Appendix 3 | Aquatic Habitat Assessment and Fish Community Results

Creek morphology and aquatic habitat conditions of the two reaches of Falcon Creek in the study area.

Reach 1					
	Riffle	**Run**	**Pool**	**Flat**	**Culvert**
Substrates[1]	Co, Gr, Sa	Bo, Co, Gr, Sa, Si	Co, Gr, Sa, Si	N/A	Si
Approximate mean depth (cm)	1.5	10.5	20	N/A	1.5
Approximate width wetted (m)	1.75	1.5	2	N/A	1.5
Approximate mean bankfull width (m)	6	5.3	6	N/A	N/A
Approximate mean bankfull depth (cm)	85	62	85	N/A	N/A
In stream cover	In stream and overhanging vegetation, cobble, boulders, undercut banks.				
In stream cover (% surface area)	Approximately 30% from overhanging vegetation, 1% from undercut banks, 15% from woody/organic debris, and 15% rocks/boulders.				
Fish migratory obstructions	Woody/organic debris, boulders, close-bottom culverts / grate at low flow.				
Reach 2					
	Riffle	**Run**	**Pool**	**Flat**	**Culvert**
Substrates[1]	Co, Gr, Sa, Si	Bo, Co, Gr, Sa, Si	Co, Gr, Sa, Si	Si, Sa	Si
Approximate mean depth (cm)	1.5	10.5	20	10	12
Approximate width wetted (m)	1.75	1.5	2	2.5	1.5
Approximate mean bankfull width (m)	6	5.3	6	6	N/A
Approximate mean bankfull depth (cm)	85	62	85	85	N/A
In stream cover	In stream and overhanging vegetation, cobble, boulders, undercut banks.				
In stream cover (% surface area)	Approximately 30% from overhanging vegetation, 1% from undercut banks, 20% from woody/organic debris, and 20% rocks/boulders.				
Fish migratory obstructions	Woody/organic debris, boulders, close-bottom culverts / grate at low flow.				

[1]Substrates: Co = cobble, Gr = gravel, Sa = sand, Si = silt. Underlined substrate is dominant.

Reach #1

Aquatic Habitat Assessment

Project Name / #: 22-1288 Falcon Creek **Date:** 7/7/22 **Time:** 7:00am **Photos:** P1-4, SDSR

Watercourse Name: Falcon Creek **Location:** ON **Length:** 246m **Observers:** DB, CT

~~Zone:~~ ~~Easting:~~ Starting Coordinates: 43.318853°N, -79.840942°W ~~Northing:~~ **Water Temp:** 18°C **Air Temp:** 20°C **% Overhead Cover:** 30%

Section Type and Morphology

Type: (check all that apply	Stream / River	Channelized	Permanent	Intermittent	Ephemeral	Associated Wetland:
	☑	☐	☑	☐	☐	

Total Section Length:	Current Velocity & Gradient:	Comments / Description
152 m	N/A	South of Enfield Rd, running until Dorset Ave

Sub-Section(s)	Run ☑	Pool ☑	Riffle ☑	Flats ☐	Culvert ☐	Other ☐
% Area	45%	9%	45%		1%	
Mean Depth Wetted (m)	10.5cm	20cm	1-2cm		1-2cm	
Mean Width Wetted (m)	67cm, 120cm, 1.4m, 2m	2cm	2m 1.5m		1.5cm	
Mean Bankfull width (m)	5.9m, 7m,	6m	6m		N/A	
Mean Bankfull Depth (m)	44cm, 89cm	85cm	65cm		N/A	
Substrate (%)	Co:25% Sa:30% Bo:1% Gr:10% Si:30%	Si:40% Sa:10% Gr:40% Co:10%	Gravel:45% Cobble 45% Sa:10%		Si:100%	

Comments:

Banks / Stability

Bank Averages	Stability	Height (m)	Slope (gradual, steep, vertical)	Natural/Manmade/ Stabilized	Erosion?	Riparian Vegetation
Left Upstream Bank	Poor	1m	gradual	partial stabilization wall at south end, Boulders.	yes	ACENEG, JUGNIG, ACEPLAT, Tart. honeysuckle, grapevine, elevated, burdock, DSR,
Right Upstream Bank	Poor	1-3m	Steep, gradual	partial stabilization wall at south end, boulders	severe	American elm, purple loosestrife, American Basswood, Virginia creeper

Habitat / Vegetation

Instream Cover	None	Sparse	Moderate	Dense	% Surface Area	Comments:
Undercut Banks		✓			1%	
Overhanging Vegetation			✓		30%	
Instream Vegetation	✓				0%	
Woody / Organic Debris			✓		15%	
Rocks/Boulders			✓		15%	

Aquatic Veg Type (%):	Submergent:	Floating:	Emergent:	None
Predominant Species:	N/A	N/A	N/A	Some bars with temporary vegetation

Migratory Obstructions:	None	Seasonal: woody debris, boulders, grate at south culvert	Permanent:
Critical Habitat:	Spawning: N/A	Groundwater: N/A	Other: young of year seen, likely spawning habitat

Enhancement Opportunities / Fish Observed / Comments

Stabilize bank, remove garbage, remove debris, remove invasives, install open bottom culvert

Reach #1

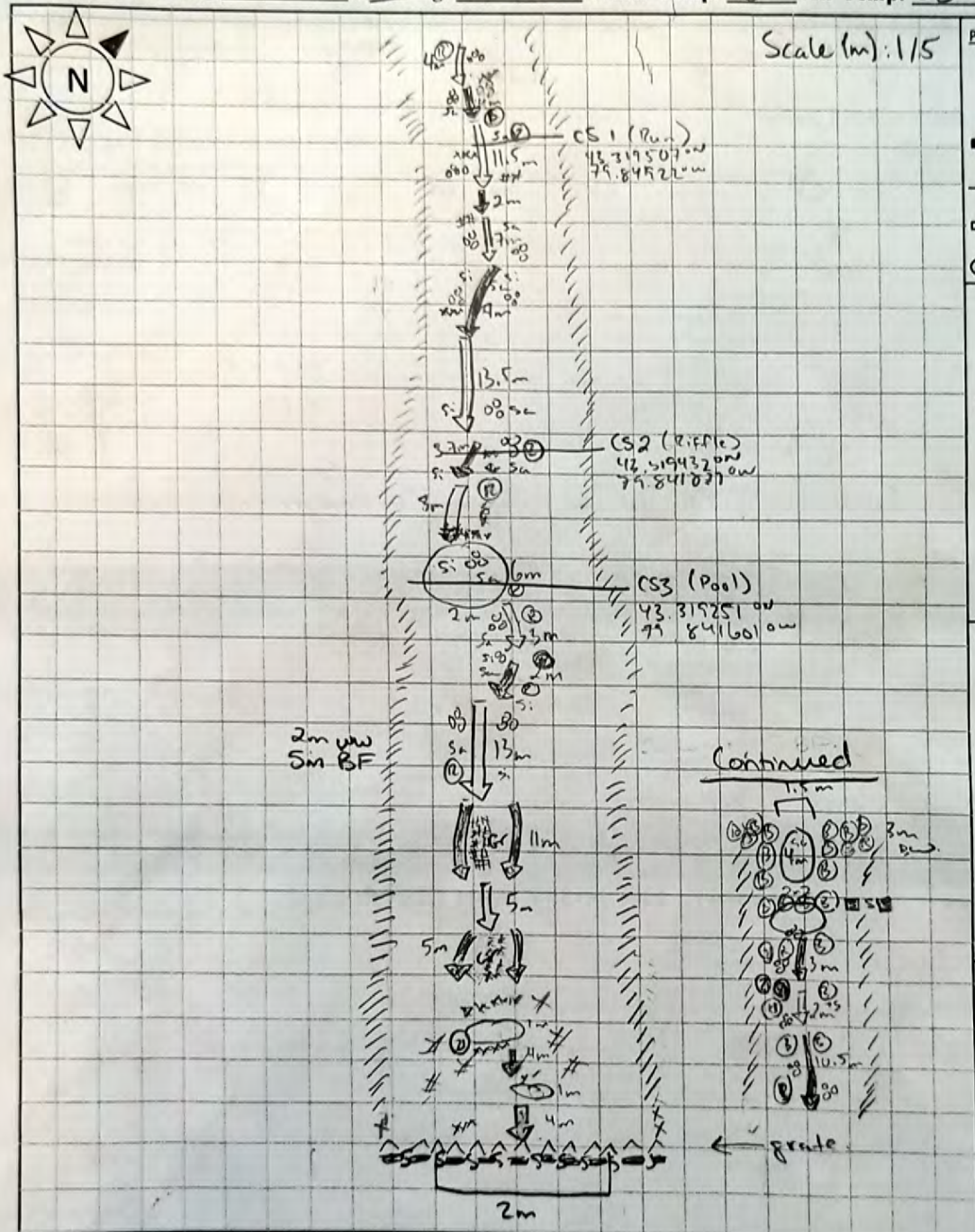
Aquatic Habitat Assessment

Project Name / #: 22-1288 Falcon Creek **Date:** 7/7/22 **Time:** 7:00am **Photos:** Yes.

Watercourse Name: Falcon Creek **Location:** ON **Section Length:** 152m **Observers:** DB, CT

Starting Coordinates: 43.318853°N, -79.840942°W

~~**Zone:**~~ ~~**Easting:**~~ ~~**Northing:**~~ **Water Temp:** 18°C **Air Temp:** 20°C **% Overhead Cover:** 30



Physical Characteristics:
- 10d — Depth (cm)
- 6w — Width (m)
- — Riffle
- — Flat
- — Run/Glide
- — Pool

Substrate:
- — Island/Bar
- — Fine Substrate
- Sa, Si, M — Sand, Silt, Muck
- #### — Gravel Substrate
- — Cobble
- Sh — Shale
- (B) — Boulder
- **** — Debris

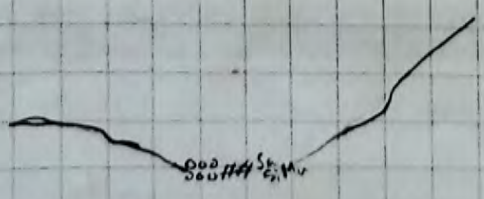
Vegetation:
- CT — Cattail
- RC — Reed Canary
- SV — Submergent Vegetation
- FV — Floating Vegetation
- EV — Emergent Vegetation
- Gr — Grasses
- (R) — Riparian Tree
- — Forested Area

Banks:
- /////// — Eroded Bank
- xxxxxxx — Riprap/other Stabilization
- — — — — Undercut Bank
- TH — Thatch

Barriers:
- — Instream Log/Tree
- ^^^^^^ — Dam/Weir/Obstruction
- — Barrier to fish movement
- S — Seasonal Barrier
- -X- -X- — Fenceline
- — Culvert

Habitat Indicators:
- Fe — Iron Staining
- — Seep/Spring
- (W) — Watercress

Profile: Horizontal Scale: | Vertical Scale: |



Reach #1

Fish Capture Record

Page: 1 of 1

Project Name: 22-1288 Falcon Creek **Project #:** 22-1288 **Date:** 7/7/22 **Time:** 11:15am

Water Temp: 19°C **Air Temp:** 23°C **Waterbody Name:** Falcon Creek **Waterbody Type:** Stream

Collectors: DB, CT **~~UTM Zone~~** Starting (coordinates: 43.318853°N, -79.840942°W) **~~Easting~~** **~~Northing~~**

Gear

ELECTROFISHER: ☒

Length (m) or Area (m^2): 152 m	Settings: 35 Frequency, 225 volt, 5DC	Seconds: 534

NETS AND TRAPS: ☐

MINNOW TRAP: ☐ # deployed: _____	DIP NET: ☐ SEINE: ☐ Other: ☐ Specify: _____	# deployed: _____
# Hauls (Seine / Dip): _____	Set Time (Minnow / Other): _____	Pull Time (Minnow / Other): _____

Sample Collection Summary

Fish Euthanized? Yes ☐ No ☒ Total # N/A	Fish Relocated? Yes ☐ No ☒ Total # _____
Species / Method: Electrofishing	Species: Creek chub, Black-nose dace
	Release Location (UTM): 433193174, -79.84177268

Capture Information

No.	Species	Length (F= Fork; T = Total) mm		Euthanized or Relocated?	Method or Location	Comments
		Min	Max.			
2.	Creek Chub	40 mm	123m	N/A	Electrofishing	Found in pool feature Adults.
6	Western Blacknose Dace	35mm	55mm	Photos	Electrofishing	Adults
40	Creek Chub & Western Blacknose Dace	8mm	15mm	Photos	Electrofishing.	Young of the year
35						Baby crayfish released

Reach #2

Aquatic Habitat Assessment

Project Name / #: 22-1288 Falcon Creek **Date:** 7/7/22 **Time:** 10:30 am **Photos:** Yes

Watercourse Name: Falcon Creek **Location:** ON **Length:** 246m **Observers:** DB, CT

Start Coordinates: 43.319674°N, -79.842795°W

Zone: ~~Zone:~~ **Easting:** ~~Easting:~~ **Northing:** ~~Northing:~~ **Water Temp:** 16°C **Air Temp:** 22°C **% Overhead Cover:** 40%

Section Type and Morphology

Type: (check all that apply)	Stream / River	Channelized	Permanent	Intermittent	Ephemeral	Associated Wetland:
	☑	☐	☑	☐	☐	

Total Section Length:	Current Velocity & Gradient:	Comments / Description
94 m	N/A.	North of Enfield Rd, running NW to tracks

Sub-Section(s)	Run ☑	Pool ☑	Riffle ☐	Flats ☑	Culvert ☑	Other ☐
% Area	5%.	5%.	60%.	5%.	25%	
Mean Depth Wetted (m)	10.5cm	21.4	4cm	10cm	12 cm	
Mean Width Wetted (m)	1.75m	1.5m	1.2 m	25m	1.5m	
Mean Bankfull width (m)	6m	4.5m	6.5m	6m	N/A.	
Mean Bankfull Depth (m)	1m	1m	85 cm	85cm	N/A	
Substrate (%)	Bo: 15%. Co: 35%. Sa: 25 Si: 25	Gr: 30% Sa: 30% Si: 30% Co: 10%.	Gr: 45%. Co: 45%. Sa: 5%. Si: 5%	Si: 40%. Sa: 60%.	Si: 100%	

Comments:

Banks / Stability

Bank Averages	Stability	Height (m)	Slope (gradual, steep, vertical)	Natural/Manmade/ Stabilized	Erosion?	Riparian Vegetation
Left Upstream Bank	moderately unstable	1m	gradual,	Natural	yes	Hawthorn sp., poison ivy, Poltsfoot, burdock, Goldenrod,
Right Upstream Bank	moderately unstable	1-2m	steep.	natural, manmade	yes.	manitoba maple, willow sp, Locust, Virginia creeper

Habitat / Vegetation

Instream Cover	None	Sparse	Moderate	Dense	% Surface Area	Comments:
Undercut Banks		✓			1%.	Plenty of instream woody debris. Boulders throughout and along bank for stabilization
Overhanging Vegetation			✓		40%.	
Instream Vegetation	✓				0%.	
Woody / Organic Debris			✓		20%.	
Rocks/Boulders			✓		20%.	

Aquatic Veg Type (%):	Submergent:	Floating:	Emergent:	None
Predominant Species:				✓

Migratory Obstructions:	None	Seasonal: woody debris, culverts	Permanent:
Critical Habitat:	Spawning:	Groundwater:	Other: lining of some areas

Enhancement Opportunities / Fish Observed / Comments

Remove invasive species, stabilize banks, remove garbage, remove impeding debris, install open bottom culvert.

Reach #2

Page: 2 of 2

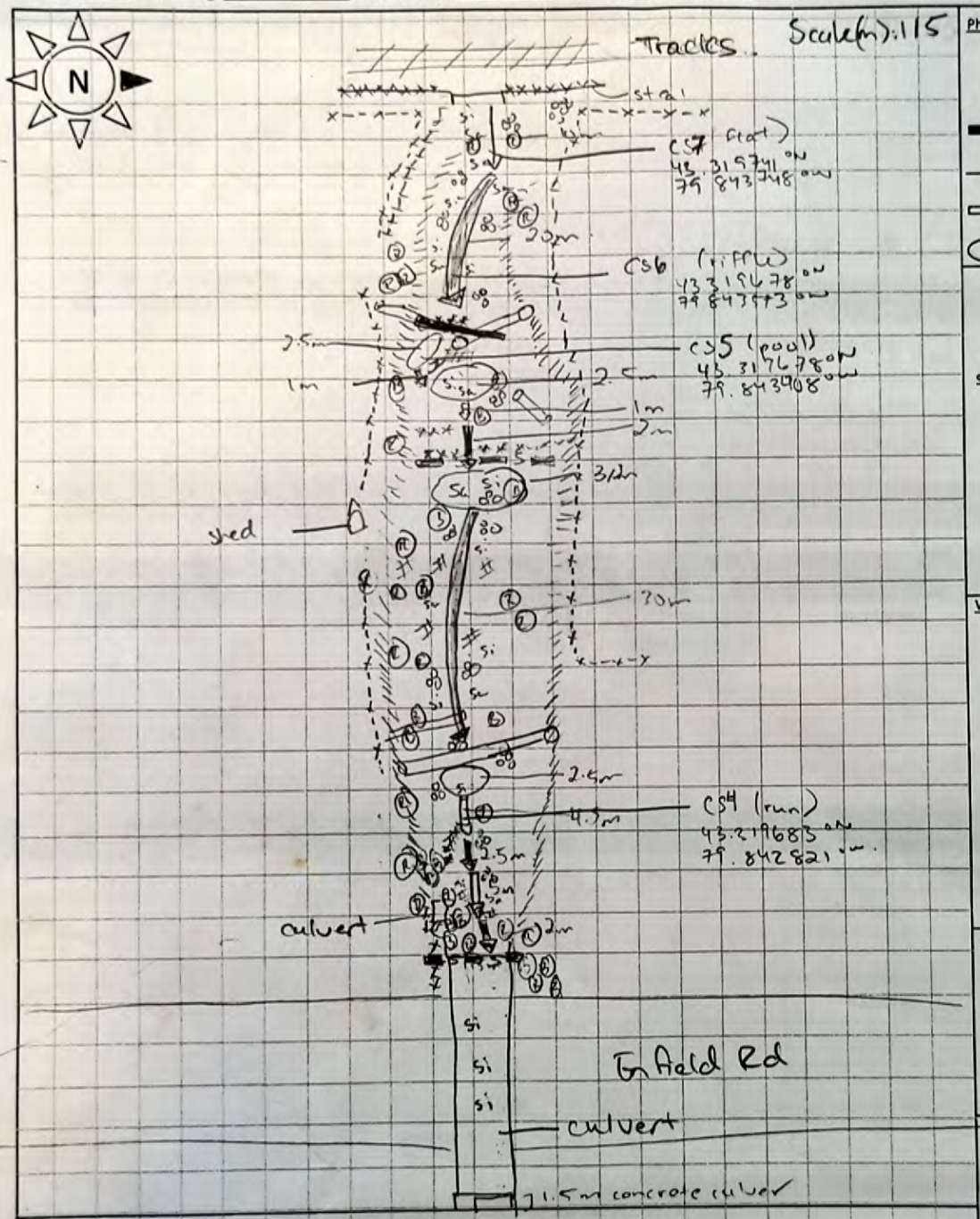
Aquatic Habitat Assessment

Project Name / #: 22-1288 Falcon Creek **Date:** 7/7/22 **Time:** 10:30am **Photos:** Yes

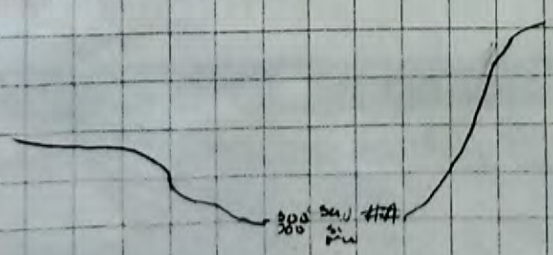
Watercourse Name: Falcon Creek **Location:** ON **Section Length:** 125m **Observers:** DB, CT

Start Coordinates: 43.319674°N -79.842795°W

~~Zone:~~ ~~Easting:~~ ~~Northing:~~ **Water Temp:** 16°C **Air Temp:** 22°C **% Overhead Cover:**



Profile: **Horizontal Scale:** 5m **Vertical Scale:** 1m



Physical Characteristics:
- 10d — Depth (cm)
- 6w — Width (m)
- — Riffle
- — Flat
- — Run/Glide
- — Pool

Substrate:
- — Island/Bar
- — Fine Substrate
- Sa, Si, M — Sand, Silt, Muck
- #### — Gravel Substrate
- — Cobble
- Sh — Shale
- (B) — Boulder
- **** — Debris

Vegetation:
- CT — Cattail
- RC — Reed Canary
- SV — Submergent Vegetation
- FV — Floating Vegetation
- EV — Emergent Vegetation
- Gr — Grasses
- (R) — Riparian Tree
- — Forested Area

Banks:
- /////// — Eroded Bank
- xxxxxxx — Riprap/other Stabilization
- — — — — Undercut Bank
- TH — Thatch

Barriers:
- — Instream Log/Tree
- ^^^^^^ — Dam/Weir/Obstruction
- — Barrier to fish movement
- S — Seasonal Barrier
- -X- - -X- — Fenceline
- — Culvert

Habitat Indicators:
- Fe — Iron Staining
- — Seep/Spring
- (W) — Watercress

Reach #2

Fish Capture Record

Page: 1 of 1

Project Name: 22-1288 Falcon Creek Project #: 22-1288 Date: 7/7/22 Time: 12:30pm

Water Temp: 19°C Air Temp: 23°C Waterbody Name: Falcon Creek Waterbody Type: Stream

Collectors: DB, CT ~~UTM: Zone~~ Coordinates: 43.319674°N, -79.842795°W ~~Easting~~ ~~Northing~~

Gear		
ELECTROFISHER: ☒		
Length (m) or Area (m^2): 94m	Settings: 35 Frequency 225 volt 5DC	Seconds: 762.
NETS AND TRAPS: ☐		
MINNOW TRAP: ☐ # deployed: _____	DIP NET: ☐ SEINE: ☐ Other: ☐ Specify: _____	# deployed: _____
# Hauls (Seine / Dip): _____	Set Time (Minnow / Other): _____	Pull Time (Minnow / Other): _____

Sample Collection Summary	
Fish Euthanized? Yes ☐ No ☒ Total # _____	Fish Relocated? Yes ☐ No ☒ Total # _____
Species / Method: Electrofishing.	Species: Creek Chub, Black-nose dace.
	Release Location (UTM): 43.319749 94, -79 843452

Capture Information

No.	Species	Length (F= Fork; T = Total) mm		Euthanized or Relocated?	Method or Location	Comments
		Min	Max.			
5	Creek Chub	60mm.	110mm	Photo	Electrofisher	Adult
11	Western Blacknose Dace	40mm	55mm	Photo	Electrofishing	Adult
70	Blacknose Dace Creek Chub	8mm	15mm	N/A	Electrofishing.	Young of year

Historical Occurrences of fish species in Falcon Creek. Data provided by Conservation Halton, surveys done between 1982-2016

Station Number	Survey Date	Common Name	Latin Name	Number of Fish	Easting	Northing	Collectors	Station Location Notes
FAL-1	3/31/1982	Bluntnose Minnow	*Pimephales notatus*	56	594907.161	4795594.335	Proctor and Redfern Limited	Sample taken at mouth
FAL-1	3/31/1982	Fathead Minnow	*Pimephales promelas*	6	594907.161	4795594.335	Proctor and Redfern Limited	Sample taken at mouth
FAL-1	3/31/1982	Mimic Shiner	*Notropis volucellus*	3	594907.161	4795594.335	Proctor and Redfern Limited	Sample taken at mouth
FAL-1	3/31/1982	Spottail Shiner	*Notropis hudsonius*	16	594907.161	4795594.335	Proctor and Redfern Limited	Sample taken at mouth
FAL-2	8/14/2001	Minnows	*Leuciscidae*	1	594922.846	4795690.769	S. Watson-Leung (Conservation Halton)	Downstream of Northshore Boulevard, east of Eagle Drive
FAL-2	8/17/2001	No fish	*No fish*		594922.846	4795690.769	B. Morrison, S. Leung, R. Kettle (Conservation Halton)	Downstream of Northshore Boulevard, east of Eagle Drive
FAL-2	8/13/2002	Common Carp	*Cyprinus carpio*	1	594922.846	4795690.769	D. Featherstone (Conservation Halton)	Downstream of Northshore Boulevard, east of Eagle Drive
FAL-3	8/17/2001	No fish	*No fish*		594350.100	4796435.970	S. Leung, B. Morrison, R. Kettle (Conservation Halton)	Downstream of Townsend Avenue between Falcon Avenue and Glen Acres Court
FAL-4	12/31/1997	Species unknown	*Species unknown*		593750.820	4796972.212	McCormick Rankin, GM Sernas &Associates, LGL	Downstream of gabion structure south of CNR tracks
FAL-5	12/31/1997	Species unknown	*Species unknown*		593433.211	4797080.364	McCormick Rankin, GM Sernas &Associates, LGL	Isolated pools within wooded area between 403 and CNR tracks
FAL-6	7/28/2008	Creek Chub	*Semotilus atromaculatus*	6	594908.557	4795705.669	R.Martens, K.Rundle, S.Hogg (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	7/28/2008	Minnows	*Leuciscidae*	1	594908.557	4795705.669	R.Martens, K.Rundle, S.Hogg (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	7/28/2008	White Sucker	*Catostomus commersoni*	1	594908.557	4795705.669	R.Martens, K.Rundle, S.Hogg (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	6/2/2010	Creek Chub	*Semotilus atromaculatus*	47	594908.557	4795705.669	K. Rundle, R. Martens, D. Necula, A. Dunn (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	7/18/2012	No fish	*No fish*		594908.557	4795705.669	R. Martens, R. Gaspardy, EGM (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	7/9/2014	Creek Chub	*Semotilus atromaculatus*	21	594908.557	4795705.669	A. Dunn, K. Ootjers (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	7/9/2014	Western Blacknose Dace	*Rhinichthys obtusus*	1	594908.557	4795705.669	A. Dunn, K. Ootjers (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	7/9/2014	White Sucker	*Catostomus commersoni*	2	594908.557	4795705.669	A. Dunn, K. Ootjers (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	4/21/2016	Goldfish	*Carassius auratus*	1	594908.557	4795705.669	L. Halyk, K. Ootjers (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	7/26/2016	Creek Chub	*Semotilus atromaculatus*	3	594908.557	4795705.669	L. Halyk, K. Ootjers, J. Vu (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	7/26/2016	White Sucker	*Catostomus commersoni*	17	594908.557	4795705.669	L. Halyk, K. Ootjers, J. Vu (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.

Station Number	Survey Date	Common Name	Latin Name	Number of Fish	Easting	Northing	Collectors	Station Location Notes
FAL-6	4/9/2018	Creek Chub	*Semotilus atromaculatus*	1	594908.557	4795705.669	K. Ootjers, A. Dunn (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	7/6/2018	Creek Chub	*Semotilus atromaculatus*	48	594908.557	4795705.669	K. Ootjers, S. Ewert, S. Burr (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	7/6/2018	Threespine Stickleback	*Gasterosteus aculeatus*	1	594908.557	4795705.669	K. Ootjers, S. Ewert, S. Burr (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	7/6/2018	Western Blacknose Dace	*Rhinichthys obtusus*	2	594908.557	4795705.669	K. Ootjers, S. Ewert, S. Burr (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.
FAL-6	7/6/2018	White Sucker	*Catostomus commersoni*	7	594908.557	4795705.669	K. Ootjers, S. Ewert, S. Burr (Conservation Halton)	Adjacent to Burlington Golf and Country Club, on west side, upstream of Northshore Boulevard.

Photographs of Falcon Creek during surveys on July 7, 2022.


Reach 1: Downstream grate/culvert with vertical wall


Reach 1: Overhanging vegetation and in-stream debris


Reach 1: Erosion


Reach 1: Upstream culvert at Enfield Rd. with boulders on both banks

Photographs of Falcon Creek during surveys on July 7, 2022.


