Appendix B

Updated proposal description (construction)

This chapter provides a consolidated update to the description of the construction of the proposal that was presented in Chapter 6 of the EIS. This revised description supersedes the description previously provided. This chapter includes a description of the revised construction methodology following engagement of the nominated construction contractor since exhibition of the EIS. New elements or additions to previously proposed construction methodology are shown in blue text, with deletions or changes shown with a ~~strikethrough~~.

6. Proposal construction

This chapter describes the likely key construction works for the proposal and describes the indicative construction staging, strategy and program.

The construction approach and methodology presented in this chapter is indicative and would continue to be refined as the design and construction planning progresses. ~~A~~ The final construction methodology and program ~~would be developed~~ is currently being refined by the nominated construction contractor. This would be reviewed for consistency with the assessment contained in this EIS, including relevant mitigation measures and any future conditions of approval.

Any material changes to the construction methodology which could result in additional environmental impacts to those assessed in this EIS would be the subject of additional environmental assessment or consistency review, as relevant.

6.1 Secretary's environmental assessment requirements

The Secretary's environmental assessment requirements relating to the description of the proposal and where these requirements are addressed in this EIS are outlined in Table 6-1.

Table 6-1 Secretary's environmental assessment requirements – Proposal construction

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 a description of the construction activities and sites associated with the proposal and is supported by figures. A description of operational component of the proposal is provided in Chapter 5 (Proposal infrastructure and operation).
	– disturbance area	The disturbance area is described in Section 6.5.
	– physical layout of the project over time, including sections of key components	Refer to Section 6.6.5 with respect to the Buronga substation upgrade and expansion. Figure 6-3 (a-c) provides the location of the proposal and key supporting main construction sites and accommodation camps.

Ref.	Secretary's environmental assessment requirements	Where addressed in the EIS
	– 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 during construction. A description of operational activities is provided in Chapter 5 (Proposal infrastructure and operation).
	– 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	This chapter provides the program and describes these phases of construction (refer to Section 6.3 to Section 6.6.7.

6.2 Construction overview

Key construction works for the proposal would typically include (but not be limited to):

- site establishment works and vegetation clearance (refer to Section 6.6.2)
- construction of access tracks (refer to Section 6.6.3)
- construction of the proposed transmission lines (refer to Section 6.6.4)
- construction of the Buronga substation upgrade and expansion (refer to Section 6.6.5)
- commissioning of the proposal (refer to Section 6.6.6)
- demobilisation and remediation of areas disturbed by construction activities (refer to Section 6.6.7)
- ancillary works to facilitate the construction of the proposal (e.g. laydown and staging areas, concrete batching plants, brake/winch sites, site offices and accommodation camps) (refer to Section 6.7).

6.3 Indicative construction program

Construction of the proposal would commence in mid to late-2021, subject to NSW Government and Commonwealth planning approvals.

The construction of the transmission lines would take approximately 18 months while the Buronga substation upgrade and expansion would be delivered in two components and be operational by mid-2023.

Site decommissioning and remediation is expected to extend approximately one year beyond the commissioning (operational) phases, with estimated completion in mid-2024.

Figure 6-1 presents an indicative program for the proposal (following planning approval). The indicative staging strategy for construction is discussed in Section 6.4.

Construction at each transmission line structure would be intermittent and construction activities would not occur for the full duration for each phase of construction as expressed in Figure 6-1.

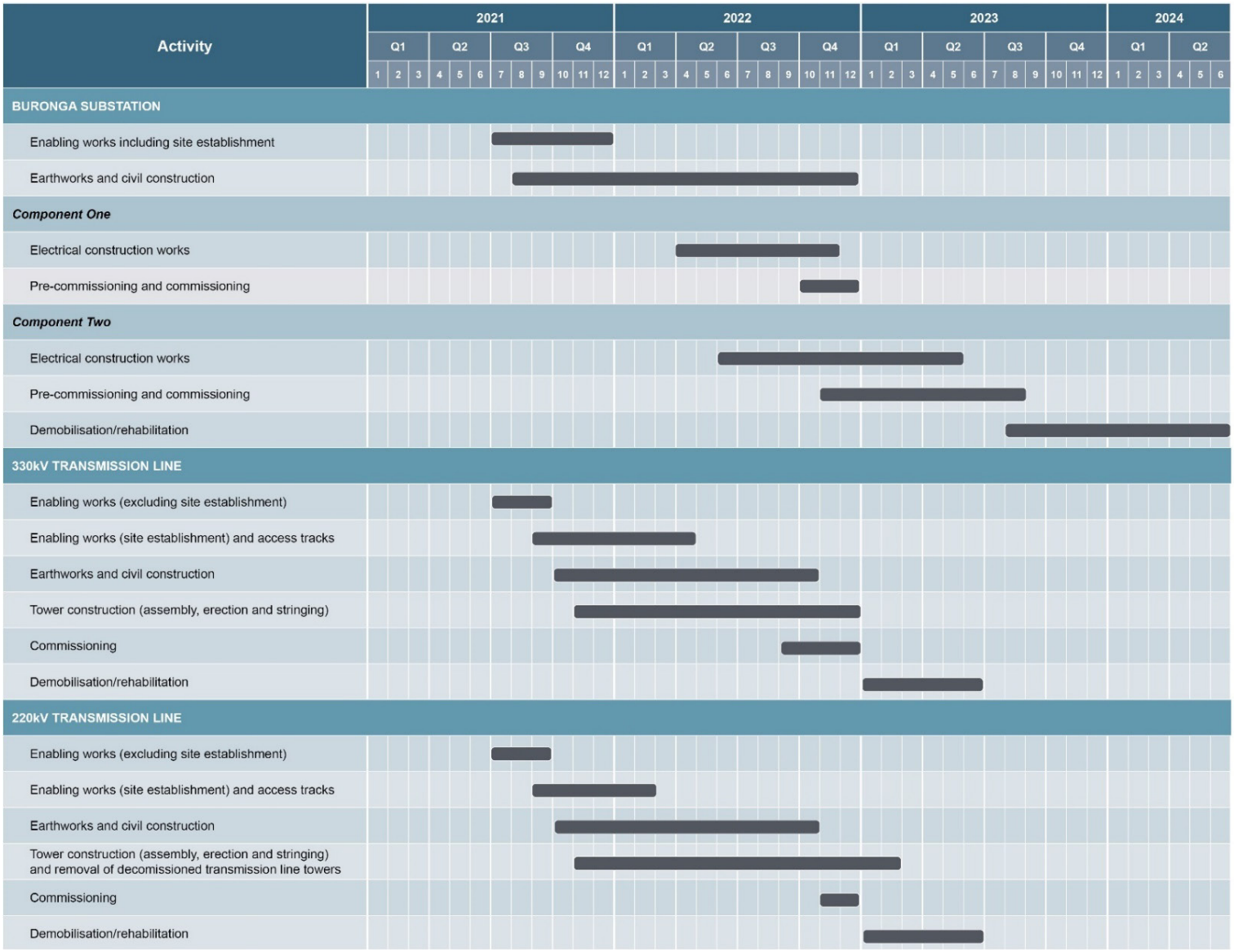

Figure 6-1 Indicative construction program

Figure 6-2 presents an indicative duration of construction activities associated with the transmission line structures. These durations could vary, and breaks between activities may be shorter which may lead to longer inactive periods in subsequent stages of construction at an individual transmission line structure. Durations of any particular construction activity, and respite periods, can vary for a number of reasons including (but not limited to), resource and engineering constraints, works sequencing and location.

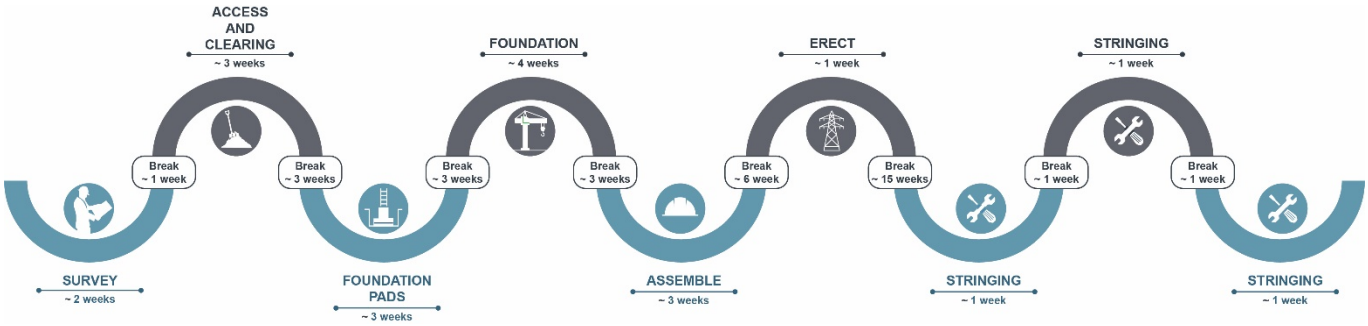

Figure 6-2 Indicative duration of construction activities at transmission line structures

6.4 Construction staging

The construction of the proposal is expected to require staging of certain elements. Staging is likely to focus on activities required to facilitate the commencement of substantial construction (enabling works). The activities would typically include establishing construction compounds and camps, preparing key construction sites and carrying out other activities required to facilitate main construction works, managing specific features or issues and collecting additional information required to finalise the detailed design and construction methodology. ~~proposed to enable the commencement of some activities, such as enabling works or low impact activities, in advance of the final design and construction methodology being finalised by the construction contractor. Construction environmental management documentation required for each stage of works would be prepared and implemented.~~

It is expected that the proposal would be phased as follows:

> enabling works as follows
  - site establishment and operation of the main construction compound and camp sites at ~~Anabranch South and~~ Buronga and Wentworth
  - site establishment and bulk earthworks at the Buronga substation upgrade and expansion site
  - biodiversity and heritage investigations, including test excavations and salvage
  - any other activities described in Section 6.6.1 that are of low impact ~~(refer to Section 23.1)~~.
> all other works, such as:
  - establishment of access tracks and construction sites not identified as enabling works
  - construction and commissioning of the new or upgraded transmission lines, including site establishment, vegetation clearance, civil construction works, tower erection and conductor stringing
  - decommissioning of redundant 220kV transmission line structures
  - construction and commissioning of the Buronga substation upgrade and expansion (excluding activities identified as enabling works). This would be delivered as two components:
    - component 1 – upgrade and expansion work required to enable the proposed connection and operation of the transmission lines between SA/NSW border and Buronga substation, and Buronga substation and the NSW/Victorian border
    - component 2 – upgrade and expansion work required to facilitate the future connection and operation of the proposed transmission lines between Buronga substation and Wagga Wagga substation.

