tera A CH2M HILL Company
TERA, A CH2M HILL Company
Suite 1100, 815 - 8th Avenue S.W., Calgary, Alberta T2P 3P2 Canada
Business: (403) 265-2885 • Fax: (403) 266-6471 • Website: www.teraenv.com

October 30, 2014

Don McCabe P. Biol.
Land Conservation and Reclamation Specialist
In Situ, Closure and Liability Branch
Alberta Energy Regulator
Suite 1000, 250 – 5th Street S.W.
Calgary, Alberta T2P 0R4

Dear Mr. McCabe

**RE: Update to the Conservation and Reclamation Report for the White Area of the Grand Rapids Pipeline GP Ltd. Grand Rapids Pipeline Project under the *Environmental Protection and Enhancement Act* (Application No. 001-328929)**

Grand Rapids Pipeline GP Ltd. (Grand Rapids) submitted a Conservation and Reclamation (C&R) Report (Application No. 001-328929) for the Grand Rapids Pipeline Project (the Project) to Alberta Environment and Sustainable Resource Development (AESRD) on May 15, 2013. Due to changes in pipe size and a number of minor route realignments since submission of the C&R Report, Grand Rapids provided a supplemental information letter to the Alberta Energy Regulator (AER) on April 24, 2014 (the AER took over the administration of Alberta *Environment Protection and Enhancement Act* [*EPEA*] from AESRD in March 2014).

Since April 2014, a number of supplemental field studies have been conducted to assess segments of the right-of-way that did not previously have survey consent. In addition, there have been a number of small route realignments adopted as a result of constructability analysis; as well as to address landowner requests and direction from the AER.

The AER issued Decision 2014 ABAER 012 on October 9, 2014 granting approval for select Project applications subject to the conditions outlined in Appendix 1 of the Decision. On behalf of Grand Rapids, TERA, a CH2M HILL Company (TERA) provides the following update to the C&R Report for the White Area of the Grand Rapids Pipeline Project. TERA and Grand Rapids anticipate that this update is acceptable to the AER and will fulfill Grand Rapids' requirements with respect to Condition 3 of the AER Decision, This supplemental information letter follows the format of the original C&R Report using the same section heading numbers.

The supplemental field surveys demonstrate that no substantial changes have been made regarding land use, environmental conditions or how potential environmental impacts will be mitigated during pipeline construction. The pipeline will be constructed in adherence with Part B, the Environmental Protection Plan (EPP), of the C&R Report. The EPP, as well as the Environmental Alignment Sheets will be updated with minor changes to depict the revised pipeline route, the associated environmental concerns and key mitigation measures to be employed during construction. The additional mitigation measures are outlined in the appropriate sections below.

TERA File: 8395
Via: Email

# 1.0 INTRODUCTION

This update to the C&R Report includes a revised construction schedule (Table 2.1). This letter provides additional information pertaining to the Project that was not included in the original C&R Report or the April 24, 2014 supplemental information letter as a result of minor route realignments, construction schedule changes and supplemental field survey results, including: :

- supplemental soil survey results;
- supplemental aquatic survey results;
- supplemental rare vascular plant and plant communities survey results;
- supplementary weed survey results;
- supplementary wildlife survey results; and
- *Historical Resource Act* (*HRA*) clearance.

Figure 1 illustrates the currently proposed pipeline route within the White Area of Alberta.

## Construction Timing

The pipeline construction schedule for the Project has been updated and is outlined in the updated Table 1.1. Clearing and construction of the NPS 20 inch of Spread 4 is scheduled to commence fall/winter 2014/2015 and topsoil will remain salvaged until completion of the NPS 36 inch pipeline in summer 2016. Clearing of Spread 8 is scheduled for winter 2014/2015.

**TABLE 1.1**

**PIPELINE INSTALLATION CONSTRUCTION SPREADS FOR THE PROPOSED GRAND RAPIDS PIPELINE PROJECT**

| Spread | From (KP)/ Legal Location | To (KP)/ Legal Location | Scheduled Clearing[1] Timing | Scheduled Construction Timing (NPS 20) | Scheduled Construction Timing (NPS 36) | Scheduled Final Clean-up Timing | Provincial Area |
|---|---|---|---|---|---|---|---|
| 1 | 0+000 (SE 34-89-14 W4M) | 66+350 (NW 19-85-18 W4M) | November 2014 to April 2015 | November 2015 to April 2016 | November 2016 to April 2017 | Winter 2017/2018 | Green Area |
| 2 | 66+350 (NW 19-85-18 W4M) | 131+950 (SW 26-80-15 W4M) | N/A | N/A | November 2016 to April 2017 | Winter 2017/2018 | Green Area |
| 3A | 131+950 (SW 26-80-15 W4M) | 182+500 (NE 6-76-15 W4M) | November 2014 to April 2015 | November 2015 to April 2016 | November 2016 to April 2017 | Winter 2017/2018 | Green Area |
| 3B | 182+500 (NE 6-76-15 W4M) | 202+000 (NW 16-74-16 W4M) | October 2014 to April 2015 | October 2014 to April 2015 | November 2016 to April 2017 | Winter 2017/2018 | Green Area |
| 4 | 202+000 (NW 16-74-16 W4M) | 266+000 (NE 16-68-17 W4M) | October 2014[2] to April 2015 | October 2014 to April 2015 | November 2015 to April 2016 | Summer 2016 (White Area) Winter 2016/2017 (Green Area) | Green/ White Area |
| 5 | 266+000 (NE 16-68-17 W4M) | 326+000 (SE 14-63-20 W4M) | November 2014 to April 2015 | June 2015 to November 2015 | June 2016 to November 2016 | Summer 2017 | White Area |
| 6 | 326+000 (SE 14-63-20 W4M) | 386+000 (NE 35-57-20 W4M) | November 2014 to April 2015 | June 2015 to November 2015 | June 2016 to November 2016 | Summer 2017 | White Area |
| 7 | 386+000 (NE 35-57-20 W4M) | 419+500 (SE 28-55-21 W4M) | November 2014 to April 2015 | June 2015 to November 2015 | June 2016 to November 2016 | Summer 2017 | White Area |
| 8[3] | 419+500 (SE 28-55-21 W4M) | 462+300 (NE 32-52-23 W4M) | November 2014 to April 2015 | April 2015 to April 2016[4] | October 2014 to January 2016 | June 2017 to November 2017 | White Area |

Notes: 1 Topsoil salvage will be completed in the White Area immediately following clearing.

2 For the portion of this spread within the White Area, clearing and topsoil stripping will be completed during non-frozen and frozen conditions.

3 In Spread 8, the NPS 20 inch and NPS 36 inch will be installed concurrently at named watercourse crossings in winter 2015/2016.

## 2.0 ROUTE SELECTION

There have been minor revisions to the Project route as a result of constructability analysis and direction from impacted landowners and the AER. The currently proposed route is illustrated in Figure 1.

Grand Rapids Wandering River Pump Station
Grand Rapids Grassland Pump Station
Grand Rapids Newbrook Pump Station
Grand Rapids Heartland Terminal
Green Area
White Area
MUNICIPAL DISTRICT OF LESSER SLAVE RIVER NO. 124
MUNICIPAL DISTRICT OF OPPORTUNITY NO. 17
ATHABASCA COUNTY
LAC LA BICHE COUNTY
WESTLOCK COUNTY
COUNTY OF THORHILD NO. 7
SMOKY LAKE COUNTY
COUNTY OF BARRHEAD NO. 11
STURGEON COUNTY
LAC STE. ANNE COUNTY
LAMONT COUNTY
COUNTY OF TWO HILLS NO. 21
PARKLAND COUNTY
STRATHCONA COUNTY
I.D. NO. 13 (ELK ISLAND)
COUNTY OF MINBURN NO. 27
BEAVER COUNTY
LEDUC COUNTY
Otter-Orloff Lakes Wildland Provincial Park
Calling Lake Provincial Park
La Biche River Wildland Provincial Park
Cross Lake Provincial Park
Hubert Lake Wildland Provincial Park
Long Lake Provincial Park
Sir Winston Churchill Provincial Park
Buffalo Lake Metis Settlement
Kikino Metis Settlement
Beaver Lake I.R.131
White Fish Lake I.R.128
Saddle Lake I.R.125
Alexander I.R.134
Stony Plain I.R.135
Rock Lake
Fawcett Lake
Calling Lake
Lawrence Lake
Lac La Nonne Lake
Flat Lake
Mcmillan Lake
North Buck Lake
Missawawi Lake
Charron Lake
Lac La Biche Lake
Beaver Lake
Amisk River
Whitefish Lake
Smoky Lake
Whitford Lake
Beaverhill Lake
Cooking Lake
Wandering River
Calling River
Athabasca River
Gold River
Redwater River
North Saskatchewan River
Sturgeon River
Vermilion River
Athabasca
Cross Lake Provincial Park
Morinville
Gibbons
Bruderheim
Fort Saskatchewan
Lamont
Onoway
St. Albert
Sherwood Park
Mundare
Vegreville
Tofield
Beaumont
Devon
Edmonton
Westlock
Legal
Redwater
Smoky Lake
Two Hills
T.74
T.50
R.3 W5M
R.12 W4M
N
NWT
BC
ALBERTA
SK
Fort McMurray
Map Area
Edmonton
Calgary

Proposed Facility
Currently Proposed Route
May 2013 C&R Report Route
63 Highway
Railway
Watercourse
Waterbody
Populated Area
Military
Indian Reserve/Settlement
Park/Protected Area
White Area
Municipal Boundary

**FIGURE 1**

**REGIONAL LOCATION - WHITE AREA**

**PROPOSED GRAND RAPIDS PIPELINE GP LTD.**
**GRAND RAPIDS PIPELINE PROJECT**

tera
A CH2M HILL Company

UTM Zone 12N
Proposed Facility, Proposed Pipeline Routing: Focus Corporation 2013 & 2014; Highway: IHS Inc. 2014; Railway: Natural Resources Canada 2012; Hydrology: IHS Inc. 2004; Populated Area, Municipal Boundary: AltaLIS 2014; Military: IHS Inc. 2013; Indian Reserve/Settlement: Government of Canada 2014, IHS Inc. 2013; Park/Protected Area: AlbertaTourism, Parks and Recreation 2012; Green/White Area: AltaLIS 2010; Hillshade: TERA Environmental Consultants 2008.



Grand Rapids Pipeline Project

SCALE: 1:700,000
0 10 20 km
(All Locations Approximate)

October 2014 | 8395
Mapped By: LS | Checked By: DS

t8395_EPP_Figure1_Regional_Location_Rev1_WhtArea_Rev4vsRev7.mxd

# 3.0 CONSULTATION

Consultation has been ongoing with landowners, occupants, regulators and Aboriginal communities along the proposed Project. Grand Rapids understands that pre-construction consultation is only one part of the process and will continue to consult with all impacted stakeholders as the Project moves into the construction phase.

# 4.0 ENVIRONMENTAL SETTING

As outlined in Section 6.0 of Part A, Supplemental and Additional Studies, of the C&R Report (TERA Environmental Consultants 2013) and the April 24, 2014 supplemental information submission (TERA 2014a), Grand Rapids conducted a variety of environmental surveys along the proposed pipeline route in spring and summer 2013 to supplement the environmental survey information collected in 2012. Additional supplemental surveys along select portions of the pipeline route, including detailed soil surveys, Qualified Aquatic Environment Specialist (QAES) assessments, vegetation, wildlife surveys and archaeological assessments were conducted in spring and summer 2014 where land access was not available at the time of the 2013 field surveys and along portions of the route realigned since completion of the 2013 field surveys.

The results of the supplemental surveys completed to date are provided below under the section headings in which the original survey results were provided in the C&R Report. Any revisions to the mitigative measures and any new mitigative measures required as a result of these surveys will be incorporated on the Environmental Alignment Sheets and EPP, Part B of the C&R Report.

## 4.1 Physiography and Geology

### *4.1.1 Physiography*

The current pipeline route crosses the same physiographic sections and districts; and experiences the same topographic relief described in the 2013 C&R Report, outlined in Section 4.1.1 (TERA Environmental Consultants 2013).

### *4.1.2 Bedrock Geology*

There have been no updates to the bedrock geology for the proposed Project since the submission of the 2013 C&R Report, outline in Section 4.1.2 (TERA Environmental Consultants 2013).

### *4.1.3 Surficial Geology*

The current pipeline route encounters the same surficial deposits and topography described in the 2013 C&R Report, outlined in Section 4.1.3 (TERA Environmental Consultants 2013).

## 4.2 Soils

Supplementary soil surveys were conducted along segments of the pipeline route that could not be conducted in 2013 due to landowner consent and route realignments, including a reroute in the vicinity of Beaverhill Creek and near the Grand Rapids Heartland Terminal. These supplementary soil surveys were conducted by Mentiga Pedology Consultants Ltd. (Mentiga) in early May 2013, as outlined in the April 24, 2014 supplementary information letter, and in summer 2014, as outlined below. In spring 2014, supplementary soil surveys were conducted within a total of 21 quarter-sections in summer 2014:

- SE 16-56-20 W4M;
- SE 35-55-21 W4M;
- SW 4-53-23 W4M;
- NE 9-56-20 W4M;
- NE 26-55-21 W4M;
- SW 21-54-22 W4M;
- NW 9-56-20 W4M;
- NW 26-55-21 W4M;

- NW 16-54-22 W4M;
- NW 31-55-20 W4M;
- SE 27-55-21 W4M;
- NE 17-54-22 W4M;
- NE 36-55-21 W4M;
- SW 27-55-21 W4M;
- SW 8-54-22 W4M;
- SE 36-55-21 W4M;
- SE 12-55-22 W4M;
- NE 6-54-22 W4M;
- SW 36-55-21 W4M;
- NE 31-53-22 W4M; and
- SE 6-54-22 W4M.

The soil investigations were conducted in accordance with the methodology described in Appendix 1 of Part A of the C&R Report (TERA Environmental Consultants 2013). There were four areas where additional soil investigations and sampling were conducted in areas of three-lift soil handling along the route to confirm if three-lift was warranted. Based on morphological characteristics and laboratory analyses, three-lift soil handling procedures are not warranted in three of the four areas investigated. Appendix A provides the results of the soil sampling at the locations described above (Mentiga 2014). Table 4.3 of the C&R Report has been updated and provides a summary of the soil characteristics along the current pipeline route. Segments of the proposed route that have been realigned since the summer 2014 supplementary soil surveys will be assessed by Mentiga. If it is determined that the realignments could result in a change in the soil unit or depth, additional supplementary surveys will be conducted prior to construction, as required. The results of any such supplementary surveys will be updated on the Environmental Alignment Sheets and provided to the AER.

## TABLE 4.3

## SUMMARY OF SOIL CHARACTERISTICS FOR THE PROPOSED GRAND RAPIDS PIPELINE PROJECT

| Soil Symbol | Soil Name | Soil Classification[1] | Parent Material[2] | Texture Class[3] | Drainage Class[4] | Topsoil Depth Range (cm) | Colour Differentiation Between Topsoil and Subsoil | Erosion Hazards[5] | | Susceptible to Soil Compaction and Rutting | Susceptible to Trench Instability | Comments or Other Concerns |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Wind | Water | | | |
| ABC | Athabasca | O.GL | T | L-CL | W-MW | 0-22 | Fair-Good | M | S-M | -- | -- | • No topsoil in forested areas; salvage the upper 15-20 cm of material. |
| glABC | gleyed Athabasca | GL.GL | T | L-CL | I | 0-21 | Fair-Good | M | S | Yes | -- | • No topsoil in forested areas; salvage the upper 15-20 cm of material. |
| stABC | stony Athabasca | O.GL | stT | stL-stCL | W-MW | 15-22 | Good | M | S | -- | -- | • Will require a significant amount of stone removed during final clean-up. |
| AGS | Angus Ridge | O.BLC-E.BLC | T | L/L-CL<br>L/CL<br>L/C | W-MW<br>W<br>MW-I | 17-42 | Excellent | M | S | -- | -- | -- |
| shAGS | shallow Angus Ridge | O.BLC-E.BLC | T/B | L-CL/SiC | MW | 16-25 | Excellent | M | S-M | -- | -- | • Strongly sodic weathered bedrock at 46-70 cm below the surface. |
| stAGS | stony Angus Ridge | O.BLC-E.BLC | stT | stL-stCL | W-MW | 35-38 | Excellent | M | M | -- | -- | • Only the subsoil is exceedingly stony; topsoil is only slightly stony. |
| AGS1 | Angus Ridge 1 | O.BLC-E.BLC | wT | L-SL | W | 19-30 | Excellent | M | S | -- | -- | • Sandy and stony layers in till. |
| AV | Alluvium | CA.HR-O.HR<br>R.HG | F | fSL-L<br>L-SiCL/L | W-MW<br>MW-I | 18-30 | Good | M | S | -- | -- | • May have thin layers of sand. |
| COA | Cooking Lake | O.GL | T | L-CL | W-MW | 0-22 | Fair-Good | M | S-M | -- | -- | • No topsoil in forested areas; salvage the upper 15-20 cm of material. |
| glCOA | gleyed Cooking Lake | GL.GL | T | L-CL | I | 14-18 | Fair-Good | M | S | Yes | -- | -- |
| DEV1 | Devon 1 | T.M | O/GF, GL or T | O/SL-C | VP | 0 | - | S | S | Yes | -- | • Underlying mineral material will be encountered within trench depth. |
| DEV2 | Devon 2 | TY.M | O | O | VP | 0 | - | S | S | Yes | -- | -- |
| ELP | Elk Point | D.GL | GF | SL | W | 20 | Good | H | S | -- | Yes | -- |
| FNC | Franchere | O.GL | GL | L-SCL | W | 0-27 | Fair-Good | M | S | -- | -- | • No topsoil horizon in forested areas; salvage upper 15-20 cm of material. |
| glFNC | gleyed Franchere | GL.GL | GL | L-SCL | I | 8-24 | Fair-Good | M | S | Yes | -- | -- |
| shFNC | shallow Franchere | O.GL | GL/T | L-SCL/<br>L-CL | W-MW | 16-18 | Fair-Good | M | S | -- | -- | • Surface stoniness may be increased due to underlying till. |
| GBL | Gabriel | D.GL | GF/T or GL | SL/L-CL or C | W-MW | 16-40 | Good | H | S | -- | Yes* | • Surface stoniness may be increased due to underlying till. |
| glGBL | gleyed Gabriel | GLD.GL | GF/T or GL | SL/L-CL or C | I | 20-44 | Good | H | S | -- | Yes* | • Surface stoniness may be increased due to underlying till. |

