

6 March 2019

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Dear Nicola,

Re: Clarence Correctional Centre, Transmission Line, Clarence River Valley—Heritage Impact Statement

Curio Projects has been commissioned by Infrastructure NSW to prepare a Heritage Impact Statement (HIS) in the form of a letter for the construction of a new 132 kV transmission line and 55 associated poles to service and provide power to the new Clarence Correctional Centre (CCC). The Transmission Line is proposed to run through the Clarence River Valley from the new CCC 12.5km across modern agricultural land, towards the Clarence River (Figure 1).

This letter details the nature and location of the proposed transmission line, in relation to the proposed location of installation, within the context of heritage significance of the Clarence River Valley.

Project Summary and Location

The proposed development is located in the Clarence River Valley, predominately within the Clarenza locality with the eastern section of the development entering the Lavadia locality. The proposed route of the CCC Transmission Line is to extend from the existing TransGrid HV transmission line in the west, across 12.5km to the new Clarence Correctional Centre in the east (currently under construction).

The development will consist of a new 132kV transmission line, and 55 associated poles, being implemented along a 12.5km path within a 30m easement. There will also be associated ancillary works/impact works required to facilitate the construction of the line, including the establishment of temporary construction work sites and additions, repairs and upgrades of access tracks, and equipment laydown areas, all of which are also included within the assessed study area (Figure 2).

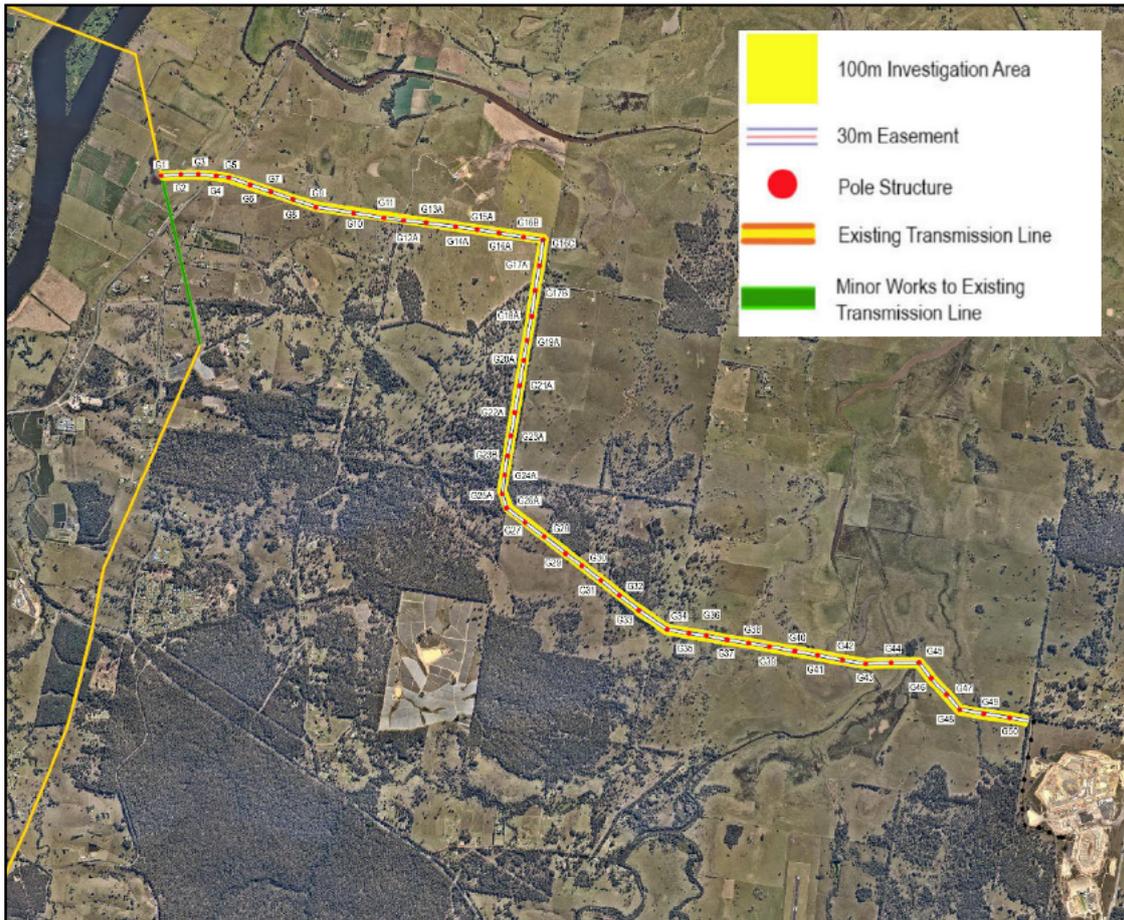


Figure 1: Proposed Transmission Line Route (Source: INSW 2019)

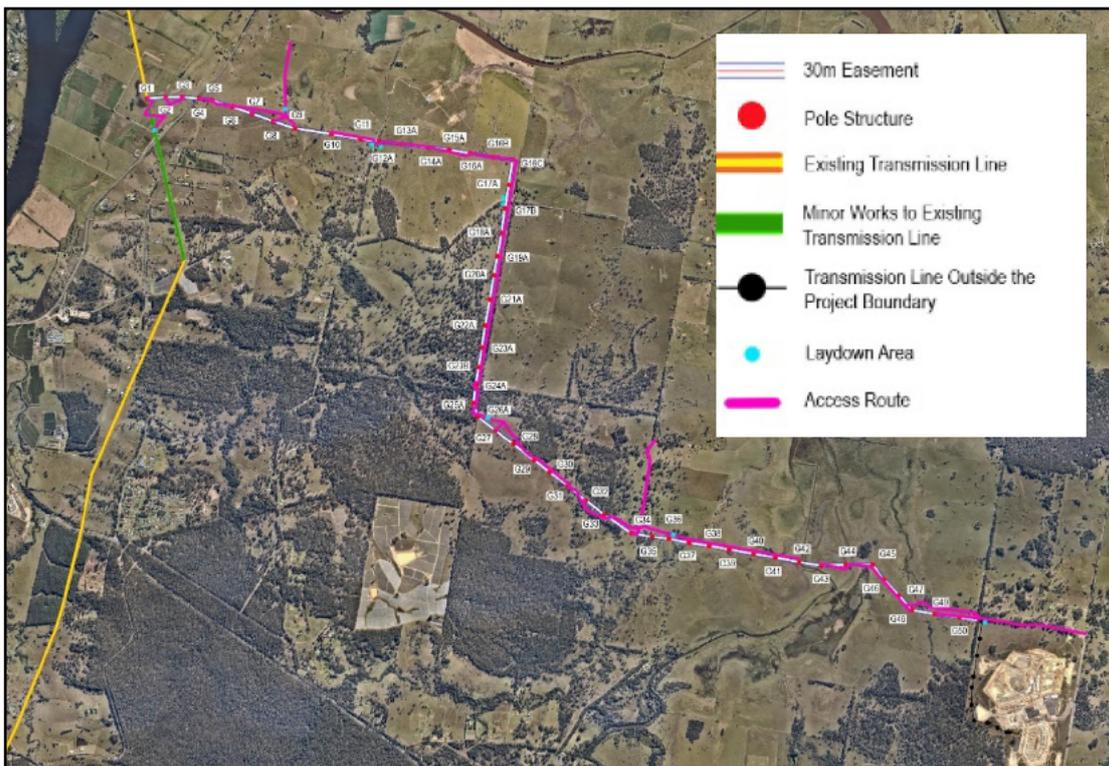


Figure 2: Proposed Access Routes in Pink (Source: INSW 2019)

Description of Proposal

The proposed development is the construction, operation and maintenance of a new 12.5km long 132kV electrical transmission line between the existing TransGrid transmission line to the west and the CCC's new substation to the east within a 30m easement (see Figure 3), in order to provide electricity to the new CCC (currently under construction). The primary construction will also include ancillary works to facilitate the operation of the transmission line and its construction. These works also have the potential to disturb the ground surface, and are therefore also included within the due diligence assessment contained within this report.

Proposed works for the CCC Transmission Line project include:

- A new 132 kV transmission line and 55 associated poles
 - The poles would be a combination of steel and concrete, generally 25 to 30 metres in height.
 - Typically, the footings for these would be a single bore hole, up to 1100mm wide and 6m deep, back filled with steel and concrete.
 - Deeper and wider single bored footing, or numerous smaller piles with a cap, may be required for boreholes on poorer soils.
- New easement clearing, construction pads, access gates, and new access tracks
- Clearing of trees and vegetation within the 30m easement, including potentially damaging vegetation outside the easement.
- Construction of suitable access tracks.
- Optical Ground Wire (OPGW) from the existing transmission line to the new substation (along the new transmission line)
 - Pulling back the existing OPGW coil partly along the existing transmission line
 - Splicing of the OPGW as required at the intersection of the new and existing transmission line

Ancillary works to facilitate the construction of the Transmission Line include:

- The establishment of temporary construction work sites around each structure to allow deployment of elevated work platforms (EWPs)
- The establishment of laydown areas.
- Construction of flat work benches within a 40m x 40m area adjacent to structures located on uneven topography.
- Guy wire installation on structures to provide additional structural support
- Repair or upgrade of existing access tracks including possible grading, additional gravel and compaction where necessary as well as potential culvert and causeway additions
- Some additional access tracks of approximately 4-6 meters wide typically consisting of unsealed surface roads.

Statutory Context—Heritage

Heritage places and items of particular importance to the people of New South Wales are listed on the NSW State Heritage Register. The Register was created in April 1999 by amendments to the *Heritage Act 1977*. The Clarence Valley Local Environmental Plan 2011 (LEP) identifies heritage items of local heritage significance within the Council area. No State significant heritage items are located directly within the development area. There is one local heritage item registered within the proposed development area.

The local heritage item 'Livingstone's House' (LEP Heritage Item #I945) is located within the development area, approximately beneath the existing transmission line for which minor works are proposed. 'Livingstone's House' is located at 25 Livingstone Lane, Swan Creek (Lot 12, DP 863869) (Figures 3 and 4).

The heritage listing for 'Livingstone's House' describes this item as a four-room brick cottage from prior to 1890, associated with the prominent Livingstone family. The existing transmission line and easement (for which minor works are proposed) traverses the land parcel within which the heritage item is located. However, the heritage item itself is located further east within the lot than the existing transmission line. The heritage item is located approximately half a kilometre south of the path of the new transmission line.



Figure 3: Livingstone's House Local Heritage Item (Source: Heritage Inventory Listing)

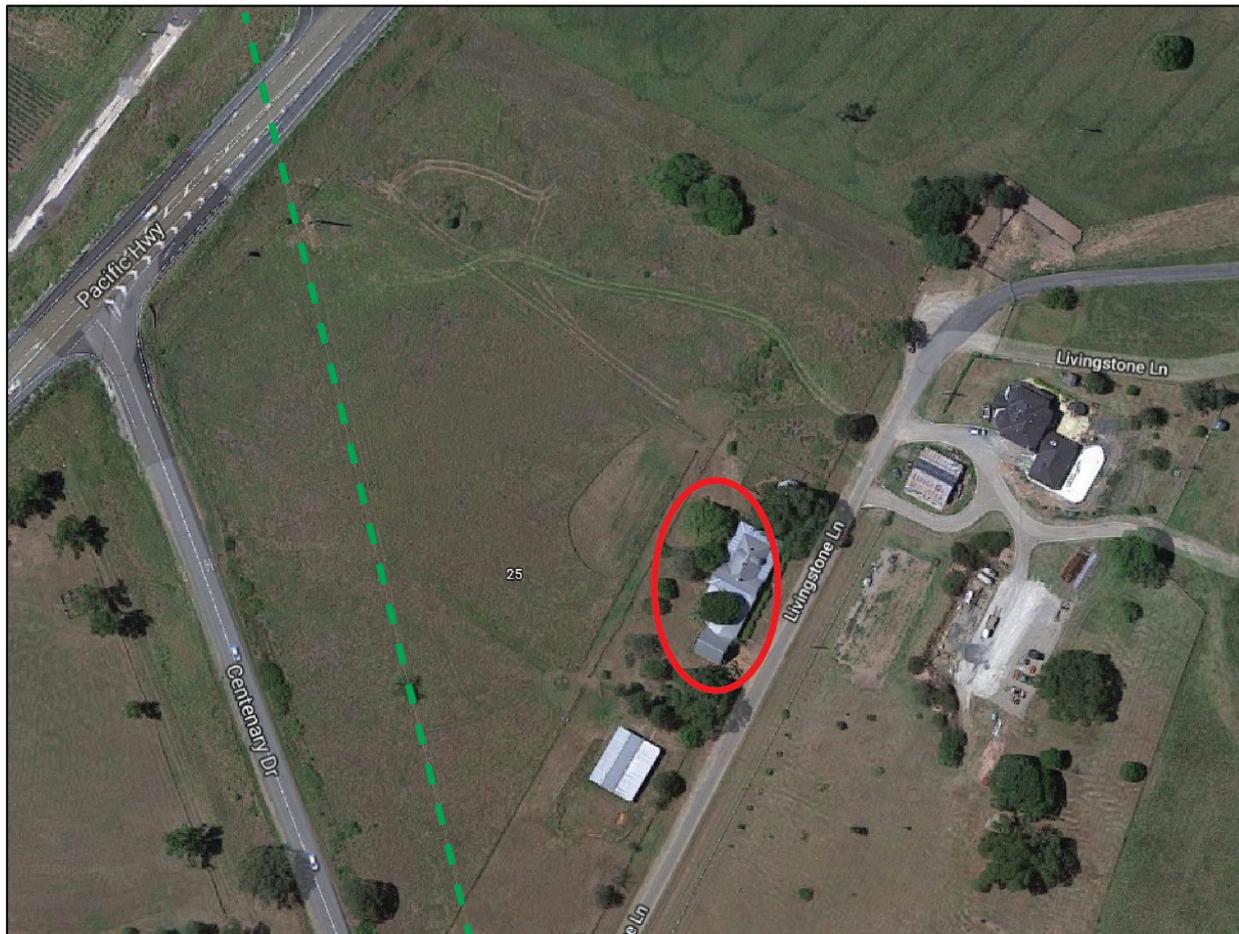


Figure 4: Path of Existing Transmission Easement (Green), in relation to heritage Item (Circled In Red) (Source: Google Maps 2018 with Curio additions)

In addition, there are two further locally listed heritage items (Clarence Valley LEP 2011) in the general proximity to the proposed development. These include:

- Dwelling 'Kincross' (LEP Local Heritage Item #1946), Swan Lane and Pacific Highway, Swan Creek (Lot 1, DP 657567)
 - This item is listed as a high-set weatherboard cottage significant for its association with the early settlement of Swan Hill.
 - This item is approximately half a kilometre north of the proposed development area.
- Gum Tree (*Eucalyptus seeana*) (LEP Local Heritage Item #1934), 144 Washpool Road, South Grafton (Road reserve)
 - A rare specimen of natural flora potentially from prior to European settlement.
 - This item is approximately 1km south and 1km west of the proposed development.

The location of all heritage items as referenced above, are presented in Figure 5.