Reach 2: Downstream culvert and stabilization wall


Reach 2: Debris fish barrier


Reach 2: Riffle (facing downstream)


Reach 2: Upstream culvert

Appendix 4 | Species Lists

Plant List

Scientific Name	Common Name	Introduced	G Rank	S Rank	COSEWIC	SARO	SARA	Halton (2006)
Acer negundo	Manitoba Maple		G5	S5				
Acer platanoides	Norway Maple	TRUE	GNR	SNA				
Acer saccharinum	Silver Maple		G5	S5				
Acer saccharum	Sugar Maple		G5	S5				
Alisma subcordatum	Southern Water-plantain		G5	S4?				
Alliaria petiolata	Garlic Mustard	TRUE	GNR	SE5				
Allium canadense var. canadense	Canada Garlic		G5T5	S5				HU
Amphicarpaea bracteata	American Hog Peanut		G5	S5				
Arctium minus	Common Burdock	TRUE	GNR	SNA				
Arisaema triphyllum subsp. triphyllum	Jack-in-the-pulpit		G5T5	S5				
Bidens frondosa	Devil's Beggarticks		G5	S5				
Circaea canadensis subsp. canadensis	Canada Enchanter's Nightshade		G5TNR	S5				
Cornus sericea	Red-osier Dogwood		G5	S5				
Crataegus sp.	Hawthorn		GNR	S?				
Cryptotaenia canadensis	Canada Honewort		G5	S5				
Daucus carota	Wild Carrot	TRUE	GNR	SNA				
Elaeagnus umbellata	Autum Olive	TRUE	GNR	SNA				
Erigeron annuus	Annual Fleabane		G5	S5				
Eutrochium maculatum	Spotted Joe Pye Weed		G5	S5				
Fraxinus pennsylvanica	Red Ash		G5	S4				
Geranium robertianum	Herb-Robert		G5	S5				
Geum sp.	Geum		GNR	S?				
Hesperis matronalis	Dame's Rocket	TRUE	G4G5	SNA				
Impatiens capensis	Spotted Jewelweed		G5	S5				
Juglans nigra	Black Walnut		G5	S4?				
Juniperus virginiana var. virginiana	Eastern Red Cedar		G5T5	S5				HU
Lapsana communis	Common Nipplewort	TRUE	GNR	SNA				
Lonicera tatarica	Tartarian Honeysuckle	TRUE	GNR	SNA				
Lythrum salicaria	Purple Loosestrife	TRUE	G5	SNA				
Morus alba	White Mulberry	TRUE	GNR	SNA				
Parthenocissus quinquefolia	Virginia Creeper		G5	S4?				
Phalaris arundinacea	Reed Canarygrass		G5	S5				
Pilea pumila	Canada Clearweed		G5	S5				
Plantago major	Common Plantain	TRUE	G5	SNA				
Poa pratensis	Kentucky Bluegrass		G5	S5				
Reynoutria japonica var. japonica	Japanese Knotweed	TRUE	GNRTNR	SNA				
Rhamnus cathartica	European Buckthorn	TRUE	GNR	SNA				
Rhus typhina	Staghorn Sumac		G5	S5				
Ribes rubrum	European Red Currant	TRUE	G4G5	SNA				
Robinia pseudoacacia	Black Locust	TRUE	G5	SNA				
Rosa multiflora	Multiflora Rose	TRUE	GNR	SNA				
Rumex crispus	Curled Dock	TRUE	GNR	SNA				
Salix fragilis	Crack Willow	TRUE	GNR	SNA				
Solanum dulcamara	Bittersweet Nightshade	TRUE	GNR	SNA				
Solidago flexicaulis	Zigzag Goldenrod		G5	S5				

Plant List

Scientific Name	Common Name	Introduced	G Rank	S Rank	COSEWIC	SARO	SARA	Halton (2006)
Solidago sp.	Goldenrod		GNR	S?				
Symphyotrichum novae-angliae	New England Aster		G5	S5				
Syringa vulgaris	Common Lilac	TRUE	GNR	SNA				
Thuja occidentalis	Eastern White Cedar		G5	S5				
Tilia americana	American Basswood		G5	S5				
Toxicodendron radicans var. radicans	Eastern Poison Ivy		G5T5	S5				
Tussilago farfara	Coltsfoot	TRUE	GNR	SNA				
Ulmus americana	White Elm		G4	S5				
Urtica dioica	Stinging Nettle		G5	S5				
Vinca minor	Lesser Periwinkle	TRUE	GNR	SNA				
Vitis riparia	Riverbank Grape		G5	S5				

Wildlife List

Taxa	Family	Scientific Name	Common Name	Exotic	G Rank	S Rank	Bird Breeding	COSEWIC Status	SARA	SARO	Area Sensitive	Halton (2006)
Amphibian	Ranidae	*Lithobates clamitans*	Green Frog		G5	S5						
Bird	Accipitridae	*Accipiter cooperii*	Cooper's Hawk		G5	S4	O	NAR		NAR	TRUE	HU
Bird	Icteridae	*Agelaius phoeniceus*	Red-winged Blackbird		G5	S4	PO					
Bird	Paridae	*Baeolophus bicolor*	Tufted Titmouse		G5	S4	PO				TRUE	HU
Bird	Cardinalidae	*Cardinalis cardinalis*	Northern Cardinal		G5	S5	PO					
Bird	Apodidae	*Chaetura pelagica*	Chimney Swift		THR	S4B S4N	PO	THR	THR	THR		HU
Bird	Corvidae	*Corvus brachyrhynchos*	American Crow		G5	S5B	O					
Bird	Corvidae	*Cyanocitta cristata*	Blue Jay		G5	S5	PO					
Bird	Mimidae	*Dumetella carolinensis*	Gray Catbird		G5	S4B	PO					
Bird	Hirundinidae	*Hirundo rustica*	Barn Swallow		G5	S5B	O	SC	THR	SC		
Bird	Icteridae	*Icterus galbula*	Baltimore Oriole		G5	S4B	PO					
Bird	Laridae	*Larus delawarensis*	Ring-billed Gull		G5	S5B S4N	O					
Bird	Picidae	*Melanerpes carolinus*	Red-bellied Woodpecker		G5	S4	O					HU
Bird	Passerellidae	*Melospiza melodia*	Song Sparrow		G5	S5B	PO					
Bird	Icteridae	*Molothrus ater*	Brown-headed Cowbird		G5	S4B	PO					
Bird	Passeridae	*Passer domesticus*	House Sparrow	SE	G5	SNA	PR					
Bird	Picidae	*Picoides pubescens*	Downy Woodpecker		G5	S5	O					
Bird	Paridae	*Poecile atricapillus*	Black-capped Chickadee		G5	S5	PO					
Bird	Icteridae	*Quiscalus quiscula*	Common Grackle		G5	S5B	C					
Bird	Sittidae	*Sitta canadensis*	Red-breasted Nuthatch		G5	S5	O				TRUE	HU
Bird	Fringillidae	*Spinus tristis*	American Goldfinch		G5	S5B	PO					
Bird	Passerellidae	*Spizella passerina*	Chipping Sparrow		G5	S5B	PO					
Bird	Sturnidae	*Sturnus vulgaris*	European Starling	SE	G5	SNA	PO					
Bird	Troglodytidae	*Troglodytes aedon*	House Wren		G5	S5B	PO					
Bird	Turdidae	*Turdus migratorius*	American Robin		G5	S5B	PO					
Bird	Columbidae	*Zenaida macroura*	Mourning Dove		G5	S5	PO					
Insect	Calopterygidae	*Calopteryx maculata*	Ebony Jewelwing		G5	S5						
Mammal	Vespertilionidae	*Eptesicus fuscus*	Big Brown Bat		G5	S4						
Mammal	Vespertilionidae	*Lasiurus borealis*	Eastern Red Bat		G3G4	S4						
Mammal	Vespertilionidae	*Lasiurus cinereus*	Hoary Bat		G3G4	S4						
Mammal	Procyonidae	*Procyon lotor*	Raccoon		G5	S5						
Mammal	Sciuridae	*Sciurus carolinensis*	Eastern Gray Squirrel		G5	S5						
Mammal	Sciuridae	*Tamias striatus*	Eastern Chipmunk		G5	S5						
Mammal	Sciuridae	*Tamiasciurus hudsonicus*	Red Squirrel		G5	S5						

Appendix 5 | Bat Habitat Suitability Assessment

Table 6: Bat Habitat Suitability Assessment

Tree Point (#)	Common Name	Scientific Name	DBH (cm)	Height Class[1]	Decay Class (#)[2]	Snag Attribute					Other Snag (within 10m)	Location		Notes
						Cavity	Cavity Height (m)	Loose Bark	Crack	Knot Hole		x	y	
1	Siberian Elm	*Ulmus pumila*	66	Co-dominant	1	Yes	14	No	Yes	Yes	Yes	-79.8409107	43.3187971	
2	Siberian Elm	*Ulmus pumila*	29.7, 58.3	Co-dominant	2	Yes	6	No	No	Yes	Yes	-79.8409577	43.3189029	
3	Siberian Elm	*Ulmus pumila*	36.3, 26.1, 23.3	Intermediate	2	Yes	6	No	Yes	Yes	Yes	-79.8412568	43.3190893	
4	Elm sp.	*Ulmus sp.*	58.3	Co-dominant	2	Yes	13	Yes	No	Yes	Yes	-79.8414878	43.3191667	No nearby buds or leaves to identify, possible Ulmus pumila.
5	Elm sp.	*Ulmus sp.*	22.5	Intermediate	2	No		No	Yes	No	Yes	-79.8414832	43.3191623	No nearby buds or leaves to identify, possible Ulmus pumila.
6	Dead sp.	*Dead sp.*	17.5	Suppressed	6	Yes	6	Yes	No	No	Yes	-79.8414770	43.3191580	
7	Elm sp.	*Ulmus sp.*	31.6	Co-dominant	2	No		Yes	No	Yes	Yes	-79.8414712	43.3191524	Difficult to see in photos, but has loose bark on top limb arching over Falcon creek.
8	Siberian Elm	*Ulmus pumila*	20, 28.3	Co-dominant	2	Yes	6	Yes	No	Yes	Yes	-79.8414333	43.3191106	
9	Siberian Elm	*Ulmus pumila*	37	Intermediate	2	No		Yes	Yes	Yes	Yes	-79.8414276	43.3191042	
10	Siberian Elm	*Ulmus pumila*	72.6	Co-dominant	2	Yes	9	No	No	Yes	Yes	-79.8413631	43.3190681	
11	Siberian Elm	*Ulmus pumila*	41.9	Co-dominant	2	Yes	9	Yes	Yes	Yes	Yes	-79.8412563	43.3190064	
12	Siberian Elm	*Ulmus pumila*	50, 31.5	Co-dominant	2	Yes	8	Yes	No	Yes	No	-79.8412448	43.3189982	
13	Maple sp.	*Acer sp.*	22	Suppressed	4	No		Yes	No	No	No	-79.8415318	43.3192238	Fungus growing on trunk, peeling bark, can't find live buds. Appears to be dead/dying.
14	Crack Willow	*Salix fragilis*	85	Co-dominant	1	Yes	Multiple	Yes	Yes	Yes	Yes	-79.8416108	43.3193034	
15	Crack Willow	*Salix fragilis*	85.1	Co-dominant	2	Yes	Multiple	Yes	Yes	Yes	Yes	-79.8416799	43.3193473	Multiple cavities.
16	Crack Willow	*Salix fragilis*	87.5	Co-dominant	1	Yes	11	Yes	No	Yes	Yes	-79.8417688	43.3194029	
17	Black Walnut	*Juglans nigra*	41.8	Co-dominant	1	Yes	6	No	No	No	Yes	-79.8418438	43.3194964	
18	Dead sp.	*Dead sp.*	25.8	Suppressed	5	No		Yes	No	No	Yes	-79.8422807	43.3196303	Potential bat habitat, but unlikely to be used with more suitable trees nearby.
19	Sweet Cherry	*Prunus avium*	32, 35	Intermediate	2	No		Yes	Yes	No	Yes	-79.8422713	43.3196287	
20	Green Ash	*Fraxinus pennsylvania*	17.5, 35.5, 20	Suppressed	2	No		Yes	No	No	Yes	-79.8421562	43.3195995	Appears to be dead/dying.
21	Unknown sp.	-	88	Co-dominant	2	Yes	Multiple	Yes	Yes	Yes	Yes	-79.8420615	43.3195113	Unable to identify from a distance without leaves or buds, tree DBH estimated.
22	Crack Willow	*Salix fragilis*	105	Co-dominant	2	No		No	Yes	Yes	Yes	-79.8419060	43.3194569	
23	Crack Willow	*Salix fragilis*	90.5	Intermediate	2	No		Yes	Yes	Yes	Yes	-79.8418898	43.3194499	
24	Manitoba Maple	*Acer negundo*	29.2, 29, 17, 17	Suppressed	3	Yes	6	Yes	Yes	Yes	Yes	-79.8418986	43.3194114	DBH estimated.
25	Dead sp.	*Dead sp.*	35	Suppressed	4	No		Yes	No	Yes	No	-79.8427368	43.3196542	DBH estimated.
26	Black Walnut	*Juglans nigra*	71	Co-dominant	2	No		Yes	No	No	No	-79.8429683	43.3197186	
27	Crack Willow	*Salix fragilis*	85	Co-dominant	1	No		No	Yes	Yes	No	-79.8430401	43.3196722	
28	Crack Willow	*Salix fragilis*	96	Co-dominant	1	No		No	Yes	Yes	Yes	-79.8432706	43.3196712	

Tree Point (#)	Common Name	Scientific Name	DBH (cm)	Height Class[1]	Decay Class (#)[2]	Snag Attribute					Other Snag (within 10m)	Location		Notes
						Cavity	Cavity Height (m)	Loose Bark	Crack	Knot Hole		x	y	
29	Green Ash	*Fraxinus pennsylvania*	19	Suppressed	4	No		Yes	No	No	Yes	-79.8433830	43.3196935	
30	Crack Willow	*Salix fragilis*	96, 100, 96, 75	Intermediate	2	Yes	Multiple	Yes	Yes	Yes	Yes	-79.8434499	43.3196808	Excellent potential bat habitat.
31	Unknown sp.	-	26.9, 12.5	Suppressed	5	No		Yes	No	No	Yes	-79.8434683	43.3196893	Dead larger trunk, smaller trunk live.
32	Ash sp.	*Fraxinus sp.*	34.5	Co-dominant	3	No		Yes	No	Yes	Yes	-79.8436915	43.3197191	Appears to be dead/dying (peeling bark along entirety of trunk), difficult to confirm with no leaves or accessible buds.
33	Crack Willow	*Salix fragilis*	80,80	Co-dominant	1	No		Yes	Yes	Yes	Yes	-79.8437353	43.3196960	Bark could provide potential bat habitat. DBH estimated.

[1]Height Class: Dominant= above canopy, Co-dominant= canopy height, Intermediate= just below canopy height, Suppressed= well below canopy height

[2]Decay Class: Decay Class 1= Healthy living tree, Decay Class 2= Declining live tree, part of canopy lost, Decay Class 3= Very recently dead, no canopy, bark intact, branches intact, Decay Class 4= Recently dead, bark peeling, only large branches intact, Decay Class 5= Older dead tree, 90% of bark lost, few branch stubs, broken top, Decay Class 6= Very old dead tree, advanced decay, no branches, parts of stem rotted away

Appendix 6 | Species at Risk Screening Table

Endangered and Threatened Species							
Species	**Source**	**Status**	**General Habitat Requirements of the Species**	**Likelihood of Presence**	**Surveys Conducted**	**Survey Results**	**Likelihood of Impacts to Species from Proposed Activities**
Fish / Other Aquatic							
American eel *Anguilla rostrata*	iNaturalist, 2019	COSEWIC- THR ESA- END	"found in fresh water and salt water areas that are accessible from the Atlantic Ocean. This area extends from Niagara Falls in the Great Lakes up to the mid-Labrador coast." (MECP, 2014)	LOW - Falcon Creek has a direct connection to Hamilton Harbour, Lake Ontario.	Fish Survey Review of fish sampling data from nearby CH stations	Not recorded.	None. Species has not been recorded in Falcon Creek based on surveys conducted within the reach and at either of the six CH stations between 1982 and 2022.
Lilliput *Toxolasma parvum*	iNaturalist, 2021	ESA- THR SARA- END	"soft river bottoms, such as mud, sand, and silt. Likely hosts are Johnny darter, white crappie, bluegill and green sunfish." (MECP, 2014)	LOW- Soft river bottoms present.	No mussel surveys were conducted	Not recorded.	LOW, though unlikely. Species has not been recorded in Falcon Creek. Is known from nearby Hamilton Harbour (Sunfish Pond). Potential impacts will be mitigated by construction timing windows.
Plants							
American Chestnut *Castanea dentata*	iNaturalist, 2016	SARA- END ESA- END	"moist to well drained forests on sand, occasionally heavy soils" (OMNR, 2000)	LOW-Floodplain forest is present, with sandy soils.	Botanical Inventory	Not recorded.	None. Species not present.
American Columbo *Frasera caroliniensis*	iNaturalist, 2017; NHIC	SARA- END ESA- END	"open deciduous forests, and to a lesser extent along open forest edges and dense shrub thickets in Ontario. It is most commonly found in dry upland woods, but in parts of its range it has been found in grasslands, moist woods and swampy habitats." (MECP, 2014)	LOW-Floodplain forest is present.	Botanical Inventory	Not recorded.	None. Species not present.
Black Ash *Fraxinus nigra*	iNaturalist, 2019	COSEWIC-THR ESA- END	Occurs in moist to wet sites such as swamps, bogs, and riparian areas (COSSARO, 2021)	LOW-Floodplain forest is present.	Botanical Inventory	Not recorded.	None. Species not present.
Butternut *Juglans cinerea*	iNaturalist, 2018; NHIC	SARA- END ESA- END	Deciduous forests with moist, well-drained soil. Often found along streams and on well drained gravel sites. (OMNR, 2013)	LOW-Floodplain forest is present.	Botanical Inventory	Not recorded.	None. Species not present.

Species	Source	Status	General Habitat Requirements of the Species	Likelihood of Presence	Surveys Conducted	Survey Results	Likelihood of Impacts to Species from Proposed Activities
Cucumber Tree *Magnolia acuminata*	iNaturalist, 2016	SARA- END ESA- END	"rich, partly open, moist to wet woods" (OMNR, 2000)	LOW-Floodplain forest is present.	Botanical Inventory	Not recorded.	None. Species not present.
Eastern Flowering Dogwood *Cornus florida*	iNaturalist, 2017; CWS	SARA- END ESA- END	"under taller trees in mid-age to mature deciduous or mixed forests. It most commonly grows on floodplains, slopes, bluffs and in ravines, and is also sometimes found along roadsides and fencerows." (MECP, 2014)	LOW-Floodplain forest is present.	Botanical Inventory	Not recorded.	None. Species not present.
Insects							
None							
Amphibians							
Jefferson Salamander *Ambystoma jeffersonianum*	Ontario Reptile & Amphibian Atlas, 2014; iNaturalist, 2015; Halton NAI (2006)	SARA- END ESA- END	"damp shady deciduous forest, swamps, moist pasture, lakeshores; temporary woodland pools for breeding; hides under leaf litter, stones or in decomposing logs" (OMNR, 2000)	NO-No suitable breeding habitat (vernal pools)	Incidental Wildlife	Not recorded.	None. Habitat not suitable.
Unisexual Ambystoma (Jefferson Salamander dependant) *Ambystoma laterale - (2) jeffersonianum*	NHIC	SARA- END ESA- END	"leaf litter, under logs and in underground cavities in deciduous and mixed forests, typically within close proximity to breeding habitats. Adults breeds in vernal pools or fish-free permanent wetlands. Unisexual Ambystoma salamanders spend the winter underground where they can get below the frost line and avoid freezing temperatures, such as in mammal burrows, rock crevices or other underground cavities." (MECP, 2017)	NO-No suitable breeding habitat (vernal pools)	Incidental Wildlife	Not recorded.	None. Habitat not suitable.

Species	Source	Status	General Habitat Requirements of the Species	Likelihood of Presence	Surveys Conducted	Survey Results	Likelihood of Impacts to Species from Proposed Activities
Western Chorus Frog *Pseudacris triseriata*	Ontario Reptile & Amphibian Atlas, 2013; CWS	SARA- THR ESA- NAR	"roadside ditches or temporary ponds in fields; swamps or wet meadows; woodland or open country with cover and moisture; small ponds and temporary pool" (OMNR, 2000)	NO-No suitable breeding habitat (vernal pools)	Incidental Wildlife	Not recorded.	None. Habitat not suitable.
Reptiles							
Blanding's Turtle *Emydoidea blandingii*	iNaturalist, 2021; CWS; Ontario Reptile & Amphibian Atlas, 2018	SARA- END ESA- THR	"shallow water marshes, bogs, ponds or swamps, or coves in larger lakes with soft muddy bottoms and aquatic vegetation; basks on logs, stumps, or banks; surrounding natural habitat is important in summer as they frequently move from aquatic habitat to terrestrial habitats; hibernates in bogs; not readily observed" (OMNR, 2000)	LOW- Species is encountered infrequently in nearby Hamilton and Mississauga.	Incidental Wildlife	Not recorded.	LOW. Mitigation is recommended.
Birds							
Acadian Flycatcher *Empidonax virescens*	iNaturalist, 2019	SARA- END ESA- END	"mature, shady, deciduous forests; heavily wooded ravines; creek bottoms or river swamps; availability of good quality habitat is limiting factor; needs at least 30 ha of forest" (OMNR, 2000)	NO- 30 ha of forest habitat is not present.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.
Bank Swallow *Riparia riparia*	iNaturalist, 2021	SARA-THR ESA-THR	"Sand, clay or gravel riverbanks or steep riverbank cliffs; lakeshore bluffs of easily crumbled sand or gravel; gravel pits, road-cuts, grassland or cultivated fields that are close to water; nesting sites are a limited factor for species presence" (OMNR 2000).	LOW - Possible suitable nesting habitat along Falcon Creek.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat. Banks are not suitable. Species not observed.

Species	Source	Status	General Habitat Requirements of the Species	Likelihood of Presence	Surveys Conducted	Survey Results	Likelihood of Impacts to Species from Proposed Activities
Barn Owl *Tyto alba*	CWS	SARA- END ESA- END	"open areas such as fields, agricultural lands with scattered woodlots, buildings and/or orchards; grasslands, sedge meadows, marshes; snow-cover limits ability to catch prey; species has intolerance to severe cold; nests in hollow trees and live trees >46 cm dbh; also nests in barns, abandoned buildings" (OMNR, 2000)	NO- no fields, agricutural lands, barns, or abandoned buildings are present.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat. Species very rare in Ontario.
Barn Swallow *Hirundo rustica*	iNaturalist, 2018; NHIC; Ontario Breeding Bird Atlas; eBird, 2020	SARA- THR ESA- SC	"farmlands or rural areas; cliffs, caves, rock niches; buildings or other man-made structures for nesting; open country near body of water" (OMNR, 2000)	MODERATE - Possible suitable nesting habitat on adjacent buildings.	Breeding Bird Surveys	**Four individuals observed foraging over the study area.**	LOW. No breeding habitat is present. Only foraging individuals observed. Recommended mitigation (timing windows) will avoid active bird season.
Bobolink *Dolichonyx oryzivorus*	Ontario Breeding Bird Atlas NHIC, iNaturalist, 2018	SARA-THR ESA-THR	"Large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50 ha" (OMNR 2000).	NO - Study area does not contain grassland.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.
Cerulean Warbler *Setophaga cerulea*	iNaturalist, 2021	SARA- END ESA- THR	"mature deciduous woodland of Great Lakes- St. Lawrence and Carolinian forests, sometimes coniferous; swamps or bottomlands with large trees; area sensitive species needing extensive areas of forest (>100 ha)" (OMNR, 2000)	NO- Study area and adjacent lands do not provide extensive forest area.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.

Species	Source	Status	General Habitat Requirements of the Species	Likelihood of Presence	Surveys Conducted	Survey Results	Likelihood of Impacts to Species from Proposed Activities
Chimney Swift *Chaetura pelagica*	iNaturalist, 2018 Ontario Breeding Bird Atlas	SARA- THR ESA-THR	"Commonly found in urban areas near buildings; nests in hollow trees, crevices of rock cliffs, chimneys; highly gregarious; feeds over open water" (OMNR 2000).	MODERATE - Possible suitable habitat in trees and buildings on adjacent lands.	Breeding Bird Surveys	**Two individuals observed foraging over the study area.**	LOW. No breeding habitat is present. Only foraging individuals observed. Recommended mitigation (timing windows) will avoid active bird season.
Common Nighthawk *Chordeiles minor*	iNaturalist, 2018; eBird, 2020	SARA- THR ESA- SC	Generally prefer open, vegetation-free habitats including dunes, beaches, recently harvested forests, burnt-over areas, logged areas, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores, and riverbanks. This species also inhabits mixed and coniferous forests. Can also be found in urban areas (nest on flat roof-tops) (Environment Canada 2016).	LOW - Possible suitable habitat in trees and buildings on adjacent lands.	Breeding Bird Surveys	Not recorded.	LOW. Not observed. Recommended mitigation (timing windows) will avoid active bird season.
Eastern Meadowlark *Sturnella magna*	Ontario Breeding Bird Atlas; NHIC; iNaturalist, 2013	SARA-THR ESA-THR	Generally prefers large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50 ha. In migration and winter uses freshwater marshes and grasslands (OMNR 2000).	NO - Study area does not contain grassland.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.
Eastern Whip-poor-will *Antrostomus vociferus*	iNaturalist, 2019	SARA-THR ESA-THR	"dry, open, deciduous woodlands of small to medium trees; oak or beech with lots of clearings and shaded leaflitter; wooded edges, forest clearings with little herbaceous growth; pine plantations; associated with >100 ha forests; may require 500 to 1000 ha to maintain population" (OMNR 2000)	NO - Study area not contain open forests >100 ha.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.

Species	Source	Status	General Habitat Requirements of the Species	Likelihood of Presence	Surveys Conducted	Survey Results	Likelihood of Impacts to Species from Proposed Activities
Golden-winged Warbler *Vermivora chrysoptera*	iNaturalist, 2021; Ontario Breeding Bird Atlas	SARA-THR ESA-SC	"early successional habitat; shrubby, grassy abandoned fields with small deciduous trees bordered by low woodland and wooded swamps; alder bogs; deciduous, damp woods; shrubbery clearings in deciduous woods with saplings and grasses; brier-woodland edges; requires >10 ha of habitat" (OMNR, 2000)	NO- 10+ ha of habitat is not present.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.
Least Bittern *Ixobrychus exilis*	iNaturalist, 2019 Ontario Breeding Bird Atlas	SARA-THR ESA-THR	"deep marshes, swamps, bogs; marshy borders of lakes, ponds, streams, ditches; dense emergent vegetation of cattail, bulrush, sedge; nests in cattails; intolerant of loss of habitat and human disturbance" (OMNR, 2000)	NO- Marshes, swamps, bogs, lakes, and dense emergent vegetation are not present.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.
Louisiana Waterthrush *Parkesia motacilla*	iNaturalist, 2013	SARA-THR ESA-THR	"prefers wooded ravines with running streams; also woodlands swamps; large tracts of mature deciduous or mixed forests; canopy cover is essential; has strong affinity to nest sites; nests on ground" (OMNR, 2000)	NO- No large tract of mature forest is present.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.
Olive-sided Flycatcher *Contopus cooperi*	iNaturalist, 2020	SARA- THR ESA-SC	"semi-open, conifer forest, prefers spruce; near pond, lake or river; treed wetlands for nesting; burns with dead trees for perching" (OMNR 2000)	NO - No open wetlands, lakes, marshes, or wet meadows are present.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.

Species	Source	Status	General Habitat Requirements of the Species	Likelihood of Presence	Surveys Conducted	Survey Results	Likelihood of Impacts to Species from Proposed Activities
Red-headed Woodpecker *Melanerpes erythrocephalus*	iNaturalist, 2021; Ontario Breeding Bird Atlas; eBird, 2014	SARA- THR ESA- END	"open, deciduous forest with little understory; fields or pasture lands with scattered large trees; wooded swamps; orchards, small woodlots or forest edges; groves of dead or dying trees; feeds on insects and stores nuts or acorns for winter; loss of habitat is limiting factor; requires cavity trees with at least 40 cm dbh; require about 4 ha for a territory" (OMNR 2000)	LOW-Possible suitable habitat within lowland forest along Falcon Creek.	Breeding Bird Surveys	Not recorded.	LOW. Not observed. Recommended mitigation (timing windows) will avoid active bird season.
Wood Thrush *Hylocichla mustelina*	Ontario Breeding Bird Atlas iNaturalist, 2018	SARA- THR ESA-SC	"Undisturbed moist mature deciduous or mixed forest with deciduous sapling growth; near pond or swamp; hardwood forest edges" (OMNR 2000).	NO- No large tract of mature forest is present.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.
Mammals							
Little Brown Myotis *Myotis lucifugus*	iNaturalist, 2020	SARA – END ESA – END	"hibernates during winter in mines or caves; during summer males roost alone and females form maternity colonies of up to 60 adults; roosts in houses, manmade structures but prefers hollow trees or under loose bark; hunts within forests, below canopy" (OMNR 2000)	MODERATE TO HIGH - Woodland is present.	Bat Habitat Screening Assessment	Not recorded.	LOW. Species not recorded during two nights of acoustic surveys. Recommended mitigation (timing window) will avoid active bat season. Limiting tree removals is recommended. Consultation with MECP may be required.
Northern Myotis *Myotis septentrionalis*	Bat Conservation International	SARA – END ESA – END	"hibernates during winter in mines or caves; during summer males roost alone and females form maternity colonies of up to 60 adults; roosts in houses, manmade structures but prefers hollow trees or under loose bark; hunts within forests, below canopy" (OMNR 2000)	MODERATE TO HIGH - Woodland is present.	Bat Habitat Screening Assessment	Not recorded.	LOW. Species not recorded during two nights of acoustic surveys. Recommended mitigation (timing window) will avoid active bat season. Limiting tree removals is recommended. Consultation with MECP may be required.

Species	Source	Status	General Habitat Requirements of the Species	Likelihood of Presence	Surveys Conducted	Survey Results	Likelihood of Impacts to Species from Proposed Activities
Tri-coloured Bat *Pipistrellus subflavus*	Bat Conservation International	SARA – END ESA – END	"found in a variety of forested habitats. Forms day roosts and maternity colonies in older forest and occasionally in barns or other structures. They forage over water and along streams in the forest. At the end of the summer they travel to a location where they swarm; it is generally near the cave or underground location where they will overwinter." OMNR, 2016)	MODERATE TO HIGH - Woodland is present.	Bat Habitat Screening Assessment	Not recorded.	LOW. Species not recorded during two nights of acoustic surveys. Recommended mitigation (timing window) will avoid active bat season. Limiting tree removals is recommended. Consultation with MECP may be required.
Special Concern Species							
Species	**Source**	**Status**	**General Habitat Requirements of the Species**	**Desktop Habitat Assessment (Pre Site Visits)**	**Surveys Conducted**	**Survey Results**	**Likelihood of Impacts to Species from Proposed Activities**
Plants							
Common Hoptree *Ptelea trifoliata*	iNaturalist, 2017	COSEWIC- SC ESA - SC	"along shorelines in areas of nutrient poor sandy soils, although it is sometimes found on thin soils overlying limestone. It does best in full sun and is intolerant of shade." (MECP, 2014)	LOW-Floodplain forest is present, with sandy soils.	Botanical Inventory	Not recorded.	None. Species not present.
Green Dragon *Arisaema dracontium*	iNaturalist, 2021	COSEWIC- SC ESA - SC	Mesic to wet deciduous forest along streams, particularly maple forest and forest dominanted by Red Ash and White Elm trees. (MECP 2022)	LOW-Floodplain forest is present.	Botanical Inventory	Not recorded.	None. Species not present.
Swamp Rose Mallow *Hibiscus moscheutos*	iNaturalist, 2020	COSEWIC- SC ESA - SC	"swamp marshes, wet woods and ponds" (OMNR, 2000)	LOW-Floodplain forest is present.	Botanical Inventory	Not recorded.	None. Species not present.
Fish / Other Aquatic							
Mapleleaf *Quadrula quadrula*	iNaturalist, 2020	SARA- SC ESA- SC	"medium to large rivers with slow to moderate currents and firmly packed sand, gravel, or clay and mud bottoms. It also lives in lakes and reservoirs. In Canada, the fish host of the Mapleleaf is the Channel catfish." (MECP, 2014)	NO- Falcon Creek is not a medium to large river, lake, or reservoir.	No mussel surveys were conducted	Not recorded.	NONE - Study area offers no suitable habitat.

Species	Source	Status	General Habitat Requirements of the Species	Likelihood of Presence	Surveys Conducted	Survey Results	Likelihood of Impacts to Species from Proposed Activities
Insects							
Monarch *Danaus plexippus*	iNaturalist, 2017 Ontario Butterly Atlas, 2021	SARA- SC ESA- SC	Breeding habitat is confined to where milkweed grows, since the leaves of these plants are the sole food of the caterpillars. Different species of milkweed grow in a variety of environments, including meadows, along roadsides and in ditches, open wetlands, dry sandy areas, short and tall grass prairies, river banks, irrigation ditches, arid valleys and south facing hillsides. Nectaring habitat ranges from native grasslands to home gardens with adult butterflies nectaring on a wide variety of flowers including Goldenrods, Asters and Milkweeds. (Environment Canada 2014)	MODERATE TO HIGH-potential habitat present along roadsides and riverbanks	Incidental Wildlife	Not recorded.	LOW. Species not recorded, though may occasionally use the study area. Vegetated habitat is expected to be retained, though may be temporarily impacted. Species is common on the landscape and is a habitat generalist (i.e., no habitat critical to the species is present).
Yellow-banded Bumblebee *Bombus terricola*	iNaturalist, 2021	SARA- SC ESA- SC	"This species is a forage and habitat generalist, able to use a variety of nectaring plants and environmental conditions. It can be found in mixed woodlands, particularly for nesting and overwintering, as well as a variety of open habitat such as native grasslands, farmlands and urban areas. Nest sites are often underground in abandoned rodent burrows or decomposing logs." (MECP 2021)	MODERATE-potential habitat present along roadsides and riverbanks	Incidental Wildlife	Not recorded.	LOW. Species not recorded, though may occasionally use the study area. Vegetated habitat is expected to be retained, though may be temporarily impacted. Species is a habitat generalist (i.e., no habitat critical to the species is present).
Amphibians							
None							
Reptiles							

Species	Source	Status	General Habitat Requirements of the Species	Likelihood of Presence	Surveys Conducted	Survey Results	Likelihood of Impacts to Species from Proposed Activities
Midland Painted Turtle *Chrysemys picta marginata*	Ontario Reptile & Amphibian Atlas, 2019; NHIC	SARA- SC ESA- NAR	"quiet, warm, shallow water with abundant aquatic vegetation such as ponds, large pools, streams, ditches, swamps, marshy meadows; eggs are laid in sandy places, usually in a bank or hillside, or in fields; basks in groups; not territorial" (OMNR, 2000)	MODERATE - Potential habitat is present in Falcon Creek and study area provides potential nesting habitat.	Incidental Wildlife	Not recorded.	LOW. Species not recorded, though may occasionally use the study area. Recommended mitigation includes construction timing windows, exclusionary fencing, and SAR awareness training.
Snapping Turtle *Chelydra serpentina*	Ontario Reptile & Amphibian Atlas, 2019; NHIC; iNaturalist, 2017	SARA- SC ESA- SC	"permanent, semi-permanent fresh water; marshes, swamps or bogs; rivers and streams with soft muddy banks or bottoms; often uses soft soil or clean dry sand on south-facing slopes for nest sites; may nest at some distance from water; often hibernate together in groups in mud under water; home range size ~28 ha" (OMNR, 2000)	MODERATE - Potential habitat is present in Falcon Creek and study area provides potential nesting habitat.	Incidental Wildlife	Not recorded.	LOW. Species not recorded, though may occasionally use the study area. Recommended mitigation includes construction timing windows, exclusionary fencing, and SAR awareness training.
Eastern Milksnake *Lampropeltis triangulum*	iNaturalist, 2014; NHIC; Ontario Reptile & Amphibian Atlas, 2019	SARA- SC ESA- NAR	"farmlands, meadows, hardwood or aspen stands; pine forest with brushy or woody cover; river bottoms or bog woods; hides under logs, stones, or boards or in outbuildings; often uses communal nest sites" (OMNR, 2000)	LOW- Eastern Milksnake is a habitat generalist and may be present in river bottom areas and adjacent forest.	Incidental Wildlife	Not recorded.	LOW. Species not recorded, though may occasionally use the study area. Recommended mitigation includes construction timing windows, exclusionary fencing, and SAR awareness training.
American Horned Grebe *Podiceps auritus cornutus*	iNaturalist, 2018	SARA- SC ESA-SC	"deep water marshes or sloughs with a mix of open water, emergent vegetation; small freshwater ponds or protected bays of larger lakes with emergent vegetation; territories are about 1 ha, but birds are very territorial" (OMNR, 2000)	NO- Deep water marsh or sloughs with emergent vegetation is not present.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.

