

5 Connecting the Wind Farm

5.1 Grid Connection Overview

Introduction

One of the key challenges with this project has been securing a feasible and viable route for the main powerline to connect the wind farm to the existing transmission infrastructure. To export power from the wind farm, Epuron assessed a number of potential grid connection options and powerline corridors in the region of the wind farm.

Linear infrastructure is complex to develop over private land. Where in the past authorities could compulsorily acquire land for public purposes such as electricity transmission, today network operators are private enterprises and are more reluctant to use their compulsory acquisition powers than their public authority predecessors. Epuron, as a private company, has no right to compulsorily acquire land and therefore is reliant on working with landowners who are willing to enter into agreements to host powerline infrastructure.

In the consideration of which route to progress the number of private landholders is a key element in the decision. One land owner declining the use of their land to host an easement can result in major deviations to the route, introduce the requirement for multiple new landowners, and result in a route which is no longer optimal from an environmental perspective.

The process followed by Epuron is outlined below and further detail can be found in Chapter 3.4 of the exhibited Environmental Assessment (EA). This approach started with a desktop assessment of route options to determine which appears to have the lowest impact and is theoretically the most likely to be secured, followed by numerous site visits and meetings with landowners to identify an environmentally acceptable corridor which is supported by the hosting landowners.

Preliminary Corridor Selection

In 2010-11 at the same time as preparing the preliminary wind farm layout, Epuron commenced investigations into the various grid connection options and general powerline corridors available for connecting the project. A number of broad grid connection options and powerline corridors were identified for connecting the project to the grid as indicated in the Grid Connection Options and Powerline Corridor Options maps below. [Figure 5-1 and Figure 5-2]

These options and corridors were then assessed in more detail, and preliminary consultation carried out with potentially involved stakeholders to identify a route suitable for further development.

The following grid connection options were identified as being proximate to the wind farm site;

- ▶ Transgrid's Wollar – Wellington 330kV Transmission Line near Ulan.
- ▶ Transgrid's Wollar – Wellington 330kV Transmission Line near Gulgong.
- ▶ Transgrid's Wollar – Bayswater 500kV Transmission Line south of Merriwa.
- ▶ Country Energy's 66kV Substation located at Dunedoo.
- ▶ Country Energy's 132kV Substation located at Beryl (near Gulgong).

Connections to the Country Energy 66kV / 132kV lines were quickly eliminated as these connection points do not have sufficient capacity to connect the wind farm.

