Unnamed Tributary of Nelson River

Location

Datum:	NAD 83		
UTM:	Zone: Easting: Northing:	15V 365158 6246184	
Location Depicted Below:			

General Morphology

Gen. Description:	Wetland/bog drainage
Pattern:	-
Confinement:	Unconfined
Stage:	Moderate
Flow Regime:	Perennial
U/S Drainage:	1 km^2
Receiving Water/Dist.:	Nelson River/2 km





Physical Data	Su	urvey Date:	21 Ju	ly 2009)	
hannel Profile						
hannel and Flow		Water	Depths	(m)		
Channel Width (m)	1-4		Max.	~1.5		
Wetted Width (m)	1-4		Avg.	<1.0		
anks						
Right Bank Height (m):	-	Shape:	-		Stability:	-
Left Bank Height (m):	-	Shape:	-		Stability :	-
ubstrate		Habit	at Tvp	e		
ubstrate Type (%)		Habita	t Comp	osition (%	%)	
Fines	100		Pool	98		
Small Gravel	-		Flat	-		
Large Gravel	-		Run	-		
Cobble	-		Riffle	2 (at m	argins of beaver dam)	
Boulder	-					
over Types					Rinarian	
tover types		US	DS			
otal Cover Available (%)		5	20		Riparian Vegetation	Type (Y/N)
Cover Composition (%	o of Total)		10		Moss (0 1	Y
Large Woody	Debris	-	10		Grasses/Sedges	Y
Overhanging V	egetation	-	-		Snrubs	Ŷ
Instream Vege	tation	100	90		Conifers	-
Pool		-	-		Deciduous	-
Boulder		-	-		Mixed Forest	-
Undercut Bank		-	-			
Surface Turbul	ence	-	-		Canopy Cover (%)	-
Water Quality Da	ta					
Surface Temp (°C):		17			DO (mg/L):	7.01
Specific Conductance	(µS/cm):	136			pH:	5.08
		0.00			Turbidity (NTI).	3 50
TDS (g/L):		0.09				5.57

+ Fish Habitat Potential

Large-Bodied Fish: Small-Bodied Fish:

N

Spawning Moderate Moderate Rearing/Feeding Moderate Moderate

Overwintering

Low Moderate

Impediments to Migration: None observed Fish Presence: Unknown

+ Fish and Fish Habitat Sensitivity

Sensitivity Rating: Low







Photo 2. Upstream view 50 m downstream from Site 18 crossing.



Photo 3. Downstream view of crossing at Site 18.

Photo 1. View of crossing at Site 18.



Photo 4. Beaver dam and impoundment downstream of Site 18.



Nelson River

Y)	Location
Summer of the local division of the local di	

Datum:	NAD 83		
UTM:	Zone: Easting: Northing:	15V 364829 6246995	
Location Depicted Below:			

General Morphology

Gen. Description:	Large River
Pattern:	Straight
Confinement:	Confined
Stage:	Moderate
Flow Regime:	Perennial
U/S Drainage:	1,376,565 km ²
Receiving Water/Dist.:	Stephens Lake/3 km





Site	e Conditions					
+ Ph	ysical Data	Sur	vey Date:	21 July 200)9	
Chann	nel Profile					
Channe	el and Flow		Water	Depths (m)		
	Channel Width (m)	810		Max		
	Wetted Width (m)	810		Avg		
Banks			C1		a. 1.11	
	Right Bank Height (m):	-	Shape:	vertical	Stability:	unstable
	Left Bank Height (m):	-	Shape:	vertical	Stability :	unstable
Substr	ate		Habita	at Type		
Substra	te Type (%)		Habita	t Composition	(%)	
	Fines	-		Pool -		
	Small Gravel	-		Flat -		
	Large Gravel	-		Run -		
	Cobble	-		Riffle -		
	Boulder	-				
Cover	Types				<u>Riparian</u>	
			US	DS		
Total C	over Available (%)		-	-	Riparian Vegetation	Type (Y/N)
	Cover Composition (%	of Total)			Moss	-
	Large Woody D	ebris	-	-	Grasses/Sedges	-
	Overhanging Ve	egetation	-	-	Shrubs	-
	Instream Vegeta	ation	-	-	Conifers	Y
	Pool		-	-	Deciduous	-
	Boulder		-	-	Mixed Forest	-
	Undercut Bank		-	-		
	Surface Turbule	nce	-	-	Canopy Cover (%)	-
+ Wa	ater Quality Dat	а				
	Surface Temp (°C):		_		DO (mg/L) :	_
	Specific Conductance (uS/cm):	_		nH:	_
	specific Conductance ()	us, chij.			P	
	TDS (g/L) :		-		Turbidity (NTL):	-

