APPENDIX A

WATERCOURSE SITE RECORDS

Watercourse (Site#): Goldbar Creek (WC1)
Legal Location: SW 28-52-23 W4M
UTM (Zone 12): 344933E, 5932486N
Environmental KP (as of September 2012): E1.8
Field Crew: E. Schneuker, J. Evans

Survey Date: July 25, 2012
Watercourse Class: Uncoded Mapped Class D
Restricted Activity Period: None
Habitat Survey Length: 300 m

CHANNEL AND FLOW CONDITIONS (No. of Transects: 8)	
Confinement	Occasionally confined
Channel Pattern	Sinuous
Bankfull Width (m): Mean, Range	1.1, 0.5-1.4
Wetted Width (m): Mean, Range	1.1, 0.7-1.6
Water Depth (m): Mean, Range	0.2, 0.1-0.3
Ordinary Highwater Mark (m): Mean, Range	0.2, 0.1-0.3
Discharge (m^3/s)	0.06
Stream Gradient (%)	1-3
Embeddedness	Highly embedded

CHANNEL AND FLOW CONDITIONS CONTINUED		
Beaver Dams	None	
Native Channel Width (m)	n/a	
BANK CONDITIONS	**LEFT BANK**	**RIGHT BANK**
Bank Shape	Vertical	Vertical
Bank Texture	Fines	Fines
Bank Height (m): Mean, Range	0.6, 0.3-0.8	0.6, 0.3-0.7
Grade of Approach Slopes (%)	<4	<4
Riparian Area Width (m)	5-10	5-10
Riparian Vegetation Type	Wetland	Wetland

SUBSTRATE	%
Organics	0
Fines (<2 mm)	74
Small Gravel (2-20 mm)	18
Large Gravel (21-65 mm)	7
Cobble (66-250 mm)	1
Boulder (>250 mm)	0

WATER QUALITY PARAMETERS	
Water Temperature (^oC)	17.3
pH	7.5
Dissolved Oxygen (mg/L)	5.1
Conductivity (µS/cm)	615
Turbidity (visual)	Clear

HABITAT	No.	Length (m)	%	Velocity (m/s)
Pool 1 (depth >1.00 m)	0	0	0	n/a
Pool 2 (depth 0.5-1.00 m)	2	15	5	n/r
Pool 3 (depth <0.5 m)	1	4	1	nr
Run 1 (>1.00 m)	0	0	0	n/a
Run 2 (0.5-1.00 m)	1	5	2	n/r
Run 3 (<0.5 m)	11	271	92	n/r
Flat 1 (>1.00 m)	0	0	0	n/a
Flat 2 (0.5-1.00 m)	0	0	0	n/a
Flat 3 (<0.5 m)	0	0	0	n/a
Riffle	0	0	0	n/a
Other	0	0	0	n/a
Other	0	0	0	n/a
Other	0	0	0	n/a

COVER TYPES	m^2
Boulders	0.0
Undercut Banks	3.0
Overhanging Vegetation	7.0
Woody Debris	3.0
Depth	0.0
Instream Vegetation	1.0
Other	0.0
Other	0.0
Other	0.0
Other	0.0
Other	0.0
TOTAL COVER	14.0
Stream Shading	21-40

FISH HABITAT POTENTIAL RATINGS

Species	Spawning	Rearing	Wintering	Migration
northern pike	Poor	Poor	Unsuitable	Suboptimal
walleye	Poor	Poor	Unsuitable	Suboptimal
white sucker	Fair	Fair	Unsuitable	Suboptimal
lake chub	Suboptimal	Suboptimal	Poor	Suboptimal

FISH SPECIES PRESENT	No. Captured	No. Observed	Fork Length (mm): Mean, Range
brook stickleback	1	0	45, n/a
fathead minnow	7	0	21, 20-29

FISH SPECIES PREVIOUSLY DOCUMENTED

Brook stickleback and fathead minnow previously documented approximately 900 m downstream of the proposed crossing, lake chub previously documented approximately 4 km downstream (AESRD 2012).

FISH SAMPLING EFFORT	
Sampling Method	Backpack electrofishing
Distance (m)	150
Time (seconds)	592
No. Captured	8
CPUE	1.4

ADDITIONAL HABITAT COMMENTS

Low approach slopes with flooded wetland on both sides of the proposed crossing. Cover consisting of dense vegetation along banks and undercut banks. Substrates consist predominantly of fines with small patches of small gravel throughout reach. The reach generally lacks larger substrate.

Crossing Method	DFO Regulatory Process	Risk to Fish/Fish Habitat
Recommended Pipeline Crossing Method		
Isolate if water present/open cut if dry or frozen to bottom	Notification	Covered under OS
Recommended Vehicle Crossing Method (Open Water)		
Clear span bridge	Notification	Covered under OS
Recommended Vehicle Crossing Method (Frozen)		
Snow fill/Ice bridge	Notification	Covered under OS

Notes: n/a not applicable, n/r not recorded, CPUE: Catch-per-unit-effort is the number of fish captured per 100 seconds of electrofishing effort.

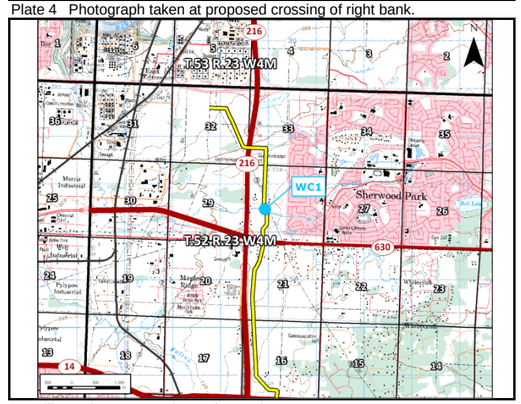
Plate 1 Photograph taken at proposed crossing looking upstream.

Plate 2 Photograph taken at proposed crossing looking downstream.

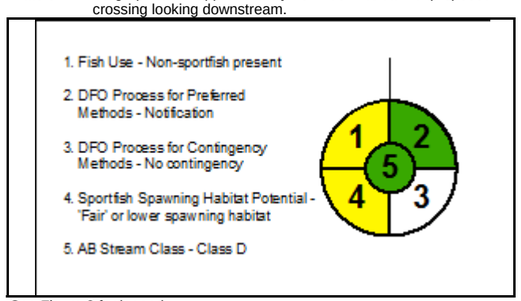
Plate 3 Photograph taken at proposed crossing of left bank.

Plate 4 Photograph taken at proposed crossing of right bank.

Plate 5 Photograph taken approximately 25 m downstream of proposed crossing looking downstream.



Map illustrating proposed crossing and watercourse.