## TABLE 4.3 Cont'd

| Soil Symbol | Soil Name | Soil Classification[1] | Parent Material[2] | Texture Class[3] | Drainage Class[4] | Topsoil Depth Range(cm) | Colour Differentiation Between Topsoil and Subsoil | Erosion Hazards[5] | | Susceptible to Soil Compaction and Rutting | Susceptible to Trench Instability | Comments or Other Concerns |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Wind | Water | | | |
| GMT | Grosmont | D.GL | T | L-CL | W-MW | 17-42 | Good | M | S | -- | -- | -- |
| glGMT | gleyed Grosmont | GLD.GL | T | L-CL | I | 15-42 | Good | M | S | Yes | -- | -- |
| HBM | Hobbema | O.BLC | GL/T | L-SiCL.L-CL | W-MW | 0 | Excellent | M | S | -- | -- | • Surface stoniness may be increased due to underlying till. |
| HGT | Haight | O.HG-R.HG | GL or T | SiC-C | P | 23-45 | Good | S | S | Yes | -- | • Susceptible to unstable trench walls when excessively wet. |
| HLW | Helliwell | O.DGC | GF-E | LS | R | 8-40 | Good | H | S-M | -- | Yes | • Droughty soil and difficult to re-establish vegetation. |
| glHLW | gleyed Helliwell | GL.DGC | GF-E | LS | I | 18 | Good | H | S | -- | Yes | -- |
| JVE | Jarvie | HU.LG-O.HG | GL | L, SiL-SiCL | P | 22-40 | Good | M | S | Yes | -- | • Susceptible to unstable trench walls when excessively wet. |
| ptJVE | peaty Jarvie | ptHU.LG - ptO.HG | GL | L,SiL-SiCL | P-VP | 35 | Good | M | S | Yes | -- | • Susceptible to unstable trench walls when excessively wet.<br>• Salvage both the peat and topsoil to a maximum depth of 50 cm. |
| KVG | Kavanagh | BL.SS | B | SiC-C | MW | 18 | Fair-Poor | M | S | -- | -- | • Strongly sodic subsoil.<br>• Weathered bedrock is soft and can be easily excavated using normal construction equipment. |
| MDR | Mundare | O.BLC | GF-E | LS | R | 10-44 | Excellent | H | S | -- | Yes | -- |
| shMDR | shallow Mundare | O.BLC | GF-E/T-GL | LS/CL-C | W-R | 22-90 | Excellent | H | S | -- | Yes* | -- |
| MLA | Macola | D.GL | GL | C | MW | 23-41 | Good | S | S | Yes | -- | -- |
| glMLA | gleyed Macola | GLD.GL | GL | C | I | 23-33 | Good | S | S | Yes | -- | -- |
| MMO | Malmo | D.GL<br>O.BLC | GL | C<br>SiCL/CL-C<br>C-SiC | MW | 18-55 | Good | S | S-M | Yes | -- | -- |
| saMMO | saline Malmo | GLD.GL | GL | SiC-C | MW | 16-30 | Good | S | S | Yes | -- | • Subsoils and possibly topsoils are weakly to moderately saline. |
| scMMO | Malmo with saline lower subsoil | saO.BLC-scE.BLC scO.BLC | GL | SiC | MW | 26-34 | Good | S | S | Yes | -- | • Moderately saline and sodic lower subsoils.<br>• Recommended for the three-lift soil handling procedure. |
| shMMO | shallow Malmo | O.BLC-E.BLC | GL/T | SiC<br>SiCL/(C/CL) | MW | 15-42 | Good | S | S | Yes | -- | • Surface stoniness may be increased due to underlying till. |
| MPV | Mapova | HU.LG | T | CL-C | P | 20-32 | Good | M | S | Yes | -- | • Susceptible to unstable trench walls when excessively wet. |

## TABLE 4.3 Cont'd

| Soil Symbol | Soil Name | Soil Classification[1] | Parent Material[2] | Texture Class[3] | Drainage Class[4] | Topsoil Depth Range(cm) | Colour Differentiation Between Topsoil and Subsoil | Erosion Hazards[5] | | Susceptible to Soil Compaction and Rutting | Susceptible to Trench Instability | Comments or Other Concerns |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Wind | Water | | | |
| ptMPV | peaty Mapova | ptHU.LG | T | CL-C | P-VP | 10 | Good | M | S | Yes | -- | • Susceptible to unstable trench walls when excessively wet.<br>• Salvage both the peat and topsoil to a maximum depth of 50 cm. |
| MWI | Missawawi | O.GL | GF/T-GL | SL/CL-C | W | 0-20 | Good | H | S-M | -- | -- | • No topsoil in forested areas; salvage the upper 15-20 cm of material.<br>• Surface stoniness may be increased due to underlying till. |
| NIT | Nicot | E.EB | GF-E | LS | R | 0-17 | Fair-Poor | H | S | -- | Yes | • No topsoil in forested areas; salvage the upper 15-20 cm of material.<br>• droughty soil and difficult to re-establish vegetation. |
| NWB | Newbrook | O.LG | T | CL | P | 0 | -- | M | S | Yes | -- | • No topsoil horizon; salvage upper 15-20 cm of material.<br>• susceptible to unstable trench walls when excessively wet. |
| ptNWB | peaty Newbrook | ptO.LG | T | CL | P-VP | 0-3 | -- | M | S | Yes | -- | • No topsoil; salvage the peat material.<br>• Susceptible to unstable trench walls when excessively wet. |
| NVR | Navarre | GL.BLC-GLE.BLC | GL | SiC-C | I | 14-48 | Good | S | S | Yes | -- | -- |
| ONW | Onoway | O.HG-R.HG | T | L-CL | P | 10-50 | Good | M | S | Yes | -- | • Susceptible to unstable trench walls when excessively wet. |
| ptONW | peaty Onoway | ptO.HG-ptR.HG | T | L-CL | P-VP | 10-25 | Good | M | S | Yes | -- | • Susceptible to unstable trench walls when excessively wet.<br>• Salvage both the peat and topsoil to a maximum depth of 50 cm. |
| PED | Penhold | CAR.BLC | GF | L-SiL | W | 25-30 | Excellent | M | S | -- | -- | -- |
| PHS | Peace Hills | O.BLC | GF | SL/SL-L/L-SL | W | 20-55 60 | Excellent | H | S | -- | Yes | -- |
| glPHS | gleyed Peace Hills | GL.BLC | GF | SL Fsl/ (fSL/LfS) | I | 18-42 | Excellent | H | S | -- | Yes | -- |
| PLM | Plamondon | O.GL | GL | C | MW | 0-21 | Fair-Good | M | S | Yes | -- | • No topsoil in forested areas; salvage the upper 15-20 cm of material. |
| glPLM | gleyed Plamondon | GL.GL | GL | C | I | 0-5 | Fair-Poor | M | S | Yes | -- | • No topsoil in forested areas; salvage the upper 15-20 cm of material. |
| POK | Ponoka | O.BLC-E.BLC | GL | L-SiCL L/L | W-MW | 13-48 | Excellent | M | S | Yes | -- | -- |

## TABLE 4.3 Cont'd

| Soil Symbol | Soil Name | Soil Classification[1] | Parent Material[2] | Texture Class[3] | Drainage Class[4] | Topsoil Depth Range(cm) | Colour Differentiation Between Topsoil and Subsoil | Erosion Hazards[5] | | Susceptible to Soil Compaction and Rutting | Susceptible to Trench Instability | Comments or Other Concerns |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Wind | Water | | | |
| glPOK | gleyed Ponoka | GL.BLC-GLE.BLC | GL | L-SiCL | I | 21-30 | Excellent | M | S | Yes | -- | -- |
| shPOK/st | shallow Ponoka overlying stony till | O.BLC-E.BLC | GL/stT | L-SiCL/ stL-CL | W-MW | 25-30 | Excellent | M | S | -- | -- | • Exceedingly stony till at 75-90 cm below the surface.<br>• Recommended for the three-lift soil handling procedure. |
| POK/s | Ponoka overlying sand | O.BLC-E.BLC | GL/GF | L-SiCL/SL-LS | W-MW | 24-32 | Excellent | M | S | -- | -- | • Glaciofluvial sands at 120-130 cm below the surface. |
| RCS | Rochester | R.HG-O.HG | GF | SL-LS | P-VP | 40-50 | Good | H | S | Yes | Yes | -- |
| ptRCS | peaty Rochester | ptR.HG-ptO.HG | GF | SL-LS | P-VP | 10-18 | Good | H | S | Yes | Yes | • Salvage both the peat and topsoil to a maximum depth of 50 cm. |
| RLV | Rolly View | O.DGC | T | L-CL | MW | 15-48 | Good | M | S | -- | -- | -- |
| glRLV | gleyed Rolly View | GL.DGC | T | L-CL | I | 17-27 | Good | M | S | Yes | -- | • Not saline but moderately to strongly acidic |
| glsaRLV | gleyed, saline Rolly View | saGL.DGC | T | L-CL | I | 18 | Good | M | S | Yes | -- | • Saline and sodic subsoils may hinder revegetation efforts. |
| scRLV | Rolly View with saline lower subsoil | scO.DGC | T | L-CL | MW | 24-32 | Good | M | S | -- | -- | • Weakly to moderately saline and strongly sodic lower subsoil.<br>• Recommended for the three-lift soil handing procedure. |
| RMY | Rimbey | O.DGC | GL | L-SiCL-SiL | W-MW | 30 | Good | M | S | -- | -- | -- |
| glRMY | gleyed Rimbey | GL.DGC | GL | L-SiCL-SiL | I | 20-40 | Good | M | S | Yes | -- | -- |
| SWY | Sawdy | HU.LG-R.HG | GL | C | P | 14 | Fair | S | S | Yes | -- | • Susceptible to unstable trench walls when excessively wet. |
| ptSWY | peaty Sawdy | ptHU.LG-ptR.HG | GL | C | P-VP | 18-25 | Good | S | S | Yes | -- | • Susceptible to unstable trench walls when excessively wet.<br>• Salvage both the peat and topsoil to a maximum depth of 50 cm. |
| UCS | Uncas | D.GL | T | L-CL | W-MW | 13-29 | Good | M | S | -- | -- | -- |
| glUCS | gleyed Uncas | GLD.GL | T | L-CL/L | I | 13-32 | Good | M | S | Yes | -- | -- |
| scUCS | Uncas with saline lower subsoil | D.GL | T | L-CL | W-MW | 15-22 | Good | M | S | -- | -- | • Recommended for the three-lift soil handling procedure. |
| UKT | Ukalta | O.BLC | GF/T or GL | SL/L-CL LS/L-SiCL | W-MW | 18-42 | Excellent | H | S | -- | Yes* | • Surface stoniness may be increased due to underlying till. |
| glUKT | glUkalta | Gl.BLC | GF/T | SL/L-CL | I | 24-27 | Excellent | H | S | Yes | -- | • Surface stoniness may be increased due to underlying till. |

## TABLE 4.3 Cont'd

**Source:** Mentiga 2013, 2014

**Notes:**

1 Soil Classification according to the Soil Classification Working Group (1998).

2 Parent Material

| | | | | | |
|---|---|---|---|---|---|
| B | weathered bedrock | GF | glaciofluvial | T | till |
| E | eolian | GL | glaciolacustrine | wT | water-worked' till |
| F | fluvial | O | organic | | |

3 Texture Classes

| | | | | | |
|---|---|---|---|---|---|
| C | clay | SiL | silt loam | S | sand |
| CL | clay loam | SiCL | silty clay loam | c | coarse |
| SC | sandy clay | SiC | silty clay | f | fine |
| SCL | sandy clay loam | SL | sandy loam | gv | gravelly |
| L | loam | LS | loamy sand | st | stony |
| O | organic | | | | |

4 Drainage Classes

| | | | | | |
|---|---|---|---|---|---|
| R | rapidly | MW | moderately well | P | poorly |
| W | well | I | imperfectly | VP | very poorly |

5 Erosion

| | | | | | |
|---|---|---|---|---|---|
| S | slight | M | moderate | H | high |

\- Indicates no specific information provided in soil survey.

* Susceptible to trench instability when sandy textured material is greater than 60 cm thick after topsoil removal.

## 4.3 Hydrology and Fish

### *4.3.1 Hydrology*

A QAES completed open water aquatic assessments along the proposed pipeline route from September 5 to 21, 2012 prior to submission of the C&R Report (TERA 2014b). Aquatic assessments were also conducted in winter 2013 and from May 29 to June 7, June 17 to 21 and on July 5 and August 9, 2013 for incorporation into the April 24, 2014 supplemental information submission (TERA 2014c). There were seven proposed watercourse crossings and seven proposed drainage crossings rerouted or added since the completion of the open water aquatic assessments during 2012 and 2013 (Table 4.4). There were five proposed watercourse crossings and one proposed drainage crossing that required supplemental aquatic surveys. The remainder of the watercourse and drainage crossings did not require reassessment since the pipeline realignment fell within the zone of influence of the originally assessed watercourse crossing location (*e.g.,* a QAES has determined that the realignment did not change the fish or fish habitat quality or quantity of the crossing location). Supplemental aquatic surveys were conducted at Beaver Hill Creek on May 20, 2014 and Point-aux-Pins Creek on July 10, 2014. TERA collected field data for the remaining three proposed watercourse crossings on Clover Bar Creek and the proposed drainage crossing at SE 21-53-23 W4M on June 16, 2013.

Based on a review of the current route, Revision 7, no additional supplementary aquatics surveys are required for the proposed route. In total, the proposed route traverses 23 watercourse crossings that fall under the *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body* and the *Code of Practice for Watercourse Crossings* with defined bed and banks and 3 fish-bearing drainages (Table 4.5).

**TABLE 4.4**

**RE-ROUTED AND ADDITIONAL WATERCOURSE CROSSINGS ALONG THE GRAND RAPIDS PIPELINE PROJECT**

| Site No. | Name | Legal Location and UTM Coordinates (Zone 12) | |
|---|---|---|---|
| | | Originally Proposed Crossing Location | Updated Proposed Crossing Location |
| WC3 | Livock River | SW 18-86-18 W4M 386492E, 6257862N | SW 18-86-18 W4M 386467E, 6257779N |
| WC27 | Unnamed tributary to the Wandering River | SE 30-71-16 W4M 408102E, 6115156N | SE 30-71-16 W4M 408066E, 6115123N |
| WC39 | Beaverhill Creek | SW 16-56-20 W4M 373837E, 5966966N | SW 16-56-20 W4M 374185E, 5966679N |
| WC43 | Pointe-aux-Pins Creek and meander | SW 31-53-22 W4M 351890E, 5943585N | SW 31-53-22 W4M 352123E, 5943492N |
| WC46.1 | Unnamed Tributary to Clover Bar Creek | Not on originally proposed route | SE 21-53-23 W4M 345843E, 5940537N |
| WC46.2 | Clover Bar Creek | Not on originally proposed route | SE 21-53-23 W4M 345680E, 5940333N |
| WC47 | Clover Bar Creek | SW 21-53-23 W4M 345448E, 5940059N | SW 21-53-23 W4M 345494E, 5939871N |
| n/a | Drainage | SW 4-85-18 W4M 389573E, 6245532N | SW 4-85-18 W4M 389506E, 6245448N |
| n/a | Drainage | SE 2-83-18 W4M 393039E,6234911N | SE 2-83-18 W4M 392914E,6234879N |
| n/a | Drainage | NW 14-82-17 W4M 403476E, 6219462N | NW 14-82-17 W4M 403246E, 6219352N |
| n/a | Drainage | NW 22-68-17 W4M 402616E, 6084762N | NW 22-68-17 W4M 402522E, 6084885N |
| n/a | Drainage | NE 17-54-22 W4M 354303E, 5948533N | SE 17-54-22 W4M 3543013E, 5948444N |
| n/a | Drainage | SW 8-54-22 W4M 353242E, 5946266N | SW 8-54-22 W4M 353166E, 5946271N |

**TABLE 4.4 Cont'd**

| Site No. | Name | Legal Location and UTM Coordinates (Zone 12) | |
|---|---|---|---|
| | | Originally Proposed Crossing Location | Updated Proposed Crossing Location |
| n/a | Drainage | Not on Rev 4 | SE 21-53-23 W4M<br>345878E, 5940538N |

Note: n/a (not applicable)

### *4.3.2 Fish Resources*

Table 4.5 outlines the fish species captured or observed during the open water assessments.

