# 4. Description of Proposed Development

*This Chapter describes the proposed development which is the subject of this EIS. The essential elements are described in sufficient detail to allow effective assessment of potential environmental effects. Unique to this project is that the assessment has been undertaken on a nominated alignment which was pegged prior to undertaking detailed field investigations. This allows for very accurate assessment and detailed mitigation strategies.*

## 4.1 Preferred Alignment Overview

A preferred alignment within the preferred Northern Corridor has been developed as a result of technical considerations by TransGrid, through discussions with property owners and other key stakeholders, and the results of environmental studies. Wherever possible, the preferred alignment has been located to utilise existing easements, tracks and infrastructure to limit the degree of environmental impact as far as possible.

As a result of these investigations, the exact locations of structures have been determined and pegged by land survey. In addition, the location of ancillary works such as access tracks has been determined in consultation with landowners. Although the access tracks required for the construction and ongoing maintenance of the line form part of the development proposal, TransGrid has made an undertaking to landowners that their location will not be varied as a result of the environmental assessment and approval process without prior discussion with the affected landowner.

Landowner issues have played a key role, and in many circumstances, a dominating role in the development of the project. However, identification of the exact location of line and associated tracks at this early stage of the process has enabled detailed environmental investigations to be undertaken as part of the EIS process. This work has been done without the benefit of an easement being registered on property titles and has therefore relied solely on negotiated access.

## 4.2 Project Overview

The location of the proposed 330 kV Transmission Line is shown on Figures 1 to 3 which are contained in Volume 3. The line will commence from the new Wollar 330 kV Switching Station located off Barigan Road south of Wollar. The line travels north towards Wollar Road, then the Ulan to Wollar Road before turning west to parallel the Sandy Hollow to Maryvale Rail Line. The line crosses land owned by two mining companies and the route has been negotiated to avoid sterilising future coal resources and interactions with existing and proposed mining infrastructure and extraction areas.

Once past the Ulan Coal Mine and surface facilities area, the line passes the village of Ulan before turning north, crossing Ulan Road then Cope Road to meet the existing 132 kV Beryl to Ulan Transmission Line. The proposed 330 kV Line then parallels the existing 132 kV line for over 15 km, diverging near Stubbo Creek.

The line travels generally in a south westerly direction crossing Barneys Reef Road, Slapdash Creek, the Gwabegar-Wallerawang Railway, Jacksons Lane and then the Castlereagh Highway before turning slightly further south towards the village of Beryl.

The proposed line then travels to the north of the Cudgegong River over relatively steep terrain towards Spring Ridge Road. The line crosses several local dirt roads including Mebul Road, Gum Gully Road and several private access tracks before crossing the sealed Goolma Road and then Gorries Lane.

The line continues west meeting the existing 132 kV Wellington to Beryl Transmission Line. Running parallel but on the northern side of the existing line for approximately 15 km, the proposed 330 kV line diverges slightly in order to cross to the southern side of the existing line. After rejoining a parallel alignment for a further 10 km, the line diverges south and crosses Twelve Mile Road and then west into Wellington Substation. This last deviation is to avoid the Cadonia Estate.

### 4.3 Project Schedule

The overall timing for the proposed development is outlined below.

- August 2005 - EIS public exhibition.
- November 2005 - Submissions to the EIS are compiled and a Representations Report is lodged with DIPNR.
- February 2006 - DIPNR makes a recommendation to the Minister for Planning.
- March 2006 - Ministerial approval of the project.
- Mid 2006 - Construction of transmission line and switching station begins.
- Late 2007 - The Wollar to Wellington transmission line and Wollar switching station are commissioned.

## 4.4 Detailed Description of the Route

The physical environment through which the proposed transmission line will pass is described in detail in the following sections. The justification for locating each section of the line is provided in Table 4.2.

### 4.4.1 Wollar Substation Site – Wollar Road

(Map Sheet A & B, Route Plans 1-4)

The proposed transmission line will originate from a new substation located at Wollar. Development approval for the substation follows a separate process with the Local Council, and is not included in this EIS.

The substation will require minimal tree clearing, but is situated within a grassland area with scattered isolated trees. Access to the substation and hence the transmission line will be from Barigan Road, Wollar. A new access is to be constructed to the substation site.

From the Wollar substation, the proposed transmission line will cross cleared agricultural grassland containing scattered isolated trees in a north/west – west direction for approximately 2.2 km, then north for 1.3 km, and then north – north/west for 1.7 km. At this point, the transmission line will continue in the same direction through woodland vegetation for approximately 2.2 km, emerging near the intersection of Upper Cumbo Road and Wollar Road.

A more easterly path towards the road that traversed less vegetation was rejected due to the more significant impact caused to the next property as the alignment tracked on to run close to the edge of the cleared land adjacent to the Crown Reserve. This alignment is considered to be the best alternative for crossing this woodland belt which runs on either side of Wollar Road.

### 4.4.2 Wollar Road – Sandy Hollow-Maryvale Railway

(Sheets B & C, Plans 4 – 5)

At the intersection with Wollar Road and Upper Cumbo Road the transmission line will turn in a north – east direction crossing Wollar Road. The initial 100 m will be through woodland vegetation, before traversing approximately 1.5 km of agricultural grassland containing isolated scattered trees, before a further 60 m of woodland. The transmission line will then turn due north through cleared grassland for approximately 2.6 km where it will cross the Ulan Wollar Road to the northern side of the Sandy Hollow – Maryvale Railway line. This section passes through the largely cleared valley east of the Crown Reserve instead of an option that was considered on the western side of the Reserve.

Issues affecting the eastern option primarily comprised concerns from residents along Slate Gully Road, some 375 – 750 m away, about the impact of the line on the amenity of their rural residential properties, particularly visual impacts.

Issues affecting the western option comprised difficulties resolving the range of impacts the proposed Wilpinjong Mine would have had on the transmission line if constructed close to the edge of the open cut, and the extensive ecological and potential archaeological impacts of the option, given that the line would have had to traverse a significant extent of the woodland adjacent to and within the Crown Reserve.

On balance it was concluded that the eastern option would have the least impact overall.
The route in this area places the towers close to the east side of the existing vegetated hill of the Crown Reserve to assist with screening. The towers will be painted green which has been proven to camouflage the towers when viewed against the background of a vegetated hillside as seen from dwellings on Slate Gully Road.

### 4.4.3 Sandy Hollow-Maryvale Railway – Ulan Colliery (around Goulburn River National Park)

(Sheets C & D, Plans 6-12)

The proposed transmission line will run parallel to the railway line and Ulan Wollar Road in a westerly direction across cleared agricultural land for approximately 1.2 km where it will span across Cumbo Creek, a tributary of Wilpinjong Creek. The transmission line will then continue across cleared land for a further 1.8 km where it crosses Wilpinjong Creek three times over a distance of approximately 750 m.

For this section of the line the Goulburn River National Park is located approximately 1 km to the north of the proposed line. The alignment passes through the proposed Environment and Conservation Area proposed by Excel Mining as part of the Wilpinjong Coal Mine Project. The area is currently cleared however, Excel proposes to establish a vegetated corridor to link existing woodland to the north and south in order to enhance the value of remnant vegetation and to encourage fauna movement. The alignment closely parallels the existing road/railway corridor and was chosen so as not to conflict with coal recovery or mining infrastructure requirements. TransGrid has made a submission to the Wilpinjong Coal Mine Project EIS in which TransGrid indicated willingness to discuss allowing vegetation of restricted height to be planted on the proposed easement.

The proposed transmission line then continues to follow parallel to the railway in a north-westerly direction for approximately 4 km across cleared agricultural land where there is a double crossing of the Wilpinjong Creek. Approximately 1.5 km further through agricultural land the proposed line will again cross the Wilpinjong Creek 3 times over a distance of 900 m. The line then traverses a further 500 m before entering a forested area owned by Ulan Coal Mine. The crossings of Wilpinjong Creek are necessary in order to continue within and existing service corridor consisting of the road and railway line. The alternative to travelling

within the Wilpinjong Creek valley would be to cross large tracts of woodland to the north or conflict with future mining operations to the south.

The proposed transmission line will cross the forested land for a distance of around 1.2 km before again crossing private agricultural land for 1.6 m where it turns due west for 150 m before crossing the Sandy Hollow-Maryvale Railway Line, near the intersection of Wollar Road with Murragamba Road.

The line will then be situated on cleared agricultural land between Wollar Road and the railway line due west for a distance of approximately 2.3 km where it crosses the Ulan Road to enter the Ulan Colliery Holding. The alignment falls within the service corridor created by Wollar Road and Sandy Hollow-Maryvale Railway Line but also takes into account a possible future realignment of the Wollar Road towards the intersection with Ulan Road. The alignment was negotiated with Ulan Coal Mine and White Mining Limited to take into account future infrastructure and mining requirements covering both Ulan and the proposed future Moolarben Coal Project.

### 4.4.4 Ulan Colliery – Cope State Forest

(Sheet D–F, Plans 12-17)

The proposed transmission line will travel in a westerly direction around Ulan Colliery pit top and coal handling facilities through cleared areas for approximately 1.6 km running alongside the road, railway and an existing airstrip. The alignment crosses to the south of Ulan Road near the western end of the airstrip where a further 500 m west it will cross forested land owned by the Colliery for 120 m before again traversing cleared agricultural land for another 670 m where it crosses the Moolarben Creek south of Ulan township.

The line will then continue across cleared land parallel to Ulan Road for a further 440 m before turning north – west to cross Ulan Road and the Sandy Hollow – Maryvale Railway line.

It has been accepted by TransGrid and Ulan Coal that the proposed alignment in this section will impact upon the viability of the existing airstrip on land owned by Ulan Coal. The range of issues considered in assessing alignment alternatives in this vicinity included the sterilisation of coal reserves by the transmission line and the airstrip, the need for and viability of the airstrip, the need to remove vegetation and associated impacts on flora and fauna, impacts of alternative alignments on mine infrastructure and vegetation, and the proximity of the alternative alignments to the Ulan township.

It has been concluded by TransGrid that the proposed alignment represents the best compromise of the potentially conflicting land-use impacts, taking into account all environmental and community issues. However, this conclusion could be affected by the quantification of the impact on the airstrip and the significance of the impacts of any necessary airstrip relocation.

In a manner similar to the way in which the nearby alignment was adjusted to accommodate the possible future alignment of Wollar Road and the future infrastructure and mining requirements of Ulan Coal and White Mining with regard to the Moolarben Coal Project, a number of alternative locations for a relocated airstrip have been identified and TransGrid will work with the stakeholders and the relevant consent authority to determine the appropriate development application process for such a relocated airstrip if required.

