

APPENDIX 8.

**NORTHERN GROUND ELECTRODE LINE WATERCOURSE CROSSING
ASSESSMENT BOOKLETS**

Construction Camp CC1

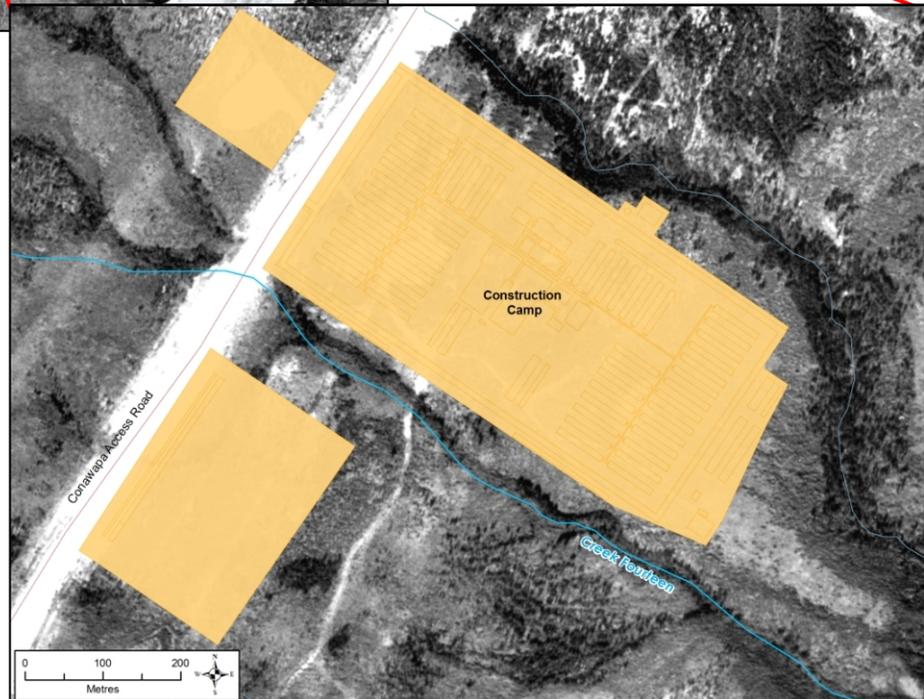
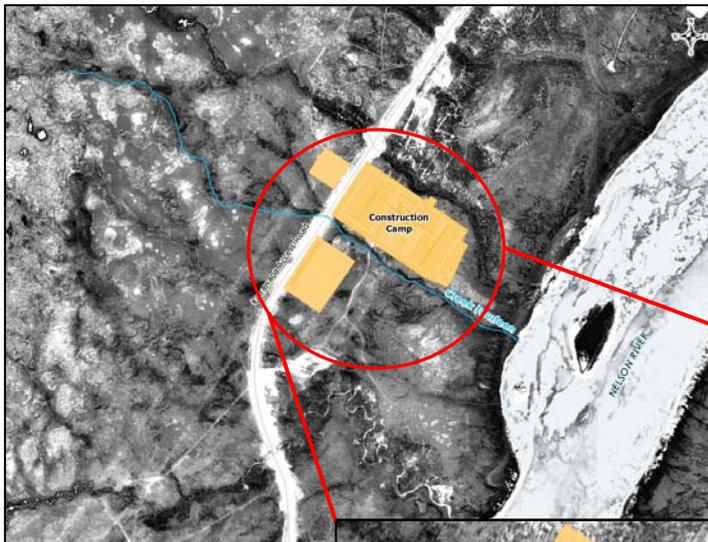
Creek Fourteen

Location

Datum:	NAD 83
UTM:	<i>Zone:</i> 14N
	<i>Easting:</i> 816184
	<i>Northing:</i> 6293171
Data Source:	DOI. Site visit

General Morphology

Stream/Lake:	Stream
Pattern:	SI
Confinement:	UN
Stage:	-
Flow Regime:	Intermittent
Morphology:	-
U/S Drainage:	12.2 km ²
Distance to Receiving Water:	Nelson River 1.1 km



Site Conditions

+ Physical Data

Survey Date: 02 June 2011

Stage: Moderate

Channel Profile

Channel and Flow

Wetted Width (m)	0.84
Channel Width (m)	1.12

Banks (%)

Right Bank Stability	100
Left Bank Stability	100

Riparian

Floodplain Distance (m)

Right Bank	-
Left Bank	-

Riparian Distance (m)

Right Bank	-
Left Bank	-

Riparian Vegetation Type (Y/N)

None	-
Grasses/sedges	Y
Shrubs	-
Conifers	-
Deciduous	Y
Mixed Forest	-

Canopy Cover (%)

Tr

Substrate

Substrate Type (dominance)

Fines	sub-dominant
Small Gravel	dominant
Large Gravel	-
Cobble	-
Boulder	-

Cover Types

Total Cover Available (%)	25
Cover Composition (% of Total)	-
Large Woody Debris	40
Overhanging Vegetation	-
Instream Vegetation	60
Pool	-
Boulder	-
Undercut Bank	-
Surface Turbulence	-
Turbidity	-

Habitat Type

Habitat Composition

Pool	-
Run	100
Flat	-
Riffle	-
Rapid	-



Upstream view of Creek Fourteen from the Conawapa Access Road.



