McKINLEY
ENVIRONMENTAL
SOLUTIONS

1053/1075/1145 March Road
Headwaters Drainage Assessment (HDA) (Revised)

November 2019
Prepared for CU Developments Inc.

McKINLEY ENVIRONMENTAL SOLUTIONS
613-620-2255 | mckinleyenvironmental@gmail.com
www.mckinleyenvironmental.com

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1.0 INTRODUCTION

1.1 Background and Site Overview

McKinley Environmental Solutions (MES) was retained by CU Developments Inc. to complete a Headwaters Drainage Assessment (HDA) to support their Kanata North development. The development lands owned by CU Developments Inc. includes several properties under the municipal addresses 1053, 1075 and 1145 March Road (Part of Lot 13 and 14, Concession 3, Township of March) (Figure 1). The North Tributary of Shirley's Brook (Tributary #2) enters the CU Developments property in the northwest and flows in an approximately southeast direction to March Road. A small pond is located along Shirley's Brook, adjacent to 1035 March Road. The development is part of the Kanata North Urban Expansion Area (KNUEA), which is intended to include an integrated open space system, which will include riparian corridors around the existing tributaries of Shirley's Brook. The Community Design Plan (CDP) and the associated Environmental Management Plan (EMP) for the KNUEA were approved by Ottawa City Council in 2016 through an Official Plan Amendment (Novatech 2016a; 2016b). Notably, the KNUEA EMP establishes a minimum 40 m wide corridor of vegetated habitat, which is to be retained and/or enhanced surrounding the tributaries of Shirley's Brook (Novatech 2016b). MES was also retained to concurrently prepare a Combined Environmental Impact Statement (EIS) and Tree Conservation Report (TCR) (under separate cover) (MES 2019).

This HDA report was completed in order to provide background information, documentation of current conditions, an impact assessment, classification, and management recommendations for the North Tributary of Shirley's Brook. As described in greater detail below, CU Development Inc. proposes to realign a portion of the watercourse, during which aquatic habitat enhancement will be undertaken. The realignment of the North Tributary will include habitat restoration and enhancement activity, which will be intended to improve the quality of the aquatic habitat and riparian areas for Blanding's Turtles (threatened) (as well as for fish and other wildlife). It is anticipated that the habitat enhancement requirements for Blanding's Turtle (threatened) will be mandated by a forthcoming Overall Benefit Permit under the *Ontario Endangered Species Act* (ESA). Ultimately, the proposed watercourse realignment and habitat enhancement will also be subject to review by the Mississippi Valley Conservation Authority (MVCA) and will require approval under the *Development, Interference with Wetlands and Alteration to Shorelines and Watercourses Regulation* (O.Reg. 153/06). The realignment and habitat enhancement project is anticipated to result in a net improvement in the quality of fish habitat. Therefore, it is anticipated that an authorization under the *Fisheries Act* is unlikely to be required. However, Department of Fisheries and Oceans (DFO) guidelines are such that the realignment of the North Tributary will require submission of a review

request to DFO. This HDA report has been prepared to support the MVCA and DFO review and approval processes.

The Study Area addressed by this HDA encompasses the northwest quadrant of the designated KNUEA (Figure 1). In order to remain consistent with previous studies completed as part of the KNUEA process (MEP 2016, Novatech 2016a, Novatech 2016b, MES 2019), the entirety of the KNUEA northwest quadrant is included in the Study Area for this HDA. The majority of the KNUEA northwest quadrant consists of agricultural lands which CU Developments Inc. proposes to develop as a residential subdivision. However, the current development proposal does not include the entirety of the KNUEA northwest quadrant. Several developed residential and institutional properties are present along the west side of March Road, and the existing developed areas are not part of the current development proposal. There is also a block of land in the southeast corner of the Study Area which is not owned by CU Developments Inc., and is therefore outside of the scope of the current development proposal. The CU Developments Inc. development limits are shown in Figure 1 (the Site). The KNUEA northwest quadrant as a whole is approximately 64 ha in size (the Study Area), whereas the current development proposal only includes approximately 48.05 ha (the Site).

The Study Area is within the urban area of the City of Ottawa and is zoned Rural Countryside. Within the Study Area, several developed residential properties with single detached houses exist along March Road, and existing institutional uses include the St. Isidore Church and the St. Isidore Public School. The majority of the Study Area consists of undeveloped open habitats including Cultivated Fields and recently Fallow Fields (Graminoid Meadows). Treed habitats within the Study Area include several Coniferous Hedgerows and Deciduous Hedgerows, two (2) small Cultural Woodlots, areas of regenerating Cultural Thicket/Cultural Woodlot, and a Dry-Fresh White Cedar Coniferous Forest (the Southwest Wooded Area) (which is no longer connected to Woodlot S-12).

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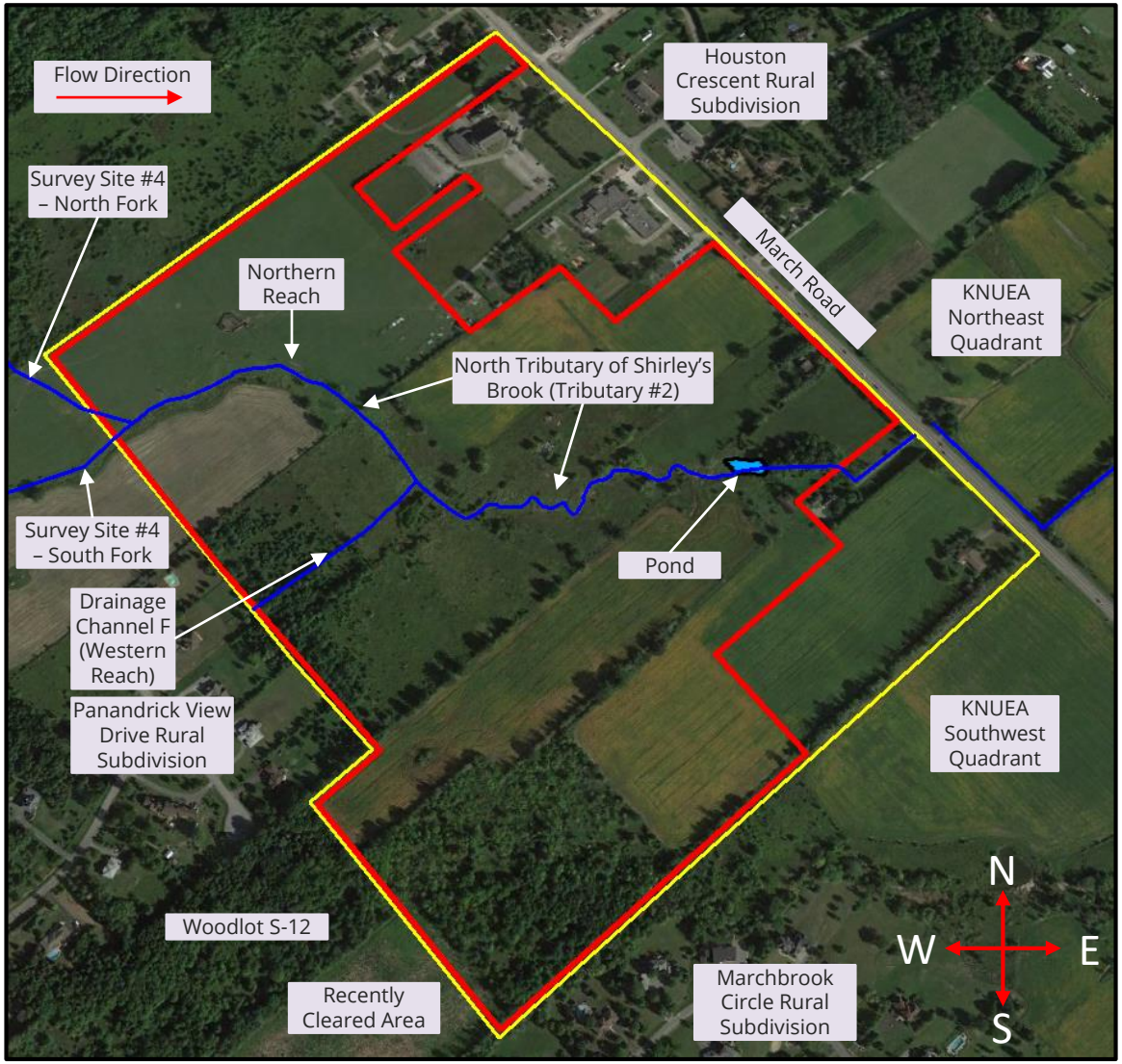
FIGURE 1: SITE OVERVIEW

1053/1075/1145 March Road - CU Developments Inc.

Headwaters Drainage Assessment (HDA) (Revised)



Please Note: This is not a legal land survey. All dimensions and locations are shown as approximate.

