Appendix A

Updated proposal description (operation)

This chapter provides a consolidated update to the proposal infrastructure and operational description of the proposal that was presented in Chapter 5 of the EIS. This revised description supersedes the description previously provided. This chapter includes a description of the infrastructure operational components of the amended proposal which has been updated following since exhibition of the EIS. New elements or additions to previously proposed proposal are shown in blue text, with deletions or changes shown with a ~~strikethrough~~.

5. Proposal infrastructure and operation

This chapter provides a description of the key elements of the proposal, including the proposed transmission lines and works associated with the upgrade and expansion of the Buronga substation. This chapter also outlines how the proposal would operate and be maintained. A description of how the proposal would be constructed is provided in Chapter 6 (Proposal construction).

The description of the proposal components presented in this chapter are indicative and based on the current level of design, including the proposed amendments as described in the Amendment Report for the Proposal. Some detailed elements of the proposal would continue to be refined as part of the ongoing design development process. For this EIS, a proposed study area has been defined within which the proposal would be constructed and operated.

The final design would be reviewed for consistency with the assessment contained in this EIS, including relevant mitigation measures and any future conditions of approval.

5.1 Secretary's environmental assessment requirements

The Secretary's environmental assessment requirements relating to description of the proposal and where these requirements are addressed in this EIS are outlined in Table 5-1.

Table 5-1 Secretary's environmental assessment requirements – Proposal infrastructure and operation

Ref.	Secretary's environmental assessment requirements	Where addressed in the EIS
General requirements	The EIS must include:	
	> a full description of the project, accompanied by suitable maps and plans, including the:	This chapter provides an operational description of the proposal, and is supported by Figure 5-1 to Figure 5-8. A description of construction activities is provided in Chapter 6 (Proposal construction).
	– disturbance area	The disturbance area is described in Section 6.5.

Ref.	Secretary's environmental assessment requirements	Where addressed in the EIS
	– physical layout of the project over time, including sections of key components	The transmission line corridor is shown in Figure 5-1 and Figure 5-2, with typical arrangement of each structure in Figure 5-3 and Figure 5-5. The Buronga substation upgrade and expansion is shown in Figure 5-6 to Figure 5-8.
	– key uses and activities to be carried out on site	This chapter provides a description of the key uses and activities to be carried out. A description of construction activities is provided in Chapter 6 (Proposal construction).
	– likely timing of the project including any stages, the key phases within each stage (site preparation, construction, commissioning, operation, decommissioning and rehabilitation) and the sequencing of these stages and phases	Refer to Chapter 6 (Proposal construction).

5.2 Proposal overview

An overview of the key components of the proposal is provided below and shown on Figure 5-1. Section 5.3 provides a greater level of details about each of the key components of the proposal and Section 5.4 provides the operational and maintenance aspects of the proposal.

The key components of the proposal include:

> about 135 kilometres of new 330 kilovolt (kV) double circuit transmission line and associated infrastructure between the SA/NSW border near Chowilla and the existing Buronga substation

> an upgrade of the existing, ~~24~~ 22 kilometre long 220kV single circuit transmission line between the existing Buronga substation and the NSW/Victoria border at Monak, near Red Cliffs in Victoria to a 220kV double circuit transmission line, and the decommissioning of the 220kV single circuit transmission line (known as Line 0X1)

> a significant upgrade and expansion of the existing Buronga substation to a combined operating voltage of 220kV/330kV

> a minor realignment of the existing 0X2 220kV transmission line, in proximity to the Darling River

> new/and or upgrade of access tracks as required.

The final alignment and easement of the transmission line would be confirmed during detailed design and would be located within the transmission line corridor as shown in Figure 5-1.

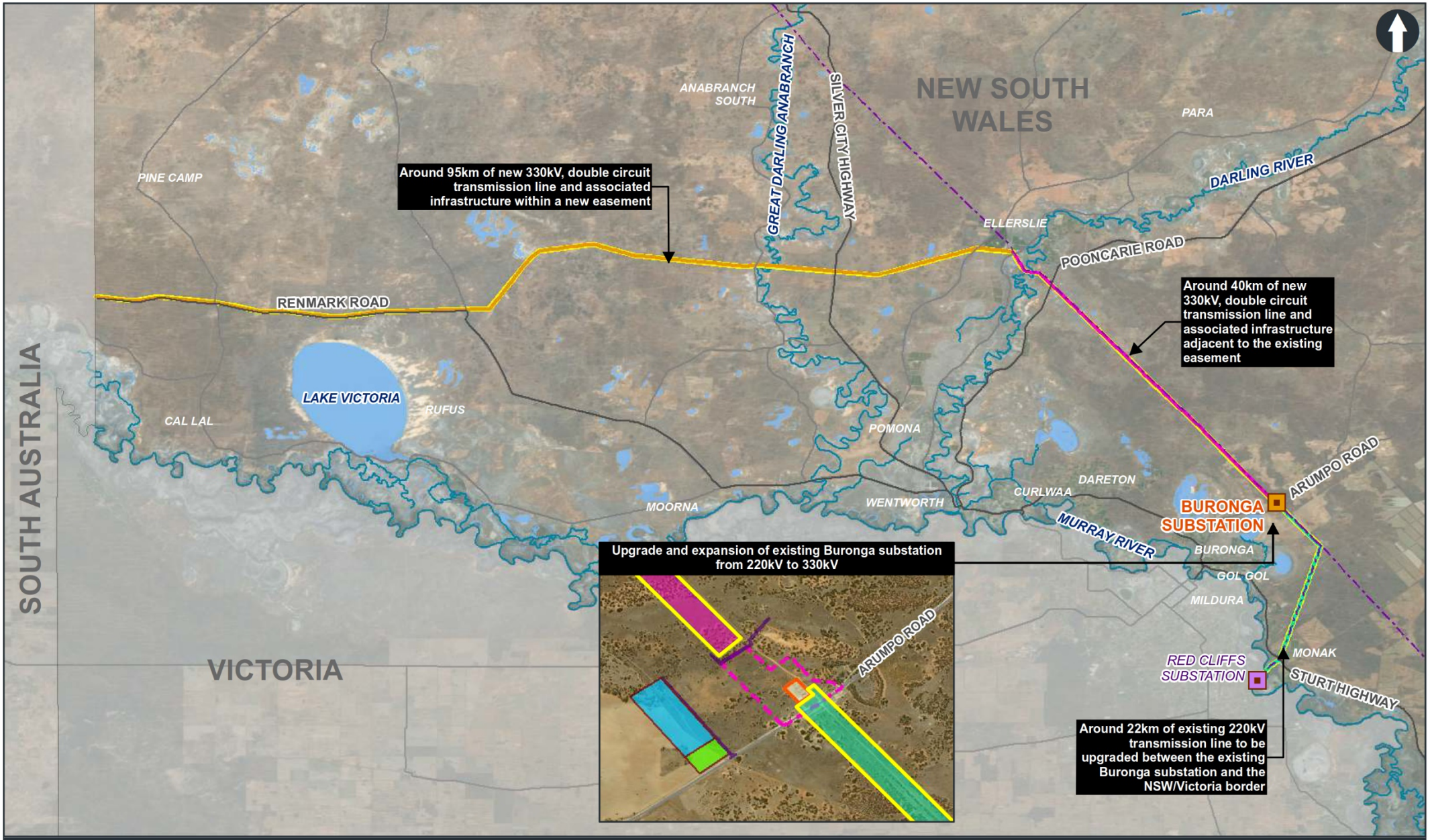


Figure 5-1

Key proposal features

5.3 Components of the proposal

5.3.1 Transmission line between SA/NSW border to Buronga substation

This component of the proposal comprises of a new double circuit 330kV transmission line from the SA/NSW border in the vicinity of Chowilla eastwards towards the existing 220kV Buronga substation. The nominal distance of this line would be about 135 kilometres.

From the SA border, the transmission line would run parallel to Renmark Road for about 37 kilometres. The transmission line would be located on the north of Renmark Road from the NSW border to the point at which it crosses over Nulla Road.

East of Nulla Road, the alignment would travel in north east direction for about 10 kilometres, before heading in an easterly direction, crossing over the Darling Anabranch, Darling River, Silver City Highway and various other roads, before intersecting with the existing TransGrid 0X2 220kV transmission line. This section would extend for about 48 kilometres.

From this point, the alignment would turn southeast and be located parallel to the existing TransGrid 0X2 220kV transmission line to connect with the Buronga substation. This section of the alignment would consist of around 40 kilometres of parallel transmission line.