The final staging arrangements, including the proposed timing and scope of each stage, would be confirmed by the construction contractor. The revised approach to environmental management for staging is described in Appendix C of the Amendment Report for the proposal. ~~during detailed design~~

6.5 Disturbance area

The disturbance area for the proposal would encompass all construction activities and components of the proposal (including access tracks). The permanent works footprint and easements would be within the disturbance area.

For the transmission line component of the proposal, the disturbance area would encompass all disturbance required for the construction of the transmission line and any ancillary infrastructure. This disturbance area would be largely located within the transmission line corridor, with the exception of some access tracks. In these instances, access tracks would be located within the proposal study area.

The proposal study area and transmission line corridor is shown in Figure 6-3a to Figure 6-3c, as well as the disturbance area for the Buronga substation upgrade and expansion and the two main construction compounds and accommodation camps at ~~Anabranch South and~~ Wentworth and Buronga. The final disturbance area would be confirmed during detailed design with consideration to the mitigation measures established for the proposal.

For the purposes of this EIS ~~and as discussed further in Chapter 8 (Approach to impact assessment)~~:

- the majority of the impact assessments have assumed disturbance (refer below) across the transmission line corridor, and the areas required for Buronga substation upgrade and expansion, the main construction compounds and accommodation camps at ~~Anabranch South and~~ Wentworth and Buronga
- for biodiversity and heritage assessments, an indicative disturbance area for the transmission line component (and ancillary construction works) has been assumed.

The disturbance areas for the proposal would include the following categories:

- **disturbance area A** – this is the area where ground disturbance would be required. It refers to an area around the transmission towers and for access tracks in which all vegetation would be removed during construction. It would include potential sub-surface impacts through construction activities such as grading, excavation, and full tree removal. Except in areas where only temporary disturbance is required (i.e. temporary access tracks), this area would also be subject to ongoing maintenance during operation (i.e. removal to ground level) for operational and safety requirements (including bushfire).
- **disturbance area A (centreline clearing)** – this is the area where ground disturbance would be minimised wherever possible. It refers to areas between the proposed transmission towers in which all vegetation would be removed during construction to ground however topsoil materials and ground material would be retained (where possible) and would not require sub-surface impacts in these locations. This area would also be subject to ongoing maintenance during operation (i.e. removal to maintain vegetation clearance requirements) for operational and safety requirements (including bushfire).
- **disturbance area B** – this is the area where ground disturbance would not be required except in limited circumstances. It refers to an area between transmission towers in which vegetation growth heights have the potential for infringing TransGrid's vegetation clearance requirements. This would be managed using a transitional approach scaling from a four metre growth height potential at the middle of the easement, extending to a 10 metre growth height potential or higher at the outer extents of the easement.

~~There may also be the requirement for an additional main construction compound and accommodation camp site beyond those identified in the Figure 6-2, as well as refinements to the location of the Anabranch South main construction compound and accommodation camp site. These~~ Additional sites may also be required outside the proposal study area and the selection criteria for these possible sites ~~refinements~~ are is discussed further in Section 6.7.1.

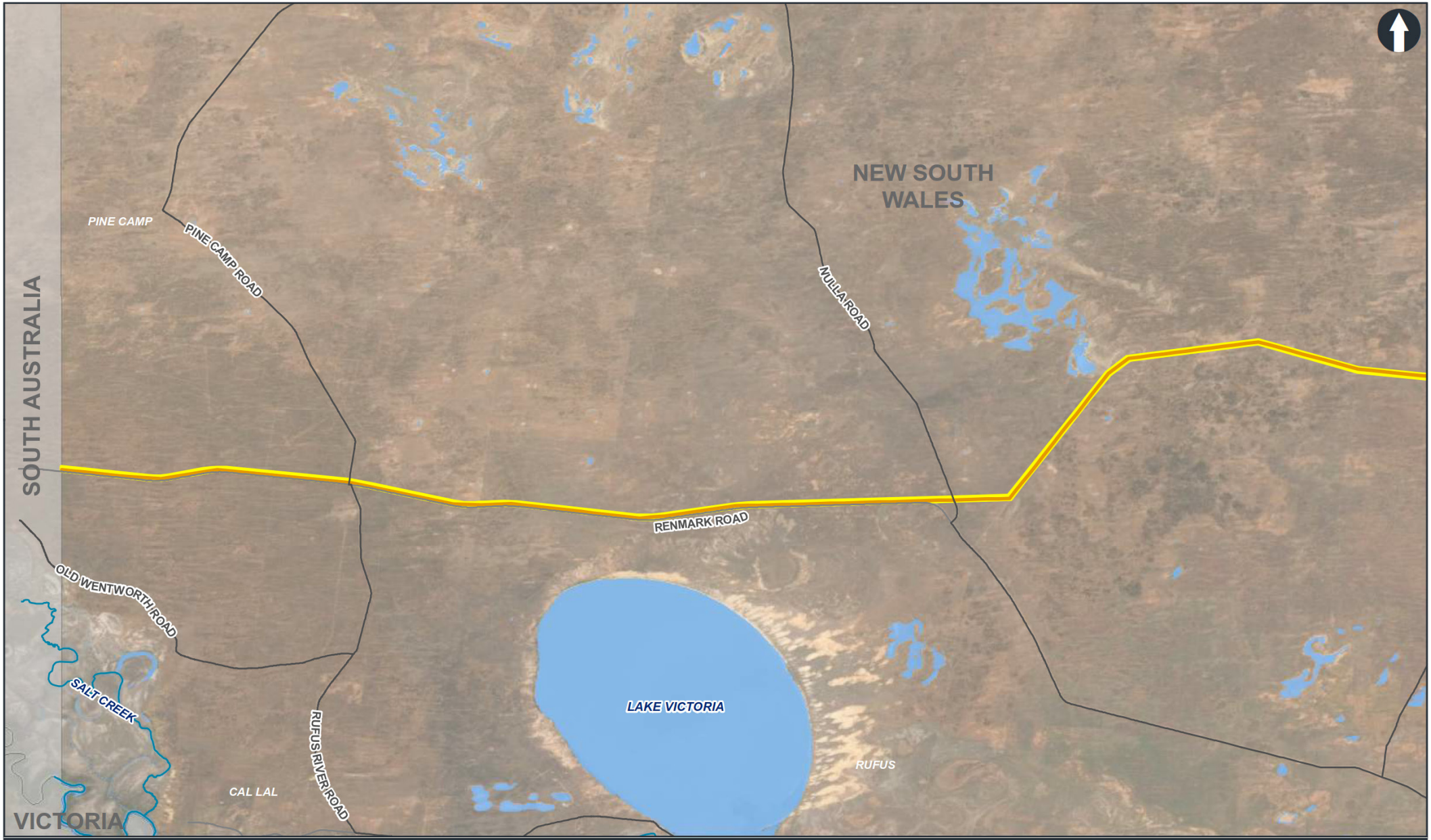

Figure 6-3a

Construction overview

330kV double circuit transmission line within a new easement

Transmission line corridor

Source: NSWSS, ESRI, Transgrid, WSP

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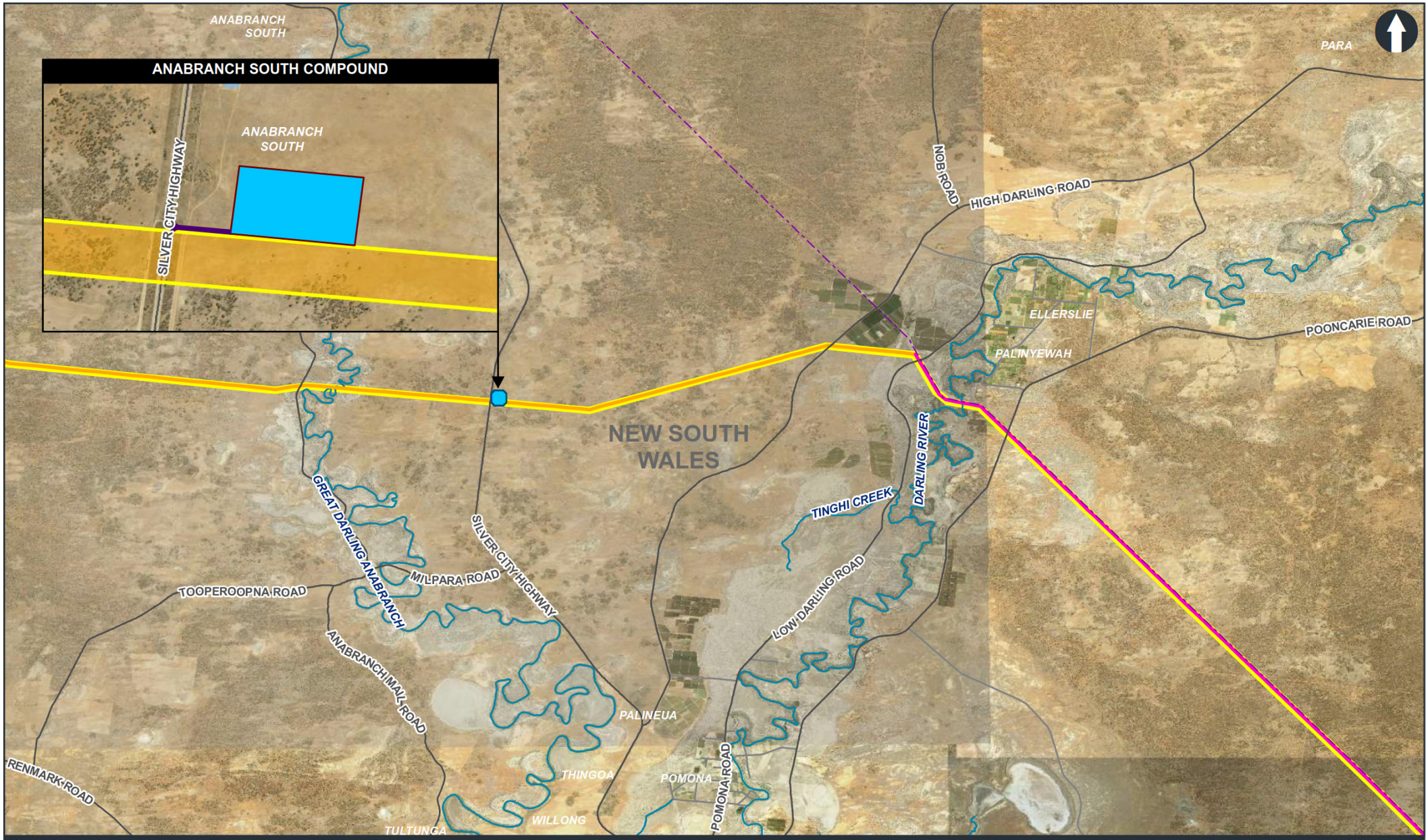