Species	Source	Status	General Habitat Requirements of the Species	Likelihood of Presence	Surveys Conducted	Survey Results	Likelihood of Impacts to Species from Proposed Activities
Bald Eagle *Haliaeetus leucocephalus*	iNaturalist, 2017 eBird, 2022	SARA - NAR ESA - SC	"require large continuous area of deciduous or mixed woods around large lakes, rivers; require area of 255 ha for nesting, shelter, feeding, roosting; prefer open woods with 30 to 50% canopy cover; nest in tall trees 50 to 200 m from shore; require tall, dead, partially dead trees within 400 m of nest for perching; sensitive to toxic chemicals" (OMNR 2000)	NO - Requirement for continuous areas of deciduous or mixed woods around large lakes and rivers is not met.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.
Black Tern *Chlidonias niger*	iNaturalist, 2011	SARA- NAR ESA- SC	"wetlands, coastal or inland marshes; large cattail marshes, marshy edges of rivers, lakes or ponds, wet open fens, wet meadows; returns to same area to nest each year in loose colonies; must have shallow (0.5 to 1 m deep) water and areas of open water near nests; requires marshes >20 ha in size; feeds over adjacent grasslands for insects; also feeds on fish, crayfish and frogs" (OMNR, 2000)	NO- Marshes >20 ha in size is not present.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.
Canada Warbler *Cardellina canadensis*	iNaturalist, 2020	SARA- SC ESA- SC	"an interior forest species; dense, mixed coniferous, deciduous forests with closed canopy, wet bottomlands of cedar or alder; shrubby undergrowth in cool moist mature woodlands; riparian habitat; usually requires at least 30 ha " (OMNR 2000)	NO - Requirement for continuous areas of mature deciduous or mixed woods is not met when considering subject property and adjacent lands.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.

Species	Source	Status	General Habitat Requirements of the Species	Likelihood of Presence	Surveys Conducted	Survey Results	Likelihood of Impacts to Species from Proposed Activities
Eastern Wood-Pewee *Contopus virens*	Ontario Breeding Bird Atlas; NHIC; iNaturalist, 2019	SARA- SC ESA- SC	"open, deciduous, mixed or coniferous forest; predominated by oak with little understory; forest clearings, edges; farm woodlots, parks" (OMNRF, 2000)	LOW - Deciduous forest adjacent to study area with forest clearings, edges, and open areas.	Breeding Bird Surveys	Not recorded.	LOW Species not recorded, however may occasionally use the study area. Recommended mitigation (timing windows) will avoid the active bird season. It is also recommended that any tree removals be limited.
Evening Grosbeak *Coccothraustes vespertinus*	iNaturalist, 2021	SARA- SC ESA- SC	"coniferous or mixed forests; deciduous tree stands; parks, orchards" (OMNR 2000)	NO - Coniferous forest, parks, orchards not present.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.
Grasshopper Sparrow *Ammodramus savannarum pratensis*	iNaturalist, 2013	SARA-SC ESA-SC	"well-drained grassland or prairie with low cover of grasses, taller weeds on sandy soil; hayfields or weedy fallow fields; uplands with ground vegetation of various densities; perches for singing; requires tracts of grassland > 10 ha" (OMNR 2000)	NO - No grassland >10 is present.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.
Olive-sided Flycatcher *Contopus cooperi*	iNaturalist, 2020	SARA- SC ESA- SC	"semi-open, conifer forest, prefers spruce; near pond, lake or river; treed wetlands for nesting; burns with dead trees for perching" (OMNR 2000)	NO - Coniferous forest not present.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.
Peregrine Falcon *Falco Peregrinus*	Ontario Breeding Bird Atlas iNaturalist, 2019	SARA- SC ESA- SC	"rock cliffs, crags, especially situated near water; tall buildings in urban centres; threatened by chemical contamination; reintroduction efforts have been attempted in numerous locations throughout Ontario" (OMNR 2000)	NO - No rock cliffs, crags, tall buildings or urban centres are present.	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.

Appendix 7 | Significant Wildlife Habitat Assessment Table

Species	Source	Status	General Habitat Requirements of the Species	Likelihood of Presence	Surveys Conducted	Survey Results	Likelihood of Impacts to Species from Proposed Activities
Savannah Sparrow *Passerculus sandwichensis*	Ontario Breeding Bird Atlas	SARA- SC ESA-NAR	"hayfields, pastures, fields and meadows with dense ground vegetation of grasses and other vegetation of moderate height; moist lowlands and sedge meadows bordered by willows and sweet gale; territory is 1.5 to 2 ha in size; requires tracts of grassland >50 ha" (OMNR 2000)	NO - No grassland >50 ha is present .	Breeding Bird Surveys	Not recorded.	NONE - Study area offers no suitable habitat.
Mammals							
None							

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Waterfowl Stopover and Staging Areas (Terrestrial) **Rationale:** Habitat important to migrating waterfowl.	American Black Duck Northern Pintail Gadwall Blue-winged Teal Green-winged Teal American Wigeon Northern Shoveler Tundra Swan	CUM1 CUT1 Plus evidence of annual spring flooding from meltwater or run-off within these Ecosites. Fields with seasonal flooding and waste grains in the Long Point, Rondeau, Lake St. Clair, Grand Bend and Point Pelee areas may be important to Tundra Swans.	•Fields with sheet water during Spring (mid-March to May) •Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl •Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH unless they have spring sheet water available <u>Information Sources</u> •Anecdotal information from the landowner, adjacent landowners or local naturalist clubs may be good information in determining occurrence. •Reports and other information available from Conservation Authorities •Sites documented through waterfowl planning processes (eg. EHJV implementation plan) •Field Naturalist Clubs •Ducks Unlimited Canada •Natural Heritage Information Centre (NHIC) Waterfowl	Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” •Any mixed species aggregations of 100 or more individuals required •The flooded field ecosite habitat plus a 100-300m radius, dependent on local site conditions and adjacent land use is the significant wildlife habitat •Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates) •SWH MIST Index #7 provides development effects and mitigation measures.	ABSENT - The ecosites that are present on the subject property do not meet the criteria for SWH. No suitable open fields containing spring sheet water are present.

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Waterfowl Stopover and Staging Areas (Aquatic) **Rationale:** Important for local and migrant waterfowl populations during the spring or fall migration or both periods combined. Sites identified are usually only one of a few in the eco-district.	American Black Duck Northern Pintail Gadwall Blue-winged Teal Green-winged Teal American Wigeon Northern Shoveler Tundra Swan Canada Goose Cackling Goose Snow Goose American Black Duck Northern Pintail Northern Shoveler American Wigeon Gadwall Green-winged Teal Blue-winged Teal Hooded	MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7	• Ponds, marshes, lakes, bays, coastal inlets and watercourses used during migration. Sewage treatment ponds and storm water ponds do not qualify as a SWH, however a reservoir managed as a large wetland or pond/lake does qualify • These habitats have an abundant food supply (mostly aquatic invertebrates and vegetation in shallow water). <u>Information Sources</u> • Environment Canada • Naturalist clubs often are aware of staging/stopover areas. • OMNRF Wetland Evaluations indicate presence of locally and regionally significant waterfowl staging. • Sites documented through waterfowl planning processes (eg. EHJV implementation plan) • Ducks Unlimited projects • Element occurrence specification by Nature Serve: http://www.natureserve.org • Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area	Studies carried out and verified presence of: • Aggregations of 100 or more of listed species for 7 days, results in >700 waterfowl use days • Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH • The combined area of the ELC ecosites and a 100m radius area is the SWH • Wetland area and shorelines associated with sites identified within the SWHTG Appendix K are significant wildlife habitat. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” • Annual Use of Habitat is Documented from Information Sources or Field Studies (Annual can be based on completed studies or determined from past surveys with species numbers and dates recorded). • SWH MIST Index #7 provides development effects and mitigation measures.	ABSENT - The ecosites that are present on the subject property do not meet the criteria for SWH.

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Shorebird Migratory Stopover Area **Rationale:** High quality shorebird stopover habitat is extremely rare and typically has a long history of use.	Greater Yellowlegs Lesser Yellowlegs Marbled Godwit Hudsonian Godwit Black-bellied Plover American Golden-Plover Semipalmated Plover Solitary Sandpiper Spotted Sandpiper Semipalmated Sandpiper Pectoral Sandpiper White-rumped Sandpiper Baird's Sandpiper Least Sandpiper Purple Sandpiper Stilt Sandpiper	BBO1 BBO2 BBS1 BBS2 BBT1 BBT2 SDO1 SDS2 SDT1 MAM1 MAM2 MAM3 MAM4 MAM5	• Shorelines of lakes, rivers and wetlands, including beach area, bars and seasonally flooded, muddy and un-vegetated shoreline habitats • Great Lakes coastal shorelines, including groynes and other forms of armour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October • Sewage treatment ponds and storm water ponds do not qualify as SWH. <u>Information Sources</u> • Western hemisphere shorebird reserve network • Canadian Wildlife Service (CWS) Ontario Shorebird Survey • Bird Studies Canada • Ontario Nature • Local birders and naturalist clubs • Natural Heritage Information Centre (NHIC) Shorebird Migratory Concentration Area	Studies confirming: • Presence of 3 or more of listed species and >1000 shorebird use days during spring or fall migration period (shorebird use days are the accumulated number of shorebirds counted per day over the course of the fall or spring migration period) • Whimbrel stop briefly (<24hrs) during spring migration, any site with >100 Whimbrel used for 3 years or more is significant. • The area of significant shorebird habitat includes the mapped ELC shoreline ecosites plus a 100m radius area • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #8 provides development effects and mitigation measures.	ABSENT - The ecosites that are present on the subject property do not meet the criteria for SWH.

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Raptor Wintering Area **Rationale:** Sites used by multiple species, a high number of individuals and used annually are most significant	Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl **Special Concern:** Short-eared Owl Bald Eagle	Hawks/Owls: Combination of ELC Community Series; need to have present one Community Series from each land class; Forest: FOD, FOM, FOC. Upland: CUM, CUT, CUS, CUW. Bald Eagle: Forest Community Series: FOD, FOM, FOC, SWD, SWM or SWC on shoreline areas adjacent to large rivers or adjacent to lakes with open water (hunting area).	•The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors •Raptor wintering (hawk/owl) sites need to be >20 ha with a combination of forest and upland •Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15ha) with adjacent woodlands •Field area of the habitat is to be wind swept with limited snow depth or accumulation. •Eagle sites have open water and large trees and snags available for roosting <u>Information Sources</u> •OMNRF Ecologist or Biologist •Naturalist clubs •Natural Heritage Information Centre (NHIC) Raptor Winter Concentration Area •Data from Bird Studies Canada •Results of Christmas Bird Counts •Reports and other information available from Conservation Authorities	Studies confirm the use of these habitats by: •One or more Short-eared Owls or; One or more Bald Eagles or; At least 10 individuals and two of the listed hawk/owl species. •To be significant a site must beused regularly (3 in 5 years) for a minimum of 20 days by the above number of birds. •The habitat area for an Eagle winter site is the shoreline forest ecosites directly adjacent to the prime hunting area •Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” •SWHMiST Index #10 and #11 provides development effects and mitigation measures.	ABSENT - The ecosites that are present on the subject property do not meet the criteria for SWH.

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Bat Hibernacula **Rationale**: Bat hibernacula are rare habitats in all Ontario landscapes.	Big Brown Bat	Bat Hibernacula may be found in these ecosites: CCR1 CCR3 CCA1 CCA2 (Note: buildings are not considered SWH)	• Hibernacula may be found in caves, mine shafts, underground foundations and Karsts • Active mine sites should not be considered as SWH • The locations of Bat Hibernacula are relatively poorly known. <u>Information Sources</u> • OMNRF for possible locations and contact for local experts • Natural Heritage Information Centre (NHIC) Bat Hibernaculum • Ministry of Northern Development and Mines for location of mine shafts. • Clubs that explore caves (eg. Sierra Club) • University Biology Departments with bat experts.	• All sites with confirmed hibernating bats are SWH • The area includes 200 m radius around the entrance of the hibernaculum for most development types and 1000 m for wind farms • Studies are to be conducted during the peak swarming period (Aug. – Sept.). Surveys should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #1 provides development effects and mitigation measures.	ABSENT – No caves, mine shafts, underground foundations or other suitable structures are present in the study area.

Bat Maternity Colonies
 	
Rationale: Known locations of forested bat maternity colonies are extremely rare in all Ontario landscapes.
	Big Brown Bat
	Silver-haired Bat
		Maternity colonies considered SWH are found in forested Ecosites.
		
		All ELC Ecosites in ELC Community Series: FOD, FOM, SWD, SWM
			• Maternity colonies can be found in tree cavities, vegetation and often in buildings (buildings are not considered to be SWH).
			• Maternity roosts are not found in caves and mines in Ontario
			• Maternity colonies located in Mature deciduous or mixed forest stands with >10/ha large diameter (>25cm dbh) wildlife trees
			• Female bats prefer wildlife trees (snags) in early stages if decay, class 1-3 or class 1 or 2
			• Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred
			
			<u>Information Sources</u>
			• OMNRF for possible locations and contact for local experts
			• University Biology Departments with bat experts.
				• Maternity colonies with confirmed use by:
				  o 10 Big Brown Bats
				  o 5 adult female Silver-haired Bats
				• The area of habitat includes the entire woodland or a forest stand ELC Ecosite or an Ecoelement containing the maternity colonies
				• Evaluation methods for maternity colonies should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for Wind Power Projects"
				• SWH MIST Index #12 provides the development effects and mitigation measures.
					CANDIDATE – Cavity trees are believed to be present. A bat maternity roost tree assessment will be completed in Fall 2022. Big Brown Bat was recorded during acoustic calling surveys in June 2022.

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Turtle Wintering Areas **Rationale:** Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant	**Special Concern:** Midland Painted Turtle Northern Map Turtle Snapping Turtle	Snapping and Midland Painted Turtles: SW, MA, OA and SA; FEO and BOO. Northern Map Turtle: Open water areas such as deeper rivers or streams and lakes with current can also be used as overwintering habitat.	• For most turtles, wintering areas are in the same general areas as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. • Overwintering sites are permanent water bodies, large wetlands and bots or fens with adequate dissolved oxygen. • Manmade ponds such as sewage lagoons or storm water ponds should not be considered SWH. <u>Information Sources</u> • EIS studies carried out by conservation authorities. • Field naturalists clubs. • OMNRF ecologist or biologist • NHIC	• Presence of five overwintering Midland Painted Turtles is significant. • One or more Northern Map Turtle or Snapping Turtle overwintering within a wetland is significant. • The mapped ELC ecosite area with the overwintering turtles is the SWH. If the hibernation site is within a stream or river, the deep-water pool where the turtles are overwintering is the SWH. • Overwintering areas may be identified by searching for congregations (basking areas) of turtles on warm, sunny days during the fall (September to October) or spring (March to May). Congregation of turtles is more common where wintering areas are limited and therefore significant. • SWH MIST Index #28 provides development effects and mitigation measures for turtle wintering habitat	**CANDIDATE** – No turtles were observed in the study area, though potential habitat is present.

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Reptile Hibernaculum **Rationale:** Generally sites are the only known sites in the area. Sites with the highest number of individuals are	Snakes: Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake **Special Concern:** Milksnake Eastern Ribbonsnake	For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Rock Barren, Crevice, Cave, and Alvar sites may be directly related to these habitats. Observations or congregations of snakes on sunny warm days in the spring or fall is a good indicator.	• For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural or naturalized locations. The existence of features that go below frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying candidate SWH. • Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line • Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover. <u>Information Sources</u> • In spring, local residents or landowners may have observed the emergence of snakes on their property (e.g. old dug wells). • Reports and other information available from Conservation Authorities. • Field Naturalist Clubs • University herpetologists • Natural Heritage Information Centre (NHIC)	Studies confirming: • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. near potential hibernacula (eg. foundation or rocky slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct) • NOTE: If there are Special Concern Species present, then site is SWH • NOTE: Sites for hibernation possess specific habitat parameters (e.g. temperature, humidity, etc) and consequently are used annually, often by many of the same individuals of a local population (i.e. strong hibernation site fidelity). Other critical life processes (e.g. mating) often take place in close proximity to hibernacula. • The feature in which the hibernacula is located plus a 30 m radius area is the SWH • SWH MIS Index #13 provides development effects and mitigation measures for snake hibernacula.	**CANDIDATE** – No snakes were observed anywhere in the study area, however, there is potential for them to be present. No ideal habitat is present (i.e., there are no rock piles, rock fissures, or crumbling foundations), however, snake hibernacula can be present in various habitats with features permitting snakes to move below the frost line (e.g. animal burrows).

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Colonially - Nesting Bird Breeding Habitat (Bank and Cliff) **Rationale:** Historical use and number of nests in a colony make this habitat significant. An identified colony can be very important to local populations. All swallow population are declining in Ontario.	Cliff Swallow Northern Rough-winged Swallow (this species is not colonial but can be found in Cliff Swallow colonies)	Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles Cliff faces, bridge abutments, silos, barns. Habitat found in the following ecosites: CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	• Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area. • Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles. • Does not include a licensed/permitted Mineral Aggregate Operation. <u>Information Sources</u> • Reports and other information available from Conservation Authorities • Ontario Breeding Bird Atlas • Bird Studies Canada NatureCounts http://www.birdscanada.org/birdmon • Field Naturalist Clubs	Studies confirming: • Presence of 1 or more nesting sites with 8 or more cliff swallow pairs and/or rough-winged swallow pairs during the breeding season. • A colony identified as SWH will include a 50m radius habitat area from the peripheral nests • Field surveys to observe and count swallow nests are to be completed during the breeding season. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #4 provides development effects and mitigation measures.	ABSENT – The ecosites that are present on the subject property do not meet the criteria for SWH.
Colonially - Nesting Bird Breeding Habitat (Tree/Shrubs) **Rationale:** Large colonies are important to local bird population, typically sites are only known colony in area and are used annually.	Great Blue Heron Black-crowned Night-Heron Great Egret Green Heron	SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1	• Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used. • Most nests in trees are 11 to 15 m from ground, near the top of the tree. <u>Information Sources</u> • Ontario Breeding Bird Atlas colonial nest records. • Ontario Heronry Inventory 1991 available from Bird Studies Canada or NHIC (OMNRF). • Natural Heritage Information Centre (NHIC) Mixed Wader Nesting Colony • Aerial photographs can help identify large heronries. • Reports and other information available from Conservation Authorities. • MNRF District Offices • Field Naturalist Clubs.	Studies confirming: • Presence of 2 or more active nests of Great Blue Heron or other listed species. • The habitat extends from the edge of the colony and a minimum 300m radius or extent of the Forest Ecosite containing the colony or any island <15 ha with a colony is the SWH • Confirmation of active heronries are to be achieved through site visits conducted during the nesting season (April to August) or by evidence such as the presence of fresh guano, dead young and/or eggshells • SWH MIST Index #5 provides development effects and mitigation measures.	ABSENT – The ecosites that are present on the subject property do not meet the criteria for SWH.

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Colonially - Nesting Bird Breeding Habitat (Ground) **Rationale:** Colonies are important to local bird population, typically sites are only known colony in area and are used annually.	Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern Caspian Tern Brewer's Blackbird	Any rocky island or peninsula (natural or artificial) within a lake or large river (two-lined on a 1;50,000 NTS map). Close proximity to watercourses in open fields or pastures with scattered trees or shrubs (Brewer's Blackbird) MAM1 – 6 MAS1 – 3 CUM CUT CUS	• Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas. • Brewers Blackbird colonies are found loosely on the ground in or in low bushes in close proximity to streams and irrigation ditches within farmlands. <u>Information Sources</u> • Ontario Breeding Bird Atlas, rare/colonial species records. • Canadian Wildlife Service • Reports and other information available from Conservation Authorities. • Natural Heritage Information Centre (NHIC) Colonial Waterbird Nesting Area • MNRF District Offices. • Field Naturalist Clubs	Studies confirming: • Presence of > 25 active nests for Herring Gulls or Ring-billed Gulls, >5 active nests for Common Tern or >2 active nests for Caspian Tern • Presence of 5 or more pairs for Brewer's Blackbird • Any active nesting colony of one or more Little Gull, and Great Black-backed Gull is significant • The edge of the colony and a minimum 150m radius area of habitat, or the extent of the ELC ecosites containing the colony or any island <3 ha with a colony is the SWH • Studies would be done during May/June when actively nesting. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #6 provides development effects and mitigation measures.	ABSENT – The ecosites that are present on the subject property do not meet the criteria for SWH and no suitable habitat is present.

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Migratory Butterfly Stopover Areas **Rationale:** Butterfly stopover areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter.	Painted Lady Red Admiral **Special Concern:** Monarch	Combination of ELC Community Series; need to have present one Community Series from each landclass: FIELD: CUM, CUT, CUS FOREST: FOC, FOD, FOM, CUP Anecdotally, a candidate site for butterfly stopover will have a history of butterflies being observed.	• A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present, and will be located within 5 km of Lake Erie or Lake Ontario • The habitat is typically a combination of field and forest, and provides the butterflies with a location to rest prior to their long migration south • The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat • Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes <u>Information Sources</u> • MNRF District Offices • Natural Heritage Information Centre (NHIC) • Agriculture Canada in Ottawa may have list of butterfly experts. • Field Naturalist Clubs • Toronto Entomologists Association	Studies confirm: • The presence of Monarch Use Days (MUD) during fall migration (Aug/Oct). MUD is based on the number of days the site is used by Monarchs, multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500/day, significant variation can occur between years and multiple years of sampling should occur • Observational studies are to be completed and need to be done frequently during the migration period to estimate MUD. • MUD of >5000 or >3000 with the presence of Painted Ladies or Red Admiral's is to be considered significant. • SWH MIST Index #16 provides development effects and mitigation measures.	**CANDIDATE** – The study area is within 5 km of Lake Ontario. Habitat size and criteria is met when adjacent lands to the north are considered. A background search revealed no records of the study area being a butterfly stopover area.

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Landbird Migratory Stopover Areas **Rationale:** Sites with a high diversity of species as well as high numbers are most significant.	All migratory songbirds Canadian Wildlife Service Ontario website: http://www.ec.gc.ca/nature/default.asp?lang=En&n=421B7A9D-1 All migrant raptor species: Ontario Ministry of Natural Resources: Fish and Wildlife Conservation Act, 1997. Schedule 7: Specially Protected Birds (Raptors)	All Ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD	• Woodlots >5 ha in size and within 5 km of Lake Erie and Lake Ontario. If woodlands are rare in an area of shoreline, woodland fragments 2-5 ha can be considered for this habitat • If multiple woodlands are located along the shoreline those woodlands <2 km from Lake Erie and Lake Ontario are more significant • Sites have a variety of habitats: forest, grassland and wetland complexes • The largest sites are more significant • Woodlots and forest fragments are important habitats to migrating birds, these features located along the shore and within 5 km of Lake Erie and Lake Ontario are Candidate SWH. <u>Information Sources</u> • Bird Studies Canada • Ontario Nature • Local birders and field naturalist clubs • Ontario Important Bird Areas (IBA) Program	Studies confirm: • Use of the habitat by >200 birds/day and with >35 species and with at least 10 bird species recorded on at least 5 different survey dates. This abundance and diversity of migrant bird species is considered above average and significant • Studies should be completed during spring (Mar.-May) and fall (Aug.-Oct.) migration using standardized assessment techniques. Evaluation to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #9 provides development effects and mitigation measures.	ABSENT – There is no woodlot >10 ha in size.

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Deer Winter Congregation Areas **Rationale:** Deer movement during winter in the southern areas of Eco-region 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands to reduce or avoid the impacts of winter conditions	White-tailed Deer	All forested Ecosites with these ELC Community Series: FOC, FOM, FOD, SWC, SWM, SWD Conifer plantations much smaller than 50 ha may also be used.	• Woodlots >100 ha in size or if large woodlots are rare in a planning area, woodlots >50 ha • Deer movement during winter in the southern areas of Ecoregion 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands • Large woodlots >100 ha and up to 1,500 ha are known to be used annually by densities of deer that range from 0.1-0.5 deer/ha • Woodlots with high densities of deer due to artificial feeding are not significant. <u>Information Sources</u> • MNRF District Offices • LIO/NRVIS	Studies confirm: • Deer management is an MNRF responsibility, deer winter congregation areas considered significant will be mapped by MNRF • Use of the woodlot by white-tailed deer will be determined by MNRF, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNRF • Studies should be complete4d during winter (Jan./Feb.) when >20 cm of snow is on the ground using aerial survey techniques, ground road surveys, or a pellet count deer survey • SWH MIST Index #2 provides development effects and mitigation measures	ABSENT – OMNRF has not mapped any deer wintering congregation areas in the study area.

Rare Vegetation Communities

Rare Vegetation Community	ELC Ecosite Codes	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		Habitat Description	Detailed Information and Sources	Defining Criteria	
Cliffs and Talus Slopes **Rationale:** Cliffs and Talus Slopes are extremely rare habitats in Ontario.	Any ELC Ecosite within Community Series: TAO TAS TAT CLO CLS CLT	A Cliff is vertical to near vertical bedrock >3 m in height. A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris.	• Most cliff and talus slopes occur along the Niagara Escarpment <u>Information Sources</u> • The Niagara Escarpment Commission has detailed information on location of these habitats • OMNRF Districts • Natural Heritage Information Centre (NHIC) has location information available on their website • Field Naturalist Clubs • Conservation Authorities	• Confirm any ELC Vegetation Type for Cliffs or Talus Slopes • SWH MIST Index #21 provides development effects and mitigation measures	ABSENT – None of the listed Ecosites are present in the study area.
Sand Barren **Rationale:** Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry	ELC Ecosites: SBO1 SBS1 SBT1 Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always <60%	Sand barrens typically are exposed sand, generally sparsely vegetated and caused by a lack of moisture, periodic fires and erosion. Usually located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered but less than 60%.	• A sand barren area >0.5 ha in size <u>Information Sources</u> • The Niagara Escarpment Commission has detailed information on location of these habitats • OMNRF Districts • Natural Heritage Information Centre (NHIC) has location information available on their website • Field Naturalist Clubs • Conservation Authorities	• Confirm any ELC Vegetation Type for Sand Barrens • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic spp.) • SWH MIST Index #20 provides development effects and mitigation measures	ABSENT – None of the listed Ecosites are present in the study area.

Rare Vegetation Communities

Rare Vegetation Community	ELC Ecosite Codes	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		Habitat Description	Detailed Information and Sources	Defining Criteria	
Alvar **Rationale:** Alvars are extremely rare habitats in Ecoregion 7E.	ALO1 ALS1 ALT1 FOC1 FOC2 CUM2 CUS2 CUT2-1 CUW2 **Five Alvar Indicator Species:** Carex crawei Panicum philadelphicum Eleocharis compressa Scutellaria parvula Trichostema brachiatum These indicator species are very specific to Alvars within Ecoregion 7E	An Alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. The hydrology of alvars is complex, with alternating periods of inundation and drought. Vegetation cover varies from sparse lichen-moss associations to grasslands and shrublands and comprising a number of characteristic or indicator plants. Undisturbed alvars can be phyto- and zoogeographically diverse, supporting many uncommon or are relict plant and animal species. Vegetation cover varies from patchy to barren with a less than 60% tree cover	• An Alvar site >0.5 ha in size • Alvar is particularly rare in Ecoregion 7E where the only known sites are found in the western islands of Lake Erie <u>Information Sources</u> • Alvars of Ontario (Federation of Ontario Naturalists, 2000) • Conserving Great Lakes Alvars (Ontario Nature) • OMNRF Districts • Natural Heritage Information Centre (NHIC) has location information available on their website • Field Naturalist Clubs • Conservation Authorities	• Field studies identify that four of the five **Alvar Indicator Species** at a Candidate Alvar Site is significant • Site must not be dominated by exotic of introduced species (<50% vegetative cover are exotic spp.) • The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses • SWH MIST Index #17 provides development effects and mitigation measures	ABSENT – None of the listed Ecosites or indicator species are present in the study area.
Old Growth Forest **Rationale:** Due to historic logging practices and land clearance for agriculture, old growth forest is rare in Ecoregion 7E.	Forest Community Series: FOD FOC FOM SWD SWC SWM	Old Growth Forests are characterized by heavy mortality or turnover of over-storey trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris.	• Woodland area is >0.5 ha <u>Information Sources</u> • OMNRF Forest Resource Inventory mapping • OMNRF Districts • Field Naturalist Clubs • Conservation Authorities • Sustainable Forestry License (SFL) companies will possibly know locations through field operations • Municipal forestry departments	Field studies will determine: • If dominant tree species of the forest are >140 years old, then the area containing these trees is SWH • The forested area containing the old growth characteristics will have experienced no recognizable forestry activities (cut stumps will not be present) • The area of forest ecosites combined or an eco-element within an ecosite that contain the old growth characteristics is the SWH • Determine ELC vegetation types for the forest area containing the old growth characteristics • SWH MIST Index #23 provides development effects and mitigation measures	ABSENT – No forest communities with frequent old growth trees, snags, canopy gaps or multi-layered canopy structure were identified.

Rare Vegetation Communities

Rare Vegetation Community	ELC Ecosite Codes	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		Habitat Description	Detailed Information and Sources	Defining Criteria	
Savannah **Rationale:** Savannahs are extremely rare habitats in Ontario.	TPS1 TPS2 TPW1 TPW2 CUS2	A Savannah is a tallgrass prairie habitat that has tree cover between 25-60% In Ecoregion 7E, known tallgrass prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in the Toronto area (north of Lake Ontario).	• No minimum size to site • Site must be restored or a natural site. Remnant sites such as railway right-of-ways are not considered SWH <u>Information Sources</u> • Natural Heritage Information Centre (NHIC) has location information available on their website • Field Naturalist Clubs • Conservation Authorities	Field studies confirm: • One or more of the Savannah indicator species listed in Appendix N should be present. Note: savannah plant spp. List from Ecoregion 7E should be used. • Area of the ELC Ecosite is the SWH • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic spp.) • SWH MIST Index #18 provides development effects and mitigation measures.	ABSENT – None of the listed Ecosites are present in the study area.
Tallgrass Prairie **Rationale:** Tallgrass Prairies are extremely rare habitats in Ontario.	TPO1 TPO2	A tallgrass prairie has ground cover dominated by prairie grasses. An open tallgrass prairie habitat has <25% tree cover. In Ecoregion 7E, known tallgrass prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in the Toronto area (north of Lake Ontario).	• No minimum size to site • Site must be restored or a natural site. Remnant sites such as railway right-of-ways are not considered SWH <u>Information Sources</u> • Natural Heritage Information Centre (NHIC) has location information available on their website • Field Naturalist Clubs • Conservation Authorities	Field studies confirm: • One or more of the Prairie indicator species listed in Appendix N should be present. Note: savannah plant spp. List from Ecoregion 7E should be used. • Area of the ELC Ecosite is the SWH • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic spp.) • SWH MIST Index #19 provides development effects and mitigation measures.	ABSENT – None of the listed Ecosites are present in the study area.
Other Rare Vegetation Communities **Rationale:** Plant communities that often contain rare specieswhich depend on the habitat for survival.		Provincially rare (S1, S2, S3) vegetation communities are listed in Appendix M of the Significant Wildlife Habitat Technical Guide (MNRF, 2000). Any ELC Ecosite Code that has a possible ELC Vegetation Type that is provincially rare is candidate SWH. Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps.	• ELC Ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in Appendix M of the Significant Wildlife Habitat Technical Guide (MNRF, 2000). • MNRF/NHIC will have up to date listing for rare vegetation communities. <u>Information Sources</u> • Natural Heritage Information Centre (NHIC) has location information available on their website • Field Naturalist Clubs • Conservation Authorities	• Field studies should confirm if an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of the Significant Wildlife Habitat Technical Guide (MNRF, 2000). • Area of the ELC Vegetation Type polygon is the SWH. • SWH MIST Index #37 provides development effects and mitigation measures.	ABSENT – No rare vegetation communities are present within the study area.

