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Twin Creek Wind Farm
RES Australia Pty Ltd
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# Twin Creek Wind Farm

## Civil, Geology and Hydrology

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Civil, Geology and Hydrology

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ABN: N/A

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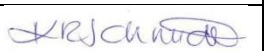
| B | 28 June 2017 | Final | Kylie Schmidt<br>Project Manager |  |
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# Executive Summary

The following report highlights key issues associated with the project based on a desktop review. It is noted there are a number of items that will be further addressed during future detailed investigations, design and documentation, including the preparation of a construction environmental management plan.

This report addresses:

- Preliminary civil design completed for access tracks and hardstands
- Desktop Geotechnical review
- Desktop Hydrology review

The scope of this report included a site visit that identified many turbine sites are located on areas with rocky outcrops or areas with very thin topsoil. Erosion was observed in the lower valley areas, where stormwater is flowing down through the catchment to the Light River. This highlights the lower lying areas have a high potential for erosion and sedimentation through the ephemeral creek lines which will need to be considered in the stormwater management sections of the CEMP.

# 1.0 Project Description

## 1.1 Introduction

RES Australia Pty Ltd (RES Australia) proposes to develop the Twin Creek Wind Farm within the Mid North area of South Australia. The site of the proposed wind farm is approximately 90km north east of Adelaide and north east of Kapunda.

RES is one of the world's leading independent renewable energy companies, with the expertise to develop, engineer, construct, finance, and operate projects around the globe. RES Australia has been developing renewable energy projects in Australia since 2004.

## 1.2 Project Overview

The proposed wind farm will consist of the following components:

- Up to 51 Wind Turbines Generators (WTG)
- Each WTG has a capacity up to 3.6 Megawatts (MW), with a total installed wind capacity up to 183MW
- Overall height of turbines would be up to 180 metres at the blade tip
- Associated hard standing areas and access roads
- Operations and maintenance building and compound with associated car parking
- Two electrical substations
- Battery energy storage
- Overhead and underground electrical cable reticulation
- 275kV overhead transmission line
- Meteorological masts for measuring wind speed and other climatic conditions
- Temporary construction facilities including a borrow pit and concrete batching plant facilities.

# 2.0 Project Siting/Locality Description

RES Australia proposes to develop the Twin Creek Wind Farm within the Mid North area of South Australia. The site of the proposed wind farm is approximately 90km north east of Adelaide and 11km north east of Kapunda. The proposed development is located between the townships of Kapunda, Eudunda and Truro.

The site is located on the tablelands that form the wide ridgeline associated with Bald Hill and Long Hill situated within the Northern Mount Lofty Ranges.

Landform of the area is defined by numerous ridgelines that run north-south through the site creating a series of parallel ridges, wide open valleys, tablelands and isolated topographic features.

Surrounding the site of the proposed development, the landscape is dominated by grazing with open paddocks defined by fenced boundaries and occasional trees to fence lines and creek lines. The land use that occurs in the open valley floor between the local ridgelines and across the tablelands associated with Bald Hill is more diverse with areas of arable cropping and grazing.

# 3.0 Introduction

This report has been prepared to provide a preliminary assessment of civil, geology and hydrology for the proposed wind farm located at Twin Creek approximately 10 km north east of Kapunda. .

The purpose of the preliminary geology and hydrology assessment is to provide a baseline assessment of features that may be impacted by the project or that may impact on the design of the project.

The objective of the preliminary civil design is to optimise the infrastructure layout (access tracks, substation, construction compounds).

The scope of this desktop civil, geology and hydrology assessment comprised:

- Preliminary access road civil design and proposed siting of substation, construction compounds etc
- Review of readily available documents, including:
  - Geology maps;
  - Topographic maps;
  - Mineral Resource Potential maps;
  - On-line government databases relating to geology, surface water, registered water bores, mining tenements, historical mine and mineral workings;
  - Selected report books produced by the Department of Mines South Australia;
  - Selected reports regarding the Light River hydrology;
  - Stereo pairs of aerial photographs; and
- A site visit (drive-over) by a geotechnical engineer and civil engineer from AECOM's Adelaide office on 15 March 2016.

# 4.0 Project Description and Preliminary Civil Design

## 4.1 Project Description

The project and site is described in Sections 1 and 2.

The infrastructure at the wind farm site includes up to 51 wind turbine generators, access roads, foundations and crane hard standing areas and transformer housings at each turbine, a wind farm substation and control room, communication towers (if required) O&M office/workshop compound, temporary and permanent wind monitoring masts and temporary construction compounds.

Underground/overhead electrical cables connecting each turbine will generally be located adjacent to the site access roads. A wind farm substation and transmission line will also be required and will be located near the site access point, with a grid route through to the terminal substation located at the gird connection point.

Turbines will generally be located along ridge lines. Access tracks linking all turbines will be constructed and site access will be gained from a dedicated route via public roads to the site via new or upgraded routes.

During construction, additional temporary infrastructure will include quarries for road base and concrete aggregate, on-site concrete batching plants, water sources for concrete, temporary soil stockpile locations, laydown areas for equipment and construction site compounds with facilities for the workforce.

## 4.2 Preliminary Civil Design

Preliminary civil design has been completed and is included in Appendix A. This provides an initial preliminary layout and location for:

- Internal access road corridor/easement typically 150 m wide and 75 m beyond the edge of the hardstand
- Proposed location for substation, construction compound, temporary lay down areas and also batch plants

Preliminary cut/fill estimates for the internal access roads and hardstands suggest the cut would be in the order of 700,000 $m^3$ and fill in the order of 350,000 $m^3$.

# 5.0 Hydrology, Hydrogeology and Geology Review

## 5.1 Surface Features

Based on the 1:50,000 “Truro” topographic map sheet, the site is located within the North Mount Lofty Ranges, on the eastern side of the Kapunda – Eudunda Road, approximately 10 km fom Kapunda and 15 km from Eudunda.

The proposed wind turbine locations extend over an area approximately 5 km wide in the east-west direction, and about 6 km to 7 km in the north-south direction, although the overall project boundaries extend considerably further.

The topography of the site is hilly, with numerous incised creek valleys typically draining towards the west into the Light River. The elevation of the Light River near the site varies from about RL 270 m to 290 m AHD, whereas the ridge lines and hills within the project site typically have elevations in the range of about RL 400 m to 450 m AHD.

The hills and ridge tops are generally rounded, but become steeper towards the valleys where creeks are incised in relatively steep sided channels. In general the terrain undulates somewhat more steeply in the southern part of the site.

Rock outcrops are visible throughout the site, ranging from rocky hill tops and ridges, to rocky creek beds. Orange clay typically overlay the rock, with the soil thickness varying up to about 3 m in some creek beds, but reducing to close to zero on the hill tops

At the time of the site visit, vegetation typically comprised low grass with occasional, scattered mature trees.

Numerous small farm dams, some windmills and old stone ruins were also present across the site.

Access tracks across the site appeared to have been constructed from local materials, and typically comprised a mixture of gravel and exposed clay. The main tracks/roads had been sheeted with gravel that resembled local site won crushed/sorted rock. Trafficability was general acceptable for a light 4WD vehicles in dry conditions, but the more clayey tracks were slippery when wet.

No evidence of significant landslides was observed from either the stereo pairs of aerial photographs, or from the areas of the site observed during the walk-over, although considerable erosion and ‘wombat holes’ were observed in the orange clay, particularly near the creeks.

## 5.2 Regional Hydrology

Watercourses within the site area are predominantly fed by rainfall and are ephemeral, ceasing to flow in dry weather. The Light River flows along the western boundary of the site, entering from the north western corner and leaving at the south western corner. The Light River has a catchment of approximately 1820 $km^2$. The majority of the catchment is used for dryland agriculture, with cereal and canola crops as well as livestock grazing.

Freshwater Creek enters the site in the north eastern area, flows in a south westerly direction through the site and contributes the Light River approximately halfway along the western boundary of the site. The catchment for Freshwater Creek is approximately 34.66 $km^2$ in size with approximately 20 $km^2$ of the catchment within the site boundary. Spring Creek originates in the south east area of the site, flows west and contributes to the Light River just outside the south west corner of the site. The catchment for Spring Creek is approximately 9.26 $km^2$.

Other watercourses within the site originate from the ridge on the eastern side of the site and flow through naturally occurring valleys before contributing to the Light River, or Freshwater Creek or Spring Creek. The watercourses throughout the site have catchment sizes ranging from 1 $km^2$ to over 30 $km^2$ for Freshwater Creek.

Some small farm dams were noted during the site visit as well as on toporgraphical maps, which will capture some runoff.

Outside of the site boundary, Julia Creek mine is located upstream of Freshwater Creek. The presence of the mine indicates the potential for naturally occurring increased levels of mineral salts in

the groundwater. There is no readily available information regarding mineralisation historically targeted in the mine.

Reference to Location SA and WaterConnect websites indicated the following regarding site hydrology:

- The site is within the surface water catchment of the Light River that flows through to Kapunda, Hamley Bridge and out to sea. There are numerous emphemeral creeks across the site that feed into Spring or Freshwater Creek and into the Light River.
- While the site is not located in a prescribed water resources area, it is noted that the site is located north and outside the Barossa Prescribed Water Resources Area, which covers groundwater, water courses and surface water.

The Light River has been subject to water quality monitoring downstream of the site at Mingays waterhole located approximately 4 km south west of the site. The report on water quality by the EPA in 2011 indicated that at Mingays Waterhole that the Light River has marginal water quality at the times of year when low flow occurs. The report also identified that the Light River at this location was permanently wet and saline in autumn and Spring 2011, with nutrient and salinization impacts observed, large sediment deposition, sparse macroinverterbates present and riparian vegetation dominated by introduced species. Another monitoring location is located further downstream at Kapunda.

The Light River is also subject to a River Catchment Plan dated September 2004. This included mapping of the subcatchments. This noted that creeks on the site have poor native watercourse vegetation, or exotic trees. In the area where the Light River is the eastern site boundary, the Light River has remnant vegetation and downstream is has good native watercourse vegetation. This vegetation should be protected to avoid damage.

The CEMP should consider sediment and erosion control and management, as well as bunding and containment of any fuels stored on site given the stormwater from the site flows to the Light River. These measures will manage the water quality from the construction site and ongoing operation of the wind farm.

Reference should be made to the SA EPA construction guidelines regarding sedimentation and erosion control measures.

## 5.3 Regional Hydrogeology

Reference to Location SA and WaterConnect websites indicated that the site is:

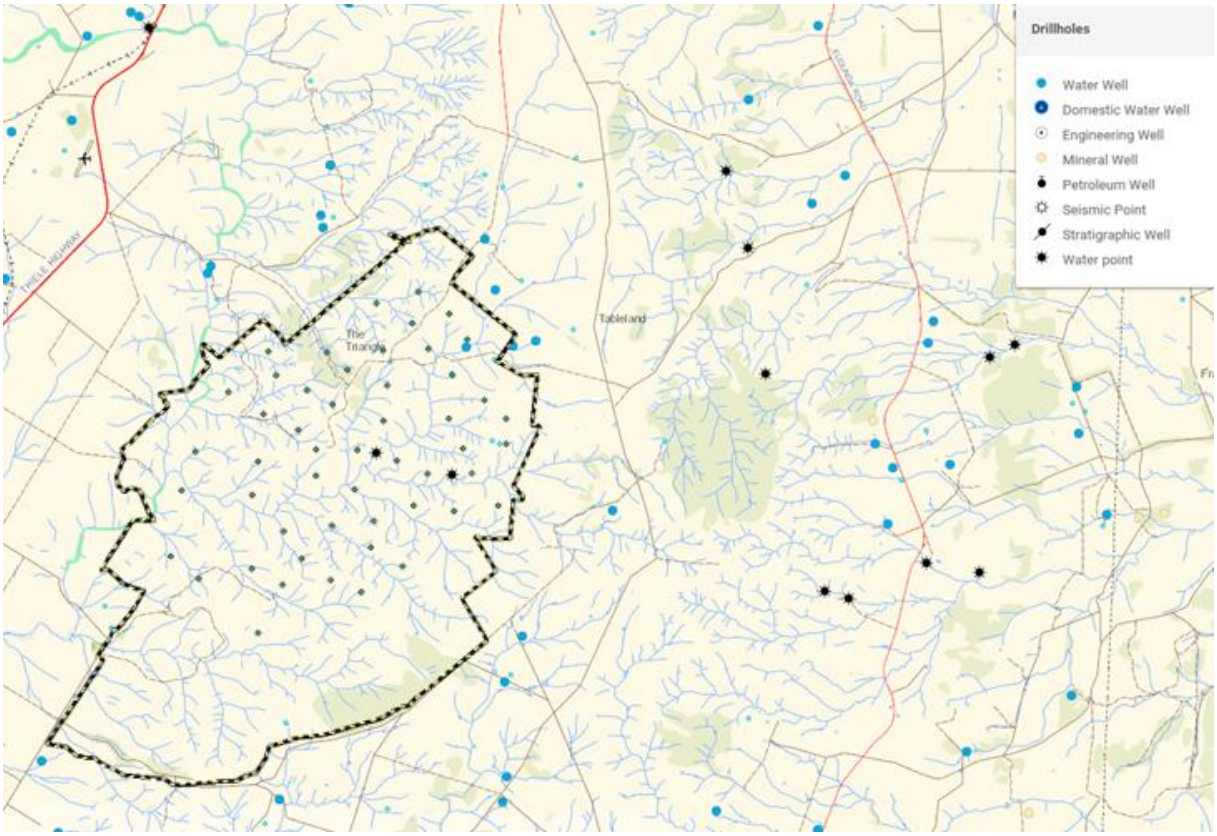
- There are numerous emphemeral creeks across the site that feed into Spring or Freshwater Creek and into the Light River influencing groundwater and base flows
- While the site is not located in a prescribed water resources area, it is noted that the site is located north and outside the Barossa Prescribed Water Resources Area, which covers groundwater, water courses and surface water.
- Fractured Rock aquifer in Cambrian and Precambrian rocks underlies the site, this is expected to have seeps (as observed during the site visit) and a strong connection to rainfall and stormwater flows on site
- One operational well is present on the site 6729-126, located adjacent to a track running north off of Newlands Road. This is shown to have the use of stock watering, was drilled in 1970 to a depth of 47 m, with a standing water level of 17 m, TDS of 4000 mg/L and yield of 0.3 L/s
- Operational wells were also located in areas in close proximity to the eastern site boundary including:
    - Three wells near Holding Road being 6729-128, 129, 130 all being shown as operational, drilled in 1955 to 1970, drilled to 35 to 40 m with SWL ranging from 23 to 27 m, TDS ranging from 3000 to 7000 mg/L, yield ranging from 0.3 to 0.5 L/s and all being shown to have the purpose of stock watering

- One well was also located just near Noack Road being 6729-274, shown as operational and used for stock watering purpose, drilled in 1975 to 22m with a SWL of 17m, TDS of 1500 mg/L
- The groundwater salinity and yields on site or very close by align with the stock watering purpose based on the yields and also the TDS salinities observed.

- Operational wells with higher yields (over 10 L/s) used for irrigation are located close to the Kapunda township approximately 10 km west of the site boundary and approximately 5 km south and south east of the site. Many of these wells are drilled to depths of over 50 m.

