Heritage Evaluation and Heritage Impact Assessment of the Hillsburgh Dam Bridge. This report will establish the cultural heritage significance of the structure and assess impacts of the proposed undertaking in consideration of its determined cultural heritage value. This assessment is being conducted under the Municipal Class Environment Process. The bridge carries one lane each of eastbound and westbound Station Street traffic over the spillway separating Hillsburgh Pond and Ainsworth Pond in the Town of Erin, Ontario (Figure 1). According to available bridge documentation, the Hillsburgh Dam Bridge was built in 1917 (Town of Erin Bridge Inventory 2013).

Figure 1: Location of the Study Area.
Base Map: ©OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA ESRI Street Maps)

The following report is presented as part of an approved planning and design process subject to Environmental Assessment (EA) requirements. This portion of the EA study is intended to address the proposed replacement/rehabilitation of the subject structure. The principal aims of this report are to:

- Describe the methodology that was employed and the legislative and policy context that guides heritage evaluations of bridges over 40 years old;
- Provide an historical overview of the design and construction of the bridge within the broader context of the surrounding township and bridge construction generally;
- Describe existing conditions and heritage integrity;

- Evaluate the bridge within Regulation 9/06 of the *Ontario Heritage Act* and draw conclusions about the heritage attributes of the structure; and
- Assess impacts of the undertaking, ascertaining sensitivity to change in the context of identified heritage attributes and recommend appropriate mitigation measures.

2.0 LEGISLATION AND POLICY CONTEXT

Infrastructure projects have the potential to impact cultural heritage resources in a variety of ways. These include loss or displacement of resources through removal or demolition and the disruption of resources by introducing physical, visual, audible or atmospheric elements that are not in keeping with the resources and/or their setting.

A 40-year-old threshold is used as a guiding principle when considering cultural heritage resources in the context of improvements to specified areas. While identification of a resource that is 40 years old or older does not confer outright heritage significance, this threshold provides a means to collect information about resources that may retain heritage value. Similarly, if a resource is slightly younger than 40 years old, this does not preclude the resource from retaining heritage value.

The analysis used throughout the cultural heritage resource assessment process addresses cultural heritage resources under various pieces of legislation and their supporting guidelines:

- *Environmental Assessment Act* (R.S.O. 1990, Chapter E.18)
    - *Guideline for Preparing the Cultural Heritage Resource Component of Environmental Assessments* (MCC 1992)
    - *Guidelines on the Man-Made Heritage Component of Environmental Assessments* (MCR 1981)

- *Ontario Heritage Act* (R.S.O. 1990, Chapter O.18) and a number of guidelines and reference documents prepared by the Ministry of Tourism and Culture (MTC):
    - *Ontario Heritage Tool Kit* (MCL 2006)
    - *Screening for Impacts to Built Heritage and Cultural Heritage Landscapes* (November 2010)

2.1 Municipal Context and Policies

2.1.1 The Town of Erin Official Plan

The *Town of Erin Official Plan* outlines existing policies in the municipality pertaining to cultural heritage resources. Section 3.3 of the plan provides a “framework for the identification, protection and enhancement of the Towns heritage resources” (Town of Erin 2012: 14).

This plan identifies specific objectives pertaining to the identification and conservation of heritage resources. These include

a) To encourage the protection of those heritage resources which contribute in a significant way, to the identity and the character of the town;

b) To encourage the maintenance, restoration and enhancement of buildings, structures, areas or sites in Erin which are considered to be of significant architectural, historical or archaeological value; and
c) To encourage new development, redevelopment and public works to be sensitive to, and in harmony with, Erin's heritage resources.

Heritage resources are described in section 3.3.3 as:

a) A property or area of historic value or interest, possessing one of the following attributes:
    i) An example of the Town's past social, cultural, political, technological or physical development;
    ii) A representative example of the work of an outstanding local, national or international personality;
    iii) A property associated with a person who has made a significant contribution to the social, cultural, political, economic, technological or physical development of the Town, County, Province or Country
    iv) A property which dates from an early period in the Town's development

b) A property or area of architectural value or interest, possessing one of the following attributes:
    i) A representative example of a method of construction which was used during a certain time period or is rarely used today;
    ii) A representative example of an architectural style, design, or period of building;
    iii) An important Town landmark;
    iv) A work of substantial engineering merit;
    v) A property which makes an important contribution to the urban composition or streetscape of which it forms a part.

c) A property or area recognized by the Province as being archaeologically significant.

d) An area in which the presence of properties collectively represent a certain aspect of the development or cultural heritage landscape of the Town, or which collectively are considered significant to the community as a result of their location or setting.

Section 3.3.4 states that by-laws may be passed to designate heritage buildings, landscapes, or districts based on Part IV and Part V of the *Ontario Heritage Act.* These by-laws are based on the following criteria:

a) An area associated with a particular aspect, era or event in the history of the development of the municipality; or
b) An area characterized by a style of architecture, design, construction or ambience which is considered architecturally or historically significant to the community as a result of location or setting; or
c) An area considered unique or otherwise significant to the community as a result of location or setting; or
d) An area characterized by a group of buildings which are not architecturally or historically significant individually but are when considered collectively.

2.1.2 Municipal Consultation

The Town of Erin was also consulted for additional information on the bridge.[1] According to this correspondence, and contrary to the 2013 Structure Inventory provided by the Town of Erin, the bridge is listed on the Town of Erin's heritage register.

2.2 Cultural Heritage Evaluation and Heritage Impact Assessment Report

The scope of a Cultural Heritage Evaluation (CHE) is guided by the Ministry of Tourism, Culture and Sport's *Ontario Heritage Toolkit* (2006). Generally, CHEs include the following components:

- A general description of the history of the study area as well as a detailed historical summary of property ownership and building(s) development;
- A description of the cultural heritage landscape and built heritage resources;
- Representative photographs of the exterior and interior of a building or structure, and character-defining architectural details;
- A cultural heritage resource evaluation guided by the *Ontario Heritage Act* criteria;
- A summary of heritage attributes;
- Historical mapping, photographs; and
- A location plan.

Using background information and data collected during the site visit, the cultural heritage resource is evaluated using criteria contained within Regulation 9/06 of the *Ontario Heritage Act*.

Ontario Heritage Act Regulation 9/06 provides a set of criteria, grouped into the following categories which determine the cultural heritage value or interest of a potential heritage resource in a municipality:

i) Design/Physical Value;
ii) Historical/Associative Value; and
iii) Contextual Value.

Should the potential heritage resource meet one or more of the above mentioned criteria, a Heritage Impact Assessment (HIA) is required and the resource considered for designation under the *Ontario Heritage Act*.

In early 2011, the Ministry of Tourism and Culture (MTC) indicated that bridges not owned by the Ministry of Transportation be evaluated against Ontario Regulation 9/06 and not the Ministry of Transportation's *Ontario Heritage Bridge Guidelines* (Interim, 2008) or the *Ontario Heritage Bridge Program* (1991). With this in mind, the MTC recommends that a Heritage Impact Assessment is necessary for structures found to have potential heritage significance, as determined by the cultural heritage evaluation (MTC, June 2011).

The scope of a Heritage Impact Assessment (HIA) is provided by the MTC's *Ontario Heritage Tool Kit.* An HIA is a useful tool to help identify cultural heritage value and provide guidance in supporting environmental assessment work. As part of a heritage impact assessment, proposed site alterations and

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[1] Email correspondence occurred in October 2014.

project alternatives are analyzed to identify impacts of the undertaking on the heritage resource and its heritage attributes. The impact of the proposed development on the cultural heritage resource is assessed, with attention paid to identifying potential negative impacts, which may include, but not limited to:

- Destruction of any, or part of any, significant heritage attributes or features;
- Alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance;
- Shadows created that alter the appearance of a heritage attribute or change the viability of an associated natural feature or plantings, such as a garden;
- Isolation of a heritage attribute from its surrounding environment, context or a significant relationship;
- Direct or indirect obstruction of significant views or vistas within, from, or of built and natural features;
- A change in land use (such as rezoning a church to a multi-unit residence) where the change in use negates the property's cultural heritage value;
- Land disturbances such as a change in grade that alters soils, and drainage patterns that adversely affect a cultural heritage resource, including archaeological resources.

Where negative impacts of the development on the cultural heritage resource are identified, mitigative or avoidance measures or alternative development or site alteration approaches are considered.

3.0 HISTORICAL CONTEXT AND CONSTRUCTION

3.1 Introduction

Built in 1917, the Hillsburgh Dam Bridge is a single span rigid frame structure carrying one lane each of eastbound and westbound Station Street vehicular traffic over the spillway separating Hillsburgh Pond and Ainsworth Pond in the Town of Erin, Ontario. Historically, the study area is located within Lot 24, Concession XII in the Township of Erin, Ontario (Figures 2 and 3).

Cultural heritage resources are those buildings or structures that have one or more heritage attributes. Heritage attributes are constituted by and linked to historical associations, architectural or engineering qualities and contextual values. Inevitably many, if not all, heritage resources are inherently tied to "place"; geographical space, within which they are uniquely linked to local themes of historical activity and from which many of their heritage attributes are directly distinguished today. In certain cases, however, heritage features may also be viewed within a much broader context. Section 3.0 of this report details a brief historical background to the settlement of the surrounding area. A description is also provided of the construction of the bridge within its historical context.

3.2 Local History and Settlement

3.2.1 Erin Township

The land within Erin Township was acquired by the British from the Mississaugas in 1818. The first township survey was undertaken in 1819, and the first legal settlers occupied their land holdings in the following year. The township was first named for a poetic name of Ireland, *Ierne*, mentioned by the Greek geographer Strabo. Erin was initially settled by the children of Loyalists, soldiers who had served during the War of 1812, and by immigrants from England, Scotland and Ireland (Smith 1846:55-56; Erin 1967; McMillan 1974; Armstrong 1985:143; Rayburn 1997:113).

