

Appendix C - TFO Environmental and Land Use Effects Assessment



**AUC RULE 007 NID 2 CONSIDERATIONS FOR THE
Vauxhall Transmission Development Project**

Presented to the Alberta Electric System Operator (AESO)

Date: October 28, 2021

1. INTRODUCTION TO AUC RULE 007, NID 2 CONSIDERATIONS

1. In consideration of the AESO's development for the Needs Identification Document (NID); the AESO has requested AltaLink to assess the NID 2 environmental and land use effects for seven preliminary options being considered to remove limitations on the 138 kV transmission lines between Taber 83S and Bownmanton 244S created by six near-term renewable energy projects.
2. AltaLink used the current AUC *Rule 007*¹, NID 7(9) consideration to inform the features to be included in this report which include land assessment, agriculture and other land use, environmental features (wildlife sensitivity areas, protected areas) and *Alberta Land Stewardship Act* regional land use plans. This summary provides a desktop level assessment of these NID aspects and other relevant environmental and land use effects associated with the seven technical alternatives in consideration.

2. TECHNICAL ALTERNATIVES

3. In the NID Specification – Vauxhall Area Transmission Development Project, Project No. 7075, dated May 27, 2021 (V1) (the Specification), the AESO directed AltaLink to consider the following six preliminary transmission development options (the Options) for the Project:
 - Option 1: 610L and 879L Line Rating Increase and 1 Static Synchronous Series Capacitor (SSSC) per phase;
 - Option 2: 610L and 879L Line Rating Increase and 2 SSSC per phase;
 - Option 3: 879L Line Rating Increase and 610L Line Upgrade;
 - Option 4: 879L Line Rating Increase, 610L Line Upgrade and 1 SSSC per phase;
 - Option 5: 879L Line Rating Increase and Construction of a New 138 kV Circuit in 180 MVA;
 - Option 5A: 879L Line Rating Increase and Construction of a New 138 kV Circuit in 120 MVA; and
 - Option 5B: 879L Line Rating Increase and Construction of a New 138 kV Circuit in 173 MVA .
4. The scope for each of the Options are provided below:
 - Option 1 includes:
 - Increase the line rating of the 138 kV transmission line 610L to approximately 118 MVA by removing the DFO underbuild;
 - Increase the line rating of the 138 kV transmission line 879L (between P2212 RESC Rattlesnake Ridge MPC tap-point to Bownmanton 244S substation) to approximately 118 MVA by removing the DFO underbuild and potentially other clearance mitigation works;
 - Modify the line structures of the 138 kV transmission line 610L outside of the Fincastle 336S substation as required to accommodate the change of line terminal of 610L due to the additional of the proposed SSSC in the Fincastle 336S substations;
 - Re-terminate the 138 kV transmission line 610L at the Fincastle 336S substation as required to connect the proposed SSSC;

¹ Alberta Utilities Commission, Rule 007, Applications for Power Plants, Substations, Transmission Lines, Industrial System Designations and Hydro Developments, effective date April 1, 2019.

- Add one (1) set (3 phases) of SSSC, supplied by Smart Wires Inc., into the 138 kV transmission line 610L;
 - Add three (3) 138 kV motor operated disconnect (MOD) switches, 1 per phase for isolation and bypass purposes for maintenance purpose;
 - Expand the Fincastle 336S substation as required to accommodate the additional equipment; and
 - Make necessary modifications or changes in the relevant substations to accommodate the changes above.
- Option 2 includes:
 - Increase the line rating of the 138 kV transmission line 610L to approximately 118 MVA by removing the DFO underbuild;
 - Increase the line rating of the 138 kV transmission line 879L (between P2212 RESC Rattlesnake Ridge MPC tap-point to Bowmanton 244S substation) to approximately 118 MVA by removing the DFO underbuild and potentially other clearance mitigation works;
 - Modify the line structures of the 138 kV transmission line 610L outside of the Fincastle 336S substation as required to accommodate the change of the line terminal of 610L due to the additional of the proposed SSSC in the Fincastle 336S substations;
 - Re-terminate the 138 kV transmission line 610L at the Fincastle 336S substation as required to connect the proposed SSSC;
 - Add two (2) sets (3 phases) of SSSC, supplied by Smart Wires Inc., into the 138 kV transmission line 610L in the Fincastle 336S substation;
 - Add three (3) 138 kV motor operated disconnect (MOD) switches, 1 per phase for isolation and bypass purposes for maintenance purpose;
 - Expand the Fincastle 336S substation as required to accommodate the additional equipment; and
 - Make necessary modifications or changes in the relevant substations to accommodate the changes above.
 - Option 3 includes:
 - Increase the line rating of the 138 kV transmission line 879L (between P2212 RESC Rattlesnake Ridge MPC tap-point to Bowmanton 244S substation) to approximately 118 MVA by removing the DFO underbuild and potentially other clearance mitigation works;
 - Re-conductor the 138 kV transmission line 610L to have thermal rating capacity of approximately 180 MVA; and
 - Make necessary modifications or changes in the relevant substations to accommodate the changes above.
 - Option 4 includes:
 - Increase the line rating of the 138 kV transmission line 879L (between P2212 RESC Rattlesnake Ridge MPC tap-point to Bowmanton 244S substation) to approximately 118 MVA by removing the DFO underbuild and potentially other clearance mitigation works;
 - Re-conductor the 138 kV transmission line 610L to have thermal rating capacity of approximately 180 MVA;

- Modify the line structures of the 138 kV transmission line 610L outside of the Fincastle 336S substation as required to accommodate the change of the line terminal of 610L due to the additional of the proposed SSSC in the Fincastle 336S substations;
 - Re-terminate the 138 kV transmission line 610L at the Fincastle 336S substation as required to connect the proposed SSSC;
 - Add one (1) set (3 phases) of SSSC, supplied by Smart Wires Inc., into the 138 kV transmission line 610L in the Fincastle 336S substation;
 - Add three (3) 138 kV motor operated disconnect (MOD) switches, 1 per phase for isolation and bypass purposes for maintenance purpose;
 - Expand the Fincastle 336S substation as required to accommodate the additional equipment; and
 - Make necessary modifications or changes in the relevant substations to accommodate the changes above.
- Option 5 includes:
 - Increase the line rating of the 138 kV transmission line 879L (between P2212 RESC Rattlesnake Ridge MPC tap-point to Bowmanton 244S substation) to approximately 118 MVA by removing the DFO underbuild and potentially other clearance mitigation works;
 - Construct a new 138 kV circuit in thermal rating capacity of approximately 180 MVA, between Fincastle 336S and Taber 83S substations. Discontinue the use of the 138 kV transmission line 610L for transmission purposes. Terminate the new circuit into the Fincastle 336S and Taber 83S substation; and
 - Make necessary modifications or changes in the relevant substations to accommodate the changes above.
- Option 5A includes:
 - Increase the line rating of the 138 kV transmission line 879L (between P2212 RESC Rattlesnake Ridge MPC tap-point to Bowmanton 244S substation) to approximately 118 MVA by removing the DFO underbuild and potentially other clearance mitigation works;
 - Construct a new 138 kV circuit in thermal rating capacity of approximately 120 MVA, between Fincastle 336S and Taber 83S substations. Tie the two ends together with the existing 138 kV transmission line 610L outside of the Fincastle 336S and Taber 83S substations.
 - Make necessary modifications or changes in the relevant substations to accommodate the changes above.
- Option 5B includes:
 - Increase the line rating of the 138 kV transmission line 879L (between P2212 RESC Rattlesnake Ridge MPC tap-point to Bowmanton 244S substation) to approximately 118 MVA by removing the DFO underbuild and potentially other clearance mitigation works;
 - Construct a new 138 kV circuit in thermal rating capacity of approximately 180 MVA, between Fincastle 336S and Taber 83S substations. Tie the two ends together with the existing 138 kV transmission line 610L outside of the Fincastle 336S and Taber 83S substations.
 - Make necessary modifications or changes in the relevant substations to accommodate the changes above.

5. The modifications to the different transmission facilities varies between the Options. However there is a significant amount of overlap between the Options. Some Options also require the modifications of distribution facilities in the area as some of these facilities are located on the existing transmission lines and will need to be removed to attain the required MVA ratings as stated in the Specification. Table 1 below details the anticipated scope of work for each Option that was considered in the Specification.

Table 1 – Conceptual Scope of Work for Specification Options

NID Specification Option	Transmission Line Scope ¹								Substation Scope ¹	
	610L Transmission Line Scope				879L Transmission Line Scope				Fincastle 336S	
	New Transmission Line Required (Yes/No)	Anticipated Distance of New Transmission Line (km)	DFO Facilities Required (Yes/No)	Anticipated Distance of New Distribution Line (km) ²	New Transmission Line Required (Yes/No)	Anticipated Distance of New Transmission Line (km)	DFO Facilities Required (Yes/No)	Anticipated Distance of New Distribution Line (km) ²	Expansion Area (m ²)	New Land Acquisition Required
Option 1: 610L and 879L Line Rating Increase and 1 (SSSC) per phase	No	N/A	Yes	13-14	No	N/A	Yes	1.5-2	17m x 48m (816 m ²)	No
Option 2: 610L and 879L Line Rating Increase and 2 SSSC per phase	No	N/A							17m x 48m (816 m ²)	No
Option 3: 879L Line Rating Increase and 610L Line Upgrade	No	N/A							N/A	N/A
Option 4: 879L Line Rating Increase, 610L Line Upgrade and 1 SSSC per phase	No	N/A							17m x 48m (816 m ²)	No
Option 5: 879L Line Rating Increase and Construction of a New 138 kV Circuit in 180 MVA	Yes	13-20							N/A	N/A
Option 5A: 879L Line Rating Increase and Construction of a New 138 kV Circuit in 120 MVA tied together with 610L.	Yes	13-20	No	N/A					N/A	N/A
Option 5B: 879L Line Rating Increase and Construction of a New 138 kV Circuit in 173 MVA tied together with 610L.	Yes	13-20	No	N/A					N/A	N/A

1. Transmission line lengths and substation expansion areas are based on preliminary engineering and subject to change upon detailed engineering.