**Figure 1 Well locations**

(noting many are abandoned and those operational detailed above)




## 5.4 Regional Geology

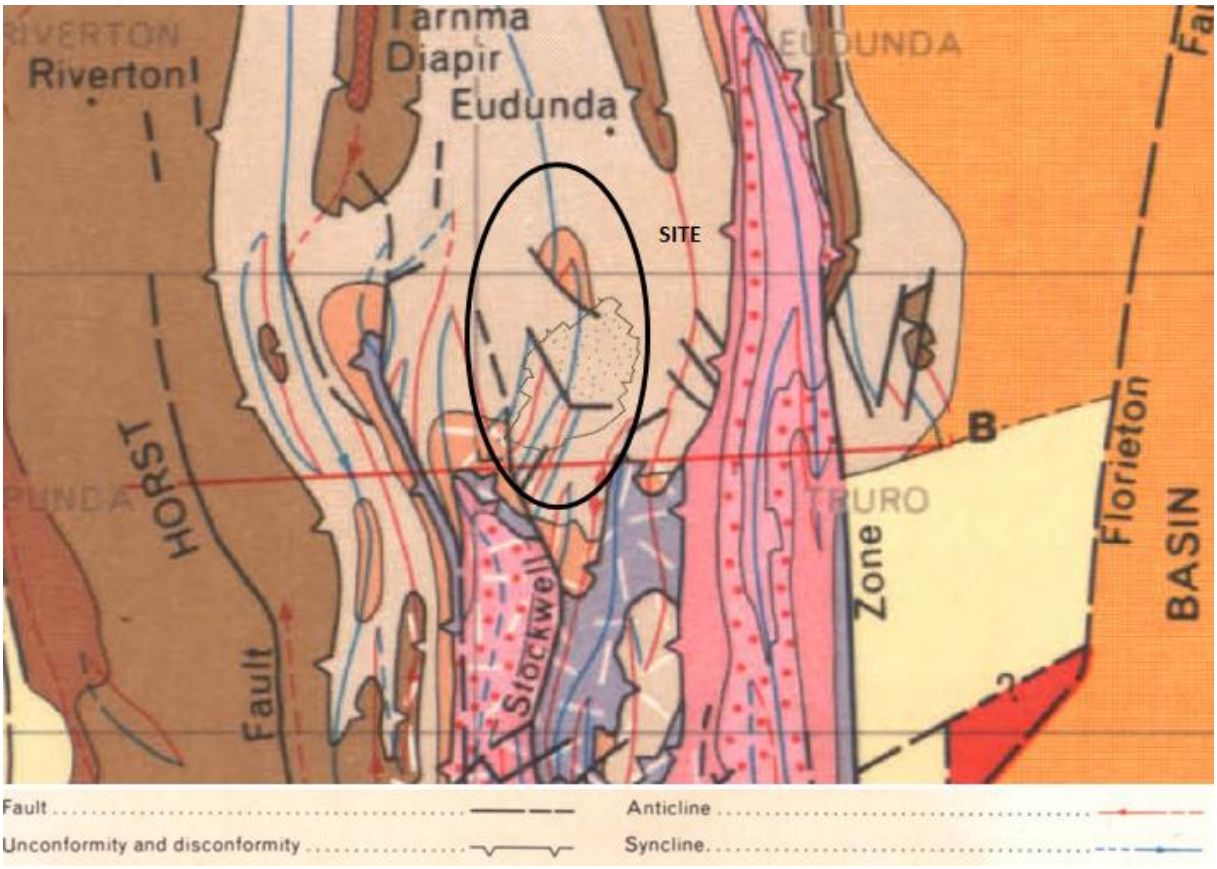
The site is located within the Adelaide Geosyncline, comprising thick sedimentary and minor igneous rocks that were formed during the late Precambrian (between about 1,100 Ma and 600 Ma). These rocks later became folded, metamorphosed, intruded and uplifted (Preiss, 1987).

An approximate sketch of the wind farm site boundary and preliminary turbine locations has been overlaid onto an extract of the tectonic sketch from the Adelaide geology map sheet. The overlay is shown in Figure 2.

The tectonic sketch indicates that the Stockwell fault extends into the southern end of the site, beyond any currently proposed turbine locations. Two other un-named faults (possibly related to splintering at the northern end of the Stockwell fault) are shown trending north-west to south-east through the central parts of the site.

A parallel series of closely spaced anticlines and synclines are shown extending from the Stockwell fault to the un-named fault close to the centre of the site. To the north of this fault, a single syncline is shown trending approximately north-south through the site.

**Figure 2 Tectonic sketch (extract from 'Adelaide' 1:250,000 geology sheet)**




A similar overlay of the site boundary has been made on the relevant portion of the SARIG geology database, shown in Figure 3. A legend of geological units is presented in Table 1.

The geology database indicates that for the main wind farm site:

- In the southern part of the site, which is more heavily folded via a parallel series of synclines and anticlines, the near-surface geology is expected to comprise "Ne – Yerelina Subgroup", comprising siltstone, sandstone and diamictite;
- Through the central part of the site (where the majority of the turbines are proposed) a zone of "Nep – Pepuarta Tillite" is expected, along the axis of the single north-south trending syncline. The tillite is expected to resemble pale grey or greyish green siltstone and sandy siltstone with sparse granule to boulder erratics. Limited structural mapping shown on the "Adelaide" geology sheet suggests that the bedding of the tillite dips towards the axis of the syncline at about 20 degrees on both the eastern and western limbs.
- To both the east and west of the tillite, "Nir - Tarcowie Siltstone" is expected, comprising sandy siltstone.
- A relatively thin band of "Neu – Gumbowie Arkose" (arkosic sandstone) is also expected between the tillite and siltstone on the eastern limb of the syncline.
- In places, these rocks (especially the Tarcowie Siltstone) have been intruded by dykes containing dolerite, microdiorite and porphyrite. These dykes appear to be related to mineralisation that was exploited by the Julia Creek and Newlands mines, where barite was extracted from close the project area.
- Within the northern part of the site, "Nsu - Ulupa Siltstone" flanked by a relatively thin band of "Nsn - Nuccaleena Formation" is expected. The Ulupa Silstone is described as resembling grey green and purple siltstone. The Nuccaleena Formation is expected to comprise white dolomite.

The proposed alignment of a new transmission line to connect the wind farm to the existing Robertstown – Tungkillo Transmission line to the east of the wind farm was not known at the time of reporting. It is assumed, however, that the new transmission line will pass to the south of Mount Rufus.

Irrespective of the exact alignment of the transmission line, it is expected to be underlain by:

- Siltstone in the west, associated with the Tarcowie Siltstone, Tapley Hill Formation and Wilyerpa Formation; and
- Sandstone in the east, associated with the Backstairs passage Formation and Tapanappa Formation. Sandwiched between these two sandstone units is a relatively thin band of pyritic shale or siltstone known as the Karinya Shale (Elk). Rock containing pyrite can often be acid-producing. As such, excavations within the Karinya Shale should be avoided where possible. If excavations in the Karinya Shale cannot be avoided, then a management plan to control and mitigate potential the effects of potential acidic run off from the cutting and spoil material must be implemented.

A section running east-west slightly to the south of the site is shown in Figure 4, illustrating the rock relationships.

**Figure 3 Extracts from SARIG geology database**

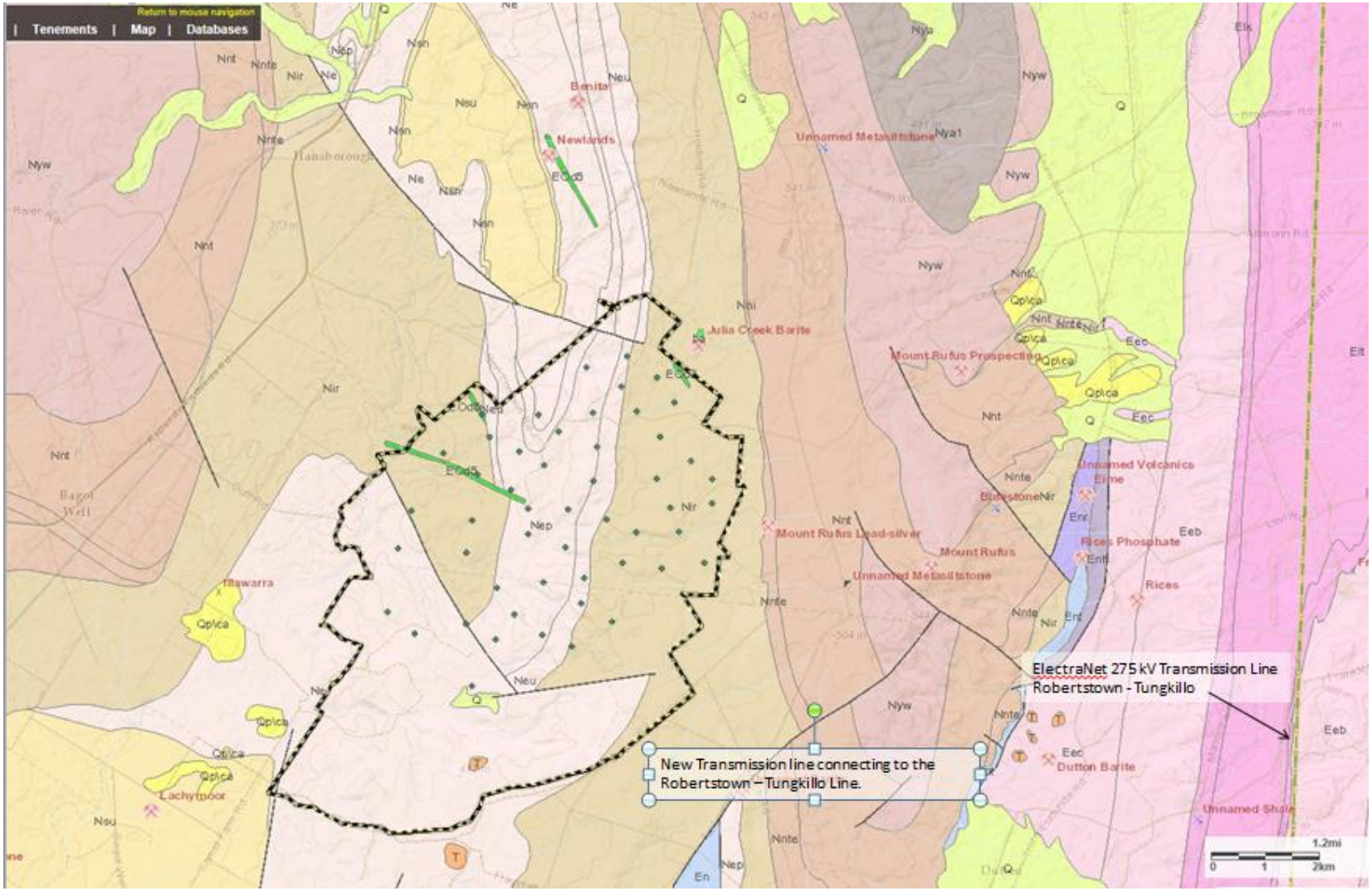
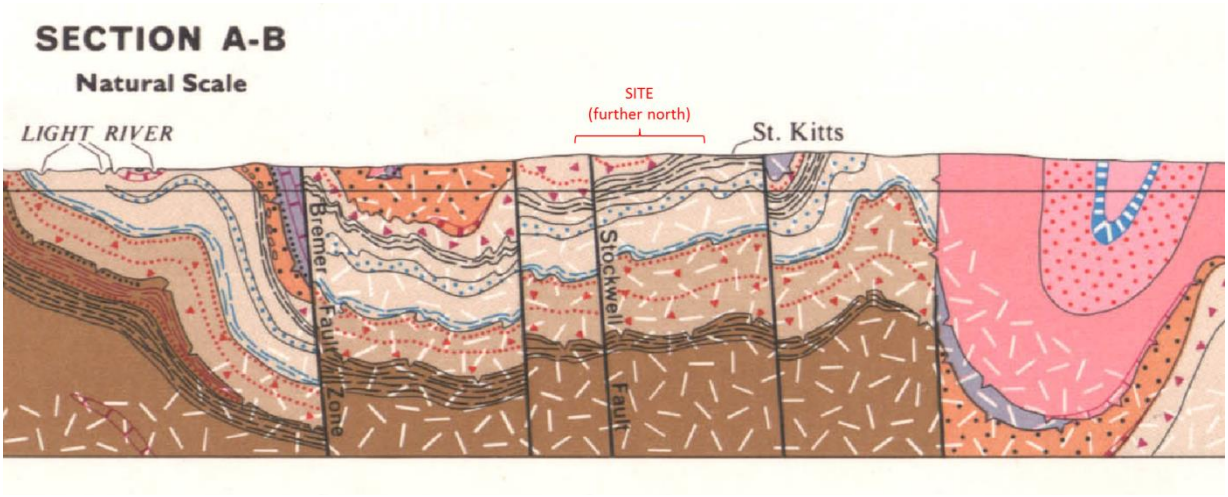


**Table 1 Geology Legend**

| Map unit | Stratigraphic name | Stratigraphic description | Parent name | Age | Min age |
|---|---|---|---|---|---|
| Q | Unnamed GIS Unit - see description | Undifferentiated Quaternary rocks | - | PLEISTOCENE-HOLOCENE | Quaternary |
| Qp\ca | Unnamed GIS Unit - see description | Undifferentiated Pleistocene calcrete | Unnamed GIS Unit - see description | PLEISTOCENE | Pleistocene |
| T | Unnamed GIS Unit - see description | Undifferentiated Tertiary rocks | - | TERTIARY | Tertiary |
| Elk | Karinya Shale | Shale, siltstone, blue-black, pyritic, laminated, carbonaceous. | Bollaparudda Subgroup | CAMBRIAN | Toyonian |
| Elt | Tapanappa Formation | Sandstone to greywacke, fine to coarse-grained, dark grey, thick-bedded to laminated; interbedded with laminated siltstone and thin, sulphidic siltstone and lenticular grit to conglomerate beds. scour-and fill channels, rare cross-bedding. | Bollaparudda Subgroup | CAMBRIAN | Toyonian |
| Eeb | Backstairs Passage Formation | Sandstone, laminated, thick bedded, slumped, crossbedded, with minor siltstone interbeds. Widespread siltstone unit at base. | Keynes Subgroup | CAMBRIAN | Botomian |
| Eec | Carrickalinga Head Formation | Sandstone, grey, thick bedded, with thinly bedded, muddy, siltstone interbeds. Minor cross-bedding, ripples, rare trace fossils. | Keynes Subgroup | CAMBRIAN | Cambrian, Early |
| Nsu | Ulupa Siltstone | Siltstone; shale, green-grey and purple. | Wilpena Group | NEOPROTEROZOIC | Marinoan |
| Nsn | Nuccaleena Formation | Dolomite, thin, laminated, micritic, with interbedded shale near the top. | Wilpena Group | NEOPROTEROZOIC | Marinoan |
| Ne | Yerelina Subgroup | Siltstone; sandstone; diamictite. | Umberatana Group | NEOPROTEROZOIC | Marinoan |
| Neg | Grampus Quartzite | Quartzite, arenaceous, with conglomerate lenses. | Yerelina Subgroup | NEOPROTEROZOIC | Marinoan |
| Neu | Gumbowie Arkose | Sandstone, arkosic. | Yerelina Subgroup | NEOPROTEROZOIC | Marinoan |

| Map unit | Stratigraphic name | Stratigraphic description | Parent name | Age | Min age |
|---|---|---|---|---|---|
| Nep | Pepuarta Tillite | Siltstone and sandy siltstone, sparse granule to boulder erratics, pale grey or greyish green, massive or bedded, often calcareous. Minor lenses and interbeds of massive and laminated calcareous sandy siltstone and calcareous sandstone. | Yerelina Subgroup | NEOPROTEROZOIC | Marinoan |
| Nir | Tarcowie Siltstone | Siltstone, sandy, flaser bedded. | Upalinna Subgroup | NEOPROTEROZOIC | Marinoan |
| Nni | Brighton Limestone | Limestone, massive, oolitic, stromatolitic, ripple marks. Colour from blue-grey at base to reddish-grey at top. | Nepouie Subgroup | NEOPROTEROZOIC | Sturtian |
| Nnt | Tapley Hill Formation | Siltstone, grey to black, dolomitic and pyritic grading upwards to calcareous, thinly laminated, locally cross-bedded; dolomite, grey, flaggy to massive; limestone conglomerate, intraformational; greywacke. | Nepouie Subgroup | NEOPROTEROZOIC | Sturtian |
| Nnte | Eudunda Arkose Member | Arkosic siltstone, blue, flaggy and thinly bedded, lenticular | Tapley Hill Formation | NEOPROTEROZOIC | Sturtian |
| Nyw | Wilyerpa Formation | Siltstone, green. Lower third is fine grained, includes glacial dropstones; middle unit is medium to coarse sandstone; upper unit is siltstone with minor sandstone. Minor diamictite, sandy and pebbly dolomite. | Yudnamutana Subgroup | NEOPROTEROZOIC | Sturtian |
| Nds | Saddleworth Formation | Mudstone; siltstone; shale, partly carbonaceous. | Bungarider Subgroup | NEOPROTEROZOIC | Torrensian |
| Ent | Mount Terrible Formation | Arkose, cross-bedded, coarse-grained to conglomeratic, Basal part, fluviatile? pyritic and glauconitic sandstone, minor shale siltstone and dolomite. | Normanville Group | CAMBRIAN | Atdabanian |
| | | | | | |
| EOd5 | Unnamed GIS Unit - see description | Undifferentiated Delamerian basic igneous rocks | Unnamed GIS Unit - see description | CAMBRIAN-ORDOVICIAN | Ordovician |
| ba | Unnamed GIS Unit - see description | Barite, undifferentiated. | - | MISCELLANEOUS | - |

**Figure 4 Geology section (extract from 'Adelaide' 1:250,000 geology sheet)**




Observations of the main geological units from the site visit walk-over are summarised below.

## Yerelin siltstone/sandstone

A small borrow pit/quarry was observed within the Yerelina siltstone/sandstone near the southern tip of the site, immediately adjacent to Flagstaff Hill Road (approximate coordinates of MGA94 Zone 54 E318705 N6198224). It was inferred that this borrow pit may have been used as a source of gravel to sheet Flagstaff Hill Road. In general the rock fragments remaining at the borrow pit appeared to be slightly to moderately weathered and ranged up to high or very high strength. At the uphill side of the borrow pit, the natural hillside had many rock fragments exposed at the surface that were typically of the order of 100 mm across. Some larger boulders up to about 1 m across were also present in a stockpile, suggesting variability of fracture spacing across the relatively small borrow pit. A photograph of the larger siltstone fragments is presented in Figure 4.