+ Fish Habitat PotentialSpawningRearing/FeedingOverwinteringLarge-Bodied Fish:HighModerate-HighLowSmall-Bodied Fish:HighModerate-HighLow

Impediments to Migration: None observed

Common Fish: brook stickleback, burbot, cisco, fathead minnow, finescale dace, freshwater drum, goldeye, Iowa darter, Johnny darter, lake chub, lake sturgeon, lake whitefish, longnose dace, longnose sucker, mooneye, northern pike, northern redbelly dace, pearl dace, rainbow smelt, sauger, slimy sculpin, spottail shiner, trout-perch, walleye, white sucker, yellow perch (J. Holm, pers. comm., July 2011)

+ Fish and Fish Habitat Sensitivity

Sensitivity Rating: Mo

Moderate-High





Photo 1. View of crossing at Site 19.



Unnamed Tributary of Stephens Lake

Location

Datum:	NAD 83		
UTM:	Zone: Easting: Northing:	15V 371607 6244290	
Location Depicted Below:			

General Morphology

Gen. Description:	Wetland/bog drainage
Pattern:	-
Confinement:	Unconfined
Stage:	Moderate
Flow Regime:	Perennial
U/S Drainage:	0.6 km^2
Receiving Water/Dist.:	Stephens Lake/0.8 km





Site Conditions

+ Physical Data	S	urvey Date:	25 Jul	y 2009		
Channel Profile Channel and Flow Channel Width (m) Wetted Width (m)	-	Water I	Depths (1 Max. Avg.	n) ~ 1 < 1		
Right Bank Height (m): Left Bank Height (m):	-	Shape: Shape:	-		Stability: Stability :	Stable Stable
Substrate Substrate Type (%) Fines Small Gravel Large Gravel Cobble Boulder	100 - - -	<u>Habita</u> Habitat	at Type Composition Pool Flat Run Riffle	sition (% 100 - -	ó)	
<u>Cover Types</u> Total Cover Available (%)		US 30	DS 30		<u>Riparian</u> Riparian Vegetation 7	Гуре (Y/N)
Cover Composition (% Large Woody I Overhanging V Instream Veget Pool Boulder Undercut Bank Surface Turbul	o of Total) Debris Vegetation ation	5 20 75 - - - -	5 20 75 - - -		Moss Grasses/Sedges Shrubs Conifers Deciduous Mixed Forest Canopy Cover (%)	- Y Y - - 0
+ Water Quality Da Surface Temp (°C): Specific Conductance TDS (g/L): Salinity (ppt):	ta (μ S/cm):	- - - -			DO (mg/L): pH: Turbidity (NTU):	- - -

Fish Habitat Classification and Sensitivity

+ Fish Habitat Potential

Large-Bodied Fish: Small-Bodied Fish: SpawningRearLow-ModerateLowModerateModerate

Rearing/Feeding Low Moderate Overwintering

Low Low

Impediments to Migration: None observed Fish Presence: Unknown

+ Fish and Fish Habitat Sensitivity

Sensitivity Rating: Low









Photo 2. Connection to lake upstream of Site 21.



Unnamed Tributary of Stephens Lake

Location

Datum:	NAD 83		
UTM:	Zone: Easting: Northing:	15V 372752 6243944	
Location Depicted Below:			

General Morphology

Gen. Description:	Wetland/bog drainage
Pattern:	-
Confinement:	Unconfined
Stage:	Moderate
Flow Regime:	Perennial
U/S Drainage:	17 km ²
Receiving Water/Dist.:	Stephens Lake/0.5 km





Site Conditions

+ Physical Data	(Survey Date:	25 Ju	y 2009		
Channel Profile Channel and Flow Channel Width (m) Wetted Width (m)	-	Water	Depths (Max. Avg.	m) ~ 2 < 1		
Right Bank Height (m): Left Bank Height (m):	-	Shape: Shape:	-		Stability: Stability :	Stable Stable
Substrate Substrate Type (%) Fines Small Gravel Large Gravel Cobble Boulder	100 - - -	<u>Habita</u> Habita	at Type t Compo Pool Flat Run Riffle	2 sition (% 100 - - -	6)	
<u>Cover Types</u> Total Cover Available (%)		US 20	DS 20		<u>Riparian</u> Riparian Vegetation	Гуре (Y/N)
Cover Composition (% Large Woody I Overhanging V Instream Veget Pool Boulder Undercut Bank Surface Turbul	o of Total) Debris Gegetation ation	5 85 10 - - -	5 85 10 - - -		Moss Grasses/Sedges Shrubs Conifers Deciduous Mixed Forest Canopy Cover (%)	- Y Y - - -
+ Water Quality Da Surface Temp (°C): Specific Conductance (TDS (g/L): Salinity (ppt):	ta (μS/cm):	- - -			DO (mg/L): pH: Turbidity (NTU):	- -