The Moolarben Coal Project also has the potential to impact upon the viability of the airstrip and possible alternate locations for it. Therefore a modification to the preferred alignment may need to be developed to avoid these impacts. Such a realignment would run more on the Ulan township side of the rail and road corridor. This would be contrary to undertakings made to the Ulan community during the corridor selection phase of the project, and would have impacts on the coal handling operations and other mine infrastructure north of the railway. It would also run closer to several residences and would bring the line closer to Ulan Public School.

Discussions with relevant stakeholders to confirm and define the actual extent of the impact on the airstrip and to resolve the question of responsibility for the costs are proceeding.

After crossing Ulan Road and the railway line the proposed transmission line crosses a patch of woodland for approximately 250 m before the line spans Sportsmans Hollow Creek, across 300 m of cleared land, over Cope Road and into a forested crown reserve. The alignment is designed to head towards the existing Beryl – Ulan 132 kV transmission line but at the same time maximise the distance from the township of Ulan.

Approximately 1.6 km across the Crown land, the alignment crosses the existing Wellington – Ulan 66 kV line and continue a further 1.2 km north-west where it will run parallel to the existing Beryl – Ulan 132 kV transmission line in a north/west – west direction. The initial 600 m will be through the forested crown land before crossing Highett Road, 150 m of grassland, 180 m of timber, 4.6 km of grassland. The proposed line will then run along the northern end of Cope State Forest within the tree line for 500 m.

### 4.4.5 Cope State Forest – Gwabegar–Wallerawang Railway Line

(Sheet F-H, Plan 17-22)

Emerging from Cope State Forest the proposed transmission line will continue parallel to the existing Beryl – Ulan 132 kV line in a westerly direction across cleared agricultural land for 3.6 km before entering 360 m of timber either side of Blue Springs Road. The proposed alignment crosses to the northern side of the existing 132 kV line to achieve this minimal traverse of timbered land. The line will then continue across cleared agricultural land for a further 4.6 km before diverging from the existing Beryl – Ulan 132 kV line to run in a west – south/west direction for a further 1.1 km before crossing Stubbo Creek. The divergence is

necessary since the Beryl substation is located near Gulgong and to continue to parallel the line would significantly increase the overall length of the line on route to Wellington.

The proposed line will then continue across cleared agricultural land for a further 2 km before crossing Barneys Reef Road (Merotherie Road) at a point approximately 8 km north of Gulgong. This crossing point was selected to minimise vegetation removal and visual impact. A further 450 m across cleared land the line will cross Slapdash Creek to continue once again across cleared agricultural land for a further 2.3 km to cross the Gwabegar – Wallerawang Railway line.

### 4.4.6 Gwabegar–Wallerawang Railway Line – Castlereagh Highway

(Sheet H, Plan 22-23)

After crossing the Gwabegar-Wallerawang Railway Line the proposed transmission line will continue across cleared agricultural land in a south – west direction for approximately 450 m before crossing Puggoon Siding Road, a further 1.2 km to cross Jacksons Lane, and another 1.1 km to cross the dog-leg in Puggoon Road.

The line will then continue in its south-west direction across cleared land for 1.7 km before it crosses the Castlereagh Highway (Dunedoo Road). The alignment is primarily governed by the need to maximise distance from existing residences while at the same time attempting to avoid remnant woodland.

### 4.4.7 Castlereagh Highway – Goolma Road

(Sheet I-K, Plan 23-29)

After passing over the Castlereagh Highway the line will continue for 950 m through cleared land where an 11 kV transmission line already exists where it will cross the existing Coonabarabran – Beryl – Mudgee 66 kV Transmission Line. After crossing the transmission line it will continue across cleared land for a further 800 m before heading in a westerly direction for 1.4 km where it will cross Spring Ridge Road.

The proposed transmission line will then continue across cleared agricultural land containing numerous scattered isolated trees for 2.2 km where it will turn south – south/west short of Goodman Creek in a lightly timbered area. The line will then continue through cleared land for 1.6 km before turning in a more south-westerly direction for 1.4 km where it will cross Goodman Creek (a tributary of the Gudgegong River), then a further 80 m to cross Mebul Road.

Approximately 300 m south west of Mebul Road the proposed line will cross 160 m of scattered timber to continue for 830 m across cleared agricultural land to cross Gum Gully Road.

On the western side of Gum Gully Road the line will traverse approximately 700 m of forest where it will again travel through cleared agricultural land with scattered isolated trees for a further 4.2 km, crossing Mebul Creek after 2 km, to meet the abandoned railway. A further 970 m across cleared land the transmission line will cross Goolma Road. The alignment is governed by the need to meet the existing Wellington – Beryl 132 kV line near Mount Molly but also avoid the Cudgegong River, remnant vegetation and maximising distance from residences.

### 4.4.8 Goolma Road – Spicer Creek Road

(Sheet K-M, Plan 29-34)

After crossing Goolma Road the proposed line will traverse cleared land for 1.3 km to cross Goolma Creek and its tributary. A further 1.6 km across cleared land containing a few trees, the line will cross Gorries Lane. For a distance of approximately 2 km the proposed line will travel through scattered timber before crossing Gorries Lane again twice, then 1.9 km of lightly scattered timber to cross a tributary of Uamby Creek. A further 1 km through generally cleared land, the proposed line will meet the Wellington – Beryl 132 kV Transmission Line.

The proposed Wollar – Wellington 330 kV will then closely parallel the existing Wellington – Beryl 132 kV Transmission Line through lightly timbered country for approximately 2 km in a westerly direction before turning south west again. The two lines continue parallel for approximately 5.8 km through cleared agricultural land containing isolated trees and lightly scattered timber to cross Spicer Creek Road.

### 4.4.9 Spicer Creek Road – Wellington Substation

(Sheet M-O, Plan 35-42)

From Spicer Creek Road the proposed Wollar – Wellington 330 kV Transmission Line and the existing Wellington – Beryl 132 kV Transmission Line will continue to run adjacent and parallel through cleared areas containing scattered timber in a west – south/westerly direction for approximately 4.7 km before they diverge, with the Wollar – Wellington line heading in a south – west direction across cleared land for almost 2 km, before again turning north-west for 600 m to again run parallel and adjacent to the Wellington – Beryl 132 kV Transmission Line. This divergence is to enable the proposed 330 kV line to cross to the southern side of the existing 132 kV line which in turn enables the lines to diverge again on approach to Wellington Substation.

The two lines will again run parallel and adjacent through cleared agricultural land with isolated trees for 1.1 km in a south – west direction to cross Mitchell Creek and continue parallel for approximately 7.8 km.

The proposed Wollar – Wellington line will then diverge from the existing Wellington – Beryl 132 kV Transmission Line and head south – south/west across

cleared land for 1.3 km to cross The Twelve Mile Road before continuing for a further 832 m where it will head west for approximately 2.2 km before again turning in a north west direction for 750 m where it will turn west for approximately 1.4 km to reach the Wellington Substation. This last deviation was required to avoid the Cadonia Estate rural residential development which is bisected by the existing Wellington to Beryl 132 kV line.

### 4.4.10 Determination of Tower Sites Access Track Locations

The route for the proposed transmission line as described in detail in the preceding section was selected as a result of a consideration of the broad environmental aspects during the corridor selection process and initial stages of the EIS preparation. The locations were then further refined during the course of the detailed EIS studies to avoid as far as practicable adverse ecological, heritage, social, agricultural and land management impacts. The result of this process has been to enable precise locations of each tower along the entire route to be determined and then inspected by the EIS specialists (with only a few exceptions). It has also been possible to negotiate the location of access tracks that are required for construction and ongoing maintenance. Track locations have been determined in close consultation with land owners and agreement has been reached on any upgrading works required. The resultant detailed Project Route Plans are provided in Volume 3 of the EIS.

The environmental constraints, impacts and justification for each individual structure is summarised in Table 4.2 below. The principal matters considered include the distance from residences, where the transmission line will have a visual and social impact, archaeological constraints, existing landuse and vegetation, distance from a natural watercourse due to potential archaeological constraints and ecological issues, access and landowner requirements. As a result of the extensive consideration given to the above matters, the line has been able to be located a significant distance away from residences, schools and other sensitive locations. The following Table 4.1 summarises the proximity of residences to the proposed transmission line alignment.

**Table 4.1 – Distance of the Proposed Transmission Line to Residences**

| Distance from alignment (m) | Number of residences |
|---|---|
| 0 to 200 | Nil |
| 201 to 300 | 6 |
| 301 to 400 | 5 |
| 401 to 600 | 16 |
| 601 to 800 | 19 |
| 801 to 1000 | 5 |
| 1001 to 1200 | 11 |
| 1201 to 1600 | 8 |

Note 1:The closest residence is 250 m for the alignment.
Note 2: The above count excludes houses on land owned by Ulan and Wilpinjong Coal Companies where the alignment has been negotiated with the Coal Companies and may not necessarily correlate with the distance for structures included in Table 4.2. In one case it has been agreed to remove a house in the Wilpinjong mine development area as it would lie partly in the proposed transmission line easement.