**Figure 5 Photograph of borrow pit in Yerelina siltstone/sandstone**

## Tarcowie siltstone

Dedicated borrow pits were not observed in the Tarcowie siltstone, however, old stone ruins were observed west of Mosey Road, between the Freshwater Road and Noack Road intersections. It was inferred that these stone buildings had been constructed from Tarcowie siltstone, either fossicked from the surface or from excavation of a small nearby dam. The siltstone used in the building construction was typically moderately weathered, grading to slightly weathered and assessed to be of medium to high strength. Photographs of the stone ruins are presented in

**Figure 6 Photographs of Tarcowie siltstone used in building construction**

## Pepuarta tillite

Observations during the site visit was that the tillite generally resembled grey siltstone or fine grained sandstone, with evidence of turbulent bedding and occasional erratics (drop stones), suggesting deposition in a shallow glacial lake. Selected photographs of the tillite are presented in Figure 7.

Where the tillite was only slightly weathered, it appeared to be of high strength. Fracture spacing varied considerably with fracture spacing observed to be of the order of 1 m in places, but less than 100 mm elsewhere. In particular, an exposure in the bed of Freshwater creek (approximate coordinates of MGA94 Zone 54 E321850 N6202232) showed the fracture spacing varying over this range across a very short distance, where a shear zone appeared to be present. A photograph of the exposure is shown in Figure 8, where to the left (west) of the superimposed red line, fracture spacing of about 1 m was present, but to the right (east) fracture spacing of about 100 mm was present. Also visible in Figure 8 is the variation in thickness of the overlying orange clay.

**Figure 7 Photographs of Pepuarta Tillite**

**Figure 8 Photograph of exposure in Freshwater Creek (looking south to south-east)**

## 5.5 Mining at the site

### 5.5.1 Current Mining Tenements

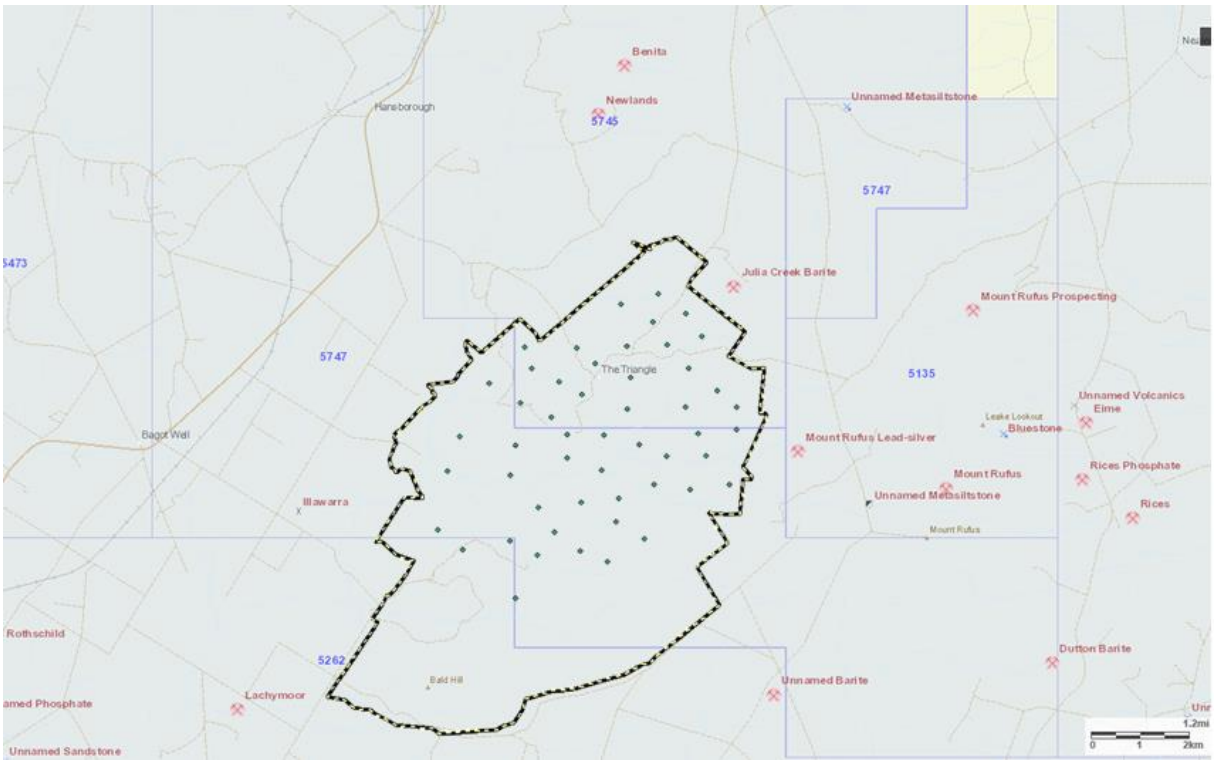
Details of current mining tenements that cover the site were obtained from the South Australia government SARIG website on 2 March 2016. A plan showing the current mining tenements and approximate site boundaries / turbine locations is shown in Figure 9 and details available through the SARIG database are summarised in Table 2. A review of the current mining plans (if any) of the licencees

**Table 2 Summary of mining tenements**

| Tenement Number | Tenement Status | Licencees | Commodities Sought | Tenement Start Date | Tenement Expiry Date | Area ($km^2$) |
|---|---|---|---|---|---|---|
| 5135 | Active | Maximus Resources Limited | Gold | 3/9/2012 | 2/9/2016 | 26 |
| 5262 | Active | Terramin Exploration Pty Ltd | Gold, rare earths, zinc, copper, lead | 28/4/2013 | 27/4/2015* | 624 |
| 5745 | Active | Seesaw Resources Pty Ltd | Silver, rare earths. Zinc, copper, lead | 22/2/2016 | 21/2/2018 | 128 |
| 5747 | Active | Seesaw Resources Pty Ltd | Gold, rare earths. Zinc, copper, lead | 22/2/2016 | 21/2/2017 | 955 |

Note: *renewal application date of 18/3/2015

**Figure 9 Existing mining tenements**




### 5.5.2 Historic mining activities

On 2 March 2016, the SARIG database shows two former mines within the project boundaries, and a further mine close to the eastern boundary of the site, comprising:

- Benita Copper;
- Newlands Barite; and
- Julia Creek Barite.

**Benita Copper**

The only information regarding the Benita copper mine available on the SARIG database comprised:

- Location coordinates (139.071667, -34.243525 or MGA94 Zone 54 E322420, 6209160);
- Commodity was copper;
- The mine has had no other names;
- The mine has a status of abandoned. The status date is listed as 9/4/2008, however it is not clear whether this date was the date that the mine was abandoned, or the last date that the database was updated.

No records or report books could be located relating to the Benita copper mine. As such, the extent of underground mine workings associated with this mine is unknown. Its remote distance from any proposed turbines, however, suggest that this abandoned mine should not impact on the proposed development.

**Newlands Barite**

The SARIG database lists the location coordinates of the mine as 139.066829, -34.250933 or MGA94 Zone 54 E321990, 6208330.

Reference has been made to Fleming (1965), which indicates that in 1964 this mine comprised a series of open cut diggings that extended for about 200 feet (60 m) across a hill top, following the strike of a barite deposit. The largest of the open cut diggings was about 75 feet (23 m) long and 6 to

10 feet (1.8 to 3 m) deep. The excavation had followed the deposit down dip, such that the hanging wall was undercut.

The open cut diggings had been abandoned by December 1964. Underground mining was considered the only feasible method to extend the mine, however, it was not considered to be of economic value at that time.

No further records of mining activity at the Newlands mine were found. The apparently limited extent of the mining activity at the Newlands mine and its remote distance from any proposed turbines suggest that this abandoned mine should not impact on the proposed development.

**Julia Creek Barite**

The SARIG database lists the location coordinates of the mine as 139.091755, -34.277111 or MGA94 Zone 54 E324340, 6205470.

Reference has been made to a South Australian government website (minerals.statedevelopment.sa.gov.au) which states that “numerous mines have been worked in the past but are now abandoned, including: a number of small mines at Julia Creek (72 km northeast of Adelaide) producing 10,500 t of barite between 1925 and 1974”.

Further reference has been made to Mansfield (1950), which indicates that two vertical shafts were dug at the Julia Creek Barite mine. A sketch dated 17/10/1947 indicates that the northern (main) shaft was 68 feet (20.7 m) deep and the southern shaft was 20 feet (6.1 m) deep, with a north-south drive connecting the two shaft and extending further north and south. Advice from Mansfield (Inspector of Mines and Quarries) to the mine operators at the time was to extend the shaft to 100 feet depth and then drive further north and south. A sketch also shows “suggested costeans” running east and west. All of the mapped and suggested mine workings on the sketch were within a radius of approximately 50 m from the shafts.

No records were located describing the mining activities at Julia Creek from after 1950. As such, the final extent of underground mine workings at Julia Creek is not known. Based on the preliminary turbine layout, the closest turbines to the Julia Creek mine (T52 and T60) are more than 600 m or 700 m from the mine. As such, this abandoned mine should not impact on the proposed development.

# 6.0 Potential Borrow Sources

Reference has been made to the Truro mineral resource potential map sheet, which does not identify any potential resources within the project boundary suitable for construction of road base, concrete aggregate or road sealing aggregate. Identified deposits of construction aggregates are shown to the east of the site, within the Tapley Hill Formation, which is present running north-south along the alignment of Tablelands Road. A borrow pit was observed adjacent to the intersection of Tablelands Road and Newlands Road, which is beyond the project boundaries, but within the Tapley Hill Formation. Other identified resources of construction aggregate are shown further to the east in the Tapanappa Formation (close to the existing alignment of the Robertstown to Tungkillo 275 kW transmission line).

Nonetheless, based on site observations, it appears that potential borrow pits for unsealed track construction could be sited within the majority of the main geological units (Yerelina siltstone/sandstone, Tarcowie siltstone, Pepuarta tillite). Trials and laboratory testing would be required to more reliably assess the ease of processing and quality of the materials produced from different borrow sources.

It is anticipated that concrete aggregate would be sourced off-site from established quarries with acceptable quality control/assurance

# 7.0 Geotechnical Constraints and Opportunities

## 7.1 Turbine Foundations

Rock is expected to be present either at the surface or at very shallow depth at all turbine locations, which should make anchored footings a viable option for many turbines. However, if the rock is highly fractured or deeply weathered, the anchors may need to be excessively deep and/or the associated overall rock mass may have a low stiffness which would result in excessive deflections of the base of turbine. In such areas gravity footings may be required.

Future geotechnical investigations will be required to assess the condition of the rock at each turbine location.

## 7.2 Construction Materials

### 7.2.1 Aggregate

Potential borrow pit sites that are suitable for producing aggregate for unsealed road construction are expected to be readily available throughout the project area. Selecting areas where the rock is more closely fractured but still of high strength should result in reduced effort during excavation and crushing of the aggregate.

Due to the higher quality demands on concrete aggregate, it is expected that off-site sources of concrete will be used.

### 7.2.2 Water

Whilst a number of farm dams are present throughout the site, the majority appeared small and were located either on ephemeral creeks or hillsides. Many of the dams observed on 15 March 2016 had little or no water. The ability to utilise surface water for construction is therefore expected to be limited to the wetter months of the year.

A number of existing bores are present throughout the project area that are currently used for stock watering or other agricultural purposes. Existing data indicates that they are of low yield of 0.3 to 0.5 L/S and ranged from 1500 mg/L TDS (fresh to brackish) up to 7000 mg/L (saline). It is noted that the existing bore observations noted above were from the 1970's and should be checked on site if on site groundwater is to be considered.

Should the installation and development of new bores be required during construction, a South Australian Government permit (from the Department of Water and Natural Resources) will be required for each new bore.

## 7.3 Slope Stability

No evidence of significant existing landslides was observed at the site during this study, however, slope stability assessment was beyond the scope of the current study.

If significant thicknesses of new cuts or fills are required for access road construction, the stability of such earthworks must be assessed.

The stability of turbine footings in close proximity to steep slopes must also be assessed, particularly where the rock mass is highly fractured or has unfavourably orientated defects.

## 7.4 Excavatability

The majority of footing excavations for the turbines are expected to be in rock, which will require the use of rock excavation techniques, such as hydraulic rock breakers mounted on large excavators. The use of blasting should be avoided however, as it may loosen the rock mass and lower the stiffness of the rock below the footing level.

## 7.5 Erosion

Considerable erosion of the relatively thin soil cover was observed across the site, especially adjacent to creeks. The soil erosion had resulted in the accumulation of significant quantities of sediment in some creek beds.

Any new excavations that expose the soil profile must be provided with protection from erosion, and mitigation measures such as silt fences may be required down gradient of active earthworks areas to avoid fouling the natural creeks.

## 7.6 Future Geotechnical Investigations

A staged approach to future geotechnical investigations is recommended, with initial test pitting recommended at each turbine location to assess the near-surface rock strength, weathering, fracture spacing and the orientation of the main rock defects at each proposed turbine site. Similar investigations at key points along proposed access road tracks and at the proposed substation site should also be performed.

Following a review of the test pit results, seismic refraction surveys should be considered at a range of turbine locations, if the option of anchored footings is to be assessed. Seismic surveys should be performed at a selection of sites covering the range of more favourable to less favourable rock foundations conditions observed in the test pits to allow an initial assessment of the feasibility of anchored footings.

Diamond cored boreholes to about 15 m depth should then be performed to better assess the viability of anchored footings at sites that are potentially unsuitable for anchored footings, and at selected sites that cover the different rock types where favourable conditions are predicted.

# 8.0 References

Department for Environment and Heritage, South Australia (2001) *Truro* 1:50,000 topographic map.

Department of Mines Adelaide (1969) *Adelaide* 1:250,000 geology sheet, Geological Survey of South Australia.

Department for Manufacturing, Innovation, Trade, Resources and Energy (2013) *Truro* 1:50,000 Mineral Resource Potential, Geological Survey of South Australia.

Fleming, PD (1965) *Report on "Newlands" Barytes Deposit Sections 162 and 201 Hundred Julia Creek*. Report Book 60/3, Department of Mines South Australia

Mansfield, LL (1950) *E.A. Linke Bartes* [sic] *Mine – HD. Julia Creek*, Report book 29-3, Department of Mines South Australia

Priess, WV (1987) *The Adelaide Geosyncline Late Proterozoic Stratigraphy, Sedimentation, Palaeontology and Tectonics*, Bulletin 53. Geological Survey of South Australia, Department of Mine and Energy.

South Australian Government http://minerals.statedevelopment.sa.gov.au/geoscience/mineral_commodities/barite, accessed on 2 March 2016.

# 9.0 Limitations

AECOM Services Pty Limited (AECOM) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of RES and only those third parties who have been authorised in writing by AECOM to rely on the report.

It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the contract.

The methodology adopted and sources of information used by AECOM are outlined in this the Report.

Where this report indicates that information has been provided to AECOM by third parties, AECOM has made no independent verification of this information unless required as part of the agreed scope of work. AECOM assumes no liability for any inaccuracies in or omissions to that information.

This Report was prepared between March and October 2016. The information in this report is considered to be accurate at the date of issue and is in accordance with conditions at the site at the dates sampled. Opinions and recommendations presented herein apply to the site existing at the time of our investigation and cannot necessarily apply to site changes of which AECOM is not aware and has not had the opportunity to evaluate. This document and the information contained herein should only be regarded as validly representing the site conditions at the time of the investigation unless otherwise explicitly stated in a preceding section of this report. AECOM disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

This report contains information obtained by inspection, sampling, testing or other means of investigation. This information is directly relevant only to the points in the ground where they were obtained at the time of the assessment. The borehole logs indicate the inferred ground conditions only at the specific locations tested. The precision with which conditions are indicated depends largely on the uniformity of conditions and on the frequency and method of sampling as constrained by the project budget limitations. The behaviour of groundwater and some aspects of contaminants in soil and groundwater are complex. Our conclusions are based upon the analytical data presented in this report and our experience. Future advances in regard to the understanding of chemicals and their behaviour, and changes in regulations affecting their management, could impact on our conclusions and recommendations regarding their potential presence on this site.

Where conditions encountered at the site are subsequently found to differ significantly from those anticipated in this report, AECOM must be notified of any such findings and be provided with an opportunity to review the recommendations of this report.