See Figure 3 for legend

Edmonton to Hardisty Pipeline Project

Watercourse (Site#): Mill Creek (WC2)
Legal Location: SE 35-51-23 W4M
UTM (Zone 12): 349087E, 5924205N
Environmental KP (as of September 2012): E14.4
Field Crew: E. Schneuker, B. Edwards

Survey Date: July 18, 2012
Watercourse Class: Uncoded Mapped Class D
Restricted Activity Period: None
Habitat Survey Length: 600 m

CHANNEL AND FLOW CONDITIONS (No. of Transects: 8)	
Confinement	Unconfined
Channel Pattern	Meandering
Bankfull Width (m): Mean, Range	1.9, 1.2-2.4
Wetted Width (m): Mean, Range	6.5, 3.4-12.6
Water Depth (m): Mean, Range	0.9, 0.6-1.2
Ordinary Highwater Mark (m): Mean, Range	n/r (flood)
Discharge (m^3/s)	0.7
Stream Gradient (%)	1
Embeddedness	Low

CHANNEL AND FLOW CONDITIONS CONTINUED		
Beaver Dams	None	
Native Channel Width (m)	n/a	
BANK CONDITIONS	**LEFT BANK**	**RIGHT BANK**
Bank Shape	Vertical	Vertical
Bank Texture	Fines / Organics	Fines / Organics
Bank Height (m): Mean, Range	0.6, 0.3-0.9	0.6, 0.4-0.9
Grade of Approach Slopes (%)	<4	<4
Riparian Area Width (m)	5-10	5-10
Riparian Vegetation Type	Deciduous trees	Deciduous trees

SUBSTRATE	%
Organics	28
Fines (<2 mm)	51
Small Gravel (2-20 mm)	1
Large Gravel (21-65 mm)	10
Cobble (66-250 mm)	6
Boulder (>250 mm)	4

WATER QUALITY PARAMETERS	
Water Temperature (°C)	20.0
pH	7.3
Dissolved Oxygen (mg/L)	2.3
Conductivity (µS/cm)	577
Turbidity (visual)	Stained

HABITAT	No.	Length (m)	%	Velocity (m/s)
Pool 1 (depth >1.00 m)	0	0	0	n/a
Pool 2 (depth 0.5-1.00 m)	0	0	0	n/a
Pool 3 (depth <0.5 m)	0	0	0	n/a
Run 1 (>1.00 m)	1	2	1	0.3
Run 2 (0.5-1.00 m)	5	583	97	0.3
Run 3 (<0.5 m)	0	0	0	n/a
Flat 1 (>1.00 m)	0	0	0	n/a
Flat 2 (0.5-1.00 m)	0	0	0	n/a
Flat 3 (<0.5 m)	0	0	0	n/a
Riffle	0	0	0	n/a
Culvert	1	15	2	n/a
Other	0	0	0	n/a
Other	0	0	0	n/a

COVER TYPES	m²
Boulders	0.1
Undercut Banks	0.0
Overhanging Vegetation	2.4
Woody Debris	1.1
Depth	0.0
Instream Vegetation	2.1
Other	0.0
Other	0.0
Other	0.0
Other	0.0
Other	0.0
TOTAL COVER	5.7
Stream Shading	>90

FISH HABITAT POTENTIAL RATINGS

Species	Spawning	Rearing	Wintering	Migration
northern pike	Poor	Poor	Unsuitable	Suboptimal
walleye	Poor	Unsuitable	Unsuitable	Suboptimal
white sucker	Poor	Poor	Unsuitable	Suboptimal
lake chub	Fair	Fair	Poor	Suboptimal

FISH SPECIES PRESENT	No. Captured	No. Observed	Fork Length (mm): Mean, Range
brook stickleback	30	>25	56, 33-81
fathead minnow	19	>25	62, 51-80

FISH SPECIES PREVIOUSLY DOCUMENTED

Brook stickleback and fathead minnow previously documented 200 m downstream of the proposed crossing (AESRD 2012).

FISH SAMPLING EFFORT		
Sampling Method	Dipnet	Minnow Trapping
No. of nets/ No. of Traps	1	6
Time (seconds/hours)	n/a	32
No. Captured	9	40
CPUE	n/a	1.3

Crossing Method	DFO Regulatory Process	Risk to Fish/Fish Habitat
Recommended Pipeline Crossing Method		
Isolate if water present/open cut if dry or frozen to bottom	Notification	Covered under OS
Recommended Vehicle Crossing Method (Open Water)		
Clear span bridge	Notification	Covered under OS
Recommended Vehicle Crossing Method (Frozen)		
Snow fill/Ice bridge	Notification	Covered under OS

ADDITIONAL HABITAT COMMENTS

Crossing was flooded at time of assessment. At the proposed crossing, adequate shading by willows located within the riparian area. Poplar stands provides adequate shade downstream from the proposed crossing. Existing vehicle crossing with culvert located approximately 250 m downstream from the proposed crossing.

Notes: n/r: not recorded. n/a: not applicable. CPUE: Catch-per-unit-effort is the number of fish captured per one hour of minnow trapping effort.

Plate 1 Photograph taken at proposed crossing looking upstream.

Plate 2 Photograph taken at proposed crossing looking downstream.

Plate 3 Photograph taken at approximately 40 m downstream of the proposed crossing looking upstream.

Plate 4 Photograph taken at approximately 40 m downstream of the proposed crossing looking downstream.

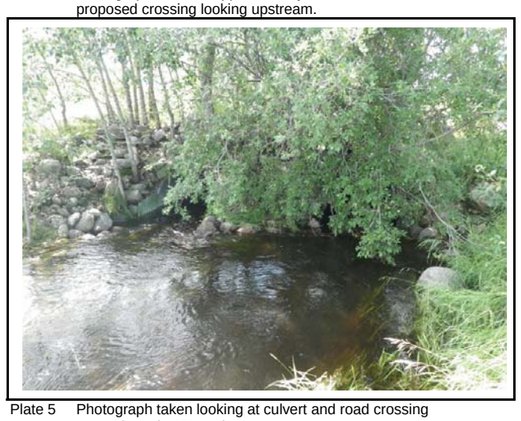
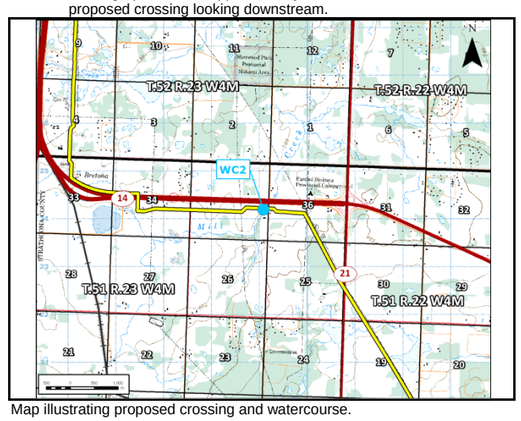
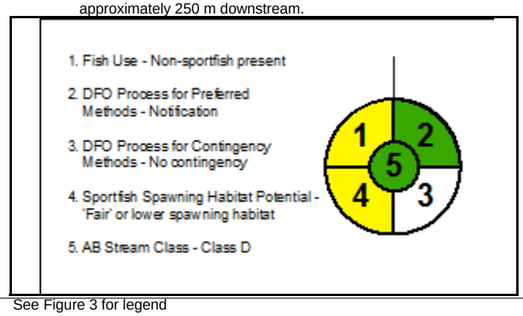


Plate 5 Photograph taken looking at culvert and road crossing approximately 250 m downstream.



Map illustrating proposed crossing and watercourse.