3.2.2 Hillsburgh

This post office village was situated on the Grand River on part Lots 22 to 25 Concessions VII and VIII, Erin Township. The village was founded in the 1840s, when a tavern and sawmill were constructed by Hiram and Nazareth Hill. It became a post office village in 1851. Registered plans of subdivision for this village date from 1857-1862. It contained two grist mills, a woollen factory, a foundry and tannery. The village also contained four churches, four stores, three hotels and a telegraph office. It was a station on the Canadian Pacific Railway. The population was approximately 400 in 1873 (Crossby 1873:145; Winearls 1991:697; Scott 1997:102; Rayburn 1997:158). By the mid-nineteenth century Hillsburgh had become an important market town for grains harvested from the surrounding farms. This grain was sent to larger settlements in the south such as Oakville and Toronto.

3.3 History of the Study Area, Station Street, and Previous Bridge Crossings

Historically, the subject bridge crossing is located on Lot 24, Concession XII in Erin Township, Ontario. A review of historic mapping, archival records, council minutes, and periodicals confirmed that an earlier bridge crossing was extant adjacent to the location of the present structure. According to the Abstract Index for Lot 24, Concession VII, the subject property was granted to Patrick McCartin by the Crown in 1832 and was subsequently sold to Mary O'Reilly in 1850. In that same year the land was sold to William Gooderham and J.E. Worts, partners in the large Toronto distilling firm Gooderham and Worts. Part of the property was sold to the Credit Valley Railway Company in 1875 before the remaining land, including the study area, was passed to George Gooderham, William's son, in 1877.

As Station Street does not appear on the 1877 *Historical Atlas of Waterloo and Wellington Counties*, it is not considered an historically surveyed road (Figure 2). At that time Lot 24, Concession VII was owned by George Gooderham and a flour mill was established south of the study area. It is likely that the Hillsburgh Dam and an early bridge were built at the same time as the mill, sometime between 1877 and 1890.

According to the Abstract Index and additional land transfer documents dating to 1902, the land was then sold to local farmers John and Isaiah Aurey in 1890 (Davis 1902: 9). These documents confirm that the Hillsburgh Dam and Station Street were extant by 1902 and outline the maintenance details of the dam and mill raceway. J.C. MacMillan confirms that the Aurey brothers constructed another mill, likely sometime between 1877 and 1890 (MacMillan 1974: 10). However, the contract does not describe a structure spanning the spillway, and thus it is unclear what type of structure existed there at this time.

According to a 1902 *Plan of the Town of Hillsburgh* (Figure 3), the Hillsburgh Dam and Station Road had been surveyed and subdivided lots were proposed flanking the thoroughfare to the south of the dam. The road was likely named for the Credit Valley Railway station located to the southwest of the subject bridge. The *Historical Atlas of Wellington County*, published in 1906 (Figure 4), confirms that a dam and bridge structure fording the spillway existed prior to 1917, though no further information is offered regarding its type, size, or condition. In addition to indicating the existence of a structure, the map confirms that the Aurey Brothers owned the lot surrounding the bridge, including Hillsburgh Pond. The map indicates that a house had been built to the southeast of the subject bridge. A railway station is pictured contiguous with the railway to the south of the bridge.

Figure 2: Subject bridge located on 1877 mapping
Base Map: *Illustrated Historical Atlas of Waterloo And Wellington Counties, 1877*

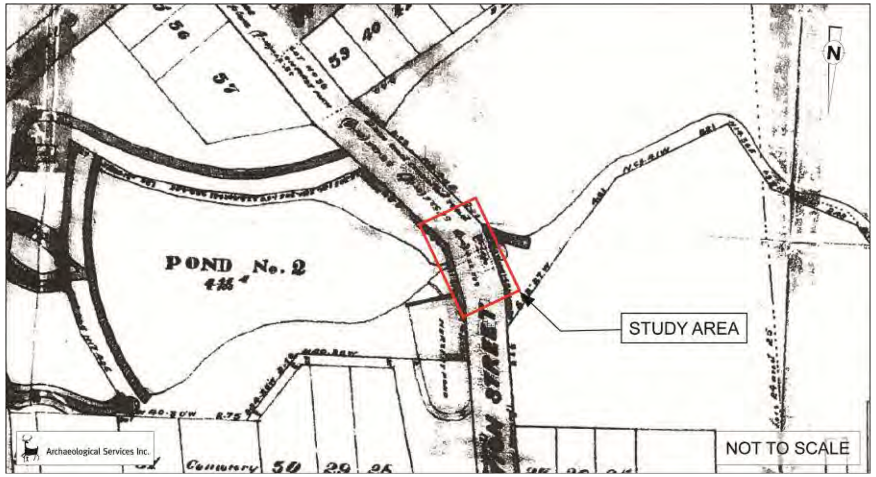

Figure 3: Subject bridge located on 1902 mapping
Base Map: *Plan Showing the Property of the Village of Hillsburgh, 1902*

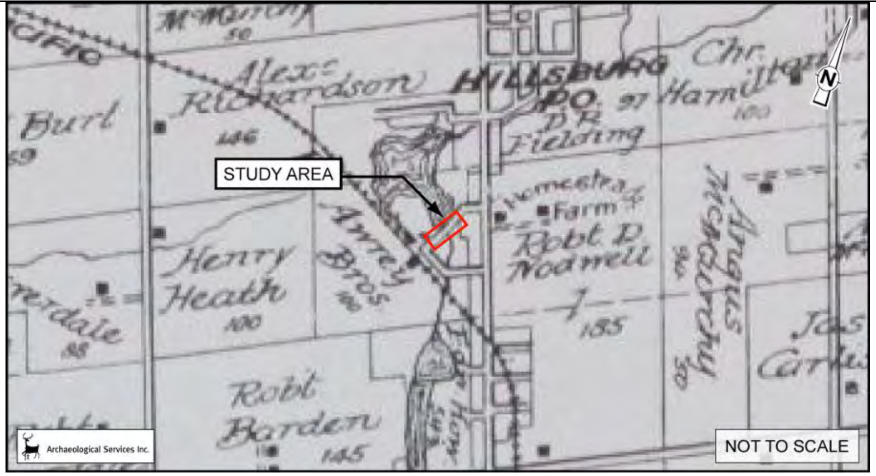

Figure 4: Subject bridge located on 1906 mapping
Base Map: *Illustrated Historical Atlas of the County of Wellington, 1906*

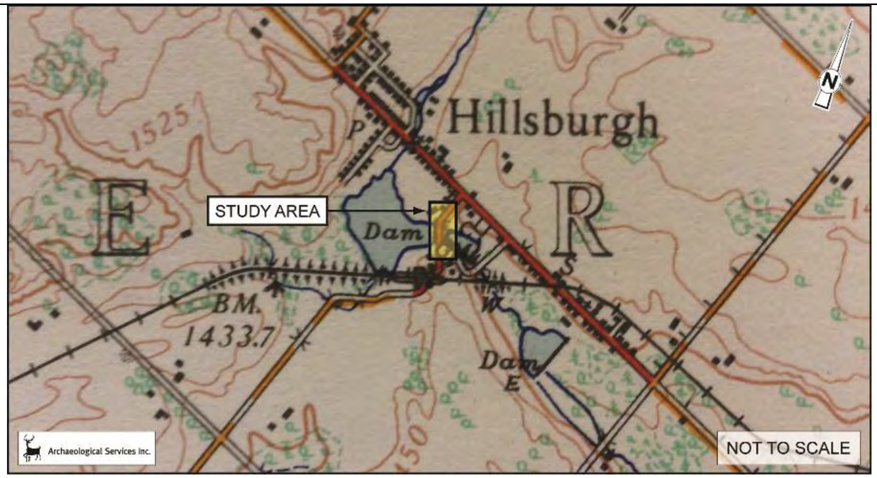

Figure 5: Subject bridge located on 1937 mapping
Base Map: *Energy, Mines, and Resources Canada, NTS 40 P/16*

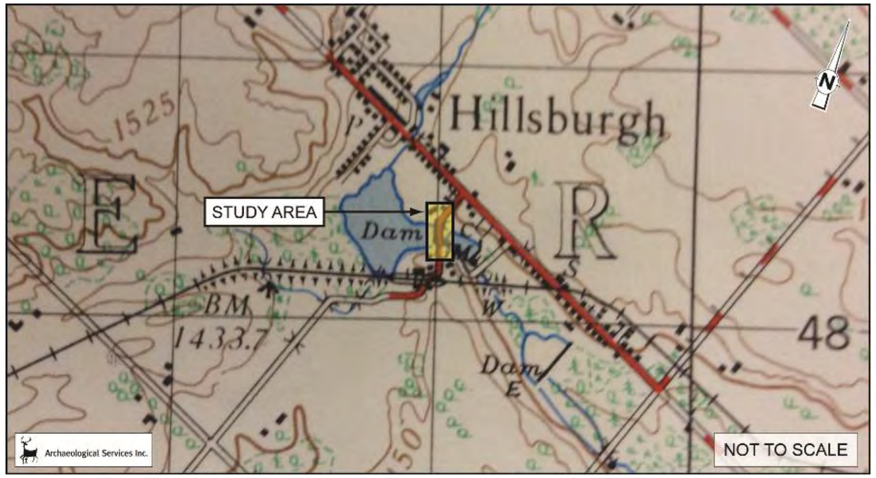

Figure 6: Subject bridge located on 1952 mapping
Base Map: *Energy, Mines, and Resources Canada, NTS 40 P/16*

