APPENDIX C

GUIDELINES FOR ALTERNATIVE SOIL HANDLING PROCEDURES DURING PIPELINE CONSTRUCTION

(After: APESC, June 1996)

CRITERIA FOR ALTERNATIVE SOIL HANDLING PROCEDURES

The criteria in this section are not presented in any order of priority. Definitions and additional technical information are included in the appendices. Also, there is a soil handling procedure decision flow chart at the end of this section which may be helpful in applying the criteria.

Soil Handling Unit

The soil handling unit is the soil map unit. All units identified on a map with a particular symbol (soil map unit delineation) should be handled in the same manner.

Soil Handling Unit Length

A soil handling unit length is equivalent to one soil map unit delineation at a map scale of 1:10,000. Except for situations where there are strongly contrasting soils or topographic features (e.g., bedrock ridge, stream channels, pot holes) the soil handling length would normally be a minimum of 100 m. The minimum soil handling length and the minimum soil map unit size are assumed to be equal.

Soil Sampling Criteria for Problem Soil Management

Sufficient soil sampling (based on professional judgement) should be completed to determine if the map unit delineation should be considered for alternative soil handling. If problem soils are anticipated, there should be at least one sample every 400 m.

Additional soil investigation or sampling may be required at a later time to better define a problem soil area identified by the pedologist in the initial survey. If an alternative soil handling candidate map unit delineation is less than or equal to 400 m in length and there are no soil chemistry data for that unit, the entire map unit delineation should be considered for alternative soil handling.

Further soil investigation or sampling is suggested as necessary to reduce the length of alternative handling procedures as requested or suggested by the field pedologist.

Topsoil Thickness Criteria

For topsoil stripping, the average topsoil thickness in a map unit delineation must be between 10 cm and 35 cm, and must be of "better quality" than the upper subsoil. Actual stripping depths can be modified during construction by on-site inspection. Again, special situations might suggest consideration of < 10 cm.

Upper Subsoil Thickness Criteria

The average thickness of the upper subsoil of the soil map must be greater than 15 cm before separate subsoil lift handling is considered.

Maximum aggregate thickness of topsoil and upper subsoil to be separately handled is 50 cm. Therefore, the maximum amount of upper subsoil to be separately salvaged is 40 cm. This limit is set to allow for better planning of right-of-way width requirements.

Actual stripping depths can be modified during construction by on-site inspection.

Stone or Gravel Content (Coarse Fragments) Criteria

Alternate soil handling procedures will be considered when the upper subsoil is non-gravelly or non-stony material and:

i) the lower subsoil (50 cm to trench depth) has a coarse fragment (> 2 mm in diameter) content of >35% if gravelly and > 20% if cobbly (See Agriculture Canada 1987 for details),
ii) consolidated bedrock is encountered that would break into hard fragments with trenching.

Sodic Bedrock Criteria

Alternate soil handling procedures will be considered when the upper subsoil has an electrical conductivity (EC) of less than 8 dS/m and the lower subsoil includes sodic bedrock which, by definition, has a SAR greater than 15.

Subsoil Salinity

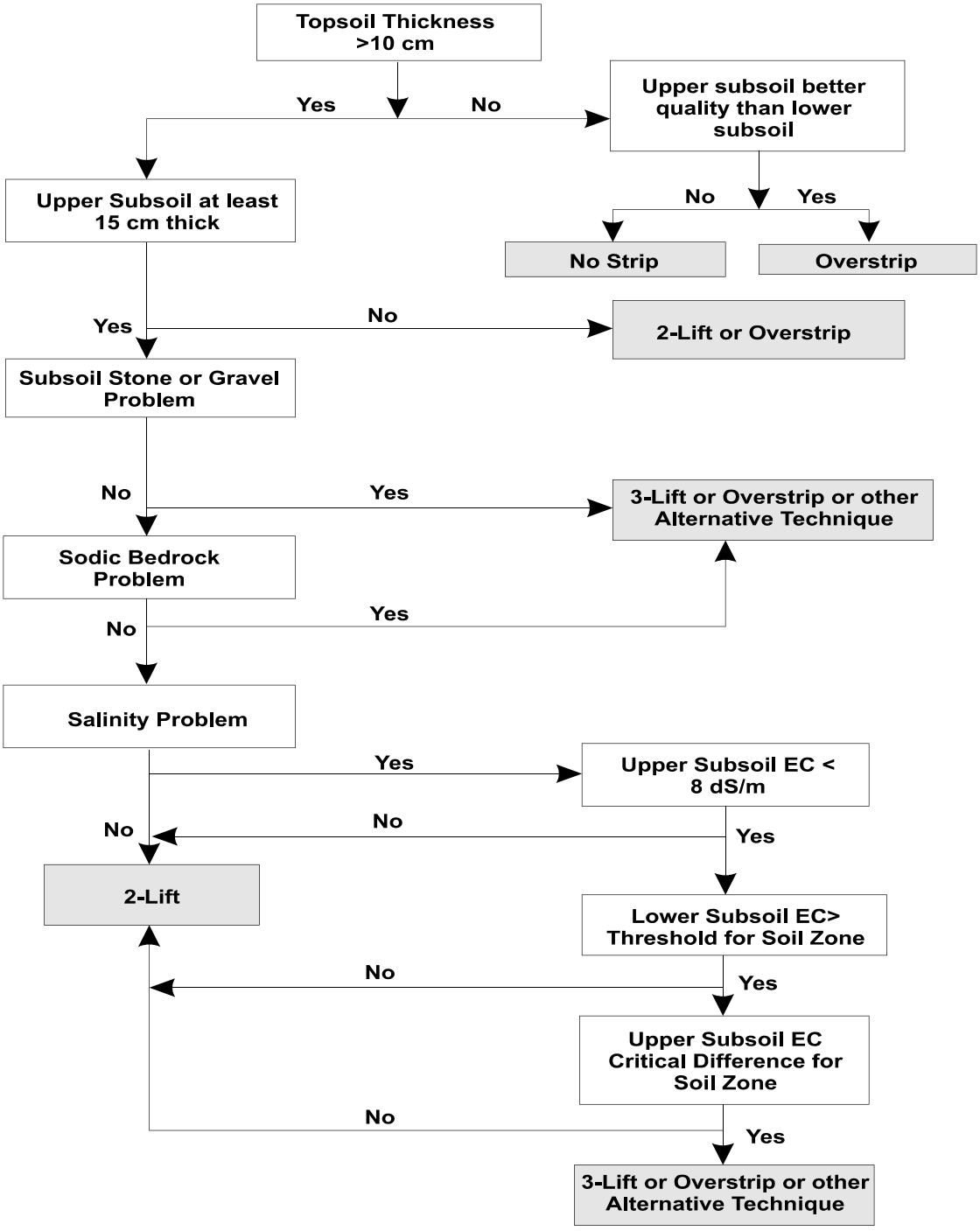
As a general guide for identifying problem areas and to avoid those areas with a minor amount of lower subsoil that meets the chemistry criteria identified in Section 5.9, alternative soil handling procedures should be considered when: lower subsoil with an EC of greater than 10 dS/m occupies 50% or more by depth of the material below 50 cm to trench depth. These numbers should not be taken as definitive but rather to alert the assessor of potential problems. Also, this criterion should not be dealt with in isolation from other soil characteristics such as the presence of Bn or Bnt horizons.

Salinity Criteria for Three-Lift

Three-lift procedures should be considered when the upper subsoil has an EC of less than 8 dS/m and the following conditions for salinity are met:

i) pre-construction EC of the upper subsoil must be less than 8dS/m,
ii) Threshold EC of lower subsoil must be exceeded (see table), and
iii) critical difference EC (lower subsoil minus upper subsoil) must be greater than or equal to 4 dS/m

Soil Zone	Upper Subsoil EC (dS/m)	Lower Subsoil Threshold EC (dS/m)	Critical Difference EC (dS/m)
Brown	<8	>5	≥4
Dark Brown	<8	>6	≥4
Others	<8	>8	≥4



PROBLEM SOIL HANDLING PROCEDURE CHART

APPENDIX D

GUIDELINES FOR WIND AND WATER SOIL EROSION HAZARD RATINGS

Criteria for Evaluating Wind Soil Erosion Hazard in the Lloydminster Area*

Rating	Characteristics
Slightly to None (S)	All soils with SiCL or CL surface textures and containing at least 3 percent organic matter.
Moderate (M)	All soils with L or SiL surface textures and containing at least 3 percent organic matter.
High (H)	All soils with LS, S or SL surface textures and containing at least 3 percent organic matter.

Criteria for Evaluating Water Soil Erosion Hazard in the Lloydminster Area*

Rating	Characteristics
Slightly to None (S)	All soils with SiL and SiCL surface textures occurring on less than 5 percent slopes. All soils with L and SL surface textures occurring on less than 9 percent slopes. Little erosion can be expected with minimal disturbance. All poorly and very poorly drained soils on level and enclosed depressional positions of the landscape. No erosion can be expected; however, additions will occur if the surrounding upland is disturbed.
Moderate (M)	All soils with SiL and SiCL surface textures occurring on 5 to 9 percent slopes. All soils with L and SL surface textures occurring on 9 to 15 percent slopes. Rill erosion and some gullying can be expected.
High (H)	All soils with SiL and SiCL surface textures occurring on greater than 9 percent slopes. All soils with L and SL surface textures occurring on greater than 15 percent slopes. Extensive gullying can be expected when the protective vegetation is removed.

* These guidelines were developed by Al Twardy and are based on review of local literature, review of U.S.A. guidelines and practical experience.

APPENDIX E

LABORATORY RESULTS

MENTIGA PEDOLOGY CONSULTANTS LTD.
Al Twardy
#3, 9816 - 47 Avenue
Edmonton, AB
T6E 5P3

TEST REPORT SUPPLEMENTAL TO # 040510-4727
TEST REPORT #040511-4727
MAY 11, 2004

PROJECT NAME: BORDER CRUDE OIL PIPELINE EXPANSION FOE HUSKY ENERGY
P.O.# 03008

				Saturated Paste											
LAB #	SITE #	DEPTH cm	HORIZON	pH	E.C. mS/cm	SAT %	Na	K	CaMg	SAR	N	P	K	SO4	OM %
								mEq/L				ppm			
4727	1	19-75	Bm	6.6	0.67	53	0.8	0.09	6.8	0.4					
4728		75-160	Ck	7.8	0.52	56	1.6	0.09	4.0	1.1					
4729	3	0-27	Ap	6.0	0.63	54					6.4	4.0	109	<5.0	6.2*
4730		27-77	Bm	5.8	0.78	55	1.7	0.05	6.5	0.9					
4731		77-160	Ck	7.2	1.80	55	5.0	0.03	16.5	1.7					
4732	12	10-60	Bm	5.8	0.95	50	1.1	0.13	8.0	0.6					
4733		60-160	Csk	7.1	5.90	54	22.3	0.71	65.8	3.9					
4734	19	18-80	Btj	5.6	0.41	41	0.6	0.16	3.0	0.5					
4735		80-160	Ck	6.9	0.29	53	0.4	0.13	2.3	0.4					
4736	20	16-54	Bm	6.4	1.48	51	5.0	0.14	12.5	2.0					
4737		54-160	Csk	6.7	6.99	57	20.6	0.55	94.3	3.0					
4738	24	24-62	Bgj	7.0	0.61	41	0.5	0.15	5.8	0.3					
4739		62-160	Ckgj	7.4	1.05	54	1.4	0.25	10.0	0.6					
4740	28	68-160	Ck	7.6	0.66	53	1.0	0.07	6.0	0.6					
4741	29	54-110	Ck	7.7	7.46	52	28.5	0.68	91.0	4.2					
4742		110-160	Csk	7.7	7.28	51	28.4	0.67	88.0	4.3					

* DATA MISSING FROM PREVIOUS REPORT

FERTILIZER RECOMMENDATION (LB/ACRE) FOR NEW GRASS

N	P205	K20	SO4-S
105	35	-	5

METHOD REFERENCE: MANUAL ON SOIL SAMPLING AND METHODS OF ANALYSIS, 2ND EDITION 1978
J.A. McKEAGUE 3.21 SOLUBLE SALTS
3.26 SAR
3.14 pH

Report Authorized By: _____
Manager - Lab Services

Unless otherwise stated, all samples were received in good condition.
Test results are only representative of the samples submitted to the laboratory.

APPENDIX F

SOILS LEGEND

SOILS LEGEND

Soil Symbol	Soil Name	Soil Classification	Parent Material	Texture Class	Drainage Class
EOR	Elnora	Orthic Black Chernozem Eluviated Black Chernozem	till	loam to clay loam	well to moderately well
HGT	Haight	Rego Humic Gleysol Orthic Humic Gleysol	till	loam to clay loam	poorly

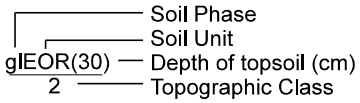
Miscellaneous Land Units:

DC	Drainage Channel	Poorly drained Gleysolic soils along intermittent drains
DD	Drainage Ditch	Person-made drainage ditch
DL	Disturbed Land	Land disturbed due to prior activities
IL	Industrial Land	Land used to store oildfield equipment
TB	Topsoil Berm	Area of stored topsoil

Soil Phases:

gl	gleyed	Soils that are imperfectly drained and exhibit mottling and gleying features in the subsoil.
sc	saline lower subsoil	Soils with a significantly higher level of salts in the lower subsoil than upper subsoil

NOTATIONS:



x 6 - Soil Inspection Site
(x) 12 - Soil Sampling Site

TOPOGRAPHY CLASSES:

1	-	0 - 0.5%	level
2	-	0.5 - 2%	nearly level
3	-	2 - 5%	very gentle slopes
4	-	6 - 9%	gentle slopes
5	-	10 - 15%	moderate slopes
6	-	16 - 30%	strong slopes

PRESENT LAND USE:

C	-	cultivated
DL	-	disturbed land
G	-	grass
H	-	hay
IL	-	industrial land
P	-	improved pasture

APPENDIX 1B

LAB RESULTS
FROM AREA OF POTENTIAL
CRUDE OIL CONTAMINATION

3650 - 21st STREET N.E.
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Certificate of Analysis

CLIENT NAME: TERA ENVIRONMENTAL CONSULTANTS (ALT

AGAT WORK ORDER 04E082182

ATTENTION: GORDON DUNN

Soil Analysis - Salinity

SAMPLE TYPE: soil
SAMPLE ID: 383368
SAMPLE DESCRIPTION: #9, A.T

DATE SAMPLED: May 05, 2004
DATE RECEIVED: May 06, 2004
DATE REPORTED: May 13, 2004

PARAMETER	RESULTS	UNITS	M.D.L.	DATE ANALYZED	INITIALS	DATE PREPARED
pH (Saturated Paste)	7.18		N/A	May 13, 2004	KT	May 12, 2004
Electrical Conductivity (Sat. Paste)	6.88	mS/cm	0.01	May 13, 2004	KT	May 12, 2004
Saturation Percentage	58.9	%	N/A	May 13, 2004	KT	May 12, 2004
Chloride, Soluble		mg/L	0.1	May 13, 2004	KK	May 13, 2004
Calcium, Soluble	465	mg/L	3	May 13, 2004	MG	May 13, 2004
Potassium, Soluble	10	mg/L	6	May 13, 2004	MG	May 13, 2004
Magnesium, Soluble	547	mg/L	2	May 13, 2004	MG	May 13, 2004
Sodium, Soluble	520	mg/L	6	May 13, 2004	MG	May 13, 2004
Sulfate, Soluble	3770	mg/L	9	May 13, 2004	MG	May 13, 2004
Sodium Adsorption Ratio	3.87					
Theoretical Gypsum Requirement	0	tonnes/ha				

COMMENTS:
M.D.L. - Method Detection Limit

Renette Garbutt

Certified By: Renette Garbutt, Analyst

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CLIENT NAME: TERA ENVIRONMENTAL CONSULTANTS (ALT

AGAT WORK ORDER 04E082182

ATTENTION: GORDON DUNN

Soil Analysis - Salinity

SAMPLE TYPE: soil
SAMPLE ID: 393516
SAMPLE DESCRIPTION: #10

DATE SAMPLED: May 05, 2004
DATE RECEIVED: May 06, 2004
DATE REPORTED: May 13, 2004

PARAMETER	RESULTS	UNITS	M.D.L.	DATE ANALYZED	INITIALS	DATE PREPARED
pH (Saturated Paste)	7.47		N/A	May 13, 2004	KT	May 12, 2004
Electrical Conductivity (Sat. Paste)	4.37	mS/cm	0.01	May 13, 2004	KT	May 12, 2004
Saturation Percentage	52.6	%	N/A	May 13, 2004	KT	May 12, 2004
Chloride, Soluble	82.4	mg/L	0.1	May 13, 2004	KK	May 13, 2004
Calcium, Soluble	175	mg/L	3	May 13, 2004	MG	May 13, 2004
Potassium, Soluble	<6	mg/L	6	May 13, 2004	MG	May 13, 2004
Magnesium, Soluble	132	mg/L	2	May 13, 2004	MG	May 13, 2004
Sodium, Soluble	516	mg/L	6	May 13, 2004	MG	May 13, 2004
Sulfate, Soluble	1780	mg/L	9	May 13, 2004	MG	May 13, 2004
Sodium Adsorption Ratio	7.17					
Theoretical Gypsum Requirement	0.42	tonnes/ha				

COMMENTS:
M.D.L. - Method Detection Limit

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AGAT WORK ORDER 04E082182

ATTENTION: GORDON DUNN

Soil Analysis - Salinity

SAMPLE TYPE: soil
SAMPLE ID: 393517
SAMPLE DESCRIPTION: #11

DATE SAMPLED: May 05, 2004
DATE RECEIVED: May 06, 2004
DATE REPORTED: May 13, 2004

PARAMETER	RESULTS	UNITS	M.D.L.	DATE ANALYZED	INITIALS	DATE PREPARED
pH (Saturated Paste)	7.22		N/A	May 13, 2004	KT	May 12, 2004
Electrical Conductivity (Sat. Paste)	2.31	mS/cm	0.01	May 13, 2004	KT	May 12, 2004
Saturation Percentage	56.9	%	N/A	May 13, 2004	KT	May 12, 2004
Chloride, Soluble	18.4	mg/L	0.1	May 13, 2004	KK	May 13, 2004
Calcium, Soluble	242	mg/L	3	May 13, 2004	MG	May 13, 2004
Potassium, Soluble	7	mg/L	6	May 13, 2004	MG	May 13, 2004
Magnesium, Soluble	101	mg/L	2	May 13, 2004	MG	May 13, 2004
Sodium, Soluble	90	mg/L	6	May 13, 2004	MG	May 13, 2004
Sulfate, Soluble	984	mg/L	9	May 13, 2004	MG	May 13, 2004
Sodium Adsorption Ratio	1.22					
Theoretical Gypsum Requirement	0	tonnes/ha				

COMMENTS:
M.D.L. - Method Detection Limit

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CLIENT NAME: TERA ENVIRONMENTAL CONSULTANTS (ALT

AGAT WORK ORDER 04E082182

ATTENTION: GORDON DUNN

CCME Petroleum Hydrocarbons in Soil (CWS)

SAMPLE TYPE: soil
SAMPLE ID: 353368
SAMPLE DESCRIPTION: AS A1

DATE SAMPLED: May 05, 2004
DATE RECEIVED: May 06, 2004
DATE REPORTED: May 13, 2004

PARAMETER	RESULTS	UNITS	M.D.L.	DATE ANALYZED	INITIALS	DATE PREPARED
Benzene	<0.005	mg/kg	0.005	May 07, 2004	MS	May 07, 2004
Toluene	<0.005	mg/kg	0.005	May 07, 2004	MS	May 07, 2004
Ethylbenzene	<0.005	mg/kg	0.005	May 07, 2004	MS	May 07, 2004
Xylenes	<0.005	mg/kg	0.005	May 07, 2004	MS	May 07, 2004
C6 - C10 (F1)	<1.4	mg/kg	1.4	May 07, 2004	MS	May 07, 2004
C6 - C10 (F1 minus BTEX)	<1.4	mg/kg	1.4			
C>10 - C16	<10	mg/kg	10	May 10, 2004	PG	May 07, 2004
C>16 - C34	40	mg/kg	10	May 10, 2004	PG	May 07, 2004
C>34 - C50	<10	mg/kg	10	May 10, 2004	PG	May 07, 2004
Gravimetric Heavy Hydrocarbons	N/A	mg/kg	1000			
Gravimetric Heavy Hydrocarbons - Silic	N/A	mg/kg	1000			
Moisture Content	16	%	1	May 10, 2004	PG	May 07, 2004

COMMENTS:

M.D.L. - Method Detection Limit
Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH (if requested) contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.

