

December 16, 2014

Attention: Wade Vienneau
Executive Director – Facilities
Alberta Utilities Commission
Fifth Avenue Place
4th Floor, 425 - 1 Street SW
Calgary, AB T2P 3L8

Dear Mr. Vienneau:

Re: Application to the Alberta Utilities Commission (AUC) for approval of the Thickwood Hills 240 kV Transmission Development Needs Identification Document

Please find enclosed the Alberta Electric System Operator (AESO) application for approval of the Thickwood Hills 240 kV Transmission Development Needs Identification Document (NID). The AESO respectfully requests that the Thickwood Hills 240 kV Transmission Development NID be considered for approval and that it not be combined with any facilities proposals to prepare to meet the needs identified.

Please do not hesitate to contact the below if you have questions or concerns regarding the foregoing:

Melissa Mitchell
Senior Regulatory Coordinator
need.applications@aes0.ca
403-539-2948

Sincerely,



Doyle Sullivan, P. Eng.
Director, Regulatory



Alberta Utilities Commission

**In the Matter of the Need for the Thickwood Hills 240 kV
Transmission Development**

**And in the matter of the *Electric Utilities Act*, S.A. 2003, c. E-5.1,
the *Alberta Utilities Commission Act*, S.A. 2007, c. A-37.2, the
Hydro and Electric Energy Act, R.S.A. 2000, c. H-16, the
Transmission Regulation, AR 86/2007 and Alberta Utilities
Commission Rule 007, all as amended**

**Application of the Alberta Electric System Operator for
Approval of the Needs Identification Document for the
Thickwood Hills 240 kV Transmission Development**

PART A - APPLICATION

1 Introduction

1.1 Application – Pursuant to section 34 of the *Electric Utilities Act* (Act), and in accordance with further provisions set out in legislation,¹ the Alberta Electric System Operator (AESO) applies to the Alberta Utilities Commission (Commission) for approval of the *Thickwood Hills 240 kV Transmission Development Needs Identification Document* (Application), as more specifically described herein.

1.2 Application Overview – This Application describes the 240 kV transmission system developments (240 kV Transmission Developments) needed to establish a northern termination point for two single circuit 500 kV AC transmission facilities (500 kV Lines) that will run from the Edmonton region to the Fort McMurray area. The 500 kV Lines, together with the associated facilities required to interconnect the 500 kV facilities (collectively, CTI Facilities), have been designated as “critical transmission infrastructure” (CTI) by the Government of Alberta.² The 240 kV Transmission Developments are required to integrate the CTI Facilities into the Alberta interconnected electric system (AIES).

The first of the 500 kV Lines will run from the Wabamun area west of Edmonton to the Thickwood Hills area west of Fort McMurray³ (FMM West Line), and is expected to enter service on or about June 1, 2019. The 240 kV Transmission Developments required to enable integration of the FMM West Line include: (i) the 240 kV portion of the 500/240 kV Thickwood Hills 951S substation (Thickwood Hills substation), including a +200/-100

¹ The *Alberta Utilities Commission Act*, S.A. 2007, c. A-37.2, the *Hydro and Electric Energy Act*, R.S.A. 2000, c. H-16, the *Transmission Regulation*, AR 86/2007 and Alberta Utilities Commission Rule 007, all as amended.

² Section 4 of the Schedule to the Act.

³ As described in sections 4(a) and 4(b) of the Schedule to the Act.

Thickwood Hills 240 kV Transmission Development – Needs Identification Document

MVAr Static Var System (SVS) and capacitor banks with a capacity totaling 100 MVAr, and (ii) new 240 kV transmission circuits connecting the Thickwood Hills substation to the existing transmission system. These facilities are required to be in-service prior to the CTI Facilities in approximately Q3 2018 to facilitate commissioning, testing and integration of the FMM West Line.⁴

The second of the 500 kV Lines will run from the Heartland 12S substation northeast of Edmonton to the Thickwood Hills substation⁵ (FMM East Line) and is expected to enter service sometime after 2020.⁶ The 240 kV Transmission Developments required for the FMM East Line consist of a second bank of capacitors totaling 100 MVAr, to enter service commensurate with the in-service date of the FMM East Line.

The 240 kV Transmission Developments are described in greater detail in section 4.1 of this Application and comprise the transmission system developments required to establish a northern termination point for the CTI Facilities. The AESO, therefore, submits this Application to the Commission for approval.⁷

1.3 AESO Directions – In the process of identifying the need and preparing this Application, the AESO issued various directions to ATCO Electric Ltd., being the legal owner of transmission facilities (TFO) in the applicable service area, including, pursuant to section 39 of the Act and section 14 of the *Transmission Regulation*, a direction to assist the AESO in preparing this Application.⁸

⁴ Refer to Section 3.2 for further detail.

⁵ As described in section 4(c) of the Schedule to the Act.

⁶ As stated at page 81 of the AESO's *2013 Long-term Transmission Plan*.

⁷ For information, some of the legislative provisions relating to the AESO's planning duties and duty to provide system access service are referenced in notes i and ii of Part C of this Application.

⁸ The directions are described in more detail in the following sections of this Application and in Part C, note vi.

2 Need for the 240 kV Transmission Developments

The CTI Facilities consist of the 500 kV Lines and the 500 kV portion of the Thickwood Hills substation, including the associated facilities required to interconnect the foregoing facilities, being the 500/240 kV transformation facilities in the Thickwood Hills substation.

The 240 kV Transmission Developments are needed to establish a northern termination point for the CTI Facilities.

3 Process for Approval of the 240 kV Transmission Developments

The AESO is responsible for identifying when new transmission facilities are needed and, subject to certain exceptions, for submitting a needs identification document (NID) to the Commission for approval of the identified need.⁹ At the time of preparing, after submitting, or following approval of a NID, the AESO may also direct the TFO for the applicable service area (i.e., the incumbent TFO) to submit, for Commission approval under the *Hydro and Electric Energy Act*, an application for the construction and operation of transmission facilities to meet the identified need.¹⁰

An exception to the foregoing, standard approval process exists for transmission facilities that have been designated as CTI.¹¹ CTI consists of facilities that are specifically described in the Schedule to the Act¹² and for which the AESO is not required to submit a NID for approval by the Commission, as the need for the CTI has already been approved by the Government of Alberta. Further, for certain CTI projects, including the CTI Facilities, the AESO must develop a competitive process to determine

⁹ Section 34 of the Act.

¹⁰ Section 35 of the Act.

¹¹ Section 1(1)(f.1) of the Act.

¹² *Ibid.*

Thickwood Hills 240 kV Transmission Development – Needs Identification Document

who is eligible to apply for the construction and operation of CTI (Competitive Process).¹³

A determination as to who is eligible to apply for the construction and operation of the FMM West Line, as well as the 500 kV portion of the Thickwood Hills substation is currently proceeding by way of a Competitive Process that has been approved by the Commission.¹⁴

In exercising its responsibility to arrange for the expansion and enhancement of the transmission system¹⁵ and to direct the safe, reliable and economic operation of the AES, ¹⁶ the AESO has determined that the 240 kV Transmission Developments should proceed by way of a NID to be approved by the Commission rather than as part of the CTI Facilities. The AESO has proceeded in this manner for the following reasons:

- a) establishing a northern termination point for the CTI Facilities will require modification and alteration of the existing 240 kV infrastructure owned and operated by the incumbent TFO in the Thickwood Hills area. These modifications and alterations can most efficiently be undertaken by the incumbent TFO. In particular, the existing 9L07 line will need to be split and terminated with an in-out configuration at the Thickwood Hills substation via new 240 kV transmission circuits, and exiting 9L01 line will need to be split to accommodate connection of two additional circuits, all of which must be completed prior to interconnection with the FMM West Line;

¹³ Section 24.2(2) of the *Transmission Regulation*.

¹⁴ Commission Decision 2013-044: *Alberta Electric System Operator, Competitive Process Pursuant to Section 24.2(2) of the Transmission Regulation Part B: Final Determination*, issued February 14, 2013.

¹⁵ Section 17(j) of the Act.

¹⁶ Sections 16, 17(h) and 33 of the Act.

Thickwood Hills 240 kV Transmission Development – Needs Identification Document

- b) direct assignment of the 240 kV Transmission Developments to the incumbent TFO will ensure that ownership and operation of the significant existing 240 kV system in the Fort McMurray area, as well as any future 240 kV facilities (including transmission lines, associated protections and controls) will remain with the incumbent TFO, ensuring the safe and reliable development, operation and maintenance of 240 kV infrastructure in the area;
- c) for purposes of the Competitive Process for the FMM West Line, the point between the 240 kV side of the 500/240 kV transformers and the 240 kV buswork in the Thickwood Hills substation is the efficient and appropriate demarcation point for the infrastructure that will be owned by the winner of the Competitive Process and the existing system owned by the incumbent TFO. Demarcation at this point has limited the scope of the Competitive Process for the FMM West Line to 500 kV infrastructure; and
- d) because the AESO originally assessed the 240 kV Transmission Developments as being required:
 - (i) to provide transfer-in capability to the Fort McMurray area in advance of completion of the CTI Facilities.¹⁷ As the AESO refined its need assessment studies in preparation for this Application, updated study assumptions revealed transfer-in capability in the Fort McMurray area would remain adequate, such that the 240 kV Transmission Developments would only be required prior to the in-service date for the FMM West Line for the purposes of testing and commissioning the FMM West Line; and

¹⁷ In particular, it was determined that the 240 kV Transmission Developments could, on their own, replace the need to proceed with early energization of a portion of the FMM West Line at 240 kV, as contemplated by section 41.4(3) of the Act. See also the AESO's *Long-term Transmission Plan* (filed June 2012) at sections 4.5.2.2 and 4.5.2.3, and the *AESO 2013 Long-term Transmission Plan* at page 134.

- (ii) to facilitate requests for system access service in or around the area of the Thickwood Hills substation that may have arisen prior to the in-service date of the FMM West Line.

The two additional needs described in paragraph d) have either changed (in the case of paragraph d)(i)) or not materialized (in the case of paragraph d)(ii)) since planning and development of this Application was initially undertaken by the AESO. However, they were factors considered by the AESO in its assessment that the 240 kV Transmission Developments should be addressed through this Application instead of being included as part of the CTI Facilities. Further, the efficiency and reliability reasons described above in paragraphs a) through c) remain. Accordingly, the AESO respectfully requests that the 240 kV Transmission Developments be approved as applied-for. Assuming approval, the AESO intends to direct the incumbent TFO to apply to the Commission for approval to construct and operate the 240 kV Transmission Developments.

4 240 kV Transmission Developments

This section describes the 240 kV Transmission Developments required to meet the need identified in Section 2 above. Figure 1 below illustrates the existing transmission system. Figure 2 illustrates the transmission system following completion of the CTI Facilities and the 240 kV Transmission Developments.

4.1 240 kV Transmission Developments – The 240 kV Transmission Developments are described more fully as follows:¹⁸

¹⁸ Equipment ratings are approximated to the accuracy level required by the AESO for transmission planning purposes. Actual ratings of constructed facilities may vary. The AESO's functional specification will identify the components of the preferred development in greater detail, ensuring that the TFO applies for approval of facilities that are functionally consistent with the approved need for transmission development. Also, line numbering and substation names provided here are for ease of reference and are subject to change as engineering and design progresses.

Stage 1

- a) Add a new 240 kV switching substation with one +200/-100 MVar SVS and capacitor banks totaling approximately 100 MVar. The substation will become functionally integrated with the CTI Facilities to form the Thickwood Hills substation.
- b) Split the existing 9L07 line and terminate with an in-out configuration at the new switching substation via new 240 kV transmission circuits, as required. New transmission circuits should have a rating no less than the rating of existing 9L07 line. Retain numbering of segment extending to existing Dawes 2011S substation and re-number segment extending to existing Dover 888S as 9L112.
- c) Split the existing 9L01 line and terminate with an in-out configuration at the new switching substation via new 240 kV transmission circuits, as required. New transmission circuits should have a rating no less than the rating of existing 9L01 line. Retain numbering of segment extending to existing Ruth Lake 848S substation and re-number segment extending to existing Dover 888S as 9L30.
- d) Modify, alter, add or remove equipment, including switchgear, and any operational, protections, control and telecommunication devices required to undertake the work as planned in the 240 kV Transmission Developments, and ensure proper integration with the transmission system.

Stage 2

- a) Add a second bank of capacitors at the 240 kV Thickwood switching substation, totaling approximately 100 MVar, commensurate with the planned in-service date of the FMM East Line.
- b) Modify, alter, add or remove equipment, including switchgear, and any operational, protections, control and telecommunication devices required to

Thickwood Hills 240 kV Transmission Development – Needs Identification Document

undertake the work as planned in the 240 kV Transmission Developments, and ensure proper integration with the transmission system.

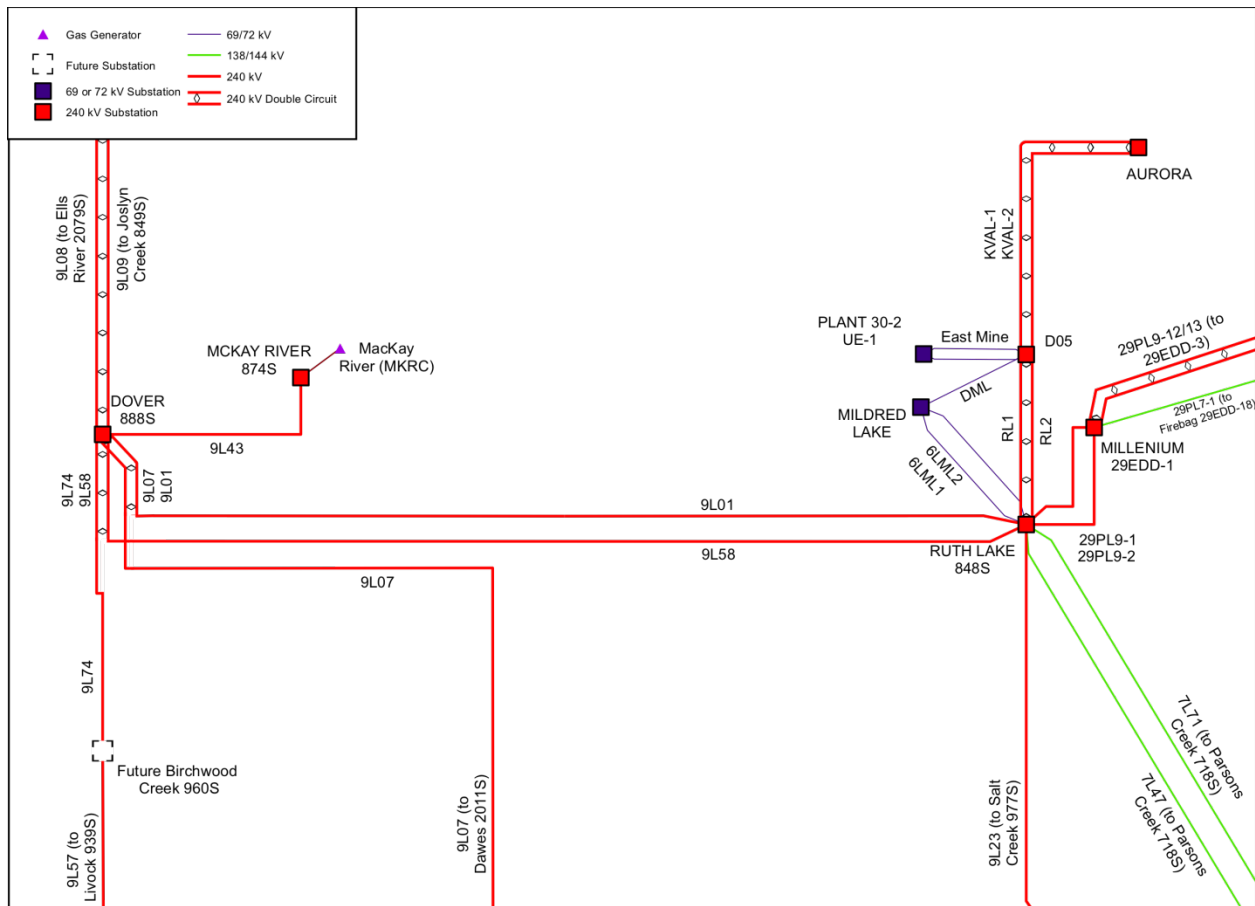


Figure 1: Existing Transmission System

Stage 2

These developments are needed to integrate the FMM East Line and, accordingly, the timing for these developments will be coordinated with the construction schedule for the FMM East Line. An estimate of the scheduled timing for Stage 2 is not currently available; however, as the entity conducting the Competitive Process that will be used to award the construction and operation of the FMM East Line, the AESO will monitor the in-service requirements for Stage 2. Once the in-service date for the FMM East Line is established, the AESO will issue the appropriate directions to the incumbent TFO, including specifying the required in-service date for Stage 2.