Fish Habitat Classification and Sensitivity

+ Fish Habitat Potential

Large-Bodied Fish: Small-Bodied Fish: SpawningRearLow-ModerateLowModerateModerate

Rearing/Feeding Low Moderate Overwintering

Low Low

Impediments to Migration: None observed Fish Presence: Unknown

+ Fish and Fish Habitat Sensitivity

Sensitivity Rating: Low





Photo 1. View of crossing Site 22.



Photo 2. Downstream view of Site 22.



Photo 3. Upstream view of Site 22.



Photo 4. Gilliat Lake upstream of Site 22.



Man-Made Drainage Channel

Location

Datum:	NAD 83		
UTM:	Zone: Easting: Northing:	15V 376790 6243307	
Location Depicted Below:			

General Morphology

Gen. Description:	Man-made drainage
Pattern:	-
Confinement:	Unconfined
Stage:	Moderate
Flow Regime:	Perennial
U/S Drainage:	$0.0.08 \text{ km}^2$
Receiving Water/Dist.:	No outflow





Site	e Conditions						
+ Ph	ysical Data	Sur	vey Date:	25 Ju	ly 2009	9	
<u>Chanı</u> Channe	nel Profile el and Flow Channel Width (m) Wetted Width (m)	2.9-4.9 3.4-5.6	Water	Depths Max. Avg.	(m) 1.2 < 1		
Banks	Right Bank Height (m): Left Bank Height (m):	-	Shape: Shape:	-		Stability: Stability :	Stable Stable
<u>Substr</u> Substra	rate ate Type (%) Fines Small Gravel Large Gravel Cobble Boulder	100 - - -	<u>Habit</u> Habita	at Typ t Compo Pool Flat Run Riffle	<u>e</u> osition (' 100 - - -	%)	
<u>Cover</u> Total C	<u>• Types</u> Cover Available (%)		US 90	DS 90		<u>Riparian</u> Riparian Vegetation ⁷	Гуре (Y/N)
	Cover Composition (% Large Woody D Overhanging Ve Instream Vegeta Pool Boulder Undercut Bank Surface Turbule	of Total) ebris egetation ation	- 20 80 - - -	- 20 80 - - -		Moss Grasses/Sedges Shrubs Conifers Deciduous Mixed Forest Canopy Cover (%)	- Y Y - - 0
+ Wa	ater Quality Dat	а					
	Surface Temp (°C): Specific Conductance (J TDS (g/L): Salinity (ppt):	uS/cm):	12.8 240 0.22			DO (mg/L): pH: Turbidity (NTU):	8.33 6.29 5.3

+ Fish Habitat Potential	Spawning	Rearing/Feeding	Overwintering
Large-Bodied Fish: Small-Bodied Fish:	Low Low	Low Low	Low Low
Impediments to Migration: Butnau dyke			

Fish Presence: Unknown

N

+ Fish and Fish Habitat Sensitivity

Sensitivity Rating: Low





Photo 1. Looking towards crossing Site 23 from Butnau dyke.



Photo 2. Looking inland (southwest) from crossing Site 23.



Photo 3. Connection to inland lake near Site 23.



Photo 4. Approximately 50 m further inland from Photo 2 looking the same direction (southwest).



Butnau River

Location

Datum:	NAD 83			
UTM:	Zone: Easting: Northing:	15V 381727 6243570		
Location Depicted Below:				

🕥 General Morphology

Gen. Description:	Backwatered area of river
Pattern:	Irregular wandering
Confinement:	Confined
Stage:	Flood
Flow Regime:	Perennial
U/S Drainage:	2 km^2
Receiving Water/Dist.:	Kettle River/10 km