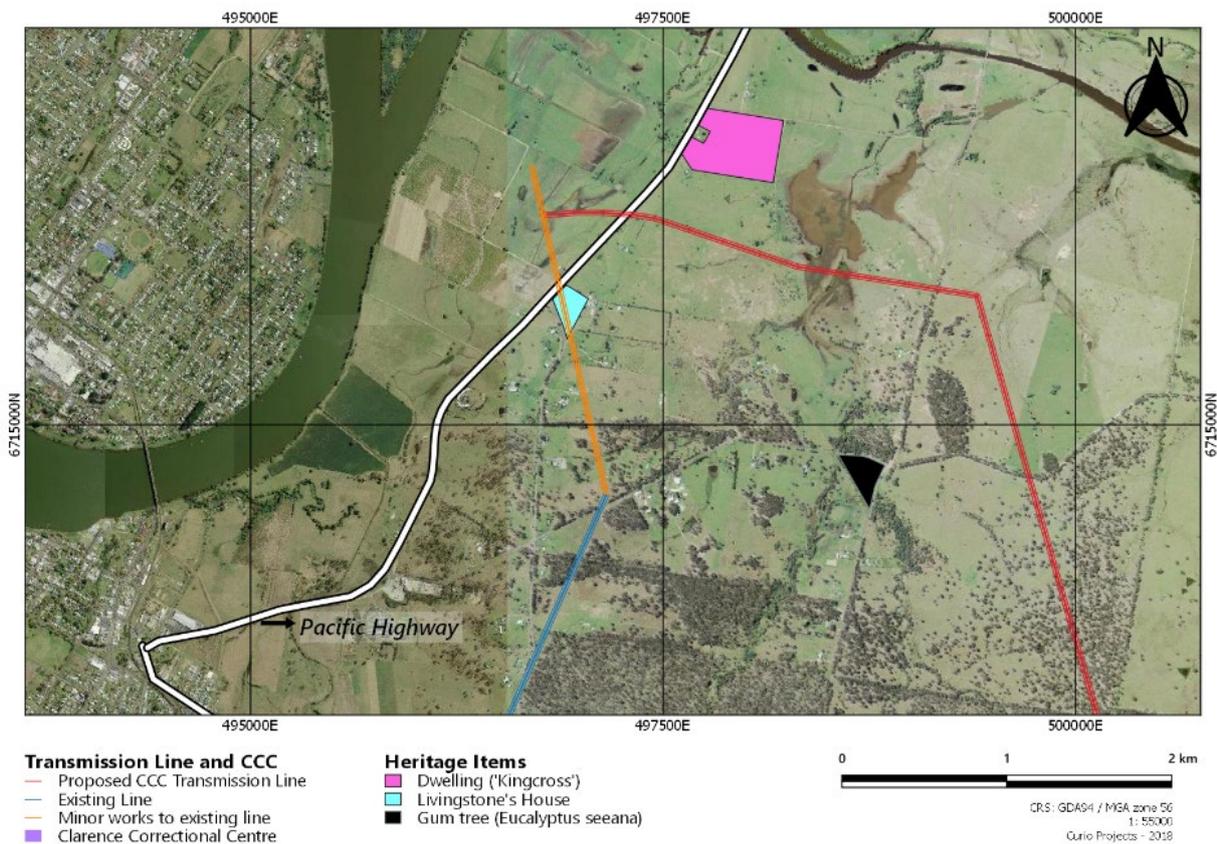


Figure 5: Heritage Listings. Note, land of 'Livingstone's House' located directly beneath existing Transmission Line requiring minor works (Source: Curio 2018)

Archaeological Potential and Heritage Significance

The proposed development route is located in an area of the Clarence River Valley that is not expected to contain any potential for historical archaeological objects of either local or State significance. This results from a lack of historical uses for the land beyond the clearing of the original riparian rainforest environment. This clearing was carried out in order to implement farming in the areas surrounding the township of Grafton. Subsequent to the initial clearing, the land has been continually and intensively farmed, with very few dwellings or buildings constructed. Additionally, there has been little to no activity that would leave physical subsurface (archaeological) remains within this area. Therefore, it is concluded that there is low to nil potential for historical archaeological resources to be present within the development area.

The Statement of Significance for 'Livingstone's House' is described in the heritage listing as:

The house is historically significant showing early settlement c1880 in the Swan Creek area. Originally built on the riverbank it was moved prior to 1890 to higher land and hence has the ability to tell of the impact of flooding on the location of dwellings. It is associated with the extended Livingston family who were well known in the Swan Creek area. Recently restored from a dilapidated condition by its present owner. ¹

¹ 'Livingstone's House', State Heritage Inventory Listing, Available from <https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=1640691>

The main heritage significance associated with 'Livingstone's House' is historical significance, demonstrating the historical growth of the Swan Creek area and influence of flooding on property locations; and associative significance, associated with the Livingstone family who were well known in the Swan Creek area.

Assessment of Heritage Impact—Physical and Visual

The major physical impacts from the proposed development works will constitute excavation, the clearing of vegetation, creation of new access route and paths, and increased plant and truck movements. Excavation will occur during the boreholing for the 55 poles, the grading and levelling for access roads and work sites, and the potential construction of additional culverts and causeways. Vegetation will be cleared within the 30-metre easement of the new transmission line, as well as in areas outside of this zone where the vegetation may potentially damage the proposed works. Clearing may also be necessary along access roads that require repair or upgrade, and also for other potential ancillary works described within the description of proposal. During the construction there will also be increased truck and vehicle movements along the access roads, between work sites, and laydown areas that could pose potential impact.

As concluded in Clarence Correctional Centre Transmission Line, Landscape Character and Visual Impact Assessment,² there is only a modest visual impact from the proposed construction of the transmission line. As the area is predominately agricultural and rural, there are minimal residential receptors affected. The surrounding vegetation and topography largely obscure much of the transmission line, which is not dissimilar from the nearby existing transmission lines. Furthermore, where the transmission line is at its most visible, where it passes over the Pacific Highway, the highway itself, as well as the vehicles utilising it and the existing transmission lines, mitigate the proposed transmission line's visual impact.

The surrounding heritage items, including Livingstone's House, are likely to be only minimally visually impacted by the proposed development. This is as a result of the topography of the landscape, existing vegetation, and the heritage items' distance from the transmission line.

The 'Livingstone's House' local heritage item is located beneath the existing transmission line, for which minor works are proposed. These minor works entail modifications to the existing Optical Ground Wire (OPGW), which is minimal in nature, and would result in no noticeable visual impacts to the existing transmission line, from that which currently exists. No ground disturbing works are proposed within the land parcel on which 'Livingstone's House' is located. The proposed development will have no physical impact to the local heritage item.

The newly proposed transmission line will not be highly visible from the existing heritage item, and will, in contrast to the existing transmission line within the 'Livingstone's House' property, only be visible in highly restricted and filtered views as a result of existing vegetation and its distance from the heritage item. Therefore, the visual impact of the propose development to this local heritage item is considered to be minimal (neutral).

The 'Kincross' dwelling is situated in a topographical location unlikely to have visibility of the transmission line. The distance from the transmission line, the geographical and topographical positioning of the heritage item, in addition to existing vegetation will serve to obscure any possible

² Clouston Associates, Clarence Correctional Centre Transmission Line, Landscape Character and Visual Impact Assessment, for Infrastructure NSW, p.69

views of the new transmission line from the heritage item. The adjacent Pacific Highway, with its associated vehicles, infrastructure and transmission lines, will also contribute to the restriction of any potential view lines between the 'Kincross' heritage item and the new proposed transmission line.

From the Gum Tree heritage item there are unlikely to be views beyond highly filtered views. Even the possibility of filtered views of the transmission line are considered to be highly unlikely due to the topography at this location, and the existing vegetation. Therefore, the significance of this heritage item is unlikely to be impacted by the proposed transmission line.

Conclusions and Recommendations

Overall, it is assessed that the proposed 132kV transmission line, 55 associated poles between the current TransGrid line and new Clarence Correctional Centre, and the minor works to the existing western transmission line, will have no adverse impacts, physically or visually, on any nearby heritage items. There are no potential historical archaeological sites located directly within, or in close proximity to the development area.

While one heritage item ('Livingstone's House') is located on land over which the existing transmission line proposed for minor works passes, the development works to this transmission line are considered to be minor in nature, and would have no physical impact, and a neutral visual impact to the heritage item.

Therefore, it is recommended that the proposed development should be able to be supported on heritage grounds. While it is considered that the study area has low to no potential for any historical archaeological relics to be present, it is still recommended that should any unexpected historical archaeological objects be discovered within the study area during development works, then works should cease in the immediate area of the find, and the NSW Heritage Division notified in accordance with the Section 146 provisions of the *Heritage Act 1977*.

Kind Regards,



Sam Cooling

Senior Archaeologist

Curio Projects Pty Ltd.

Infrastructure NSW

**Clarence Correctional Centre
Electricity Transmission Line**

Traffic Impact Assessment

Issue | 6 March 2019

This report takes into account the particular instructions and requirements of our client

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party

Job number 263193-00

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Appendices

Appendix A

Transmission Line Route

1 Introduction

1.1 Background

Arup has been engaged by Infrastructure NSW to prepare a traffic impact assessment associated with the provision of a new electricity transmission line which will service the Clarence Correctional Centre, located approximately 12.5km southeast of Grafton.

The project involves the construction, operation and maintenance of a new 12km long 132kV electricity line to be established between the existing TransGrid transmission line to the west of the Pacific Highway and the Correctional Centre's new substation to the east. More specifically, the proposed activity comprises:

- Approximately 12.5km of 132kV double circuit transmission line strung with single lemon conductor and Optical Ground Wire (OPGW) from the existing 96H transmission line Structure 339 to the new substation, including approximately 55 new structures
- New easement clearing, construction pads, access gates, and new access tracks OPGW works, including:
 - Pulling back the coil of OPGW from Structure 328 to Structure 339 on the existing 96H Koolkhan-Coffs Harbour 132kV Transmission Line
 - Splicing OPGW as required at the intersection of the new 132kV double circuit transmission line and the existing 96H Koolkhan-Coffs Harbour 132kV Transmission Line
- Removal of trees and vegetation within the 30m easement to enable installation of the new transmission line
- Removal of 'danger trees' outside the easement which have the potential to fall onto or come in contact with the transmission line
- Construction of suitable access tracks.

Ancillary works to facilitate the above works will also be required, and will involve:

- Establishment of temporary construction work sites around each structure to allow deployment of elevated work platforms (EWPs), cranes and pulleys
- Establishment of laydown areas for the offloading and temporary storage of plant, equipment and materials
- Construction of work benches adjacent to structures located on uneven topography. The work benches would provide a safe and level work surface for EWPs, cranes and other equipment
- Guy wire installation on structures to provide additional structural support.

- Repair or upgrade of existing access tracks and development of new access tracks (including possible watercourse crossings and installation of gates) as required for construction vehicles to gain safe access to structures.

The proposed transmission line route, including the location of structures, are appended to this report in **Appendix A**

1.2 Report Scope

This report has been prepared as part of the Review of Environmental Factors (REF) for the project and considers the following:

- Identification of existing access arrangements and traffic conditions
- Assessment of construction impacts in relation to:
 - Identification of construction vehicles and volumes
 - Access arrangements (use of existing tracks and any requirement for new tracks)
 - Any impacts on access to public roads
 - Any approvals required from road authorities if cable string works and/or other works proposed over roadways
- Assessment of any operational impacts
- Identification of any mitigation measures if relevant

2 Existing situation

2.1 Road network

The surrounding road network is shown in Figure 1. The main roads surrounding the study area are:

- Pacific Highway to the west,
- Eight Mile Lane to the south,
- Centenary Drive to the west,
- Avenue Road to the east.

Local roads within the study area are

- Washpool Road,
- Tancreds Lane,
- Four Mile Lane,
- Swan Lane,
- Duncans Road,
- Timbs Lane;and
- Six Mile Lane.

Given the proposed route of the transmission line, the use of local roads and local traffic routes during construction cannot be avoided (e.g. Swan Lane and Tancreds Lane). Construction vehicles will, however, avoid the use of narrow and unsealed roads as much as possible, using alternative routes along a higher quality roads where appropriate.

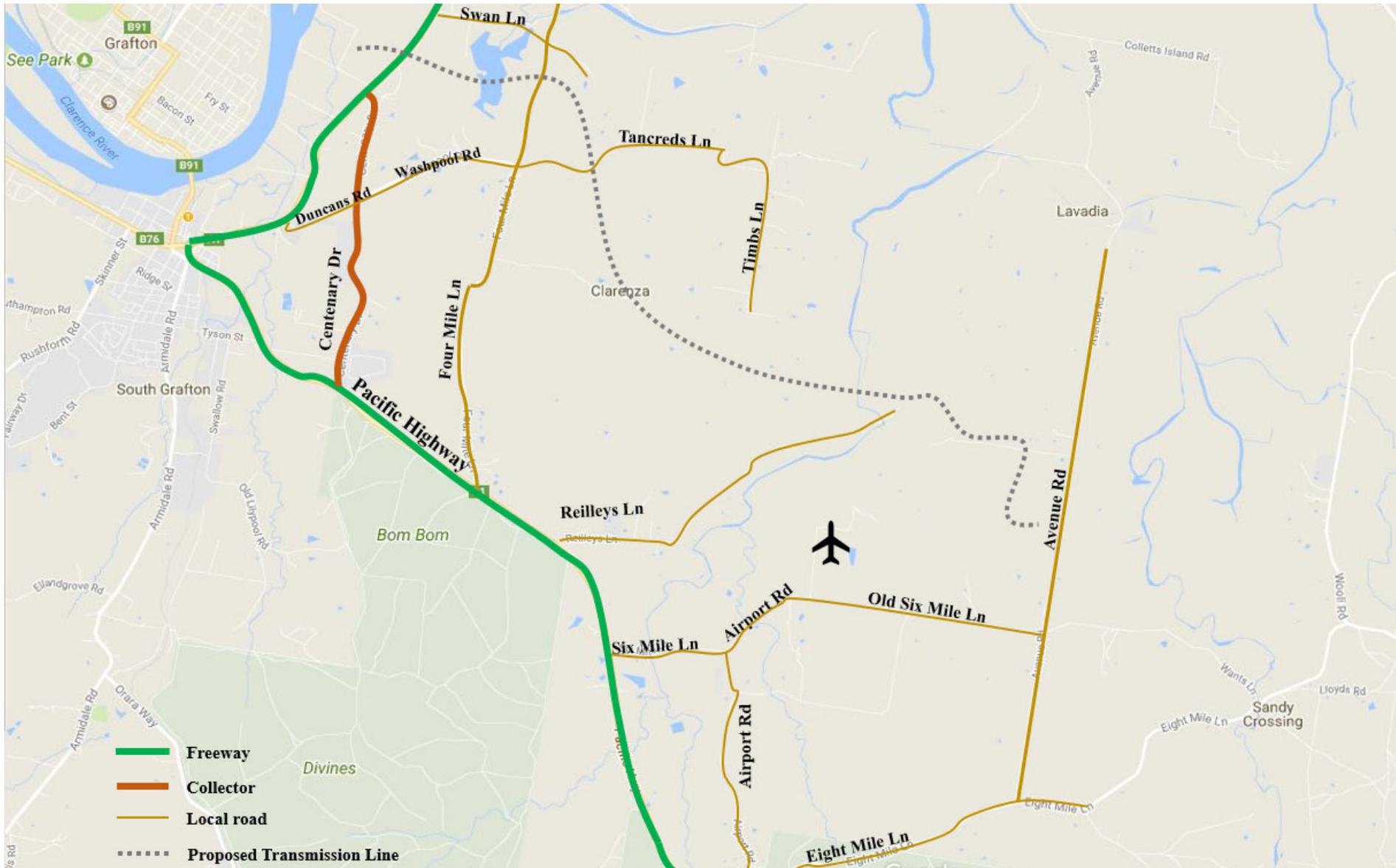


Figure 1 Road network classification surrounding the study area

2.1.1 Pacific Highway

The existing Pacific Highway is generally one lane in each direction with a speed limit of 100 km/h. Passing lanes are provided for northbound traffic to avoid traffic turning right into Eight Mile Lane and Old Six Mile Lane and slip lanes are provided for southbound traffic turning left into Eight Mile Lane and Old Six Mile Lane. Access from the Pacific Highway onto the local road network is via non-signalised intersections. Each intersection has differing treatments such as acceleration and deceleration lanes and protected turning lanes. This road is suitable for use by all vehicle types.

2.1.2 Centenary Drive

Centenary Drive is a two-way collector road that runs in a general north-south direction. It is subject to a sign posted speed limit of 80 km/h. The intersections with Pacific Highway (at the north and south) are T-intersections with good sight distances. This road is suitable for use by all vehicle types.



Figure 2 View looking north along Centenary Drive

2.1.3 Eight Mile Lane

Eight Mile Lane which runs from the Pacific Highway to Wooli in the east. It is a surfaced two-way road with a 100km/h speed limit. At the intersection of Eight Mile Lane and the Pacific Highway, the Pacific Highway has a dedicated northbound right turn lane into Eight Mile Lane and a southbound left turn lane into Eight Mile Lane. This road is suitable for use by all vehicle types.

2.1.4 Avenue Road

Avenue Road runs along the east boundary of the Clarence Correction Facility from Eight Mile Lane to the south and Deep Creek Road to the north. It is approximately 6m wide and forms T-intersections with Eight Mile Lane with good sight distances. This road is suitable for use by all vehicle types.