**TABLE 4.5**

**SUMMARY OF WATERCOURSE CROSSINGS IN THE WHITE AREA OF THE PROJECT**

| Name | Legal Location (W4M), UTM Coordinates (NAD 83, Zone 12) Latitude/Longitude (DD-MM-SS) | Watercourse Class and Restricted Activity Period[1] | Open Water Mean Channel Morphology (m) | Fish Species Captured or Observed During Open Water Assessment (Previously Documented) [2] | Beaver Activity Present | 2013/2014 Results | Planned Contingency Pipeline Crossing Method | Planned Vehicle/ Equipment Crossing Method (Frozen) | Planned Vehicle/ Equipment Crossing Method (Open Water) | Planned Pipeline Crossing Method[3] | Fisheries and Oceans Canada (DFO) Regulatory Requirement for Planned Crossing Methods | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unnamed tributary to the Wandering River | SE 30-71-16 408066E, 6115123N 55° 10' 26.9" N/112° 26' 36.5" W | Mapped Class C April 16 to July 15 | Bankfull Width: 8.7 Wetted Width: 6.6 Water Depth: 0.4 | Fathead minnow, lake chub, pearl dace, trout-perch, longnose sucker, white sucker, brook stickleback (northern pike previously documented at crossing. Walleye, burbot, northern pike, finescale dace, pearl dace, lake chub, fathead minnow, longnose sucker, white sucker, brook stickleback and trout-perch previously documented in the Wandering River). | Yes - influencing water levels | Ice Depth: 0.1 Water Depth: 0.6 DO: 12.0 mg/L Velocity: 0.2-0.5 m/s | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 1 km upstream from the Wandering River. |
| Fish-bearing drainage | NW 23-70-17 405178E, 6104407N 55° 4' 38.5" N/ 112° 29' 6.9" W | n/a | Bankfull Width: n/a Wetted Width: 14.3 Water Depth: 0.5 | Brook stickleback (brook stickleback, fathead minnow previously documented at the proposed crossing. Burbot, yellow perch, goldeye, northern pike, lake chub, flathead chub, spottail shiner, white sucker, longnose sucker and trout-perch previously documented in the La Biche River). | Yes – influencing water levels | Ice Depth: 0.4 Water Depth: 0.6 DO: 3.5 mg/L Flow: <0.1 $m^3/s$ | n/a | Snowfill/ice bridge | Access from both sides | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 3 km upstream from the La Biche River. |
| La Biche River | SW 35-68-17 404565E, 6087930N 54° 55' 45.2" N/112° 29' 21.6" W | Mapped Class C April 16 to July 15 | Bankfull Width: 31.2 Wetted Width: 27.1 Water Depth: 1.1 | Yellow perch, white sucker (Burbot, yellow perch, goldeye, northern pike, lake chub, flathead chub, spottail shiner, white sucker, longnose sucker and trout-perch previously documented in the La Biche River). | No | Ice Depth: 0.4 Water Depth: 0.4 DO: n/r Flow: 1.7 $m^3/s$ | n/a | Snowfill/ice bridge | Clear span bridge | Trenchless | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 50 km upstream from the Athabasca River. |
| Unnamed tributary to Pine Creek | SE 31-66-18 390159E, 6068580N 54° 45' 8.8" N/112° 42' 24.1" W | Unmapped Class C None | Bankfull Width: 2.0 Wetted Width: 1.9 Water Depth: 0.1 | No fish captured or observed (lake chub, fathead minnow, brook stickleback previously documented in Pine Creek). | No | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 10 km upstream from Pine Creek. |
| Unnamed tributary to Flat Lake | SW 34-65-19 384330E, 6058936N 54° 39' 52.2" N/112° 47' 36.2" W | Unmapped Class C April 16 to July 15 | Bankfull Width: 2.6 Wetted Width: 5.7 Water Depth: 0.5 | No fish captured or observed (brook stickleback previously documented in Flat Creek and Flat Lake). | Yes - influencing water levels | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 5 km upstream from Flat Lake. |
| Unnamed tributary to Flat Lake | NE 8-65-19 381738E, 6052952N 56° 36' 36.5" N/112° 49' 52.1" W | Mapped Class C April 16 to July 15 | Bankfull Width: 10.1 Wetted Width: 18.8 Water Depth: 0.9 | Brook stickleback (northern pike and brook stickleback previously documented in unnamed tributary to Flat Lake). | Yes - influencing water levels | Ice Depth: 0.3 Water Depth: 0.6 DO: <1.0 mg/L Flow: <0.1 $m^3/s$ | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 5 km upstream from Flat Lake. |
| Unnamed tributary to Flat Creek | SW 30-64-19 379202E, 6047757N 54° 33' 46.4" N/112° 52' 5.7" W | Unmapped Class C April 16 to July 15 | Bankfull Width: 0.8 Wetted Width: 2.1 Water Depth: 0.1 | No fish captured or observed (brook stickleback previously documented in Flat Creek and Flat Lake). | No | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 1.5 km upstream from Flat Creek. |
| Unnamed tributary to Flat Creek | SW 19-64-19 379149E, 6046184N 54° 32' 55.5" N/112° 52' 6.3" W | Unmapped Class C April 16 to July 15 | Bankfull Width: 1.4 Wetted Width: 1.2 Water Depth: 0.1 | No fish captured or observed (brook stickleback previously documented in Flat Creek and Flat Lake). | No | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 1.4 km upstream from Flat Creek. |
| Unnamed tributary to Flat Creek | NW 7-64-19 378517E, 6043658N 54° 31' 33.8" N/112° 52' 2.6" W | Unmapped Class C April 16 to July 15 | Bankfull Width: 1.8 Wetted Width: 1.5 Water Depth: 0.1 | No fish captured or observed (brook stickleback previously documented in Flat Creek and Flat Lake). | No | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 3 km upstream from Flat Creek. |
| Flat Creek | NW 25-63-20 376802E, 6038383N 54° 28' 41.2" N/112° 54' 5.2" W | Mapped Class C April 16 to July 15 | Bankfull Width: 2.8 Wetted Width: 12.6 Water Depth: 0.8 | Brook stickleback (Brook stickleback previously documented in Flat Creek. Lake chub, fathead minnow, brook stickleback previously documented in Pine Creek). | Yes - influencing water levels | Ice Depth: 0.3 Water Depth: 0.5 DO: 2.9 mg/L Flow: <0.1 $m^3/s$ | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 35 km upstream from Pine Creek. |

**TABLE 4.5 Cont'd**

| Name | Legal Location (W4M), UTM Coordinates (NAD 83, Zone 12) Latitude/Longitude (DD-MM-SS) | Watercourse Class and Restricted Activity Period[1] | Open Water Mean Channel Morphology (m) | Fish Species Captured or Observed During Open Water Assessment (Previously Documented) [2] | Beaver Activity Present | 2013/2014 Results | Planned Contingency Pipeline Crossing Method | Planned Vehicle/ Equipment Crossing Method (Frozen) | Planned Vehicle/ Equipment Crossing Method (Open Water) | Planned Pipeline Crossing Method[3] | Fisheries and Oceans Canada (DFO) Regulatory Requirement for Planned Crossing Methods | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Namepi Creek | SE 32-58-20<br>373368E, 5991088N<br>54° 3' 8.8" N/112° 56' 3.8" W | Mapped Class C<br>April 16 to June 30 | Bankfull Width: 12.5<br>Wetted Width: 16.0<br>Water Depth: 0.9 | Fathead minnow, brook stickleback, unknown dace species (Brassy minnow, lake chub, river shiner, fathead minnow and brook stickleback previously documented in Namepi Creek. Rainbow trout previously documented near the confluence with the North Saskatchewan River). | Yes - influencing water levels | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 9 km upstream from the North Saskatchewan River. |
| Unnamed tributary to the North Saskatchewan River | SW 2-58-20<br>377427E, 5983162N<br>53° 58' 56.0" N/112° 52' 9.2" W | Unmapped Class C<br>April 16 to July 31 | Bankfull Width: 1.4<br>Wetted Width: 3.8<br>Water Depth: 0.2 | No fish captured or observed. (Mooneye, walleye, shorthead redhorse, longnose sucker, white sucker, longnose dace, river shiner, trout-perch (lake sturgeon, mountain whitefish, rainbow trout, lake trout, burbot, northern pike, sauger, yellow perch, goldeye, emerald shiner, fathead minnow, finescale dace, flathead chub, goldfish, Iowa darter, lake chub, mountain sucker, northern redbelly dace, pearl dace, quillback, silver redhorse, slimy sculpin, spoonhead sculpin, spottail shiner and brook stickleback, previously documented in the North Saskatchewan River). | No | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 3 km upstream from the North Saskatchewan River. |
| North Saskatchewan River | NW 36-57-20<br>378902E, 5982201N<br>53° 58' 26.2" N/112° 50' 46.9" W | Mapped Class C<br>April 16 to July 31 | Bankfull Width: 276.5<br>Wetted Width: 272.4<br>Water Depth: 1.4 | Mooneye, walleye, shorthead redhorse, longnose sucker, white sucker, longnose dace, river shiner, trout-perch (lake sturgeon, mountain whitefish, rainbow trout, lake trout, burbot, northern pike, sauger, yellow perch, goldeye, emerald shiner, fathead minnow, finescale dace, flathead chub, goldfish, Iowa darter, lake chub, mountain sucker, northern redbelly dace, pearl dace, quillback, silver redhorse, slimy sculpin, spoonhead sculpin, spottail shiner and brook stickleback, previously documented in the North Saskatchewan River). | Yes but not influencing water levels | No winter data collected | Trenchless (redrill) | Access from both sides | Access from both sides | Trenchless | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | |
| Beaverhill Creek | SE 16-56-20<br>374185E, 5966679N<br>53° 50' 0.2" N/<br>112° 54' 42.7" W | Mapped Class C<br>April 16 to July 31 | Bankfull Width: 8.7<br>Wetted Width: 7.4<br>Water Depth: 0.8 | No fish captured or observed (white sucker, fathead minnow and brook stickleback previously documented in Beaverhill Creek). | Yes - influencing water levels | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 10 km upstream from the North Saskatchewan River. |
| Unnamed tributary to Beaverhill Creek | SW 8-56-20<br>372095E, 5965141N<br>53° 49' 8.6" N/<br>112° 56' 34.7" W | Unmapped Class C<br>April 16 to July 31 | Bankfull Width: 5.8<br>Wetted Width: 5.8<br>Water Depth: 0.3 | Brook stickleback (white sucker, fathead minnow and brook stickleback previously documented in Beaverhill Creek). | No | Ice Depth:0.3<br>Water Depth: FTB<br>DO: FTB<br>Flow: FTB | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 3.5 km upstream from Beaverhill Creek. |
| Astotin Creek | SW 22-55-21<br>364977E, 5958812N<br>53° 45' 37.4" N/113° 2' 53.7" W | Mapped Class C<br>April 16 to June 30 | Bankfull Width: 3.3<br>Wetted Width: 2.6<br>Water Depth: 0.3 | Brook stickleback (white sucker, fathead minnow and brook stickleback previously documented in Astotin Creek). | No | Ice Depth: 0.1<br>Water Depth: FTB<br>DO: FTB<br>Flow: FTB | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 25 km upstream from Beaverhill Creek. |
| Ross Creek | SE 28-54-22<br>355910E, 5950988N<br>53° 41' 15.7" N/113° 10' 55.4" W | Mapped Class C<br>April 16 to June 30 | Bankfull Width: 3.8<br>Wetted Width: 3.8<br>Water Depth: 0.6 | Fathead minnow, brook stickleback (white sucker, fathead minnow and brook stickleback previously documented in Ross Creek). | No | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 7 km upstream of the North Saskatchewan River. |

**TABLE 4.5 Cont'd**

| Name | Legal Location (W4M), UTM Coordinates (NAD 83, Zone 12) Latitude/Longitude (DD-MM-SS) | Watercourse Class and Restricted Activity Period[1] | Open Water Mean Channel Morphology (m) | Fish Species Captured or Observed During Open Water Assessment (Previously Documented) [2] | Beaver Activity Present | 2013/2014 Results | Planned Contingency Pipeline Crossing Method | Planned Vehicle/ Equipment Crossing Method (Frozen) | Planned Vehicle/ Equipment Crossing Method (Open Water) | Planned Pipeline Crossing Method[3] | Fisheries and Oceans Canada (DFO) Regulatory Requirement for Planned Crossing Methods | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pointe-Aux-Pins Creek | SW 31-53-22<br>352119E, 5943492N<br>53° 37' 9.6" N/<br>113° 14' 8.8" W | Mapped Class C<br>April 16 to June 30 | Bankfull Width: 4.2<br>Wetted Width: 5.7<br>Water Depth: 0.6 | Fathead minnow, brook stickleback (longnose sucker, white sucker, fathead minnow and brook stickleback previously documented approximately in Point-aux-pins Creek. Northern pike previously documented approximately in Point-aux-pins Creek near its confluence with the North Saskatchewan River). | Yes – influencing water levels | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom (concurrent pipeline construction) | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 11 km upstream from the North Saskatchewan River. |
| Oldman Creek | SW 26-53-23<br>348337E, 5941965N<br>53° 36' 16.3" N/<br>113° 17' 32.0" W | Mapped Class C<br>April 16 to June 30 | Bankfull Width: 3.1<br>Wetted Width: 10.0<br>Water Depth: 0.9 | Longnose sucker, white sucker, brook stickleback (fathead minnow and lake chub previously documented in Oldman Creek). | Yes - influencing water levels | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom (concurrent pipeline construction) | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 2 km upstream from the North Saskatchewan River. |
| Unnamed tributary to the North Saskatchewan River | NE 22-53-23<br>347456E, 5941380N<br>53° 35' 56.4" N/113° 18' 18.9" W | Mapped Class C<br>April 16 to June 30 | Bankfull Width: 1.1<br>Wetted Width: 4.5<br>Water Depth: 0.4 | No fish captured or observed (lake sturgeon, mountain whitefish, rainbow trout, lake trout, burbot, mooneye, walleye, northern pike, sauger, yellow perch, goldeye, longnose sucker, white sucker, mountain sucker, river shiner, emerald shiner, spottail shiner, fathead minnow, longnose dace, finescale dace, northern redbelly dace, pearl dace, flathead chub, lake chub, goldfish, Iowa darter, quillback, shorthead redhorse,silver redhorse, slimy sculpin, spoonhead sculpin, trout-perch and brook stickleback previously documented in the North Saskatchewan River). | No | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Trenchless | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 700 m upstream from the North Saskatchewan River. |
| Fish-bearing drainage | NE 21-53-23<br>346414E, 5940702N<br>53° 35' 33.4" N/113° 19' 14.3" W | n/a | Bankfull Width: n/a<br>Wetted Width: 284.5<br>Water Depth: 0.4 | Brook stickleback, fathead minnow (brook stickleback previously documented in the fish-bearing drainage). | No | No winter data collected | n/a | Snowfill/ice bridge | Access from both sides | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 1.3 km upstream from the North Saskatchewan River. |
| Unnamed tributary to Clover Bar Creek | SE 21-53-23<br>346006E, 5940591N<br>53° 35' 29.2"<br>N/113° 19' 36.2" W | Unmapped Class C<br>April 16 to June 30 | Bankfull Width: 2.4<br>Wetted Width: 1.7<br>Water Depth: 0.9 | Longnose sucker, white sucker, fathead minnow, brook stickleback (Brook stickleback previously documented at proposed crossing. Brook stickleback and fathead minnow previously documented in Clover Bar Creek.) | No | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 1.4 km upstream from the North Saskatchewan River. Watercourse may become subterrian downstream and not be directly connected to the North Saskatchewan River. |
| Clover Bar Creek | SE 21-53-23<br>345843E, 5940537N<br>53° 35' 27.5" N/113° 19' 45.1" W | Unmapped Class C<br>April 16 to June 30 | Bankfull Width: 4.9<br>Wetted Width: 9.3<br>Water Depth: 0.5 | Brook stickleback, fathead minnow (Brook stickleback and fathead minnow previously documented in Clover Bar Creek.) | Yes - influencing water levels | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 1.5 km upstream from the North Saskatchewan River. Watercourse may become subterrian downstream and not be directly connected to the North Saskatchewan River. |
| Clover Bar Creek | SE 21-53-23<br>345680E, 5940333N<br>53° 35' 20.7" N/113° 19' 53.5" W | Unmapped Class C<br>April 16 to June 30 | Bankfull Width: 1.0<br>Wetted Width: 18.3<br>Water Depth: 0.8 | Brook stickleback, fathead minnow (Brook stickleback and fathead minnow previously documented in Clover Bar Creek). | Yes - influencing water levels | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 1.6 km upstream from the North Saskatchewan River. Watercourse may become subterrian downstream and not be directly connected to the North Saskatchewan River. |

**TABLE 4.5 Cont'd**

| Name | Legal Location (W4M), UTM Coordinates (NAD 83, Zone 12) Latitude/Longitude (DD-MM-SS) | Watercourse Class and Restricted Activity Period[1] | Open Water Mean Channel Morphology (m) | Fish Species Captured or Observed During Open Water Assessment (Previously Documented) [2] | Beaver Activity Present | 2013/2014 Results | Planned Contingency Pipeline Crossing Method | Planned Vehicle/ Equipment Crossing Method (Frozen) | Planned Vehicle/ Equipment Crossing Method (Open Water) | Planned Pipeline Crossing Method[3] | Fisheries and Oceans Canada (DFO) Regulatory Requirement for Planned Crossing Methods | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Clover Bar Creek | SW 21-53-23<br>345494E, 5939871N<br>53° 35' 5.5" N/<br>113° 20' 2.8" W | Unmapped Class C<br>April 16 to June 30 | Bankfull Width: 1.2<br>Wetted Width: 2.4<br>Water Depth: 0.6 | Brook stickleback, fathead minnow (Brook stickleback and fathead minnow previously documented in Clover Bar Creek). | Yes – influencing water levels | No winter data collected | n/a | Snowfill/ice bridge | Clear span bridge | Trenchless | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 2 km upstream from the North Saskatchewan River. Watercourse may become subterrian downstream and not be directly connected to the North Saskatchewan River. |
| Fish-bearing drainage | SW 4-53-23<br>345266E, 5935471N<br>53° 32' 43.0" N/113° 20' 7.4" W | n/a | Bankfull Width: n/a<br>Wetted Width: 18.4<br>Water Depth: 0.2 | Small-bodied fish species observed (fathead minnow, river shiner and brook stickleback previously documented in fish-bearing drainage). | No | No winter data collected | n/a | Snowfill/ice bridge | Access from both sides | Isolate if water present/open cut if dry or frozen to bottom | Meets DFO's self-assessment process if all QAES recommendations and mitigation measures are implemented. | Proposed crossing is approximately 10 km upstream from the North Saskatchewan River. |

Notes: n/a (not applicable), n/r (not recorded), FTB (frozen to bottom)

1 Determined from the *Code of Practice Management Area Maps* for Fort McMurray, Lac La Biche, St. Paul and Camrose (AENV 2006a,b,c,d).

2 FWMIS 2014.

3 A trenchless pipeline crossing method can be used at any proposed crossing.

## 4.4 Vegetation

### *4.4.1 Natural Subregions of Alberta*

There have been no updates to the natural subregions for the proposed Project since the submission of the 2013 C&R Report, outlined in Section 4.4.1 (TERA Environmental Consultants 2013).