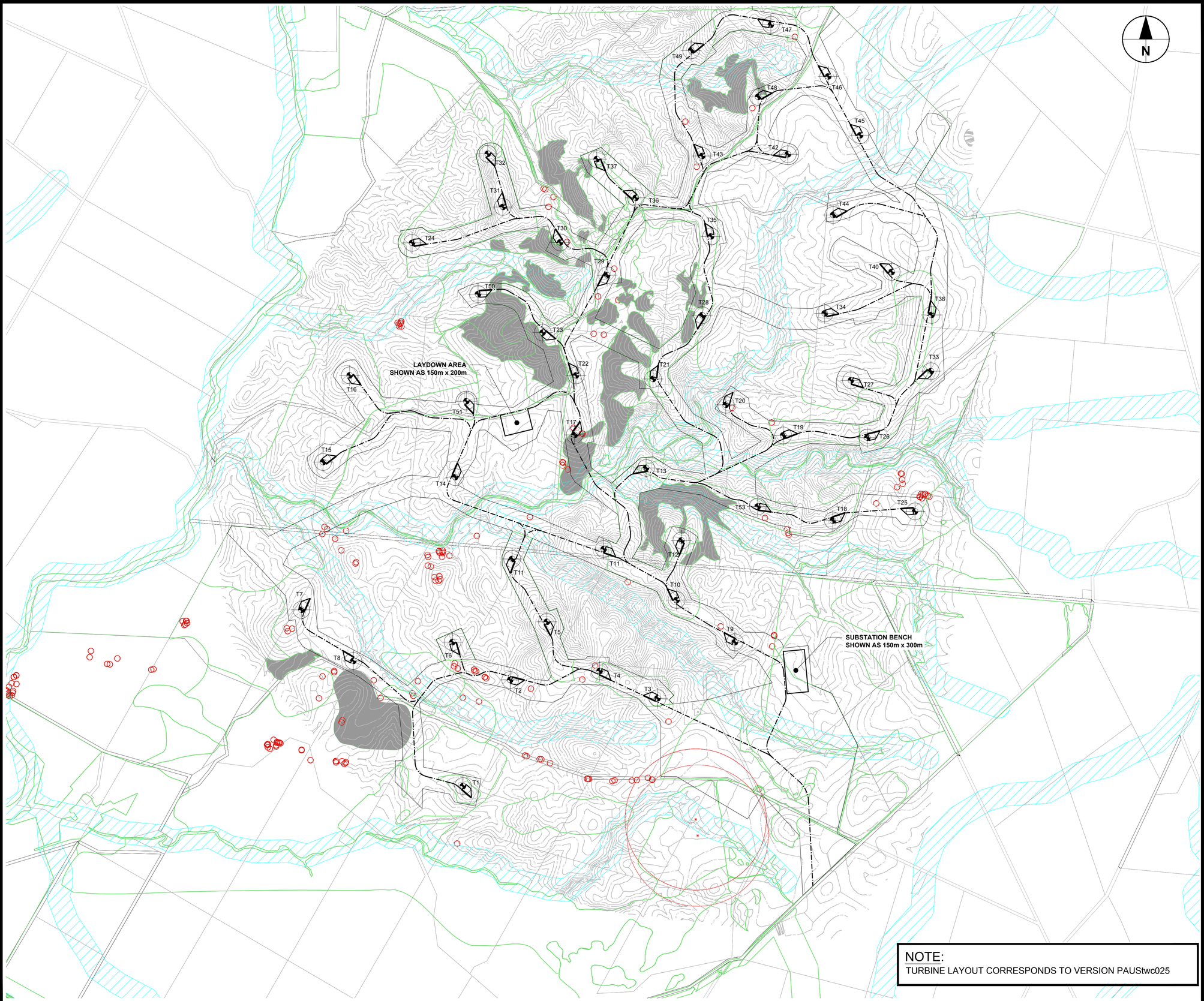
Whilst to the best of our knowledge information contained in this report is accurate at the date of issue, subsurface conditions, including groundwater levels can change in a limited time.

Therefore this document and the information contained herein should only be regarded as valid at the time of the investigation unless otherwise explicitly stated in this report.

Except as required by law, no third party may use or rely on, this Report unless otherwise agreed by AECOM in writing. Where such agreement is provided, AECOM will provide a letter of reliance to the agreed third party in the form required by AECOM. To the extent permitted by law, AECOM expressly disclaims and excludes liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this Report. AECOM does not admit that any action, liability or claim may exist or be available to any third party. AECOM does not represent that this Report is suitable for use by any third party. Except as specifically stated in this section, AECOM does not authorise the use of this Report by any third party. It is the responsibility of third parties to independently make inquiries or seek advice in relation to their particular requirements and proposed use of the relevant property.

# Appendix A

## Preliminary Civil Design




LEGEND

- LOMANDRA EFFUSA + AUSTROSTIPA SP. GRASSLAND
- RADIUS OF FAUNA CONSTRAINT
- PROPOSED HARDSTAND
- PROPOSED TRACK CENTRELINE
- FLOODWAY

NOTE:
TURBINE LAYOUT CORRESPONDS TO VERSION PAUStwc025

power for good

# TWIN CREEK WIND FARM

## CI-001

## TURBINE, EASEMENT AND TRACK CENTRELINE LAYOUT PLAN

DRAFT

NOT FOR CONSTRUCTION

| | | | |
|---|---|---|---|
| INFRA DWG | N/A | APPD DATE | 2017.03.20 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER

**60490763-CI-001**

**SCALE - 1: 13,000 @A1**

COORDS

**MGA94 (Z54)**

**PLANNING PERMIT APPLICATION**



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power for good

hudson howells

strategic management consultants

# RES Australia Pty Ltd

# Twin Creek Wind Farm Socio-Economic Impact Assessment

**Final Report**

March 2017

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# EXECUTIVE SUMMARY

This socio-economic impact assessment focuses on the effect of the Twin Creek Wind Farm Project on regional incomes and employment associated with the construction and operating phases of the project. This effect arises through the primary expenditure directly associated with the project, and then from further 'rounds' of indirect expenditure that this direct expenditure stimulates as it flows to supplying industries and into incomes and consumption.

The economic modelling for the project has been undertaken using indicative assumptions with respect to labour supply. The commitment of the project developers is that there will be prioritisation of local contractors wherever possible, but the modelling assumes that the wind turbine generators are imported from interstate or overseas, and the major local impact is based on transport and assembly.

From a **State perspective**, economic modelling indicates that the project will generate $209 million of value added (which is a net contribution to Gross State Product[1]) in the State of South Australia over the period of construction and that this would happen over three years (allowing for lagged flow through effects). 1,447 person years[2] of employment in South Australia would be supported – or an average of over 480[3] jobs sustained per year over three years. Once operational the project is estimated to support annually $15.5 million of value added in South Australia, and support directly and indirectly in the order of 105 jobs per year. The impact at the national level would be similar to the state level, unless there are constraints in national labour and capital markets with such constraints likely to be limited in the current macroeconomic environment.

From a **regional perspective**[4], the modelling indicates that the project will generate $64 million of value added (contribution to Gross Regional Product) in the region (Barossa and Lower North) over the period of construction and, again allowing for lagged flow through effects, this would happen over three years. 477 person years of employment would be supported, or an average of 159 jobs sustained per year over three years. Once operational the project is estimated to support annually $6.2 million of value added in the region, and support directly and indirectly (including the multiplier impact) approximately 44 jobs per year.

[1] Value added is the way in which economic activity is measured in the National Accounting system. At the national level this is equivalent to Gross Domestic Product (GDP) and is made up of returns to labour (wages and salary and taxes on labour) and returns to capital (gross operating surplus (or profits plus depreciation and financing costs) and company tax and GST). At the state level, the national accounts call this amount the Gross State Product.
[2] i.e. the number of full time equivalent annual jobs created over the period.
[3] 1,474÷3
[4] Regional in this context is defined as the ABS regions of the Barossa and Lower North.

From a **local perspective**[5], based on the assumptions used (which involve the project drawing labour from both the Goyder and Light areas) the modelling indicates that the project will generate:

- $18 million of value added (contribution to Gross Regional Product) in the LGA of Goyder over the period of construction and, again allowing for lagged flow through effects, this would happen over three years. 130 person years of employment for local residents would be supported, or an average of 43 jobs sustained per year over three years. Once operational the project is estimated to support annually $1.8 million of value added in the region, and support directly and indirectly (including the multiplier impact) approximately 12 jobs per year.

- $20 million of value added (contribution to Gross Regional Product) in the LGA of Light over the period of construction over three years. 146 person years of employment for local residents would be supported, or an average of 49 jobs sustained per year over three years. Once operational the project is estimated to support annually $2.3 million of value added in the region, and support directly and indirectly (including the multiplier impact) approximately 16 jobs per year.

The above economic modelling results are summarised in the following tables:

### 3 Year Construction Impacts

| Contribution to GRP - South Australia | Employment Impact - South Australia | Contribution to GRP - Lower North & Barossa | Employment Impact - Region of Lower North & Barossa | Contribution to GRP - Goyder LGA | Employment Impact - Goyder LGA | Contribution to GRP - Light LGA | Employment Impact - Light LGA |
|---|---|---|---|---|---|---|---|
| $209.1 million | 1447; or 482 per annum | $64.3 million | 477; or 159 per annum | $18.3 million | 130; or 43 per annum | $20.1 million | 146; or 49 per annum |

*Note – GSP is Gross State Product, GRP is Gross Regional Product, and jobs are in FTE's or person years*

### Annual Operational Impacts

| Contribution to GRP - South Australia | Employment Impact - South Australia | Contribution to GRP - Lower North & Barossa | Employment Impact - Region of Lower North & Barossa | Contribution to GRP - Goyder LGA | Employment Impact - Goyder LGA | Contribution to GRP - Light LGA | Employment Impact - Light LGA |
|---|---|---|---|---|---|---|---|
| $15.5 million | 105 per annum | $6.2 million | 44 per annum | $1.8 million | 12 per annum | $2.3 million | 16 per annum |

[5] Local in this context is the LGA's of Goyder and Light.

These outcomes are based on assumed levels of local supply, and where more of the activity can be retained in the region (while acknowledging the specialist nature of the construction itself), the more extensive the degree of regional economic activity.

Wind farms can have other positive and negative socio-economic impacts depending on a variety of factors and the specific communities being impacted by the developments. For example, farmers hosting turbines may receive positive financial benefits while other communities might be subject to visual impacts from windfarm infrastructure with no financial benefits. In addition to employment and income generation, property values and carbon emissions are socio-economic externalities of wind farms..

**In relation to property values**, many studies[6] by independent organisations around the world have failed to find any correlation between wind turbines and declining property values. Some studies have found positive property value impacts associated with:

- Improved regional amenities and infrastructure including local roads, firefighting access roads, etc.
- Increased regional incomes, jobs and property demand (as assessed above).
- Additional rental income from hosting wind turbine generators.
- Provision of a drought-proofing income streams.
- Provision of post-retirement income for farmers.
- Improved biodiversity via less intensive farm activity.
- Prevention of land subdivision and slowing down the process of productive agricultural land changing to rural residential uses in the short to medium term with the shift caused by the additional income generated from the wind farm providing additional cash streams to underpin agricultural use.
- Erosion control and passive wind protection for stock from sub stations and turbine wind turbine generators structures.

6 For example, the Lawrence Berkeley Study, United States, States http://eetd.lbl.gov/ea/ems/reports/lbnl-2829e.pdf, reported in Wind Energy the Facts, Clean Energy Council, March 2013

There will be localised positive and negative impacts associated with wind farms depending on individual property locations. Some may appreciate faster than market trends due to improved farm incomes from hosting wind turbine generators and improved access to infrastructure. Some may fail to keep pace with market trends due to visual and noise impacts. Potential disruption during wind turbine generator assembly and infrastructure establishment is also noted. However, the evidence supports no overall long term negative impact on property values associated with wind farm developments.

Finally, renewable wind energy generation has significant environmental benefits through **carbon emissions reduction** where it replaces coal or gas generated electricity.

It is assumed that the Twin Creek Wind Farm will have the following operating characteristics:

- Total wind farm capacity of up to 183 megawatts.
- Annual average utilisation rate of 40%[7].
- Total generation of 613 Gigawatt hours (Gwh) per annum.

It is conservatively assumed that when electricity is generated through coal fired stations, it produces 0.8 tonnes of carbon per megawatt hour[8] of electricity generated. So the generation of 613 Gwh per annum through coal generation would produce in the order of 0.491 million tonnes of carbon emissions. At a carbon price of $20 per tonne (historically conservative relative to international trading schemes, and much lower than what is expected in the longer term – but matching current prices[9]), the value of carbon emission savings associated with the Twin Creek Wind Farm is estimated to be $9.8 million per annum or a net present value of $104 million over a 20 year period (discount rate of 7% real).

[7] Defined as the actual output of the project relative to its maximum possible output
[8] Annual carbon emissions from the National Electricity Market fell by over 12 million tonnes (CO2-e) between June 2012 and May 2013. They fell by only around 1.5 million tonnes over the previous twelve-month period. Carbon pollution per megawatt-hour has also fallen: from 0.86 to 0.81 tonnes per unit of output, or a little over 5 per cent. Source: The Climate Institute – www.climateinstitute.org.au
[9] http://www.worldbank.org/en/programs/pricing-carbon cites "Royal DSM has put a so-called internal price on carbon of EUR50 per ton of CO2e. Sijbesma said this will 'future proof' the business by changing the mindset when reviewing large investment decisions". http://calcarbondash.org/ indicates a current price of US$13 per tonne (having fallen somewhat in the last few years)

# 1 INTRODUCTION

RES Australia Pty Ltd (RES Australia) proposes to develop the Twin Creek Wind Farm within the Mid North area of South Australia. The site of the proposed wind farm is approximately 90km north east of Adelaide and north east of Kapunda. The site is located about 10km northeast of Kapunda, accessed via Twin Creek Road. In addition to employment and income generation, property values and carbon emissions are socio-economic externalities of wind farms.

RES is one of the world's leading independent renewable energy companies, with the expertise to develop, engineer, construct, finance, and operate projects around the globe. RES Australia has been developing renewable energy projects in Australia since 2004.

The proposed wind farm will consist of the following components:

- Up to 51 Wind Turbines Generators (WTG).
- Each WTG has a capacity up to 3.6 Megawatts (MW), with a total installed wind capacity up to 183MW.
- Overall height of turbines would be up to 180 metres at the blade tip, with indicative dimensions of the wind turbine generators being approximately 120 metres and blades approximately 63 metres long.
- Associated hard standing areas and access roads.
- Operations and maintenance building with associated car parking.
- An electrical substation.
- Overhead and underground electrical cable reticulation.
- 275kV overhead transmission line for approximately 15 kilometres from the on-site substation to the existing overhead transmission line adjacent Truro.
- Meteorological masts for measuring wind speed and other climatic conditions.

- Temporary construction facilities including a borrow pit and concrete batching plant facilities.

Hudson Howells has been engaged by RES Australia to undertake a Socio-Economic Impact Assessment on the project in terms of economic benefits to South Australia and the local region (i.e. the Light Regional Council and Regional Council of Goyder). This report contains the following key assessments:

- A Regional Baseline Assessment that details the socio-economic environment of the region for both the Light Regional Council and Regional Council of Goyder. It is recognised that transmission lines will travel through the Mid Murray Council region (to Truro) but there will be little socio economic impact on this region.

- An economic assessment of the Twin Creek Wind Farm Project in terms of economic benefits to local communities of \ Goyder and Light, the broader region of Barossa and Lower North (ABS regions) and also to the state of South Australia.

- An assessment of the associated benefits of offsetting carbon by displacing the need for further non-renewable generation development, such as coal or gas fired power stations.

In addition to the above, consideration is given in this assessment to the potential impact of the project on local property values.