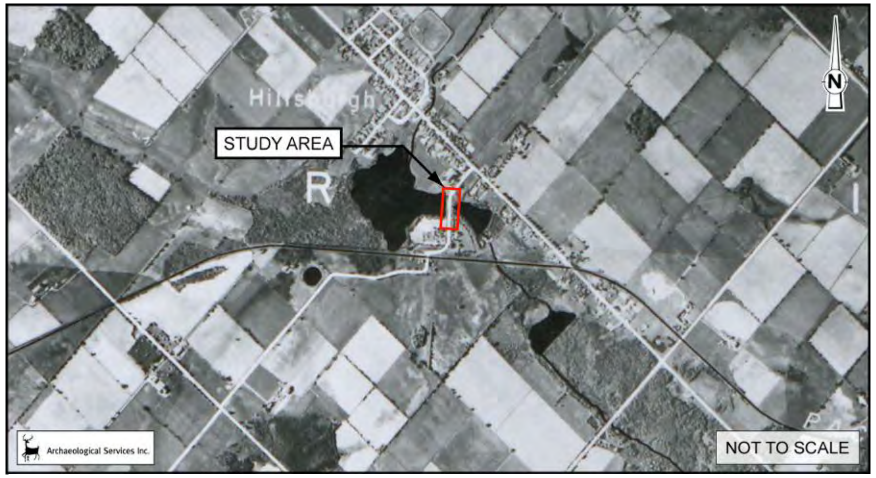

Figure 7: Subject bridge located on 1954 aerial mapping
Base Map: *Hunting Survey Corporation, 1954*

Figure 8: Subject bridge located on 1979 mapping
Base Map: *Energy, Mines, and Resources Canada, NTS 40 P/16*

Figure 9: Subject bridge located on 1994 mapping
Base Map: *Energy, Mines, and Resources Canada, NTS 40 P/16*, 1994

NTS mapping dating to 1937 reveals that both Main Street and Station Street were paved roads, and that no significant changes had been made to the Hillsburgh Dam. A mill is pictured to the southeast of the dam, located on the south bank of Ainsworth Pond. The map indicates that a number of houses existed to the north of the bridge and that the Hillsburgh train station was still extant to the south. In addition, a significant increase in house construction appears to have occurred along Main Street to the north of the subject bridge.

Topographic mapping and aerial photography dating to the 1950s indicates that little change had occurred since 1937 (Figures 6 and 7). However, it appears that the Hillsburgh train station located to the south of the subject bridge had been removed by this time.

By 1979, significant settlement had occurred to the north of the subject bridge, however little development had occurred to the Hillsburgh Dam and the subject bridge (Figure 8). NTS mapping dating to 1994 indicates that several new buildings had been erected directly adjacent to the north of the subject bridge (Figure 9).

3.4 Bridge Construction

3.4.1 Early Bridge Building in Ontario

Up until the 1890s, timber truss bridges were the most common bridge type built in southern Ontario. Stone and wrought iron materials were also employed but due to higher costs and a lack of skilled craftsmen, these structures were generally restricted to market towns. By the 1890s, steel was becoming the material of choice when constructing bridges given that concrete was less expensive and more durable than its wood and wrought iron predecessors. Steel truss structures were very common by 1900, as were steel girder bridges. The use of concrete in constructing bridges was introduced at the beginning of the twentieth century, and by the 1930s, it was challenging steel as the primary bridge construction material in Ontario (Ministry of Culture and Ministry of Transportation [n.d.]:7-8).

3.4.2 Construction of the Hillsburgh Dam Bridge

The Hillsburgh Dam Bridge is a single-span, solid concrete slab bridge carrying two lanes of Station Street traffic over the spillway separating Hillsburgh Pond and Ainsworth Pond in the historic Erin Township, Wellington County, Ontario. According to available documentation, the bridge was completed in 1917, likely to replace an earlier structure of unknown construction. Unfortunately, original bridge drawings were not in the holdings at the Town of Erin or the Wellington County Museum and Archives. In addition, council minutes for the Erin Township and Wellington County were consulted to establish further detail about the construction of the bridge. However, no information could be determined from these sources.

According to the available reference documents, no refurbishments have been undertaken on the subject bridge.

4.0 EXISTING CONDITIONS AND INTEGRITY

A field review was undertaken by Joel Konrad on 9 October 2014 to conduct photographic documentation of the bridge crossing and to collect data relevant for completing a heritage evaluation of the structure. Results of the field review and bridge inspection reports received from the client were then utilized to describe the existing conditions of the bridge crossing. This section provides a general description of the bridge crossing and associated cultural heritage features. For ease of description the bridge is considered to have a north-south orientation. Photographic documentation of the bridge crossing is provided in Appendix A.

The Hillsburgh Dam Bridge is located on Lot 24, Concession VII, in the Town of Erin (Figure 8). The concrete, rigid frame bridge was built in 1917 to carry two lanes of Station Street traffic over the spillway separating Hillsburgh Pond and Ainsworth Pond.

The bridge crossing is bounded by a small wooded area at the northeast corner of the bridge, beyond which sits the Hillsburgh Fire Station. To the northeast of the bridge is a new area under development adjacent to an early-twentieth-century brick dwelling. To the west of the bridge sits the Hillsburgh Pond, and to the southwest a nineteenth-century farmhouse is extant. A number of mid- to late-twentieth-century houses sit to the southwest of the bridge while the Ainsworth Pond is visible to the east. The subject bridge is identified as a heritage structure by the Town of Erin, though it is not designated under Part IV of the *Ontario Heritage Act* and is not currently on the *Ontario Heritage Bridge List*.

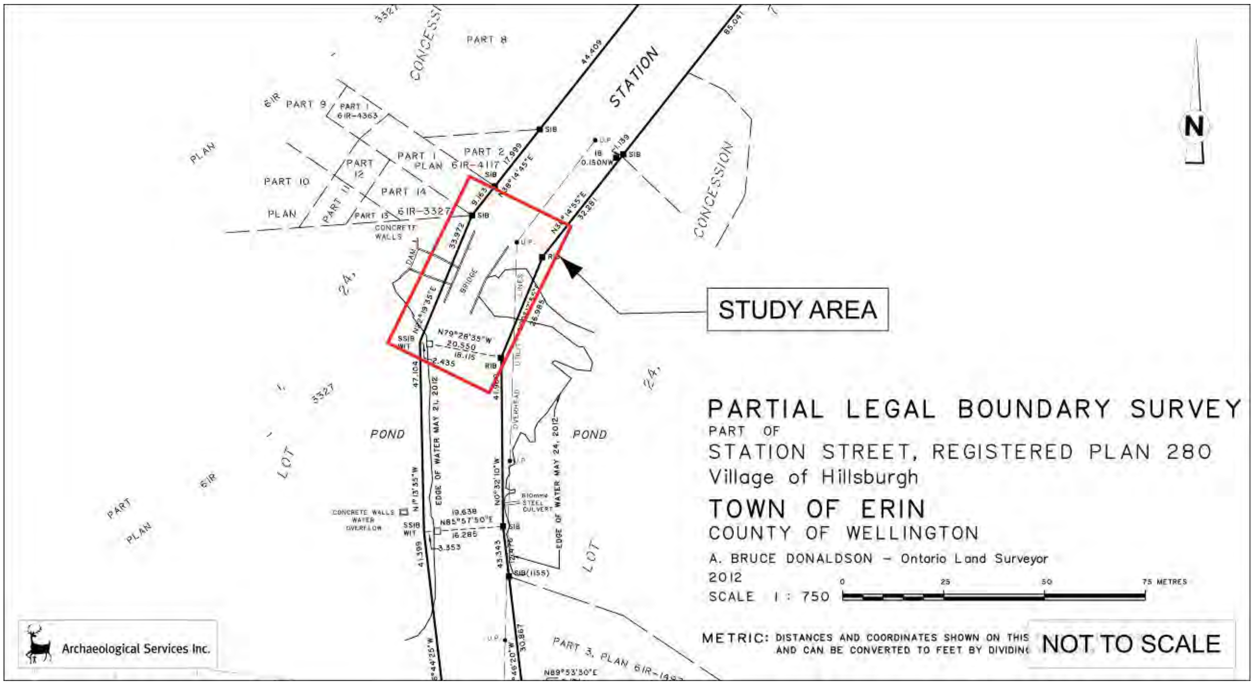

Figure 10: Site Plan of the subject bridge, 2012.
Base Map: Black, Shoemaker, Robinson & Donaldson Limited, Project Number 12-9198

The Hillsburgh Dam Bridge is currently owned/maintained by the Town of Erin. According to an inspection undertaken in 2013, the structure features a total deck length of 5.2 metres with a 6 metre wide asphalt wearing surface (AECOM 2013: 2). The existing bridge features a rigid frame, poured-in-place concrete deck and concrete abutments. The original concrete railing system is still extant and features concrete posts connected by concrete rails, separated by concrete spindles. A sphere adorns the southeast concrete railing endpost, indicating that three similar spheres likely existed atop the other endposts of the bridge. Several spindles have been removed from the west railing while, between the east and west railings, the asphalt-wearing surface of the bridge deck is cracked. The wingwalls and abutments are free from ornamentation and appear to have been parged with concrete, though significant concrete deterioration is still visible. A concrete stop log control structure is located on the west side of the subject bridge while the spillway runs beneath the bridge and down towards Ainsworth Pond to the east of the structure. Both concrete abutments terminate at the spillway. It was not possible to view the bridge's west elevation from a distance during fieldwork due to access constraints.

According to the data received from the client, the bridge has not been rehabilitated by the Town of Erin or Wellington County, though the bridge was identified for replacement as early as 1973.