Amber Alderman

Certified By: Amber Alderman, Analyst

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CLIENT NAME: TERA ENVIRONMENTAL CONSULTANTS (ALT

AGAT WORK ORDER 04E082182

ATTENTION: GORDON DUNN

CCME Petroleum Hydrocarbons in Soil (CWS)

SAMPLE TYPE: SOIL
SAMPLE ID: 393516
SAMPLE DESCRIPTION: #10

DATE SAMPLED: May 05, 2004
DATE RECEIVED: May 06, 2004
DATE REPORTED: May 13, 2004

PARAMETER	RESULTS	UNITS	M.D.L.	DATE ANALYZED	INITIALS	DATE PREPARED
Benzene	<0.005	mg/kg	0.005	May 07, 2004	MS	May 07, 2004
Toluene	<0.005	mg/kg	0.005	May 07, 2004	MS	May 07, 2004
Ethylbenzene	<0.005	mg/kg	0.005	May 07, 2004	MS	May 07, 2004
Xylenes	<0.005	mg/kg	0.005	May 07, 2004	MS	May 07, 2004
C6 - C10 (F1)	<1.4	mg/kg	1.4	May 07, 2004	MS	May 07, 2004
C6 - C10 (F1 minus BTEX)	<1.4	mg/kg	1.4			
C>10 - C16	<10	mg/kg	10	May 10, 2004	PG	May 07, 2004
C>16 - C34	<10	mg/kg	10	May 10, 2004	PG	May 07, 2004
C>34 - C50	<10	mg/kg	10	May 10, 2004	PG	May 07, 2004
Gravimetric Heavy Hydrocarbons	N/A	mg/kg	1000			
Gravimetric Heavy Hydrocarbons - Silic	N/A	mg/kg	1000			
Moisture Content	15	%	1	May 10, 2004	PG	May 07, 2004

COMMENTS:

M.D.L. - Method Detection Limit
Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34
Gravimetric Heavy Hydrocarbons are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH (if requested) contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.

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AGAT WORK ORDER 04E082182

ATTENTION: GORDON DUNN

CCME Petroleum Hydrocarbons in Soil (CWS)

SAMPLE TYPE:	soil	**DATE SAMPLED:**	May 05, 2004
SAMPLE ID:	393517	**DATE RECEIVED:**	May 06, 2004
SAMPLE DESCRIPTION:	#11	**DATE REPORTED:**	May 13, 2004

PARAMETER	RESULTS	UNITS	M.D.L.	DATE ANALYZED	INITIALS	DATE PREPARED
Benzene	<0.005	mg/kg	0.005	May 07, 2004	MS	May 07, 2004
Toluene	<0.005	mg/kg	0.005	May 07, 2004	MS	May 07, 2004
Ethylbenzene	<0.005	mg/kg	0.005	May 07, 2004	MS	May 07, 2004
Xylenes	<0.005	mg/kg	0.005	May 07, 2004	MS	May 07, 2004
C6 - C10 (F1)	<1.4	mg/kg	1.4	May 07, 2004	MS	May 07, 2004
C5 - C10 (F1 minus BTEX)	<1.4	mg/kg	1.4			
C>10 - C16	<10	mg/kg	10	May 10, 2004	PG	May 07, 2004
C>16 - C34	30	mg/kg	10	May 10, 2004	PG	May 07, 2004
C>34 - C50	10	mg/kg	10	May 10, 2004	PG	May 07, 2004
Gravimetric Heavy Hydrocarbons	N/A	mg/kg	1000			
Gravimetric Heavy Hydrocarbons - Silic	N/A	mg/kg	1000			
Moisture Content	18	%	1	May 10, 2004	PG	May 07, 2004

COMMENTS:

M.D.L. - Method Detection Limit
Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH (if requested) contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.

Amber Alderman

Certified By: Amber Alderman, Analyst

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Quality Assurance

CLIENT NAME: TERA ENVIRONMENTAL CONSULTANTS (ALT

AGAT WORK ORDER 04E082182

ATTENTION TO: GORDON DUNN

Soil Analysis

RPT DATE: May 13, 2004

PARAMETER	Batch	Sample ID	DUPLICATE			REFERENCE MATERIAL				METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup. #1	Dup. #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Soil Analysis - Salinity															
pH (Saturated Paste)	112		7.18	7.15	0.3%	N/A	95%	90%	110%						
Electrical Conductivity (Sat. Paste) (mS/c	112		6.88	6.97	1.3%	< 0.01	105%	90%	110%						
Saturation Percentage (%)	112		58.9	60.9	3.3%	N/A									
Chloride, Soluble (mg/L)	2803				0.1%	< 0.1	102%	90%	110%				100%	90%	110%
Calcium, Soluble (mg/L)	4310				0.3%	< 3	101%	90%	110%				97%	75%	125%
Potassium, Soluble (mg/L)	4310				0.4%	< 6	96%	90%	110%				96%	75%	125%
Magnesium, Soluble (mg/L)	4310				0.0%	< 2	103%	90%	110%				101%	75%	125%
Sodium, Soluble (mg/L)	4310				0.0%	< 6	96%	90%	110%				96%	75%	125%
Sulfate, Soluble (mg/L)	4310				0.0%	< 9	98%	90%	110%				100%	75%	125%

Comments:
N/A: Not applicable

Certified By: Renette Garbutt

3650 - 21st STREET N.E.
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Quality Assurance

CLIENT NAME: TERA ENVIRONMENTAL CONSULTANTS (ALT

AGAT WORK ORDER 04E082162

ATTENTION TO: GORDON DUNN

Trace Organics Analysis

RPT DATE: May 13, 2004

PARAMETER	Batch	DUPLICATE Sample ID	Dup. #1	Dup. #2	RPD	REFERENCE MATERIAL Method Blank	Measured Value	Acceptable Limits Lower	Upper	METHOD BLANK SPIKE Recovery	Acceptable Limits Lower	Upper	MATRIX SPIKE Recovery	Acceptable Limits Lower	Upper
CCME Petroleum Hydrocarbons in Soil (CWS)															
Benzene (mg/kg)	1395				A	< 0.005	77%	70%	130%	97%	70%	130%	80%	70%	130%
Toluene (mg/kg)	1395				A	< 0.005	108%	70%	130%	111%	70%	130%	118%	70%	130%
Ethylbenzene (mg/kg)	1395				A	< 0.005	82%	70%	130%	94%	70%	130%	93%	70%	130%
Xylenes (mg/kg)	1395				A	< 0.005	89%	70%	130%	98%	70%	130%	99%	70%	130%
C6 - C10 (F1) (mg/kg)	1395				A	< 1.4	80%	70%	130%	81%	70%	130%	81%	70%	130%
C>10 - C16 (mg/kg)	1536				10.0%	< 10	98%	70%	130%	71%	70%	130%	93%	70%	130%
C>16 - C34 (mg/kg)	1536				11.0%	< 10	103%	70%	130%	80%	70%	130%	75%	70%	130%
C>34 - C50 (mg/kg)	1536				14.4%	< 10	95%	70%	130%	75%	70%	130%	83%	70%	130%

Certified By: Amber Alder

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Method Summary

CLIENT NAME: TERA ENVIRONMENTAL CONSULTANTS (A **AGAT WORK ORDER** 04E082182

ATTENTION TO: GORDON DUNN

PARAMETER	AGAT S.O.P.	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Parameters			
pH (Saturated Paste)	SOIL 150	McKeague 3.14	pH METER
Electrical Conductivity (Sat. Paste)	SOIL 180	McKeague 4.13/3.21	CONDUCTIVITY METER
Saturation Percentage	SOIL 140	McKeague 3.21	GRAVIMETRIC ANALYSIS
Chloride, Soluble	SOIL -190 & TEC-107	McKeague 3.21	ION CHROMATOGRAPH
Calcium, Soluble	SOIL -190 & INS 0103	McKeague 3.21/ EPA 6010	ICP
Potassium, Soluble	SOIL -190 & INS 0103	McKeague 3.21/ EPA 6010	ICP
Magnesium, Soluble	SOIL -190 & INS 0103	McKeague 3.21/ EPA 6010	ICP
Sodium, Soluble	SOIL -190 & INS 0103	McKeague 3.21/ EPA 6010	ICP
Sulfate, Soluble	SOIL -190 & INS 0103	McKeague 3.21/ EPA 6010	ICP
Trace Organics Parameters			
Benzene	TO 0340	EPA SW-846 5035/8260	GC / MS
Toluene	TO 0340	EPA SW-846 5035/8260	GC / MS
Ethylbenzene	TO 0340	EPA SW-846 5035/8260	GC / MS
Xylenes	TO 0340	EPA SW-846 5035/8260	GC / MS
C6 - C10 (F1)	TO-0510	CCME Tier 1 Method	GC / FID
C6 - C10 (F1 minus BTEX)	TO 0510	CCME Tier 1 Method	GC / FID
C>10 - C16	TO-0510	CCME Tier 1 Method	GC / FID
C>16 - C34	TO-0510	CCME Tier 1 Method	GC / FID
C>34 - C50	TO-0510	CCME Tier 1 Method	GC / FID
Gravimetric Heavy Hydrocarbons		CCME Tier 1 Method	GC / FID
Gravimetric Heavy Hydrocarbons - Silica Treated		CCME Tier 1 Method	GC / FID
Moisture Content			GRAVIMETRIC ANALYSIS

S.O.P - Standard Operating Procedure

E.2 Fish Population and Riverine Habitat Inventories of an Unnamed Tributary to Big Gully Creek, Saskatchewan. April 2004. Applied Aquatic Research Ltd.

FISH POPULATION AND RIVERINE HABITAT INVENTORIES OF AN UNNAMED TRIBUTARY TO BIG GULLY CREEK, SASKATCHEWAN

Husky Border Crude Oil Pipeline Expansion

Submitted to:

TERA Environmental Consultants.
Calgary, Alberta

As Agents for:

Husky Oil Limited
Calgary, Alberta

Submitted by:

Applied Aquatic Research Ltd.
Calgary, Alberta

April 2004
File: AAR04-44

FISH POPULATION AND RIVERINE HABITAT INVENTORIES OF AN UNNAMED TRIBUTARY TO BIG GULLY CREEK, SASKATCHEWAN

Husky Border Crude Oil Pipeline Expansion

Submitted to:

TERA Environmental Consultants.
Calgary, Alberta

As Agents for:

Husky Oil Limited
Calgary, Alberta

Submitted by:

A. Morton and T.D. Boag

Applied Aquatic Research Ltd.
Calgary, Alberta

April 2004
File: AAR04-44

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

LIST OF DRAWINGS

1.0 INTRODUCTION

1.1 Project Overview

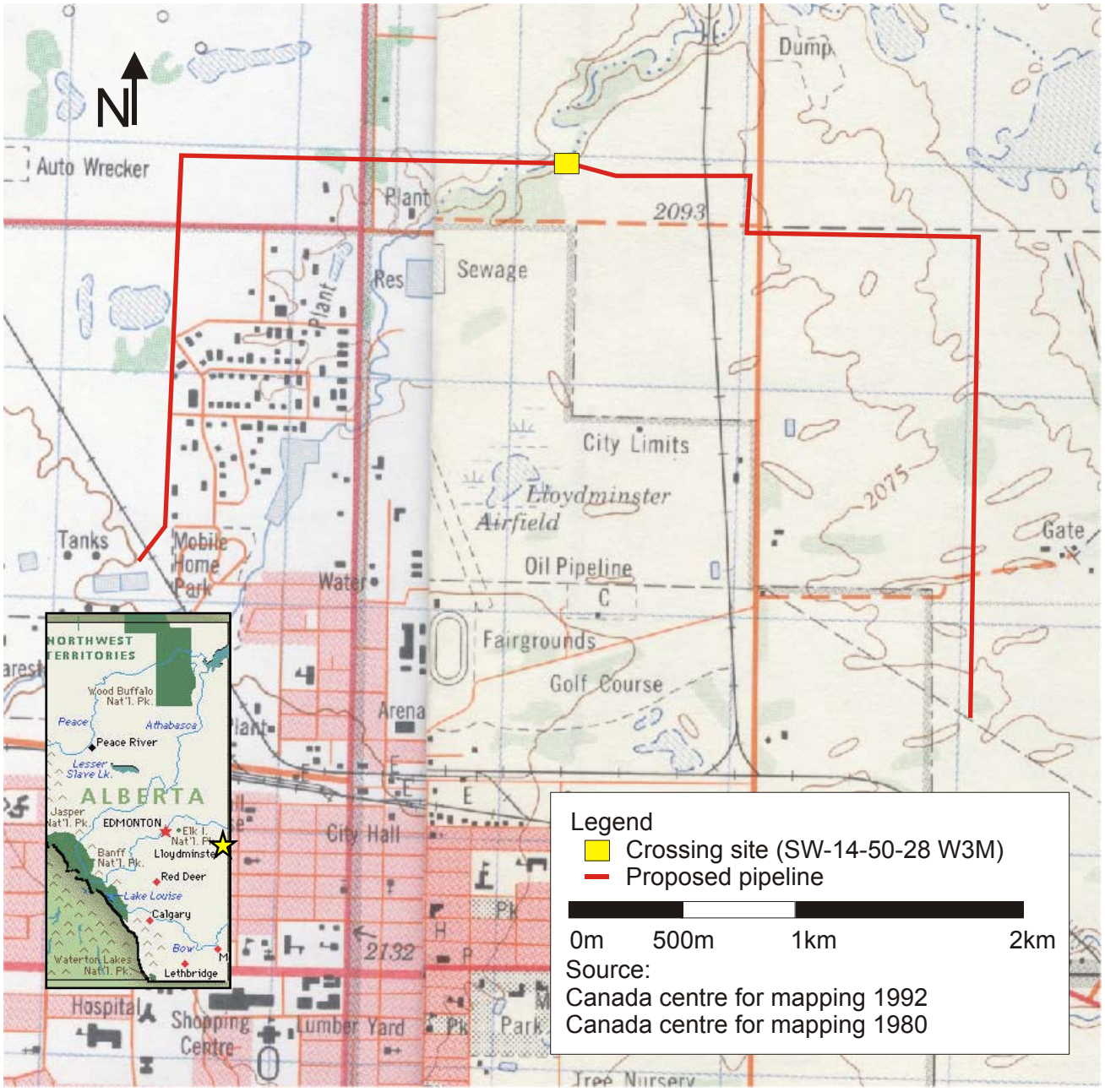
Husky Oil Limited (Husky) is applying to the National Energy Board (NEB) to construct the Border Crude Oil Pipeline Expansion (Border Expansion) between the Lloydminster Pipeline Terminal (14-01-50-01 W4M) and an existing Husky pipeline junction (the 'East Till Junction') in legal sub division 10-1-50-28 W3M (Figure 1). The proposed 508 mm O.D. pipeline is approximately 8 km long and crosses the Alberta/Saskatchewan border immediately north of the city of Lloydminister. The pipeline will cross one watercourse within SW-14-50-28 W3M in Saskatchewan. The location of the proposed pipeline crossing is directly adjacent to four existing Husky pipelines. Construction is currently scheduled to commence in the last quarter of 2004.

Pipeline watercourse crossings in Saskatchewan are regulated by Saskatchewan Environment (SENV) and Saskatchewan Watershed Authority Corp under the Environmental Assessment Act, Environmental Management and Protection Act 2002 (Water Regulations) and the Water Corporation Act (CPWCC 1999). SENV requires proponents to apply for a Shoreland Alteration Permit for all watercourse crossings which must include information on the fish species and watercourses that will be affected by the crossing (EMPA 2002). Permit applications must also include proposed measures to mitigate or prevent any potential effect of the activity proposed on aquatic and riparian habitats, including erosion and sediment control plans.

In addition to provincial requirements, the Federal *Fisheries Act* prohibits the destruction of fish, disruption of fish habitat, or deposition of deleterious substances into waters frequented by fish or that flow into waters frequented by fish (sections 32, 35 and 36 of the *Act*, respectively). It is important to recognize that only Fisheries and Oceans Canada (DFO) can determine whether the *Fisheries Act* has, or could be, contravened. However, it is the proponent's responsibility to provide sufficient data and information with respect to the watercourse such that DFO can issue a letter of advice stating whether violation of the *Fisheries Act* is likely to occur given the works proposed. If a violation is likely to occur, then the proponent must obtain Ministerial Authorization to proceed with the works and remain in compliance with the *Fisheries Act*.

Timing restrictions are intended to protect sensitive life-history stages of fishes (e.g. incubating eggs, spawning or migration of adults) and are imposed through a restricted activity period (RAP). Within Saskatchewan, RAP's are determined by the Department of Fisheries and Oceans Canada (DFO) and are presented in Table 1 (DFO 2004). If any of the indicated species are present, the watercourse must be crossed by a trenchless method when construction occurs inside the RAP. A trenchless crossing is a construction technique in which there is no disturbance of the bed and banks of a watercourse. Where construction plans do not conform to the DFO's guidelines, a proponent is required to undertake detailed fish population and aquatic habitat inventories at the crossing proposed. Results of inventory work are interpreted to provide recommendations which ensure that the quantity and productive capacity of the aquatic environment affected will not decrease during, or after, construction.