Figure 3 View looking north along Avenue Road

2.1.5 Six Mile Lane, Airport Road and Old Six Mile Lane

This route connects Pacific Highway (to the west) with Avenue Road (to the east), south of the transmission line. The route is south of the proposed transmission line and varies in quality, from an approximately 6m wide sealed surface between Pacific Highway and the Airport access to an approximately 5m wide unsealed surface east of the Airport access (Old Six Mile Lane). The Pacific Highway upgrade works intersects this route at a number of points east of the Airport.

This route can be used by heavy vehicles, however use the Old Six Mile Lane section should be minimised where possible



Figure 4 View looking east along Six Mile Lane

2.1.6 Duncans Road and Washpool Road

Duncans Road and Washpool Road is a local route running in an east- west direction connecting Pacific Highway to the west and Four Mile Lane to the east and is dissected by Centenary Drive. West of Four Mile Lane the route is named Tancreds Lane. It has a sealed surface approximately 6m width with grassed verges on each side. The route is suitable for use by heavy vehicles.

2.1.7 Tancreds Lane and Timbs Lane

Tancreds Lane is a local road running in an east-west direction connecting between Four Mile Lane to the west and Timbs Lane to the east. It has an unsealed surface of approximately 4-5m in width. This route can be used by heavy vehicles, however its use should be minimised where possible given the difficulty two larger vehicles passing will have.



Figure 5 View looking east along Tancreds Lane



Figure 6 View looking south along Timbs Lane

2.1.8 Four Mile Lane

Four Mile Lane is a local road which runs in a north-south direction connecting between Pacific Highway to the south and Swan Lane north of the transmission line. It is a mix of sealed and unsealed surface, approximately 6m in width. It is considered to be suitable for use by heavy vehicles.



Figure 7 View looking south along Four Mile Lane

2.1.9 Swan Lane

Swan Lane is a local traffic road which runs in an east-west direction between the Pacific Highway (to the west) and Four Mile Lane (to the east). It has an unsealed surface and is approximately 4m – 5m in width. This route can be used by heavy vehicles, however it's use should be minimised where possible due to the surface conditions and difficulty for vehicles to pass.



Figure 8 View looking east along Swan Lane

2.2 Ongoing roadworks

The Glenugie to Tyndale section of the Woolgoolga to Ballina Pacific Highway upgrade works (see Figure 9) are ongoing at present and will overlap with the construction of the proposed transmission line. Depending on what stage of construction is completed, access to/from Avenue Road, Old Six Mile Lane and Eight Mile Lane may be impacted with detours or traffic lane changes in place.

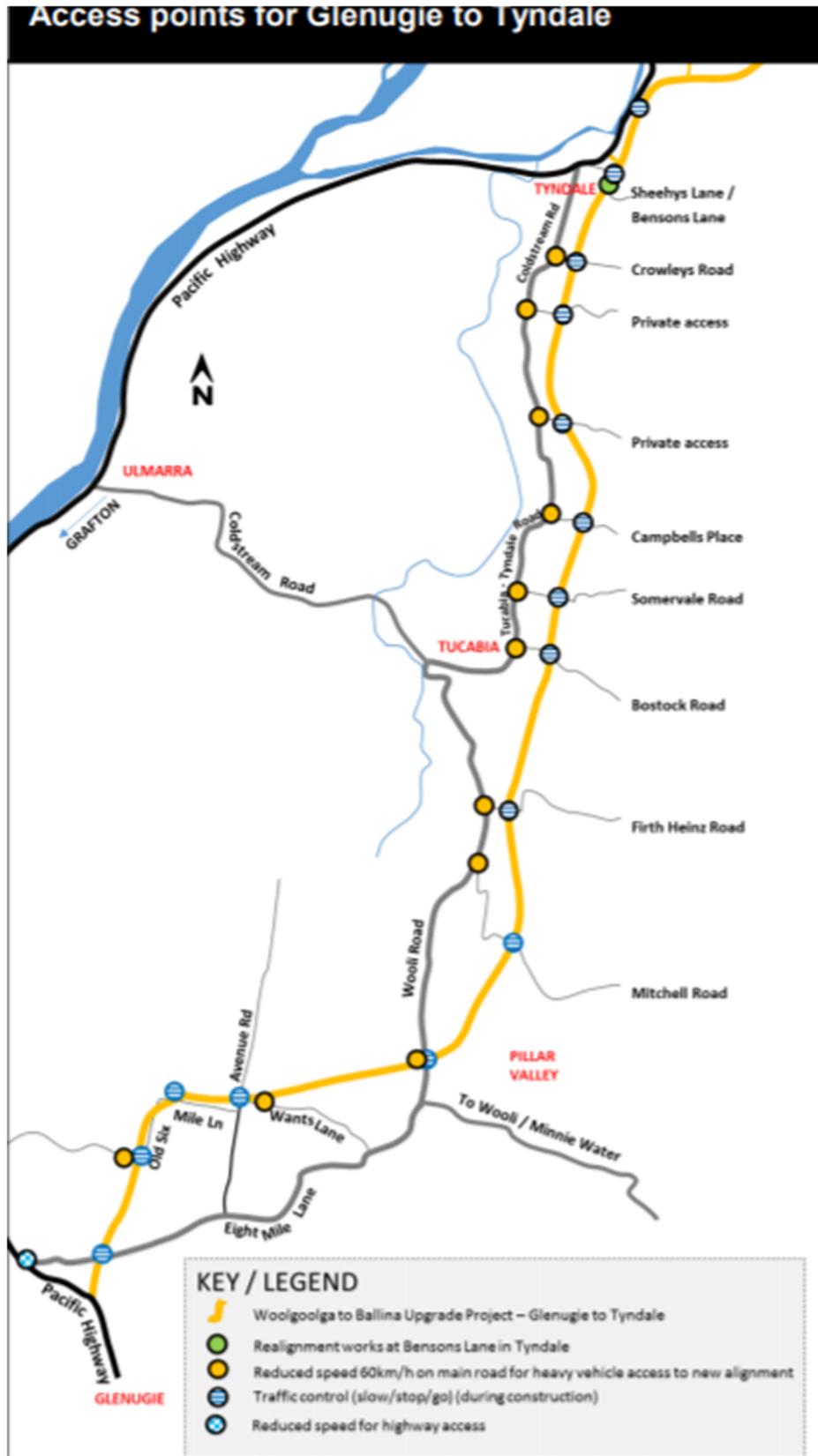


Figure 9 Gelnugie to Tyndale construction works alignment

3 Assessment of construction impacts

3.1 Construction routes and access arrangements

Depending on the section of the works under construction, the route and access arrangements for construction vehicles will vary. In order to access the transmission line structure sites, access tracks will need to be constructed through private property to facilitate the movement of plant and machinery. These tracks would typically consist of unsealed surface roads and would allow for ongoing access during the operation of the proposed activity for maintenance purposes. As required the surfaces would have aggregate placed on them in order to minimise erosion. Track boundaries and routes would be delineated with markings. The tracks would be established such that they do not impact on existing trees as far as possible. These tracks would be built in accordance with the Best Practice Guidelines for Fire Trail Construction and Maintenance (Bushfire Coordinating Committee 2007).

For the purposes of this transport assessment, the transmission line structure sites have been broken up into five (5) main zones as shown in Figure 10. Each zone has been assessed in terms of the following access and egress, both from the formal road network and future access tracks.

The proposed access tracks to and from all five zones are shown in Figure 11 and Figure 12 respectively. These routes seek use of the arterial road network as much as possible with the use of local streets and local lanes only where required. The final locations of these tracks would be determined in consultation with the landholders in order to coordinate with landholder activities and to minimise impacts.