### *4.4.2 Rare Plant Occurrences*

TERA's Botanists completed rare plant and rare plant community surveys along the White Area portion of the Project prior to C&R Report submission between August 20 and 25, 2012 (TERA Environmental Consultants 2014a) and following C&R Report submission on June 3 to 13, August 6 and 19 to 26, 2013 for inclusion into the April 2014 supplemental information submission (TERA 2014d). Based on a desktop review of current land use and vegetative cover, the majority of new lands impacted by Project route realignments since the completion of the 2013 surveys were considered to have low potential to support rare plants. However, TERA's Botanists recommended than an additional field visit be completed at the Beaverhill Creek crossing at SW 16-56-20 W4M to identify any potential rare plant species and rare ecological communities along this route realignment. These supplementary vegetation studies were conducted from June 9 to 13, 2014.

No Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or *Species at Risk Act* (*SARA*)-listed species and no species designated under the Alberta *Wildlife Act* were observed during the June 2014 supplementary survey. No Alberta Conservation Information Management System (ACIMS)-listed rare ecological communities were observed. An ACIMS-listed rare vascular plant species, American water-horehound, was observed during the vegetation survey at the realigned Beaverhill Creek crossing (Table 4.6).

The American water-horehound is ranked S3 and is on the Watch List in Alberta. There were four plants observed on the proposed right-of-way. Qualified, experienced Botanists implemented appropriate mitigation for these plants based on species and site-specific information. Site-specific mitigation has been incorporated on the Environmental Alignment Sheets enclosed with this letter and will be incorporated into Part B, EPP of the C&R Report, as appropriate.

Based on a review of the current route, Revision 7, no additional supplementary vegetation surveys are required.

## TABLE 4.6

## OBSERVED RARE PLANT SPECIES IN THE WHITE AREA ALONG THE PROPOSED GRAND RAPIDS PIPELINE PROJECT

| Common Name | Scientific Name | Type | Provincial Rank[1] | Number of Occurrences |
|---|---|---|---|---|
| alternating dog-lichen | *Peltigera polydactylon* | lichen | S2 | 1 |
| American water-horehound | *Lycopus americanus* | vascular plant | S3 (W) | 1 |
| beard lichen | *Usnea fulvoreagens* | lichen | S1S3 | 1 |
| blunt-lobe grape-fern | *Botrychium oneidense* | vascular plant | S1 | 1 |
| *Botrychium* hybrid (field grape fern and northwestern grapefern) | *Botrychium* hybrid *(Botrychium campestre* and *Botrychium pinnatum)* | vascular plant | S1-S3 | 1 |
| broom sedge | *Carex Scoparia* | vascular plant | S1 | 1 |
| cavernous crystalwort | *Riccia cavernosa* | liverwort | S1 | 1 |
| cinnamon dog pelt lichen | *Peltigera cinnamomea* | liverwort | S2 | 1 |
| crystalwort | *Riccia fluitans* | liverwort | S2 | 1 |
| false dragonhead | *Physostegia ledinghamii* | vascular plant | S3 (W) | 2 |
| few-flowered salt-meadow grass | *Torreyochloa pallida* var. *pauciflora* | vascular plant | S1 | 1 |
| flagon-fruited splachnum | *Splachnum ampullaceum* | moss | S2 | 1 |
| golden saxifrage | *Chrysosplenium iowense* | vascular plant | S3? | 14 |
| goldthread | *Coptis trifolia* | Vascular plant | S3 (W) | 4 |
| green ash | *Fraxinus pennsylvanica* | vascular plant | S1 | 2 |
| Hooker's sedge | *Carex hookerana* | vascular plant | S3 (W) | 1 |
| *Hypnum* moss | *Hypnum pallescens* | moss | S2 | 1 |
| leather grape fern | *Botrychium multifidum* var. *intermedium* | vascular plant | S3 (W) | 3 |
| Macloskey's violet | *Viola pallens* | vascular plant | S2S3 | 2 |
| meadow bitter cress | *Cardamine pratensis* | vascular plant | S3 (W) | 1 |
| northwestern grapefern | *Botrychium pinnatum* | vascular plant | S3 | 1 |
| *Pellia* liverwort | *Pellia* species | liverwort | S1-S2 | 1 |
| porcupine sedge | *Carex hystericina* | vascular plant | S1 | 1 |
| purple-fringed riccia | *Ricciocarpos natans* | liverwort | S2 | 5 |
| red collar moss | *Splachnum rubrum* | moss | S3 | 1 |
| *Riccardia* liverwort | *Riccardia latifrons* | liverwort | S2 | 1 |
| Rock ramalina | *Ramalina intermedia* | liverwort | S2 | 2 |
| snakeskin liverwort | *Conocephalum salebrosum* | liverwort | S2 | 3 |
| tinged sedge | *Carex tincta* | Vascular plant | SU | 1 |
| western grape fern | *Botrychium hesperium* | vascular plant | SU | 1 |
| yellow collar moss | *Splachnum luteum* | moss | S3 | 1 |

Notes:

1 Provincial (S) ranks are assigned by the provincial and federal Conservation Data Centre(s) (CDC[s]); in cases of conflict or missing data, the provincial CDC will have preference. Ranks range from 1 (five or fewer occurrences) to 5 (demonstrably secure under present conditions); definitions below are adapted from NatureServe (2013) unless noted otherwise.

- S1 = Critically Imperilled: because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation. Typically five or fewer occurrences or very few remaining individuals (<1,000).
- S2 = Imperilled: 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.
- 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.
- S#? = Inexact numeric rank: denotes inexact numeric rank.
- SU = Unrankable: currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
- (W) = Watch List: elements that are not currently considered as high conservation concern, but there is some information to suggest that they may become rare should there be significant alterations to the element's habitats or population. Data for watch listed elements are collected by ACIMS (2013).

### *4.4.3 Non-Native and Invasive Species*

Weed surveys were conducted on foot from August 20 to 24, 2012 and supplementary weed surveys were conducted from June 12 to 16, 2013 in order to identify any areas of weed infestation. At the time of the 2013 surveys, approximately 42% of agricultural land along the proposed route could not be surveyed due to land access restrictions. These lands, as well as any lands that warranted additional surveys due to route revisions, were surveyed in June 2014.

Noxious weeds found during the 2014 survey included: creeping (Canada) thistle; white cockle; scentless chamomile; perennial sow-thistle; common burdock; common toadflax; tall buttercup; common tansy; ox-eye daisy; and leafy spurge. Mitigation measures, including the development of appropriate weed-cleaning stations are being developed to minimize the risk of weed and soil-borne disease, introduction and spread. Mitigation measures have been determined in the field by weed specialists and was primarily based on county boundaries, presence of weed species, presence of Noxious weeds and the absence or abundance of weeds on adjacent lands.

### *4.4.4 Clubroot*

Clubroot sampling was conducted on April 12 and 13 and June 12 to 15, 2014 along the proposed pipeline route between NE 35-57-20 W4M and SE 28-55-21 W4M, as well as between SE 28-55-21 W4M and SW 26-53-23 W4M, where land owner access was granted.

### *4.4.5 Land Capability*

There have been no updates to the land capability for the proposed Project since the submission of the 2013 C&R Report, outlined in Section 4.4.5 (TERA Environmental Consultants 2013).

## 4.5 Wetlands

TERA Wetland Specialists completed ground-based wetland surveys along the proposed pipeline route prior to the submission of the C&R Report in September and October 2012 as well as in June, August and September 2013 (Revision 4) to confirm and refine wetland delineations and classifications along the White Area portion of the Project (TERA Environmental Consultants 2014b). Based on a route comparison review of Revision 6, no additional wetland classes have been identified that were not previously visited during ground-based wetland surveys.

It was determined that no further wetland surveys are recommended as no new wetland classes were identified as being crossed by the current route (Revision 7). Recommended mitigation measures for wetlands are included in the EPP and Environmental Alignment Sheets for the Project.

Table 4.10 has been updated since C&R Report submission and summarizes the wetlands identified within the White Area of Alberta along the proposed pipeline route.

## TABLE 4.10

## WETLAND CLASS AND DISTRIBUTION CROSSED IN THE WHITE AREA BY THE PROPOSED GRAND RAPIDS PIPELINE PROJECT

| Legal Location of Wetland (W4M) | Wetland Group | Wetland Classification – Subclass and Class |
|---|---|---|
| NW and SW 19-72-16 | Mossy-peat | Treed Fen |
| NW 23-70-17 | Woody-peat to mineral | Shrubby Swamp |
| NW 23-70-17 | Shallow open water | Open Water Pond |
| NW 11-70-17 to NW 2-70-17 | Mossy-peat | Treed Fen |
| NW and SE 2-70-17 | Mossy-peat | Treed Bog |
| SE 35-69-17 | Shallow open water | Open Water Pond |
| NE and SE 26-69-17 | Mossy-peat | Treed Fen |
| SE 26-69-17 to NE 23-69-17 | Mossy-peat | Shrubby Fen |
| NE 23-69-17 to NE 14-69-17 | Mossy-peat | Treed Fen |
| NW and SW 11-69-17 | Mossy-peat | Treed Fen |
| NW 2-69-17 | Mossy-peat | Shrubby Fen |
| SW 2-69-17 | Mossy-peat | Treed Fen |
| SW 2-69-17 to NW 35-68-17 | Woody-peat to mineral | Seasonal Emergent Marsh |
| NW 35-68-17 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SW 35-68-17 | Mossy-peat | Shrubby Swamp |
| SW 35-68-17 to NE 27-68-17 | Mossy-peat | Treed Fen |
| NE and SE 27-68-17 | Mossy-peat | Treed Fen |
| SW 27-68-17 to NW 22-68-17 | Woody-peat to mineral | Treed Fen |
| NE 8-68-17 | Woody-peat to mineral | Seasonal Emergent Marsh |
| NE and NW 8-68-17 | Mossy-peat | Shrubby Swamp |
| NE and NW 8-68-17 | Mossy-peat | Shrubby Swamp |
| NW 30-67-17 | Woody-peat to mineral | Treed Fen |
| NE 25-67-18 | Mossy-peat | Shrubby Swamp |
| NE 15-67-18 | Mossy-peat | Treed Fen |
| SE 15-67-18 | Woody-peat to mineral | Treed Fen |
| NE 30-66-18 | Woody-peat to mineral | Seasonal Emergent Marsh |
| NE 30-66-18 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SE 30-66-18 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SE 24-66-19 | Mossy-peat | Treed Bog |
| NE 13-66-19 | Mossy-peat | Treed Bog |
| NE and NW 13-66-19 | Mossy-peat | Treed Bog |
| NW 12-66-19 | Woody-peat to mineral | Shrubby Swamp |
| NW 2-66-19 | Woody-peat to mineral | Shrubby Swamp |
| NW 2-66-19 | Woody-peat to mineral | Shrubby Swamp |
| SW 2-66-19 toSE 3-66-19 | Mossy-peat | Treed Bog |
| NW 27-65-19 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SW 21-65-19 | Mossy-peat | Shrubby Fen |
| NW 16-65-19 | Woody-peat to mineral | Shrubby Swamp |
| SE 8-65-19 | Woody-peat to mineral | Seasonal Emergent Marsh |
| NE and SE 5-65-19 | Woody-peat to mineral | Shrubby Swamp |
| SE and SW 5-65-19 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SW 5-65-19 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SW 5-65-19 | Woody-peat to mineral | Seasonal Emergent Marsh |
| NE 30-64-19 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SW 30-64-19 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SW 30-64-19 | Woody-peat to mineral | Seasonal Emergent Marsh |
| NW 18-64-19 | Woody-peat to mineral | Shrubby Swamp |
| NW 7-64-19 to NE 12-64-20 | Mossy-peat | Shrubby Swamp |
| NE 1-64-20 | Woody-peat to mineral | Treed Bog |
| SE 1-64-20 | Woody-peat to mineral | Deep Marsh |

**TABLE 4.10 Cont'd**

| Legal Location of Wetland (W4M) | Wetland Group | Wetland Classification – Subclass and Class |
|---|---|---|
| SE 1-64-20 | Woody-peat to mineral | Deep Marsh |
| SE 1-64-20 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SE 1-64-20 | Woody-peat to mineral | Shrubby Swamp |
| NW and SW 25-63-20 | Woody-peat to mineral | Shrubby Swamp |
| NW 24-63-20 | Woody-peat to mineral | Wet Meadow |
| NE 14-63-20 | Mossy-peat | Deep Marsh |
| SE 11-63-20 to SE 2-63-20 | Mossy-peat | Treed Fen |
| NE 34-62-20 | Mossy-peat | Treed Fen |
| SE 34-62-20 | Mossy-peat | Shrubby Fen |
| NE and SE 27-62-20 | Mossy-peat | Shrubby Fen |
| NE and SE 22-62-20 | Mossy-peat | Shrubby Fen |
| NE 15-62-20 | Woody-peat to mineral | Shrubby Swamp |
| NE and SE 15-62-20 | Woody-peat to mineral | Deep Marsh |
| NW 3-62-20 | Woody-peat to mineral | Seasonal Emergent Marsh |
| NW and NE 16-61-20 | Woody-peat to mineral | Shrubby Swamp |
| SE 28-60-20 | Woody-peat to mineral | Deep Marsh |
| NE 21-60-20 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SE 3-58-20 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SE 2-57-20 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SE 2-57-20 | Woody-peat to mineral | Wet Meadow |
| SW 35-56-20 | Woody-peat to mineral | Wet Meadow |
| NW and SW 26-56-20 | Woody-peat to mineral | Seasonal Emergent Marsh |
| NW 15-56-20 | Woody-peat to mineral | Seasonal Emergent Marsh |
| NW 15-56-20 | Woody-peat to mineral | Seasonal Emergent Marsh |
| NE 6-56-20 | Woody-peat to mineral | Seasonal Emergent Marsh |
| NE 6-56-20 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SE 6-56-20 to NE 31-55-20 | Woody-peat to mineral | Seasonal Emergent Marsh |
| NE 21-55-21 | Woody-peat to mineral | Deep Marsh |
| SW 15-22-21 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SW 34-54-22 | Woody-peat to mineral | Shrubby Swamp |
| NE 28-54-22 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SE 17-54-22 | Woody-peat to mineral | Shrubby Swamp |
| SE 6-54-22 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SW 31-53-22 | Woody-peat to mineral | Seasonal Emergent Marsh |
| NE 26-53-23 | Woody-peat to mineral | Deep Marsh |
| SE 27-53-23 to NE 22-53-23 | Woody-peat to mineral | Seasonal Emergent Marsh |
| SE 21-53-23 | Woody-peat to mineral | Shrubby Swamp |
| SW 21-53-23 | Woody-peat to mineral | Shrubby Swamp |
| SW 9-53-23 | Woody-peat to mineral | Deep Marsh |
| SW 9-53-23 | Woody-peat to mineral | Deep Marsh |
| SW 4-53-23 | Woody-peat to mineral | Deep Marsh |

## 4.6 Wildlife

### *4.6.2 Provincially Identified Wildlife Areas*

Tables 4.12 to 4.14 have been updated to outline the provincially identified wildlife areas in the White Area along the current pipeline route.

**TABLE 4.12**

**KEY WILDLIFE AND BIODIVERSITY ZONES CROSSED BY THE PROPOSED GRAND RAPIDS PIPELINE PROJECT**

| Key Wildlife and Biodiversity Zone | Legal Location (W4M) | Total Length[1] (km) |
|---|---|---|
| La Biche River | 14-35-68-17 to 6-35-68-17 | 0.8 |
| North Saskatchewan River | 5-2-58-20 to 11-36-57-20 | 2.5 |
| North Saskatchewan River | 5-26-53-23 to 4-26-53-23 | 0.4 |
| North Saskatchewan River | 14-22-53-23 to 13-22-53-23 | 0.3 |
| North Saskatchewan River | 12-22-53-23 to 13-22-53-23 | 0.6 |

Source: AESRD 2013

Note: 1 Lengths are approximate.

**TABLE 4.13**

**SENSITIVE RAPTOR RANGE FOR BALD EAGLE CROSSED BY THE PROPOSED PIPELINE PROJECT**

| Legal Location (W4M) | Total Length[1] (km) |
|---|---|
| 10-36-57-20 to 7-36-57-20 | 0.8 |
| 3-24-57-20 to 5-26-56-20 | 9.0 |
| 7-8-56-20 to 8-5-53-23 | 50.7 |

Source: AESRD 2013

Note: 1 Lengths are approximate.

**TABLE 4.14**

**SHARP-TAILED GROUSE RANGE CROSSED BY THE PROPOSED GRAND RAPIDS PIPELINE PROJECT**

| Legal Location (W4M) | Total Length[1] (km) |
|---|---|
| 10-36-57-20 to 7-36-57-20 | 0.8 |
| 3-24-57-20 to 5-26-56-20 | 9.0 |
| 7-8-56-20 to 8-5-53-23 | 50.7 |

Source: AESRD 2013

Note: 1 Lengths are approximate.

### *4.6.6 Results of the Wildlife Field Work*

Wildlife field work was conducted along the proposed pipeline route from August 22 to September 3, 2012, and January 9 to 13 and March 15 to 20, 2013, prior to the submission of the C&R Report (TERA 2014e). Supplemental surveys were conducted from May 22 to June 6, 2013 and the results were included in the April 2014 supplementation information submission (TERA 2014f). There were several locations during the 2012/2013 wildlife surveys where landowner consent was not available, and/or where, due to route realignments, the pipeline impacted areas were not previously assessed. During the summer 2014 surveys,

supplemental wildlife field work was conducted from May 27 to June 1, 2014 along the remaining segments of the pipeline route noted below.

- NE 29-79-14 W4M;
- SE 29-79-14 W4M;
- SW 14-70-17 W4M;
- NE 35-69-17 W4M;
- SE 35-69-17 W4M;
- NW 25-63-20 W4M;
- SW 25-63-20 W4M;
- NW 24-63-20 W4M;
- NE 15-62-20 W4M;
- SE 15-62-20 W4M;
- SW 16-61-20 W4M;
- NW 36-57-20 W4M;
- NE 36-57-20 W4M;
- SE 16-56-20 W4M;
- NW 9-56-20 W4M;
- NW 31-55-20 W4M;
- NE 31-55-20 W4M;
- SW 31-53-22 W4M;
- NW 26-53-23 W4M;
- NE 26-53-23 W4M;
- SW 26-53-23 W4M;
- SE 27-53-23 W4M;
- SW 21-53-23 W4M; and
- SE 21-53-23 W4M.