Upstream view of Creek Fourteen directly south of the Conawapa Access Road., showing defined channel.

↘ Fish Habitat Classification and Sensitivity

+ Fish Habitat

Fish Habitat Present	Yes
DFO Manitoba Agricultural Watershed Classification:	-
Fish Habitat Classification:	Marginal

Fish Presence: Electrofish June 2, 2011, no fish captured. No existing information.

Comments:

From field assessment, it was found that Creek Fourteen originates in a low-lying saturated area, located approximately 100 m upstream of the Conawapa Access Road, and flows southeast within a defined channel to the Nelson River. The creek receives additional flows from roadside ditches, located on either side of the existing road. The channel connection to the Nelson River was undefined with flows dispersed through an area highly vegetated with grasses. Channel measurements were taken directly downstream of the Conawapa Access Road.

Creek Fourteen is considered an ephemeral stream with no defined channel connectivity to the Nelson River. This creek is rated as Marginal Fish Habitat and does not support fish directly. The creek provides indirect fish habitat in the form of water, nutrients and food (lower trophic levels) to the Nelson River. Considering the small size of this unnamed creek and the large size of the Nelson River, the relative contribution of water, food and nutrients to the Nelson River are not significant.

+ Habitat Sensitivity

Sensitivity Rating: Low

Comments:

Marginal fish habitat results in a low sensitivity rating.



Upstream view of Creek Fourteen 0.6km south of the Conawapa Access Road.



Undefined channel of Creek Fourteen at connection to the Nelson River. Discharge spilling out over grass banks of the Nelson River at time of assessment.

Construction Camp CC2

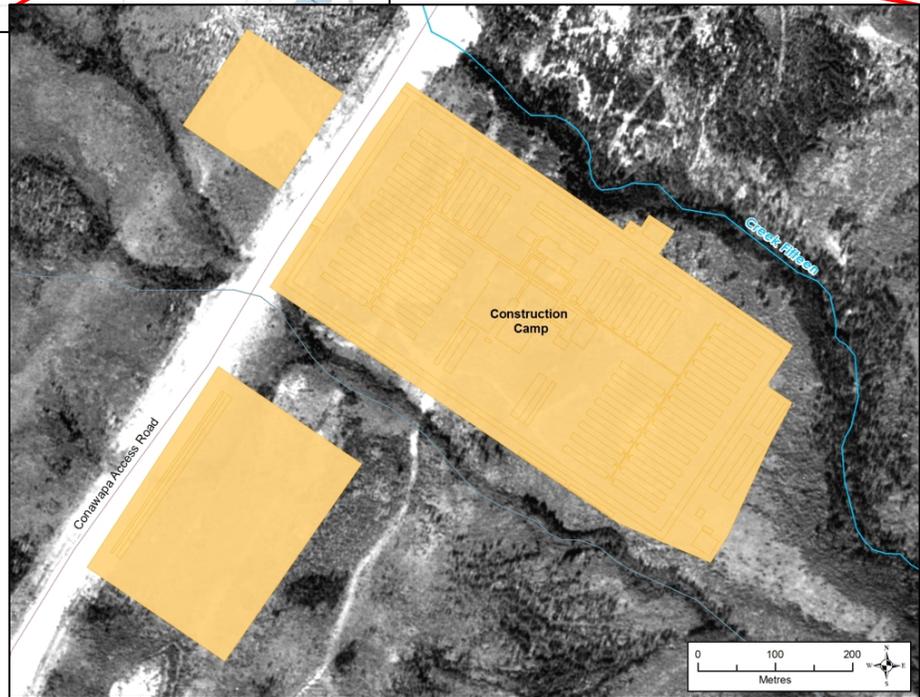
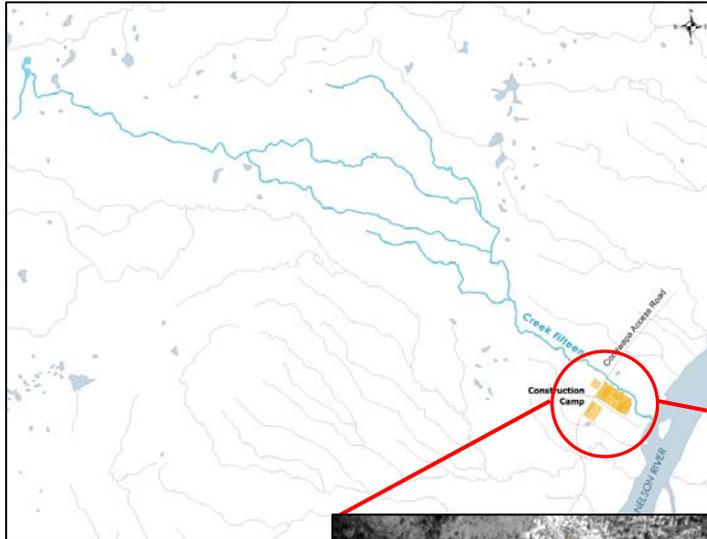
Creek Fifteen