4.3 240 kV Transmission Developments Costs – The AESO has estimated the capital cost of Stage 1 of the 240 kV Transmission Developments to be in the order of \$200 million (\$2018). The AESO has estimated the capital cost of Stage 2 of the 240 kV Transmission Developments to be in the order of \$6 million (\$2021). While the AESO has based its estimates on estimates provided by the TFO, the accuracy level is estimated to be approximately +/- 50%. The AESO has therefore requested estimates from the TFO that meet the requirements of Commission Rule 007, section 6.1, NID11, and will submit these estimates separately when they become available. In accordance with the ISO tariff, the AESO has determined that these estimated costs are all system-related costs.

4.4 Participant Involvement Program – The AESO conducted a participant involvement program (PIP), in accordance with NID14 and Appendix A of Commission Rule 007. The AESO utilized various methods to notify stakeholders of the need for transmission development in the areas where transmission facilities could be installed to implement the 240 kV Transmission Developments. To date, the AESO has not received any indication of concern regarding the 240 kV Transmission Developments.

4.5 Information in Regards to Rule 007, Section 6.1 - NID13 – In preparing this Application, the AESO directed the incumbent TFO to conduct an assessment of the major aspects relating to the 240 kV Transmission Developments, as contemplated by

Thickwood Hills 240 kV Transmission Development – Needs Identification Document

Commission Rule 007, Section 6.1, NID13. Given that specific routing and siting matters are not addressed in this Application, the incumbent TFO's assessment does not provide an analysis of specific routes or sites, but discusses the potential impacts of future routing or siting that may occur within a broadly defined geographic area. The assessment considers the 240 kV Transmission Developments, but does not consider in detail any aspects related to future 500 kV developments in the Fort McMurray area.

In its assessment of the 240 kV Transmission Developments and the area where the 240 kV Transmission Developments may be located, the incumbent TFO determined that there is potential for the 240 kV Transmission Developments to have adverse impacts, but none of the potential impacts identified would preclude the 240 kV Transmission Developments as described in this Application. Because consideration of specific routes or sites is beyond the scope of the incumbent TFO's assessment, the AESO has not indicated a preference for siting or routing of the 240 kV Transmission Developments to the incumbent TFO. The AESO understands that impacts associated with specific routes and substation locations will be considered in the development of the incumbent TFO's facility proposal(s).

The incumbent TFO's assessment confirmed that the 240 kV Transmission Developments are to be located within the Lower Athabasca Regional Planning (LARP), and are aligned with the seven Regional Outcomes described in the LARP. For example, the 240 kV Transmission Developments will not be located in a new conservation area or provincial recreation area, nor will they impact air quality in the region. Each of the Regional Outcomes described in the LARP will be further considered by the incumbent TFO in its facility proposal(s).

4.6 Transmission Interdependencies and Risks – The integration of the CTI Facilities depends on the 240 kV Transmission Developments. Accordingly, delays to the in-service dates of the 240 kV Transmission Developments could impact the integration of the CTI Facilities. Significant delays to the in-service date for the FMM West Line could subsequently impact the in-service date of the FMM East Line. There are no other transmission developments that have been previously approved, or that

Thickwood Hills 240 kV Transmission Development – Needs Identification Document

are currently before the Commission, that directly rely on the 240 kV Transmission Developments. The 240 kV Transmission Developments are consistent with the AESO's regional plans for the Northeast and Edmonton planning regions.

Future transmission system developments will also be planned and engineered to be consistent with the 240 kV Transmission Developments. For example, NIDs prepared and submitted following this Application, provided it is approved by the Commission, will assume the 240 kV Transmission Developments will be in-service for the date specified, unless new information indicates otherwise. Furthermore, NIDs that will be filed for forthcoming transmission developments will continue to identify specific system development dependencies, where appropriate and practical, to ensure that the integrated nature of the 240 kV Transmission Developments are represented.

4.7 Approval is in the Public Interest – The AESO submits that the 240 kV Transmission Developments are in the public interest after considering the following factors: the transmission planning duties of the AESO as described in sections 17, 29, 33 and 34 of the Act; information obtained from the AESO's PIP; the estimated costs; the transmission developments approved in section 4 of the Schedule to the Act; the AESO's long-term transmission system plans, including the *AESO 2013 Long-term Transmission Plan*; and the *AESO 2014 Long-term Outlook*, which is used to plan other transmission system developments in the Fort McMurray area.

5 Relief requested

5.1 Having regard to the factors set out in section 38 of the *Transmission Regulation*, particularly subsections 38(d) and (e), the AESO submits that its assessment of the need for the 240 kV Transmission Developments is technically complete and that the manner proposed to meet the identified need is consistent with AESO long-term forecasts, transmission system plans, and the need to plan the transmission system to provide efficient, reliable and non-discriminatory system access service and the timely implementation of required transmission system expansions and enhancements. As a result of the AESO's consideration of these factors, the AESO submits that approval of this Application is in the public interest.

5.2 For the reasons set out herein, and pursuant to section 34 of the Act, the AESO requests that the Commission approve this Application, including issuing an approval of the need for the 240 kV Transmission Developments, comprised of the following:

Stage 1 – to be completed commensurate with the in-service requirements for the FMM West Line:

- a) a new 240 kV switching substation with one +200/-100 megavolt-ampere-reactive (MVar) Static Var System (SVS) and capacitor banks with an approximate total rating of 100 MVar;
- b) split the existing 9L07 line and terminate with an in-out configuration at the new switching substation via new 240 kV transmission circuits, as required;
- c) split the existing 9L01 line and terminate with an in-out configuration at the new switching substation via new 240 kV transmission circuits, as required; and
- d) additional potential modifications to existing substations in the area including equipment or device changes, as described in the application.

Thickwood Hills 240 kV Transmission Development – Needs Identification Document

Stage 2 – to be completed commensurate with the in-service requirements for the FMM East Line:

- a) add capacitor banks with an approximate total rating of 100 MVAR to the 240 kV switching substation; and
- b) additional potential modifications to existing substations in the area including equipment or device changes, as described in the application.

All of which is respectfully submitted this 16th day of December 2014.

Alberta Electric System Operator



Doyle Sullivan, P. Eng.
Director, Regulatory

PART B – APPLICATION APPENDICES

The following appended documents support the Application (Part A). The appendices include work undertaken by the AESO, and the TFO, under the AESO's direction, to support this Application.

APPENDIX A AESO Capital Cost Estimates – Appendix A contains the capital cost estimates referred to in this Application. Estimates were prepared by the AESO based on estimates previously prepared by the TFO, and correspond to the scope of work for the 240 kV Transmission Developments. While the AESO has based its estimates on estimates provided previously by the TFO, the accuracy level is estimated to be approximately +/-50%. The AESO has therefore requested estimates from the TFO that meet the requirements of Commission Rule 007, Section 6.1, NID11, and will submit these estimates separately when they become available. In accordance with the ISO tariff, the AESO has determined that the estimated costs are all system-related costs.

APPENDIX B AESO Participant Involvement Program (PIP) – Appendix B provides a summary of the AESO's PIP activities conducted regarding the need for the transmission developments described in this Application. Copies of the relevant materials distributed during the PIP are attached for reference.

APPENDIX C Information in Regards to Rule 007, Section 6.1 - NID13 – Appendix C provides a report by the TFO addressing the major aspects of Commission Rule 007, Section 6.1, NID13. The report, described as a Land Impact Assessment, was requested by the AESO to assist in its overall assessment of the 240 kV Transmission Developments.

PART C – REFERENCES

- i. **AESO Planning Duties and Responsibilities and Duty to Forecast Need** – Certain aspects of AESO duties and responsibilities with respect to planning the transmission system are described in the Act. For example, Section 17, Subsections (g), (h), (i), and (j), describe the general planning duties of the AESO.¹⁹ Section 33 of the Act states that the AESO “must forecast the needs of Alberta and develop plans for the transmission system to provide efficient, reliable, and non-discriminatory system access service and the timely implementation of required transmission system expansions and enhancements”. Other aspects of the AESO’s transmission planning duties and responsibilities are set out in Sections 8, 10, and 11, of the *Transmission Regulation*.
- ii. **Duty to Provide Transmission System Access** – Section 29 of the Act states that the AESO “must provide system access service on the transmission system in a manner that gives all market participants wishing to exchange electric energy and ancillary services a reasonable opportunity to do so”.
- iii. **Application for Approval of the Need for Expansion or Enhancement of the Capability of the Transmission System** – This Application is directed solely to the question of the need for expansion or enhancement of the capability of the transmission system as more fully described in the Act and the *Transmission Regulation*. This Application does not seek approval of those aspects of transmission development that are managed and executed separately from the needs identification document approval process. Other aspects of the AESO’s responsibilities regarding transmission development are managed under the appropriate processes, including ISO Rules, Alberta Reliability Standards and the ISO Tariff, which are also subject to specific regulatory approvals. While the Application or its supporting appendices may refer to such other processes or information from time to time, the inclusion of such information is for context and reference only.

Any reference within the Application to market participants or other parties and/or the facilities they may own and operate or may wish to own and operate is not intended to constitute an application for approval of such facilities, and the responsibility for seeking such regulatory or other approval remains the responsibility of such market participants or other parties.

¹⁹ The legislation and regulations refer to the Independent System Operator or ISO. "AESO" and "Alberta Electric System Operator" are the registered trade names of the Independent System Operator.

Thickwood Hills 240 kV Transmission Development – Needs Identification Document

- iv. **Directions to the TFO** – The AESO has directed the TFO, pursuant to section 39 of the Act and section 14 of the *Transmission Regulation*, to assist in the preparation of the AESO’s Application and, under section 39 of the Act, to prepare a proposal to provide services to address the need for the proposed transmission development.

- v. **Capital Cost Estimates** – Capital costs estimates provided in the Application are used by the AESO for the sole purpose of comparing and considering transmission development alternatives. Where only a single transmission development alternative has been studied, capital cost estimates are provided for context. Project costs will be determined by the TFO as part of its facility proposal. The AESO’s responsibilities with respect to project cost reporting are described in the *Transmission Regulation*, including section 25, and ISO Rule 9.1.

APPENDIX A AESO CAPITAL COST ESTIMATE

Estimate Summary for Need Identification Document (NID)

Thickwood Hills 240kV Transmission Development Stage 1 - 2018 ISD

Project: Thickwood Hills 240kV Transmission Development
 TFO: ATCO Electric
 Prepared by: AESO
 Date: December 10, 2014
 Accuracy:

	System Portion	Customer Portion	TOTAL
Transmission Lines	\$ 60,628,000	\$ -	\$ 60,628,000
Substation Facilities	\$ 59,697,000	\$ -	\$ 59,697,000
Telecommunication	\$ 715,000	\$ -	\$ 715,000
Total Facility Costs	\$ 121,040,000	\$ -	\$ 121,040,000
Proposal to Provide Service	\$ 462,000	\$ -	\$ 462,000
Facility Applications	\$ 2,616,000	\$ -	\$ 2,616,000
Land Rights - Easements	\$ -	\$ -	\$ -
Land - Damage Claims	\$ -	\$ -	\$ -
Land - Acquisitions	\$ 1,383,000	\$ -	\$ 1,383,000
Owners Costs	\$ 4,461,000	\$ -	\$ 4,461,000
Procurement	\$ 2,412,000	\$ -	\$ 2,412,000
Project Management	\$ 2,762,000	\$ -	\$ 2,762,000
Construction Management	\$ 3,697,000	\$ -	\$ 3,697,000
Contingency	\$ 16,600,000	\$ -	\$ 16,600,000
Distributed Costs	\$ 25,471,000	\$ -	\$ 25,471,000
Total Owners and Dist. Costs	\$ 29,932,000	\$ -	\$ 29,932,000
Total Direct Costs	\$ 150,972,000	\$ -	\$ 150,972,000
Salvage Costs	\$ 91,000	\$ -	\$ 91,000
Other Costs			
Inflation	\$ 28,414,000	\$ -	\$ 28,414,000
E&S	\$ 16,310,000	\$ -	\$ 16,310,000
AFUDC	\$ -	\$ -	\$ -
Total Indirect Costs	\$ 44,815,000	\$ -	\$ 44,815,000
TOTAL PROJECT COSTS	\$ 195,787,000	\$ -	\$ 195,787,000

Assumptions

1. This estimate includes deduction of cap banks at Engstrom and Quigley substations
2. This estimate includes addition of cap bank at Thickwood substation
3. No scope/costs impact on transmission lines and Telecom
4. The deduction/addition of cap banks do not affect owner costs
5. The distributed costs are adjusted by the ratio of deduction and addition over facility costs
6. No AFUDC is included
7. Inflation rate is 4% annually equivalent based on direct costs and E&S
8. E&S cost is based on 10.8% of direct costs
9. Substation cost is based on bottom-up estimate and referenced from AESO benchmark
10. Double circuit steel structures for 9L30/9L01
11. \$2014 base year
12. The TOTAL PROJECT COSTS figure shown is reported in 2018 dollars

Estimate Summary for Need Identification Document (NID)

Project: Thickwood Hills 240kV Transmission Development
TFO: Stage 2 - 2021 ISD
Prepared by: ATCO Electric
Date: AESO
Accuracy: December 10, 2014

	System Portion	Customer Portion	TOTAL
Transmission Lines	\$ -	\$ -	\$ -
Substation Facilities	\$ 3,445,000	\$ -	\$ 3,445,000
Telecommunication	\$ -	\$ -	\$ -
Total Facility Costs	\$ 3,445,000	\$ -	\$ 3,445,000
Proposal to Provide Service	\$ 13,000	\$ -	\$ 13,000
Facility Applications	\$ 74,000	\$ -	\$ 74,000
Land Rights - Easements	\$ -	\$ -	\$ -
Land - Damage Claims	\$ -	\$ -	\$ -
Land - Acquisitions	\$ -	\$ -	\$ -
Owners Costs	\$ 87,000	\$ -	\$ 87,000
Procurement	\$ 69,000	\$ -	\$ 69,000
Project Management	\$ 79,000	\$ -	\$ 79,000
Construction Management	\$ 106,000	\$ -	\$ 106,000
Contingency	\$ 473,000	\$ -	\$ 473,000
Distributed Costs	\$ 727,000	\$ -	\$ 727,000
Total Owners and Dist. Costs	\$ 814,000	\$ -	\$ 814,000
Total Direct Costs	\$ 4,259,000	\$ -	\$ 4,259,000
Salvage Costs	\$ -	\$ -	\$ -
Other Costs			
Inflation	\$ 1,490,000	\$ -	\$ 1,490,000
E&S	\$ 460,000	\$ -	\$ 460,000
AFUDC	\$ -	\$ -	\$ -
Total Indirect Costs	\$ 1,950,000	\$ -	\$ 1,950,000
TOTAL PROJECT COSTS	\$ 6,209,000	\$ -	\$ 6,209,000

Assumptions

1. This estimate includes addition of cap bank at Thickwood substation only
2. No scope/costs impact on transmission lines and Telecom
3. The addition of cap bank does not affect owner costs
4. The distributed costs are adjusted by the ratio of addition over facility costs
5. No AFUDC is included
6. Inflation rate is 4% annually equivalent based on direct costs and E&S
7. E&S cost is based on 10.8% of direct costs
8. Substation cost is based on bottom-up estimate and referenced from AESO benchmark
9. \$2014 base year
10. The TOTAL PROJECT COSTS figure shown is reported in 2021 dollars

APPENDIX B PARTICIPANT INVOLVEMENT PROGRAM (PIP)

Thickwood Hills 240 kV Transmission Development – Needs Identification Document

1.0 Participant Involvement Program (PIP)

From April 2014 to December 2014, the AESO conducted a Participant Involvement Program (PIP) to assist in preparing its Thickwood Hills 240 kV Transmission Development Needs Identification Document (Thickwood Hills NID).