To meet Provincial and Federal regulatory requirements regarding the watercourse crossing by the Border Expansion pipeline, TERA Environmental Consultants (on behalf of Husky) retained



APPLIED AQUATIC RESEARCH Ltd.	**Husky Oil Limited Border Crude Oil Pipeline Expansion**
	Figure 1 Proposed pipeline and watercourse crossing location.
	AAR04-44 | March 2004

Applied Aquatic Research Ltd. (AAR) to investigate fish populations and their habitat at the SW-14 crossing along the proposed pipeline's alignment (Figure 1). Data collected about fish species composition, relative abundance and distribution, the nature and extent of riverine habitat and its potential to support individual species, and life-history stages gathered at the watercourse crossing will be used to comply with regulatory requirements for habitat protection.

TABLE 1
Restricted Activity Periods for Saskatchewan, South of Churchill River (DFO 2004)

Species in Watercourse	Closed Construction Timing Window
Spring spawners only[1]	16 April – 30 June
Fall spawners only[2]	15 October – 15 May
Fall and spring spawners	15 October – 30 June
Lake Trout (*Salvelinus namaycush*) present	Fall closure begins 15 September
Brook Trout (*S. fontinalis*) present	Fall closure begins 1 October
Lake Sturgeon (*Acipenser fulvescens)*	Extend spring closure to 15 July

1. Spring spawners include sauger (*Stizostedion canadense*), walleye (*S. vitreum*), yellow perch (*Perca flavescens*), lake sturgeon (spring/summer spawners), northern pike (*Esox lucius*), smallmouth bass (*Micropterus dolomieu*), mooneye (*Hioden tergisus*), goldeye (*H. alosoides*), suckers, cutthroat trout (*Oncorhynchus clarki*), rainbow trout (*O. mykiss*) and arctic grayling (*Thymallus arcticus*).
2. Fall spawners include lake trout, brook trout, brown trout (*Salmo trutta*), lake whitefish (*Coregonus clupeaformis*), cisco (*C. artedi*) and burbot (*Lota lota*) (winter spawners).

1.2 Study Area

The proposed pipeline will cross the Alberta/Saskatchewan border immediately north of the city limits of Lloydminster. Lloydminster straddles the Alberta/Saskatchewan border and has a population of approximately twenty one thousand (City of Lloydminster 2004). Lloydminster is located within the Central Parkland Region of Alberta (AEP 1994). This zone contains grassland with groves of aspen, aspen forests, and balsam poplar forests. Other than native vegetation, the landcover in this region is dominated by cropland (<50% range land) (PFRA 2004).

The watercourse crossed by the proposed pipeline comprises part of the North Saskatchewan Drainage Basin. The SW-14 crossing is located on an unnamed tributary to Big Gully Creek which is a tributary to the North Saskatchewan River. The SW-14 tributary flows through Neale and Edmunds Lakes before entering Big Gully Creek at a location approximately 50 km from the North Saskatchewan River. Big Gully Creek supports white sucker (*Catostomus commersoni*), shorthead redhorse (*Moxostoma macrolepidotum*), northern pike, and walleye, which migrate up the lower reaches of Big Gully Creek during spring flows (J. Merkowsky, pers. comm., A. Schweitzer, pers. comm.). In the past few years drier climate has hampered fish migrations. The upper reaches of Big Gully Creek contains various forage fish including brook stickleback (*Culaea inconstans*) and fathead minnow (*Pimephales promelas*). Neale and Edmunds Lakes are non-fish bearing (J. Merkowsky, pers. comm.). In 1960, walleye and northern pike inhabited Neale Lake, however, it is managed currently for water fowl production by Ducks Unlimited. As such, it has limited sportfish habitat potential.

Fish species of concern in the natural sub-region of the proposed pipeline project are identified in Table 2. Many species included in the table are present in the North Saskatchewan River but

have not been reported in Big Gully Creek, therefore, it is concluded that the right-of-way is not within the species range. Of the species that might be affected by the right-of-way, only lake chub have a preferred habitat in the vicinity of the right-of-way. However, lake chub are not considered a species at risk and are therefore not included in the table. Walleye are considered a species at risk but they do not have a preferred habitat in the vicinity of the right-of-way.

1.3 Study objectives

The specific objectives of this study were to:

- determine fish presence in the SW-14 tributary near the crossing;
- describe aquatic habitat at, and adjacent to, the proposed crossing in terms of type, quantity, area, quality, and potential to support individual species and life-history stages;
- identify appropriate vehicle and pipeline crossing methods and timing restrictions for the watercourse;
- develop an appropriate contingency crossing method in the event that a trenchless crossing is not feasible or unsuccessful;
- assess the potential for the harmful alteration, destruction or disruption (HADD) to fish habitat given resident populations, habitat available, timing of pipeline construction, and proposed crossing methods; and,
- identify restoration and mitigation measures to reduce adverse effects of instream activity on aquatic resources.

TABLE 2

Fish Species of Concern in the Natural Subregion of the Proposed Pipeline Project

Latin Name	Common Name	Habitat	Right-of-way within species range	Preferred habitat in vicinity of right-of-way	Alberta Provincial Rank[1]	SK Provincial Rank	Additional Designations
Acipenser fulvescens	lake sturgeon	AB: Larger rivers and lakes; May-June cool water spawner in swift water, 0.5-4.5 m deep. SK: Deepest parts of channels or deep pools.	No	No	S2	S2	AB: G3G4[2] SK: G3[2]
Stizostedion vitreum	walleye	In aquatic vegetation and along rocky shoals but can adapt to survive in any conditions.	Yes	No	S3	S5	-
Ambloplites rupestris	rock bass	Well-oxygenated, hard water walleye lakes with boulder and sand bottoms.	No	No	-	S2S3	-
Ameiurus nebulosus	brown bullhead	Clear water in deep pools with submerged vegetation.	No	No	-	S3	-
Carpiodes cyprinus	quillback	AB: Spawn in the spring, generally in sluggish and turbid streams, or overflow areas at river bends, by randomly depositing eggs over sand or mud bottoms. SK: Rocky reefs with caves and crevices.	No	No	S3 (W)	S3S4	-
Cottus ricei	spoonhead sculpin	Small swift streams, turbid rivers or inshore shallows and deep waters of lakes; spring to fall cold water spawner in deep water under rocks.	No	No	S3 (W)	S5	Not at Risk[3]
Hiodon tergisus	mooneye	AB: Shallow, clear waters; April-May cool water spawner in large, clear streams. SK: Clear water of large streams, rivers and lakes.	No	No	S2S3 (W)	S3	-
Ichthyomyzon castaneus	chestnut lamprey	Soft silt and muck in areas of quiet water with some aquatic vegetation.	No	No	-	S3S4	Special Concern[3]
Ictalurus punctatus	channel catfish	Rivers and large creeks in slow to moderate current over sand, gravel or rocks; ponds, lakes, reservoirs.	No	No	-	S2S3	-
Ictiobus cyprinellus	bigmouth buffalo	Lowland lakes, sloughs and large rivers with slow to still waters and bottoms of mud, silt, sand and gravel.á	No	No	-	S3	Special Concern[3]
Margariscus margarita	pearl dace	Cool, clear headwater streams, bogs, ponds and small lakes; spring cool water spawner on sand or gravel, with weak to moderate current.	No	No	S3 (W)	-	-

Latin Name	Common Name	Habitat	Right-of-way within species range	Preferred habitat in vicinity of right-of-way	Alberta Provincial Rank[1]	SK Provincial Rank	Additional Designations
Moxostoma anisurum	silver redhorse	AB: Spawn in clear running water in late spring. Frequents pools or areas of low gradient in large rivers. SK: Clear rivers and medium-sized streams with gravelly riffles and permanent pools.	No	No	S2	S3S4	-
Moxostoma macrolepidotum	shorthead redhorse	Spawn in the spring (likely in late May). Found in large rivers and streams.	Yes	No	S3 (W)	-	-
Notropis blennius	river shiner	AB: Large streams; summer spawner over sand and gravel bottoms. Likely to spawn in July and August. SK: Cool, clear tributaries.	No	No	S2	S3S4	-
Notropis cornutus	common shiner	Large, slow moving cool streams with gravel, boulder or sandy bottoms.	No	No	-	S3S4	-
Notropis stramineus	sand shiner	Flowing water over sand or gravel bottoms.	No	No	-	S3S4	-
Percina maculata	blackside darter	Rocky riffles to pebbly and sandy runs of small to large rivers.	No	No	-	S3S4	-
Phoxinus eos	northern redbelly dace	Quiet often acidic waters of beaver ponds, bogs, small lakes, or stream pools; spring spawner in masses of algae.	No	No	S3 (W)	-	-
Phoxinus neogaeus	finescale dace	Cool bog lakes and slow-moving streams; spring spawner under woody debris.	No	No	S3S4 (W)	-	-
Platygobio gracilis	flathead chub	Turbid waters with swift current and sand or fine gravel bottoms.	No	No	-	S3S4	-
Rhinichthys atratulus	blacknose dace	Springs and cool, clear creeks with moderate to swift current over gravel or rocks.	No	No	-	S3S4	-
Salvelinus confluentus	bull trout	Gravelly to muddy, cold creeks, rivers or lakes; fall coldwater spawner in spring-fed rivers with moderate current and medium-large gravel.	No	No	S3 (W)	-	G3[2]
Semotilus atromaculatus	creek chub	Clear to faintly cloudy waters over gravel, sand, or rubble bottoms.	No	No	-	S3S4	-
Stizostedion canadense	sauger	Large, shallow, turbid lakes or rivers; spring cool water spawner on shoals of gravel.	No	No	S3 (W)	-	-

Sources: ANHIC 2004, Nelson and Paetz 1992, Scott and Crossman 1973, SK CDC 2004, NatureServe 2004.

1.Provincial (S) ranks are based solely on the species' status within the province, and range from 1 (5 or fewer occurences) to 5 (demonstrably secure under present conditions) (NatureServe 2004).

S1 =Critically Imperiled: because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation. Typically 5 or fewer occurrences or very few remaining individuals (<1,000).
S2 =Imperiled: because of rarity or because of some factor(s) making it very vulnerable to extirpation. Typically 6-20 occurrences or few remaining individuals (1,000-3,000).
S3 =Vulnerable: because rare and uncommon, or found in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation. Typically 21-100 occurrences or between 3,000 and 10,000 individuals.
S4 =Apparently Secure: uncommon but not rare, and usually widespread in the province. Possible cause of long-term concern. Usually more than 100 occurrences and more than 10,000 individuals.
S#S# =Range Rank: a numeric range rank (*e.g.*, S2S3) is used to indicate the range of uncertainty about the exact status of the element.
SU=Unrankable: currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
A =Accidental: infrequent and outside usual range. Includes species recorded once or only a few times at a location.
B = Breeding: basic rank refers to the breeding population of the element.
Q = Questionable taxonomy: taxonomic status is questionable; numeric rank may change with taxonomy.
T = Designates a rank associated with a subspecies.
(W) = Watch List: elements for which ANHIC wants to collect more information (ANHIC 2004). All other elements are on the ANHIC Tracking List.
2.Global (G) ranks are based on a species' status world-wide and follow a system parallel to that for Provincial Ranks (Note 1), ranging from 1 (5 or fewer occurrences) to 5 (demonstrably secure under present conditions). For legibility, ranks G4-G5 and T4-T5 are not displayed.
3.Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2004). Species listed as "Extirpated", "Not at Risk" or "Data Deficient" were generally not included in the table without other noteworthy factors being present.
Endangered: A species facing imminent extirpation or extinction.
Threatened: A species likely to become endangered if limiting factors are not reversed.
Special Concern: A species that is particularly sensitive to human activities or natural events, but is not an endangered or threatened species.

2.0 APPROACH

2.1 Riverine Habitat Inventory

On 21 and 22 April 2004, a fish biologist and field assistant investigated riverine habitat along the unnamed creek (Figure 1). Sections of channel sampled encompassed that which may be affected by instream construction also known as the zone of influence. This zone represents "…the area of the water body where 90% of the sediment discharged as a result of the works will be deposited" (AENV 2001). The extent of this zone depends on various parameters, which includes channel gradient, width, depth, morphology (shape and roughness), water velocity, discharge, and instream vegetation. Professional judgment based on experience and an understanding of these factors was used to determine the extent of the zone of influence downstream from the crossing.

Physical parameters including channel bankfull and wetted widths, bank height and water depth were quantified across transects spaced evenly throughout the zone of influence. Channel width, bank height and water depth were measured to the nearest 0.1 m and 0.01 m respectively. Water velocity was measured with a Swoffer digital current meter and wading rod at vertical stations across a single transect to calculate discharge. The transect across which depth and velocity were measured was established in a section of channel that exhibited laminar flow. Discharge was calculated using a mid-section method (Nielson and Johnson 1983). Water temperature (ºC), pH, conductivity (µS/cm), and dissolved oxygen concentration (mg/L) were measured at the right-of-way (ROW) with a Multiline P4™ multimeter. Bank stability and shape, dominant and sub-dominant substrate, and embeddedness were described qualitatively at each transect. A modified wentworth particle scale was used to describe substrate particle size (Nielson and Johnson 1983)

Habitat units throughout the zone of influence were identified and enumerated. The length of each unit was measured with a hip chain. Maximum depth of each habitat unit was measured. Watercourse and riparian vegetation characteristics that affect fish habitat potential were described. These included substrate composition, instream and overhead cover, riparian vegetation composition, and canopy closure. The presence of limiting factors such as beaver dams and ground water intrusion were mapped, photographed and described. Fish habitat was rated as high, moderate or low according to its potential to support spawning, rearing, wintering, and/or migrating fish species.

A photographic record of the site was compiled and is included in a stream catalogue in Appendix A. Raw data was reviewed, entered into an electronic database, and then summarized in a stream catalogue format.

2.2 Fish Population Inventory

Fish communities were sampled, where water levels permitted, using a backpack electrofisher (Smith-Root, Type XII-B, POW) and baited "Gee"-type minnow traps. Electrofisher sampling effort was apportioned evenly across each habitat type throughout the zone of influence. Minnow traps were set along creek margins or in areas too deep to wade including the pond upstream from the crossing proposed.

Fish immobilized by the electrofisher were retrieved with a dip net and placed in a bucket to recover. Catch-per-unit-effort (CPUE) was described as the number of fish caught per 100 seconds electrofished. Any fish captured were identified to species, measured to the nearest millimeter and sex and life-history stage assigned (if discernable externally). Once sampled, any fishes caught were returned to the creek unharmed from where they were captured.

3.0 RESULTS AND DISCUSSION

Appendix A contains a stream catalogue in which physical data collected from the sections of channel investigated are summarized. The catalogue is composed of watershed information, water quality data, channel characteristics, and photographs. Note that regardless of fish presence or absence, proposed construction and restorative measures are based on the potential of riverine habitat in the zone of influence to support different life-history stages of representative fish species that could reside in the watercourse.

Channel Characteristics

The SW-14 tributary was sampled on 21 and 22 April 2004 over a distance of 475 m: from 150 m upstream from the proposed crossing to 325 m downstream (Plates 1-4). The incised channel meanders through native grassland, which is surrounded by cropland. Stream banks are primarily sloping with some sections of vertical or undercut bank. Mean height was 0.48 m. In some sections the banks are unstable because cattle repeatedly gain access to the creek. Channel habitat was comprised of successive beaver ponds and run units. Beaver dams are located 48 m upstream and 37 m downstream from the ROW, respectively (Plate 5). The beaver dams create two large pools, one upstream from and one through the ROW. Both dams create vertical drops of 1.0 and 1.15m respectively. The remainder of the study section is comprised of a continuous run habitat unit. A succession of old, breached beaver dams starting at 250 m downstream from the ROW indicate that fish movement in the channel is likely often impeded (Plate 6). Substrate throughout the study section was highly embedded and composed of 88% fines, 7% gravel, 4% cobble, and 1% boulder (Appendix A).

Including the beaver ponds, the channel had a mean width of 13.2 m with a mean wetted width of 10.8 m at the time of sampling. Excluding the beaver ponds, mean channel width was 3.8 m and mean depth was 0.17 m. Mean water depth was 0.38 m with a maximum recorded depth in excess of 1.00 m. Discharge was 0.074 cms, dissolved oxygen was 10.5 mg/L, pH was 8.5, and conductivity was 850 µS/cm.

Fish Presence

The channel was sampled over a distance of 275 m with a backpack electrofisher and 11 minnow traps were set in the channel for 16.5 hours each for a total of 181.5 trap hours (Appendix A). A total of 518 seconds of electrofishing effort produced no fish. The efficiency of backpack electrofishing may have been reduced by the high conductivity of water sampled. Based on channel structure and fish habitat available, large numbers of fish were not expected from the channel outside of the ponds. A total of 181.5 trap hours produced 37 lake chub, most of which were caught in the beaver ponds.

Fish Habitat Potential

The beaver dams limit fish migration in the SW-14 tributary. Spawning habitat for pike is rated as low to moderate because instream vegetation is limited. Since substrate is highly embedded, its suitability for walleye is low. Rearing potential is moderate as a result of depth in the beaver ponds, overhanging vegetation and undercut banks. Wintering in the creek is rated as low to moderate, dependent on seasonal flow and oxygen levels.

Crossing Recommendations

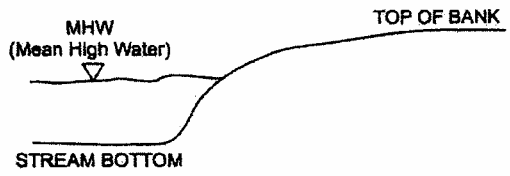
The SW-14 tributary was found to contain no sport fish, therefore there is no RAP associated with this crossing (DFO 2004). Husky intends to use a trenchless HDD to cross the creek and a road directly east from the channel (Table 1). If a HDD is not feasible geo-technically, or HDD attempts fail repeatedly, then a contingency isolated crossing method (dam and pump) is recommended. The ROW can be isolated using steel plates without draining the pond. Upon completion of construction, banks should be restored to their original profile and stabilized using bio-engineered techniques. A detailed crossing plan is provided below should an isolated crossing be undertaken:

- It is recommended that water quality be monitored (turbidity and total suspended solids (TSS)) throughout the zone of influence to ensure that water quality is maintained. The Saskatchewan Environmental Protection Branch (SEPB) requires that Surface Water Quality Objectives are achieved in intermittent streams where ponded stream water is utilized for beneficial purposes (i.e. cattle watering), therefore, turbidity levels should not exceed 25 turbidity units above ambient values (EPB 1997);
- Trench water should be pumped onto vegetation away from the channel;
- Once the trench is backfilled, the bed of the channel should be restored using washed cobble to minimize mobilization of sediment when flow is restored post-construction and supplement fish cover;
- Bio-engineered bank restoration is recommended using soil wraps and brush layering (Dwg. 1);
- The top of each bank should be lined with coconut matting and secured with willow stakes (Dwg. 2);

Equipment and vehicle access to the ROW can use the existing road east from the channel. A bridge may be used to cross the channel at the ROW if necessary (Sentar 1995). Filter fence should be used to isolate the approaches to the crossing on both sides to minimize run-off from entering the creek.

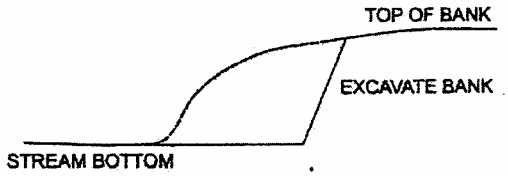
Step-by-step process to reconstruct sloping bank.