1.2 Description of Development

The Draft Plan of Subdivision is included below. As noted above, the Study Area as a whole is approximately 64 ha in size, however, the current development proposal only includes approximately 48.05 ha (the Site). The Site will be developed in multiple phases, each of which will include a mixture of single detached homes, townhomes, and multi-unit residential dwellings. The development will also include three (3) institutional blocks including a Park and Ride (Block 297) and Fire Hall (Block 296) to be located at March Road, and a third institutional block (Block 291), which provides a portion of a future school site. An approximately 2.23 ha municipal park block (Block 278) is included along the western Site boundary. The Site will receive municipal services. Stormwater runoff will be addressed through construction of a new Stormwater Management (SWM) Pond (Block 295) adjacent to March Road. The new SWM Pond will outlet clean water to the realigned North Tributary of Shirley's Brook.

The Kanata North Urban Expansion Area (KNUEA) Environmental Management Plan (EMP) (Novatech 2016b), which was approved through a City of Ottawa Official Plan Amendment, establishes a minimum 40 m wide corridor of retained and/or enhanced habitat around the tributaries of Shirley's Brook. Within the Site, this corridor is provided by several connected Open Space blocks (Blocks 272, 273, and 293) that total approximately 4.1 ha in size and which run in a northwest to southeast direction through the Site. As part of the Site development, the North Tributary of Shirley's Brook (referred to as Tributary #2 in the KNUEA EMP) will be realigned into the Open Space Blocks. Portions of the existing channel of the North Tributary are already within the Open Space Blocks, although much of the existing channel will require decommissioning, with a new channel to be built within the minimum 40 m wide corridor. As part of the realignment, the small pond that is currently located along the North Tributary (adjacent to 1035 March Road) will also be decommissioned. As discussed below, the realignment of the North Tributary will include habitat restoration and enhancement activity, which will be intended to improve the quality of the aquatic habitat and riparian areas for Blanding's Turtles (as well as for fish and other wildlife). Per the recommendations of the KNUEA EMP, the western reach of the North Tributary (Referred to in the KNUEA EMP as Drainage Channel F) will be intercepted at the KNUEA property boundary and piped to the realigned North Tributary. Channel F is an overland stormwater flow channel which receives stormwater from the Panandrick View Drive subdivision (located to the west). Two (2) new roads will cross the realigned North Tributary. The future road crossings will include suitable wildlife passage culverts that will allow Blanding's Turtles (and other wildlife) to pass beneath the new roads. As discussed in the Combined Environmental Impact Statement (EIS) and Tree Conservation Report (TCR) (MES 2019), the minimum 40 m wide corridor surrounding the North Tributary will also include fencing that will be designed to prevent Blanding's Turtles and other wildlife from leaving the Open Space

Blocks to enter the subdivision/roads. A 6 m wide recreational pathway will be included adjacent to the North Tributary watercourse corridor.

An additional 0.6 ha Open Space Block (Block 285) is located within the southwest corner of the Site. This Open Space Block is intended to preserve a portion of the Southwest Wooded Area, in order to provide a riparian buffer for the North Branch of Shirley's Brook (Referred to as Tributary #3 in the KNUEA EMP), which is located to the south (beyond the Site). Although the North Branch is not located within either the Site or the current Study Area, it is close enough to the Site that a portion of the minimum 40 m wide corridor for that watercourse overlaps the southwest corner of the Site. The intention of the Open Space Block in the southwest corner of the Site is to preserve the riparian habitat of the adjacent North Branch.

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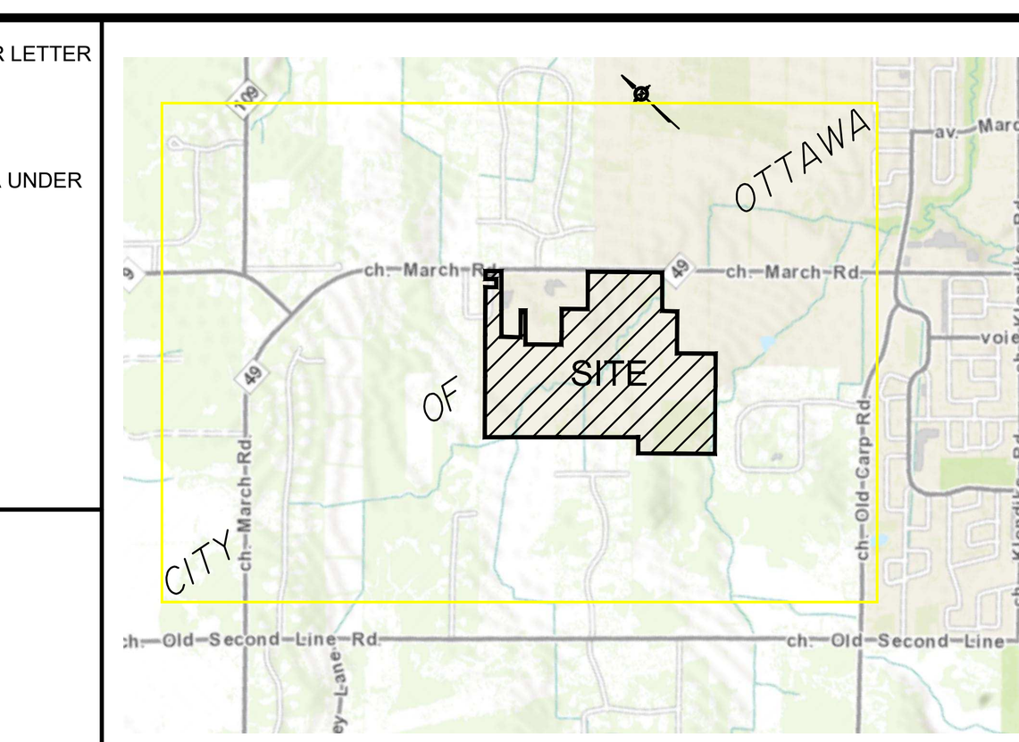
SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED

_______________________.

THIS DRAFT PLAN IS APPROVED BY THE CITY OF OTTAWA UNDER SECTION 51 OF THE PLANNING ACT.
THIS ____ DAY OF ____________, 20__ .

____
DERRICK MOODIE, MANAGER
DEVELOPMENT REVIEW-WEST
PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA



KEY MAP
NOT TO SCALE

DRAFT PLAN OF SUBDIVISION OF
PART OF LOTS 13 And 14 CONCESSION 3
Geographic Township of March
CITY OF OTTAWA
Prepared by Annis, O'Sullivan, Vollebekk Ltd.

Scale 1 : 1000

40 30 20 10 0 20 40 Metres

Metric
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

Surveyor's Certificate

I CERTIFY THAT :
The boundaries of the lands to be subdivided and their relationship to adjoining lands have been accurately and correctly shown.

___________ Date

___________________ Andre Roy
Ontario Land Surveyor

OWNER'S CERTIFICATE

This is to certify that we are the owners of the lands to be subdivided and that this plan was prepared in accordance with our instructions.

___________ Date

___________________ Jim Burghout
CU DEVELOPMENTS INC.
I have the authority to bind the corporation.

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51-17 OF THE PLANNING ACT

(a) see plan
(b) see plan
(c) see plan
(d) residential housing, institutional, storm water management, open space
(e) see plan
(f) see plan
(g) see plan
(h) City of Ottawa
(i) see soils report
(j) see plan
(k) sanitary, storm sewers, municipal water, bell, hydro, cable and gas to be available
(l) see plan

REVISION SCHEDULE

NO.	REVISION	DATE	BY
9	REVISIONS	SEPT. 24, 2019	N
8	REVISIONS	JULY 11, 2019	N
7	REVISIONS PER CITY	APR 29, 2019	N
6	Add lands from PIN 0219	June 20, 2018	AR
5	Remove lands from PIN 0124	June 20, 2018	AR
4	REVISIONS	MAY 25, 2018	N
3	REVISIONS	MAY 16, 2018	N
2	REVISIONS	MAY 3, 2018	N
1	PLAN PREPARED	2017	N

Ontario Land Surveyors

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com

Job No. 18628-18 Claridge Pt Lts 13 14 C3 MA DPS D9 | N

2.0 METHODOLOGY

The field component of the Headwater Drainage Assessment (HDA) was undertaken following the *Evaluation, Classification and Management of Headwater Drainage Features Guideline* (TRCA 2014). The sampling sites included 40 m upstream and 40 m downstream of each constriction or confluence. As shown in Figure 2, two (2) constrictions and two (2) confluences were identified, requiring four (4) Survey Sites. Each upstream and downstream drainage feature segment was measured at each of the four (4) Survey Sites. The roadside ditches along March Road were observed to be dry throughout the survey period, even in late March during the spring freshet. As such, it was determined that the roadside ditches contribute negligible flow to the North Tributary, and hence they were not investigated in detail as part of the HDA field surveying. Site surveys included the following:

- **OSAP Module S4.M10 – Assessing Headwater Drainage Features (Stanfield et al. 2013):** This included an assessment of hydrological and physical functions. Parameters measured are summarized in Tables A, B and C. Measurements included the watercourse type, flow conditions, bankfull width, channel depth, riparian corridor vegetation, and connectivity. Flow measurements were completed on March 30th (spring freshet), May 12th (early spring) and July 4th, 2018 (mid-summer). Channel measurements were completed during the March 30th, 2018 Site visit. Prior to the March 30th Site visit, significant spring snow melt was observed, and there was approximately 10 mm of rain the day before (March 29th). No rain was observed for several days prior to the May 12th Site visit. No rain occurred for approximately 72 hours prior to the July 4th Site visit.
- **Fish Survey:** Fish surveys were completed on June 12th, 2018 following the *OSAP Module S3.M1 – Single Pass Electrofishing Survey* method (Stanfield 2013). This includes a single pass electrofishing survey to identify fish species present within the Study Area. Electrofishing was completed in Survey Site #1 (downstream), Survey Site #2 (upstream), Survey Site #3 (downstream) and Survey Site #4 (downstream). In each sampling location, approximately 40 m of the watercourse was surveyed using the backpack electrofisher. The Survey Sites are shown below in Figure 2. Fish survey results are summarized in Table E.
- **Marsh Monitoring Program – Amphibian Call Counts (Konze and McLaren 1998):** Amphibian breeding habitat was identified according to the *Marsh Monitoring Program – Amphibian Call Counts Method* (Konze and McLaren 1998). This method includes three (3) night time surveys in April, May, and June to survey for amphibian breeding activity by listening for frog calls. Surveys were conducted on April 23rd, May 22nd, and June 22nd, 2018. Conditions on April 23rd included clear skies and temperatures of 13 ºC. Conditions on May 22nd included 11 ºC and clear skies. Conditions on June 22nd, 2018 included clear skies and temperatures of 19 ºC. Amphibian call

counts were conducted in the upstream and downstream portions of each Survey Site. Amphibian survey results are included in Table D.

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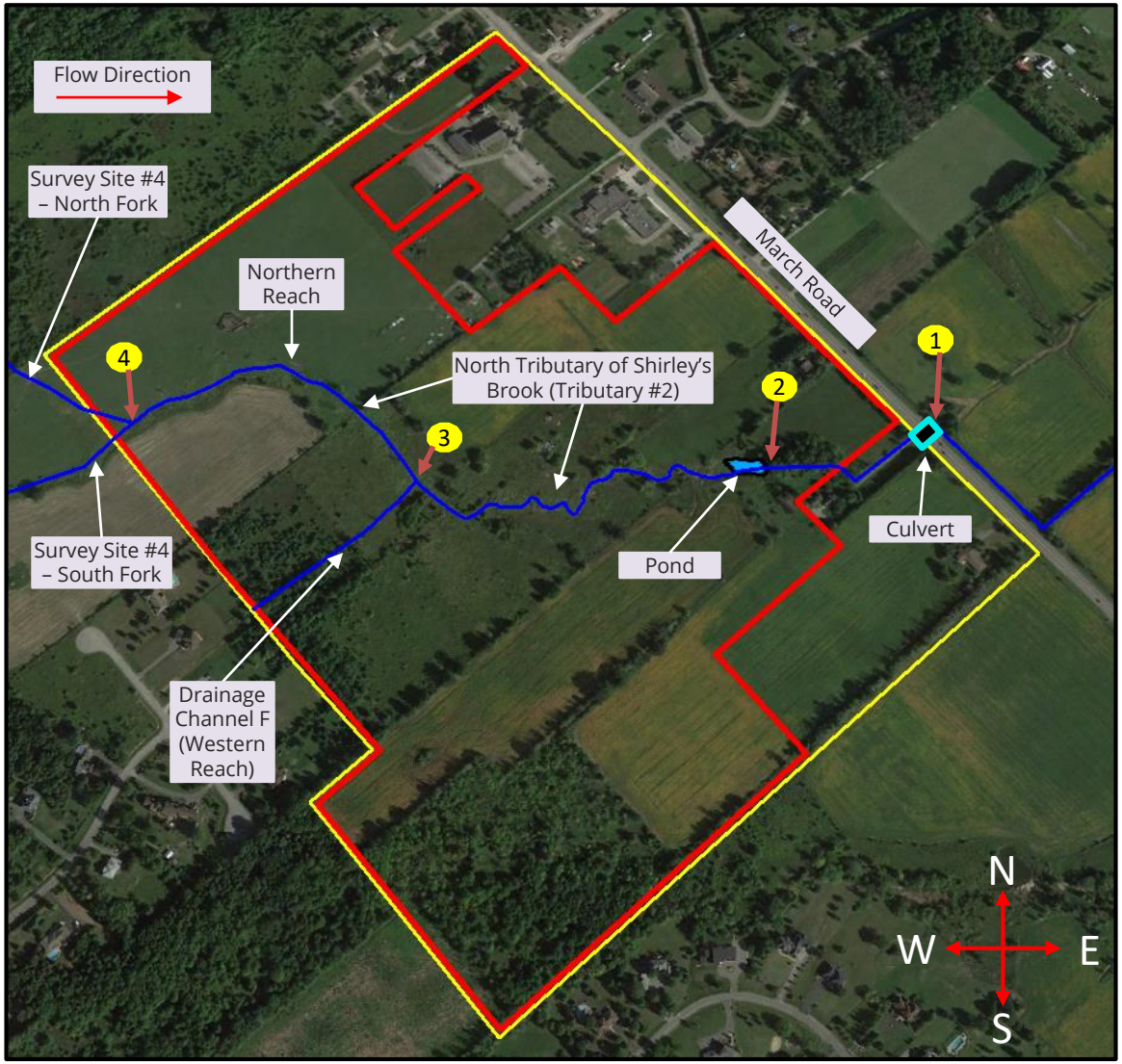
FIGURE 2: SURVEY SITES

1053/1075/1145 March Road - CU Developments Inc.

Headwaters Drainage Assessment (HDA) (Revised)



- Study Area (Northwest Quadrant)
- Development Limits
- # - Survey Sites

Please Note: This is not a legal land survey. All dimensions and locations are shown as approximate.

3.0 EXISTING CONDITIONS

3.1 Drainage Feature Overview

The Survey Sites are shown in Figure 2. Site photographs are included in Appendix A. The Study Area has a gradual slope from approximately 90 m ASL in the northwest corner (1075 March Road) down to approximately 80 m ASL in the southeast corner (1015 March Road). The majority of the Study Area is well drained, and there are no wetlands within the Study Area or within the immediately surrounding area. Aquatic habitats within the Study Area include the North Tributary of Shirley's Brook (Referred to as Tributary #2 in the Kanata North Urban Expansion Area (KNUEA) Environmental Management Plan (EMP)) and a 0.08 ha inline pond located west of 1035 March Road (Figure 2). The North Tributary enters the Study Area in its northwest corner, originating from the adjacent rural lands located to the northwest (outside of the urban boundary of the City of Ottawa). The North Tributary of Shirley's Brook runs through the Study Area from northwest to southeast. The North Tributary exits the Study Area at March Road. At March Road, the North Tributary passes through a culvert beneath the road, and then flows within the eastern March Road roadside ditch, before turning east into the southeast quadrant of the KNUEA.

As recommended by the Headwaters Drainage Assessment (HDA) survey protocols, the watercourse is described from downstream (Survey Site #1) to upstream (Survey Site #4) (Stanfield et al. 2013). The downstream channel of Survey Site #1 occurs east of March Road. Moving upstream, the channel passes through three (3) stacked 60 cm CSP culverts that run under an old farm driveway east of March Road. The North Tributary crosses under March Road through a 2 m concrete box culvert. West of March Road, the upstream portion of Survey Site #1 passes through another 60 cm CSP culvert under a farm path. The downstream portion of Survey Site #2 passes through a small Cultural Woodlot, beyond which is the 0.08 ha inline pond (west of 1035 March Road). The pond is maintained by a degraded crushed stone weir. Survey Site #2 upstream occurs upstream of the pond. Survey Site #3 occurs at the confluence between the North Tributary and Drainage Channel F. Drainage Channel F is an overland stormwater swale which receives intermittent outflow from the Panandrick View Drive Rural Subdivision (located to the west). Survey Site #4 occurs where the North Tributary splits into two (2) smaller tributaries (the north fork and south fork). The feature type for all segments other than Survey Site #1 downstream and Drainage Channel F was determined to be Defined Natural Channel. However, it should be noted that the channel is highly altered throughout the Study Area (discussed below). Survey Site #1 downstream is a channelized roadside ditch, whereas Drainage Channel F is a stormwater swale.

Previous investigations and discussion with the Ontario Ministry of Natural Resources and Forestry (OMNRF) and the Ministry of Environment, Conservation, and Parks (MECP) have resulted in the 0.08

ha pond being designated as Category 1 habitat for Blanding's Turtle. The tributaries of Shirley's Brook are considered Category 2 habitat for Blanding's Turtle. Refer to MES (2019) for additional detail.