The AESO's application seeks Alberta Utilities Commission (Commission) approval of a new 240 kV substation, to be called Thickwood Hills 951S; new 240 kV transmission lines connecting the new substation to the existing transmission system; and reactive power equipment installed in the new substation.

The AESO's PIP was designed to notify and provide information to stakeholders, including occupants, residents, and landowners in or near the area where the proposed development may be built, as well as with the government agencies, organizations, Métis Nations and First Nations listed below:

- Counties and Municipal Districts:
 - o Regional Municipality of Wood Buffalo
 - o Lac La Biche County
- Members of the Legislative Assembly of Alberta
 - o MLA for Fort McMurray-Wood Buffalo
 - o MLA for Fort McMurray-Conklin
- First Nations and Métis Nations
 - o Whitefish/Goodfish Lake First Nation
 - o Heart Lake First Nation
 - o Beaver Lake First Nation
 - o Mikisew Cree First Nation
 - o Fort McMurray First Nation
 - o Fort McKay First Nation
 - o Chipewyan Prairie First Nation
 - o Athabasca Chipewyan First Nation
 - o Métis Nation Zone 1

1.1 Description of Participant Involvement Program

The AESO used a variety of methods to notify stakeholders on the need for the proposed transmission developments to be applied for in the Thickwood Hills NID. The AESO developed a four-page newsletter that described the need for the transmission developments. The newsletter was mailed out to stakeholders during the week April 28, 2014. A copy of this document was posted to the AESO website at

<http://www.aeso.ca/transmission/30514.html> on April 28, 2014. A copy of the newsletter is included in Attachment 1. The AESO also advertised notice of the Thickwood Hills application in its bi-weekly newsletter on April 29, 2014. The AESO subsequently sent an update letter to stakeholders during the week of October 22, 2014. A copy of this document was posted to the AESO website on October 23, 2014. A copy of the newsletter is included in Attachment 2. The AESO also advertised notice of this update in its bi-weekly stakeholder newsletter on October 23, 2014.

The AESO advertised its intention to file the Thickwood Hills NID in the following newspapers:

- Fort McMurray Today
- Fort McMurray Connect

A proof of this advertisement is included in Attachment 3.

The AESO also published notice of its intention to file in its bi-weekly stakeholder newsletter on November 27, 2014.

To ensure that stakeholders have the opportunity to learn more about the proposed CETD amendment and provide feedback, the AESO also provides stakeholders with a dedicated, toll-free telephone line (1-888-866-2959) and a dedicated email address (stakeholder.relations@aeso.ca). AESO contact information, along with the AESO's mailing address (2500, 330 5th Ave, SW, Calgary) and website address (www.aeso.ca), and a privacy statement that describes how the AESO honours Alberta's Personal Information Protection Act, were included on all AESO communications related to this application.

1.2 Issues and Concerns Raised

The AESO received no inquiries related to this application.

1.3 List of Attachments

- Attachment 1 – AESO Newsletter, April 2014
- Attachment 2 – Update letter, October 2014
- Attachment 3 – Notification of Filing Advertisement, November 2014

Attachment 1 – AESO Newsletter, April 2014

Thickwood Hills 240 kV Transmission Development and Reactive Power Reinforcement

At the Alberta Electric System Operator (AESO), we plan the province's electric transmission system. We study the transmission system to determine what future upgrades and expansions will be needed to continue to serve Alberta's growing power demands.



HOW DOES THE AESO DETERMINE THE NEED FOR TRANSMISSION DEVELOPMENT?

Alberta's growing population and expanding industry are driving an increasing demand for power. Power generation developers are planning and building new power plants to meet this demand. The transmission system must have enough capacity to transmit power from where it is generated to where it will be used.

As Alberta's transmission system planner, the AESO forecasts both demand from consumers and supply from generators. We study the location and amount of new generation and growing demand and develop plans to ensure Albertans continue receiving reliable power.

Why transmission development is needed?

New transmission development is being planned in the Fort McMurray area. Transmission development is needed to connect the Fort McMurray West 500 kV Transmission Project to the existing transmission system in the Thickwood Hills area, west of Fort McMurray. New development is also needed to provide voltage stability in the Fort McMurray area.

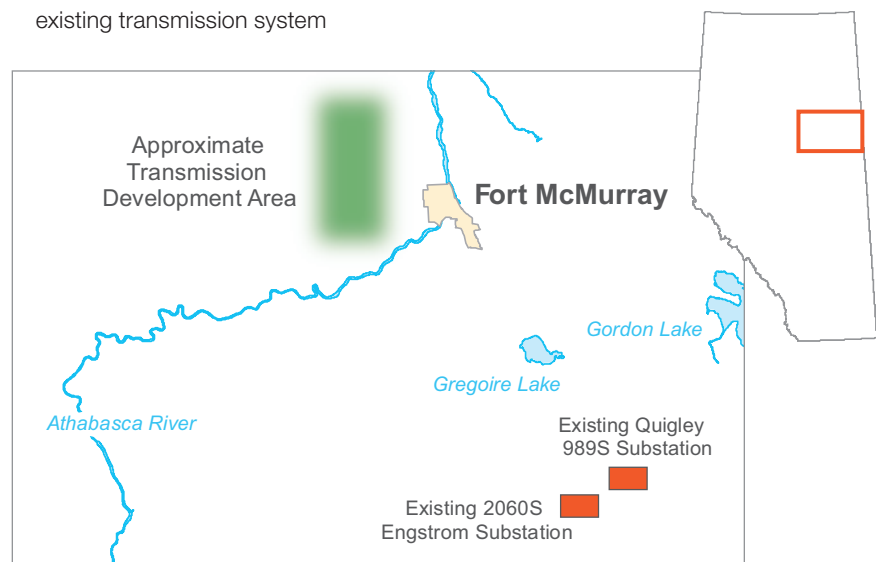
The transmission developments proposed to meet these needs include:

- A new 240 kV substation (called Thickwood Hills 951S*)
- Two new 240 kV transmission lines connecting the new Thickwood Hills substation to existing transmission system

- Reactive power equipment installed in the new Thickwood Hills 951S substation and in the existing Quigley 989S and Engstrom 2060S substations.

We will be applying to the Alberta Utilities Commission (AUC) in late spring or summer of 2014 to have these proposed developments approved. Our application will be called the *Thickwood Hills 240 kV Transmission Development and Reactive Power Reinforcement*.

* The Thickwood Hills 951S substation will later be expanded to include the 500 kV equipment associated with the Fort McMurray West transmission line.



The shaded area on the map shows the approximate area where the proposed substation and transmission lines are needed, along with the approximate locations of the existing Quigley 989S and Engstrom 2030S substations. In a separate application, called a facilities application, ATCO Electric Ltd. (ATCO), the transmission facilities owner (TFO) in the area, will propose specific routes and siting details for the developments, and request AUC approval to construct and operate these transmission facilities. The specific transmission line routes applied for by ATCO may extend beyond the shaded area shown. For more information on AESO and TFO roles, see page 2.



AESO AND TFO ROLES

The AESO operates the provincial transmission system so that all Albertans can count on safe and reliable electricity to power our homes and businesses each and every day. The AESO also carefully plans upgrades, reinforcements and expansions to the system to ensure the transmission system keeps pace with Alberta's growing demand for power.

ATCO Electric Ltd. (ATCO) is the TFO in the project area. While the AESO is responsible for identifying that transmission system development is needed, ATCO is responsible for detailed siting and routing, constructing, operating and maintaining the associated transmission facilities. The AESO will direct ATCO to file a facility application with the AUC, which will include a detailed description and location of the proposed transmission development.

Planning for Growth in the Fort McMurray Area

Fort McMurray West is a new 500 kV AC transmission line that will run from the Wabamun area west of Edmonton to the Thickwood Hills area west of Fort McMurray. We sent out information about this project earlier this year.

Fort McMurray West is one of two 500 kV transmission line developments comprising the Fort McMurray Transmission System Reinforcement. The second line is the Fort McMurray East 500 kV Transmission project, a new 500 kV AC line running from the Heartland 12S substation northeast of Edmonton to the new Thickwood Hills

951S substation. The Fort McMurray Transmission System Reinforcement is one of four reinforcements that were designated as Critical Transmission Infrastructure pursuant to the *Electric Utilities Act (2009)*. The AESO will use the Competitive Process to deliver Fort McMurray West and Fort McMurray East transmission projects.

For information about the Fort McMurray West 500 kV Transmission project and the Competitive Process, please visit www.poweringalberta.com

TFOs IN ALBERTA

There are four major TFOs in Alberta:

ATCO Electric Ltd.

AltaLink

EPCOR Utilities

(owned by The City of Edmonton)

ENMAX Power Corporation

(owned by The City of Calgary)



WHO IS THE ALBERTA ELECTRIC SYSTEM OPERATOR?

The AESO is an independent, not-for-profit organization acting in the public interest of all Albertans. We plan Alberta's transmission system, which is made up of the transmission lines, substations and other related equipment that transmit electricity from where it is generated to where it will ultimately be used.





Transmission Development Approval in Alberta

A TWO-PART PROCESS

1 PART ONE: APPROVAL OF NEED

The AESO studies the transmission system to identify needed upgrades or expansions, and applies to the AUC for review and approval of our plans. The AUC is the regulator for transmission development in Alberta.

The AESO's application to the AUC is called a Needs Identification Document, or NID. The NID outlines our specific plans to upgrade or expand the transmission system, which the AUC must approve.

2 PART TWO: APPROVAL TO CONSTRUCT

TFOs build what is in the AESO's plans. They consult with stakeholders to find specific routes for transmission lines and sites for substations.

Before TFOs begin building, they submit details to the AUC in what are called Facility Applications (FAs). The AUC must review and approve the specific routes and facility locations in the TFOs' applications.



FAST FACT

> In Alberta's electricity industry, transmission lines, substations and other related equipment used to move power are called facilities.

AESO Process

AESO identifies need for transmission development

AESO stakeholder engagement (mailouts, open houses, meetings)

AESO submits a NID to the AUC for approval of need and plan

TFO Process

TFO consultation, detailed design, routing and siting

TFO submits a FA to the AUC for approval of siting and routing, and to construct and operate

AUC Review and Approval



Approval of need



Approval of siting and routing, and to construct and operate

To learn more about the transmission approval process please contact the Alberta Utilities Commission (AUC):

Web: www.auc.ab.ca

Phone: 780-427-4903

Dial 310-0000 before the 10-digit number to be connected toll-free from anywhere in Alberta.

The AUC must review and provide a decision on both the AESO's application and the TFO's application before developments can proceed. While the AESO will be submitting its application for AUC review shortly, the TFO will submit its application for separate AUC review at a later date.

Other projects in the area



Other transmission system developments that have received AUC NID approval in the area include:

1180 – NW of Fort McMurray 240 kV Transmission System Development

NID approved June 18, 2012.

New 240 kV transmission lines between existing line 9L08, the new Ells River 2079S substation, and the new Birchwood Creek 960S substation, all northwest of Fort McMurray.

1267 – Algar Area System Development

NID approved April 18, 2013.

New 240/144 kV substation called Dawes 2011S to reinforce the existing 144 kV transmission system south of Fort McMurray.

1106 – Kettle River Substation and Bohn Substation

NID approved March 25, 2013.

New 240/144 kV substation to serve as a point of supply to industrial loads southeast of Fort McMurray.

1101 – Christina Lake Area 240 kV Transmission System Development

NID approved on April 24, 2012.

New 240 kV transmission lines between the existing Heart Lake 898S substation and new substations called Ipatik 167S, Pike 170S and Black Spruce 154S, all located in the Christina Lake area.



Next Steps



Over the coming months we will respond to any of your questions or comments. Before the proposed transmission developments can be built, the AUC must approve the AESO's NID application. ATCO must also apply to the AUC for approval to build the transmission facilities.

We will apply to the AUC in the spring or summer of 2014. When we submit our NID application to the AUC, it will be available on our website at

www.aeso.ca/transmission/8969.html



We want to hear from you

We appreciate your views, both on the need for transmission system development and our proposed transmission plans. Your comments are encouraged. If you have any questions or suggestions regarding our proposed transmission system development in the Fort McMurray area, or our application regarding this need, please contact:

Matt Gray

AESO Stakeholder Relations

EMAIL: stakeholder.relations@aeso.ca

PHONE: 1-888-866-2959

ADDRESS: 2500, 330 – 5th Avenue SW, Calgary, Alberta T2P 0L4

To learn more about the electricity industry and its importance to our quality of life and the province's economic well-being, please visit **www.poweringalberta.com**



Attachment 2 – Update Letter, October 2014

October 24, 2014

Dear Stakeholder,

Re: Thickwood Hills 240 kV Transmission Development and Reactive Power Reinforcement – Update

I am writing to inform you about a change to some information we sent earlier this year.

In April we sent out a newsletter describing the need for new transmission development in the Fort McMurray area. In the newsletter we explained that a new 240,000 volt (240 kV) substation and new 240 kV transmission lines are needed in the Thickwood Hills area to connect the Fort McMurray 500 kV Transmission project to the grid. We also explained that new equipment is needed to better manage voltage in the area. This new equipment is needed in the new Thickwood Hills substation, and also in the existing Quigley and Engstrom substations. However, after further consideration, we have determined that the new equipment needed in the Quigley and Engstrom substations will no longer be included in this application. We will include this equipment in a future application instead. Please refer to the maps on the next page for further clarification.

The original newsletter we sent out in April can be found at www.aeso.ca/thickwood We plan to file this application later this year or early in January 2015, under the new name *Thickwood Hills 240 kV Transmission Development*.

Please contact us at 1-888-866-2959 or stakeholder.relations@aesocanada.com if you wish to discuss this information further.

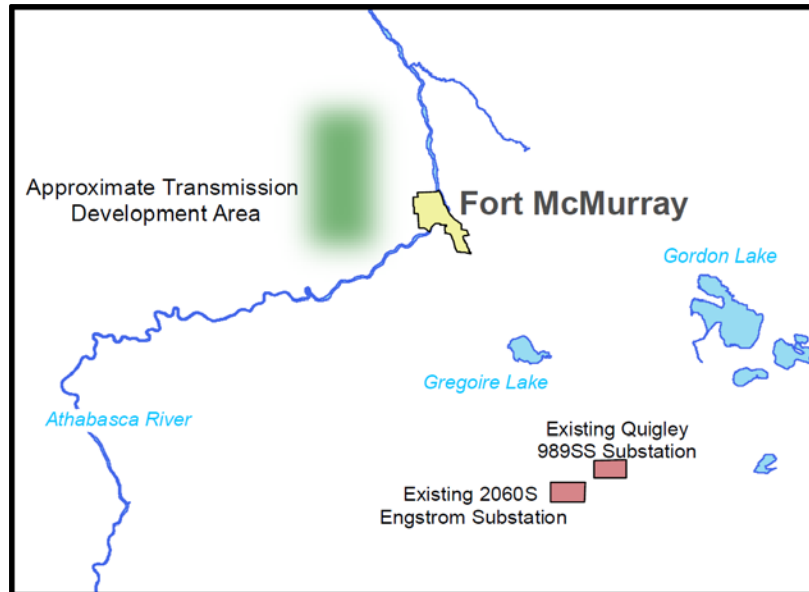
Yours truly,



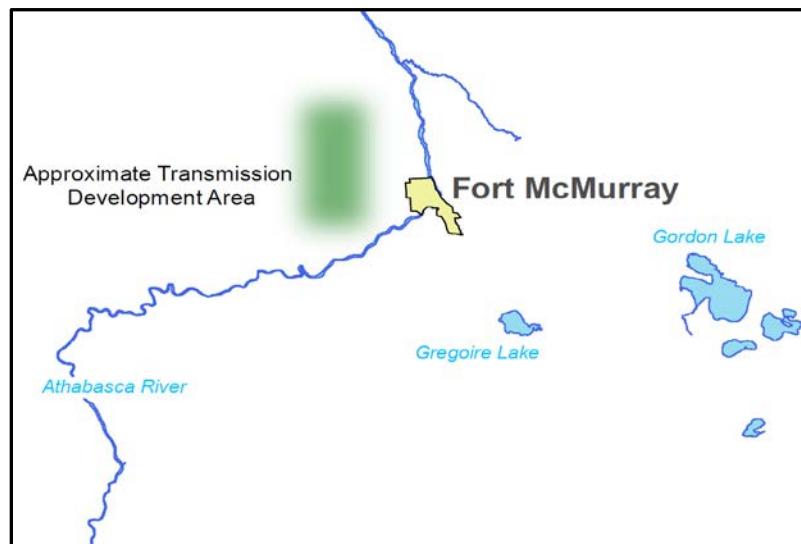
Matt Gray
Corporate Communications

Thickwood Hills 240 kV Transmission Development

April 2014



October 2014



The map on the top appeared in our **Thickwood Hills 240 kV Transmission Development and Reactive Power Reinforcement** newsletter which we sent out in April of this year. The green shaded area on this map shows the approximate area where transmission developments are needed. It also shows substations south of Fort McMurray where new equipment is needed to support voltage in the area. The need for this voltage support equipment will now be removed from our Thickwood Hills application. The map on the bottom has been revised to show this change. We will apply for the voltage equipment in a future application instead.