Physical Data	Sur	vey Date:	21 Ju	ly 2009	9	
Channel Profile						
Channel and Flow		Water	Depths	(m)		
Channel Width (m)	40		Max.	~5		
Wetted Width (m)	100-150		Avg.	< 2		
Banks						
Right Bank Height (m):	-	Shape:	-		Stability:	-
Left Bank Height (m):	-	Shape:	-		Stability :	-
Substrate		Hahit	at Typ	e		
Substrate Type (%)		Habita	t Comp	<u>-</u> osition (*	%)	
Fines	-	monta	Pool	100	<i>,</i> , , , , , , , , , ,	
Small Gravel	_		Flat	-		
Large Gravel	-		Run	-		
Cobble	-		Riffle	-		
Boulder	-					
G					DI 1	
Cover Types		ЦС	DC		<u>Riparian</u>	
Fatal Carron Arraitable (0/)		US	D2		Dinarian Vacatation	
I otal Cover Available (%)		80	80		Riparian vegetation	1 ype (Y/N)
Cover Composition (%	of Total)				Moss	-
Large Woody I	Debris	5	5		Grasses/Sedges	-
Overhanging V	egetation	-	-		Shrubs	Y
Instream Veget	ation	65	65		Conifers	-
Pool		30	30		Deciduous	-
Boulder		-	-		Mixed Forest	Y
Undercut Bank		-	-			
Surface Turbule	ence	-	-		Canopy Cover (%)	0
+ Water Quality Da	ta					
		10 C			DO(mg/I)	5 61
Suppoor Comp ("1")		10.0			DO(mg/L):	5.04
Surface Temp (°C):	S(am).	146			nU.	5 20
Surface Temp (°C): Specific Conductance (TDS (q/L):	μS/cm):	146			pH: Turbidity (NTU):	5.39

+ Fish Habitat Potential	Spawning	Rearing/Feeding	Overwintering
Large-Bodied Fish:	Moderate	High	Moderate
Small-Bodied Fish:	Moderate	High	Moderate

Impediments to Migration: None observed

Fish Presence: lake whitefish, longnose sucker, northern pike, walleye, and white sucker (Johnson and Barth 2007)

+ Fish and Fish Habitat Sensitivity

Sensitivity Rating:

N

Moderate

Manitoba Hydro: Keeyask Transmission Project Watercourse Crossing Assessment: Site 24 – Butnau River Page 2 of 3









Photo 2. West view of crossing at Site 24.



Kettle River

Datum:	NAD 83			
UTM:	Zone: Easting: Northing:	15V 390834 6243509		
Location Depicted Below:				

🕥 General Morphology

Gen. Description:	Medium sized river
Pattern:	Irregular wandering
Confinement:	Confined
Stage:	High
Flow Regime:	Perennial
U/S Drainage:	$1,928 \text{ km}^2$
Receiving Water/Dist.:	Nelson River/19 km





Dh	veical Data	C	NOV Dete	01 Ju	L. 2000		
PII	ysical Data	Sur	vey Date:	ZIJU	IY 2009		
<u>'hanr</u>	<u>nel Profile</u>						
hanne	el and Flow	10	Water	Depths ((m)		
	Channel Width (m)	12		Max.	-		
onka	wetted width (m)	12		Avg.	-		
anks	Right Bank Height (m)	~5	Shape:	sloped	(< 30°)	Stability.	Stable
	Left Bank Height (m):	~5	Shape:	sloped	(< 30°)	Stability :	Stable
	6 ()		1	1	~ /		
ubstr	rate		Habit	at Type	2		
ubstra	nte Type (%)		Habita	t Compo	osition (%	6)	
	Fines	-		Pool	-		
	Small Gravel	-		Flat	-		
	Large Gravel	-		Run	100		
	Cobble	-		Riffle	-		
	Boulder	-					
over	Types					Rinarian	
	<u></u>		US	DS			
otal C	over Available (%)		5	5		Riparian Vegetation	Гуре (Y/N)
	Cover Composition (%	of Total)	60	<i>c</i> 0		Moss	-
	Large Woody D	ebris .	60	60		Grasses/Sedges	-
	Overhanging Ve	egetation	40	40		Shrubs	Y
	Instream Vegeta	ition	-	-		Conifers	Y
	Pool		-	-		Deciduous	-
	Boulder		-	-		Mixed Forest	-
	Undercut Bank		-	-			
	Surface Turbule	nce	-	-		Canopy Cover (%)	0
\// =	ater Quality Dat	a					
VVC	ator Quanty Dat	u					
	Surface Temp (°C):		-			DO (mg/L):	-
	Specific Conductance (µ	uS/cm):	-			pH:	-
	$TDS(\alpha/I)$					Turbidity (NTID)	
	1D5 (g/L):		-				-

+ Fish Habitat Potential	Spawning	Rearing/Feeding	Overwintering
Large-Bodied Fish:	Moderate	Low	Low
Small-Bodied Fish:	Low	Low	Low

Impediments to Migration: None observed

Fish Presence: brook trout, longnose sucker, northern pike, walleye, white sucker (Johnson and Barth 2007)

+ Fish and Fish Habitat Sensitivity

Sensitivity Rating: Moderate-High

N

Manitoba Hydro: Keeyask Transmission Project Watercourse Crossing Assessment: Site 26 – Kettle River Page 2 of 3





Photo 1. View of crossing at Site 26.