Figure 6-3b

Construction overview

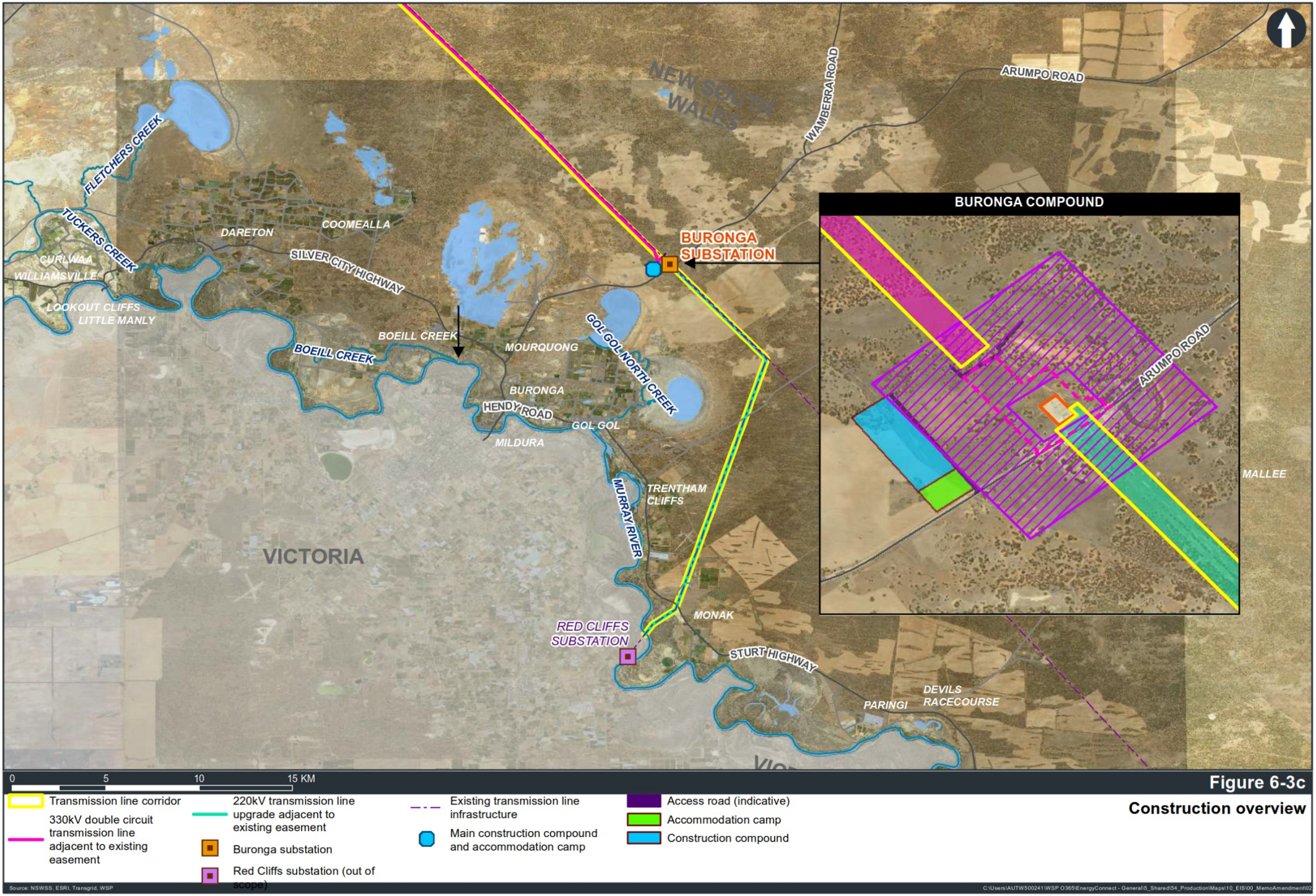

Figure 6-3c

Construction overview

In relation to the proposed construction compound and accommodation camps at Buronga and Wentworth, and the construction compound site at Anabranch South, the disturbance area has been determined based on the inclusion of a 50 metre buffer around the perimeter of the sites to allow for an Asset Protection Zone for bush fire protection.

6.6 Construction methodology

6.6.1 Enabling works

Enabling works are activities that would ~~typically~~ be carried out before the start of substantial construction in order to make ready the key construction sites (including camps and compounds), facilitate the commencement of substantial construction, ~~and to~~ manage specific features or issues and collect additional information required to finalise the detailed design and construction methodology ~~of the proposal.~~

Enabling works are expected to include:

- site establishment and operation of the main construction compound and camp sites at ~~Anabranch South and~~ Wentworth and Buronga (refer to Section 6.7.1)
- site establishment and bulk earthworks at the Buronga substation upgrade and expansion site, including crushing and screening activities (refer to Section 6.6.5)
- biodiversity and heritage investigations, including test excavations, protection, salvage and recordings
- minor clearing of vegetation to facilitate the establishment of construction compounds, accommodation camps, laydown areas, excavation material sites and access creation
- utility connections, adjustments, relocations and protection (refer to Section 6.6.2)
- property adjustment work, including adjustments to property fencing (Section 6.6.2)
- installation of fencing, gates, barricades, exclusion zones and other access controls
- establishing access tracks (refer to Section 6.6.3) and ~~including~~ adjustment to regional and state roads at main construction compound and accommodation camp locations
- additional geotechnical and contamination investigations and remediation if identified as required
- other survey work, such as road dilapidation surveys, and surveys of the general alignment and existing utilities
- installation of environmental controls, mitigation measures and monitoring equipment.

These works are described further in the relevant sections of this chapter.

~~Some of these work are proposed to take place prior to the approval of the main works construction environmental management plan (refer to Section 6.4).~~

6.6.2 Site establishment

~~At the commencement of construction, the main activities which would be undertaken~~ Site establishment activities would typically include:

- clearing and removal of top soils and vegetation. Top soil would be stockpiled on site
- establishing construction compounds, batching plants, camp sites and ancillary facilities, including offices, amenities, workshops and internal roads
- connections to utilities (water and power) to main construction compounds and camp sites, where possible
- establishing vehicle access and egress points including adjustment of state and regional roads to ensure safe vehicle movements at relevant locations such as accommodation camps
- establishing truck wheel wash or rumble grids
- establishing hardstand areas for storage, laydown and carparking

- establishing fencing around the perimeter of the construction area, where required
- installing temporary fencing and security measures as well as any necessary construction environmental management measures such as erosion and sediment controls.

Further discussion on some components of site establishment are discussed below.

Vegetation clearance

In general, vegetation within the construction disturbance area (including scrub, undergrowth and ground vegetation) would be removed (refer to Section 6.5). Where logs and tree hollows that could provide fauna habitat are identified, these would be relocated to adjacent woodland where feasible.

The exception would be along the transmission line corridor. For this area, the disturbance area and vegetation clearance requirements would be confirmed during detailed design and would be informed by:

- future operational requirements as outlined in Section 5.4.1 of Appendix A of the Amendment Report ~~(refer to Figure 5-9 and Figure 5-10) as set by *Vegetation Clearance Requirements at Maximum Line Operating Conditions* (TransGrid, 2003) (the Vegetation Clearance Requirements)~~
- clearing around each transmission tower construction pad of around ~~60~~ 50 metres by 80 metres to provide clear access to the tower during construction
- clearing for access tracks and ancillary construction activities.

Gates and fences

Installation or adjustment of gates and fences would be required at some locations along the alignment to enable access from the nearest roadway to construction areas. These would be constructed in consultation with the relevant council and/or affected landholder.

Where the transmission line crosses or closely runs parallels to a metallic fence, an earthing or isolation section would be installed.

Service relocations and/or protection works

The existing alignment of the 0X2 220kV Broken Hill transmission line would require relocation at two locations. This would comprise of:

- a permanent relocation of the existing transmission line in the vicinity of the Darling River (refer to Section 5.3.1). This would require the construction of two new monopoles, and the stringing of conductors/earthwires between the existing and new structures. The redundant tower would be decommissioned
- a temporary relocation of a section of the existing transmission line that currently passes through the existing Buronga substation. This would be temporarily relocated around 200 metres to the east of its current alignment (along the eastern boundary of the existing substation site). Once the construction works to upgrade the substation are completed, the alignment of the 220kV Broken Hill line would be restored in a location generally consistent with the original line location.

Based on known utility information, works would also be required to convert overhead distribution powerlines up to and including 66kV to underground cables for the entire width of the transmission line easement.