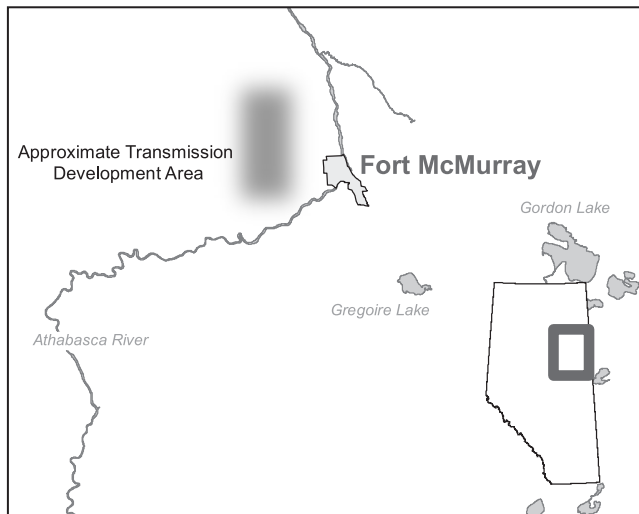
**Attachment 3 – Notification of Filing Advertisement,
November 2014**

Notification of AESO Regulatory Filing Addressing the Need for New Transmission Development in the Thickwood Hills area west of Fort McMurray

The Alberta Electric System Operator (AESO) advises you that it intends to file a Needs Identification Document (NID) for the new Thickwood Hills 951S Substation with the Alberta Utilities Commission (AUC) on or after December 12, 2014.

New transmission development is being planned in the Fort McMurray area. Transmission development is needed to connect the Fort McMurray West 500 kV Transmission Project to the existing transmission system in the Thickwood Hills area, west of Fort McMurray. The new transmission needed includes:

- A new 240 kV substation (called Thickwood Hills 951S)
- Two new 240 kV transmission lines connecting the new Thickwood Hills 951S substation to existing transmission system
- Reactive power equipment installed in the new Thickwood Hills 951S substation




The shaded area on the map shows the approximate area where the proposed substation and transmission lines are needed. In a separate application, called a facilities application, ATCO Electric Ltd. (ATCO), the transmission facilities owner (TFO) in the area, will propose specific routes and siting details for the developments, and request AUC approval to construct and operate these transmission facilities. The specific transmission line routes applied for by ATCO may extend beyond the shaded area shown.

The AESO presented this need to stakeholders, including residents, occupants and landowners, from April 2014 to November 2014. The AESO has considered feedback gathered from stakeholders, and technical and cost considerations, and will apply to the AUC for approval of the need for this transmission development. Once filed, the NID will be posted on the AESO website at <http://www.aeso.ca/transmission/30514.html>.

Please visit our website, www.aeso.ca for more information, or contact the AESO at 1-888-866-2959 or stakeholder.relationships@aeso.ca



 <small>Integrated Marketing Communications</small>	
Artist:	2N
Docket:	103307
Date:	Nov 14, 2014
Size:	5"
Proof:	2.2
1 of 1	
Publications(s):	FtMac Today FtMac Connect

**APPENDIX C INFORMATION IN REGARDS TO RULE 007, SECTION
6.1 - NID13**



LAND IMPACT ASSESSMENT

for the

Fort McMurray Area 240-kV Transmission Development (FMATD)

**Prepared for the
Alberta Electric System Operator (AESO)
in Support of the
AESO Needs Identification Document (NID)**

November 18, 2014

Table of Contents

<i>EXECUTIVE SUMMARY</i>	4
<i>1 INTRODUCTION & OVERVIEW</i>	6
1.1 BACKGROUND	6
1.2 FORT McMURRAY 240-kV AREA TRANSMISSION DEVELOPMENT SYSTEM PLAN.....	6
1.3 SCOPE OF THE LIA.....	6
1.4 PROJECT COMPONENTS	7
1.4.1 <i>Thickwood Hills transmission development</i>	7
1.4.1.1 <i>Thickwood Hills 951S substation development</i>	7
1.4.1.2 <i>Proposed double-circuit 240-kV transmission line 9L01/9L30</i>	7
1.4.1.3 <i>Proposed in/out connection on existing 240-kV transmission line 9L07</i>	7
1.5 PRELIMINARY STUDY AREA SELECTION CRITERIA	7
1.5.1 <i>Thickwood Hills transmission development</i>	7
<i>2 LIA ASSESSMENT PROCESS</i>	9
2.1 METHODOLOGY	9
2.2 LIMITATIONS OF ASSESSMENT.....	9
<i>3 LAND IMPACTS & MEASURABLE INDICATORS</i>	10
3.1 AGRICULTURAL IMPACT	10
3.1.1 <i>Specific Concerns</i>	10
3.1.2 <i>Indicators of Agricultural Impact</i>	12
3.2 RESIDENTIAL IMPACT	12
3.2.1 <i>Specific Concerns</i>	13
3.2.2 <i>Indicators of Residential Impacts</i>	14
3.3 ENVIRONMENTAL IMPACTS	14
3.3.1 <i>Specific Concerns</i>	14
3.3.2 <i>Indicators of Environmental Impacts</i>	16
3.4 COST	16
3.5 ELECTRICAL CONSIDERATIONS.....	16
3.5.1 <i>Specific Considerations</i>	16
3.5.2 <i>Electrical Indicators</i>	17
3.6 VISUAL IMPACTS.....	17
3.6.1 <i>Specific Concerns</i>	18
3.6.2 <i>Indicators of Visual Impact</i>	18
3.7 SPECIAL CONSTRAINTS	19
3.7.1 <i>Specific Concerns</i>	19
3.7.2 <i>Other Special Constraints</i>	19
3.7.3 <i>Indicators of Special Constraints</i>	20
3.8 LOWER ATHABASCA REGIONAL PLAN (LARP)	20
<i>4 ASSESSMENT OF COMPONENTS</i>	23
<i>5 RESULTS AND CONCLUSIONS</i>	25
<i>6 ACRONYMS</i>	27
<i>7 INFORMATION SOURCES</i>	28

Attachments

ATTACHMENT 1 FORT McMURRAY AREA TRANSMISSION DEVELOPMENT AREA MAP

- Regional Map Drawing RS-FMATD-LIA-01

ATTACHMENT 2 THICKWOOD HILLS TRANSMISSION DEVELOPMENT STUDY AREA MAPS

- Constraints Map – Land Use Drawing RS-FMATD-LIA-02a
- Constraints Map – Forest Land Capability & Wildlife Drawing RS- FMATD-LIA-02b
- Constraints Map – Historical Resource Value & Wetlands Drawing RS- FMATD-LIA-02c
- Constraints Map – Environmentally Significant Areas Drawing RS- FMATD-LIA-02d

EXECUTIVE SUMMARY

The Alberta Electric System Operator (AESO) has directed that ATCO Electric Ltd. (ATCO Electric) provide a Land Impact Assessment (LIA) for the proposed Fort McMurray Area 240-kV Transmission Development (“FMATD”), located within ATCO Electric’s service territory. The LIA is to be used by the AESO in support of a Needs Identification Document (NID) for this transmission development project.

The assessment of FMATD was driven by the major aspects of the Alberta Utilities Commission (AUC) *Rule 007, Section 6.1, NID 13* (i.e., agricultural impact, residential impact, environmental impact, cost, electrical considerations, visual impact and special constraints) and the Lower Athabasca Regional Plan (LARP) requirements as defined by AUC Bulletin 2012-10 and later refined revisions to *Rule 007*. As per AUC *Rule 007*, associated with each major aspect are several specific considerations that require assessment. This LIA focuses on those aspects and considerations for which indicators of impact can be developed based on information currently available and relevant to the project.

The following features were considered as part of the land impact assessment process:

- Agriculture;
- Wetlands;
- Wildlife (caribou habitat);
- Residences and workcamps;
- Provincial and National ESAs;
- AESAs;
- Provincial and National Parks;
- Historical resources;
- Oil and Gas development;
- Mine sites;
- Airports; and
- Other existing and planned linear developments (pipeline, transmission line, roadways).

After review of various available data sets, ATCO Electric undertook a comprehensive assessment of the project study area. This assessment included the application of suitable indicators to determine whether the potential for impact exists.

Prior to filing a facility application with the AUC, the Transmission Facility Owner (TFO) will need to undertake an extensive routing & siting and participant involvement program adhering to AUC *Rule 007* requirements.

Table 1 – Proposed System Development Study Area Features

Features	Thickwood Hills transmission development Study Area
Wetlands (% of study area)	17.9%
Wildlife -Caribou Habitat (% of study area)	16.1%
AESAs (% of study area)	28.9%
Provincial ESA (% of study area)	17.9%
Historical Resources HRV4 (% of study area)	0.1%
Parks – National and Provincial (% of study area)	0%
Mine sites - Surface Mineable Area (% of study area)	0%

Upon commencement of facility application routing & siting activities, an assessment of potential impacts to these features should be undertaken. Once impacts are determined, options of avoidance and mitigation should be investigated to minimize these impacts.

An assessment of the project study area components indicated the following impacts:

- Thickwood Hills 951S substation – the study area examined for siting of the facilities included areas of wetland, variable slopes, ESA, AESA, and Caribou Zone. In addition to lands required for the 240-kV portion of the substation, an additional portion of land is to be included as part of the substation land requirements for future 500-kV development. A substation location is anticipated in proximity to the existing utility corridor and approximately 20 km south of the confluence point, to be situated near existing access in an area of minimized environmental concern.
- Potential routing options for the proposed double-circuit 9L01/9L30 transmission line are available along the existing 9L07 transmission line ROW. Options will likely include two major creek crossings with potential for impact to caribou habitat, wetlands, ESAs, AESAs, historical resources, and oil and gas development. Finding a suitable route option will require mitigation options to reduce impacts.
- At the confluence point, the two existing single-circuit circuit transmission lines 9L01 and 9L58 and the in/out connection points adjacent to existing 9L07 will have few constraints. Because of this, viable connection options with minimal impacts are anticipated.
- Where reasonable, a suggested route option for 9L01/9L30 may parallel an existing utility corridor from the confluence point to Thickwood Hills 951S substation. Because of this, it is anticipated there will be less impact than a route that would not parallel an existing utility corridor.

1 INTRODUCTION & OVERVIEW

1.1 Background

On October 23, 2013, the Alberta Electric System Operator (AESO) requested that ATCO Electric Ltd. provide a Land Impact Assessment (LIA) for the proposed Fort McMurray Area Transmission Development, located within ATCO Electric's service territory. The LIA is to be used by the AESO in support of a Needs Identification Document for this transmission development project.

1.2 Fort McMurray 240-kV Area Transmission Development System Plan

The FMATD system plan consists of the Proposed Thickwood Hills transmission development, as determined by the AESO.

The Thickwood Hills 240-kV Area Transmission Development and Christina Lake Area Reactive Power Reinforcement project system plan includes the Thickwood Hills Transmission development, which consists of the following major components, as determined by the AESO:

- 1) Construction of new 240 kilovolt (kV) portion of the Thickwood Hills 951S substation that is assumed to include the following system facilities;
 - a. Eight (8) 240-kV breakers;
 - b. One (1) +200/-100 MVar Static VAR System (SVS);
 - c. One (1) 100 MVar cap bank connected off the north main bus complete with a 240 kV circuit breaker;
 - d. Land for a future 500-kV substation site with siting preference on the west side of new 951S; and
 - e. Allowance of adequate land for possible future development requirements.
- 2) Termination of existing 9L01 to an in/out configuration and construction of new double-circuit 240-kV transmission line approximately 20 kilometres (km) south to the proposed Thickwood Hills 951S substation. The new portion of transmission line connecting Thickwood Hills 951S substation to Dover 888S substation will be renamed 9L30; and
- 3) Termination of existing 9L07 to an in/out connection and construction of two new segments of single-circuit 240-kV transmission line connecting to the proposed Thickwood Hills 951S substation. A new segment of transmission line will be constructed from the proposed Thickwood Hills 951S substation to existing 9L07 right-of-way (ROW) connecting the proposed Thickwood Hills substation to Dover 888S substation (will be renamed 9L68). Construction of a segment of new single-circuit transmission line from the proposed Thickwood Hills 951S substation to the existing 9L07 ROW, connecting Thickwood Hills 951S to Dawes 2011S (will retain the name 9L07).

1.3 Scope of the LIA

As per the AESO's LIA Scope Document, this LIA focuses on the components outlined above. The study area is located northwest of Fort McMurray. This area is the basis for the qualitative assessment of

the potential impacts of the proposed project. The TFO should assess specific routing & siting details prior to filing a facility application with the AUC.

1.4 Project Components

The components considered in the LIA are those associated with the Thickwood Hills 951S transmission development.

1.4.1 Thickwood Hills transmission development

The Thickwood Hills transmission development consists of three separate components described below.

1.4.1.1 Thickwood Hills 951S substation development

For the purposes of this LIA the Thickwood Hills substation is assumed to be approximately 20 km south of the confluence point of existing transmission lines 9L01/9L58 and 9L07. In addition to lands required for the 240-kV portion of the substation, an additional 800m x 800m portion of land is to be included as part of the substation land requirements for future 500-kV development. To date, final location and land requirements for both the 240-kV and 500-kV future development portions of the project have not been determined.

As per the AESO scope, the 500-kV portion of the site is intended to be located to the west of new 240-kV Thickwood Hills 951S substation. While impacts associated with the 500-kV site are not within the scope of this LIA, further cumulative impacts of the future developments should be considered in the assessment of these facilities.

1.4.1.2 Proposed double-circuit 240-kV transmission line 9L01/9L30

While the exact location of the in/out configuration point on existing 9L01 has not been determined, for the purposes of this LIA, this point is assumed to be at the confluence of existing single-circuit 9L01, 9L58 and 9L07 transmission lines. As such, a final route for proposed transmission line 9L01/9L30 has not been selected; however to minimize impacts, it is assumed to be parallel existing 9L07 transmission line ROW. The ROW for the 240-kV transmission line is assumed to be 50 m and will traverse through forested area and adjacent to an existing utility corridor.

1.4.1.3 Proposed in/out connection on existing 240-kV transmission line 9L07

Since the in/out configuration point for existing 9L07 is dependent on the location of the proposed Thickwood Hills 951S substation, routing & siting of the two new single-circuit transmission line segments for 9L07 and 9L68 have not been determined. However, it will be assumed that the Thickwood Hill substation is approximately 20 km south of the confluence point of existing transmission lines 9L01/9L58 and 9L07. It is anticipated that there will be two new small segments of transmission line created from this new in/out connection on 9L07. The ROW for a single-circuit 240-kV transmission line is assumed to be 34 m and will traverse through forested area.