STEP 1

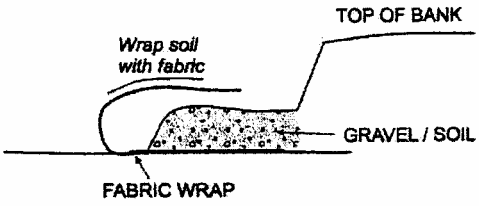


STEP 2

Construct during periods of low water or isolate work area.

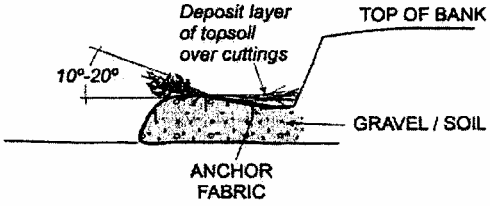


STEP 3

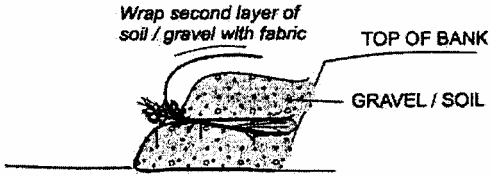


STEP 4

Crisscross layers of dormant cuttings and/or transplants.

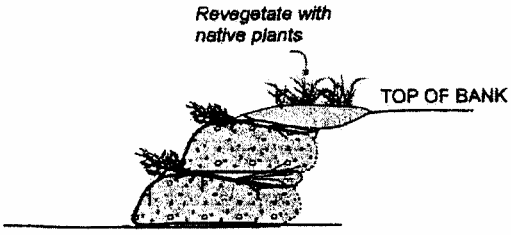


STEP 5

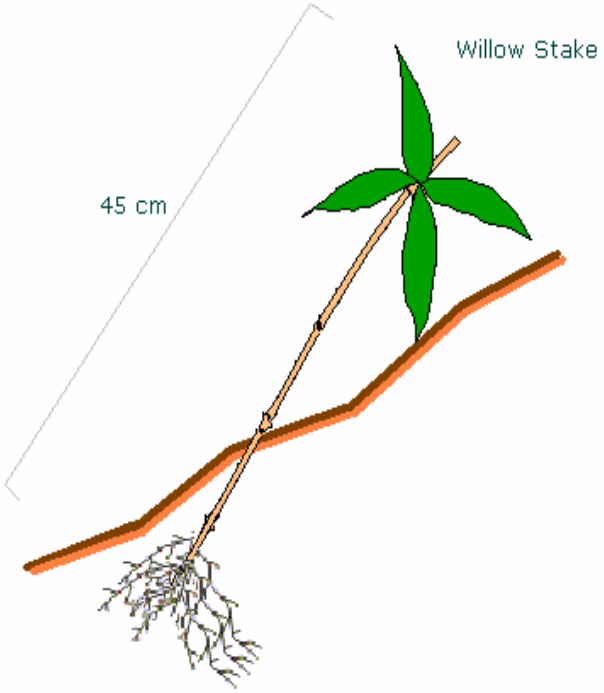


STEP 6

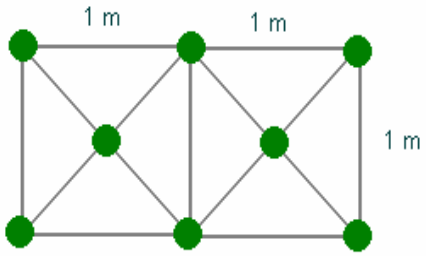
Repeat steps 3, 4, 5 as required, until desired height of bank is reached.



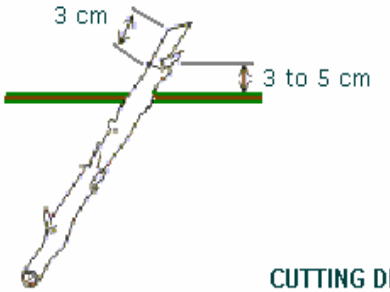
APPLIED AQUATIC RESEARCH Ltd.	**Husky Border Crude Oil Pipeline Expansion**	
	Drawing 1 Streambank Protection – Soil wraps and brush layering	
	AAR04-44	April 2004



PROFILE
(Not to Scale)



STAKING PATTERN



CUTTING DETAIL

Notes

- Select stock from bottom of branches of willow shrubs, not tips.
- Make clean cuts with unsplit ends (see Cutting Detail above).
- Mark basal ends to ensure correct installation.
- Ensure at least one lateral bud above surface and three below. Plant cutting at an angle.
- Protect material from drying out by capping stakes with wax or pruning paste.
- Trim side shoots close to main stock.
- Minimize damage to stake when driving.

APPLIED AQUATIC RESEARCH Ltd.	**Husky Border Crude Oil Pipeline Expansion**	
	Drawing 2 Streambank Protection – Willow Stake Transplant	
	AAR04-44	April 2004

4.0 REFERENCES

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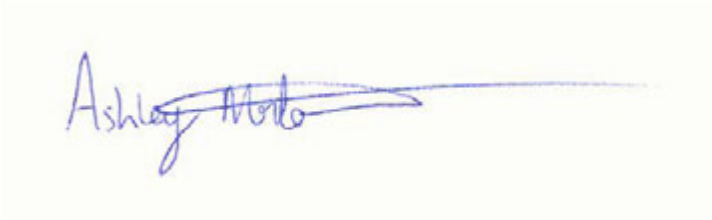
5.0 CLOSURE

The statements and conclusions reported are accurate and address requirements of the Operational Position Statement (DFO 2004).



Ashley Morton, B.Sc., B.Sc.
Jr. Aquatic Biologist

Reviewed by,

Thomas Boag M.Sc. P. Biol.
Senior Fish Biologist, President

APPENDIX A

STREAM CATALOGUES AND PLATES

Stream Catalogue

Project No.:	AAR04-44	UTM Location (NAD 83) 12	567188 E 5906969 N
Watershed:	North Saskatchewan	Upper Boundary (UTM):	566946 E 5907212 N
Stream sampled:	Tributary to Big Gully Creek	Lower Boundary (UTM):	567054 E 5907422 N
Location Name:	SW-14	Legal Description:	- 14 - 50 - 28 W 3 M
Date sampled:	21-Apr-04 Time sampled 15:00		

Channel Morphology:

Pattern:	Irregular	
Confinement:	Occasionally Confined	
Bank Shape	Sloping	
	Mean (m)	Range (m)
Wetted Width:	10.79	2.1 - 30
Channel Width:	13.2	2.5 - 34
Channel Depth:	0.38	0.05 - 1.08
Bank Height:	0.48	0.1 - 0.8
Max. Pool Depth:	>1	1 - >1

Water Quality/Quantity:

Water Temp. (C):	9.5	D. Oxygen (mg/L):	10.5
Cond. (uS/cm):	850	Discharge (cms):	0.074
pH:	8.5	Flow Regime:	Seasonal

Substrate (%):

Fines:	88
Gravel:	7
Cobble:	4
Boulder:	1

Riffle/Run Habitat:

	Length (m)	Number	%
Riffle:		0	0
Run:	287	1	61
Pool:	185	2	39
Rapid:		0	0
Cascade:		0	0

Fish Capture

Species	Life History	Count	Method
LKCH	U	37	MNTR

Electrofishing Effort

Distance (m)	Volts	Hz	Effort (s)
275	200	60	518

Other Fish Sampling Methods

Method	Effort	Units
Minnow Trap	181.5	hrs

Fish Observed but not Captured

No fish observed.

Fish Habitat Potential:

Species:	Spawning:	Rearing:	Wintering:	Migration:
NRPK	L	M	M	L
WALL	L	M	L	L
LKCH	M	M	M	L

NRPK rearing restricted to ponds

Reference Notes

Life History: YOY = young-of-the-year; J=Juvenile; A=Adult; E=Egg; U=Unknown
Habitat Potential: H=high; M=medium; L=low; N=none
Methods: BPEF = Backpack Electrofish FLEF = Float Electrofish MNTR = Minnow Trap ANGL = Angling
Fish species codes are taken from Mackay et al. 1990. (Fish Ageing Methods for Alberta)

Plate 1 View of the left bank at the proposed right-of way of the unnamed tributary at SW-14-50-28 W3M (21-Apr-04).

Plate 2 View of the right bank at the proposed right-of way of the unnamed tributary at SW-14-50-28 W3M (21-Apr-04).

Plate 3 View upstream at the proposed right-of way of the unnamed tributary at SW-14-50-28 W3M (21-Apr-04).

Plate 4 View downstream at the proposed right-of way of the unnamed tributary at SW-14-50-28 W3M (21-Apr-04).

Plate 5 View 150 m upstream from the right-of way of the unnamed tributary at SW-14-50-28 W3M (21-Apr-04).

Plate 6 View 250 m downstream at the proposed right-of way of the unnamed tributary at SW-14-50-28 W3M (21-Apr-04).

Appendix F Summit Liability Solutions. 2015. Husky Oil Operations Ltd. Environmental Assessments Letter for the Proposed SGS Pipeline Expansion Projects (PARF# 18859-011)

February 19, 2015 Summit Project No. EAS0000481

Husky Oil Operations Ltd.
707 8th Ave SW
Calgary, AB. T2P 3G7

Attention: Darren Marchand

Subject: **Husky Oil Operations Ltd. Environmental Assessments Letter for the Proposed SGS Pipeline Expansion Projects (PARF# 18859-011)**

Dear Darren,

Under the authorization of Husky Oil Operations Ltd. (Husky), Summit Liability Solutions Inc. (Summit) conducted environmental assessments of the proposed project area. The environmental assessment included specific details of wetlands and rare and listed wildlife.

Wetlands

Consultation with the 73F/05 and 73E/08 1:50000 topographic maps, air photos and construction plan indicated that the proposed project may be in close proximity to low areas/wetlands. The wetland assessment was conducted by Steve Fedorchuk (Summit) on June 26, July 2 and July 3, 2014. During the field investigation it was confirmed that the proposed development is in close proximity to thirteen wetlands and transects nine wetlands, three ephemeral draws and one watercourse.

The wetlands identified during the assessment were classified using methods described in Stewart and Kantrud's *Classification of Natural Ponds and Lakes in the Glaciated Prairie Region*. This classification system uses vegetation zones and key species as indicators of wetland type and morphology. Table 1 briefly outlines details of the wetlands identified during the field assessment.

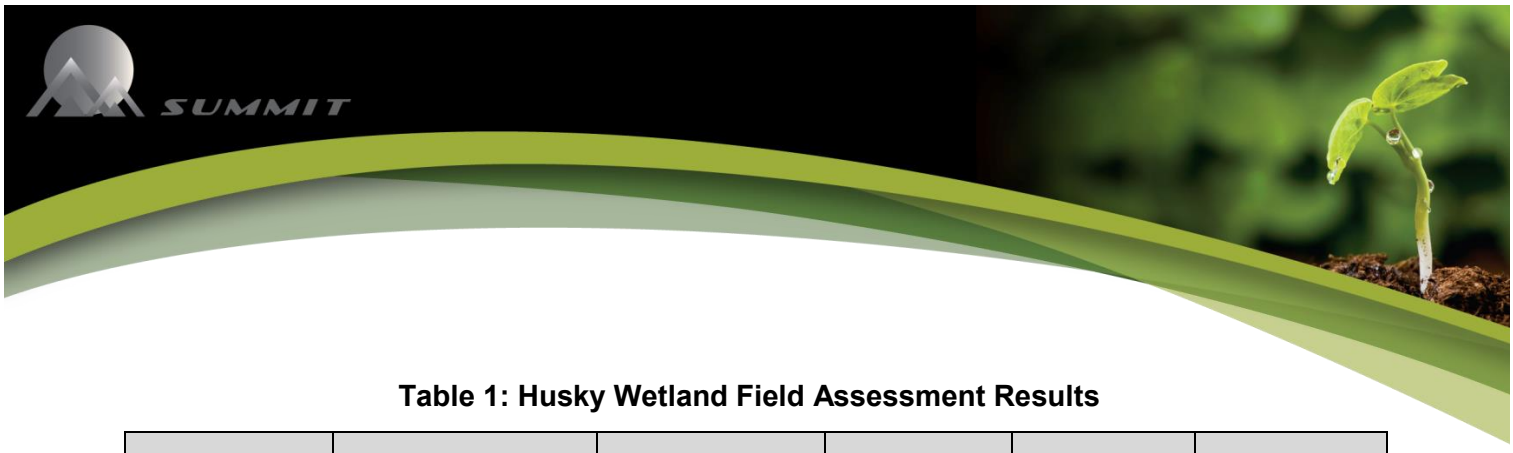


Table 1: Husky Wetland Field Assessment Results

Wetland Number	Land Location	UTM Coordinates (NAD 83)	Habitat / Land Use	Wetland Class	Distance From ROW
1	10-01-50-28W3M	0569016 E 5904878 N	Cultivation	II	30 m East
2	15-01-50-28W3M	0569016 E 5905117 N	Cultivation	II	40 m East
3	07-12-50-28W3M	0568975 E 5905916 N	Cultivation	II	10 m East
4	10-12-50-28W3M	0568971 E 5906139 N	Cultivation	III	Transects
Draw 1	14-12-50-28W3M	0568814 E 5906862 N	Cultivation	Man-Made	Transects
5	14-12-50-28W3M	0568521 E 5906889 N	Cultivation	III	15 m North
Draw 2	14-12-50-28W3M	0568471 E 5906832 N	Cultivation	Ephemeral	Transects
6	01-14-50-28W3M	0567873 E 5907290 N	Cultivation	II	30 m North
7	02-14-50-28W3M	0567555 E 5907260 N	Cultivation	II	20 m South
Watercourse 1 (Crossing 1)	03-14-50-28W3M	0567186 E 5907298 N	Modified Pasture	Semi-Permanent	Transects
Watercourse 1 (Crossing 2)	01-13-50-01W4M	566129E 5907302N	Cultivation	Semi-Permanent	Transects
Draw 3	01-13-50-01W4M	0565994 E 5907290 N	Cultivation	Ephemeral	Transects
8	02-13-50-01W4M	0565614 E 5907288 N	Cultivation	I	Transects
9	03-13-50-01W4M	0565614 E 5907282 N	Cultivation	II	Transects
10	03-13-50-01W4M	0565432 E 5906902 N	Cultivation	II	Transects
11	02-13-50-01W4M	0565492 E 5906899 N	Cultivation	II	60 m East
12	03-13-50-01W4M	0565330 E 5906902 N	Cultivation	II	98 m West

13	14-12-50-01W4M	0565405 E 5906863 N	Seeded Grass	III	30 m West
14	14-12-50-01W4M	0565420 E 5906771 N	Seeded Grass	III	Transects
15	14-12-50-01W4M	0565371 E 5906558 N	Seeded Grass	IV	18 m West
16	11-12-50-01W4M	0565433 E 5906414 N	Seeded Grass	II	Transects
17	11-12-50-01W4M	0565450 E 5906233 N	Seeded Grass	II	Transects
18	11-12-50-01W4M	0565384 E 5906273 N	Seeded Grass	III	80 m West
19	11-12-50-01W4M	0565480 E 5906172 N	Seeded Grass	I	15 m East
20	06-12-50-01W4M	0565394 E 5905829 N	Seeded Grass	I	80 m West
21	06-12-50-01W4M	0565463 E 5905799 N	Cultivation	II	Transects
22	03-12-50-01W4M	0565343 E 5905527 N	Cultivation	II	Transects

Note: The exact pipeline routing was not known during the time of the assessment, therefore the distances to the water features may vary from the current pipeline route.

Wetland 1

The proposed pipeline ROW is approximately 30 m west of a *Class II Temporary Wetland* (Wetland 1).

Wetland 1 was approximately 100 m in diameter, well vegetated, isolated and contained <10 cm of water at the time of the field assessment (Photo 1). Riparian vegetation and vegetation identified within the wetland consisted primarily of trembling aspen (*Populus tremuloides*), willow (*Salix spp*.), smooth brome (*Bromus inermis*), sedge (*Carex spp.*), rush (*Juncus spp.*) and northern reedgrass (*Calamagrostis inexpansa*).

Photo 1: Viewing southeast toward Wetland 1 (Class II).

Wetland 2

The proposed pipeline ROW is approximately 40 m west of a *Class II Temporary Wetland* (Wetland 2).

Wetland 2 was approximately 65 m in diameter, well vegetated, isolated and contained <10 cm of water at the time of the field assessment (Photo 2). Riparian vegetation and vegetation identified within the wetland consisted primarily of trembling aspen, willow, rush, sedge, reedgrass, smooth brome and sloughgrass (*Beckmannia syzigachne*).

Photo 2: Viewing east toward Wetland 2.

Wetland 3

The proposed pipeline ROW is approximately 10 m west of a *Class II Temporary Wetland* (Wetland 3).

Wetland 3 was approximately 80 m (northwest/southeast) by 25 m (northeast/southwest), moderately vegetated, isolated and contained <10 cm of water at the time of the field assessment (Photo 3). Riparian vegetation and vegetation identified within the wetland consisted primarily of sedge, rush, common horsetail (*Equisetum arvense*), sloughgrass, and broad-leaved water plantain (*Alisma triviale*).

Photo 3: Viewing southeast toward Wetland 3.

Wetland 4

The proposed pipeline ROW transects a *Class III Seasonal Wetland* (Wetland 4).

Wetland 4 was approximately 60 m in diameter, well vegetated, isolated and contained <15 cm of water at the time of the field assessment (Photo 4). Riparian vegetation and vegetation identified within the wetland consisted primarily of trembling aspen, balsam poplar (*Populus balsamifera*), sedge, rush, common cattail (*Typha latifolia*), common duckweed (*Lemna minor*) and water plantain.

Photo 4: Viewing south within Wetland 4.

Draw 1

The proposed pipeline ROW transects an *Ephemeral Draw* (Draw 1).

Draw 1 is a south/north oriented man-made storm water drainage channel system from the City of Lloydminster. Draw 1 was approximately 15 m wide, 5 m deep, had a grade of approximately 2%, was moderately vegetated and contained flowing water approximately 30 cm in depth at the time of the field assessment (Photo 5). Riparian vegetation and vegetation identified within the draw consisted primarily of sedge, rush, smooth brome and northern reedgrass.

Photo 5: Viewing south along Draw 1.

Wetland 5

The proposed pipeline ROW is approximately 15 m south of a *Class III Seasonal Wetland* (Wetland 5).

Wetland 5 was approximately 25 m (north/south) by 60 m (east/west), well vegetated, isolated and contained <15 cm of water at the time of the field assessment (Photo 6). Riparian vegetation and vegetation identified within the wetland consisted primarily of trembling aspen, willow, common cattail, sedge, rush and smooth brome.

Photo 6: Viewing west toward Wetland 5.

Draw 2

The proposed pipeline ROW transects an *Ephemeral Draw* (Draw 2).

Draw 2 was southwest/northeast oriented, approximately 5 m wide, 0.25 m deep and had a grade of approximately 2%. Draw 2 lacked a defined channel and contained numerous pools of standing water at the time of the field assessment (Photo 7). Riparian vegetation and vegetation identified within the draw consisted primarily of trembling aspen, balsam poplar, common horsetail, willow and smooth brome.