See Figure 3 for legend

Edmonton to Hardisty Pipeline Project

Watercourse (Site#): Irvine Creek (WC3)
Legal Location: SW 33-50-22 W4M
UTM (Zone 12): 356003E, 5914212N
Environmental KP (as of September 2012): 24.2
Field Crew: E. Schneuker, B. Edwards

Survey Date: July 21, 2012
Watercourse Class: Unmapped Class D
Restricted Activity Period: None
Habitat Survey Length: 300 m

CHANNEL AND FLOW CONDITIONS (No. of Transects: 8)	
Confinement	Unconfined
Channel Pattern	Straight
Bankfull Width (m): Mean, Range	4.9, 4.0-6.0
Wetted Width (m): Mean, Range	32.5, 1.8-150.0
Water Depth (m): Mean, Range	0.4, 0.1-0.6
Ordinary Highwater Mark (m): Mean, Range	n/r (flood)
Discharge (m^3/s)	Negligible
Stream Gradient (%)	0
Embeddedness	n/a

CHANNEL AND FLOW CONDITIONS CONTINUED		
Beaver Dams	None	
Native Channel Width (m)	n/a	
BANK CONDITIONS	**LEFT BANK**	**RIGHT BANK**
Bank Shape	Sloping	Sloping
Bank Texture	Fines	Fines
Bank Height (m): Mean, Range	0.4, n/a	0.4, n/a
Grade of Approach Slopes (%)	<4	<4
Riparian Area Width (m)	30-40	30-40
Riparian Vegetation Type	Wetland	Wetland

SUBSTRATE	%
Organics	43
Fines (<2 mm)	57
Small Gravel (2-20 mm)	0
Large Gravel (21-65 mm)	0
Cobble (66-250 mm)	0
Boulder (>250 mm)	0

WATER QUALITY PARAMETERS	
Water Temperature (^oC)	17.3
pH	6.9
Dissolved Oxygen (mg/L)	1.3
Conductivity (µS/cm)	293
Turbidity (visual)	Stained

HABITAT	No.	Length (m)	%	Velocity (m/s)
Pool 1 (depth >1.00 m)	0	0	0	n/a
Pool 2 (depth 0.5-1.00 m)	0	0	0	n/a
Pool 3 (depth <0.5 m)	0	0	0	n/a
Run 1 (>1.00 m)	0	0	0	n/a
Run 2 (0.5-1.00 m)	0	0	0	n/a
Run 3 (<0.5 m)	0	0	0	n/a
Flat 1 (>1.00 m)	0	0	0	n/a
Flat 2 (0.5-1.00 m)	0	0	0	n/a
Flat 3 (<0.5 m)	0	0	0	n/a
Riffle	0	0	0	n/a
Impoundment	2	270	86	n/a
Culvert	2	42	13	n/a
Other	0	0	0	n/a

COVER TYPES	m^2
Boulders	0.0
Undercut Banks	0.0
Overhanging Vegetation	0.0
Woody Debris	0.0
Depth	0.0
Instream Vegetation	10.0
Other	0.0
Other	0.0
Other	0.0
Other	0.0
Other	0.0
TOTAL COVER	10.0
Stream Shading	0%

FISH HABITAT POTENTIAL RATINGS				
Species	**Spawning**	**Rearing**	**Wintering**	**Migration**
northern pike	Unsuitable	Unsuitable	Unsuitable	Fair
walleye	Unsuitable	Unsuitable	Unsuitable	Fair
white sucker	Unsuitable	Unsuitable	Unsuitable	Fair
lake chub	Poor	Poor	Poor	Fair

FISH SPECIES PRESENT	No. Captured	No. Observed	Fork Length (mm): Mean, Range
No fish captured or observed	0	0	n/a

FISH SPECIES PREVIOUSLY DOCUMENTED

No fish previously documented at the proposed crossing or in Irvine Creek (AESRD 2012). The following fish species have been previously documented in Blackmud Creek: white sucker; longnose sucker; longnose dace; lake chub; fathead minnow; and brook stickleback (AESRD 2012).

FISH SAMPLING EFFORT		
Sampling Method	Backpack Electrofishing	Minnow Trapping
Distance (m)/ No. of Traps	200	5
Time (seconds/hours)	663	18
No. Captured	0	0
CPUE	0	0

ADDITIONAL HABITAT COMMENTS

Watercourse was flooded at the time of assessment with multiple marshy areas exceeding the normal high water mark. Braided, undefined channel upstream and downstream of proposed by via excavated channels. There is a culvert vehicle crossing approximately 25 m upstream of the proposed crossing at the proposed crossing and also several culverts downstream of the proposed crossing.

Crossing Method	DFO Regulatory Process	Risk to Fish/Fish Habitat
Recommended Pipeline Crossing Method		
Isolate if water present/open cut if dry or frozen to bottom	Notification	Covered under OS
Recommended Vehicle Crossing Method (Open Water)		
Clear span bridge	Notification	Covered under OS
Recommended Vehicle Crossing Method (Frozen)		
Snow fill/Ice bridge	Notification	Covered under OS

Notes: n/r: not recorded. n/a: not applicable. CPUE: Catch-per-unit-effort is the number of fish captured per 100 seconds of electrofishing effort or the number of fish captured per one hour of minnow trapping effort.

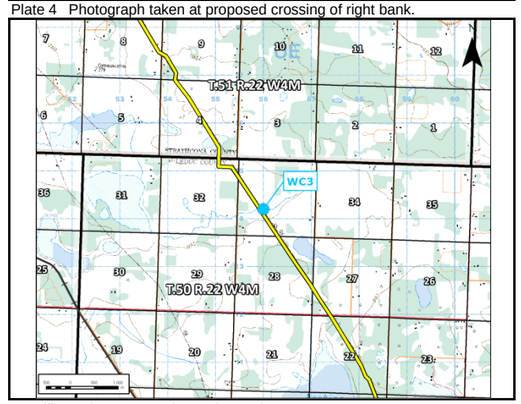
Plate 1 Photograph taken at proposed crossing looking upstream.

Plate 2 Photograph taken at proposed crossing looking downstream.

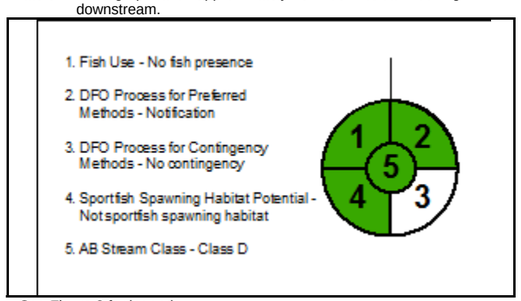
Plate 3 Photograph taken at proposed crossing of left bank.

Plate 4 Photograph taken at proposed crossing of right bank.

Plate 5 Photograph taken approximately 25 m downstream looking downstream.



Map illustrating proposed crossing and watercourse.



See Figure 3 for legend

Edmonton to Hardisty Pipeline Project

Watercourse (Site#): Unnamed Ditch (WC4)
Legal Location: NW 31-46-16 W4M
UTM (Zone 12): 411778E, 5874974N
Environmental KP (as of September 2012): 94.1
Field Crew: E. Schneuker, B. Edwards

Survey Date: July 16, 2012
Watercourse Class: Unmapped Class D
Restricted Activity Period: n/a
Habitat Survey Length: 500 m

CHANNEL AND FLOW CONDITIONS (No. of Transects: 7)	
Confinement	Entrenched
Channel Pattern	Sinuous
Bankfull Width (m): Mean, Range	2.8, 2.3 – 3.3
Wetted Width (m): Mean, Range	2.1, 1.3 – 2.5
Water Depth (m): Mean, Range	0.2, 0.1 – 0.5
Ordinary Highwater Mark (m): Mean, Range	0.5, 0.3 – 0.7
Discharge (m^3/s)	Negligible
Stream Gradient (%)	0
Embeddedness	n/a

CHANNEL AND FLOW CONDITIONS CONTINUED		
Beaver Dams	None	
Native Channel Width (m)	n/a	
BANK CONDITIONS	**LEFT BANK**	**RIGHT BANK**
Bank Shape	Sloping	Sloping
Bank Texture	Fines / Organics	Fines / Organics
Mean Bank Height (m)	0.8, 0.7 – 1.0	0.8, 0.7 – 0.9
Grade of Approach Slopes (%)	<4	<4
Riparian Area Width (m)	5 – 10	5 - 10
Riparian Vegetation Type	Cultivated Field	Cultivated Field

SUBSTRATE	%
Organics	46
Fines (<2 mm)	54
Small Gravel (2-20 mm)	0
Large Gravel (21-65 mm)	0
Cobble (66-250 mm)	0
Boulder (>250 mm)	0