Unnamed Tributary of Boots Creek

Location

Location Depicted Below:

Datum:	NAD 83	
UTM:	Zone: Easting: Northing:	15V 394844 6243944

General Morphology

Gen. Description:	Wetland/bog drainage
Pattern:	-
Confinement:	Unconfined
Stage:	Flooded
Flow Regime:	Perennial
U/S Drainage:	0.5 km^2
Receiving Water/Dist.:	Nelson River/18 km





Ph	ysical Data	Su	rvey Date:	24 Ju	ly 2009)	
Chan	nel Profile						
Chann	el and Flow		Water	Depths (m)		
	Channel Width (m)	0.4		Max.	~1.0		
	Wetted Width (m)	0.8		Avg.	0.5		
Banks			~			~	~
	Right Bank Height (m):	0	Shape:	vertical		Stability:	Stable
	Left Bank Height (m):	0	Shape:	vertical		Stability :	Stable
Subst	rate		Habit	at Typ	<u>p</u>		
Substra	ate Type (%)		Habita	t Compo	sition (%	%)	
	Fines	5		Pool	50		
	Small Gravel	-		Flat	-		
	Large Gravel	-		Run	50		
	Cobble	95		Riffle	-		
	Boulder	-					
Cover	·Types					Riparian	
			US	DS			
Fotal C	Cover Available (%)		80	80		Riparian Vegetation	Туре (Y/N)
	Cover Composition (%	of Total)				Moss	_
	Large Woody D	ebris	50	50		Grasses/Sedges	Y
	Overhanging Ve	egetation	10	10		Shrubs	Y
	Instream Vegeta	ation	40	40		Conifers	Y
	Pool		-	-		Deciduous	-
	Boulder		-	-		Mixed Forest	-
	Undercut Bank		-	-			
	Surface Turbule	ence	-	-		Canopy Cover (%)	75
+ Wa	ater Quality Dat	a					
	Surface Temp (°C):		19.9			DO (mg/L) :	7 48
			1).)			20 (mg/11).	7.40
	Specific Conductance (uS/cm)·	106			nH:	7.0
	Specific Conductance (J TDS (g/L):	uS/cm):	106 0.07			pH: Turbidity (NTID):	7.0 190

+ Fish Habitat Potential	Spawning	Rearing/Feeding	Overwintering
Large-Bodied Fish:	Low	Low	Low
Small-Bodied Fish:	Moderate	Moderate	Low

Impediments to Migration: Beaver dam ~110 m upstream of ROW **Fish Presence:** Unknown

+ Fish and Fish Habitat Sensitivity

Sensitivity Rating: Low

N





Photo 1. Wetland area downstream of crossing at Site 30.



Photo 2. Upstream view towards Site 30.



Photo 3. Immediately upstream of beaver dam ~110 m upstream of Site 30.



Photo 4. Downstream of dam.



Kettle River

Location

Datum:	NAD 83	
UTM:	Zone: Easting: Northing:	15V 391094 6242140
Location Depic	ted Below:	

🕥 General Morphology

Gen. Description:	Medium sized river
Pattern:	Irregular meander
Confinement:	Confined
Stage:	High
Flow Regime:	Perennial
U/S Drainage:	696 km ²
Receiving Water/Dist.:	Nelson River/23 km





Site Conditions

+ Ph	nysical Data		Surve	y Date:	24 Ju	ly 2009		
<u>Chan</u> Chann	nel Profile el and Flow Channel Width (m) Wetted Width (m)	14 14		Water	Depths (Max. Avg.	(m) - -		
Dairks	Right Bank Height (m): Left Bank Height (m):	<5 <5		Shape: Shape:	sloped sloped	(< 30°) (< 30°)	Stability: Stability :	Stable Stable
<u>Subst</u> Substr	rate ate Type (%) Fines Small Gravel Large Gravel Cobble Boulder	- - -		<u>Habit</u> Habita	at Type t Compo Pool Flat Run Riffle	e ssition (% 20 30 50 -	ó)	
<u>Cover</u> Total (<u>r Types</u> Cover Available (%)			US 25	DS 25		<u>Riparian</u> Riparian Vegetation	Type (Y/N)
	Cover Composition (% Large Woody D Overhanging Ve Instream Vegeta Pool Boulder Undercut Bank Surface Turbule	of Total) ebris egetation ition		- 40 - 60 - - -	- 40 - 60 - -		Moss Grasses/Sedges Shrubs Conifers Deciduous Mixed Forest Canopy Cover (%)	- - Y Y - - 0
+ Wa	ater Quality Dat Surface Temp (°C): Specific Conductance (µ TDS (g/L): Salinity (ppt):	a 18/cm):		- - -			DO (mg/L): pH: Turbidity (NTU):	- -