Potential impacts to other existing services and utilities would be confirmed during detailed design and any proposed relocation and/or protection works would be determined in consultation with the relevant asset owners.

Temporary bypass for 220kV transmission line

In order to minimise the disturbance area during the construction of 0X1 transmission line, an option to construct and operate a temporary bypass has been identified as part of the ongoing development of the construction methodology following appointment of the nominated construction contractor.

The proposed bypass line would consist of around 6.5 kilometres of temporary transmission line and around 60 supporting transmission line poles (around 18 metres in height).

The bypass line would commence from the existing Buronga substation and travel in a south east direction parallel to the eastern side of the existing 0X1 220kV transmission line (between the 0X1 220kV transmission line and the existing X3 220kV transmission line).

The bypass line would have an offset of around 25 metres from both the existing 220kV 0X1 and X3 transmission lines.

The location of the temporary bypass line was also considered with respect to minimising additional environmental impacts for construction including:

> the temporary bypass line would be between and within two existing TransGrid easements
> any area cleared for the temporary bypass line would be temporary and allowed to regrow following removal of the bypass line.

The construction sequence for the proposed bypass line would include the following construction activities:

> installation of around 60 new bypass poles between existing transmission line 0X1 Tower 1 and Tower 19 between the existing 0X1 and X3 220kV transmission lines
> stringing of two phases for the existing 0X1 circuit on the new bypass poles, leaving one single phase on the existing 220kV towers strung (i.e. completion of the bypass)
> connection and energisation of the bypass at existing transmission line 0X1 Tower 1 and Tower 19
> concurrently with the initial activities above, construction of the foundations would be commenced for the new double circuit steel pole line (as per the proposal described in the EIS)
> completion of construction of the new poles for the new double circuit line with only external one circuit strung
> energisation of the new line
> isolation and demolition of the existing (existing redundant) 220kV tower line and the temporary bypass transmission line
> stringing of the second circuit of the new 220kV double circuit line.

The indicative program for proposed bypass line is as follows:

> construction of the bypass – around three months
> commissioning (energisation) and use of the bypass – around seven months
> decommissioning and removal of the temporary poles and lines – around two months.

6.6.3 Establishment of access tracks

The establishment of access tracks would include:

> construction of access tracks to accommodate safe access of construction machinery and materials to each transmission line tower site and the expanded substation site
> construction of temporary watercourse crossings (discussed further in Section 6.6.4).

Each of these elements are described in greater detail below.

Construction access tracks

Access to each tower would be required during construction, and may be retained for operational purposes. Access tracks would be required to be traversable by a range of vehicles. Access tracks would fall into two broad groups:

- un-improved access tracks
- constructed access tracks.

Where access tracks extend beyond the transmission line easement, the location of the access tracks would be agreed with the landholder and subject to separate agreements. For permanent access tracks beyond the transmission line easement, an access easement may be required and negotiated with the landholder.

Un-improved access tracks

Un-improved access tracks would provide access to work sites by using existing roads or tracks, or driving on existing soil or ground surface with minimal or no prior preparation. Existing roads, tracks and other existing disturbed areas would be used wherever possible in order to minimise vegetation clearing requirements with shorter sections of constructed track (see below) being provided to access specific locations. By utilising existing road or track networks wherever possible, construction traffic would be able to utilise existing, dual direction traffic lanes to pass, minimising the need for a wider centre line access tracks or the construction of multiple passing bay areas at regular intervals.

Where access is across open spaces, particularly in cultivated areas, pasture improved grazing land or native grasslands, care would be exercised to ensure that minimum damage is caused to the surface by confining movement, as far as possible, to one route.

Constructed access tracks

Constructed access tracks would be required in areas where there are no existing roads or tracks, or where terrain conditions prevent continuous access along the line easement between road crossings. In these situations, 'off easement' access ~~may~~ would be required and suitable access tracks would be constructed. Typically, the proposed constructed 'off-easement' access tracks would be located parallel to the proposed easement.

All new access tracks would be ~~around~~ between six and 10 metres wide and would generally follow the natural contour of the land as far as practicable to minimise the amount of cut and fill and soil disturbance. Access tracks would also include drainage control features such as table drains or cross banks to minimise erosion.

In the case of cultivated land, it may be necessary to route access tracks along fence lines or otherwise in accordance with landholder requirements. Track construction would be carried out so as to cause minimum disturbance to soil and vegetation both on and adjacent to the track, including restricting the use of bulldozers where practical.

Access tracks would be constructed in accordance with the following guidelines:

- *Guidelines for the Planning, Construction and Maintenance of Tracks* (Department of Land & Water Conservation, 1994)
- *Managing Urban Stormwater: Soils and Construction – Volume 2C Unsealed Roads* (Department of Environment and Climate Change, 2008).

Where tracks are, or are required to be, located in areas which are not suitable for use by vehicles and plant following adverse weather conditions, the area would be temporarily by-passed (i.e. alternative access paths would be identified). Access tracks would be designed and formed such that the track is suitable for use by vehicles during subsequent use as part of future maintenance access (i.e. suitable for use by long wheel-base 4WD vehicles).

6.6.4 Transmission line construction

Main works associated with the construction of the transmission lines would include (but not be limited to):

- earthworks and footing construction including:
  - earthworks and establishment of construction pads for each transmission line tower
  - construction of footings and foundation works for the new transmission line towers including either concrete or steel piles (driven and/or screw), boring and/or excavation, steel fabrication works and concrete pours
- construction of transmission line towers
- erection of the transmission line towers
- stringing of the conductors and overhead earth wires and optical ground wire
- installation of earthing conductors
- earthing of fences and gates (as required).

The typical methodology for the construction of the transmission lines would be similar for both the new 330kV line and the upgraded 220kV line. Further detail of these key tasks is provided below.

Earthworks and transmission tower footing construction

Excavation works at each tower site would be required for the installation of foundations, levelling around the individual tower foundations, drainage and grading or preparation for construction at the tower site. Excavations would typically be up to five metres in depth. Where groundwater is shallow, alternative construction methodologies and designs would be implemented (such as boring) to limit interaction with groundwater.

Typical transmission line tower piling depth would be generally up to 25 metres below ground level and would depend on ground conditions (e.g. greater piling depths would be required where soft soil types are present).

The foundation type would also vary and (subject to detailed design) would consist of either:

- bored pile (reinforced concrete)
- driven or screw pile (concrete or steel)
- helical screw anchor, or cast in-situ reinforced concrete.

If groundwater is encountered or the excavations are filled by rainwater, the excavation would be dewatered and appropriately managed.

Bench sites (stepped ground excavation) may be required to provide a level platform for equipment setup, the erection of the tower and other construction activities. Benching would be constructed by use of earthing equipment such as graders and excavators.

Excavated material would be stockpiled to be used for backfill around the transmission line tower foundations and embankment filling at the tower site from which it was excavated. Top soil would be kept separate from the excavated material to allow for placement at ground level during backfilling. Any excess excavated material would be spread evenly around the site after completion of the foundation backfilling (if suitable) or removed from the site and disposed of in accordance with the appropriate waste classification.

Construction of transmission line towers

The transmission line towers would typically be erected by assembling in sections on the ground and hoisting or lifting successive sections into place using cranes. Alternatively, towers may be erected in place on the footings by installing individual members. These towers would include infrastructure such as step bolts, climbing attachment plates, ladders, platforms, climbing barriers, identification plates, warning plates, other fixtures and fittings for the attachment of earthwires and insulators.

Following erection and securing of the tower, the transmission line would be strung by either a ground pulled draw wire (with brake/winch sites) or a line stringing drone.

The area required for the construction of each tower would require access for tower assembly and stringing works. Where a transmission tower is proposed to allow for a direction change of the transmission line, a larger area would be required (to allow for brake and winching sites). At a typical site, this would include a temporary area of up around 60 metres by 80 metres at each transmission line tower location.

Transmission line watercourse crossings

The proposed transmission line would require three major watercourse crossings. These crossings are proposed at:

- the Great Darling Anabranch, Wentworth NSW
- Darling River, Ellerslie NSW
- Murray River, Monak NSW / Red Cliffs Victoria.

Generally, the design of the transmission line would include a transmission line structure on either side of each major river crossing. A drone would then be used to take a lead wire over the river to allow cables to then be pulled and strung tower to tower.

It is not envisaged that any access tracks or bridges would be required for these particular crossings due to the design and proposed construction method of the transmission line at these locations. There would likely be some temporary works at the transmission line structure on each side of the crossing to allow for the construction of the transmission line structure, however it is likely that these would be between at least 50 metres from the river bank (subject to detailed design) and with appropriate environmental controls (such as erosion and sediment controls).

Where alternative access routes are impractical, a number of local waterway crossings and causeways would be required at other smaller waterway locations along the length of the proposal. Where required, bed-level fords (i.e. construction of a good footing where a river or stream may be crossed) or causeways may be required to be constructed to provide temporary access. Where these crossings are required, they would typically be constructed using the following typical methodology:

- removing all loose material from the watercourse at the point to be crossed, forming a depression with firm base and sides
- the depression would then be filled with graded layers of rock. The rock layers would be placed so as to produce an interlocked bed of rock, sloped and dished, to allow water to drain freely through and flow over the causeway (minimum thickness of around 450 millimetres but not higher than the bed of the watercourse).

All watercourse crossing would be designed and installed in accordance with relevant Department of Primary Industries (DPI) guidelines for waterway crossings including:

- *Policy and Guidelines for Fish Friendly Waterway Crossings* (DPI, 2004a)
- *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings* (DPI, 2004b)
- *Water Guidelines for Controlled Activities on Waterfront Land* (DPI, 2012a).

If required as part of a water crossing, culverts may also be installed in accordance with required standards (such as AS/NZS 4058 *Precast concrete pipes (pressure and non-pressure)*).