2. Distribution line lengths were provided via correspondence with the local DFO/REA and subject to change based on DFO specific needs during project development. AltaLink does not take responsibility for DFO/REA anticipated line lengths.

6. AltaLink has applied the following assumptions to complete the assessment of the Options:
 - For Options where the 610L and 879L line rating is increasing:
 - a. All work can occur on the existing transmission line alignments;
 - b. In the event structure changes are required, the new structure can be near to the current structure location;
 - The expansion area size at Fincastle 336S substation will be the same for the installation of one or two SSSC's²;
 - For Option 3 and Option 4, the existing 610L transmission line can be re-conducted to achieve an acceptable MVA rating for the line and no transmission line rebuild is required³;
 - For Option 5, 5A and 5B, the same transmission line route for the new 138kV transmission line would be used for either option;
 - For Option 5, the 610L transmission line must remain in service while the new 138 kV transmission line is constructed;
 - Option 5A and 5B will require the same level of transmission line development and have been grouped together as "Option 5A/B" when discussed in this report
 - For options where the DFO circuits need to be removed from either the 610L or 879L transmissions lines, the DFO scope of work will remain the same across all options.
 - The scope of work for the 879L transmission line has the same potential effects across all Options.
7. These assumptions are based on an initial high level review of the options presented in the Specification. These assumptions may change during further detailed siting and engineering as the project progresses.

3. AUC RULE 007, NID 2 CONSIDERATIONS

8. Outlined below are the NID 2 considerations that AltaLink assessed for the Options. A summary of each of the findings is contained in **Appendix A**.
9. AltaLink has created a set Study Area Maps (SAM) for the 610L and 879L portions of the Project and are in **Appendix B** of this report.
10. The study area for the portion of the Project involving the 610L transmission line and Fincastle 336S substation (the 610L study area) is shown on the SAM1 (Photo Map) and is wholly located within the Municipal District of Taber.
11. The study area for the portions of the Project involving the upgrades to the 879L transmission line (the 879L study area) is shown on the SAM2 (Photo Map). A short segment of the 879L is located within the County of Forty Mile No. 8 and the remainder of the transmission line is in Cypress County.
12. The study area boundaries provide an opportunity to review the potential effects of each Option identified by the AESO in the Specification. Any route configuration, where applicable, outside

² Based on preliminary engineering, it is assumed two SSSCs can be stacked on top of one another.

³ AESO confirmed via email on June 2, 2021, that a rating of 173MVA is acceptable. This allows the 610L to be reconducted with 477S Hawk which can be supported by the existing structures. Some existing structures may need to be replaced.

of the study area is anticipated to result in longer transmission line lengths with higher overall effects and is not considered here.

13. The study area boundary for the 610L study area is approximately 800m north of Township Road 104. The west boundary follows the edge of the Oldman River and the outskirts of the developed areas of the Town of Taber. The southern boundary is approximately 800m south of Township Road 100. The eastern boundary is approximately 800m east of Range Road 153.
14. The study area boundary for the 879L study area is approximately 800m on either side of the 879L transmission line. There was no need to have a larger study area as it is anticipated modification to the 879L will remain in the same alignment. The 879L transmission line is located on double circuits structure with the 676L transmission line between the Bullshead 523S and Bowmanton 244S substations.
15. To assist with the assessment of the NID2 consideration below, AltaLink has created a Detailed Base map (DB1 and DB2) included in **Appendix B**. These maps illustrate the study areas along with the considerations discussed in this report.

3.1 Land Assessment

16. The majority of the 610L study area falls under private land and all the Options evaluated in the NID 2 report have the potential to impact these lands. There are some small pockets of public lands scattered throughout the study area. There are two parcels of public land that have potential to be crossed by new transmission line routes. One of the public land parcels has a grazing lease registered to it. Both public land parcels have protective notations and other industrial dispositions registered to them. There is potential for routes associated with the Options requiring new transmission lines to be located within road allowance which can minimize effects to both the private and public lands. There are no Federal, First Nations' reserve lands or transportation utility corridors within the study area.
17. The majority of the 879L study area falls under private land and all the Options evaluated in the NID 2 report have the potential to impact these lands. Approximately 20% of the study area crosses public lands with a large block located south of the Bowmanton 244S substation for approximately 14 km. Beyond this large block, there are some small pockets of public lands scattered throughout the study area. No new transmission line routes are anticipated on the private or public lands but modifications to the existing transmission line structures and distribution line in the area are expected. There are no Federal, First Nations' reserve lands or transportation utility corridors within the study area.
18. Both study areas are predominantly rural in nature dominated by agricultural activities. The 610L study area is primarily cultivated with most cultivated fields having either quarter or full section irrigation pivots.
19. The Fincastle 336S substation is located on land leased to AltaLink and the northern portion of the leased parcel is cultivated by another stakeholder.
20. The 879L study area is a mix of cultivated and grazing lands. Between the RESC t-tap point and the Bullshead 523S, the area is primarily cultivated with many of those fields having either quarter or full section irrigation pivots. This land use continues for approximately 8km east of the Bullshead 523S substation. The remainder of the study area up to Bowmanton 244S is

primarily native vegetation predominantly used cattle grazing with some scattered parcels of cultivated lands.

21. In the 610L study area, it is anticipated Option 5 and 5A/B will have the greatest potential impact between the Options as these require a new 138 kV transmission line. It is anticipated that for Option 5 and 5A/B the existing 610L will either remain in service or continue to be used after construction resulting in the 138kV transmission line to be located on a new alignment. Generally, land uses in the area have developed in the presence of the 610L and have adjusted to take the existing 610L into account. A new transmission line alignment in the area will create new effects where there are currently no impacts related to transmission line development.
22. There is a slight preference for Option 5 over Option 5A/B as Option 5 would remove the existing 610L from the landscape after the new line is placed in service. This would keep the overall transmission line length in the area similar to what it is today. Option 5A/B would approximately double the linear transmission line length in the study area.
23. It is anticipated Option 1, 2, 3 and 4 will have comparable effects within the 610L study area. Three out of the four options require expansion at the Fincastle 336S substation (Option 3 does not). AltaLink does not anticipate having to acquire new lands for the substation expansion and it would be located on lands currently under lease by AltaLink and therefore set aside for use for transmission facilities. There is a slight preference toward Option 3 due to less overall development needed for the Project.

Agricultural Land

24. Options that require new transmission lines (610L study area only) have the potential to impact agricultural land. There are opportunities for new transmission lines to be located along developed road allowances in the study area. Based on conversation with the local DFO, it is anticipated new distribution lines would also be typically be located along road allowances.⁴ Locating both new transmission and distribution lines within road allowance boundary would potentially minimize the impact to agricultural lands.
25. There is potential for new transmission line routes to also be located on quarter line. Generally, the cultivation patterns in the 610L study area stay within the quarter section boundary. By locating the transmission line along quarter line, effects to the cultivation operations can be minimized.
26. Most of the cultivated fields within the 610L study area have irrigation pivots. Irrigation pivots can come in different sizes (e.g. quarter section or full section pivots) and may have modifications to them that allows the irrigation of the dry corners including a swing arms or water cannons on the end of the pivot.
27. Effects to irrigated pivot parcels can be minimized by attempting to place structures in the dry corner outside of the irrigation pivot. At times, induction issues can occur on the irrigation pivots, however these effects can be mitigated with the use of grounding wires and other forms of technology. AltaLink would work with stakeholders to assess the potential induction issues and install mitigations during the development of the Project.

⁴ The DFO is responsible for the siting of distribution facilities and AltaLink does not take responsibility for the final location of the DFO distribution lines.

28. There are some full section pivots within the 610L study area. In the event a route option crosses a full section pivot, mitigations are typically not available due to the large area the section pivot covers and compensation may be required to modify the pivot. Where possible, full section pivots would be avoided.
29. The area around the Fincastle 336S substation is primarily cultivated. The expansion area to add either one or two SSSC would be located on cultivated lands taking this area out of production. This land is included in AltaLink's lease land and therefore is already set aside of use by transmission facilities.
30. Agricultural effects within the 879L study area are anticipated to be minor as no new transmission line routes or substation modifications are required.
31. In the 610L study area, it is anticipated that Option 5 and Option 5A/B will have the greater potential impact to agricultural lands as these two options require new transmission line development. It is anticipated the effects between the two options to be similar as the new transmission line would follow a similar route regardless of the option selected. The existing 610L is in a developed road allowance and has limited impact to existing agricultural operation and the differences between keeping or removing the 610L from an agricultural perspective is viewed as comparable.
32. Options 1, 2, 3 and 4 are viewed as comparable with similar potential effects to agricultural operations. There is a slight preference to Option 3 as this option does not require expansion of the Fincastle 336S substation leaving the small piece of agricultural lands associated with the expansion in agricultural production.