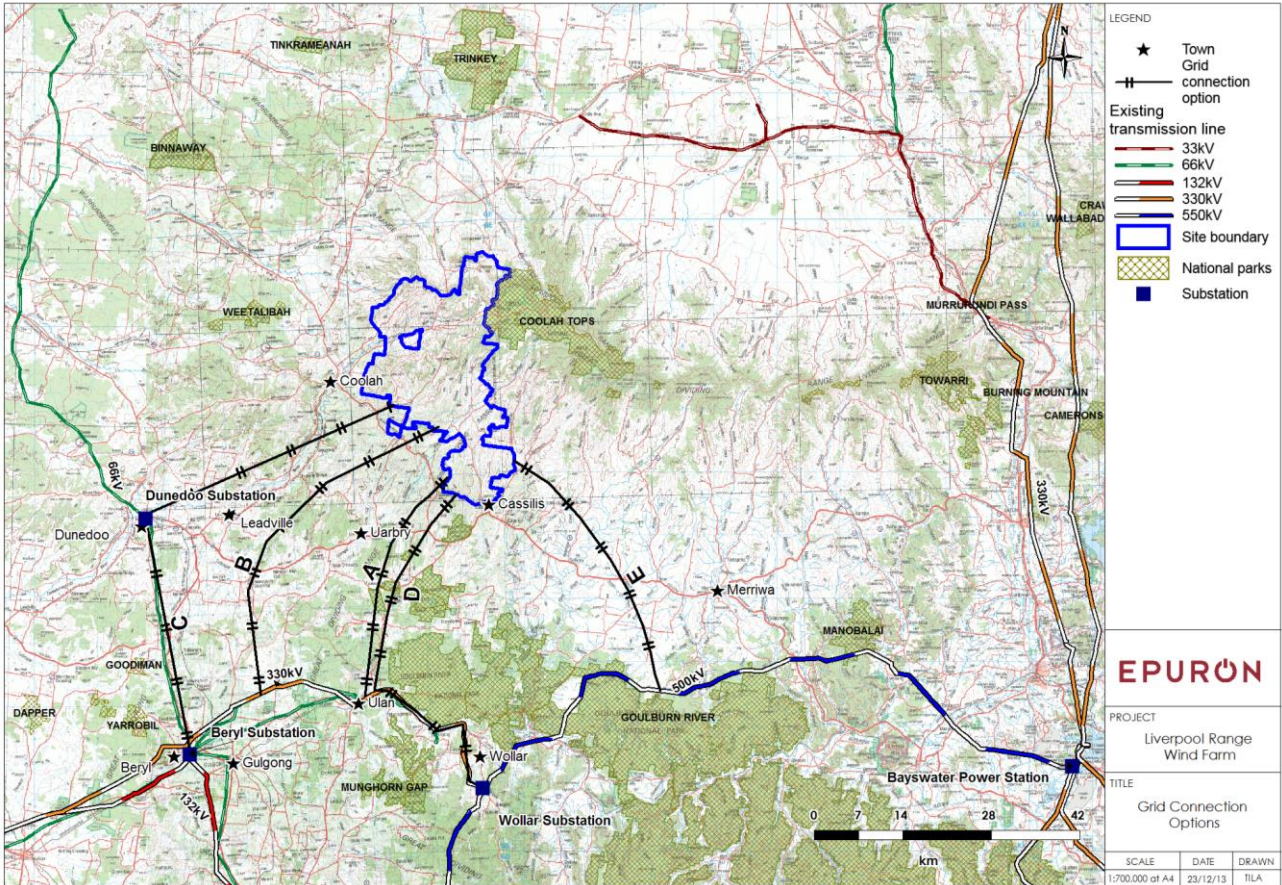


Figure 5-1 Grid Connection Options as presented in the EA

5.2 Powerline Corridors

Alongside the grid connection options a grid connection assessment was carried out for the project which aimed to consolidate the various factors into a ranked order by:

- ▶ Assessing the viability of the identified grid connection options
- ▶ Assessing the various lands, technical and environmental constraints for developing each powerline corridor to connect to the identified grid connection options from the wind farm site boundary.
- ▶ Identifying and selecting a Preferred and Alternate powerline route suitable for further development within an identified corridor.

Preparing an initial concept design of the Preferred and Alternate powerline routes to facilitate consultation with stakeholders and to enable development works to progress.

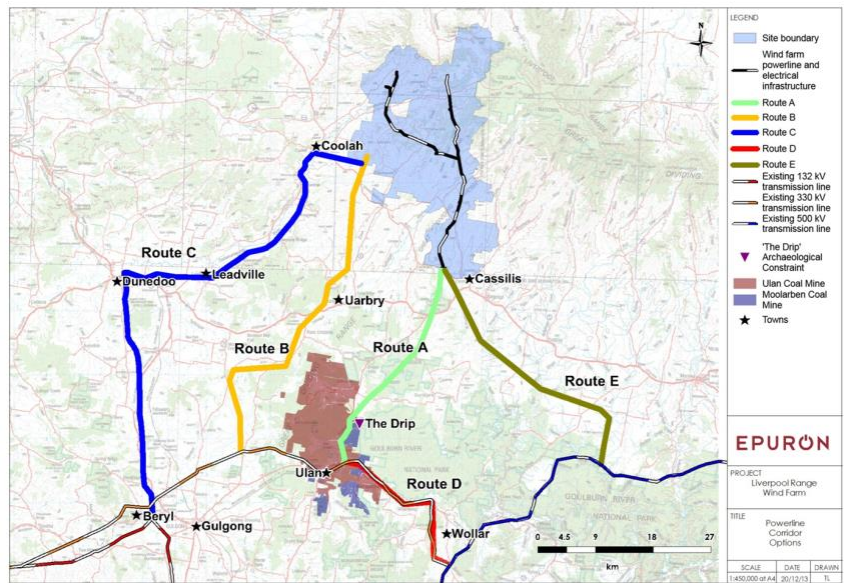


Figure 5-2 Powerline Corridor Options as presented in the EA

The assessment was included in the EA and is tabulated below.