Specialized Habitat for Wildlife

Habitat Type	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Waterfowl Nesting Area **Rationale:** Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant.	American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1, MAS2, MAS3, SAS1, SAM1, SAF1, MAM1, MAM2, MAM3, MAM4, MAM5, MAM6, SWT1, SWT2, SWD1, SWD2, SWD3, SWD4 NOTE Includes adjacency to Provincially Significant Wetlands	• A waterfowl nesting area extends 120 m from a wetland (>0.5 ha) or a wetland (>0.5 ha) and any small wetlands (0.5 ha) within 120 m or a cluster of 3 or more small (<0.5 ha) wetlands within 120 m of each individual wetland where waterfowl nesting is known to occur • Upland areas should be at least 120 m wide so that predators such as raccoons, skunks and foxes have difficulty finding nests • Wood Ducks and Hooded Mergansers utilize large diameter trees (>40 cm dbh) in woodlands for cavity nest sites. <u>Information Sources</u> • Ducks Unlimited staff may know the locations of particularly productive nesting sites • MNRF Wetland Evaluations for indication of significant waterfowl nesting habitat • Reports and other information available from Conservation Authorities	Studies confirmed: • Presence of 3 or more nesting pairs for listed species excluding Mallards, or; • Presence of 10 or more nesting pairs for listed species including Mallards. • Any active nesting site of an American Black Duck is considered significant. • Nesting studies should be completed during the spring breeding season (April - June). Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” • A field study confirming waterfowl nesting habitat will determine boundary of the waterfowl nesting habitat for the SWH, this may be greater or less than 120 m from the wetland and will provide enough habitat for waterfowl to successfully nest • SWH MIST Index #25 provides development effects and mitigation measures.	ABSENT - The ecosites that are present on the subject property do not meet the criteria for SWH. There is no suitable habitat.

Specialized Habitat for Wildlife

Habitat Type	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat **Rationale**: Nest sites are fairly uncommon in Eco -region 7E and are used annually by the se species. Many suitable nesting locations may be lost due to increasing shoreline development pressures and scarcity of habitat.	Osprey SPECIAL CONCERN Bald Eagle	ELC Forest Community Series: FOD, FOM, FOC, SWD, SWM and SWC directly adjacent to riparian areas – rivers, lakes, ponds and wetlands.	• Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. • Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy. • Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting platforms) <u>Information Sources</u> • NHIC compiles all known nesting sites for Bald Eagles in Ontario • MNRF values information (LIO/NRVIS) will list known nesting locations. Note: data from NRVIS is provided as a point and does not represent all the habitat • Nature Counts, Ontario Nest Records Scheme data. • OMNRF District. • Check the Ontario Breeding Bird Atlas or Rare Breeding Birds in Ontario for species documented • Reports and other information available from Conservation Authorities. • Field Naturalists clubs	Studies confirm the use of these nests by: • One or more active Osprey or Bald Eagle nests in an area • Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH. • For an Osprey, the active nest and a 300 m radius around the nest or the contiguous woodland stand is the SWH, maintaining undisturbed shorelines with large trees within this area is important • For a Bald Eagle the active nest and a 400-800 m radius around the nest is the SWH. Area of the habitat from 400-800 m is dependent on sight lines from the nest to the development and inclusion of perching and foraging habitat • To be significant a site must be used annually. When found inactive, the site must be known to be inactive for > 3 years or suspected of not being used for >5 years before being considered not significant. • Observational studies to determine nest site use, perching sites and foraging areas need to be done from early March to mid-August. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #26 provides development effects and mitigation measures	ABSENT – Large watercourses or waterbodies suitable to support Bald Eagle and Osprey are not present.

Specialized Habitat for Wildlife

Habitat Type	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Woodland Raptor Nesting Habitat **Rationale:** Nests sites for these species are rarely identified; these area sensitive habitats and are often used annually by these species.	Northern Goshawk Cooper's Hawk Sharp-shinned Hawk Red-shouldered Hawk Barred Owl Broad-winged Hawk	May be found in all forested ELC Ecosites. May also be found in SWC, SWM, SWD and CUP3.	• All natural or conifer plantation woodland/forest stands >30 ha with > 4 ha of interior habitat. Interior habitat determined with a 200 m buffer. • Stick nests found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests, within tops or crotches of trees. Species such as Cooper's Hawk nest along forest edges sometimes on peninsulas or small off-shore islands. • In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest <u>Information Sources</u> • OMNRF Districts. • Check the Ontario Breeding Bird Atlas or Rare Breeding Birds in Ontario for species documented. • Check data from Bird Studies Canada. • Reports and other information available from Conservation Authorities.	Studies confirm: • Presence of one or more active nests from species list is considered significant • Red-shouldered Hawk and Northern Goshawk – A 400 m radius around the nest or 28 ha areaof habitat is the SWH. The 28 ha habitat area would be applied where optimal habitat is irregularly shaped around the nest. • Barred Owl – A 200m radius around the nest is the SWH • Broad-winged Hawk and Coopers Hawk, – A 100m radius around the nest is the SWH • Sharp-Shinned Hawk – A 50m radius around the nest is the SWH • Conduct field investigations from early March to end of May. The use of call broadcasts can help in locating territorial (courting/nesting) raptors and facilitate the discovery of nests by narrowing down the search area. • SWH MIST Index #27 provides development effects and mitigation measures	ABSENT – The wooded area does not exceed the 30-hectare threshold and the >10 ha threshold to be considered candidate SWH.

Specialized Habitat for Wildlife

Habitat Type	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Turtle Nesting Areas **Rationale:** These habitats are rare and when identified will often be the only breeding site for local populations of turtles	**Special Concern:** Midland Painted Turtle Northern Map Turtle Snapping Turtle	Exposed mineral soil (sand or gravel) areas adjacent (<100 m) or within the following ELC Ecosites: MAS1, MAS2, MAS3, SAS1, SAM1, SAF1, BOO1, FEO1	• Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals. • For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and is located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments and shoulders are not SWH. • Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes and rivers are most frequently used. <u>Information Sources</u> • Use Ontario Soil Survey reports and maps to help find suitable substrate for nesting turtles (well-drained sands and fine gravels). • Check the Ontario Herpetofaunal Summary Atlas records or other similar atlases for uncommon turtles; location information may help to find potential nesting habitat for them. • Natural Heritage Information Centre (NHIC). • Field naturalist clubs.	Studies confirm: • Presence of 5 or more nesting Midland Painted Turtles. • One ore more Northern Map Turtles or Snapping Turtles nesting is a SWH. • The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30 to 100 m around the nesting area dependent on slope, riparian vegetation and adjacent land use is the SWH. • Travel routes from wetland to nesting area are to be considered within the SWH as part of the 30 to 100 m area of habitat. • Field investigations should be conducted in prime nesting season typically late spring to early summer. Observational studies observing the turtles nesting is a recommended method. • SWH MIST Index #28 provides development effects and mitigation measures for turtle nesting habitat.	**CANDIDATE** – The sandy banks of Falcon Creek may provide suitable nesting habitat. No turtles or evidence of turtle nests were observed during field surveys.
Seeps and Springs **Rationale:** Seeps/Springs are typical of headwater areas and are often at the source of coldwater streams.	Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamanders	Seeps/springs are areas where groundwater comes to the surface. Often they are found within headwater areas within forested habitats. Any forested Ecosite within the headwater areas of a stream could have seeps/springs.	• Any forested area (with <25% meadow/field/pasture) within the headwaters of a stream or river system • Seeps and springs are important feeding and drinking areas. Especially in the winter will support a variety of plant and animal species. <u>Information Sources</u> • Topographical Map. • Thermography. • Hydrological surveys conducted by Conservation Authorities and MOECC. • Field Naturalists Clubs and landowners. • Municipalities and Conservation Authorities may have drainage maps and headwater areas	Field studies confirm: • Presence of a site with 2 or more seeps/springs should be considered SWH. • The area of an ELC forest ecosite or an ecoelement within ecosite containing the seeps/springs is the SWH. The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat • SWH MIST Index #30 provides development effects and mitigation measures	ABSENT – Groundwater discharge areas (i.e., seeps, springs) were not observed during field surveys. The study area is not within the headwaters of Falcon Creek.

Specialized Habitat for Wildlife

Habitat Type	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Amphibian Breeding Habitat (Woodland). **Rationale:** These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	All Ecosites associated with these ELC Community Series: FOC, FOM, FOD, SWC, SWM, SWD Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians.	• Presence of a wetland, pond or woodland pool (including vernal pools) >500 m2 (about 25 m diameter) within or adjacent (within 120 m) to a woodland (no minimum size). Some small wetlands may not be mapped and may be important breeding pools for amphibians. • Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat. <u>Information Sources</u> • Ontario Herpetofaunal Summary Atlas (or other similar atlases) for records • Local landowners may also provide assistance as they may hear spring-time choruses of amphibians on their property. • OMNRF Districts and wetland evaluations • Field Naturalist clubs • Canadian Wildlife Service Amphibian Road Call Survey • Ontario Vernal Pool Association: http://www.ontariovernalpools.org	Studies confirm: • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or egg masses) or 2 or more of the listed frog species with Call Level Codes of 3. • A combination of observational study and call count surveys will be required during the spring (Mar.-Jun.) when amphibians are concentrated around suitable breeding habitat within or near the woodland/wetlands • The habitat is the wetland area plus a 230m radius of woodland area. If a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is to be included in the habitat. • SWH MIST Index #14 provides development effects and mitigation measures	ABSENT - There are no wetlands, ponds, or vernal pools in the study area.

Specialized Habitat for Wildlife

Habitat Type	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Amphibian Breeding Habitat (Wetlands) **Rationale:** Wetlands supporting breeding for these amphibian species are extremely important and fairly rare within Central Ontario landscapes.	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	ELC Community Classes SW, MA, FE, BO, OA and SA. Typically these wetland ecosites will be isolated (>120 m) from woodland ecosites, however larger wetlands containing predominantly aquatic species (e.g. Bullfrog) may be adjacent to woodlands.	• Wetlands >500m2 (about 25m diameter), supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats • Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators • Bullfrogs require permanent water bodies with abundant emergent vegetation. <u>Information Sources</u> • Ontario Herpetofaunal Summary Atlas (or other similar atlases) • Canadian Wildlife Service Amphibian Road Surveys and Backyard Amphibian Call Count. • OMNRF Districts and wetland evaluations. • Reports and other information available from Conservation Authorities	Studies confirm: • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog/toad species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog/toad species with Call Level Codes of 3 or; Wetland with confirmed breeding Bullfrogs are significant • The ELC ecosite wetland area and the shoreline are the SWH • A combination of observational study and call count surveys will be required during the spring (March-June) when amphibians are concentrated around suitable breeding habitat within or near the wetlands. • If a SWH is determined for Amphibian Breeding Habitat (Wetlands) then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. • SWH MIST Index #15 provides development effects and mitigation measures.	ABSENT – No wetlands are present in the study area.
Woodland Area - Sensitive Bird Breeding Habitat **Rationale:** Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive inte rior forest song birds.	Yellow-bellied Sapsucker Red-breasted Nuthatch Veery Blue-headed Vireo Northern Parula Black-throated Green Warbler Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager Winter Wren Pileated Woodpecker **Special Concern:** Cerulean Warbler Canada Warbler	All Ecosites associated with these ELC Community Series: FOC, FOM, FOD, SWC, SWM, SWD	• Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >30 ha • Interior forest habitat is at least 200 m from forest edge habitat Information Sources: • Local birder clubs. • Canadian Wildlife Service (CWS) for the location of forest bird monitoring. • Bird Studies Canada conducted a 3-year study of 287 woodlands to determine the effects of forest fragmentation on forest birds and to determine what forests were of greatest value to interior species • Reports and other information available from Conservation Authorities.	Studies confirm: • Presence of nesting or breeding pairs of 3 or more of the listed wildlife species. • Note: any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH • Conduct field investigations in spring and early summer when birds are singing and defending their territories • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” • SWH MIST Index #34 provides development effects and mitigation measures HABITATS OF SPECIES OF CONSERVATION CONCERN	ABSENT – Forest stands are not greater than 30 ha in size. Interior forest habitat is not present.

Habitat for Species of Conservation Concern (Not including Endangered or Threatened Species)

Habitat Type	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Marsh Breeding Bird Habitat **Rationale:** Wetlands for these bird species are typically productive and fairly rare in Southern Ontario landscapes.	American Bittern Virginia Rail Sora Common Gallinule American Coot Pied-billed Grebe Marsh Wren Sedge Wren Common Loon Green Heron Trumpeter Swan **Special Concern:** Black Tern Yellow Rail	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SAS1 SAM1 SAF1 FEO1 BOO1 For Green Heron: all SW, MA and CUM1 sites	• Nesting occurs in wetlands. • All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present • For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water <u>Information Sources</u> • OMNRF District and wetland evaluations. • Field Naturalist clubs • Natural Heritage Information Centre (NHIC) Records. • Reports and other information available from Conservation Authorities. • Ontario Breeding Bird Atlas	Studies confirm: • Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren or breeding by any combination of 4 or more of the listed species • Note: any wetland with breeding of 1 or more Black Terns, Trumpeter Swan, Green Heron or Yellow Rail is SWH • Area of the ELC ecosite is the SWH. • Breeding surveys should be done in May/June when these species are actively nesting in wetland habitats. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #35 provides development effects and mitigation measures	ABSENT – No wetland habitat is present in the study area.
Open Country Bird Breeding Habitat **Rationale;** This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper have declined significantly the past 40 years based on CWS (2004) trend records.	Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow **Special Concern:** Short-eared Owl	CUM1 CUM2	• Large grassland areas (includes natural and cultural fields and meadows) >30 ha • Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e. no row cropping or intensive hay or livestock pasturing in the last 5 years) • Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older. • The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species <u>Information Sources</u> • Agricultural land classification maps, Ministry of Agriculture. • Local bird clubs. • Ontario Breeding Bird Atlas • EIS Reports and other information available from Conservation Authorities	Field studies confirm: • Presence of nesting or breeding of 2 or more of the listed species • A field with 1 or more breeding Short-eared Owls is to be considered SWH • The area of SWH is the contiguous ELC ecosite field areas • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #32 provides development effects and mitigation measures	ABSENT – Habitat threshold criteria (i.e. large grassland areas > 30 ha) is not met. No grassland is present in the study area.

Habitat for Species of Conservation Concern (Not including Endangered or Threatened Species)

Habitat Type	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Shrub/Early Successional Bird Breeding Habitat **Rationale;** This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records.	Indicator Species: Brown Thrasher Clay-coloured Sparrow Common Species: Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher **Special Concern:** Yellow-breasted Chat Golden-winged Warbler	CUT1, CUT2, CUS1, CUS2, CUW1, CUW2 Patches of shrub ecosites can be complexed into a larger habitat for some bird species	• Large field areas succeeding to shrub and thicket habitats >10 ha in size • Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e. no row-cropping, haying or live-stock pasturing in the last 5 years) • Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species • Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands <u>Information Sources</u> • Agricultural land classification maps, Ministry of Agriculture. • Local bird clubs. • Ontario Breeding Bird Atlas • Reports and other information available from Conservation Authorities	Field studies confirm: • Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species • A habitat with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as Significant Wildlife Habitat • The area of the SWH is the contiguous ELC ecosite field/thicket area. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #33 provides development effects and mitigation measures	ABSENT – Large field areas succeeding to shrub and thicket habitats are not present in the study area.
Terrestrial Crayfish **Rationale:** Terrestrial Crayfish are only found within SW Ontario in Canada and their habitats are very rare.	Chimney or Digger Crayfish; (*Fallicambarus fodiens*) Devil Crayfish or Meadow Crayfish; (*Cambarus diogenes*)	MAM1, MAM2, MAM3, MAM4, MAM5, MAM6, MAS1, MAS2, MAS3, SWD, SWT, SWM CUM1 with inclusions of above meadow marsh ecosites can be used by terrestrial crayfish	• Wet meadow and edges of shallow marshes (no minimum size) should be surveyed for terrestrial crayfish • Constructs burrows in marshes, mudflats, meadows, the ground can't be too moist. Can often be found far from water • Both species are a semi-terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels. Usually the soil is not too moist so that the tunnel is well-formed. <u>Information Sources</u> • Information sources from "Conservation Status of Freshwater Crayfishes" by Dr. Premek Hamr for the WWF and CNF, March, 1998	Studies confirm: • Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable meadow marsh, swamp or moist terrestrial sites • Area of ELC ecosite or an ecoelement area of meadow marsh or swamp within the larger ecosite area is the SWH • Surveys should be done April to August in temporary or permanent water. Note the presence of burrows or chimneys are often the only indicator of presence, observance or collection of individuals is very difficult • SWH MIST Index #36 provides development effects and mitigation measures	ABSENT – The ecosites that are present within the study area do not provide suitable habitat or meet the criteria for SWH.

Habitat for Species of Conservation Concern (Not including Endangered or Threatened Species)

Habitat Type	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Special Concern and Rare Wildlife Species **Rationale:** These species are quite rare or have experienced significant population declines in Ontario.	All Special Concern and Provincially Rare (S1, S2, S3, SH) plant and animal species. Lists of these species are tracked by the NHIC	All plant and animal element occurrences (EOs) within a 1 km or 10 km grid. Older EOs were recorded prior to GPS being available, therefore location information may lack accuracy.	• When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites <u>Information Sources</u> • Natural Heritage Information Centre (NHIC) will have Special Concern and Provincially Rare (S1-S3, SH) species lists with element occurrences data. • NHIC Website "Get Information": http://nhic.mnr.gov.on.ca • Ontario Breeding Bird Atlas • Expert advice should be sought as many of the rare spp. Have little information available about their requirements	Studies confirm: • Assessment/inventory of the site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable. • The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs be easily mapped and cover an important life stage component for a species e.g. specific nesting habitat or foraging habitat. • SWH MIST Index #37 provides development effects and mitigation measures	**CONFIRMED** – One species of Special Concern, Barn Swallow, was recorded. Four individuals were observed foraging over the study area. No nesting habitat was observed.

Animal Movement Corridors

Habitat Type	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Amphibian Movement Corridors **Rationale:** Movement corridors for amphibians moving from their terrestrial habitat to breeding habitat can be extremely important for local populations.	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	Corridors may be found in all ecosites associated with water. Corridors will be determined based on identifying the significant breeding habitat for these species in Table 1.1	• Movement corridors between breeding habitat and summer habitat • Movement corridors must be determined when amphibian breeding habitat is confirmed as SWH (Amphibian Breeding Habitat, Wetland) <u>Information Sources</u> • MNRF District Office. • Natural Heritage Information Centre (NHIC). • Reports and other information available from Conservation Authorities. • Field Naturalist Clubs	• Field Studies must be conducted at the time of year when species are expected to be migrating or entering breeding sites • Corridors should consist of native vegetation, with several layers of vegetation. Corridors unbroken by roads, waterways or bodies, and undeveloped areas are most significant • Corridors should have at least 15m of vegetation on both sides of waterway or be up to 200m wide of woodland habitat and with gaps <20m • Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat • SWH MIST Index #40 provides development effects and mitigation measures	ABSENT - Amphibian breeding habitat was not confirmed as SWH and thus, movement corridors, if present, are not considered SWH.

Significant Wildlife Habitat Exceptions for Ecodistricts within EcoRegion 7E

EcoDistrict, Habitat Type and	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
7E-2 **Bat Migratory Stopover Area** **Rationale:** Stopover areas for long distance migrant bats are important during fall migration	Hoary Bat Eastern Red Bat Silver-haired Bat	No specific ELC types.	• Long distance migratory bats typically migrate during late summer and early fall from summer breeding habitats throughout Ontario to southern wintering areas. Their annual fall migration may concentrate these species of bats at stopover areas. • This is the only known bat migratory stopover habitats based on current information. <u>Information Sources</u> • OMNRF for possible locations and contact for local experts • University of Waterloo, Biology Department	• Long Point (42°35'N, 80°30'E, to 42°33'N, 80°03'E) has been identified as a significant stop- over habitat for fall migrating Silver-haired Bats, due to significant increases in abundance, activity and feeding that was documented during fall migration. • The confirmation criteria and habitat areas for this SWH are still being determined. • SWH MIST Index #38 provides development effects and mitigation measures	ABSENT - Study area is not located in EcoDistrict 7E-2.

water's edge
ENVIRONMENTAL SOLUTIONS TEAM LTD.

Falcon Creek (CN Rail line to Willowbrook Road)

Fluvial Geomorphological & Erosion Assessment

April 15, 2024

April 12, 2024
WE 22024

Mr. Bill Coffey, M.Sc., P. Eng.
Head of Water Resources,
Valdor Engineering Inc.
571 Chrislea Road, Suite 4,
Woodbridge, Ontario
L4L 8A2

Dear Mr. Bill Coffey:

RE: Falcon Creek Fluvial Geomorphological Assessment and Channel Design
Burlington, Ontario

Water's Edge was authorized by Valdor Engineering Inc. to complete a fluvial assessment of Falcon Creek in Burlington, Ontario. The purpose of the study was to address fluvial geomorphological issues related to the proposed works, specifically:

- Determination of geomorphic stream conditions.
- General review of erosion and bankfull flows; and,

We have completed our assessment of the creek in accordance with the approved project Terms of Reference. Data sources for the analysis include:

- Aerial photograph of the study area (Google Imagery);
- Conservation Halton (Historic Ortho Photos)
- Physiography of Southern Ontario by Chapman & Putnam (digital data from Ministry of Northern Development and Mines (MNDM)); and Report #43 of Ontario Soils Survey;
- Site Inspections and Surveys; and,
- Discussions with Valdor Engineering Inc. staff.

Site inspections and a geomorphic survey of Falcon Creek were completed by Water's Edge staff on May 16, 17, and 26, 2022 followed by a Creek walk through on June 29, 2022. The site inspection was undertaken after an initial review of the mapping and available literature was completed in order to confirm site and general system characteristics.

The Study Area (see **Figure 2**) is located in Burlington. Falcon Creek study reach is ~270m long and is bounded by CN Railroad Upstream and Willowbrook Road at the downstream end.

There are four erosion sites that have been identified as needing analysis and will be investigated in this report along with providing design solutions.

1.0 EXISTING CONDITIONS

1.1 Geology & Physiography

Reviewing the site area's surficial materials is important to evaluate active channel processes. Stream channel form and sediment supply are controlled by the region's physiography and underlying surficial geology. Falcon Creek is in the Escarpment and Sand Plains physiographic regions at its upstream and downstream sections, respectively. The Escarpment region is composed of Paleozoic bedrock. The Sand Plains is composed of sand, gravel, minor silt and clay and can be classified as course-textured glaciolacustrine deposits. **Figure 1** shows the local physiography in the study area.

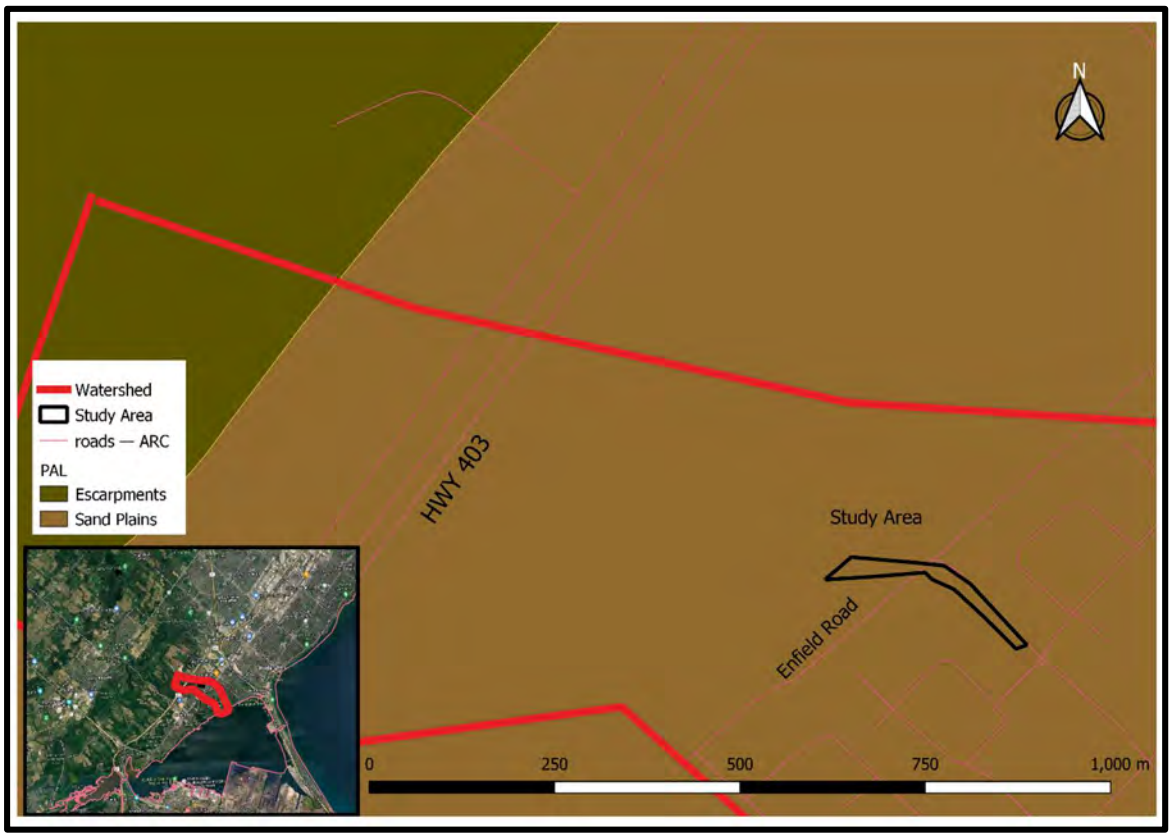


Figure 1: Local Physiography (data from MNDM & Google Maps)

1.2 General Watershed Characteristics

Falcon Creek is a 3rd order channel which discharges into Lake Ontario. The watershed to this point is largely agriculture (53%) Deciduous trees 18%, Community Infrastructure (6%), Swamp & Hedgerows (7%) based on (OFAT). Based on general observations of watershed aerial photography, the channel valley generally consists of a large riparian buffer zone and is mostly forested. Falcon Creek Watershed begins at Hwy 5 Dundas St. East of Waterdown, ON. The creek passes through the CN rail line where it becomes an urban stream being straightened and enters an underground culvert at Willowbrook Road, Burlington, ON. The creek exits the culvert below Plains Rd. and continues as an urbanized creek before flowing into Lake Ontario. The watershed at Willowbrook Road is 3.25km^2 and has an average slope of 7.55%.

1.3 Channel Characterization

In addition to confirming our desktop assessment, our field reconnaissance and geomorphic survey also included the determination of various geomorphic parameters. The geomorphic survey conducted included a longitudinal profile (Figure **3**) and twelve cross sections for this reach. Five of which are riffles and are used to characterize the reach. The riffles geomorphic characteristics are summarized in **Table 1**. The channel has been classified as a E3 channel under the Rosgen Classification.

Figure 2: Aerial Photograph of Study Area with surveyed XSs

Figure 3 details the longitudinal profile of the surveyed reach. Cross sections are shown in **Appendix A.** Photographs showing typical channel conditions within the reach are in **Appendix B**.

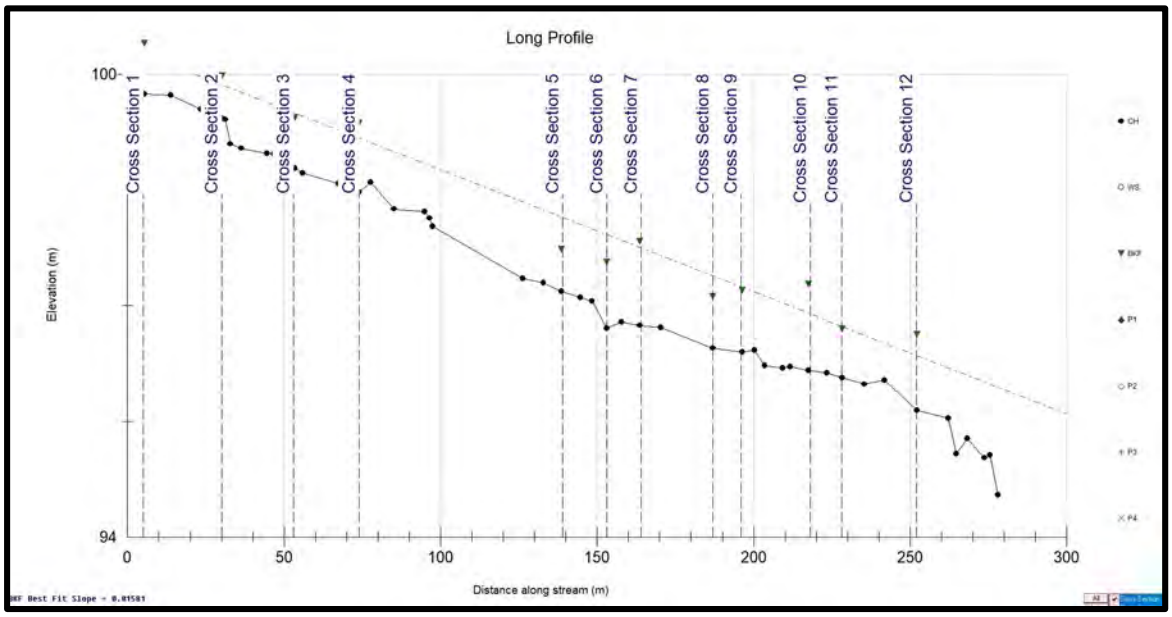


Figure 3: Falcon Creek Reach Profile

The reach is a single thread, in a mostly straight reach (Sinuosity 1.08). The channel is confined along Willowbrook Road and appears to have been straightened. The top of the reach is a culvert

under the CN Rail line that prevents large woody debris from entering the channel from the above watershed. Below the creek crosses under Enfield Road culvert. The creek enters a culvert on Willowbrook Road at the end of the reach and the flow is screened through a grate. The channel generally has eroding banks but at the point where the channel impacts the valley walls, the erosion has become excessive and may impact private property or public infrastructure if left uncontrolled. As a result of erosion within the reach and sediment contributions from upstream sources, the substrate within the reach ranges from course sand to cobbles. The riffles are predominantly composed of cobbles and gravels. Generally, the channel is slightly entrenched within the floodplain (Entrenchment Ratio = 2.62) and has a Width/Depth ratio that is moderate to high (W/D ratio >10.8). This means there has been some undercutting of the bed of the river from its natural state. The bankfull slope in this reach is 0.0016 m/m. Over extended time or high sediment loads, the slope starts to lessen. The general bankfull width ranges from 3 to 7 m (based on our evaluation of bankfull conditions). In general, the channel exhibits a range of characteristics but can generally be described as a C3/C4 system using the Rosgen Classification system.

The existing sediment and flow regime suggests a dynamic channel as evidenced by the active erosion and depositional features observed in the reach. As with other C3/C4 type channels, the sediment supply from upstream and over bank sources is high given the erodibility of the bank material. Since the riffles are primarily composed of cobbles as opposed to sand, the possibility of a major lateral migration is low. Additionally, the existing riparian conditions and manmade infrastructure reduce the possibility of lateral migration. However, since continued bank erosion can be expected if left untreated, private and public infrastructure is at risk.

The results of the observed and calculated geomorphic parameters noted in **Table 1**. Bankfull parameters were calculated based on surveyed bankfull indicators (BKF in **Figure 3**).

Table 1: Summary of Study Area Geomorphic Parameters

Parameter	Mean	Min	Max
Bankfull Width (m)	5.3	3.20	6.93
Bankfull Mean Depth (m)	0.53	0.25	0.73
Bankfull Max Depth (m)	0.86	0.55	1.12
Bankfull Area (m^2)	3.04	1.09	4.78
Bankfull Flow (m^3/s)	5.16	1.19	12.26
Wetted Perimeter (m)	5.7	3.48	7.43
Hydraulic Radius (m)	0.49	0.23	0.68
Width-Depth Ratio	10.78	8.68	17.64
Entrenchment Ratio	2.62	1.4	3.27
Bankfull Slope (m/m)	0.016	0.016	0.016
Channel Substrate D50 (mm)*	165	75	255
Channel Substrate D84 (mm)*	277	126	510
Channel Sinuosity	1.08	-	-
Rosgen Classification	C3/C4		

**Estimated from site observations*

2.0 STREAM ASSESSMENT SCORES

In addition to classification of a stream system, various techniques for geomorphic assessments are used to better understand general stream conditions (stability, habitat, erosion/degradation, riparian, etc.). In our assessment of Falcon Creek, we used Rapid Geomorphic Assessment and Rapid Stream Assessment Technique.

