CN Milton Logistics Hub: Follow-up Program for Fish and Fish Habitat

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Abbreviations

CISEC	Certified Inspector of Sediment and Erosion Control
CPUE	catch per unit effort
DFO	Department of Fisheries and Oceans
EIS	Environmental Impact Statement
ESC	erosion and sediment control
IAAC	Impact Assessment Agency of Canada
LAA	Local Assessment Area
MNRF	Ministry of Natural Resources and Forestry
PDA	Project Development Area
TDR	Technical Data Report

1.0 GENERAL

This document outlines the follow-up program for fish and fish habitat in relation to the construction and operation of the Milton Logistics Hub.

The fish and fish habitat monitoring program presented below, and the associated monitoring details were originally developed to support the Request for Authorization from Fisheries and Oceans Canada (DFO) and to comply with the conditions of approval outlined in the Minister of the Environment's Decision Statement issued January 21, 2021. Specifically, this program has been developed based on the Letter of Intent prepared by Stantec and submitted to DFO in support of the works requiring Authorization under the *Fisheries Act* and to comply with Condition 7.12 of the Decision Statement. A *Fisheries Act* Authorization was received from DFO on July 23, 2021.

A draft version of this document was provided to DFO, Conservation Halton (CH), Mississaugas of the Credit First Nation (MCFN), and Six Nations of the Grand River (Six Nations). Draft versions of this follow-up program were provided to DFO on June 5, 2020 and May 27, 2021, CH on July 31, 2020, MCFN on January 14, 2021, and Six Nations on March 3, 2021. Comments were received from DFO and MCFN. Any comments received have been considered and incorporated in this document, as appropriate. Any revisions and manner by which comments were addressed, including corresponding rationale, were communicated to those who responded to CN's request for input.

2.0 PROGRAM DESIGN CONSIDERATIONS

A follow-up program for fish and fish habitat will be implemented during construction and operation to verify the accuracy of the environmental assessment and determine the effectiveness of proposed mitigation measures.

The program will consist of two components:

1. Monitoring of construction activities and channel construction as it relates to the protection of fish and fish habitat.
2. Post-construction and operations monitoring to confirm that created fish habitat in the realigned portions of Indian Creek and Tributary A is functioning as intended.

3.0 FOLLOW-UP PROGRAM FOR FISH AND FISH HABITAT DURING CONSTRUCTION

During construction, mitigation measures are proposed to reduce the risk of impacts of construction activities on fish and fish habitat within the project development area (PDA) and downstream of the PDA to the extent possible. The purpose of monitoring during construction will be to document that the stream channels are constructed as designed, and to verify the effectiveness of the mitigation measures implemented.

3.1 CONSTRUCTION MONITORING

Construction monitoring will be completed by a qualified fluvial geomorphologist or stream design engineer and a qualified fisheries biologist. The fluvial geomorphologist/design engineer and fisheries biologist will conduct monitoring to document consistency of construction activities related to channel design drawings and conditions of regulatory approval. Additionally, the fluvial geomorphologist/design engineer and fisheries biologist will recommend corrective actions in the event that deviations from the design drawings or unforeseen conditions are observed or are otherwise deemed necessary.

An environmental monitor, who is a Certified Inspector of Sediment and Erosion Control (CISEC), will monitor and document erosion and sediment control (ESC) measures and will recommend corrective measures to the contractor when necessary. Proposed ESC measures are detailed in Drawing C-600 to C-602, under separate cover**.**

Regular inspections of ESC measures will be undertaken throughout all stages of construction until disturbed areas have stabilized. Monitoring will occur at the following frequencies:

- daily during in-water work
- after significant (>25 mm) rainfall events
- daily or as deemed appropriate by the environmental monitor during extended rain periods
- regular monitoring (e.g., weekly or as deemed appropriate by the environmental monitor) following in-water work

Damaged or ineffectively functioning ESC measures will be repaired and/or replaced within 48 hours of the contractor being notified of a deficiency.

Water from dewatering for isolated in-stream work areas (or in areas requiring excavation, as applicable), or for dewatering of the excavated areas (due to rain or minor amounts of groundwater), will be pumped through a filter bag or into an area of undisturbed vegetation at least 30 m from watercourses or an alternate area approved by the engineer/fisheries biologist.