3.2 Hydrological Characteristics

Hydrological characteristics of the North Tributary are summarized below in Table A. Water levels throughout the Study Area were at their highest during the spring freshet (March), during which average water depth throughout the system varied between approximately 143 mm and 453 mm. The deepest portion of the North Tributary was Survey Site #1 upstream and Survey Site #1 downstream. Survey Site #2 downstream and Drainage Channel F both had comparatively shallow average water depths. During the spring freshet, all segments experienced comparatively substantial flow volumes, with the exception of Drainage Channel F, which had minimal flow volume.

During late spring (May), water levels and flow rates were observed to decline compared to the spring freshet (March). By May, water depths varied between 43 mm and 240 mm. The wetted width of the channel also declined significantly. Although water depths and wetted width were both reduced by May, all segments continued to experience comparatively substantial flow volumes, with the exception of Drainage Channel F, which again had minimal flow volume.

By mid-summer (July), wetted width, standing water depth, and flow volumes decreased substantially. All segments were observed to have comparatively minimal flow volume, with the exception of Survey Site #4 (upstream – north fork) which had standing water depths of 43 mm but no flow (standing water only). By July, no standing water was observed in Drainage Channel F.

In the vicinity of Survey Site #2 upstream, flow is contributed to the system from an agricultural tile drain outlet, which drains the fields to the southwest. However, the volume of flow from the tile drain was observed to be negligible compared to the existing flow volume within the North Tributary at Survey Site #2. Similarly, water flow from Drainage Channel F in the vicinity of Survey Site #3 was minimal. The north and south forks of the upstream portion of Survey Site #4 contributed the majority of water to the system from upstream areas, with each fork estimated to contribute approximately equally to the hydration of the system. Overland flow from the open areas within the Study Area likely contributes significantly to the overall flow volume within the system, particularly during the spring melt and major storm events.

In summary, the North Tributary conveys substantial flows during the spring freshet (March) and throughout late spring (May), with water depths and flow volumes declining significantly by mid-summer (July). Although water depths are minimal by mid-summer, all segments remained hydrated with the exception of Drainage Channel F.

TABLE A: HYDROLOGY CLASSIFICATION

SITE	SEGMENT	FEATURE TYPE	FLOW REGIME*			WETTED WIDTH (cm)			AVERAGE WATER DEPTH (mm)			AVERAGE HYDRAULIC HEAD (mm)		
			Mar.30	May 12	July 4	Mar.30	May 12	July 4	Mar.30	May 12	July 4	Mar.30	May 12	July 4
Site #1 - March Road	Downstream	Channelized/Roadside Ditch	Substantial	Substantial	Minimal	280	97	56	450	150	63	20	20	4
	Upstream	Defined Natural Channel	Substantial	Substantial	Minimal	454	246	62	453	240	173	13	7	1
Site #2 - Pond	Downstream	Defined Natural Channel	Substantial	Substantial	Minimal	530	165	54	243	123	87	17	10	2
	Upstream	Defined Natural Channel	Substantial	Substantial	Minimal	380	96	75	183	140	73	40	7	1
Site #3 - Channel F Confluence	Downstream	Defined Natural Channel	Substantial	Substantial	Minimal	890	69	39	360	207	63	17	17	10
	Channel F	Swale	Minimal	Minimal	Dry	185	27	0	143	43	0	12	7	N/A
	Upstream (Northern Reach)	Defined Natural Channel	Substantial	Substantial	Minimal	680	71	42	320	227	80	17	8	2
Site #4 - Northern Reach Confluence	Downstream	Defined Natural Channel	Substantial	Substantial	Minimal	770	323	80	280	187	103	28	1	2
	Upstream (South Fork)	Defined Natural Channel	Substantial	Substantial	Minimal	570	82	54	210	220	90	4	3	2
	Upstream (North Fork)	Defined Natural Channel	Substantial	Substantial	No Flow	600	58	25	307	193	43	17	3	0

*****Flow Regime categories are defined as Substanial = Surface Flow >0.5 L/sec; Minimal = Surface Flow <0.5 L/Sec

3.3 Channel and Riparian Characteristics

Channel measurements and riparian characteristics are summarized below in Tables B and C. The current vegetation composition along the majority of the North Tributary's length suggests that historically land was cleared and cultivated up to the edge of the watercourse throughout the majority of the Study Area. As a result of historic plowing, the majority of the North Tributary throughout the Study Area includes a broad channel (bankfull width 4.6 m to 10.4 m) with shallow and poorly defined banks (channel depths of 330 mm to 1160 mm). Survey Site #1 downstream includes a cobble and silt substrate with some growth of terrestrial grasses. Survey Site #2 downstream includes silt and woody debris where the North Tributary passes through a Cultural Woodlot. Survey Site #2 upstream includes the fastest flowing segment within the Study Area, which is likely due to the fact that the substrate is dominated by exposed bedrock with some silt. The channel width at Survey Site #2 upstream is also narrower compared to Survey Sites #3 and #4, which likely contributes to the increased flow velocity. All other segments throughout the Study Area have silt substrates that are partially exposed during the spring freshet but which become overgrown with terrestrial grasses throughout the majority of the growing season. The dominant terrestrial plant found growing within the channel is Reed Canary Grass, although riparian plants including Spotted Joe-Pye-Weed, Purple Loosestrife and Spotted Touch-Me-Not occur in some areas. The majority of the North Tributary is overgrown with Reed Canary Grass and other terrestrial vegetation throughout the majority of the growing season.

Along the majority of its length throughout the Study Area, the North Tributary has comparatively little riparian tree cover. The only area of continuous tree cover occurs around Survey Site #2 downstream, where the watercourse passes through a small Cultural Woodlot downstream of the inline pond. Other than the small Cultural Woodlot, the riparian zone surrounding the North Tributary consists of either cultivated agricultural fields or fallow agricultural fields (Graminoid Meadow). The only exception to this is Survey Site #1 downstream, where March Road and patches of lawn occur along the left bank of the watercourse, and Survey Site #1 upstream, where the driveway of 1035 March Road and patches of lawn occur along the left bank.

As noted above, west of 1035 March Road water flow is held back by a crushed stone weir, which creates a 0.08 ha inline pond. The pond includes a deep pool that reaches standing water depths of greater than 1 m (MEP 2016). The substrate of the pond consists primarily of muck. Aquatic plant species grow around the margins of the pond, however, the majority of the feature consists of open water throughout the summer.

TABLE B: CHANNEL MEASUREMENTS

SITE	SEGMENT	FEATURE TYPE	BANKFUL WIDTH (m)	CHANNEL DEPTH (mm)	SUBSTRATE	FEATURE ROUGHNESS**	CONSTRICTIONS
Site #1 - March Road	Downstream	Channelized/Roadside Ditch	6.7	1160	Mostly Cobble, Some Silt	Moderate	3x Stacked 60 cm CSP Culverts East of March Road (Farm Driveway), 2 m Concrete Box Culvert under March Road, 60 cm CSP Culvert West of March Road (Farm Driveway)
	Upstream	Defined Natural Channel	7.2	1050	Silt/Grasses	Extreme	
Site #2 - Pond	Downstream	Defined Natural Channel	6.9	630	Silt and Woody Debris	High	Old Stone Weir at Downstream Side of Pond
	Upstream	Defined Natural Channel	4.6	330	Mostly Bedrock, Some Silt	Moderate	
Site #3 - Channel F Confluence	Downstream	Defined Natural Channel	10.4	1040	Silt/Grasses	Extreme	None
	Channel F	Swale	4.7	570	Grasses	Extreme	
	Upstream (Northern Reach)	Defined Natural Channel	7.6	740	Silt/Grasses	Extreme	
Site #4 - Northern Reach Confluence	Downstream	Defined Natural Channel	9.2	530	Silt/Grasses	Extreme	None
	Upstream (South Fork)	Defined Natural Channel	8.0	710	Silt/Grasses	Extreme	
	Upstream (North Fork)	Defined Natural Channel	6.0	420	Silt/Grasses	Extreme	

**Feature Roughness categories are defined by OSAP Module 4.10 as; Minimal = Less than 10% of the areal coverage of the channel substrates contains materials that diffuse flows; Moderate = 10-40% of the areal coverage of the channel substrates contains materials that diffuse flows; High = 40-60% of the areal coverage of the channel substrates contains materials that diffuse flows; Extreme = More than 60% of the areal coverage of the channel substrates contains materials that diffuse flows.