WATER QUALITY PARAMETERS	
Water Temperature (°C)	21.8
pH	7.4
Dissolved Oxygen (mg/L)	4.4
Conductivity (µS/cm)	587
Turbidity (visual)	Stained

HABITAT	No.	Length (m)	%	Velocity (m/s)
Pool 1 (depth >1.00 m)	0	0	0	n/a
Pool 2 (depth 0.5-1.00 m)	0	0	0	n/a
Pool 3 (depth <0.5 m)	0	0	0	n/a
Run 1 (>1.00 m)	0	0	0	n/a
Run 2 (0.5-1.00 m)	0	0	0	n/a
Run 3 (<0.5 m)	0	0	0	n/a
Flat 1 (>1.00 m)	0	0	0	n/a
Flat 2 (0.5-1.00 m)	0	0	0	n/a
Flat 3 (<0.5 m)	1	470	98	0
Riffle	0	0	0	n/a
Dry	1	10	2	0
Other	0	0	0	n/a
Other	0	0	0	n/a

COVER TYPES	m^2
Boulders	0
Undercut Banks	0
Overhanging Vegetation	0
Woody Debris	0
Depth	0
Instream Vegetation	40
Other	0
Other	0
Other	0
Other	0
Other	0
TOTAL COVER	40
Stream Shading	0

FISH HABITAT POTENTIAL RATINGS

Species	Spawning	Rearing	Wintering	Migration
All sportfish species that may occur	Unsuitable	Unsuitable	Unsuitable	Poor

FISH SPECIES PRESENT	No. Captured	No. Observed	Fork Length (mm): Mean, Range
brook stickleback	22	0	58, 45 - 68

FISH SPECIES PREVIOUSLY DOCUMENTED

No fish previously documented at proposed crossing or downstream (AESRD 2012).

FISH SAMPLING EFFORT	
Sampling Method	Minnow Trapping
Distance (m)/ No. of Traps	6
Time (seconds/hours)	30
No. Captured	22
CPUE	0.7

ADDITIONAL HABITAT COMMENTS

Channelized ditch through cultivated canola field. Dense instream vegetation consisting primarily of sedges. Culvert and vehicle crossing approximately 400 m downstream of proposed crossing.

Crossing Method	DFO Regulatory Process	Risk to Fish/Fish Habitat
Recommended Pipeline Crossing Method		
Isolate if water present/open cut if dry or frozen to bottom	Notification	Covered under OS
Recommended Vehicle Crossing Method (Open Water)		
Clear span bridge	Notification	Covered under OS
Recommended Vehicle Crossing Method (Frozen)		
Snow fill/ice bridge	Notification	Covered under OS

Notes: n/r: not recorded. n/a: not applicable. CPUE: Catch-per-unit-effort is the number of fish captured per 100 seconds of electrofishing effort or the number of fish captured per one hour of minnow trapping effort.

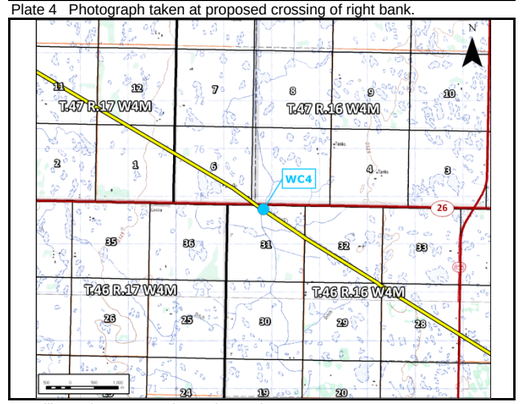
Plate 1 Photograph taken at proposed crossing looking upstream.

Plate 2 Photograph taken at proposed crossing looking downstream.

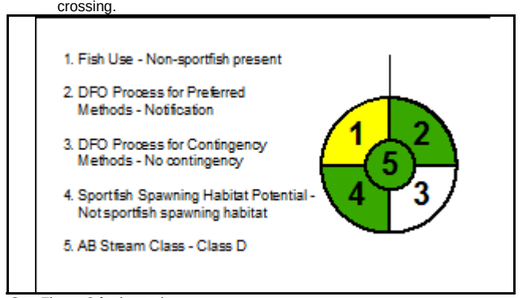
Plate 3 Photograph taken at proposed crossing of left bank.

Plate 4 Photograph taken at proposed crossing of right bank.

Plate 5 Culvert at vehicle crossing approximately 400 m south of proposed crossing.



Map illustrating proposed crossing and watercourse.



See Figure 3 for legend

Edmonton to Hardisty Pipeline Project

Watercourse (Site#): Unnamed tributary to Iron Creek (WC5)
Legal Location: NW 26-44-13, W4M
UTM (Zone 12): 447153E, 5853340N
Environmental KP (as of September 2012): 135.6
Field Crew: E. Schneuker, B. Edwards

Survey Date: July 22, 2012
Watercourse Class: Mapped Class D
Restricted Activity Period: n/a
Habitat Survey Length: 500 m

CHANNEL AND FLOW CONDITIONS (No. of Transects: 8)	
Confinement	Unconfined
Channel Pattern	Irregular meandering
Bankfull Width (m): Mean, Range	1.0, 0.1 – 0.1
Wetted Width (m): Mean, Range	16.3, 3.4-41.0
Water Depth (m): Mean, Range	0.4, 0.26 – 0.49
Ordinary Highwater Mark (m): Mean, Range	n/a (flooded)
Discharge (m^3/s)	0.02
Stream Gradient (%)	0
Embeddedness	n/a

CHANNEL AND FLOW CONDITIONS CONTINUED		
Beaver Dams	No	
Native Channel Width (m)	n/a	
BANK CONDITIONS	**LEFT BANK**	**RIGHT BANK**
Bank Shape	Sloping	Sloping
Bank Texture	Fines	Fines
Mean Bank Height (m)	0.4	0.4
Grade of Approach Slopes (%)	<4	<4
Riparian Area Width (m)	20-30	20-30
Riparian Vegetation Type	Wetland	Wetland

SUBSTRATE	%
Organics	33
Fines (<2 mm)	88
Small Gravel (2-20 mm)	0
Large Gravel (21-65 mm)	0
Cobble (66-250 mm)	0
Boulder (>250 mm)	0

WATER QUALITY PARAMETERS	
Water Temperature (^oC)	22.0
pH	7.8
Dissolved Oxygen (mg/L)	4.8
Conductivity (µS/cm)	1888
Turbidity (visual)	Stained

HABITAT	No.	Length (m)	%	Velocity (m/s)
Pool 1 (depth >1.00 m)	0	0	0	n/a
Pool 2 (depth 0.5-1.00 m)	0	0	0	n/a
Pool 3 (depth <0.5 m)	0	0	0	n/a
Run 1 (>1.00 m)	0	0	0	n/a
Run 2 (0.5-1.00 m)	0	0	0	n/a
Run 3 (<0.5 m)	1	160	32	0.06
Flat 1 (>1.00 m)	0	0	0	n/a
Flat 2 (0.5-1.00 m)	0	0	0	n/a
Flat 3 (<0.5 m)	0	0	0	n/a
Riffle	0	0	0	n/a
Impoundment	2	330	66	0.06
Road Crossing (Ford)	1	10	2	0.06
Other	0	0	0	n/a

COVER TYPES	m^2
Boulders	<1
Undercut Banks	0
Overhanging Vegetation	0
Woody Debris	0
Depth	0
Instream Vegetation	5
Other	0
Other	0
Other	0
Other	0
Other	0
TOTAL COVER	5.5
Stream Shading	0

FISH HABITAT POTENTIAL RATINGS				
Species	**Spawning**	**Rearing**	**Wintering**	**Migration**
northern pike	Unsuitable	Unsuitable	Unsuitable	Poor
walleye	Unsuitable	Unsuitable	Unsuitable	Poor
white sucker	Unsuitable	Unsuitable	Unsuitable	Poor
lake chub	Unsuitable	Poor	Poor	Poor

FISH SPECIES PRESENT	No. Captured	No. Observed	Fork Length (mm): Mean, Range
brook stickleback	60	10	48, 31-61

FISH SPECIES PREVIOUSLY DOCUMENTED

No fish previously documented at crossing. Fathead minnow, white sucker and brook stickleback have been previously documented in Iron Creek approximately 25 km downstream (AESRD 2012).