The proposed ESC plan is detailed in Drawings C-600 to C-602, under separate cover. The intent of the ESC plan is to reduce the risk of potential effects of the channel works on nearby areas and the receiving water bodies (Indian Creek, Tributary A and Tributary C).

Erosion control fencing or other similarly functioning structures will be installed and maintained between flowing water and construction traffic or un-stabilized areas. Mud mats are proposed at construction entrances to minimize the transfer of sediments off-site.

Construction is proposed to be in short stages such that watercourse flows are diverted around a work area using pump-around operations. To reduce the extent of in-water work, most of the channel realignments will be constructed offline. The sections of the realignment not in contact with the existing channel will be constructed first, followed by points of contact with the existing channel, moving from downstream to upstream. The work areas will be sized such that planned activities can be completed as quickly as possible to reduce the duration of pumping. A pump around detail is presented on Drawing C-503**,** under separate cover. Work areas will be stabilized with seed and matting upon completion of final grading as the Project proceeds. Additional construction notes are provided on Drawings C-500, C-950, C-951 and C-952**,** under separate cover.

3.2 ADAPTATIVE MANAGEMENT

As requested by DFO during the Review Panel Hearing, the following contingency measures/adaptive management measures were developed to address unexpected situations or occurrences that could potentially affect fish and fish habitat (within the PDA and downstream watercourses outside of the LAA). The following information is provided with respect to contingency planning (adaptive management) during the construction phase of the Project.

As identified in the Project mitigation measures presented in the Environmental Impact Statement (EIS), contingency equipment and materials related to erosion and sediment control will be available on site prior to the commencement of in-water work and near-water work. If construction monitoring concludes that existing mitigation measures are insufficient to prevent sediment from entering the watercourse or installed measures are in need of repair, additional measures will be implemented under the direction of the environmental monitor. Measures may include adding silt fencing, erosion control blankets or installing measures in additional locations, or repairing existing measures where necessary.

Where de-watering of in-water work areas is required, back-up pumps, intake screens, hoses, and equipment will be available on site in order to maintain downstream flow in the event of equipment failure or if additional materials are needed for work area isolation.

If high stream flows result in a breach of the isolation measures and water re-enters isolated work area in areas where fish relocations have already been conducted, fish removals will be repeated. If necessary, the MNRF and DFO will be consulted if extensions to the in-water timing window are anticipated.

3.3 REPORTING

The results of the construction monitoring activities proposed as part of the follow-up program related to the protection of fish and fish habitat will be reviewed, analyzed and presented as a final report. The report will include the following components:

(a) the results of the monitoring program

(b) a summary of additional mitigation measures implemented during construction and copies of agency correspondence if changes to the design or ESC plan were implemented during construction

(c) the effectiveness of the mitigation measures implemented, if required.

The report will be provided to DFO, Conservation Halton, Mississaugas of the Credit First Nation and Six Nations of the Grand River and will be included as a component of the annual report to IAAC.

4.0 FOLLOW-UP PROGRAM FOR FISH AND FISH HABITAT POST-CONSTRUCTION/OPERATIONS

Post-construction and operations monitoring will be conducted to confirm that created fish habitat in the realigned portions of Indian Creek and Tributary A is functioning as intended.

4.1 POST-CONSTRUCTION MONITORING

The requirements and frequency of the post-construction monitoring program are set out as conditions of approval by IAAC and have been proposed by CN through consultation with DFO. The following post-construction monitoring is proposed for five years following completion of the channel construction:

- Geomorphic monitoring to confirm that installed channel features are stable and that no excessive erosion is occurring throughout the Project reach
- Geomorphic monitoring to document the success of the installed channel features as measures to offset serious harm to fish
- Fisheries monitoring to document habitat use
- Vegetation monitoring to document establishment and propagation

Monitoring is proposed to begin after construction of the realignment (year zero) and conclude in year five.

A summary of the proposed post-construction monitoring program is outlined in **Table 1** with success criteria provided in **Table 2**. Further detail regarding each monitoring component is provided below.