Location

Datum: NAD 83
UTM: Zone: 15V
Easting: 448969
Northing: 6281880
Data Source: DOI.

General Morphology

Stream/Lake: Stream
Pattern: IR
Confinement: UN
Stage: -
Flow Regime: Perennial
Morphology: -
U/S Drainage: 23.0 km²
Distance to Receiving Water: Nelson River 0.83 km



Site Conditions

+ Physical Data

Channel Profile

Channel and Flow

Wetted Width (m)	-
Channel Width (m)	-

Banks (%)

Right Bank Stability	-
Left Bank Stability	-

Riparian

Floodplain Distance (m)

Right Bank	-
Left Bank	-

Riparian Distance (m)

Right Bank	-
Left Bank	-

Riparian Vegetation Type (Y/N)

None	-
Grasses/sedges	Y
Shrubs	Y
Conifers	-
Deciduous	-
Mixed Forest	-

Canopy Cover (%) 80

Substrate

Substrate Type (%)

Fines	-
Small Gravel	-
Large Gravel	-
Cobble	-
Boulder	-

Cover Types

Total Cover Available (%) -

Cover Composition (% of Total)

Large Woody Debris	-
Overhanging Vegetation	-
Instream Vegetation	-
Pool	-
Boulder	-
Undercut Bank	-
Surface Turbulence	-
Turbidity	-

Habitat Type

Habitat Composition

Pool	-
Run	-
Flat	-
Riffle	-
Rapid	-

Fish Habitat Classification and Sensitivity

+ Fish Habitat

Fish Habitat Present	Yes
DFO Manitoba Agricultural Watershed Classification:	-
Fish Habitat Classification:	Important

Fish Presence: Fish reported within Creek Fifteen include brook stickleback, fathead minnow, longnose sucker, white sucker, brook trout, suckers, slimy sculpin, brook stickleback, longnose dace, pearl dace, finescale dace and burbot (Johnson et al. 2005, Kroeker 1992, 1993). This creek provides important fish habitat including nursery habitat for brook trout.

Comments:

Creek Fifteen is a small tributary of the Nelson River approximately 15 km in length. Fish habitat in the creek is characterized by cascade-scour pool and riffle-scour pool in the lower 2 km and by bog/wetland habitat upstream of 2 km (Swanson and Kansas 1987). Fish presence is well documented within this tributary.

+ Habitat Sensitivity

Sensitivity Rating: Moderate

Comments:

Creek Fifteen is small and sensitive to potential disturbance. Furthermore, large bodied and forage fish are present and nursery habitat for brook trout exists. These factors result in a moderate sensitivity rating.

Construction Camp CC3

Unnamed Tributary of Nelson River

Location

Datum: NAD 83
UTM: Zone: 15V
Easting: 448399
Northing: 6281048
Data Source: DOI. Site visit

General Morphology

Stream/Lake: Stream
Pattern: SI
Confinement: UN
Stage: -
Flow Regime: Ephemeral
Morphology: -
U/S Drainage: 0.95 km²
Distance to Receiving Water: Nelson River 0.93 km



Site Conditions

+ Physical Data

Channel Profile

Channel and Flow

Wetted Width (m)	-
Channel Width (m)	-

Banks (%)

Right Bank Stability	-
Left Bank Stability	-

Riparian

Floodplain Distance (m)

Right Bank	-
Left Bank	-

Riparian Distance (m)

Right Bank	-
Left Bank	-

Riparian Vegetation Type (Y/N)

None	-
Grasses/sedges	Y
Shrubs	Y
Conifers	-
Deciduous	-
Mixed Forest	-

Canopy Cover (%) ~55

Substrate

Substrate Type (%)

Fines	-
Small Gravel	-
Large Gravel	-
Cobble	-
Boulder	-

Cover Types

Total Cover Available (%) -

Cover Composition (% of Total)

Large Woody Debris	-
Overhanging Vegetation	-
Instream Vegetation	-
Pool	-
Boulder	-
Undercut Bank	-
Surface Turbulence	-
Turbidity	-

Habitat Type

Habitat Composition

Pool	-
Run	-
Flat	-
Riffle	-
Rapid	-

Fish Habitat Classification and Sensitivity

+ Fish Habitat

Fish Habitat Present	Yes
DFO Manitoba Agricultural Watershed Classification:	-
Fish Habitat Classification:	Marginal

Fish Presence: N/A

Comments:

Few if any fish are anticipated in this tributary. There is no to low overwintering potential for fish and habitat is considered marginal.