Photo 7: Viewing west toward Draw 2.

Wetland 6

The proposed pipeline ROW is approximately 30 m south of a *Class II Temporary Wetland* (Wetland 6).

Wetland 6 was approximately 40 m (northeast/southwest) by 60 m (northwest/southeast), well vegetated, isolated and contained <10 cm of water at the time of the field assessment (Photo 8). Riparian vegetation and vegetation identified within the wetland consisted primarily of sedge, rush, common cattail, smooth brome and common horsetail.

Photo 8: Viewing north toward Wetland 6.

Wetland 7

The proposed pipeline ROW is approximately 20 m north of a *Class II Temporary Wetland* (Wetland 7).

Wetland 7 was approximately 18 m in diameter, poorly vegetated, isolated and contained <5 cm of water at the time of the field assessment (Photo 9). Riparian vegetation and vegetation identified within the wetland consisted primarily of sedge, rush and smooth brome.

Photo 9: Viewing southwest toward Wetland 7.

Watercourse 1 (Crossing 1)

The proposed pipeline ROW transects a *Semi-Permanent Watercourse.*

Watercourse 1 was southwest/northeast oriented, approximately 3 m wide, 0.75 m deep and had a grade of approximately 2% to 3%. Watercourse 1 had a defined channel and contained flowing water (<30 cm) at the time of the field assessment (Photo 10). Riparian vegetation and vegetation identified within the watercourse consisted primarily of willow, smooth brome, northern reedgrass, sedge and rush.

Photo 10: Viewing north along Watercourse 1.

Watercourse 1 (Crossing 2)

The proposed pipeline transects Watercourse 1 in SE 13-50-1W4 (Also transected by pipeline in SW-14-50W3). At this crossing location Watercourse 1 was north/south oriented, approximately 10 m wide, 0.25 m deep and had a grade of approximately 1% to 2%. At the time of the field assessment to watercourse lacked a defined channel and consisted of a series of isolated pools holding <10 cm of standing water (Photos 11 & 12). Riparian vegetation and vegetation identified within the watercourse consisted primarily of willow, common cattail, sedge, rush, northern reedgrass, smooth brome, sloughgrass and common plantain.

It appears that this stretch of Watercourse 1 has been previously disturbed by farming activities.

Photo 11: Viewing southeast toward Watercourse 1.

Photo 12: Viewing northeast toward Watercourse 1 transecting location.

Draw 3

The proposed pipeline ROW transects an *Ephemeral Draw* (Draw 3).

Draw 3 was northwest/southeast oriented, approximately 12 m wide, 0.25 m deep and had a grade of approximately 1% to 2%. Draw 2 lacked a defined channel and contained numerous pools of standing water <20 cm deep at the time of the field assessment (Photo 13). Riparian vegetation and vegetation identified within the draw consisted primarily of common cattail, sedge, rush, northern reedgrass, smooth brome, sloughgrass and water plantain.

Photo 13: Viewing northwest toward Draw 3.

Wetland 8

The proposed pipeline ROW transects a *Class I Ephemeral Wetland* (Wetland 8).

Wetland 8 was approximately 16 m in diameter, poorly vegetated, isolated and contained <10 cm of water at the time of the field assessment (Photo 14). Riparian vegetation and vegetation identified within the wetland consisted primarily of common horsetail, water plantain and cereal crop stubble.

Photo 14: Viewing west toward Wetland 8.

Wetland 9

The proposed pipeline ROW transects a *Class III Seasonal Wetland* (Wetland 9).

Wetland 9 was approximately 85 m (northeast/southwest) by 30 m (northwest/southeast), well vegetated, and contained <10 cm of water at the time of the field assessment (Photo 15). Wetland 9 was connected to Draw 3. Riparian vegetation and vegetation identified within the wetland consisted primarily of common cattail, sedge, rush, common horsetail, sloughgrass, western dock, northern reedgrass and smooth brome.

Photo 15: Viewing south toward Wetland 9.

Wetland 10

The proposed pipeline ROW transects a *Class II Temporary Wetland* (Wetland 10).

Wetland 10 was approximately 12 m in diameter, moderately vegetated, isolated and contained <10 cm of water at the time of the field assessment (Photo 16). Riparian vegetation and vegetation identified within the wetland consisted primarily of sedge, rush, common cattail, northern reedgrass, smooth brome, western dock and water plantain.

Photo 16: Viewing north toward Wetland 10.

Wetland 11

The proposed pipeline ROW is located approximately 60 m west a *Class II Temporary Wetland* (Wetland 11).

Wetland 11 was approximately 10 m (north/south) by 30 m (east/west), moderately vegetated, isolated and contained <5 cm of water at the time of the field assessment (Photo 17). Riparian vegetation and vegetation identified within the wetland consisted primarily of sedge, rush, common cattail, smooth brome and water plantain.

Photo 17: Viewing east toward Wetland 11.

Wetland 12

The proposed pipeline ROW is located approximately 98 m east a *Class II Temporary Wetland* (Wetland 12).

Wetland 12 was approximately 20 m in diameter, well vegetated, isolated and contained <5 cm of water at the time of the field assessment (Photo 18). Riparian vegetation and vegetation identified within the wetland consisted primarily of willow, common cattail, water plantain, sedge, rush, smooth brome and common cattail.

Photo 18: Viewing west toward Wetland 12.

Wetland 13

The proposed pipeline ROW is located approximately 30 m east a *Class III Seasonal Wetland* (Wetland 13).

Wetland 13 was approximately 20 m in diameter, well vegetated, and contained <15 cm of water at the time of the field assessment (Photo 19). Wetland 13 was connected to a larger low area to the southwest. Riparian vegetation and vegetation identified within the wetland consisted primarily of willow, common cattail, balsam polar, sedge, smooth brome, common cattail, water plantain, sloughgrass and western dock.

Photo 19: Viewing west toward Wetland 13.

Wetland 14

The proposed pipeline ROW transects a *Class III Seasonal Wetland* (Wetland 14).

Wetland 14 was approximately 30 m (north/south) by 150 m (east/west), well vegetated, isolated and contained <10 cm of water at the time of the field assessment (Photo 20). Riparian vegetation and vegetation identified within the wetland consisted primarily of common cattail, balsam poplar, trembling aspen, willow, sedge, rush, smooth brome, northern reedgrass and western dock.

Photo 20: Viewing southwest toward Wetland 14.

Wetland 15

The proposed pipeline ROW is located approximately 18 m east a *Class IV Semi-Permanent Wetland* (Wetland 15).

Wetland 15 was approximately 150 m (north/south) by 200 m (east/west), well vegetated, isolated and contained <1 m of water at the time of the field assessment (Photo 21). Riparian vegetation and vegetation identified within the wetland consisted primarily of common cattail, balsam poplar, trembling aspen, willow, sedge, rush, smooth brome, northern reedgrass, sloughgrass, western dock, reed canary grass (*Phalaris arundinacea*) and common duckweed.

Photo 21: Viewing west toward Wetland 15.

Wetland 16

The proposed pipeline ROW transects a *Class II Temporary Wetland* (Wetland 16).

Wetland 16 was approximately 12 m in diameter, well vegetated, isolated and contained <10 cm of water at the time of the field assessment (Photo 22). Riparian vegetation and vegetation identified within the wetland consisted primarily of sedge, sloughgrass, western dock, water plantain and common horsetail.

Photo 22: Viewing north toward Wetland 16.

Wetland 17

The proposed pipeline ROW transects a *Class II Temporary Wetland* (Wetland 17).

Wetland 17 was approximately 20 m in diameter, moderately vegetated, isolated and contained <15 cm of water at the time of the field assessment (Photo 23). Riparian vegetation and vegetation identified within the wetland consisted primarily of sedge, rush, common cattail, sloughgrass, water plantain and smooth brome.

Photo 23: Viewing south toward Wetland 17.

Wetland 18

The proposed pipeline ROW is located approximately 80 m east of a *Class III Seasonal Wetland* (Wetland 18).

Wetland 18 was approximately 20 m in diameter, moderately vegetated and contained <40 cm of water at the time of the field assessment (Photo 24). Wetland 18 was connected to Wetland 15. Riparian vegetation and vegetation identified within the wetland consisted primarily of willow, common cattail, sedge, rush, sloughgrass and water plantain.

Photo 24: Viewing north toward Wetland 18.

Wetland 19

The proposed pipeline ROW is located approximately 15 m west of a *Class I Ephemeral Wetland* (Wetland 19).

Wetland 19 was approximately 15 m in diameter, well vegetated, isolated and contained <5 cm of water at the time of the field assessment (Photo 25). Riparian vegetation and vegetation identified within the wetland consisted primarily of willow, smooth brome, slender wheatgrass (*Elymus trachycaulus*), common cattail and water plantain.

Photo 25: Viewing southeast toward Wetland 19.

Wetland 20

The proposed pipeline ROW is located approximately 80 m east of a *Class I Ephemeral Wetland* (Wetland 20).

Wetland 20 was approximately 12 m in diameter, poorly vegetated, isolated and contained <5 cm of water at the time of the field assessment (Photo 26). Riparian vegetation and vegetation identified within the wetland consisted primarily of common horsetail and water plantain.

Photo 26: Viewing southwest toward Wetland 20.

Wetland 21

The proposed pipeline ROW transects a *Class II Temporary Ephemeral Wetland* (Wetland 21).

Wetland 21 was approximately 110 m (north/south) by 30 m (east/west), well vegetated, isolated and contained <40 cm of water at the time of the field assessment (Photo 27). Riparian vegetation and vegetation identified within the wetland consisted primarily of common cattail, sedge, rush, northern reedgrass, trembling aspen and sloughgrass.

Photo 27: Viewing north toward Wetland 21.

Wetland 22

The proposed pipeline ROW transects a *Class II Temporary Ephemeral Wetland* (Wetland 22).

Wetland 22 was approximately 25 m in diameter, well vegetated, isolated and contained <5 cm of water at the time of the field assessment (Photo 28). Riparian vegetation and vegetation identified within the wetland consisted primarily of common cattail, sedge, trembling aspen, willow, northern reedgrass and smooth brome.

Photo 28: Viewing west toward Wetland 22.

Rare/Listed Wildlife Survey

Prior to completing the field work, a wildlife habitat screening of the study area was performed to become familiarized with the potential rare wildlife that could potentially occur in the area. The screening procedure consisted of Saskatchewan Conservation Data Centre (SCDC) database and AER Fish and Wildlife Management Information System (FWMIS) searches to determine if rare or listed wildlife is known to exist within the proposed project area. Consultation with the SCDC indicated that there are no known historical occurrences of rare or listed wildlife within 1 km of the proposed pipeline project. The FWMIS search indicated that the pipeline is within 1 km of an unnamed watercourse that historically contains brook stickleback (*Culaea inconstans*) within the SE 12-50-01W4M. To determine what species searches were required, each species with distribution within the Lloydminster area was entered into a Species At Risk Matrix. The matrices are included in the attachments.

Rare/Listed Wildlife Survey Methodology

The Government of Saskatchewan Ministry of Environment, Fish and Wildlife Branch, Species Detection Survey Protocols (February 2014) and the Alberta Environment and Sustainable Resource Development (ESRD) Sensitive Species Inventory Guidelines (March 2013) were adhered to during these surveys.

Northern leopard frogs are classified as uncommon in Saskatchewan (S3), listed as *At Risk* in Alberta and are listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as being of *special concern*. The northern leopard frog inhabits semi-permanent to permanent wetlands with emergent vegetation in the spring for breeding, and moves out to the wet areas adjacent to the breeding sites in summer. A survey for northern leopard frogs was undertaken on June 26th and August 22nd under partially cloudy skies with gentle winds. No northern leopard frogs were observed during the surveys. The following activity restrictions around ponds used by leopard frogs will be observed in the future if warranted:

Saskatchewan	
Year Round	10m for low-intensity activities
	200m for medium-intensity activities
	500m for high-intensity activities
Alberta	
Year Round	100m for low-intensity activities
	100m for medium-intensity activities
	100m for high-intensity activities

Canadian toads are classified as common and apparently secure in Saskatchewan (S4), listed as *May Be At Risk* in Alberta and are listed by COSEWIC as being *not at risk*. This species is generally associated with sandy soils and can be found in borders of shallow lakes, ponds and ephemeral wetlands. Surveys for Canadian toads were conducted on June 26th and August 22nd under clear skies with gentle winds. No Canadian toads were observed during the survey. The following activity restrictions will be observed around wetlands used for breeding in the future if warranted:

Saskatchewan

Year Round	90m for medium-intensity activities
	90m for high-intensity activities

Alberta

No activity restriction has been developed for Canadian toads within Alberta.

We trust the information herein is satisfactory for present requirements. If there are any questions please do not hesitate to call the undersigned at (780) 872-0772.

Sincerely,

Steve Fedorchuk B.Sc., A.Ag
Environmental Specialist

CC: Dean Woznesensky, Husky Oil Operations Ltd.
Darren Marchand, Husky Oil Operations Ltd.
Eric Sonnenberg, Husky Oil Operations Ltd.

Attachments:
FWMIS Consultation
ACIMS Consultation
LAT Report
SCDC Consultation
Species at Risk Matrices
Construction Plan With Water Feature Overlay

FWMIS Consultation

Alberta Environment and Sustainable Resource Development

Fish and Wildlife Internet Mapping Tool (FWIMT)

(source database: Fish and Wildlife Management Information System (FWMIS))

Species Summary Report

Report Created: 14-Nov-2014 08:36

Species present within the current extent :

Fish Inventory	Wildlife Inventory
BROOK STICKLEBACK	No records found.

Buffer Extent

Centroid (X,Y):	Projection	Centroid: (Qtr Sec Twp Rng Mer)	Buffer Radius:
831759, 5914503	10-TM AEP Forest	SW 12 50 1 4	1 kilometers

Wildlife Contact Information

Primary Contact

Name:	Phone:	Email:	Town:
Dave Moore	780-853-8137	Dave.Moore@gov.ab.ca	

Alternative

Name:	Phone:	Email:	Town:

Fisheries Contact Information

Primary Contact

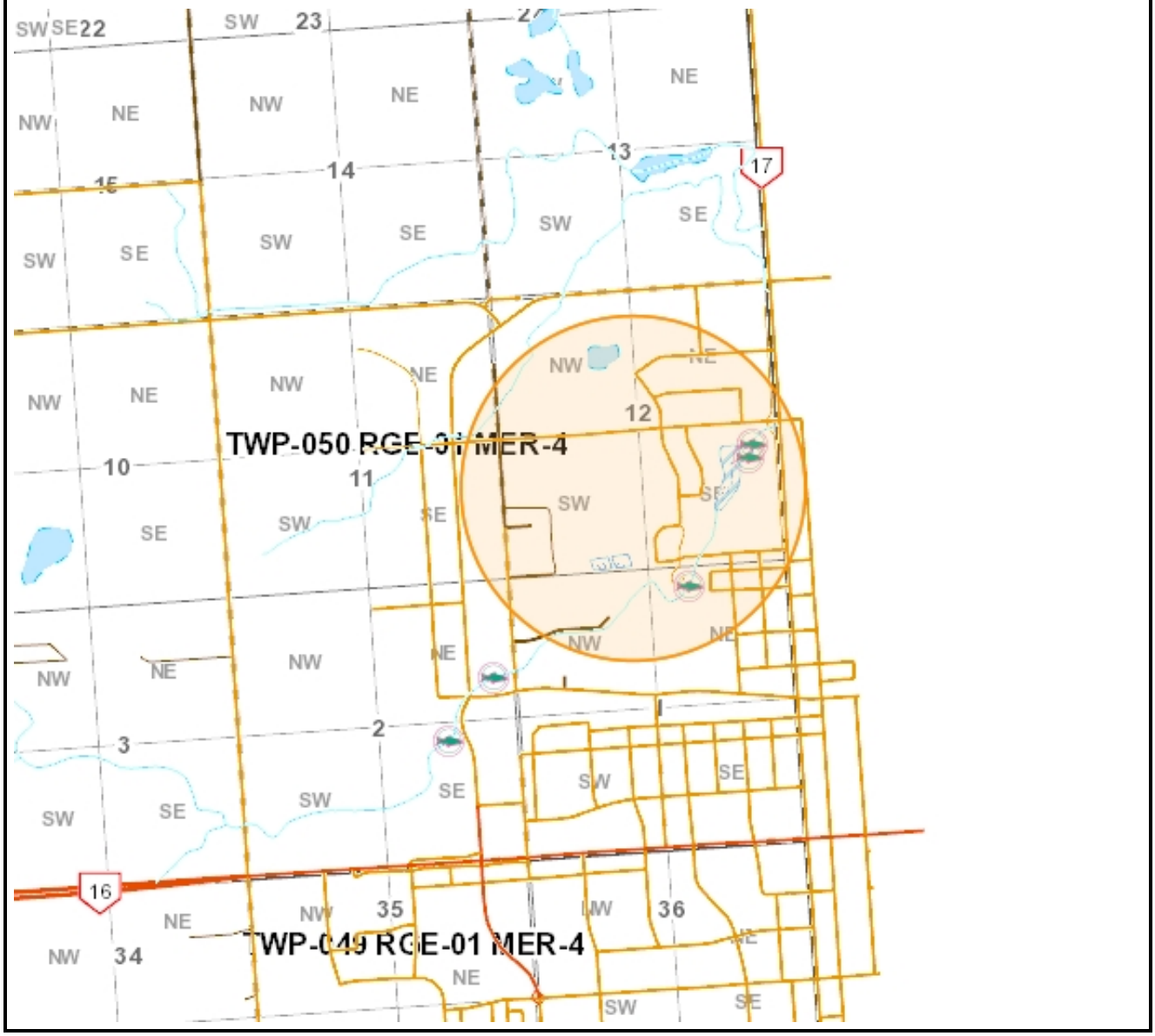
Name:	Phone:	Email:	Town:
Jason Cooper	403-340-7685	Jason.Cooper@gov.ab.ca	Red Deer

Alternative

Name:	Phone:	Email:	Town:
			Red Deer

14-Nov-2014 08:36

Map Results



Alberta Environment and Sustainable Resource Development

Fish and Wildlife Internet Mapping Tool (FWIMT)

(source database: Fish and Wildlife Management Information System (FWMIS))

Species Summary Report

Report Created: 14-Nov-2014 08:45

Species present within the current extent :

Fish Inventory	Wildlife Inventory
BROOK STICKLEBACK	No records found.

Buffer Extent

Centroid (X,Y):	Projection	Centroid: (Qtr Sec Twp Rng Mer)	Buffer Radius:
831720, 5915302	10-TM AEP Forest	NW 12 50 1 4	1 kilometers

Wildlife Contact Information

Primary Contact

Name:	Phone:	Email:	Town:
Dave Moore	780-853-8137	Dave.Moore@gov.ab.ca	

Alternative

Name:	Phone:	Email:	Town:

Fisheries Contact Information

Primary Contact

Name:	Phone:	Email:	Town:
Jason Cooper	403-340-7685	Jason.Cooper@gov.ab.ca	Red Deer

Alternative

Name:	Phone:	Email:	Town:
			Red Deer

14-Nov-2014 08:45

Map Results

Alberta Environment and Sustainable Resource Development

Fish and Wildlife Internet Mapping Tool (FWIMT)

(source database: Fish and Wildlife Management Information System (FWMIS))

Species Summary Report

Report Created: 14-Nov-2014 08:49

Species present within the current extent :

Fish Inventory

No records found.