Residential

33. New transmission facilities can have potential effects to residential properties. These effects can be both physical effects to residential properties, like the removal of trees or outbuilding and visual (aesthetic) effects which are subjective and varies between stakeholders.
34. There are several rural residences located within the 610L study area. These residences are generally scattered throughout the study area with a higher density located along the Oldman River on the west side of the study area.
35. Residences within the 610L study area are generally located near local developed roads. New transmission line routes along these road allowances are anticipated to have higher effects to these residences than route options located along quarter line.
36. There are some residences within 800m of the Fincastle 336S substation. These residences are located approximately 280m or greater to the south of the substation and south of Highway 3. As the expansion area is anticipated to be on the north side of the Fincastle 336S substation, effects to these residences as a result of the substation expansion are anticipated to be negligible.
37. The 879L study area has a higher density of residential density compared to the 610L study area. The higher density areas occur between the RESC T-tap point to the Bullshead 523S Substation and continues east through the area directly south of the city of Medicine Hat. Many of these residences are small acreage parcels. The population density drops significantly on the east side of Medicine Hat north to the Bowmanton 244S Substation.

38. All the Options considered by the AESO to increase the rating of the 879L transmission line do not require new transmission line routes. From a transmission line perspective, effects created by this Project on residences within the 879L study area are anticipated to be negligible.
39. It is anticipated that Option 5 and Option 5A/B will have greatest potential effects to residences as these two options require a new 138kV transmission line. Some residences within the 610L study area will be close to a transmission line than they currently are increasing the effects to these residences. There is a slight preference toward Option 5 as this Option removes the 610L from the study area and would potentially improve the distance some residences are from a transmission line.
40. Option 1, 2, 3 and 4 are anticipated to have lower residential effects and viewed as comparable.

Wind and Solar Farms⁵

41. AltaLink is not aware of proposed or existing wind farms within the 610L study area. The Fortis Taber 83S DER Solar Farm 1 through 4 (ISD Nov 2022) is located within the northern extent of the 610L study area.
42. There are two renewable energy projects with the 879L study area. RES Rattlesnake is a wind farm located in the far western portion of the study area and has an ISD of July 2021. There is the Dunmore Solar project located east of Medicine Hat and has an ISD of April 2023.
43. It is anticipated that all Options will not impact these proposed facilities.

Oil and Gas Infrastructure

44. Both study areas have a significant amount of oil and gas infrastructure with the 879L study area having higher density than the 610L study area. Transmission facilities can have an impact on existing oil and gas infrastructure (for example AC interference that needs to be mitigated). Paralleling or sharing oil and gas infrastructure (such as access roads) can also be beneficial from a land impact perspective.
45. There is a higher density of oil and gas facilities in the central and eastern portions of the 610L study area. New transmission lines associated with some options will require coordination with the oil and gas facilities owners to mitigate effects to those facilities.
46. The 879L study area has oil and gas facilities located throughout with a significantly higher density located east of Medicine Hat up to the Bowmanton 244S substation. No new transmission lines are required within this study area and as a result effects to existing oil and gas infrastructure is expected to be negligible.
47. Option 5 and Option 5A/B are anticipated to have greater potential effects on oil and gas facilities as the new transmission line will be in closer to proximity to some oil and gas facilities that currently do not have a transmission line near them. This may result in the need for addition AC mitigations required on those facilities.
48. There are no oil and gas facilities directly adjacent to the Fincastle 336S substation. Option 1, 2, 3 and 4 are anticipated to similar potential effects to oil and gas infrastructure.

⁵ Taken from AESO Connection Project Map- July 2021

(<https://aeso.maps.arcgis.com/apps/webappviewer/index.html?id=249334daa4dd45cd96554982b1b4131d>)

3.2 Environmental Features

49. There are several environmental features identified across the both study areas. The 610L study area has two large waterbodies: Taber Lake east of the town of Taber and Fincastle Lake in the eastern extent of the study area. The Oldman River borders the western boundary of the study area.
50. The 879L study area crosses four creek; Seven Persons Creek, Bullshead Creek, Ross Creek and Mitchel Creek. There is also a small lake, Seven Persons Lake, within the study area.
51. Further assessment of the potential environmental effects discussed below will be completed during the development of the facility application for this Project.

AEP Wildlife Sensitivity areas

52. A review of the AEP Wildlife Sensitivity layers identified that both study areas fall within a number AEP Wildlife sensitivity ranges. Table 2 below outlines the wildlife sensitivity ranges crossed and the associated the recommended restricted activity periods.

Table 2 – Sensitive Species Range Recommended Restricted Activity Windows and Setback Distances by Level of Disturbance.

Species	Location	Time of Year	Level of Disturbance		
			Low	Medium	High
Bull Snake, Western Hognose, Prairie Rattlesnake	Hibernacula	Year Round	200m	200m	500m
	Rookery	March 15 th -October 31 st	200m	200m	500m
		November 1 st – March 14 th	50m	50m	200m
Burrowing Owl	Nesting Sites	April 1 st – August 15 th	200m	500m	500m
		August 16 th – October 15 th	200m	200m	500m
		October 16 th – March 31 st	50m	100m	500m
Prairie Falcon, Golden Eagle, Ferruginous Hawk	Nesting Sites	March 15 th – July 15 th	1000m	1000m	1000m
		July 16 th – March 14 th	50m	100m	1000m
Sensitive Amphibians (multiple species associated with this group)	Wetland and Waterbodies	Species Dependant	Species Dependant		
Sharp-tailed Grouse	Leks	March 15 th – June 15 th	500m	500m	500m
		June 16 th – March 14 th	100m	100m	500m
Threatened and Endangered Plants	Habitat	Year Round	30m	30m	300m

(This table was created using excerpts from the AEP – *Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural regions of Alberta*, 2011, Page 5)

53. The 610L study area also includes Colonial Nesting Bird sites. Fincastle Lake has a Great Blue Heron colony and Taber Lake has a heron colony as well as a White Pelican colony. These colonies require a 1000m setback from April 1 to July 31.

54. The 879L study area is just outside of the Short Horned Lizard range. This range is a mapped ranged however there may be potential to find the Short Horned Lizard in the area. Suitable habitat for the Short Horned Lizard has a year round setback of 100m.
55. Option 5 and 5A/B have the greatest potential to cross ranges of these species where a transmission currently does not cross. Further surveys during the development of the facility application will be required to determine the species exist along the routes.
56. Option 1, 2, 3 and 4 are anticipated to have comparable effects to these specie ranges.

Environmentally Significant Areas

57. Environmental Significant Areas (ESAs), as defined by AEP, are areas important to maintenance of biodiversity and include, for example, unique landforms and species, wildlife habitat, and large blocks of native grasslands. ESAs are identified by quarter section, and the actual level of importance may vary within each quarter section, and between ESAs. ESAs are a useful planning tool, but need to be considered on a site specific basis and in combination with other information sources. Depending on the circumstances, the features on the landscape that merit an ESA may not be impacted by new transmission facilities.
58. There are relatively few ESA designated quarter sections across each study area.
59. It is anticipated Option 5 and 5A/B have greater potential to create new effects across the ESA's. The other options avoid the ESA's and no new effects are anticipated.

3.3 Other Environmental Features

Vegetation

60. The 879L study area crosses the AEP Endangered and Threatened Plants range for Tiny Cryptanthe which has a year round setback of 30m. The 879L transmission line comes within proximity of this range near the Bullshead and Bowmanton substation.
61. Both study areas have some native vegetation within them. The 610L study area generally has less native vegetation within it with the majority around Taber Lake and Fincastle Lake.
62. The 879L study area has native vegetation throughout with the majority of it located on the crown lands near the Bowmanton 244S substation. As the scope is limited for the 879L portion of the Project, effects to native vegetation are viewed to be minor.
63. Option 5 and 5A/B has greater potential to impact native vegetation due to the new transmission line required between Taber 83S and Fincastle 336S. The other options are anticipated to have similar impact to native vegetation.

3.4 Visual Effects

64. All the Options considered in report have the potential to create some level of visual effects. Options requiring the removal of DFO facilities will change the appearance of the existing transmission structures while at same time more linear infrastructure may be required to replace the underbuilt distributions lines.
65. It is anticipated Option 5 and 5A/B will have the greatest potential visual impact in the 610L study area due to the new 138 kV transmission line. There is a slight preference to Option 5 as

the removal of the 610L transmission line may improve the visual effects associated with a transmission line along the current alignment.

66. Options 1, 2, 3 and 4 are anticipated to comparable visual impact. There is a slight preference toward Option 3 as this option does not require expansion of the Fincastle 336S substation, but the expansion occurs in an industrial area so the effects of the expansion are viewed as minor.

3.5 Regional Land Use plan

67. The study area is located within the boundary of the South Saskatchewan Regional Plan (SSRP). The SSRP came into effect in September 2014.
68. The SSRP, like all regional plans, is a wide ranging document that looks to balance a number of impacts and provide direction for decision-makers when conducting land use planning. Overall, the implications of the SSRP are similar across all four options. The SSRP does not place restrictions for any of the Options under consideration.