6.6.5 Buronga substation upgrade and expansion

As described in Section 5.3.3, the existing Buronga 220kV substation would be upgraded and expanded to add a new 330kV substation on the land parcel adjacent to the existing 220kV substation. The construction methodology for the proposed expansion of the Buronga substation would consist of the following key activities:

- site establishment, including vegetation removal and establishment of temporary construction site office and amenities within the expanded substation site
- ~~bulk~~ earthworks to form the substation pad including placement of around 350,000 cubic metres of rock/gravel/soil to allow for the construction of the substation pad, and the temporary stockpiling of existing soil that does not meet engineering requirements for the substation pad
- excavation and preparation of the site for concrete foundations
- installation of reinforced concrete and piled foundations for the electrical equipment
- excavation and installation of electrical equipment conduits, trenches and general site drainage works
- construction of two to three new ancillary and equipment control buildings
- erection of galvanised steel towers to support electrical equipment, using cranes
- installation of electrical equipment on foundations
- installation of site wiring and electrical control equipment within the control buildings.
- erection of the expanded substation site boundary security fence, including site access gates
- surfacing and stabilising works for access, dust and vegetation suppression and drainage.

Site establishment and ~~bulk~~ earthworks would be carried out as enabling works. Material for the earthworks would be sought from both within the substation site (and surrounds) and, where required external sources (refer to Section 6.9.1).

Blasting may be required, depending on geotechnical conditions. This would be confirmed during detailed design and would be subject to further assessment.

6.6.6 Pre-commissioning and commissioning phases

Pre-commissioning activities would form part of the final construction and installation works and would incorporate all tests and checks to confirm that construction quality assurance documentation, inspection and test plans, checklists and associated activities have been completed for each individual component of plant. This would be to ensure that it has been supplied and installed in accordance with the design and statutory standards and is safe to proceed to commissioning.

The key pre-commissioning and commissioning activities which would be undertaken would include:

- testing and commissioning of the new substation equipment
- point to point testing of the new transmission lines and substation connections
- earthing testing
- high voltage testing
- high voltage equipment operational checks
- testing of the installed protection, metering, control, and communication systems
- cut over (energisation) of electricity between the existing and new transmission lines (where required, such as the section south of the Buronga substation).

Once all high voltage and low voltage testing is completed, the electrical protection systems have been set and all quality assurance documentation has been completed, commissioning would proceed.

The key activities involved in the main commissioning process would include:

- transmission line cut in and connection to the electrical network
- protection, control, and metering checks
- high voltage equipment operation and energisation
- audible noise, thermographic imaging and electric and magnetic field (EMF) testing.

The new substation components would be commissioned and integrated with any necessary TransGrid external facilities.

6.6.7 Demobilisation

Decommissioning of existing infrastructure

Once the new double circuit 220kV line between Buronga substation and Red Cliffs substation is constructed and operational, the existing 220kV single circuit transmission line (Line 0X1), including all existing structures and conductors, would be decommissioned and removed from the easement. A single 220kV transmission structure would also be removed on the Broken Hill to Buronga substation (Line 0X2).

The methodology for the removal of the existing 220kV single circuit infrastructure would typically consist of the following key activities:

- disconnection and removal of the existing transmission lines
- dismantling of transmission line towers and removal from site (including removal of foundations to one metre below ground)
- remediation of access tracks (where no longer required for access to the new double circuit line). This would include remediation of an area around 30 metres in all directions from the existing tower, with access to these sites for remediation provided along the existing access tracks to the (decommissioned) tower locations
- handover of excess land (resulting from adjusted easement) back to landholder.

The decommissioning of infrastructure to the south of the Buronga substation would also include the removal of the temporary bypass transmission line infrastructure installed to allow construction of the new double circuit 220kV line.

Site rehabilitation and landscaping

Site rehabilitation would be carried out progressively along sections of the transmission line and at tower and pole installation sites as well as the expanded substation site. This phase would occur following the completion of construction and involve the removal of all materials not required during the operation of the substation and/or transmission lines. This phase would include the removal/remediation of the construction compounds and camp sites, removal of any site buildings and temporary environmental controls. Rehabilitation of access roads or tracks would also be undertaken where they are not required for further construction activities.

These areas would be restored back to their previous natural conditions as far as possible.

Works may also be undertaken to restore:

- irrigation and water infrastructure facilities to pre-existing conditions before arrival on site
- natural drainage in areas where temporary facilities were provided
- fences, gates, etc., which may have been damaged during construction.

Installation of the permanent TransGrid property boundary fence surrounding the expanded substation site would also likely occur during this phase.

6.7 Construction facilities

6.7.1 Main construction compound and accommodation camp sites

The main construction compound and accommodation camp sites would be in place throughout the period of construction of the proposal.

Each main construction compound and camp site would accommodate a range of facilities including:

- staging and laydown facilities
- concrete batching plants
- workforce accommodation camp areas
- demountable offices for up to around 50 workers
- construction support facilities including vehicle and equipment storage, maintenance sheds, chemical/ fuel stores and potential stockpile areas.
- parking for up to around 190 light vehicles, 45 heavy vehicles and five 20-seat buses
- waste water treatment facilities to reuse the effluent and greywater produced by the accommodation camps and construction sites.

The workforce camp area would accommodate between ~~100 to 200~~ 200 and 400 workers at the Wentworth and Buronga sites respectively (refer to Table 6-2).

Table 6-2 Estimated number of workers that would be accommodated at each proposed camp

Accommodation camp and compound site location	Camp accommodation [1]	Office staff
Buronga substation	Around 400 workers	Around 100 workers
Wentworth	Around 200 workers	Around 50 workers

The camp accommodation would include accommodation facilities, food and catering facilities, fitness and recreational facilities (such as indoor and outdoor recreational spaces, gymnasium areas), first aid facilities and telecommunication services for personal use. The main construction compound and accommodation camp sites would range in size from around ~~150~~ 200 metres by ~~200~~ 500 metres (around ~~30~~ 10 hectares) to up to around 250 metres by ~~300~~ 750 metres (around ~~75~~ 18.5 hectares). Within each site, the size of accommodation camps ~~laydown~~ areas could be up to ~~150~~ 160 metres by ~~150~~ 250 metres (up to ~~22.5~~ 4 hectares).

Upon completion of works, the construction compound and accommodation camp sites would be cleared of any temporary infrastructure and equipment, and rehabilitated in line with Section 6.6.6.

~~Up to~~ Three main construction compounds, two of which would include accommodation camps, ~~sites~~ would be required during the construction of the proposal.

Anabranch South

The Anabranch South main construction compound ~~and accommodation camp~~ site would be located on the Silver City Highway and would provide ~~primary~~ support for the construction of the western end of the 330kV transmission line. An indicative location for the main compound site is shown on Figure 6-3b. The final location would be determined in consultation with the landholder and would be subject to the criteria identified in Section 3.3.6. Should the final location reflect the indicative location, the site would be established as part of enabling works.

Buronga

The Buronga main construction compound and accommodation camp site would be located in the vicinity of the Buronga substation (refer to Figure 6-3c), and would be established as part of enabling works. It would provide primary support for the construction of the eastern end of the 330kV transmission line, the 220kV transmission line and the Buronga substation upgrade and expansion.

Wentworth ~~(and surrounds)~~

~~A third site may be required to provide primary support for the construction of the central section of the 330kV transmission line. The location of this site, if required, is subject to further investigation, but would be located in general proximity to Wentworth and its surrounds.~~

~~The location of the site would be selected to minimise potential environmental impacts (applying the below factors) and would be subject to landholder agreement.~~

The Wentworth main construction compound and accommodation camp site would be located on the northern side of Renmark Road, around 17 kilometres west of the township of Wentworth (refer to Figure 6-3d), and would be established as part of enabling works. It would primarily service construction activities for the western end of the proposal.

Additional construction sites (if required)

The following factors, in general order of priority, would be considered ~~when selecting the~~ should any additional sites be required:

- being in areas which have previously been disturbed, or would already require disturbance as part of the construction of the proposal
- no impacts to threatened species (or their habitats) or threatened ecological communities (within the meaning of the *Biodiversity Conservation Act 2016* or the *Environmental Protection and Biodiversity Conservation Act 1999*)
- being located on sites of identified lower ecological and heritage value
- located an appropriate distance from watercourses (i.e. locations greater than 200 metres away)
- located an appropriate distance from sensitive receivers to minimise potential impacts (i.e. enabling adequate separate from residential buildings) with consideration of matters such as compliance with the *Interim Construction Noise Guideline* (DECCW, 2009), traffic and access impacts, dust impacts, and visual (including light spill) impacts
- sites being of relatively level ground to minimise earthwork requirements and offsite drainage risks
- of minimal environmental impact with respect to flooding
- proximity to key construction activities to minimise durations of travel for workforce and transport of materials and equipment
- easily accessible for heavy vehicle construction traffic (including deliveries).

The selected site would be subject to additional environmental assessment or consistency review, as relevant. If the location is confirmed prior to any planning approvals, this site would be established as part of the enabling works identified in Section 6.6.1.

6.7.2 Other ancillary facilities and the transmission line construction corridor

A number of minor staging, storage and laydown ancillary areas would be required along the proposal study area for the temporary storage of materials, plant and equipment required to construct the various elements of the proposal (in particular transmission line structures).

Some temporary mobile batching plant locations may also need to be established to enable for easily access to concrete at the more western end of the proposal, and would be located at least 500 metres away from any residential dwelling. Upon completion of works, these ancillary sites would be cleared of any temporary infrastructure and equipment, and rehabilitated in line with Section 6.6.6. These sites would be in place for shorter periods at locations suitable to support the construction works as they move along the alignment.

6.8 Plant and equipment

An indicative list of construction plant and equipment likely to be required for the key construction elements is provided below. Not all the equipment identified below would be required for all phases of construction.

- air compressor
- backhoe
- bob cat
- CAT 140M grader
- cranes (ranging from 50 to 300 tonnes)
- concrete agitator
- concrete pump
- crawler crane with grab attachments
- D6 dozer
- D10 dozer
- drones
- dumper trucks
- elevated working platforms
- excavators (ranging from five to 45 tonnes)
- excavator(s) with hammer
- franna cranes (ranging from 12 to 25 tonnes)
- flatbed Hi-Ab trucks
- generators
- graders
- mulchers
- mobile crushing and screening plant
- piling rig(s)
- pneumatic jackhammers
- rigid tippers
- rollers (ranging from 10 to 15 tonnes)
- scrapers
- semi-trailers
- stringing winches
- tilt tray trucks
- transport trucks
- trenchers
- watercarts.