The Town of Erin Municipal Structure Inspection Form, completed in 2013, presented the following deficiencies regarding the bridge:

- Decks: Narrow to wide transverse cracks and localized potholes in asphalt wearing surface;
- Soffit: Spalling and delaminations, narrow stained cracks, exposed corroded rebar, spalls on south fascia, and efflorescence;
- Railing System: Five missing spindles on the west side, narrow to wide cracks, abrasions, isolated delaminations – Missing three of four end cap pieces (decorative feature), section of barrier in SW quadrant has been fitted with steel beam guiderail;
- Abutments: Narrow to wide cracks, light to medium scaling, delaminations, and spalls;
- Wingwalls: Narrow to wide cracks, light to severe scaling, spalls, delaminations;
- Signs: Hazard marker missing at southwest quadrant; and
- Approaches: Narrow to medium longitudinal cracks.

4.1 Comparative Geographic and Historic Context of Rigid Frame Bridges

ASI requested Triton Engineering to contact the Town of Erin to procure an inventory of bridges owned by the municipalities. This inventory can be found in Appendix B of this report.

Built in 1917, the Hillsburgh Dam Bridge is indicated as the second oldest bridge (excluding culverts) in the Town of Erin, and the oldest of its type. "Bridge 2," a concrete Bowstring Arch Bridge built in 1910 and located on the 10th line, is listed as the oldest bridge owned by the Town of Erin. Subsequently, the Hillsburgh Dam Bridge is understood to be the oldest concrete rigid frame bridge owned by the Town of Erin.

The Hillsburgh Dam Bridge has the 29th longest span of structures owned by the Town of Erin, and has the 29th longest structure length. "Bridge 16," located on Mill Street, has the longest span and structure length of any bridge owned by the Town of Erin, recorded as 18.25m.

4.2 Additional Cultural Heritage Resources

There are no previously identified cultural heritage resources located adjacent to the subject bridge. However, two nineteenth-century farmhouses located on the southeast and southwest of the subject bridge were identified during field review (see Appendix A, Plates 21 and 22).

5.0 HERITAGE EVALUATION OF THE HILLSBURGH DAM BRIDGE

While the Hillsburgh Dam Bridge is listed on the Town of Erin's register of heritage properties, it does not appear to have been evaluated against Regulation 9/06 of the *Ontario Heritage* Act - Table 1 contains the evaluation of Hillsburgh Dam Bridge against criteria as set out in the regulation. Within the Municipal EA process, Regulation 9/06 is the prevailing evaluation tool when determining if a heritage resource, in this case a bridge, has cultural heritage value.

Table 1: Evaluation of the Hillsburgh Dam Bridge using *Ontario Heritage Act* Regulation 9/06

1. The property has design value or physical value because it :

Ontario Heritage Act Criteria	Analysis
i. is a rare, unique, representative or early example of a style, type, expression, material or construction method;	The Hillsburgh Dam Bridge's rigid frame construction is an early example of its type and is the first of its type owned by the Town of Erin. However, both the span and structure length are not significant when compared to the bridges owned by the Town of Erin.
ii. displays a high degree of craftsmanship or artistic merit, or;	The Hillsburgh Dam Bridge retains a degree of craftsmanship exemplified in the spindled concrete railing system. However, the railing system has sustained some damage and is now missing spindles and three of its four decorative spheres placed at the four bridge endposts.
iii. demonstrates a high degree of technical or scientific achievement.	This bridge exhibits a low degree of technical achievement given its short span, easy access, and gentle water flow along the spillway.

2. The property has historical value or associative value because it:

Ontario Heritage Act Criteria	Analysis
i. has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community;	The structure maintains a direct connection with a number of significant themes. First, the bridge is associated with Hillburgh's rail history as it is located along Station Street, the primary route to the former Hillsburgh Railway Station. Second, the bridge sits upon a mill dam constructed in the late nineteenth century by the influential distillers Gooderham and Worts and spans the dam's spillway. Finally, the construction of the bridge facilitated increased settlement east of Hillsburgh.
ii. yields, or has the potential to yield, information that contributes to an understanding of a community or culture, or;	This criterion is not satisfied given that the structure does contribute to an understanding of a community or culture.
iii. demonstrates or reflects the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community.	Unfortunately, no information on the construction of this bridge was uncovered.

Table 1: Evaluation of the Hillsburgh Dam Bridge using *Ontario Heritage Act* Regulation 9/06

3. The property has contextual value because it:

Ontario Heritage Act Criteria	Analysis
i. is important in defining, maintaining or supporting the character of an area;	The design, scale and general massing of the bridge is small in scale and reflects the surrounding natural/agricultural landscape. This bridge continues to complement the rural character of the area and contributes to the picturesque setting of the spillway connecting Hillsburgh Pond and Ainsworth Pond.
ii. is physically, functionally, visually or historically linked to its surroundings, or;	The bridge is physically, functionally and historically linked to its surroundings. It serves as a bridging point for vehicles over the spillway and is physically associated with Hillsburgh Pond, Ainsworth Pond, and the settlement of Hillsburgh. This is a traditional bridging point and was probably first established between 1877 and 1890 when Hillsburgh Dam was created.
iii. is a landmark.	Due to its location adjacent to the settlement of Hillsburgh and ornate railing system this bridge can be considered a gateway structure.

The above evaluation confirms that this structure meets at least one of the criteria contained in Regulation 9/06 of the *Ontario Heritage Act.* In particular, it was determined to retain design, historical and contextual value given its construction and location on Station Street and the Hillsburgh Dam which is associated with settlement, growth, and economic development in the region. Given that the Hillsburgh Dam Bridge met at least one of the criteria contained in Regulation 9/06, this structure is considered to be a cultural heritage resource and is eligible for designation under the *Ontario Heritage Act.*

In summary, character-defining elements associated with the Hillsburgh Dam Bridge include but are not limited to:

- Location of the bridge on Station Street;
- Historical associations with mill owned by Gooderham and Worts;
- Spindled concrete railing system;
- Early construction date; and
- Association with the settlement, growth, and economic development of Hillsburgh.

6.0 ALTERNATIVES TO BE CONSIDERED FOR HERITAGE BRIDGES AS PART OF THE ENVIRONMENTAL ASSESSMENT PROCESS

Following the evaluation of the subject cultural heritage resource, the Hillsburgh Dam Bridge was determined to retain cultural heritage value. The following nine conservation options/alternatives are arranged according to the level or degree of intervention from minimum to maximum. The conservation options are based on the *Ontario Heritage Bridge Program* (1991), which is regarded as current best practice for conserving heritage bridges in Ontario and ensures that heritage concerns, and appropriate mitigation options, are considered.

1. Retention of existing bridge and restoration of missing or deteriorated elements where physical or documentary evidence (e.g., photographs or drawings) can be used for their design;
2. Retention of existing bridge with no major modifications undertaken;

3. Retention of existing bridge with sympathetic modification;
4. Retention of existing bridge with sympathetically designed new structure in proximity;
5. Retention of existing bridge no longer in use for vehicle purposes but adapted for pedestrian walkways, cycle paths, scenic viewing etc.;
6. Relocation of bridge to appropriate new site for continued use or adaptive re-use;
7. Retention of bridge as heritage monument for viewing purposes only;
8. Replacement/removal of existing bridge with salvage elements/members of heritage bridge for incorporation into new structure or for future conservation work or displays;
9. Replacement/removal of existing bridge with full recording and documentation of the heritage bridge.

Given that the bridge was found to retain cultural heritage value under Regulation 9/06, all nine of these conservation options should be considered as part of the Hillsburgh Dam Bridge Cultural Heritage Evaluation Report.

7.0 ENVIRONMENTAL ASSESSMENT OPTIONS

Based on the age of the structure and deficiencies observed in 2009 and 2013, the Town of Erin retained Triton Engineering to complete a Class Environmental Assessment to assess alternatives for replacing the Hillsburgh Dam Bridge. As part of the study, the nine conservation alternatives listed in Section 6.0 are under consideration as bridge improvement alternatives.

7.1 Evaluation of Impacts

To assess the potential impacts of the proposed alternatives, the cultural heritage resource and identified heritage attributes were considered against a range of possible impacts (Table 2) as outlined in the Ministry of Tourism and Culture document entitled *Screening for Impacts to Built Heritage and Cultural Heritage Landscapes* (November 2010), which include:

- Destruction of any, or part of any, significant heritage attribute or feature (III.1).
- Alteration which means a change in any manner and includes restoration, renovation, repair or disturbance (III.2).
- Shadows created that alter the appearance of a heritage attribute or change the visibility of a natural feature of plantings, such as a garden (III.3).
- Isolation of a heritage attribute from its surrounding environment, context, or a significant relationship (III.4).
- Direct or indirect obstruction of significant views or vistas from, within, or to a built and natural feature (III.5).
- A change in land use such as rezoning a battlefield from open space to residential use, allowing new development or site alteration to fill in the formerly open spaces (III.6).
- Soil disturbance such as a change in grade, or an alteration of the drainage pattern, or excavation, etc. (III.7)

Table 2: Evaluation of the Potential Impacts of Bridge Improvement Alternatives on the Cultural Heritage Resource and Identified Heritage Attributes