TABLE C: RIPARIAN CLASSIFICATION

SITE	SEGMENT	FEATURE TYPE	LEFT BANK*			RIGHT BANK*		
			0 - 1.5 m	1.5 - 10 m	10 - 30 m	0 - 1.5 m	1.5 - 10 m	10 - 30 m
Site #1 - March Road	Downstream	Channelized/Roadside Ditch	Lawn	Road	Road	Meadow	Crop	Crop
	Upstream	Defined Natural Channel	Lawn	Driveway	Crop	Crop	Crop	Crop
Site #2 - Pond	Downstream	Defined Natural Channel	Meadow	Lawn	Lawn	Forest	Forest	Forest
	Upstream	Defined Natural Channel	Meadow	Meadow	Crop	Meadow	Meadow	Crop
Site #3 - Channel F Confluence	Downstream	Defined Natural Channel	Meadow	Meadow	Meadow	Meadow	Meadow	Meadow
	Channel F	Swale	Meadow	Meadow	Meadow	Meadow	Meadow	Meadow
	Upstream (Northern Reach)	Defined Natural Channel	Meadow	Meadow	Meadow	Meadow	Meadow	Meadow
Site #4 - Northern Reach Confluence	Downstream	Defined Natural Channel	Meadow	Crop	Crop	Meadow	Crop	Crop
	Upstream (South Fork)	Defined Natural Channel	Meadow	Crop	Crop	Meadow	Crop	Crop
	Upstream (North Fork)	Defined Natural Channel	Meadow	Meadow	Crop	Meadow	Crop	Crop

*Left and right bank are facing upstream

3.4 Amphibian Habitat

Table D summarizes the frog call survey results. Amphibian breeding activity throughout the Study Area was minimal. No amphibian calling activity was observed on April 23rd. On May 22nd, amphibian calling activity was limited to one (1) Spring Peeper heard calling at Survey Site #1 upstream and one (1) Spring Peeper and one (1) American Toad heard calling at Survey Site #3 upstream. On June 22nd, a total of seven (7) Green Frogs were heard calling at several locations within the Study Area, including within the pond (at Survey Site #2 upstream), at Survey Site #3 downstream, at Survey Site #4 downstream, and within the south fork of Survey Site #4 upstream. No amphibian calling activity was observed within Drainage Channel F throughout the survey. Although calling activity was observed for three (3) amphibian species (Spring Peeper, American Toad and Green Frog), the density of calling was very low, and was not sufficient for the Study Area to be considered Significant Wildlife Habitat (SWH) for amphibian breeding (OMNRF 2014b).

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TABLE D: AMPHIBIAN SURVEY RESULTS

SITE	SEGMENT	FEATURE TYPE	AMPHIBIAN CALL ACTIVITY		
			April 23	May 22	June 22
Site #1 - March Road	Downstream	Channelized/Roadside Ditch	*None*	*None*	*None*
	Upstream	Defined Natural Channel	*None*	*None*	*None*
Site #2 - Pond	Downstream	Defined Natural Channel	*None*	*None*	*None*
	Upstream	Defined Natural Channel	*None*	**1x Spring Peeper within Site**	**4x Green Frogs within Site**
Site #3 - Channel F Confluence	Downstream	Defined Natural Channel	*None*	*None*	**1x Green Frog within Site**
	Channel F	Swale	*None*	*None*	*None*
	Upstream (Northern Reach)	Defined Natural Channel	*None*	**1x Spring Peeper and 1x American Toad within Site**	*None*
Site #4 - Northern Reach Confluence	Downstream	Defined Natural Channel	*Killdeer*	*None*	**1x Green Frog within Site**
	Upstream (South Fork)	Defined Natural Channel	*None*	*None*	**1x Green Frog within Site**
	Upstream (North Fork)	Defined Natural Channel	*Wilson's Snipe*	*None*	*None*

3.5 Fish Community and Fish Habitat

Table E summarizes the fish survey results. Five (5) species were observed within the Study Area including Brook Stickleback, Creek Chub, Blacknose Dace, Finescale Dace, and Longnose Dace. Each of these are common species typically found in degraded systems and areas of low quality fish habitat. Survey Sites #1 and #4 had the greatest numbers of fish, however, fish were found throughout the Study Area. These results suggest that the North Tributary provides low quality, primarily intermittent fish habitat. The North Tributary appears to add to the overall productivity of the Shirley's Brook system, especially during the spring period. However, water depths are very low by mid-summer and portions of the North Tributary are prone to drying out in some years. As such, fish communities may migrate downstream in the summer in some years. No fish were observed within Drainage Channel F, suggesting that the feature is too shallow and ephemeral to provide direct fish habitat.

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TABLE E: FISH SURVEY RESULTS

SITE	SEGMENT	Brook Stickleback (*Culaea inconstans)*	Creek Chub (*Semotilus atromaculatus)*	Blacknose Dace (*Rhinichthys atratulus)*	Finescale Dace (*Chrosomus neogaeus)*	Longnose Dace (*Rhinichthys cataractae)*
Site #1 - March Road	Downstream	3	4	19	2	1
Site #2 - Pond	Upstream	5	0	1	0	0
Site #3 - Channel F Confluence	Downstream	6	3	1	1	0
Site #4 - Northern Reach Confluence	Downstream	20	9	2	0	0

3.6 Summary of Habitat Quality

As a whole, the North Tributary can be characterized as a highly degraded agricultural watercourse that has a hydro-period that is typically confined to the spring freshet and late spring in most years. Although water depths and flow volumes are substantial in the early to late spring, water depths decline significantly by mid-summer, such that portions of the system likely dry out in drought years. In 2018, the system remained hydrated in July. However, 2018 was a relatively wet year, and survey results from previous years have shown that portions of the system were dry by mid-summer (MEP 2016). Although some areas of cobble, bedrock, and woody debris substrate occur in various places throughout the North Tributary, the dominant substrate condition is silt overgrown with terrestrial grasses. By mid-summer, the majority of the system is heavily overgrown and the channel is difficult to see. Historic plowing and agricultural land usage has resulted in a very broad channel with poorly defined banks throughout the majority of the Study Area. Throughout the majority of the Study Area, the watercourse has very little shade and low quality riparian habitat. The dominant riparian vegetation consists of cultivated crops and/or fallow agricultural fields (Graminoid Meadow). A small Cultural Woodlot in the vicinity of Survey Site #2 downstream provides the only area of continuous tree cover. March Road, the 1035 March Road driveway, and patches of lawn are also present within the riparian zone in the vicinity of Survey Site #1.

Although amphibian calling activity was observed for three (3) amphibian species (Spring Peeper, American Toad and Green Frog), the density of calling was very low, and was not sufficient for the Study Area to be considered Significant Wildlife Habitat (SWH) for amphibian breeding (OMNRF 2014b). Fish survey results indicate that the North Tributary provides intermittent, low quality fish habitat, which supports a low diversity, tolerant warm-water fish community.

As described above, Drainage Channel F is a stormwater swale that receives intermittent flow and is dry throughout the majority of the growing season. No evidence of amphibian breeding or direct fish habitat was documented for Drainage Channel F.

Shirley's Brook and the inline pond are designated as Blanding's Turtle habitat. The presence of Blanding's Turtle habitat represents the most significant natural function provided by the aquatic habitats throughout the Study Area. Previous investigations and discussion with the Ontario Ministry of Natural Resources and Forestry (OMNRF) and the Ministry of Environment, Conservation, and Parks (MECP) have resulted in the 0.08 ha pond being designated as Category 1 habitat for Blanding's Turtle. The tributaries of Shirley's Brook are considered Category 2 habitat for Blanding's Turtle. However, it should be noted that the Blanding's Turtle habitat throughout the Study Area has

been described as low quality and highly degraded habitat for the species. Refer to MES (2019) for additional detail.

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4.0 CLASSIFICATION AND MANAGEMENT RECOMMENDATIONS

The Classification Criteria for Headwaters Drainage Assessments is provided by TRCA (2014). Refer to TRCA (2014) for further detail regarding the Classification Criteria. The Classification Criteria results for the North Tributary within the Study Area are as follows:

- **Hydrological Classification:** Valued Function – Intermittent. TRCA definition: *Water is present in the spring as a result of seasonally high groundwater discharge or seasonally extended contributions from wetlands or other areas that support intermittent flow or water storage conditions. These features are typically still flowing in late spring but dry or surface-damp by July.*
- **Riparian Classification:** Valued Function. TRCA definition: *Any of the riparian corridor categories (0 - 1.5 m, 1.5 - 10 m, or 10 - 30 m on either side of the feature) is dominated by meadow and there are no important riparian functions.* As noted above, the dominant riparian vegetation is fallow agricultural fields (Graminoid Meadow) and cultivated fields.
- **Fish and Fish Habitat Classification:** Important Function. TRCA definition: *Fish are present year round (permanent habitat) in standing pools; or suitable habitat present for fish spawning/rearing; or feature designated as occupied Species at Risk habitat.*
- **Terrestrial Habitat Classification:** Valued Functions. TRCA definition: *General amphibian habitat: stepping stone habitat (stop over to higher quality habitat) or suitable for feeding or hydration for low mobility wildlife (amphibians). Wetland habitat occurs within the corridor, but no breeding amphibians are present.*

Following TRCA (2014) guidelines, drainage features with Contributing or Valued Hydrology and Important Fish Habitat require Protection. TRCA (2014) Management Recommendations include the following:

- *Protect and/or enhance the existing feature and its riparian zone corridor, and groundwater discharge or wetland in-situ;*
- *Maintain hydro-period;*
- *Use natural channel design techniques or wetland design to restore and enhance existing habitat features, if necessary; and*
- *Design and locate the stormwater management system to avoid impacts to the feature.*

The Management Recommendations will be achieved by implementing the habitat enhancement and mitigation measures described below in Section 5.0.