The final alignment of the transmission line within the transmission line corridor would be confirmed during detailed design with a view to further minimising environmental impacts, wherever practicable. An overview of the proposed transmission line from the SA/NSW border to the Buronga substation is shown in Figure 5-2a to Figure 5-2c.

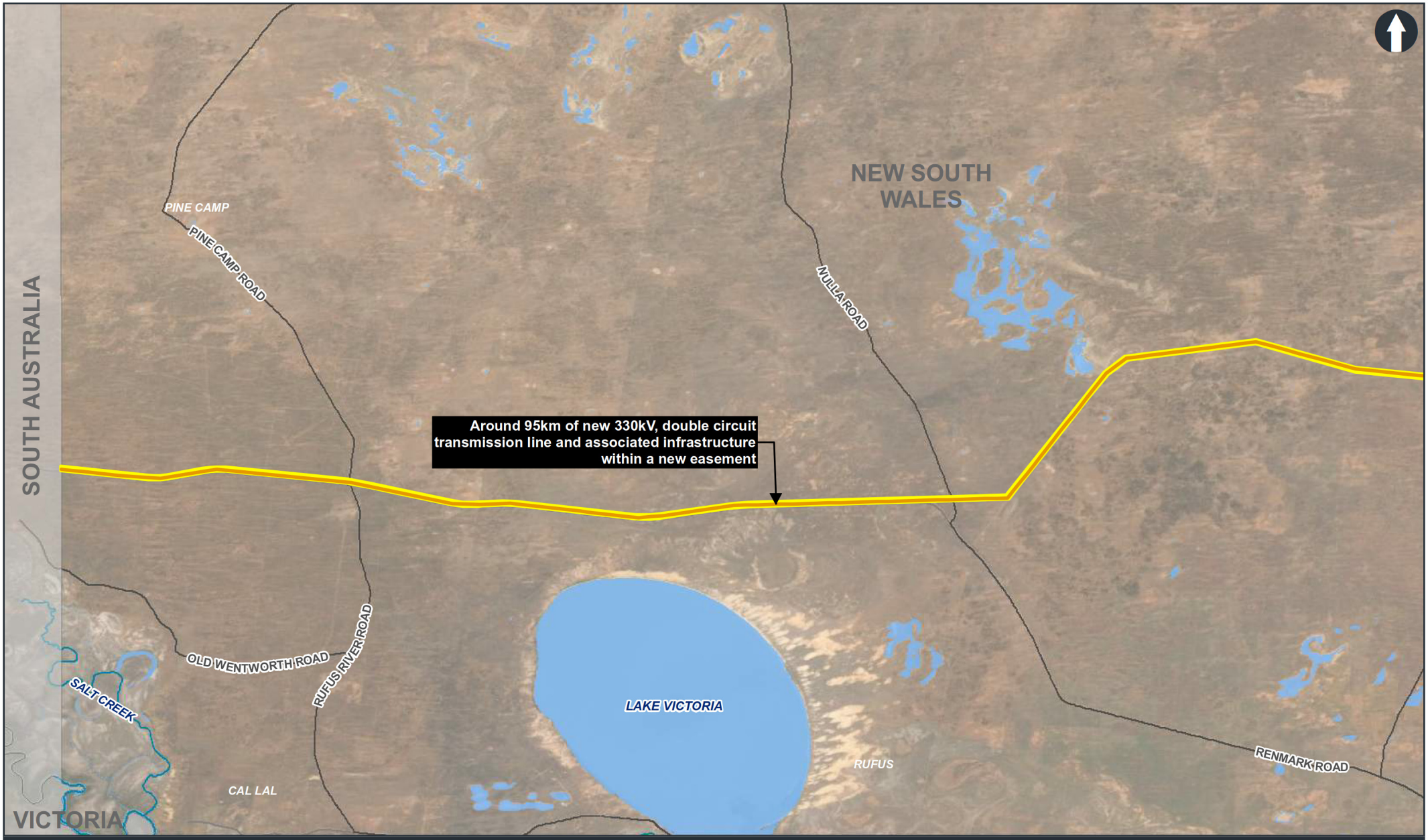


Figure 5-2a

Proposed transmission line corridor

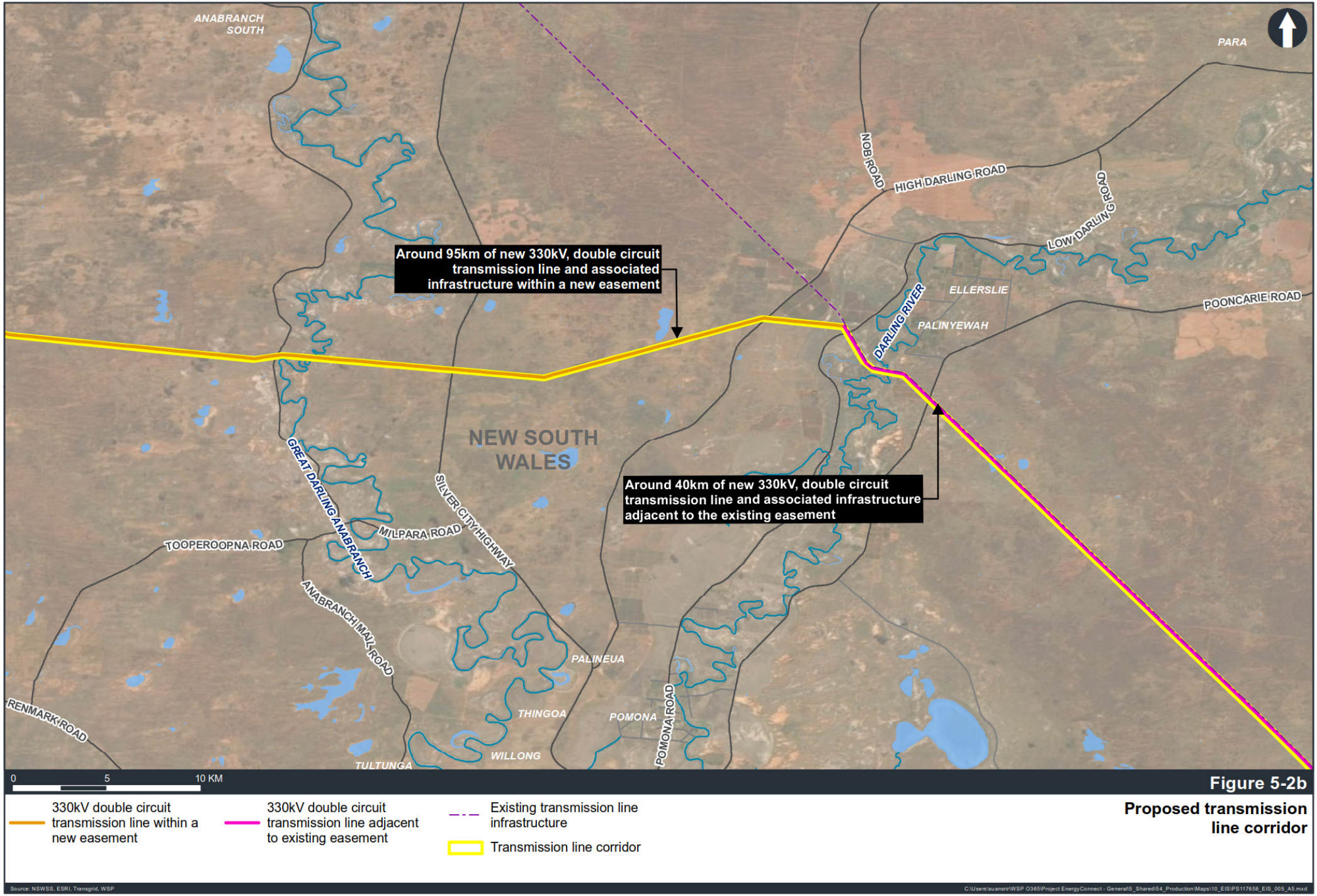


Figure 5-2b

Proposed transmission line corridor

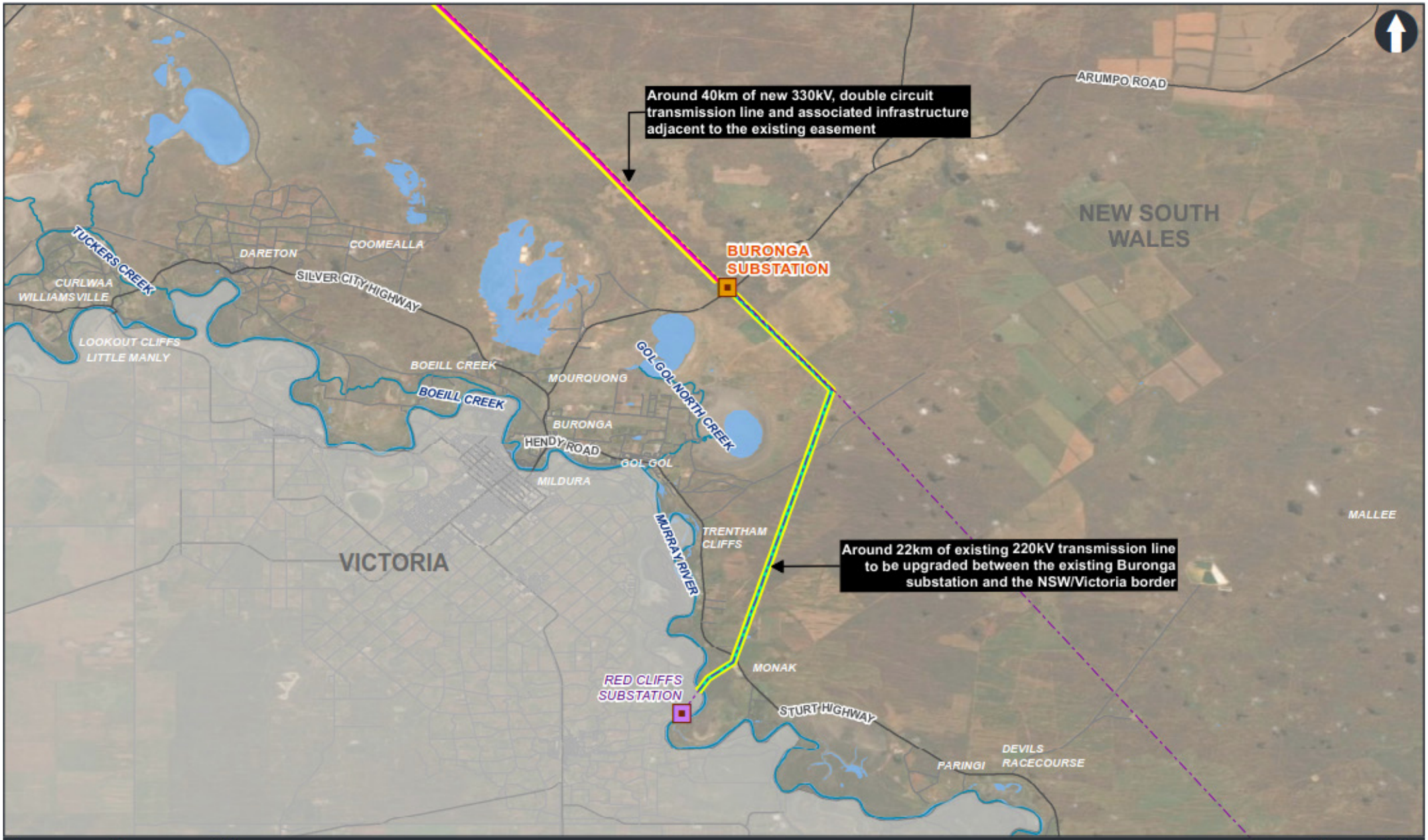


Figure 5-2c

Proposed transmission line corridor

Source: NSWSS, ESRI, Transgrid, WSP

Transmission line structures

The transmission line would be supported on a series of transmission line towers. These would be typically spaced between 450 and 600 metres apart, however shorter distances may be required in limited circumstances. The number and exact type of towers required would be confirmed during detailed design.

The tower types for this section would consist of:

- suspension towers, comprised of:
  - a guyed steel tower – consisting of a thinner tower design with guy wires and ground anchors attached to provide stability. Typical height between around 50 and 70 metres