# 2 REGIONAL BASELINE ASSESSMENT - LIGHT

## *2.1 LOCATIONAL ANALYSIS*

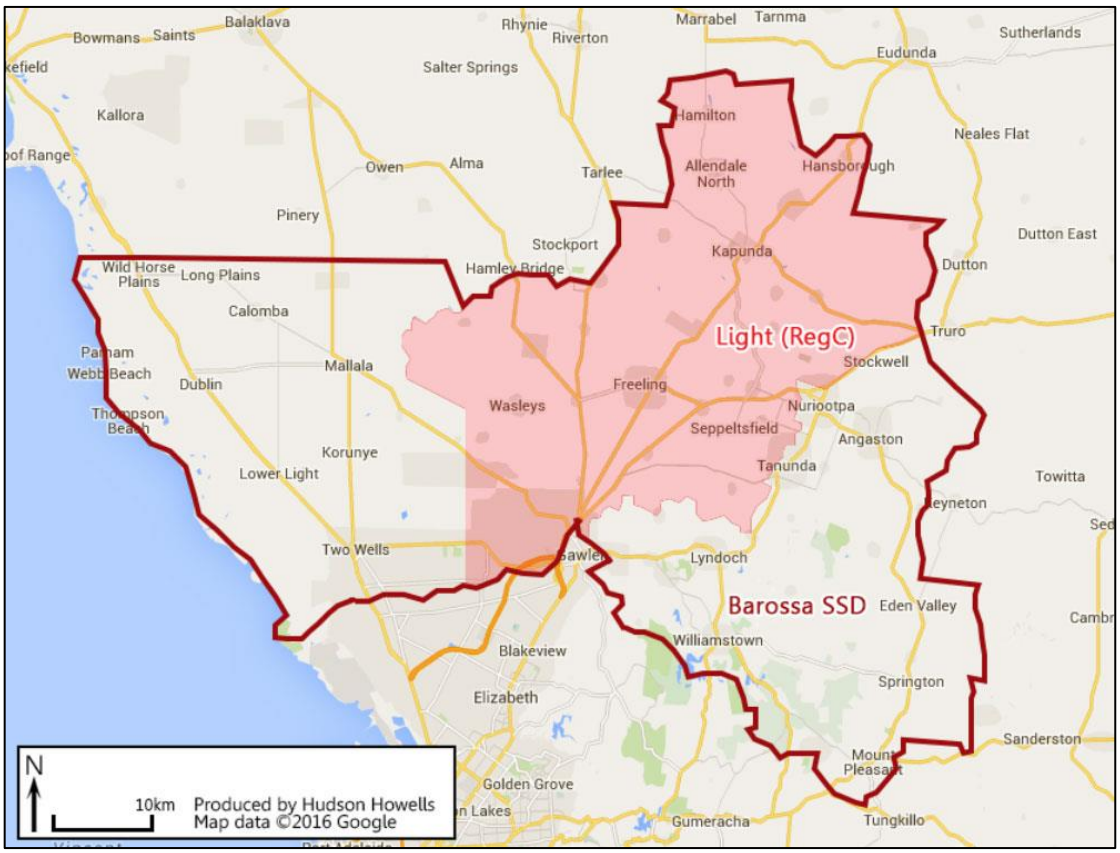
The information contained in this section has been sourced from publicly available data with relevant sources noted and includes:

- A brief description of the Light Regional Council.
- An overview of population growth in the Light Regional Council Local Government Area (LGA), including forecast future growth in population in the region.
- An analysis of socio-demographics of the Light LGA population.
- A brief analysis of internal population migration into and out of the Light LGA.
- An analysis of employment trends in Light LGA, including the growth in employment, using the latest 2011 Census data.
- An analysis of businesses within the Light LGA by industry, including size and turnover.

The Light Regional Council is located within the Barossa Statistical Subdivision (SSD) and is located north-east of the Adelaide metropolitan area, stretching between the District Council of Barossa to the east and District Council of Mallala to the west. The Barossa SSD forms the northern section of the Outer Adelaide Statistical Division, which is included within the Greater Adelaide region. The Council contains the townships of Kapunda, Greenock, Freeling, Wasleys and Roseworthy, and the suburb of Hewett. The region mixes a rich mining heritage with farming, with the benefits of the Barossa Valley. Map 2.1 illustrates the Council's boundary in relation to the surrounding councils.

The Sturt Highway and Barrier Highway are the key transport routes through the region, providing regional access from Adelaide, and further to regional New South Wales and Victoria. Main roads provide access to regional towns within the Council and alternative routes to other major regional towns throughout the State.

***Map 2.1 – Light Regional Council***




## *2.2 POPULATION AND DEMOGRAPHICS*

### 2.2.1 Historical Population

Historical Estimated Resident Population (ERP) figures are released annually by the Australian Bureau of Statistics (ABS). Table 2.2 compares the historical population levels of Light LGA in comparison with the Barossa SSD, Greater Adelaide and South Australia. The Barossa SSD region comprises the Local Government Areas of Light, Barossa, and Mallala. Key points to note from Table 2.2 include:

- Light LGA population increased by over 3,400 people between 2001 and 2011. This represented average growth of 2.9% per annum, which exceeded the average South Australian population growth of 0.8% per annum over the same period.

- Historically, around 30% of the Barossa SSD region resided within the Light LGA.

- Current population of Light LGA is estimated at around 14,840 people.

***Table 2.2 –Estimated Resident Population, 2001 – 2015[1]***

| | Light LGA | Barossa SSD | Greater Adelaide | South Australia |
|---|---|---|---|---|
| 2001 | 10,542 | 37,431 | 1,147,168 | 1,511,728 |
| 2006 | 12,830 | 42,413 | 1,189,442 | 1,567,888 |
| 2011 | 13,984 | 44,992 | 1,252,804 | 1,639,614 |
| 2013(r) | 14,422 | 45,830 | 1,279,662 | 1,670,274 |
| 2014(r) | 14,653 | 46,304 | 1,292,984 | 1,685,550 |
| 2015(p) | 14,841 | 46,695 | 1,304,998 | 1,698,660 |
| Av. Annual Change (%) | | | | |
| 2001-2006 | 4.0% | 2.5% | 0.7% | 0.7% |
| 2006-2011 | 1.7% | 1.2% | 1.0% | 0.9% |
| 2011-2015 | 1.5% | 0.9% | 1.0% | 0.9% |
| 2001-2011 | 2.9% | 1.9% | 0.9% | 0.8% |

*1. As at June. (r) revised; (p) preliminary*
*Source: Australian Bureau of Statistics, Regional Population Growth, Australia, Cat. No. 3218.0.*

### 2.2.2 Forecast Population

Table 2.3 provides population forecast comparisons for Light LGA, Barossa SSD, Greater Adelaide and South Australia from 2016 to 2031. Population forecasts are as presented in the Department of Planning Transport and Infrastructure (DPTI) 'Population Projections for South Australian Local Government Areas, 2011-31' released in February 2016.

***Table 2.3 –Estimated Resident Population, 2016 – 2031[1]***

| | Light LGA | Barossa SSD | Greater Adelaide | South Australia |
|---|---|---|---|---|
| 2015 ERP | 14,841 | 46,695 | 1,304,998 | 1,698,660 |
| 2016 | 15,295 | 48,959 | 1,416,420 | 1,715,299 |
| 2021 | 16,499 | 53,186 | 1,488,821 | 1,791,767 |
| 2026 | 17,712 | 57,587 | 1,560,468 | 1,866,715 |
| 2031 | 18,760 | 62,010 | 1,628,083 | 1,936,812 |
| Av. Annual Change (%) | | | | |
| 2016-2021 | 1.5% | 1.7% | 1.0% | 0.9% |
| 2021-2026 | 1.4% | 1.6% | 0.9% | 0.8% |
| 2026-2031 | 1.2% | 1.5% | 0.9% | 0.7% |

*1. As at June.*
*Source: Department of Planning, Transport and Infrastructure, Government of South Australia, 2016, Population Projections for South Australian Local Government Areas, 2011-31, February 2016 release*

Future population growth for Light LGA is projected to increase to nearly 18,800 people by 2031, representing a net increase of over 3,900 people from 2015, or an average increase of 1.5% per annum over the 16-year period. In comparison, Barossa SSD is forecast to have a

slightly higher population growth of 1.8% per annum between 2015 and 2031, and South Australia is forecast to increase by an average of 0.8% per annum over the same period.

### 2.2.3 Socio-demographic Profile

Key socio-demographic characteristics of the Light LGA from the 2011 Census are provided in Table 2.4, with the main features as follows:

- The average age distribution of Light LGA residents indicates a younger family profile, with over 22% of the population aged under 15 years, and an average age of 38 years. In comparison, the Barossa SSD has an older age with an average age of 41 years.

- Average weekly per capita income of Light LGA residents is 7% above the South Australian average and 3% above the Barossa SSD average.

- Average weekly household income is 22% above the South Australian average.

- Average household size is higher than the South Australian average of 2.4 people, reflecting the younger family profile of the region.

- House ownership within the Light LGA is higher when compared to both Barossa SSD and South Australia (85% compared to 81% and 71% respectively). Median monthly mortgage payments are $70 less when compared to the South Australian median ($1,430 compared to $1,500).

- Car ownership is higher than the South Australian average of 91% of households owning one or more cars, reflecting the regional location.

***Table 2.4 – Light LGA Socio-Economic Characteristics, 2011***

| | Light LGA | Barossa SSD | Greater Adelaide | South Australia |
|---|---|---|---|---|
| Age Distribution: | | | | |
| 0 - 14 years | 22.6% | 19.9% | 17.7% | 19.3% |
| 15 - 24 years | 12.5% | 11.1% | 13.7% | 13.3% |
| 25 - 44 years | 25.1% | 23.8% | 27.2% | 28.1% |
| 45 - 64 years | 28.5% | 29.4% | 26.0% | 25.3% |
| 65+ years | 11.3% | 15.8% | 15.4% | 14.0% |
| Median Age | 38 | 41 | 39 | 39 |
| Dependency Ratio[1] | 33.9% | 35.7% | 33.1% | 33.3% |
| Av. Weekly Per Capita Income | $570 | $551 | $554 | $534 |
| Per Capita Income Var.[2] | 7% | 3% | 4% | |
| Household Income: | | | | |
| $0 - $31,199 | 19.3% | 24.2% | 25.1% | 26.7% |
| $31,200 - $77,999 | 39.7% | 40.9% | 38.1% | 38.8% |
| $78,000 - $155,999 | 33.5% | 28.9% | 28.6% | 27.1% |
| $156,000+ | 7.5% | 6.0% | 8.2% | 7.3% |
| Av. Weekly Household Income | $1,274 | $1,102 | $1,106 | $1,044 |
| Household Income Var.[2] | 22% | 6% | 6% | |
| Av. Household Size | 2.8 | 2.5 | 2.4 | 2.4 |
| Housing Status: | | | | |
| Owner/purchaser[3] | 84.9% | 80.9% | 70.7% | 70.9% |
| Renter | 15.1% | 19.1% | 29.3% | 29.1% |
| Median Monthly Mortgage | $1,430 | $1,343 | $1,545 | $1,500 |
| Median Weekly Rent | $200 | $200 | $250 | $220 |
| Car Ownership: | | | | |
| % 0 cars | 2.2% | 3.8% | 9.6% | 9.0% |
| % 1 car | 24.0% | 29.6% | 38.5% | 37.8% |
| % 2+ cars | 73.8% | 66.7% | 51.9% | 53.2% |

*Note: Based on place of enumeration.*
*1. Dependency ratio refers to the proportion of the population aged between 0-14 and over 65 years.*
*2. Compared to the South Australian benchmark.*
*3. 'Other' tenure types have not been included.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

### 2.2.4 Internal Migration

The following table highlights net migration between 2006 and 2011 for the Light LGA.

The region had a net population gain of 1,080 people through migration. Net population gains to the region came from the Cities of Playford, Salisbury, and Tea Tree Gully, while top statistical areas for population migration out of Light LGA were the adjacent Barossa LGA, and southern LGAs of The Coorong and Alexandrina.

***Table 2.5 – Key Statistical Areas Ranked by Light LGA Net Migration***

| Statistical Area | Net Gain | Statistical Area | Net Loss |
|---|---|---|---|
| Playford (C) | 240 | Barossa (DC) | -95 |
| Overseas | 206 | The Coorong (DC) | -17 |
| Salisbury (C) | 199 | Alexandrina (DC) | -16 |
| Tea Tree Gully (C) | 153 | Queensland | -15 |
| Gawler (T) | 87 | Victor Harbor (C) | -14 |
| New South Wales | 51 | Adelaide (C) | -13 |
| Port Adelaide Enfield (C) | 41 | Yorke Peninsula (DC) | -12 |
| Marion (C) | 33 | Norwood Payneham St Peters (C) | -10 |
| Clare and Gilbert Valleys (DC) | 26 | Barunga West (DC) | -9 |
| Victoria | 26 | Berri and Barmera (DC) | -9 |
| Wakefield (DC) | 22 | Flinders Ranges (DC) | -9 |
| Northern Territory | 21 | Tasmania | -9 |

## *2.3 LABOUR MARKET*

### 2.3.1 Light LGA Employment Profile – Key Trends

The demographics and employment profile of Light LGA residents has changed over the years due to an aging population.

Examining Census information from 2006 and 2011, Table 2.6 outlines the key demographic trends for the residents in Light LGA in comparison to Barossa SSD and Greater Adelaide.

The key findings from this analysis are as follows:

- Incomes have increased by 22%, stronger compared to the Barossa SSD (20.3%) and slightly lower than that experienced across Greater Adelaide (23.9%).

- The age profile of the Light LGA population is becoming slightly older, with population aged 25-44 years decreasing from 27.8% in 2006 to 25.1% in 2011 (-2.7%), greater than the Barossa SSD benchmark change (-1.6%). In comparison, the Greater Adelaide population is aging slower, with a decrease in the 25-44 year old age bracket decreasing by 0.3% over the same period.

- Blue-collar occupations have decreased in the Light LGA. In 2011, 38.1% of the region's population were working in blue-collar occupations, which is lower than 2006 (40.4%). This proportion is higher than the Greater Adelaide benchmark and slightly lower than Barossa SSD, indicating the high proportion of industrial employment in the region.

- Labour force participation within the Light LGA has increased to 79.6% (+3.5%), remains comparable to Barossa SSD (80.1%) and is higher than the Greater Adelaide average (74.7%).

- Unemployment in the Light LGA is some 0.4% higher than the Barossa SSD (4.3% compared to 3.9%) and lower when compared to the Greater Adelaide average of 5.8%.

The demographic trends occurring in the Light LGA are consistent with an aging population and decreasing employment opportunities within the region.

***Table 2.6 – Light LGA Resident Population Demographics***

| | Light (RegC) | Barossa SSD | Greater Adelaide |
|---|---|---|---|
| Median Weekly Per Capita Income: | | | |
| *% growth 2006-2011* | *+22.1%* | *+20.3%* | *+23.9%* |
| Population Aged 25-44 Years: | | | |
| *% change 06-11* | *-2.7%* | *-1.6%* | *-0.3%* |
| Blue Collar Occupations: | | | |
| 2006 | 40.4% | 41.9% | 31.6% |
| 2011 | 38.1% | 40.3% | 30.1% |
| *% change 06-11* | *-2.2%* | *-1.6%* | *-1.5%* |
| Labour Force Participation: | | | |
| 2006 | 76.1% | 76.9% | 72.3% |
| 2011 | 79.6% | 80.1% | 74.7% |
| *% change 06-11* | *3.5%* | *3.1%* | *2.4%* |
| Unemployment[1]: | | | |
| 2006 | 4.1% | 3.9% | 5.2% |
| 2011 | 4.3% | 3.9% | 5.8% |
| *% change 06-11* | *+0.1%* | *+0.0%* | *+0.5%* |

*Note: Based on place of usual residence.*
*1. Unemployed as proportion of total labour force.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

### 2.3.2 Resident Labour Force Structure

The following Table 2.7 examines the labour force and age profile of Light LGA population in 2011.

- Light LGA had a labour force of 7,200 people, of who 58.1% were employed full-time.

- The proportion of full-time workers is higher when compared to Greater Adelaide (56.9%).

- As mentioned previously the unemployment rate of 4.3% in 2011 is lower than the Greater Adelaide average of 5.8%.

- It is clear that youth unemployment is particularly high, with 24% of unemployed aged between 15-19 years compared to 19% in Greater Adelaide.

***Table 2.7 – Light LGA Resident Population Demographics***

| | Light (RegC) | Barossa SSD | Greater Adelaide |
|---|---|---|---|
| Employed: | | | |
| - Full-time | 58.1% | 58.7% | 56.9% |
| - Part-time | 31.6% | 31.8% | 31.6% |
| - Away from work | 6.0% | 5.5% | 5.7% |
| Total Employed | 95.7% | 96.1% | 94.2% |
| Unemployed: | | | |
| - Looking for full-time work | 2.4% | 2.4% | 3.4% |
| - Looking for part-time work | 1.9% | 1.6% | 2.4% |
| Total Unemployed | 4.3% | 3.9% | 5.8% |
| Total Labour Force | 7,212 | 16,933 | 612,227 |
| Not in the labour force | 3,108 | 8,728 | 352,642 |
| *Unemployed:* | | | |
| 15-19 years | 24% | 22% | 19% |
| 20-24 years | 16% | 14% | 19% |
| 25-29 years | 11% | 10% | 12% |
| 30-34 years | 7% | 7% | 10% |
| 35-39 years | 9% | 9% | 9% |
| 40-44 years | 9% | 8% | 8% |
| 45-49 years | 9% | 11% | 8% |
| 50-54 years | 6% | 8% | 6% |
| 55-59 years | 5% | 7% | 5% |
| 60-64 years | 4% | 3% | 3% |

*Note: Based on place of usual residence.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

### 2.3.3 Employment by Industry

Census data for 2006 and 2011 also show that the changing demographics are resulting in a shift in the type of industries employing these residents, as outlined in Tables 2.8 and 2.9.