1.5 Preliminary Study Area Selection Criteria

1.5.1 Thickwood Hills transmission development

The study area was selected by using the following assumptions outlined in the AESO's revised LIA Scope of Work Document [File No. P1186, Rev. 3, October 8, 2014]

1. The proposed Thickwood Hills 951S substation is to be located approximately 20 km south of the confluence point of existing transmission lines 9L01, 9L58 and 9L07; and

2. Construction of a new double-circuit 9L01/9L30 transmission line is assumed to be located between Thickwood Hills 951S substation and the confluence point of existing 9L01, 9L58 and 9L07.

The Thickwood Hills transmission development study area is located northwest of Fort McMurray, within the Regional Municipality of Wood Buffalo. The Thickwood Hills 951S substation study area was selected to meet the approximate 20 km location south of the confluence point assumption described by the AESO while being sufficiently broad so that multiple options for siting could be considered. Opportunity for sufficient access is optimized through siting locations in proximity to Tower Road. The study area extent was limited to the east and west of the existing utility corridor based on increased line length and associated impacts. The study area was limited to the north and south based on increased opportunity for access from Tower Road and reduction of associated environmental impacts from access road construction. As part of the facility application process, the TFO may further refine the study area.

Given the opportunity to reduce impacts associated with transmission line development through paralleling existing linear development, the study area for 9L01/9L30 transmission line routing is proposed in the vicinity of an existing utility corridor.

2 LIA ASSESSMENT PROCESS

2.1 Methodology

The Land Impact Assessment process allows the AESO to consider the potential land impacts associated with the system plan components in their determination of need.

To ensure consistent data for all plans, the LIA process is driven by common criteria. The LIA uses the “major aspects” (with the exception of cost and certain electrical aspects) as identified within AUC *Rule 007 (NID 13, Section 6.1)* as the basis for identifying specific land-impact concerns. These include:

- Agricultural impact;
- Residential impact;
- Environmental impact;
- Electrical considerations;
- Visual impact; and
- Special constraints.

(Note that AUC’s “Item 4 – Cost” was not part of the scope of this impact assessment. A cost estimate for the project has been provided in the NID Estimate Report)

Considerations of major aspects in many cases (e.g. reduced efficiency of field operations, psychological impact, noise and TV interference, visual impact of tree removal) are not readily comparable until detailed route and tower locations and design have been undertaken during the facility application stage. The LIA focuses on those aspects and considerations that can be described using information currently available.

As per the AESO’s LIA Scope of Work Document, the AESO requested that ATCO Electric assess the proposed developments effects in context of the Lower Athabasca Regional Plan (LARP) requirements as defined by the AUC in Bulletin 2012-10 and AUC *Rule 007*. Once detailed routing & siting has been undertaken, the proposed developments can be further assessed against the requirements of the LARP.

2.2 Limitations of Assessment

The limitations for the assessment and conclusion of the project are based on a desktop assessment of various data sets to understand the potential impacts of the proposed developments within the project study area. The study area was defined based on assumptions outlined in the AESO’s LIA Scope of Work Document. A major limitation of this LIA is that detailed routing & siting activities within the study area have not been completed. As part of the facility application process, the TFO should undertake a comprehensive assessment of the required components as defined within *Rule 007* for the proposed development. Once routing & siting activities have commenced and project specific impacts are defined, options for mitigation and avoidance can be explored.

3 LAND IMPACTS & MEASURABLE INDICATORS

The LIA uses the “major aspects”, with the exception of cost and certain electrical factors, identified in the AUC *Rule 007 (Section 6.1, NID13)* as direction in identifying measurable indicators and specific concerns that can be used to determine levels of potential land-related impacts.

The major impact categories under *Rule 007* are: agricultural impact, residential impact, environmental impact, cost, electrical considerations, visual impact, and special constraints. Under each aspect in *Rule 007* are a list of concerns that must be addressed. These concerns are discussed with regards to the FMATD in the following sections.

3.1 Agricultural Impact

Agricultural impacts refer to agricultural activities associated with rural lands, which may include cultivation of crops and livestock, and also includes ranching.

Agricultural impacts will not be significant factors in this project, as the study area is located in the “Green Area”¹ of the province. The “White Area”¹ of the province contains most of the land suitable for cultivation. The majority of land within the Green Area is undesirable from an agricultural perspective and, as such, Canada Land Inventory (CLI) capability ratings for Agriculture are not available for this area.

3.1.1 Specific Concerns

ATCO Electric has considered the agricultural concerns outlined in AUC’s *Rule 007*. These concerns are listed below with commentary provided on some mitigation strategies for the potential impacts identified for this project.

a. Loss of Crops. This includes short-term loss caused by construction; longer-term losses possible from soil erosion, rutting, drainage, disturbance, and soil mixing; and permanent loss of crop area under or adjacent to the tower base

Short-term crop loss during construction is kept to a minimum with appropriate mitigation and construction practices. Any such short-term losses are compensated through damage payments to landowners. Any permanent loss of crop under or adjacent to the tower base is mitigated through consultation with landowners, routing along quarter lines or next to existing linear features and compensation by annual tower payments. Where reasonable, construction activities are avoided during preferred field work periods, namely seeding, harvesting and cultivations. Potential impacts may be further reduced by landowner input on tower placement.

b. Short-term disruption of farming and livestock grazing resulting from construction

These potential impacts are mitigated through appropriate construction practices and working with specific landowners to minimize any disruption.

¹ The White Area and Green Area are defined in the *Public Lands Operational Handbook*, December 2004, published by Alberta Sustainable Resource Development.

c. Reduced efficiency of field operations

This potential impact is mitigated through strategic tower placement. Long-term impacts are considered when determining annual structure payments for towers. The TFO should work with landowners to determine the most efficient location of structures where practicable to provide physical clearances that are safe across various types of access situations, allowing for agricultural patterns and topographical features.

d. Restrictions on use of aircraft and high pressure irrigation systems

The presence of a transmission line potentially impacts agricultural aircraft use, such as crop spraying. This, however, is landowner specific and any unavoidable impacts are considered when determining compensation payments for mitigations or impacts.

e. Risk of collision with tower; damage to equipment, lost time, liability for damage to tower and secondary liabilities

Landowner liability and indemnity concerns are covered in the Right-of-Way Agreement. In general, landowners are not liable for accidental damage to the transmission structures arising from permitted uses of the right-of-way, including the presence of farming equipment and livestock. If the transmission line is taken out of service by the damage, it is typically restored to service within 24 to 48 hours, so any disruption to farming activities due to repairs of the line and tower is short in duration. The potential of collision with a transmission tower is considered very low. Operating farming equipment around and under transmission lines is feasible, given the TFO's compliance with provincial and federal safety regulations requiring minimum ground clearances

f. Reduction in yield adjacent to towers due to overlapping farming operations and added soil compaction

Permanent loss of crop under or adjacent to the tower base is mitigated through working with specific stakeholders during the facility application consultation phase. This is addressed and compensated for through annual tower payments. Potential impacts are further reduced by landowner input to tower placement. Quantifying the amount of cropland and forage lands can be used as an indicator of the potential level of impact with cropland being the most significant indicator.

g. Added cost and inconvenience of weed control under towers

The added cost and inconvenience of weed control is compensated as part of the annual structure payments to landowners.

h. Impact of height restrictions on equipment during field operations

Operating farming equipment around and under transmission lines is feasible, when in compliance with provincial and federal safety regulations requiring minimum ground clearances. In the case of overhead lines, design standards should adhere to Canadian Standards Association Standard C22.3 ("CSA") and the Alberta Electrical Utility Code ("AEUC").

i. Psychological impact of line

This is a subjective impact involving factors such as visual impact, electric and magnetic fields (EMF), land values, and other issues, all of which are incorporated in the LIA. Concerns identified through consultation should be addressed during the facility application stage. Provision of unbiased

information around EMF research from national and international health and scientific agencies often helps address stakeholders' concerns.

j. Loss of shelter belts

Impacts to shelter belts can be mitigated through routing offsets relative to legal boundaries such as quarter-lines along which shelter belts may exist. Additionally, shelter belts may be used for livestock shelter. In some cases only trimming may be required while maintaining safe and reliable operation of the transmission line. Compensation for re-establishment of low shrubs once construction is complete is also an option. All of these are site specific and identified through consultation with the potentially affected landowner during facility application consultation.

k. Shared use with other utilities and transmission lines

Utilization of existing linear disturbances is a factor in the final determination of routing during the facility application stage, as per the Alberta Environment and Sustainable Resource Development's *R&R/11-03: Environmental Protection Guidelines for Transmission Lines* and the *Electric Utilities Act Transmission Regulation*. Paralleling existing linear disturbances is often preferred by government agencies and local jurisdictional authorities (e.g., Counties or Municipal Districts) in order to minimize fragmentation of the landscape.

l. Interference with citizen band radios

This is becoming less of an issue as Citizen Band (CB) radios are being replaced with newer technologies. However, CB radios operate at frequencies close to those of AM radios, neither of which are designed to be immune to power line interference. The interference produced by power lines diminishes with distance from the power lines, therefore interference is highly localized. All facilities will comply with federal guidelines related to radio interference.

Telecommunication towers must also be considered in the development of the system plans.

3.1.2 Indicators of Agricultural Impact

Agricultural land use is represented by cropland and forage. The project study area is located in the Green zone, adjacent to existing industrial developments and has no known grazing leases; therefore the project is anticipated to have limited agricultural potential and associated impacts. As part of the facility application process, the TFO should re-assess agriculture and/or grazing impacts that may occur from the project.

3.2 Residential Impact

Minimizing residential impact is an important consideration in the routing & siting of transmission facilities. There are sources of information that can be used to provide an indication of the potential residential impacts associated with the proposed system-development plan. These can include Municipal District and County maps, along with aerial photo and satellite image interpretation.

Residential impact is a significant factor in routing & siting for transmission facilities. This holds true for both rural and urban environments and residential properties. The study area is anticipated to have minimal residential impact as the project is located in the Green Zone and are adjacent to existing industrial developments. Due to the remote location of the Thickwood Hills study area, there may be trappers cabins in the vicinity of the study area. Additionally, because the study area is located adjacent

to existing industrial developments, there may be work camps in region. For the purpose of this LIA, the residential concerns as outlined in *Rule 007 NID 13* also apply to work camps and trappers cabins.

3.2.1 Specific Concerns

ATCO Electric has considered the specific residential concerns outlined in *Rule 007 NID 013* which are listed below with commentary provided on mitigation strategies and the identification of potential impacts for this project.

a. Decrease of property values

This is a very site-specific impact. As part of the facility application, a metrics assessment of the number potential residences within 150 m and 800 m of the project will be completed. For the purpose of this LIA, decrease in property value is not a concern at this stage as the study area is within the Green zone, adjacent to existing industrial developments and is primarily forested.

b. Loss of developable lands and constraints on development

Development tends to happen in proximity to existing developed (urban) areas, i.e., residential density is a measure of potential impact. Therefore, minimizing routing & siting in areas of existing residential density may help avoid areas with the highest development potential.

c. Relocation or removal of residences

A preliminary determination of potential residences within 150 m can be used as a general indicator of the potential level of impact. However, at this preliminary stage of evaluation this is difficult to assess, and should be assessed during the facility application process.

d. Psychological impact of the line

This is a subjective impact involving factors such as visual impact, EMF, land values and other issues, all of which are incorporated in the LIA and are addressed in the facility application. Provision of unbiased information around EMF research from national (e.g., Canadian Electricity Association) and international health and scientific agencies (e.g., World Health Organization) often helps address some stakeholders' concerns.

e. Noise and television interference

TV reception problems related to high-voltage transmission lines are unlikely. If interference does occur, it can often be resolved by relocating the TV or changing the antennae. The transmission lines are designed to meet allowable audible noise and TV interference. Where individual landowners are concerned, measurements will be taken before and after construction so that signal interference beyond allowable levels can be identified and mitigated. As these types of concerns tend to be associated with residences, the number of residences within 150 m can be used as an indicator of the potential level of impact.

f. Windbreak and other vegetation removal

This is an issue where the removal or trimming of trees or other vegetation may be required when establishing a new ROW. It is also important to note that the overall impact is considered in making compensation payments for towers and land rights. This is site-specific and determined in consultation with the potentially affected landowner at the facility application stage.

g. Conflict with recreational use of land holdings

The proximity of known recreational areas, such as parks and natural areas, can be used as a preliminary indicator of potential impacts. There may be recreational development within the study area, including various disposition holdings that will be considered during the facility application process. There are multiple ESAs and AESAs within the study area [Table 1, Attachment 2, Drawing 02d and Attachment 3, Drawing 03b].

h. Public versus private land

Landowners may view the use of public land as a preferable alternative to using private lands. Existing data sources can provide a general indication of the amount of public (“Crown”) versus private land, providing an indicator of the potential level of impact. The majority of public land is located within the Green Area of the province, while the majority of private lands are located within the White Area. The project study area is located in the Green Area where the predominant land use is forestry and oil and gas development.

3.2.2 Indicators of Residential Impacts

The City of Fort McMurray is located east of the Thickwood Hills transmission development study area. Given that the study area is located in the Green Zone and none of the study area is located in rural residential areas, concerns surrounding the direct impact of the facilities on residences are not anticipated [Attachment 1 Drawing 01]. As part of the routing & siting activities of the facility application process, the TFO should undertake a comprehensive assessment of potential residential impacts due to the project.

3.3 Environmental Impacts

Analysis of existing data sources provided a generalized indication of the potential environmental issues and relative impacts that may occur within the system-development plan. These impacts should be assessed in greater detail as part of the facility application process.

Potential environmental impacts from transmission lines are a concern for a variety of stakeholders. Efforts to minimize such environmental impacts factor into the assessment of the potential routing and potential mitigation measures for transmission lines. Large scale land use, including the presence of environmentally significant areas and aquatic environmentally significant areas within the study area, has been considered during assessment as part of this LIA.

The planned line and substation facilities can be built in numerous locations within the study area and will have some level of environmental impact. As part of the detailed routing & siting activities of the facility application process, the TFO should undertake a comprehensive assessment of potential environmental impacts due to the project. At this stage, various planning, routing, and construction techniques to eliminate, mitigate, or minimize the overall potential impact should be considered.

3.3.1 Specific Concerns

As per *AUC Rule 007 NID 13*, ATCO Electric has considered the specific environmental concerns. These concerns are listed below with the identification of potential impacts and associated mitigation strategies.

a. Increased public accessibility to wildlife areas

Typically, this is an issue for forested areas where there is currently little to no existing access. Should issues of access be identified, during the consultation phase of the facility application process, the TFO

should work with the stakeholder to address their concerns where possible. Paralleling existing linear development can also reduce some of the potential access concerns associated with new facilities. The proximity of known wetlands and large treed areas can be determined using existing data sources, and can provide a general indication of the potential for an increase in the level of public access. Wetlands can be found in the study area and potential impacts to these should be considered during the facility application process.

b. Alteration of natural areas and interference with outdoor educational opportunities

The number of protected or designated areas can be determined using existing data sources. This can provide a general indication of the potential level of this impact. Since the project study area is located entirely on Crown land, these lands may be used for outdoor educational opportunities. Should the issue of interference with outdoor educational opportunities arise during the consultation phase of the facility application process, the TFO should work with the stakeholder to address their concerns where possible. There are no provincial parks or recreational areas identified within the study area [Attachment 1, Drawing-01]. Specific areas of traditional land use that may involve traditional educational components should be further defined through consultation with First Nations groups as part of the facility application process.

c. Use of the Restricted Development Area

While the utilization of existing areas set aside for utility developments such as transmission lines is preferable, the closest Transportation Utility Corridors (TUCs) are located around the cities of Edmonton and Calgary. The location of the TUCs in relation to the project study area removes TUC's from consideration as components for future routing.