  - a free standing tower – which typically has a wider base but does not require other supporting infrastructure. Typical height between around 40 and 60 metres.
- strain towers – which consist of a wider base and are self supporting. This type of structure is used for the first and last structure of the transmission line, at road or river crossings, and where there is a change in direction. This type of structure can also be used for structural reasons to break up long runs of suspension towers.

Depending on local circumstances, the tower heights for both forms of towers could be up to 80 metres (refer to Figure 5-3).

The final location and specification of each tower would be dependent on a range of factors such as distance between each tower, local geotechnical conditions, local environmental constraints (for example the need to avoid specific areas of biodiversity). The type and arrangement of the towers would be refined during detailed design.

For simplicity, all structures along this corridor are referred to as transmission line structures within this EIS.

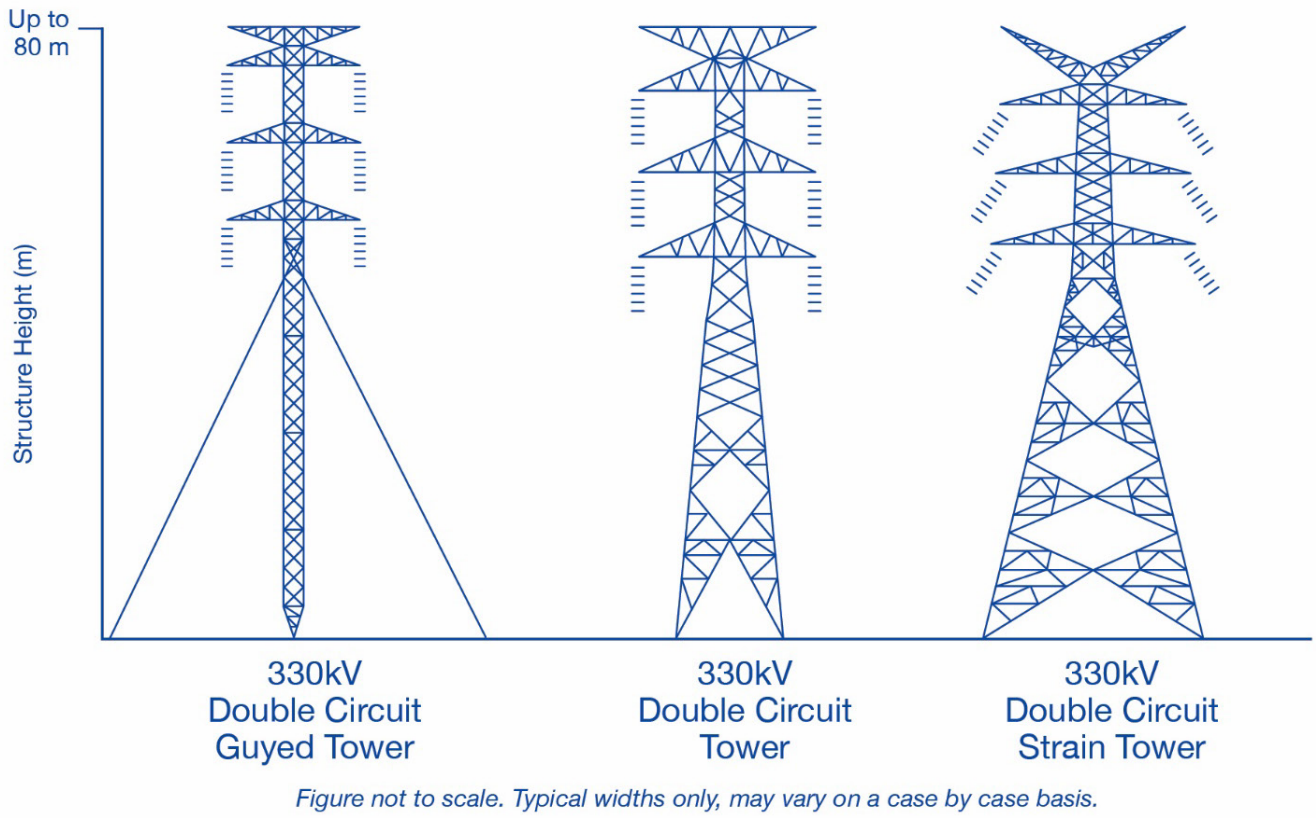


Figure 5-3 Proposed concept design for the transmission line towers on the 330kV line