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S1A | 550 | 700 | Agriculture | Nil | Nil | Tower located adjacent to the proposed Wollar 330kV Switching Station |
| S2A | 720 | 790 | Agriculture | Nil | Nil | Transmission line route heading west towards the escarpment and away from residence along Barigan Road. Tower located in a saddle adjacent to a fence to reduce impact on farming land |
| S3A | 640 | >1000 | Agriculture | Nil | Nil | Alignment heading west towards the escarpment and generally following southern property boundary to reduce impact on farming activities. |
| S4A | 200 | >1000 | Agriculture | Nil | Nil | Alignment heading west towards the escarpment and generally following the southern property boundary to reduce impact on farming activities. |
| S5A | 160 | >1000 | Agriculture | Nil | Nil | Alignment heading west towards the escarpment and generally follow the southern property boundary. |
| S6 | 140 | >1000 | Agriculture | Nil | Nil | Angle positing chosen to reduce impact on existing trees adjacent to the watercourse between structures S5A and S6. The angle position also allows the line to turn north to follow the timberline along the base of the escarpment. |
| S7 | 250 | >1000 | Agriculture | Nil | Nil | Alignment to skirt woodland along the base of the escarpment with least impact on farming operations and provide a vegetation backdrop to camouflage the towers from Barigan Road. |
| S8 | 400 | >1000 | Agriculture | Nil | Nil | Alignment to skirt woodland along the base of the escarpment with least impact on farming operations. |
| S9 | 700 | >1000 | Agriculture | Nil | Archaeological site found, not impacted | Alignment to skirt woodland along the base of the escarpment with least impact on farming operations. |
| S10 – S14 | >1000 | >1000 | Agriculture | Nil | Nil | Alignment angles to follow the base of the escarpment and skirt woodland and to head for a low area in escarpment to cross the escarpment with minimal visual impact from Wollar village and Mudgee – Wollar Road |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S15 – S17 | >1000 | >1000 | Forest | Some clearing required in EEC Potential habitat Vulnerable bird species | Nil | On top of the ridgeline passing between hill to screen the transmission line from Wollar Village and Wollar – Mudgee. Crosses woodland in order to cross Wollar - Mudgee Road on the western side of a cleared valley. Avoids more extensive woodland. |
| S18 – S20 | >1000 | >1000 | Agriculture | Nil | Nil | Alignment in grazing land and skirts woodland at the base of the escarpment of the Crown Reserve. |
| S21 | >1000 | 730 | Agriculture | Nil | Nil | Alignment in grazing land and skirts woodland at the base of the escarpment of the Crown Reserve. |
| S22 | >1000 | 430 | Forest | Some clearing required. Potential habitat | Nil | Crosses minor woodland area at narrowest point in the valley. Line route angles at this point to skirt the timber along the base of the escarpment of the Crown Reserve. |
| S22.1 | >1000 | 420 | Agriculture | Nil | Nil | Passes close to residences but avoids large area of woodland and mining constraints. Keeps close to woodland and the base of the escarpment for visual impact mitigation |
| S23 | >1000 | 700 | Agriculture | Nil | Nil | Passes close to residences but avoids large area of woodland and mining constraints. Keeps close to woodland and the base of the escarpment for visual impact mitigation |
| S24 | >1000 | 900 | Agriculture | Nil | Nil | Passes close to residences but avoids large area of woodland and mining constraints. Keeps close to woodland and the base of the escarpment for visual impact mitigation. The line route angles to follow the woodland at the base of the escarpment. |
| S25 – S27 | >1000 | >1000 | Agriculture | Nil | Nil | Passes close to residences but avoids large area of woodland and mining constraints. Keeps close to woodland for visual impact mitigation |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S28 | 770 | 660 | Agriculture | Nil | Nil | Passes close to residences but avoids large area of woodland and mining constraints. Keeps close to woodland for visual impact mitigation. Angle tower located on southern side of Ulan – Wollar Road to provide adequate clearance over Ulan – Wollar Road and the crossing of Sandy Hollow – Maryvale railway line. |
| S28.1 | 530 | 450 | Agriculture | Nil | Nil | Angle position in corner of cleared faming line to provided clearance over railway line. |
| S28.2 | 440 | 450 | Agriculture | Nil | Nil | Angle positioned to allow the transmission line to parallels road and railway west towards Ulan. |
| S29 | 300 | 860 | Agriculture | Nil | Nil | Located in grazing line to parallels road and railway |
| S30 | 100 | >1000 | Agriculture | Nil | Archaeological site | Parallels road and railway in farming land between railway and Wilpinjong Creek. Section 87(1) permit to monitor required. |
| S31 | 10 | >1000 | Agriculture | Nil | Nil | Parallels road and railway. Crosses tributary of Wilpinjong Creek |
| S32 | 120 | >1000 | Agriculture | Nil | Archaeological site | Parallels road and railway in cleared farming land. Section 87(1) permit to monitor required. |
| S33 | 150 | 760 | Agriculture | Nil | Nil | Parallels road and railway in cleared faming land. |
| S34 | 230 | 350 | Agriculture | Nil | Nil | Parallels road and railway in cleared farming land. |
| S35 | 130 | 50 | Agriculture | Nil | Archaeological site | Section 87(1) permit to monitor required. Alignment to avoid impact on farm buildings and stockyards on Cumbo Station. |
| S36A | 20 | 300 | Agriculture | Nil | Nil | Parallels road and railway in cleared farmland crossing Wilpinjong Creek. |
| S37A | 20 | 620 | Agriculture | Nil | WC-PAD 1 | Avoids Wilpinjong mine extraction area but passes through proposed Environment and Conservation Area. Parallels road and railway. Alignment to reduce impact on Wilpinjong Creek. Section 87(1) permit for test excavation will be required at this archaeological site. |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S38 | 20 | 700 | Agriculture | Nil | WC-PAD 2 | Angle positioned to continue in parallel with road and railway. Avoids Wilpinjong mine extraction area but passes through Environment and Conservation Area. Section 87(1) permit for test excavation will be required at this archaeological site. |
| S39 | 40 | 450 | Agriculture | Nil | Nil | Angle positioned to continue in parallel with road and railway. Avoids Wilpinjong mine extraction area. |
| S40 | 130 | 500 | Agriculture | Nil | Nil | Parallels road and railway. Avoids Wilpinjong mine extraction area. |
| S41 | 70 | 300 | Agriculture | Nil | Archaeological site | Parallels road and railway. Section 87(1) permit to monitor required. |
| S42 | 150 | 250 | Agriculture | Nil | Nil | Generally parallels road and railway located between Wilpinjong Creek and railway line. |
| S43 | 230 | 130 | Agriculture | Nil | Nil | Parallels road and railway with sufficient distance from the railway line to allow the future relocation of the Ulan – Wollar road to the northern side of the railway line to avoid future mining operations. |
| S44 | 160 | 300 | Agriculture | Nil | Nil | Parallels road and railway with sufficient distance from the railway line to allow the future relocation of the Ulan – Wollar road to the northern side of the railway line to avoid future mining operations. |
| S45 | 100 | 25 | Agriculture | Nil | Nil | Parallels road and railway with sufficient distance from the railway line to allow the future relocation of the Ulan – Wollar road to the northern side of the railway line to avoid future mining operations. The alignment crosses Nana Lane. |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S46 | 25 | 85 | Agriculture | Nil | Archaeological site | Property owned by Excel Mining. There is an agreement to permanently vacate the residence. Section 87(1) permit to monitor required. Parallels road and railway with sufficient distance from the railway line to allow the future relocation of the Ulan – Wollar road to the northern side of the railway line to avoid future mining operations. |
| S47 | 210 | 200 | Agriculture | Nil | Nil | Parallels road and railway with sufficient distance from the railway line to allow the future relocation of the Ulan – Wollar road to the northern side of the railway line to avoid future mining operations. |
| S48 | 180 | 600 | Agriculture | Nil | Nil | Parallels road and railway with sufficient distance from the railway line to allow the future relocation of the Ulan – Wollar road to the northern side of the railway line and minimum impact on Wilpinjong Creek. |
| S49 | 120 | >1000 | Agriculture | Nil | Nil | Parallels road and railway with sufficient distance from the railway line to allow the future relocation of the Ulan – Wollar road to the northern side of the railway line. |
| S50 | 100 | >1000 | Agriculture | Nil | Nil | Parallels road and railway with sufficient distance from the railway line to allow the future relocation of the Ulan – Wollar road to the northern side of the railway line. |
| S51 | 60 | >1000 | Agriculture | Nil | Archaeological site | Section 87(1)permit to monitor required. Parallels road and railway with sufficient distance from the railway line to allow the future relocation of the Ulan – Wollar road to the northern side of the railway line. |
| S52 | 120 | 920 | Agriculture | Nil | Nil | Parallels road and railway with sufficient distance from the railway line to allow the future relocation of the Ulan – Wollar road to the northern side of the railway line. |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S53 | 90 | 410 | Agriculture | Nil | WC-OS17 with PAD | Section 87(1) permit for test excavation will be required at this archaeological site. Crosses Wilpinjong Creek to avoid area where the creek is adjacent to railway line. |
| S54 | 60 | 160 | Agriculture | Nil | Nil | Crosses Wilpinjong Creek to avoid area where the creek in located in the woodland at the base of the escarpment adjacent to Goulbourn River National Park. |
| S55 | 70 | 450 | Agriculture | Nil | Nil | Diverges away from parallel with road and railway to cross low area in a small ridge system to avoid following the railway and road through woodland area adjacent to Wilpinjong Creek. |
| S56 | 330 | 900 | Forest | Clearing required may cause habitat fragmentation | Nil | Deviation through woodland due to inability to continue paralleling road and railway corridor without affecting Wilpinjong Creek and floodplain. |
| S57 | 500 | >1000 | Forest | Clearing required may cause habitat fragmentation | Nil | Deviation through woodland due to inability to continue paralleling road and railway corridor without affecting Wilpinjong Creek and floodplain. |
| S58 | 350 | 760 | Forest | Clearing required may cause habitat fragmentation | Nil | Deviation through woodland due to inability to continue paralleling road and railway corridor without affecting Wilpinjong Creek and floodplain. |
| S59 Not surveyed | 100 | 410 | Agriculture | Nil | Nil | Access not available, alignment chosen to generally follow the railway line and provide separation from dwelling located adjacent to the railway. The alignment will impact on old clay mining area. |
| S60 Not surveyed | 30 | 460 | Agriculture | Nil | Nil | Access not available, alignment crosses Wilpinjong Creek and provide separation from existing dwelling adjacent to railway line. |
| S61 Not surveyed | 130 | 400 | Agriculture | Nil | Nil | Access not available, alignment chosen to again follow railway line and corridor existing infrastructure in the area. |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S62 Not surveyed | 130 | 260 | Agriculture | Nil | Nil | Access not available, alignment chosen to follow railway line and corridor existing infrastructure in the area. |
| S63 Not surveyed | 80 | 340 | Agriculture | Nil | Nil | Access not available, alignment chosen to follow railway line and corridor existing infrastructure in the area. Angle position before crossing railway line. |
| S64 | 360 | 400 | Agriculture | Nil | Nil | Alignment chosen to run between road and railway line through Ulan Coal property and to avoid impacts on future mine infrastructure. |
| S65 | 300 | 680 | Agriculture | Nil | Nil | Alignment chosen to run between road and railway line through Ulan Coal property and to avoid impacts on future mine infrastructure. |
| S66 | 350 | 980 | Agriculture | Nil | Nil | Alignment chosen to run between road and railway line through Ulan Coal property and to avoid impacts on future mine infrastructure. Structures 67, 68 and 69 do not exist. |
| S70 | 450 | >1000 | Agriculture | Nil | Nil | Alignment chosen to run between road and railway line through Ulan Coal property and to avoid impacts on future mine infrastructure. |
| S71 | 550 | >1000 | Agriculture | Nil | Nil | Alignment chosen to run between road and railway line through Ulan Coal property and to avoid impacts on future mine infrastructure. |
| S72 | 450 | >1000 | Agriculture | Nil | Nil | Alignment chosen to run between road and railway line through Ulan Coal property and to avoid impacts on future mine infrastructure. |
| S72.1 | 380 | >1000 | Agriculture | Nil | Nil | Alignment chosen to run between road and railway line through Ulan Coal property and to avoid impacts on future mine infrastructure. |
| S73A | 430 | >1000 | Agriculture | Nil | Nil | Alignment agreed with Ulan Coal Company to avoid mine operational area and coal reserves south of Ulan Road |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S74 | 550 | >1000 | Agriculture | Nil | Nil | Alignment agreed with Ulan Coal Company to avoid mine operational area and coal reserves south of Ulan Road |
| S75 | 690 | >1000 | Agriculture | Nil | Nil | Alignment agreed with Ulan Coal Company to avoid mine operational area and coal reserves south of Ulan Road |
| S76 | 900 | >1000 | Agriculture | Nil | Nil | Alignment agreed with Ulan Coal Company to avoid mine operational area and coal reserves south of Ulan Road |
| S77 | 900 | >1000 | Agriculture | Nil | Nil | Alignment agreed with Ulan Coal Company to avoid mine operational area and coal reserves south of Ulan Road |
| S78 | 690 | 900 | Agriculture | Nil | Nil | Alignment agreed with Ulan Coal Company to avoid mine operational area and coal reserves south of Ulan Road |
| S79 | 340 | 530 | Agriculture | Nil | Nil | Alignment agreed with Ulan Coal Company to avoid mine operational area and coal reserves south of Ulan Road |
| S80 | 100 | 200 | Agriculture | Nil | Archaeological site | Alignment agreed with Ulan Coal Company to avoid mine operational area and coal reserves south of Ulan Road. Section 87(1) permit to monitor required. |
| S81 | 400 | 220 | Agriculture | Nil | Nil | Angle structure located to maximise distance from Ulan township for next leg toward existing Ulan – Beryl 132kV transmission line. |
| S82 | 80 | 280 | Forest | Some clearing required | Nil | Shortest distance to existing Ulan – Beryl T/L. Alignment agreed with Ulan Coal Company. |
| S83 | 300 | 450 | Forest | Some clearing required | Nil | Shortest distance to existing Ulan – Beryl T/L. Alignment agreed with Ulan Coal Company |
| S84 | 760 | 500 | Forest | Some clearing required Vulnerable bird species | Nil | Shortest distance to existing Ulan – Beryl T/L. Alignment agreed with Ulan Coal Company. |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S85 | 930 | 820 | Forest | Some clearing required Vulnerable bird species | Nil | Shortest distance to existing Ulan – Beryl T/L. Alignment agreed with Ulan Coal Company |
| S86 | >1000 | 930 | Forest | Some clearing required | Nil | Shortest distance to existing Ulan – Beryl T/L. Alignment agreed with Ulan Coal Company. |
| S87 | >1000 | 900 | Forest | Some clearing required | Nil | Shortest distance to existing Ulan – Beryl T/L. Alignment agreed with Ulan Coal Company |
| S88 | >1000 | 900 | Forest | Some clearing required | Nil | Shortest distance to existing Ulan – Beryl T/L. Alignment agreed with Ulan Coal Company |
| S89 | 770 | 720 | Forest | Some clearing required in EEC | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line and local power line. Alignment agreed with Ulan Coal Company. |
| S90 | 400 | 550 | Forest | Some clearing required | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line and local power line. Alignment agreed with Ulan Coal Company |
| S91 | 20 | 630 | Agriculture | Nil | CT-OS7 | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line and local power line. archaeological site now avoided |
| S92 | 350 | 850 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line and local power line.. |
| S93 | 700 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line and local power line. |
| S94A | 680 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan - Beryl 132kV transmission line and local power line. |
| S95 | 250 | 950 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan - Beryl 132 transmission line and local power line. |
| S96 | 150 | 850 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line and local power line. |
| S97 | 170 | 720 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line and local power line. |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S98 | 230 | 540 | Agriculture | Nil | Nil | Line will run parallel and adjacent to the existing transmission line. Minor deviation to move the alignment closer to the existing Ulan – Beryl 13kV transmission line to taken into account that the existing local power line deviates towards the north away from the parallel corridor. |
| S99A | 50 | 500 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line. |
| S100A | 100 | 660 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line. |
| S101 | 540 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line. |
| S102A | 950 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing transmission line. |
| S103 | 660 | >1000 | Forest | Minor clearing | Nil | Line will run in close parallel and adjacent to existing Ulan – Beryl 132kV transmission line and skirts a section of Cope SF. Distance to existing line reduced to minimise necessary easement clearing. |
| S104 | 360 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line. |
| S105 | 150 | 800 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line. |
| S106 | 200 | 550 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line. |
| S107 | 30 | 600 | Agriculture | Isolated trees | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line. |