Within the Thickwood Hills study area there is an existing disposition for provincial roadway development. This development may impact potential routing & siting of project facilities. As part of the facility application process, the TFO should assess and incorporate current and future planning developments into the routing & siting stage where reasonable [Attachment 2, Drawing 02a].

d. Effect on erosion

There is potential to affect erosion if areas near surface water or on slopes are disturbed. Where possible, the TFO should attempt to avoid areas that pose potential erosion problems and should be considered further during the facility application stage. If they cannot be avoided, then the intent should be to work with associated regulatory agencies and other stakeholders to develop appropriate mitigations and construction practices to minimize potential impacts.

e. Unique ecological areas

There are no Key Wildlife Biodiversity Zones, National or Provincial Parks within the Thickwood Hills project study area. However, within the Thickwood Hills study area, the western portion of the study area lies within caribou habitat. In addition, there are three creek crossings: Parsons Creek, Little Fishery Creek and Conn Creek, as well as the boreal forest in which the project is located. These should be considered further in the routing & siting stage of the facility application. As described in Table 1, there are multiple ESAs and AESA found in the study area. ESAs are also found through the study area, and are listed based on several criteria, including containing elements of conservation concern, containing rare or unique landforms, containing habitat for focal species and wildlife, and containing large natural areas and sites of recognized significance [Attachment 2, Drawing 02d].

3.3.2 Indicators of Environmental Impacts

Surface water bodies (creeks and a lake), wetlands, ESAs, AESAs and forested areas are all found within the Thickwood Hills study area. While the creek crossings may be avoided, where the transmission lines, substation site and future development area is located should be determined during the routing & siting portion of the facility application stage. Options to reduce or mitigate these impacts will need to be considered when routing or siting the project.

Since the Thickwood Hills study area partially lies within an ESA, AESA and caribou habitat, impacts associated with timing restrictions may have to be considered during the routing & siting stage of the facility application process should any of these areas be impacted. Appropriate mitigation measures should be developed and implemented for management of these impacts related to the line and substation site at the detailed planning stage.

The Thickwood Hills study area partially lies within a number of Protective Notations. As part of the routing & siting stage of the facility application, should any of these areas be impacted, appropriate mitigation measures should be development and implemented.

The Forest Capability Class can also provide an indication of the general quality of the land in relation to forest growth. Forest Capability Classes 1-3 generally represent the larger, older forest types, while Classes 4-7 would be smaller, younger or less productive areas from a forest growth perspective. This is applied in forested areas, known as the “Green Area”. The project areas under consideration are located in the “Green Area.” The Thickwood Hills transmission development portion of the study area is located within Classes 4, 5, 6 and 7 forests [Attachment 2, Drawings 02b]. For the selection of the 240-kV substation site and future development site, the TFO should attempt to locate the substation within an area of suitable surface conditions (level topography, well drained soils) where reasonable. Substation and future development siting should occur during the facility application process.

3.4 Cost

In support of the AESO’s Needs Identification Document (NID) submission, ATCO Electric will undertake an assessment of cost considerations for project. Refer to the NID Estimate Report and covering letter for further information.

Costs should be further considered as part of the facility application once detailed routing & siting activities have commenced.

3.5 Electrical Considerations

Electrical considerations play an important role when assessing potential impacts associated with the proposed system development. While the technical considerations, such as transfer capability, system flexibility, system reliability and losses are considered by the AESO separately, some land impacts related to electrical considerations can be identified. Technical requirements and the other electrical considerations associated with the plan can affect the presence or level of impacts on the land.

3.5.1 Specific Considerations

ATCO Electric has considered the specific electrical concerns outlined in *AUC Rule 007 NID 13*. These concerns are listed below with commentary provided on mitigation strategies and the identification of potential impacts.

a. Ease of connections to future load areas

This relates to electrical capacity, location of the facilities and the type of technology used (overhead vs. underground). This specific concern does not have a direct land impact for purposes of this study and will be considered by the AESO separately.

The Thickwood Hills substation study area was selected to be sufficiently broad to allow ease for connection of future loads.

b. Reliability and repairability of the line

The reliability and maintenance of a line as it relates to the specific technology being considered does not have any impact from a land perspective. However, paralleling certain existing linear developments can provide better access, thus improving the ability to repair the line in a timely fashion. Paralleling certain linear developments can also potentially reduce impacts associated with the amount of adjacent trees, resulting in greater transmission line reliability as the potential for faults caused by falling trees is reduced. The Thickwood Hills transmission development transmission line routing is anticipated to parallel an existing utility corridor where reasonably possible.

Wet soil conditions can present difficulties for future maintenance; however, since wet soils are common in the study area, they may be difficult to avoid. Wet areas should be considered during the facility application stage.

c. Access for construction and maintenance of the line

Since paralleling major roads and/or existing linear developments (cut lines, pipelines, distribution lines and transmission lines) can provide existing access, this can reduce potential access concerns associated with access to new facilities. The transmission line routing is anticipated to parallel an existing utility corridor where reasonably possible. Routing & siting opportunities adjacent to other linear developments should be considered during the facility application stage.

3.5.2 Electrical Indicators

ROW lengths that parallel existing transmission lines or other linear developments (such as pipelines) are high-level indicators of electrical factors. The length of the transmission line is a cost driver that can be used in line loss calculations by the AESO. Further consideration should be given at the facility application stage.

3.6 Visual Impacts

Visual impacts are generally considered a social impact and are difficult to quantify and relatively subjective. Visual impacts are closely related to residential impacts as they are typically influenced by similar factors, particularly the aesthetics of transmission lines and tower structures. However, visual and other impacts may be experienced by other stakeholder groups, such as recreational users (hikers, fishermen, hunters, etc.), recreational installations, and back-country access roads.

There are some general assumptions regarding visual impacts that are relevant to all overhead transmission lines:

- The closer the line is to a residence, the more likely a visual impact will be perceived.
- The higher the residential density, the more likely a visual impact will be perceived.

- Paralleling similar, existing transmission facilities has a lower visual impact than a new greenfield ROW where there is no existing line. Double-circuiting on tower structures helps to reduce impacts to land base and aesthetic considerations.
- Close proximity to parks, natural areas, and other recreational areas, can be viewed as creating a higher degree of visual impact than in other less frequented areas.
- Avoiding hilltops, ridges, and other topographic features, reduces the potential level for visual impact, particularly when these features serve as local vistas.

The Thickwood Hills substation siting and transmission line routing involve opportunities to locate in proximity to an existing utility corridor therefore reducing the visual impact.

3.6.1 Specific Concerns

ATCO Electric has considered the specific visual concerns outlined in *AUC Rule 007 NID 13*. These concerns are listed below with commentary provided on mitigation strategies and the identification of potential impacts for this project.

a. Visual impact of tree removal as seen from roads and recreational installations

Many stakeholders view the removal of trees as a visual impact. The study area for this project involves the Green Area of the province. The Canada Land Inventory (Forest Capability) data provides an indication of where forested lands occur. The amount of forested area crossed by a particular alternative may be considered a potential indicator of visual impact. As part of the facility application routing & siting activities, an assessment of tree removal should be undertaken.

b. Visual impact on dispersed recreational users such as hikers, fishermen, hunters, scenic viewers, and cross-country skiers

An assessment of areas frequented by recreational users was considered as part of this LIA. While there were no Parks and Protected Areas found within the study area, these considerations should be re-assessed during the facility application stage. Should concerns of visual impact on dispersed recreational uses arise during the consultation phase of the facility application, the TFO should work with the stakeholder to address their concerns where possible.

c. Visual impact of towers and lines as seen from residences, farms, roads, and recreational installations

Number of residences can provide an indication of potential visual impact. Additionally, the type of tower being proposed can impact the potential level of visual impact. Where reasonable, visual impacts can be reduced through adjusting structure placement to reduce visibility of specific structures from residential vantage points.

Given the study area is located in the Green Zone of the province and is located adjacent to existing industrial development, concerns with visual impacts are not anticipated to be a significant concern. As part of the facility application, an assessment of visual impacts should be undertaken.

3.6.2 Indicators of Visual Impact

Visual Impacts are closely related to residential development, the presence of existing transmission lines, and the presence of recreation areas in the study area.

Since the project study area is remotely located and located adjacent to existing industrial development, it is anticipated that the visual impact will be low. During the facility application stage, recreational areas within the study area should be further considered.

3.7 Special Constraints

Special constraints are issues or factors that may impact potential routing & siting options for the study area. Using existing sources of available data, there are several special constraints that have been identified for the study area.

3.7.1 Specific Concerns

a. Electrical interference with radio transmitting stations and other telecommunication equipment

Transmission lines have been known to cause some interference with AM radio and analog TV reception. The type of interference is usually limited to receivers directly located beneath the transmission line and diminish very quickly with distance from the line. Communication devices such as satellite TC, FM radio, cellular phones and wireless internet operate at much higher frequencies and rarely experience interference from transmission lines.

Transmission lines are to be designed to meet all Canadian and Alberta electric codes with respect to communications interference. Should reception issues arise as a result of the facilities, the TFO should work with Industry Canada to resolve the problem.

3.7.2 Other Special Constraints

Within the project study area, the ATCO Electric has considered a number of additional special constraints that can be associated with *AUC Rule 007 NID 13* as a specific concern.

a. Proximity to Historical Resources

Historical resources are specific sites (given an associated Historical Resource Value - HRV) which have been identified within the province and hold particular archaeological, or historical and cultural significance. Alberta Culture (AC) maintain a registry of known locations and depending on the significance of a particular site, there may be constraints placed on nearby planned developments or disturbances. *Historical Resources Act* clearance for development should be obtained as part of the facility application process.

b. Oil and Gas

Oil and gas is a major land use in this area of the province. While there are no surface minable areas within the project study area, oil sands leases are widespread and pipelines are a common feature on the landscape. Conflicts with oil and gas facilities on transmission ROWs can be mitigated by avoidance.

c. Mine Sites

There are no mine sites within the study area; however, there is one oil sands mining and dry tailings disposition in the northern extent of the study area. Should conflicts with mine sites or the tailings disposition arise, impacts can be mitigated by avoidance and/or consultation with the potentially affected stakeholder.

d. Proximity to Major and Minor Airports

The presences of airports, airstrips and aerodromes present a challenge for routing since each have a specific setback. The conflicts range from collision hazards to potential radio and navigational equipment interference. Based on the available information, there are no airport, airstrips or aerodromes within the study area; however, these features may be present outside of the study area. As part of the facility application process, the TFO should undertake an assessment of aerodromes within the study area.

e. Proximity to Indian Reserves and Metis Settlements

This involves determination of the proximity or likelihood of crossing through Indian Reserves. ATCO Electric has considered this factor as part of this LIA and there are no Indian Reserves in the study area.

f. Proximity to Military Bases and Military Lands

This involves determination of the proximity or likelihood of crossing through a Military Base in the project study area. ATCO Electric has considered this factor in this LIA and there are no Military Bases or Military Lands within the project study area.

g. Proximity to Cemeteries

This involves determination of the proximity or likelihood of crossing through cemeteries in the project study area. ATCO Electric has considered this factor; however, there were no databases or information sources available at the time of the LIA. This should be considered further at the facility application stage.

3.7.3 Indicators of Special Constraints

With the information available during the LIA process, oil and gas development, an oil sands mining and dry tailing disposition, historical resources and forestry have all been identified within the Thickwood Hills study area [Attachment 2, Drawings 02a, 02b and 02c]. These constraints may not be avoidable; however, impacts will need to be reduced or mitigated when considering any routing or siting for the project at the facility application stage. Given the northern extent of the oil sands tailings disposal facility, it is anticipated the proposed project should not impact this facility.

3.8 Lower Athabasca Regional Plan (LARP)

The project study area is within the LARP boundary. As part of the facilities application process, the TFO should undertake a detailed analysis of how the project will align with the “Regional Outcomes” outlined within the LARP (Government of Alberta 2012). General outcomes and a description of the future project’s compliance are listed below

- The economic potential of the oil sands resource is optimized.
 - The development of electric transmission infrastructure is required to enable the operation and expansion of oil sands production in the region.
 - The project will be developed through extensive consultation with oil sands producers in the region, as well as other industrial land users.
- The region’s economy is diversified.
 - New electrical infrastructure development creates increased opportunity and support for other industrial connections within the region.

- Construction, operation and maintenance employment opportunities relating to the new infrastructure are anticipated to be created by the project.
- Landscapes are managed to maintain ecosystem function and biodiversity.
 - Extensive consultation and planning efforts will be applied during project development to ensure compliance with AESRD's best management practices and recommendations.
 - Desktop analysis will be completed during the planning phase to identify routing & siting opportunities and constraints. Prior to construction, field surveys to identify wildlife, vegetation, soil and waterbodies should be conducted during the planning process to provide guidance for the necessary mitigation measure to minimize impacts to ecosystem function and biodiversity.
 - Where practical, the project footprint will be located adjacent to existing industrial disturbance and access to minimize disturbance to natural systems in the study area.
- Air and water are managed to support human and ecosystem needs.
 - As part of the facility application stage, an assessment of the project to impact ambient air or water quality in the region should be undertaken.
- Infrastructure development supports economic and population growth.
 - Expansion of the Alberta Interconnected Electric System in the region will provide increased opportunity for economic and population growth by aiding electrical connections for similar developments.
- The quality of life of residents is enhanced through increased opportunities for recreation and active living.
 - Recreation opportunities in the area will be considered during the facilities application stage. This included a strategy of general avoidance of existing recreation areas, parks, scenic vistas and ESAs. Although a portion of the project study area abuts or intersects AESAs and/or ESAs, the Thickwood Hills transmission development project should route parallel to existing industrial land use where feasible and site substation facilities such as to reduce new clearing and new access to AESAs [Attachment 2, Drawing 02d].
- Inclusion of aboriginal peoples in land-use planning.
 - The TFO should place a very high priority on developing and maintaining positive and collaborative relationships with aboriginal peoples. This initiative factors heavily in the planning stages of transmission projects.
 - As part of the facility application stage, extensive in-person consultation should be undertaken with identified aboriginal communities. Feedback should then be incorporated into project planning and consultation should continue throughout the planning and construction of the project.
 - Impact to traditional land use can be minimized by siting the project adjacent to existing industrial land use.

- The proposed location also meets the objective of following Integrated Land Management (ILM) principles and approaches through co-ordinated industry planning of associated infrastructure on public lands. This is also consistent with the LARP intent of minimizing land disturbance.

The proposed location of the project will also assist in the implementation of the Comprehensive Regional Infrastructure Sustainability Plan (CRISP) for the Athabasca Oil Sands Area by supporting additional industrial and commercial development in the immediate vicinity of Fort McMurray.

The proposed location of the project does not fall in any of the new conservation areas or provincial recreation areas so it will not negatively affect these newly zoned lands, as specified in the LARP.

The project does not include any equipment that would affect ambient air quality.

Depending on the location of final routing & siting, the project may require the use of surface water for the purpose of freezing in access roads and temporary work space. Depending on weather and ground conditions, the TFO may withdraw water to assist freezing in work areas. If this is required, the TFO should obtain the necessary regulatory approvals, and if necessary, implement sediment and erosion control measures to protect ambient surface water quality.

The project does not require the use of groundwater and will therefore not affect ambient groundwater quality.

The Regional Municipality of Wood Buffalo's Municipal Development Plan (MDP) includes Regional Growth Management Directions. Direction 3.1 states that the municipality will work with the Province of Alberta to support integrated resource management and planning practices. Further, the municipality aims to limit development along streams, lakes, rivers, and other environmentally sensitive areas. The project supports the MDP.

4 ASSESSMENT OF COMPONENTS

This section assesses the Thickwood Hills transmission development system components according to indicators derived from the major land impact aspects of AUC *Rule 007 NID 13*. A discussion of the major aspects and the selected indicators is presented in Sections 3.1 to 3.7. Those representative indicators are used below to characterize the potential impacts of each component of the system plan.

The proposed Thickwood Hills transmission development consists of three components: Thickwood Hills 951S substation, double-circuit 240-kV transmission line 9L01/9L30 and an in/out connection on existing 240-kV transmission line 9L07.