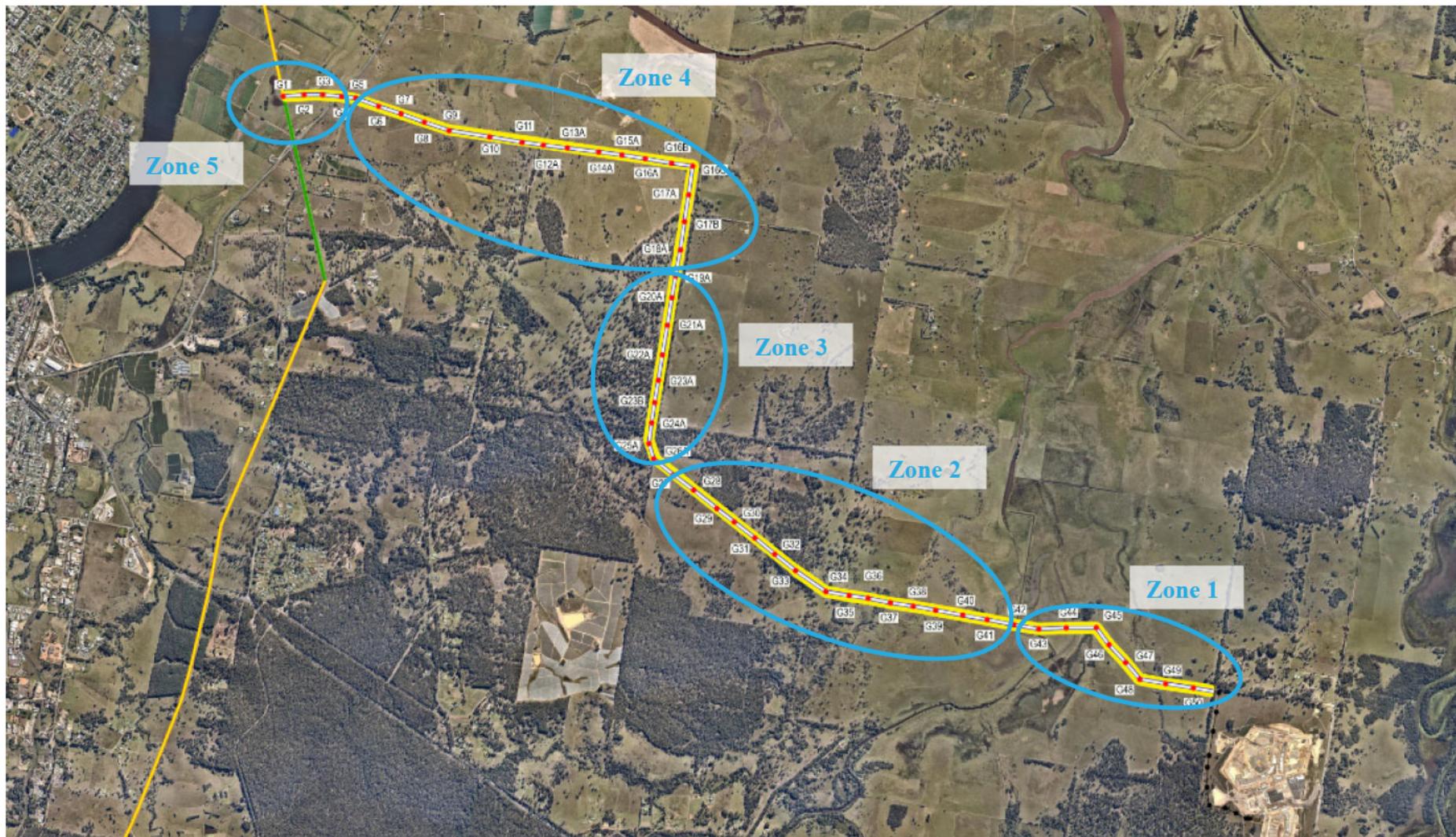


Figure 10 Main zones for construction works

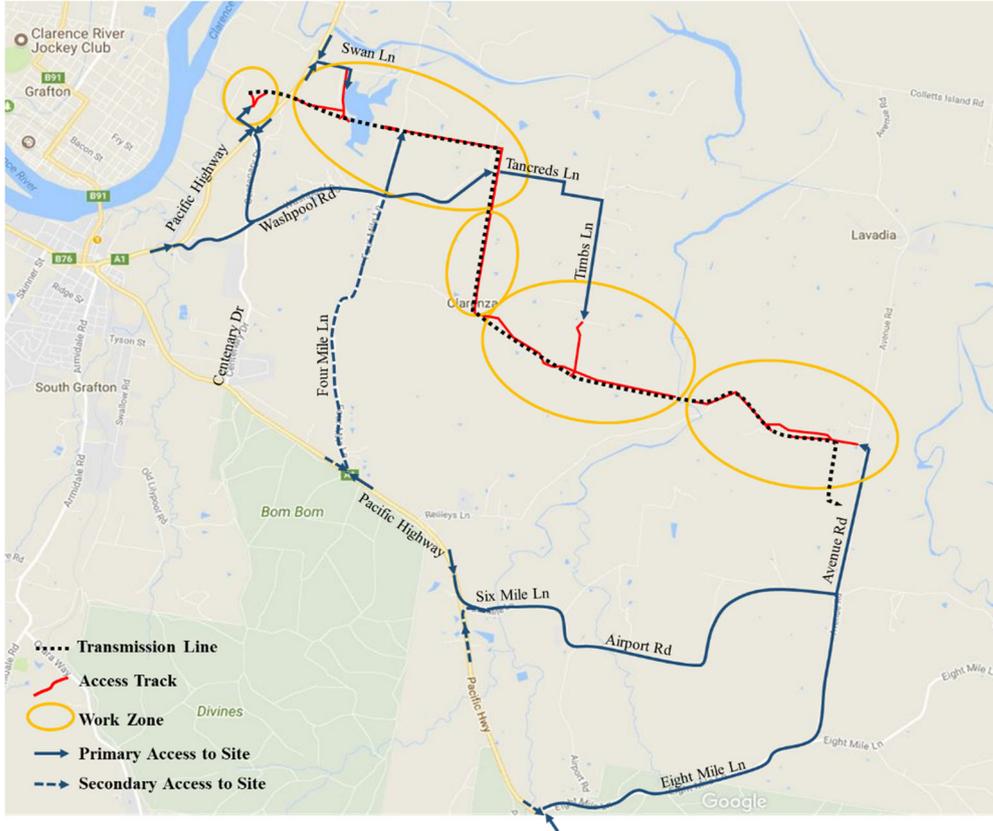


Figure 11 Proposed access routes

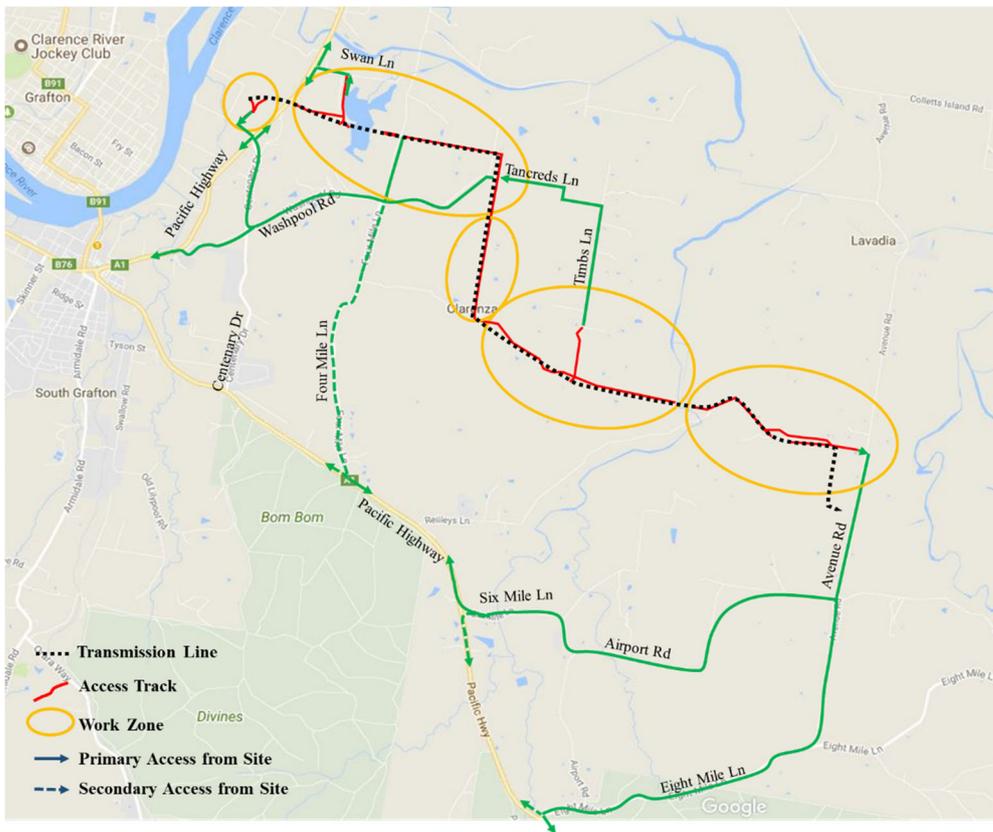
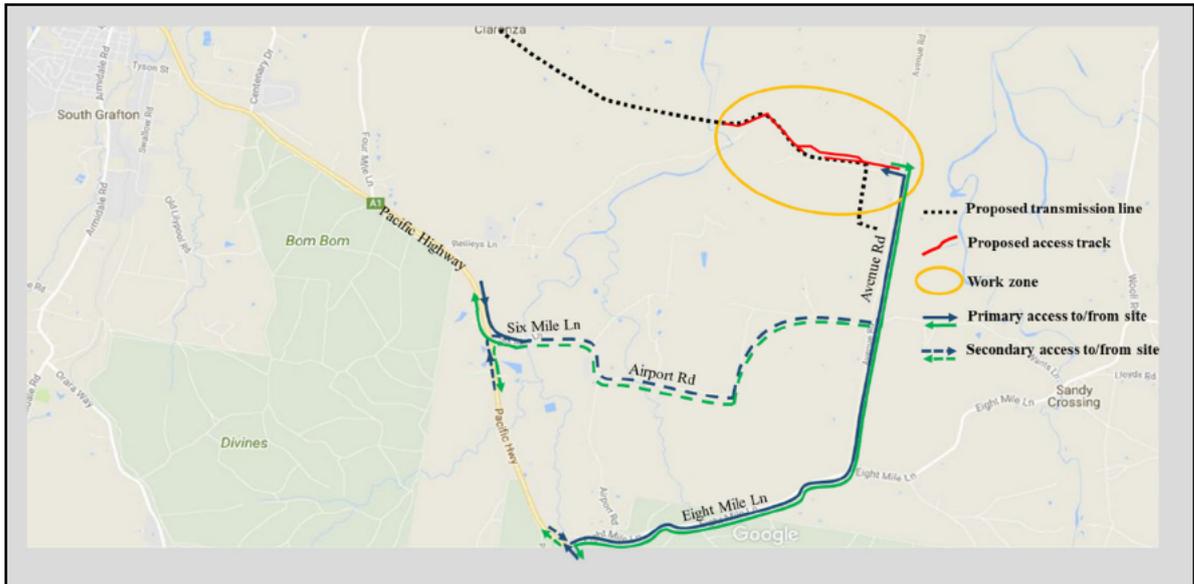


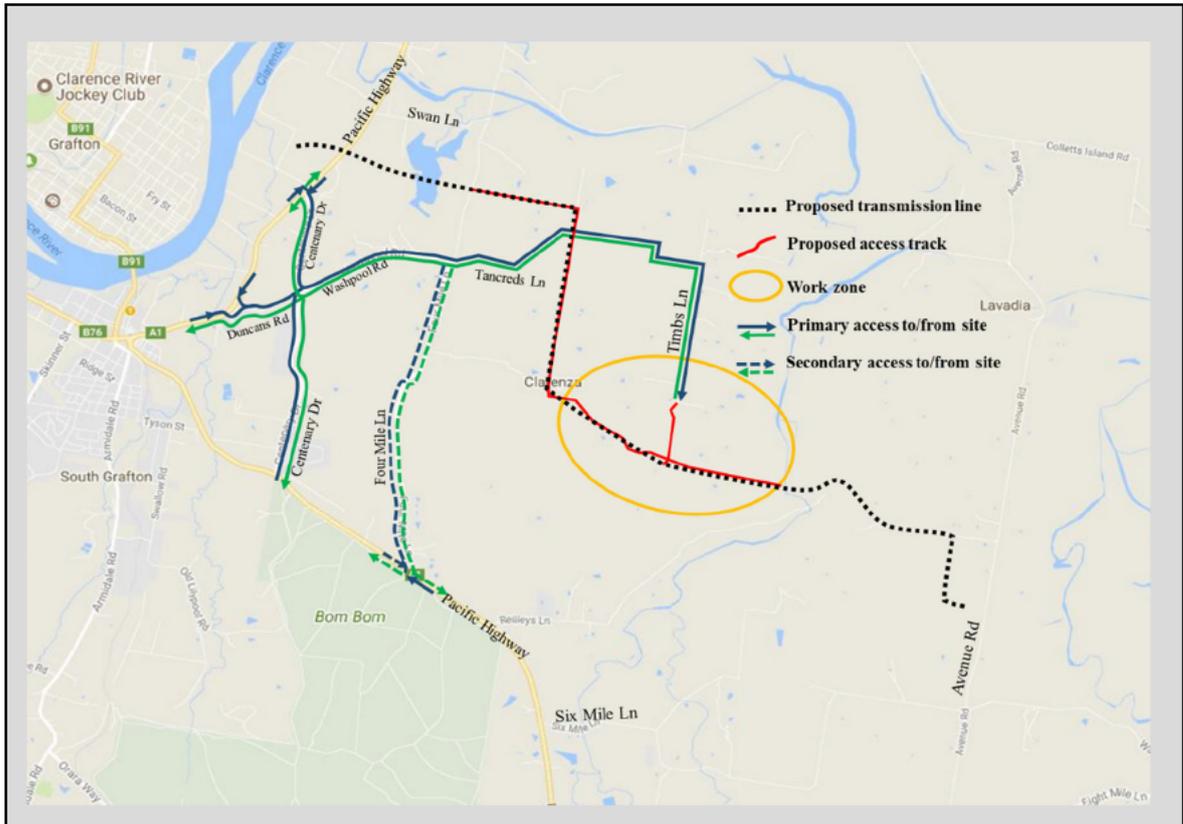
Figure 12 Proposed egress routes

3.1.1 Zone 1



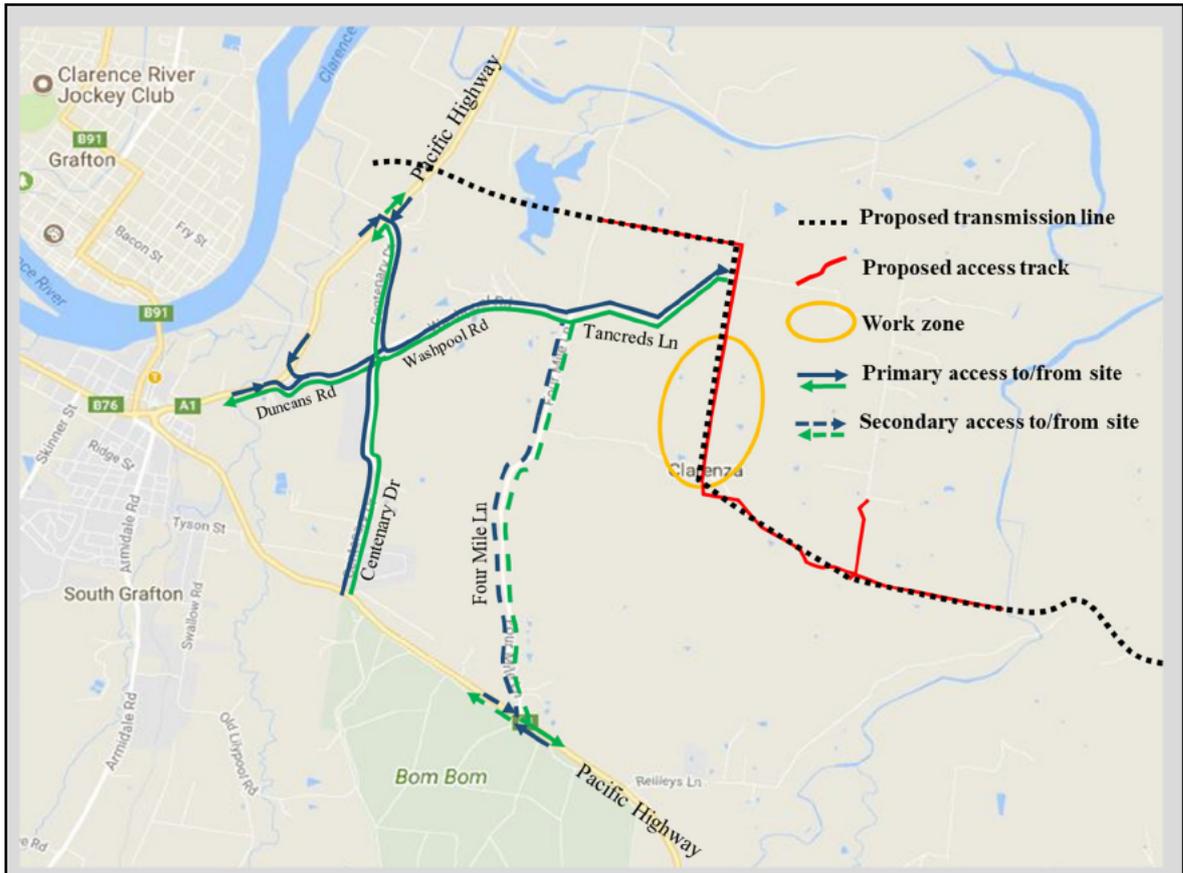
<p>Access routes from adjacent road network</p>	<p>Heavy vehicles are expected to use Pacific Highway, Eight Mile Lane and Avenue Road to access and egress the site. A secondary route available is Six Mile Lane, Airport Road and Old Six Mile Lane. The use of this route should be minimised given the condition of Old Six Mile Lane and be used by smaller vehicles only if required.</p>
<p>Access track works</p>	<p>One access track is proposed, this track links with Avenue Road at the eastern end of the zone, continuing west along the alignment of proposed transmission line.</p>

3.1.2 Zone 2



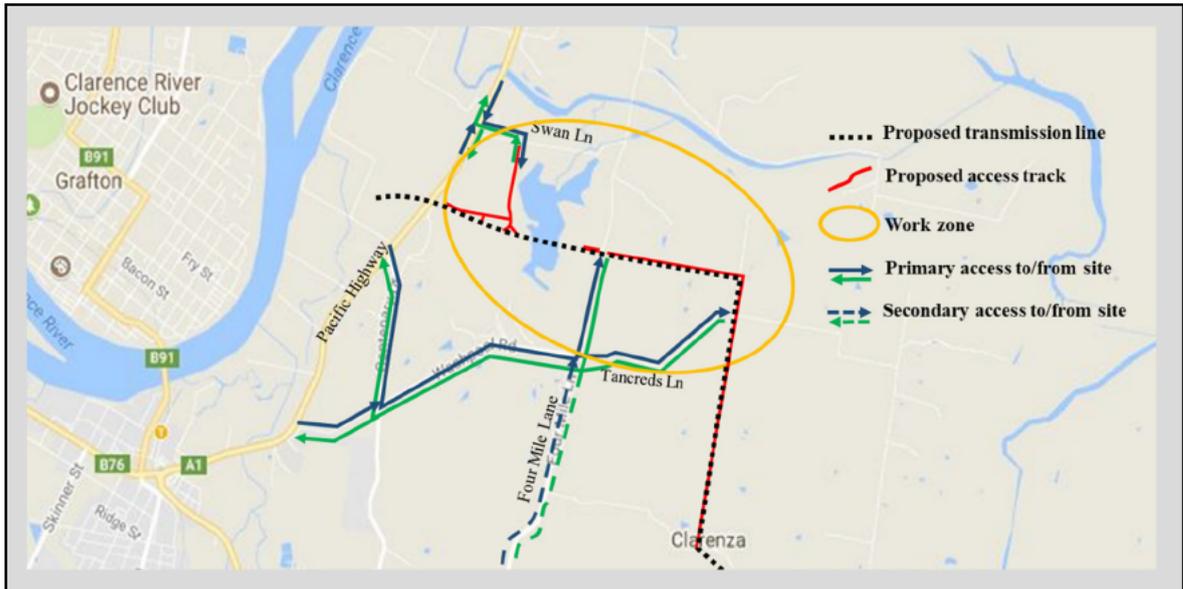
<p>Access routes from adjacent road network</p>	<p><u>To/From Pacific Highway</u></p> <p>There are three routes to the Pacific Highway, depending on the origin and destination of vehicles. The use of Centenary Drive is the most suitable for access to Pacific Highway while Duncan’s Road can also be used if travelling west. Four Mile Lane could be used as a secondary route if required.</p> <p>All routes converge at the Washpool Road & Four Mile Lane intersection, continuing eastwards on Tancreds Lane and turning onto Timbs Lane where the access track lies.</p> <p>Alternatively, vehicles may join onto the continuous access track from Tancreds Lane at the location which Tancreds Lane passes underneath the transmission line.</p>
<p>Access track works</p>	<p>An access track is proposed at the end of Timbs Lane, extend southwards which will provide access to the construction site for vehicles.</p>

3.1.3 Zone 3



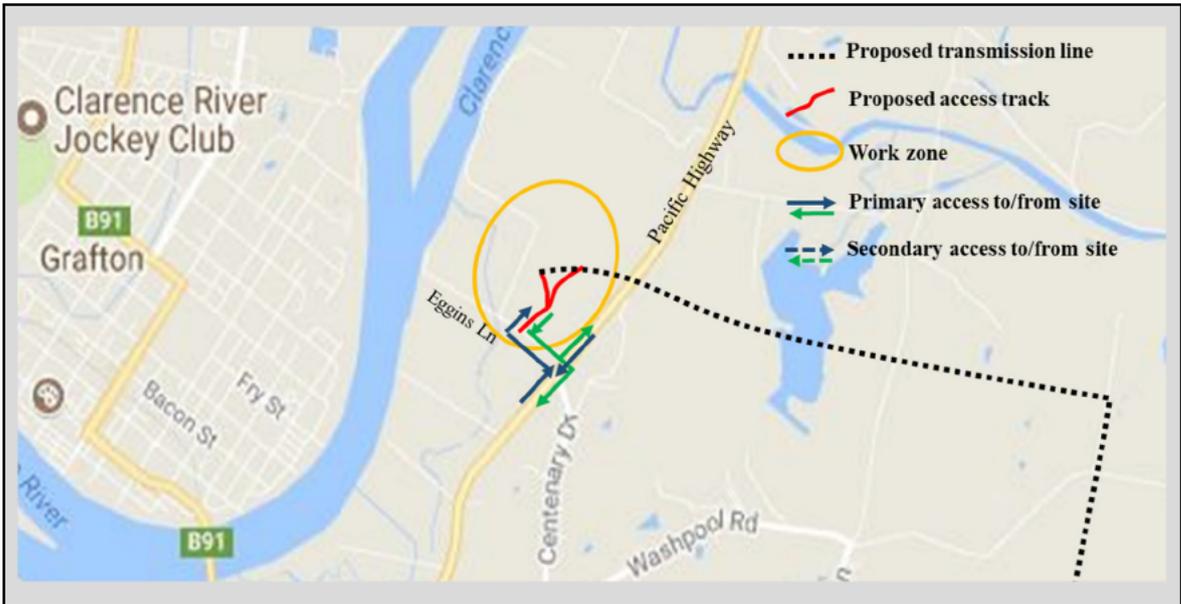
<p>Access routes from adjacent road network</p>	<p>The use of Duncans Road, Centenary Drive, Washpool Road and Four Mile Lane are the most suitable in terms of accessing the site from the Pacific Highway, depending on the direction of approach to this zone.</p> <p>Four Mile Lane can also be used as a secondary route for vehicles with an origin/destination to the south along the Pacific Highway.</p> <p>The access track directly connects with Tancreds Lane.</p>
<p>Access track works</p>	<p>One main continuous access track is proposed to service this and adjacent work zones and is immediately accessible via Tancreds Lane.</p>

3.1.4 Zone 4



<p>Access routes from adjacent road network</p>	<p>To access the track located on Swan Lane, vehicles will be able to turn to and from the Pacific Highway and use Swan Lane (the access track is approximately 500m from Swan Lane Pacific Highway intersection).</p> <p>To access the site from Four Mile Lane and Tancreds Lane, it is recommended to use Centenary Drive, Washpool Road and either Four Mile Lane or Tancreds Lane. Four Mile Lane can also be used as a secondary route for vehicles with an origin/destination to the south along the Pacific Highway.</p>
<p>Access track works</p>	<p>For the western portion of this work zone, one access track is accessible from Swan Lane while for the eastern portion of the work zone, access tracks are accessible via Four Mile Lane and Tancreds Lane.</p>

3.1.5 Zone 5



<p>Access routes from adjacent road network</p>	<p>Access to this part of the site will be directly via the Pacific Highway and Eggins Lane.</p>
<p>Access track works</p>	<p>The access track from Eggins Lane will provide access to work zone 5 which lies to the west of Pacific Highway.</p>

3.2 Vehicle types

Typical vehicles accessing the construction zones are expected to consist of :

- Light vehicles
- Concrete agitator trucks
- Concrete pump
- Cranes (various sizes up to 200 tonnes)
- Dumper trucks
- Flatbed Hi-ab truck
- Tipper trucks
- Semi-trailers
- Tilt tray trucks

3.3 Program

The average daily construction workforce is estimated at 30 staff.