Sish Habitat Classification and Sensitivity

+ Fish Habitat PotentialSpawningRearing/FeedingOverwinteringLarge-Bodied Fish:LowModerateModerateSmall-Bodied Fish:LowModerateModerate

Impediments to Migration: None observed

Fish Presence: brook trout, longnose sucker, northern pike, walleye, white sucker (Johnson and Barth 2007)

+ Fish and Fish Habitat Sensitivity

Sensitivity Rating: Moderate

Manitoba Hydro: Keeyask Transmission Project Watercourse Crossing Assessment: Site 31 – Kettle River Page 2 of 3





Photo 1. Looking upstream at Site 31.



Photo 2. Looking downstream at Site 31.



Butnau River Diversion Channel

Location

Datum:	NAD 83	
UTM:	Zone: Easting: Northing:	15V 389574 6241875
Location Depic	ted Below:	

General Morphology

Gen. Description:	Man-made channel
Pattern:	Straight
Confinement:	Confined
Stage:	High
Flow Regime:	Perennial
U/S Drainage:	862 km ²
Receiving Water/Dist.:	Kettle River/0.5 km





+ Ph	ysical Data	Sui	vey Date:	24 Ju	ly 2009		
Chanr	el Profile		-		-		
Channe Channe	el and Flow		Water	Depths (m)		
	Channel Width (m)	14		Max.	~ 1.0		
	Wetted Width (m)	14		Avg.	-		
Banks				-			
	Right Bank Height (m):	~7	Shape:	sloped	(~ 45°)	Stability:	Stable
	Left Bank Height (m):	~5	Shape:	sloped	(~ 45°)	Stability :	Stable
Substr	ate		Habit	at Typ	e		
Substra	te Type (%)		Habita	t Compo	sition (%	(0)	
	Fines	10		Pool	-		
	Small Gravel	-		Flat	-		
	Large Gravel	25		Run	-		
	Cobble	60		Riffle	100		
	Boulder	5					
Cover	Types					Riparian	
			US	DS			
Total C	over Available (%)		25	25		Riparian Vegetation	Гуре (Y/N)
	Cover Composition (%	of Total)				Moss	-
	Large Woody D	ebris	-	-		Grasses/Sedges	Y
	Overhanging Ve	egetation	38	38		Shrubs	Y
	Instream Vegeta	ation	2	2		Conifers	Y
	Pool		-	-		Deciduous	-
	Boulder		-	-		Mixed Forest	-
	Undercut Bank		-	-			
	Surface Turbule	ence	60	60		Canopy Cover (%)	0
	ater Quality Dat	a					
+ Wa			10.0			DO(mg/L)	7 37
+ Wa	Surface Temp (°C):		18.9				
+ Wa	Surface Temp (°C): Specific Conductance (1	uS/cm):	18.9			pH:	6.72
+ Wa	Surface Temp (°C): Specific Conductance (µ TDS (g/L):	uS/cm):	18.9 119 0.08			pH: Turbidity (NTU):	6.72 221

+ Fish Habitat Potential	Spawning	Rearing/Feeding	Overwintering
Large-Bodied Fish:	Moderate	Low	Low
Small-Bodied Fish:	Low	Low	Low

Impediments to Migration: Rapids approximately 250 m downstream Fish Presence: lake whitefish, longnose sucker, northern pike, walleye, white sucker (Johnson and Barth 2007); small unidentified minnows observed at ROW area during survey

+ Fish and Fish Habitat Sensitivity

Sensitivity Rating: Moderate-High

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Photo 1. View of crossing at Site 32.





Photo 3. 50 m downstream of Site 32 looking downstream.



Photo 4. Upstream view of Site 32.



Butnau River Diversion Channel

Location

Datum:	NAD 83				
UTM:	Zone: Easting: Northing:	15V 386938 6241622			
Location Depicted Below:					

Seneral Morphology

Gen. Description:	Man-made channel
Pattern:	Straight
Confinement:	Confined
Stage:	High
Flow Regime:	Perennial
U/S Drainage:	853 km ²
Receiving Water/Dist.:	Kettle River/3.3 km