| S108 | 100 | 800 | Agriculture | Isolated trees | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line. |
| S109 | 30 | 700 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing transmission line. |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S110 | 20 | 360 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line. Crosses over to the northern side of existing 132kVline. |
| S111 | 140 | 250 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing Ulan – Beryl 132kV transmission line on northern side. |
| S112 | 150 | 440 | Agriculture | Nil | BSR-OS8 | Line will run parallel and adjacent to existing 132kV transmission line. Section 87(1) permit for test excavation will be required at this archaeological site. Tower site located to avoid large gully adjacent to Blue Springs Road. |
| S113 | 20 | 700 | Agriculture | Minor clearing | Nil | Line will run parallel and adjacent to existing transmission line. |
| S114 | 300 | 920 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing 132kV transmission line. |
| S115 | 350 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing 132kV transmission line. |
| S116 | 30 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing 132kV transmission line. |
| S117 | 330 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing 132kV transmission line. |
| S118 | 250 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing 132kV transmission line. |
| S119 | 400 | >1000 | Agriculture | Minor clearing | Nil | Line will run parallel and adjacent to existing 132kV transmission line. |
| S120 | 400 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing 132kV transmission line. |
| S121 | 450 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing 132kV transmission line. |
| S122A | 700 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing 132kV transmission line. |
| S123 | 650 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing 132kV transmission line. |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S124 | 260 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing 132kV transmission line. |
| S125 | 600 | >1000 | Agriculture | Nil | Nil | Line will run parallel and adjacent to existing 132kV transmission line. |
| S126 | 500 | >1000 | Agriculture | Nil | Nil | Existing Ulan – Beryl 132kV transmission line divergence south away from the parallel to head towards the existing Beryl 132/66kV substation. The alignment of the new 330kV line will continues in straight line to avoid woodland areas. |
| S127 | 200 | >1000 | Agriculture | Nil | Nil | No constraints. Maintain straight alignment. |
| S128 | 20 | >1000 | Agriculture | Minor clearing along creek | Archaeological site BSR-OS8 | Section 87(1) permit to monitor required. Maintain straight alignment. |
| S129 | 370 | >1000 | Agriculture | Nil | Nil | No constraints. Maintain straight alignment. |
| S130 | 710 | >1000 | Agriculture | Nil | Nil | No constraints. Maintain straight alignment. |
| S131 | >1000 | >1000 | Agriculture | Nil | Nil | No constraints. Maintain straight alignment |
| S132 | 850 | >1000 | Agriculture | Nil | Nil | Angle structure to negotiate crossing Barneys Reef Road and to avoid vegetation |
| S133 | 460 | 800 | Agriculture | Nil | Nil | Angle structure to negotiate crossing Barneys Reef Road and to avoid vegetation |
| S134 | 30 | 430 | Agriculture | Nil | Archaeological site | Section 87(1) permit to monitor required. Crossing of Slapdash Creek. Structure located away from creek. |
| S135 | 280 | 300 | Agriculture | Nil | Nil | Structure located away from Slapdash Creek bank |
| S136 | 670 | 600 | Agriculture | Nil | Nil | Alignment chosen to avoid residences and isolated shade trees. |
| S137 | 980 | 950 | Agriculture | Nil | Nil | Alignment chosen to avoid residences and isolated trees |
| S138 | >1000 | >1000 | Agriculture | Nil | Nil | Alignment chosen to avoid residences and isolated trees. |
| S139 | >1000 | 950 | Agriculture | Nil | Nil | Alignment chosen to avoid residences. Crossing of Gwabegar – Wallerawang railway line |
| S140 | >1000 | 550 | Agriculture | Nil | Nil | Alignment chosen to avoid residences. |
| S141 | >1000 | 250 | Agriculture | Nil | Nil | Alignment chosen to avoid residences. |
| S142 | >1000 | 500 | Agriculture | Nil | Nil | Alignment chosen to avoid residences and isolated shade trees. |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S143 | >1000 | 860 | Agriculture | Nil | Nil | Alignment chosen to avoid residences with minimum impact on trees along Jacksons Lane. Crossing of Jacksons Lane |
| S144 | >1000 | >1000 | Agriculture | Nil | Nil | Alignment chosen to avoid residences |
| S145 | 550 | >1000 | Agriculture | Nil | Nil | Alignment chosen to avoid residences |
| S146 | 150 | >1000 | Agriculture | Nil | Nil | Alignment chosen to avoid residences with minimum impact on trees along Puggoon Road. Crossing of Puggoon Road |
| S147 | 250 | >1000 | Agriculture | Nil | Nil | Alignment chosen to avoid residences and woodland area. |
| S148 | 600 | 850 | Agriculture | Nil | Nil | Alignment chosen to avoid residences woodland area. |
| S149A | 850 | 450 | Agriculture | Nil | Nil | Alignment chosen to avoid residences. Structure located near existing fence to reduce impact on cultivation paddock. |
| S150 | 600 | 200 | Agriculture | Nil | Nil | Crossing of Castlereagh Highway to stay north of Wialdra Creek and away from residents |
| S151A | 300 | 400 | Agriculture | Nil | Nil | Crossing of Castlereagh Highway to stay north of Wialdra Creek and away from residents. Structure located near existing fence to reduce impact on cultivation paddock. |
| S152A | 200 | 650 | Agriculture | Nil | Nil | Crossing of Castlereagh Highway to stay north of Wialdra Creek and away from residents |
| S153A | 370 | 600 | Agriculture | Nil | Nil | Crossing of Castlereagh Highway to stay north of Wialdra Creek and away from residents. Crossing of existing 66kV transmission line. |
| S154 | 170 | 370 | Agriculture | Nil | Nil | Crossing of Castlereagh Highway to stay north of Wialdra Creek and away from residents. Structure located near fence to reduce impact on cultivation paddock. |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S155 | 120 | 400 | Agriculture | Nil | Archaeological site WC-IF1 | Angle structure located to ultimately avoid woodland south of structure 164. Section 87(1) permit to monitor required. Structure located near fence to reduce impact on farming operations |
| S156A | 550 | 650 | Agriculture | Nil | Nil | Alignment to avoid woodland south of structure 164. Structure located near fence to reduce impact on cultivated paddock. |
| S157A | 650 | 550 | Agriculture | Nil | Nil | Alignment to avoid woodland south of structure 164.Structure located top of ridge to reduce impacts on cultivated areas and provide separation for local residence. |
| S158 | 950 | 800 | Agriculture | Nil | Nil | Alignment to avoid woodland south of structure 164. Structure located adjacent to Spring Ridge Road. Crossing of Spring Ridge Road. |
| S159A – S160 | >1000 | >1000 | Agriculture | Nil | Nil | Alignment to avoid woodland south of structure 164 and isolated trees east of structure 159A. Structure 159A located near fence to reduce impact on cultivation paddock. |
| S161 | >1000 | 900 | Agriculture | Nil | Nil | Alignment to avoid woodland south of structure 164. Alignment passes north of Blue Biddy Mountain. |
| S162 | 880 | 660 | Agriculture | Nil | Nil | Alignment to avoid woodland south of structure 164. Alignment passes north of Blue Biddy Mountain. |
| S163 | 420 | 330 | Agriculture | Nil | Nil | Alignment to avoid woodland south of structure 164. Alignment passes north of Blue Biddy Mountain. |
| S164 | 70 | 350 | Agriculture | Minor clearing, Vulnerable bird species detected | Nil | Angle structure to redirect alignment to cleared land and passes west of Blue Biddy Mountain. |
| S165A | 150 | 670 | Agriculture | Nil | Nil | Alignment to avoid woodland and crossing of unnamed creek. Structure located to reduce the impact on cultivated area. |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S166 | 230 | >1000 | Agriculture | Nil | Nil | Alignment to avoid woodland. Structure located on low stony ridge system to avoid cultivation paddocks. |
| S167 | 290 | >1000 | Agriculture | Nil | Nil | Alignment chosen to reduce impact on cultivation paddocks and woodlands adjoining Blue Biddy Mountain. |
| S168 | 150 | >1000 | Agriculture | Nil | Nil | Angle to intersect at a saddle in the ridge system at structure 172. Alignment to reduce impact on cultivation paddocks and woodlands adjoining Blue Biddy Mountain. |
| S169 | 230 | >1000 | Agriculture | Nil | Nil | Alignment located in grazing paddocks. |
| S170 | 200 | 990 | Agriculture | Nil | Nil | Alignment though valley. Structure located in grazing paddock. |
| S171 | 60 | 660 | Agriculture | Nil | Nil | Structure 171 located near fence to reduce impact on cultivation paddock. |
| S172 | 430 | 600 | Agriculture | Minor clearing | Nil | Angle structure 172 located in saddle on the ridge system to reduce visual impact from Mebul Road and provide suitable crossing of the ridge with one tower. |
| S173 | 870 | 840 | Agriculture | Nil | Nil | Alignment chosen to use existing ridge systems to maximise spaning and avoid vegetation clearing |
| S174 | >1000 | >1000 | Agriculture | Nil | Nil | Best alignment to avoid vegetation clearing. Crossing Gum Gully Road. |
| S175 – S176 | >1000 | >1000 | Forest | Threatened woodland birds | Nil | Alignment chosen to minimise clearing, only two towers are located in woodland |
| S177 | >1000 | >1000 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S178 | 700 | 770 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S179 | 430 | 700 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S180 | 150 | 700 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland. Crossing Mebul Creek. |
| S181 | 120 | 900 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S182 | 430 | >1000 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S183 | 250 | >1000 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S184 | 520 | >1000 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S185 | 300 | >1000 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S186 | 150 | >1000 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S187 | 600 | >1000 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland. Crossing of Goolma Road. |
| S188 | 220 | >1000 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S189 | 200 | >1000 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S190 | 70 | >1000 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland. Crosses Goolma Creek. |
| S191 | 80 | >1000 | Agriculture | Nil | GC-OS5 with PAD | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland. Section 87(1) test excavation within impact footprint of tower required. Tower moved 45 m to reduce impact on archaeological site |
| S192 | 300 | >1000 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S193 | 550 | >1000 | Agriculture | Minor clearing | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland. Crosses Gorries Lane. |
| S194 | 550 | >1000 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S195 | 720 | >1000 | Agriculture | Minor clearing | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S196 | 560 | >1000 | Agriculture | Minor clearing | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S197 | 220 | >1000 | Agriculture | Minor clearing in EEC | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland. Crosses Uamby Road. |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S198 | 160 | 900 | Agriculture | Minor clearing in EEC, Vulnerable bird species detected | Site CR-OS4 with PAD | Attempt to relocated this tower was not successful. Crosses Uamby Road. Section 87(1) Test excavation of tower foundations required |
| S199 | 450 | 500 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S200 | 720 | 530 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S201 | 520 | 800 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S202 | 290 | >1000 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S203 | 360 | 700 | Agriculture | Nil | Nil | Alignment chosen on basis of shortest distance to existing Wellington-Beryl T/L that still maximises distance from houses and avoids woodland |
| S204 | 220 | 350 | Agriculture | Nil | Nil | Angle structure adjacent to the existing Wellington-Beryl T/L near Mount Molly. The transmission line will parallel the existing 132kV line on the northern side. |
| S205 | 420 | 260 | Forest | Some clearing required | Nil | Parallels existing Wellington-Beryl T/L |
| S206A | 150 | 400 | Forest | Some clearing required | Nil | Parallels existing Wellington-Beryl T/L |
| S207 | 120 | 700 | Forest | Clearing required in EEC | Nil | Parallels existing Wellington-Beryl T/L |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S208 | 220 | >1000 | Forest | Some clearing required in EEC | Nil | Parallels existing Wellington-Beryl T/L |
| S209 | 330 | >1000 | Forest | Some clearing required in EEC. Vulnerable bird species | Nil | Parallels existing Wellington-Beryl T/L |
| S210 | 500 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S211 | 220 | >1000 | Agriculture | Some clearing required in EEC | Nil | Parallels existing Wellington-Beryl T/L |
| S212 | 200 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S213 | 120 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S214 | 50 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S215 | 250 | >10000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S216 | 200 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S217 | 130 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S218 | 120 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S219 | 70 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S220 | 190 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S221 | 140 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S222 | 250 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S223 | 450 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S224 | 70 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S225 | 330 | >1000 | Agriculture | Some clearing required in EEC | Nil | Parallels existing Wellington-Beryl T/L |
| S226 | 330 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S227 | 220 | >1000 | Agriculture | Minor clearing in EEC | Nil | Parallels existing Wellington-Beryl T/L |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S228 | 220 | 1000 | Agriculture | Minor clearing in EEC | Nil | Parallels existing Wellington-Beryl T/L |
| S229 | 200 | 900 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S230 | 380 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S231 | 200 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S232 | 200 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S233 | 400 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S234 | 170 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S235 | 100 | >1000 | Agriculture | Nil | Nil | Minor deviation to cross over existing line, facilitating the later divergence around Cadonia Estate and transmission line connections to Wellington Substation. |
| S236 | 100 | >1000 | Agriculture | Nil | Nil | Alignment deviates from the parallel with the existing Wellington – Beryl T/L to satisfy landowner requirements to reduce impact on trees. |
| S237 | 450 | >1000 | Agriculture | Nil | Nil | Alignment deviates from the parallel with the existing Wellington – Beryl T/L to satisfy landowner requirements to reduce impact on trees. |
| S238 | 750 | >1000 | Agriculture | Nil | Nil | Alignment deviates from the parallel with the existing Wellington – Beryl T/L to satisfy landowner requirements to reduce impact on trees. |
| S239-S241 | >1000 | >1000 | Agriculture | Nil | Nil | Alignment deviates from the parallel with the existing Wellington – Beryl T/L to satisfy landowner requirements to reduce impact on trees. At structure 241 the alignment rejoins the parallel with the existing Wellington – Beryl 132kV transmission line. |
| S242 | 680 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S243 | 220 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L. Crosses Mitchell Creek. |
| S244 | 200 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S245 | 450 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S246 | 200 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S247 | 300 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S248 | 680 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S249-S256 | >1000 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S257 | 650 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S258 | 300 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S259 | 100 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S260 | 550 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L |
| S261 | 150 | >1000 | Agriculture | Nil | Nil | Parallels existing Wellington-Beryl T/L. Alignment deviates south to avoid Cadonia Estate |
| S262 | 300 | >1000 | Agriculture | Nil | Nil | Deviation around Cadonia Estate. Alignment parallels existing fence line. |
| S263 | 120 | 900 | Agriculture | Nil | Nil | Deviation around Cadonia Estate. Alignment parallels existing fence line. Crosses Twelve Mile Road. |
| S264 | 200 | 720 | Agriculture | Nil | Nil | Deviation around Cadonia Estate. Alignment parallels existing fence line and property boundary. |
| S265 | 120 | 750 | Agriculture | Nil | Nil | Deviation around Cadonia Estate. Alignment parallels existing fence line and property boundary. |
| S266 | 300 | 850 | Agriculture | Nil | Nil | Deviation around Cadonia Estate. Crosses existing 11kV power line. Alignment angles toward the west to span valley. |
| S267 | 120 | 760 | Agriculture | Nil | Nil | Deviation around Cadonia Estate. Alignment located behind local ridge system to screen the transmission line from local residence, Cadonia Estate and Wellington |
| S268 | 50 | 800 | Agriculture | Some clearing required in EEC | Nil | Deviation around Cadonia Estate. Alignment located behind local ridge system to screen the transmission line from local residence, Cadonia Estate and Wellington |
| S269 | 50 | 700 | Agriculture | Nil | Nil | Deviation around Cadonia Estate. Alignment located behind local ridge system to screen the transmission line from local residence, Cadonia Estate and Wellington |
| S270 | 60 | 350 | Agriculture | Nil | Nil | Deviation around Cadonia Estate. Alignment located behind local ridge system to screen the transmission line from local residence, Cadonia Estate and Wellington |