+ Habitat Sensitivity

Sensitivity Rating: Low

Comments:

Marginal fish habitat results in a low sensitivity rating.



Construction Camp CC4

Nelson River

Location

Datum:	NAD 83
UTM:	<i>Zone:</i> 15V
	<i>Easting:</i> 450057
	<i>Northing:</i> 6280866
Data Source:	DOI.

General Morphology

Stream/Lake:	Stream
Pattern:	SI
Confinement:	FC
Stage:	Moderate
Flow Regime:	Perennial
Morphology:	LC
U/S Drainage:	-
Distance to Receiving Water:	Hudson Bay 80 km



Site Conditions

+ Physical Data

Channel Profile

Channel and Flow

Wetted Width (m)	858.7
Channel Width (m)	858.7

Banks (%)

Right Bank Stability	-
Left Bank Stability	-

Riparian

Floodplain Distance (m)

Right Bank	-
Left Bank	-

Riparian Distance (m)

Right Bank	14.0
Left Bank	31.8

Riparian Vegetation Type (Y/N)

None	-
Grasses/sedges	Y
Shrubs	Y
Conifers	-
Deciduous	-
Mixed Forest	-

Canopy Cover (%)

0

Substrate

Substrate Type (%)

Fines	-
Small Gravel	-
Large Gravel	-
Cobble	-
Boulder	-

Cover Types

Total Cover Available (%)

-

Cover Composition (% of Total)

-

Large Woody Debris	-
Overhanging Vegetation	-
Instream Vegetation	-
Pool	-
Boulder	-
Undercut Bank	-
Surface Turbulence	-
Turbidity	-

Habitat Type

Habitat Composition

Pool	-
Run	100
Flat	-
Riffle	-
Rapid	-

Fish Habitat Classification and Sensitivity

+ Fish Habitat

Fish Habitat Present

Yes

DFO Manitoba Agricultural Watershed Classification:

-

Fish Habitat Classification:

Important

Fish Presence: N/A

Comments:

The Nelson River is a major river system that drains into the Hudson Bay. The river is a perennial watercourse that supports a diverse fish community, providing spawning, rearing, feeding and overwintering habitat. Within the lower Nelson River mainstem, 40 species of fish have been documented including burbot, goldeye, lake cisco, lake chub, lake sturgeon, lake whitefish, longnose sucker, mooneye, northern pike, sauger, walleye, white sucker, yellow perch, brook trout, freshwater drum, and rainbow smelt (Bernhardt et al. 1991, Johnson and MacDonell 2004, Swanson et al. 1990).

+ Habitat Sensitivity

Sensitivity Rating: Moderate

Comments:

Important fish habitat within a large riverine system results in a moderate sensitivity rating.