Ph	nysical Data	Sur	vey Date:	24 July 2009)	
Chan	<u>nel Profile</u>					
Chann	el and Flow		Water	Depths (m)		
	Channel Width (m)	10-13		Max		
n 1	Wetted Width (m)	12.5-15		Avg		
Banks	Right Bank Height (m):	~5	Shape	sloped (s. 15°)	Stability	Stable
	Left Bank Height (m):	<5	Shape.	sloped (~ 45°) sloped (~ 45°)	Stability ·	Stable
	Leit Dank Height (III).		Shape.	sloped (* +5)	Stability.	Stuble
Subst	rate		Habita	at Type		
Substr	ate Type (%)		Habita	t Composition (%	%)	
	Fines	94		Pool -	,	
	Small Gravel	5		Flat -		
	Large Gravel	-		Run 100		
	Cobble	1		Riffle -		
	Boulder	-				
Cove	r Tynes				Rinarian	
					Tupullull	
			US	DS		
Total (Cover Available (%)		US 5	DS 5	Riparian Vegetation	Type (Y/N)
Total (Cover Available (%)	of Total)	US 5	DS 5	Riparian Vegetation	Type (Y/N)
Total (Cover Available (%) Cover Composition (%	of Total) ebris	US 5	DS 5	Riparian Vegetation ' Moss Grasses/Sedges	Type (Y/N) - Y
Total (Cover Available (%) Cover Composition (% Large Woody D Overhanging Ve	of Total) ebris	US 5	DS 5 - 50	Riparian Vegetation Moss Grasses/Sedges Shrubs	Type (Y/N) - Y Y
Total (Cover Available (%) Cover Composition (% Large Woody D Overhanging Ve Instream Vegeta	of Total) ebris egetation ution	US 5	DS 5 - 50 50	Riparian Vegetation Moss Grasses/Sedges Shrubs Conifers	Type (Y/N) - Y Y Y Y
Total (Cover Available (%) Cover Composition (% Large Woody D Overhanging Ve Instream Vegeta Pool	of Total) ebris egetation ttion	US 5 50 50	DS 5	Riparian Vegetation Moss Grasses/Sedges Shrubs Conifers Deciduous	Type (Y/N) - Y Y Y Y -
Total (Cover Available (%) Cover Composition (% Large Woody D Overhanging Ve Instream Vegeta Pool Boulder	of Total) ebris egetation ttion	US 5 50 50 -	DS 5 50 50 -	Riparian Vegetation Moss Grasses/Sedges Shrubs Conifers Deciduous Mixed Forest	Type (Y/N) - Y Y Y - -
Total (Cover Available (%) Cover Composition (% Large Woody D Overhanging Ve Instream Vegeta Pool Boulder Undercut Bank	of Total) ebris egetation ttion	US 5 50 50 - -	DS 5 50 - - -	Riparian Vegetation Moss Grasses/Sedges Shrubs Conifers Deciduous Mixed Forest	Type (Y/N) - Y Y Y - -
Total (Cover Available (%) Cover Composition (% Large Woody D Overhanging Ve Instream Vegeta Pool Boulder Undercut Bank Surface Turbule	of Total) ebris egetation ttion	US 5 50 50 - - -	DS 5 50 50 - - - -	Riparian Vegetation Moss Grasses/Sedges Shrubs Conifers Deciduous Mixed Forest Canopy Cover (%)	Type (Y/N) - Y Y Y 0
Fotal (Cover Available (%) Cover Composition (% Large Woody D Overhanging Ve Instream Vegeta Pool Boulder Undercut Bank Surface Turbule	of Total) ebris egetation ition	US 5 50 50 - - -	DS 5 50 - - - -	Riparian Vegetation Moss Grasses/Sedges Shrubs Conifers Deciduous Mixed Forest Canopy Cover (%)	Type (Y/N) - Y Y Y - - 0
+ VV	Cover Available (%) Cover Composition (% Large Woody D Overhanging Ve Instream Vegeta Pool Boulder Undercut Bank Surface Turbule	of Total) ebris egetation ation	US 5 50 50 - - -	DS 5 50 - - - -	Riparian Vegetation ' Moss Grasses/Sedges Shrubs Conifers Deciduous Mixed Forest Canopy Cover (%)	Type (Y/N) - Y Y Y - - 0
+ W	Cover Available (%) Cover Composition (% Large Woody D Overhanging Ve Instream Vegeta Pool Boulder Undercut Bank Surface Turbule ater Quality Dat Surface Temp (°C):	of Total) ebris egetation ttion	US 5 50 50 - - - - - -	DS 5 50 50 - - - -	Riparian Vegetation ' Moss Grasses/Sedges Shrubs Conifers Deciduous Mixed Forest Canopy Cover (%)	Type (Y/N) - Y Y Y 0 6.76
+ VV	Cover Available (%) Cover Composition (% Large Woody D Overhanging Ve Instream Vegeta Pool Boulder Undercut Bank Surface Turbule ater Quality Dat Surface Temp (°C): Specific Conductance (p	of Total) ebris egetation ttion nce a	US 5 50 50 - - - - - - - - - - - - - - - -	DS 5 50 50 - - -	Riparian Vegetation ' Moss Grasses/Sedges Shrubs Conifers Deciduous Mixed Forest Canopy Cover (%) DO (mg/L): pH:	Type (Y/N) - Y Y Y 0 6.76 6.61
Total (Cover Available (%) Cover Composition (% Large Woody D Overhanging Ve Instream Vegeta Pool Boulder Undercut Bank Surface Turbule ater Quality Dat Surface Temp (°C): Specific Conductance (p TDS (g/L):	of Total) ebris egetation ition nce a iS/cm):	US 5 50 50 - - - - - - - - - - - - - - - -	DS 5 50 - - - -	Riparian Vegetation ' Moss Grasses/Sedges Shrubs Conifers Deciduous Mixed Forest Canopy Cover (%) DO (mg/L): pH: Turbidity (NTU):	Type (Y/N) - Y Y Y 0 6.76 6.61 166