Observations of species with special conservation status during the 2014 supplemental wildlife field work included bank swallow and barn swallow (both designated as Threatened by COSEWIC). Bank swallow were observed flying over in SE 35-69-17 W4M and a colony was observed in 4-27-53-23 W4M. The colony is located further away than the provincially recommended setback of 100 m from important habitat features (*e.g.*, nesting colonies) (Government of Alberta 2013). Barn swallows were observed foraging at SE 35-69-17 W4M and NE 36-57-20 W4M and flying over an existing pipeline right-of-way at SW 16-61-20 W4M. No species listed on Schedule 1 of *SARA* were observed during the supplemental wildlife field work.

Canadian toad were heard in a wetland located at NE 26-53-23 W4M, which is proposed to be crossed by the current route (Revision 7). This wetland is located on private land with cultivated land as the surrounding land use. Government of Alberta (2013) recommends a year-round 100 m setback from Canadian toad breeding ponds (measured from the bed and shore of the wetland). The Project parallels several existing pipeline rights-of-way at this location that are located between the wetland of interest and the proposed right-of-way. An amphibian salvage will be completed, if required, and clearing and construction will be avoided in proximity to the wetland during the amphibian breeding period. Grand Rapids will consult with the AER to discuss mitigation measures for working within the 100 m setback.

Pied-billed grebe were observed on a wetland located in NE 26-53-23 W4M, which is proposed to be crossed by the current route (Revision 7). This wetland is located on private land with cultivated land as the surrounding land use. The Government of Alberta (2013) recommends a 500 m setback distance from active pied-billed grebe nesting sites from April 15 to July 31. The Project parallels several existing pipeline rights-of-way at this location that are located between the wetland of interest and the proposed right-of-way. Wildlife monitoring will be conducted if construction occurs within the recommended timing constraint. Grand Rapids will consult with the AER to discuss mitigation measures for working within the 500 m setback during the recommended timing constraint.

An active osprey nest was observed on an artificial nest platform approximately 430 m northwest of the proposed pipeline right-of-way in SE 28-53-23 W4M. This land is within the City of Edmonton. The

Government of Alberta (2013) recommends a 750 m year-round setback distance. The proposed Project parallels several existing pipeline rights-of-way and 137 Avenue NE, which are located between the Project and the active osprey nest. Grand Rapids will consult with the AER to discuss mitigation measures for working within the 750 m setback.

Tables 4.15 and 4.16 outline wildlife species observed along the pipeline route in the White Area.

Mitigation for activities within the Caribou Range (Table 4.17) has been included in the Caribou Mitigation Plan (CMP) for the Grand Rapids Pipeline Project. This CMP will be provided to the AER for review prior to construction.

Based on a review of the current route, Revision 7, no supplementary wildlife surveys are required for this Project. Site-specific mitigation, where appropriate, will be incorporated in the Environmental Alignment Sheets and Part B, EPP of the C&R Report.

## TABLE 4.15

## WILDLIFE SPECIES OBSERVED ALONG THE PROPOSED GRAND RAPIDS PIPELINE PROJECT

| Common Name | Scientific Name | Signs Used to Identify Species | Conservation Status[1] |
|---|---|---|---|
| FALL FIELD WORK – AUGUST 22 TO SEPTEMBER 3, 2012 | | | |
| Mammals | | | |
| American beaver | *Castor canadensis* | chewed trees, dams, lodges, runs | --- |
| American black bear | *Ursus americanus* | visual, scat ,tracks, tree scratches | --- |
| American mink | *Neovison vison* | tracks | --- |
| canid sp. | *Species unidentified* | scat, tracks | --- |
| coyote | *Canis latrans* | scat, tracks | --- |
| deer sp. | *Species unidentified* | pellets, tracks | --- |
| felid sp. | *Species unidentified* | tracks | --- |
| gray wolf | *Canis lupus* | tracks, scat | --- |
| jumping mouse sp. | *Species unidentified* | visual | --- |
| least chipmunk | *Neotamias minimus* | visual | --- |
| moose | *Alces americanus* | visual, pellets, tracks, skull, antlers | --- |
| mustelid sp. | *Species unidentified* | tracks | --- |
| northern pocket gopher | *Thomomys talpoides* | dirt mounds | --- |
| red fox | *Vulpes vulpes* | tracks | --- |
| red squirrel | *Tamiasciurus hudsonicus* | auditory, visual | --- |
| southern red-backed vole. | *Myodes gapperi* | dead specimen | --- |
| snowshoe hare | *Lepus americanus* | runs, pellets | --- |
| western jumping mouse | *Zapus princeps* | visual | --- |
| white-tailed deer | *Odocoileus virginiana* | visual, pellets, tracks, shed antler | --- |
| woodland caribou | *Rangifer tarandus* | tracks | S1 (T)[1]<br>Threatened[2]<br>At Risk[3]<br>Threatened[4,5] |
| Birds | | | |
| American coot | *Fulica americana* | visual | --- |
| American crow | *Corvus brachyrhynchos* | auditory, visual | --- |
| American goldfinch | *Spinus tristis* | auditory, visual | --- |
| American kestrel | *Falco sparverius* | visual | S5 (W)[1]<br>Sensitive[3] |
| American pipit | *Anthus rubescens* | visual | --- |
| American robin | *Turdus migratorius* | auditory, visual | --- |
| American white pelican | *Pelecanus erythrorhynchos* | visual (flyover) | S2B(T)[1],<br>Sensitive[3] |
| bald eagle | *Haliaeetus leucocephalus* | visual | S4[1],<br>Sensitive[3] |
| barn swallow | *Hirundo rustica* | visual | S4 (W)[1]<br>Sensitive[3]<br>Threatened[4] |
| bay-breasted warbler | *Setophaga castanea* | visual | S3 (W)[1]<br>Sensitive[3] |
| belted kingfisher | *Megaceryle alcyon* | auditory, visual | --- |
| black-backed woodpecker | *Picoides arcticus* | auditory, visual | S2S3 (W)[1]<br>Sensitive[3] |
| black-billed magpie | *Pica hudsonia* | auditory, old nest, visual | --- |
| black-capped chickadee | *Poecile atricapillus* | auditory, visual | --- |
| blackbird sp. | *Species unidentified* | visual | --- |
| blackpoll warbler | *Setophaga striata* | visual | --- |
| blue jay | *Cyanocitta cristata* | auditory, visual | --- |
| boreal chickadee | *Poecile hudsonicus* | auditory, visual | --- |
| Canada goose | *Branta canadensis* | auditory, visual | --- |

**TABLE 4.15 Cont'd**

| Common Name | Scientific Name | Signs Used to Identify Species | Conservation Status[1] |
|---|---|---|---|
| Cape May warbler | *Setophaga tigrina* | visual | S3 (W)[1] Sensitive[3] |
| clay-colored sparrow | *Spizella pallida* | visual | --- |
| common loon | *Gavia immer* | visual | --- |
| common raven | *Corvus corax* | auditory, visual | --- |
| common yellowthroat | *Geothlypis trichas* | auditory, visual | S5[1], Sensitive[3] |
| crossbill sp. | *Species unidentified* | auditory | --- |
| dark-eyed junco | *Junco hyemalis* | visual | --- |
| downy woodpecker | *Picoides pubescens* | auditory, visual | --- |
| duck sp. | *unidentified species* | visual | --- |
| eagle sp. | *unidentified species* | visual | --- |
| gray jay | *Perisoreus canadensis* | auditory, visual | --- |
| great blue heron | *Ardea herodias* | visual | S3(W)[1], Sensitive[3] |
| great horned owl | *Bubo virginianus* | visual | --- |
| greater white-fronted goose | *Anser albifrons* | auditory, visual (flyover) | --- |
| gull sp. | *Species unidentified* | visual | --- |
| hairy woodpecker | *Picoides villosus* | auditory, visual | --- |
| Lincoln's sparrow | *Melospiza lincolnii,* | visual | --- |
| magnolia warbler | *Setophaga magnolia* | visual | --- |
| mallard | *Anas platyrhynchos* | visual | --- |
| merlin | *Falco columbarius* | visual | --- |
| Nashville warbler | *Setophaga ruficapilla* | visual | --- |
| northern flicker | *Colaptes auratus* | auditory, visual | --- |
| northern goshawk | *Accipiter gentilis* | visual | S3S4 (W)[1] Sensitive[3] |
| northern harrier | *Circus borealis (cyaeneus)* | visual | S5[1], Sensitive[3] |
| orange-crowned warbler | *Oreothlyoisp celata* | visual | --- |
| palm warbler | *Setophaga palmarum* | visual | --- |
| Philadelphia vireo | *Vireo philadelphicus* | visual | --- |
| pileated woodpecker | *Dryocopus pileatus* | auditory, visual, excavations | S4[1], Sensitive[3] |
| pine siskin | *Spinus pinus* | auditory, visual | --- |
| red-breasted nuthatch | *Sitta canadensis* | visual | --- |
| red-eyed vireo | *Vireo olivaceus* | visual | --- |
| red-tailed hawk | *Buteo jamaicensis* | auditory, visual | --- |
| ring-necked duck | *Aythya collaris* | visual | --- |
| ruby-crowned kinglet | *Regulus calendula* | visual | --- |
| ruffed grouse | *Bonasa umbellus* | visual | --- |
| sandhill crane | *Grus canadensis* | auditory, tracks, visual | S4[1], Sensitive[3] |
| sharp-shinned hawk | *Accipiter striatus* | visual | --- |
| solitary sandpiper | *Tringa solitaria* | visual | --- |
| song sparrow | *Melospiza melodia* | visual | --- |
| sora | *Porzana carolina* | auditory | S5[1], Sensitive[3] |
| sparrow sp. | *Species unidentified* | visual | --- |
| spotted sandpiper | *Actitis macularius* | visual, tracks | --- |
| spruce grouse | *Falcipennis canadensis* | visual | --- |
| swamp sparrow | *Melospiza georgiana* | visual | --- |
| Tennessee warbler | *Oreothlypis peregrina* | visual | --- |
| turkey vulture | *Cathartes aura* | visual | S2S3B[1] |
| Wilson's snipe | *Gallinago delicata* | visual | --- |

**TABLE 4.15 Cont'd**

| Common Name | Scientific Name | Signs Used to Identify Species | Conservation Status[1] |
|---|---|---|---|
| Wilson's warbler | *Cardellina pusilla* | visual | --- |
| white-throated sparrow | *Zonotrichia albicollis* | visual | --- |
| yellow warbler | *Setophaga petechia* | visual | --- |
| yellowlegs *sp.* | *Tringa* sp.. | visual | --- |
| yellow-bellied sapsucker | *Sphyrapicus varius* | bark wells, visual | --- |
| yellow-rumped warbler | *Setophaga coronata* | visual | --- |
| Amphibians | | | |
| boreal chorus frog | *Pseudacris maculata* | visual | --- |
| wood frog | *Rana sylvatica* | visual | --- |
| WINTER TRACKING FIELD WORK – JANUARY 9 TO 13, 2013 AND MARCH 15 TO 18, 2013 | | | |
| Mammals | | | |
| American black bear | *Ursus americanus* | tree scratches | --- |
| American marten | *Martes americana* | tracks | --- |
| Canada lynx | *Lynx canadensis* | tracks | S4 (W)[1]<br>Sensitive[3] |
| canid sp. | *Species unidentified* | tracks | --- |
| coyote | *Canis latrans* | tracks | --- |
| deer sp. | *Species unidentified* | pellets, tracks, beds, rubbed trees | --- |
| ermine | *Mustela erminea* | tracks | --- |
| gray wolf | *Canis lupus* | tracks, scat | --- |
| least weasel | *Mustela nivalis* | tracks | --- |
| moose | *Alces americanus (alces)* | visual, pellets, tracks | --- |
| mouse sp. | *Species unidentified* | tracks | --- |
| mustelid sp. | *Species unidentified* | tracks | --- |
| northern river otter | *Lontra canadensis* | tracks | --- |
| red fox | *Vulpes vulpes* | tracks | --- |
| red squirrel | *Tamiasciurus hudsonicus* | tracks,auditory, feeding sign | --- |
| snowshoe hare | *Lepus americanus* | tracks,runs, scat, feeding sign | --- |
| shrew sp. | *Soricidae sp.* | tracks | --- |
| vole sp. | *Microtus sp.* | tracks | --- |
| white-tailed deer | *Odocoileus virginiana* | visual, tracks, pellets | --- |
| woodland caribou | *Rangifer tarandus* | tracks, scat, feeding basins | S1 (T)[1]<br>Threatened[2]<br>At Risk[3]<br>Threatened[4,5] |
| Birds | | | |
| American three-toed woodpecker | *Picoides dorsalis* | visual, auditory | --- |
| black-capped chickadee | *Poecile atricapillus* | visual, auditory | --- |
| boreal chickadee | *Poecile hudsonicus* | visual, auditory | --- |
| common raven | *Corvus corax* | visual, auditory | --- |
| common redpoll | *Carduelis flammea* | visual | --- |
| crossbill sp. | *Loxia sp.* | auditory | --- |
| golden eagle | *Aquila chrysaetos* | visual | S3 (W)[1]<br>Sensitive[3] |
| gray jay | *Perisoreus canadensis* | visual | --- |
| grouse sp. | *Species unidentified* | tracks, punch holes, scat | --- |
| hairy woodpecker | *Picoides villosus* | visual, auditory | --- |
| pileated woodpecker | *Dryocopus pileatus* | foraging sign on trees | S4[1],<br>Sensitive[3] |
| red crossbill | *Loxia curvirostra* | visual, auditory | --- |
| sharp-tailed grouse | *Tympanuchus phasianellus* | visual | S3S4 (W)[1]<br>Sensitive[3] |
| spruce grouse | *Falcipennis canadensis* | tracks, punch holes, scat | --- |

**TABLE 4.15 Cont'd**

| Common Name | Scientific Name | Signs Used to Identify Species | Conservation Status[1] |
|---|---|---|---|
| yellow-bellied sapsucker | *Sphyrapicus varius* | sap wells on paper birch | --- |
| woodpecker sp. | *Picoides sp.* | foraging sign | --- |
| BREEDING BIRD/AMPHIBIAN SURVEYS – MAY 22 TO JUNE 6, 2013 | | | |
| Mammals | | | |
| American beaver | *Castor canadensis* | visual, forage sign, tracks, dams, lodges | --- |
| American black bear | *Ursus americanus* | tree scratches, scat, tracks | --- |
| American mink | *Neovison vison* | tracks | --- |
| coyote | *Canis latrans* | scat, tracks | --- |
| gray wolf | *Canis lupus* | scat, tracks | --- |
| least chipmunk | *Neotamias minimus* | visual | --- |
| moose | *Alces americanus (alces)* | visual, pellets, tracks | --- |
| muskrat | *Ondatra zibethicus* | lodge | --- |
| red fox | *Vulpes vulpes* | tracks | --- |
| red squirrel | *Tamiasciurus hudsonicus* | auditory, feeding sign, visual | --- |
| snowshoe hare | *Lepus americanus* | runs, scat | --- |
| vole sp. | *Microtus sp.* | tracks | --- |
| western jumping mouse | *Zapus princeps* | visual | --- |
| white-tailed deer | *Odocoileus virginianus* | visual, scat, tracks | --- |
| woodland caribou | *Rangifer tarandus* | tracks | S1 (T)[1]<br>Threatened[2]<br>At Risk[3]<br>Threatened[4,5] |
| Birds | | | |
| alder flycatcher | *Empidonax alnorum* | auditory | --- |
| American coot | *Fulica americana* | visual | --- |
| American crow | *Corvus brachyrhynchos* | auditory, visual | --- |
| American goldfinch | *Carduelis tristis* | visual | --- |
| American redstart | *Setophaga ruticilla* | auditory | --- |
| American robin | *Turdus migratorius* | auditory, visual | --- |
| American kestrel | *Falco sparverius* | visual | Sensitive[3] |
| American wigeon | *Anas americana* | visual | --- |
| bald eagle | *Haliaeetus leucocephalus* | visual | S4S5(W)[1]<br>Sensitive[3] |
| barred owl | *Strix varia* | auditory | S3S4(W)[1]<br>Special Concern[2]<br>Sensitive[3] |
| barn swallow | *Hirundo rustica* | visual | S4(W)[1]<br>Sensitive[3]<br>Threatened[4] |
| belted kingfisher | *Ceryle alcyon* | visual | --- |
| black-and-white warbler | *Mniotilta varia* | auditory, visual | --- |
| black-billed magpie | *Pica hudsonia* | visual | --- |
| black-capped chickadee | *Poecile atricapillus* | auditory, visual | --- |
| blue-headed vireo | *Vireo solitaries* | auditory, visual | --- |
| blue-winged teal | *Anas discors* | visual | --- |
| blue jay | *Cyanocitta cristata* | auditory, visual | --- |
| boreal chickadee | *Poecile hudsonicus* | auditory, visual | --- |
| boreal owl | *Aegolius funereus* | auditory | --- |
| brown-headed cowbird | *Molothrus ater* | visual | --- |
| bufflehead | *Bucephala albeola* | visual | --- |
| Canada goose | *Branta Canadensis* | auditory, visual | --- |
| canvasback | *Aythya valisineria* | visual | --- |