Table 2.8 indicates that industrial employment is significant within the Light LGA with over a third of residents employed within Manufacturing, Construction, Transport/Warehousing, and Wholesale Trade (33.6% compared to 26.2% of Greater Adelaide). The proportion of Light LGA residents employed in Manufacturing has decreased to 17.5% (-2.1% between 2006 and 2011), while Health Care increased by 1.3% in the five years to 2011 to 11.0%.

***Table 2.8 – Light LGA Proportion of Population by Industry, 2006 - 2011***

| | Light LGA | | | Greater Adelaide |
|---|---|---|---|---|
| | 2006 | 2011 | Change | 2011 |
| Manufacturing | 19.5% | 17.5% | -2.1% | 10.6% |
| Health care and social assistance | 9.7% | 11.0% | 1.3% | 14.5% |
| Retail trade | 10.8% | 10.1% | -0.7% | 11.6% |
| Agriculture, forestry and fishing | 12.1% | 9.5% | -2.6% | 1.0% |
| Construction | 8.0% | 8.1% | 0.1% | 7.7% |
| Education and training | 7.2% | 7.3% | 0.1% | 8.4% |
| Public administration and safety | 5.0% | 6.4% | 1.3% | 7.8% |
| Accommodation and food services | 4.6% | 5.5% | 0.9% | 6.2% |
| Transport, postal and warehousing | 4.8% | 4.8% | -0.1% | 4.2% |
| Administrative and support services | 3.1% | 3.4% | 0.3% | 3.6% |
| Professional, scientific and technical services | 3.0% | 3.3% | 0.3% | 6.4% |
| Wholesale trade | 3.0% | 3.2% | 0.2% | 3.7% |
| Financial and insurance services | 1.8% | 1.9% | 0.1% | 3.5% |
| Mining | 0.8% | 1.1% | 0.4% | 0.7% |
| Electricity, gas, water and waste services | 0.6% | 1.0% | 0.4% | 1.4% |
| Arts and recreation services | 0.9% | 0.9% | 0.1% | 1.4% |
| Rental, hiring and real estate services | 1.0% | 0.9% | -0.2% | 1.4% |
| Information media and telecommunications | 1.0% | 0.8% | -0.2% | 1.7% |
| Other services | 3.2% | 3.3% | 0.2% | 4.1% |

*Note: Based on place of usual residence.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

### 2.3.4 Employment by Occupation

Table 2.9 provides an overview of the change in occupations within Light LGA between 2006 and 2011.

Although a third of Light LGA residents are employed within industrial sectors (33.6% compared to 30% of Greater Adelaide), over half of occupations within Light LGA are white-collar.

Blue-collar employment decreased by 2.5% between 2006 and 2011, with the greatest reduction of occupations within the Labourers category (-3.1%). Employment within Community and personal service category increased by 2.2% to 10.4% of the Light LGA population.

***Table 2.9 – Light LGA Proportion of Population by Occupation, 2006 – 2011***

| | Light LGA | | | Greater Adelaide |
|---|---|---|---|---|
| | 2006 | 2011 | Change | 2011 |
| Blue Collar: | | | | |
| Labourers | 16.8% | 13.7% | -3.1% | 10.1% |
| Machinery Operators and Drivers | 7.5% | 8.0% | 0.6% | 5.8% |
| Technicians and Trades Workers | 16.1% | 16.2% | 0.1% | 14.1% |
| Total Blue Collar | 40.4% | 37.9% | -2.5% | 30.0% |
| White Collar: | | | | |
| Managers | 18.1% | 16.7% | -1.4% | 11.3% |
| Professionals | 12.8% | 13.7% | 0.9% | 21.9% |
| Clerical and Administrative Workers | 8.2% | 10.4% | 2.2% | 10.9% |
| Sales Workers | 12.4% | 12.7% | 0.3% | 15.7% |
| Community and Personal Service Workers | 8.2% | 8.6% | 0.5% | 10.1% |
| Total White Collar | 59.6% | 62.1% | 2.5% | 70.0% |

*Note: Based on place of usual residence.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

## *2.4 JOURNEY TO WORK*

Tables 2.10 to 2.11 analyse the structure employment of both Light LGA residents and those employed within the region who live outside the LGA. The following tables are based on Journey to Work data from the 2011 Census.

### 2.4.1 Working within Light LGA

The total workforce employed in Light LGA in 2011 was over 3,700 people.

Table 2.10 shows that workers commute to the Light LGA from close proximity to the region, with over half of employment in Light LGA filled by Light LGA residents (51%). Industrial industries are more likely to employ residents from beyond the Barossa SSD (63% compared to 71% of employees within other industries) while employees in other industries are more likely to reside locally, e.g. 70% of Light LGA residents working within 'Agriculture, Forestry and Fishing' industries.

***Table 2.10 – Light LGA Workforce by Home LGA, 2011***

| | Total Industrial Industries | | Total Other Industries | Total Industries |
|---|---|---|---|---|
| **Home LGA** | **No.** | **%** | **%** | **%** |
| Light (RegC) | 557 | 40% | 57% | 51% |
| Barossa (DC) | 298 | 21% | 12% | 16% |
| Mallala (DC) | 20 | 1% | 2% | 2% |
| *Total Barossa SSD* | *875* | *63%* | *71%* | *68%* |
| Clare and Gilbert Valleys (DC) | 17 | 1% | 2% | 2% |
| Goyder (DC) | 10 | 1% | 1% | 1% |
| Wakefield (DC) | 19 | 1% | 2% | 2% |
| *Total Lower North SSD* | *46* | *3%* | *5%* | *4%* |
| Adelaide Hills (DC) | 12 | 1% | 1% | 1% |
| Charles Sturt (C) | 19 | 1% | 1% | 1% |
| Gawler (T) | 158 | 11% | 11% | 11% |
| Mid Murray (DC) | 30 | 2% | 1% | 1% |
| Playford (C) | 107 | 8% | 4% | 5% |
| Port Adelaide Enfield (C) | 12 | 1% | 1% | 1% |
| Salisbury (C) | 51 | 4% | 2% | 3% |
| Tea Tree Gully (C) | 35 | 3% | 1% | 2% |
| Remainder SA | 46 | 3% | 2% | 3% |
| Interstate | 3 | 0% | 0% | 0% |

*Note: Based on place of usual residence.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

### 2.4.2 Light LGA Resident Workforce

Table 2.11 provides an overview of the locations where residents of Light LGA work.

Nearly half of Light LGA residents work within the Barossa SSD (45%) with over a quarter of residents working locally within Light LGA (28%). Gawler LGA is a popular location for residents working in other industries (14%) with a total of 11% employed within that region. Light LGA residents were likely to travel to LGAs close to home, including Playford LGA (8%), Salisbury LGA (8%) and Port Adelaide Enfield (5%), and 4% travelling further to Adelaide for work.

***Table 2.11 – Light LGA Workforce by Work LGA, 2011***

| | Total Industrial Industries | | Total Other Industries | Total Industries |
|---|---|---|---|---|
| **Work LGA** | **No.** | **%** | **%** | **%** |
| Light (RegC) | 558 | 25% | 30% | 28% |
| Barossa (DC) | 437 | 20% | 15% | 16% |
| Mallala (DC) | 12 | 1% | 1% | 1% |
| *Total Barossa SSD* | *1,007* | *46%* | *45%* | *45%* |
| Adelaide (C) | 24 | 1% | 5% | 4% |
| Charles Sturt (C) | 59 | 3% | 1% | 1% |
| Clare and Gilbert Valleys (DC) | 21 | 1% | 1% | 1% |
| Gawler (T) | 94 | 4% | 14% | 11% |
| Goyder (DC) | 6 | 0% | 1% | 1% |
| Norwood Payneham St Peters (C) | 12 | 1% | 1% | 1% |
| Playford (C) | 189 | 9% | 8% | 8% |
| Port Adelaide Enfield (C) | 194 | 9% | 3% | 5% |
| Salisbury (C) | 198 | 9% | 7% | 8% |
| Tea Tree Gully (C) | 16 | 1% | 1% | 1% |
| Wakefield (DC) | 3 | 0% | 1% | 1% |
| West Torrens (C) | 35 | 2% | 1% | 1% |
| Remainder SA | 320 | 14% | 10% | 12% |
| Interstate | 29 | 1% | 1% | 1% |

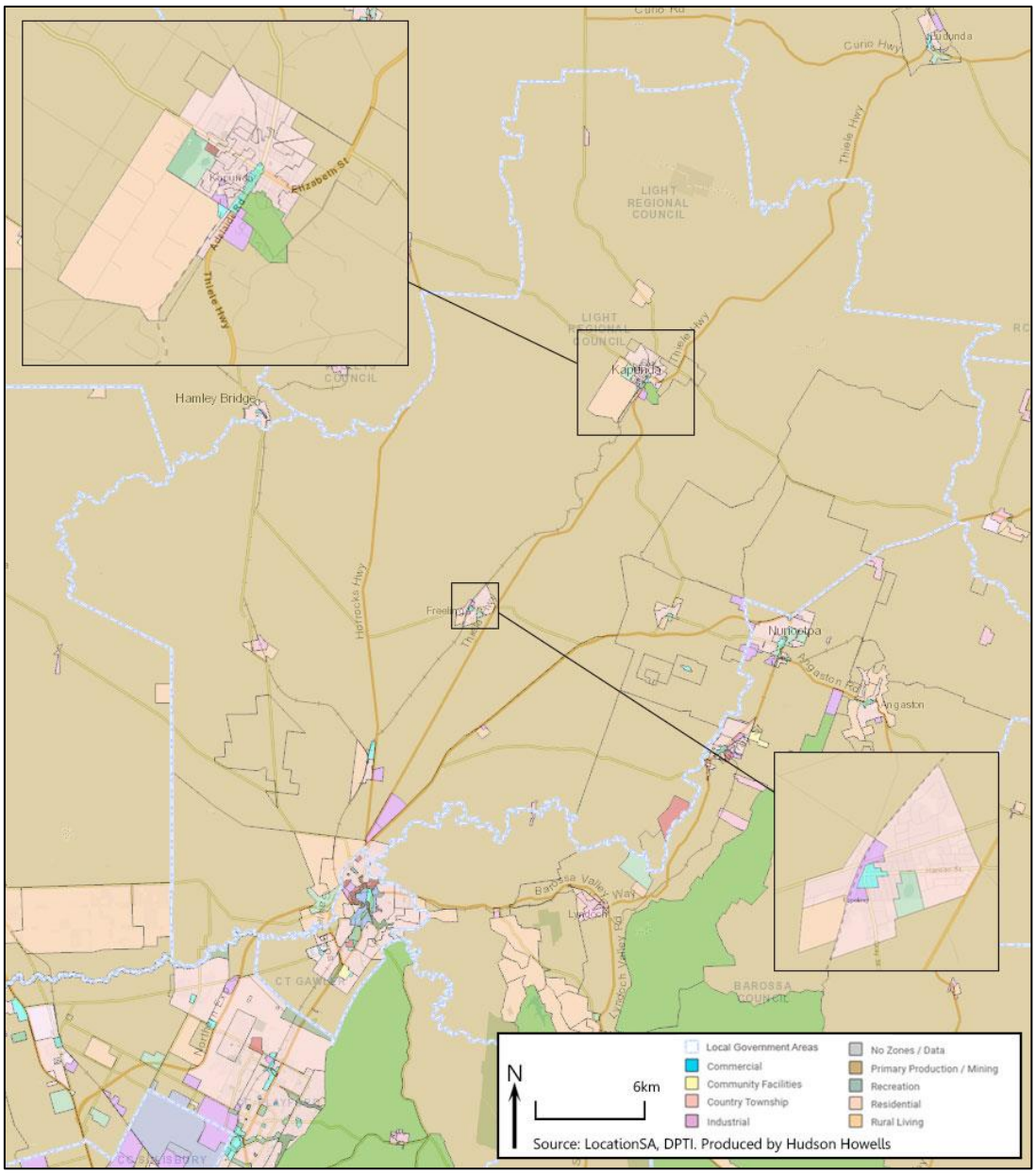
*Note: Based on place of usual residence.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

## *2.5 EMPLOYMENT TRENDS*

### 2.5.1 Land Use

As shown in Map 2.1, the Light LGA is predominantly currently zoned for primary production. Larger towns of Kapunda and Freeling are primarily residential with rural living on the fringe of the town, with commercial uses located along main roads and adjacent industrial areas. Townships of Wasleys, Greenock, Allendale North, Roseworthy are a mix of residential and rural living with associated small commercial areas.

***Map 2.1 –Land Use***




## 2.5.2 Number of Businesses

Data relating to the 'Counts of Australian Businesses' are released annually by the Australian Bureau of Statistics (ABS). The counts in this release are heavily influenced by entry and exits within Australia's small business sector, and we note that the scope of business counts is limited to businesses actively remitting in a GST role.

Table 2.12 and Chart 2.1 compares the change in the number of businesses within the Light LGA between 2010 and 2015 by employment size and industry division.

Key points to note from Table 2.12 and Chart 2.1 include:

- Light LGA had a total of 823 businesses in 2015, decreasing by one business since 2010.

- Businesses employing four or less employees accounted for 91% of total businesses in 2015, comprising 507 non-employing businesses and 244 businesses employing between one and four employees.

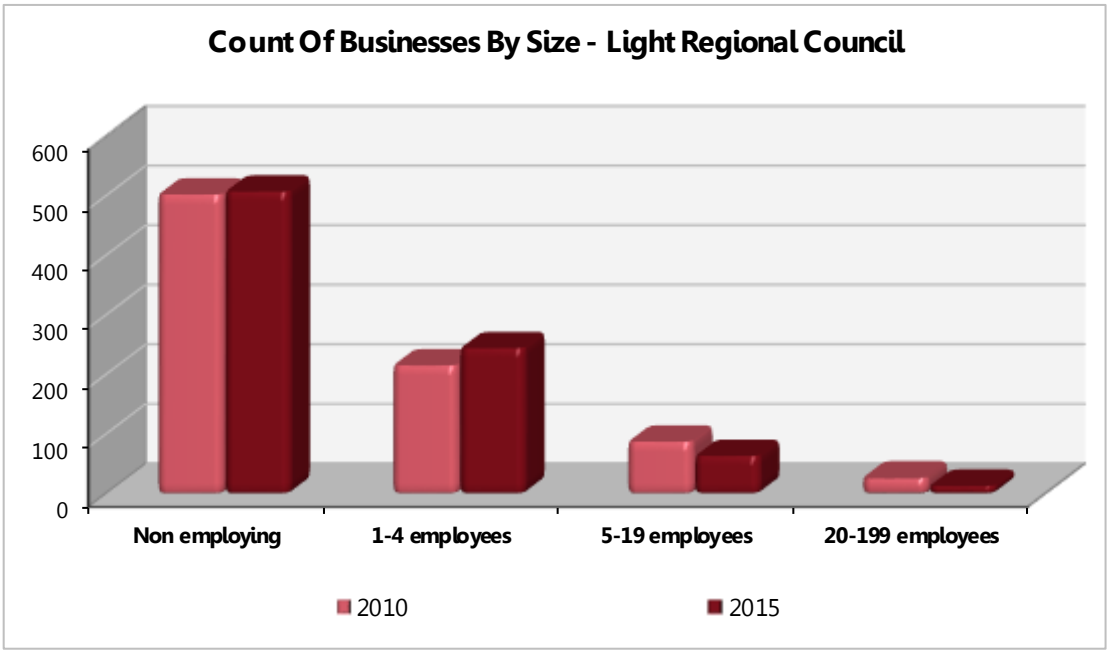
- Agriculture, Forestry and Fishing had the most businesses operating in the Light LGA in 2015 (317 businesses or 39% of total businesses).