FISH SAMPLING EFFORT		
Sampling Method	Backpack Electrofishing	Minnow Trapping
Distance (m)/ No. of Traps	500	6
Time (seconds/hours)	1,376	18
No. Captured	14	46
CPUE	0.01	2.6

ADDITIONAL HABITAT COMMENTS

There are areas of non-defined channel and channel flows into a large impoundment downstream of the proposed crossing.

Crossing Method	DFO Regulatory Process	Risk to Fish/Fish Habitat
Recommended Pipeline Crossing Method		
Isolate if water present/ open cut if dry or frozen to bottom	Notification	Covered under OS
Recommended Vehicle Crossing Method (Open Water)		
Clear span bridge	Notification	Covered under OS
Recommended Vehicle Crossing Method (Frozen)		
Snow fill/Ice bridge	Notification	Covered under OS

Notes: n/r: not recorded. n/a: not applicable. CPUE: Catch-per-unit-effort is the number of fish captured per 100 seconds of electrofishing effort or the number of fish captured per one hour of minnow trapping effort.

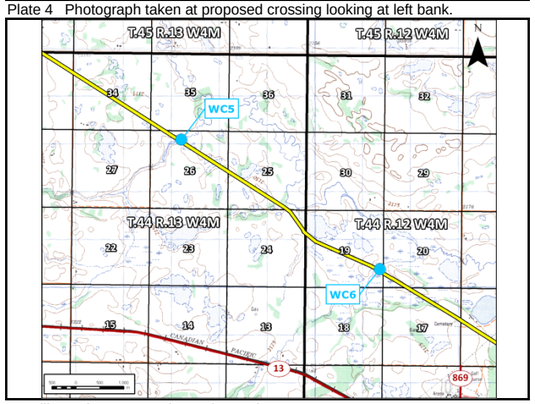
Plate 1 Photograph taken at proposed crossing looking upstream.

Plate 2 Photograph taken at proposed crossing looking downstream.

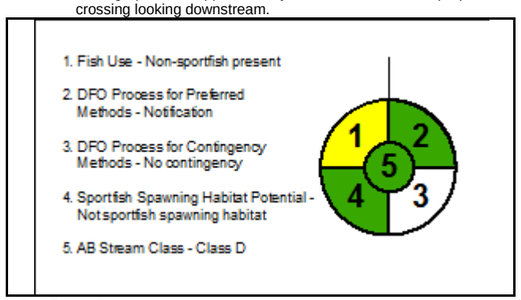
Plate 3 Photograph taken at proposed crossing looking at right bank.

Plate 4 Photograph taken at proposed crossing looking at left bank.

Plate 5 Photograph taken approximately 300 m downstream of proposed crossing looking downstream.



Map illustrating proposed crossing and watercourse.



See Figure 3 for legend

Edmonton to Hardisty Pipeline Project

Watercourse (Site#): Unnamed tributary to Iron Creek (WC6)
Legal Location: SE 19-44-12 W4M
UTM (Zone 12): 451297E, 5850627N
Environmental KP (as of September 2012): 140.6
Field Crew: E. Schneuker, J. Evans

Survey Date: July 27, 2012
Watercourse Class: Unmapped Class D
Restricted Activity Period: n/a
Habitat Survey Length: 300 m

CHANNEL AND FLOW CONDITIONS (No. of Transects: 8)	
Confinement	Unconfined
Channel Pattern	Sinuous
Bankfull Width (m): Mean, Range	0.9, 0.8-1.1
Wetted Width (m): Mean, Range	0.9, 0.8-1.1
Water Depth (m): Mean, Range	0.3, 0.1-0.5
Ordinary Highwater Mark (m): Mean, Range	0.6, 0.31-0.61
Discharge (m^3/s)	0.1
Stream Gradient (%)	1
Embeddedness	n/a

CHANNEL AND FLOW CONDITIONS CONTINUED		
Beaver Dams	Yes	
Native Channel Width (m)	0.9	
BANK CONDITIONS	**LEFT BANK**	**RIGHT BANK**
Bank Shape	Vertical	Sloping
Bank Texture	Fines	Fines
Mean Bank Height (m)	0.5	0.6
Grade of Approach Slopes (%)	<4	<4
Riparian Area Width (m)	40-50	40-50
Riparian Vegetation Type	Wetland	Wetland

SUBSTRATE	%
Organics	0
Fines (<2 mm)	100
Small Gravel (2-20 mm)	0
Large Gravel (21-65 mm)	0
Cobble (66-250 mm)	0
Boulder (>250 mm)	0

WATER QUALITY PARAMETERS	
Water Temperature (°C)	16.6
pH	8.0
Dissolved Oxygen (mg/L)	6.8
Conductivity (µS/cm)	835
Turbidity (visual)	Clear

HABITAT	No.	Length (m)	%	Velocity (m/s)
Pool 1 (depth >1.00 m)	0	0	0	n/a
Pool 2 (depth 0.5-1.00 m)	0	0	0	n/a
Pool 3 (depth <0.5 m)	0	0	0	n/a
Run 1 (>1.00 m)	0	0	0	n/a
Run 2 (0.5-1.00 m)	2	6	3	0.47
Run 3 (<0.5 m)	7	184	92	0.47
Flat 1 (>1.00 m)	0	0	0	n/a
Flat 2 (0.5-1.00 m)	0	0	0	n/a
Flat 3 (<0.5 m)	0	0	0	n/a
Riffle	0	0	0	n/a
Impoundment	1	10	5	0
Road Crossing (Ford)	0	0	0	n/a
Other	0	0	0	n/a

COVER TYPES	%
Boulders	0
Undercut Banks	0
Overhanging Vegetation	0
Woody Debris	0
Depth	0
Instream Vegetation	15
Other	0
Other	0
Other	0
Other	0
Other	0
TOTAL COVER	15
Stream Shading	0

FISH HABITAT POTENTIAL RATINGS				
Species	**Spawning**	**Rearing**	**Wintering**	**Migration**
All sportfish species that may occur	Unsuitable	Poor	Unsuitable	Fair
lake chub	Unsuitable	Poor	Unsuitable	Fair

FISH SPECIES PRESENT	No. Captured	No. Observed	Fork Length (mm): Mean, Range
brook stickleback	0	2	n/a

FISH SPECIES PREVIOUSLY DOCUMENTED

Brook stickleback previously documented at crossing. Fathead minnow, white sucker and brook stickleback have been previously documented in Iron Creek approximately 20 km downstream (AERSD 2012).

FISH SAMPLING EFFORT		
Sampling Method	No sampling since site not on Fish Research License	
Distance (m)/ No. of Traps	n/a	n/a
Time (seconds/hours)	n/a	n/a
No. Captured	n/a	n/a
CPUE	n/a	n/a

ADDITIONAL HABITAT COMMENTS

Flow at this watercourse originates from the outflow of an upstream wetland. Large colonies of algae cover the water surface, providing cover, and numerous fish were observed throughout the downstream reach. There is beaver activity upstream of the proposed crossing, including both a large lodge and partially breached beaver dam.