**TABLE 4.15 Cont'd**

| Common Name | Scientific Name | Signs Used to Identify Species | Conservation Status[1] |
|---|---|---|---|
| Cape May warbler | *Setophaga tigrina* | visual | S3 (W)[1]<br>Sensitive[3] |
| cedar waxwing | *Bombycilla cedrorum* | visual | --- |
| chipping sparrow | *Spizella passerine* | auditory, visual | --- |
| cinnamon teal | *Anas cyanoptera* | visual | --- |
| clay-colored sparrow | *Spizella pallid* | auditory | --- |
| common goldeneye | *Bucephala clangula* | visual | --- |
| common loon | *Gavia immer* | auditory, visual | --- |
| common merganser | *Mergus merganser* | visual | --- |
| common raven | *Corvus corax* | auditory, visual | --- |
| common yellowthroat | *Geothlypis trichas* | auditory, visual | S4(W)[1]<br>Sensitive[3] |
| Connecticut warbler | *Oporornis agilis* | auditory | --- |
| dark-eyed junco | *Junco hyemalis* | auditory, visual | --- |
| downy woodpecker | *Picoides pubescens* | visual | --- |
| duck sp. | *unidentified species* | visual | --- |
| eared grebe | *Podiceps nigricollis* | visual | --- |
| Franklin's gull | *Leucophaeus pipixcan* | visual | --- |
| gadwall | *Anas strepera* | visual | --- |
| gray jay | *Perisoreus canadensis* | auditory, visual | --- |
| great gray owl | *Strix nebulosa* | visual | S4(W)[1]<br>Sensitive[3] |
| greater yellowlegs | *Tringa melanoleuca* | visual | --- |
| green-winged teal | *Anas crecca* | visual | S4S5(W)[1]<br>Sensitive[3] |
| grouse species | *Species unidentified* | scat | --- |
| gull sp. | *Species unidentified* | visual | --- |
| hairy woodpecker | *Picoides villosus* | visual | --- |
| hermit thrush | *Catharus guttatus* | auditory | --- |
| horned grebe | *Podiceps auritus* | visual | S3(W)[1]<br>Sensitive[3]<br>Special Concern[4] |
| house wren | *Troglodytes aedon* | visual | --- |
| killdeer | *Charadrius vociferus* | auditory, visual | --- |
| least flycatcher | *Empidonax minimus* | auditory | Sensitive[3] |
| Le Conte's sparrow | *Ammodramus leconteii* | auditory | --- |
| lesser scaup | *Aythya affinis* | visual | S5(W)[1]<br>Sensitive[3] |
| lesser yellowlegs | *Tringa flavipes* | visual | --- |
| Lincoln's sparrow | *Melospiza lincolnii* | auditory | --- |
| magnolia warbler | *Dendroica magnolia* | auditory | --- |
| mallard | *Anas platyrhynchos* | visual | --- |
| marsh wren | *Cistothorus palustris* | auditory, visual | --- |
| mourning warbler | *Oporornis philadelphia* | auditory | --- |
| northern flicker | *Colaptes auratus* | auditory, visual | --- |
| northern harrier | *Circus cyaneus* | visual | S5(W)[1]<br>Sensitive[3] |
| northern pintail | *Anas acuta* | visual | S4S5(W)[1]<br>Sensitive[3] |
| northern shoveler | *Anas clypeata* | visual | --- |
| northern waterthrush | *Seiurus noveboracensis* | auditory, visual | --- |
| olive-sided flycatcher | *Contopus cooperi* | auditory, visual | S3[1]<br>May Be At Risk[3]<br>Threatened[4,5] |

**TABLE 4.15 Cont'd**

| Common Name | Scientific Name | Signs Used to Identify Species | Conservation Status[1] |
|---|---|---|---|
| orange-crowned warbler | *Oreothlyoisp celata* | visual | --- |
| ovenbird | *Seiurus aurocapilla* | auditory | --- |
| palm warbler | *Setophaga palmarum* | auditory | --- |
| Philadelphia vireo | *Vireo philadelphicus* | auditory | --- |
| pied-billed grebe | *Podilymbus podiceps* | auditory, visual | S4[1]<br>Sensitive[3] |
| pileated woodpecker | *Dryocupus pileatus* | forage sign | S4[1]<br>Sensitive[3] |
| pine siskin | *Carduelis pinus* | auditory, visual | --- |
| purple finch | *Carpodacus purpureus* | auditory, visual | --- |
| red-breasted nuthatch | *Sitta canadensis* | auditory | --- |
| red-eyed vireo | *Vireo olivaceus* | auditory | --- |
| red-tailed hawk | *Buteo jamaicensis* | visual | --- |
| red-winged blackbird | *Agelaius phoeniceus* | auditory, visual | --- |
| rose-breasted grosbeak | *Pheucticus ludovicianus* | auditory, visual | --- |
| ruby-crowned kinglet | *Regulus calendula* | auditory | --- |
| ruddy duck | *Oxyura jamaicensis* | visual | --- |
| ruffed grouse | *Bonasa umbellus* | auditory | --- |
| sandhill crane | *Grus canadensis* | auditory, visual, tracks | S4[1]<br>Sensitive[3] |
| Savannah sparrow | *Passerculus sandwichensis* | auditory | --- |
| sedge wren | *Cistothorus platensis* | auditory | S2(T)[1]<br>Sensitive[3] |
| sharp-shinned hawk | *Accipiter striatus* | visual | --- |
| sharp-tailed grouse | *Tympanuchus phasianellus* | visual | S3S4(W)[1]<br>Sensitive[3] |
| snow goose | *Chen caerulescens* | visual | --- |
| solitary sandpiper | *Tringa solitaria* | visual | --- |
| song sparrow | *Melospiza melodia* | auditory | --- |
| sora | *Porzana carolina* | auditory, visual | Sensitive[3] |
| spotted sandpiper | *Actitis macularius* | visual | --- |
| Swainson's thrush | *Catharus ustulatus* | auditory | --- |
| swamp sparrow | *Melospiza georgiana* | auditory | --- |
| Tennessee warbler | *Oreothlypis peregrina* | visual | --- |
| tree swallow | *Tachycineta bicolour* | visual | --- |
| vesper sparrow | *Pooecetes gramineus* | auditory | --- |
| warbling vireo | *Vireo gilvus* | auditory | --- |
| western tanager | *Piranga ludoviciana* | auditory, visual | S4[1]<br>Sensitive[3] |
| western wood-pewee | *Contopus sordidulus* | auditory | --- |
| white-throated sparrow | *Zonotrichia albicollis* | auditory, visual | --- |
| Wilson's snipe | *Gallinago delicate* | auditory, visual | --- |
| Wilson's warbler | *Cardellina pusilla* | visual | --- |
| winter wren | *Troglodytes troglodytes* | auditory | --- |
| woodpecker sp. | *Picoides sp.* | foraging sign | --- |
| yellow warbler | *Setophaga petechia* | visual | --- |
| yellowlegs *sp.* | *Tringa* sp. | visual | --- |
| yellow-bellied flycatcher | *Empidonax flaviventris* | auditory | --- |
| yellow-bellied sapsucker | *Sphyrapicus varius* | auditory, visual | --- |
| yellow-headed blackbird | *Xanthocephalus xanthocephalus* | visual | --- |
| yellow-rumped warbler | *Setophaga coronata* | auditory | --- |
| Amphibians | | | |
| boreal chorus frog | *Pseudacris maculate* | auditory, visual | --- |

**TABLE 4.15 Cont'd**

| Common Name | Scientific Name | Signs Used to Identify Species | Conservation Status[1] |
|---|---|---|---|
| western toad | *Anaxyrus boreas boreas* | visual | S3(T)[1]<br>Sensitive[3]<br>Special Concern[4,5] |
| wood frog | *Lithobates sylvaticus* | visual, egg masses | --- |
| SUMMER FIELD WORK – MAY 27 TO JUNE 1, 2014 | | | |
| Mammals | | | |
| American black bear | *Ursus americanus* | tree scratches, tracks | --- |
| beaver | *Castor canadensis* | visual, tracks, dams, lodge | --- |
| Common porcupine | *Erethizon dorsatum* | visual | --- |
| coyote | *Canis latrans* | tracks | --- |
| gray wolf | *Canis lupus* | tracks | --- |
| jumping mouse sp. | *Zapus spp.* | visual | --- |
| moose | *Alces alcess* | pellets, tracks | --- |
| muskrat | *Ondatra zibethicus* | visual | --- |
| northern pocket gopher | *Thomomys talpoides* | mounds | --- |
| red fox | *Vulpes vulpes* | tracks | --- |
| red squirrel | *Tamiasciurus hudsonicus* | auditory, visual | --- |
| vole sp. | *Vole ssp.* | visual | --- |
| white-tailed deer | *Odocoileus virginiana* | pellets, tracks, visual | --- |
| Birds | | | |
| Alder flycatcher | *Empidonax alnorum* | auditory | --- |
| American coot | *Fulica americana* | visual | --- |
| American crow | *Corvus brachyrhynchos* | auditory, visual | --- |
| American goldfinch | *Sinus tristis* | auditory, visual | --- |
| American kestrel | *Falco sparverius* | visual | S5 (W)[1]<br>Sensitive[3] |
| American redstart | *Setophaga ruticilla* | auditory, visual | --- |
| American robin | *Turdis migratorius* | auditory, visual | --- |
| American wigeon | *Anas americana* | visual | --- |
| bald eagle | *Haliaeetus leucocephalus* | visual | S4[1],<br>Sensitive[3] |
| Baltimore oriole | *Icterus galbula* | auditory, visual | Sensitive[3] |
| bank swallow | *Riparia riparia* | visual | S4(W)[1]<br>Threatened[4] |
| barn swallow | *Hirundo rustica* | visual | S4(W)[1]<br>Sensitive[3]<br>Threatened[4] |
| Baltimore oriole | *Icterus galbula* | auditory, visual | Sensitive[3] |
| bay-breasted warbler | *Dendroica castanea* | auditory, visual | S3 (W)[1]<br>Sensitive[3] |
| Belted kingfisher | *Megaceryle alcyon* | auditory, visual | --- |
| Black-and-white warbler | *Mniotilta varia* | auditory, visual | --- |
| Black-billed magpie | *Pica Hudsonia* | auditory, visual | --- |
| black-capped chickadee | *Poecile atricapillus* | auditory, visual | --- |
| Blackpoll warbler | *Dendroica striata* | auditory | --- |
| black tern | *Chilidonias niger* | visual | Sensitive[3] |
| Blue jay | *Cyanocitta cristata* | auditory | --- |
| Blue-headed vireo | *Vireo solitaries* | auditory | --- |
| blue-winged teal | *Anas discors* | visual | --- |
| boreal chickadee | *Poecile hudsonicus* | auditory, visual | --- |
| Brown thrasher | *Toxostoma rufum* | auditory | --- |
| Brown-headed cowbird | *Molothrus ater* | auditory, visual | --- |
| bufflehead | *Bucephala albeola* | visual | --- |
| California gull | *Larus californicus* | visual | --- |

**TABLE 4.15 Cont'd**

| Common Name | Scientific Name | Signs Used to Identify Species | Conservation Status[1] |
|---|---|---|---|
| Canada goose | *Branta canadensis* | auditory, visual | --- |
| canvasback | *Aythya valisineria* | visual | --- |
| Cedar waxwing | *Bombycilla cedrorum* | auditory, visual | --- |
| Chipping sparrow | *Spizella passerine* | auditory, visual | --- |
| Clay-colored sparrow | *Spizella pallida* | auditory, visual | --- |
| common goldeneye | *Bucephala clangula* | visual | --- |
| Common raven | *Corvus corax* | auditory, visual | --- |
| common yellowthroat | *Geothlypis trichas* | visual | S5[1], Sensitive[3] |
| Downy woodpecker | *Picoides pubescens* | visual | --- |
| downy woodpecker | *Picoides pubescens* | visual | --- |
| eared grebe | *Podiceps nigricollis* | visual | --- |
| eastern kingbird | *Tyrannus tyrannus* | auditory, visual | --- |
| eastern phoebe | *Sayornis phoebe* | auditory | Sensitive[3] |
| European starling | *Sturnus vulgaris* | auditory, visual | --- |
| Franklin's gull | *Leucophaeus pipixcan* | visual | --- |
| gadwall | *Anas strepera* | visual | --- |
| Gray catbird | *Dumetella carolinensis* | auditory, visual | --- |
| Gray jay | *Perisoreus canadensis* | visual | --- |
| great blue heron | *Ardea herodias* | Visual (flyover) | S3(W)[1], Sensitive[3] |
| Great horned owl | *Bubo virginianus* | visual | --- |
| Greater yellowlegs | *Tringa Melanoleuca* | auditory, visual | --- |
| green-winged teal | *Anas crecca* | visual | S4S5(W)[1] Sensitive[3] |
| hairy woodpecker | *Picoides villosus* | visual | --- |
| Hermit thrush | *Catharus guttatus* | auditory | --- |
| Horned lark | *Eremophila alpestris* | visual | --- |
| House wren | *Troglodytes aedon* | auditory | --- |
| killdeer | *Charadrius vociferus* | auditory, visual | --- |
| Lapland longspur | *Calcarius lapponicus* | visual | --- |
| least flycatcher | *Empidonax minimus* | auditory, visual | Sensitive[3] |
| Le Conte's sparrow | *Ammodramus leconteii* | auditory | --- |
| lesser scaup | *Aythya affinis* | visual | S5(W)[1] Sensitive[3] |
| Lincoln's sparrow | *Melospiza lincolnii* | auditory | --- |
| Magnolia warbler | *Dendroica magnolia* | auditory | --- |
| mallard | *Anas platyrhynchos* | visual | --- |
| merlin | *Falco columbarius* | visual | --- |
| northern flicker | *Colaptes auratus* | auditory, visual | --- |
| northern shoveler | *Anas clypeata* | visual | --- |
| orange-crowned warbler | *Vermivora celata* | auditory, visual | --- |
| osprey | *Pandion haliaetus* | visual | Sensitive[3] |
| ovenbird | *Seiurus aurocapilla* | auditory | --- |
| palm warbler | *Dendroica palmarum* | auditory | --- |
| pied-billed grebe | *Podilymbus podiceps* | auditory, visual | S4[1] Sensitive[3] |
| pileated woodpecker | *Dryocopus pileatus* | visual | S4[1], Sensitive[3] |
| vireo species | *Vireo spp.* | auditory | --- |
| redhead | *Aythya americana* | visual | --- |
| red-eyed vireo | *Vireo olivaceus* | auditory, visual | --- |
| red-necked grebe | *Podiceps grisegena* | auditory | --- |
| red-necked phalarope | *Phalaropus lobatus* | visual | --- |

**TABLE 4.15 Cont'd**

| Common Name | Scientific Name | Signs Used to Identify Species | Conservation Status[1] |
|---|---|---|---|
| red-tailed hawk | *Buteo jamaicensis* | auditory, visual | --- |
| red-winged blackbird | *Agelaius phoeniceus* | auditory, visual | --- |
| ring-necked duck | *Aythya collaris* | visual | --- |
| rose-breasted grosbeak | *Pheucticus ludovicianus* | auditory | --- |
| Ross's goose | *Chen rossi* | visual | --- |
| rough-winged swallow | *Stelgidopteryx serripennis* | visual | --- |
| ruby-crowned kinglet | *Regulus calendula* | auditory | --- |
| ruddy duck | *Oxyura jamaicensis* | visual | --- |
| ruffed grouse | *Bonasa umbellus* | auditory, visual | --- |
| sandhill crane | *Grus canadensis* | auditory | S4[1], Sensitive[3] |
| Savannah sparrow | *Passerculus sandwichensis* | auditory, visual | --- |
| sharp-shinned hawk | *Accipiter striatus* | visual | --- |
| Shorebird species | *Shorebird spp.* | Visual (flyover) | --- |
| solitary sandpiper | *Tringa solitaria* | visual | --- |
| Song sparrow | *Melospiza melodia* | auditory, visual | --- |
| sora | *Porzana carolina* | auditory | S5[1], Sensitive[3] |
| spotted sandpiper | *Actitis macularius* | visual | --- |
| Swainson's thrush | *Catharus ustulatus* | auditory, visual | --- |
| swamp sparrow | *Melospiza Georgiana* | auditory | --- |
| Tennessee warbler | *Vermivora peregrina* | auditory | --- |
| tree swallow | *Tachycineta bicolour* | visual | --- |
| veery | *Catharus fuscescens* | auditory | --- |
| vesper sparrow | *Pooecetes gramineus* | auditory | --- |
| violet-green swallow | *Tachycineta thalassina* | visual | --- |
| warbling vireo | *Vireo gilvus* | auditory | --- |
| western wood-pewee | *Contopus sordidulus* | visual | --- |
| White-throated sparrow | *Zonotrichia albicollis* | auditory, visual | --- |
| Wilson's snipe | *Gallinago delicata* | auditory, visual | --- |
| Wilson's warbler | *Wilsonia pusilla* | auditory, visual | --- |
| yellow-bellied sapsucker | *Sphyrapicus varius* | visual | --- |
| yellow-headed blackbird | *Xanthocephalus xanthocephalus* | auditory, visual | --- |
| yellow-rumped warbler | *Dendroica coronate* | auditory, visual | --- |
| yellow warbler | *Dendroica petechia* | auditory, visual | --- |
| Amphibians | | | |
| boreal chorus frog | *Pseudacris maculate* | auditory | --- |
| Canadian toad | *Anaxyrus hemiophrys* | auditory | May be at Risk[3] |
| wood frog | *Lithobates sylvaticus* | auditory, visual | --- |

Sources: Scientific names and status ranks from Alberta Sustainable Resource Development 2011, COSEWIC 2013, Government of Canada 2013, NatureServe 2012a,b

Notes:
1 Provincial (S) Rank.
2 Listed under the *Alberta Wildlife Act*.
3 Status designation assigned in The 2010 General Status of Alberta Wild Species (Alberta Sustainable Resource Development 2011).
4 Listed by COSEWIC (2013).
5 Listed under *SARA* Schedule 1 (Government of Canada 2013).

**TABLE 4.16**

**LOCATIONS OF BEAVER ACTIVITY ON OR ADJACENT TO THE PROPOSED GRAND RAPIDS PIPELINE PROJECT**

| Legal Location (W4M) | Comments |
|---|---|
| SE 30-71-16 | Active beaver dams observed on unnamed tributary to the Wandering River |
| NW 23-70-17 | Active beaver pond and dam observed on the proposed pipeline route at an unnamed tributary. A beaver lodge is located to the east of the proposed pipeline route. |
| SE 35-69-17 | Active beaver pond observed on the proposed pipeline route. A beaver dam and lodge are located to the west of the proposed pipeline route. |
| NE 23-69-17 | Old beaver ponds and dams on the proposed pipeline route. |
| NE 34-62-20 | A dugout containing two beaver lodges observed on the proposed pipeline route. |
| SW 22-55-21 | Beaver dam observed on the proposed pipeline route at Astotin Creek. |
| SW 15-62-20 | Beaver dam and lodge observed approximately 45 m west of the proposed centre line within temporary workspace. |
| SW 16-56-20 | Beaver dam observed approximately 50 m northwest of proposed centre line. |
| SW 16-56-20 | Beaver dam observed approximately 55 m southeast of proposed centre line. |
| SW 21-53-23 | Beaver dam observed approximately 70 m south of proposed centre line. |
| SW 21-53-23 | Beaver dam observed approximately 35 m south of proposed centre line within temporary workspace. |
| SW 21-53-23 | Beaver lodge observed approximately 20 m west of proposed centre line. |

Note: All locations are approximate.