5.0 HABITAT ENHANCEMENT AND MITIGATION MEASURES

5.1 Tributary Setbacks

The Kanata North Urban Expansion Area (KNUEA) Environmental Management Plan (EMP), which was approved through a City of Ottawa Official Plan Amendment, establishes a minimum 40 m wide corridor of retained and/or enhanced habitat around the tributaries of Shirley's Brook (Novatech 2016b). Within the Site, this corridor is provided by several connected Open Space blocks (Blocks 272, 273, and 293) that total approximately 4.1 ha in size and which run in a northwest to southeast direction through the Site. As part of the Site development, the North Tributary of Shirley's Brook (Referred to as Tributary #2 in the KNUEA EMP) will be realigned into the Open Space Blocks. As discussed below, the realignment of the North Tributary will include habitat restoration and enhancement activity, which will be intended to improve the quality of the aquatic habitat and riparian areas for Blanding's Turtles (as well as for fish and other wildlife). As part of the realignment, the small pond that is currently located along the North Tributary (adjacent to 1035 March Road) will be decommissioned. Per the recommendations of the KNUEA EMP, Drainage Channel F will be intercepted at the KNUEA property boundary and piped to the realigned North Tributary (Novatech 2016b). As described above, Drainage Channel F is an overland stormwater flow channel which receives stormwater from the Panandrick View Drive subdivision (located to the west). Drainage Channel F was not observed to provide any significant functionality in terms of fish and amphibian habitat. A 6 m wide recreational pathway will be included adjacent to the North Tributary watercourse corridor.

The purpose of the minimum 40 m wide corridor surrounding the North Tributary of Shirley's Brook is to provide a buffer which will help to slow, filter and absorb overland stormwater flow, while also providing habitat for wildlife and wildlife movement. Trees growing within the setback area help to protect the watercourse from edge effects including noise, pollution, and other forms of human disturbance. Trees also provide shade which helps to cool surface water temperatures, while they also help to prevent erosion, stabilize banks, and enhance absorption and filtration of overland stormwater flow.

As specified in Section 4.7.3 of the City of Ottawa Official Plan, current policy recommends that the setback from watercourses should be the greater of either 15 m from the top of slope or 30 m from the normal high-water mark of the watercourse. The minimum 40 m wide corridor surrounding the tributaries of Shirley's Brook established by the KNUEA EMP effectively requires implementation of a 20 m setback from the watercourses. The City of Ottawa Official Plan Policy 4.7.3 identifies four (4) items that are to be addressed in cases where watercourse setbacks are less than 30 m from the normal high-water mark. These include:

A. **Slope and Bank Stability:** The realigned North Tributary of Shirley's Brook will be designed to minimize erosion potential. Tree planting within the setbacks (discussed below in Section 5.4), will help stabilize the slope and prevent future erosion. No significant slope and bank stability issues have been identified.
B. **Natural Vegetation and Ecological Functions in the Setback Area:** As discussed above, under existing conditions the majority of the North Tributary lacks riparian tree cover. During the realignment process, vegetation cover within the watercourse corridor will be enhanced, thereby improving the quality of the habitat above existing conditions.
C. **The Nature of the Abutting Waterbody and the Presence of the Floodplain:** The floodplain of the North Tributary will be confined within the minimum 40 m wide watercourse corridor following development of the Site (Novatech 2016b).
D. **No Negative Impacts on Fish Habitat:** As discussed above, the North Tributary currently provides low quality, intermittent fish habitat for a tolerant warm-water fish community. As described below, the realignment process will include habitat restoration works, which will improve the quality of fish habitat above existing conditions.

In summary, the minimum 40 m wide corridor surrounding the realigned North Tributary is anticipated to be sufficient to protect the ecological functions of the watercourse. As part of the realignment process, habitat restoration and habitat enhancement works will be undertaken, which will improve the quality of the aquatic habitat above existing conditions.

5.2 Shirley's Brook Realignment – Aquatic Habitat Enhancement Features

Habitat enhancement measures for the northwest quadrant of the Kanata North Urban Expansion Area (KNUEA) were designed primarily to improve the quality of the North Tributary (Referred to as Tributary #2 in the Environmental Management Plan (EMP)) as habitat for Blanding's Turtle (DST 2015). However, the habitat enhancement measures will also improve the quality of the aquatic habitat for other organisms, including amphibians and fish. As discussed above, the North Tributary can be characterized as a highly degraded agricultural drain that has limited water depths and a hydro-period that is typically confined to the spring in most years. Throughout the majority of the Study Area, the watercourse has very little shade and low quality riparian habitat. Much of the North Tributary becomes overgrown with terrestrial vegetation by mid-summer each year, limiting its ability to provide fish habitat throughout much of the growing season. The North Tributary provides intermittent, low quality fish habitat, which supports a low diversity, tolerant warm-water fish community. As described in MES (2019), the North Tributary also provides low quality Category 2 habitat for Blanding's Turtle.

The *Kanata North Community Design Plan – Blanding's Turtle Habitat Compensation Plan* (DST 2015) and the KNUEA EMP (Novatech 2016b) outline in detail the proposed habitat enhancement works that are to be undertaken during the realignment of the North Tributary. The conceptual design for the realignment is included below. The arrangement of Open Space Blocks to accommodate the realigned watercourse corridor are shown above in the Draft Plan of Subdivision.

An Overall Benefit Permit under the Ontario Endangered Species Act is anticipated to be required to support the proposed realignment. Typically the Overall Benefit Permit is obtained prior to initiating the detailed design process for a watercourse realignment, as the Overall Benefit Permit may contain provisions that need to be reflected in the final design. Following obtainment of the Overall Benefit Permit, a detailed design for the North Tributary realignment will be developed and submitted to the Mississippi Valley Conservation Authority (MVCA) and the Ministry of Environment, Conservation, and Parks (MECP) for review and approval.

The conceptual design for the North Tributary realignment includes the following (Refer to DST (2015) and Novatech (2016b) for additional detail):

1. **Stream Corridor:** Areas where the existing channel will be realigned should be designed using natural channel design techniques to ensure long-term stability and enhance the ecological functions of the corridor. This should include the following:
    a. Areas where the realigned channel bed is situated directly on bedrock will require geotechnical evaluation and measures to prevent excessive diversion of baseflows into rock fractures.
    b. The low flow channel should have a bottom width of between 1 m and 4 m.
    c. The maximum bank angle within the wetted channel should be approximately 25 degrees (2:1) and the bank beyond the wetted channel should be approximately 10 to 15 degrees maximum (4:1 to 6:1) and should be nearly flat to 6 degrees (10% slope).
    d. Limited portions of the stream may have a steeper bank angle where final grades would require extensive excavation to create a shallow angle, but the majority of the watercourse will feature a shallow bank.
    e. The water depth profile will be similar to the existing channel, with bankfull depths ranging from 30 cm to 75 cm during periods of high water.
    f. Water depths will be less than 30 cm during low flow periods.

2. **Blanding's Turtle Category 1 Habitat Creation:** A total of 0.27 ha of Category 1 habitat will be created within the watercourse corridor. The KNUEA EMP (Novatech 2016b) and DST (2015) originally identified that the Category 1 habitat creation should include two (2) Deep Pools and two (2) Artificial Nesting Areas, which collectively would create approximately 0.2 ha of Category 1 habitat. However, during the Overall Benefit Permit review process, the Ministry of Environment, Conservation, and Parks (MECP) requested that the two (2) Artificial Nesting Areas be eliminated from the design. The MECP requested that the Artificial Nesting Areas be replaced with two (2) additional Deep Pools (four (4) Deep Pools in total). This change increases the amount of Category 1 habitat creation from the 0.2 ha outlined by Novatech (2016b) and DST (2015) to approximately 0.27 ha. The design for these features is as follows:
    a. **Deep Pools** will function as potential hibernacula sites for Blanding's Turtles, while also providing general foraging habitat and refuge areas for other aquatic wildlife (including fish). Each deep pool will measure approximately 15 m x 45 m (675 m^2) and may be designed as either inline or offline ponds. The conceptual design shows all four (4) deep pools as inline ponds. Each will include the following:
        - Each pool should have a maximum depth of approximately 2 m and an average depth of approximately 1 m.

- Approximately 2/3^{rds} of each pool area will be graded to maintain 1 m water depth or greater, and graded so that the remaining 1/3rd of the area transitions to an approximate average depth of 30 m.
- Deep pools will include similar substrate and vegetation characteristics as the typical channel sections, including seeding with a native wetland restoration mix/riparian vegetation mix.