**Table 4.2 – Environmental Summary of Supporting Structures**

| Tower Number | Nearest Natural Watercourse (m) | Nearest Residence (m) | Landuse | Threatened Flora/Fauna | Archaeological Issues | Justification of Location |
|---|---|---|---|---|---|---|
| S271 | 50 | 500 | Agriculture | Nil | Nil | Angle structure located for correct approach to Wellington Substation. Alignment located behind local ridge system to screen the transmission line from local residence, Cadonia Estate and Wellington |
| S272 | 110 | 550 | Agriculture | Nil | Nil | Alignment necessary to approach Wellington Substation |
| S273 | 40 | 550 | Agriculture | Nil | Nil | Alignment necessary to approach Wellington Substation |
| S274 | 350 | 600 | Agriculture | Nil | Nil | Alignment necessary to approach Wellington Substation |
| S275 | 160 | 650 | Agriculture | Nil | Nil | Alignment necessary to approach Wellington Substation |
| S276 | 250 | 650 | Agriculture | Nil | Nil | Alignment necessary to approach Wellington Substation |

## 4.5 Physical Components of the Transmission Line

A three phase alternative current transmission line comprises supporting structures between which are strung the conductor cables that transmit the electricity and overhead shielding wires. It is envisaged that the single circuit transmission line to be constructed will carry twin conductors of approximately 27 mm in diameter, spaced 380 mm apart and two overhead ground wires, one being an optical fibre ground wire. These will be supported by rectangular or square-based, steel lattice towers throughout, with typical tower heights ranging from 22 to 36 m and tower spacings typically 400 m according to terrain. Longer and shorter spans will be used according to terrain conditions and constraints. Overall, a total of 277 structures will be erected over a line length of 117 km.