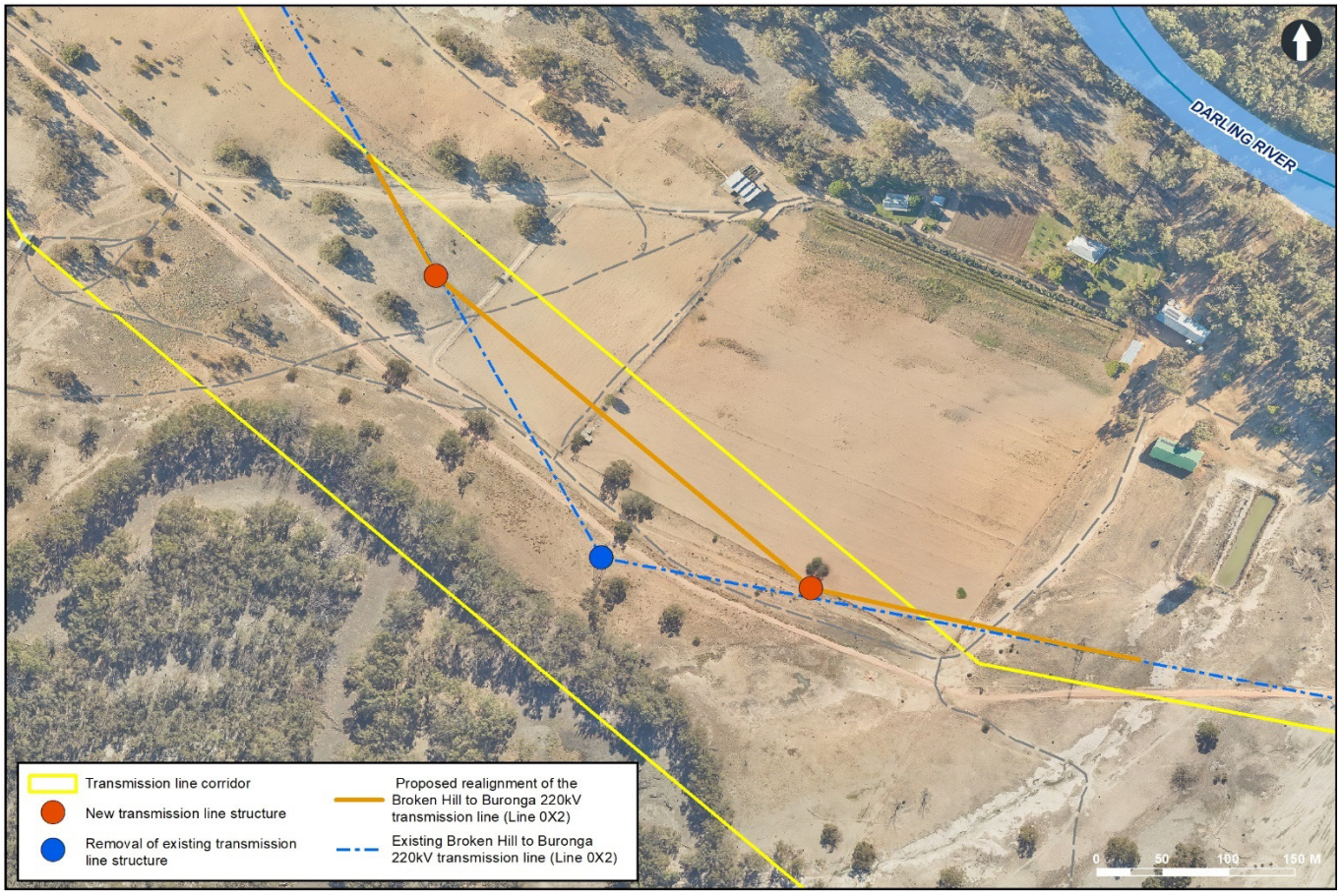
Transmission line access

Land access protocols would be established with each landholder during the acquisition of property or easement interests including access requirements where necessary. Access to the proposed easement for construction and operational purposes would preferentially use existing public and private roads and tracks although ~~some~~ new access ~~may~~ would be required to provide appropriate access to some construction areas ~~and~~ which may be retained for operational purposes in limited circumstances.

Further discussion regarding the current access track strategy for the Proposal is provided in section 6.6.3 of the amended Chapter 6 (Proposal construction) (refer to Appendix B of the Amendment Report).

Realignment of the existing 220kV transmission line

A short section of the existing Broken Hill to Buronga 220kV transmission line (Line 0X2) in proximity to the Darling River would be realigned to accommodate the new 330kV transmission line (refer to Figure 5-4). This would be for around 700 metres in length and require two new monopole structures to replace one existing tower structure. The new monopoles would be around 41 metres in height. The redundant tower would be decommissioned and removed from the easement.



Note: Figure has been updated compared to exhibited EIS version

Figure 5-4 Proposed realignment of the Broken Hill to Buronga 220kV transmission line (Line 0X2)

5.3.2 Transmission line between Buronga substation and NSW/Victoria border

This component of the proposal comprises the upgrade of the existing TransGrid 220kV single circuit transmission line between Buronga substation and the NSW/Victoria border (known as Line 0X1) to a 220kV double circuit transmission line. The existing 0X1 transmission line runs within an existing 50 metre wide easement between the Buronga substation and the Red Cliffs Substation in north west Victoria.

From the Buronga substation, the new transmission line would run parallel to the existing 'Line X5/3' 220kV transmission line for around 6.5 kilometres. It would then turn generally south west running parallel to the existing Line 0X1 for a further 16 kilometres before reaching the NSW/Victoria border, near Monak, at the Murray River (which comprises the end of the NSW proposal component). The current design runs parallel to the eastern side of the existing line. The new double circuit line is proposed to be constructed within a 50 metre wide easement (offset 25 metres to the south and east of the existing line).

The final alignment of the transmission line along this section would be determined during detailed design with consideration of limitations relating to working safely near the existing line and further minimising environmental impacts, wherever practicable.

An overview of the proposed transmission line from the Buronga substation to the NSW/Victoria border at Monak is shown in Figure 5-2c.

Transmission line structures

The transmission line would be supported on a series of transmission line towers or poles. These would be typically spaced about 400 metres apart however shorter distances may be required in limited circumstances. The final number and type of structures required would be determined during detailed design.

The transmission line structure type for this section would consist of:

- suspension structures, consisting of
  - a pole structure
  - a self-supporting tower.
- strain poles. This type of structure is used for the first and last structure of the transmission line, at road or river crossings, and where there is a change in direction. This type of structure is also used for structural reasons to break up long runs of suspension structures. Two pole structures may be required at some locations.

The structures (regardless of design) would be between around 30 and up to 50 metres in height depending on local circumstances such as topography etc (refer to Figure 5-5). The final location and height, depending on a range of factors such as distance between each structure, local ground and topography conditions and the need to minimise environmental and land use impacts. The type and arrangement of the structures would be refined during detailed design.

For simplicity, all structures along this corridor are referred to as transmission line structures within this EIS.