4. CONCLUSION

69. Based on the assessment provided in this report, AltaLink has determined that from an environmental and land use effects perspective, all the Options considered in this report are viable and there were no features identified that would preclude development of the Options.
70. Option 3 is anticipated to have the potential for lower overall effects compared to the other Options as it does not require a new 138 kV transmission line or expansion of the Fincastle 336S Substation. As result, effects associated within this Option are considered minor.
71. Option 1, 2 and 4 are anticipated to have the next lowest overall potential effects and are viewed as comparable as the expansion area of the Fincastle 336S substation is the same. The expansion of the Fincastle 336S Substation has the potential to impact agricultural area and potentially increase visual effects near the substation, but these effects are considered to be negligible.
72. Option 5 and Option 5A/B are anticipated to have the highest overall impact as these options require approximately 13-20 km of new transmission line. There is a preference for Option 5 as it requires the removal of the 610L after the new transmission line is constructed which may improve upon existing effects along the current 610L alignment.

Appendix A – Summary of NID 2 Considerations

Technical Alternatives	Land Assessment	Agriculture features	Other Land Use Features	Environmental Features: Wildlife / Protected areas	Visual Effects	Provincial Land Use Plans	Conclusions
<p>Option 1 – 610L and 879L Line Rating Increase and 1 Static Synchronous Series Capacitor (SSSC) per phase.</p> <ul style="list-style-type: none"> Increase the line rating of the 138 kV transmission line 610L to approximately 118 MVA by removing the DFO underbuild; Increase the line rating of the 138 kV transmission line 879L (between P2212 RESC Rattlesnake Ridge MPC tap-point to Bowmanton 244S substation) to approximately 118 MVA by removing the DFO underbuild and potentially other clearance mitigation works; Modify the line structures of the 138 kV transmission line 610L outside of the Fincastle 336S substation as required to accommodate the change of line terminal of 610L due to the additional of the proposed SSSC in the Fincastle 336S substations; Re-terminate the 138 kV transmission line 610L at the Fincastle 336S substation as required to connect the proposed SSSC; Add one (1) set (3 phases) of SSSC, supplied by Smart Wires Inc., into the 138 kV transmission line 610L; Add three (3) 138 kV motor operated disconnect (MOD) switches, 1 per phase for isolation and bypass purposes for maintenance purpose; Expand the Fincastle 336S substation as required to accommodate the additional equipment; and Make necessary modifications or changes in the relevant substations to accommodate the changes above. <p><i>Potential Transmission Facility Requirements:</i></p> <p>610L Transmission</p> <ul style="list-style-type: none"> New Transmission Line Length - N/A New Distribution Line Length – 13 to 14 km <p>879L Transmission Line</p> <ul style="list-style-type: none"> New Transmission Line Length – N/A New Distribution Line Length – 1.5 to 2 km <p>Fincastle 336S Substation Expansion</p> <ul style="list-style-type: none"> Size - 17m x 48m (816 m²) 	<p>Potential lower impact due to lack of new transmission line development.</p> <p>Viewed to have slightly higher impacts than Option 3 due to the expansion of the Fincastle 336S substation.</p>	<p>Potential lower impact as there is no new transmission line development associated with this option.</p> <p>Viewed to have slightly higher impacts than Option 3 due to the expansion of the Fincastle 336S substation which will take a small portion of agricultural lands out of production.</p>	<p>Potential lower residential impacts as no new transmission line development as there is no new transmission line development associated with this option. Impacts associated with expansion at the Fincastle 336S substation are anticipated to be negligible.</p> <p>Not anticipated to impact wind or solar projects in the study area.</p> <p>Anticipated to have similar impacts to oil and gas facilities as Options 2, 3 and 4.</p>	<p>Anticipated to have comparable impacts to Option 2, 3 and 4 to AEP Wildlife Sensitivity ranges.</p> <p>Avoids ESA's.</p> <p>Anticipated to have similar impacts as Options 2, 3 and 4 to native vegetation.</p>	<p>Anticipated to have lower visual impact similar to Options 2, 3 and 4.</p>	<p>Located within the boundaries of the South Saskatchewan Regional Plan (SSRP) and implications of the plan are anticipated to be similar across all Options.</p>	<p>Anticipated to provide the second lowest overall impacts and is viewed as comparable to Options 2 and 4.</p>

Technical Alternatives	Land Assessment	Agriculture features	Other Land Use Features	Environmental Features: Wildlife / Protected areas	Visual Effects	Provincial Land Use Plans	Conclusion
<p>Option 2 – 610L and 879L Line Rating Increase and 2 SSSC per phase;</p> <ul style="list-style-type: none"> • Increase the line rating of the 138 kV transmission line 610L to approximately 118 MVA by removing the DFO underbuild; • Increase the line rating of the 138 kV transmission line 879L (between P2212 RESC Rattlesnake Ridge MPC tap-point to Bowmanton 244S substation) to approximately 118 MVA by removing the DFO underbuild and potentially other clearance mitigation works; • Modify the line structures of the 138 kV transmission line 610L outside of the Fincastle 336S substation as required to accommodate the change of the line terminal of 610L due to the additional of the proposed SSSC in the Fincastle 336S substations; • Re-terminate the 138 kV transmission line 610L at the Fincastle 336S substation as required to connect the proposed SSSC; • Add two (2) sets (3 phases) of SSSC, supplied by Smart Wires Inc., into the 138 kV transmission line 610L in the Fincastle 336S substation; • Add three (3) 138 kV motor operated disconnect (MOD) switches, 1 per phase for isolation and bypass purposes for maintenance purpose; • Expand the Fincastle 336S substation as required to accommodate the additional equipment; and • Make necessary modifications or changes in the relevant substations to accommodate the changes above. <p><i>Potential Transmission Facility Requirements:</i></p> <p>610L Transmission Line</p> <ul style="list-style-type: none"> • New Transmission Line Length - N/A • New Distribution Line Length – 13 to 14 km <p>879L Transmission Line</p> <ul style="list-style-type: none"> • New Transmission Line Length – N/A • New Distribution Line Length – 1.5 to 2 km <p>Fincastle 336S Substation Expansion</p> <ul style="list-style-type: none"> • Size - 17m x 48m (816 m²) 	<p>Potential lower impact due to lack of new transmission line development.</p> <p>Viewed to have slightly higher impacts than Option 3 due to the expansion of the Fincastle 336S substation.</p>	<p>Potential lower impact as there is no new transmission line development associated with this option.</p> <p>Viewed to have slightly higher impacts than Option 3 due to the expansion of the Fincastle 336S substation which will take a small portion of agricultural lands out of production.</p>	<p>Potential lower residential impacts as no new transmission line development as there is no new transmission line development associated with this option. Impacts associated with expansion at the Fincastle 336S substation are anticipated to be negligible.</p> <p>Not anticipated to impact wind or solar projects in the study area.</p> <p>Anticipated to have similar impacts to oil and gas facilities as Options 1, 3 and 4</p>	<p>Anticipated to have comparable impacts to Option 1, 3 and 4 to AEP Wildlife Sensitivity ranges.</p> <p>Avoids ESA's.</p> <p>Anticipated to have similar impacts as Options 1, 3 and 4 to native vegetation.</p>	<p>Anticipated to have lower visual impact similar to Options 1, 3 and 4.</p>	<p>Located within the boundaries of the South Saskatchewan Regional Plan (SSRP) and implications of the plan are anticipated to be similar across all Options.</p>	<p>Anticipated to provide the second lowest overall impacts is viewed as comparable to Options 1 and 4.</p>