+ Fish Habitat Potential	Spawning	Rearing/Feeding	Overwintering
Large-Bodied Fish:	Low	Low	Low-Moderate
Small-Bodied Fish:	Low	Low	Low-Moderate

Impediments to Migration: None observed

Fish Presence: lake whitefish, longnose sucker, northern pike, walleye, white sucker (Johnson and Barth 2007)

+ Fish and Fish Habitat Sensitivity

Sensitivity Rating: Moderate

Manitoba Hydro: Keeyask Transmission Project Watercourse Crossing Assessment: Site 33 – Butnau River Diversion Channel Page 2 of 3





Photo 1. Site 33 crossing looking towards right bank.



Photo 2. Upstream view of Site 33.



Photo 3. Downstream view of Site 33.



Photo 4. 100 m upstream of Site 33; looking upstream.



Butnau River

Location

Datum:	NAD 83					
UTM:	Zone: Easting: Northing:	15V 383494 6241310				
Location Depicted Below:						

🕥 General Morphology

Gen. Description:	Small river
Pattern:	Irregular meander
Confinement:	Confined
Stage:	High
Flow Regime:	Perennial
U/S Drainage:	680 km^2
Receiving Water/Dist.:	Kettle River/11.5 km





Site	e Conditions								
+ Ph	ysical Data	Ş	Survey Da	ate: 2	4 Ju	ly 2009			
<u>Chann</u> Channo Banks	nel Profile el and Flow Channel Width (m) Wetted Width (m)	9-11 11-12	W٤	ater Dej M A	pths (lax. vg.	m) - -			
	Right Bank Height (m): Left Bank Height (m):	< 2 m < 2 m	Sha Sha	ape: sl ape: sl	oped oped	(< 35°) (< 35°)		Stability: Stability :	Stable Stable
<u>Substr</u> Substra	rate ate Type (%) Fines Small Gravel Large Gravel Cobble Boulder	100 - - -	Ha Ha	<mark>abitat '</mark> bitat C P(F] R R R	Type omperiod ool lat un iffle	<u>e</u> sition (% - - 100 -	6)		
<u>Cover</u> Total C	<u>• Types</u> Cover Available (%)		US 5	D 5	S		<u>Riparian</u> Riparian Vegeta	tion Type	(Y/N)
	Cover Composition (% Large Woody D Overhanging Ve Instream Vegeta Pool Boulder Undercut Bank Surface Turbule	of Total) ebris egetation ttion	5 45 50 - - - -	5 45 50 - - -	5		Moss Grasses/Sedges Shrubs Conifers Deciduous Mixed Forest Canopy Cover (%	- - Y Y - - 5) 0	7
+ Wa	ater Quality Dat Surface Temp (°C):	а	17.	7			DO (mg/L):	7	.37
	Specific Conductance (TDS (g/L): Salinity (ppt):	18/cm):	124 0.0 -	8			рн: Turbidity (NTU)): 2	63

+ Fish Habitat Potential	Spawning	Rearing/Feeding	Overwintering
Large-Bodied Fish:	Low	Moderate	Low
Small-Bodied Fish:	Low	Moderate	Low

Impediments to Migration: None observed

Fish Presence: lake whitefish, longnose sucker, northern pike, walleye, white sucker (Johnson and Barth 2007)

+ Fish and Fish Habitat Sensitivity

Sensitivity Rating: Moderate

Manitoba Hydro: Keeyask Transmission Project Watercourse Crossing Assessment: Site 35 – Butnau River Page 2 of 3







Photo 1. View of crossing at Site 35.

Photo 2. Downstream view of Site 35.



Photo 3. Upstream view of Site 35.



Photo 4. Downstream view of Site 35.