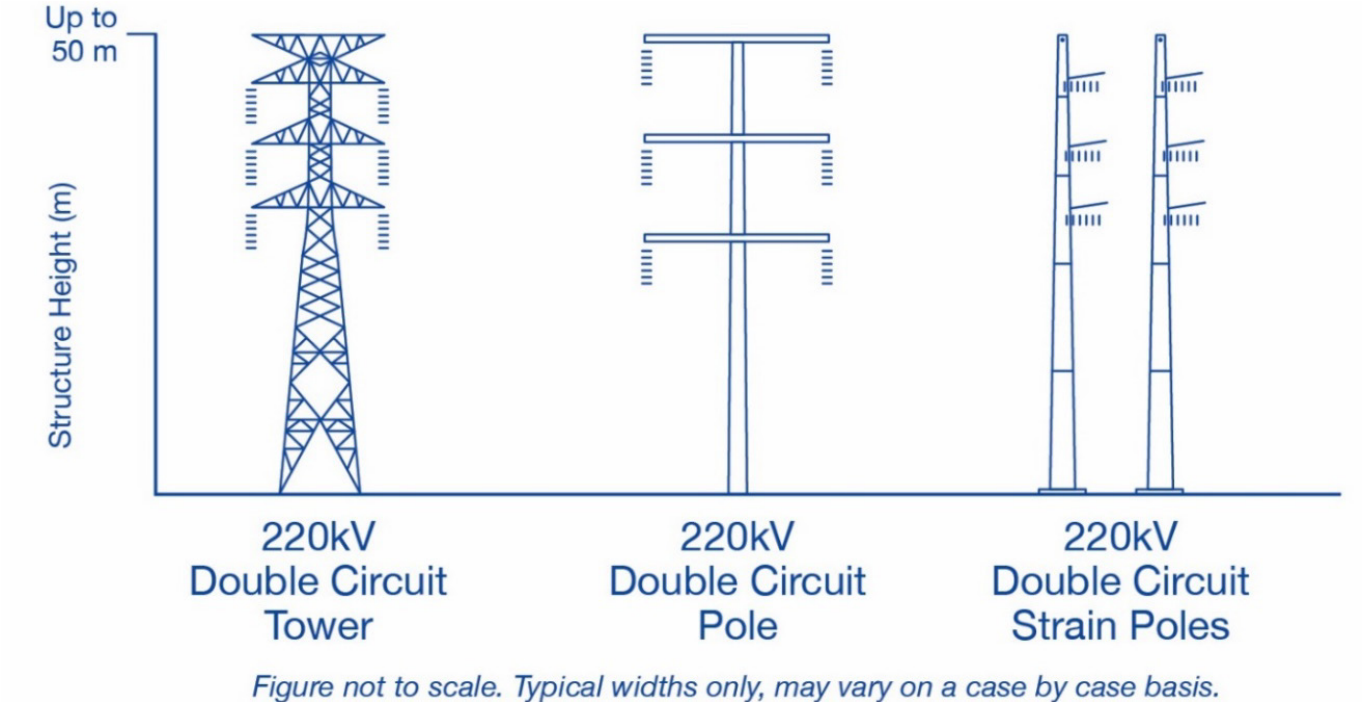


Figure 5-5 Proposed concept design for the transmission line structures on the 220kV line

Transmission line access

Where possible, existing access track(s) associated with the existing single circuit 220kV transmission line would be utilised to access the upgraded double circuit 220kV line. Should it not be feasible to retain the existing access track(s) due to the final location of the new double circuit transmission line, the access track used for construction of the transmission line may be retained for access during operation.

Decommissioning of the existing transmission line

Once the new double circuit 220kV line is operational, the existing 220kV single circuit transmission line (Line 0X1), including all existing towers, fittings and conductors, would be decommissioned and removed from the easement.

5.3.3 Upgrade and expansion of Buronga substation

Built form and layout

The proposal would include a significant upgrade and expansion of the existing Buronga 220kV substation to a combined operating voltage of 220kV/330kV, which would continue to service existing 220kV connections to Broken Hill, Red Cliffs and Balranald while also servicing the new 330kV connections to SA and eastwards towards Wagga Wagga. This would require the construction of a new 330kV component for the substation (the expanded substation site). The new 330kV component would be connected to the north western side of the existing 220kV substation site (refer to Figure 5-6). The maximum additional area required for the upgrade and expansion of the Buronga substation would be around ~~530 metres by 630 metres~~ 470 metres by 630 metres (a total additional area of around approximately ~~33.5~~ 21.6 hectares). The final area required would be confirmed during detailed design.

The expanded substation site consists of three main areas:

- new 220kV switchyard – to enable connection and operation of the upgraded 220kV transmission line to Red Cliffs substation
- northern expansion area – to enable connection and operation of the new transmission line between Buronga substation and the SA/NSW border (the 330kV transmission line described in section 5.3.1)
- southern expansion area – to enable connection and operation of the new transmission line between Buronga substation and Wagga Wagga and transformation to 220kV.

The typical infrastructure and equipment that would be installed within the expanded substation site would include:

- up to five new phase shifting transformers
- a range of supporting 330kV and 220kV electrical components including overhead conductors busbars and gantries
- new 220kV and 330kV circuit breaker equipment
- shunt reactors
- two 50 mega volt ampere (MVA) capacitor banks
- three 200MVA 330kV/220kV/11kV transformer units (within the southern expansion area)
- two 100 megavar (MVAr) synchronous condensers.

Other key features of the expanded substation would include:

- construction of up to two secondary system control buildings to accommodate protection for new switchgear and fixed portions of secondary system (such as fire protection, security system, air conditioning etc.) and 125V direct current (DC) and 50V DC battery system
- control and protection systems (including relays, metering, disturbance recorder, etc.)
- 125V DC and 400V DC electrical distribution system
- lightning mast(s)
- oil containment system (including bunding and containment tank)
- new or upgraded communications network infrastructure including:
  - optical ground wire to be established within the substation
  - provision of a microwave link
  - two optical multiplexer network systems.

The maximum height of the new equipment would be around 65 metres.

Minor connection works between the existing substation and the expanded substation may also be required. These connections would be expected to occur within the operating footprint of the existing substation.

All key substation equipment (such as the transmission gantries, transformers, etc.) within the expanded substation site would be fixed to either a driven steel pile or reinforced concrete footing. The new transformers within the expanded substation site would be bunded and incorporate a flame trap and drainage point in the event of an emergency. The hardstand areas of the expanded substation site would be designed to drain to a reinforced concrete spill oil containment tank.

Figure 5-6 to Figure 5-8 show the layout and elevations of the proposed new substation infrastructure, which are indicative only and would be subject to detailed design.

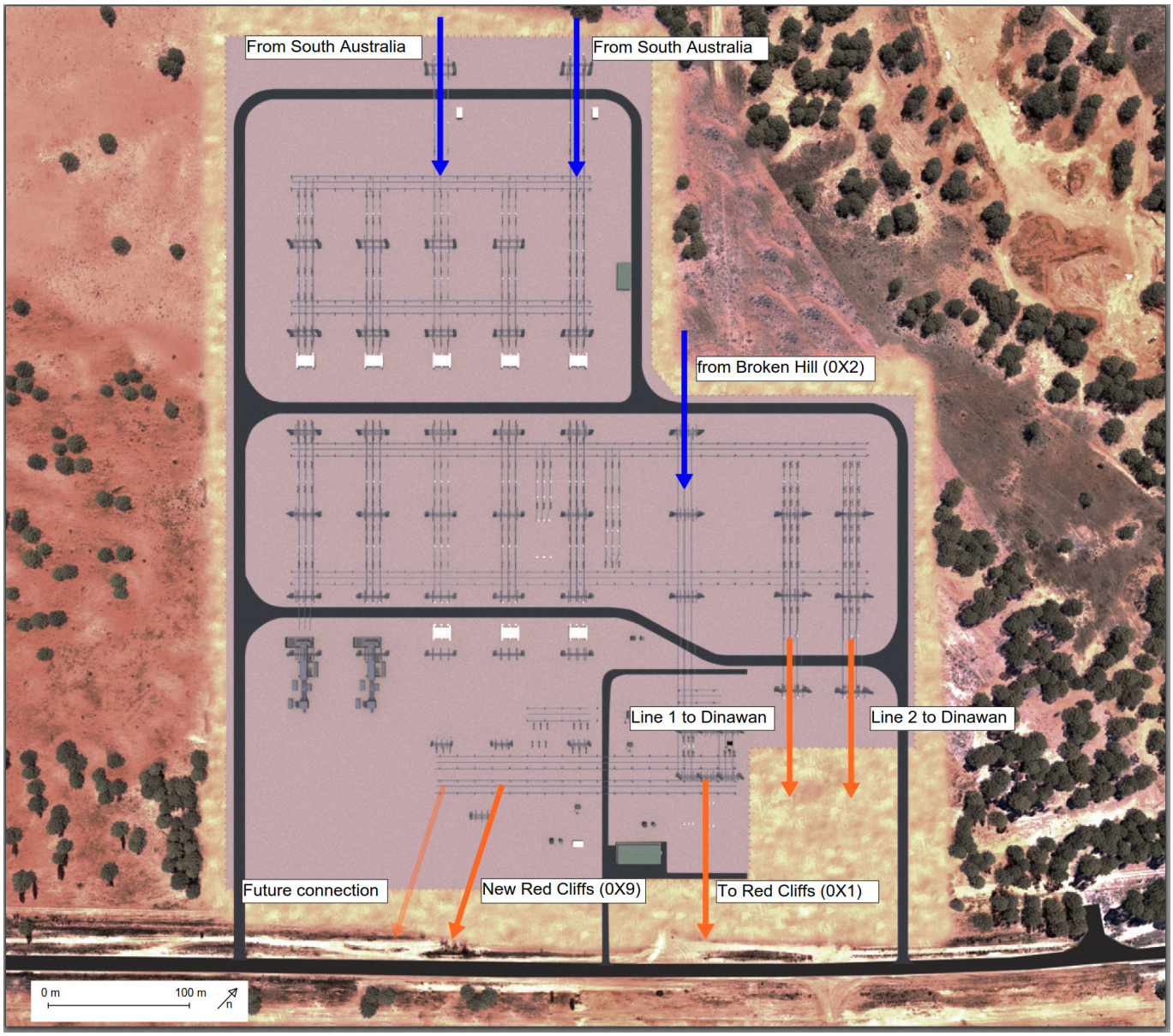


Figure 5-6 Arrangement of the proposed substation layout (indicative)