Nine Bridge Improvement Alternatives	Destruction, removal or relocation	Alteration	Shadows	Isolation	Direct or indirect obstruction of significant views	A change in land use	Soil disturbance
1) Retention of existing bridge and restoration of missing or deteriorated elements where physical or documentary evidence (e.g. photographs or drawings) can be used for their design	No impact.	No impact.	No impact.	No impact.	No impact.	No impact.	No impact.
2) Retention of existing bridge with no major modifications undertaken	No impact.	No impact.	No impact.	No impact.	No impact.	No impact.	No impact.
3) Retention of existing bridge with sympathetic modification	No impact.	No impact given that alterations would be sympathetic to heritage attributes.	No impact.	No impact.	No impact.	No impact.	No impact.
4) Retention of existing bridge with sympathetically designed new structure in proximity	No impact.	Yes – impacts are expected given that a new bridge in proximity to the existing one will alter the immediate setting and context of the bridge site. In particular, both Hillsburgh and Ainsworth Ponds would be severely impacted by the construction of a new bridge.	No impact.	No impact.	No impact.	No impact.	Yes – impacts are expected through the construction of a new structure in proximity.
5) Retention of existing bridge no longer in use for vehicle purposes but adapted for pedestrian walkways, cycle paths, scenic viewing etc	No impact.	Yes – a change in use would result in alterations to the heritage resource.	No impact.	No impact.	No impact.	Yes – use of bridge for pedestrian walkways, cycle paths, scenic viewing, et cetera, would result in a change from the original use of the structure.	No impact.
6) Relocation of bridge to appropriate new site for continued use or adaptive re-use	Yes – impacts to the heritage resource are expected through relocation.	Yes – alterations to the resource are expected through relocation.	No impact.	Yes – relocation of the resource will isolate it from its original context and relationship to Hillsburgh Pond, Ainsworth Pond, Hillsburgh Dam, and the spillway.	No impact.	Yes – the adaptive re-use of the bridge for purposes other than vehicular purposes would result in a change from the original use of the structure. If the bridge remains in vehicular use, no impact is expected.	Yes – impacts are expected through process of removing the bridge from its current location.
7) Retention of bridge as heritage monument for viewing purposes only	No impact.	Yes – use of bridge for viewing purposes only would result in a change from the original use of the structure and thus is considered to be an alteration.	No impact.	No impact.	No impact.	Yes – use of bridge for viewing purposes only would result in a change from the original use of the structure.	No impact.
8) Replacement/removal of existing bridge with salvage elements/members of heritage bridge for incorporation into new structure or for future conservation work or displays	Yes - Impacts to the heritage resource are expected through removal.	Yes – alterations to the resource are expected through removal.	No impact.	No impact.	No significant impacts to the Station Street streetscape are expected provided that a new bridge incorporates a similar grade and concrete construction.	No impact.	Yes – impacts are expected through removal of the existing bridge and the introduction of a new structure.
9) Replacement/removal of existing bridge with full recording and documentation of the heritage bridge	Yes - Impacts to the heritage resource are expected through removal.	Yes – alterations to the resource are expected through removal.	No impact.	No impact.	No significant impacts to the Station Street streetscape are expected provided that a new bridge incorporates a similar grade and concrete	No impact.	Yes – impacts are expected through removal of the existing bridge and the introduction of a new

Table 2: Evaluation of the Potential Impacts of Bridge Improvement Alternatives on the Cultural Heritage Resource and Identified Heritage Attributes

					construction.		structure.

8.0 CONCLUSIONS

Based on the results of archival research, an analysis of bridge design and construction in Ontario, field investigations, and application of Regulation 9/06 of the *Ontario Heritage Act*, the Hillsburgh Dam Bridge was determined to possess heritage value. The following factors determined this assessment: bridge design, early bridge construction date, and both historical and contextual value given its location on the Hillsburgh Dam which is associated with Gooderham and Worts as well as the general settlement, growth, and economic development in the region. Given that the Hillsburgh Dam Bridge met at least one of the criteria contained in Regulation 9/06, this structure is considered to be a cultural heritage resource and is eligible for designation under the *Ontario Heritage Act.*

8.1 Summary Statement of Cultural Heritage Value

The Hillsburgh Dam Bridge is a single span, concrete rigid frame bridge that was built in 1917 to carry Station Road over the spillway connecting Hillsburgh Pond and Ainsworth Pond in the Township of Erin. The bridge has undergone limited modifications since its construction in 1917 and no major alterations to its original form or design are apparent.

Historically, the Hillsburgh Dam Bridge retains direct associations with the Hillsburgh Dam, built for milling purposes by Gooderham and Worts, likely between 1877 and 1890, as well as Station Street, a thoroughfare connecting Hillsburgh to the Credit Valley Railway station to the southwest.

In terms of design value this bridge exhibits some degree of craftsmanship and artistic merit. The retention of the original concrete railing system, in particular, adds to the Bridge’s heritage value.

Contextually, the Hillsburgh Dam Bridge contributes to the scenic character of Station Street and functions as a gateway structure. Moreover, it is strongly linked to its location on Station Street, which served as an historic thoroughfare in the region and continues to be an important road.

In summary, character-defining elements associated with the Hillsburgh Dam Bridge include but are not limited to:

- Location of the bridge on Station Street;
- Historical associations with mill owned by Gooderham and Worts;
- Spindled concrete railing system;
- Early construction date; and
- Association with the settlement, growth, and economic development of Hillsburgh.

9.0 RECOMMENDATIONS

Based on the results of archival research, an analysis of bridge design and construction in Ontario, field investigations and heritage evaluation, the Hillsburgh Dam Bridge was determined to retain cultural heritage value following application of Regulation 9/06 of the *Ontario Heritage Act*. Its heritage significance centres on its artistic merit, historical and contextual value, location on the Hillsburgh Dam, its early construction date and associations with Gooderham and Worts as well as general historic settlement in the region. As such, the structure was found to meet at least one of the criteria of Regulation

9/06 under the *Ontario Heritage Act* and may therefore be considered for municipal designation under the *Ontario Heritage Act.*

Following the evaluation of potential impacts on the heritage resource (see Table 2), it was determined that Conservation Alternatives 1 – 3 are the preferred alternatives, given that no impacts are expected to the heritage resource and its identified heritage attributes, with Alternative 1 being the most preferred. The remaining conservation alternatives (4 – 9) have a range of impacts, with Alternatives 8 and 9 being the least preferred options given the level and nature of the impacts resulting from removal of the bridge.

Given the identified heritage value of the Hillsburgh Dam Bridge, the following recommendations and mitigation measures should be considered and implemented:

1. Conservation Alternatives 1 -3 are the preferred alternatives, with Alternative 1 being the most preferred. As part of the selection of the preferred alternatives as part of the Environmental Assessment, a clear rationale for the proposed course of action should be documented.

2. This report should be filed with the heritage staff at the municipalities of the Town of Erin, Wellington County Museum and Archives, the Archives of Ontario, and other local heritage stakeholders that may have an interest in this project.

3. This report should be filed with the Ministry of Tourism, Culture and Sport for review and comment.

4. Should retention of the bridge be chosen as the preferred alternative (one of Conservation Alternatives 1 – 7), the character-defining elements identified in Section 8.1 should be retained and treated sympathetically.

5. Should replacement of the bridge be chosen as the preferred alternative (Conservation Alternative 8 or 9), three mitigation options should be considered:

    a. Replacement/removal of existing bridge and construction of a new bridge with replication of the appearance of the heritage bridge in the new design, with allowances for the use of modern materials. The character-defining elements identified in Section 8.1 should be considered for replication.

    b. Replacement/removal of existing bridge and construction of a new bridge with historically sympathetic design qualities to the heritage bridge, with allowances for the use of new technologies and materials.

    c. In addition to (a) and (b), development of a commemorative strategy, such as plaquing, may be appropriate.

6. Should replacement of the bridge be chosen a documentation report should be completed by a Cultural Heritage Specialist and filed with the Town of Erin, the Archives of Ontario, and any other heritage stakeholders that may have an interest in this project.

10.0 REFERENCES

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APPENDIX A:
Photographic Plates

Plate 1: North approach to the bridge.

Plate 2: South approach to the bridge.

Plate 3: East elevation of the bridge.

Plate 4: Oblique view of the east elevation, looking north. Note the spherical adornment on the southeast endpost of the railing system.

Plate 5: Oblique view of the west elevation, looking north.

Plate 6: Oblique view of the east elevation, looking south.

Plate 7: Oblique view of the west elevation, looking south.

Plate 8: View of the bridge deck, looking south. Note the concrete railings with spindles lining the asphalt deck.

Plate 9: View of concrete railing system at the northwest corner of the bridge.

Plate 10: Detail of steel barrier attached to the concrete railing system at the southeast corner of the bridge.

Plate 11: Detail of east side of east railing.

Plate 12: Detail of circular design on bridge post.

Plate 13: Detail of concrete railing system with spindles removed.

Plate 14: Detail of soffit, east railing system, and south abutment.

Plate 15: Detail of concrete deterioration at east side of north abutment.

Plate 16: View towards east side of south abutment.

Plate 17: Detail of the footings on the southeast corner of the south abutment.

Plate 18: View west along the spillway to the stop log control structure.

Plate 19: Detail of stop log control structure.

Plate 20: Spillway to the east of the subject bridge, looking northeast.

Plate 21: View along the Hillsburgh Dam to the south of the subject bridge.

Plate 20: View west towards Hillsburgh Pond from Hillsburgh Dam.

Plate 21: Nineteenth-century, two-storey farmhouse with hipped roof located to the southwest of the subject bridge.

Plate 22: Two-storey, nineteenth-century brick farmhouse with "L" shape footprint and gable roof located to the northwest of the subject bridge.