Crossing Method	DFO Regulatory Process	Risk to Fish/Fish Habitat
Recommended Pipeline Crossing Method		
Isolate if water present/open cut if dry or frozen to bottom	Notification	Covered under OS
Recommended Vehicle Crossing Method (Open Water)		
Clear span bridge	Notification	Covered under OS
Recommended Vehicle Crossing Method (Frozen)		
Snow fill/ice bridge	Notification	Covered under OS

Notes: n/r: not recorded. n/a: not applicable. CPUE: Catch-per-unit-effort is the number of fish captured per 100 seconds of electrofishing effort or the number of fish captured per one hour of minnow trapping effort.

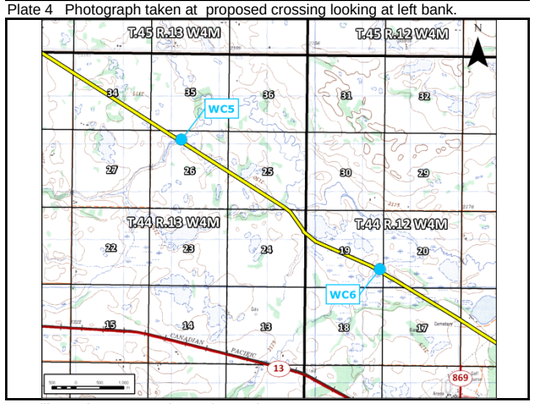
Plate 1 Photograph taken at proposed crossing looking upstream.

Plate 2 Photograph taken at proposed crossing looking downstream.

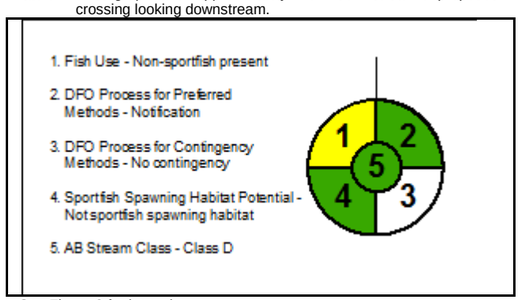
Plate 3 Photograph taken at proposed crossing looking at right bank.

Plate 4 Photograph taken at proposed crossing looking at left bank.

Plate 5 Photograph taken approximately 125 m downstream of proposed crossing looking downstream.



Map illustrating proposed crossing and watercourse.



See Figure 3 for legend

Edmonton to Hardisty Pipeline Project

Watercourse (Site#): Battle River (WC7)
Legal Location: NE 25-42-10, W4M
UTM (Zone 12): 479339E, 5833485N
Environmental KP (as of September 2012): 173.6
Field Crew: E. Schneuker, J. Evans, B. Edwards

Survey Date: July 23, 2012
Watercourse Class: Mapped Class C
Restricted Activity Period: April 16 to June 30
Habitat Survey Length: 500 m

CHANNEL AND FLOW CONDITIONS (No. of Transects: 8)	
Confinement	Frequently confined
Channel Pattern	Straight
Bankfull Width (m): Mean, Range	20.6, 17.3 – 23.8
Wetted Width (m): Mean, Range	19.6, 17.0 – 22.0
Water Depth (m): Mean, Range	0.8, 0.64 – 1.05
Ordinary Highwater Mark (m): Mean, Range	0.7, 0.5 – 0.8
Discharge (m^3/s)	4.4
Stream Gradient (%)	1
Embeddedness	n/a

CHANNEL AND FLOW CONDITIONS CONTINUED		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
BANK CONDITIONS	**LEFT BANK**	**RIGHT BANK**
Bank Shape	Vertical	Vertical
Bank Texture	Fines	Fines
Mean Bank Height (m)	3.5	3.6
Grade of Approach Slopes (%)	4 – 14	<4
Riparian Area Width (m)	10 – 20	10 – 20
Riparian Vegetation Type	Shrubs	Shrubs

SUBSTRATE	%
Organics	0
Fines (<2 mm)	99
Small Gravel (2-20 mm)	0
Large Gravel (21-65 mm)	0
Cobble (66-250 mm)	<1
Boulder (>250 mm)	<1

WATER QUALITY PARAMETERS	
Water Temperature (°C)	23.5
pH	8.3
Dissolved Oxygen (mg/L)	5.8
Conductivity (µS/cm)	668
Turbidity (visual)	Turbid

HABITAT	No.	Length (m)	%	Velocity (m/s)
Pool 1 (depth >1.00 m)	1	5	1	n/r
Pool 2 (depth 0.5-1.00 m)	0	0	0	n/a
Pool 3 (depth <0.5 m)	0	0	0	n/a
Run 1 (>1.00 m)	0	395	66	n/r
Run 2 (0.5-1.00 m)	4	200	33	n/r
Run 3 (<0.5 m)	0	0	0	n/a
Flat 1 (>1.00 m)	0	0	0	n/a
Flat 2 (0.5-1.00 m)	0	0	0	n/a
Flat 3 (<0.5 m)	0	0	0	n/a
Riffle	0	0	0	n/a
Other	0	0	0	n/a
Other	0	0	0	n/a
Other	0	0	0	n/a

COVER TYPES	%
Boulders	0
Undercut Banks	0
Overhanging Vegetation	5
Woody Debris	0
Depth	30
Instream Vegetation	0
Other	0
Other	0
Other	0
Other	0
Other	0
TOTAL COVER	35
Stream Shading	1 - 20

FISH HABITAT POTENTIAL RATINGS				
Species	**Spawning**	**Rearing**	**Wintering**	**Migration**
northern pike	Poor	Poor	Poor	Optimal
walleye	Fair	Suboptimal	Fair	Optimal
goldeye	Fair	Fair	Fair	Optimal
white sucker	Poor	Poor	Suboptimal	Optimal
lake chub	Poor	Poor	Suboptimal	Optimal

FISH SPECIES PRESENT	No. Captured	No. Observed	Fork Length (mm): Mean, Range
lake chub	7	0	77, 25 – 95
longnose sucker	1	0	75, n/a
white sucker	3	0	285, 41 – 450
trout-perch	4	0	64, 40 – 75
unidentified large-bodied fish	0	3	n/a

FISH SPECIES PREVIOUSLY DOCUMENTED

the following fish species have been previously documented in the Battle River within approximately 20 km upstream and downstream of the proposed crossing: northern pike; goldeye; walleye; longnose dace; lake chub; shorthead redhorse; white sucker; and trout-perch (AESRD 2012).

FISH SAMPLING EFFORT		
Sampling Method	Float Electrofishing	Minnow Trapping
Distance (m)/ No. of Traps	1,000	6
Time (seconds/hours)	1,330	108
No. Captured	12	3
CPUE	0.01	0.03

ADDITIONAL HABITAT COMMENTS

Laminar flow throughout reach dominated by fine substrates. Little cover throughout the river, with steep vertical banks. Flood signs apparent 100 m upstream from the proposed crossing. Recent beaver activity noted with a partially constructed dam at 300 m downstream.

Crossing Method	DFO Regulatory Process	Risk to Fish/Fish Habitat
Recommended Pipeline Crossing Method		
Trenchless	Notification	Covered under OS
Recommended Contingency Pipeline Crossing Method		
Isolation	Case-specific review	Low
Recommended Vehicle Crossing Method (Open Water)		
Clear span bridge	Notification	Covered under OS
Recommended Vehicle Crossing Method (Frozen)		
Snow fill/ice bridge	Notification	Covered under OS

Notes: n/r: not recorded. n/a: not applicable. CPUE: Catch-per-unit-effort is the number of fish captured per 100 seconds of electrofishing effort or the number of fish captured per one hour of minnow trapping effort.