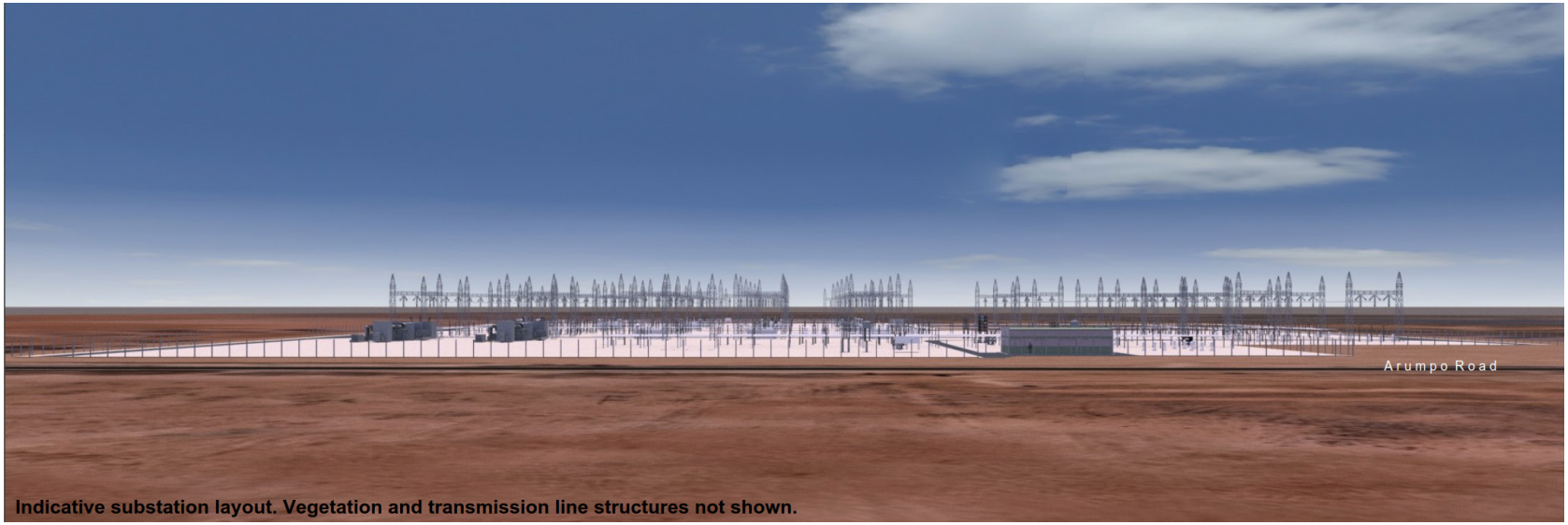


Figure 5-7 Indicative elevation of the proposed substation, facing Arumpo Road (south-east elevation)

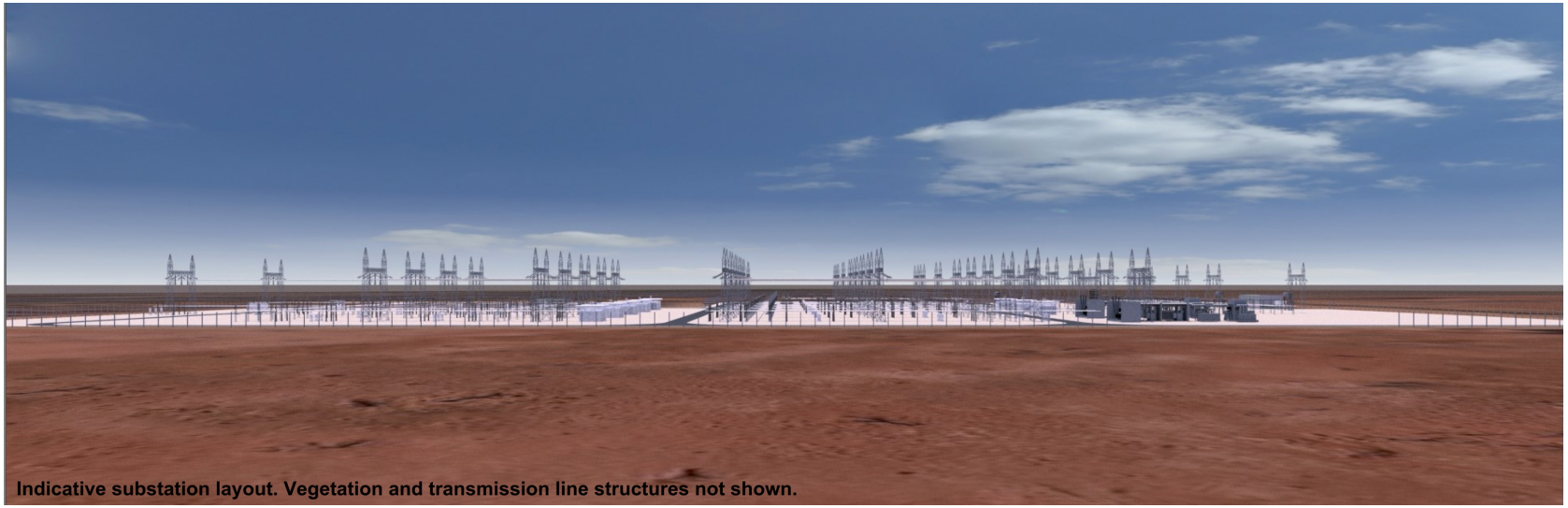


Figure 5-8 Indicative elevation of the proposed substation, with Arumpo Road located to the left of the image (south-west elevation)

Safety and security

Three metre high security fencing would be installed on all sides of the switchyard and would be compliant with current TransGrid standards for substation fencing. The security fence would be comprised of a galvanised steel (or similar) material. Two motorised sliding gates would also be installed to provide an overall opening of around seven metres at the main entrance point to the site.

To comply with TransGrid's safety requirements, additional security measures which would be incorporated across and around the substation site. This would include:

- security cameras within the substation upgrade and expansion site
- safety and public information signage on both the substation and incoming and outgoing transmission line towers connections to ensure public safety
- an asset protection zone (APZ) – consisting of an area maintained to be cleared of all trees and vegetation which may affect the substation during a bushfire in accordance with TransGrid design and safety standards.

Lighting

Operational lighting would be required for the operation of the substation for site security and for the safety of operational personnel operating and maintaining the substation equipment. Operation of the substation lighting would be from dusk until dawn, seven days a week. The external lighting would be installed to maintain an even distribution across the site, typically located on poles around four metres in height. The final lighting design would minimise light spill to areas beyond the substation boundary including potential impacts on passing traffic along Arumpo Road and local fauna.

Access and parking

The existing entry point from Arumpo Road would be maintained for external access to the existing 220kV substation. Two new entry and exit roads would be provided to provide vehicular access from Arumpo Road to the expanded substation site. The access driveway would be designed to allow access for employees undertaking maintenance operations and would also be suitable to allow longer vehicles as required (such as equipment replacement). The new access points would also be designed to ensure that it meets relevant NSW road design and council guidelines, including required sight-lines along Arumpo Road.

Additional parking for a small number of heavy vehicle and maintenance crew vehicles would be provided within the site boundary near the new control room buildings. Additional parking bays would be used by occasional maintenance and operational crew visiting the site. An internal perimeter road would be constructed as shown in Figure 5-6.

Water supply

Water would be required for maintenance activities and the operation of the Buronga substation. This would require around an additional 20,000 litres of water per year (during operation) compared to the existing requirements and would be sourced from Wentworth Shire Council and rainwater tanks at the substation.

Stormwater and drainage

An on-site stormwater drainage system would be installed to capture and discharge stormwater collected from within the expanded substation site during operation.

Runoff from outside the expanded substation site would be intercepted and diverted around the site by new drainage infrastructure. The drains would be designed for rainfall corresponding to an annual exceedance probability (AEP) of around 0.02 exceedances per year (equivalent to around a one in 50-year average exceedance). The runoff would be diverted to natural watercourses using appropriate dispersion/dissipation structures or drainage systems.

Within the expanded substation site, the stormwater drainage system would be designed for a rainfall corresponding to an AEP of 0.11 per year (equivalent to around a one in 10-year average exceedance). This system would include a series of surface drains which would interconnect with a grid of stormwater pits within the expanded substation site.