Wildlife Inventory

No records found.

Buffer Extent

Centroid (X,Y):	Projection	Centroid: (Qtr Sec Twp Rng Mer)	Buffer Radius:
831681, 5916027	10-TM AEP Forest	SW 13 50 1 4	1 kilometers

Wildlife Contact Information

Primary Contact

Name: Dave Moore **Phone:** 780-853-8137 **Email:** Dave.Moore@gov.ab.ca **Town:**

Alternative

Name: **Phone:** **Email:** **Town:**

Fisheries Contact Information

Primary Contact

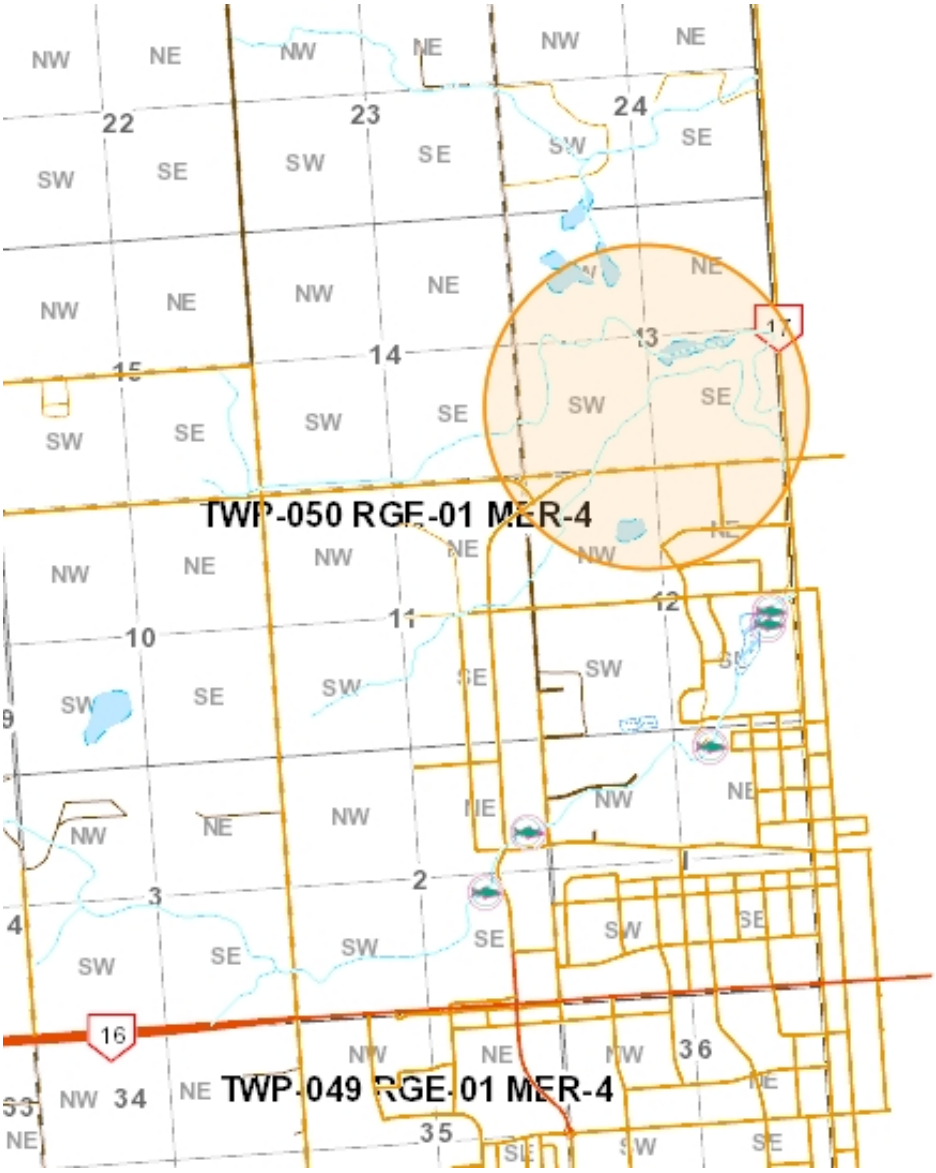
Name: Jason Cooper **Phone:** 403-340-7685 **Email:** Jason.Cooper@gov.ab.ca **Town:** Red Deer

Alternative

Name: **Phone:** **Email:** **Town:** Red Deer

14-Nov-2014 08:49

Map Results



Alberta Environment and Sustainable Resource Development

Fish and Wildlife Internet Mapping Tool (FWIMT)

(source database: Fish and Wildlife Management Information System (FWMIS))

Species Summary Report

Report Created: 14-Nov-2014 09:10

Species present within the current extent :

Fish Inventory

No records found.

Wildlife Inventory

No records found.

Buffer Extent

Centroid (X,Y):	Projection	Centroid: (Qtr Sec Twp Rng Mer)	Buffer Radius:
832117, 5916099	10-TM AEP Forest	SE 13 50 1 4	1 kilometers

Wildlife Contact Information

Primary Contact

Name:	Phone:	Email:	Town:
Dave Moore	780-853-8137	Dave.Moore@gov.ab.ca	

Alternative

Name:	Phone:	Email:	Town:

Fisheries Contact Information

Primary Contact

Name:	Phone:	Email:	Town:
Jason Cooper	403-340-7685	Jason.Cooper@gov.ab.ca	Red Deer

Alternative

Name:	Phone:	Email:	Town:
			Red Deer

14-Nov-2014 09:10

Map Results

ACIMS Consultation

Table of Results Print Preview

Date: 26/11/2014
Requestor: Consultant
Reason for Request: Environmental Assessment
SEC: 12 **TWP:** 050 **RGE:** 01 **MER:** 4

Non-sensitive EOs: 0 (*Data Updated:Oct 2014*)

M-RR-TTT-SS	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D

No Non-sensitive EOs Found: Next Steps - See FAQ

Sensitive EOs: 0 (*Data Updated:Oct 2014*)

M-RR-TTT	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D

No Sensitive EOs Found: Next Steps - See FAQ

Protected Areas: 0 (*Data Updated:April 2013*)

M-RR-TTT-SS	PROTECTED AREA NAME	TYPE	IUCN

No Protected Areas Found

Crown Reservations/Notations: 0 (*Data Updated:April 2013*)

M-RR-TTT-SS	NAME	TYPE

No Crown Reservations/Notations Found

Table of Results Print Preview

Date: 26/11/2014
Requestor: Consultant
Reason for Request: Environmental Assessment
SEC: 13 **TWP:** 050 **RGE:** 01 **MER:** 4

Non-sensitive EOs: 0 (*Data Updated:Oct 2014*)

M-RR-TTT-SS	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D

No Non-sensitive EOs Found: Next Steps - See FAQ

Sensitive EOs: 0 (*Data Updated:Oct 2014*)

M-RR-TTT	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D

No Sensitive EOs Found: Next Steps - See FAQ

Protected Areas: 0 (*Data Updated:April 2013*)

M-RR-TTT-SS	PROTECTED AREA NAME	TYPE	IUCN

No Protected Areas Found

Crown Reservations/Notations: 0 (*Data Updated:April 2013*)

M-RR-TTT-SS	NAME	TYPE

No Crown Reservations/Notations Found

LAT Report

Alberta Energy Regulator

Pipeline Agreement (PLA)

Landscape Analysis Tool Report

Time:	15:02 21 PM
LAT Number:	0000033DF9
LAT Date:	2014-04-15
Project Name:	PIpeline
Project Description:	

Disposition Type:	Pipeline Agreement (PLA)
Purpose Type:	Pipeline-Cathodic protection / anode bed-below grd (CATHPROTBG)

Responsibility of Applicants:

It is the applicant's responsibility to conduct a full review of the generated LAT Report, ensuring that you have a full understanding of the defined standards and conditions, and any limitations as may also be imposed by any other law or Order of the Province or the Government of Canada that may impact on the proposed use of the land.

The applicant must assess if the proposed activity can meet those standards, conditions and limitations which will subsequently determine if an EAP application will be submitted to the regulatory body as "Standard" or "Non-Standard". Applicants should complete a thorough review of EAP processes, IS&G documents and generated LAT Reports prior to making this determination.

- "Standard" EAP application submissions are those where the applicant chooses to meet all of the associated Approval Standards identified in the LAT Report submitted as part of the application and aligns those standards to the associated supplements and the application plan.

- "Non-Standard" EAP application submissions are those where the applicant chooses not to meet, or is not able to meet, one or more of the associated Approval Standards identified in the LAT Report submitted as part of the application, or the requirements of reservations as identified within the land status report. Non-Standard EAP application submissions require the inclusion of a completed Non-Standard Mitigation Supplement.

The information provided within the LAT Tool is a spatial representation of features provided for land use planning. The accuracy of these layers varies depending on the resource value being represented. Site visits, wildlife surveys and ground-truthing is required to ensure that you, the applicant will meet the applicable Pre-Application requirements, Approval Standards, Operating Conditions and Best Management Practices of the Integrated Standards and Guidelines.

Landscape Analysis Tool Report

Base Features

Crown Ownership:	Private/Titled,Municipal/Titled	FMU:	
Green/White Area:	White Area	FMA:	
Municipality:	County of Vermilion River		
Higher Level Plans:		Provincial Grazing Reserve:	
		Rocky Mountain Forest Reserve:	
		PLUZ Areas:	

Provincial Sanctuaries

Wildlife Corridors:		Game Bird:	
Restricted Area:		Seasonal:	

Landscape Analysis Tool Report

Sensitive Features

Wildlife

Burrowing Owl Range:		Other Sensitive and Endangered Species:	Yes
Caribou Zones:		Piping Plover Waterbodies:	
Colonial Nesting Birds:		Sensitive Amphibians Ranges:	
Eastern Short-horned Lizard Range:		Sensitive Raptor Range:	
Endangered and Threatened Plants Ranges:		Sensitive Snake Species Range:	
Greater Sage Grouse Habitat and Buffer:		Sharp-tailed Grouse Leks and Buffer:	
Greater Sage Grouse Leks and Buffer:		Sharp-tailed Grouse Survey:	Yes
Grizzly Bear Zone:		Special Access Area:	
Key Wildlife and Biodiversity Areas:		Swift Fox Range:	
Mountain Goat and Sheep Areas:		Trumpeter Swan Waterbodies/Watercourse:	
Ord's Kangaroo Rat Range:			

Water

Proximity to Waterbody:	Industry will ensure that the Watercourse/Waterbodies standards and conditions as defined within the Integrated Standards and Guidelines are followed. To ensure these setbacks and buffers are addressed and maintained, it is recommended that a pre-site assessment occur.

Grassland and Parkland Natural Region:

Grassland and/or Parkland Natural Region:	Yes

Federal Orders:

Greater Sage Grouse:	

Alberta Energy Regulator

Pipeline Agreement (PLA)

Landscape Analysis Tool Report

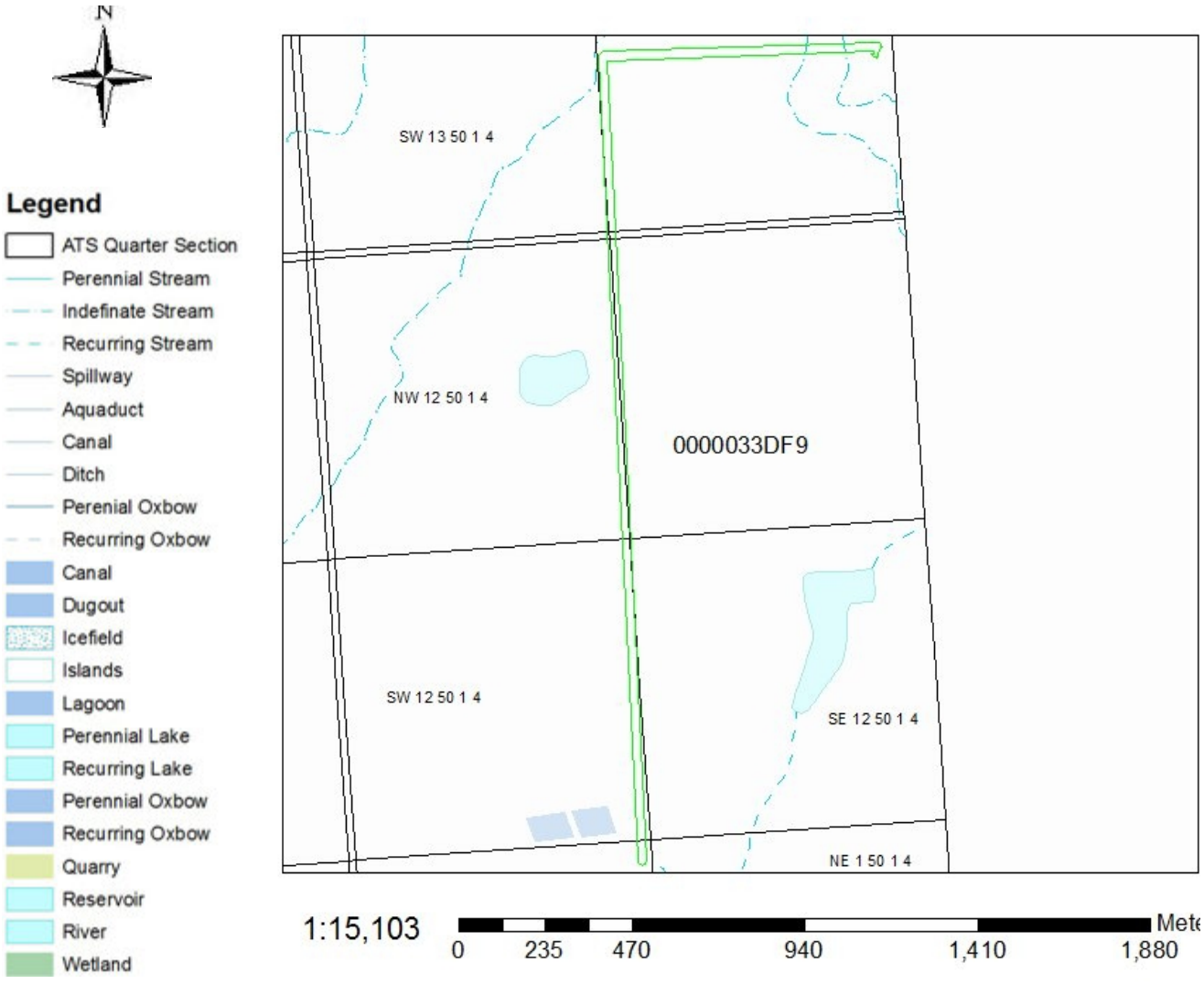
0000033DF9

Quarter	Section	Township	Range	Meridian	Road Allow.	Sensitive Features by Quarter Section
NW	1	50	1	4		Other Sensitive and Endangered Species, Sharp-tailed Grouse Survey,Grassland and/or Parkland Natural Region
NE	12	50	1	4		Other Sensitive and Endangered Species, Sharp-tailed Grouse Survey,Grassland and/or Parkland Natural Region
NW	12	50	1	4		Other Sensitive and Endangered Species, Sharp-tailed Grouse Survey,Grassland and/or Parkland Natural Region
SE	12	50	1	4		Other Sensitive and Endangered Species, Sharp-tailed Grouse Survey,Grassland and/or Parkland Natural Region
SW	12	50	1	4		Other Sensitive and Endangered Species, Sharp-tailed Grouse Survey,Grassland and/or Parkland Natural Region

Landscape Analysis Tool Report

SE	13	50	1	4		Other Sensitive and Endangered Species, Sharp-tailed Grouse Survey,Grassland and/or Parkland Natural Region
SE	13	50	1	4	RS	Other Sensitive and Endangered Species, Sharp-tailed Grouse Survey,Grassland and/or Parkland Natural Region
SW	13	50	1	4	RS	Other Sensitive and Endangered Species, Sharp-tailed Grouse Survey,Grassland and/or Parkland Natural Region
SW	13	50	1	4		Other Sensitive and Endangered Species, Sharp-tailed Grouse Survey,Grassland and/or Parkland Natural Region

Landscape Analysis Tool Report



Provincial Section Approval Standards and Operating Conditions

Approval Standards

100.1.1.
Location of proposed developments shall be sited as follows, unless alternative siting can be supported by Regulated Industry Standards:

a. New linear developments shall:
    i. Use existing unoccupied linear disturbances (> 4 metres wide), unless doing so results in greater disturbance (i.e., footprint hectares), and/or negative environmental impacts (e.g., impacting sensitivities), or;
    ii. Adjoin existing occupied linear industrial dispositions, unless doing so results in greater disturbance (i.e., footprint hectares), and/or negative environmental impacts (e.g., impacting sensitivities), or;
    iii. With the exception of pipelines, use surveyed road allowances, unless doing so results in greater disturbance (i.e., footprint hectares), and or negative environmental impacts (e.g., impacting sensitivities). ROW width shall not exceed the government road allowance width.

100.1.6
Pipeline Right of Way (ROW) widths shall not exceed the limits listed below, unless alternative ROW widths can be supported by Regulated Industry Standards. Variable width is preferred:

a. Cross Country
    i. Conventional Pipelines with an outside diameter > 200 millimetres: the ROW width shall not exceed 20 metres.
    ii. Conventional Pipelines with an outside diameter < 200 millimetres: the ROW width shall not exceed 15 metres.
    iii. Multi-pipe installation projects within a single ROW width shall not exceed 20 metres.
b. Adjoining Existing Linear Disturbances
    i. Proposed pipelines adjoining existing linear disturbances, excluding pipelines, shall not exceed 10 metres disposition width.
    ii. Proposed pipelines adjoining existing pipeline disturbances shall not exceed 15 meters disposition width.
    iii. Multi-pipe installation projects within a single ROW width adjoining existing linear disturbances shall not exceed 20 metres.
    iv. Effort will be made to gain approval (documented) from the adjacent disposition holder to utilize portion(s) of their disposition for temporary work space.
c. All pipelines shall be installed consistent with ERCB Directive 056 - Energy Development Applications and Schedules. To access the directive, search for “Directives” on ercb.ca, and Alberta Environment’s Water Act, Water (Ministerial) Regulation, and the appropriate Code of Practice related to pipelines. To access codes of practice, search for “Water Codes of Practice” on srd.alberta.ca.