### 4.5.1 Supporting Structures

Supporting structures are required at regular intervals along the line to ensure that adequate and safe clearance is maintained. The exact location of each structure has been determined and is shown on the attached route plans in Volume 3 of this EIS. The supports will be self supporting galvanised steel, lattice towers with the three phases arranged horizontally, spaced at approximately 10.5 m between phases.

The transmission line will include two basic structure types – suspension and tension. The majority of the structures (over 90%) will be suspension structures with tension structures used at angle positions and where other engineering requirements dictate the use of a tension structure.

Suspension structures are designed to "suspend" the conductors. They are used in straight line positions or where very small angles are encountered. The suspension structure is designed to carry the vertical and transverse load from the conductors as well as horizontal wind loads on the conductors and on the support structure itself. All suspension structure types have crossarms from which the conductors are suspended on insulators. Suspension structures are supported on reinforced concrete foundations at each corner leg. The foundations typically reach 300 mm above ground level but may extend up to a metre above ground level.

Tension structures are designed to "terminate" conductors. They are of heavier construction than the suspension structures as they are designed to withstand much larger horizontal loads resulting from directional change in the transmission line as well as longitudinal loads from the termination of the conductors on the structure, as well as vertical loads and horizontal wind load. The conductors are attached to the crossarms by means of a twin insulator arrangement, in line with the conductors. Each crossarm carries two such insulator arrangements, one in each direction of the line. Electrical continuity is maintained from one side of the structure to the other by a "jumper" below each crossarm. The above ground appearance of tension structure foundations will be very similar to the suspension structure foundations, although the footings are much larger below ground.

Table 4.3 shows typical characteristics of the supporting towers. It should be noted however, that the stated figures are indicative only, and may be altered to suit local requirements at each site.

**Table 4.3 – Typical Structure Characteristics**

| | **Supporting Towers** | |
|---|---|---|
| | **Suspension** | **Tension** |
| Typical Use | Along straight line sections | At major directional changes and railway crossings. |
| Max Height (m) | 36.0 | 38.0 |
| Average Height (m) | 28.0 | 28.0 |
| Max Dimension of Base (m) | 9.6 x 4.7 | 12.3 x 12.3 |
| Max Height to cross-arm (m) | 32 | 28 |
| Insulator Arrangement | Suspension Arrangement | Longitudinal Tension Arrangement |
| Foundation Type | Four Bored Footing | Four bored or mass concrete footing |
| Typical Average Span on Level Ground | 400 | 400 |

### 4.5.2 Conductors

The current carrying conductors are of multi-strand construction consisting of several layers of aluminium strands surrounding a steel stranded core, with each conductor being approximately 27 mm in diameter. There will be 6 conductors on this transmission line arranged in three pairs.

### 4.5.3 Insulators

Electrical insulation between the current-carrying conductors and the supporting structures is provided by means of a fibreglass reinforced composite synthetic insulators. Insulation between the conductors in the span is provided by the spacing in air.

### 4.5.4 Earthwires

Above the conductors are two overhead earthwires. The earthwires shield the power-carrying conductors from lightning strikes that might otherwise strike the conductors. The electrical discharge is then transferred along the earthwires to the supporting structures, which are earthed. In the event of a power fault the earthwires carry much of the fault current and contribute to the safety of the line and its environment.

One overhead earthwire will comprise aluminium alloy cable approximately 16 mm in diameter, near either end of the line and 11.3 mm galvanised steel wire for the remainder of the line. The other earthwire will be strung with Optical Fibre Ground Wire (OPGW) with an approximate diameter of 20 mm. The OPGW will provide a communications link between the two end points of the line for the transfer of power system protection signalling, and for voice and data communications.

## 4.6 Ground Clearance

The conductors will be strung so that a minimum clearance from the ground of 9 m is maintained under all operating conditions. The height and spacing of individual supporting structures will vary depending on the terrain, vegetation etc. A typical height structure will be 28 m, with taller and shorter structures being used as required to suit the terrain.

Additional clearance, usually necessitating tall supporting structures, will be provided to cross features such as rivers, roads, railway tracks and other transmission lines. The line will be designed to meet design clearances when the conductors are operating at their highest temperature and hence have sagged the greatest amount. Under normal operating conditions ground clearances will be significantly greater than the minimum.

## 4.7 Associated Infrastructure

### 4.7.1 New Switching Station in Wollar

A switching station is used to connect multiple transmission lines operating at the same voltage in an operationally flexible and safe manner. It allows the electrical power from a number of sources to be connected to consumers, allowing greater flexibility in operation.

A switching station is similar to a substation except that it does not require transformers as the incoming and outgoing transmission lines operate at the same voltage. The Bayswater to Mt Piper 500 kV transmission line is operating at 330 kV at present. When this transmission line is energised to 500 kV the switching station will be converted into a 500/330 kV substation by the installation of a transformer.

The switching station site will need to be of a size to permit future conversion and a 24 ha site will therefore be required. The switching station will comprise a fenced switchyard on a bench of about 600 m by 400 m and will include a control building about 20 m x 16 m.

Constraints relevant to the selection of a switching station site include:

- Suitable access to allow heavy vehicles access when a transformer is required in the future;
- Reasonably level ground and close proximity to the Bayswater to Mt Piper transmission line;
- No subsidence;
- Screened or screenable from surrounding environment;

- ❒ Line routes available for proposed transmission line;
- ❒ No prohibition under any planning instrument;
- ❒ Minimum community impact; and
- ❒ Low impact on biodiversity including habitat conditions, conservation status, threatened flora and fauna, indigenous and non-indigenous heritage and visual impact.

While the new switching station proposed at Wollar is essential to the operation of the proposed 330 kV transmission line assessed in this EIS, the switching station, its access road and connections to the existing 500 kV transmission line do not form part of this EIS. Approval for the switching station will be sought under a separate process through Mid-Western Regional Council.

### 4.7.2 Augmentation of Wellington 330 kV Substation

In order to connect the new 330 kV line into Wellington Substation, it will be necessary deviate the last two spans (approximately 1.3 km) of the existing Mt Piper to Wellington 330 kV transmission line into the substation. This will involve replacing an existing suspension tower with a tension tower and the stringing of conductors and earthwires for the existing Mt Piper to Wellington 330 kV transmission line between existing towers 398 and existing tower 400B adjacent to the substation. The assessment for the deviation of the existing Mt Piper to Wellington 330 kV line is part of this EIS.

Other substation works inside the substation boundaries are also required. These works do not form part of this assessment and will be assessed separately.

### 4.7.3 Connections to Wollar Substation

To connect the new substation to the existing 500 kV transmission line will involve loop connecting the northern circuit (74 line) of the existing double circuit line into the new substation. This will involve replacing an existing double circuit suspension tower with a double circuit tension tower to facilitate the connection of the Bayswater to Mt Piper transmission line (74 Line). The approval for this work will be included as part of the approval process for the new Wollar substation.

## 4.8 Easement Requirements

It is TransGrid's policy to acquire easements for its transmission lines. The easement for the transmission line has two major functions, it:

- ❒ provides right of access to TransGrid to construct, operate and maintain the line;
- ❒ provides for clearing of vegetation; and

- ensures the safety of the public and the security of the line by restricting certain activities within the easement area.

TransGrid's standard width of the easement for a 330 kV transmission line is 60 m. The 60 m wide easement allows for long spanning distances between structures and for the removal of most trees that could fall on the transmission line.

Within the easement, certain rights and limitations are applied to both the landowner and TransGrid. These limitations are designed to ensure the two primary functions of the easement are fulfilled for the life of the transmission line.

At some locations TransGrid may acquire easement rights for access to the transmission line where this access is not available within the transmission line easement. The easement for access will generally be 4 m wide and ensures that future development does not impede access to the transmission line during construction, operation and maintenance of the line.

In exchange for easement rights, property owners are entitled to compensation based on the impact of the easement. The ownership of the land involved does not change and, although there are constraints on the use of the land within the easement, most normal agricultural activities can continue unaffected.

## 4.9 Construction Procedures

The construction of the transmission line will have a number of discrete activities and these are described below. The specific pattern of construction activities will generally follow this sequence although some activities may be carried out concurrently depending on the work program, the availability of labour and equipment, and extent of work at any specific location.

### 4.9.1 Centreline and Easement Surveys

The line design and structure locations along the preferred alignment have been completed using ground level data drawn from topographic information obtained by laser survey and photogrammetry.

Survey teams have confirmed each structure location and carried out "check" survey to confirm ground levels and site conditions. Some structure locations have been revised to suit ground conditions, environmental protection and additional property owner requirements following the check survey.

Easement surveys for the majority of the preferred alignment have been completed with plans for proposed easements registered at the Lands Title Office. Acquisition of the transmission line easement will progress following approval of the project.

### 4.9.2 Access Track Construction

Access to each new structure location will be required. Access will also be required to temporary sites needed for storing conductor drums, winching and breaking equipment during the conductor stringing.

Where possible existing access tracks will be used with upgrading of these tracks where required. Where new access is required, the location has been determined by the prevailing conditions and property owner preferences. The use of existing tracks and the location of any new tracks have been discussed with the owners.

There is no specific need for continuous access along the entire route of the transmission line, although where there are no major terrain barriers or clearing constraints, continuous access would generally provide the simplest and least extensive method of access to individual structures and proposed easement area.

Where new tracks are required, road plant may be used to construct the track and for final trimming and construction of drains. The location and construction of any new tracks will follow the recommendations contained in the "Guidelines for the Planning, Construction and Maintenance of Tracks" published by DLWC (now DIPNR).

Temporary erosion control measures will be installed during the construction work. Measures may include installation of silt fences, hay bales and drains.

Where additional material is required for the construction of tracks, local material will be used where suitable material is available.

It is anticipated that a construction gang of four or five workers will be engaged on access track construction and upgrading of existing access. There will be one or two working on track construction as required, and a further two or three engaged in the construction of drains and final trim and maintenance of tracks.