APPENDIX B:
Town of Erin Bridge Inventory

Structure ID	Road Name	Location	Owner	Structure Class	Structure Type	Total Deck Length	Overall Structure Width	SPANS	TOTAL_SPAN_LENGTH	No. of Lanes	CONST_YEAR
2066	Erin - Garafraxa Townline	1.3km East of Wellington Rd 24	Town of Erin	Culvert	Open Footing	4.1	17.1	1	3.6	2	0
2068	Erin - Garafraxa Townline	0.5km East of First Line	Town of Erin	Culvert	Open Footing	4.2	7.4	1	3.7	2	0
1	Winston Churchill Blvd	0.1 km North of Sideroad 27	Town of Erin	Culvert	Open Footing	6.6	5	1	6.1	1	1930
2002	Winston Churchill Blvd	1.1 km North of Sideroad 27	Town of Erin	Culvert	Open Footing	5.7	17	1	5	2	1990
2026	Sideroad 32	0.3 km East of Sixth Line	Town of Erin	Culvert	Rectangular Culvert	4.5	10.25	1	4	0	1990
2027	Sideroad 32	0.4 km West of Sixth Line	Town of Erin	Culvert	Open Footing	7.5	8.5	1	3	0	1940
2046	5th. Line	1.6 km South of Sideroad 17	Town of Erin	Culvert	Rigid Frame, Vertical legs	9.35	7.82	1	8.55	2	
2048	5th. Line	0.5 km South of Sideroad 24	Town of Erin	Culvert	Rectangular Culvert	4.1	7.4	1	3.6	2	1960

2051	8th. Line	1.8 km North of Wellington Rd 22	Town of Erin	Culvert	Rectangular Culvert	4.9	19.7	1	4.2	2	1920
16P	Mill Street	0.1km East of Main Street	Town of Erin	Bridge		18.25	2.5	1	18.25	0	0
2052	8th. Line	0.1 km South of Erin-Garafraxa Town Line	Town of Erin	Culvert	Rectangular Culvert	3.7	9.5	1	3.2	2	1910
2053	27th Sideroad	1.2 km east of Ninth Line	Town of Erin	Culvert	Rectangular Culvert	5.6	6.7	1	5	2	1950
2055	17th Side Road	0.6 km East of Fifth Line	Town of Erin	Culvert	Rectangular Culvert	3.9	14.5	1	3.9	2	1950
2057	17th Side Road	0.1 km East of First Line	Town of Erin	Culvert	Rectangular Culvert	3.6	7	1	3.1	2	1945
2059	Station Road (Sideroad 24)	1.3 km West of Fifth Line	Town of Erin	Culvert	Rectangular Culvert	4.5	6.2	1	3.6	2	1930
2060	Station Road (Sideroad 24)	0.2 km East of Fifth Line	Town of Erin	Culvert	Rectangular Culvert	3.5	8	1	3	2	1960
2061	Station Road (Sideroad 24)	0.4 km east of Fifth Line	Town of Erin	Culvert	Rectangular Culvert	4.1	6.4	1	3.6	2	1930

2064	Station Road	0.2 km West of Wellington Rd. 24	Town of Erin	Bridge	Solid Slab	5.2	7.4	1	4.4	2	1917
2067	East Garafraxa Erin Townline	0.01 km East of Second Line	Town of Erin	Culvert	Arch Culvert	5.1	15	1	3.2	2	2000
2071	East Garafraxa Erin Townline	0.1 km East of Third Line	Town of Erin	Culvert	Rectangular Culvert	5.4	14	1	4.7	2	1996
2072	East Garafraxa Erin Townline	0.8 km East of Third Line	Town of Erin	Culvert	Rectangular Culvert	5.4	11.7	1	4.9	2	1970
2082	9th Line	0.8 km South of Erin-Garafraxa Town Line	Town of Erin	Culvert	Rectangular Culvert	4.8	15.7	1	4.2	2	1970
3	1st Line	6.1 km North of Sideroad 32	Town of Erin	Bridge	Frame, Inclined Legs	10.9	5.6	1	10	0	1920
4	1st. Line	4.5 km North of Wellington Rd 22	Town of Erin	Culvert	Rectangular Culvert	10.8	20.6	2	9.6	2	1985
5	2nd. Line	1.2 km South of Erin-Garafraxa	Town of Erin	Bridge	T-Beam	6.5	5.6	1	6	2	1920

		Town Line									
6	3rd Line	1.5 km North of Wellington Rd. 124	Town of Erin	Bridge	T-Beam	9.3	5.6	1	8.5	0	1920
7	3rd. Line	2.1 km North of Sideroad 27	Town of Erin	Bridge	Bowstring Arch	8.8	7.2	1	7	2	1925
8	4th Line	0.1 km South of Wellington Rd 22	Town of Erin	Culvert	Rectangular Culvert	7.5	11.6	1	6.6	2	1960
9	8th Line	0.2 km South of Sideroad 17	Town of Erin	Bridge	Earth Filled Arch	9.8	6.5	1	8	1	1930
2	10th Line	1.5km South of 15th Sideroad	Town of Erin	Bridge	Bowstring Arch	12	5.8	1	11	1	1910
10	17th Sideroad	0.1km West of 8th Line	Town of Erin	Culvert	Arch Culvert	10	16	2	8	2	1970
11	8th Line	0.01KM North of Sideroad 17	Town of Erin	Bridge	T-Beam	8.8	5.8	1	7.3	1	1920
12	Sideroad 17	0.2km East of Third Line	Town of Erin	Bridge	Frame, Inclined Legs	14	9.1	1	13	2	2001
13	Dundas St. West	0.4KM West of Main St.	Town of Erin	Culvert	Rectangular Culvert	11.2	10.3	2	10	2	1976

14	Church Street	0.3km West of Main St.	Town of Erin	Culvert	Rectangular Culvert	4.3	6.8	1	3.5	1	1930
15	Charles Street	0.1KM West of Main St.	Town of Erin	Bridge	Rectangular Voided Slab	9.2	6	1	8	2	1964
16	Mill Street	0.1km East of Main St.	Town of Erin	Culvert	Rectangular Culvert	5	8.5	1	4.2	2	1930
2005	10th Line	1.4km North of Wellington Rd. 124	Town of Erin	Culvert	Rectangular Culvert	5.6	12.2	1	5	2	1965
2009	15th Sideroad	1.0km West of Winston Churchill Blvd. (Wellington Rd. 25)	Town of Erin	Culvert	Arch Culvert	6.3	11.4	1	5	2	2006
2010	15th Sideroad	0.7km West of Winsotn Churchill Blvd (Wellington Rd. 25)	Town of Erin	Culvert	Arch Culvert	5	11.9	1	3.5	2	2006
2011	10th Line	0.2km South of Sideroad 15	Town of Erin	Culvert	Rectangular Culvert	7	9.4	1	5.8	2	1988
2018	1st. Line	5.0km North of Sideroad 32	Town of Erin	Culvert	Rectangular Culvert	7.4	6.3	1	3.7	2	
2019	3rd. Line	1.2km South of Hwy 124	Town of Erin	Culvert	Rectangular Culvert	7.2	7.2	1	3	2	

2023	5th. Line	South of Side road 10	Town of Erin	Culvert	Rectangular Culvert	5.6	12.4	1	4.8	2	1965
2033	1st. Line	0.3km South of Sideroad 17	Town of Erin	Culvert	Rectangular Culvert	4.3	5.6	1	3.6	2	
2039	3rd. Line	0.6KM North of Sideroad 27	Town of Erin	Culvert	Rectangular Culvert	4.9	11.1	1	4.4	0	1970
2040	4th. Line	1.1km South of Erin-Garafraxa Townline	Town of Erin	Culvert	Rectangular Culvert	3.5	14.5	1	3.1	0	2003
2042	Forth Line	0.1km North Station Rd. (Sideroad 24)	Town of Erin	Culvert	Rectangular Culvert	4.2	11.7	1	3.6	2	1970
2045	4th. Line	0.8km South of Sideroad 17	Town of Erin	Culvert	Rectangular Culvert	5.6	8	1	5	2	1950

APPENDIX C-7

Bridge Inspection Report

Summary Action Report

Structure 2064 (MTO Site No.)

Bridge 2064

Inspection Date 06/06/2013 mm/dd/yyyy

Next Biennial Inspection 06/06/2015 mm/dd/yyyy

Condition Index Value (BCI) **68.6**

Current Rep. Value **$325,455**

Additional Investigations

Investigation	Priority	Cost	Investigation	Priority	Cost

No additional investigations required.

Performance Deficiencies

Element Group	Element	Performance Deficiency
Barriers	Railing Systems	Pedestrian/vehicular hazard
Accessories	Signs	Pedestrian/vehicular hazard

Maintenance Needs

Element Group	Element	Maintenance Required	Priority	Comment
Accessories	Signs	Other	1 yr	Replace hazard marker.
Decks	Wearing Surface	Rout and Seal	2 yr	Seal cracks
Decks	Wearing Surface	Bridge Surface Repair	2 yr	Surface patches
Approaches	Wearing Surface	Rout and Seal	2 yr	Seal Cracks

Repair/Rehabilitation

Element Group	Element	Repair/Rehabilitation		Priority	Cost
Abutments	Wingwalls	Minor Rehab	Patch repair and crack repair	1-5 yrs	$8,000
Decks	Soffit - Thick Slab	Minor Rehab	Patch repair	1-5 yrs	$6,000
Abutments	Abutment Walls	Minor Rehab	Seal cracks	1-5 yrs	$4,000
Barriers	Railing Systems	Minor Rehab	Reconstruct missing spindles and repair cracks	Within 1	$9,000
			Total Repair/Rehabilitation Cost		**$27,000**

Town of Erin	100 %	$51,000.00	**Total Associated Work Cost**	**$24,000**
	0 %	$0.00	**Total Cost**	**$51,000**

Overall Comments

Repair railing system, abutment, deck soffit, wingwalls. Guiderail is connected to first interior barrier post, substandard connection.