100.1.7
Pipeline replacement shall occur within the original approved Right of Way (ROW).

100.1.8
Where materials are available, rollback shall be applied as follows, unless alternative methods can be supported by Regulated Industry Standards:

a. Place rollback across the entire pipeline/easement width for a distance of at least 200 metres from all points of intersection with wellsites, plant sites, roads and permanent watercourses.
b. Place rollback across the entire pipeline/easement width on all slopes greater than or equal to 10%.
c. Rollback on lands under agricultural disposition (grazing lease, farm development lease) will only be applied after obtaining consent from the disposition holder.
d. In substitution of a proportion of rollback, use dog-legs, directional drilling, or other techniques to retain at least 50 metres of forest cover (where it exists) to block line-of-sight and vehicle access at all points of pipeline/easement intersection with all permanent watercourses and roads.
e. No rollback shall occur on wildfire control breaks, containment lines or other designated debris free locations identified in a Wildfire Management Plan or FireSmart Plan.

100.1.9
Incidental Activities that fall within the sizing parameters, as defined within the PLAR Approvals and Authorizations Manual - 2013 shown at the time of application for a short term disposition shall be valid for the term of the short term disposition. To access the PLAR Approvals and Authorizations Manual - 2013, search “PLAR Approvals and Authorizations Manual - 2013” on srd.alberta.ca.

100.1.11
Where an Integrated Resource Plan or a Reservation/Protective Notation identifies a greater set back, the greater set back shall prevail.

100.1.13
Where a Higher Level Plan exists, the direction provided shall be followed. To access a list of Higher Level Plans, see Appendix B.

100.2.1
All cleared pipeline right-of-ways (ROW) shall be re-vegetated.

a. Pipeline vegetation removal associated with step-out or wildcat wells shall not start until it is known that the activity is required based on a producing well.
b. For in-field wells, pipeline vegetation removal may occur concurrently with wellsite clearing. The pipeline right of way of all non-producing wells shall be reclaimed within 3 years of entry date.

100.3.1
Permafrost degradation is not permitted. Onsite permafrost depth must be maintained to the same depth as offsite control.

100.3.2
In permafrost areas, the surface shall not be stripped.

100.4.1
Resource extraction activities on islands and the bed and shore of waterbodies and watercourses is prohibited.

100.4.2
Activities shall not interrupt natural drainage (including ephemeral and fens), block water flow or alter the water table.

100.4.4
The following watercourse setbacks for all activities from the disposition edge (MSL or PIL), or paralleling linear dispositions (PLA or LOC), or pipeline bore site (PLA), shall be followed, except for vehicle or pipeline crossings:

a. Intermittent watercourses and springs shall have a setback of at least 45 metres from the top of the break.
b. Small Permanent watercourses shall have a setback of at least 45 metres from the top of the break.
c. Large Permanent watercourses shall have a setback of at least 100 metres from the top of the break.

100.4.5
The following waterbody setbacks for all activities from the disposition edge (MSL or PIL), or paralleling linear dispositions (PLA or LOC), or pipeline bore site (PLA), shall be followed:

a. A minimum setback of 45 metres of undisturbed vegetation shall be maintained from non-permanent seasonal wetlands.
b. A minimum setback of 100 metres from the bed and shore of semi-permanent ponds/wetlands and shallow open water ponds and lakes.

100.4.6
The number of crossings shall be minimized, unless doing so results in greater disturbance (i.e., footprint hectares) and/or negative environmental impacts (e.g., impacting landscape sensitivities) than creating a new crossing.

100.4.7
All crossings shall maintain fish passage. Crossings shall be compliant with the departments Code of Practice under the Water Act, Water (Ministerial) Regulation.

100.4.8
Large and small permanent watercourses shall be bored unless geotechnical data indicates unsuitable bore conditions or watercourses are non-fish bearing

100.8.1
Locate activities away from important wildlife features including mineral licks, raptor nests, active den sites, and hibernacula by a minimum buffer distance of 100 metres. A wildlife sweep of the immediate area (site plus 100 metres) is required prior to construction to identify these important wildlife features. All observations must be reported to the regional ESRD Wildlife Biologist, the Alberta Energy Regulator and entered into the Fisheries and Wildlife Management Information System (FWMIS). Buffer distances will be greater for identified sensitive species and features (Subsection 100.9.1.).

Operating Conditions

200.1.3
Locate temporary activities adjacent to permanent, all-weather access or to existing industrial dispositions.

200.1.8
Any identified improvements (e.g., fences, water control structures, and signage) that were damaged as a result of industry activities on the land shall be repaired and/or replaced to pre-existing condition within 30 days of entry or immediately if occupied by livestock.

200.1.10
The application of rollback within FireSmart Community Zones shall be determined through the Consultative Notation (CNT) process.

200.1.11
In addition to the operating conditions in this document, all activities shall be coordinated through Energy Industry Control at (780) 842-5850 for activity on Canadian Forces Base/Area Support Unit, Wainwright, and (780) 573-7206 for activity on Canadian Forces Base/Area Support Unit, Cold Lake.

200.1.12
Concurrent construction of a pipeline prior to proven results shall only be permitted for in-field wells where a high degree of production certainty can be demonstrated.

200.1.13
The disposition holder shall comply with all consultation requirements and direction provided by the regulatory body, including direction provided in Appendix A (Reservations and Notations) and in Appendix B (Higher Level Plans) of this document for all activities occurring within the identified lands.

200.2.1
Manage all weeds as per the Weed Control Act.

200.2.2
Vegetation control (mechanical - mowing/brush control) along linear ROWs shall not occur between May 1st and July 31st, notwithstanding the need to comply with the Weed Control Act with the following exception: in the Grassland and Parkland Natural Regions, vegetation control between May 1st and July 31st for vehicle access, is limited to mowing no more than a 4 metre width centred on the driving lane.

200.2.4
Vegetation control along pipelines is permitted to a maximum of 3 metres, centred on the pipeline, notwithstanding the requirement to control weeds as per the Weed Control Act.

200.2.5
Chemical application, for the purpose of vegetation control, shall not occur within 30 metres of any waterbody or watercourse, unless otherwise authorized.

200.2.7
Natural recovery (a technique for reclaiming sites by allowing the land to re-vegetate naturally (without seeding) by conserving and replacing reclamation material) shall be used for activities on native landscapes forested and peatlands for all areas of the site, not required for operations or padded with clay. Natural recovery is to be implemented within 6 months of completions (post-drill) and for sites that have been prepared but not drilled within 6 months of construction. Assisted natural recovery on native grasslands, forested or peatland sites is allowed on high erosion sites, or sites prone to weeds, or agronomic invasion, or padded sites (forested and peatland).

a. During assisted natural recovery, on Native Grassland and Parkland sites, refer to 200.10.3.
b. During assisted natural recovery on forested and peatland sites when reseeding with herbaceous seed native to the Natural Subregion or agronomic annuals and seed mixes as approved by the regulatory body shall be free of the species listed in the Weed Control Act. A seed certificate (under the rules and regulation of the Canada Seeds Act) for each species shall be provided, to the regulatory body, upon request.
c. On forested and peatlands, assisted natural recovery can be used for planting woody species for the purpose of accelerated reclamation. The woody species must be native to the Natural Subregion and follow the Alberta Forest Genetic Resource Management and Conservation Standards.

200.2.8
When seeding pasture or cultivated lands, the agronomic or forage seed shall meet or exceed Certified #1 as outlined in the Canada Seeds Act and Seeds Regulations. Seed mixes are to be free of species listed in the Weed Control Act. A seed certificate (under the rules and regulation of the Canada Seeds Act) for each species shall be provided to the regulatory body, upon request.

200.2.9
Revegetation with trees or shrubs within the Green Area shall be consistent with the Alberta Forest Genetic Resource Management and Conservation Standards document. To access the document, search “Alberta

Forest Genetic Resource Management and Conservation Standards" on.srd.alberta.ca.

200.2.10
Merchantable timber shall be salvaged unless a request for waiver is approved by regulatory body.

200.2.11
Timber salvage shall be conducted according to the utilization standards for the overlapping timber disposition(s) (i.e., FMA, CTL, DTL) or, where no overlapping timber disposition exists, as per the Alberta Timber Harvest Planning and Operating Ground Rules. To access the document, search "Alberta Timber Harvest Planning and Operating Ground Rules" on srd.alberta.ca

200.3.1
Activity shall be suspended during adverse ground conditions.

200.3.2
Soil and surface erosion and sedimentation shall be prevented and controlled on all disturbed lands.

200.3.3
Soil shall not be removed from the disposition unless authorized. This includes all soil horizons and all soil types (e.g. leaf litter, organic soils such as muskeg, and clay fill material are all included).

200.3.4
Where soil stripping occurs, salvage all topsoil (typically includes forest floor and/or A horizon). Where two-lift stripping occurs, topsoil and part or all of the upper subsoil (B horizon) must be stripped and stored separately.

a. Where topsoil is less than 15 centimetres, conservation shall include the topsoil plus part of the upper subsoil (B horizon) up to a total depth of 15 centimetres (unless the B horizon is considered unsuitable chemically or physically).
b. On forested sites where site infrastructure can be constructed on the upper subsoil (B), two-lift stripping may not be necessary but the upper subsoil shall not be degraded.

200.3.5
Store reclamation materials separately (topsoil, subsoil, and coarse woody debris) on the disposition, such that it can be distributed evenly over the disturbed area for progressive (interim) and/or final reclamation.

200.3.6
Wood chips shall not be mixed with forest floor and/or surface soil.

200.3.7
Storage piles/windrows shall not encroach into standing timber.

200.3.8
Disposal pits, required in connection with the activity, shall be located in impermeable soil. Where impermeable soil is not available, impermeable tanks may be used to collect all waste and then dispose of at

an authorized waste disposal facility.

200.3.9
Soil sterilants are prohibited.

200.3.10
All spoil material excavated from the pipeline trench shall be returned to the trench in a manner that there is no pooling of water or erosion occurring on the surface. The maximum height of crown (roach) shall not exceed 60 cm on frozen soils and 30 cm on dry or non-frozen soils. Breaks in pipeline roaches shall occur as to not impede water drainage and allow for passage of water.

200.3.12
Soil rutting shall not occur on minimal disturbance sites.

200.3.13
In permafrost areas, utilize snow (natural or man-made) to establish a level surface.

200.4.1
Activities shall not result in the deposition or placement of debris, soil or other deleterious materials into or through any watercourse and/or waterbody, or on the ice of any watercourse and/or waterbody.

200.4.2
Keep watercourse crossings free of accumulated debris or ice that could impede the flow of water and subsequently cause erosion.

a. Remove ice-dams from culverts. Culverts plugged with ice are to be re-opened to prevent flooding over the road, through the ditch, or around the crossing structure.
b. Remove debris that compromises water flow immediately upstream from or under crossing structures.

200.4.4
Where crossings have been removed, the bank or shoreline of all affected watercourses and/or waterbodies shall be immediately stabilized and/or alterations or modifications to the bank or shoreline shall be restored.

200.4.5
Access (off-disposition) for water withdrawal requires an Approval or Authorization from the regulatory body.

200.4.6
Bridge abutments shall not constrict the normal watercourse channel. Bridge spans shall extend beyond stream banks and abutment walls.

200.4.7
Water from roads, ditches and bared soil surfaces are not to be permitted to drain directly into watercourses. Where vegetated buffers alone do not retard water and sediment movement effectively, appropriate obstructions (e.g., logs, rocks, mounds) or sediment control structures shall be installed to dissipate the flow of water and capture sediment prior to entering the watercourse.

200.4.8
Watercourse structures shall be maintained to prevent sedimentation and erosion.

200.4.9
Erosion control measures (e.g., silt fences, matting, gravel, and check dams) shall be installed and maintained.

200.4.10
A horizontal directional drill frac containment and clean-up specialist shall be on-site during all boring or directional drilling activities under permanent watercourses. All equipment required for containment and clean -up shall also be present.

200.5.1
Conduct progressive reclamation and interim clean-up, including built but not drilled sites, for the wellsite and all associated disturbances (log decks, remote sumps, campsites, borrow sites, etc) of that disposition as per External Directive SD 2010-02 Progressive Reclamation and Interim Clean up. To access the directive, search “External Directive SD 2010-02 Progressive Reclamation and Interim Clean up” on srd.alberta.ca.

200.5.2
For final reclamation, follow the Reclamation Criteria for Wellsites and Associated Facilities documents. To access the documents, search “Wellsite Reclamation Certificate Application Process” on srd.alberta.ca

Sensitivity Section Approval Standards and Operating Conditions

Other Sensitive and Endangered Species

Approval Standards

100.9.1.13.1
No new construction shall occur on native grasslands within the Grassland and Parkland Natural Region between April 1st and July 15th, unless grassland bird surveys are completed using inventory procedures outlined by ESRD. To access the guidelines, search “Sensitive Species Inventory Guidelines” on srd.alberta.ca. If an active nest site is located, a set back of 100 metres from the nest site will apply between April 1st and July 15th for the following species:

- short-eared owl
- mountain plover
- long-billed curlew
- upland sandpiper
- Sprague’s pipit

Sharp-tailed Grouse Survey

Approval Standards

100.9.1.6.1
The disposition holder shall conduct appropriate pre-construction wildlife surveys for all activities occurring within the identified Species At Risk ranges of the Landscape Analysis Tool, as per the direction of the Pre-Application Requirements. Any and all observed Species At Risk features (such as leks, nests, dens, etc.,) shall be buffered by the setbacks and timing restrictions specified on the LAT Report for that Species At Risk.

100.9.1.6.2
Activities conducted between October 31st and March 15th can occur without a sharp-tailed grouse survey, however all areas of identified leks within the Landscape Analysis Tool shall be avoided by the appropriate standards as identified in 100.9.1.6.3 and 100.9.1.6.4.

100.9.1.6.6
Use noise reduction equipment to muffle or otherwise control noise so that operational noise will not exceed 49 decibels measured at 10 metres from the source within 500 metres of a lek.

100.9.1.6.7
Activities shall not occur within 500 meters of the perimeter of an active sharp-tailed grouse lek between March 15th and June 15th.

Operating Conditions

200.9.1.6.1
During the lekking season (March 15th to June 15th), work within 500 metres of a sharp-tailed grouse lek shall

be limited to the portions of the day after 10:00am and before 4:00pm. Emergency situations are exempt from this condition.

Approval Standards

100.9.1.6.4
Low impact activities shall not occur within 100 meters of the perimeter of an active sharp-tailed grouse lek between June 16th and March 14th.

Grassland and/or Parkland Natural Region

Approval Standards

100.10.1
Locate activities outside of Fescue Grasslands by using existing disturbances or locate adjacent to existing occupied dispositions (e.g., transportation corridors, cultivated lands, existing access trails, previously disturbed and/or non-native cover areas).

100.10.2
Activities shall not occur on Fescue Grasslands from Dec 16th to July 31st.

Operating Conditions

200.10.1
Straw crimping shall not occur on native grasslands.

200.10.2
Use mechanical equipment that will not cause surface disturbance in coulees or through river benchland areas.

200.10.3
On Native Grasslands natural recovery re-vegetation shall be utilized for all minimal disturbance activities.

a. On high erosion sites, where natural recovery cannot be used, assisted natural recovery is allowed. The application rate is a 50:50 ratio of no greater than 1/2 bushel (25-30 lbs/ac) of fall rye and flax only. See Vegetation Operating Conditions (Section 200.2) for standards on seed quality.
b. On sites that are prone to weeds and agronomic species invasion or other factors can be demonstrated that limit natural recovery, reseeding with suitable native species is required. Rationale for seeding must be submitted to a departmental officer for approval. Appropriate seed mixes are to be designed based on adjacent native plant communities within the immediate vicinity and must correspond with the onsite ecological range site (See appropriate Range Plant Community Guide). Seed mixes are to be free of species listed in the Weed Control Act. Seed mixes are to be free of all agronomic species (excepting those identified for assisted recovery techniques). A seed certificate (under the rules and regulation of the Canada Seeds Act) for each species shall be provided to the issuing regulatory body prior to seed mix approval.

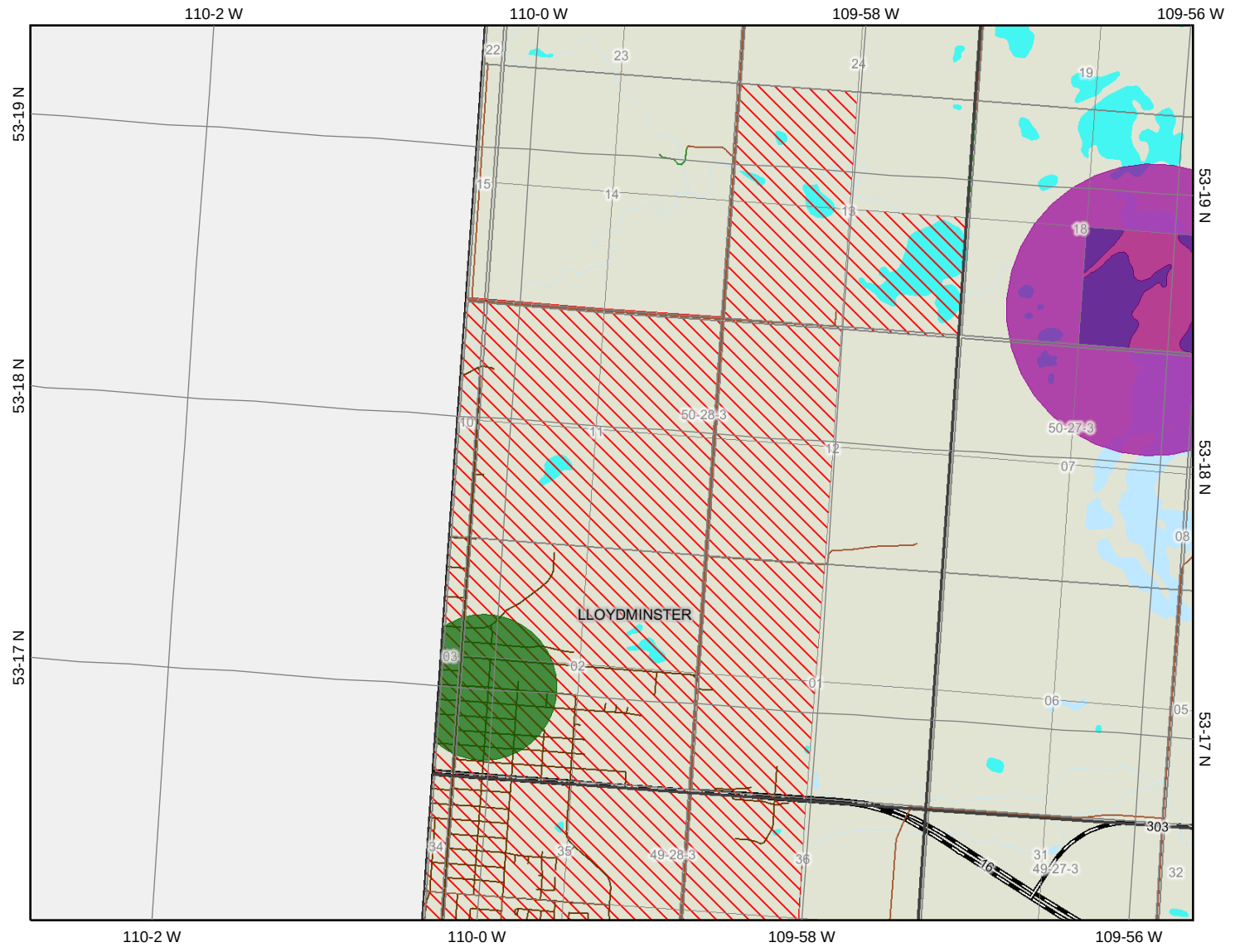
200.10.6
Construct pipelines to minimal disturbance. Pipeline trenches shall not exceed the pipe diameter plus an additional 30 centimetre trench width.