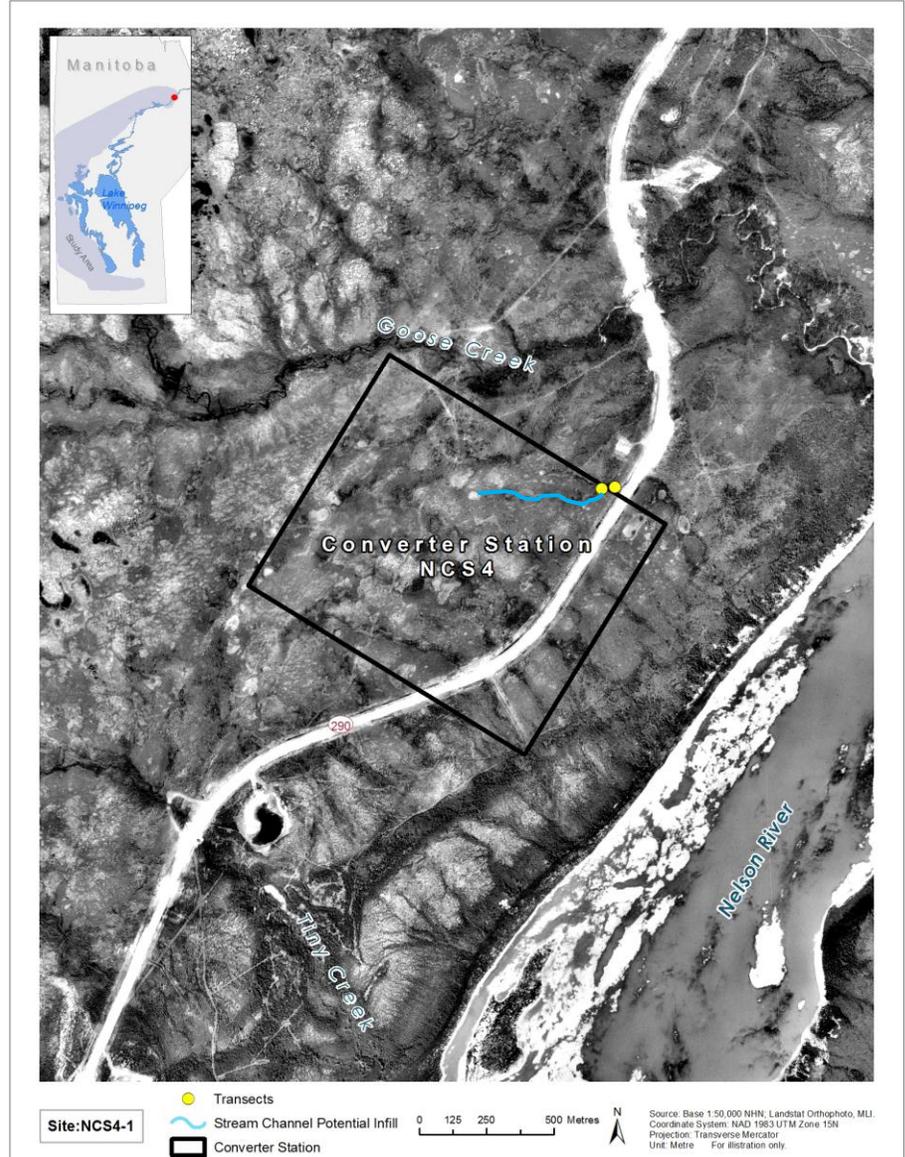
Site NCS4-1 Unnamed Tributary of the Nelson River

Location

Datum: NAD 83
UTM: 14V 815960 6291265

General Morphology

Pattern: Irregular/Braided
Channel Profile: Planar
Confinement: Unconfined
Flow Regime: Ephemeral
Upstream Drainage Area (km²): 0.38
Nearest Major Downstream Waterbody: Nelson River
Distance to Nelson River (m): Little or no connectivity



Site Conditions

Survey Date: August 30, 2010 and June 1, 2011
Avg Velocity (m/s): No Flow
Stage: Moderate



Site: NCS4-1

- Transects
- ~ Stream Channel Potential Infill
- Converter Station



Source: Base 1:50,000 NHN Landsat Orthophoto, MLI
 Coordinate System: NAD 1983 UTM Zone 16N
 Projection: Transverse Mercator
 Units: Metre For illustration only.



+ Physical Channel Data

Transect	1	2
Distance from Crossing (m)	Centre	50 US
Channel and Flow		
Channel Width (m)	9.0	10.0
Wetted Width (m)	2.3	3.5
Depth at 25% (m)	0.04	0.05
Depth at 50% (m)	0.37	0.18
Depth at 75% (m)	0.30	0.11
Maximum Depth (m)	0.37	0.21
Gradient (%)		
	-	-
Banks		
Left Bank Height (m)	0.03	0.00
Right Bank Height (m)	0.00	1.00
Left Bank Shape	Sloping	Sloping
Right Bank Shape	Sloping	Sloping
Left Bank Stability	High	High
Right Bank Stability	High	High
Substrate Type and Distribution (%)		
Fines	-	-
Small Gravel	-	-
Large Gravel	-	-
Cobble	-	-
Boulder	-	-
Organic Matter	100	100



Site Conditions Continued

+ Riparian Area/Floodplain

Transect	1	2
Floodplain Distance (m)		
Left Bank	0	10
Right Bank	20	0
Riparian Distance (m)		
Left Bank	1	4
Right Bank	2	1
Riparian Vegetation Type (%)		
None	-	-
Grasses/sedges	45	50
Shrubs	45	50
Conifers	-	-
Deciduous	-	-
Mixed Forest	10	-
Canopy Cover (%)	40	10

+ Habitat Type

Transect	1	2
Flat	-	-
Pool	100	100
Rapid	-	-
Riffle	-	-
Run	-	-

+ Water Quality Data

Transect:	1	2
Surface Temp (°C):	9.0	10.1
Minimum Ground Temp (°C):	6.1	4.2
Maximum Ground Temp (°C):	8.7	11.4
pH:	-	-
Turbidity (NTU):	-	-
Specific Conductance (µS/cm):	-	-
DO (mg/L):	2.37	2.48



Upstream view of the unnamed tributary from the Conawapa Access Road (June 1, 2011).