Town of Erin

Municipal Structure Inspection Form **Structure Number:** 2064

Inventory Data

Structure Name Bridge 2064 **Hwy No.**

Key Photo

Cross. Type Over ☑ Road ☐ Rail ☐ Ped ☐ Nav. Water ☐ Non-Nav. Wat ☐ Other

Cross. Type Under ☐ Road ☐ Rail ☐ Ped ☐ Nav. Water ☑ Non-Nav. Wat ☐ Other

Road Name Station Road

Structure Location 0.2 km West of Wellington Rd. 24

Latitude 43.78718 **Longitude** -80.14203 **Cur. Rep.Value** $325,455 **

Owner(s)/ % Share Town of Erin 100 %

0 %

		Heritage Status	Not Considered for Designation
MTO Region	Southwestern	**Road Side Env.**	Unspecified
MTO District	London/Stratford	**Road Class**	Local
Old County	Wellington	**Lane Type**	
Geographic Twp.	Erin	**Posted Speed**	50
Structure Type	Solid Slab	**AADT**	700
Structure Material		**Inspection Route Sequence**	
Articulation		**Interchange Number**	

No. of Lanes 2

Pct. Trucks 0

Total Deck Length	5.2 m	**Road Width**	6 m	**Interchange Structure Number**			
Overall Width	7.4 m	**Vert. Clear.**	0 m	**Detour Length**	0 km	**Skew Angle**	0 °
Total Deck Area	38.00 m^2	**No. of Spans**	1	**Fill on Structure**	0 m	**Struct. Dir.**	East-West

Special Routes ☐ Transit ☐ Schoo ☐ Truck ☐ Bicycle **Insp. Duration** hr

** Current Replacement Value is based on in kind replacement of the existing structure and calculated using benchmark costs. Capital planning should consider site specific cost factors and requirements for widening or lengthening of the structure.

Spans

Span Name	Span Length	Span Name	Span Length
Span 1	4.4 m		

Historical Data

Year Built	1917 yyyy	**Year of Last Major Rehab**	0 yyyy
Last OSIM Inspection	mm/dd/yyyy	**Contract No. When Built**	
Last Enhanced OSIM	mm/dd/yyyy	**Last Evaluation**	mm/dd/yyyy
Last Enhanced Access	mm/dd/yyyy	**Current Load Limit**	0 t 0 t 0 t
Last Underwater Insp.	mm/dd/yyyy	**Load Limit By-Law No.**	mm/dd/yyyy
Last Condition Survey	mm/dd/yyyy	**By-Law Expiry Date**	mm/dd/yyyy

Rehab History

Town of Erin

Municipal Structure Inspection Form

Structure Number: **2064**

Field Inspection Information:

Inspection Date 06/06/2013 mm/dd/yyyy ☐ Multi Day Inspection ☑ OSIM ☐ Enhanced OSIM **BCI** 68.6

Inspector Mario Marin **Eng. Responsible** Christine Beard Laaber, P.Eng.

Others in Party Kyle McTavish

Access Equip. ☐ Lift ☐ Ladder ☐ Boat ☐ Bridge Master Other

Other Equip. Camera, Hammer, Other Hand Tools

Weather Partly Cloudy **Temperature** 12 °C

Additional Investigations Required:

Investigation	None	**Priority** Normal	Urgent	**Estimated Cost**
Detailed Deck Condition Survey	☑	☐	☐	$0
Delamination Survey of Asphalt-Covered Deck	☑	☐	☐	$0
Concrete Substructure Condition Survey	☑	☐	☐	$0
Detailed Coating Condition Survey	☑	☐	☐	$0
Detailed Timber Investigation	☑	☐	☐	$0
Post-Tensioned Strand Investigation	☑	☐	☐	$0
Underwater Investigation	☑	☐	☐	$0
Fatigue Investigation	☑	☐	☐	$0
Seismic Investigation	☑	☐	☐	$0
Structure Evaluation	☑	☐	☐	$0
Monitoring of Deformations, Movements and Settlements	☑	☐	☐	$0
Monitoring of Crack Widths	☑	☐	☐	$0
			Total Cost	$0

Investigation Notes

Overall Structure Notes:

Recommedend Work on Structure ☐ None ☑ Rehab ☐ Replace ☐ Remove

Timing of Recommended Work ☐ None ☐ Now ☑ 1 to 5 years ☐ 6 to 10 years

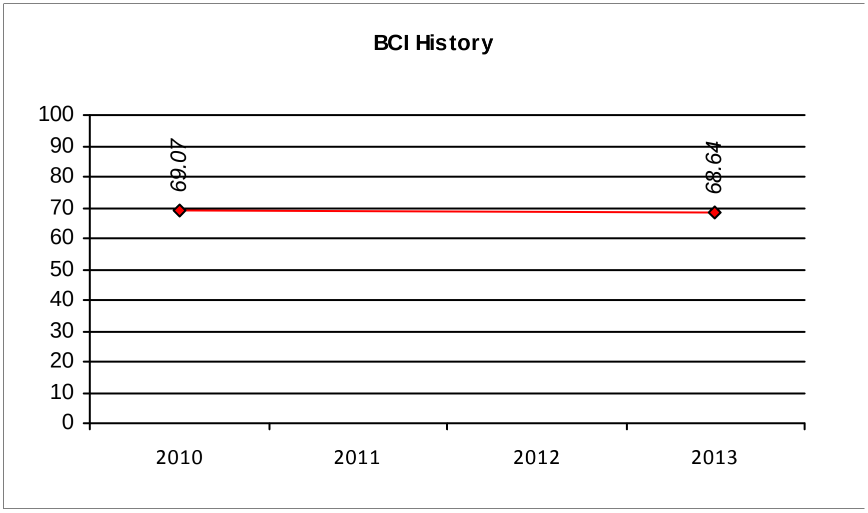
Overall Comments Repair railing system, abutment, deck soffit, wingwalls. Guiderail is connected to first interior barrier post, substandard connection.

BCI Change Justification

Next Inspection 06/06/2015 mm/dd/yyyy **Estimated Load Limit** 0 t 0 t 0 t

BCI History

Insp. Date	BCI	Inspector
01-Nov-10	69.07	Scott Davis, P.Eng.
06-Jun-13	68.64	Mario Marin



All BCI values are based on the MTO BCI methodology published in April 2008. As a result, BCI values for 2007 and earlier are approximate only, with potential discrepancies resulting from changes (over time) in the way quantities for certain elements are calculated.

Standard Codes

Suspected Performance Deficiencies

00	None	06	Bearing not uniformly loaded/unstable	12	Slippery surfaces
01	Load carrying capacity	07	Jammed expansion joint	13	Flooding/channel blockage
02	Excessive deformations (deflections/rotations)	08	Pedestrian/vehicular hazard	14	Undermining of foundation
03	Continuing settlement	09	Rough riding surface	15	Unstable embankments
04	Continuing movements	10	Surface ponding	16	Other
05	Seized bearings	11	Deck drainage		

Maintenance Needs

01	Lift and Swing Bridge Maintenance	07	Repair to Structural Steel	13	Erosion Control at Bridges
02	Bridge Cleaning	08	Repair of Bridge Concrete	14	Concrete Sealing
03	Bridge Handrail Maintenance	09	Repair of Bridge Timber	15	Rout and Seal
04	Painting Steel Bridge Structures	10	Bailey Bridges - Maintenance	16	Bridge deck Drainage
05	Bridge Deck Joint Repair	11	Animal/Pest Control	17	Scaling (Loose Concrete or ACR Steel)
06	Bridge Bearing Maintenance	12	Bridge Surface Repair	18	Other

Element Data

Decks - Wearing Surface

Element Group Decks

Element Name Wearing Surface

Location

Material Asphalt

Element Type

Protection System

Length 5.20 **Width** 6.00

Height 0.00 **Count** 1.00

Total Quantity 31.20

☐ **Limited Inspection**

Environment

☐ Benign

☐ Moderate

☑ Severe

Condition Data

Units	***Excell.***	***Good***	***Fair***	***Poor***
sq. m	0.00	25.20	2.00	4.00

Comments

Narrow to wide transverse cracks and ocalized potholes.

Performance Deficiencies

None

Maintenance Needs	***Priority***	***Comments***
Bridge Surface Repair	2 yr	Surface patches
Rout and Seal	2 yr	Seal cracks

Rehab/Repair Recommendations	***Priority***	***Cost***	***Comments***

Decks - Deck Top

Element Group Decks

Element Name Deck Top

Location

Material Cast-in-place concrete

Element Type

Protection System

Length 5.20 **Width** 7.40

Height 0.00 **Count** 1.00

Total Quantity 38.48

☐ **Limited Inspection**

Environment

☐ Benign

☑ Moderate

☐ Severe

Condition Data

Units	***Excell.***	***Good***	***Fair***	***Poor***
sq. m	0.00	35.48	3.00	0.00

Comments

Estimated from soffit.

Performance Deficiencies

None

Maintenance Needs	***Priority***	***Comments***

Rehab/Repair Recommendations	***Priority***	***Cost***	***Comments***

Municipal Structure Inspection Form

Structure Number: 2064

Decks - Soffit - Thick Slab

Element Group	Decks	**Length**	7.40	**Width**	4.40
Element Name	Soffit - Thick Slab	**Height**	0.00	**Count**	1.00
Location		**Total Quantity**	32.56		
Material	Cast-in-place concrete	☐ **Limited Inspection**			
Element Type					
Protection System					

Environment

☑ Benign

☐ Moderate

☐ Severe

Condition Data	*Units*	*Excell.*	*Good*	*Fair*	*Poor*
	sq. m	0.00	27.56	2.50	2.50

Comments

Spalling and delaminations, narrow stained cracks, exposed corroded rebar, spalls on south fascia and efflorescence.

Performance Deficiencies

None

Maintenance Needs	*Priority*	*Comments*

Rehab/Repair Recommendations	*Priority*	*Cost*	*Comments*
Minor Rehab	1-5 yrs	$6,000	Patch repair

Barriers - Railing Systems

Element Group	Barriers	**Length**	19.60	**Width**	0.00
Element Name	Railing Systems	**Height**	1.00	**Count**	2.00
Location	Each Side	**Total Quantity**	39.20		
Material	Cast-in-place concrete	☐ **Limited Inspection**			
Element Type	Concrete Post and Continuous Railing				
Protection System					

Environment

☐ Benign

☐ Moderate

☑ Severe

Condition Data	*Units*	*Excell.*	*Good*	*Fair*	*Poor*
	m	0.00	31.20	4.00	4.00

Comments

5 missing spindles on the northside, narrow to wide cracks, abrasions, isolated delaminations. Missing 3 of 4 end cap pieces (decorative feature), section of barrier in SW quadrant has been fitted with steel beam guiderail.