Table 1: Proposed 5-Year Post-Construction Monitoring Program

Monitoring Year	Component	Details
Year 0	Geomorphic Monitoring	• Establish monitoring locations and photo points • Establish monitoring baseline through 'as-constructed' geomorphic assessment
	Fisheries Monitoring	• Visually assess the quality of fish and overall aquatic habitat and establish monitoring stations for year 1 • Verify the installation of fish and aquatic habitat structures
	Vegetation Monitoring	• Verify installation of plant materials as per planting plan
Years 1, 2, 3, 4 and 5	Geomorphic Monitoring	Spring • Visual assessment of Project conditions • Photos at photo points (including in-water structures) Fall • Geomorphic assessment as per Section 4.1.1
	Fisheries Monitoring	Late Spring/Early Summer • Supplement photographs taken during the geomorphic assessment • Annual assessment of fish species diversity and relative abundance of species as per Section 4.1.2 (late spring/early summer monitoring) • Annual visual assessment of fish habitat Fall • Annual assessment of fish species diversity, productivity and habitat use as per Section 4.1.2 fall monitoring
	Vegetation Monitoring	Fall • See Section 4.1.3 • Vegetation Assessment per contract warranty maintenance clause (year 1 and 2) • Visual assessment of vegetation as it relates to stability of the Project (years 3, 4 and 5)

Table 2: Criteria and Schedule to Assess the Implementation and Success of Offsetting Measures

Attribute	Success Criteria	Monitoring Schedule
Construction and Physical Form of Offset Measures (Geomorphic Assessments and Vegetation Monitoring)		
Profile	• Channel features remain generally within design ranges, without demonstrating excessive aggradation, degradation or profile adjustment	Year 0, 1, 2, 3, 4 and 5
Pattern	• The pattern features remain generally within design ranges, without demonstrating excessive adjustment from the design parameters	Year 0, 1, 2, 3, 4 and 5
Dimension	• Channel features generally remain within design ranges	Year 0, 1, 2, 3, 4 and 5
Pebble Counts	• Bed particle size remains consistent with riffle material design goals and objectives over the monitoring period	Year 0, 1, 2, 3, 4 and 5
Stability of Structures and Channel Banks	• Constructed habitat features remain in place as constructed or with only minor changes (e.g., wood toe protection, riffles). • The constructed channel is stable and not eroding (less than 5% of bank length shows signs of erosion requiring repair or no severe erosion areas exceed 5 m in length)	Year 0, 1, 2, 3, 4 and 5 Year 1, 2, 3, 4 and 5
Vegetation Establishment	• Stem count of enhancement area achieves 80% of planting density*: ○ Tributary A Planting Density: 6,400 stems/ha ○ Indian Creek Planting Density: 2,940 stems/ha	Year 1, 2, 3, 4 and 5
Habitat Use (Fisheries Monitoring)		
Species Presence	• Fish community (species diversity) is similar to baseline and/or reference data	Year 1**, 2, 3, 4 and 5
Life Cycle Usage	• Multiple year classes are present in the realigned channel segments (as demonstrated by length frequency distribution of fish captured) • Habitat is available for a range of fish life stages	Year 1**, 2, 3, 4 and 5
Abundance/ Productivity	• Catch per unit effort (CPUE) is similar to baseline data and/or reference data	Year 1**, 2, 3, 4 and 5

* Based on plantings of livestakes, trees and shrubs as per the landscape plans taking into consideration natural regeneration. DFO has identified 80% as a target in the *Fisheries Act* Authorization.
** Low diversity, habitat usage and productivity in new channel segments is likely to occur in Year 1 prior to the establishment of the fish community in the newly created habitat areas (channel realignments)

4.1.1 Geomorphic Monitoring

Channel alignment stabilization and restoration programs are intended to meet regulatory requirements. Post-construction monitoring of the new channel bed and streambanks includes an evaluation of stability which provides an indicator of long-term function.

The purpose of the geomorphic assessment is to confirm that installed channel features are stable, and that no excessive erosion is occurring throughout the Project reach. Evaluation of stream characteristics within the realigned channels will include profile, pattern, dimensions and pebble count at established monitoring locations and photo points.