2.1 Rapid Geomorphic Assessment (RGA)

River stability was assessed using a Rapid Geomorphic Assessment (MOE, 2003). The RGA assessment focuses entirely on the geomorphic component of a river system. The RGA method

consists of four factors that summarize various components of channel adjustment, specifically: aggradation, degradation, channel widening and plan form adjustment. Each factor is assessed separately, and the total score indicates the overall stability of the system. This methodology has been applied to numerous streams and rivers and the following table details the ranking criteria (see **Table 2**).

Table 3 presents the results of the RGA assessments. Generally, the lower the score the more stable the channel is. With these criteria the Study Reach was assessed to have a score of 0.63 which ranks it as 'In Adjustment'. Two processes were particularly evident from the assessment form which are aggradation and widening. Indices present in the river for aggradation were siltation in pools, accretion on point bars, and deposition in the overbank zone. Indices for widening were fallen/leaning trees, large organic debris, exposed tree roots, and fracture lines along top of bank. The other two categories of degradation and planimetric form adjustment had minimal indices present.

Table 2: Interpretation of RGA Score

Stability Index (SI) Value	Classification	Interpretation
SI ≤ 0.20	In Regime	The channel morphology is within a range of variance for rivers of similar hydrographic characteristics and evidence of instability is isolated or associated with normal river meander processes.
0.21 ≤ SI ≤0.40	Transitional/Stressed	Channel morphology is within a range of variance for rivers of similar hydrographic characteristics, but the evidence of instability is frequent.
SI ≥ 0.40	In Adjustment	Channel morphology is not within the range of variance and evidence of instability is widespread.

Table 3: RGA Scores and Ranking

Creek	Score	Verbal Ranking
Falcon Creek	0.43	In Adjustment

2.2 Rapid Stream Assessment Technique (RSAT)

Rapid Stream Assessment Technique was developed by John Galli and other staff of the Metropolitan Washington (DC) Council of Governments (Galli et al, 1996). The RSAT systematically focuses on conditions reflecting aquatic-system response to watershed urbanization. It groups responses into six categories, presumed to adequately evaluate the conditions of the river system at the time of measurement on a reach-by-reach basis. The six categories are:

1. Channel stability,
2. Channel scouring and sediment deposition,
3. Physical in-stream habitat,
4. Water quality,
5. Riparian habitat conditions, and
6. Biological conditions.

River channel stability and cross-sectional characterization is a critical component of RSAT. The entire channel was inspected for signs of instability (such as bank sloughing, recently exposed non-woody tree roots, general absence of vegetation within bottom third of the bank, recent tree falls, etc.) and channel degradation or downcutting (such as high banks in small headwater streams and erosion around man-made structures). Observations were noted and cross-section measurements were made.

A rapid assessment of soil conditions along the riverbanks is also conducted to determine soil texture and potential erodibility of the watercourse bank. Qualitative water quality measurements were also made (temperature, turbidity, colour and odour) along with an indication of substrate fouling (i.e., the unwanted accumulation of sediment).

RSAT also typically involves a quantitative sampling and evaluation of benthic organisms. As no benthic sampling was undertaken, the score was based on site conditions and general observations of water quality.

Each category was assigned a value which was then summed to provide an overall score and ranking. **Table 4** details the range of scores and rankings with a higher score suggesting a healthier system.

Within these broad categories, we evaluated the river and determined the RSAT score which is outlined in **Table 5**. The overall score received from the RSAT assessment was 26 which ranks the Study Reach as 'Fair'. The river received poor scoring in multiple categories including Riparian Habitat, Channel Stability, and Water Quality. The rest of the indicator the river scored an average assessment close to the middle of the scale. The assessment generally scored the Study Reach poorly due to the high amount of sedimentation and instability visible throughout the channel and poor riparian zone. This is typical for the urban creeks.

Table 4: Interpretation of RSAT Score

RSAT Score	Ranking
41-50	Excellent
31-40	Good
21-30	Fair
11-20	Poor
0-10	Degraded

Table 5: RSAT Scores and Ranking

River	Score	Verbal Ranking
Falcon Creek	26	Fair

3.0 CHANNEL FLOWS

Using data from the geomorphic field work, and using a friction factor/relative roughness methodology, bankfull flows in this highly disturbed system were determined to range from 1.19 m^3/s to 12.26 m^3/s at different cross sections within the study reach of Falcon Creek. The average bankfull flow through all the riffle cross sections is 5.16 m^3/s.

Additionally, we regressed the existing return period flows as provided by Valdor Engineering Inc.. Falcon Creek Hydrology and Hydraulic Study (2012). The resultant 1:1.5 period flow is expected to be 1.72 m^3/s at the CNR and 1.86 m^3/s at Willowbrook respectively (see **Figure**). Typically, bankfull return periods have been associated with 1.5 year return period. If we input the friction factor bankfull flow values from **Table 1** into **Figure 4**, we can regress return period based on the bankfull flows. Based on the with an average bankfull of 5.16 m^3/s (estimated 3-year return period) minimum bankfull 1.19 m^3/s (estimated 1.3-year return period), and a maximum bankfull of 12.26 m^3/s (estimated 15.6-year return period). Because the average bankfull produces a return period greater than 1.5-years it shows that the reach is not operating as per the standard for rivers. This proves further that the river is strained.

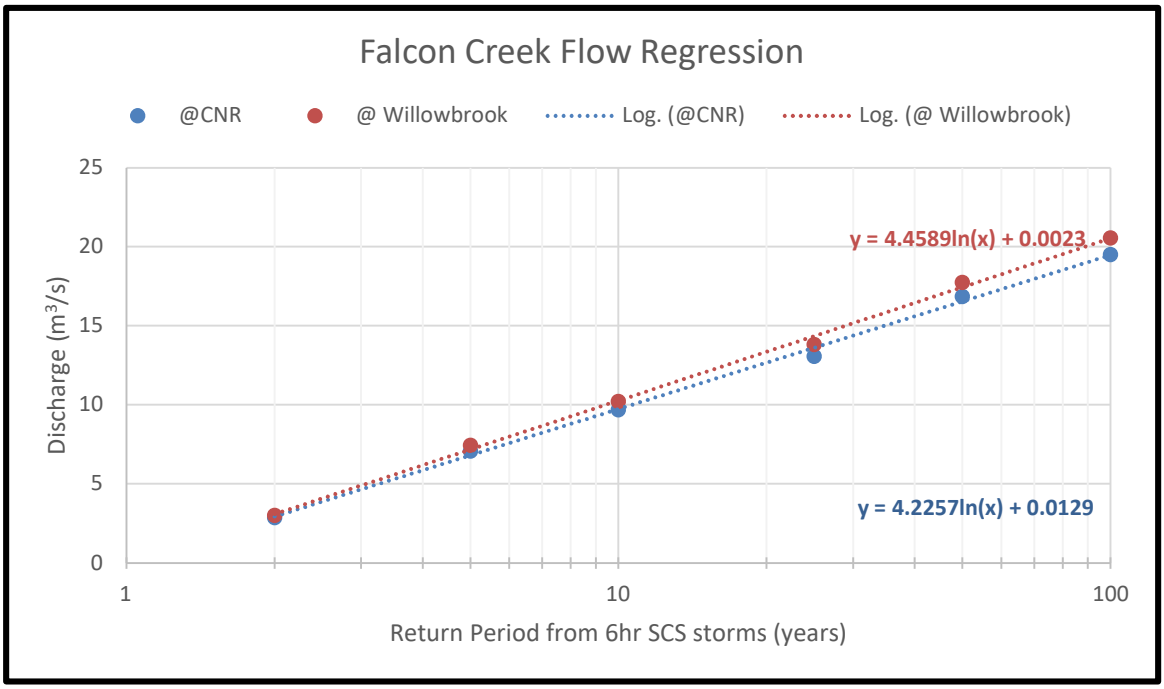


Figure 4: Flow Regression Analysis

4.0 EROSION ASSESSMENT

Working with Valdor Engineering Inc., the City of Burlington, and Conservation Halton, a stream walk was completed June 29, 2022. From this walk, four erosion sites were determined. Valdor Engineering and Water's Edge has developed options and assessment for these four options. The options will be examined below. Water's Edge identified based on inspection that measures have already been done to control erosion in the creek in spots not addressed in this report:

- Concrete block wall at Enfield Road
- Armourstone downstream Enfield Road Culvert
- Concrete retaining wall along Willowbrook Road connected to the culvert

Comparing historic photos as well as talking to land owners, the city completes regular maintenance on the creek to remove sediment at the Willowbrook Road culvert as well as removing deadfall from the channel and floodplain. The continuation of these mitigation factors is encouraged, but the impact is not examined in this report. Depending on when the maintenance first started, would provide greater understanding of the erosion on Falcon Creek.

4.1 Historical Analysis

Historical erosion assessments are normally completed using historic orthographic photos. Due to poor resolution, and high tree cover the orthographic photos were not useful to disseminate erosion rates. As a result, erosion rates at present will only be qualitatively described in **Section 3.3** and compared to Water's Edge Creek walk photos from 2015.

4.2 Cause of Erosion

In order to determine solutions for erosion sites, it is important to determine their cause, significance, as well as the estimated lasting impact if not treated.

Bank erosion has been determined as the problem for all the sites. This is identified through steep banks, exposed roots, fallen trees, lack of vegetated banks. Because of the banks are eroding, it is a sign that the shear forces on the banks exceeds the shields parameter Critical Shear Stress

(θ_{cr}). Though the banks are eroding, this could be affected by the bed characteristics. As sediment is transported throughout the river it can cause friction upon the banks. As the bed in general has larger particle sizes, and there is armouring, there is a need for the armouring to break up in order for sediment transport to increase. When the larger materials are beginning to be transported, erosion rates increase. Causes for the sediment transport to be increased in Falcon Creek are briefly described below.

- Increase in frequency and intensity of storms due to climate change, and upstream urbanization causes more friction, lift forces, shear stress in riverbanks. This is expected to remain like this unless work is done to increase detention time in the watershed.
- Historic Straightening – increases the velocity and thereby shear stress compared to natural meanders. With the channelization of the river having one steep bank and another gradual bank will create vortices that encourage undercutting in the river at high flows.
- Lack of freezing - as rivers remain open longer due to warmer weather, rainfall in winter months that once would have been snow, now continue to flow into river providing shear stress all year from runoff.
- Increase of freeze thaw cycles - when rivers are not completely frozen and experience freeze thaw cycles, there are many processes that create erosion prone conditions, such as frost heave and ice crystals expanding to break apart soil structures.
- Debris - As the vegetation around the creek matures, there is decay, and branches create debris in the creek which create log jams. This causes cutting, scouring and scrapes.
- Erosion – as sites upstream have erosion, this causes more sediment transport which can accelerate erosion downstream by friction on the banks. See (**Appendix B)** for historical upstream photos showing erosion.
- Back Water – due to sedimentation, log jams downstream, increase the water level for each event. More of the bank would be submerged in the creek than if there was not back water. Saturated banks do not have as much shear strength compared to unsaturated.
- Lack of Vegetation on banks – potentially when the creek was straightened, the banks were not built to support vegetation, or large trees. As a result, if trees and shrubs cannot stay with the slope of banks, then there will be no armouring of banks from vegetation.

Knowing these causes of erosion will help determine solutions that are longer lasting. The geomorphic impact from erosion will be described below for each site.

4.3 Erosion Site Descriptions

Erosion Site #1
Erosion Site #1 is a steep left bank and is having bank failure of non-cohesive bank material. Though the bank has lots of gravel, the angle of the bank combined with the silty sand is at risk for erosion due to the flow resulting in stress greater than the critical shear stress of the bank material. There is also undercutting at the bank. This is the outside bank of a curve and would have the highest velocities in the channel. The right bank opposite ES#1 is a point bar, with deposition taking place. Across from point bars creating a vortex flow which can lead to the undercutting of the bank due to the geometry of the cross section. The banks are almost vertical at points which is at risk to continue degradation over time. The rate of erosion is not high (as noted in Section 5.0 ES#1).

Erosion Site #2
Erosion Site #2 is across from ES #1. The top of bank has been eroding causing fences and trees to lean into the river. Judging by the slope of the bank there has been slump/rotational failure in the bank and or possible frost heave associated with it. The bank appears to be less course material than the RB so it would react differently to the flows. The private infrastructure is not at current risk, but it is unsightly. Though there is deposition at this site, it is not enough to make up for the erosion. Compared to 2015 photo (**Appendix B**), the site has not been altered significantly. As a result, annual erosion rates are seen to be low.

Erosion Site #3

Erosion Site #3 is along Willowbrook Road. This is a cut bank on a corner of the creek. As it is the outside bank it will have the highest velocities of the cross section. The bank is unnaturally steep and is close to public infrastructure (Willowbrook Road). The Toe of the slope has been completely eroded away. There is minimal vegetation to stabilize the bank. The bank material appears to be silty clay which has the potential to slump. There are exposed tree roots indicating erosion. Compared to 2015 there is not significant change in the section (**See Appendix B**).

Erosion Site #4

Erosion Site #4 is also along Willowbrook Road. The left bank is the site of erosion and is a steep bank. The section appears to have been straightened. The opposite side of the river has a gradual slope into the floodplain of private landowners. The site of erosion has public infrastructure at risk. The toe of the right bank has been undercut. Roots are exposed and there is almost no vegetation to armor the bank. The channel is wider and deeper than other spots showing that the river is being entrenched and widened. Compared to 2015 the top of bank has been eroded further. In 2015 there are trees that have recently fallen over. In 2022, the roots have been exposed further. This site has the highest priority due to the high rate of erosion and proximity to Willowbrook Road.

The options for the four sites have been evaluated for different alternatives. They are examined in **Tables 6-9.** Generally, we are looking to include advantages/ disadvantages in these tables specific to fluvial geomorphology. Valdor is compiling a finale complete table of all advantages. disadvantages in our overall report.

Table 6 Summary of Mitigation Options – Falcon Creek - Erosion Site #1

Mitigation Option	Description	Advantages	Disadvantages
1	Do Nothing (Existing Conditions) – No mitigation work to be completed	• Cost savings (if erosion risk is low and if mitigation is not required) • Not having construction will not impede any fish habitat	• Erosion issues may become worse • Ultimate repair costs will be higher (if mitigation is required) • Potential liability issues (private property) • (if erosion risk is high) • Possible sediment loading
2	Vegetated slope (3:1 to 4:1) with riverstone toe protection to the 2-yr water surface elevation with or without channel realignment and cut or fill to achieve the requisite slope	• Very naturalized long-term solution • Low maintenance costs • No reduction in floodplain storage • (if slope is achieved by cut) • Will improve fish habitat and passage • Will stabilize banks • Will reduce existing and prevent further river entrenchment • River stone will armour banks from scouring	• Potential reduction in floodplain storage (if slope is achieved by fill) • Significant addition/removal of material required • Disturbance to private infrastructure may occur (if slope is achieved by cut)
3	Vegetated sub-angular riverstone slope (2:1) or vegetated earth-anchoring system (e.g. Terrafirm) at 2:1 slope with geogrid and turf reinforcement mat and including riverstone toe protection to the 2-yr water surface elevation with or without channel realignment and cut or fill to achieve the requisite slope	• No reduction in floodplain storage (if slope is achieved by cut) • Will improve aesthetics of site • Will stabilize banks • Will reduce sedimentation at downstream sites	• Potential long term maintenance costs • Potential reduction in floodplain storage (if slope is achieved by fill) • Will require machinery in the river
4	Vegetated slope stabilization system (e.g. Terra Slope 45) with geogrid and erosion mat at 1:1 slope and including riverstone toe protection to the 2-yr water surface elevation	• No reduction in floodplain storage	• Significant excavation and engineered fill required • Disturbance to private infrastructure may occur • Produces higher water level than 2:1 slope
5	Implement monitoring program (e.g. using erosion pins) to track and assess erosion risk and the requirement for mitigation	• Cost savings (if erosion risk is low and if mitigation is not required) • Provides more certainty whether mitigation is required • Does not impede any flow or affect fish habitat	• Ultimate repair costs will be higher (if mitigation is required) • Will not reduce sedimentation at downstream sites if ES#1 continues to erode • Will not be protected from increase of flashy storms from urbanization and climate change

Table 7 Summary of Mitigation Options – Falcon Creek - Erosion Site #2

Mitigation Option	Description	Advantages	Disadvantages
1	Do Nothing (Existing Conditions) – No mitigation work to be completed	• Cost savings (if erosion risk is low and if mitigation is not required) • Does not have construction activity in the river	• Erosion issues may become worse • Ultimate repair costs will be higher (if mitigation is required) • Potential liability issues (private property) (if erosion risk is high) • Possible sediment loading
2	Vegetated slope (3:1 to 4:1) with riverstone toe protection to the 2-yr water surface elevation with or without channel realignment and cut or fill to achieve the requisite slope	• Very naturalized long-term solution • Low maintenance costs • No reduction in floodplain storage (if slope is achieved by cut) • Prevents bank failure • Improve aesthetics • Channel realignment can restore natural sinuosity back to river	• Potential reduction in floodplain storage (if slope is achieved by fill) • Significant addition/removal of material required • Disturbance to private infrastructure may occur (if slope is achieved by cut) Tree removal may be required
3	Vegetated sub-angular riverstone slope (2:1) or vegetated earth-anchoring system (e.g. Terrafirm) at 2:1 slope with geogrid and turf reinforcement mat and including riverstone toe protection to the 2-yr water surface elevation with or without channel realignment and cut or fill to achieve the requisite slope	• No reduction in floodplain storage (if slope is achieved by cut) • Tree removal may be avoided • Prevents bank failure	• Potential long term maintenance costs • Potential reduction in floodplain storage (if slope is achieved by fill)
4	Vegetated slope stabilization system (e.g. Terra Slope 45) with geogrid and erosion mat at 1:1 slope and including riverstone toe protection to the 2-yr water surface elevations	• No reduction in floodplain storage • Prevents bank failure	• Significant excavation and engineered fill required • Disturbance to private infrastructure may occur • Tree removal may be required • Produces higher water level than 2:1 slope • May have to dig up private property to install geogrid
5	Implement monitoring program (e.g. using erosion pins) to track and assess erosion risk and the requirement for mitigation	• Cost savings (if erosion risk is low and if mitigation is not required) • Provides more certainty whether mitigation is required • Does not impede any flow or affect fish habitat due to lack of work in the river	• Ultimate repair costs will be higher (if mitigation is required)

Table 8 Summary of Mitigation Options – Falcon Creek - Erosion Site #3

Mitigation Option	Description	Advantages	Disadvantages
1	Do Nothing (Existing Conditions) – No mitigation work to be completed	• Cost savings (if erosion risk is low and if mitigation is not required)	• Erosion issues may become worse • Ultimate repair costs will be higher (if mitigation is required) • Potential liability issues (private property)(if erosion risk is high) • Possible sediment loading
2	Vegetated slope (3:1 to 4:1) with riverstone toe protection to the 2-yr water surface elevation with or without channel realignment and cut or fill to achieve the requisite slope	• Very naturalized long-term solution • Low maintenance costs • No reduction in floodplain storage (if slope is achieved by cut) • Prevents bank failure • May prevent further sedimentation at Willowbrook culvert	• Potential reduction in floodplain storage (if slope is achieved by fill) • Significant addition/removal of material required • Disturbance to private infrastructure may occur (if slope is achieved by cut) • Tree removal may be required
3	Vegetated earth-anchoring system (e.g. Terrafirm) at 2:1 slope with geogrid and turf reinforcement mat and bank stabilization system (e.g. Scourlok) at 0.125:1 slope with earth anchors with cut to achieve the requisite slope	• No reduction in floodplain storage (if slope is achieved by cut) • Tree removal may be avoided • Prevents bank failure • May prevent further sedimentation at Willowbrook culvert • May restore river's meandering reducing channelization affect	• Potential long term maintenance costs • Potential reduction in floodplain storage (if slope is achieved by fill)
4	Vegetated slope stabilization system (e.g. Terra Slope 45) with geogrid and erosion mat at 1:1 slope and including riverstone toe protection to the 2-yr water surface elevation	• No reduction in floodplain storage • Prevents bank failure • May prevent further sedimentation at Willowbrook culvert	• Significant excavation and engineered fill required • Disturbance to private infrastructure may occur • Tree removal may be required • Produces higher water level than 2:1 slope
5	Partial height armourstone retaining wall for bottom portion of the slope including riverstone toe protection with the top portion of the slope either with vegetated sub-angular riverstone (2:1 slope) or vegetated earth anchoring system (e.g. Terrafirm) at 2:1 slope with geogrid and turf reinforcement mat or vegetated slope stabilization system (e.g. Terra Slope 45) with geogrid and erosion mat at 1:1 slope	• Less armourstone required than Mitigation Concept 'E' • No reduction in floodplain storage • Prevents bank failure • May prevent further sedimentation at Willowbrook culvert	• Costly to build and maintain
6	Full height armourstone retaining wall with riverstone toe protection	• No reduction in floodplain storage • May prevent further sedimentation at Willowbrook culvert • Prevents bank failure	• Costly to build and maintain

Table 9 Summary of Mitigation Options – Falcon Creek - Erosion Site #4

Mitigation Option	Description	Advantages	Disadvantages
1	Do Nothing (Existing Conditions) – No mitigation work to be completed	• Cost savings (if erosion risk is low and if mitigation is not required)	• Erosion issues may become worse • Ultimate repair costs will be higher (if mitigation is required) • Potential liability issues (private property) (if erosion risk is high) • Possible sediment loading
2	Vegetated slope (3:1 to 4:1) with riverstone toe protection to the 2-yr water surface elevation with or without channel realignment and cut or fill to achieve the requisite slope	• Very naturalized long-term solution • Low maintenance costs • No reduction in floodplain storage (if slope is achieved by cut) • Stabilizes bank • Provides increased roughness, adding oxygen to water • May prevent further sedimentation at Willowbrook culvert	• Potential reduction in floodplain storage (if slope is achieved by fill) • Significant addition/removal of material required • Disturbance to private infrastructure may occur (if slope is achieved by cut) • Tree removal may be required
3a	Vegetated earth-anchoring system (e.g. Terrafirm) at 2:1 slope with geogrid and turf reinforcement mat and bank stabilization system (e.g. Scourlok) at 0.125:1 slope with earth anchors with cut to achieve the requisite slope	• No reduction in floodplain storage (if slope is achieved by cut) • Tree removal may be avoided • Increases Stabilizes bank • May prevent further sedimentation at Willowbrook culvert • Natural look	• Potential long term maintenance costs • Potential reduction in floodplain storage (if slope is achieved by fill)
4	Vegetated slope stabilization system (e.g. Terra Slope 45) with geogrid and erosion mat at 1:1 slope and including riverstone toe protection to the 2-yr water surface elevation	• No reduction in floodplain storage • Provides more naturalized solution than armourstone (Mitigation Concepts '5' & '6') • May avoid works encroaching on private property • May prevent further sedimentation at Willowbrook culvert	• Significant excavation and engineered fill required • Disturbance to private infrastructure may occur • Tree removal may be required
5	Partial height armourstone retaining wall for bottom portion of the slope including riverstone toe protection with the top portion of the slope either with vegetated sub-angular riverstone (2:1 slope) or vegetated earth anchoring system (e.g. Terrafirm) at 2:1 slope with geogrid and turf reinforcement mat or vegetated slope stabilization system (e.g. Terra Slope 45) with geogrid and erosion mat at 1:1 slope	• Less armourstone required than Mitigation Concept '6' • No reduction in floodplain storage • May avoid works encroaching on private property • May prevent further sedimentation at Willowbrook culvert • Prevents bank failure	• Costly to build and maintain
6	Full height armourstone retaining wall with riverstone toe protection	• No reduction in floodplain storage • May avoid works encroaching on private property • May prevent further sedimentation at Willowbrook culvert	• Costly to build and maintain • Reduces roughness in channel (increasing velocities) • Does not improve fish habitat

5.0 DESIGN INPUT

Based on the fluvial geomorphic and erosion assessment, best design options are being presented below:

ES#1

It is recommended our the study to implement a Monitoring Program (Option 5) for this site. As the site has not changed much from 2015, the rate of erosion is not high. Continued maintenance of downfall and removing debris is recommend for this site. Following the monitoring program, if erosion is still occurring, it is recommended to pursue adding vegetated river stone if the private owner property can be graded.

ES#2

It is also recommended to implement a Monitoring Program (Option 5) for this site. This site has not changed much since 2015. The private infrastructure is not at immediate risk and the impact of further erosion at current rates will not negatively affect downstream sites at this point. Continued maintenance of downfall and removing debris is recommend for this site. Following the monitoring program, if erosion is still occurring, it is recommended to pursue adding vegetated river stone if the private owner property can be graded restore bank stability and improve aesthetics of the river.

ES#3

For this site it is recommended to choose the vegetated earth – anchoring system and vegetated bank stabilization system (Option 3). Though this site has not changed much since 2015, many tree roots are exposed. The bank is unnaturally steep. If this site is left unattended, with significant storm event along with continued stress on there is risk to public infrastructure. There is a smaller buffer of bank compared to ES# 1 &2. Additionally, it is recommended to realign the channel at this point, if required due to space constraints. This will transform this site from a cut bank to a site that will no longer experience the same shear stress. Continued maintenance of downfall and removing debris is recommended for this site.

ES#4

For this site, it is recommended to choose the vegetated earth – anchoring system and vegetated bank stabilization system (Option 3). Though this may require, working on Willowbrook Road it is more accepted than a retaining wall from the stakeholders. This will allow less grading compared to vegetated riverstone as there is not enough room to provide the naturalized bank slope. Continued maintenance of downfall and removing debris is recommend for this site.

6.0 SUMMARY

Falcon Creek is a 3rd order stream that flows through the Escarpment and Sand Plains physiographic regions and drains into Lake Ontario. The study reach is located in Burlington, Ontario.

In order to carry out a fluvial geomorphic and erosion assessment, a geomorphic survey of approximately 270 m of the stream reach in the area of interest was carried out. The sediment substrate in the riffles of the studied reach was dominated by gravels and cobbles. As such, the study reach was determined to show characteristics of a Rosgen C3/C4 channel. Our field investigations indicate that the bankfull discharge is approximately 5.16 m^3/s.

Bank erosion is occurring within the reach. The channel has been classified as ‘In Adjustment’ and ‘Fair’ conditions for river stability. There are signs of significant erosion. ES# 1 and 2 do however not require immediate responses, but it is recommended to implement monitoring programs. It is recommended to complete immediate action at ES# 3 with the vegetated earth -anchoring system

and vegetated bank stabilization system (Option3) to protect public infrastructure. For site ES#4 which is also threatening public property, it is recommended to also implement the vegetated earth-anchoring system and vegetated bank stabilization system (Option3).

Continued maintenance is recommended for all sites. Design must include consideration for fish passage. Additionally, it is recommended that the city investigate the Willowbrook culvert and impact of the existing grate on Falcon Creek.

Respectfully submitted,

Ed Gazendam, Ph.D., P.Eng.

President, Sr. Geomorphologist

Tim Antonio, B.A.Sc.,P. Eng.
Water Resources Engineer

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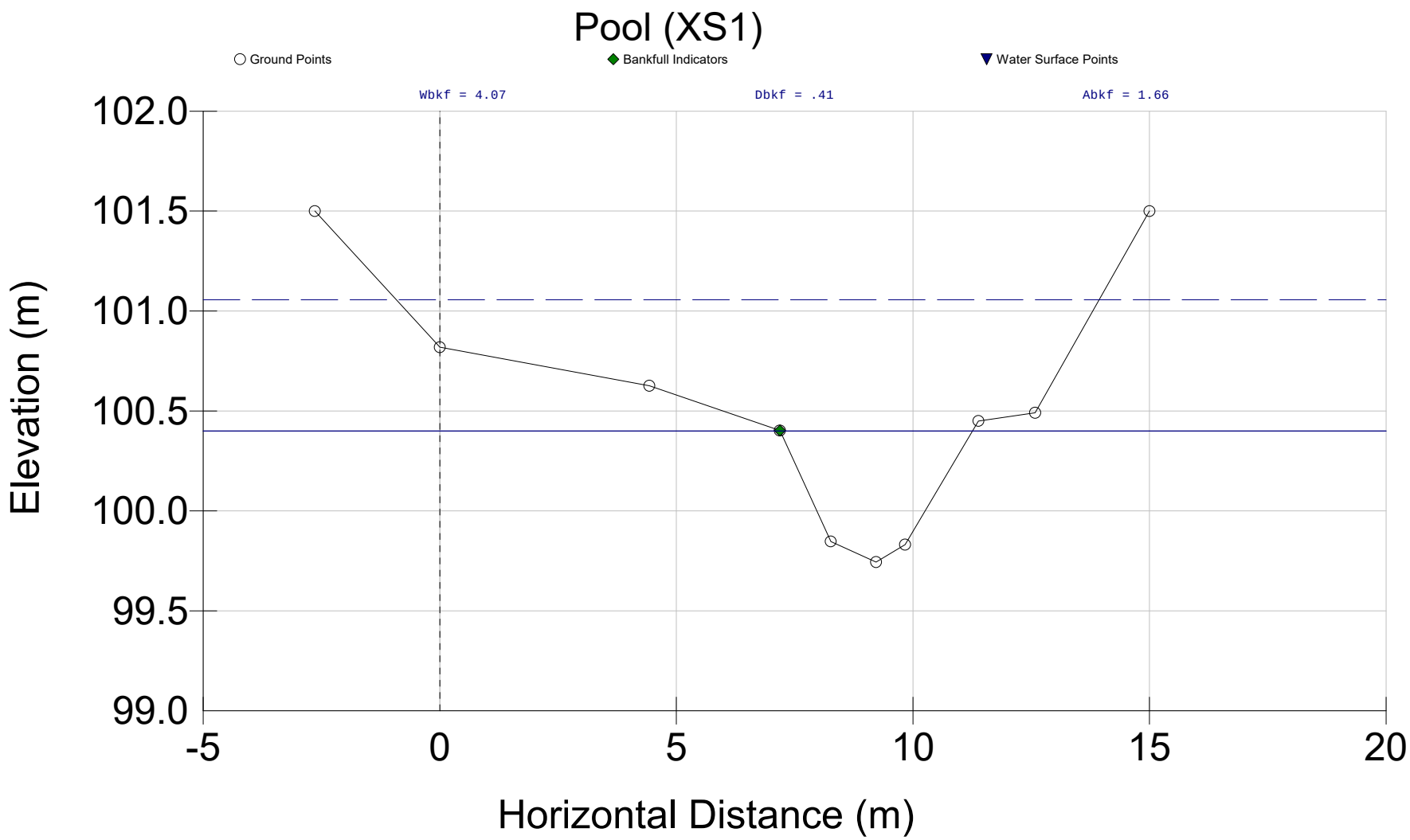
APPENDIX A:

Cross Sections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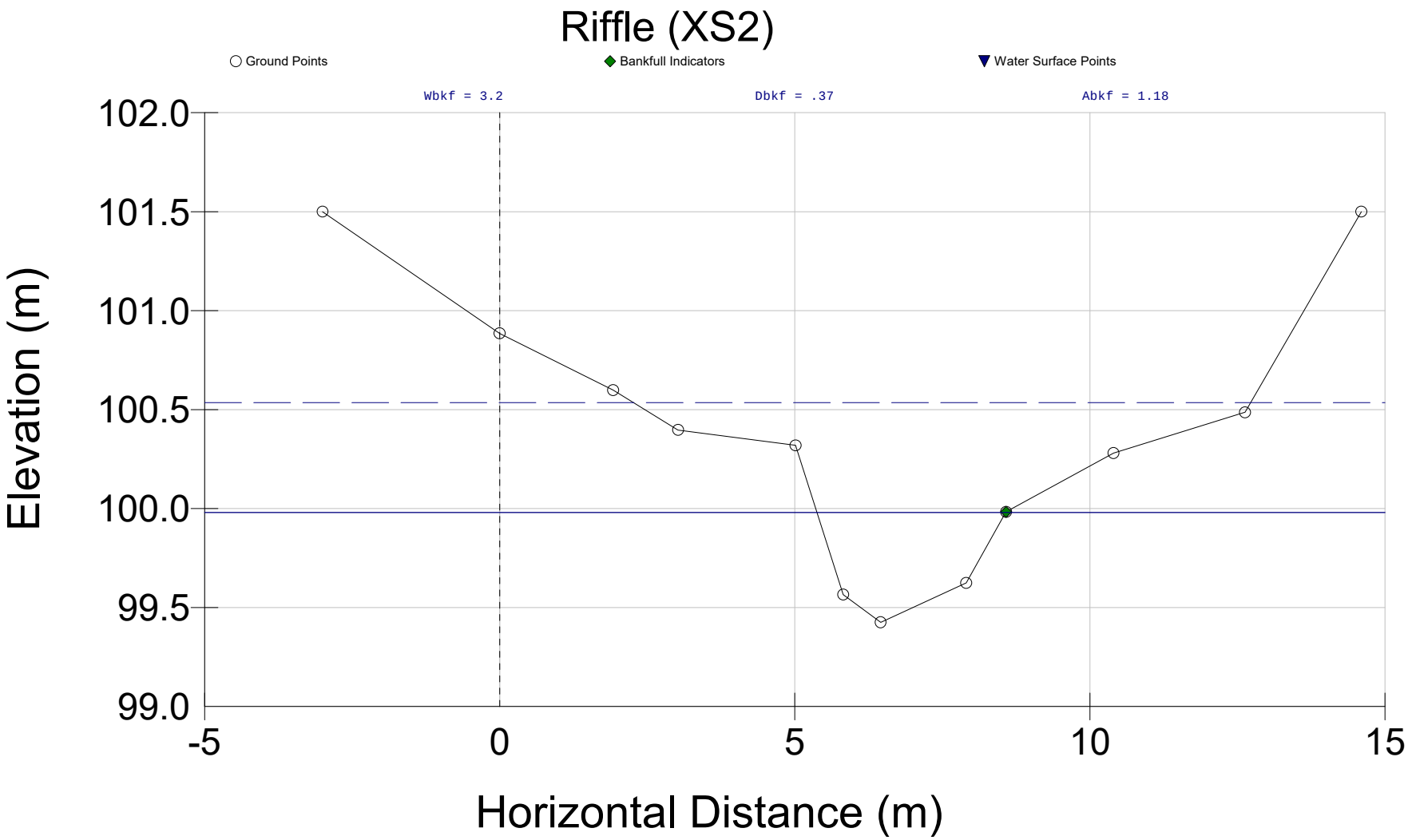
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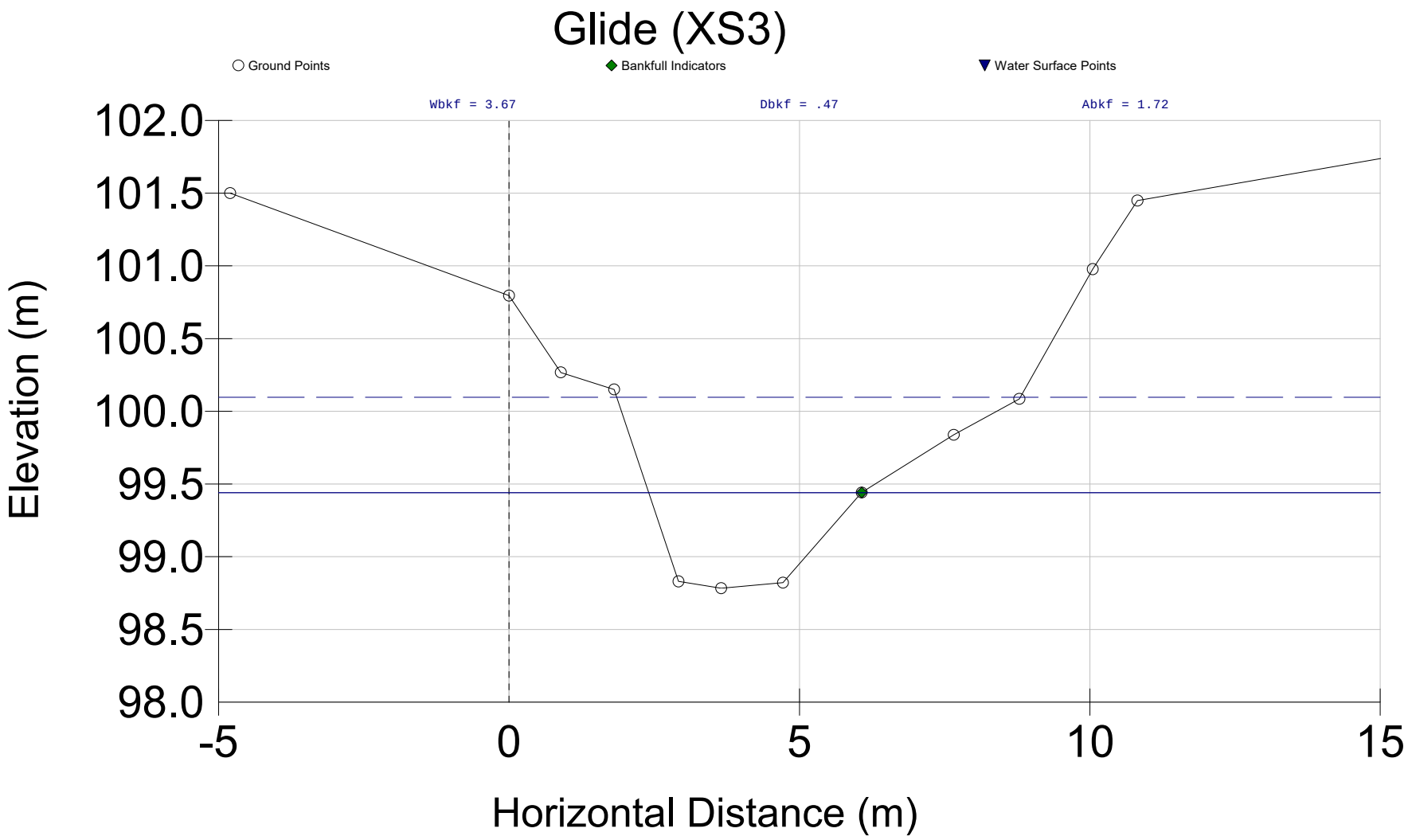
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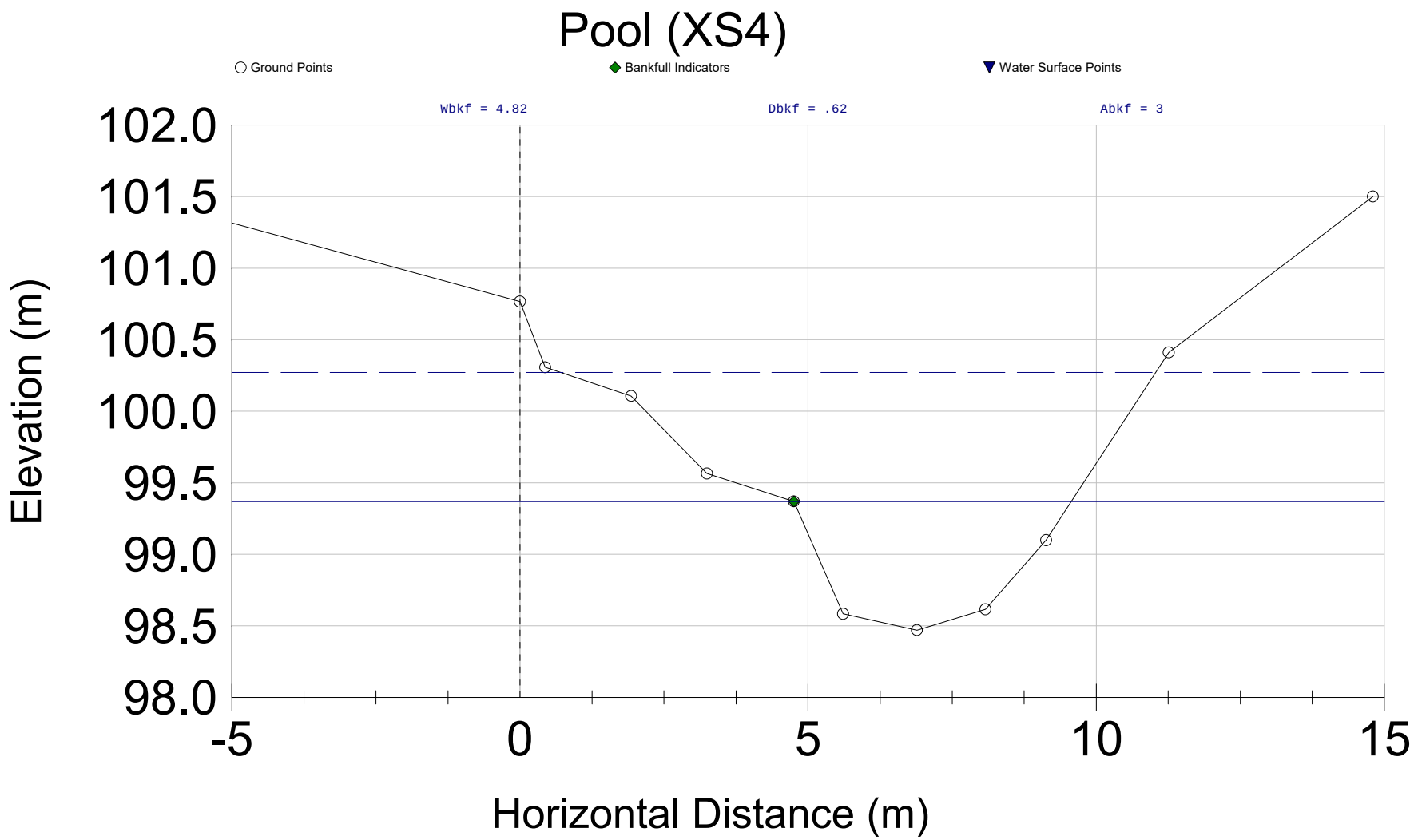
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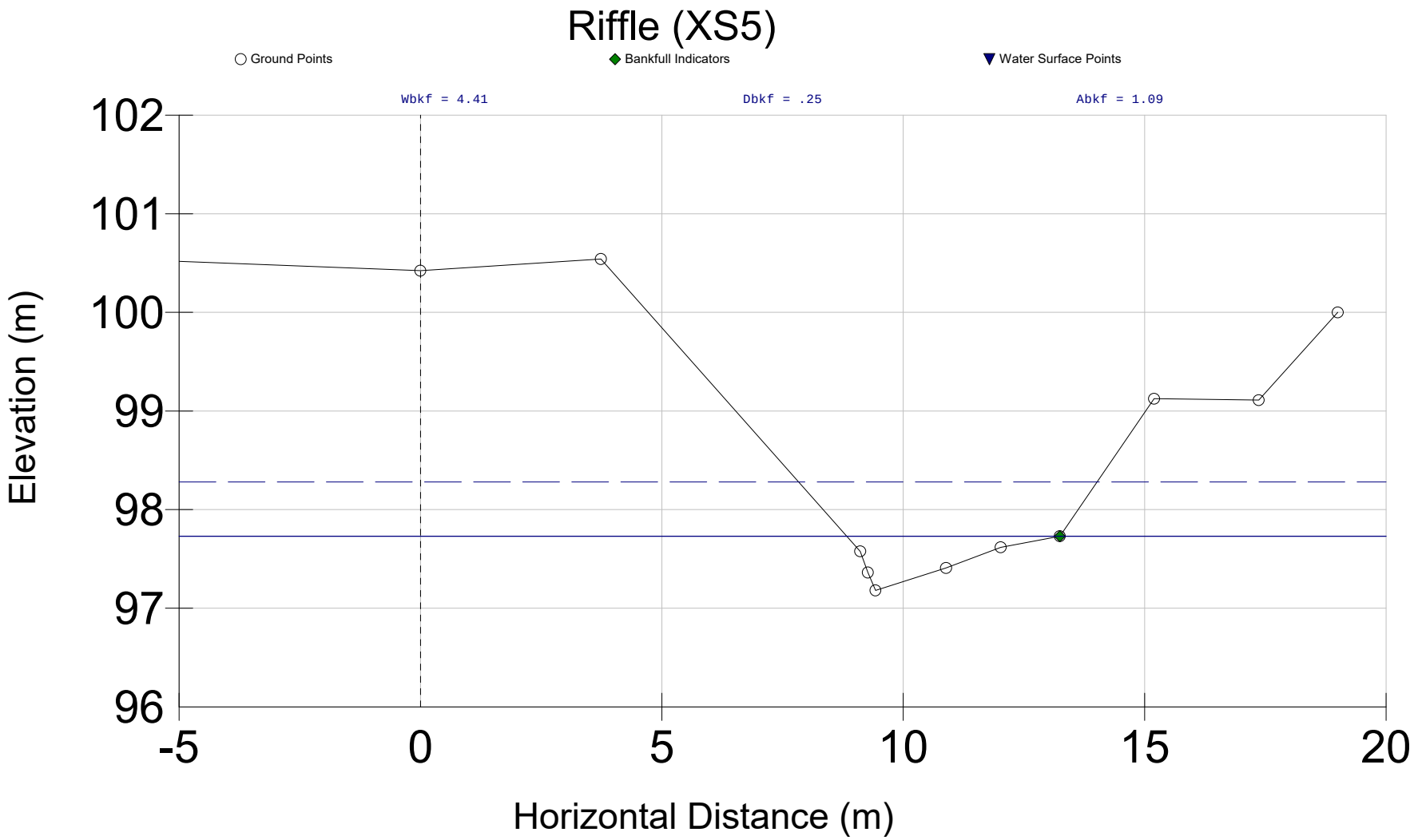
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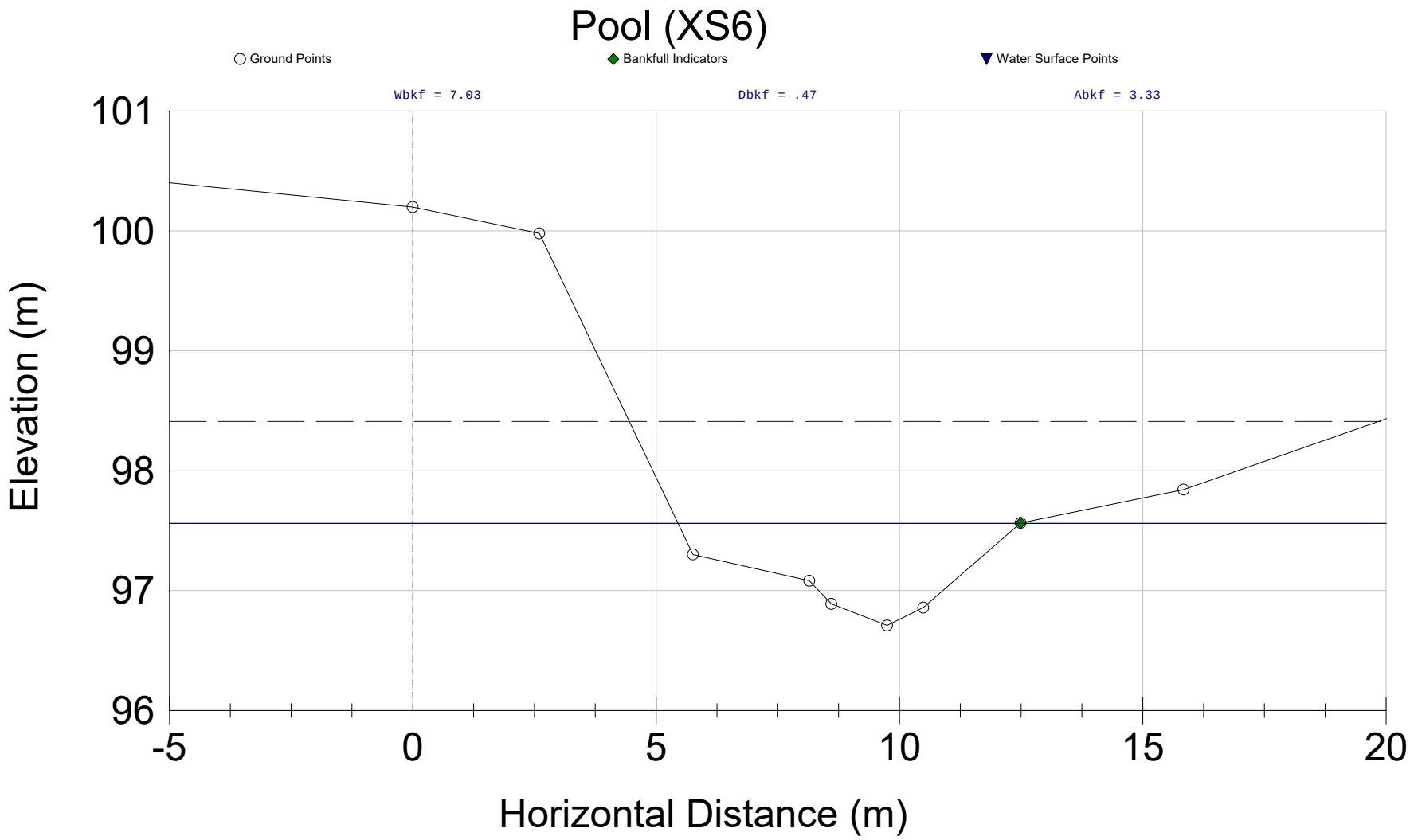
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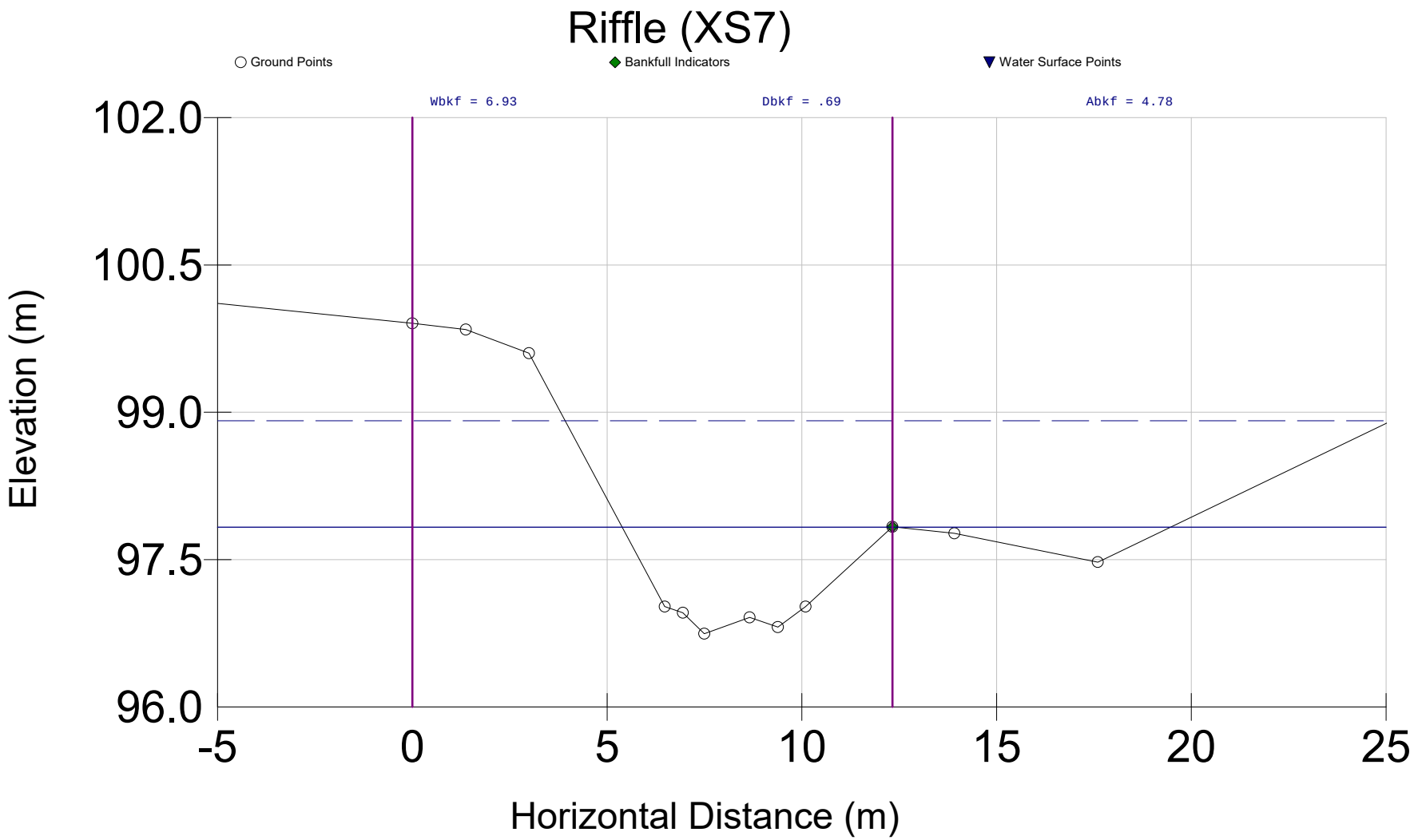
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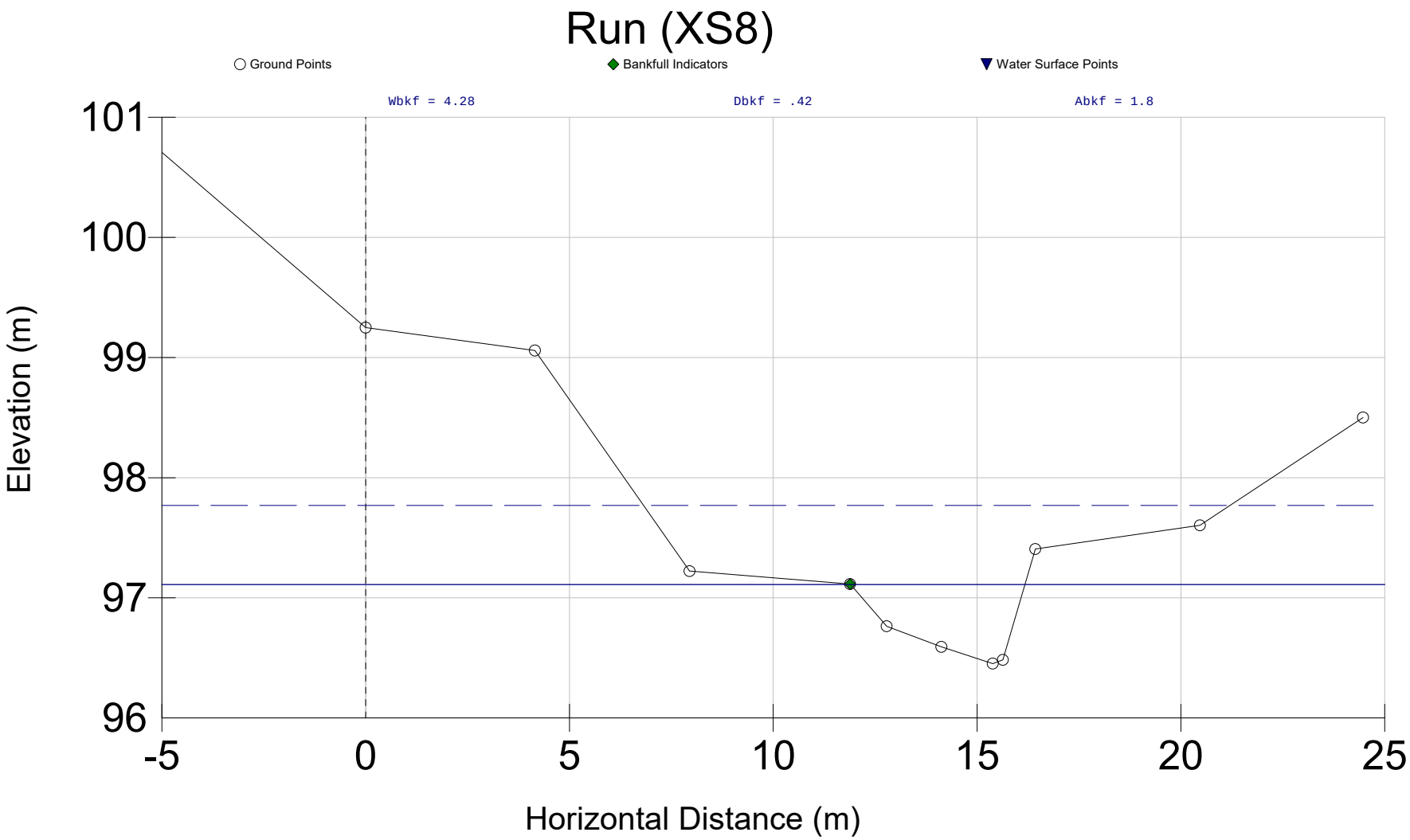
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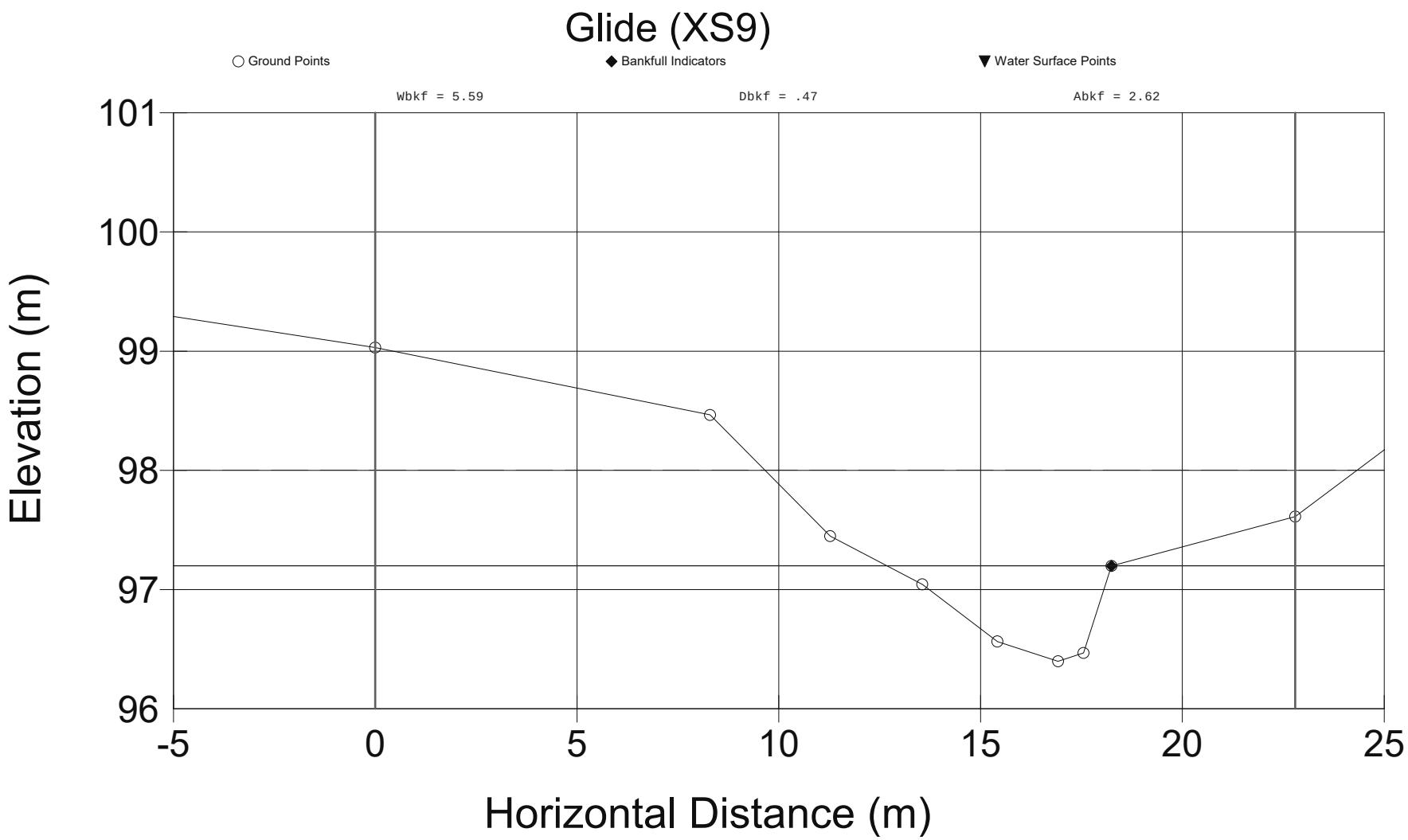
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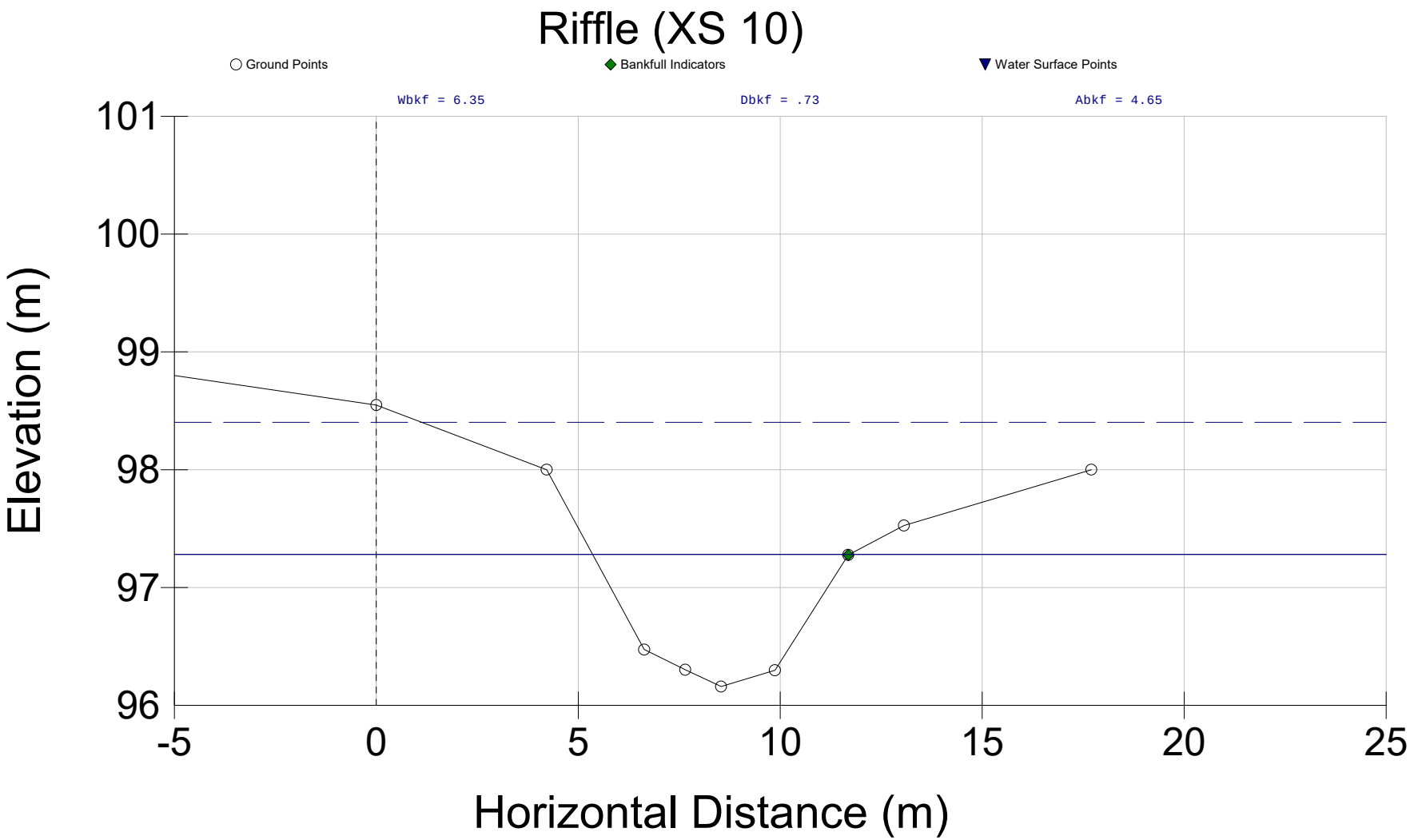
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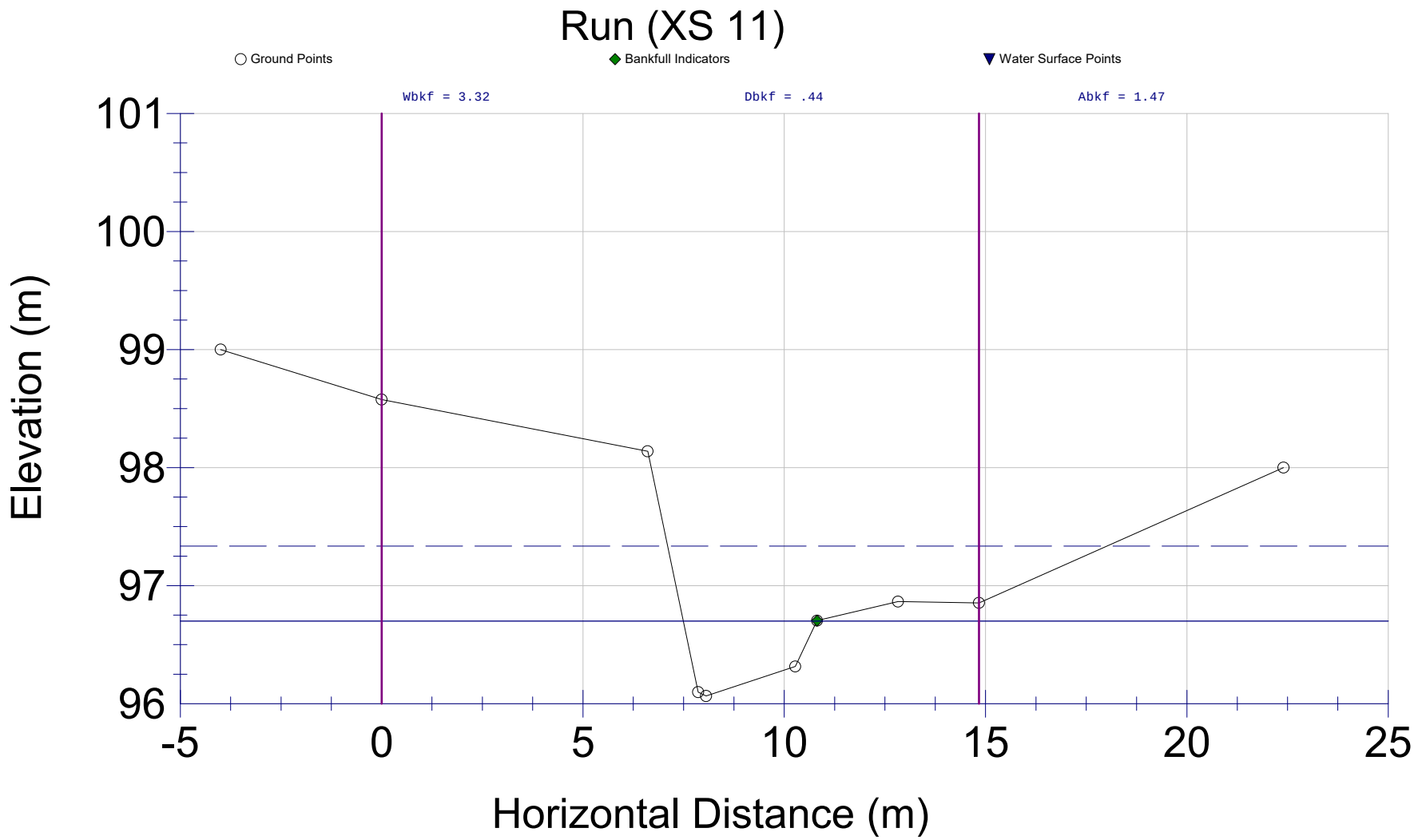
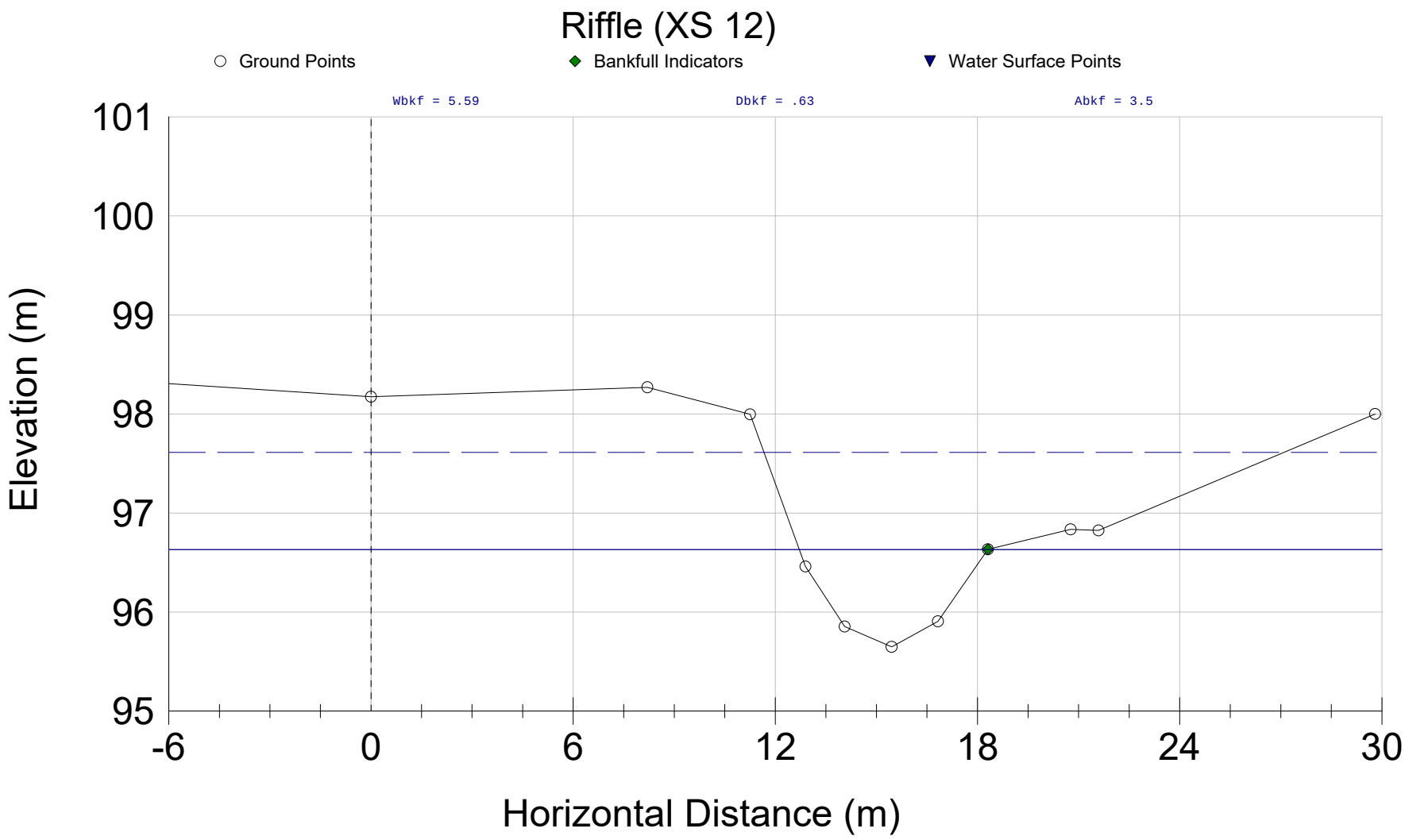
Water Surface Points
Wbkf = 6.35
Dbkf = .73
Abkf = 4.65
101
100
99
98
97
96
Elevation (m)
-5
0
5
10
15
20
25
Horizontal Distance (m)