Right bank view of the unnamed tributary from transect 1 (August 30, 2010).



Downstream view of the unnamed tributary from transect 1, where the tributary starts to disappear (August 30, 2010).



Left bank view of the unnamed tributary from transect 1 (August 30, 2010).

↘ Site Conditions Continued

+ Cover

Transect	1	2
Total Cover Available (%)	60	80
Cover Composition (% of Total)		
Large Woody Debris	10	<1
Overhanging Vegetation	40	10
Instream Vegetation	50	90
Pool		
Boulder	-	-
Undercut Bank	-	-
Surface Turbulence	-	-
Turbidity	-	-



Downstream view of the unnamed tributary from transect 2 (August 30, 2010).



Right bank view of the unnamed tributary from transect 2 (August 30, 2010).



Upstream view of the unnamed tributary from transect 2 (August 30, 2010).



Left bank view of the unnamed tributary from transect 2 (August 30, 2010).



Fish Habitat Classification and Sensitivity

+ Fish Habitat

Fish Habitat Present	Yes
DFO Manitoba Agricultural Watershed Classification:	-
Fish Habitat Classification:	Marginal

Fish Presence: Small mesh gillnet, electrofish August 30, 2010 – no fish captured. Electrofish June 1, 2011- no fish captured. No existing information.

Comments:

This unnamed tributary of the Nelson River is approximately 734 m to the south of Goose Creek but has no apparent connection to Goose Creek. It is considered an ephemeral stream and lacks defined channel connectivity to the Nelson River. This tributary is rated as Marginal Fish Habitat and does not support fish directly. It provides indirect fish habitat in the form of water, nutrients and food (lower trophic levels) to the Nelson River. Considering the small size of this unnamed tributary and the large size of the Nelson River, the relative contribution of water, food and nutrients to the Nelson River are negligible. Note that all physical channel and site condition data was collected on the August 30, 2010 site visit.

+ Habitat Sensitivity

Sensitivity Rating: Low

Comments:

Marginal fish habitat results in a low sensitivity rating.

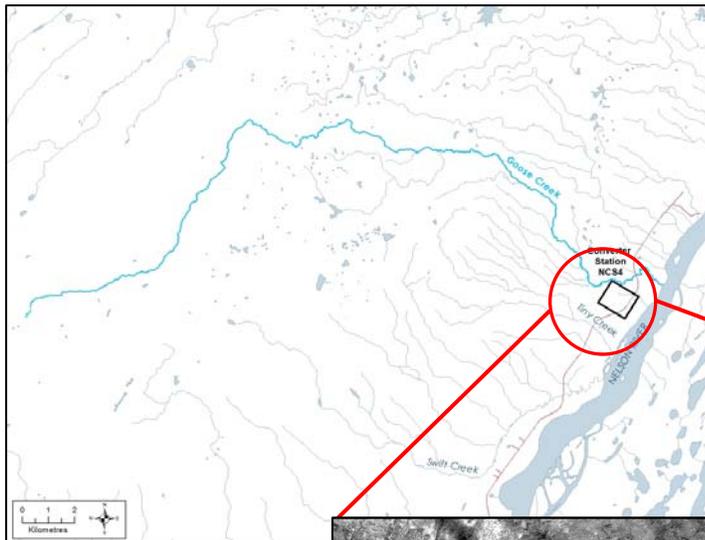


Location

Datum: NAD 83
UTM: Zone: 14V
Easting: 815662
Northing: 6291754
Data Source: DOI.

General Morphology

Stream/Lake: Stream
Pattern: TM
Confinement: UN
Stage: -
Flow Regime: Perennial
Morphology: -
U/S Drainage: -
Distance to Receiving Water: Nelson River 2.57 km



Site Conditions

+ Physical Data

Channel Profile

Channel and Flow

Wetted Width (m)	-
Channel Width (m)	-

Banks (%)

Right Bank Stability	-
Left Bank Stability	-

Riparian

Floodplain Distance (m)

Right Bank	-
Left Bank	-

Riparian Distance (m)

Right Bank	102 (total)
Left Bank	-

Riparian Vegetation Type (Y/N)

None	-
Grasses/sedges	-
Shrubs	-
Conifers	-
Deciduous	Y
Mixed Forest	-

Canopy Cover (%)

	-
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Substrate

Substrate Type (%)

Fines	-
Small Gravel	-
Large Gravel	-
Cobble	-

Cover Types

Total Cover Available (%)

