

# **Appendix E**

## **Sheldon Creek – East Branch Fish Habitat Conditions Technical Memorandum**



## Memorandum

To	Wolfgang Wolter, AECOM	Page 1
CC	File	
Subject	Sheldon Creek – East Branch Fish Habitat Conditions	
From	Sarah Aitken, Nicola Lower, AECOM	
Date	April 24, 2012	Project Number 60114069

### 1. Introduction

The Municipality Region of Halton (Region) is undertaking a Class Environmental Assessment (Class EA) study for the Phase 2 Expansion of the existing Burloak Water Purification Plant (WPP), located at 3380 Rebecca Street, in the Town of Oakville. As a result of the plant expansion, a new discharge into the East branch of Sheldon Creek is being proposed as part of the preferred design concept.

The east branch of Sheldon Creek is located within the Town of Oakville within Halton Region. It is a tributary to the main branch of Sheldon Creek which flows into Lake Ontario. The proposed discharge is located between Rebecca Street and Creek Path Avenue.

In support of the Class EA study activities, AECOM has completed a separate investigation to assess the existing fish habitat conditions and the potential impacts associated with the proposed discharge into the east branch of Sheldon Creek. A combination of field investigations and background review were utilized in order to obtain a description of the aquatic habitat features of the east branch of Sheldon Creek. The methods and results of the desktop study and field investigations are discussed in the following sections.

### 2. Methods

#### 2.1 Desktop Study

Existing aquatic ecology information pertaining to the site was collected from the Ministry of Natural Resources – Natural Heritage Information Centre (NHIC) Biodiversity Explorer, Conservation Halton (CHA) and the Department of Fisheries and Oceans (DFO) Species at Risk Mapping (2011).

#### 2.2 Field investigations

Field investigations relating to aquatic features were conducted on December 14<sup>th</sup>, 2011. The detailed study area included an assessment of Reach 1, Reach 2, Reach 3 and Reach 4 from Creek Path Avenue to Great Lakes Blvd in Oakville, Ontario (see Figure 3.1.1 Sheldon Creek, East Branch – Environmental Assessment Support, AECOM 2011). Photographs obtained as part of the assessment are provided in Appendix A. Information collected included:

- a) mapping of in-stream fish habitat features;
- b) flow characteristics of features, with particular emphasis on fish habitat availability;
- c) channel morphological characteristics; and
- d) riparian characteristics.

### 3. Aquatic Habitat Assessment

#### 3.1 Background data

The Shortnose Cisco (*Coregonus reighardi*) was identified through the NHIC search downstream of the study area in Lake Ontario at the mouth of Sheldon Creek. The Shortnose Cisco is designated as endangered under the Federal Species at Risk Act (SARA) and is potentially extinct from Lake Ontario. The last observation date in this area is greater than 20 years and is therefore considered a historical record. The Shortnose Cisco habitat preference is clear deep lakes, therefore it is highly unlikely this species is present within the study area.

No fish or mussel species at risk were identified within the study area from the DFO SAR mapping.

CHA identified two fish species Brook Stickleback (*Culaea inconstans*) and Creek Chub (*Semolilus atromaculatus*) in the east branch of Sheldon Creek north of Rebecca and east of Great Lakes Boulevard. Both species are classified as cool water (water temperature preferences of 18-25°C), and are common and widely distributed in Ontario. CHA also identified the presence of Rainbow Trout (*Oncorhynchus mykiss*) and Brown Trout (*Salmo trutta*) in the main branch of Sheldon Creek where it flows under Spruce Avenue (one kilometer upstream of the confluence with the east branch). Fantail Darter (*Etheostoma flabellare*) are located within the main branch of Sheldon Creek downstream of the confluence of the east branch with the main stem. Common White Sucker (*Catostomus commersonii*), Blacknose Dace (*Rhinichthys atratulus*) and Fathead Minnow (*Pimephales promelas*) were also identified in the east branch of Sheldon Creek (CHA, 2012).

#### 3.2 Existing Conditions

According to comments provided in a letter by HRCA (April 16, 2012), 'recently collected surface water temperature data during summer 2010 indicates that Sheldon Creek has a cool-warm water thermal regime'. The East Branch of Sheldon Creek originates south east of the Queen Elizabeth Parkway in the Town of Oakville and flows in a south easterly direction to Lake Ontario. Sheldon Creek has been largely impacted by urban development, stream alterations and storm water inputs.