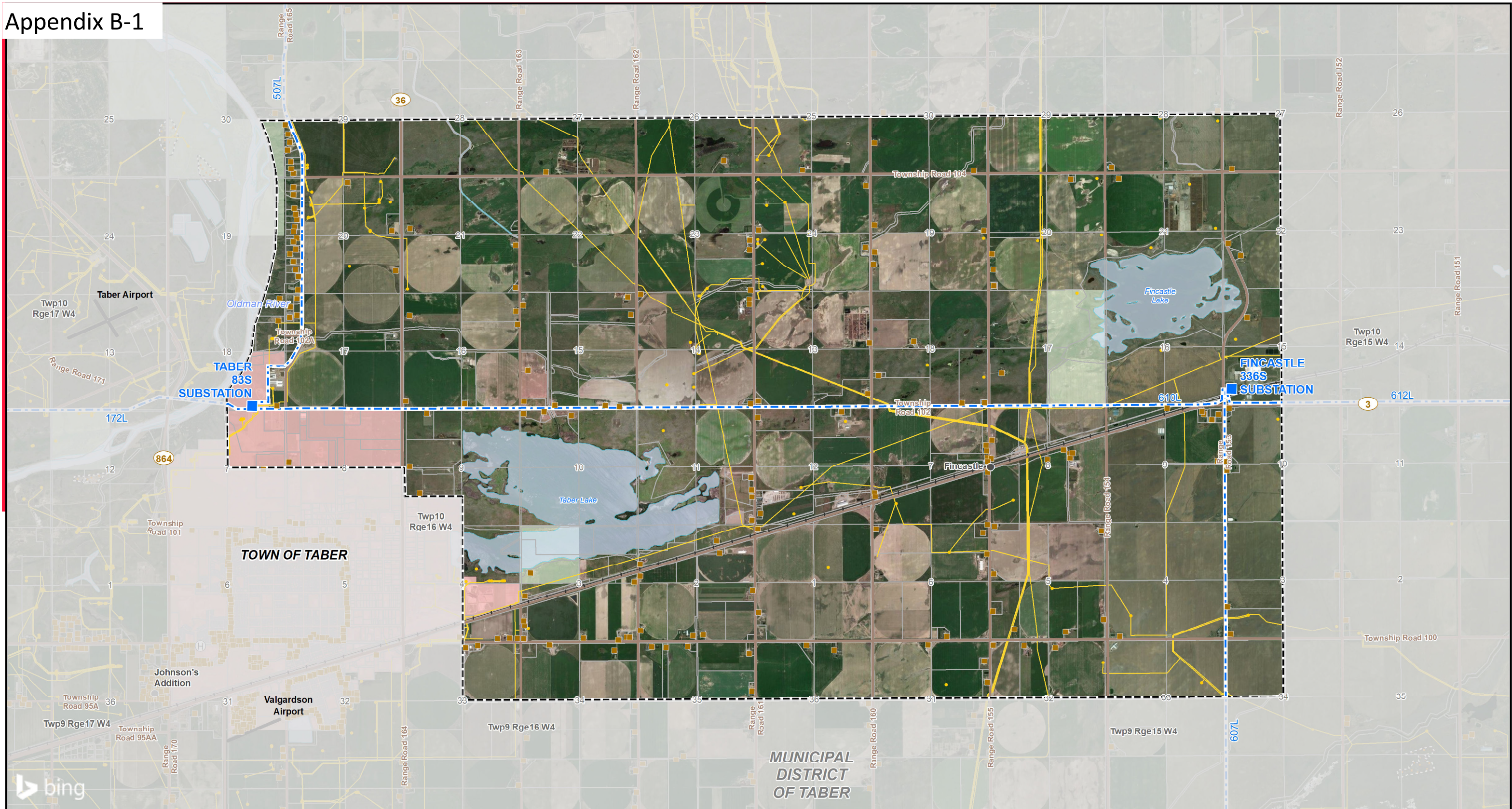
Technical Alternatives	Land Assessment	Agriculture features	Other Land Use Features	Environmental Features: Wildlife / Protected areas	Visual Effects	Provincial Land Use Plans	Conclusion
<p>Option 3 – 879L Line Rating Increase and 610L Line Upgrade.</p> <ul style="list-style-type: none"> Increase the line rating of the 138 kV transmission line 879L (between P2212 RESC Rattlesnake Ridge MPC tap-point to Bowmanton 244S substation) to approximately 118 MVA by removing the DFO underbuild and potentially other clearance mitigation works; Re-conductor the 138 kV transmission line 610L to have thermal rating capacity of approximately 180 MVA; and Make necessary modifications or changes in the relevant substations to accommodate the changes above. <p><i>Potential Transmission Facility Requirements:</i></p> <p>610L Transmission Line</p> <ul style="list-style-type: none"> New Transmission Line Length - N/A New Distribution Line Length – 13 to 14 km <p>879L Transmission Line</p> <ul style="list-style-type: none"> New Transmission Line Length – N/A New Distribution Line Length – 1.5 to 2 km <p>Fincastle 336S Substation Expansion</p> <ul style="list-style-type: none"> Size – N/A 	<p>Potential to have the lowest overall impacts due to lack of new transmission line and substation development associated with this Option.</p>	<p>Potential to have the lowest agricultural impacts due to the lack of new transmission line and substation development.</p>	<p>Potential to have the lowest residential impacts due the lack of new transmission line and substation development.</p> <p>Not anticipated to impact wind or solar projects in the study area.</p> <p>Anticipated to have similar impacts to oil and gas facilities as Options 1, 2, and 4</p>	<p>Anticipated to have comparable impacts to Option 1, 3 and 4 to AEP Wildlife Sensitivity ranges.</p> <p>Avoids ESA's.</p> <p>Anticipated to have similar impacts as Options 1, 2 and 4 to native vegetation.</p>	<p>Potential to have lowest visual impact due to the lack of new transmission line and substation development.</p>	<p>Located within the boundaries of the South Saskatchewan Regional Plan (SSRP) and implications of the plan are anticipated to be similar across all Options.</p>	<p>Potential to have the lower overall impacts compared to the other options due to the lack of transmission line and substation development.</p> <p>The difference in conductor type between Option 3, 3A and 3B does not influence the land impacts associated with this Option.</p>

Technical Alternatives	Land Assessment	Agriculture features	Other Land Use Features	Environmental Features: Wildlife / Protected areas	Visual Effects	Provincial Land Use Plans	Conclusion
<p>Option 4 – 879L Line Rating Increase, 610L Line Upgrade and 1 SSSC per phase;</p> <ul style="list-style-type: none"> Increase the line rating of the 138 kV transmission line 879L (between P2212 RESC Rattlesnake Ridge MPC tap-point to Bowmanton 244S substation) to approximately 118 MVA by removing the DFO underbuild and potentially other clearance mitigation works; Re-conductor the 138 kV transmission line 610L to have thermal rating capacity of approximately 180 MVA; Modify the line structures of the 138 kV transmission line 610L outside of the Fincastle 336S substation as required to accommodate the change of the line terminal of 610L due to the additional of the proposed SSSC in the Fincastle 336S substations; Re-terminate the 138 kV transmission line 610L at the Fincastle 336S substation as required to connect the proposed SSSC; Add one (1) set (3 phases) of SSSC, supplied by Smart Wires Inc., into the 138 kV transmission line 610L in the Fincastle 336S substation; Add three (3) 138 kV motor operated disconnect (MOD) switches, 1 per phase for isolation and bypass purposes for maintenance purpose; Expand the Fincastle 336S substation as required to accommodate the additional equipment; and Make necessary modifications or changes in the relevant substations to accommodate the changes above. <p><i>Potential Transmission Facility Requirements:</i></p> <p>610L Transmission Line</p> <ul style="list-style-type: none"> New Transmission Line Length - N/A New Distribution Line Length – 13 to 14 km <p>879L Transmission Line</p> <ul style="list-style-type: none"> New Transmission Line Length – N/A New Distribution Line Length – 1.5 to 2 km <p>Fincastle 336S Substation Expansion</p> <ul style="list-style-type: none"> Size - 17m x 48m (816 m²) 	<p>Potential lower impact due to lack of new transmission line development.</p> <p>Viewed to have slightly higher impacts than Option 3 due to the expansion of the Fincastle 336S substation.</p>	<p>Potential lower impact as there is no new transmission line development associated with this option.</p> <p>Viewed to have slightly higher impacts than Option 3 due to the expansion of the Fincastle 336S substation which is take a small portion of agricultural lands out of production.</p>	<p>Potential lower residential impacts to residences as no new transmission line development is anticipated. Impacts associated with expansion at the Fincastle 336S substation are anticipated to be negligible.</p> <p>Not anticipated to impact wind or solar projects in the study area.</p> <p>Anticipated to have similar impacts to oil and gas facilities as Options 1, 2, and 3.</p>	<p>Anticipated to have comparable impacts to Option 1, 2, 3 and 4 to AEP Wildlife Sensitivity ranges.</p> <p>Avoids ESA's.</p> <p>Anticipated to have similar impacts as Options 1, 2 and 3 to native vegetation.</p>	<p>Anticipated to have lower visual impact similar to Options 1, 2, and 3.</p>	<p>Located within the boundaries of the South Saskatchewan Regional Plan (SSRP) and implications of the plan are anticipated to be similar across all Options.</p>	<p>Anticipated to provide the second lowest overall impacts is viewed as comparable to Options 1 and 2.</p>

Technical Alternatives	Land Assessment	Agriculture features	Other Land Use Features	Environmental Features: Wildlife / Protected areas	Visual Effects	Provincial Land Use Plans	Conclusion
<p>Option 5 – 879L Line Rating Increase and Construction of a New 138 kV Circuit in 180 MVA</p> <ul style="list-style-type: none"> • Increase the line rating of the 138 kV transmission line 879L (between P2212 RESC Rattlesnake Ridge MPC tap-point to Bowmanton 244S substation) to approximately 118 MVA by removing the DFO underbuild and potentially other clearance mitigation works; • Construct a new 138 kV circuit in thermal rating capacity of approximately 180 MVA, between Fincastle 336S and Taber 83S substations. Discontinue the use of the 138 kV transmission line 610L for transmission purposes. Terminate the new circuit into the Fincastle 336S and Taber 83S substation; and • Make necessary modifications or changes in the relevant substations to accommodate the changes above. <p><i>Potential Transmission Facility Requirements:</i></p> <p>610L Transmission Line</p> <ul style="list-style-type: none"> • New Transmission Line Length – 13 to 20 km • New Distribution Line Length – 13 to 14 km <p>879L Transmission Line</p> <ul style="list-style-type: none"> • New Transmission Line Length – N/A • New Distribution Line Length – 1.5 to 2 km <p>Fincastle 336S Substation Expansion</p> <ul style="list-style-type: none"> • Size – N/A 	<p>Potential to have the second highest land impact due to the new transmission line required.</p> <p>This option is preferred over Option 5A/B as it required the salvage of the existing 610L which can improve impacts along the existing transmission line alignment.</p>	<p>Potential for higher agricultural impacts due to the new transmission line required.</p> <p>As the 610L transmission line is located within developed road allowance, the removal the transmission line is not viewed to change impact to agricultural operations.</p>	<p>Potential to have the second highest residential impact. The removal of the 610L transmission line is viewed to potentially improve impacts to residences currently in proximity to 610L transmission line.</p> <p>Not anticipated to impact wind or solar projects in the study area.</p> <p>Potential for highest impacts for oil and gas facilities.</p>	<p>Potential for highest environment impacts. Has the potential to cross the largest amount of AEP Sensitive Wildlife ranges, ESA's, and native vegetation.</p>	<p>Potential for the second highest visual impacts. The removal of the 610L transmission line is seen to potential improve visual impacts along the existing transmission line.</p>	<p>Located within the boundaries of the South Saskatchewan Regional Plan (SSRP) and implications of the plan are anticipated to be similar across all Options.</p>	<p>Potential for the second highest overall impacts compared to the other Options.</p> <p>This option is slightly preferred over Option 5A/B due to the removal of the existing 610L transmission line.</p>