Table 5-1 Summary of possible grid connection corridors considered

Corridor	Overall Length (km)	Number of Land Parcels	Number of Land-owners	Dwellings within 1 km	Est. of Cost (\$M)	Land access constraints	Environmental Constraints	Grid connection & technical constraints	Assessment
Corridor A South to 330 kV line near Ulan	35	57	11	7	65	low	medium	low	Most viable connection corridor overall. Land limitations in vicinity of Ulan and Moolarben Mines. Traversing Durridgere State Conservation Area. Sufficient connection capacity available for wind farm output.
Corridor B South west to 330 kV line via Uarbry	56	87	45	18	85	high	low	low	Close to Uarbry township. Large number of landholdings but unwilling landowners. Long and indirect route increases cost and visual impact.
Corridor C West to Beryl 132 kV substation via Dunedoo 66 kV substation	87	135	50	131	85	high	low	high	Insufficient grid connection capacity for output. Close to population centres at Beryl, Dunedoo and Gulgong Greatest length of all options and lowest viability. Large number of landholdings and unwilling landowners
Corridor D South then east to Wollar 500 kV substation	62	62	18	11	100	high	medium	high	Significantly more expensive and complex than other routes and with greater impacts for no additional benefits.
Corridor E South east to Wollar – Bayswater 500 kV transmission line	45	36	21	3	100	high	low	high	Cost prohibitive due to line length plus requirements for new 500kV substation and technical complexities.

5.3 Two options selected for progression

The assessment identified that the two most suitable options were south to Ulan or south west via Uarbry. These two options pivoted around the key constraint each posed – for Corridor A to Ulan there was a medium environmental constraint and for Corridor B via Uarbry there was a high land access constraint.

Following initial enquiries with landowners on Corridor B it was confirmed that land access would be a high constraint for this route with the potential to make the route longer than initially identified and consequently increase the number of landowners, the cost and the overall constraint level. A number of key landowners were unwilling to negotiating a powerline easement on their land which ultimately made this route untenable.

While the environmental constraints posed by Corridor A are non-trivial, these constraints are manageable through avoidance and mitigation to achieve an acceptable outcome. Conversely, early discussions with landowners on Corridor B, which on paper was longer, indicated that the route would be longer than anticipated due to the need to go around some landowners. This tipped Corridor B from potentially viable and feasible into unviable.

Corridor A was therefore progressed and a Preferred and Alternate powerline route within the broader Corridor A was identified and assessed including mapping of all nearby residences and completing appropriate specialist studies. The Preferred (orange) and Alternate (red) powerline routes proposed in the Environmental Assessment are shown in Figure 5-3. A further variation to this corridor (following Durridgere Rd east from Ulan Rd and skirting to the south and east of Durridgere SCA) was considered as it offered the potential to avoid impacts to the Durridgere SCA, however this corridor passes over a number of constraining land parcels and again key landowners were unwilling to host a powerline easement on their land which ultimately made this route untenable

The powerline route was divided into sections and constraints associated with each were reviewed.

The two feasible options were put on public exhibition enabling stakeholders to flag any reservations or concerns formally through submissions.

Issues raised in submissions included:

- ▶ consent requirements from landowners (including the Crown and the Minister for the Environment);
- ▶ avoiding and minimising impacts on existing vegetation where possible, and particularly any sensitive native vegetation;
- ▶ avoiding and minimising impacts on existing archaeological artefacts and areas of significance where possible;
- ▶ avoiding or minimising impacts where possible in existing vegetation offset areas (e.g. Ulan Coal);
- ▶ avoiding where possible, or minimising impacts to existing reserves (e.g. Durridgere SCA);
- ▶ technical and commercial feasibility considerations (e.g. connection switchyard location).

Following receipt of submissions the sections were reassessed and Table 5-2 which was in the EA was updated to outline the key constraints which were addressed for each section. Sections in **bold** are part of the current proposal.