##### Reach 1

Reach 1 flows under Creek Path Avenue through an open bottom culvert into a historically straightened channel. The surrounding landscape is dominated by residential properties, a park with hiking trails and commercial business. The stream channel was surveyed from Creek Path Avenue to Milkweed Way.

Reach 1 is a fairly uniform, straight, flat channel with substrates dominated by shale, cobble and some fines. The mean wetted width is 3-3.5 m with an estimated average depth of 0.6 m. Stream



morphology in this reach consists mostly of pool and riffle areas. The dominant in-stream cover is provided by large woody debris, overhanging tree cover, exposed tree roots, detritus and refuse. Aquatic vegetation was not observed in Reach 1. Reach 1 is surrounded by a narrow strip of vegetation along the creek and is dominated by shrubs, some tree cover, herbaceous vegetation and grasses.

The stream banks were well vegetated with areas of undercut banks and exposed shale. Within Reach 1 the channel narrowed to form a chute feature which created an approximate 1 m elevation drop into a scour pool approximately 0.7 m deep.

Several small surface water inputs were observed throughout Reach 1 as well as moist swales directing overland flow into Sheldon Creek.

### ***Reaches 2 and 3***

The east branch of Sheldon Creek meanders through Reaches 2 and 3, which begins at Milkweed Way and ends at Creek Path Avenue. The surrounding landscape in Reach 2 and 3 includes a wooded park with trails and residential properties.

Within Reaches 2 and 3, the east branch of Sheldon Creek is a fairly uniform, meandering channel with cobble, gravel, and sand substrates with shale gradually increasing in quantity throughout Reach 3. The mean wetted width is 4 m with an estimated average depth of 0.16 m. Stream morphology in this reach consists mostly of riffle/pool sequence. The dominant in-stream cover is provided by cobble, large woody debris, large fallen trees, overhanging trees, exposed tree roots, detritus, and undercut banks. Overall, there is no in-stream aquatic vegetation present although there were some infrequent occurrences of watercress (*Nasturtium officinale*) along the banks. Watercress is often an indicator of groundwater discharge. Groundwater seepage contributes to base flow and acts to cool water temperatures during the summer resulting in more favourable conditions for cool and cold water fish species.

Riparian cover along this reaches is provided by large overhanging mature trees and shrubs. The stream banks are steeply graded, and appear moderately stable to unstable. Erosion and scouring was evident throughout Reach 2 and 3, particularly along the meander bends.

### ***Reach 4***

Reach 4 is a naturalized meandering channel that flows through a wooded community. The stream channel was surveyed from Creek Path Avenue to Great Lakes Blvd.

Reach 4 flows under Creek Path Ave through a wide spanned bridge. The channel then narrows and substrates are dominated by shale, cobble, rubble, gravel and fines with some small boulders. The mean wetted width is approximately 3.5 m with a mean depth of 0.14 m and a maximum depth of 0.18 m. Stream morphology in this reach consists mostly of riffle/pool sequences. The dominant in-stream cover is provided by cobble, and large and small woody debris. Riparian cover is dominated by large mature trees, shrubs, herbaceous vegetation, grasses and exposed tree roots. There was no aquatic vegetation observed within Reach 4.

The stream banks in Reach 4 consist of sandy soils, with exposed shale that are steeply graded, and appear moderately stable to unstable. There was evidence of severe erosion and scouring throughout Reach 4. The severe erosion is likely the result of fast, high flows from rain events and the spring freshet. The intensity of the high flow events are characterized by debris up in tree branches, exposed root masses and the severity of the bank erosion. Rip-rap has been placed along the meander of the right bank of the east branch of Sheldon Creek near the Storm Water Management Pond (SWMP). The rip-rap extends into the floodplain approximately 10 m back from the creek bank. Filter cloth has also been installed along this bank and the banks are severely eroded behind the cloth. Rip-rap has fallen into Sheldon Creek and more rock sits precariously on top of bank.