Noise generating works would be limited to the recommended standard hours for construction work being:

- Monday to Saturday 7:00 am to 6:00 pm
- No works on Sundays or Public Holidays.

Work outside standard hours is anticipated to only comprise of the following:

- transmission line cutover and commissioning
- the delivery of materials outside standard hours requested by police or other authorities for safety reasons
- emergency work to avoid the loss of lives and/or property
- work timed to correlate with system planning outages.

Once construction works commence, the proposed activity is estimated to take approximately 12 months

Indicative Date	Proposed Activity
November 2018	Site establishment and mobilise to site
December 2018 to January 2019	Construction of access tracks
February 2019 to May 2019	Footing and structure construction
June 2019	Stringing, cut-in and energisation

3.4 Construction traffic impacts

The number of vehicle movements would fluctuate throughout the construction of the transmission line with the maximum daily heavy vehicle movements occurring during the pole delivery and pole erection stages of construction. The number of construction vehicle movements is estimated as follows:

- Average Light Vehicle Movements (typical day): 35
- Average Heavy Vehicle Movements (typical day): 20

This volume of traffic will be distributed on different roads and is considered a minor volume in the context of existing traffic conditions. All access roads proposed to be used for the construction of the transmission line have the capacity to accommodate these vehicle movements. The additional vehicles passing through key intersections in the study area are considered to have a negligible impact on the performance of the road network.

Any works occurring over the Pacific Highway will be subject to a separate Traffic Control Plan (TCP) to be submitted to Roads and Maritime prior to construction.

4 Operational impacts

During the operational phase, access by field staff would be on a regular basis to complete routine inspection and maintenance works including:

- inspection and maintenance of transmission lines, structures and poles
- vegetation removal required to maintain appropriate clearances between ground vegetation and transmission lines.

Typically, maintenance activities would be infrequent and only require light to medium-sized plant and vehicles to access the transmission line. Additional measures, plant and equipment may be required in response to emergencies.

In consideration of the above, the traffic impacts as a result of operational activities is considered negligible.

5 Conclusion

Arup has been engaged by Infrastructure NSW to prepare a traffic impact assessment associated with the provision of a new electricity transmission line which will service the Clarence Correctional Centre, located approximately 12.5km southeast of Grafton.

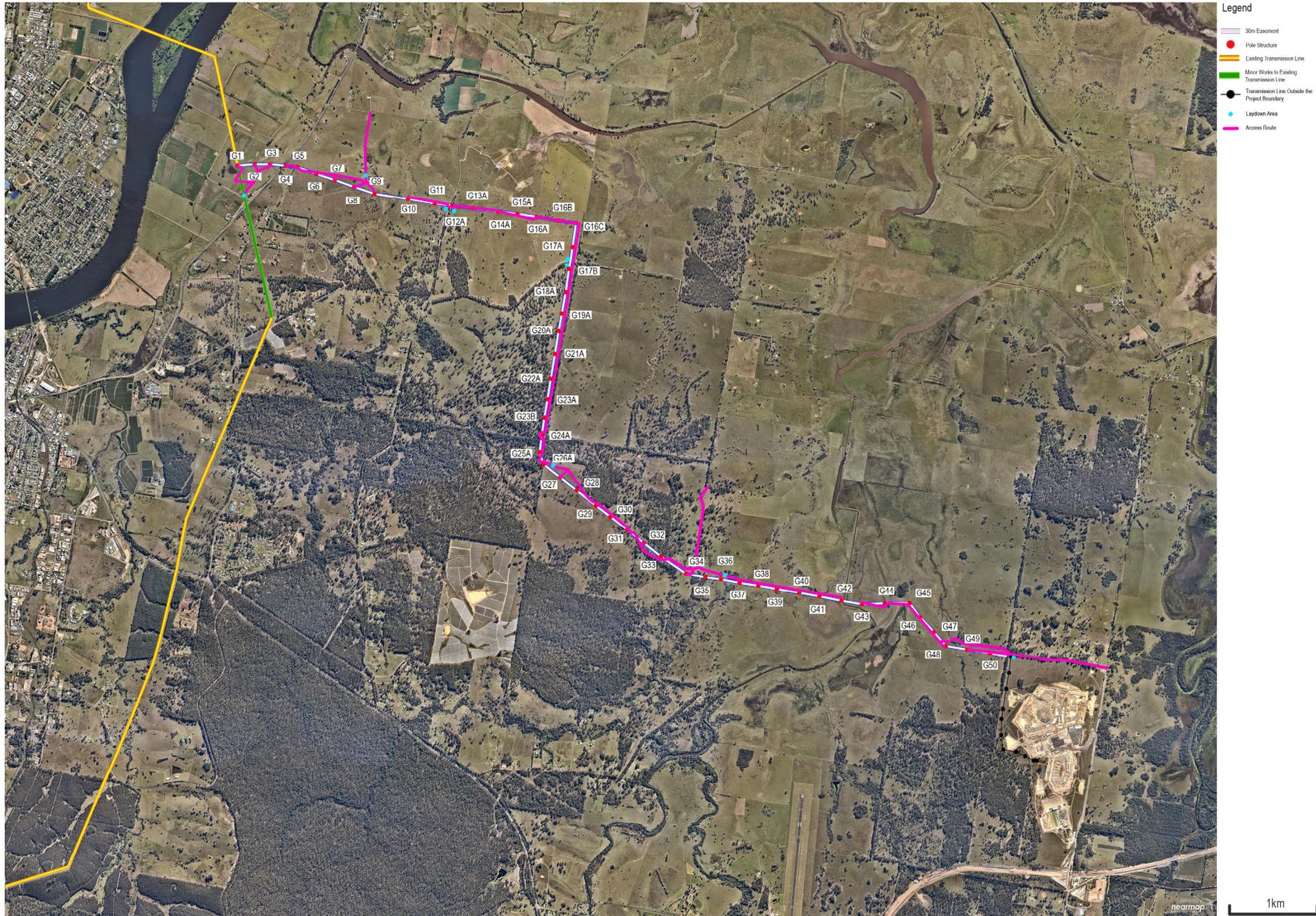
The assessment has considered the various access and egress routes vehicles will use to access the worksite. These routes seek use of the arterial road network as much as possible with the use of local streets and local lanes only where required. In order to access the transmission line structure sites, access tracks (4m-6m wide) will need to be constructed through private property to facilitate the movement of plant and machinery.

The traffic generation during the construction stage is expected to be on average 55 vehicles per day, of which 20 would be heavy vehicles. All access roads proposed to be used for the construction of the transmission line have the capacity to accommodate these vehicle movements.

Following the completion of construction, some maintenance vehicles may need to access the transmission line. Typically, maintenance activities would be infrequent and only require light to medium-sized plant and vehicles to access the transmission line.

Appendix A

Transmission Line Route





New Grafton Correctional Centre Transmission Line

Infrastructure NSW

Bushfire Assessment

Final

IA90800-BF-01 | 02

05 March 2019

New Grafton Correctional Centre Transmission Line

Project No: IA90800
Document Title: Bushfire Assessment
Document No.: IA90800-BF-01
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Date: 5 March 2019
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Project Manager: Rachel Vazey
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Document history and status

Revision	Date	Description	By	Review	Approved
01	1/8/2018	Draft for Client review	A. Stephens	C.Clifton	R.Vazey
02	3/8/2018	Final	A. Stephens	C.Clifton	R.Vazey
03	05/02/2019	Incorporation of proposed deviation	K. Moss	C.Clifton	R.Vazey
04	05/03/2019	Incorporation of client review	R.Vazey	R.Vazey	R.Vazey

Executive summary

Infrastructure New South Wales (INSW) is preparing a Review of Environmental Factors (REF) under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for a new electricity transmission line (the proposal), which will provide electricity to the Clarence Correctional Centre (CCC). This Bushfire Assessment is being prepared to inform the preparation of the REF.

The proposal route is located to the east of Grafton, NSW, within the Clarence Valley local government area (LGA). The proposal involves the construction, operation and maintenance of a new 12.5 kilometre long 132 kilovolt electrical transmission line to be established between the existing TransGrid transmission line to the west and the Correctional Centre's new substation to the east. This working paper assesses bushfire hazards associated with the proposal and describes applicable bushfire protection measures (BPMs).

The proposal route supports a mix of pasture grassland, woodland and dry sclerophyll forest with a grassy understorey. Bush fire-prone land (BPL) mapping published by the Clarence Valley Council indicates a small portion of the proposal area to be bush fire prone land. It is considered that this classification underestimates the risk and that considerably more of proposal area (refer to **Figure 3-7**) should be considered bush fire prone land (as defined by NSW RFS 2015).

In summary, while substantial bush fires could occur in the landscape, the landscape bush fire risk is moderate, relative to other areas in NSW. Construction of an electrical transmission line, with appropriate bushfire measures in place, is appropriate in this landscape.

The main BPM for the proposal is the adoption of vegetation management standards in accordance with *ISSC3 - Guide for Management of Vegetation in the Vicinity of Electricity Assets* (ISSC 2016). This requires:

- A clearance of 5.5 metres in all directions from the first and last sixth of spans between 200-300 metres for bare conductors (not including steel) of 132 kilovolt and 6.5 metres for the middle two thirds. An additional 0.5 metres is added for bush fire prone areas.
- A minimum clearance of 2 metres is required around poles.
- Fall in vegetation hazards shall be assessed and managed as far as it reasonable practicable to do so; this process should also consider the need to implement "Clear to the Sky" Hazard Reduction where high risk vegetation is identified.

The other relevant BPM that will be incorporated into the proposal is to include sufficient access for the management of vegetation and access to the site for construction and maintenance of infrastructure. This will also provide access for managing ignitions.

The proposed vegetation removal for the proposal includes:

- Removal of trees and vegetation within the 30 metre easement to enable construction of the new transmission line.
- Removal of 'hazard trees' outside the easement which have the potential to fall onto or come in contact with the transmission line.
- Removal of vegetation for the construction of suitable access tracks.

Potential environmental impacts of the proposed BPM are largely confined to the clearing of remnant native vegetation and the potential for erosion and sedimentation associated with this and the proposed access tracks. Vegetation clearance is incorporated into the initial planning of the proposal and no additional clearing is proposed as part of this bush fire assessment. Vegetation removal and access track design, construction and maintenance should aim to minimise erosion and the generation and transportation of sediments.

Recommendations arising from this assessment are that:

- Bush fire prone mapping presented in this report should be adopted when implementing *ISSC3 - Guide for Management of Vegetation in the Vicinity of Electricity Assets* (ISSC 2016).

- In accordance with ISSC3, vegetation removal and management of hazard trees should be undertaken with consideration of minimising environmental impact while ensuring risk is mitigated to a level consistent with the objectives of the Guide.
- Vegetation removal and access track design, construction and maintenance should aim to minimise erosion and the generation and transportation of sediments.
- During construction and maintenance activities contractors should ensure suitable BPM are incorporated into safe work procedures to ensure bush fire risk is appropriately managed.
- Network operators should maintain vegetation standards and infrastructure to minimise the risk of bush fire ignition from infrastructure failure.

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1. Introduction

1.1 Background

Infrastructure New South Wales (INSW) is overseeing the delivery of a new electricity transmission line (the proposal), which will provide electricity to the Clarence Correctional Centre (CCC), currently under construction. This Bushfire Assessment is being prepared to support the Review of Environmental Factors (REF) that is being prepared under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.2 Locality

The proposal commences around 1 kilometre to the east of Grafton within the Clarence Valley local government area (LGA), in northern NSW (refer to **Figure 1-1**). The transmission line starts around 500 metres to the west of the Pacific Highway and extends 1.6 kilometres to the east, across the Pacific Highway and Washpen Creek to Four Mile Lane. From here, the transmission orientates south-east towards Clarenza, before crossing the McPhillips and Glenugie Creeks and tying in with the CCC.

The proposal site traverses a low gradient, mildly undulating landscape predominantly comprising rural / agricultural land uses. Grafton airport is located around 1.2 kilometres west of the location at which the new transmission line would tie in with the CCC.

1.3 Proposal description

The proposal involves the construction, operation and maintenance of a new 12.6 kilometre long 132 kilovolt double circuit electrical transmission line, which is to be established between the existing TransGrid transmission line to the west and the Correctional Centre's new substation to the east. **Figure 1-2** shows the location of the proposal. At its westernmost extent it would connect into the existing 96H 132 kilovolt line that runs from Koolkhan to Coffs Harbour.

The proposal comprises:

- Approximately 12.5 kilometres of 132 kilovolt double circuit transmission line strung with a single lemon conductor and an Optical Ground Wire (OPGW) from the existing 96H transmission line Structure 339 to the new substation, including approximately 54 new structures. Structures would be a combination of steel and concrete poles, generally 25 to 30 metres in height.
- New easement clearing, construction pads, access gates, and new access tracks.
- OPGW works, including:
 - Pulling back the coil of OPGW from Structure 328 to Structure 339 on the existing 96H Koolkhan-Coffs Harbour 132 kilovolt Transmission Line.
 - Splicing OPGW as required at the intersection of the new 132 kilovolt double circuit transmission line and the existing 96H Koolkhan-Coffs Harbour 132 kilovolt Transmission Line.
- Removal of trees and vegetation within the 30 metre easement to enable construction of the new transmission line.
- A 100 metre investigation area around the proposed transmission line.
- Removal of 'hazard trees' outside the easement which have the potential to fall onto or come in contact with the transmission line.
- Construction of suitable access tracks.
- Purchase of land for easements.

Ancillary works to facilitate the above works would also be required, involving:

- Establishment of temporary construction work sites around each structure to allow deployment of elevated work platforms (EWPs), cranes and pulleys.
- Establishment of laydown areas for the offloading and temporary storage of plant, equipment and materials.
- Construction of work benches adjacent to structures located on uneven topography. The work benches would provide a safe and level work surface for EWPs, cranes and other equipment.
- Guy wire installation on structures to provide additional structural support.
- Repair or upgrade of existing access tracks and development of new access tracks (including possible watercourse crossings and installation of gates) as required for construction vehicles to gain safe access to structures.

As part of the installation of the new transmission line, an OPGW would be strung as the line is constructed. OPGW is a cable that combines the functions of electrical grounding and communications. The OPGW cable would comprise a tubular structure with one or more optical fibres, surrounded by layers of steel and aluminium wiring. The OPGW cable would be strung between the top of each of the electricity poles. The conductive part of the cable would serve to earth adjacent towers and shield the high-voltage conductors from lightning strikes. Optical fibres within the cable would be used for data and communications transmission as part of TransGrid's eventual operation and control of the transmission line.

Where possible, existing access tracks would be used to access the transmission line easement. However, some additional access points to each of the transmission line pole structures would be required. These access points would be approximately 4-6 metres wide. The tracks would typically consist of unsealed surface roads and would allow for ongoing access during the operation of the proposed activity for maintenance purposes. As required, the surfaces would have aggregate placed on the surface in order to minimise erosion. Track boundaries and routes would be delineated with markings. The tracks would be established such that they do not impact on existing trees as far as possible. Tracks would be built in accordance with the Best Practice Guidelines for Fire Trail Construction and Maintenance (Bushfire Coordinating Committee 2007).