Technical Alternatives	Land Assessment	Agriculture features	Other Land Use Features	Environmental Features: Wildlife / Protected areas	Visual Effects	Provincial Land Use Plans	Conclusion
<p>Option 5A/B – 879L Line Rating Increase and Construction of a New 138 kV Circuit in 120 MVA or 180 MVA</p> <ul style="list-style-type: none"> Increase the line rating of the 138 kV transmission line 879L (between P2212 RESC Rattlesnake Ridge MPC tap-point to Bowmanton 244S substation) to approximately 118 MVA by removing the DFO underbuild and potentially other clearance mitigation works; Construct a new 138 kV circuit in thermal rating capacity of approximately 120 MVA or 180 MVA, between Fincastle 336S and Taber 83S substations. Discontinue the use of the 138 kV transmission line 610L for transmission purposes. Tie the two ends together with the existing 138 kV transmission line 610L outside of the Fincastle 336S and Taber 83S substations. Make necessary modifications or changes in the relevant substations to accommodate the changes above. <p><i>Potential Transmission Facility Requirements:</i></p> <p>610L Transmission Line</p> <ul style="list-style-type: none"> New Transmission Line Length – 13 to 20 km New Distribution Line Length – N/A <p>879L Transmission Line</p> <ul style="list-style-type: none"> New Transmission Line Length – N/A New Distribution Line Length – 1.5 to 2 km <p>Fincastle 336S Substation Expansion</p> <ul style="list-style-type: none"> Size - 17m x 48m (816 m²) 	<p>Potential to have the highest overall impacts. This option requires the construction of new transmission line as well as leaving the existing 610L in place double the length of transmission line in the area.</p>	<p>Potential for higher agricultural impacts due to the new transmission line required.</p> <p>As the 610L transmission line is located within developed road allowance, the 610L transmission line remaining in operation is not viewed to impact the existing agricultural operations.</p>	<p>Potential for the highest residential impacts due to the construction of a new transmission line and leaving the existing 610L in operation.</p> <p>Not anticipated to impact wind or solar projects in the study area.</p> <p>Potential for highest impacts for oil and gas facilities.</p>	<p>Potential for highest environment impacts. Has the potential to cross the largest amount of AEP Sensitive Wildlife ranges, ESA's, and native vegetation.</p>	<p>Potential for the highest visual impacts due to the construction of a new transmission line and leaving the 610L in operation.</p>	<p>Located within the boundaries of the South Saskatchewan Regional Plan (SSRP) and implications of the plan are anticipated to be similar across all Options.</p>	<p>Potential for the highest overall impacts compared to the other Options due to the construction of a new transmission line and leaving the existing 610L in operation.</p>

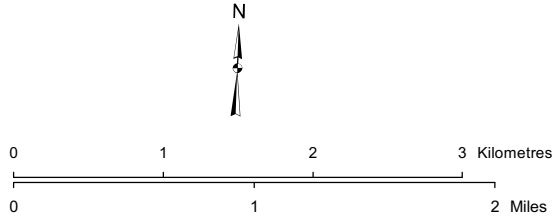
Appendix B-1



LEGEND

- Existing Substation
- - - Existing Transmission Line
- Study Area
- Hamlet or Locality
- Residence
- Wellsite
- Pipeline
- Railway
- River or Stream
- Road
- Airport
- Environmentally Significant Area
- Gravel Pit
- Urban Area
- Water Body

NO:
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 FILE NO.: XXXXXXXX
 REVISION: 0.00.00
 AL FOLDER: Vauxhall Area Transmission Development
DATE: 2021-06-22

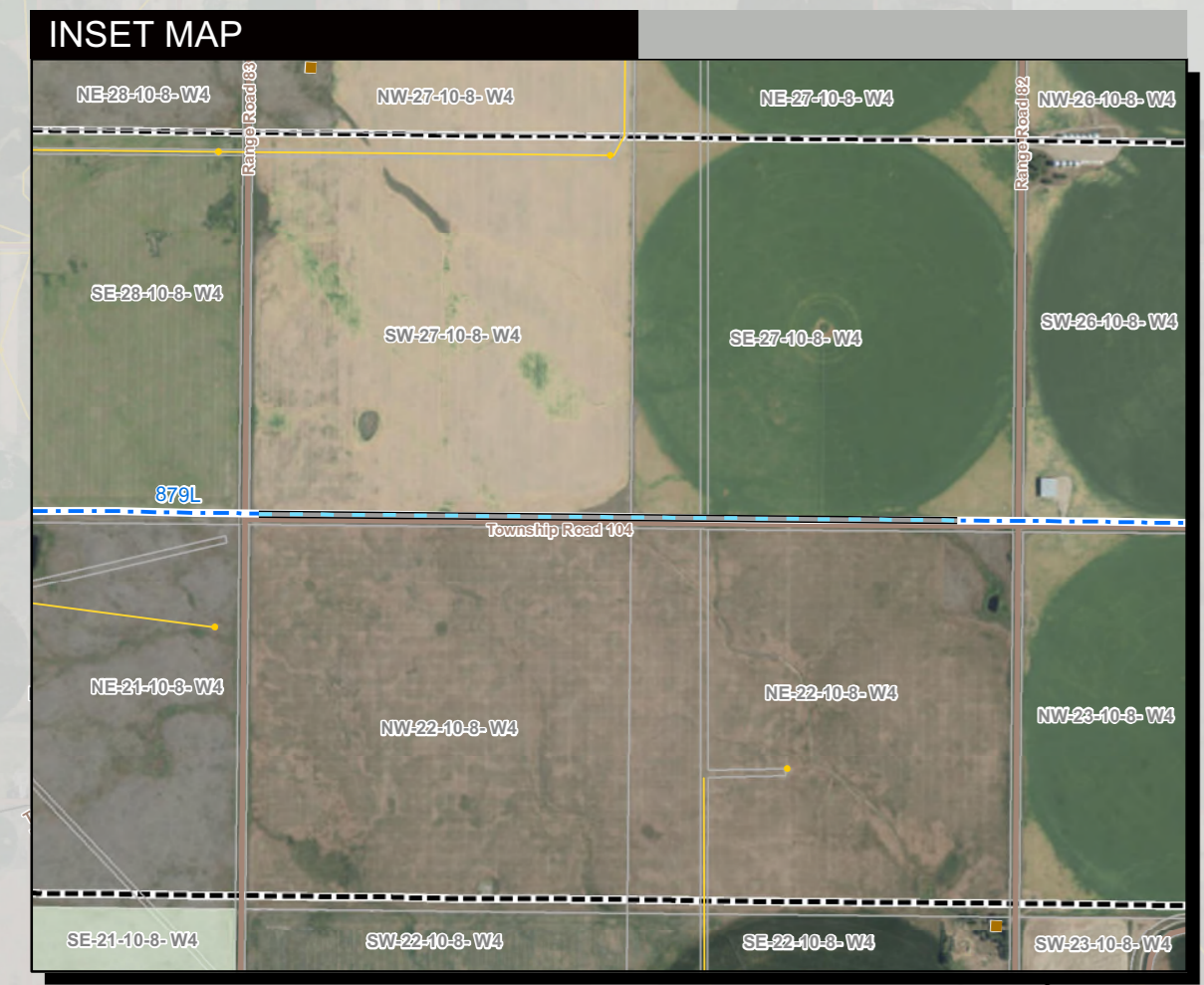
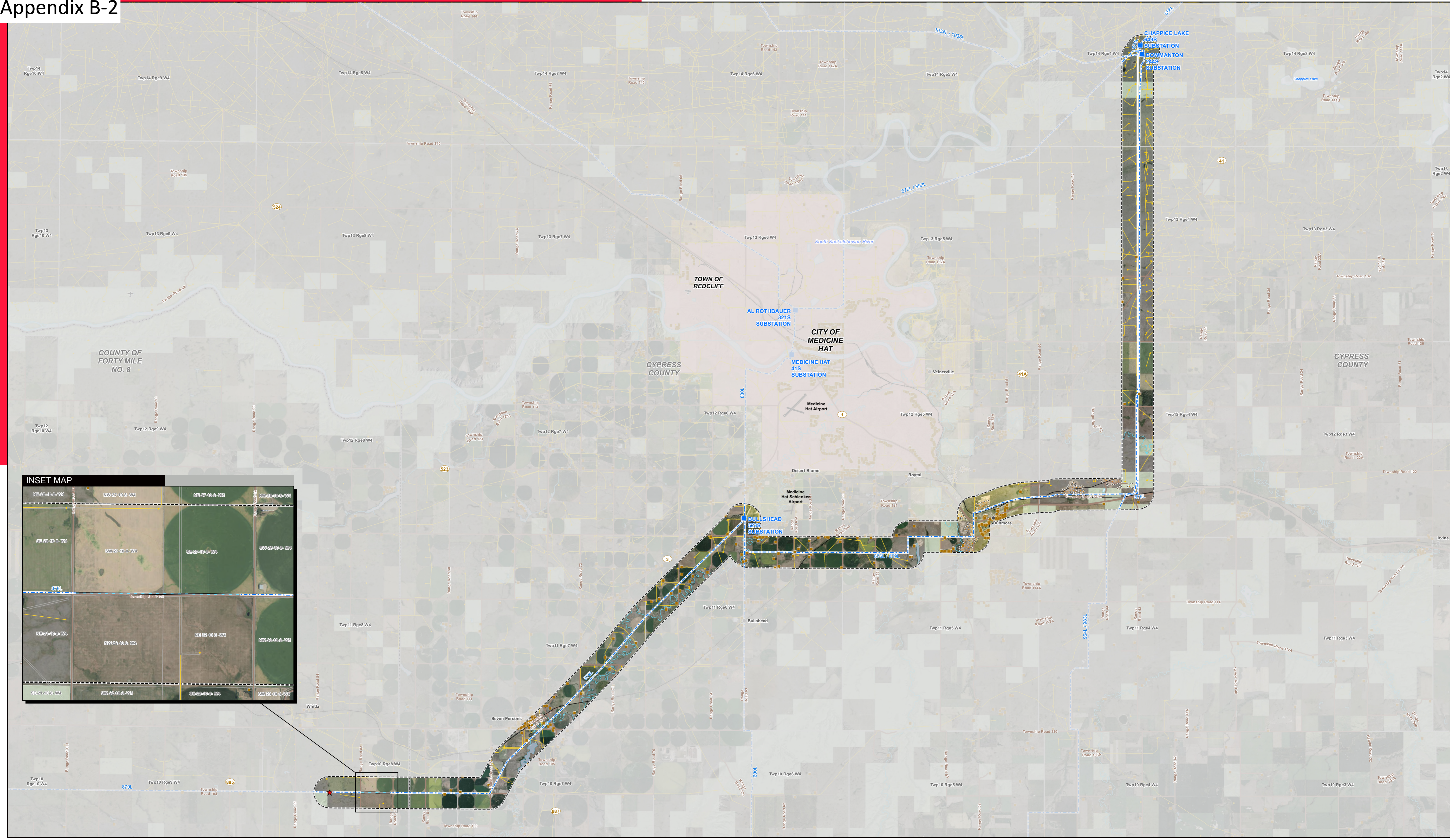