Figure 5-3 Preferred and Alternate Powerline Routes outlined in the EA

Table 5-2 Summary of review of EA powerline route following submissions

Section	Route Option	Positives	Negatives
Section A - B	Single option (Preferred and Alternate)	Generally follows existing disturbed road reserve corridor and land between road and coal mine.	Minimal. Amended since EA to avoid existing mine infrastructure on and near the road reserve. The location of the switchyard land is on previously disturbed mine land.
Section B - C	Western Option (Alternate)	Follows existing disturbed area of mine infrastructure Increases distance to heritage points (The Drip, Hands on Rock)	More constraints than eastern option, unacceptable to Ulan Coal Mine due to potential impact on mine management. Less favoured by Mudgee Local ALC due to the number of artefacts. Encroaches on sensitive cliff line habitat and existing environmental offset areas.
Section B - C	Eastern Option (Preferred)	Impacts to Reserve and riparian area can be avoided and minimised by micro-siting of easement. Use of road reserve maximised. Impacts to Ulan offset area minimised and offset	Encroaches on and near proposed environmental offset area declared for Ulan Coal Mine.
Section C - D	Western Option (Preferred)	Direct Route over private landholding No longer used - see new route west and north of 'Green Hills' on map below.	Epuron unable to secure land agreement. Landowner has other plans for land. Timing of land sale rules out use of land.
Section C - D	Eastern Option (Alternate)	Route over private landholding No longer used – see new route west and north of 'Green Hills' on map below.	Epuron unable to secure land agreement. Landowner has other plans for land. Timing of land rules out use of land.
Section C - E	New section replacing both previous C–D options and D-F-E option	Lands secured, minimised environmental impacts, creates linkage between two segments of the SCA for offsetting	Includes minimised impacts to additional portions of the SCA along edges. Has taken time to secure.
Section D - E	Eastern Option (Preferred)	Revised route significantly minimises impacts. Most direct route with lower overall environmental impacts than section D – F. Reduced clearing requirements and number of houses nearby	Fragmentation of and impacts to Durridgere SCA in previous route not supported by OEH
Section D - F	Western Option (Alternate)	No longer used.	Impacts to sensitive vegetation (Turill SCA) Proximity to houses in the vicinity of Turill. Complex land tenure issue causing gap in corridor
Section F - E	Eastern Option (Preferred)	No longer used.	Road crossing at Golden Highway and Ulan Road.

			<i>Narrow portions constrain options</i> <i>Clearing vegetation on road reserves.</i> <i>Proximity to houses.</i>
Section F - G	<i>Western Option (Alternate)</i>	<i>No longer used.</i>	<i>Longer and more expensive corridor.</i> <i>Impacts sensitive western edge of Turill State Forest. Terrain poses construction challenges</i>
Section E - G	Single Option (Preferred)	Avoids impacts to sensitive vegetation identified in F – G section. Avoids impacts to a larger number of landowners and residences, further south in the vicinity of Turill.	Minimal. Crosses Golden Highway near Cassilis.

5.4 Key issues to be addressed

The four key issues to be addressed by further exploration of the powerline route were:

1. Ensure that the proposed route could be secured, and is viable and feasible.
2. Minimise impacts to Durridgere State Conservation Area in particular, and to ecological impacts generally,
3. Minimise (assess, liaise and agree) the final route arrangements in the vicinity of the Ulan Coal Mine's proposed Bobadeen East Vegetation Offset Area,
4. Finalise the location of and land tenure arrangements for the switchyard on Ulan Coal Mine's land, and

Secure a viable and feasible route

At the time of submitting the EA, Epuron had held preliminary discussions with potential powerline hosts to confirm that the corridor was likely to be acceptable.

Since submitting the EA, Epuron has actively negotiate with all potential landowners with a view to securing land agreements for the relevant powerline corridor prior to finalising the route and preparing its response to submissions. This is essential to provide certainty of the final corridor.

'Discussions have been held with all relevant landowners including

- ▶ OEH (see below)
- ▶ Ulan Coal Mine Limited (see below)
- ▶ The relevant Local Aboriginal Land Council
- ▶ Crown Lands and
- ▶ All private landowners

A number of private landowners for various reasons were unwilling or unable to enter into land agreements with Epuron which would allow the project to be technically and commercially feasible. Affected land parcels were removed from the corridor and alternate paths pursued. As a result the final route includes a number of changes:

- ▶ The corridor labelled C to D in Figure 5-3 has by necessity been relocated to the west, impacting the western section of the Durridgere SCA;
- ▶ The corridor labelled F to E in Figure 5-3 is unable to be used; and
- ▶ The corridor labelled D to F in Figure 5-3 is no longer tenable, both due to the ability to secure land and due to elevated environmental impacts on approach to the Durridgere SCA (see below).