6.9 Resources and materials

6.9.1 Excavation works ~~volumes~~

As described in Section 6.4, excavation works would be required within the disturbance area for activities such as transmission line structure construction, preparation of the expanded substation site to provide a level surface, to create the trenches for drainage, earthing, and electrical conduits and to construct access tracks.

Spoil from the excavations associated with the transmission line may be reused on site wherever possible (refer to proposed material earthworks sites below), however in some instances spoil would be removed from site and disposed of at an appropriately licenced facility. Any such on site re-use would be within the disturbance area, and would not substantially alter landform or drainage in the vicinity of the transmission line structures. Excavation works would be carried out using earth moving equipment such as excavators, dozers, piling rigs and rock breakers. Mobile crushing and screening plant would also be used to prepare material sources from the material earthworks sites.

Based on the current design of the proposal, the anticipated excavation volumes for the proposal are shown in Table 6-3.

Table 6-3 Indicative earthwork volumes

Approximate volume of material to be excavated	Approximate volume of material required for fill	Earthwork balance	Typical depth
Buronga substation upgrade and expansion site			
~~Bulk~~ Earthworks to remove sand/soils unsuitable for compaction as part of construction of the expanded substation pad 250,000 to 350,000 cubic metres	Imported quarry products / fill suitable for compaction 250,000 to 350,000 cubic metres	Landscaping, drainage, crushed rock topping Approximately 25,000 cubic metres	Typical depth two metres (majority) to six metres (low spots in land parcel to be filled)
330kV transmission line – SA/NSW border to Buronga substation			
Excavation for tower foundations 54,000 cubic metres	Reinforced concrete would be used to fill the excavations	Nil	15 to 20 metres
220kV transmission line – Buronga substation to NSW/Victoria border			
Excavation for tower foundations 12,000 cubic metres	Reinforced concrete would be used to fill the excavations	Nil	15 to 20 metres

It is proposed that a substantial portion of the required fill material may be sourced from two areas adjacent to the substation upgrade and expansion site (referred to hereafter as the 'earthwork material sites') (subject to the suitability of the available fill material). Additional materials (such as gravel or other materials that would not be won from these sites) would still be required to be imported to the site from external location(s).

The proposed earthwork material sites are slightly mounded areas generally to the north and west of the proposed substation upgrade and expansion site (refer to Figure 6-4). Based on the current LiDAR information, the two locations have high points of up to seven metres above the surrounding landform. The suitability of fill material for the raised substation pad and the final extent of the earthwork material sites would be confirmed by further geotechnical investigations during detailed design.

The construction methodology for the earthwork material sites would consist of the following key activities:

- existing topsoil would be stripped from the substation site, laydown, camp and earthwork material sites locations. These would be stockpiled within the indicative disturbance areas and proposed asset protection zones
- excavation of the earthwork material sites. Following excavation, the material may be passed through a mobile crushing and screening plant (refer to section below)
- following the crushing and screening process, the refined material would be transferred to the pad site for the substation upgrade and expansion
- the proposed earthworks would remove the mounded areas of the two sites down to a level which is generally consistent with the surrounding landform, including re-establishment of the existing topsoil and seeding with appropriate vegetation seed mix to assist with stabilisation of the sites (subject to detailed design and consideration by a qualified ecologist). The landform of the sites would be reinstated so that water can freely run from and across the site along similar flow paths to existing conditions.

Figure 6-5

Proposed location of the earthwork material sites adjacent to the substation upgrade and expansion site

Crushing and screening

The main purpose of the mobile crushing plant would be to reduce the size of large rocks and meet the engineering requirements for use as the substation base.

Up to around 100,000 cubic metres (total volume) of material may need to be crushed and screened at a rate of around 600 to 700 cubic metres per day (with the final quantity material requiring crushing and screening to be confirmed during detailed design after geotechnical investigations are completed). Crushing and screening activities would be undertaken from 7:00am to 7:00pm seven days per week for the duration of the earthworks at this site.

Typical crushing and screening operation would include:

- unloading the accepted material via dump trucks / scrapers to a designated area within the earthwork material sites ready for the crushing and screening process
- loading the material into a hopper that feeds the crushing plant which would process material into a finer grade material
- the finer grade material would then feed into a screening machine which would consist of a deck which holds a screening media, that, when vibrated, causes particle separation
- once processed, a conveyer belt would transport the material out of the plant. Material for use would be stockpiled in a designated area adjacent to the earthwork material site.

The proposed crushing and screening plant would be relatively small and typically consist of two separate elements requiring a footprint of around 40 square metres to 60 square metres each. The specifications of the plant would be confirmed during detailed design.

The crushing and screening plant and material stockpiles would be contained within the earthworks material sites as shown in Figure 6-5. Material that is not suitable for use in the substation pad would be used during the re-instatement of the earthwork material sites.

Figure 6-5 Example of a mobile crushing and screening plant process as proposed for use within the earthwork material sites

Where materials cannot be sourced from the proposed earthwork materials sites ~~required~~, imported quarry products would likely be sourced locally and be transported by road to the expanded substation or transmission line sites. ~~Opportunities to win material within or in proximity to the proposal is being investigated, and would be subject to separate approvals.~~

As identified in Section 6.6.2, in order to reduce potential earthwork requirements, top soils would be stockpiled within the construction disturbance area and reused for re-establishing grasses and other vegetation in areas proposed to be rehabilitated. Where excavated spoil is determined not to be appropriate for reuse on site, it may be necessary to import additional material to site to make up any identified deficit. Where this is required, this would be sourced locally.

There would also be a requirement to maintain safe working clearances under the existing transmission lines where the proposal would be located in or adjacent to existing lines or the Buronga substation. Accordingly, excavation works would generally commence where clearances from natural ground level to the above transmission lines exceed the safe working requirements. Benching and spoil removal would progress using rock breakers, excavators and trucks. This methodology would ensure that safe clearances are maintained and excavation works can proceed without the requirement to disconnect electrical transmission along these lines during construction.

6.9.2 Water supply

Water would be required during construction for:

- dust suppression on substation construction sites and line tower construction sites, and on access tracks through the use of a water spray attached to a tanker vehicle (including the possible use of water reduction polymers)
- concrete batching activities for use when mixing with cement, aggregates and water for transmission line towers and substation foundations
- wetting backfill material (if it is too dry for effective compaction)
- general worker facilities at the main construction compound and camp sites.

It is estimated that about 616 megalitres of water would be required for construction, comprising:

- 428 megalitres for dust suppression
- 91 megalitres for earthworks compaction
- 11 megalitres for concrete batching activities (potable water)
- four megalitres for vehicle washdown facilities
- 82 megalitres for camp sites (potable water).

Water would be supplied for the proposal from existing regulated sources. Water would be purchased from the existing water market within the region or from local council facilities. Access to these sources would occur through the use of existing, licensed water extraction infrastructure only.

A series of water supply points have been identified which would provide connection points to existing water supply pipelines. No new extraction infrastructure from existing watercourses is proposed as part of the water supply points proposed and water would be purchased under licencing agreements with the various water suppliers/landowners as required. The currently identified water supply points are shown in Figure 6-6 and described in Table 6-4. These sites would be confirmed during final negotiations with the water supplier.

Table 6-4 Proposed construction water source locations

Location	Description of water supply point
Alcheringa Road, Buronga	**Type**: Non-potable **Typical use**: Buronga substation and surrounding area and Transmission line west of Buronga **Description**: This site would be located at the point of the existing Buronga re-lift pump station operated by Western Murray Irrigation pipeline. The proposed works would include installation of a new standpipe and connection to the existing Western Murray Irrigation pipeline. The area is currently cleared and adjacent to Alcheringa Road. It is estimated that, at peak construction, the site would accommodate up to around 20 loads per day (indicatively using between 15,000 and 40,000 litre water trucks).
Fletchers Lake Drive, Dareton	**Type**: Non-potable **Typical use**: Transmission line west of Buronga **Description**: The site does not currently provide any existing aboveground water supply infrastructure. The proposed works would include installation of a new standpipe and connection to the existing Western Murray Irrigation pipeline. The area is currently not utilised (road reserve/verge) adjacent to Fletchers Lake Drive. It is estimated that, at peak construction, the site would accommodate up to around 20 loads per day (indicatively using between 15,000 and 40,000 litre water trucks).
Silver City Highway intersection with Milpara Road, Anabranch South	**Type**: Non-potable **Typical use**: Transmission line around Great Darling Anabranch **Description**: The site does not currently provide any existing aboveground water supply infrastructure. The proposed works would include the installation of a new standpipe and connection to the existing Broken Hill pipeline. The area is currently cleared and adjacent to Milpara Road on the western side of the Silver City Highway. It is estimated that, at peak construction, the site would accommodate up to around 20 loads per day (indicatively using between 15,000 and 40,000 litre water trucks).
River Drive, Buronga	**Type**: Potable **Typical use**: Buronga accommodation camp and construction compound **Description**: The site currently includes an access road to an existing overhead fill point of River Drive, Buronga. No new infrastructure would be required to allow for access to this water supply point. It is understood that the existing infrastructure is used on an infrequent basis, and the demand for the fill point demand fluctuates depending on what projects are taking place within the region. It is estimated that, at peak construction, the site would accommodate up to around two to three loads per day (indicatively using between 15,000 and 40,000 litre water trucks).