3. **Blanding's Turtle Category 2 Habitat Creation:** Category 2 Blanding's Turtle habitat includes watercourses and wetlands, and the surrounding terrestrial areas up to 30 m from the water's edge. The total size of the Open Space Blocks (Blocks 272, 273, and 293) surrounding the realigned North Tributary is approximately 4.1 ha. All of the 4.1 ha will count as Category 2 habitat following completion of the realignment, with the exception of the 0.27 ha that will feature Category 1 habitat features (see above). In total, the realigned watercourse corridor will contain 0.27 ha of Category 1 habitat and approximately 3.83 ha of Category 2 habitat (4.1 ha total size). The Category 2 habitat within the watercourse corridor will be enhanced by including two (2) Shallow Pans/Shallow Pools, five (5) Deep Channel Pockets, and hard substrate habitat features within the watercourse corridor. It should be noted that the KNUEA EMP (Novatech 2016b) and DST (2015) originally proposed the inclusion of three (3) Shallow Pans/Shallow Pools within the realigned North Tributary watercourse corridor. However, the density of Shallow Pans/Shallow Pools was determined by DST (2015) based on the assumption that the entire length of the North Tributary through the Northwest Quadrant of the KNUEA would be addressed collectively during the realignment process. However, as noted above, the 1035 March Road and 1015 March Road properties are not included within the currently proposed development (e.g. the Site). A portion of the North Tributary's length through the KNUEA Northwest Quadrant flows through the 1035 March Road property. The exclusion of the 1035 March Road property from the current Site leaves insufficient space to include all three (3) Shallow Pans/Shallow Pools. It is recommended that the inclusion of the third Shallow Pan/Shallow Pool could be considered as a habitat enhancement feature within the 1035 March Road property, if the 1035 March Road property is developed in the future. The design for these features is as follows:
    a. **Shallow Pans/Shallow Pools** excavated around the channel will expand the wetted area and provide areas where aquatic and semi-aquatic vegetation can grow to create habitat for amphibians, turtles and other aquatic wildlife. Each shallow pan / shallow pool should measure approximately 10 m wide (5 m on either side of the channel) and approximately 60 m long (600 m^2).

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- Shallow pans / shallow pools will be dug to an average of approximately 30 cm below the channel grade, so that they maintain an average water depth of approximately 30 cm.

b. **Deep Channel Pockets** will be dug approximately 30 cm to 45 cm below the main channel grade. These features will be constructed along the length of the channel and will create deeper refuge pools within the channel for turtles, fish and other aquatic wildlife.
    - Deep channel pockets will be relatively small (approximately 5 m diameter) and should be semi-randomly placed along the channel length.

c. **Hard Substrate Features** including woody debris, logs, root wads, and cut trees will be placed within wider sections of the channel (>2 m low flow bottom width). Woody debris, grubbed stumps, logs, flat rocks, rock piles and other cover materials should be interspersed along the banks of the realigned channel to create habitat within (or adjacent) to the main channel.

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NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
1.	ISSUED WITH THE COMBINED ENVIRONMENTAL IMPACT STATEMENT AND TREE CONSERVATION REPORT	OCT 2019	MSP

SCALE 1:1250

DESIGN MSP
CHECKED MSP
DRAWN RBG
CHECKED MSP
APPROVED MSP

FOR REVIEW ONLY

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CU DEVELOPMENTS INC.
1053, 1075 AND 1145 MARCH ROAD

DRAWING NAME
CREEK RE-ALIGNMENT
LAYOUT PLAN

PROJECT No. 116132
REV REV # 1
DRAWING No. 116132-CRK-FIG

5.3 Shirley's Brook Realignment – Wildlife Passage Culverts

As shown in the Draft Plan of Subdivision (above), two (2) new roads will cross the realigned North Tributary. The future road crossings will include suitable wildlife passage culverts that will allow Blanding's Turtles (and other wildlife) to pass beneath the new roads. Per the Kanata North Urban Expansion Area (KNUEA) Environmental Management Plan (EMP) (Novatech 2016b), the wildlife passage culverts should include box culverts that are a minimum of 1.8 m wide x 1.2 m high. As discussed in MES (2019), the minimum 40 m wide watercourse corridor will include fencing designed to prevent Blanding's Turtles from leaving the watercourse corridor to enter the development area. The fencing will be required to connect to the wildlife passage culverts, to ensure there are no gaps in the system.

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5.4 Shirley's Brook Realignment – Riparian Planting

The KNUEA EMP makes the following recommendations regarding planting requirements within the minimum 40 m wide watercourse corridor (Novatech 2016b):

- *Realigned channel sections should be seeded with a native wetland/riparian seed mix to encourage re-establishment of native vegetation and improve habitat quality*;
- *Where possible, the realigned channel sections should be designed to take advantage of existing shade trees and surrounding woody vegetation in hedgerows;*
- *Shade tree planting should be selective, as the goal is not to create a fully shaded riparian corridor. Landscaping and grading features will be identified at the detailed design stage to ensure that critical habitat areas are well separated from the adjacent recreational trails.*

The riparian planting recommendations of the KNUEA EMP (Novatech 2016b) will be implemented as follows:

- Following completion of excavation and other earthworks, bare areas of the watercourse corridor will be seeded with a native wetland/riparian seed mix. Seeds will be broadcast over any bare areas in the early part of the growing season, in order to encourage the establishment of native wetland vegetation.
- Where feasible, existing trees will be preserved within the Open Space Blocks that will form the minimum 40 m wide corridor surrounding the realigned North Tributary of Shirley's Brook.
- It is not desirable to completely reforest the watercourse corridor, as Blanding's Turtle require open areas with full sun for basking and thermal regulation. Complete reforestation of the watercourse corridor would make the habitat less suitable for Blanding's Turtle. However, trees growing within the watercourse corridor will help to protect the watercourse from edge effects including noise, pollution, and other forms of human disturbance. Trees also provide shade which helps to cool surface water temperatures, while they also help to prevent erosion, stabilize banks, and enhance absorption and filtration of overland stormwater flow. As such, tree planting within the watercourse corridor is desirable, but should be undertaken selectively, with relatively few dense stands.
- During detailed design, landscaping and grading features will be identified to ensure that critical habitat areas are well separated from the adjacent 6 m wide recreational trail. Tree/shrub planting can be utilized as a visual barrier to ensure that some portions of the watercourse corridor remain undisturbed by recreational usage.

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5.5 Servicing and Stormwater Management

Stormwater runoff will be addressed through construction of a new Stormwater Management (SWM) Pond adjacent to March Road. The new SWM Pond will outlet clean water to the North Tributary of Shirley's Brook. The Kanata North Urban Expansion Area (KNUEA) Environmental Management Plan (EMP) (Novatech 2016b) states that the recommended SWM facility design will incorporate baseflow enhancement, water quality control (80% long-term TSS removal), erosion control, and peak flow control.

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5.6 Sediment and Erosion Controls

As discussed in the Combined Environmental Impact Statement (EIS) and Tree Conservation Report (TCR) (MES 2019), Blanding's Turtle temporary exclusion fencing (wire re-enforced silt fencing) will be required surrounding the watercourse corridor Open Space Blocks (Blocks 272, 273, and 293) during the construction phase. Temporary exclusion fencing is also recommended to be installed along the northern and eastern edges of the 0.6 ha Open Space Block (Block 285) that is included in the southwest corner of the Site (adjacent to the North Branch of Shirley's Brook). In addition to preventing Blanding's Turtles from entering the development area, this fencing will also serve to mitigate potential sediment and erosion impacts on the North Tributary (Referred to as Tributary #2 in the KNUEA EMP) and the North Branch (Referred to as Tributary #3 in the KNUEA EMP) of Shirley's Brook.

During construction, existing conveyance systems along March Road and in the existing developed properties could be exposed to significant sediment loading. Although construction is only a temporary situation, a sediment and erosion control plan will be required to ensure the existing conveyance systems are not negatively impacted by sediment and erosion.

The sediment and erosion control plan will include the following:

- Groundwater in trenches (if present) will be pumped into a filter mechanism, such as a trap made up of geotextile filters and straw, prior to release to the environment;
- Bulkhead barriers will be installed at the nearest downstream manhole in each sewer which connects to an existing downstream sewer (e.g. existing sewers along March Road, if required). These bulkheads will trap any sediment carrying flows, thus preventing any construction-related contamination of existing sewers;
- Seepage barriers will be constructed in any temporary drainage ditches;
- Construction vehicles will leave the Site at designated locations. Exits will consist of a bed of granular material, in order to minimize the tracking of mud off-site;
- Any stockpiled material will be properly managed to prevent those materials from entering the sewer systems; and
- Until landscaped areas are sodded or until streets are asphalted and curbed, all catch basins and manholes will be constructed with a geotextile filter sock located between the structure frame and cover.