**TABLE 4.17**

**CARIBOU RANGE CROSSED BY THE PROPOSED GRAND RAPIDS PIPELINE PROJECT[1]**

| Caribou Range | Caribou Herd | Legal Location (W4M) | Length in Caribou Range (km)[1] |
|---|---|---|---|
| East Side Athabasca River (ESAR) | Wandering | 3-30-73-16 to 6-19-72-16 | 12.4 |

Source: AESRD 2013

Note: 1 Lengths are approximate and are based on Revision 6 of the proposed Project route.

## 4.7 Land and Natural Resource Use

### *4.7.1 Administrative boundaries, Communities and Surface Dispositions*

There have been no updates to the administrative boundaries, communities or surface dispositions for the proposed Project since the submission of the 2013 C&R Report, outlined in Section 4.7.1 (TERA Environmental Consultants 2013).

### *4.7.2 Natural Resource Use*

The proposed route traverses Consultative Notations and Surface Material Leases as detailed in Table 4.19. Grand Rapids will consult with disposition holders to ensure that any conflicts are resolved prior to the commencement of construction activities.

The proposed route traverses five Registered Trapping Areas (TPAs) in the White Area (Alberta Energy 2014) (Table 4.20). Species trapped and total returns vary widely and are dependent upon trapper effort, trapper expertise, fur prices, species abundance and weather conditions. Grand Rapids will consult with disposition holders to ensure that any conflicts are resolved prior to the commencement of construction activities.

**TABLE 4.19**

**SURFACE MINERAL DISPOSITIONS TRAVERSED BY THE PROPOSED GRAND RAPIDS PIPELINE PROJECT**

| Type | Agreement Number | Location (W4M) | Comments | Disposition Holder | Status |
|---|---|---|---|---|---|
| Consultative Notations (CNTs) | 930270 | NW 36-72-16 | Surface Mineral Potential<br>No Restrictions | Wandering River Office - Land Use Area - Lands Division<br>Department of ESRD | Active |
| Surface Material Lease (MSL) | 960005 | NW 30-72-16 | Peat | Sun Gro Horticulture Canada Ltd. | Active |
| Surface Material Lease | 020034 | NW 11-69-17<br>SW 11-69-17<br>NW 2-69-17 | Peat | University of Lethbridge, Flanagan Laboratory | Active |
| CNT | 930153 | NW 14-70-17<br>NW 11-70-17 | Surface Materials Potential<br>No Restrictions | Wandering River Office - Land Use Area - Lands Division<br>Department of ESRD | Active |

Source: Alberta Energy 2014

**TABLE 4.20**

**TRAPPING AREAS ALONG THE PROPOSED GRAND RAPIDS PIPELINE**

| Location (W4M) | Agreement Number | Status |
|---|---|---|
| 36-72-17<br>NW 30-72-16<br>25-72-17<br>19-72-16 | 1654 | Active |
| SE 2-70-17<br>SW 2-70-17<br>35-69-17<br>26-69-17<br>14-69-17 | 2436 | Active |
| 23-69-17<br>11-69-17<br>2-69-17 | 1265 | Active |
| 36-63-20<br>25-63-20<br>24-63-20<br>23-63-20<br>14-63-20<br>11-63-20<br>2-63-20<br>34-62-20<br>27-62-20 | 2913 | Active |
| 1-73-17 | 1713 | Active |

Source: Alberta Energy 2014

### *4.7.3 Surface Dispositions/Reservations Notations*

One additional Protective Notation (PNT) is traversed by the proposed pipeline Project since the submission of the 2013 C&R Report, outlined in Section 4.7.3 (TERA Environmental Consultants 2013). PNT 140003 is traversed within NW 14-70-17 W4M for adverse soil characteristics and is held by the Lac La Biche West Office-Rangeland District-Lands Division, Department of Environment and Sustainable Resource Development.

### *4.7.4 Environmentally Significant Areas and Protected Areas*

Table 4.21 outlines the Environmental Significant Areas (ESA) crossed by the pipeline route in the White Area.

**TABLE 4.21**

**ENVIRONMENTALLY SIGNIFICANT AREAS CROSSED BY THE PROPOSED GRAND RAPIDS PIPELINE PROJECT**

| ESA | Legal Location (W4M) | Approximate Length[1](km) | Importance |
|---|---|---|---|
| 690 | NW 36-57-20 | 0.9 | • Nationally significant<br>• Located along the North Saskatchewan River valley, it contains 65 elements of conservation concern and provides important habitat for focal species of plants and animals including northern leopard frog, ferruginous hawk, peregrine falcon and burrowing owl. It also contains large natural areas and riparian areas, including headwater streams, intact riparian areas and riparian areas along a major river. |
| | NE 25-57-20 | 0.8 | |
| | NW 24-57-20 | 0.5 | |
| | NW 9 to NW 5-56-20 | 3.4 | |
| | SE 27-53-23 | 0.8 | |

Source: Alberta Tourism, Parks and Recreation (ATPR) 2009

Note: 1 Lengths are approximate.

### *4.7.5 Environmentally Sensitive Areas*

There have been no updates to environmentally sensitive areas for the proposed Project since the submission of the 2013 C&R Report, outlined in Section 4.7.5 (TERA Environmental Consultants 2013).

### *4.7.6 Recreation and Wildlife Management Units*

There have been no updates to recreation and wildlife management units for the proposed Project since the submission of the 2013 C&R Report, outlined in Section 4.7.6 (TERA Environmental Consultants 2013).

## 4.8 Historical Resources

Grand Rapids has prepared a Historical Resources Impact Assessment based on the route to date and partial clearance under the *Historical Resources Act* (*HRA*) was obtained for Townships 53 - 90 and Ranges 14 - 23 W4M on September 17, 2014 (*HRA* Project File #4780-12-0068-004). Grand Rapids will work with Alberta Culture and Tourism to obtain clearance under the *HRA* for the remaining segments of the pipeline route prior to beginning work in those areas.

# 5.0 ENVIRONMENTAL PROTECTION PLAN

The Environmental Protection Plan will be updated and will be provided under a separate cover.

# 6.0 ENVIRONMENTAL ALIGNMENT SHEETS

The Environmental Alignment Sheets will be updated with minor realignments and will be provided under a separate cover.

## 7.0 CLOSING

If you have any questions or concerns, do not hesitate to contact Tammy Ramanat or me by phone at (403) 920-7378 or (403) 265-2885 or by email at tammy_ramanat@transcanada.com or lgibb@ch2m.com.

Sincerely,

**CH2M HILL ENERGY CANADA, LTD.**

*Original Signed*

Leona J.M. Gibb, M.Sc.
Senior Environmental Planner

# 8.0 REFERENCES

## 8.1 Literature Cited

Alberta Conservation Information Management System. 2013. Frequently Asked Questions: What are tracking and watch lists? Government of Alberta Tourism, Parks and Recreation. Edmonton, AB. Website: http://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-(acims)/faqs.aspx. Accessed: March 2014.

Alberta Energy. 2014. Geographic Land Information Management Planning System. Project-specific search request completed October 28, 2014.

Alberta Environment and Sustainable Resource Development. 2013. Wildlife Sensitivity Data Sets (digital files). Edmonton, AB. Available: http://www.srd.alberta.ca/MapsPhotosPublications/Maps/WildlifeSensitivityMaps/Default.aspx. Last Update Check: August 2013.

Alberta Government. 2013a. *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body*. Edmonton, AB. 36 pp.

Alberta Government. 2013b. *Code of Practice for Watercourse Crossings*. Edmonton, AB. 44 pp.

Alberta Sustainable Resource Development. 2011. General Status of Alberta Wild Species 2010. Website: http://www.srd.alberta.ca/FishWildlife/SpeciesAtRisk/GeneralStatusOfAlbertaWildSpecies/GeneralStatusOfAlbertaWildSpecies2010/SearchForWildSpeciesStatus.aspx. Accessed: February 2013.

Alberta Tourism, Parks and Recreation. 2009. Environmentally Significant Areas of Alberta. 1:1,000,000 map. Parks Division.

Committee on the Status of Endangered Wildlife in Canada. 2013. Canadian Species at Risk. Website: http://www.cosewic.gc.ca/eng/sct5/index_e.cfm. Accessed: February 2013.

Government of Alberta. 2013. Integrated Standards and Guidelines - Enhanced Approval Process. December 1, 2013. 94 pp.

Government of Canada. 2013. Species at Risk Public Registry. Website: http://www.sararegistry.gc.ca/species/default_e.cfm. Accessed: February 2013.

Mentiga Pedology Consultants Ltd. 2014. Additional Soils Information Along Various Re-Routes Along the Grand Rapid Pipeline Project for Grand Rapids Pipeline GP Ltd. Prepared for TERA Environmental Consultants on behalf of Grand Rapids. Prepared by A.G. Twardy and L. Kipling. File No. 11031.2.

NatureServe. 2012a. NatureServe Explorer - An Online Encyclopedia of Life. Website: http://www.natureserve.org/explorer/index.htm. Accessed: February 2013.

NatureServe. 2012b. Heritage Status: Global, National and Subnational Conservation Status Ranks. Website: http://www.natureserve.org/explorer/ranking.htm. Accessed: February 2013.

NatureServe. 2013. Heritage Status: Global, National and Subnational Conservation Status Ranks. Website: http://www.natureserve.org/explorer/ranking.htm. Accessed: March 2014.

TERA, a CH2M HILL Company. 2014a. Supplemental Information for the Grand Rapids Pipeline GP Ltd. Grand Rapids Pipeline Project Application No. 001-328929. Prepared for Grand Rapids Pipeline GP Ltd.

TERA, a CH2M HILL Company. 2014b. Aquatic Assessment for the Proposed Grand Rapids Pipeline GP Ltd. Grand Rapids Pipeline Project. Prepared for the Proposed Grand Rapids Pipeline GP Ltd. Grand Rapids Pipeline Project.

TERA, a CH2M HILL Company. 2014c. Results of the Supplemental Aquatics Surveys along the Proposed Grand Rapids Pipeline GP Ltd. Grand Rapids Project. Prepared for the Proposed Grand Rapids Pipeline GP Ltd. Grand Rapids Pipeline Project.

TERA, a CH2M HILL Company. 2014d. 2014 Mitigation and Supplemental Vegetation Survey Results for the Proposed Grand Rapids Pipeline GP Ltd. Grand Rapids Pipeline Project. Prepared for the Proposed Grand Rapids Pipeline GP Ltd. Grand Rapids Pipeline Project.

TERA, a CH2M HILL Company. 2014e. Wildlife Report for the Proposed Grand Rapids Pipeline GP Ltd. Grand Rapids Pipeline Project. Prepared for Grand Rapids Pipeline GP Ltd.

TERA, a CH2M HILL Company. 2014f. Results of the Supplemental Wildlife Field Work for the Proposed Grand Rapids Pipeline Project. Prepared for Grand Rapids Pipeline GP Ltd.

TERA Environmental Consultants. 2013. Conservation and Reclamation Report For The Proposed Grand Rapids Pipeline GP Ltd. Grand Rapids Pipeline Project. Prepared for Grand Rapids Pipeline GP Ltd.

TERA Environmental Consultants. 2014a. Vegetation Report for the Proposed Rapids Pipeline GP Ltd. Grand Rapids Project. Prepared for the Proposed Grand Rapids Pipeline GP Ltd. Grand Rapids Pipeline Project.

TERA Environmental Consultants. 2014b Wetland Evaluation for the Proposed Grand Rapids Pipeline GP Ltd. Grand Rapids Pipeline Project. Prepared for Grand Rapids Pipeline GP Ltd.

## 8.2 GIS and Mapping References

ATPR. 2012. Protected Areas (pashape_ocsites_10tm) (digital file). Edmonton, AB. Available: http://albertaparks.ca/albertaparksca/library/downloadable-data-sets.aspx. Acquired: February 2013. Last Update Check: March 12, 2014.

AltaLIS. 2009. Alberta Provincial Boundary (digital file). Calgary, AB. Available: http://www.altalis.com/products/base/alberta_boundary_data.html. Acquired: February 2011. Last Update Check: May 12, 2014.

AltaLIS. 2010. Alberta Green and White Areas (digital file). Calgary, AB. Available: http://www.altalis.com/products/base/alberta_boundary_data.html. Acquired: April 2011. Last Update Check: May 12, 2014.

AltaLIS. 2014. Alberta Municipal Boundaries (digital file). Calgary, AB. Available: http://www.altalis.com. Acquired: May 2014. Last Update Check: May 1, 2014.

Focus Corporation. 2014. Proposed Route, Lateral and Facilities (digital files). Calgary, AB. Acquired: February 3, 2014.

Government of Canada. 2014. Aboriginal Lands, Canada (digital file). Edmonton, AB. Available: http://www.geobase.ca. Acquired: April 2014. Last Update Check: April 22, 2014.

IHS Inc. 2004. IHS Hydro Line/Region Data (digital file). Calgary, AB. Available: http://energy.ihs.com/Solutions/Regions/Canada/. Acquired: June 2011. Last Update Check: January 21, 2014.

IHS Inc. 2013. IHS First Nations (digital file). Calgary, AB. Received: via DVD, visit http://www.ihs.comfor more info. Acquired: October 2013. Last Update Check: April 21, 2014.

IHS Inc. 2013. IHS Miscellaneous Boundaries (digital file). Calgary, AB. Received: via DVD, visit http://www.ihs.comfor more info. Acquired: July 2013. Last Update Check: April 21, 2014.

IHS Inc. 2014. IHS Road Segments (digital file). Calgary, AB. Received: via DVD, visit http://www.ihs.com for more info. Acquired: June 23, 2014. Update Interval: Monthly.

NRCan. 2012. CanVec -Transportation - 1020009 Railway (digital file). Sherbrooke, QC. Available: http://geogratis.cgdi.gc.ca/geogratis/en/download/topographic.html. Acquired: June 2012. Last Update Check: November 2012.

TERA Environmental Consultants. 2008. Hillshade. Derived from Natural Resources Canada, Earth Sciences Sector, Centre for Topographic Information. 2000-2008. Canadian Digital Elevation Data 250k (digital files). Sherbrooke, QC. Available: http://www.geobase.ca/geobase/en/data/cded/index.html. Acquired: 2008. Last Update Check: December 2010.

# APPENDIX A

# SUPPLEMENTAL SOILS REPORT

# Mentiga Pedology Consultants Ltd.

#3, 9816 - 47 Avenue
Edmonton, Alberta T6E 5P3

Phone: (780) 414-0379
Fax: (780) 438-9236
E-mail: mentiga@telusplanet.net


**June 18, 2014** **Project No. : 11031.3**

**Jessica Swanson**
**TERA, a CH2M Hill Company**
**Suite 1100, 815 – 8th Ave., S.W.**
**Calgary, Alberta**
**T2P 3P2**

**Re: Additional Soils Information Along Various Re-routes and Along Segments of the Grand Rapids Pipeline Project for Grand Rapids Pipeline GP Ltd.**

The Grand Rapids Pipeline Project was re-routed in the vicinity of Beaverhill Creek from KP 406.3-408.5 and near the proposed Grand Rapids Heartland Terminal from KP 413-420. Additional soil investigations and sampling were conducted in the areas of three-lift soil handling along the proposed route to determine if the three-lift is warranted (in the vicinity of KP 362, KP 370.5, KP 430.3 and KP 444.5). Topsoils depth checks were carried out in some of the areas where the previously existing soils information is a considerable distance (120m) from the proposed route (from KP 437.6-439.5 and from KP 442-444.2).

Soil investigations were carried out with a hand auger to a depth of 1.2 m along the re-route in the vicinity of Beaverhill Creek on May 14, 2013 (KP 406.3-408.5). The soils were inspected at seven sties (Sites 829-835, inclusively). The location of the inspection sites are shown on the accompanying Environmental Alignment Sheet (Sheet 63) and inspection data is summarized in the attached Site Inspection List. No soil samples were collected for laboratory analyses along the re-route. Peace Hills, gleyed Peace Hills, Ponoka, Ukalta and Alluvium soils were identified along the re-route. All of these soils were previously described in detail in the main soils report (Soil Survey and Reclamation Suitability Evaluation for the Grand Rapids Pipeline Project prepared for TERA Environmental Consultants on behalf of Grand Rapids Pipeline GP Ltd. in March, 2013). The distribution and extent of the various soils as well as present land use is shown on the accompanying Environmental Alignment Sheet (Sheet 63).

Soils information for the re-route near the proposed Grand Rapids Heartland Terminal from KP 413-420 was obtained from a soils report for the TransCanada Fort Saskatchewan Extension Pipeline Project prepared in 2001 by AXYS Environmental Consulting Ltd. A portion of the Fort Saskatchewan Extension Pipeline Project parallels the proposed re-route between KP 413-420. Soil inspections for the Project were carried out with a drill truck to a depth of 1.8 m. The soils were inspected at 15 locations along the seven km re-route (Sites 812-826, inclusively). The location of the inspection sites are shown

on the accompanying Environmental Alignment Sheets (Sheets 65-67, inclusively) and inspection data is summarized in the attached Site Inspection Ltd. No soil samples were collected for laboratory analyses along the re-route. Malmo, Peace Hills, Angus Ridge and shallow Malmo soils on mainly cultivated land were identified along the re-route. All of these soils were previously described in detail in the main soils report prepared for Grand Rapids Pipeline GP Ltd. in March, 2013. The distribution and extent of the various soils as well as present land use is shown on the accompanying Environmental Alignment Sheets (Sheets 65-67, inclusively).