***Table 2.12 – Count of Business by Industry and Size in Light LGA, 2010 – 2015***

| | 4 or less employees | | | Total | | |
|---|---|---|---|---|---|---|
| **Industry** | **2010** | **2015** | **% change** | **2010** | **2015** | **% change** |
| Agriculture, Forestry and Fishing | 296 | 296 | +0% | 346 | 317 | -8% |
| Construction | 98 | 97 | -1% | 104 | 97 | -7% |
| Rental, Hiring & Real Estate Services | 56 | 68 | +21% | 59 | 68 | +15% |
| Manufacturing | 52 | 40 | -23% | 61 | 57 | -7% |
| Transport, Postal and Warehousing | 33 | 39 | +18% | 39 | 45 | +15% |
| Prof., Scientific & Technical Services | 29 | 37 | +28% | 38 | 41 | +8% |
| Retail Trade | 25 | 24 | -4% | 41 | 35 | -15% |
| Financial and Insurance Services | 20 | 35 | +75% | 20 | 35 | +75% |
| Accommodation and Food Services | 17 | 14 | -18% | 26 | 25 | -4% |
| Wholesale Trade | 13 | 22 | +69% | 13 | 25 | +92% |
| Health Care and Social Assistance | 10 | 19 | +90% | 10 | 19 | +90% |
| Administrative and Support Services | 12 | 12 | +0% | 15 | 12 | -20% |
| Arts and Recreation Services | 6 | 7 | +17% | 6 | 7 | +17% |
| Education and Training | 9 | 6 | -33% | 9 | 6 | -33% |
| Public Administration and Safety | 3 | 3 | +0% | 3 | 3 | +0% |
| Elec., Gas, Water & Waste Services | 3 | 0 | - | 3 | 0 | -% |
| Other Services | 28 | 28 | +0% | 31 | 31 | +0% |
| *Total* | *710* | *747* | *+5%* | *824* | *823* | *-0%* |

*Note: Excludes 'Currently unknown'.*
*Source: Australian Bureau of Statistics, Counts of Australian Businesses, including Entries and Exits, Cat. No. 8165.0.*

***Chart 2.1 - Count of Business by Size in Light LGA, 2010 – 2015***




*Source: Australian Bureau of Statistics, Counts of Australian Businesses, including Entries and Exits, Cat. No. 8165.0.*

### 2.5.3 Business Turnover Levels

Table 2.13 and Chart 2.2 compares the change in the number of businesses within the Light LGA between 2010 and 2015 by level of turnover and industry division.

Key points to note from Table 2.13 and Chart 2.2 include:

- Nearly a quarter of all businesses within the Light LGA had an annual turnover over more than $500,000 (22%), including 4% or 36 businesses with an annual turnover of $2 million or more.

- The number of businesses within turnover ranges has increased for all ranges between 2010 and 2015, with the exception of those businesses with turnover less than $100,000 per annum.

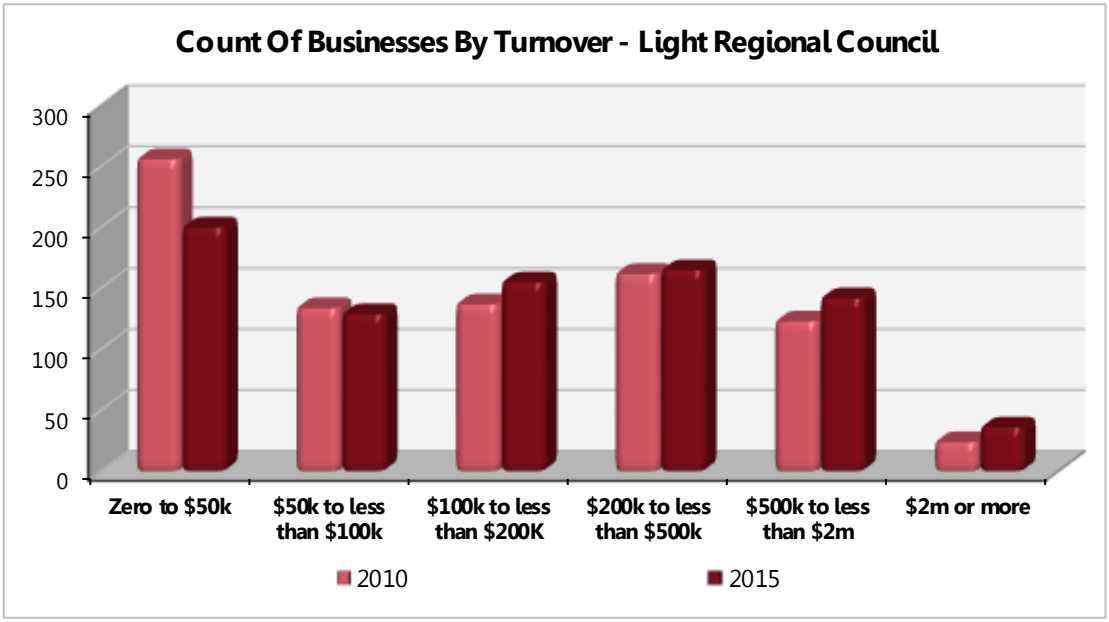
- Agriculture, Forestry and Fishing had the greatest number of businesses in the Light LGA with an annual turnover of more than $2 million in 2015 (11 businesses).

***Table 2.13 – Count of Business by Industry and Turnover in Light LGA, 2010 – 2015***

| | $200k+ turnover | | | Total | | |
|---|---|---|---|---|---|---|
| **Industry** | **2010** | **2015** | **% change** | **2010** | **2015** | **% change** |
| Agriculture, Forestry and Fishing | 129 | 137 | +6% | 337 | 317 | -6% |
| Construction | 32 | 35 | +9% | 111 | 98 | -12% |
| Rental, Hiring & Real Estate Services | 14 | 25 | +79% | 61 | 69 | +13% |
| Manufacturing | 34 | 35 | +3% | 65 | 57 | -12% |
| Transport, Postal and Warehousing | 14 | 21 | +50% | 36 | 44 | +22% |
| Prof., Scientific & Technical Services | 12 | 11 | -8% | 33 | 41 | +24% |
| Financial and Insurance Services | 0 | 6 | - | 22 | 35 | +59% |
| Retail Trade | 22 | 15 | -32% | 44 | 33 | -25% |
| Accommodation and Food Services | 12 | 13 | +8% | 21 | 24 | +14% |
| Wholesale Trade | 6 | 6 | +0% | 12 | 23 | +92% |
| Health Care and Social Assistance | 13 | 12 | -8% | 19 | 20 | +5% |
| Administrative and Support Services | 0 | 3 | - | 11 | 10 | -9% |
| Arts and Recreation Services | 6 | 3 | -50% | 15 | 7 | -53% |
| Education and Training | 3 | 3 | +0% | 6 | 6 | +0% |
| Elec., Gas, Water & Waste Services | 0 | 0 | - | 6 | 3 | -50% |
| Public Administration and Safety | 3 | 0 | -100% | 6 | 3 | -50% |
| Mining | 0 | 3 | - | 0 | 3 | - |
| Other Services | 9 | 15 | +67% | 21 | 31 | +48% |
| *Total* | *309* | *343* | *+11%* | *826* | *824* | *-0%* |

*Note: Excludes 'Currently unknown'.*
*Source: Australian Bureau of Statistics, Counts of Australian Businesses, including Entries and Exits, Cat. No. 8165.0.*

***Chart 2.2 - Count of Business by Turnover in Light LGA, 2010 – 2015***




*Source: Australian Bureau of Statistics, Counts of Australian Businesses, including Entries and Exits, Cat. No. 8165.0.*

## *2.6 TOWNSHIP SERVICES*

In addition to accommodation, workers locating temporarily to the Study Area will require a wide range of other convenience services, and the project will also need to source trade and other services from businesses located in the immediate region. This section provides an overview of the services located in the main townships in the Light region of the Study Area.

The Light Regional Council contains the townships of Kapunda, Greenock, Freeling, Wasleys and Roseworthy, and the suburb of Hewett. The region mixes a rich mining heritage with farming, with the benefits of the Barossa Valley wine region.

Kapunda serves as the major service centre for the region and will be the major source of services likely to be required to support the proposed wind farm project. It is easily accessed from Adelaide (77 kilometres) and its northern suburbs via the Fatchen Expressway and is geographically well positioned to the major tourism centres of the Barossa Valley, Clare Valley and the River Murray. Kapunda is located approximately 10 kilometres south west of the project and offers a range of regional services including:

- Accommodation options ranging from the Kapunda Tourist Park to several bed and breakfast and farm stay options. Other accommodation options within the Light Regional Council area and within easy access of the project site include:
    - Novatel Barossa Valley Resort.
    - The Louise.
    - The Reserve Barossa Valley.
    - Seppeltsfield Vineyard Cottages.
- Major banks and postal services.
- Medical and emergency services (Kapunda Hospital and medical practices).
- Hotels – Kapunda (4), plus Roseworthy (1), Allendale North (1), Freeling (2), Greenock (1) and Wasleys (1).
- Main street retail, café and bakery services.
- Automotive and mechanical services.

- Tourism and related services in Kapunda and the surrounding region, including vineyards and wineries.

- Recreation facilities including the Kapunda Library, Kapunda Bowling Club and Kapunda Golf Course.

# 3 REGIONAL BASELINE ASSESSMENT - GOYDER

## *3.1 LOCATIONAL ANALYSIS*

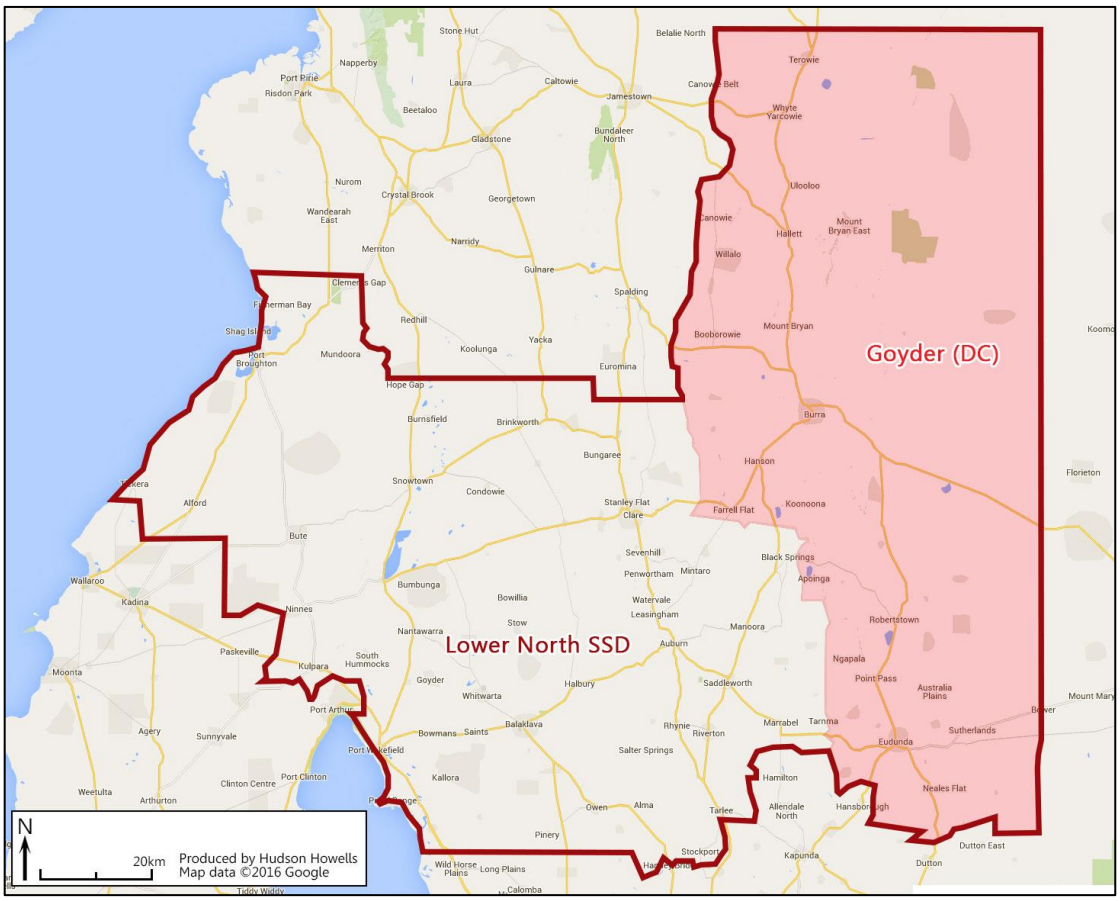
The information contained in this section has again been sourced from publicly available data with relevant sources noted and includes:

- A brief description of the Goyder Regional Council.
- An overview of population growth in the Goyder Regional Council Local Government Area (LGA), including forecast future growth in population in the region.
- An analysis of socio-demographics of the Goyder LGA population.
- A brief analysis of internal population migration into and out of the Goyder LGA.
- An analysis of employment trends in Goyder LGA, including the growth in employment, using the latest 2011 Census data.
- An analysis of businesses within the Goyder LGA by industry, including size and turnover.

The Goyder District Council is located within the Lower North Statistical Subdivision (SSD) and is located in the Mid North of South Australia, stretching between the District Council of Peterborough to the north, Mid Murray Council to the lower east and south, and the Light Regional Council, and Clare and Gilbert Valleys District Councils, and Northern Areas to the west. The Lower North SSD stretches across from Unincorporated pastoral lands to the east to upper Yorke Peninsula and Spencer Gulf to the west. The Council contains the townships of Burra, Eudunda, Hallett, Robertstown, and Terowie, in addition to a number of smaller localities. The region combines a mix of agricultural and pastoral uses with an increasing manufacturing industry. Map 3.1 illustrates the Council's boundary in relation to the surrounding councils.

The Barrier Highway is the key transport route through the region, providing regional access from Adelaide and regional New South Wales (via Broken Hill). The Thiele Highway and Goyder Highway provide access to regional towns within the Council and alternative routes to other major regional towns in adjacent regions.

***Map 3.1 – Goyder District Council***




## *3.2 POPULATION AND DEMOGRAPHICS*

### 3.2.1 Historical Population

Historical Estimated Resident Population (ERP) figures are released annually by the Australian Bureau of Statistics (ABS). Table 3.1 compares the historical population levels of Goyder LGA in comparison with the Lower North SSD, Non-Metro South Australia and South Australia. The Lower North SSD region comprises the Local Government Areas of Goyder, Clare and Gilbert Valleys, Wakefield and Barunga West. Key points to note from Table 3.1 include:

- Goyder LGA population decreased slightly between 2001 and 2011 (-47 people over ten years). This represented average growth of -0.1% per annum, which was significantly lower than the average South Australian population growth of 0.8% per annum over the same period.

- Historically, around 19% of the Lower North SSD region resided within the Goyder LGA.

- Current population of Goyder LGA is estimated at around 4,230 people.

***Table 3.1 –Estimated Resident Population, 2001 – 2015[1]***

| | Goyder LGA | Lower North SSD | Non-Metro SA | South Australia |
|---|---|---|---|---|
| 2001 | 4,272 | 21,852 | 364,560 | 1,511,728 |
| 2006 | 4,329 | 22,058 | 378,446 | 1,567,888 |
| 2011 | 4,225 | 22,333 | 386,810 | 1,639,614 |
| 2013(r) | 4,237 | 22,502 | 390,612 | 1,670,274 |
| 2014(r) | 4,241 | 22,575 | 392,566 | 1,685,550 |
| 2015(p) | 4,232 | 22,609 | 393,662 | 1,698,660 |
| Av. Annual Change (%) | | | | |
| 2001-2006 | 0.3% | 0.2% | 0.8% | 0.7% |
| 2006-2011 | -0.5% | 0.2% | 0.4% | 0.9% |
| 2011-2015 | 0.0% | 0.3% | 0.4% | 0.9% |
| 2001-2011 | -0.1% | 0.2% | 0.6% | 0.8% |

*1. As at June. (r) revised; (p) preliminary*
*Source: Australian Bureau of Statistics, Regional Population Growth, Australia, Cat. No. 3218.0.*

### 3.2.2 Forecast Population

Table 3.2 provides population forecast comparisons for Goyder LGA, Lower North SSD, Non-Metro South Australia and South Australia from 2016 to 2031. Population forecasts are as presented in the DPTI 'Population Projections for South Australian Local Government Areas, 2011-31' released in February 2016.

***Table 3.2 –Estimated Resident Population, 2016 – 2031[1]***

| | Goyder LGA | Lower North SSD | Non-Metro SA | South Australia |
|---|---|---|---|---|
| 2015 ERP | 4,232 | 22,609 | 393,662 | 1,698,660 |
| 2016 | 4,245 | 22,637 | 298,879 | 1,715,299 |
| 2021 | 4,260 | 23,118 | 302,946 | 1,791,767 |
| 2026 | 4,326 | 23,687 | 306,247 | 1,866,715 |
| 2031 | 4,402 | 24,245 | 308,729 | 1,936,812 |
| Av. Annual Change (%) | | | | |
| 2016-2021 | 0.1% | 0.4% | 0.3% | 0.9% |
| 2021-2026 | 0.3% | 0.5% | 0.2% | 0.8% |
| 2026-2031 | 0.3% | 0.5% | 0.2% | 0.7% |

*1. As at June.*
*Source: Department of Planning, Transport and Infrastructure, Government of South Australia, 2016, Population Projections for South Australian Local Government Areas, 2011-31, February 2016 release*

Future population growth for Goyder LGA is projected to increase to 4,400 people by 2031, representing a net increase of 170 people from 2015, or an average increase of 0.2% per annum over the 16-year period. In comparison, Lower North SSD is forecast to have a slightly higher population growth of 0.4% per annum between 2015 and 2031, and South Australia is forecast to increase by an average of 0.8% per annum over the same period.