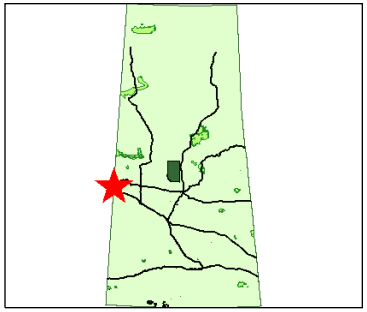
a. In areas where greater ground disturbance is required, (i.e., foreign lines crossings, bell holes for tie-ins, and areas required for boring operations), pre-stripping for soil salvage and replacement can occur upon interim reclamation. They may also be seeded as per assisted natural recovery vegetation (200.10.3, above). These areas shall be identified on the survey plan as per PLAR Approvals and Authorizations Manual - 2013 or an Authorization plan.

b. In areas where ground conditions do not allow for minimal disturbance techniques, pre-stripping for soil salvage can occur. Only the portion of the ROW that is needed for the pipeline installation is to be stripped. These areas may also be seeded as per assisted natural recovery vegetation (200.10.3) above.

SCDC Consultation

Proposed Husky PIpeline





Legend

- Sask Outline
- Sask Mask
- Townships
- Sections
- Quarter Sections

Rare and Endangered Species

- Animal
- Community
- Invertebrate
- Other
- Plant

- Fish and Wildlife Development Fund Lands
- Wildlife Habitat Protection
- Agricultural Crown Land

SURN Roads

- Local / Street
- Resource / Recreation
- Collector

- Urban Municipalities
- SURN Highways

Lakes 50k

- Intermittent Water
- Permanent Water
- Flooded Area
- Irrigation Canal

- Rivers 50k
- PFRA Community Pastures
- Ramsar Wetland
- Protected Areas

N

Scale: 1:42,935

Map center: 53° 17' 50" N, 109° 59' 22" W

Notes: 10-1-50-28W3 to 1-50-01W4M

Species At Risk Matrices

Species At Risk Matrix – Sharp-tailed Grouse

Species	Potential Habitat 1=poor 2=moderate 3=optimal	Species Range 1=Not Within 3=Within Range	Existing Disturbance 1=Cultivation 2=Tame Hay 3= Native Prairie	Historical Observations 1=No Historical Occurrences 3=Historical Occurrences	Matrix Total (Sum)
Sharp-Tailed Grouse	2	3	2	1	8

Matrix Use Instructions

1. Complete the Project Document Review.
2. Determine the rating for each of the 4 variables.
3. Calculate the sum of the ratings.
4. If the Matrix Total is 4-8 a survey does not have to be conducted.
5. If the Matrix Total is 9-12 a survey is required.

Project Document Review

- Review the survey/construction plans, topographic maps and aerial imagery to determine the potential habitat and surrounding landuse.
- Review field identification books and/or other literature to determine distribution of species.
- Determine historical species observations
  - Saskatchewan
    - **SCDC** (Sask Conservation Data Centre) - www.biodiversity.sk.ca
  - Alberta
    - **FWMIS** (Fish & Wildlife Management Information System) (http://esrd.alberta.ca/fish-wildlife/fwmis/access-fwmis-data.aspx);
    - **ACIMS** (Alberta Conservation Information Management System) (http://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-(acims).aspx);
    - **LAT** (Landscape Analysis Tool) (https://securexnet.env.gov.ab.ca/lat_login.html).

Ranking Table

Rank	Survey
4	No
5	No
6	No
7	No
8	No
9	Yes
10	Yes
11	Yes
12	Yes

Survey Notes

- Typically, if the timing of the site visit is between November 1 and March 14 no survey is required.
- Each species has timing requirements for conducting the survey. No survey should be conducted outside of the recommended timing. The following links should be viewed to determine the survey timing:
  - Saskatchewan - http://www.environment.gov.sk.ca/Default.aspx?DN=a7d1b343-5099-4578-9083-ecc975e5902e
  - Alberta - ESRD/Sensitive Species Inventory Guidelines April 2013.

Species At Risk Matrix – Yellow Rail

Species	Potential Habitat 1=poor 2=moderate 3=optimal	Species Range 1=Not Within 3=Within Range	Existing Disturbance 1=Cultivation 2=Tame Hay 3= Native Prairie	Historical Observations 1=No Historical Occurrences 3=Historical Occurrences	Matrix Total (Sum)
Yellow Rail	1	3	2	1	7

Matrix Use Instructions

1. Complete the Project Document Review.
2. Determine the rating for each of the 4 variables.
3. Calculate the sum of the ratings.
4. If the Matrix Total is 4-8 a survey does not have to be conducted.
5. If the Matrix Total is 9-12 a survey is required.

Project Document Review

- Review the survey/construction plans, topographic maps and aerial imagery to determine the potential habitat and surrounding landuse.
- Review field identification books and/or other literature to determine distribution of species.
- Determine historical species observations
  - Saskatchewan
    - **SCDC** (Sask Conservation Data Centre) - www.biodiversity.sk.ca
  - Alberta
    - **FWMIS** (Fish & Wildlife Management Information System) (http://esrd.alberta.ca/fish-wildlife/fwmis/access-fwmis-data.aspx);
    - **ACIMS** (Alberta Conservation Information Management System) (http://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-(acims).aspx);
    - **LAT** (Landscape Analysis Tool) (https://securexnet.env.gov.ab.ca/lat_login.html).

Ranking Table

Rank	Survey
4	No
5	No
6	No
7	No
8	No
9	Yes
10	Yes
11	Yes
12	Yes

Survey Notes

- Typically, if the timing of the site visit is between November 1 and March 14 no survey is required.
- Each species has timing requirements for conducting the survey. No survey should be conducted outside of the recommended timing. The following links should be viewed to determine the survey timing:
  - Saskatchewan - http://www.environment.gov.sk.ca/Default.aspx?DN=a7d1b343-5099-4578-9083-ecc975e5902e
  - Alberta - ESRD/Sensitive Species Inventory Guidelines April 2013.

Species At Risk Matrix – Northern Leopard Frog

Species	Potential Habitat 1=poor 2=moderate 3=optimal	Species Range 1=Not Within 3=Within Range	Existing Disturbance 1=Cultivation 2=Tame Hay 3= Native Prairie	Historical Observations 1=No Historical Occurrences 3=Historical Occurrences	Matrix Total (Sum)
N. Leopard Frog	2	3	2	1	8

Matrix Use Instructions

1. Complete the Project Document Review.
2. Determine the rating for each of the 4 variables.
3. Calculate the sum of the ratings.
4. If the Matrix Total is 4-8 a survey does not have to be conducted.
5. If the Matrix Total is 9-12 a survey is required.

Project Document Review

- Review the survey/construction plans, topographic maps and aerial imagery to determine the potential habitat and surrounding landuse.
- Review field identification books and/or other literature to determine distribution of species.
- Determine historical species observations
  - Saskatchewan
    - **SCDC** (Sask Conservation Data Centre) - www.biodiversity.sk.ca
  - Alberta
    - **FWMIS** (Fish & Wildlife Management Information System) (http://esrd.alberta.ca/fish-wildlife/fwmis/access-fwmis-data.aspx);
    - **ACIMS** (Alberta Conservation Information Management System) (http://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-(acims).aspx);
    - **LAT** (Landscape Analysis Tool) (https://securexnet.env.gov.ab.ca/lat_login.html).

Ranking Table

Rank	Survey
4	No
5	No
6	No
7	No
8	No
9	Yes
10	Yes
11	Yes
12	Yes

Survey Notes

- Typically, if the timing of the site visit is between November 1 and March 14 no survey is required.
- Each species has timing requirements for conducting the survey. No survey should be conducted outside of the recommended timing. The following links should be viewed to determine the survey timing:
  - Saskatchewan - http://www.environment.gov.sk.ca/Default.aspx?DN=a7d1b343-5099-4578-9083-ecc975e5902e
  - Alberta - ESRD/Sensitive Species Inventory Guidelines April 2013.

Species At Risk Matrix – Canadian Toad

Species	Potential Habitat 1=poor 2=moderate 3=optimal	Species Range 1=Not Within 3=Within Range	Existing Disturbance 1=Cultivation 2=Tame Hay 3= Native Prairie	Historical Observations 1=No Historical Occurrences 3=Historical Occurrences	Matrix Total (Sum)
Canadian Toad	2	3	2	1	8

Matrix Use Instructions

1. Complete the Project Document Review.
2. Determine the rating for each of the 4 variables.
3. Calculate the sum of the ratings.
4. If the Matrix Total is 4-8 a survey does not have to be conducted.
5. If the Matrix Total is 9-12 a survey is required.

Project Document Review

- Review the survey/construction plans, topographic maps and aerial imagery to determine the potential habitat and surrounding landuse.
- Review field identification books and/or other literature to determine distribution of species.
- Determine historical species observations
  - Saskatchewan
    - **SCDC** (Sask Conservation Data Centre) - www.biodiversity.sk.ca
  - Alberta
    - **FWMIS** (Fish & Wildlife Management Information System) (http://esrd.alberta.ca/fish-wildlife/fwmis/access-fwmis-data.aspx);
    - **ACIMS** (Alberta Conservation Information Management System) (http://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-(acims).aspx);
    - **LAT** (Landscape Analysis Tool) (https://securexnet.env.gov.ab.ca/lat_login.html).

Ranking Table

Rank	Survey
4	No
5	No
6	No
7	No
8	No
9	Yes
10	Yes
11	Yes
12	Yes

Survey Notes

- Typically, if the timing of the site visit is between November 1 and March 14 no survey is required.
- Each species has timing requirements for conducting the survey. No survey should be conducted outside of the recommended timing. The following links should be viewed to determine the survey timing:
  - Saskatchewan - http://www.environment.gov.sk.ca/Default.aspx?DN=a7d1b343-5099-4578-9083-ecc975e5902e
  - Alberta - ESRD/Sensitive Species Inventory Guidelines April 2013.

Species At Risk Matrix – Sprague's Pipit

Species	Potential Habitat 1=poor 2=moderate 3=optimal	Species Range 1=Not Within 3=Within Range	Existing Disturbance 1=Cultivation 2=Tame Hay 3= Native Prairie	Historical Observations 1=No Historical Occurrences 3=Historical Occurrences	Matrix Total (Sum)
Sprague's Pipit	1	3	2	1	7

Matrix Use Instructions

1. Complete the Project Document Review.
2. Determine the rating for each of the 4 variables.
3. Calculate the sum of the ratings.
4. If the Matrix Total is 4-8 a survey does not have to be conducted.
5. If the Matrix Total is 9-12 a survey is required.

Project Document Review

- Review the survey/construction plans, topographic maps and aerial imagery to determine the potential habitat and surrounding landuse.
- Review field identification books and/or other literature to determine distribution of species.
- Determine historical species observations
    - Saskatchewan
        - **SCDC** (Sask Conservation Data Centre) - www.biodiversity.sk.ca
    - Alberta
        - **FWMIS** (Fish & Wildlife Management Information System) (http://esrd.alberta.ca/fish-wildlife/fwmis/access-fwmis-data.aspx);
        - **ACIMS** (Alberta Conservation Information Management System) (http://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-(acims).aspx);
        - **LAT** (Landscape Analysis Tool) (https://securexnet.env.gov.ab.ca/lat_login.html).

Ranking Table

Rank	Survey
4	No
5	No
6	No
7	No
8	No
9	Yes
10	Yes
11	Yes
12	Yes

Survey Notes

- Typically, if the timing of the site visit is between November 1 and March 14 no survey is required.
- Each species has timing requirements for conducting the survey. No survey should be conducted outside of the recommended timing. The following links should be viewed to determine the survey timing:
    - Saskatchewan - http://www.environment.gov.sk.ca/Default.aspx?DN=a7d1b343-5099-4578-9083-ecc975e5902e
    - Alberta - ESRD/Sensitive Species Inventory Guidelines April 2013.

Species At Risk Matrix – Short-eared Owl

Species	Potential Habitat 1=poor 2=moderate 3=optimal	Species Range 1=Not Within 3=Within Range	Existing Disturbance 1=Cultivation 2=Tame Hay 3= Native Prairie	Historical Observations 1=No Historical Occurrences 3=Historical Occurrences	Matrix Total (Sum)
Short-Eared Owl	2	3	2	1	8

Matrix Use Instructions

1. Complete the Project Document Review.
2. Determine the rating for each of the 4 variables.
3. Calculate the sum of the ratings.
4. If the Matrix Total is 4-8 a survey does not have to be conducted.
5. If the Matrix Total is 9-12 a survey is required.

Project Document Review

- Review the survey/construction plans, topographic maps and aerial imagery to determine the potential habitat and surrounding landuse.
- Review field identification books and/or other literature to determine distribution of species.
- Determine historical species observations
  - Saskatchewan
    - **SCDC** (Sask Conservation Data Centre) - www.biodiversity.sk.ca
  - Alberta
    - **FWMIS** (Fish & Wildlife Management Information System) (http://esrd.alberta.ca/fish-wildlife/fwmis/access-fwmis-data.aspx);
    - **ACIMS** (Alberta Conservation Information Management System) (http://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-(acims).aspx);
    - **LAT** (Landscape Analysis Tool) (https://securexnet.env.gov.ab.ca/lat_login.html).

Ranking Table

Rank	Survey
4	No
5	No
6	No
7	No
8	No
9	Yes
10	Yes
11	Yes
12	Yes

Survey Notes

- Typically, if the timing of the site visit is between November 1 and March 14 no survey is required.
- Each species has timing requirements for conducting the survey. No survey should be conducted outside of the recommended timing. The following links should be viewed to determine the survey timing:
  - Saskatchewan - http://www.environment.gov.sk.ca/Default.aspx?DN=a7d1b343-5099-4578-9083-ecc975e5902e
  - Alberta - ESRD/Sensitive Species Inventory Guidelines April 2013.

Construction Plan With Water Feature Overlay

MOSAIC PLAN

SHOWING

PIPELINE RIGHT OF WAY

WITHIN

W. 1/2 SEC. 12, & S. 1/2 SEC. 13
TWP.50-RGE.1-W.4M.

AND

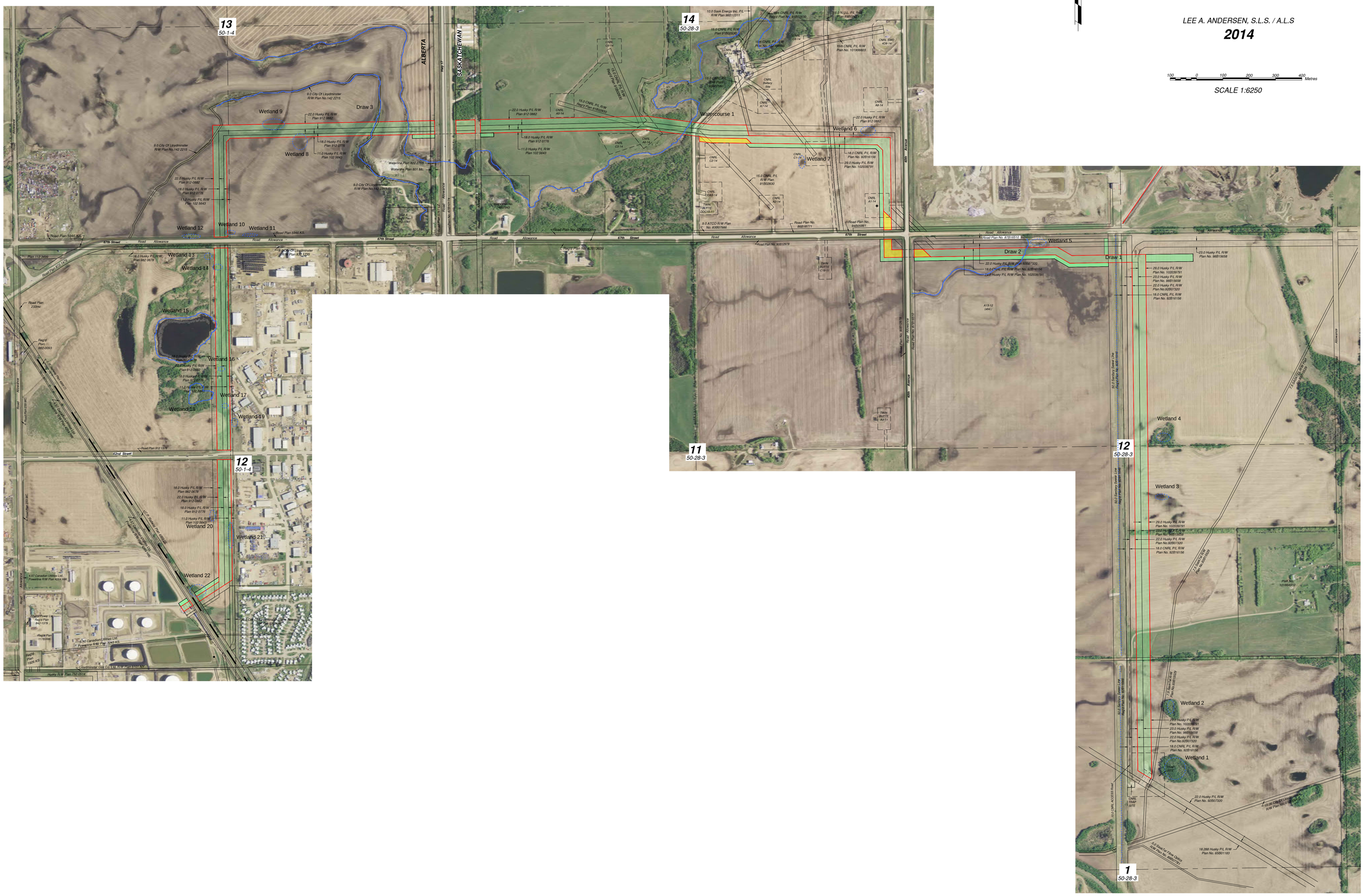
N.E. 1/4 SEC.1, N.E. 1/4 SEC.11,
E.1/2 & N.W. 1/4 SEC.12, S.1/2 SEC.14
AND S.1/2 FRAC. SEC.15
TWP.50-RGE.28-W.3M.

LEE A. ANDERSEN, S.L.S. / A.L.S

2014

100 0 100 200 300 400 Metres

SCALE 1:6250



FILE No. LS140564	DWG. LS140564(Construction)	Meridian Surveys (Alta.) Ltd	
AFE #: MS-01537-03-01-PL	PARF #: 18859-011	BOX 10219, LLOYDMINSTER, ALBERTA, T9V 3A4 Bus:(780)875-1440 Fax:(780)875-4813	
DRAWN BY: CBM	CHECKED BY: RS		
LAND FILE #: _____			

No.	REVISION	DATE	BY
			CBM / RS