Performance Deficiencies

Pedestrian/vehicular hazard

Maintenance Needs	*Priority*	*Comments*

Rehab/Repair Recommendations	*Priority*	*Cost*	*Comments*
Minor Rehab	Within 1yr	$9,000	Reconstruct missing spindles and repair cracks

Municipal Structure Inspection Form

Structure Number: 2064

Barriers - Railing Systems

Element Group Barriers

Element Name Railing Systems

Location South Side

Material Steel

Element Type Steel Flex Beam over other railing

Protection System Hot dip galvanizing

Length 0.00 **Width** 0.00

Height 0.00 **Count** 4.00

Total Quantity 4.00

☐ **Limited Inspection**

Environment

☐ Benign

☐ Moderate

☑ Severe

Condition Data

Units	Excell.	Good	Fair	Poor
m	0.00	4.00	0.00	0.00

Comments

Performance Deficiencies

None

Maintenance Needs *Priority* *Comments*

Rehab/Repair Recommendations *Priority* *Cost* *Comments*

Barriers - Posts

Element Group Barriers

Element Name Posts

Location South Side

Material Steel

Element Type

Protection System

Length 0.00 **Width** 0.00

Height 0.00 **Count** 1.00

Total Quantity 1.00

☐ **Limited Inspection**

Environment

☐ Benign

☐ Moderate

☑ Severe

Condition Data

Units	Excell.	Good	Fair	Poor
	0.00	1.00	0.00	0.00

Comments

Performance Deficiencies

None

Maintenance Needs *Priority* *Comments*

Rehab/Repair Recommendations *Priority* *Cost* *Comments*

Municipal Structure Inspection Form

Structure Number: 2064

Abutments - Abutment Walls

Element Group	Abutments	**Length** 7.40	**Width**
Element Name	Abutment Walls	**Height** 3.00	**Count** 2.00
Location	East and West	**Total Quantity**	44.40
Material	Cast-in-place concrete	☐ **Limited Inspection**	
Element Type		**Environment**	
Protection System		☐ Benign	

Condition Data	*Units*	*Excell.*	*Good*	*Fair*	*Poor*
	sq. m	0.00	38.40	4.00	2.00

☑ Moderate

☐ Severe

Comments

Narrow to wide cracks, light to medium scaling. Delaminations, spalls.

Performance Deficiencies	**Maintenance Needs**	***Priority***	***Comments***
None			

Rehab/Repair Recommendations	***Priority***	***Cost***	***Comments***
Minor Rehab	1-5 yrs	$4,000	Seal cracks

Abutments - Wingwalls

Element Group	Abutments	**Length** 7.00	**Width** 0.00
Element Name	Wingwalls	**Height** 3.50	**Count** 4.00
Location	All Four Quadrants	**Total Quantity**	98.00
Material	Cast-in-place concrete	☐ **Limited Inspection**	
Element Type		**Environment**	
Protection System		☐ Benign	

Condition Data	*Units*	*Excell.*	*Good*	*Fair*	*Poor*
	sq. m	0.00	90.00	4.00	4.00

☑ Moderate

☐ Severe

Comments

Narrow to wide cracks, light to severe scaling, spalls, delaminations.

Performance Deficiencies	**Maintenance Needs**	***Priority***	***Comments***
None			

Rehab/Repair Recommendations	***Priority***	***Cost***	***Comments***
Minor Rehab	1-5 yrs	$8,000	Patch repair and crack repair

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Structure Number: 2064

Foundations - Foundations (below ground level)

Element Group	Foundations	**Length** 0.00	**Width** 0.00
Element Name	Foundations (below ground level)	**Height** 0.00	**Count** 0.00
Location		**Total Quantity**	0.00
Material		☑ **Limited Inspection**	
Element Type		**Environment**	
Protection System		☑ Benign	
		☐ Moderate	
		☐ Severe	

Condition Data	*Units*	*Excell.*	*Good*	*Fair*	*Poor*

Comments

Performance Deficiencies

None

Maintenance Needs *Priority* *Comments*

Rehab/Repair Recommendations *Priority* *Cost* *Comments*

Embankments & Streams - Streams & Waterways

Element Group	Embankments & Streams	**Length** 0.00	**Width** 0.00
Element Name	Streams & Waterways	**Height** 0.00	**Count** 0.00
Location	Through Bridge	**Total Quantity**	100.00
Material	Cast-in-place concrete	☐ **Limited Inspection**	
Element Type		**Environment**	
Protection System		☑ Benign	
		☐ Moderate	
		☐ Severe	

Condition Data	*Units*	*Excell.*	*Good*	*Fair*	*Poor*
	All	0.00	100.00	0.00	0.00

Comments

Dam located approximately 15m upstream.

Performance Deficiencies

None

Maintenance Needs *Priority* *Comments*

Rehab/Repair Recommendations *Priority* *Cost* *Comments*

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Embankments & Streams - Embankments

Element Group	Embankments & Streams	**Length**	0.00	**Width**	0.00
Element Name	Embankments	**Height**	0.00	**Count**	4.00
Location	All Four Quadrants			**Total Quantity**	4.00
Material		☐ **Limited Inspection**			
Element Type					
Protection System					

Environment

☐ Benign

☑ Moderate

☐ Severe

Condition Data	*Units*	*Excell.*	*Good*	*Fair*	*Poor*
	Each	0.00	4.00	0.00	0.00

Comments

Performance Deficiencies	**Maintenance Needs**	*Priority*	*Comments*
None			

Rehab/Repair Recommendations	*Priority*	*Cost*	*Comments*

Embankments & Streams - Slope Protection

Element Group	Embankments & Streams	**Length**	0.00	**Width**	0.00
Element Name	Slope Protection	**Height**	0.00	**Count**	4.00
Location	All Four Quadrants			**Total Quantity**	4.00
Material	Vegetation	☐ **Limited Inspection**			
Element Type					
Protection System					

Environment

☐ Benign

☑ Moderate

☐ Severe

Condition Data	*Units*	*Excell.*	*Good*	*Fair*	*Poor*
	Each	0.00	4.00	0.00	0.00

Comments

Performance Deficiencies	**Maintenance Needs**	*Priority*	*Comments*
None			

Rehab/Repair Recommendations	*Priority*	*Cost*	*Comments*

Municipal Structure Inspection Form

Structure Number: 2064

Accessories - Signs

Element Group	Accessories	**Length**	0.00	**Width**	0.00
Element Name	Signs	**Height**	0.00	**Count**	4.00
Location	All Four Quadrants			**Total Quantity**	4.00
Material		☐ **Limited Inspection**			
Element Type	Hazard Markers	**Environment**			
Protection System		☐ Benign			

Condition Data

Units	*Excell.*	*Good*	*Fair*	*Poor*
Each	0.00	3.00	0.00	1.00

☐ Moderate
☑ Severe

Comments

Marker at SW quadrant missing.

Performance Deficiencies	**Maintenance Needs**	***Priority***	***Comments***
Pedestrian/vehicular hazard	Other	1 yr	Replace hazard marker.

Rehab/Repair Recommendations	***Priority***	***Cost***	***Comments***

Approaches - Wearing Surface

Element Group	Approaches	**Length**	6.00	**Width**	6.00
Element Name	Wearing Surface	**Height**	0.00	**Count**	2.00
Location	Each End			**Total Quantity**	72.00
Material	Asphalt	☐ **Limited Inspection**			
Element Type		**Environment**			
Protection System		☐ Benign			

Condition Data

Units	*Excell.*	*Good*	*Fair*	*Poor*
sq. m	0.00	68.00	2.00	2.00

☐ Moderate
☑ Severe

Comments

Narrow to medium longitudinal transverse cracks

Performance Deficiencies	**Maintenance Needs**	***Priority***	***Comments***
None	Rout and Seal	2 yr	Seal Cracks

Rehab/Repair Recommendations	***Priority***	***Cost***	***Comments***

Municipal Structure Inspection Form

Structure Number: 2064

Repair/Rehabilitation Required

Element Group	Element	Repair/Rehabilitation	Priority	Cost
Abutments	Abutment Walls	Minor Rehab	1-5 yrs	$4,000
Barriers	Railing Systems	Minor Rehab	Within 1	$9,000
Decks	Soffit - Thick Slab	Minor Rehab	1-5 yrs	$6,000
Abutments	Wingwalls	Minor Rehab	1-5 yrs	$8,000
			Total Repair/Rehabilitation Cost	**$27,000**

Associated Work

	Comments		Estimated Cost
Approaches			$0
Detours			$0
Traffic Control			$10,000
Utilities			$0
Right-of-Way			$0
Environmental Study			$0
Other	Engineering		$9,000
Contingencies		10 **%**	** $5,000
Engineering		**%**	** $0

** If based on a percentage calculated values rounded-up to the nearest thousand dollars.

Total Associated Work Cost	**$24,000**
Total Repair/Rehabilitation Cost	**$27,000**
Total Cost	**$51,000**
Town of Erin Share @ 100%	$51,000

Justification

Looking east at structure.

Looking upstream.

Looking downstream.

Narrow to wide cracks on wearing surface.

Missing spindles on barrier.

Wide crack on barrier.

Delaminations, wide cracks on barrier post.

North elevation.

South elevation.

Spalls, wide crack on wingwall.

Spalls, delamination on wingwall and fasica.

Spalls, exposed corroded rebar on fasica.

Typical soffit.

Delamination and efflorescence on soffit.

Delamination, spalling and scaling on abutment.

Wide crack on abutment.

Delamination, spalling and exposed corroded rebar on soffit.