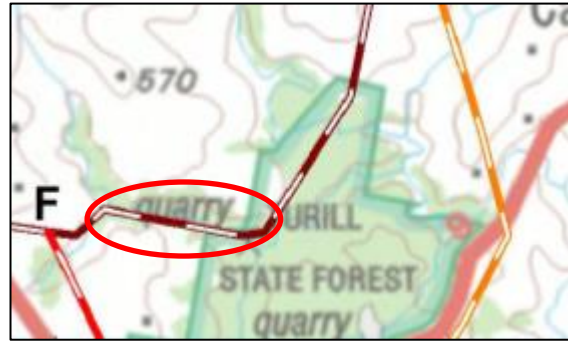
Following significant discussion with private landholders of both new options for the route and revisiting those who had already rejected the option of hosting the powerline, a final route was secured which achieves the key outcomes of minimising impacts yet securing a viable route. Commercial terms are agreed and/or land agreements are in place for all private landholdings on the currently proposed powerline route.

Minimise impacts to Durridgere State Conservation Area

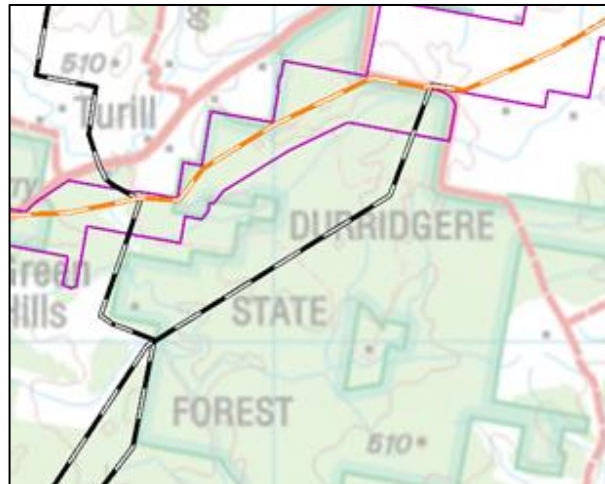
Previously the Powerline was proposed through a central area within the main Durridgere SCA. OEH expressed significant concern at the potential fragmentation resulting from this corridor, and as a result Epuron and OEH reviewed alternates and identified a corridor which more closely follows the reserve boundaries.

The two routes, the preferred and alternate, shown in the EA were the two most promising routes available to connect the wind farm. However, each option had some impacts and challenges:

- ▶ the alternate route shown in the EA which veers north west from the main Durridgere SCA towards the north had a number of issues:
 - over the course of discussions a key signed landowner was found to have an unresolved legal complication on the land title. Negotiations to bypass this landowner through neighbouring land were not progressing.
 - this route required access into Turill SCA along a 44 hectare strip of land owned by The State of NSW (see right). This strip of land has both high ecological values (TSC and EPBC Acts) and also presented a high level of engineering challenge – both constraints associated with the complex riparian corridor within it.
- ▶ The preferred route as shown in the EA dissected the Durridgere SCA (see below left). OEH did not support the location of the transmission corridor noting in their submission that it “constitutes a threat to the natural condition and the special features of the SCA”. The revised route, shown in orange (below right) skirts the edge of the SCA.



EA transmission route through Durridgere SCA



RTS Preferred transmission route

Subject to the Minister’s consent to the revised, minimised impact powerline and powerline easement in Durridgere State Conservation Areas (DSCA), in accordance with the National Parks and Wildlife Act, and the Crown’s consent to the powerline crossing a number of Crown parcels, this powerline is able to be secured.

The current proposed Powerline has minimised the impacts by entering the SCA further north through recently secured landowners and skirting around the north-west section of the SCA. This area was more recently logged and has a reduction of two kilometres in length over the previous route, being 4.8 km in length where the previous route was 6.4 km.

In creating a lower impact route through the main section of the Durridgere SCA this new powerline route:

- ▶ avoids and minimises impacts to higher value biodiversity areas within the Durridgere SCA

- ▶ avoids the powerline going through the section of the SCA which was previously Turill State Forest. The entry point of the previously exhibited alternate powerline into the Turill State Forest was through an area containing EEC and CEEC
- ▶ has reduced biodiversity impacts:
 - the previous preferred powerline route impacted 88.87 Ha of EEC
 - the previous alternate powerline impacted 113.60 Ha of EEC
 - the current proposed powerline impacts 62.66 Ha of EEC
- ▶ avoids fragmentation of areas of the SCA,
- ▶ while the currently proposed powerline includes a short additional section of SCA along the border of the Curryall SCA it also secures an adjoining block of land of 219 hectares as an offset, which creates significantly improved connectivity between two previously unconnected sections of the SCA, and
- ▶ avoids proximity to a number of dwellings in Turill where the previous route crossed the Ulan Road.