-

Cover Composition (% of Total)

Large Woody Debris	-
Overhanging Vegetation	-
Instream Vegetation	-
Pool	-
Boulder	-
Undercut Bank	-
Surface Turbulence	-
Turbidity	-

Habitat Type

Habitat Composition

Pool	-
Run	-
Flat	-
Riffle	-
Rapid	-

Fish Habitat Classification and Sensitivity

+ Fish Habitat

Fish Habitat Present

Yes

DFO Manitoba Agricultural Watershed Classification:

-

Fish Habitat Classification:

Important

Fish Presence: Kroeker and MacDonell (2006) reported burbot, fathead minnow, sculpins (mottled and slimy), pearl dace, longnose dace, white sucker, and longnose sucker. Swanson et al. (1991) reported burbot, brook trout, brook stickleback, slimy sculpin, longnose dace, finescale dace, pearl dace, white sucker, and longnose sucker. Swanson (1991) also found the stream to provide nursery habitat for brook trout. All sampling was conducted in the lower reaches of the creek.

Comments:

Goose Creek is known to provide important fish habitat for both indicator and forage fish in the lower reaches of the creek, including rearing and feeding. Within the lower 4 km, including the area adjacent to the proposed converter station, habitat consists of riffle-scour pool with coarse substrate with areas of ground water seepage.

+ Habitat Sensitivity

Sensitivity Rating: Moderate

Comments:

Goose Creek is small and sensitive to potential disturbance. Furthermore, large bodied and forage fish are present and nursery habitat for brook trout exists. These factors result in a moderate sensitivity rating.

Site NES6S1

Unnamed Tributary of the Nelson River

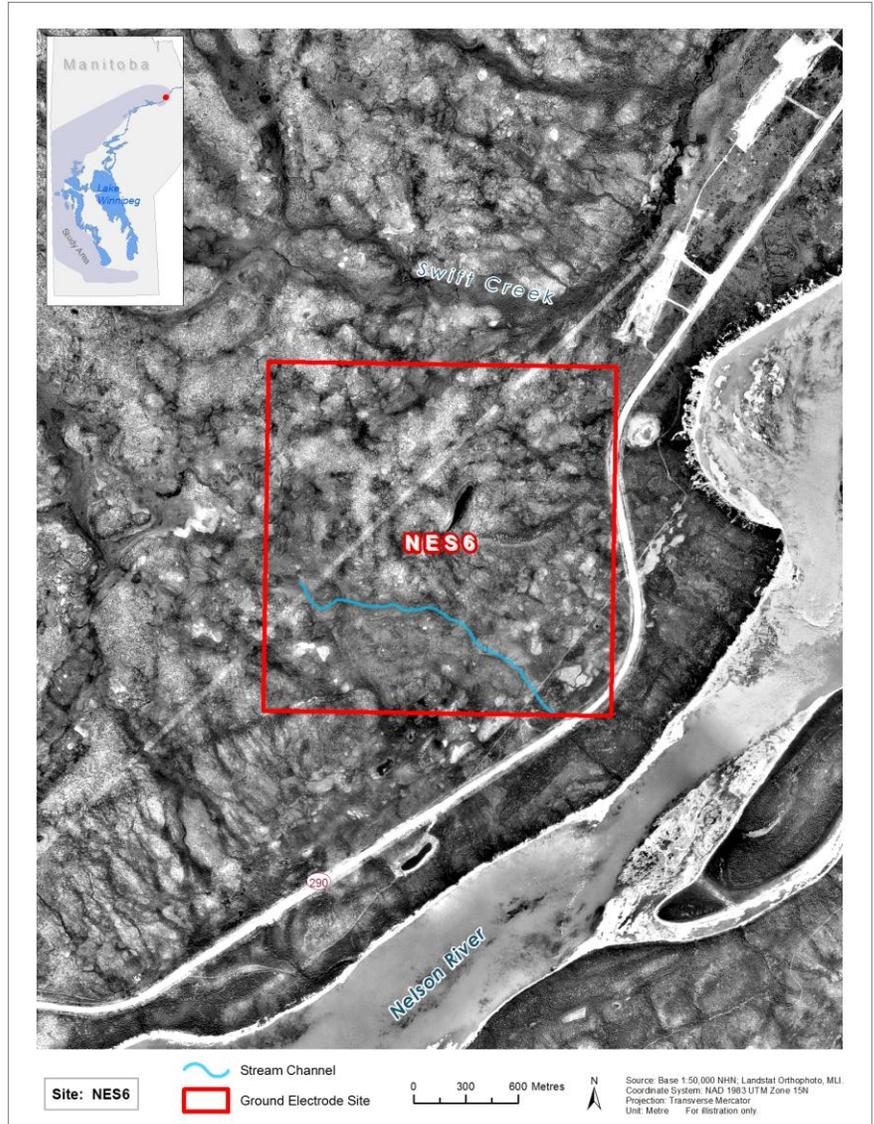
Location

Datum: NAD 83
UTM: Zone: 14V
Easting: 810864
Northing: 6281316

Data Source: DOI, Site Visit

General Morphology

Pattern: Irregular/Braided
Channel Profile: -
Confinement: Unconfined
Flow Regime: Intermittent
Upstream Drainage Area (km²): 2.4
Nearest Major Downstream Waterbody: Nelson River
Distance to Nelson River (km): 0.6