The new substation would also be designed to have an impervious surface and an oil containment system would be installed (separate to the stormwater drainage collection system to prevent cross-contamination). The oil containment system would be designed in accordance with TransGrid's substation oil containment design procedure which defines TransGrid's approach to meeting the requirements of the *Protection of the Environment Operations Act 1997*.

Landscaping

Landscaping or visual screening of the substation site is not proposed.

5.4 Operation and maintenance

The expanded substation and transmission lines would be inspected by field staff and contractors on a regular basis, with other operational activities occurring in the event of an emergency (as required).

Likely maintenance activities would include:

- regular inspection (ground and aerial) and maintenance of electrical equipment
- general building, ~~asset protection zone~~ APZ and general landscaping maintenance
- fire detection system inspection and maintenance
- fence repair
- stormwater and drainage infrastructure maintenance.

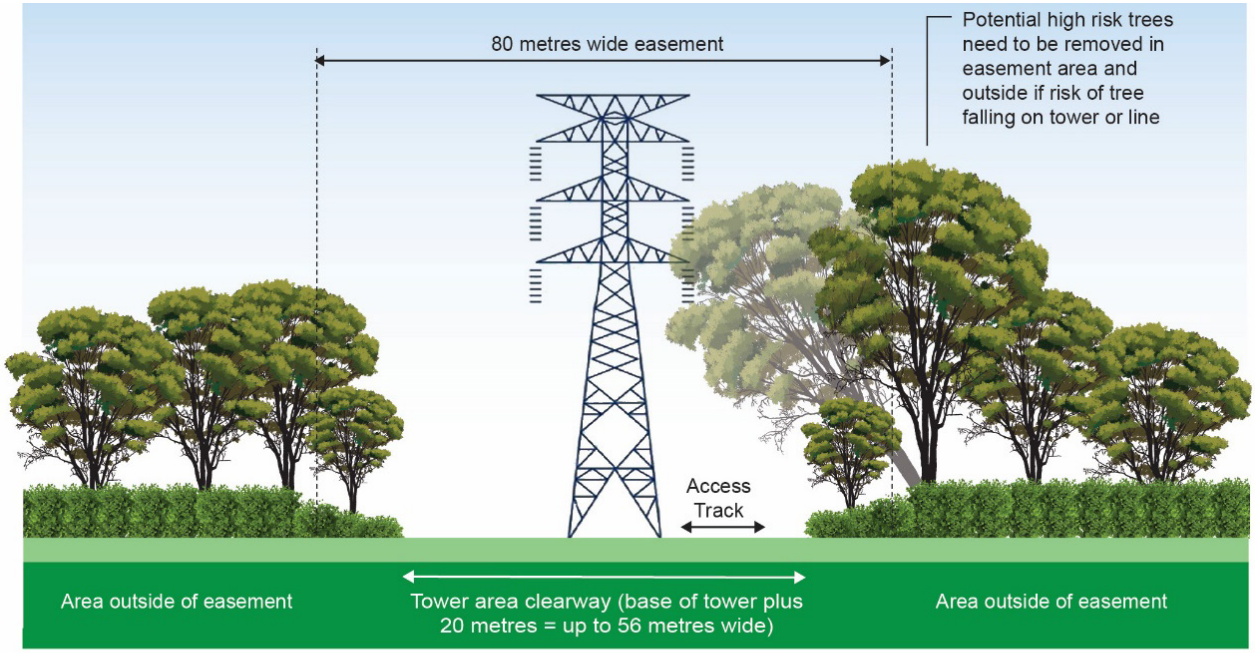
5.4.1 Transmission line maintenance

Regular maintenance activities would be required for the transmission lines during its operation. Likely maintenance activities would include:

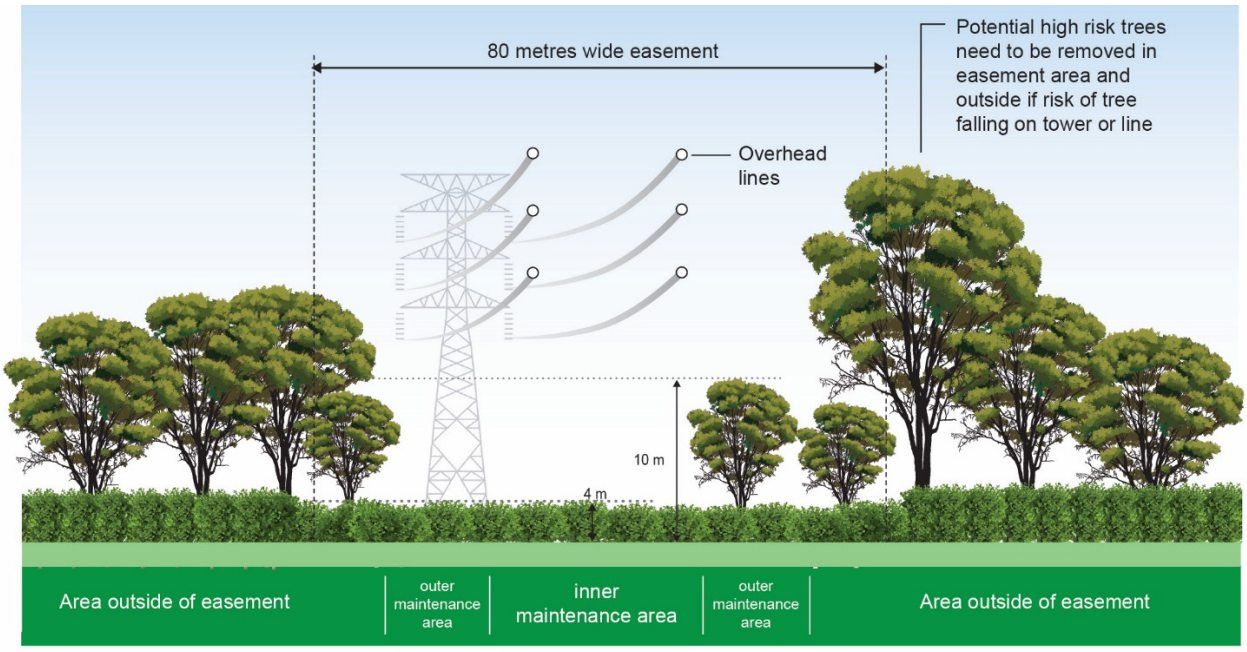
- regular inspection and maintenance of transmission lines, towers and poles including:
  - an annual fly over as part of seasonal bushfire prevention surveys
  - routine infrastructure inspection on a six-yearly cycle for self-supporting towers and three-yearly cycle for guyed towers. This would typically involve two to three maintenance crew driving a light vehicle from public roads to the easement utilising access tracks, then along the easement inspecting each transmission line tower in turn. Towers would be inspected both from the ground and by personnel climbing the tower
  - routine / planned line maintenance using a light vehicle(s), an elevated work platform and a medium sized truck with up to around five to ten personnel to rectify any defects found from routine inspections. Generally, this would occur within the same three to six-year maintenance cycles as the routine infrastructure inspection
- ad hoc fault and emergency fly over(s) to assess infrastructure condition should an unplanned outage occur (for example through a weather event or other failure of infrastructure). This maintenance would occur as required. The amount of maintenance and/or crew required for repair of any damaged infrastructure would depend on the extent of repairs required
- vegetation removal required to maintain appropriate clearances between ground vegetation and transmission lines (refer to Figure 5-9 and Figure 5-10). Vegetation below transmission lines would require ongoing maintenance throughout the operation to ensure electrical safety clearances and protection zones are maintained. The required clearance of vegetation within the corridor would be undertaken in accordance with TransGrid maintenance guides.

The following approach is proposed noting that final detailed design may allow for some increase in vegetation height to occur if vegetation clearances are able to be achieved:

- inner maintenance zone – vegetation with growth heights of up to four metres can be retained from the centreline out to 20 metres distance from the centreline (i.e. a 40 metre wide inner section of the easement)
- outer maintenance zone – vegetation with growth heights of up to 10 metres would be able to be retained in the easement section which is 20 metres to 30 metres from the centreline. This is permitted as the maximum sag point height is increased at this greater distance for the centreline and therefore taller vegetation is permitted without impacting on the vegetation clearance requirements
- for the 80 metre wide 330kV easement, vegetation clearing would generally only be required for the centre 60 metre wide section (which includes the inner and outer maintenance zones combined)
- all hazard/high risk trees located along the corridor shall be removed, inside and outside the easement area.