Location	Description of water supply point
Beverley Street, Wentworth	**Type**: Potable **Typical use**: Wentworth and Buronga accommodation camp and construction compounds, and concrete batching plants **Description**: The site currently includes an access road to an existing overhead fill point along Beverly Street, Wentworth. No new infrastructure would be required to allow for access to this water supply point. It is estimated that, at peak construction, the site would accommodate up to around two loads per day (indicatively using between 15,000 and 40,000 litre water trucks).
Wentworth construction compound and accommodation camp	**Type**: Non-potable **Typical use**: Wentworth accommodation camp and construction compound and transmission line (west of Wentworth) **Description**: The proposed location does not currently provide any existing aboveground water supply infrastructure. The proposed works would include installation of a piped connection between the pump station and the proposed Wentworth construction compound and accommodation camp (including the need to continue the pipe under Renmark Road). The connection would consist of around 400 metres of new 450 millimetre diameter pipe to allow for water supply to be available to the camp as required. The pipe would be located within a corridor around six metres wide adjacent to the existing track. It is expected that this connection would meet a majority of the water requirement for the Wentworth construction compound and accommodation camp and western section of the transmission line.
690 Pomona Road, Pomona	**Type**: Non-potable **Typical use**: Typically the transmission line west of the Darling Anabranch **Description**: The site currently includes an access road to an existing water pump out point within the property of 690 Pomona Road, Pomona. No new infrastructure would be required to allow for access to this water supply point. It is estimated that, at peak construction, the site would accommodate up to around four to five loads per day (indicatively using up to 25,000 litre water trucks).

Effluent from the wastewater treatment facilities at the Buronga and Wentworth accommodation camp sites would also would be collected and transported via water carts for reuse in dust suppression, compaction of materials or other construction activities which may require and can utilise grey water.

TransGrid has commenced discussions with Wentworth Shire Council to access the required volume of potable water for the proposal from existing council facilities. For non-potable water supply, commercial discussions with potential suppliers to secure non-potable water ~~has commenced and is~~ are also ongoing. Ongoing consultation with water suppliers may also identify other water sources that may be used by the proposal which would be secured under standard supply /purchase agreement from existing facilities (no infrastructure amendments needed for them). This may include additional sources of potable water from areas such as Mildura. Should any approvals be required for additional site(s), these would be obtained as part of separate environmental approval processes.

Water storage tanks would be provided, where required, along the transmission line corridor to manage demand requirements. Where wastewater is not to be reused on site, the solid sludge material would be collected via tanker trucks and disposed of at approved disposal locations in accordance with the NSW Environment Protection Authority (EPA) waste classification guidelines (NSW EPA, 2014).

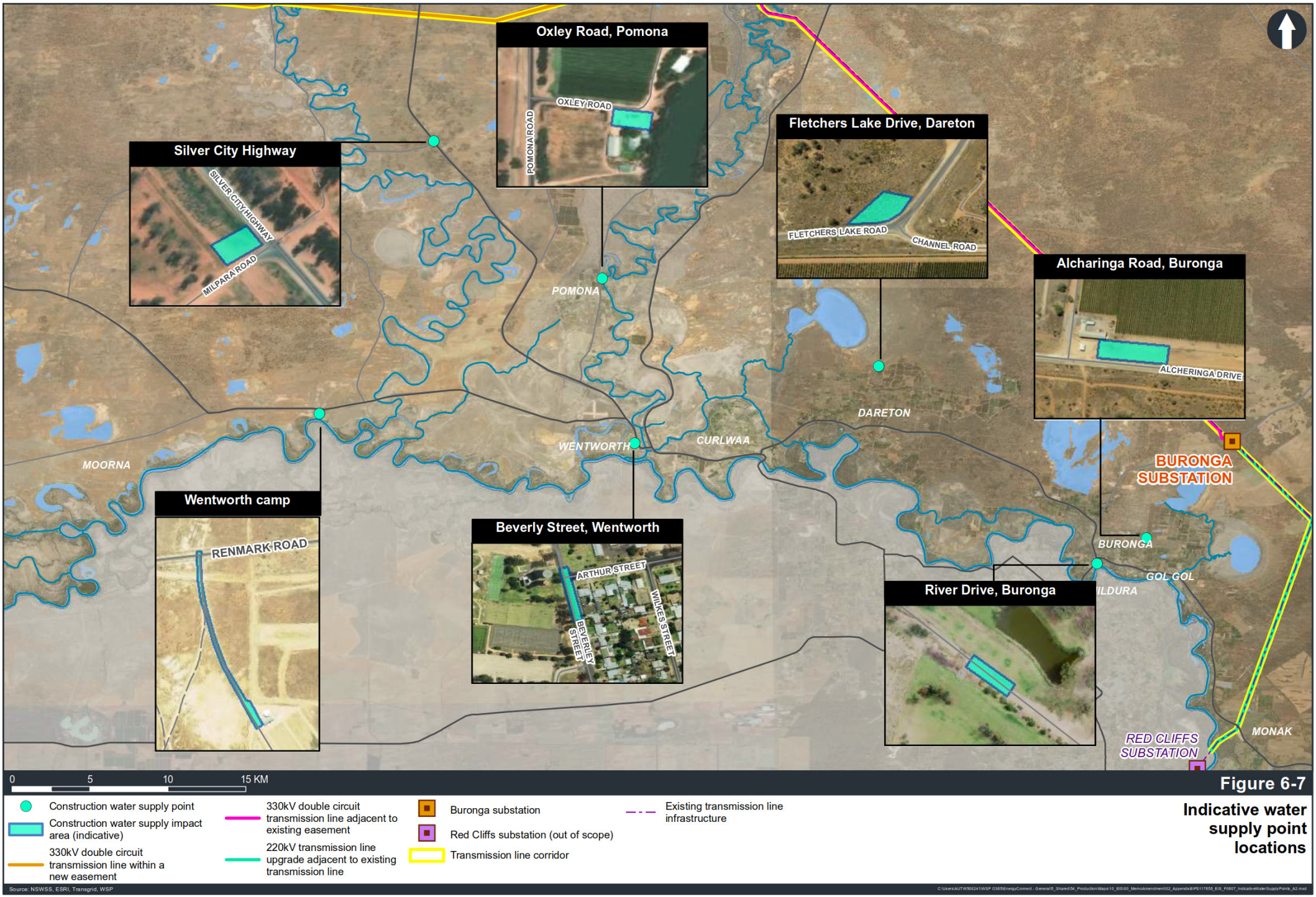

Figure 6-7

Indicative water supply point locations

6.9.3 Hazardous materials and chemicals

During construction, various hazardous materials and chemicals would likely be required to be used and/or stored on site. Hazardous materials and chemicals would typically include (but not limited to):

- acetylene, Oxygen, Liquid Petroleum Gas
- adhesives, glues, epoxies, etc.
- concrete and other mortar products
- contact cleaners
- cold-galvanising spray
- fuels, oils and lubricants (such as diesel, unleaded petrol, thinners, etc.)
- paints and other paint markers.

6.9.4 Other resources and materials

A range of other materials and resources would also be required during the construction of the proposal. Key additional materials and resources would include:

- 12,000 tonnes of steel for transmission line towers
- around 1,600 kilometres of conductor cables
- 3,400 tonnes of aluminium and 50 tonnes of copper for transmission lines
- up to 15,000 cubic metres of concrete for substation works and up to around 11,200 cubic metres of concrete for transmission tower footings.

6.10 Workforce and working hours

6.10.1 Construction workforce

The construction workforce would vary depending on the stage of construction and associated activities. During peak construction activities, the proposal is expected to employ around ~~400~~ 600 full time equivalent workers. Table 6-5 provides an overview of the anticipated construction workforce for each stage of construction.

Table 6-5 Anticipated construction workforce

Phase	Anticipated Workforce (approx.)
Buronga substation upgrade and expansion works	
Site and compound establishment and vegetation clearance	10 to 20
Substation access road	20
Civil construction works	80 to 100
Electrical construction works	80 to 100
Pre-commissioning and commissioning	20 to 30
Site clean-up and landscaping	20 to 30

Phase	Anticipated Workforce (approx.)
Transmission line works	
Site establishment, environmental controls and vegetation clearance	~~8 to 12~~ 12 to 24
Establishment of access points and tracks to towers for construction of towers	~~8 to 12~~ 14 to 22
Tower foundation installation	40 to 50
Assembly and erection of towers	~~40 to 50~~ Up to 85 at peak
Stringing of conductors	~~40 to 50~~ Up to 110 at peak
Testing and commissioning	20
Accommodation camps, offices and other laydown areas	
Office workers	50 to 100
Accommodation camp and laydown support staff	20 to 50

6.10.2 Construction work hours

Construction work would be carried out seven days per week between 7:00 am and 7:00 pm. The main construction compounds would also operate during these hours.

The accommodation camp facilities would be operational 24 hours a day, seven days a week.

Extended construction hours are proposed given the distance to sensitive receivers for the majority of the proposal study area, and the shift arrangements of the workforce given the remote nature of the proposal. Extended working hours would also achieve reductions in the overall duration of construction.

Where the extended hours are proposed for activities in proximity to sensitive receivers, additional measures would be implemented where works would potentially exceed noise management levels through an out of hours work protocol.

Out of hours works

A series of works outside the proposed construction hours for the proposal are anticipated including (but not limited to) the following:

- transmission line construction where this would occur as a crossing of a main road or railway. These locations are expected to have restricted construction hours requiring some night works for activities such as conductor stringing over the crossing(s)
- works where Road Occupancy Licences (or similar) are required
- transmission line cutover and commissioning
- the delivery of equipment or materials outside standard hours requested by police or other authorities for safety reasons (such as the delivery of transformer units)
- substation assembly (oil filling of the transformers)
- connection of the new 330kV substation to the existing 220kV substation which is likely to require longer working hours

- emergency work to avoid the loss of lives and/or property and/or to prevent environmental harm
- work timed to correlate with system planning outages
- situations where agreement is reached with affected receivers.

During detailed design, a program would be determined to identify the required night work periods (including dates and durations).

Except for emergencies, construction works would be carried out in accordance with the out of hours work protocol and would not take place outside construction hours without prior notification in line with that protocol.