Run (XS 11)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 3.32
Dbkf = .44
Abkf = 1.47
101
100
99
98
97
96
Elevation (m)
-5
0
5
10
15
20
25
Horizontal Distance (m)


Riffle (XS 12)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 5.59
Dbkf = .63
Abkf = 3.5
Elevation (m)
101
100
99
98
97
96
95
-6
0
6
12
18
24
30
Horizontal Distance (m)

APPENDIX B:

Photographs

Appendix B – Site Photos
All photos are from 2022 unless otherwise stated

FROM: 2015 Upstream CNR
LOOKING: At left bank
COMMENT: Basal scour, debris in river. Undercutting of left bank. Heavy degradation.

FROM: 2015 Upstream CNR
LOOKING: At left bank
COMMENT: Basal scour, debris in river. Undercutting of left bank. Heavy degradation.

Appendix B – Site Photos

FROM: 2015 ES#2
LOOKING: At right bank
COMMENT: Slump in bank, along with deposition

FROM: 2022 ES#2
LOOKING: At right bank
COMMENT: Slump in bank, along with deposition

Appendix B – Site Photos

FROM: 2022 Upstream ES#1
LOOKING: Upstream
COMMENT: Basal scour, debris in river. Undercutting of left bank. Cobbles and boulders in riffle widening of section from 2015

FROM: 2022 Upstream ES#1
LOOKING: Upstream
COMMENT: Basal scour, debris in river. Undercutting of left bank. Cobbles and boulders in riffle. There is widening of section from 2015

Appendix B – Site Photos

FROM: 2022 ES#1
LOOKING: At left bank
COMMENT: Debris has been removed from river. Buffer remains from private property. Tree circled for reference

FROM: 2015 ES#1
LOOKING:Upstream
COMMENT: Lots of debris in river. Tree circled for reference.

Appendix B – Site Photos

FROM: 2015 photo ES#3
LOOKING: Towards Willowbrook Road
COMMENT: Tree roots were still exposed

FROM: 2022 photo of ES#3
LOOKING: Towards Willowbrook Road

COMMENT: Excessive sediment deposition on LB, close proximity to Willowbrook Road.

FROM: 2015 Upstream Willowbrook Road culvert
LOOKING: Upstream
COMMENT: Minimal deposition upstream culvert

FROM: 2022 Upstream Willowbrook Road culvert
LOOKING: Upstream
COMMENT: Substantial deposition upstream culvert

Appendix B – Site Photos

FROM: Upstream ES# 3
LOOKING: towards Willowbrook Road
COMMENT: Eroded banks, deposition in river, exposed roots on bank.

FROM: 2015 Downstream ES#3
LOOKING: Upstream
COMMENT: The culvert that goes under Peel Street. The water depth here is very high.

Appendix B – Site Photos

FROM: 2015 downstream ES#4
LOOKING: Upstream
COMMENT: Trees are fallen over in river, roots exposed, Y shaped tree is circled for reference and has significant soil at root system.

FROM: 2022 Upstream ES#4
LOOKING: Downstream
COMMENT: Slope is unnaturally steep. Exposed roots indicate erosion. Y shaped tree is circled for reference and has roots now overhanging bank. Toe of slope has some undercutting.

ORIGINAL 06 OCTOBER 2022

STAGE 1-2 ARCHAEOLOGICAL PROPERTY ASSESSMENT

Component Study for Falcon Creek Erosion Control (CNR to Willowbank Road) Municipal Class EA (Schedule B) formerly within "Brant's Farm" (Geographic Township of Nelson, County of Halton), City of Burlington, Regional Municipality of Halton.

(AMICK Corporate File #2022-771/MTCS File #P058-2183-2022)

SUBMITTED TO:
Ontario Ministry of Tourism, Culture & Sport
(MTCS)

SUBMITTED BY:
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PIF NUMBER: P058-2183-2022

CORPORATE PROJECT NUMBER: 2022-771

06 OCTOBER 2022

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PROJECT REPORT PREPARATION & GRAPHICS
Peter Ash Cutajar

EXECUTIVE SUMMARY

This report describes the results of the 2022 Stage 1-2 Archaeological Property Assessment of the Falcon Creek Erosion Control (CNR to Willowbank Road) Municipal Class EA (Schedule B) formerly within "Brant's Farm" (Geographic Township of Nelson, County of Halton), City of Burlington, Regional Municipality of Halton, conducted by AMICK Consultants Limited. This assessment was undertaken as a requirement under the Environmental Assessment Act (RSO 1990) and was conducted under Professional Archaeologist License #P058 issued to Michael Henry by the Minister of Tourism, Culture & Sport (MTCS) for the Province of Ontario. All work was conducted in conformity with Ontario Ministry of Tourism and Culture (MTC) Standards and Guidelines for Consultant Archaeologists (MTC 2011) and the Ontario Heritage Act (RSO 1990a).

The entirety of the study area is approximately 0.98 hectares (ha) in area and includes within it part of a commercial development and two residential structures, both with associated driveways and parking areas. The study area also contains low-lying and wet areas in the form of Falcon Creek, as well as areas of steep slope flanking the creek. Additionally, Enfield Road and Willowbrook Road run through the study area The study area is bounded on the north by existing residential development and the Canadian National Railway, on the east Willowbrook Road, and on the south and west by existing residential development. AMICK Consultants Limited was engaged by the proponent to undertake a Stage 1-2 Archaeological Property Assessment of lands potentially affected by the proposed undertaking and was granted permission to carry out archaeological fieldwork. Following the criteria outlined by MTCS (2011) for determining archaeological potential, portions of the study area were determined as having archaeological potential for Pre-contact and/or Post-contact archaeological resources. Consequently, this report is being prepared in advance of the planning process for this property.

The entirety of the study area was subject to property inspection and photographic documentation concurrently with the Stage 2 Property Assessment which consisted of high intensity test pit methodology at a five-metre interval between individual test pits and test pit survey at a ten-metre interval to confirm disturbance on 29 June 2022. All records, documentation, field notes, photographs, and artifacts (as applicable) related to the conduct and findings of these investigations are held at the Lakelands District corporate offices of AMICK Consultants Limited until such time that they can be transferred to an agency or institution approved by the MTCS on behalf of the government and citizens of Ontario.

As a result of the Stage 2 Property Assessment of the study area, no archaeological resources were encountered. Consequently, the following recommendations are made:

1. *No further archaeological assessment of the study area is warranted.*
2. *The Provincial interest in archaeological resources with respect to the proposed undertaking has been addressed.*
3. *The proposed undertaking is clear of any archaeological concern.*

1.0 PROJECT CONTEXT

1.1 DEVELOPMENT CONTEXT

This report describes the results of the 2022 Stage 1-2 Archaeological Property Assessment of the Falcon Creek Erosion Control (CNR to Willowbank Road) Municipal Class EA (Schedule B) formerly within "Brant's Farm" (Geographic Township of Nelson, County of Halton), City of Burlington, Regional Municipality of Halton, conducted by AMICK Consultants Limited. This assessment was undertaken as a requirement under the Environmental Assessment Act (RSO 1990) and was conducted under Professional Archaeologist License #P058 issued to Michael Henry by the Minister of Tourism, Culture & Sport (MTCS) for the Province of Ontario. All work was conducted in conformity with Ontario Ministry of Tourism and Culture (MTC) Standards and Guidelines for Consultant Archaeologists (MTC 2011) and the Ontario Heritage Act (RSO 1990a).

The entirety of the study area is approximately 0.98 hectares (ha) in area and includes within it part of a commercial development and two residential structures, both with associated driveways and parking areas. The study area also contains low-lying and wet areas in the form of Falcon Creek, as well as areas of steep slope flanking the creek. Additionally, Enfield Road and Willowbrook Road run through the study area The study area is bounded on the north by existing residential development and the Canadian National Railway, on the east Willowbrook Road, and on the south and west by existing residential development. AMICK Consultants Limited was engaged by the proponent to undertake a Stage 1-2 Archaeological Property Assessment of lands potentially affected by the proposed undertaking and was granted permission to carry out archaeological fieldwork. Following the criteria outlined by MTCS (2011) for determining archaeological potential, portions of the study area were determined as having archaeological potential for Pre-contact and/or Post-contact archaeological resources. Consequently, this report is being prepared in advance of the planning process for this property.

The entirety of the study area was subject to property inspection and photographic documentation concurrently with the Stage 2 Property Assessment which consisted of high intensity test pit methodology at a five-metre interval between individual test pits and test pit survey at a ten-metre interval to confirm disturbance on 29 June 2022. All records, documentation, field notes, photographs, and artifacts (as applicable) related to the conduct and findings of these investigations are held at the Lakelands District corporate offices of AMICK Consultants Limited until such time that they can be transferred to an agency or institution approved by the MTCS on behalf of the government and citizens of Ontario.

The City of Burlington and Valdor Engineering Inc. intend to undertake an erosion control Municipal Class Environment Assessment study within the study area.This study will include detailed designs for the erosion control works in Falcon Creek. A plan of the study area has been submitted together with this report to the MTCS for review and reproduced within this report as Map 4.

1.2 HISTORICAL CONTEXT

1.2.1 PRE-CONTACT LAND-USE OUTLINE

Table 1 illustrates the chronological development of cultures within southern Ontario prior to the arrival of European cultures to the area at the beginning of the 17th century. This general cultural outline is based on archaeological data and represents a synthesis and summary of research over a long period of time. It is necessarily generalizing and is not necessarily representative of the point of view of all researchers or stakeholders. It is offered here as a rough guideline and as a very broad outline to illustrate the relationships of broad cultural groups and time periods.

TABLE 1 PRE-CONTACT CULTURAL CHRONOLOGY FOR SOUTHERN ONTARIO

Years ago	Period	Southern Ontario
250	Terminal Woodland	Ontario and St. Lawrence Iroquois Cultures
1000 2000	Initial Woodland	Princess Point, Saugeen, Point Peninsula, and Meadowood Cultures
3000 4000 5000 6000	Archaic	Laurentian Culture
7000 8000 9000 10000 11000	Palaeo-Indian	Plano and Clovis Cultures
		(Wright 1972)

What follows is an outline of Aboriginal occupation in the area during the Pre-Contact Era from the earliest known period, about 9000 B.C. up to approximately 1650 AD.

1.2.1.1 PALEO-INDIAN PERIOD (APPROXIMATELY 9000-7500 B.C.)

North of Lake Ontario, evidence suggests that early occupation began around 9000 B.C. People probably began to move into this area as the glaciers retreated and glacial lake levels began to recede. The early occupation of the area probably occurred in conjunction with environmental conditions that would be comparable to modern Sub-Arctic conditions. Due to the great antiquity of these sites, and the relatively small populations likely involved, evidence of these early inhabitants is sparse and generally limited to tools produced from stone or to by-products of the manufacture of these implements.

1.2.1.2 ARCHAIC PERIOD (APPROXIMATELY 8000-1000 B.C.)

By about 8000 B.C. the gradual transition from a post glacial tundra-like environment to an essentially modern environment was largely complete. Prior to European clearance of the landscape for timber and cultivation, the area was characterized by forest. The Archaic

Period is the longest and the most apparently stable of the cultural periods identified through archaeology. The Archaic Period is divided into the Early, Middle and Late Sub-Periods, each represented by specific styles in projectile point manufacture. Many more sites of this period are found throughout Ontario, than of the Palaeo-Indian Period. This is probably a reflection of two factors: the longer period of time reflected in these sites, and a greater population density. The greater population was likely the result of a more diversified subsistence strategy carried out in an environment offering a greater variety of abundant resources (Smith 2002:58-59).

Current interpretations suggest that the Archaic Period populations followed a seasonal cycle of resource exploitation. Although similar in concept to the practices speculated for the big game hunters of the Palaeo-Indian Period, the Archaic populations utilized a much broader range of resources, particularly with respect to plants. It is suggested that in the spring and early summer, bands would gather at the mouths of rivers and at rapids to take advantage of fish spawning runs. Later in the summer and into the fall season, smaller groups would move to areas of wetlands to harvest nuts and wild rice. During the winter, they would break into yet smaller groups probably based on the nuclear family and perhaps some additional relatives to move into the interior for hunting. The result of such practices would be to create a distribution of sites across much of the landscape (Smith 2002: 59-60).

The material culture of this period is much more extensive than that of the Palaeo-Indians. Stylistic changes between Sub-Periods and cultural groups are apparent, although the overall quality in production of chipped lithic tools seems to decline. This period sees the introduction of ground stone technology in the form of celts (axes and adzes), manos and metates for grinding nuts and fibres, and decorative items like gorgets, pendants, birdstones, and bannerstones. Bone tools are also evident from this time period. Their presence may be a result of better preservation from these more recent sites rather than a lack of such items in earlier occupations. In addition, copper and exotic chert types appear during the period and are indicative of extensive trading (Smith 2002: 58-59).

1.2.1.3 WOODLAND PERIOD (APPROXIMATELY 1000 B.C.-1650 A.D.)

The primary difference in archaeological assemblages that differentiates the beginning of the Woodland Period from the Archaic Period is the introduction of ceramics to Ontario populations. This division is probably not a reflection of any substantive cultural changes, as the earliest sites of this period seem to be in all other respects a continuation of the Archaic mode of life with ceramics added as a novel technology. The seasonally based system of resource exploitation and associated population mobility persists for at least 1500 years into the Woodland Period (Smith 2002: 61-62).

The Early Woodland Sub-Period dates from about 1000-400 B.C. Many of the artifacts from this time are similar to the late Archaic and suggest a direct cultural continuity between these two temporal divisions. The introduction of pottery represents and entirely new technology that was probably acquired through contact with more southerly populations from which it likely originates (Smith 2002:62).

The Middle Woodland Sub-Period dates from about 400 B.C.-800 A.D. Within the region including the study area, a complex emerged at this time termed "Point Peninsula." Point Peninsula pottery reflects a greater sophistication in pottery manufacture compared with the earlier industry. The paste and temper of the new pottery is finer and new decorative techniques such as dentate and pseudo-scallop stamping appear. There is a noted Hopewellian influence in southern Ontario populations at this time. Hopewell influences from south of the Great Lakes include a widespread trade in exotic materials and the presence of distinct Hopewell style artifacts such as platform pipes, copper or silver panpipe covers and shark's teeth. The populations of the Middle Woodland participated in a trade network that extended well beyond the Great Lakes Region.

The Late Woodland Sub-Period dates from about 500-1650 A.D. The Late Woodland includes four separate phases: Princess Point, Early Ontario Iroquoian, Middle Ontario Iroquoian and Late Ontario Iroquoian.

The Princess Point phase dates to approximately 500-1000 A.D. Pottery of this phase is distinguished from earlier technology in that it is produced by the paddle method instead of coil and the decoration is characterized by the cord wrapped stick technique. Ceramic smoking pipes appear at this time in noticeable quantities. Princess Point sites cluster along major stream valleys and wetland areas. Maize cultivation is introduced by these people to Ontario. These people were not fully committed to horticulture and seemed to be experimenting with maize production. They generally adhere to the seasonal pattern of occupation practiced by earlier occupations, perhaps staying at certain locales repeatedly and for a larger portion of each year (Smith 2002: 65-66).

The Early Ontario Iroquoian stage dates to approximately 950-1050 A.D. This stage marks the beginning of a cultural development that led to the historically documented Ontario Iroquoian groups that were first contacted by Europeans during the early 1600s (Petun, Neutral, and Huron). At this stage formal semi-sedentary villages emerge. The Early stage of this cultural development is divided into two cultural groups in southern Ontario. The areas occupied by each being roughly divided by the Niagara Escarpment. To the west were located the Glen Meyer populations, and to the east were situated the Pickering people (Smith 2002: 67).

The Middle Ontario Iroquoian stage dates to approximately 1300-1400 A.D. This stage is divided into two sub-stages. The first is the Uren sub-stage lasting from approximately 1300-1350 A.D. The second of the two sub-stages is known as the Middleport sub-stage lasting from roughly 1350-1400 A.D. Villages tend to be larger throughout this stage than formerly (Smith 2002: 67).

The Late Ontario Iroquoian stage dates to approximately 1400-1650 A.D. During this time the cultural divisions identified by early European explorers are under development and the geographic distribution of these groups within southern Ontario begins to be defined.

1.2.2 POST-CONTACT LAND USE OUTLINE

The County of Halton was named after Major William Mathew Halton, who was the Secretary to the Upper Canada provincial Lieutenant-Governor Sir Francis Gore in 1805. United Empire Loyalists were the first settlers in the area and arrived in the early 1780s. The United Empire Loyalists chose to settle in the southern part of the county and immigrants from the British Isles settled the northern part. The area was officially designated a county in 1816 and was originally part of Gore District and consisted of 4 townships; Esquesing, Nassageweya, Nelson and Trafalgar Township. The Township of Esquesing was open for settlement in 1819. (Halton Region, 2012).

The first settlement in Nelson Township, which would later become Burlington was in 1784, when the British granted a large land tract to Captain Joseph Brant in recognition of fighting on the side of the British in the US War of Independence (Tourism Burlington 2018).

The first wave of Loyalist settlers after the American Revolutionary War was followed by immigration from the British Isles and Europe. Homesteaders had to clear some timber from their lots in order to patent the deeds for their Crown Grants of land. From 1820 to 1850 pine and oak lumber was the area's principal export. Wheat became the major export during the Crimean War (1853-1856) when European sources of wheat were disrupted. By 1900, Burlington had evolved into a prosperous agricultural community with mixed farms and cash crops of fruit and vegetables (Tourism Burlington 2018).

Map 2 is a facsimile segment from Map of the County of Wentworth, Canada West (Surtees 1859). Map 2 illustrates the location of the study area and environs as of 1859. The study area is shown to belong to Thomas Douglas. This demonstrates that the original property of which the study area is a part was settled by the time that the atlas data was compiled. Accordingly, it has been determined that there is potential for archaeological deposits related to early Post-contact settlement within the study area. In addition, this map illustrates a section of the Great Western Railroad as adjacent to the study area to the northwest.

Map 3 is a facsimile segment of the Township of Flamboro map reproduced from The Illustrated Historical Atlas of the County of Wentworth (Page & Smith 1875). Map 3 illustrates the location of the study area and environs as of 1875. The study area is shown to belong to S. Douglas. This demonstrates that the original property of which the study area is a part was settled by the time that the atlas data was compiled. Accordingly, it has been determined that there is potential for archaeological deposits related to early Post-contact settlement within the study area. In addition, this map illustrates a section of the Great Western Railroad as adjacent to the study area to the northwest.

A plan of the study area is included within this report as Map 4. Current conditions encountered during the Stage 1-2 Property Assessment are illustrated in Maps 5 & 6.

1.3 ARCHAEOLOGICAL CONTEXT

The study area is located near Aldershot and Hamilton Harbour and is bounded on the north by existing residential development and the Canadian National Railway, on the east Willowbrook Road, and on the south and west by existing residential development.

The study area includes part of a commercial development and two residential structures, both with associated driveways and parking areas. The study area also contains low-lying and wet areas in the form of Falcon Creek, as well as areas of steep slope flanking the creek. Additionally, Enfield Road and Willowbrook Road run through the study area.

1.3.1 PHYSIOGRAPHIC REGION

The study area is located in the Iroquois Plain, which is located on the lowland bordering Lake Ontario. This area used to be under Lake Iroquois and the old shorelines can easily be identified based on unique features such as cliffs, beaches, bars and boulder pavements. Due to the fact that this physiographic region was under a lake, the conditions of the soil and landscape vary greatly from land smoothed by wave action to cliffs. Soil types range from a sandy base to a clay base, with poor drainage in some areas. The Iroquois Plains consists of the area from the Niagara River to the Trent River and around the western end of Lake Ontario. (Chapman and Putnam 1984: 190-196).

1.3.2 SURFACE WATER

Falcon creek runs centrally through the study area from north to south.

1.3.3 LITHIC SOURCES

The study area is not located in proximity to any formations or outcroppings of chert or other lithic sources.

1.3.4 REGISTERED ARCHAEOLOGICAL SITES

The Archaeological Sites Database administered by the MTCS indicates that there are five (5) previously documented sites within 1 kilometre of the study area. However, it must be noted that this assumes the accuracy of information compiled from numerous researchers using different methodologies over many years. AMICK Consultants Limited assumes no responsibility for the accuracy of site descriptions, interpretations such as cultural affiliation, or location information derived from the Archaeological Sites Database administered by MTCS. In addition, it must also be noted that a lack of formerly documented sites does not indicate that there are no sites present as the documentation of any archaeological site is contingent upon prior research having been conducted within the study area.

1.3.4.1 PRE-CONTACT REGISTERED SITES

A summary of registered and/or known archaeological sites within a 1-kilometre radius of the study area was gathered from the Archaeological Sites Database, administered by MTCS. As a result, it was determined that five (5) archaeological sites relating directly to Pre-contact habitation/activity had been formally registered within the immediate vicinity of the study area. However, the lack of formally documented archaeological sites does not mean that Pre-contact people did not use the area; it more likely reflects a lack of systematic archaeological

research in the immediate vicinity. Even in cases where one or more assessments may have been conducted in close proximity to a proposed landscape alteration, an extensive area of physical archaeological assessment coverage is required throughout the region to produce a representative sample of all potentially available archaeological data in order to provide any meaningful evidence to construct a pattern of land use and settlement in the past. All previously registered Pre-contact sites are briefly described below in Table 2:

TABLE 2 PRE-CONTACT SITES WITHIN 1KM

Borden #	Site Name	Time Period	Affinity	Site Type
AhGw-21	C. Bell 1	Archaic	Aboriginal	Unknown
AhGw-22	S. Atkins	Archaic	Aboriginal	Othercamp/Campsite
AhGx-31	Jobs Lane	Late Archaic	Aboriginal	Unknown
AhGx-715	Falcon Creek I	Late Archaic	Aboriginal	Camp/Campsite
AhGx-715	Falcon Creek II	Early Archaic	Aboriginal	Camp/Campsite

One of the above noted archaeological sites is situated within 300 metres of the study area. Therefore, it demonstrates archaeological potential for further archaeological resources related to Pre-contact activity and occupation with respect to the archaeological assessment of the proposed undertaking.

1.3.4.2 POST-CONTACT REGISTERED SITES

A summary of registered and/or known archaeological sites within a 1-kilometre radius of the study area was gathered from the Archaeological Sites Database, administered by MTCS. As a result, it was determined that no (0) archaeological sites relating directly to Post-contact habitation/activity had been formally registered within the immediate vicinity of the study area.

1.3.5 PREVIOUS ARCHAEOLOGICAL ASSESSMENTS

On the basis of information supplied by MTCS, no archaeological assessments have been conducted within 50 metres of the study area. AMICK Consultants Limited assumes no responsibility for the accuracy of previous assessments, interpretations such as cultural affiliation, or location information derived from the Archaeological Sites Database administered by MTCS. In addition, it must also be noted that the lack of formerly documented previous assessments does not indicate that no assessments have been conducted.

1.3.5.1 PREVIOUS REGIONAL ARCHAEOLOGICAL POTENTIAL MODELLING

The study area is situated in an area for which there is no archaeological master plan.

1.3.6 Historic Plaques

There are no relevant plaques associated with the study area, which would suggest an activity or occupation within, or near, the study area that may indicate potential for associated archaeological resources of significant CHVI.

1.3.7 Summary of Archaeological Context

The study area contains part of a commercial development and two residential structures, both with associated driveways and parking areas. The study area also contains low-lying and wet areas in the form of Falcon Creek, as well as areas of steep slope flanking the creek. Additionally, Enfield Road and Willowbrook Road run through the study area.

Current conditions within the study area indicate that some areas of the property may have no or low archaeological potential and do not require Stage 2 Property Assessment or should be excluded from Stage 2 Property Assessment. These areas would include the footprint of existing structures and areas under pavement. A significant proportion of the study area does exhibit archaeological potential and therefore a Stage 2 Property Assessment is required.

Background research also indicates that the study area is situated in the Iroquois Plain physiographic region, which is characterized by soil types ranging from a sandy base to a clay base, with poor drainage in some areas.

A total of five (5) previously registered archaeological sites have been documented within 1km of the study area. Of these, five (5) are Pre-contact. One (1) of these sites (AhGx-714) is located within 300m of the study area and, therefore, does demonstrate archaeological potential for further archaeological resources of Pre-contact activity and occupation with respect to the archaeological assessment of the current study area.

The study area is situated in an area for which there is no archaeological master plan. There are no relevant plaques associated with the study area

The study area has potential for archaeological resources of Native origins based on proximity to previously registered archaeological sites of Pre-contact origins and proximity to a source of potable water. Background research also suggests potential for archaeological resources of Post-contact origins based on proximity to a historic railroad, and proximity to areas of documented historic settlement.

2.0 Field Work Methods and Weather Conditions

2.1 Introduction

A property inspection was carried out in compliance with Standards and Guidelines for Consultant Archaeologists (MTC 2011) to document the existing conditions of the study area to facilitate the Stage 2 Property Assessment. All areas of the study area were visually

inspected and select features were photographed as a representative sample of each area defined within Maps 5 and 6. Observations made of conditions within the study area at the time of the inspection were used to inform the requirement for Stage 2 Property Assessment for portions of the study area as well as to aid in the determination of appropriate Stage 2 Property Assessment strategies. The locations from which photographs were taken and the directions toward which the camera was aimed for each photograph are illustrated in Maps 5 & 6 of this report.

The Stage 2 Assessment of the study area was carried out on 29 June 2022 and consisted of high intensity test pit methodology at a five-metre interval between individual test pits and test pit survey at a ten-metre interval to confirm disturbance which was conducted in compliance with the Standards and Guidelines for Consultant Archaeologists, section 2.1.2: Test Pit Survey & 2.1.8: Property Survey to Confirm Previous Disturbance (MTC 2011). Weather conditions were appropriate for the necessary fieldwork required to complete the Stage 2 Property Assessment and to create the documentation appropriate to this study.

2.2 Test Pit Survey

Approximately 0.4 ha of the study area was lawn that could not be strip ploughed and was subjected to test pit survey at 5m intervals per Section 2.1.2, Standard 1 (MTC 2011).