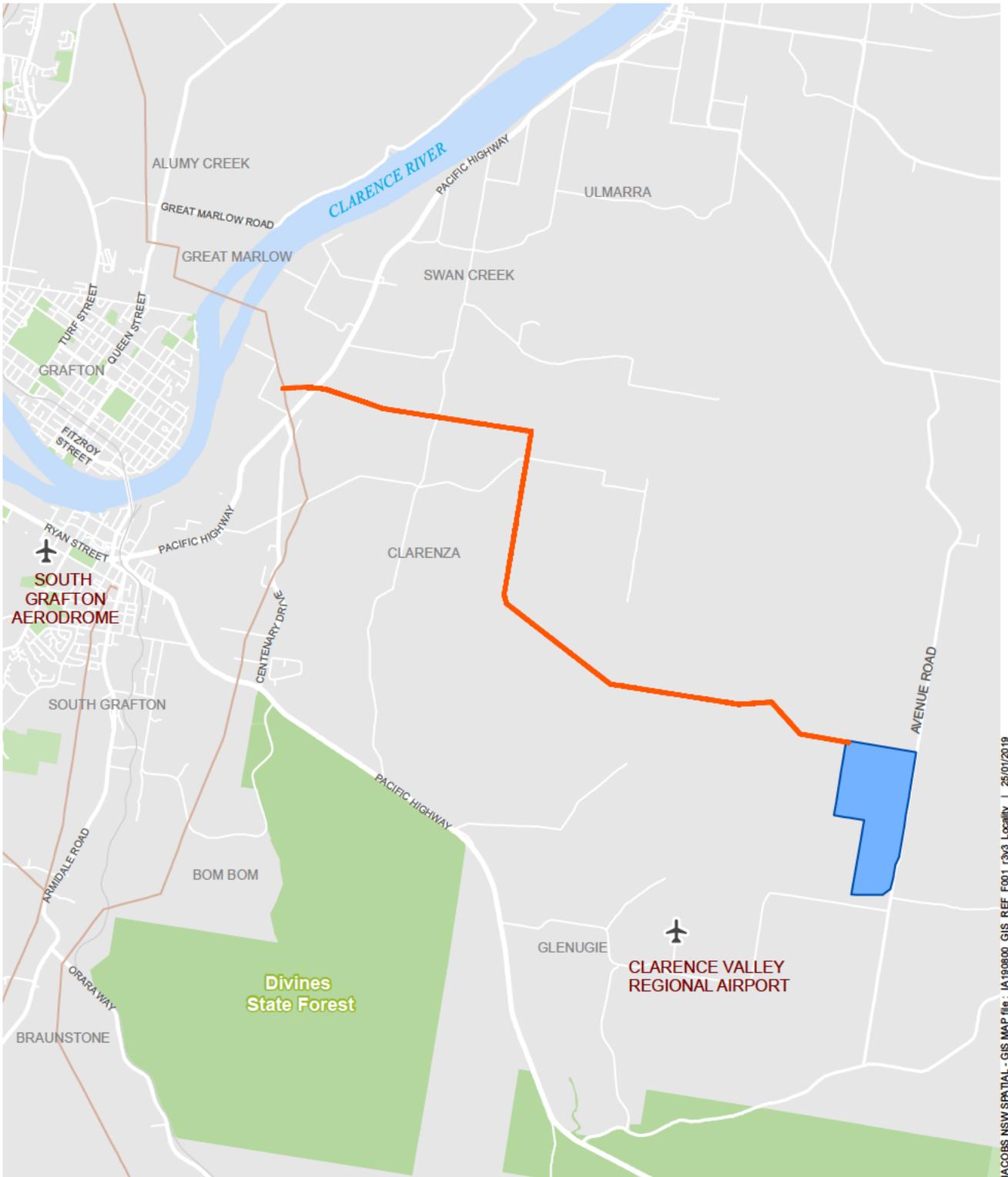
Depending on the terrain, the extent of access track construction may vary from:

- Slashing long grass only.
- Excavating and grading to level natural ground.
- Importing and placement of gravel and/or road base onto natural ground.
- Boxing out the natural ground, importing gravel and/or road base and compacting.
- Site specific solution depending on the conditions encountered.

Culverts, causeways and other drainage measures may be required to facilitate drainage and allow vehicles to cross erosion gullies and/or creek crossings.

Appropriate drainage, erosion and sediment control measure would be implemented.

Figure 1-3 provides an overview of the proposed existing and new access tracks which would be used as part of the proposed activity. The final locations of these tracks would be determined in consultation with the landholders in order to coordinate with landholder activities and minimise disruptions to their activities. The final locations would be determined to minimise impacts to native vegetation.



JACOBS NSW SPATIAL - GIS MAP file: IA190800_GIS_REF_F001_r3v3_Locality | 25/01/2019

Legend

- Project locality
- Clarence correctional centre
- Transmission line
- Railway
- Airport

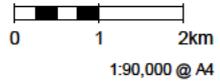


Figure 1-1 | Location of the proposal

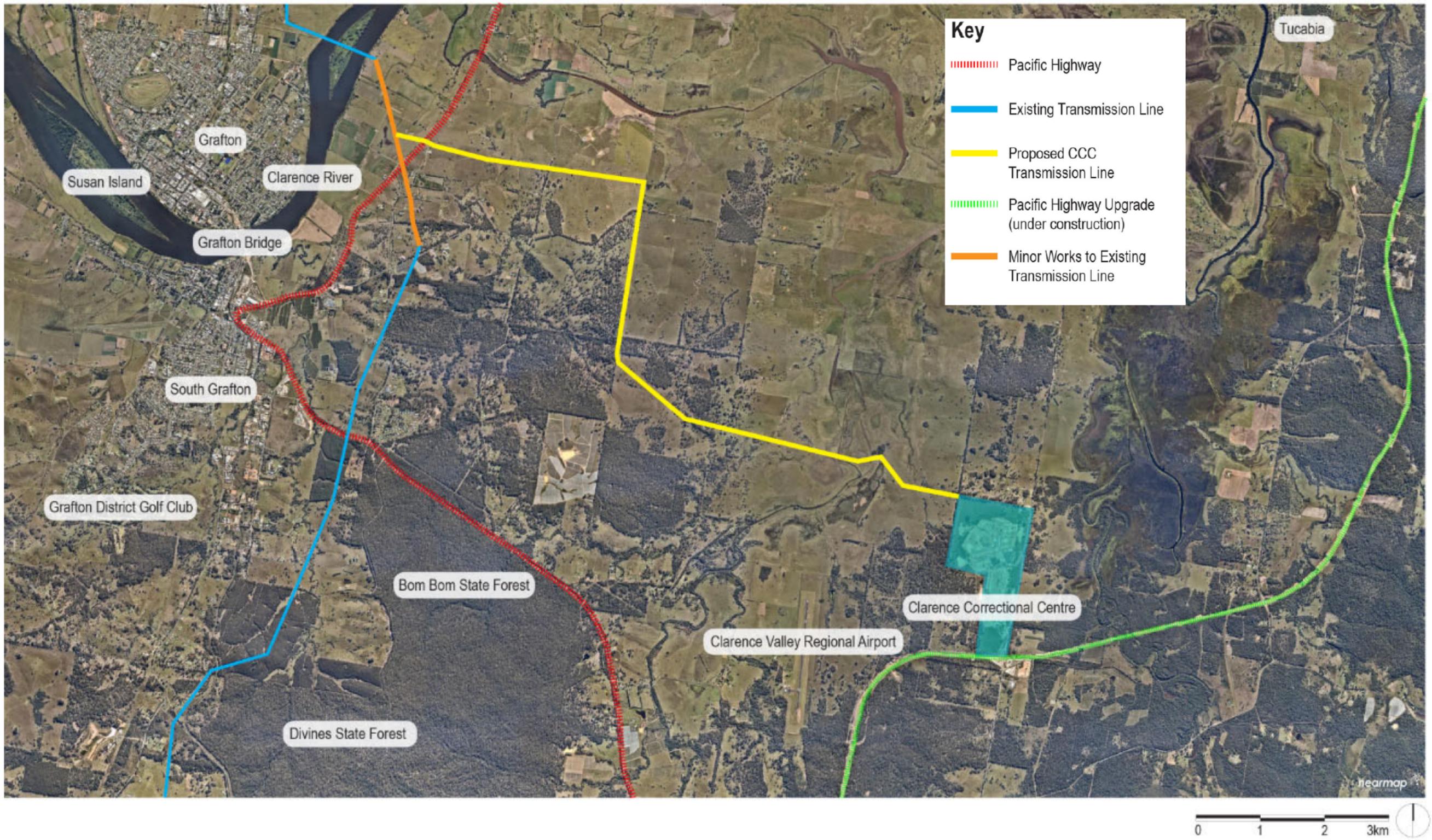


Figure 1-2 The proposal

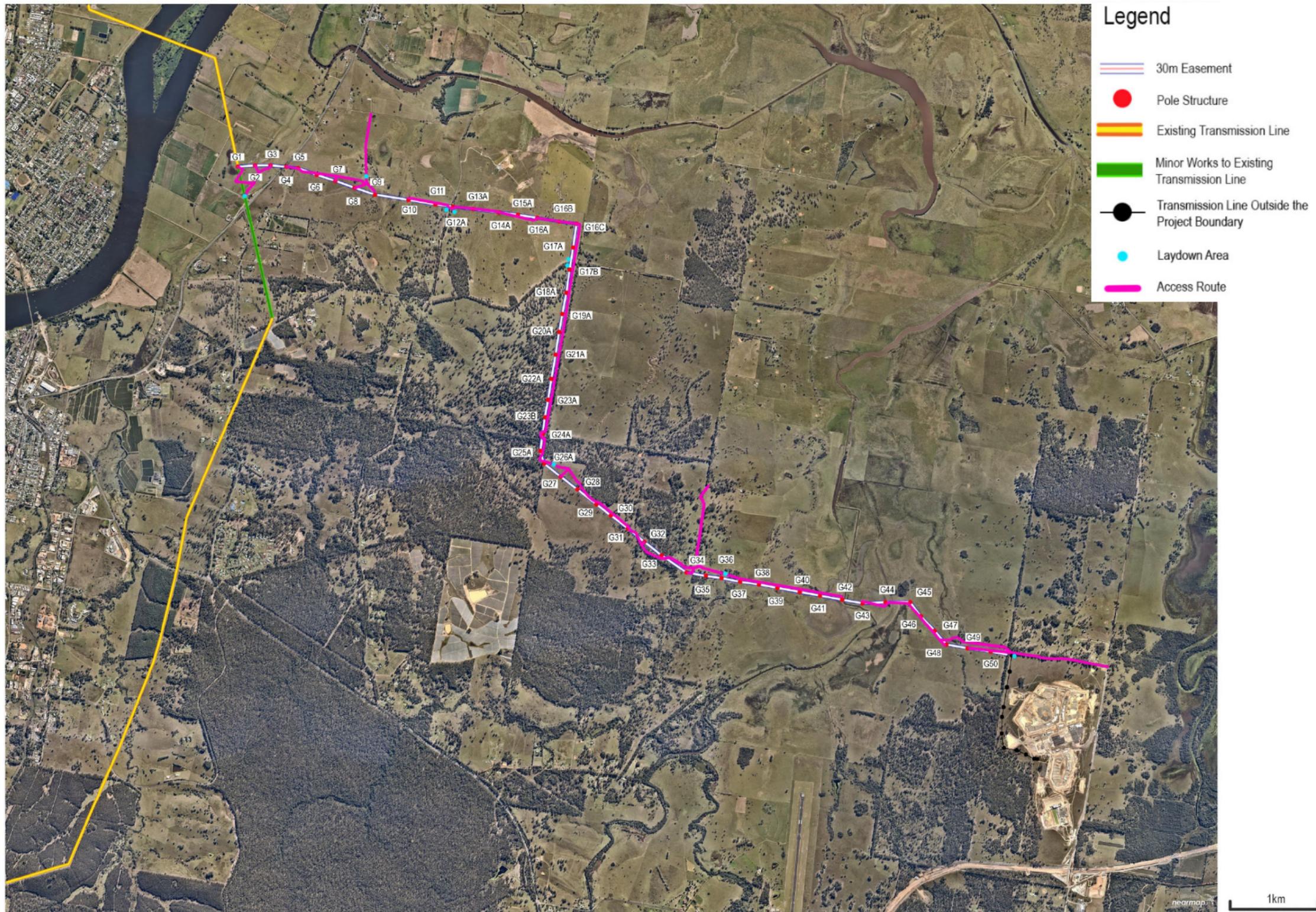


Figure 1-3 Access Roads

1.4 Report structure

This report is the *Bushfire assessment working paper* and will support the EIA required for the proposal under Division 5.1 of the EP&A Act. The structure of the report is summarised in **Table 1-1**.

Table 1-1: Report structure

Section reference	Section heading	Description
Executive summary	Executive summary	Concise summary of this technical paper and the key findings.
1	Introduction: <ul style="list-style-type: none"> • Background • Locality • Proposal description • Report structure 	Overview of the proposal and description of the structure of this working paper.
2	Assessment requirements: <ul style="list-style-type: none"> • Legislative requirements • Planning for bushfire protection • ISS3 • Bushfire prone land 	Identifies the legislative and policy bases for this assessment and their key requirements.
3	Bushfire hazard assessment: <ul style="list-style-type: none"> • Overview • Regional context • Site details • Bushfire prone land • Key bushfire risk scenarios 	The assessment of bushfire hazard for the site in terms of its bushfire prone land status and the anticipated level of bushfire attack exposure.
4	Bushfire protection measures <ul style="list-style-type: none"> • Incorporated bushfire protection measures during operation • Bushfire protection measures during construction and operation activities • Additional bushfire protection measures • Potential environmental impacts of proposed bushfire protection measures 	Describes bushfire protection measures required during the operation and construction of the proposal and their potential environmental impacts.
6	Conclusions and recommendations: <ul style="list-style-type: none"> • Bushfire hazard assessment • Bushfire risk scenarios • Bushfire protection measures • Potential environmental impacts of bushfire protection measures • Recommendations 	Concise statement about the key findings of this bushfire assessment report.

2. Assessment requirements

2.1 Legislative requirements

This Bushfire Assessment is being prepared to support the REF that is being prepared under Division 5.1 of the EP&A Act. The factors that must be taken into account concerning the impact of an activity on the environment for the purposes of Division 5.1 of the EP&A Act are listed in Clause 228 of the EP&A Regulation. These include the need to consider any risk to the safety of the environment.

2.2 Planning for bush fire protection

Planning for bushfire protection (PBP) (NSW RFS 2006) seeks to provide for human safety (including of fire responders) during bushfire events and minimise the effects of bushfires on property. It is underpinned by several principles:

- **Risk:** protection measures are proportional to the threat or risk bushfires pose to a development. Regardless of any setbacks or protection measures, the safety of a development in a bushfire-prone area cannot be entirely guaranteed.
- **Setbacks:** setbacks are used to provide a defensible space between a bushfire hazard and buildings and reduce the risk of direct flame contact and ember attack. Greater setback distances lower any subsequent requirement for bush fire protection construction standards.
- **Managing interfaces:** threats posed by bushfires are diminished by reducing the direct interface between developments and bushfire hazards.
- **Bushfire protection measures (BPM):** which assist building survival during bushfires and contribute to the safety of fire responders and members of the public located within a development on BPL. BPM must be contained within the overall development area. Only under exceptional circumstances may they be displaced onto adjoining lands.

Transmission lines are not specifically addressed in PBP. However, the document provides appropriate guidance for the consideration of bush fire risk. The main bush fire risk associated with transmission lines is the risk of ignition associated with electrical conduction; this is specifically addressed in *ISSC3 - Guide for Management of Vegetation in the Vicinity of Electricity Assets* (ISSC 2016).

NOTE: An updated version of PBP has been developed, and pre-release version issued (NSW RFS 2018). It is expected to become legislated in mid-2019, when it will replace the 2006 version as the legally referenced document. The pre-release version provides guidance for electrical transmission for residential subdivision and special fire protection purpose developments. Intent of the recommended measures is that electricity infrastructure not contribute to the risk of fire to a building.