Site Conditions

Survey Date: June 3, 2011
 Avg Velocity (m/s): -
 Stage: Moderate



Site: **NES6**



Stream Channel



Ground Electrode Site



Source: Base 1:50,000 NHN; Landstat Orthophoto, MLI.
 Coordinate System: NAD 1983 UTM Zone 15N
 Projection: Transverse Mercator
 Units: Metre For illustration only.

0 90 180 360 Metres

+ Physical Channel Data

Transect	1	2
Distance from Crossing (m)	-	-
Channel and Flow		
Channel Width (m)	0.89	-
Wetted Width (m)	0.89	-
Depth at 25% (m)	-	-
Depth at 50% (m)	-	-
Depth at 75% (m)	-	-
Maximum Depth (m)	0.21	-
Gradient (%)		
	-	-
Banks		
Left Bank Height (m)	-	-
Right Bank Height (m)	-	-
Left Bank Shape	Sloping	-
Right Bank Shape	Sloping	-
Left Bank Stability	High	-
Right Bank Stability	High	-
Substrate Type and Distribution (%)		
Fines	-	-
Small Gravel	10	-
Large Gravel	20	-
Cobble	70	-
Boulder	-	-
Organic Matter	-	-



Site Conditions Continued

+ Riparian Area/Floodplain

Transect	1	2
Floodplain Distance (m)		
Left Bank	0	-
Right Bank	0	-
Riparian Distance (m)		
Left Bank	-	-
Right Bank	-	-
Riparian Vegetation Type (%)		
None	-	-
Grasses/sedges	90	-
Shrubs	10	-
Conifers	-	-
Deciduous	-	-
Mixed Forest	-	-
Canopy Cover (%)	0	-

+ Habitat Type

Transect	1	2
Flat	-	-
Pool	-	-
Rapid	-	-
Riffle	30	-
Run	70	-

+ Water Quality Data

Transect:	1	2
Surface Temp (°C):	-	-
Minimum Ground Temp (°C):	-	-
Maximum Ground Temp (°C):	-	-
pH:	-	-
Turbidity (NTU):	-	-
Specific Conductance (µS/cm):	-	-
DO (mg/L):	-	-



Upstream view of unnamed tributary at transect 1.



Downstream view of the unnamed tributary at transect 1.



Downstream view of the unnamed tributary showing braided channel, km upstream of the Conawapa Access Road.



Upstream view of the unnamed tributary within a wetland area it flowed through.

↘ Site Conditions Continued

+ Cover

Transect	1	2
Total Cover Available (%)	35	-
Cover Composition (% of Total)		
Large Woody Debris	-	-
Overhanging Vegetation	15	-
Instream Vegetation	15	-
Pool	-	-
Boulder	70	-
Undercut Bank	-	-
Surface Turbulence	-	-
Turbidity	-	-



End of discernable stream channel of the unnamed tributary within wetland, 0.3km upstream of the Conawapa Access Road.



Upstream view of the unnamed tributary 0.1km downstream of the Conawapa Access Road.



Left bank view of the unnamed tributary at confluence with the Nelson River.



Fish Habitat Classification and Sensitivity

+ Fish Habitat

Fish Habitat Present	Yes
DFO Manitoba Agricultural Watershed Classification:	-
Fish Habitat Classification:	Marginal

Fish Presence: Electrofish June 3, 2011, no fish captured. No existing information.

Comments:

This small unnamed tributary is an ephemeral watercourse and lies within the ground electrode site approximately 587m from the Nelson River. Upstream of the Conawapa road (and within the ground electrode site), the watercourse breaks into braided channels within wetland habitat. Downstream of the Conawapa road the creek has a defined channel and descends the steep banks of the Nelson River. This steep descent to the river is believed to inhibit upstream fish movements. This creek is rated as Marginal Fish Habitat and at the ground electrode site does not support fish directly. The creek provides indirect fish habitat in the form of water, nutrients and food (lower trophic levels) to the Nelson River.

+ Habitat Sensitivity

Sensitivity Rating: Low

Comments:

Marginal habitat results in a low sensitivity rating.