All test pits were excavated within 1m of all built structures, were at least 30cm in diameter and were excavated into the first 5cm of subsoil to examine stratigraphy, cultural features and evidence of fill. All soils were screen through mesh no greater than 6mm and all test pits were backfilled. All work was photo documented.

During the 5m test pit survey, no archaeological resources were encountered.

2.3 Confirmation of Disturbance

Approximately 0.2 ha of the study area was subject to test pit survey at 10m intervals to confirm disturbance. Areas of suspected disturbance within the study area consists of an area identified as probable disturbance from the construction of Enfield and Willowbrook Roads, and the existing commercial development. AMICK Consultants Limited tested the suspected disturbed area at a 10-metre interval to confirm disturbance in a manner consistent with the objectives to ensure that the area is accurately delimited and properly identified. This procedure demonstrated that the entire disturbed portion of the study area consists of fill deposited within a deeply disturbed context. There is no archaeological potential within this area.

Approximately 20% of the study area consisted of lawn area that was test pit surveyed at an interval of 5 metres between individual test pits. Approximately 20% of the study area was unploughable lawn areas that were found to be disturbed, and thus was test pit surveyed at an interval of 10 metres between individual test pits. Approximately 30% of the study area was not assessable due to the presence of existing structures and roadways. Maps 5& 6 of this report illustrate the Stage 2 Assessment methodology within the study area.

3.0 RECORD OF FINDS

3.1 INTRODUCTION

As a result of the Stage 1-2 Assessment of the study area, no archaeological resources of any description were encountered.

The documentation produced during the field investigation conducted in support of this report includes: one sketch map, one page of photo log, one page of field notes, and 37 digital photographs.

4.0 ANALYSIS AND CONCLUSIONS

4.1 STAGE 1 ANALYSIS AND CONCLUSIONS

4.1.1 CHARACTERISTICS INDICATING ARCHAEOLOGICAL POTENTIAL

Section 1.3.1 of the Standards and Guidelines for Consultant Archaeologists specifies the property characteristics that indicate archaeological potential (MTC 2011). Factors that indicate archaeological potential are features of the local landscape and environment that may have attracted people to either occupy the land or to conduct activities within the study area. One or more of these characteristics found to apply to a study area would necessitate a Stage 2 Property Assessment to determine if archaeological resources are present. These characteristics include:

1) Within 300m of Previously Identified Archaeological Sites

2) Within 300m of Primary Water Sources (e.g., lakes, rivers, streams, and creeks)

3) Within 300m of Secondary Water Sources (e.g., intermittent streams and creeks, springs, marshes, and swamps)

4) Within 300 m of Features Indicating Past Water Sources (e.g., 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, and cobble beaches)

5) Within 300m of an Accessible or Inaccessible Shoreline (e.g., high bluffs, swamp, or marsh fields by the edge of a lake, sandbars stretching into marsh)

6) Elevated Topography (e.g., eskers, drumlins, large knolls, and plateaux)

7) Pockets of Well-drained Sandy Soil, especially near areas of heavy soil or rocky ground.

8) Distinctive Land Formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases. There may be physical indicators of their use, such as burials, structures, offerings, rock paintings or carvings.

9) Resource Areas, including:
   - food or medicinal plants (e.g., migratory routes, spawning areas, and prairie)
   - scarce raw materials (e.g., quartz, copper, ochre or outcrops of chert)
   - resources of importance to early Post-contact industry (e.g., logging, prospecting, and mining)

10) Within 300m of Areas of Early Post-contact Settlement, including:
   - military or pioneer settlement (e.g., pioneer homesteads, isolated cabins, and farmstead complexes)
   - early wharf or dock complexes, pioneer churches and early cemeteries

11) Within 100m of Early Historical Transportation Routes (e.g., trails, passes, roads, railways, portage routes)

12) Heritage Property – A property listed on a municipal register or designated under the Ontario Heritage Act or is a federal, provincial, or municipal historic landmark or site.

13) Documented Historical or Archaeological Sites – property that local histories or informants have identified with possible archaeological sites, historical events, activities, or occupations. These are properties which have not necessarily been formally recognized or for which there is additional evidence identifying possible archaeological resources associated with historic properties in addition to the rationale for formal recognition.

The study area is within 300m of AhGx-714. The study area contains Falcon Creek which is a source of potable water. The study area sits in the Iroquois Plain physiographic region which was once submerged under glacial Lake Iroquois. The Historic Atlas Map of 1875 shows the study area to be within proximity of an unnamed church. The Historic Atlas Maps of 1859 & 1875 show the study area as adjacent to the Great Western Railroad.

4.1.2 CHARACTERISTICS INDICATING REMOVAL OF ARCHAEOLOGICAL POTENTIAL

Section 1.3.2 of the Standards and Guidelines for Consultant Archaeologists specifies the property characteristics which indicate no archaeological potential or for which archaeological potential has been removed (MTC 2011). These characteristics include:

1) Quarrying

2) Major Landscaping Involving Grading Below Topsoil

3) Building Footprints

4) Sewage and Infrastructure Development

The study area contains part of a commercial development and two residential structures, both with associated driveways and parking areas. The study area also contains Enfield Road and Willowbrook Road which run through the study area east/west and north/south, respectively.

4.1.3 SUMMARY OF ARCHAEOLOGICAL POTENTIAL

Table 3 below summarizes the evaluation criteria of the Ministry of Tourism, Culture & Sport (MTCS) together with the results of the Stage 1 Background Study for the proposed undertaking. Based on the criteria, the property is deemed to have archaeological potential on the basis of proximity to a previously registered archaeological site, proximity to water, proximity to historic settlement structures, and the location of early historic transportation routes adjacent to the study area.

TABLE 3 EVALUATION OF ARCHAEOLOGICAL POTENTIAL

FEATURE OF ARCHAEOLOGICAL POTENTIAL		YES	NO	N/A	COMMENT
1	Known archaeological sites within 300m	**Y**			If Yes, potential determined
PHYSICAL FEATURES					
2	Is there water on or near the property?	**Y**			If Yes, what kind of water?
2a	Primary water source within 300 m. (lakeshore, river, large creek, etc.)	**Y**			If Yes, potential determined
2b	Secondary water source within 300 m. (stream, spring, marsh, swamp, etc.)		**N**		If Yes, potential determined
2c	Past water source within 300 m. (beach ridge, river bed, relic creek, etc.)	**Y**			If Yes, potential determined
2d	Accessible or Inaccessible shoreline within 300 m. (high bluffs, marsh, swamp, sand bar, etc.)		**N**		If Yes, potential determined
3	Elevated topography (knolls, drumlins, eskers, plateaus, etc.)		**N**		If Yes, and Yes for any of 4-9, potential determined
4	Pockets of sandy soil in a clay or rocky area		**N**		If Yes and Yes for any of 3, 5-9, potential determined
5	Distinctive land formations (mounds, caverns, waterfalls, peninsulas, etc.)		**N**		If Yes and Yes for any of 3-4, 6-9, potential determined
HISTORIC/PREHISTORIC USE FEATURES					
6	Associated with food or scarce resource harvest areas (traditional fishing locations, agricultural/berry extraction areas, etc.)		**N**		If Yes, and Yes for any of 3-5, 7-9, potential determined.
7	Early Post-contact settlement area within 300 m.	**Y**			If Yes, and Yes for any of 3-6, 8-9, potential determined

8	Historic Transportation route within 100 m. (historic road, trail, portage, rail corridors, etc.)	**Y**			If Yes, and Yes for any 3-7 or 9, potential determined
9	Contains property designated and/or listed under the Ontario Heritage Act (municipal heritage committee, municipal register, etc.)		**N**		If Yes and, Yes to any of 3-8, potential determined
APPLICATION-SPECIFIC INFORMATION					
10	Local knowledge (local heritage organizations, Pre-contact, etc.)		**N**		If Yes, potential determined
11	Recent disturbance not including agricultural cultivation (post-1960-confirmed extensive and intensive including industrial sites, aggregate areas, etc.)	**Y**			If Yes, no potential or low potential in affected part (s) of the study area.

If **YES** to any of 1, 2a-c, or 10 Archaeological Potential is **confirmed**
If **YES** to 2 or more of 3-9, Archaeological Potential is **confirmed**
If **YES** to 11 or No to 1-10 Low Archaeological Potential is **confirmed** for at least a portion of the study area.

4.2 STAGE 2 ANALYSIS AND CONCLUSIONS

No archaeological sites or resources were found during the Stage 2 survey of the study area.

5.0 RECOMMENDATIONS

5.1 STAGE 1-2 RECOMMENDATIONS

As a result of the Stage 2 Property Assessment of the study area, no archaeological resources were encountered. Consequently, the following recommendations are made:

4. *No further archaeological assessment of the study area is warranted;*
5. *The Provincial interest in archaeological resources with respect to the proposed undertaking has been addressed;*
6. *The proposed undertaking is clear of any archaeological concern.*

6.0 ADVICE ON COMPLIANCE WITH LEGISLATION

While not part of the archaeological record, this report must include the following standard advisory statements for the benefit of the proponent and the approval authority in the land use planning and development process:

a. *This report is submitted to the Minister of Tourism and Culture 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 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 Ministry of Tourism and Culture, 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.*

b. *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 Archaeological Reports referred to in Section 65.1 of the Ontario Heritage Act.*

c. *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 archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act.*

d. *The Cemeteries Act, R.S.O. 1990, c. C.4 and the Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.*

e. *Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48 (1) of the Ontario Heritage Act and may not be altered, or have artifacts removed from them, except by a person holding an archaeological licence.*

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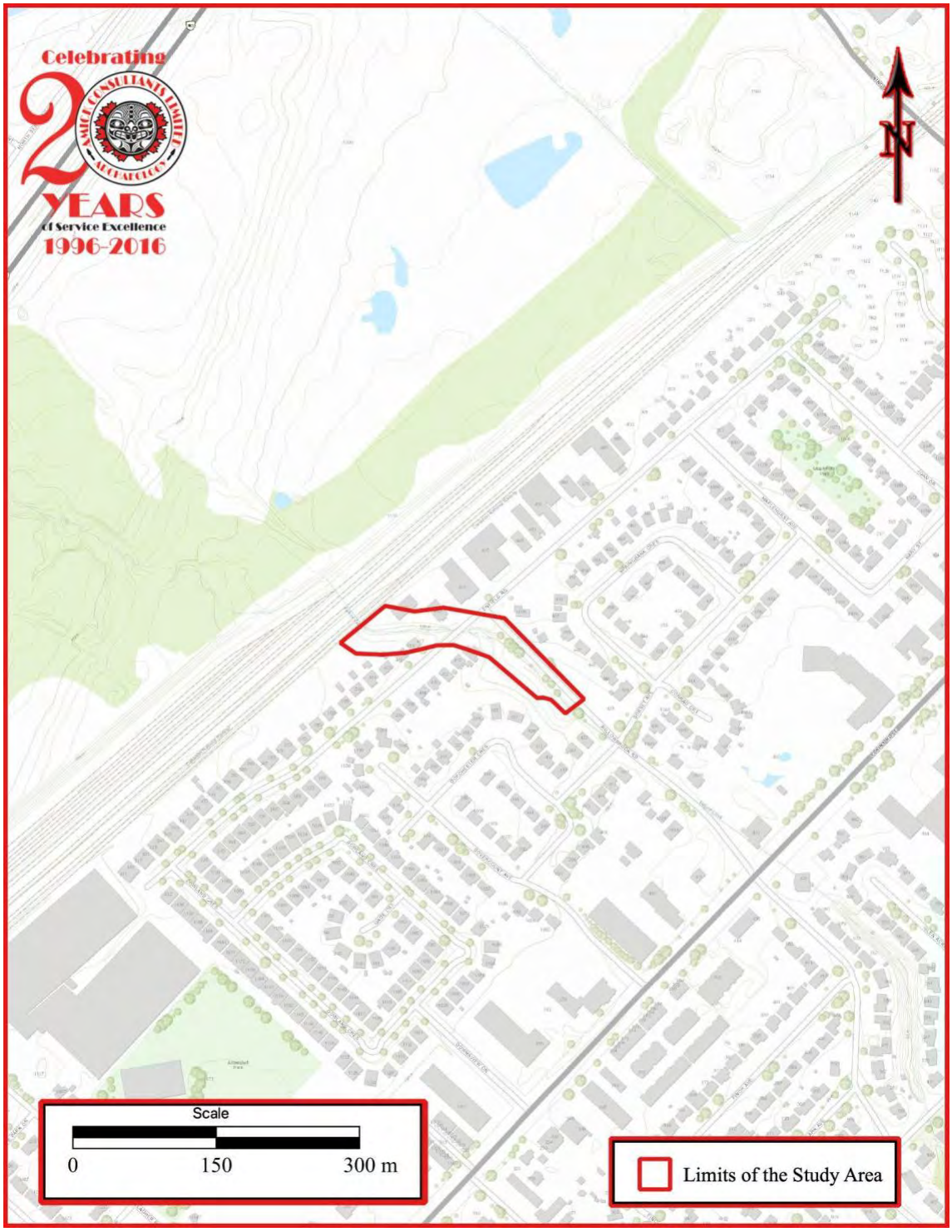
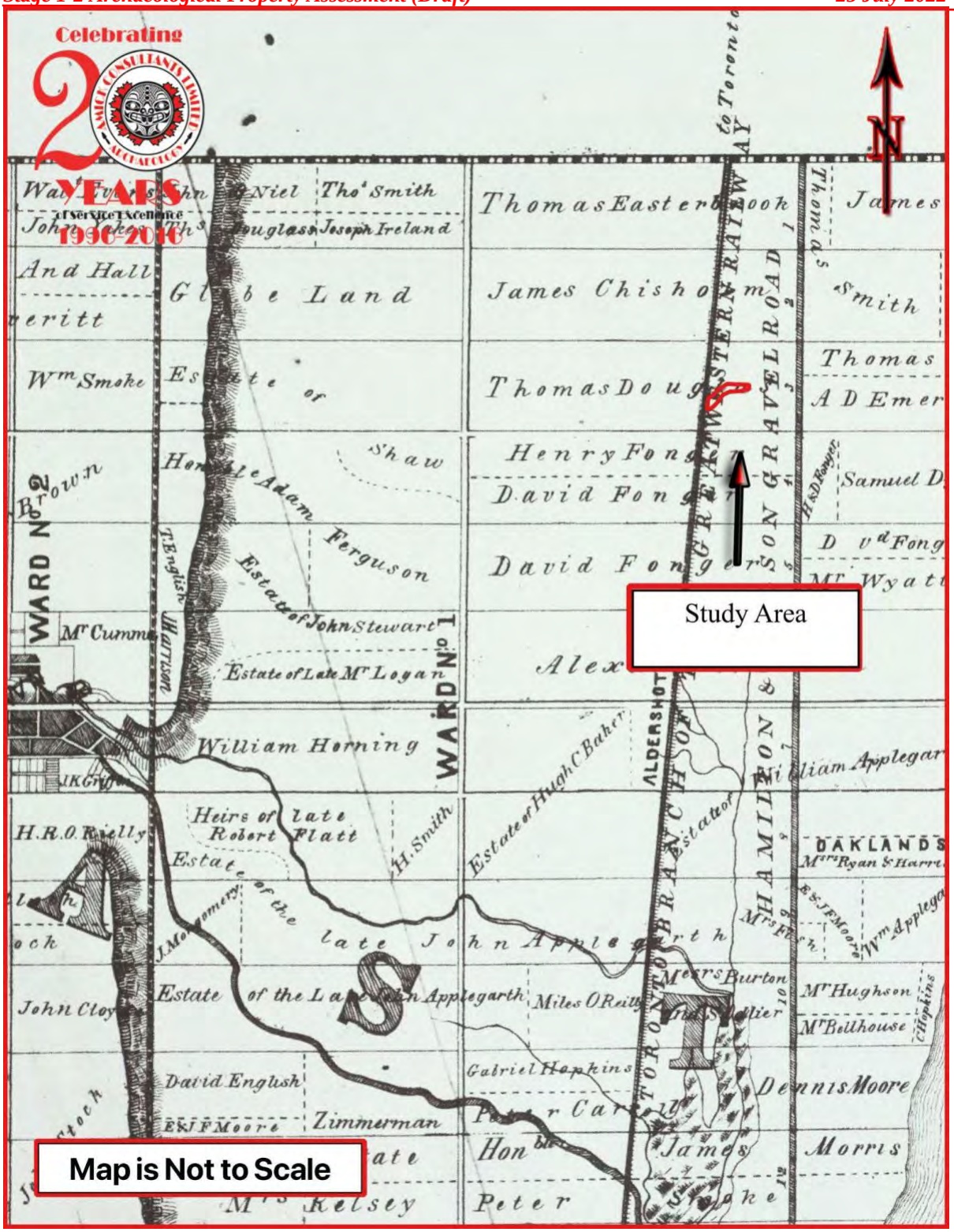
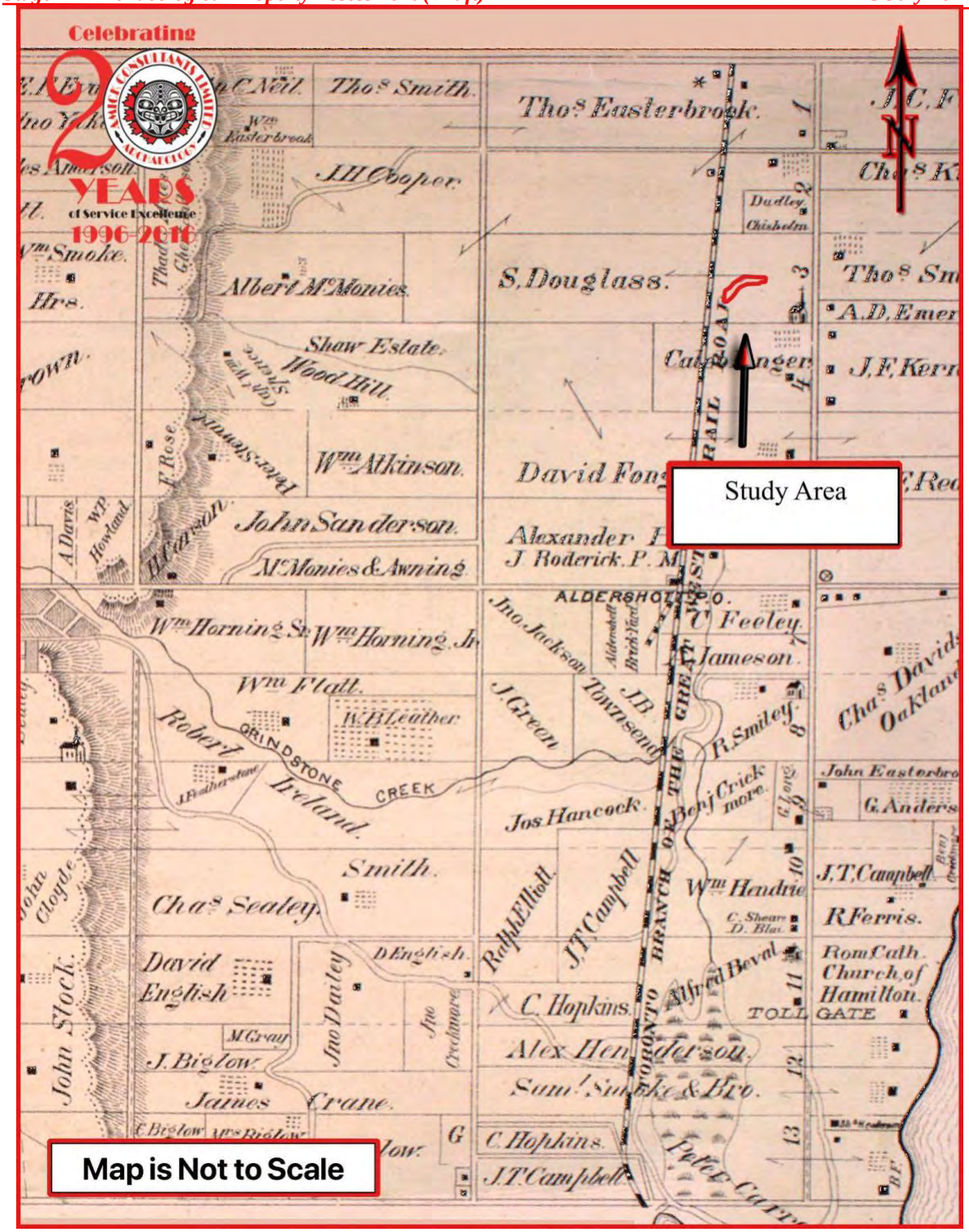
MAPS



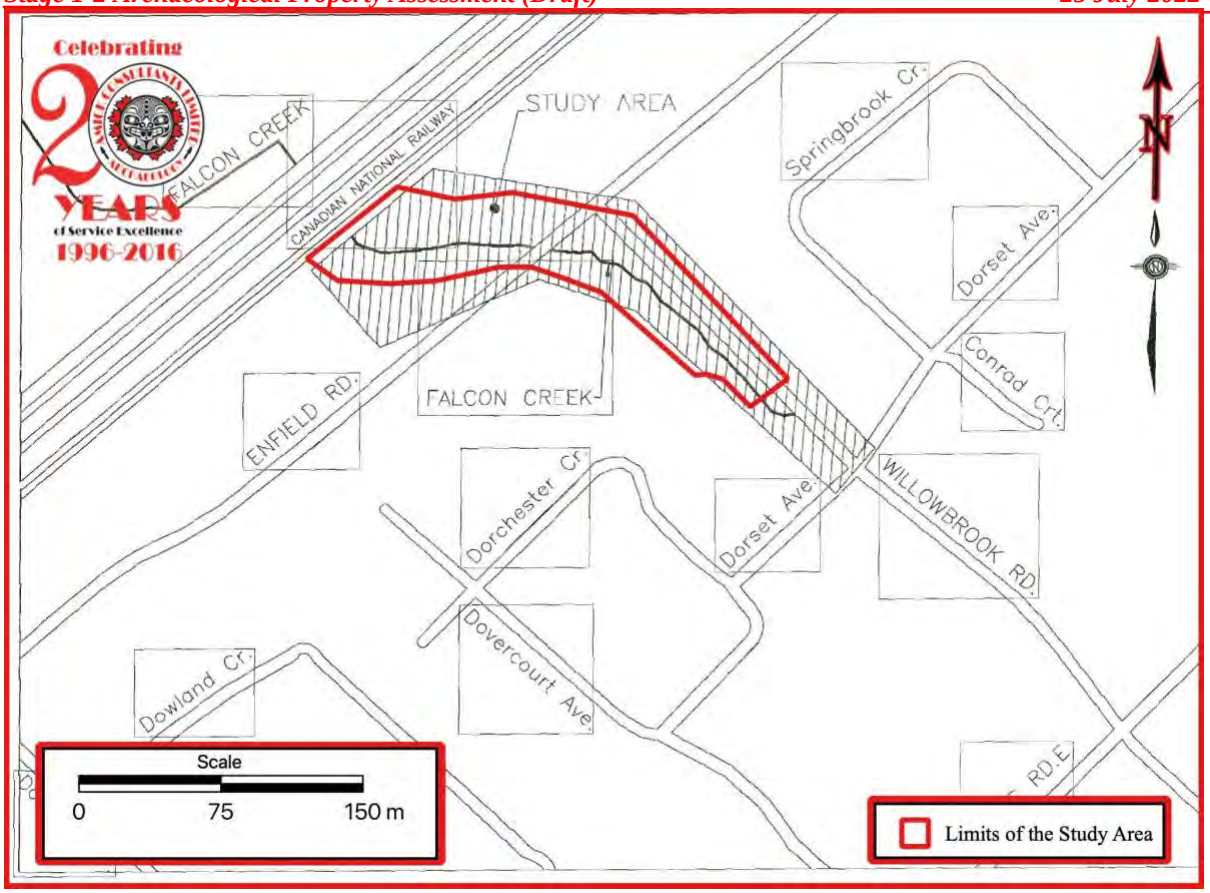
MAP 1 LOCATION OF THE STUDY AREA (ESRI 2019)



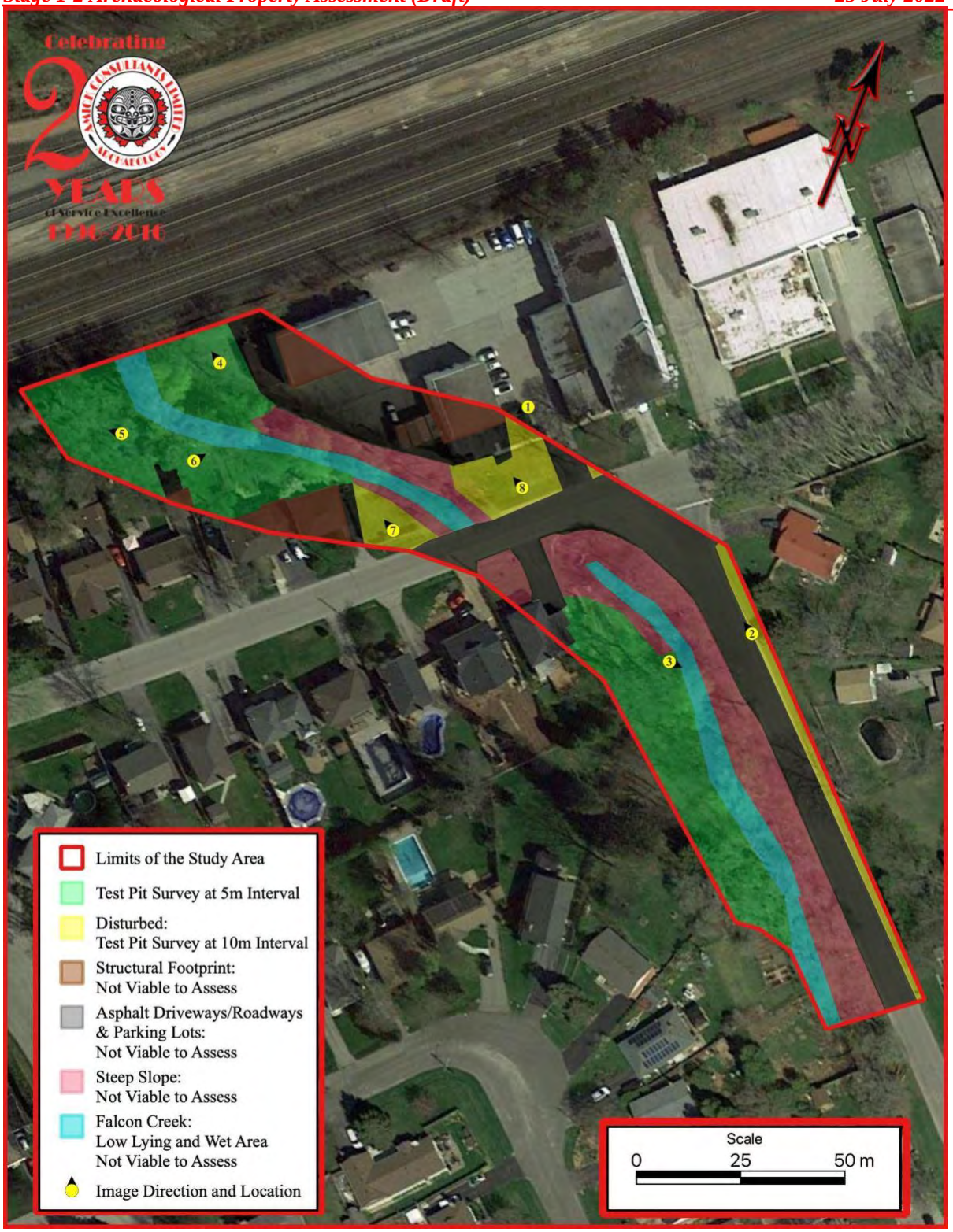
MAP 2 FACSIMILE SEGMENT OF THE MAP OF THE COUNTY OF WENTWORTH, CANADA WEST (SURTEES 1859)



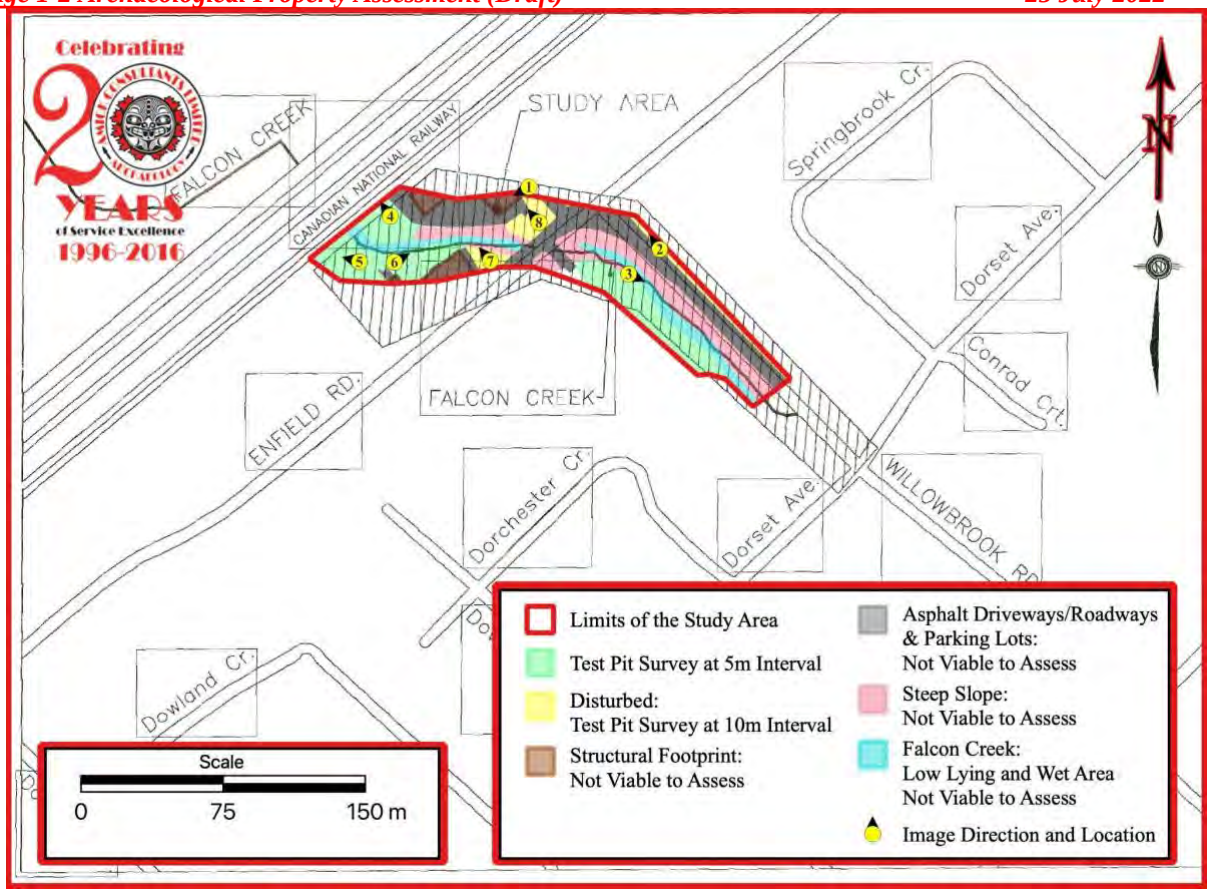
MAP 3 FACSIMILE SEGMENT OF THE HISTORIC ATLAS MAP OF THE TOWNSHIP OF FLAMBORO (PAGE & SMITH 1875)



MAP 4 KEY PLAN (VALDOR ENGINEERING INC. 2022)



MAP 5 AERIAL PHOTO OF THE STUDY AREA (GOOGLE EARTH 2016)



MAP 6 DETAILED PLAN OF THE STUDY AREA (AFTER VALDOR ENGINEERING INC. 2022)

IMAGES

IMAGE 1 COMMERCIAL DEVELOPMENT

IMAGE 2 INTERSECTION OF WILLOWBROOK & ENFIELD ROADS & ADJACENT LAWN AREA

IMAGE 3 FALCON CREEK AND STEEP SLOPE

IMAGE 4 TEST PIT SURVEY CONDITIONS & CREW AT WORK

IMAGE 5 TEST PIT SURVEY CONDITIONS & CREW AT WORK

IMAGE 6 TEST PIT IN PROGRESS

IMAGE 7 TEST PIT IN PROGRESS: DISTURBANCE ENCOUNTERED

IMAGE 8 TEST PIT IN PROGRESS: DISTURBANCE ENCOUNTERED