Plate 1 Photograph taken at proposed crossing looking upstream.

Plate 2 Photograph taken at proposed crossing looking downstream.

Plate 3 Photograph taken at proposed crossing of left bank.

Plate 4 Photograph taken at proposed crossing of right bank.

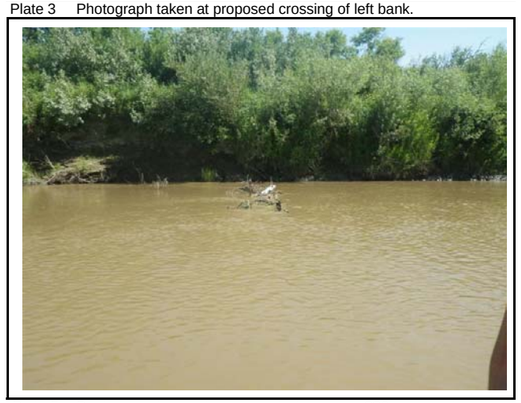
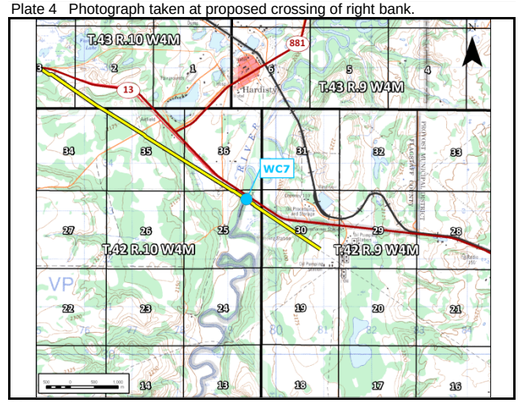
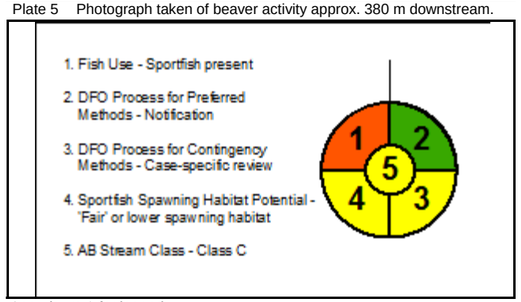


Plate 5 Photograph taken of beaver activity approx. 380 m downstream.



Map illustrating proposed crossing and watercourse.



See Figure 3 for legend

Edmonton to Hardisty Pipeline Project

APPENDIX B

FISH-BEARING WETLAND SITE RECORDS

Wetland (Site#): Fish-bearing wetland (FD1)
Legal Location: SW 18-46-15 W4M
UTM (Zone 12): 421308E, 5869022N
Environmental KP (as of September 2012): 105.3
Field Crew: E. Schneuker, B. Edwards

Survey Date: July 19, 2012
Watercourse Class: n/a
Restricted Activity Period: n/a
Habitat Survey Length: n/a

CHANNEL AND FLOW CONDITIONS (No. of Transects: 8)	
Confinement	n/a
Channel Pattern	n/a
Bankfull Width (m): Mean, Range	n/r
Wetted Width (m): Mean, Range	150
Water Depth (m): Mean, Range	>1.5
Ordinary Highwater Mark (m): Mean, Range	n/r
Discharge (m^3/s)	n/a
Stream Gradient (%)	0
Embeddedness	n/a

CHANNEL AND FLOW CONDITIONS CONTINUED		
Beaver Dams	No	
Native Channel Width (m)	n/a	
BANK CONDITIONS	**LEFT BANK**	**RIGHT BANK**
Bank Shape	Sloping	Sloping
Bank Texture	Fines	Fines
Mean Bank Height (m)	n/a	n/a
Grade of Approach Slopes (%)	<4	<4
Riparian Area Width (m)	5-10	5-10
Riparian Vegetation Type	Wetland	Wetland

SUBSTRATE	%
Organics	20
Fines (<2 mm)	80
Small Gravel (2-20 mm)	0
Large Gravel (21-65 mm)	0
Cobble (66-250 mm)	0
Boulder (>250 mm)	0

WATER QUALITY PARAMETERS	
Water Temperature (°C)	23.8
pH	10.0
Dissolved Oxygen (mg/L)	8.8
Conductivity (µS/cm)	1,140
Turbidity (visual)	Stained

HABITAT	No.	Length (m)	%	Velocity (m/s)
Pool 1 (depth >1.00 m)	0	0	0	n/a
Pool 2 (depth 0.5-1.00 m)	0	0	0	n/a
Pool 3 (depth <0.5 m)	0	0	0	n/a
Run 1 (>1.00 m)	0	0	0	n/a
Run 2 (0.5-1.00 m)	0	0	0	n/a
Run 3 (<0.5 m)	0	0	0	n/a
Flat 1 (>1.00 m)	0	0	0	n/a
Flat 2 (0.5-1.00 m)	0	0	0	n/a
Flat 3 (<0.5 m)	0	0	0	n/a
Riffle	0	0	0	n/a
Culvert	0	0	0	n/a
Other	0	0	0	n/a
Other	0	0	0	n/a

COVER TYPES	%
Boulders	<1
Undercut Banks	0
Overhanging Vegetation	0
Woody Debris	0
Depth	20
Instream Vegetation	50
Other	0
Other	0
Other	0
Other	0
Other	0
TOTAL COVER	70
Stream Shading	0

FISH HABITAT POTENTIAL RATINGS				
Species	**Spawning**	**Rearing**	**Overwintering**	**Migration**
All sportfish species that may occur	Unsuitable	Unsuitable	Poor	Unsuitable
lake chub	Poor	Poor	Poor	Unsuitable
brook stickleback	Fair	Fair	Poor	Unsuitable

FISH SPECIES PRESENT	No. Captured	No. Observed	Fork Length (mm): Mean, Range
Brook stickleback	15	>50	38, 25-50

FISH SPECIES PREVIOUSLY DOCUMENTED

No previously documented fish at the proposed crossing (AESRD 2012).

FISH SAMPLING EFFORT		
Sampling Method	Backpack Electrofishing	Minnow Trapping
Distance (m)/ No. of Traps	400	6
Time (seconds/hours)	900	36
No. Captured	15	2
CPUE	1.7	0.06

ADDITIONAL HABITAT COMMENTS

Waterbody approximately 150 m wide at proposed crossing. Water is heavily overgrown with aquatic vegetation and algae. Some areas have depth and open water; some wave action. Soft sediment and water depth prevented field crews from accessing deeper reaches and max depths are estimated. A second (smaller) wetland is located immediately to the south of the larger waterbody, and is isolated by a berm.

Crossing Method	DFO Regulatory Process	Risk to Fish/Fish Habitat
Recommended Pipeline Crossing Method		
Isolate if water present/open cut if dry or frozen to bottom	Notification	Covered under OS
Recommended Vehicle Crossing Method (Frozen)		
Snowfill/ice bridge	Notification	Covered under OS
Recommended Vehicle Crossing Method (Open Water)		
Access from both sides	n/a	n/a

Notes: n/a not applicable, n/r not recorded, CPUE: Catch-per-unit-effort is the number of fish captured per 100 seconds of electrofishing or per minnow trap hour.