#### **4. Preliminary Impact Assessment**

The proposed expansion of the existing Burloak WPP requires a discharge into the east branch of Sheldon Creek. As such, increased creek flows would be expected. Discharge to watercourses can have numerous impacts. The relevant issues to the east branch of Sheldon Creek include:

- Increased risk of erosion
- Effect on water quality and quantity
- Impacts to fish and fish habitat

##### Increased Risk of Erosion

- The anticipated discharge into the east branch of Sheldon Creek will not increase the rate of erosion as outlined in the assessment of fluvial geomorphology. Therefore there is no increase in fines that will be transported within the system and no negative effect on the existing fish habitat.

##### Effect on water quality and quantity

- Increased water levels may aid in improving water quality by promoting mixing, dilution and aeration.
- The results of the hydraulic assessment on the East Branch of Sheldon Creek (Sheldon Creek, East Branch Assessment, AECOM 2011), shows that increased depth occurs over the study reach under all flow scenarios; however, the benefit is best defined in the lower reach near the confluence with the main branch. The increased depth improves fish passage potential over the creek bed where sporadic widened sections yield low water depths. The increased water level will allow for fish passage from Sheldon Creek into the east branch of Sheldon Creek increasing available habitat with the potential of improving the diversity of fish species.

##### Impacts to Fish and Fish Habitat

- The east branch of Sheldon Creek supports a range of warmwater and coolwater fish including Brook Stickleback, Creek Chub, Fantail Darter, Common White Sucker, Blacknose Dace and Fathead Minnow. These species are extremely common throughout Ontario and are typically highly tolerant to a number of environmental factors, including changes in water quality, quantity and thermal fluctuations.
- Rapid changes in water temperature can be lethal and may impact on biological processes such as feeding and spawning; however fish are able to tolerate temperature fluctuations beyond their preferred range as observed during the seasonal changes associated with the



onset of winter or summer, particularly where there are areas of refuge (cover and pools) within a system.

- Avoidance by fish is a typical response to an environmental change. The expected change in temperature is likely to result in a localized behaviour response among the fish species. The risks related with avoidance is low because the habitat requirements of the species present are wide-ranging and not-limiting throughout the east branch of Sheldon Creek. Displacement will not restrict the fish from locating suitable feeding, spawning and rearing habitats.

## **5. Summary and Recommendations**

Direct fish habitat (as defined by DFO) is present within the east branch of Sheldon Creek, and likely can support migration, feeding, refuge and rearing for all fish species present, with some potential for spawning habitat, although not of high quality.

The proposed discharge of water from the expansion of the Burloak WPP may cause short term and minor stress to fish and fish habitat. There are no expected long term impacts to fish and fish habitat associated with the proposed discharge and may provide a net benefit to the east branch of Sheldon Creek through improvements to:

- increased stream flow – providing increased flow during low baseflow in summer months and improving connectivity to the main branch of Sheldon Creek;
- improved water quality – the discharge will promote the mixing and dilute the current water in the east branch of Sheldon Creek and improve aeration increasing oxygen within the system; and,
- The cooler discharge water will act as a thermal buffer during the summer months providing refuge areas for fish and potentially providing habitat for species that prefer cooler thermal regimes, thereby increasing the species diversity in the east branch Sheldon Creek.

A monitoring program to characterize the thermal inputs from the discharge is recommended to monitor the potential change in temperatures in the east branch of Sheldon Creek. This would require the installation of temperature loggers upstream of the discharge, near the outfall location, and downstream prior to its confluence with the main branch of Sheldon Creek. It is recommended that loggers are installed prior to construction to obtain baseline information, and then monitored at regular intervals during- and post-construction for a provisional period of two years post-construction. This information could be used to ensure proper mixing of the discharge and to ensure no thermal impacts to Sheldon Creek.

# Appendix A

- Photo log





**Photograph 1 ↑**  
Reach 1 facing downstream from Creek Path Ave.



**Photograph 2 ↑**  
Reach 1 facing upstream.



**Photograph 3 ↑**  
Reach 2 facing upstream



**Photograph 4 ↑**  
Reach 2 cobble substrate and instream cover.





**Photograph 5 ↑**  
Reach 3 undercut banks providing refuge areas.



**Photograph 6 ↑**  
Reach 3 facing upstream



**Photograph 7 ↑**  
Reach 4 facing downstream at eroded left bank



**Photograph 8 ↑**  
Reach 4 facing downstream riffle/pool sequence