It is TransGrid's policy that the tracks be maintained in a condition suitable for the construction work until the completion of the works. Where tracks are required for maintenance after the completion of the line, these tracks will remain but only to four wheel drive standard. Where access tracks are no longer required following construction, the tracks can be removed and grass seeds and fertiliser spread to enable the track to be rehabilitated, if requested by the landowner.

Where such tracks are to be constructed within State Forests, roadworks are to be constructed to conform with Forests NSW standard operating conditions for roads.

### 4.9.3 Vegetation Clearing

Vegetation clearing will remove trees and shrubs in areas within the proposed easement where the alignment necessitates vegetation clearance to ensure safe electrical clearance. The extent of clearing will also generally minimise maintenance costs and reduce the risk of bushfire outages of the transmission line. Clearing will generally be undertaken to a level where it can be maintained by

periodic slashing. In addition, outside the edges of the proposed easement, some trees that could infringe electrical clearance requirements under high wind conditions or fall on the line will be selectively removed. Vegetation in gullies, whose mature development would not infringe safe electrical clearances or create a substantial risk of bushfire ignition and forced outages, will be retained.

In areas where extensive vegetation removal is required, larger equipment such as a "tree pusher" will be used for the safe removal of larger trees, without leaving a stump.

When tree and shrub cover is removed from the transmission line easement the extent of bare earth is to be minimised and vegetation that does not need to be removed for ongoing maintenance remain. Low and slow growing species are to be encouraged and rapid and tall growing species selectively removed. Specifically, tree and shrub growth is to be arrested through regular slashing to reduce grass height to less than 30 cm.

In addition vegetation will be retained at locations crossing the transmission line easement in order to provide for fauna movement corridors. Depending on available clearance to overhead conductors, these corridors will retain shrubs and trees whose mature heights do not infringe electrical clearance requirements. The height of vegetation retained will range from 4 m upwards to full mature height, depending on the site and conductor height at the location.

In addition vegetation will be retained at numerous locations such as spans over gullies and escarpments where the conductor height is sufficient to make clearing unnecessary.

At locations near residences, at road crossings or prominent locations, on steeply sloping land and near watercourses, vegetation clearing will be restricted to preserve the natural appearance of the area. Fauna corridors will be retained at locations where they provide substantial ecological benefits. In selected sensitive areas, and where topography allows, the structures have been designed and located to span over these areas without clearing. No vegetation removal will be carried out in gullies where clearances to the conductors can be maintained, substantially above the tree tops.

Where the transmission line traverses protected lands and prescribed streams, DIPNR will be consulted before undertaking vegetation control. Vegetation clearing requirements will be discussed with individual owners and the extent of work will be clearly indicated.

It is expected that vegetation clearing in sensitive areas will be carried out by a small team of perhaps five or six, with most removal being by hand methods, using small equipment.

The preferred method of disposal for cleared vegetation will be by stacking and burning. This will be dependent on seasonal conditions and landowner requirements and will be done in consultation with relevant local authorities. Where burning is not possible other removal techniques will be considered, such as site chipping or mulching.

Consideration will be given to replanting of areas of the proposed easement with low growing native shrubs and trees to assist with screening of structures. Generally, vegetation having a height of greater than 4m is to be removed, depending upon the site, conductor height at locations and the mature height of the tree species in the area.

### 4.9.4 Tower Foundations

The construction of self supporting tower foundations generally involves boring or excavating a hole for each leg, installing steel reinforcing and the stub leg, then pouring concrete. The quantity of surplus excavated material is small and will be spread evenly across the site.

In poor ground conditions and for the heavier tension towers, more substantial foundations will be required involving open excavation, the installation of formwork, pouring of concrete, and subsequent backfilling of the excavation. These foundations take longer to install and will cause more disturbance than the construction of bored tower foundations. In steeper terrain it may be necessary to create a level bench at some tower sites to provide a working area for construction crew and equipment.

The construction of tower foundations will require a workforce of four to seven, an auger type borer or backhoe excavator and arrangements for supply of premixed concrete, by truck. Where footings are required to penetrate into solid rock, a compressor and explosive crew might be required. The construction of foundations for a typical tower might take up to three days, although the time could be a week or more where difficult foundation conditions are encountered. Foundations will be under construction at a number of sites at any one time.

Concrete batching plants will be required and these will be located at suitable sites along the length of the line, depending on access. It is expected that these plants will provide material exclusively for the transmission line construction and will not remain for more than 12 months. The plants may require approval from the DEC under the NSW *Clean Air Act 1961*, depending on the size and scale of the plants. If pollution control approval is required, this will be the responsibility of the contracted plant operator.

### 4.9.5 Tower Erection

The steel framework of the transmission towers will be fabricated (cut, drilled and galvanised) in factories, and delivered by semi-trailer or truck (depending on access) to each site in bundles. The framework of the towers will then be assembled into sections on the ground and the tower will be erected section by section with a crane.

Each structure erection crew will consist of four to six workers assembling structure parts, followed by a team of six to nine workers (climbers, ground crew and crane operator) erecting the structure.

The time required for the erection of a structure may take up to 6 days, depending on the method of construction and type of structure being erected. The construction crews will probably move along the line at a rate of about ten to twenty structures per week, although this may vary in the course of the project as a result of construction programming and concurrent activities.

### 4.9.6 Conductor and Earthwire Erection

Following erection of the towers, stringing of the conductors and earthwires will occur. A process known as "tension stringing" will be used. The conductors and earthwires will be installed under sufficient tension to be kept clear of the ground and obstacles within the easement. Stringing of the line is generally carried out in 5 to 10 km sections, depending on topography, access and structure types. The process involves specialised equipment and procedures and is outlined briefly below:

- A powerful winch (puller) is set up at one end of the section, and a braking device (tensioner) at the other;
- Specially designed pulleys (sheaves) are erected at each conductor/earthwire attachment point on each structure in the stringing section;
- A high strength plaited steel winch rope is threaded through the sheaves on each structure continuously from the winch to the tensioner. This is often facilitated by erecting light polypropylene ropes through the sheaves as they are erected – these ropes are used to pull the winch rope through the sheaves at each structure in turn;
- For each stringing section there will be 5 winch ropes run out – one for each phase of each circuit (3) and one for each earthwire (2);
- The conductors are then “run out” or pulled from the tensioner to the winch through each structure. Sufficient tension is applied to keep the conductors clear of the ground and obstructions;
- The conductors and earthwire tensions are adjusted to give the correct sag (i.e. design ground clearance);
- Conductors are clamped in the final position on the end of the insulator string at each suspension structure, and terminated on insulators at each tension structure;
- Earthwires are clamped or terminated at each structure peak; and
- Equipment is repositioned and the above process is repeated for subsequent stringing sections.

The stringing operation will involve approximately 20 people, over the section being strung. It is expected that the stringing of each section will take 1 to 2 weeks.

In certain circumstances, such as in rough terrain or areas where clearing is not permitted, helicopter stringing can be used. The procedure followed is basically similar to that described above, except that initially, a lightweight steel winch rope is pulled through the stringing section by helicopter. Workers on each structure ensure that the wire is correctly threaded through each specially designed stringing sheave. This winch rope is used to pull the normal heavier winch rope through the section and the procedure completed as for normal tension stringing.

## 4.10 Erosion and Sediment Control

During the construction of the 330 kV transmission line there is the potential for erosion and sedimentation to occur due to ground disturbance required to install the structures, access tracks and winch and conductor drum storage sites needed for the project. This is particularly so in areas with moderate to steep slopes and in areas where the soils are fragile and readily erodible.

Erosion and sediment control measures will be implemented, aimed at minimising the area and length of time that soil is to be exposed, controlling run-on and run-off water in a manner that does not result in erosion and containing sediment that may leave disturbed areas. Control measures to be applied are aimed at reducing the velocity and volume of water flowing over disturbed surfaces and controlling the path of such flows.

More detail of the erosion and sediment control measures relevant to access tracks are provided in Section 4.9.2 above.

### 4.10.1 Access Tracks

Where new access tracks are required they are to be generally constructed in accordance with DLWC's *Guidelines for the planning, construction and maintenance of tracks 1984 (revised 1985)*. These guidelines are to be used both within and outside State Forests.

New access tracks are to be designed to minimise the impact of the construction on the surrounding environment, by controlling runoff and minimising soil erosion to protect water quality and limit stream sedimentation.

The principles on which access tracks are to be constructed are outlined below:

- any new access tracks are to follow the contour of the land as far as possible, minimising earthworks and drainage requirements;

- where necessary run-on water will be diverted away from the new access track sites to minimise the risk of soil erosion occurring while the surface is disturbed;

- ❒ access across paddocks not requiring constructed tracks will occur under conditions that will not result in damage to soils and vegetation within the paddocks. In the event that mesh and or gravel is needed to obtain access, the work will be undertaken in consultation with the landholder;

- ❒ where possible, tracks will follow the top of ridges or spurs or flatter areas and will avoid steep areas with greater potential for erosion and sediment movement.

- ❒ tracks are to be constructed with outfall drainage to reduce erosion damage and minimise maintenance needs. Earth windrows on the down-slope side of the track are to be removed to prevent concentration of water from the road causing erosion;

- ❒ stormwater is to be controlled by construction of table drains with mitre drains as required, and cross drains to control concentration of runoff;

- ❒ trafficable cross banks are to be installed to direct run-off across track surfaces, preventing any concentration of flow along the tracks. Cross banks are to be constructed at the spacing required by the DLWC, shown in the Table 4.4.

- ❒ where steep country is to be traversed, where possible the most direct route up the slope will be taken rather than constructing tracks across the slope;

- ❒ stable and clear outlets for the cross banks are to be constructed to enable water to discharge without the flow concentrating. Where possible, the outlet is to spill into undisturbed vegetation;

- ❒ where the access tracks are to be temporary, topsoil will be removed and stockpiled for respreading following completion of the work;

- ❒ temporary construction tracks and associated disturbed areas will be ripped, seeded and fertilised following completion of construction;

- ❒ where large areas are to be disturbed sediment traps will be constructed downslope of the site to contain sediment. These will consist either of straw bales, filter fences or small sediment ponds;

- ❒ erosion control structures are to be monitored and maintained during the construction works to ensure that their effectiveness is maintained. Where required, sediment will be removed from sediment control ponds, straw bales replaced and filter fences maintained.