Assumptions

To date, the location for the termination point of existing 9L01, termination for in/out connection for existing 9L07, Thickwood Hills 951S substation and future 500-kV development have not been determined. As per the AESO LIA Study Scope Document, the substation location is assumed to be approximately 20 km south of the confluence point of existing transmission lines 9L01, 9L58 and 9L07. Termination for existing 9L07 is dependent on the location of the proposed Thickwood Hills 951S substation; as such, routing of each new segment of 9L07 and 9L68 has not been determined.

While the exact location of the termination point of existing 9L01 has not been determined, for the purposes of this LIA the termination point is assumed to be at the confluence of existing single-circuit transmission lines 9L01, 9L58 and 9L07. A final route for proposed double-circuit transmission line 9L01/9L30 has not been selected; however it is assumed to be parallel existing 9L07 transmission line ROW.

To allow for sufficient access and increased opportunity for reduced access road development, the substation study area is located near Tower Road west of the City of Fort McMurray. This meets the AESO assumptions to site the substation approximately 20 km south of the confluence point of existing transmission lines 9L01/9L58 and 9L07. The City of Fort McMurray provides services to the local community and supports oilfield activities. As part of the facility application stage, a 240-kV substation site and 500-kV future development site should be selected where they best meet general routing & siting criteria. Where feasible, the substation site should be located near existing linear and industrial development while allowing for adequate land requirements.

Features

There are three named and numerous unnamed creeks within the study area. The proposed transmission development study area is in a remote location where wetlands and watercourses are abundant. Wetlands cover approximately 18% of the study area [Table 1 and Attachment 2, Drawing 02a]. There is potential for the transmission development to traverse or impact wetlands, however there are non-wetland areas present in this area. There is significant opportunity to minimize impacts through routing & siting adjacent to or parallel to existing linear development and avoiding large areas of wetland sensitivity.

Forestry and oil and gas exploration and associated development is common throughout the region, as is related infrastructure (well sites, pipelines, cutblocks and oil and gas surface facilities).

The study area is located within the Boreal Forest Natural Region – Central Mixedwood Subregion. The study area is a mosaic of forested and non-forested industrially developed Crown land with generally flat to rolling terrain dominated by forested uplands but including extensive areas of muskeg (peat

forming organic soils) in low areas The dominant land use in the study area is forestry, transportation, wildlife hunting and trapping, oil and gas transmission and utilities with related roadway. electrical transmission and pipeline infrastructure.

The study area is located within the Wabasca Lowland ecoregion. This ecoregion encompasses the undulating lowlands of north-central Alberta and forms a portion of the continuous mid-boreal mixed forest extending from northwestern Ontario to the foothills of the Rocky Mountains. The ecoregion is classified as having a sub-humid mid-boreal ecoclimate. Medium to tall, closed stands of trembling aspen, balsam poplar, white and black spruce, and balsam fir that occur in late successional stages, are abundant. Cold and poorly drained fens and bogs are covered with tamarack and black spruce. The low-relief plain is rather poorly drained, and organic materials cover approximately 50% of the area. Organic soils are dominant in the region. The whole of the region slopes gently and drains northward via the Athabasca River and Wabasca River.

ESAs of provincial significance and AESAs cover approximately 18% and 29% of the study area, respectively. While the ESAs are found in the southern extent of the study area, AESAs are found throughout [Table 1 and Attachment 2, Drawing 02d]. No ESAs of national significance are located within the study area, Land is primarily owned by the Crown (Provincial Government).

Forest Capability Classes 4 and 6 exist throughout the study area, while Class 7 exists in the southwestern area and Class 5 in the southeastern area. Caribou habitat is located in the south and western portion of the study area and covers approximately 16% of the study area [Table 1 and Attachment 2, Drawing 02b]. There is a historical resource HVR value 4 located in the western portion of the study area adjacent to the existing Thickwood Hills forestry tower. There are no surface minable areas or airports within the study area [Attachment 2, Drawings 02b and 02c].

Given siting for the proposed 240-kV substation site and 500-kV future development site will require a large amount of land, finding suitable site locations that account for variable topography and potential impacts to wet soils will require special consideration during the detailed routing & siting phase of the facility application.

5 RESULTS AND CONCLUSIONS

After review of the available data, the application of suitable indicators and assessment of the project and study area, it was determined that the potential for project impacts exists. It is found, however, that there are no obstacles or anticipated impacts that would preclude the developments as scoped.

The study area is located in the Green Zone and is forested. The following features were considered as part of the land impact assessment process:

- Agriculture;
- Wetlands;
- Wildlife (caribou habitat);
- Residences and workcamps;
- Provincial and National ESAs;
- AESAs;
- Provincial and National Parks;
- Historical resources;
- Oil and Gas development;
- Mine sites;
- Airports; and
- Other existing and planned linear developments (pipeline, transmission line, roadways).

After completing a desktop assessment of various features within the project study area, there are few risks associated with the viability of the system development plan. During the routing & siting stage of the facility application process, potential impacts to these features can be reduced through avoidance or mitigation. An effects assessment of the project components identified the following potential impacts:

- Thickwood Hills transmission development – the double circuit transmission line will parallel an existing utility corridor where feasible, resulting in decreased impacts. The substation study area is defined to maximize usage of an existing road to decrease impacts associated with access road construction. Additionally, this study area has been selected to reduce the overall amount of new transmission line construction while allowing for adequate consideration of a substation site and a future development site. This transmission development component may impact multiple unnamed and named water crossings, caribou habitat, wetlands, AESAs, ESAs, PNTs, historical resources, future roadway development and oil and gas development.

Within the Thickwood Hills study area, given the high probability of impacting wet areas, watercourse crossings and caribou habitat, winter construction may be required. Should caribou habitat be impacted, a Caribou Protection Plan will be required. An assessment of mitigation techniques and timing restrictions should be further assessed at that time.

For Thickwood Hills transmission development, finding a suitable route for each transmission line component and siting for each the 240-kV substation site and a future development site will require careful consideration of multiple constraints discussed within this LIA. However various mitigation options are available and consultation with various stakeholders can reduce these impacts. Through balancing these components, a number of viable routing & siting options can be developed.

As part of the facility application stage, the TFO should undertake a comprehensive participant involvement program with various stakeholders including agency, industry and private landholdings. The participant involvement program should also involve an assessment of aboriginal communities potentially impacted by the project and extensive in-person consultation will be undertaken with these communities. Feedback should be incorporated into project planning and consultation is considered to be ongoing. Impact to traditional land use can be minimized by siting the project adjacent to existing industrial land use.

The limitations for assessment and conclusion are based on a desktop assessment of various data sets to understand the potential impacts of the proposed developments within the project study area. This study area were defined based on assumptions outlined in the AESO's LIA Scope of Work Document. A major limitation of this LIA is that detailed routing & siting activities within the study area have not been completed. As part of the facility application process, the TFO should re-assess these components as well as other components as defined within *Rule 007* for the proposed development. Once routing & siting activities have commenced and project specific impacts are defined, options for mitigation and avoidance can be explored.

6 ACRONYMS

AESA	Aquatic Environmentally Significant Area
AESO	Alberta Electric System Operator
AC	Alberta Culture
AESRD	Albert Environment and Sustainable Resource Development
ATCO Electric	ATCO Electric Ltd.
AUC	Alberta Utilities Commission
CLI	Canada Land Inventory (Land Capability for Agriculture, Forestry, Wildlife or Recreation)
EIA	Environmental Impact Assessment
ESA	Environmentally Significant Area
HRV	Historical Resource Value
km	Kilometre
kV	Kilovolt
LIA	Land Impact Assessment
m	Metre
NID	Need Identification Document
PNT	Protective Notation
ROW	Right-of-Way
TFO	Transmission Facility Owner

7 INFORMATION SOURCES

Alberta Environment and Sustainable Resource Development (AESRD). R&R/11-03: Environmental Protection Guidelines for Transmission Lines. Available online at: <http://environment.gov.ab.ca/info/library/6845.pdf>

Alberta Utilities Commission (AUC). 2013. AUC Rule 007: Rules Respecting Applications for Power Plants, Substations, Transmission Lines, and Industrial System Designations. September 1, 2013. Calgary, Alberta. Available online at: <http://www.auc.ab.ca/acts-regulations-and-auc-rules/rules/Documents/Rule007.pdf>

Alberta Culture (formerly Alberta Culture and Community Spirit) Historical Resources Management Branch. 2012. “**Listing of Historic Resources**”
<http://www.culture.alberta.ca/heritage/resourcemanagement/landuseplanning/default.aspx>

Agriculture and Agri-Food Canada. 2013. National Ecological Framework for Canada. Available online at: <http://ecozones.ca/english/>

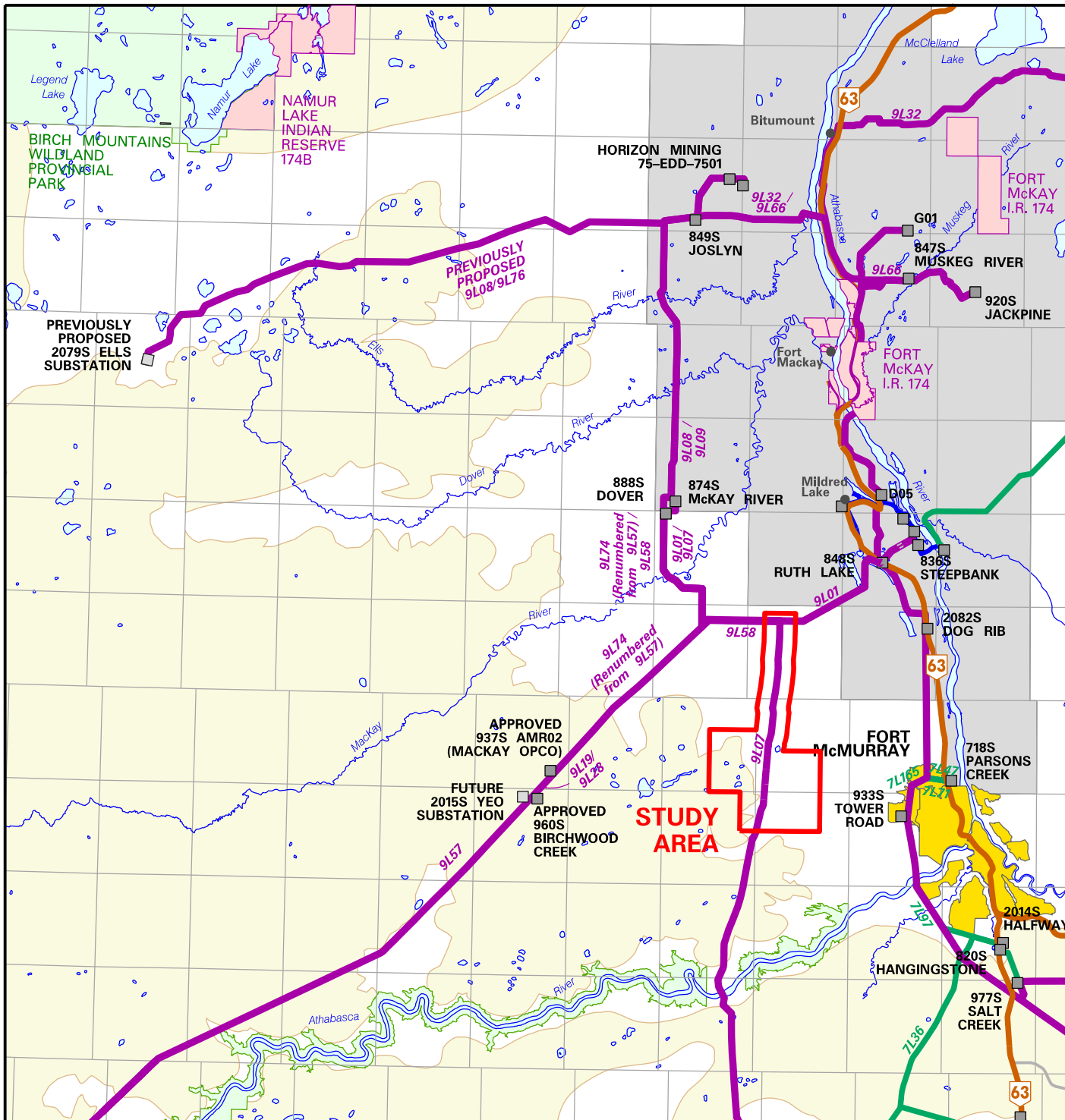
FIERA Biological Consulting Ltd.. 2010. “**Aquatic Environmentally Significant Areas in Alberta**”.
<http://www.albertaparks.ca/media/2346453/03%20-%20ESA%20Section%201%20-%20%20Introduction.pdf>

FIERA Biological Consulting Ltd. “**Environmentally Significant Areas – Provincial Update 2009**”
<http://tpr.alberta.ca/parks/heritageinfocentre/environsigareas/docs/04%20-ESA%20Boreal.pdf>

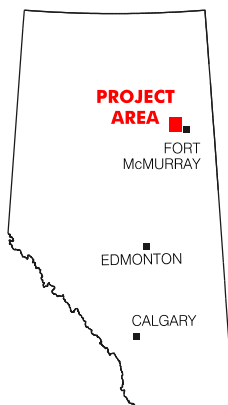
ATTACHMENT 1

FORT MCMURRAY AREA TRANSMISSION DEVELOPMENT AREA MAP

- Regional Map..... Drawing RS-FMATD-LIA-01



- Existing Substation
- Future Substation
- Existing 240 kV Transmission Line
- Existing 144 kV Transmission Line
- Existing 72 kV Transmission Line
- Caribou Range
- Oilsands ERCB Surface Mineable Area



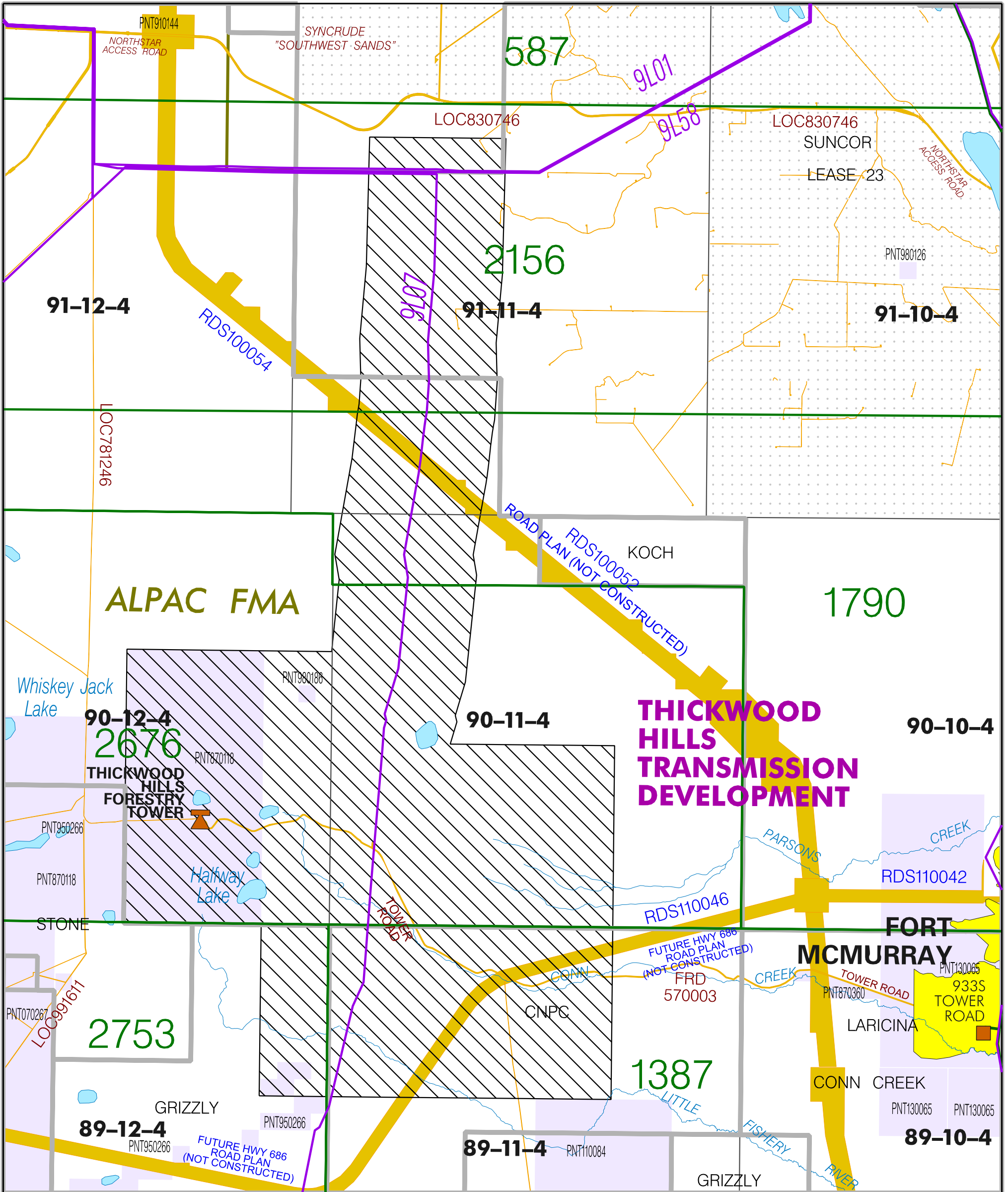
Fort McMurray Area
Transmission Development
Area Map
Thickwood Hills