2.3 ISSC3 - Guide for Management of Vegetation in the Vicinity of Electricity Assets

ISSC3 provides a set of requirements for the management of the risks associated with the impact of vegetation on Electricity Assets for the benefit of public safety, community amenity and electricity supply reliability. It has been written for the purposes of assisting Network Operators achieve the safety requirements specified in the NSW Electricity Supply (Safety and Network Management) Regulation 2014 (NSW) and Australian Standard (AS) 5577 "Electricity Network Safety Management Systems" 2013. The purpose of this Guide is to provide a minimum standard for the management of vegetation in the vicinity of electricity supply infrastructure in NSW. Variation from the specific clearance requirements may be at the discretion of the Network Operator on the basis that an alternative risk management outcome has been determined to be consistent with the risk outcomes of the Guide.

It is applicable to the following electricity assets:

- Overhead power lines;
- Poles, towers and other power line support structures;
- Network Operator communication cables attached to power line support structures;
- Street lighting luminaires (for the purposes of protection of the asset); and
- Waterway warning signs advising of overhead power line crossings.

It is not applicable to the management of vegetation during the design and construction phase of new assets, which is provided for by the associated planning and construction approvals for those assets.

The Guide requires Network Operators to develop and implement a plan for the regular identification and remediation of Vegetation Grow-In and Fall-In hazard. The remediation of hazards is to be in accordance with the minimum Clearing Requirements provided in the guide. In particular, a plan must address the increased risk from vegetation hazards during the Bushfire Danger period and ensure remediation is undertaken prior to its commencement to ensure the risk is As Low as Reasonably Practicable (ALARP). Particular consideration is required in bush fire prone areas including considering application of exceptions for amenity or environmental reasons and the application of “Clear to the Sky” risk reduction (i.e. the removal of all vegetation above the electricity assets to the width of the minimum Clearing Requirement).

2.4 Bush fire prone land

The identification of bush fire prone land (BPL) in NSW is the responsibility of local government area-based Bush Fire Management Committees (BFMC). BPL mapping is typically published by the respective local government and the maps and metadata are developed according to guidance provided by NSW RFS (2015).

BPL assessments are based on allocation of the vegetation present into one of three broad categories, as follows:

- *Category 1:* which includes areas of forest, woodland, heath, forested wetland and timber plantation.
- *Category 2:* rainforests and “lower risk vegetation parcels” these parcels contain remnant vegetation, but it is limited in its connectivity to larger areas and contain land management practices and a bush fire plan that identifies the appropriate management of bushfire risk.
- *Category 3:* which includes grasslands, freshwater wetlands, semi-arid woodlands, alpine complex and arid shrublands
- *Exclusion:* Areas of vegetation less than 1 hectare and greater than 100 metre separation from category 1, 2 or 3 vegetation; small patches or strips of remnant vegetation; managed grasslands; agricultural cropland; gardens; and mangroves are not mapped as bushfire prone.

BPL is defined as land with category 1, 2 or 3 vegetation and land within 100 metres of category 1 or within 30 metres of category 2 or 3 vegetation.

3. Bushfire hazard assessment

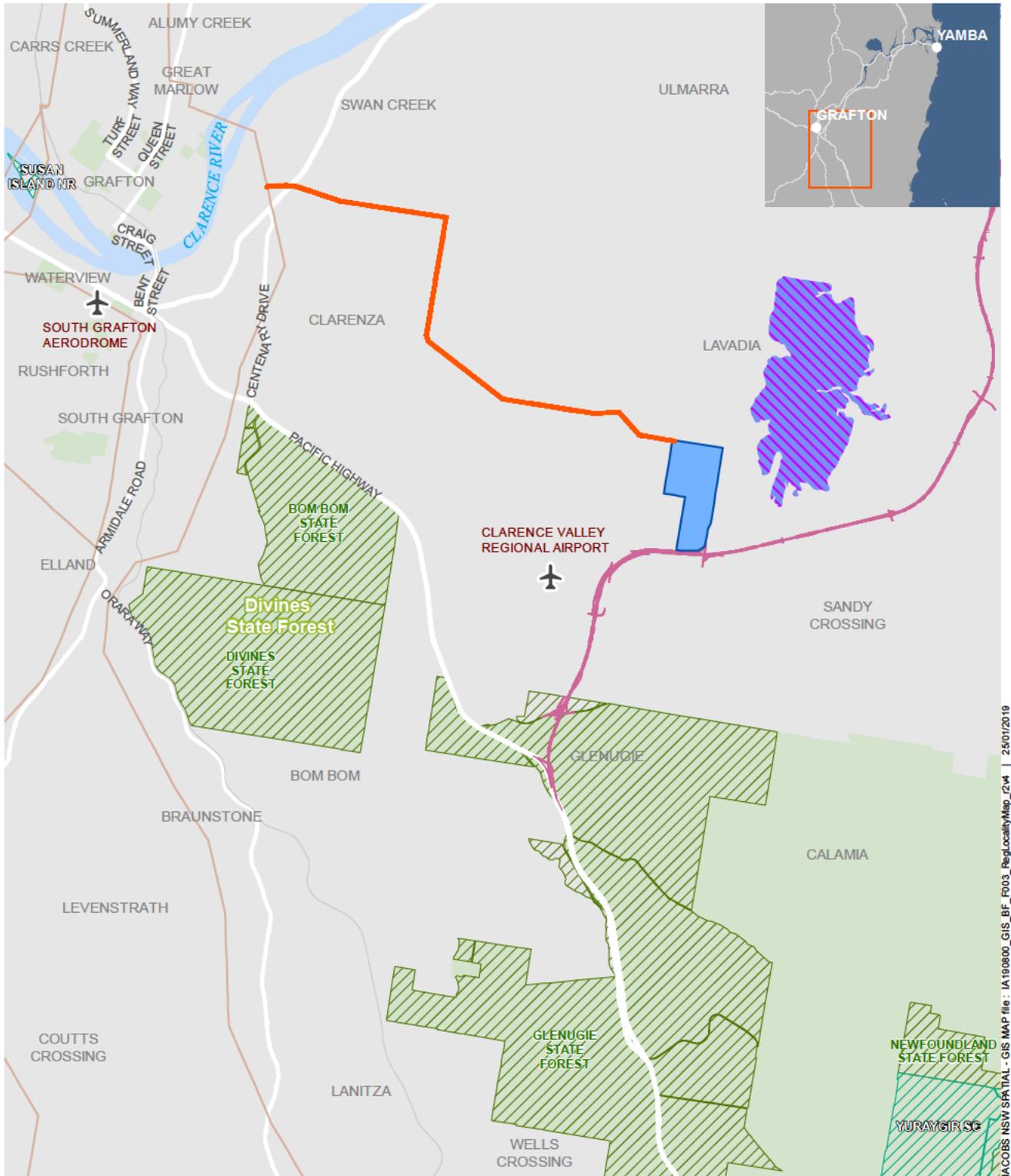
3.1 Overview

This assessment is focused on bushfire hazards and their management arising from the construction and operation of the proposed transmission line.

3.2 Regional context

The proposal is located to the east of Grafton within the Clarence Valley LGA, northern NSW, refer to **Figure 3-1**. It is located in the southern extent of the Southern Eastern Queensland Bioregion (IBRA 7) and within the Clarence Lowlands (Clarence Basin) sub-region which is characterised by low hills and plains with steeper hills to the west and south.

The plains to the north have been extensively cleared for agriculture and now mostly support pasture and areas of herbaceous wetland. The hills to the east and south contain scattered remnants of forest on private land in close proximity to the proposal and extensive areas of forested land in State Forests occurs several kilometres beyond this.



JACOBS NSW SPATIAL - GIS MAP file: IA190800_GIS_BF_F003_RegLocalityMap_214 | 25/01/2019

Legend

- Project locality
- Transmission line
- Pacific Highway Upgrade alignment
- Railway
- Clarence correctional centre
- SEPP 14 Wetlands
- NPWS area
- State Forest

Figure 3-1 | Regional locality

3.3 Site details

The proposal commences around 1 kilometre to the east of Grafton within the Clarence Valley LGA, northern NSW, refer to **Figure 1-1**. The transmission line starts around 500 metres to the west of the Pacific Highway and extends 3.9 kilometres to the east, across the Pacific Highway, Washpen Creek and Four Mile Lane to an unnamed road off Tancred's Lane. From here the transmission orientates south towards Clarenza, before crossing the McPhillips and Glenugie Creeks and tying in with the CCC.

3.3.1 Topography

The proposal site is traverses a low gradient, mildly undulating landscape made up of predominantly rural / agricultural land uses. The elevation ranges between 1 and 54 mAHD, with slopes not exceeding 6° (10 %; **Figure 3-2**).

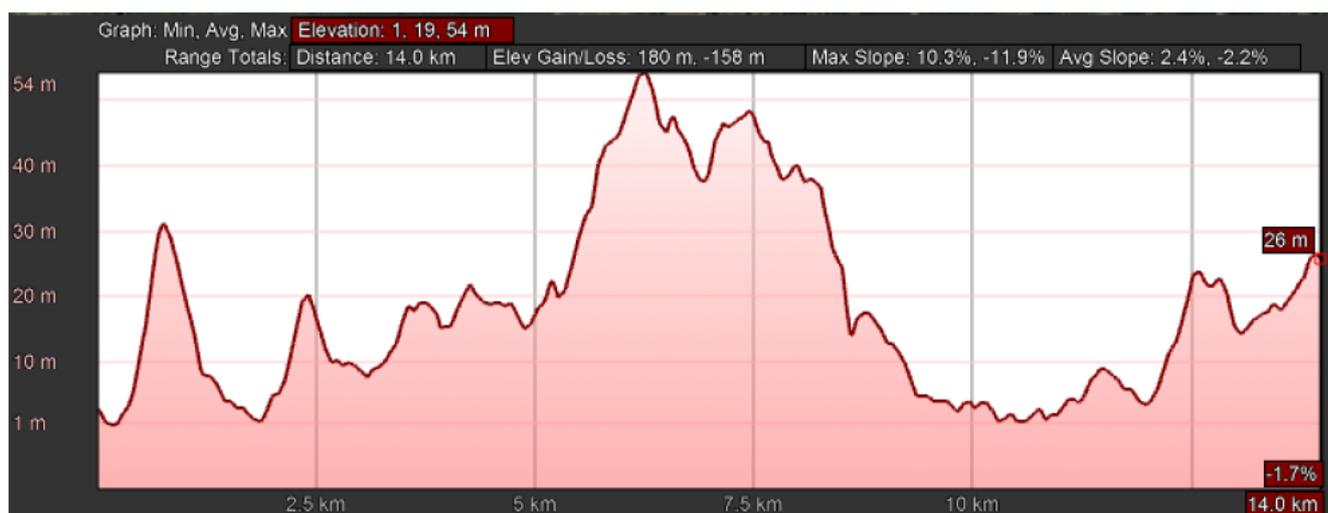


Figure 3-2: Elevation profile (Source: Google Earth Pro)

3.3.2 Vegetation

The valleys and floodplains are generally cleared of native vegetation and support pasture grasses (refer to **Figure 3-3**). The hills and slopes may be wooded, with an open grassy understorey (**Figure 3-4**) or support forest with slightly higher fuel levels (refer to **Figure 3-5**). Statewide vegetation mapping for modelling fire spread by Keith and Simpson (2017) for the proposal site is presented in **Refer to the PDF set of figures**

Figure 3-6. It shows the main vegetation type in the landscape to be Clarence Dry Sclerophyll Forests and potentially small pockets of Coastal Valley Woodlands (refer to **Figure 3-4**), Coastal Floodplain Forests, and Wet Sclerophyll Forests. Given the extensive grazing that occurs across private land, these remnants are generally maintained below their potential fuel loads within the proposal area.

Indicative potential fuel loads for these vegetation types are presented in *PBP* (NSW RFS 2017; these are presented in **Table 3-1** below).



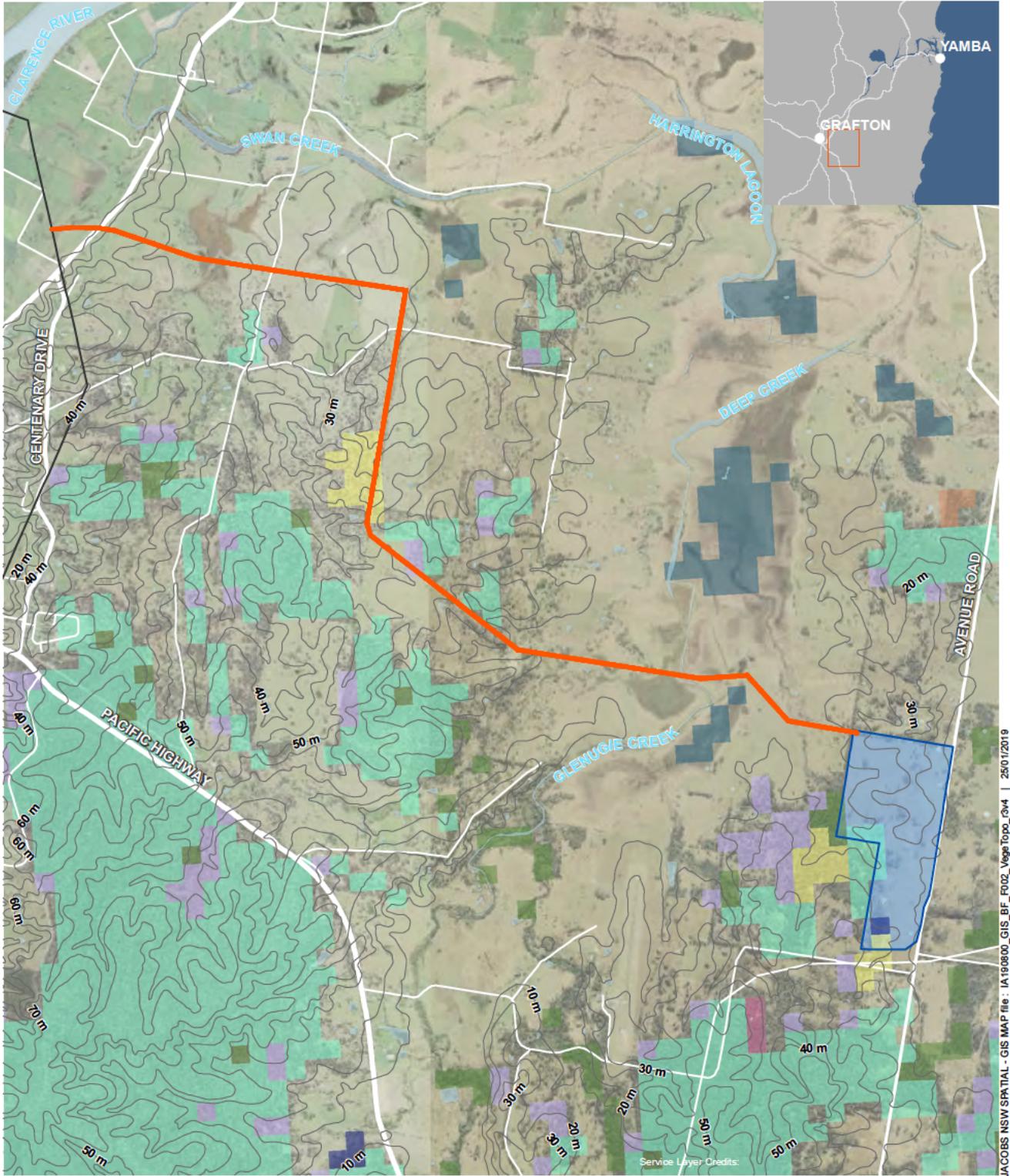
Figure 3-3: Grazed pasture dominates the cleared lowlands



Figure 3-4: Slopes may support woodland over a grassy, often grazed understorey.