**Table 4.4 - Cross Bank Spacing (m)**

| | Soil Erodibility | | |
|---|---|---|---|
| **Road Grade** | **Low** | **High** | **Very High** |
| Up to $8^0$ | 70 - 90 | 60 - 70 | 20 - 30 |
| $8^0$ to $12^0$ | 60 - 70 | 50 - 60 | n/a |
| $12^0$ to $16^0$ | 40 - 60 | n/a | n/a |
| $16^0$ to $20^0$ | 30 - 40 | n/a | n/a |
| $20^0$ to $22^0$ | 20 - 30 | n/a | n/a |

n/a - not appropriate for tracks to be constructed on these soil types within the slope range
Where tracks are constructed on slopes exceeding $12^0$ only light and infrequent traffic should be permitted

### 4.10.2 Stream and Drainage Line Crossings

- Streams and drainage lines are to be crossed with fords, culverts or bridges. Fords are preferred since they can be built with least disturbance to the stream flow and banks;

- soil and vegetation disturbance during construction of fords, culverts or bridges shall be kept to a minimum. Such disturbed areas shall be re-seeded and protected from erosion;

- where minor drainage lines have to be crossed and disturbed during the construction works they will be rehabilitated following completion of works. During rehabilitation of the sites, care will be taken to ensure that slopes of the gullies are not left steeper than they were initially, since this could result in erosion.

### 4.10.3 Works within 40 m of Prescribed Streams

Due to the location of some of the tower sites, it will be necessary to carry out works within 40 m of a prescribed stream. Separate approvals for these works will be sought under Part 3A of the Rivers and Foreshores Improvement Act 1948.

## 4.11 Cost of Construction

The latest revised cost of construction, taking into account the stage of route development in early 2005 was approximately $43 million, including the clearing of vegetation and construction of access tracks required for construction of the new 330 kV single circuit steel tower transmission line.

## 4.12 Rehabilitation Program

Rehabilitation of work sites will be carried out as work proceeds and as soon as possible after the completion of work on each site. Erosion control measures will be implemented at each work site during the work period and following the completion of work at the site, measures to restore the pre-existing ground condition will be implemented. Revegetation techniques such as loosening of ground compacted by construction equipment, improving soil quality of

excavated material spread around structure sites, spreading of fertiliser and grass or crop seeding will be implemented as required with regard to the weed control strategy where applicable. Stabilised spray mulches or grass matting may be used in steep areas.

Planting of trees and shrubs in cleared easements as replacement for additional clearing and the planting of suitable trees and shrubs beside structures or elsewhere for screening purposes will be considered. Such planting will be undertaken after discussion and with the agreement of property owners.

## 4.13 Operation and Maintenance of the Line

### 4.13.1 Structure and Conductor Maintenance

Once the transmission line is completed and comes into operation, maintenance patrols will make regular inspections of the structures, the easement and the conductor and line hardware, taking particular note of clearance conditions, damage to components or evidence of vandalism. The maintenance program typically calls for both ground and air patrols, with TransGrid inspecting each structure at least once per year. A helicopter will patrol the whole line routinely once annually.

Additional patrol of parts of the line may occur from time to time for other purposes.

### 4.13.2 Easement and Access Track Maintenance

Maintenance of the transmission line easement is necessary to ensure that the safe electrical clearances are not infringed. Generally the easement will be inspected in conjunction with the inspections of the structures.

Where necessary, vegetation control activities will be carried out. Three basic types of control are employed:

- mechanical control: Tractor driven slashing equipment capable of clearing small trees are commonly used to maintain access tracks and where heavy re-growth is occurring within the easement. This will be the primary method of easement maintenance. A work team of 2 or 3 people would be involved;

- hand clearing: In visually or environmentally sensitive areas or in areas too steep for mechanical control, hand clearing of regrowth is used. Only a portion of the regrowth is removed so as to keep the disturbance to a minimum. A team of 3 to 4 people would be used on this work;

- chemical control: Chemical vegetation control is used selectively to remove fast growing species within the easement, generally in places where mechanical control is not appropriate because of terrain or environmental constraints. Several different control treatments are used with the particular treatment being selected based on the type of vegetation and the terrain. Only approved herbicides are used and careful selection of herbicides is

carried out to ensure that the most appropriate chemicals are used for the job. Usage is carried out strictly in accordance with the manufacturers' recommendation.

Wherever possible, vegetation on the easement or along access tracks will be removed by slashing or blading only (i.e. pushing the vegetation over with a blade and not disturbing the soil beneath the plant). Soil blading is to be avoided except where required to build a track bench on side slopes, to form drainage line approaches or to make rough surfaces trafficable. Disturbed areas are to be cleared in such as way as to disturb the surface as little as possible and leave root and seed stock in the ground.

## 4.14 Construction Schedule and Hours of Operation

### 4.14.1 Construction Schedule

It is anticipated that construction will commence in the second half of 2006, with scheduled completion for late 2007.

### 4.14.2 Workforce

The workforce engaged on the project will vary during the construction program and will depend on the specific activities underway. The workforce will include plant operators, excavators, riggers, labourers, mechanics, delivery and ancillary staff. Labour requirements will range from less than 20 during the early establishment stage increasing to more than 200 during the peak stages when the full range of activities from clearing and access construction to conductor stringing will be proceeding concurrently. This workforce will be distributed at various locations along the line.

Use of local labour and local suppliers will be determined by the construction contractors.

### 4.14.3 Construction Hours

Normal working hours will be from 7.00am to 6.00pm Monday to Saturday. Working on Sunday and public holidays will be strictly limited.

Working outside normal hours and work on Sundays and Public Holidays only comprises:

- ❒ Work that does not cause a noise nuisance at any nearby residential property;
- ❒ the delivery of materials outside these hours is requested by police or other authorities for safety reasons; and
- ❒ emergency work to avoid the loss of lives and/or property.

## 4.15 Fuels and Lubricants

TransGrid's Environmental Management System has been accredited by QAS to ISO 14001. This system ensures that:

- all work complies with all relevant environmental statutes, regulations and standards;
- environmental factors are taken into account for each activity and;
- regular audits are performed to confirm compliance with environmental policies and standards.

TransGrid has a number of documented procedures which can relate specifically to the activities associated with the construction of a transmission line:

All work performed on the proposed construction of the transmission line by TransGrid staff or TransGrid's contractors shall comply with the above documented procedures and the specific issues outlined below.

The following activities relating to fuels and lubricants will be carried as part of the environmental management for the project:

- a risk assessment will be performed to evaluate the impact on the environment;
- a specific action plan will be developed to minimise any risk of spills during transportation, handling or storage of the material;
- a specific emergency response plan will be developed to handle the worst possible scenario of a spill or incident;
- specific procedures will be developed from the emergency response plan and emergency spill control equipment made available. Details of all approved waste disposal methods will also be made available;
- all staff on worksites will be trained or made aware of all the necessary procedures to minimise the impacts on the environment.

## 4.16 Fire Protection

It is very rare for fires to be caused by a transmission line such as that proposed for the 330 kV Wollar to Wellington line. The high standard of design and maintenance required to provide the necessary reliability of service of such a major element in the electricity system almost precludes fire risk. Maintenance of the condition of the line and the easement occurs regularly. The mechanical strength of the structures and the specified clearances between conductors and vegetation for the 330 kV line provide a much better margin of safety than the comparable factors associated with most lower voltage distribution lines.

The presence of the transmission line is likely to somewhat reduce the incidence of fires caused by lightning, as lightning that strikes the line is safely discharged to ground.

It is possible that bushfires may cause temporary interruptions to the operation of the line, especially where the line traverses heavily vegetated terrain. Appropriate control of the vegetation in the easement is a key point in TransGrid's maintenance policy, which, while minimising any risk of the line starting a fire, also reduces the possible hazard to the electricity system from bushfires travelling across the easement and burning underneath the conductors. TransGrid trains its maintenance teams in the use of appropriate methods and equipment to ensure that bushfire hazard is minimised.

Access tracks and sections of cleared easement also benefit fire-fighters by acting as firebreaks against small bushfires and providing access to vegetated areas.

### 4.17 Energy Statement

The main energy impact of the proposed transmission line will be to substantially reduce energy losses in the supply of electricity to the Central West of New South Wales.

The energy loss in supplying the Wellington load from two 330 kV transmission lines is about half that of supplying the load via one 330 kV transmission line as at present. Furthermore the losses in the 132 kV network during any outage of the existing Mt Piper to Wellington 330 kV line are very much greater than with the 330 kV line in service, due to the higher current required to carry the load at the lower voltage and the smaller conductors on the 132 kV lines. The new line will substantially eliminate the emerging incidence of heavy loading of the 132 kV network.

The analysis for the regulatory test showed that the commissioning of the Wollar – Wellington 330 kV Transmission Line would result in a reduction of transmission losses amounting to 47 GWh in 2007 rising to 57 GWh in 2013.

The benefits of the loss reduction can be characterised in a number of ways:

- Reduction of losses at peak load approximately 15 MW
- Average loss reduction over full year approximately 6 MW
- Energy saving over a fully year approximately 50 GWh/annum
- $CO_2$ emissions avoided 45,000 tonnes/annum
- Equivalent “cars removed from NSW” 10,000
- Equivalent “trees being planted” 150,000 trees/annum

Energy will be consumed during the construction phase of the proposed transmission line in the form of liquid fuel used to power plant and equipment and

through the energy used to manufacture materials used in construction such as concrete, steel, aluminium conductors, insulators, fittings etc.

Energy required for operational aspects of the line include that consumed in line maintenance operations and the energy consumed by the line itself. The fuel consumed during periodic maintenance activities (by vehicles or helicopter) and occasional repair works is minor.

The proposed line will provide an increased electricity supply capacity between Wollar and Wellington, providing for the demand of a growing population in the region.

## 4.18 Waste Management

**Construction Activities**
Both solid and liquid waste materials will be generated during the construction program. Empty conductor drums, surplus conductors, vegetation removed during the line erection, spoil from excavation sites, and drums and lubricants from machinery services will be generated.

Empty drums, surplus conductors, insulators and waste lubricants will be removed from site and recycled by local contractors where possible. Other wastes will be appropriately disposed of at licensed local landfill sites. Surplus conductors will be recycled in accordance with TransGrid salvage procedures.

Vegetation cleared during the construction program will generally be disposed of by stacking and burning. This will be done in consultation with local authorities and local residents. Where burning is not possible, disposal by mulching, chipping or removal from site will be considered, in consultation with local residents and local authorities.

Material that is excavated during the structure erection will be spread around the tower, or removed from the site in covered trucks for off site disposal.

All servicing of vehicles will occur at contractor sites. In the event that servicing occurs at a construction site no oils will be deposited on the site. All waste material will be removed from site and disposed of appropriately.

**Operational Activities**
No wastes are generated by the normal operation of the line. The towers will require no treatments for vermin or wood rot as is sometimes required for timber poles. Damage caused by storms may result in replacement or repair of insulators, lightning protection, and conductors or, on rare occasions, tower foundations. Any solid wastes generated will be removed from site.

An outline of the Operations Environmental Management Plan is provided at the back of this volume of the EIS Main Report.