The current proposed route for the powerline is shown in orange in Figure 5-5 with previous routes shown in black.

Minimise impacts to Bobadeen East Vegetation Offset Area

The Bobadeen East Vegetation Offset Area is part of Ulan Coal Mine Limited's (UCML) approval conditions. This Offset satisfies a number of mitigation requirements for the mine under both the NSW and Commonwealth legislation. The offset is part of a number of offsets currently being secured by UCML in perpetuity.

Epuron is working with UCML and OEH to ensure that the powerline easement proposed through the Bobadeen East Vegetation Offset Area is consistent with the existing offsetting requirements under UCML's state and federal approvals.

The current proposal is for the impacts caused by the powerline easement to the Bobadeen East Vegetation Offset Area to be addressed by a minor adjustment to the boundaries of the BEVOA within the identified offset lands. These proposed boundary adjustments will ensure that the BEVOA will continue to comply with UCML's approval conditions and UCML's offset requirements despite the powerline easement running through the original location of the BEVOA. Alongside this the impacts of the powerline generally will be offset as part of this application (SSD 6696), thus ensuring a net positive outcome.

Finalise Location and tenure - Switchyard/Substation on UCML land

Epuron and UCML have engaged in a thorough and constructive dialogue to find a location for the switchyard/substation location required by the Wind Farm in proximity to the TransGrid 330kV Wollar to Wellington transmission line. UCML had concerns that some of the previously proposed locations for the switchyard/substation might impact upon the Goulburn River Diversion Remediation Plan approved, following stakeholder consultation, in 2013.

An area of land has been identified, agreed by both parties and assessed as suitable in scale, location and impacts to host the switchyard/substation. Land tenure arrangements are well progressed. The subdivision of this parcel of land is part of the approval sought under this application SSD 6696.

5.5 Impact Area Calculations

The current proposed powerline route has a lower overall environmental impact than the previous preferred and alternate powerline routes detailed in the EA.

The impacts of the two previous options and the current option of the powerline from the existing TransGrid 330kV through the wind farm site are outlined in the table below;

Table 5-3 Impact Area Comparison

Condition class	CEEC	EEC	EA preferred (total length 94.9 km)	EA alternate (total length 99 km)	RTS current powerline (total length 81.9 km)	Reduction in impacts (from EA preferred)
Good	Yes	Yes	1.31	0	1.31	0
Moderate-Good	Yes	Yes	2.64	22.78	9.05	-6.41
Moderate	No	Yes	3.43	5.62	4.03	-0.6
Poor-Moderate	No	Yes	9.16	16.22	5.54	3.62
Poor	No	Yes	72.39	68.98	42.73	29.66
Total EEC			88.93	113.60	62.66	26.27
Total CEEC			3.95	22.78	10.36	-6.41

5.6 Final powerline route

The final powerline route shown in Figure 5-4 has been developed taking into account all submissions, and in particular the key issues identified above. The final powerline route has a number of advantages including:

- ▶ Feasibility – reviewed alongside all other routes, the current proposed powerline provides the best overall outcome when considered against land access, environmental and archaeological impacts, proximity to dwellings, easement length, cost to build, connection availability, local amenity and other environment and amenity impact considerations.
- ▶ Minimised impacts - the current proposed route reduces the impacted area of EEC vegetation by 26.27Ha compared to the EA preferred route and 50.94Ha compared to the alternate.
- ▶ Secured and securable land tenure.

In minimising impacts Epuron has worked with stakeholders to ensure that the final route is likely to achieve both planning consent and secure land tenure. Epuron is appreciative of the significant input of landowners, NP&WS, Glencore and UCML personnel, Crown Lands, the Mudgee Local Aboriginal Lands Council and NSWALC and a number of NSW state government departments in working to achieve the final viable, feasible transmission connection route.

Epuron will continue to consult with the community and all stakeholders in relation to this powerline easement.