REGIONAL MAP
ATTACHMENT 1

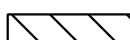




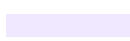

ATTACHMENT 2

THICKWOOD HILLS TRANSMISSION DEVELOPMENT STUDY AREA MAPS

- Constraints Map – Land Use..... Drawing RS-FMATD-LIA 02a
- Constraints Map – Forest Land Capability & Wildlife..... Drawing RS-FMATD-LIA-02b
- Constraints Map – Historical Resource Value & Wetlands..... Drawing RS-FMATD-LIA-02c
- Constraints Map – Environmentally Significant Areas..... Drawing RS-FMATD-LIA-02d



LEGEND

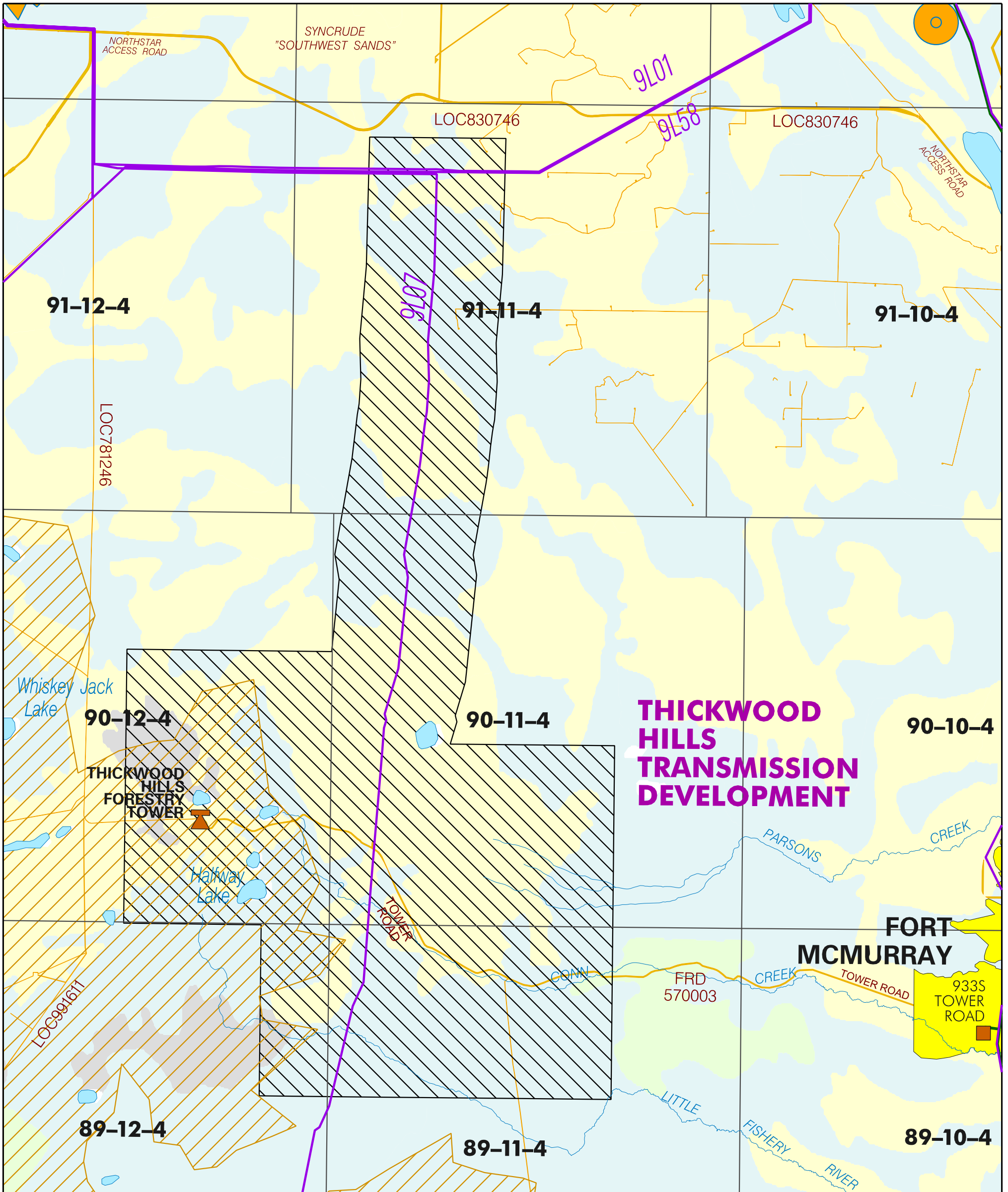
-  STUDY AREA
-  EXISTING TRANSMISSION LINE
-  OIL SANDS LEASE BOUNDARY
-  OIL SANDS ERCB SURFACE MINEABLE AREA
-  ROAD PLAN
-  FUR MANAGEMENT BOUNDARY
-  PROTECTIVE NOTATION



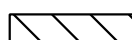

THICKWOOD HILLS TRANSMISSION DEVELOPMENT STUDY AREA MAPS

LAND USE ATTACHMENT 2



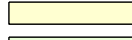
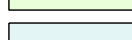

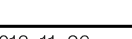




LEGEND

-  STUDY AREA
-  EXISTING TRANSMISSION LINE

-  ROAD PLAN

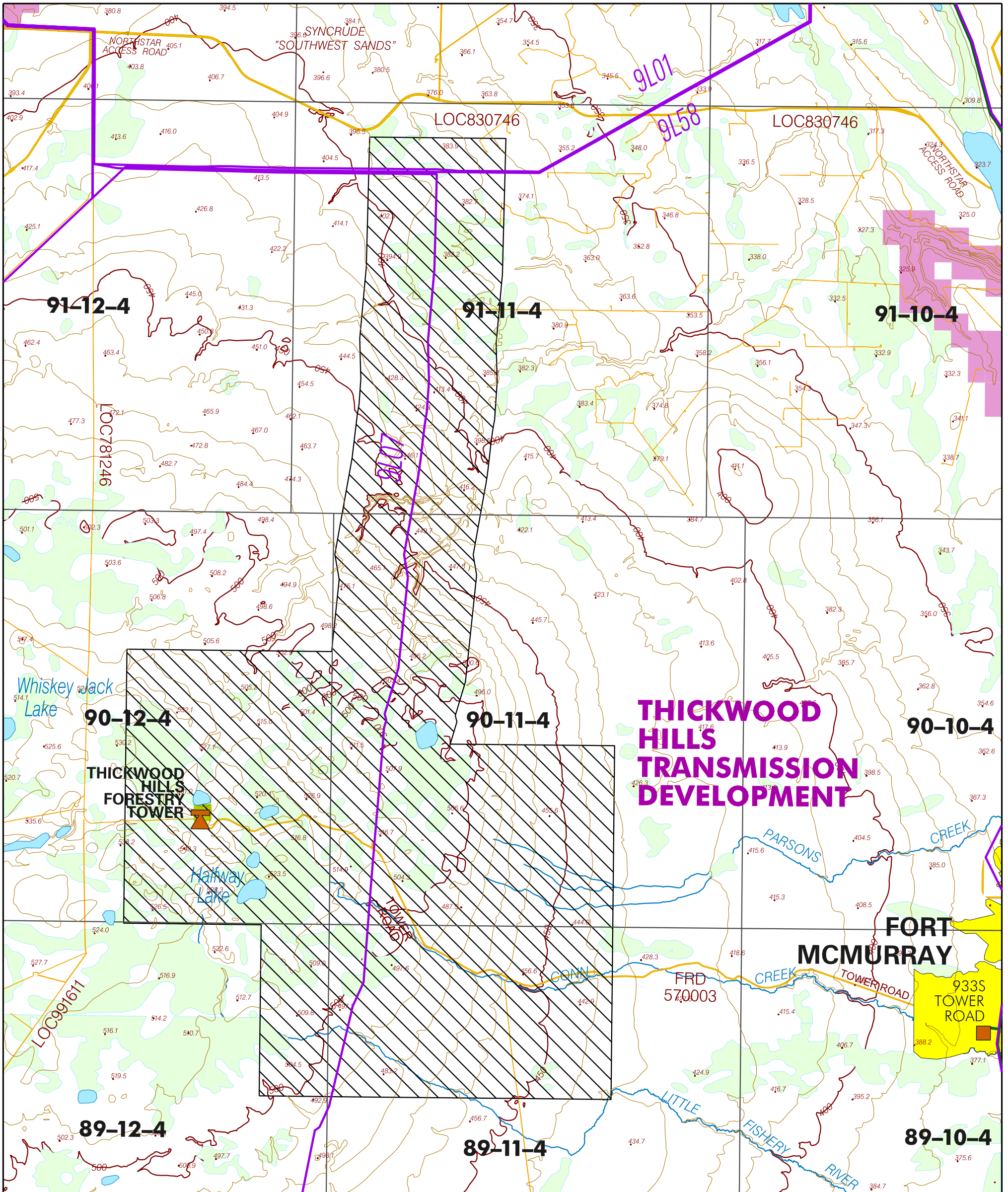
-  WILDLIFE AREA: CARIBOU ZONE
-  WILDLIFE AREA: SHARP TAILED GROUSE
-  CLASS 4 - LANDS HAVING MODERATELY SEVERE LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS.
-  CLASS 5 - LANDS HAVING SEVERE LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS.
-  CLASS 6 - LANDS HAVING SEVERE LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS.
-  CLASS 7 - LANDS HAVING SEVERE LIMITATIONS WHICH PRECLUDE THE GROWTH OF COMMERCIAL FORESTS.



THICKWOOD HILLS TRANSMISSION DEVELOPMENT STUDY AREA MAPS

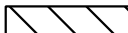
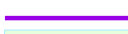




FOREST CAPABILITY & WILDLIFE ATTACHMENT 2





THICKWOOD HILLS TRANSMISSION DEVELOPMENT

LEGEND

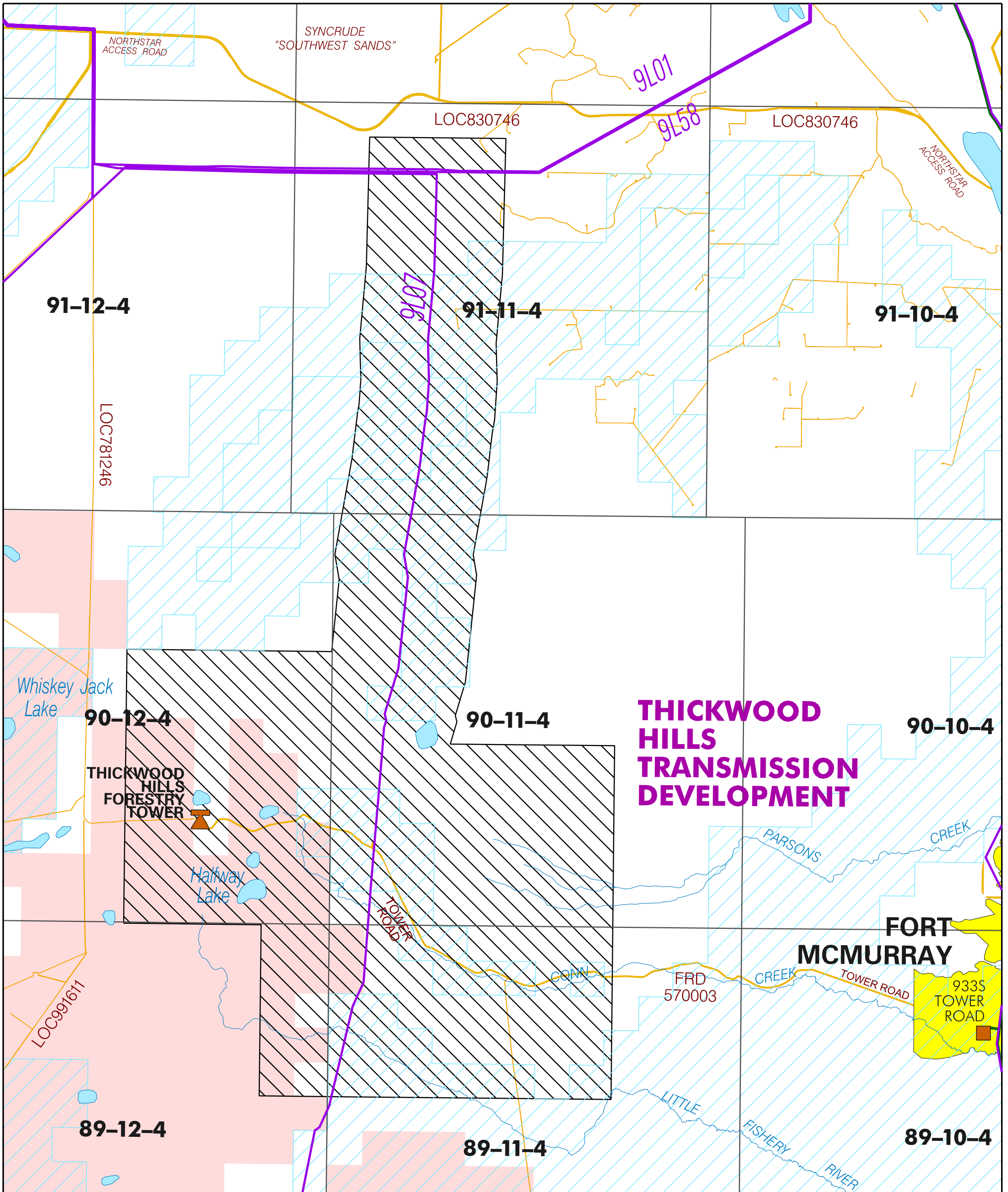
-  STUDY AREA
-  EXISTING TRANSMISSION LINE
-  WETLANDS (CANVEC)
-  ROAD PLAN
-  A HRV VALUE OF 4 APPLIES TO SITES STILL REQUIRING STUDY.
-  A HRV VALUE OF 5 APPLIES TO AREAS OF HIGH POTENTIAL FOR HISTORIC RESOURCES.



THICKWOOD HILLS TRANSMISSION DEVELOPMENT STUDY AREA MAPS

HISTORICAL RESOURCE VALUE & WETLANDS ATTACHMENT 2

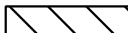








THICKWOOD HILLS TRANSMISSION DEVELOPMENT

FORT MCMURRAY

LEGEND

-  STUDY AREA
-  EXISTING TRANSMISSION LINE
-  ROAD PLAN
-  AQUATIC ENVIRONMENTALLY SIGNIFICANT AREA
-  PROVINCIAL ENVIRONMENTALLY SIGNIFICANT AREA



THICKWOOD HILLS TRANSMISSION DEVELOPMENT STUDY AREA MAPS

ENVIRONMENTALLY SIGNIFICANT AREAS ATTACHMENT 2