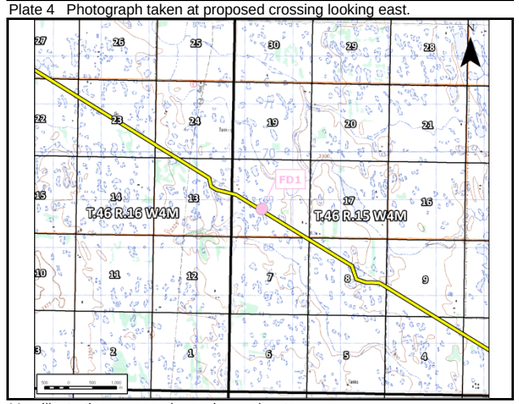
Plate 1 Photograph taken at proposed crossing looking north.

Plate 2 Photograph taken at proposed crossing looking north.

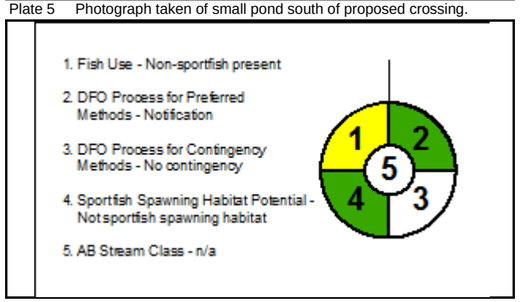
Plate 3 Photograph taken at proposed crossing looking northeast.

Plate 4 Photograph taken at proposed crossing looking east.

Plate 5 Photograph taken of small pond south of proposed crossing.



Map illustrating proposed crossing and watercourse



See Figure 3 for legend

Edmonton to Hardisty Pipeline Project

Wetland (Site#): Fish-bearing wetland (FD2)
Legal Location: NW 3-43-10 W4M
UTM (Zone 12): 474739E, 5836448N
Environmental KP (as of September 2012): 168.1
Field Crew: E. Schneuker, B. Edwards

Survey Date: July 22, 2012
Watercourse Class: n/a
Restricted Activity Period: n/a
Habitat Survey Length: n/a

CHANNEL AND FLOW CONDITIONS (No. of Transects: 8)	
Confinement	n/a
Channel Pattern	n/a
Bankfull Width (m): Mean, Range	n/r
Wetted Width (m): Mean, Range	95
Water Depth (m): Mean, Range	>1.0
Ordinary Highwater Mark (m): Mean, Range	n/r
Discharge (m^3/s)	n/a
Stream Gradient (%)	0
Embeddedness	n/a

CHANNEL AND FLOW CONDITIONS CONTINUED		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
BANK CONDITIONS	**LEFT BANK**	**RIGHT BANK**
Bank Shape	Sloping	Sloping
Bank Texture	Fines	Fines
Mean Bank Height (m)	n/a	n/a
Grade of Approach Slopes (%)	<4	<4
Riparian Area Width (m)	10-20	20-30
Riparian Vegetation Type	Wetland, Grasses	Wetland, Grasses

SUBSTRATE	%
Organics	0
Fines (<2 mm)	100
Small Gravel (2-20 mm)	0
Large Gravel (21-65 mm)	0
Cobble (66-250 mm)	0
Boulder (>250 mm)	0

WATER QUALITY PARAMETERS	
Water Temperature (^oC)	26.3
pH	8.4
Dissolved Oxygen (mg/L)	3.7
Conductivity (µS/cm)	1,335
Turbidity (visual)	Stained

HABITAT	No.	Length (m)	%	Velocity (m/s)
Pool 1 (depth >1.00 m)	0	0	0	n/a
Pool 2 (depth 0.5-1.00 m)	0	0	0	n/a
Pool 3 (depth <0.5 m)	0	0	0	n/a
Run 1 (>1.00 m)	0	0	0	n/a
Run 2 (0.5-1.00 m)	0	0	0	n/a
Run 3 (<0.5 m)	0	0	0	n/a
Flat 1 (>1.00 m)	0	0	0	n/a
Flat 2 (0.5-1.00 m)	0	0	0	n/a
Flat 3 (<0.5 m)	0	0	0	n/a
Riffle	0	0	0	n/a
Culvert	0	0	0	n/a
Other	0	0	0	n/a
Other	0	0	0	n/a

COVER TYPES	%
Boulders	0
Undercut Banks	0
Overhanging Vegetation	5
Woody Debris	5
Depth	10
Instream Vegetation	25
Other	0
Other	0
Other	0
Other	0
Other	0
TOTAL COVER	45
Stream Shading	0

FISH HABITAT POTENTIAL RATINGS				
Species	**Spawning**	**Rearing**	**Overwintering**	**Migration**
All sportfish species	Unsuitable	Unsuitable	Poor	Unsuitable
lake chub	Poor	Poor	Poor	Unsuitable
brook stickleback	Fair	Fair	Poor	Unsuitable

FISH SPECIES PRESENT	No. Captured	No. Observed	Fork Length (mm): Mean, Range
brook stickleback	389	0	60, 48-75
lake chub	1	0	57, n/a

FISH SPECIES PREVIOUSLY DOCUMENTED

No fish previously documented at the proposed crossing (AESRD 2012).

FISH SAMPLING EFFORT	
Sampling Method	Minnow Trapping
Distance (m)/ No. of Traps	5
Time (seconds/hours)	128
No. Captured	390
CPUE	3.1

ADDITIONAL HABITAT COMMENTS

Waterbody approximately 95 m wide at proposed crossing. Water is heavily overgrown with aquatic vegetation and algae. Some areas have depth and open water. Soft sediment and water depth prevented field crews from accessing deeper reaches for habitat assessment and fish sampling, maximum depths are estimated. Multiple beaver dams are established upstream, downstream and directly parallel to the proposed right of way at centre line.

Crossing Method	DFO Regulatory Process	Risk to Fish/Fish Habitat
Recommended Pipeline Crossing Method		
Isolate if water present/open cut if dry or frozen to bottom	Notification	Covered under OS
Recommended Vehicle Crossing Method (Frozen)		
Snowfill/ice bridge	Notification	Covered under OS
Recommended Vehicle Crossing Method (Open Water)		
Access from both sides	n/a	n/a

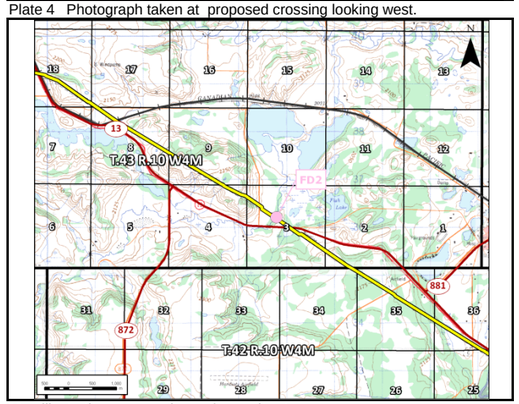
Notes: n/a not applicable, n/r not recorded, CPUE: Catch-per-unit-effort is the number of fish captured per 100 seconds of electrofishing or per minnow trap hour.

Plate 1 Photograph taken at proposed crossing looking north.

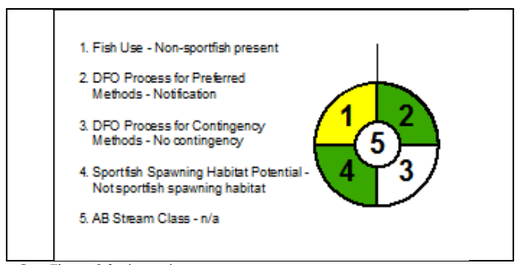
Plate 2 Photograph taken at proposed crossing looking south.

Plate 3 Photograph taken at proposed crossing looking east.

Plate 4 Photograph taken at proposed crossing looking west.



Map illustrating proposed crossing and watercourse



See Figure 3 for legend

Edmonton to Hardisty Pipeline Project