The soils were investigated at two locations with a hand auger to the 1.2 m depth near the end of the proposed route in the vicinity of KP 460 on June 6, 2014 (Sites 844 and 845). The location of the inspection sites are shown on the accompanying Environmental Alignment Sheet (Sheet 82) and inspection data is summarized in the attached Site Inspection List. No soil samples were collected for laboratory analyses. Angus Ridge soils with 25-30 cm of topsoil on gently undulating cultivated terrain occurs in this area.

The soils report for the Grand Rapids Pipeline Project recommended the three-lift soil handling procedure in four separate areas due to saline conditions in the lower subsoil. The four areas of three-lift soil handling recommendations were based on data collected from previous soil surveys for pipeline projects a number of years ago and a considerable distance (60-120 m) from the proposed route. New soil investigations and samples were collected over the proposed ditch-line of the route to determine if the three-lift soil handling procedure is still warranted in the previously recommended three-lift areas. Soil investigations and samples of the upper and lower subsoils were collected at the four, three-lift locations with a hand auger to the 1.2 m depth. The four three-lift locations occur in the vicinity of KP 362, KP 370.5, KP 430.3 and KP 444.5. At each three-lift location the upper and lower subsoil was sampled at two locations in the map unit for laboratory analyses (Sites 836 and 837 in the vicinity of KP 362; Sites 827 and 828 in the vicinity of KP 370.5; Sites 840 and 841 in the vicinity of KP 430.3 and; Sites 842 and 843 in the vicinity of KP 444.5). Soil sampling for laboratory analyses was conducted on May 12$^{th}$, May 22$^{nd}$ and June 6$^{th}$, 2014. Laboratory analyses included; soil reaction (pH), electrical conductivity (EC), saturation percentage (Sat%) and sodium adsorption ratio (SAR). Laboratory analyses were carried out by IEH Services Canada in Brooks, Alberta. Laboratory results are presented in Table 3B. Based on morphological characteristics of the soils and laboratory analyses the three-lift soil handling procedure is not warranted in three of the four areas investigated. The upper and lower subsoils have similar characteristics and salinity in the vicinity of KP 362, KP 370.5 and KP 430.3 and the three-lift soil handing procedure is no longer warranted in these areas. The three-lift soil handling procedure is still warranted in the vicinity of KP 444.5 but the distance has been reduced from 420 to 280 m since no salts were detected in the lower subsoil at Site 843. Only Site 842 has a much higher level of salts in the lower

subsoil than upper subsoil. New soil mapping reflecting the new soils information for the four previously recommended three-lift soil handling areas is provided on the accompanying Environmental Alignment Sheets (Sheets 48, 51, 71 and 76).

Topsoil depth checks were carried out with a hand auger on June 11, 2014 between KP 437.6-439.5 and from KP442-444.2. The new mapping to reflect the slight changes in topsoil depths is shown on the accompanying Environmental Alignment Sheets (Sheets 74, 75 and 76).

Yours truly,

A. Twardy, M.Sc., P.Ag.
Senior Soil Scientist

AT/lk

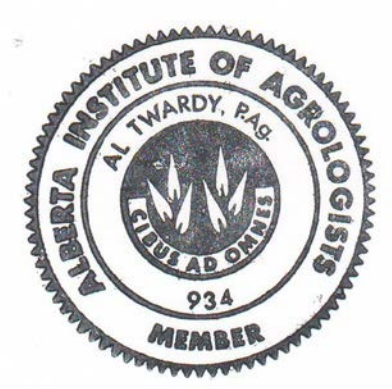

Table 3B. Soil Characteristics of Sampled Soils.

| Site | Soil Unit | Horizon | Depth (cm) | pH ($H_2O$) | EC (dS/m) | Sat (%) | SAR | Organic Carbon (%) | Field Texture | Reclamation Suitability Rating and Limitations* |
|---|---|---|---|---|---|---|---|---|---|---|
| 840 | Malmo | Bmk | 30-76 | 7.4 | 0.5 | 82 | 0.3 | - | C | P(4,6) |
| | (MMO) | Ck | 76-120 | 7.7 | 3.1 | 87 | 0.2 | - | C | P(4,6) |
| 841 | Malmo | Bmk | 36-80 | 7.6 | 0.4 | 82 | 0.4 | - | C | P(4,6) |
| | (MMO) | Ck | 80-120 | 7.9 | 0.4 | 86 | 0.5 | - | C | P(4,6) |
| 843 | Malmo | Bmk | 33-84 | 7.5 | 0.6 | 79 | 0.6 | - | C | P(6) |
| | (MMO) | Ck | 84-120 | 7.8 | 0.6 | 89 | 1.5 | - | C | P(4,6) |
| 842 | Malmo with saline lower subsoil (scMMO) | Bmk | 27-72 | 7.6 | 3.8 | 83 | 6.1 | - | C | P(4,6) |
| | | Csk | 72-120 | 7.8 | 8.5 | 100 | 9.6 | - | C | P(2,3,4,6) |
| 827 | gleyed Rolly View | Bgj | 20-75 | 9.0 | 0.9 | 84 | 12.1 | - | L-CL | U(3) |
| | (glRLV) | Ckgj | 75-120 | 9.2 | 1.2 | 131 | 22.6 | - | L-CL | U(1,3,4) |
| 828 | gleyed Rolly View | Bgj | 20-52 | 7.6 | 0.6 | 56 | 3.0 | - | L-CL | F(1,6) |
| | (glRLV) | Ckgj | 52-120 | 8.6 | 0.8 | 68 | 10.5 | - | L-CL | P(1,3) |
| 836 | Uncas | Bt | 22-78 | 6.3 | 0.7 | 43 | 0.4 | - | L-CL | F(1,6) |
| | (UCS) | Ck | 78-120 | 7.8 | 0.7 | 45 | 0.6 | - | L-CL | F(1,6) |
| 837 | gleyed Uncas | Btgj | 22-70 | 7.9 | 0.4 | 46 | 0.2 | - | L-CL | F(1,6) |
| | (glUCS) | Ckgj | 70-120 | 7.8 | 1.1 | 46 | 0.6 | - | L-CL | F(1,6) |

* Limitations
1 – pH
2 – EC
3 – SAR
4 – Sat%
5 – Stoniness
6 – Texture
7 – Consistence
8 – Organic Carbon

Ratings (After ASAC, 1987)

G – Good
F – Fair
P – Poor
U – Unsuitable

## SITE INSPECTION LIST

| Site | Soil Unit | Classification | Parent Material | Depth of Topsoil (cm) | Dominant Texture Topsoil/Subsoil | Topographic Class | Drainage Class | Surface Stoniness Class | Present Land Use | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 812 | MMO | O.BLC | GL | 32 | SiCL/CL-C | 2-3 | MW | S0-1 | C | |
| 813 | MMO | O.BLC | GL | 54 | SiCL/C | 2 | MW | S0-1 | C | |
| 814 | MMO | O.BLC | GL | 60 | SiCL/C-SiC | 2 | MW | S0 | C | |
| 815 | PHS | O.BLC | GF | 26 | SL-L/SL | 2 | W | S0 | C | |
| 816 | AGS | O.BLC | T | 35 | L/L-CL | 2 | W-MW | S1-2 | C | |
| 817 | AGS | E.BLC | T | 38 | L/L-CL | 2-3 | W | S1 | C | |
| 818 | AGS | E.BLC | T | 26 | L/CL | 2-3 | MW | S1 | C | |
| 819 | AGS | O.BLC | T | 23 | L/L-CL | 2-3 | MW | S1-2 | C | |
| 820 | AGS | O.BLC | T | 37 | L/L-CL | 2-3 | MW | S1 | C | |
| 821 | AGS | O.BLC | T | 30 | L/L-CL | 2-3 | W-MW | S1-2 | C | stonier at depth |
| 822 | AGS | E.BLC | T | 15 | L/CL | 4 | W-MW | S1-2 | C | |
| 823 | ASS | O.BLC | T | 45 | L/L-CL | 2-3 | W-MW | S1-2 | C | |
| 824 | AGS | O.BLC | T | 34 | L/CL | 2-3 | MW | S1-2 | C | |
| 825 | AGS | O.BLC | T | 25 | L/CL | 2-3 | W-MW | S1 | C | |
| 826 | shMMO | O.BLC | GL/T | 31 | SiCL/(C/CL) | 2 | MW | S0-1 | C | till at 78 cm |
| 827 | glRLV | GLD.GC | T | 20 | L/L-CL | 2-3 | I | S1-2 | C | not saline but strongly sodic |
| 828 | glRLV | GLD.GC | T | 20 | L/L-CL | 2-3 | I | S1-2 | C | not saline but moderately sodic |
| 829 | PHS | O.BLC | GF | 47 | L-SL/SL | 3-4 | W | S0 | P | |
| 830 | PHS | O.BLC | GF | 36 | SL-L/(SL/SL-LS) | 3-4 | W | S0 | P | |
| 831 | PHS | O.BLC | GF | 60 | SL/SL | 4-5 | W | S0 | P | |
| 832 | POK | O.BLC | GL | 42 | L/L | 2-3 | W | S0-1 | C | |
| 833 | AV | R.HG | F | 25 | L-SiCL/L | 2-3 | MW-I | S0 | T | |
| 834 | UKT | O.BLC | GF/GL | 27 | SL/(LS/L-SiCL) | 2-3 | W | S0 | P | glaciolacustrine at 84 cm |
| 835 | glPHS | GL.BLC | GF | 36 | fSL/(fSL/LfS) | 2 | I | S0 | P | |
| 836 | UCS | D.GL | T | 22 | L/L-CL | 3 | MW | S2 | C | not saline |
| 837 | glUCS | GLD.GL | T | 22 | L/L-CL | 3 | I | S2 | C | not saline |
| 838 | ONW | O.HG | T | 15 | L/CL | 1-2 | P | S1-2 | P | no peat on surface |
| 839 | RLV | O.DGC | T | 33 | L/CL | 3 | MW-I | S1-2 | C | |
| 840 | MMO | O.BLC | GL | 30 | SiCL/C | 2-3 | MW | S0 | C | no salts |
| 841 | MMO | O.BLC | GL | 36 | SiCL/C | 2-3 | MW | S0 | C | no salts |
| 842 | scMMO | scO.BLC | GL | 27 | SiCL/C | 2-3 | MW | S0-1 | C | salts at 72 cm |
| 843 | MMO | O.BLC | GL | 33 | SiCL/C | 2-3 | MW | S0-1 | C | no salts |
| 844 | AGS | O.BLC | T | 30 | L/CL | 2 | MW-I | S1-2 | C | 10-15% admixed |
| 845 | AGS | O.BLC | T | 25 | L/CL | 2 | MW-I | S1-2 | C | 10-15% admixed |
| | | | | | **TOPSOIL DEPTHS ONLY** | | | | | |
| 846 | MMO | O.BLC | GL | 23 | SiCL/C | 2-3 | MW | S0-1 | C | |
| 847 | MMO | O.BLC | GL | 18 | SiCL/C | 2-3 | MW | S0-1 | C | |
| 848 | MMO | O.BLC | GL | 33 | SiCL/ | 2-3 | MW | S0 | C | |
| 849 | MMO | O.BLC | GL | 26 | SiCL/C | 2-3 | MW | S0-1 | C | |
| 850 | MMO | O.BLC | GL | 28 | SiCL/C | 2-3 | MW | S0-1 | C | |
| 851 | NVR | GL.BLC | GL | 37 | SiCL/ | 2 | I | S0-1 | C | |
| 852 | MMO | O.BLC | GL | 26 | SiCL/C | 2-3 | MW | S0-1 | H | |
| 853 | MMO | O.BLC | GL | 16 | SiCL/C | 2-3 | MW | S0-1 | C | |
| 854 | MMO | O.BLC | GL | 25 | SiCL/C | 2-3 | MW | S0-1 | C | |
| 855 | AGS | O.BLC | T | 39 | L/CL | 2-3 | MW | S1-2 | C | |
| 856 | AGS | O.BLC | T | 36 | L/L-CL | 2-3 | MW | S1-2 | C | |
| 857 | AGS | O.BLC | T | 42 | L/ | 3 | W | S1-2 | C | |
| 858 | AGS | O.BLC | T | 24 | L/C | 2 | W-MW | S1-2 | C | |
| 859 | MMO | O.BLC | GL | 27 | SiCL/ | 2-3 | MW | S0-1 | C | could have till at depth |
| 860 | MMO | O.BLC | GL | 31 | SiCL/ | 2-3 | MW | S1 | C | could have till at depth |
| 861 | MMO | O.BLC | GL | 22 | SiCL/C | 2-3 | MW | S0-1 | C | could have till at depth |
| 862 | MMO | O.BLC | GL | 28 | SiCL/ | 2-3 | MW | S1 | C | could have till at depth |

**IEH SERVICES CANADA**
**Box 818 Brooks, Alberta, Canada T1R 1B7**

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

**TEST REPORT# 140602-5107**
June 2, 2014
**Project: Grand Rapids Pipeline for Trans Canada**
**P.O.#: 11031**
DATE RECEIVED: May 26, 2014

| | | | | | Saturated Paste Basis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | soluble ions | | | |
| LAB # | Site Description | | Horizon | Depth cm | pH | E.C. mS/cm | SAT % | Na | Mg mEq/L | Ca | SAR |
| 5107 | SITE 827 | 22 | Bgj | 20-75 | 9.0 | 0.90 | 84 | 9.4 | 0.7 | 0.5 | 12.1 |
| 5108 | | 23 | Ckgj | 75-120 | 9.2 | 1.17 | 131 | 12.4 | 0.4 | 0.2 | 22.6 |
| 5109 | SITE 828 | 24 | Bgj | 20-52 | 7.6 | 0.57 | 56 | 3.7 | 1.6 | 1.4 | 3.0 |
| 5110 | | 25 | Ckgj | 52-120 | 8.6 | 0.75 | 68 | 7.8 | 0.5 | 0.6 | 10.5 |
| 5111 | SITE 836 | 26 | Bt | 22-78 | 6.3 | 0.66 | 43 | 0.6 | 1.9 | 3.9 | 0.4 |
| 5112 | | 27 | Ck | 78-120 | 7.8 | 0.70 | 45 | 1.1 | 2.0 | 4.5 | 0.6 |
| 5113 | SITE 837 | 28 | Btgj | 22-70 | 7.9 | 0.40 | 46 | 0.3 | 1.6 | 2.2 | 0.2 |
| 5114 | | 29 | Ckgj | 70-120 | 7.8 | 1.10 | 46 | 1.5 | 4.9 | 6.2 | 0.6 |

| TEST | METHOD REFERENCE | DATE OF ANALYSIS | TECHNICIAN RESPONSIBLE |
|---|---|---|---|
| pH | SOP 4160 CSSS (Carter) 1993, Method 16.2 | 5/29 | BK |
| E.C. | SOP 4150 CSSS (Carter) 1993, Method 18.3.1 | 5/30 | JM |
| SAT % | SOP 4100 CSSS (Carter) 1993, Method 18.2.2 | 6/02 | RS |
| Soluble Na, Ca, Mg | SOP 4200 CSSS (Carter) 1993, Method 18.3.2 | 5/30 | JM |
| SAR | SOP 4290 CSSS (Carter) 1993, Method 18.4.3 | 6/02 | RS |

Report Authorized By: Manager/Supervisor - Lab Services

Unless otherwise stated, all samples were received in good condition.

Test results are only representative of the samples submitted to the laboratory.

This report should only be reproduced in full.

Liability is limited to the cost of analysis.

**IEH SERVICES CANADA**
**Box 818 Brooks, Alberta, Canada T1R 1B7**

**MENTIGA PEDOLOGY CONSULTANTS LTD.**
Al Twardy
#3, 9816 - 47 Avenue
Edmonton, AB
T6E 5P3
**TEST REPORT# 140612-5124**
June 12, 2014
**Project: Grand Rapids Pipeline**
**P.O.#: 11031**
DATE RECEIVED: June 9, 2014

| | | | | | Saturated Paste Basis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | soluble ions | | | |
| LAB # | Site Description | | Horizon | Depth cm | pH | E.C. mS/cm | SAT % | Na | Mg mEq/L | Ca | SAR |
| 5124 | SITE 840 | 30 | Bm | 30-76 | 7.4 | 0.46 | 82 | 0.5 | 2.3 | 2.2 | 0.3 |
| 5125 | | 31 | Ck | 76-120 | 7.7 | 3.12 | 87 | 1.1 | 19.6 | 21.4 | 0.2 |
| 5126 | SITE 841 | 32 | Bm | 36-80 | 7.6 | 0.44 | 82 | 0.5 | 1.4 | 2.6 | 0.4 |
| 5127 | | 33 | Ck | 80-120 | 7.9 | 0.43 | 86 | 0.7 | 1.3 | 2.6 | 0.5 |
| 5128 | SITE 842 | 34 | Bm | 27-72 | 7.6 | 3.84 | 83 | 22.3 | 16.3 | 10.0 | 6.1 |
| 5129 | | 35 | Csk | 72-120 | 7.8 | 8.51 | 100 | 56.6 | 48.5 | 21.2 | 9.6 |
| 5130 | SITE 843 | 36 | Bm | 33-84 | 7.5 | 0.60 | 79 | 0.9 | 2.3 | 2.3 | 0.6 |
| 5131 | | 37 | Ck | 84-120 | 7.8 | 0.64 | 89 | 2.1 | 2.2 | 1.9 | 1.5 |

| TEST | METHOD REFERENCE | ANALYSIS | TECHNICIAN RESPONSIBLE |
|---|---|---|---|
| pH | SOP 4160 CSSS (Carter) 1993, Method 16.2 | 6/11 | MS |
| E.C. | SOP 4150 CSSS (Carter) 1993, Method 18.3.1 | 6/11 | BK |
| SAT % | SOP 4100 CSSS (Carter) 1993, Method 18.2.2 | 6/12 | RS |
| Soluble Na, Ca, Mg | SOP 4200 CSSS (Carter) 1993, Method 18.3.2 | 6/12 | JM |
| SAR | SOP 4290 CSSS (Carter) 1993, Method 18.4.3 | 6/12 | RS |

Report Authorized By: Manager/Supervisor - Lab Services

Unless otherwise stated, all samples were received in good condition.
Test results are only representative of the samples submitted to the laboratory.
This report should only be reproduced in full.
Liability is limited to the cost of analysis.