Vegetation in the centre 60 metre wide section of 80 metres wide easement to be maintained to achieved minimum clearance requirements (4 to 10 metres in height)



Vegetation in the centre 60 metres wide section of 80 metres wide easement to be maintained to achieved minimum clearance requirements (based on growth heights. Assessed as up to 4 metres growth heights in inner maintenance area and up to 10 metres in outer maintenance area)

Figure 5-9 Elevation of the indicative proposed vegetation clearing requirements within the 330kV transmission line at tower locations (top) and mid easement between towers (bottom)

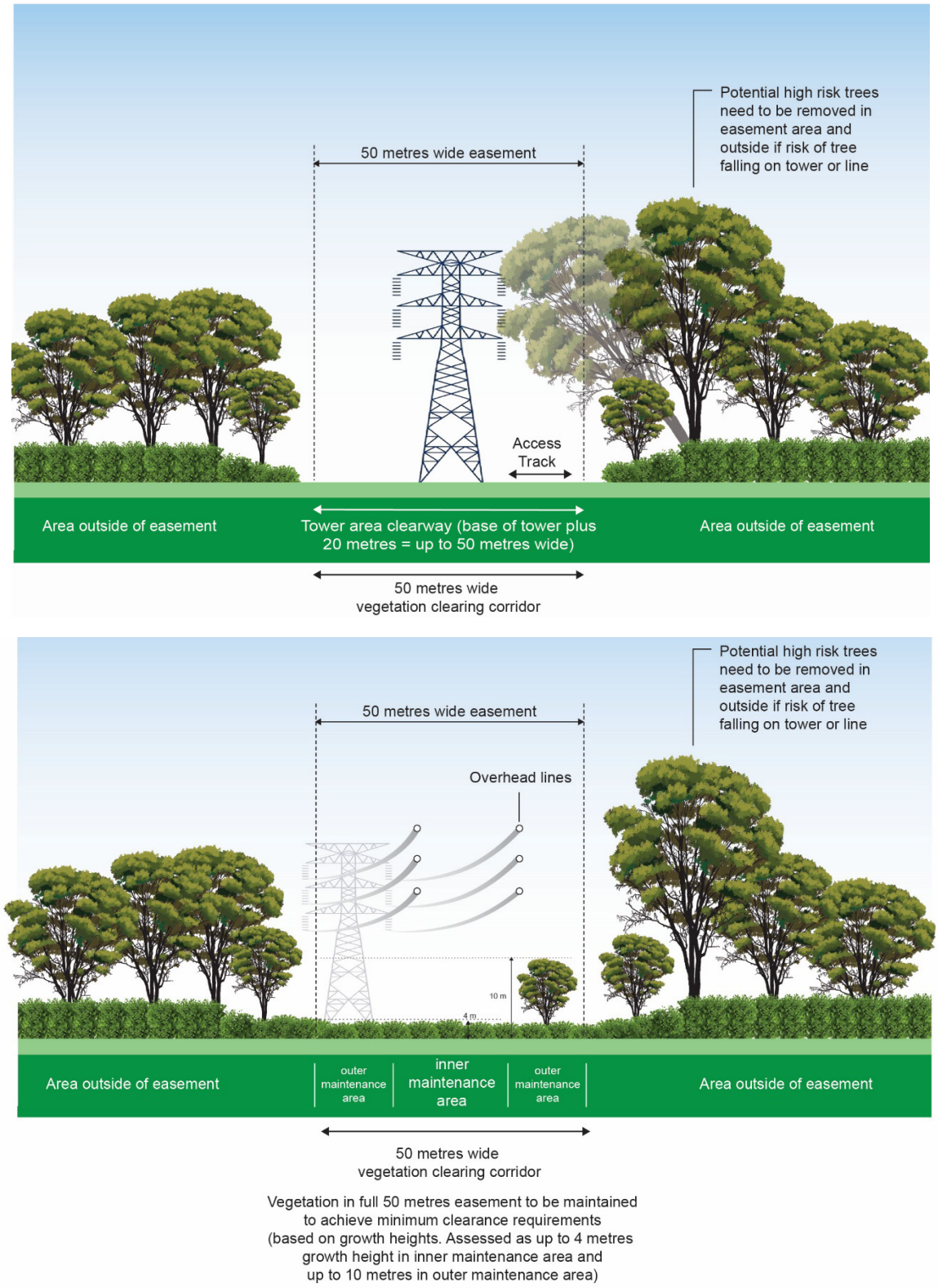


Figure 5-10 Elevation of the indicative proposed vegetation clearing requirements within the 220kV transmission line at tower locations (top) and mid easement between towers (bottom)

5.4.2 Buronga substation operation and maintenance

The substation would not accommodate full-time staff or contractors. Maintenance at the expanded substation site would typically include ad-hoc attendance (up to three times a week) of one or two switching operators to undertake planned and unplanned switching of equipment. It is expected that these activities would only require light vehicles and/or small to medium plant (depending on the works required). Any waste generated during operation would be minimal and disposed of on an 'as need' basis by the attending maintenance personnel.

Additional maintenance activities at the expanded substation site would typically include:

- routine substation infrastructure inspection (such as transformers and other electrical plant and equipment) throughout the year by around two to three personnel
- routine / planned substation maintenance of equipment, property and switchyard areas on a scheduled basis. This would typically be monthly and undertaken by around three to five maintenance personnel
- ad hoc fault and emergency works for repair of any damaged infrastructure (for example through a weather event or other failure of infrastructure). This maintenance would occur as required. The amount of maintenance and/or crew required to access for repair of any damaged infrastructure would depend on the extent of repairs required.

Equipment for the substation is expected to have a service life of around 50 years. Maintenance would be regularly undertaken for the different infrastructure components and plant items such as transformers. These components would be replaced/refurbished towards the end of their serviceable life, allowing the service life of the substation to be extended.

5.5 Land acquisition, easements and operational access

5.5.1 Freehold land acquisition

The land required for the proposed substation upgrade and expansion (inclusive of asset protection zones) has been acquired adjacent to the existing Buronga substation and comprises of part of the following parcels:

- Lot 2 DP 1195524
- Lot 1 DP 1174934.

5.5.2 Easements

TransGrid is continuing to work with relevant landholders to create the new transmission line easements. Typical easement requirements for the proposal are further discussed in the following section.

All acquisitions of privately owned land would be carried out in consultation with the landholders through the private treaty process or in accordance with the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991* and the supporting NSW Government Land Acquisition Reform 2016.

The acquisition of Crown Land would be undertaken in accordance with the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991, Crown Lands Management Act 2016* and the *Crown Land Legislation Amendment Act 2017.*

330kV transmission line easement between SA/NSW border and Buronga substation

The final alignment of the transmission line between the SA and NSW border and Buronga substation would be located within an easement up to 80 metres wide. This easement would provide a right of access to construct, maintain and operate the transmission line and other operational assets associated with the line (such as the transmission line structures and conductors). The easement would also ensure safe electrical clearances during the operation of the lines.

An adjusted easement would also be required for the realigned section of Broken Hill to Buronga 220kV transmission line near the Darling River. Sections of the previous easement no longer required would be returned to the landholder.

220kV transmission line easement between Buronga substation and NSW/Victoria border

The existing transmission line is located within a 50-metre-wide easement. The existing easement is expected to be widened by up to 25 metres to allow for the new transmission line to be positioned beside the existing line, resulting in an easement of 75 metres in width until the existing line is decommissioned and removed. Once the existing line has been removed, the easement would be reduced to 50 metres with part of the existing easement area returned to the landholder.

As with the existing easement, the new easement would continue to provide a right of access to construct, maintain and operate this section of the transmission line and other operational assets associated with the line (such as the transmission line towers and conductors). The easement would also ensure safe electrical clearances during the operation of the lines.

For the section of transmission line that would run parallel to the existing 0X5/3 and 0X1 transmission lines, this easement would be widened to the south of the existing easement. Where the transmission line diverges towards the NSW/Victoria, it is anticipated that the easement would be widened to the east of the existing easement for the existing 0X1 line. The final easement for the transmission line along this section would be determined during detailed design.

5.5.3 Operational access requirements

Access to the proposed easement for operational purposes would preferentially use existing public and private roads and tracks, although access tracks created for construction may be retained during operation of the proposal to provide safe access (refer to Section 6.5.3). Access easements may be required to provide TransGrid with access from the nearest public road to the easement. These access easements would be negotiated with landholders as necessary. TransGrid may install locked and signed access gates to enable access to the easement should a landholder not have a suitable existing gate nearby.