6.11 Construction parking, access and vehicle movements

Construction vehicle movements would comprise vehicles transporting compound and camp infrastructure, equipment and plant, materials, spoil and waste, as well as mini-buses and light vehicles associated with construction workers travelling to and from construction areas. Non-standard or oversized loads would also be required for the substation upgrade and expansion works (such as delivery of transformer units) and transportation of transmission line tower materials.

Indicative daily vehicle movements for the proposal are outlined in Table 6-6. These vehicle movements are based on the expected typical and peak construction period for the proposal. The vehicle movements stated in Table 6-6 would be confirmed during detailed design.

Table 6-6 Indicative vehicle movements

Vehicle type	Phase	Indicative total vehicle movements during construction (average)[1, 2]
Buronga substation upgrade and expansion site		
Light vehicles	Indicative daily movements (typical day)	~~50~~ 80
Light vehicles	Maximum daily movements (critical/peak construction period)	~~100~~ 200
Heavy vehicles	Indicative daily movements (typical day)	~~15~~ 40
Heavy vehicles	Maximum daily movements (critical/peak construction period)	~~80~~ 200
Transmission line works		
Light vehicles	Indicative daily movements (typical day)	~~67~~ 200
Light vehicles	Maximum daily movements (critical/peak construction period)	~~150~~ 300
Heavy vehicles	Indicative daily movements (typical day)	~~15~~ 100
Heavy vehicles	Maximum daily movements (critical/peak construction period)	~~30~~ 200

Note:

1. Indicative daily movements based on current program of works. This is an average and there would be days of increased peak activities which may impact these average/indicative numbers.

2. Vehicle movements are each way (i.e. a heavy/light vehicle arriving and leaving a site within a day counts as two movements).

Construction vehicle traffic would be greatest during the main earthworks and civil construction activities.

Most of the light vehicle movements associated with the construction works would generally be limited to construction staff travelling to and from individual sites for work from the worker accommodation sites.

Standard traffic management measures would be employed to minimise short-term traffic impacts expected during construction. These measures would be identified in the construction traffic management plan for the site.

In general, vehicle movements would be scheduled outside peak periods wherever possible. However, there would be a need for some vehicle movements during these periods. Worker vehicle movements would also be required during both the morning and afternoon peak hour periods.

6.11.1 Construction haulage routes

Routes for the movement of construction equipment and materials (local haulage routes)

Construction heavy vehicle movements would be required along the length of the proposal study area. Where feasible, this would be undertaken within the proposal study area, to minimise impacts on the public road network. However, use of public roads would also be required.

Local haulage routes would predominantly use the Sturt Highway, Silver City Highway, Renmark Road, Arumpo Road and then local roads. Given the limited number of route options within the proposal study area, these routes would be used by both general construction traffic and for heavy vehicle haulage routes.

Specifically, indicative local haulage routes would include the following:

> For the Buronga substation to the 330kV transmission line work site areas in the west via Wentworth, vehicles would travel along Arumpo Road and Silver City Highway (B79) to Wentworth, before turning onto Renmark Road and travelling towards the western worksite areas.
> For the Buronga substation to 220kV transmission line work sites (near Monak), vehicles would travel from Arumpo Road onto Silver City Highway (B79) and to the Sturt Highway (A20), exiting at the transmission line worksite areas.

The routes have been developed to minimise impacts on local roads as far as possible, while providing the most direct route to the road network and meeting specific road requirements (such as specified routes for heavy vehicles). These preliminary haulage routes would be reviewed during detailed design and confirmed following appointment of the construction contractor.

The local haulage routes along the proposal alignment are shown on Figure 6-7.

Main interstate / long distance haulage routes (oversize vehicle movements)

The shipping port locations which would receive each of the deliveries of the proposal equipment are not confirmed at this stage in the process. Locations being considered include Sydney (Port Botany), Newcastle, Wollongong (Port Kembla), Adelaide (Port of Adelaide) and Melbourne (Port of Melbourne). The final haulage routes from each of these locations would be determined by the appointed contractor and they would need to accord with the heavy vehicle haulage guidelines in each of the respective states.

Haulage routes from port facilities would be expected to include:

> Port Botany – travel from Sydney to Buronga via Wagga Wagga along the Hume Highway (M31) and Sturt Highway (A20), before reaching Arumpo Road to access the Buronga substation site.
> Port Kembla – travel from Wollongong to Buronga via Wagga Wagga along the Hume Highway (M31) and Sturt Highway (A20), before reaching Arumpo Road to access the Buronga substation site.
> Port Newcastle – travel from Newcastle to Buronga via Wagga Wagga along the Pacific Motorway (M1), Westlink M7, Hume Highway (M31) and Sturt Highway (A20), before reaching Arumpo Road to access the Buronga substation site.

- Port of Adelaide – travel from Adelaide to Buronga via Broken Hill along Silver City Highway (B79), before reaching Arumpo Road to access the Buronga substation site.
- Port of Melbourne – travel from Melbourne to Buronga via Mildura along Calder Highway (A79) and Benetook Avenue (C255) on the Victorian side, before crossing the Murray River along George Chaffey Bridge on Sturt Highway (A20) and reaching Arumpo Road to access the Buronga substation site.

The four main interstate / long distance haulage routes proposed for the proposal are shown on Figure 6-8.

Any of the proposed long distance haul routes required would be subject to permits granted by National Heavy Vehicle Regulator and would be assessed accordingly (refer to mitigation measure TA5).

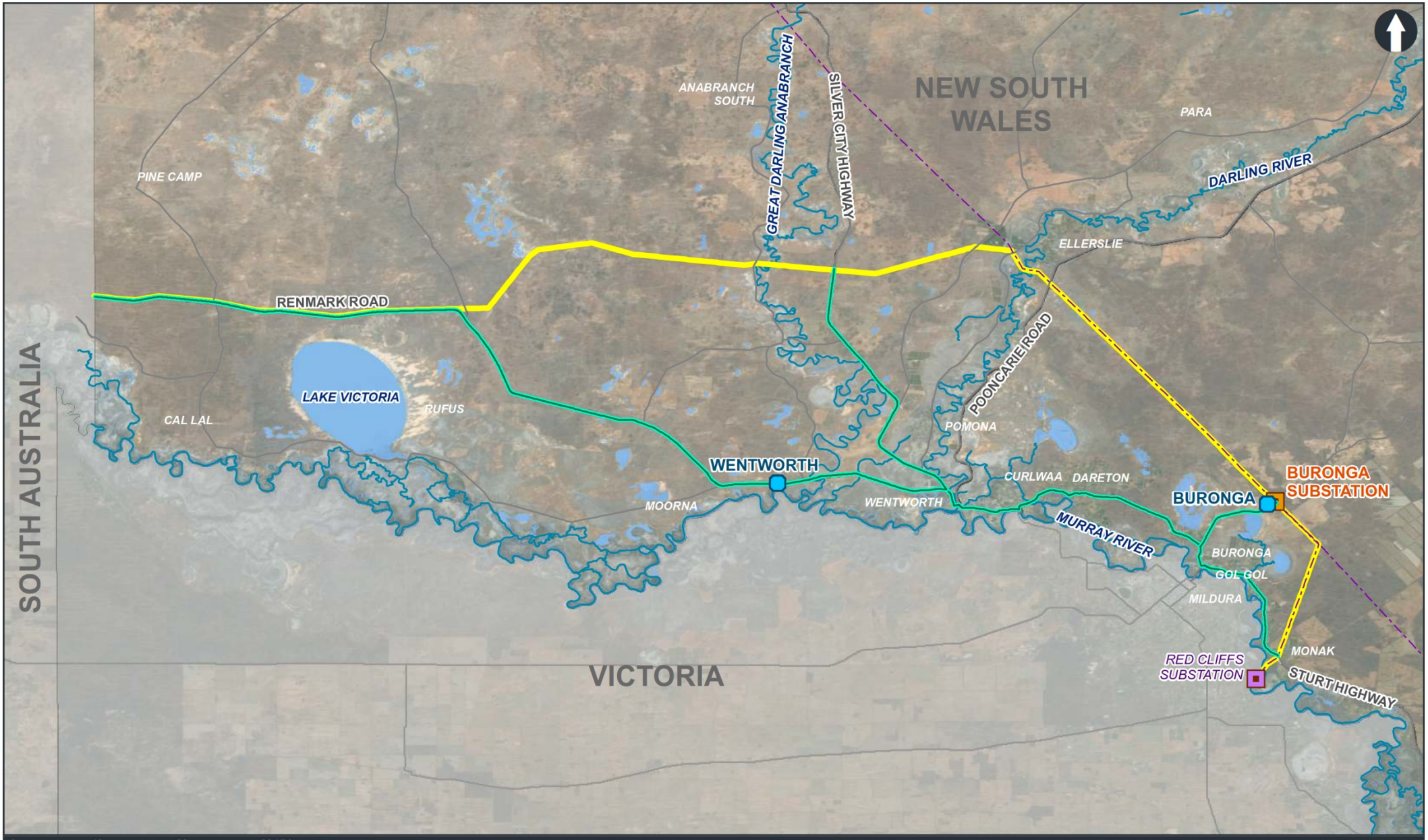

Figure 6-8

Indicative proposal local haulage routes

- Buronga substation
- Red Cliffs substation (out of scope)
- Transmission line corridor
- Existing transmission line infrastructure
- Local haulage route
- Main construction compound and camp location

Source: NSWSS, ESRI, Transgrid, WSP

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Figure 6-9

Indicative interstate haulage route to major ports

6.11.2 Construction worker parking

Construction worker parking would primarily be provided within the main construction compound and camp sites as described in Section 6.7.

For the construction works at the Buronga substation, it is expected that relevant workers would be typically based within the accommodation camp at this work site or travel to the site locally from the surrounding towns such as Buronga, Gol Gol or Mildura and park within the Buronga main construction compound.

For the transmission line alignments, given the transient nature of these construction works, and potentially long distances, it is expected that workers would typically be transported by bus to site from their relevant accommodation camp. Where other vehicles are used to access these sites, parking spaces for construction personnel would generally be within 30 metres on each tower location site.