Figure 3-5: Dry Sclerophyll Forest



Legend

— Project locality

▭ Clarence correctional centre

— Transmission line

— Contour

Vegetation class (OEH 2012)

▭ Clarence Dry Sclerophyll Forests

▭ Cleared

▭ Coastal Floodplain Forests

▭ Coastal Freshwater Lagoons and Floodplain Meadows

▭ Coastal Swamp Forests

▭ Coastal Valley Grassy Woodlands

▭ North Coast Wet Sclerophyll Forests

▭ Northern Hinterland Wet Sclerophyll Forests

▭ Northern Tableland Wet Sclerophyll Forests



Figure 3-6 | Vegetation and topography

JACOBS NSW SPATIAL - GIS MAP file: IA190800_GIS_BF_F002_VegeTopo_03v4 | 25/01/2019

Table 3-1: Vegetation fuel loads from *Planning for Bushfire Protection* (NSW RFS 2017)

Keith Vegetation Formation	Keith Vegetation Classification	Surface and elevated fuel (t/ha)	Overall (includes bark and canopy fuel (t/ha)
Wet Sclerophyll Forests (Shrubby)	North Coast WSF (Shrubby)	22	36
Wet Sclerophyll Forests (Grassy)	Northern Hinterlands WSF (Grassy)	20	33
	Northern Tablelands WSF (Grassy)	20	32
Dry Sclerophyll Forests (Shrub / Grass)	Clarence DSF	14	25
Woodlands	Coastal Valley GW	10	18
Forested Wetlands	Coastal Floodplain Forest	8	15

3.3.3 Climate and bushfire weather

The Clarence Valley LGA experiences a warm temperate climate (CVBFMC 2008). Average temperatures range between 19 and 30°C in January and 7 and 20°C in July. Monthly average rainfall ranges from about 50 mm between July and October to over 100 mm between December and March. Annual rainfall averages 1000 mm, but is highly variable between years. The bushfire season in the Clarence Valley generally commences in early September and finishes in late February/early March. The bushfire danger period has been known to commence as early as mid-July and finish as late as mid-April the following year (CVBFMC 2008). Bushfire seasons of this length are associated with extended periods of low rainfall, such as may occur during El Niño climate events. While winds in coastal areas are predominantly from the north-east to south, particularly in the afternoon, the most dangerous fire weather is associated with strong, warm, dry westerly winds during spring (CVBFMC 2008). The 1:50 year fire weather scenario is identified as Fire Danger Index (FDI) 80 (NSW RFS 2017).

3.4 Bush fire prone land

Mapping published by Clarence Valley Council (2019) identifies some of the proposal area as bush fire prone land. However, as indicated in the Bushfire Assessment for the Correctional Centre (Jacobs 2016) this appears to underestimate the extent of bush fire prone land when assessed in accordance with relevant RFS guidance (NSW RFS 2015).

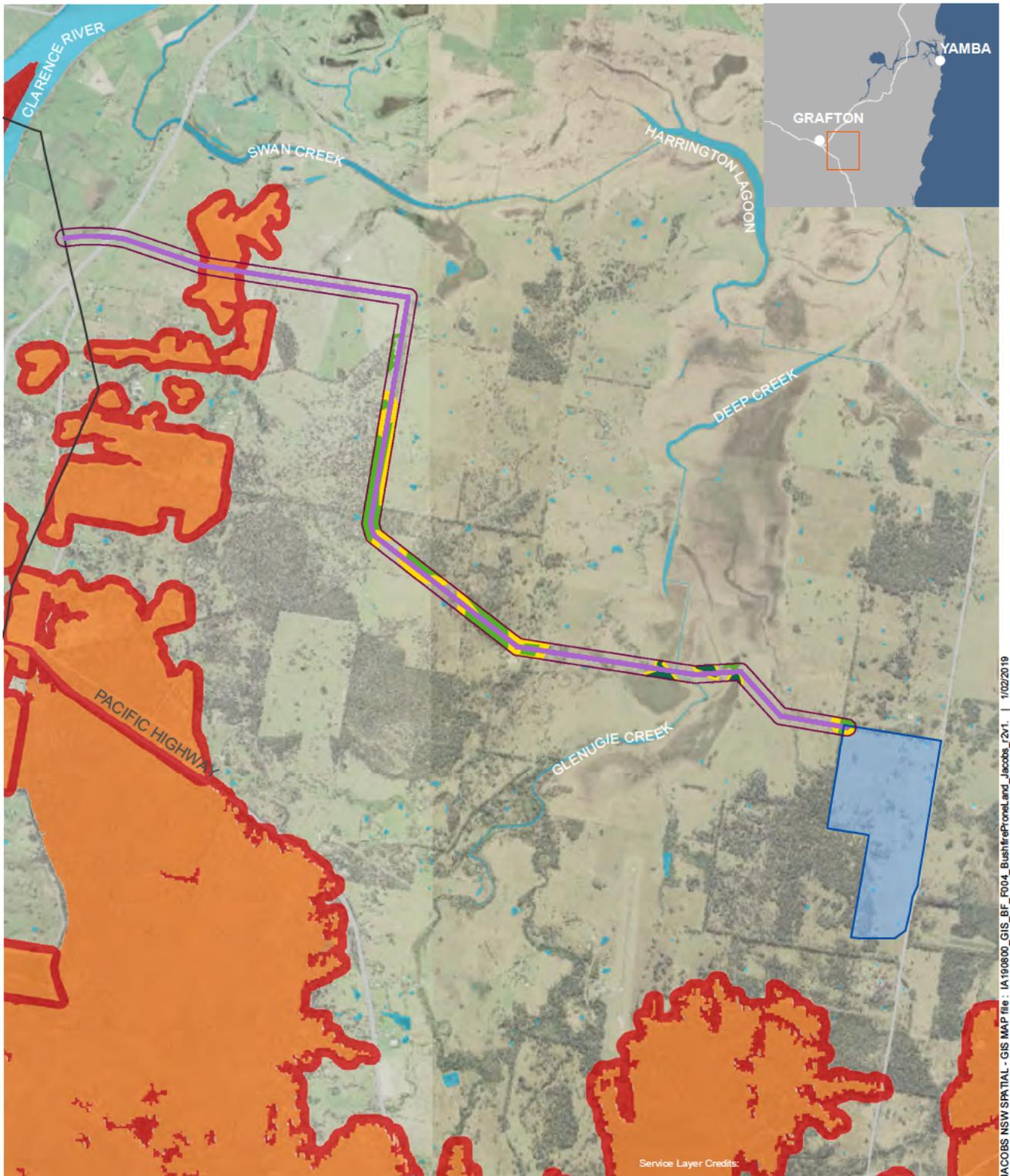
Assessment of BPL was undertaken for land within 100 metres of the proposal route (refer to **Figure 3-7**). Larger (>1 hectare) patches of treed native vegetation within 100 metres of the proposal were assessed to be Category 1 vegetation. Wetland areas of sufficient size were assessed to be Category 3 vegetation. Since the open areas have historically been managed pastures, they are considered to be excluded vegetation and not bushfire-prone.

3.5 Key bushfire risk scenarios

Given the climate of the Grafton area and location of the proposal in relation to large patches of native vegetation in which bushfires may develop, there are considered to be two main bushfire risk scenarios:

- *Scenario 1:* fire approaching the proposal through native vegetation and pasture lands, under the influence of strong, dry, warm westerly winds. Such conditions would elevate fire danger and potentially contribute to dangerous and unpredictable fire behaviour. In such a scenario, a relatively intense bushfire could approach quite rapidly.
- *Scenario 2:* fire approaching the proposal through pasturelands and/or native vegetation under the influence of strong, but mild and relatively humid winds from the south to north-east. Milder conditions would reduce the intensity and rate of spread of such a fire relative to one envisaged under the first scenario.

In summary, while substantial bush fires could occur in the landscape, the landscape bush fire risk is moderate, relative to other areas in NSW. Construction of an electrical transmission line, with appropriate bushfire measures in place, is appropriate in this landscape.



JACOBS NSW SPATIAL - GIS MAP file : IA190800_GIS_BF_F004_BushfireProneLand_Jacobs_72v1. | 1/02/2019

Legend

- Project locality
 - Clarence correctional centre
 - 100m assessment area
 - Transmission line
- | | | | |
|--|---|--|--|
| Bushfire prone land (Clarence Valley Council 2018) | | Bush fire prone land (Jacobs 2019) | |
| Buffer | Category 1 | Buffer | Category 1 |
| | | Category 3 | |

0
1
2km

N

1:65,000 @ A4

Figure 3-7 | Bushfire prone land

4. Bushfire protection measures

4.1 Incorporated bushfire protection measures during operation

The main BPM for the proposal is the adoption of vegetation management standards in accordance with *ISSC3 - Guide for Management of Vegetation in the Vicinity of Electricity Assets* (ISSC 2016). These vegetation management standards are essential to maintain the safe and effective functioning of the transmission line and also to minimise the risk of fire ignition from vegetation coming into close proximity with conductors. They also help to minimise the risk of ignition in case of failure of poles/wires/pole assemblies.

The other relevant measure that will be incorporated into the proposal is to include sufficient access for the management of vegetation and maintenance of the infrastructure, which will also provide potential access for bush fire response activities, such as responding to potential ignitions. However, the access tracks are not intended to provide defendable space in case of fire and the transmission line easement would likewise not necessarily be suitable for use as a landscape fire break.

The proposed vegetation removal for the proposal includes:

- Removal of trees and vegetation within the 30 metre easement to enable installation of the new transmission line.
- Removal of 'hazard trees' outside the easement which have the potential to fall onto, or come in contact with the transmission line. This should include high risk blow-in vegetation; i.e. where bits of tree break off and are blown into the conductor.
- Removal of vegetation for the construction of suitable access tracks.

The ongoing vegetation management will be in accordance with ISSC3. This requires:

- 5.5 metre clearance in all directions from the first and last sixth of spans between 200-300 metres for bare conductors (not including steel) of 132 kilovolt and 6.5 metres for the middle two thirds. An additional 0.5 metres is added for bush fire prone areas.
- A minimum clearance of 2 metre is required around poles
- Fall in vegetation hazards shall be assessed and managed as far as it reasonable practicable to do so; this process should also consider the need to implement "Clear to the Sky" Hazard Reduction where high risk vegetation is identified.

4.2 Bushfire protection measures during construction and maintenance activities

Construction activities pose additional risks for on-site ignitions which may result in a fire escaping to surrounding properties. These mainly arise from hot work (activities with the potential to generate sparks and cause fire ignitions), vegetation clearing and management and use of vehicles on site. Contractors should ensure suitable Bushfire Protection Measures are incorporated into safe work procedures to ensure these risks are appropriately managed. The operator will also need to ensure that the electrical infrastructure is maintained to minimise the risk of infrastructure failure causing ignition

4.3 Additional bushfire protection measures

In addition to vegetation management, other considerations apply to the operation of electricity assets to effectively manage bushfire risk, such as design standards for infrastructure and network operation. These risk mitigation measures are outside the scope of this document; however, it is noted that the proposal site is not considered a high risk location.

4.4 Potential environmental impacts of proposed bushfire protection measures

Potential environmental impacts of the proposed BPM are largely confined to the clearing of remnant native vegetation and the potential for erosion and sedimentation associated with this and the proposed access tracks. Vegetation clearance is incorporated into the initial planning of the proposal and no additional clearing is proposed as part of this bush fire assessment. In accordance with ISS3, vegetation removal and management of hazard trees should be undertaken with consideration of minimising environmental impact while ensuring risk is mitigated to a level consistent with the objectives of the Guide.

Construction of access trails will involve minor local soil disturbance along their routes and potentially localised disruption to overland flow paths. Vegetation removal and access track design, construction and maintenance should aim to minimise erosion and the generation and transportation of sediments. This should include the installation of culverts and drainage stabilisation techniques where necessary.

5. Conclusions and recommendations

5.1 Bushfire hazard assessment

The proposal commences around 1 kilometre to the east of Grafton within the Clarence Valley LGA and involves approximately 12.5 kilometres of 132 kilovolt transmission line to connect to the Clarence Correctional Centre. The proposed route supports a mix of pasture grassland, woodland and dry sclerophyll forest with a grassy understorey. The majority of the native vegetation is connected with larger patches that extend to the south.

BPL mapping published by the Clarence Valley Council indicates a small portion of the proposal area to be bush fire prone. However, based on the type of vegetation and the connection between patches of remnant vegetation, it is considered that this classification is incorrect and that substantially more of the surrounding land is bush fire prone (refer to **Figure 3-7**).

The proposed vegetation removal for the proposal includes:

- Removal of trees and vegetation within the 30 metre easement to enable installation of the new transmission line.
- Removal of 'hazard trees' outside the easement which have the potential to fall onto or come in contact with the transmission line.
- Removal of vegetation for the construction of suitable access tracks.

5.2 Bushfire risk scenarios

The bushfire season in the Clarence Valley generally commences in early September and finishes in late February/early March. As a result of the area's relatively humid climate, days with greatly elevated fire danger are uncommon. They mostly occur during spring and on days with strong, warm, dry westerly winds.

Two main bushfire risk scenarios facing the proposal site have been identified as part of this assessment:

- *Scenario 1:* fire approaching the proposal through native vegetation and pasture lands, under the influence of strong, dry, warm westerly winds. Such conditions would elevate fire danger and potentially contribute to dangerous and unpredictable fire behaviour. In such a scenario, a relatively intense bushfire could approach quite rapidly.
- *Scenario 2:* fire approaching the proposal through pasturelands and/or native vegetation under the influence of strong, but mild and relatively humid winds from the south to north-east. Milder conditions would reduce the intensity and rate of spread of such a fire relative to one envisaged under the first scenario.

In summary, while substantial bush fires could occur in the landscape, the landscape bush fire risk is moderate, relative to other areas in NSW. Construction of an electrical transmission line, with appropriate bushfire measures in place, is appropriate in this landscape.

5.3 Bushfire protection measures

The main BPM for the proposal is the adoption of vegetation management standards in accordance with *ISSC3 - Guide for Management of Vegetation in the Vicinity of Electricity Assets* (ISSC 2016).

This requires:

- A 5.5 metre clearance in all directions from the first and last sixth of spans between 200-300 metres for bare conductors (not including steel) of 132 kilovolt and 6.5 metres for the middle two thirds. An additional 0.5 metres is added for bush fire prone areas.
- A minimum clearance of two metres is required around poles.

- Fall in vegetation hazards shall be assessed and managed as far as it reasonable practicable to do so; this process should also consider the need to implement “Clear to the Sky” Hazard Reduction where high risk vegetation is identified.

The other relevant measure that will be incorporated into the proposal is to include sufficient access for the management of vegetation and maintenance of infrastructure, which will also provide potential access for bush fire response activities, such as responding to ignitions.

5.4 Potential environmental impacts of bushfire protection measures

Potential environmental impacts of the proposed BPM are largely confined to the clearing of remnant native vegetation and the potential for erosion and sedimentation associated with this and the proposed access tracks. Vegetation clearance is incorporated into the initial planning of the proposal and no additional clearing is proposed as part of this bush fire assessment. In accordance with ISSC3, vegetation removal and management of hazard trees should be undertaken with consideration of minimising environmental impact while ensuring risk is mitigated to a level consistent with the objectives of the Guide. Vegetation removal and access track design, construction and maintenance should aim to minimise erosion and the generation and transportation of sediments.

5.5 Recommendations

- Bush fire prone mapping presented in this report should be adopted when implementing *ISSC3 - Guide for Management of Vegetation in the Vicinity of Electricity Assets* (ISSC 2016).
- In accordance with ISSC3 vegetation removal and management of hazard trees should be undertaken with consideration of minimising environmental impact while ensuring risk is mitigated to a level consistent with the objectives of the Guide.
- Vegetation removal and access track design, construction and maintenance should aim to minimise erosion and the generation and transportation of sediments.
- During construction and maintenance activities contractors should ensure suitable BPM are incorporated into safe work procedures to ensure bush fire risk is appropriately managed.
- Network operators should maintain vegetation standards and infrastructure to minimise the risk of bush fire ignition from infrastructure failure.

6. Glossary

ALARP	As low as reasonably practicable.
APZ	Asset protection zone(s).
BAL	Bushfire attack level (after AS 3959-2009 <i>Construction of buildings in bushfire prone areas</i>).
BCA	Building Council of Australia.
BFCC	Bush Fire Coordinating Committee of NSW.
BFMC	Bush Fire Management Committees.
BPL	Bush fire prone land.
BPM	Bush fire protection measures.
CCC	Clarence Correctional Centre.
CVBFMC	Clarence Valley Bush Fire Management Committee.
CEMP	Construction Environmental Management Plan.
DPE	Department of Planning and Environment.
EWP	Elevated work platforms.
EP&PA Act	<i>Environmental Planning and Assessment Act 1979</i> .
FDR	Fire danger rating.
INSW	Infrastructure NSW.
LGA	Local government area.
OPGW	Optical Ground Wire.
PBP	<i>Planning for bushfire protection</i> (NSW RFS, 2006).
REF	Review of Environmental Factors.
RFS	NSW Rural Fire Service.

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