Monitoring is proposed to take place in years 0, 1, 2, 3, 4 and 5 after construction of the realigned channels. Year 0 monitoring takes place immediately after construction and sets the baseline for future years of monitoring.

Year 0 will include the establishment of monitoring locations and photo points and will establish monitoring baseline through 'as-constructed' geomorphic assessment. Years 1, 2, 3, 4 and 5 will include bi-annual monitoring in the spring and fall, as follows.

- Spring Assessment – visual assessment, including photo documentation of instream structures for geomorphic conditions
- Fall Assessment – geomorphic assessment of stream characteristics (profile, pattern, dimensions, pebble counts)

Geomorphic monitoring will be completed by a qualified geomorphologist or stream restoration engineer.

Using appropriate survey techniques, Indian Creek and Tributary A will be surveyed to document and assess the characteristics outlined below:

- **Profile:** The as-constructed (Year 0) longitudinal thalweg survey for a representative section of each reach (minimum length of section is 10 bankfull widths) will be conducted after construction is completed. Success will be determined based on whether the channel features remain generally within design ranges, without demonstrating excessive aggradation, degradation or profile adjustment.
- **Pattern:** The stability of the realignment stream pattern will be surveyed along the realigned channels. Parameters will include, at a minimum, radius of curvature, meander wavelength, and meander width ratio. Survey stationing will be based on design stationing. Success will be determined based on whether the pattern features remain generally within design ranges, without demonstrating excessive adjustment from the design parameters.
- **Dimension:** After construction, permanent cross-sections will be established in two riffles and two pools in each reach. Data collected will include, at a minimum, cross-sectional area, bankfull width, bankfull mean depth, bankfull max depth, flood-prone width, width-to-depth ratio, and entrenchment ratio. Success will be measured based on whether the channel features generally remain within design ranges. The 'as-constructed' cross-sections will be selected and established on the reach using permanent benchmarks once construction is completed.

Riffle pebble counts in the riffle cross-sections will be completed in each reach for each monitoring year using the modified Wolman Pebble Count procedure (Rosgen 1996). Data reported will include the D50 and D84 particle sizes. The first pebble count will be conducted after construction is complete, during the as-constructed (year 0) survey. As the restoration works stabilize with vegetation growth, material settlement and sediment transport through the system, the pebble count particle size will adjust especially as interstitial spacing is infilled and imbrication occurs in riffle forms. Pebble counts will be used to document that bed particle size remains consistent with riffle material design goals and objectives over the monitoring period.

4.1.2 Fisheries Monitoring

Fisheries monitoring will be completed as specified in the conditions of the *Fisheries Act* Authorization issued July 23, 2021 for the channel realignments. The monitoring will be performed by qualified fisheries biologists with experience in fish collection and identification and in post-construction monitoring of aquatic ecosystems to determine the effectiveness of proposed offsetting measures.

Monitoring is proposed to be consistent with methods used during baseline data collection, as described in Section 4.2.1 (p.14) of the Fish and Fish Habitat TDR (Stantec 2015). Specifically, sampling will be conducted for five (5) years following construction of the realigned channels and culverts.

Habitat conditions and habitat use will be documented in representative stations in the newly constructed reaches of Tributary A and Indian Creek. Field methods for fish sampling will follow the Ontario Stream Assessment Protocol (OSAP), version 3 (Stanfield et al. 2013) as described below.

Two stations will be established in the realigned portion of each watercourse and one station will be established in a reference reach of each watercourse. Each station will be at least 40 m long and selected to sample a riffle-pool sequence as per the sampling protocol. Fish will be sampled using a backpack electrofisher and may be supplemented using seine nets and minnow traps. Monitoring is proposed in late spring/early summer and in the early fall as follows:

- Late spring/early summer – single pass sampling with block nets

  Captured fish will be enumerated by species. Observations will be recorded regarding the life stages observed for each species (e.g., young-of-the-year, juvenile, adult) and the habitat type associated with the various life stages. Captured fish will be released outside of the sampling station (beyond the block nets). Habitat characteristics, level of effort, and GPS coordinates of each station will be documented.