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STUDY AREA SAM1

 A BERKSHIRE HATHAWAY ENERGY COMPANY

POTENTIAL
Vauxhall Area Transmission Development

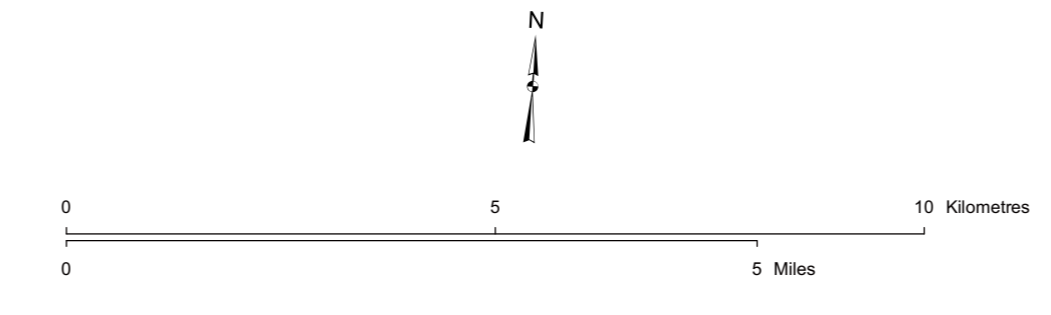


LEGEND

★ RES Tap Point	● Wellsite	▨ Gravel Pit
■ Existing Substation	▬ Municipal or County Boundary	▨ Other Industrial Site
— Existing Transmission Line	— Pipeline	■ Urban Area
— REA Underbuild Line	— Railway	■ Water Body
▬ Study Area	— River or Stream	
✈ Air Strip	— Road	
● Hamlet or Locality	✈ Airport	
■ Residence	■ Environmentally Significant Area	

NO. DRAWN: SG - AL
 FILE NO.: XXXXXX
 REVISION: 0.00.00
 AL FOLDER: Vauxhall Area Transmission Development
 DATE: 2021-06-22

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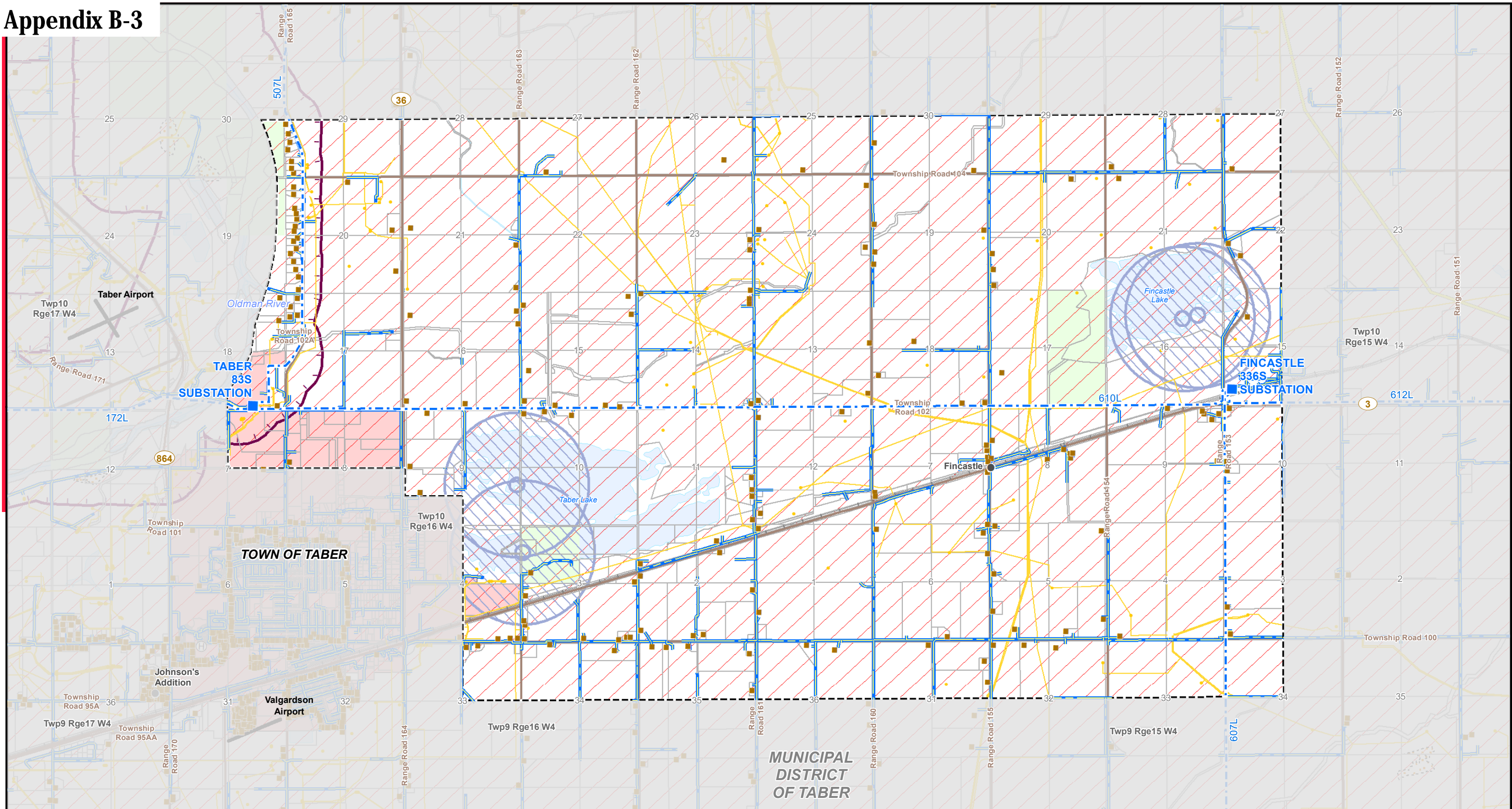
STUDY AREA **SAM2**



POTENTIAL

Vauxhall Area Transmission Development

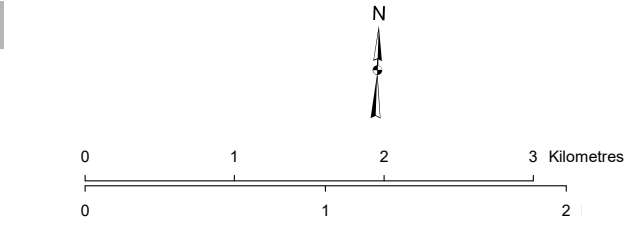
Appendix B-3



LEGEND

Existing Substation	Railway	Burrowing Owl/Sensitive Amphibian Range/Sharptail Grouse
Existing Transmission Line	River or Stream	Colonial Bird Nest
Existing Fortis Distribution Line	Road	Endangered and Threatened Plant Range
Study Area	Airport	Sensitive Snake Specie Range
Hamlet or Locality	Environmentally Significant Area	
Wellsite	Gravel Pit	
Residence	Urban Area	
Pipeline	Water Body	

NO: 35031670 - 6103
 DRAWN: SG - AL
 FILE NO.: XXXXXXX
 REVISION: 0.00.01
 AL FOLDER: Vauxhall Area Transmission Development
DATE: 2021-06-28