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5.7 Species at Risk and Wildlife Construction Stage Mitigation

Refer to MES (2019) for a detailed description of the construction stage mitigation for Species at Risk (SAR) and other wildlife. In addition to the mitigation measures outlined in MES (2019), the following requirements apply to any in-water work:

- **Dewatering:** All dewatering operations must be supervised by a Qualified Biologist, who must be present during dewatering to relocate fish, turtles and other wildlife. Full time supervision by a Qualified Biologist is necessary during initial water draw down;
- **Permits:** Prior to the decommissioning of the old alignment of the North Tributary and the pond found west of 1035 March Road, a *Wildlife Scientific Collector's Authorization* and *License to Collect Fish for Scientific Purposes* must be obtained from the Ontario Ministry of Natural Resources and Forestry (OMNRF). Relocation sites and detailed fish and wildlife salvage procedures will be identified during the fish and wildlife relocation permit application process;
- **Fish and Wildlife Salvage:** A salvage plan must be in place that will allow for relocation of any fish, reptiles, and amphibians found within dewatering work areas. In accordance with the dewatering arrangement, the water level in any dewatering work areas must be drawn down to permit safe removal of fish and wildlife. All removal activities will be undertaken before the area is completely dry, in order to avoid aquatic animals being exposed to dry conditions. During water draw down, a mesh net will be in place around any dewatering pumps to ensure that fish will not become entangled in the pumps;
- **Inspections:** Once dewatering is complete, weekly construction stage inspections by a Qualified Biologist must be undertaken throughout the duration of the realignment of the North Tributary of Shirley's Brook, and during the installation of all habitat enhancement measures;
- **Shirley's Brook Decommissioning:** Decommissioning of portions of the current alignment of the North Tributary of Shirley's Brook must occur during the Blanding's Turtle overwintering season, which is between October 16th and April 15th; and
- **Pond Decommissioning:** The pond located west of 1035 March Road is considered a potential Blanding's Turtle hibernation site. As such, the pond cannot be decommissioned during the Blanding's Turtle overwintering season. Ministry of Environment, Conservation, and Parks (MECP) guidance indicates that the pond must be fenced off before August 1st to prevent Blanding's Turtles from accessing the feature. Between August 1st and August 15th, removal of the hibernacula and dewatering of the pond must be undertaken. As with other dewatering, the pond decommissioning must be supervised by a Qualified Biologist.

6.0 DETERMINATION

The North Tributary can be characterized as a highly degraded agricultural watercourse that has a hydro-period that is typically confined to the spring freshet and late spring in most years. Although water depths and flow volumes are substantial in the early to late spring, water depths decline significantly by mid-summer, such that portions of the system likely dry out in drought years. In 2018, the system remained hydrated in July. However, 2018 was a relatively wet year, and survey results from previous years have shown that portions of the system were dry by mid-summer (MEP 2016). By mid-summer, the majority of the system is heavily overgrown with terrestrial vegetation and the channel is difficult to see. Historic plowing and agricultural land usage has resulted in a very broad channel with poorly defined banks throughout the majority of the Study Area. Throughout the majority of the Study Area, the watercourse has very little shade and low quality riparian habitat. The dominant riparian vegetation consists of cultivated crops and/or fallow agricultural fields (Graminoid Meadow). Although amphibian calling activity was observed for three (3) amphibian species (Spring Peeper, American Toad and Green Frog), the density of calling was very low, and was not sufficient for the Study Area to be considered Significant Wildlife Habitat (SWH) for amphibian breeding (OMNRF 2014b). Fish survey results indicate that the North Tributary provides intermittent, low quality fish habitat, which supports a low diversity, tolerant warm-water fish community.

As described above, Drainage Channel F is a stormwater swale that receives intermittent flow and is dry throughout the majority of the growing season. No evidence of amphibian breeding or direct fish habitat was documented for Drainage Channel F. Within the Kanata North Urban Expansion Area (KNUEA) Environmental Management Plan (EMP), Drainage Channel F was identified to be decommissioned (Novatech 2016b). Given the lack of habitat functionality observed within Drainage Channel F, removal of the feature is not considered a significant negative impact.

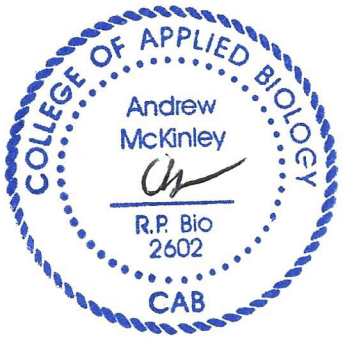
Shirley's Brook and the inline pond are designated as Blanding's Turtle habitat. The presence of Blanding's Turtle habitat represents the most significant natural function provided by the aquatic habitats throughout the Study Area. As discussed above, the North Tributary will be realigned into a 40 m wide watercourse corridor as part of the Site development. Habitat enhancement and restoration works will be undertaken as part of the realignment, which are anticipated to improve the quality of habitat for Blanding's Turtle, fish, and amphibians compared to existing conditions. The habitat enhancement requirements and mitigation measures are described in detail in this Headwaters Drainage Assessment report. Ultimately, it is anticipated that the habitat enhancement requirements for Blanding's Turtle (threatened) will be mandated by a forthcoming Overall Benefit Permit under the *Ontario Endangered Species Act* (ESA).

7.0 CLOSURE

Provided that the habitat enhancement and mitigation measures are implemented appropriately during the realignment of the North Tributary, the planned development is not anticipated to significantly negatively impact the natural features and functions of the watercourse.

We trust that the above information is sufficient; should you have any questions or require further information, please do not hesitate to contact the undersigned, at your convenience.

Sincerely,



Dr. Andrew McKinley, EP, RP Bio.
Senior Biologist, McKinley Environmental Solutions

McKINLEY ENVIRONMENTAL SOLUTIONS
613-620-2255
mckinleyenvironmental@gmail.com
www.mckinleyenvironmental.com

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613-620-2255
mckinleyenvironmental@gmail.com
www.mckinleyenvironmental.com

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mckinleyenvironmental@gmail.com
www.mckinleyenvironmental.com

APPENDIX A – SITE PHOTOGRAPHS

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613-620-2255
mckinleyenvironmental@gmail.com
www.mckinleyenvironmental.com

Photograph 1: Survey Site #1 downstream, facing upstream (March 30th, 2018).

Photograph 2: Survey Site #1 - Three (3) stacked 60 cm CSP culverts under the old farm driveway, east of March Road (facing upstream) (March 30th, 2018).

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Photograph 3: Survey Site #1 - 2 m concrete box culvert under March Road (facing upstream) (March 30th, 2018).

Photograph 4: Survey Site #1 - 60 cm CSP culvert under the driveway west of March Road (facing upstream) (March 30th, 2018).

Photograph 5: Survey Site #1 upstream, facing upstream (March 30th, 2018).

Photograph 6: Survey Site #2 downstream, facing upstream (March 30th, 2018).

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Photograph 7: Old Stone Weir downstream of pond in Survey Site #2 (March 30th, 2018).

Photograph 8: Pond within Survey Site #2 (facing upstream) (March 30th, 2018).

Photograph 9: Survey Site #2 upstream, facing upstream (March 30th, 2018).

Photograph 10: Survey Site #3 downstream, facing upstream (March 30th, 2018).

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Photograph 11: Survey Site #3 (Channel F), facing upstream (March 30th, 2018).

Photograph 12: Survey Site #3 upstream, facing upstream (March 30th, 2018).

Photograph 13: Survey Site #4 downstream, facing upstream (March 30th, 2018).

Photograph 14: Survey Site #4 upstream – south fork, facing upstream (March 30th, 2018).

Photograph 15: Survey Site #4 upstream – north fork, facing upstream (March 30th, 2018).

Photograph 16: Survey Site #1 downstream, facing upstream (May 12th, 2018).

Photograph 17: Survey Site #1 upstream, facing upstream (May 12th, 2018).

Photograph 18: Survey Site #2 downstream, facing upstream (May 12th, 2018).

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Photograph 19: Survey Site #2 upstream, facing upstream (May 12th, 2018).

Photograph 20: Survey Site #3 downstream, facing upstream (May 12th, 2018).

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Photograph 21: Survey Site #3 (Channel F), facing upstream (May 12th, 2018).

Photograph 22: Survey Site #3 upstream, facing upstream (May 12th, 2018).

Photograph 23: Survey Site #4 downstream, facing upstream (May 12th, 2018).

Photograph 24: Survey Site #4 upstream – south fork, facing upstream (May 12th, 2018).

Photograph 25: Survey Site #4 upstream – north fork, facing upstream (May 12th, 2018).

Photograph 26: Survey Site #1 downstream, facing upstream (July 4th, 2018).

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Photograph 27: Survey Site #1 upstream, facing upstream (July 4th, 2018).

Photograph 28: Survey Site #2 downstream, facing upstream (July 4th, 2018).

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Photograph 29: Survey Site #2 upstream, facing upstream (July 4th, 2018).

Photograph 30: Survey Site #3 downstream, facing upstream (July 4th, 2018).

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Photograph 31: Survey Site #3 (Channel F), facing upstream (July 4th, 2018).

Photograph 32: Survey Site #3 upstream, facing upstream (July 4th, 2018).

Photograph 33: Survey Site #4 downstream, facing upstream (July 4th, 2018).

Photograph 34: Survey Site #4 upstream – south fork, facing upstream (July 4th, 2018).

Photograph 35: Survey Site #4 upstream – north fork, facing upstream (July 4th, 2018).

Photograph 36: Longnose Dace captured in Survey Site #1 downstream (June 13th, 2018).

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Photograph 37: Blacknose Dace captured in Survey Site #4 downstream (June 13th, 2018).

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