  The data collected during the spring monitoring events will be used to document habitat use at this time of year (e.g., spawning/rearing) as an indicator of the types of habitat provided by the offsetting measures. Species diversity and relative abundance of species will be compared between the reference stations and the stations located within the realigned reaches.

- Fall - multiple-pass sampling with block nets

  Captured fish will be enumerated by species, and a subsample of each species will be weighed and measured; the remaining fish will be bulk weighed. Captured fish will be released outside of the sampling station (beyond the block nets). Habitat characteristics, level of effort, and GPS coordinates of each station will be documented.

  The data collected during the fall monitoring events will be used to calculate metrics, such as catch per unit effort (CPUE), biomass, and density. Fish size classes (length) will be used as an indicator of life stage, which can provide information with respect to habitat use. The data (abundance, length distributions, species diversity) will be compared to data collected in October 2015, to demonstrate that offsetting measures are functioning (i.e., the habitat is being used by a range of life stages and species) and that productivity (based on density and/or CPUE) has been maintained or enhanced. Data from within the realigned reaches will also be compared to the reference stations established for the monitoring program.

4.1.3 Vegetation Monitoring

Channel stability is greatly enhanced by a healthy riparian vegetation community. A monitoring program will be implemented to verify the installation of plant materials as per planting plan and evaluate the successful propagation of native plant species (planted or naturally regenerated) (Table 2).

Riparian vegetation establishment will be assessed by a terrestrial biologist or landscape architect with experience in post-construction monitoring. Monitoring will occur in the first spring and fall following completion of construction (year 1), followed by a single fall visit in the following monitoring years (year 2, year 3, year 4 and year 5). The fall visit is stipulated by the Fisheries Act Authorization issued July 23, 2021, and includes monitoring for survival in each year of the monitoring period. A minimum annual target of 80% survival of plantings is set, with replacement of all planted material to ensure a minimum of 80% survival at the end of Year 5.

Monitoring will be conducted to document the success of the revegetation efforts including the planting plan (Drawings L-300, L-310, L-500, and L-501, under separate cover) and natural regeneration. Deficient, dead, or dying plant material will be identified and replaced by the contractor as necessary such that revegetation of the enhancement areas is achieved. The landscape architect will provide input to the yearly post-construction monitoring report. Input will include details regarding monitoring methods, successes and deficiencies of the planting plan (Drawings L-300, L-310, L-500, and L-501, under separate cover), recommendations for remedial action, and a photographic record of conditions observed during monitoring.

4.2 ADAPTATIVE MANAGEMENT

As requested by DFO during the Review Panel Hearing, the following contingency measures/adaptive management measures were developed to address unexpected situations or occurrences that could potentially affect fish habitat (within the PDA and downstream watercourses outside of the LAA). The following information is provided with respect to contingency planning (adaptive management) during the operation phase of the Project, with post-construction measures summarized in **Table 3**. While the channels were designed to reduce the risk of failures, the channels are located in flashy hydrology areas with steepened channel slopes. Therefore, some repairs may be expected to be necessary while vegetation is establishing during the proposed five-year monitoring program. Since the watercourse banks and floodplain vegetation will take time to stabilize following installation, natural adjustments and significant storms could produce minor erosion in the realigned channels. For this reason, it is important that the watercourses are inspected as per the monitoring plan. In many cases, minor areas of erosion will self-stabilize, while other areas may require restorative maintenance. Triggers for maintenance and repair activities are summarized in **Table 3**.