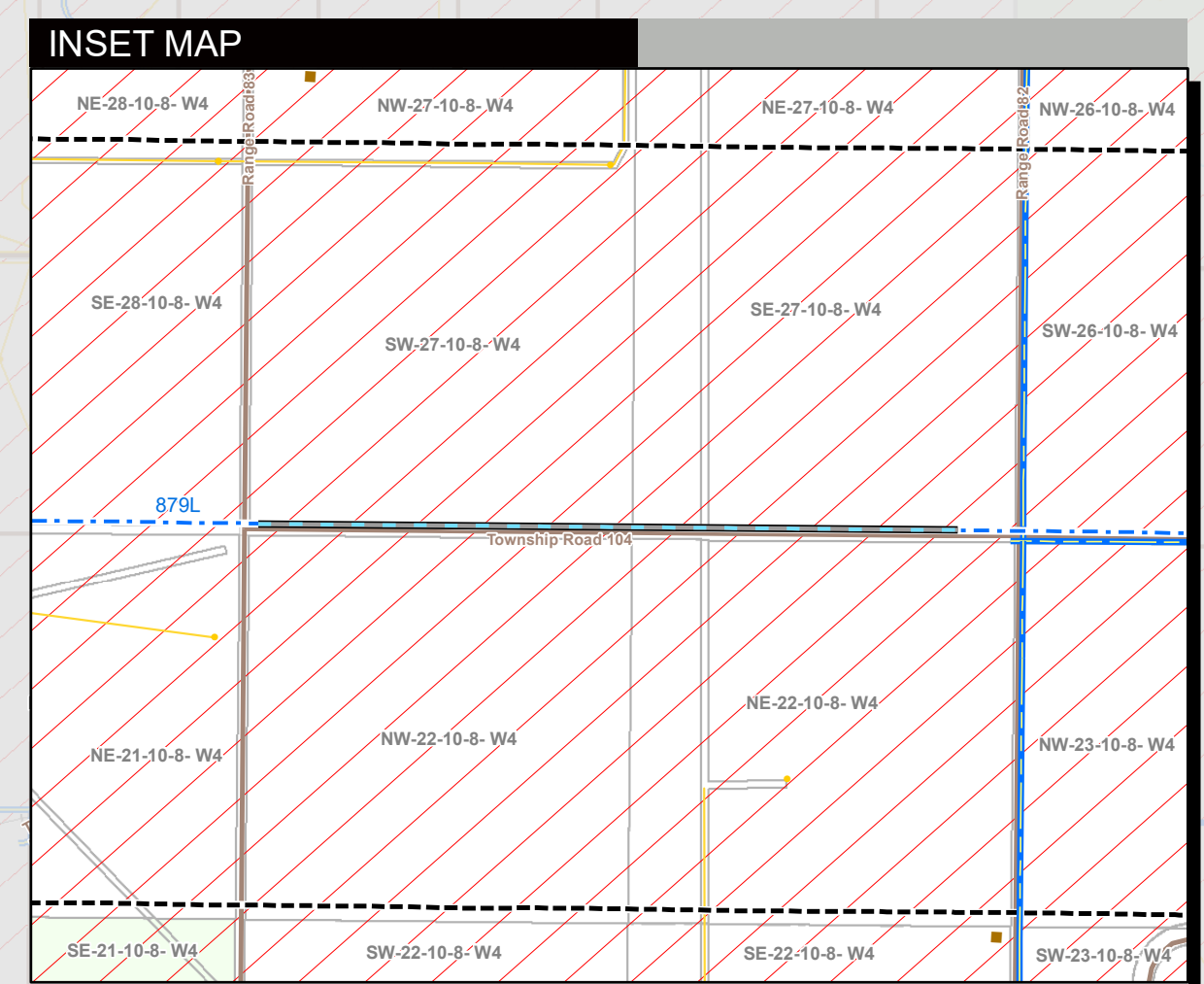
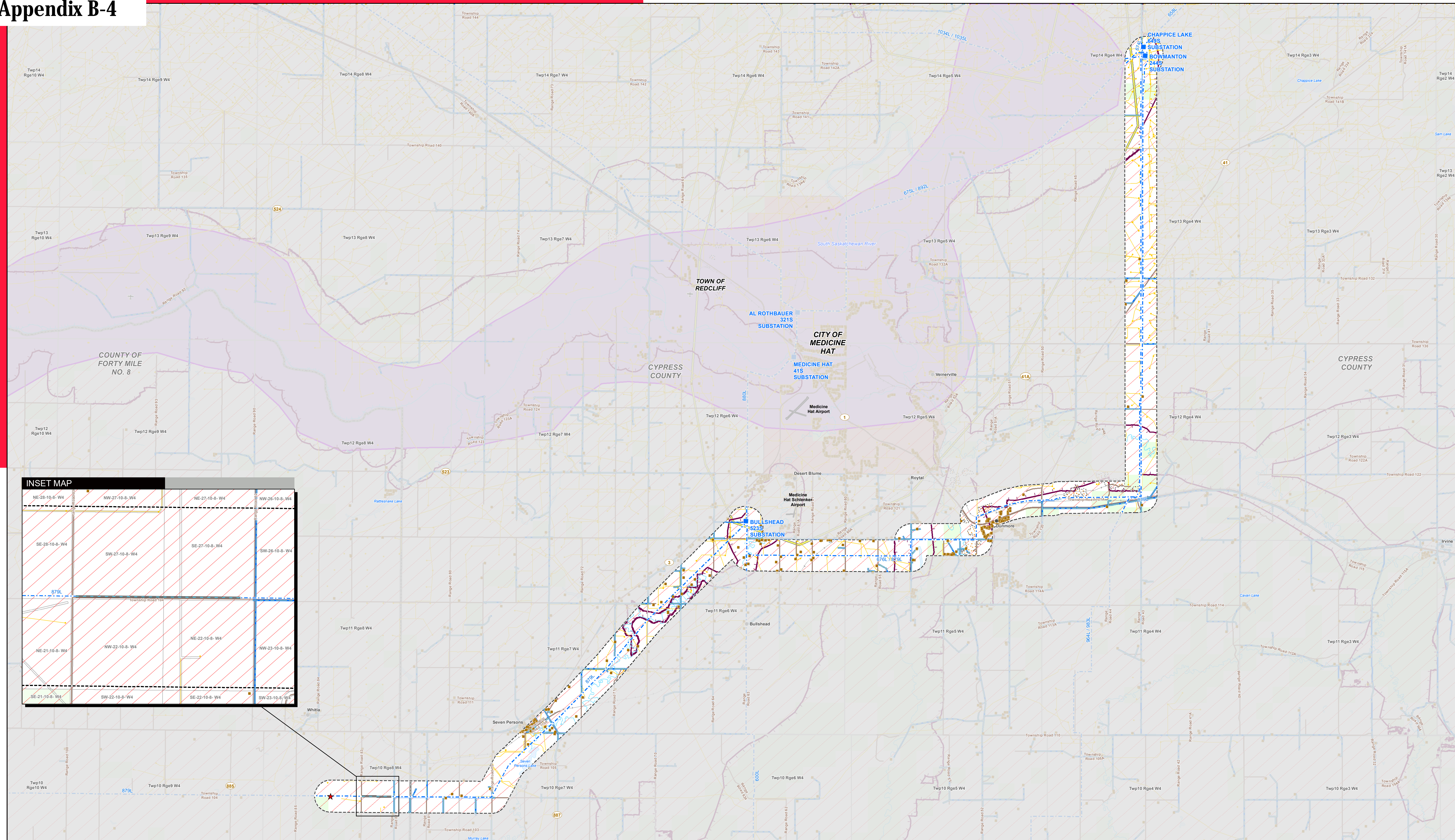
DETAIL BASE DB1

POTENTIAL

Vauxhall Area Transmission Development

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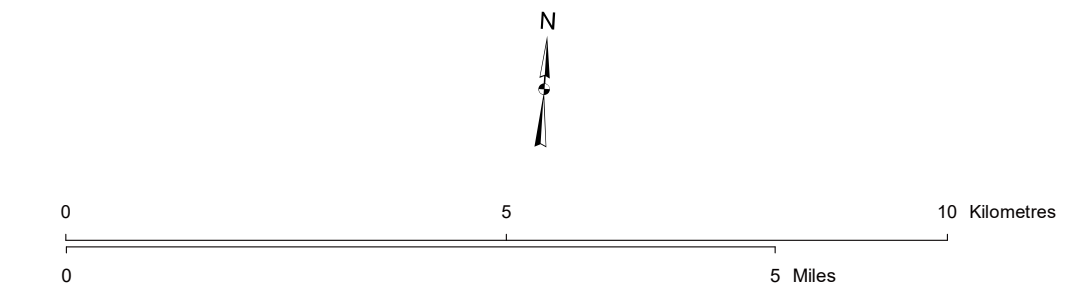
Appendix B-4



LEGEND	
★ RES Tap Point	■ Residence
● Existing Substation	■ Wellsite
— Existing Transmission Line	— Municipal or County Boundary
— Existing Fortis Distribution Line	— Pipeline
— REA Underbuild Line	— Railway
— Study Area	— River or Stream
— Air Strip	— Road
● Hamlet or Locality	— Airport
■ Environmentally Significant Area	■ Endangered and Threatened Plant Range
■ Threatened Plant Range	■ Sensitive Snake Species Range
■ Gravel Pit	■ Shorthorn Lizard Area
■ Other Industrial Site	■ Urban Area
■ Water Body	■ Burrowing Owl/Sensitive Amphibian Range/Sharp-tail Grouse

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POTENTIAL

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