Table 3: Identification of Offset Plan Failures and Contingency Measures

Attribute	Identified Failure	Contingency
Construction and Physical Form of Offset Measures (Geomorphic Assessments and Vegetation Monitoring)		
Construction	• Channel not constructed as per drawings • Habitat features not constructed as per drawings	Fluvial geomorphologist to review construction and recommend corrective actions
Profile	• Channel features are not within design ranges (there is excessive aggradation, degradation or profile adjustment)	Fluvial geomorphologist to assess failure and recommend corrective actions (See Section 5.3.2)
Pattern	• The pattern features are not within design ranges (there is excessive adjustment from the design parameters)	
Dimension	• Channel features are not within design ranges	
Pebble Counts	• Bed particle size is not consistent with riffle material design goals and objectives	
Stability of Structures and Channel Banks	• Constructed habitat features (e.g., wood toe protection, riffles) are missing or not functional • Channel not stable (more than 5% of bank length shows signs of erosion requiring repair) or severe erosion areas exceed 5 m in length)	Repair or replace structures Implement restorative measures (e.g., minor grading, replacing soil, adding matting) (See Section 5.3.2)
Vegetation Establishment	• Stem count of enhancement area is less than 80% of planting density*: Tributary A Planting Density: 6,400 stems/ha Indian Creek Planting Density: 2,940 stems/ha	Use warrantee inspections as opportunity for contractor to replace dead or dying plant material to bring # of stems/ha back to >80% of planting density. If certain species are experiencing high rates of mortality, replace these species with other approved species with demonstrated hardiness for site.

Table 3: Identification of Offset Plan Failures and Contingency Measures

Attribute	Identified Failure	Contingency
Habitat Use (Fisheries Monitoring)		
Species Presence	• Fish community (species diversity) is less than baseline studies and reference area in Year 2 and Year 3**	Collaborate with the fluvial geomorphologist to determine potential cause. Assess potential influence of external factors. Recommend corrective actions as required and based on available information.
Life Cycle Usage	• Multiple year classes that are present in baseline studies / reference area are not present in the realigned channel segments in Year 2 and Year 3**	
Abundance/ Productivity	• Catch per unit effort (CPUE) is less than baseline data and reference area in Year 2 and Year 3**	

* Based on plantings of livestakes, trees and shrubs as per the landscape plans taking into consideration natural regeneration. DFO has identified 80% as a target in the *Fisheries Act* Authorization.

** Year 1 excluded as channel stabilizes and food sources become established

Maintenance activities could include minor grading and replacing soil, and reseeding areas and replanting vegetation that did not survive or washed away, removing logs or debris that have collected on the in-water structures and are altering the flow patterns sufficiently to threaten the integrity of the site. In rare instances it may be necessary to reconstruct some of the in-water structures after a large storm event if the fluvial geomorphologist/design engineer identifies conditions of instability. Materials installed during construction (e.g., boulders, sod mats) are usually still on site, and would be recovered, repositioned and reused. After the first two years, the requirement for maintenance activities is anticipated to decline as the vegetation establishes and increases the stability of the site. The results of the monitoring program will determine if ongoing inspection is recommended beyond the three-year monitoring period.

With respect to vegetation monitoring, deficient, dead, or dying plant material identified up to and including year 5 post-construction will be replaced if the success criteria identified in **Table 3** are not achieved.

Fisheries biologists will collaborate with the fluvial geomorphologists. If the fisheries monitoring data are indicative that the offsetting measures are not functioning as expected (e.g., decreasing biomass or diversity) biologists will consult with the geomorphologists to determine if the design is functioning as intended. As discussed above, areas requiring repair or maintenance will be addressed and modified as required, to maintain bank stability and provide diverse fish habitat.

If the stream characteristics are within the expected range (as per the geomorphic assessment) other factors that may influence fish communities and/or fish habitat in the PDA will be considered, such as weather conditions during and prior to the data collection, downstream barriers to fish passage and upstream influences on water quality or quantity. The results of other follow-up programs to be completed for this Project as conditions of approval (i.e., surface water quality monitoring) will be considered as input to this determination.

If monitoring results demonstrate that offsetting measures are not having the intended effect, CN would work with DFO to identify opportunities to implement additional offsetting measures to improve habitat within the Indian Creek watershed.

4.3 REPORTING

Annual reports will be prepared, outlining the results of the monitoring program and providing recommendations for maintenance, if necessary. A final monitoring report will be prepared and submitted at the end of year-5 summarizing monitoring results and presenting conclusions regarding the success of the offsetting measures as listed in Table 1.

All reports will be provided to DFO, Conservation Halton, Mississaugas of the Credit First Nation and Six Nations of the Grand River and will be included as a component of the annual report to IAAC.

5.0 REFERENCES

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology Books, 1481 Stevens Lake Road Pagosa Springs, Co. 385 pp.

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