### 3.2.3 Socio-demographic Profile

Key socio-demographic characteristics of the Goyder LGA from the 2011 Census are provided in Table 3.3, with the main features as follows:

- The average age distribution of Goyder LGA residents indicates an older age profile, with 21% of the population aged over 65 years, and an average age of 46 years. In comparison, the Lower North SSD has an established family profile with an average age of 44 years.

- Average weekly per capita income of Goyder LGA residents is 23% below the South Australian average and 12% below the Lower North SSD average.

- Average weekly household income is 28% below the South Australian average.

- Average household size is slightly lower than the South Australian average of 2.4 people, reflecting the older age profile of the region.

- House ownership within the Goyder LGA is higher when compared to both Lower North SSD and South Australia (79% compared to 77% and 71% respectively). Median monthly mortgage payments are $740 less when compared to the South Australian median ($758 compared to $1,500).

- Car ownership is higher than the South Australian average of 91% of households owning one or more cars, reflecting the regional location.

***Table 3.3 – Goyder LGA Socio-Economic Characteristics, 2011***

| | Goyder LGA | Lower North SSD | Non-Metro SA | South Australia |
|---|---|---|---|---|
| Age Distribution: | | | | |
| 0 - 14 years | 18.6% | 19.2% | 19.0% | 19.3% |
| 15 - 24 years | 10.3% | 10.1% | 11.1% | 13.3% |
| 25 - 44 years | 19.0% | 21.1% | 23.0% | 28.1% |
| 45 - 64 years | 31.5% | 30.1% | 28.5% | 25.3% |
| 65+ years | 20.5% | 19.5% | 18.3% | 14.0% |
| Median Age | 46 | 44 | 42 | 39 |
| Dependency Ratio[1] | 39.1% | 38.7% | 37.3% | 33.3% |
| Av. Weekly Per Capita Income | $413 | $468 | $477 | $534 |
| Per Capita Income Var.[2] | -23% | -12% | -11% | |
| Household Income: | | | | |
| $0 - $31,199 | 37.0% | 32.9% | 32.1% | 26.7% |
| $31,200 - $77,999 | 43.1% | 42.3% | 41.3% | 38.8% |
| $78,000 - $155,999 | 16.1% | 20.7% | 22.3% | 27.1% |
| $156,000+ | 3.8% | 4.1% | 4.4% | 7.3% |
| Av. Weekly Household Income | $755 | $851 | $881 | $1,044 |
| Household Income Var.[2] | -28% | -18% | -16% | |
| Av. Household Size | 2.3 | 2.3 | 2.3 | 2.4 |
| Housing Status: | | | | |
| Owner/purchaser[3] | 79.3% | 77.0% | 71.6% | 70.9% |
| Renter | 20.7% | 23.0% | 28.4% | 29.1% |
| Median Monthly Mortgage | $758 | $1,060 | $1,170 | $1,500 |
| Median Weekly Rent | $120 | $150 | $155 | $220 |
| Car Ownership: | | | | |
| % 0 cars | 5.5% | 5.0% | 6.9% | 9.0% |
| % 1 car | 33.1% | 33.5% | 35.5% | 37.8% |
| % 2+ cars | 61.3% | 61.4% | 57.6% | 53.2% |

*Note: Based on place of enumeration.*
*1. Dependency ratio refers to the proportion of the population aged between 0-14 and over 65 years.*
*2. Compared to the South Australian benchmark.*
*3. 'Other' tenure types have not been included.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

### 3.2.4 Internal Migration

The following table highlights net migration between 2006 and 2011 for the Goyder LGA.

The region had a net population loss of 96 people through migration. Net population gains to the region came from the City of Salisbury, and interstate from the Northern Territory and Queensland, while top statistical areas for population migration out of Goyder LGA were the nearby LGAs of Northern Areas, Barossa, Copper Coast and Gawler.

***Table 3.4 – Key Statistical Areas Ranked by Goyder LGA Net Migration***

| Statistical Area | Net Gain | Statistical Area | Net Loss |
|---|---|---|---|
| Salisbury (C) | 32 | Northern Areas (DC) | -29 |
| Overseas | 30 | Barossa (DC) | -26 |
| Northern Territory | 21 | Copper Coast (DC) | -20 |
| Queensland | 20 | Gawler (T) | -20 |
| Onkaparinga (C) | 18 | Charles Sturt (C) | -16 |
| Victoria | 18 | Loxton Waikerie (DC) | -15 |
| Port Adelaide Enfield (C) | 17 | Alexandrina (DC) | -14 |
| Kimba (DC) | 9 | Clare and Gilbert Valleys (DC) | -14 |
| Whyalla (C) | 9 | Adelaide (C) | -13 |
| | | Wakefield (DC) | -12 |

## *3.3 LABOUR MARKET*

### 3.3.1 Goyder LGA Employment Profile – Key Trends

The demographics and employment profile of Goyder LGA residents has changed over the years due to an aging population.

Examining Census information from 2006 and 2011, Table 3.5 outlines the key demographic trends for the residents in Goyder LGA in comparison to Lower North SSD and Non-Metro South Australia.

The key findings from this analysis are as follows:

- Incomes have increased by 23.7%, slightly stronger compared to the Lower North SSD (23.2%) and stronger than that experienced across Non-Metro South Australia (20.2%).

- The age profile of the Light LGA population is becoming older, with population aged 25-44 years decreasing from 23.3% in 2006 to 19.0% in 2011 (-4.3%), greater than the Lower North SSD benchmark change (-2.1%). In comparison, the Non-Metro South Australian population is aging slower, with the 25-44 year old age bracket increasing by 1.1% over the same period.

- Blue-collar occupations have decreased in the Goyder LGA. In 2011, 38.0% of the region's population were working in blue-collar occupations, which is higher than 2006 (36.8%). This proportion is higher than the Lower North SSD benchmark and slightly lower than the Non-Metro South Australian benchmark, indicating the high proportion of agricultural and industrial employment in the region.

- Labour force participation within the Goyder LGA has increased slightly to 73.6% (+0.3%), lower than both the Lower North SSD and Non-Metro South Australia benchmarks (75.9% and 74.1% respectively).

- Unemployment in the Goyder LGA is some 0.8% higher than the Lower North SSD (4.9% compared to 4.1%) and lower when compared to the Non-Metro South Australian average of 5.4%.

The demographic trends occurring in the Goyder LGA are consistent with an aging population and decreasing employment opportunities within the region.

***Table 3.5 – Goyder LGA Resident Population Demographics***

| | Goyder LGA | Lower North SSD | Non-Metro SA |
|---|---|---|---|
| Median Weekly Per Capita Income: | | | |
| *% growth 2006-2011* | +23.7% | +23.2% | +20.2% |
| Population Aged 25-44 Years: | | | |
| *% change 06-11* | -4.3% | -2.1% | +1.1% |
| Blue Collar Occupations: | | | |
| 2006 | 36.8% | 36.6% | 39.5% |
| 2011 | 38.0% | 36.8% | 39.5% |
| *% change 06-11* | +1.3% | +0.2% | -0.0% |
| Labour Force Participation: | | | |
| 2006 | 73.2% | 73.3% | 73.1% |
| 2011 | 73.6% | 75.9% | 74.1% |
| *% change 06-11* | +0.3% | +2.7% | +0.9% |
| Unemployment[1]: | | | |
| 2006 | 5.0% | 4.2% | 5.1% |
| 2011 | 4.9% | 4.1% | 5.4% |
| *% change 06-11* | -0.1% | -0.1% | +0.3% |

*Note: Based on place of usual residence.*
*1. Unemployed as proportion of total labour force.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

### 3.3.2 Resident Labour Force Structure

The following Table 3.6 examines the labour force and age profile of Goyder LGA population in 2011.

- Light LGA had a labour force of 1,860 people, of who 58.2% were employed full-time.
- The proportion of full-time workers is higher when compared to Non-Metro South Australia (56.2%).
- As mentioned previously the unemployment rate of 4.9% in 2011 is lower than the Non-Metro South Australian average of 5.4%.
- It is clear that mature age unemployment is particularly high, with 42% of unemployed aged older than 45 years compared to 30% in Non-Metro South Australia.

***Table 3.6 – Goyder LGA Resident Population Demographics***

| | Goyder LGA | Lower North SSD | Non-Metro SA |
|---|---|---|---|
| Employed: | | | |
| - Full-time | 58.2% | 57.5% | 56.2% |
| - Part-time | 31.7% | 32.7% | 31.6% |
| - Away from work | 5.2% | 5.8% | 6.7% |
| Total Employed | 95.1% | 95.9% | 94.6% |
| Unemployed: | | | |
| - Looking for full-time work | 3.0% | 2.5% | 3.6% |
| - Looking for part-time work | 1.9% | 1.6% | 1.8% |
| Total Unemployed | 4.9% | 4.1% | 5.4% |
| Total Labour Force | 1,858 | 10,176 | 170,936 |
| Not in the labour force | 1,387 | 6,907 | 112,585 |
| *Unemployed:* | | | |
| 15-19 years | 15% | 17% | 17% |
| 20-24 years | 12% | 14% | 15% |
| 25-29 years | 10% | 8% | 10% |
| 30-34 years | 8% | 6% | 9% |
| 35-39 years | 0% | 9% | 9% |
| 40-44 years | 13% | 11% | 10% |
| 45-49 years | 18% | 12% | 10% |
| 50-54 years | 9% | 10% | 9% |
| 55-59 years | 0% | 7% | 7% |
| 60-64 years | 15% | 6% | 5% |

*Note: Based on place of usual residence.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

### 3.3.3 Employment by Industry

Census data for 2006 and 2011 also show that the changing demographics are resulting in a shift in the type of industries employing these residents, as outlined in Tables 3.7 and 3.8.

Table 3.7 indicates that employment within the agricultural industry is significant within the Goyder LGA with nearly a third of residents employed within Agriculture, Forestry and Fishing (31.7% compared to 14.3% of Non-Metro South Australia), with a quarter of the population employed in 'Sheep, Beef Cattle and Grain Farming' (25.9%). While the agriculture industry is the highest employer for Goyder LGA residents, employment within Agriculture, Forestry and Fishing has decreased by 2.5% between 2006 and 2011, while Administration and Support Services, and Accommodation and Food Services have increased in the five years to 2011 (+1.2% and +1.1% respectively).

***Table 3.7 – Goyder LGA Proportion of Population by Industry, 2006 - 2011***

| | Goyder LGA | | | Non-Metro South Aus. |
|---|---|---|---|---|
| | 2006 | 2011 | Change | 2011 |
| Agriculture, forestry and fishing | 34.2% | 31.7% | -2.5% | 14.3% |
| Manufacturing | 11.2% | 11.0% | -0.3% | 11.4% |
| Health care and social assistance | 9.9% | 9.8% | -0.2% | 11.6% |
| Retail trade | 8.7% | 9.1% | 0.4% | 10.8% |
| Accommodation and food services | 5.0% | 6.1% | 1.1% | 6.9% |
| Education and training | 5.5% | 5.8% | 0.3% | 7.1% |
| Construction | 4.3% | 4.5% | 0.2% | 7.4% |
| Transport, postal and warehousing | 3.6% | 3.8% | 0.2% | 4.4% |
| Public administration and safety | 3.6% | 3.7% | 0.0% | 4.9% |
| Administrative and support services | 1.6% | 2.8% | 1.2% | 3.1% |
| Professional, scientific and technical services | 2.6% | 1.7% | -0.8% | 2.6% |
| Wholesale trade | 2.4% | 1.6% | -0.7% | 3.1% |
| Mining | 1.2% | 1.1% | -0.1% | 3.4% |
| Electricity, gas, water and waste services | 0.8% | 1.1% | 0.3% | 1.3% |
| Financial and insurance services | 1.0% | 0.9% | -0.1% | 1.4% |
| Information media and telecommunications | 0.7% | 0.6% | -0.1% | 0.7% |
| Rental, hiring and real estate services | 0.3% | 0.6% | 0.2% | 1.0% |
| Arts and recreation services | 0.5% | 0.5% | 0.0% | 0.8% |
| Other services | 2.8% | 3.8% | 1.0% | 3.7% |

*Note: Based on place of usual residence.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

### 3.3.4 Employment by Occupation

Table 3.8 provides an overview of the change in occupations within Goyder LGA between 2006 and 2011.

Nearly a third of Goyder LGA residents are employed within manager positions (30.3% compared to 17.9% of Non-Metro South Australia), with nearly three-quarters of those managers working within the Agriculture, Forestry and Fishing industry.

Blue-collar employment increased by 0.7% between 2006 and 2011, regardless of the reduction of occupations within the Technicians and Trades Workers category (-1.2%). Employment within Community and Personal Service and Sales Workers categories experienced the greatest increase between 2006 and 2011 (+1.9% and +1.6% respectively).

***Table 3.8 – Goyder LGA Proportion of Population by Occupation, 2006 – 2011***

| | Goyder LGA | | | Non-Metro South Aus |
|---|---|---|---|---|
| | 2006 | 2011 | Change | 2011 |
| Blue Collar: | | | | |
| Labourers | 16.8% | 17.7% | 0.9% | 15.8% |
| Machinery Operators and Drivers | 5.6% | 6.6% | 1.0% | 8.7% |
| Technicians and Trades Workers | 14.9% | 13.7% | -1.2% | 15.2% |
| Total Blue Collar | 37.3% | 38.0% | 0.7% | 39.7% |
| White Collar: | | | | |
| Managers | 33.7% | 30.3% | -3.4% | 17.9% |
| Professionals | 8.6% | 8.2% | -0.4% | 13.1% |
| Clerical and Administrative Workers | 6.9% | 8.8% | 1.9% | 10.0% |
| Sales Workers | 8.4% | 8.1% | -0.4% | 10.7% |
| Community and Personal Service Workers | 5.1% | 6.7% | 1.6% | 8.6% |
| Total White Collar | 62.7% | 62.0% | -0.7% | 60.3% |

*Note: Based on place of usual residence.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

## *3.4 JOURNEY TO WORK*

Tables 3.9 to 3.10 analyse the structure employment of both Goyder LGA residents and those employed within the region who live outside the LGA. The following tables are based on Journey to Work data from the 2011 Census.

### 3.4.1 Working within Goyder LGA

The total workforce employed in Goyder LGA in 2011 was approximately 1,260 people.

Table 3.9 shows that workers commute to the Goyder LGA from close proximity to the region, with 84% of employment in Goyder LGA filled by Goyder LGA residents. The agricultural industry is more likely to employ local residents (93% compared to 78% of employees within other industries) while employees in other industries are more likely to travel from nearby regions, e.g. 7% of Barossa SSD residents travelling to work in Education and Health Care industries.

***Table 3.9 – Goyder LGA Workforce by Home LGA, 2011***

| | Agriculture, Forestry & Fishing | | Total Other Industries | Total Industries |
|---|---|---|---|---|
| **Home LGA** | **No.** | **%** | **%** | **%** |
| Goyder (DC) | 413 | 93% | 78% | 84% |
| Clare and Gilbert Valleys (DC) | 14 | 3% | 7% | 6% |
| Wakefield (DC) | 0 | 0% | 0% | 0% |
| *Total Lower North SSD* | *427* | *96%* | *85%* | *90%* |
| Barossa (DC) | 0 | 0% | 1% | 0% |
| Light (RegC) | 0 | 0% | 6% | 3% |
| Mallala (DC) | 0 | 0% | 1% | 0% |
| *Total Barossa SSD* | *0* | *0%* | *7%* | *4%* |
| Gawler (T) | 0 | 0% | 1% | 1% |
| Northern Areas (DC) | 13 | 3% | 3% | 2% |
| Remainder SA LGAs | 0 | 0% | 5% | 2% |
| Interstate | 3 | 1% | 0% | 1% |

*Note: Based on place of usual residence.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

### 3.4.2 Goyder LGA Resident Workforce

Table 3.10 provides an overview of the locations where residents of Goyder LGA work.

Nearly three-quarters of Goyder LGA residents work within the Lower North SSD (71%) with nearly two-thirds of residents working locally within Goyder LGA (61%). The Barossa SSD is a popular location for Goyder LGA residents working in other industries (9%). Of those employees working within the agriculture industry in Goyder LGA, three-quarters are local Goyder LGA residents.

***Table 3.10 – Goyder LGA Workforce by Work LGA, 2011***

| | Agriculture, Forestry & Fishing | | Total Other Industries | Total Industries |
|---|---|---|---|---|
| **Home LGA** | **No.** | **%** | **%** | **%** |
| Goyder (DC) | 411 | 75% | 57% | 61% |
| Clare and Gilbert Valleys (DC) | 19 | 3% | 13% | 9% |
| Wakefield (DC) | 0 | 0% | 0% | 0% |
| *Total Lower North SSD* | 430 | 78% | 69% | 71% |
| Barossa (DC) | 7 | 1% | 5% | 3% |
| Light (RegC) | 0 | 0% | 4% | 3% |
| Mallala (DC) | 0 | 0% | 0% | 0% |
| *Total Barossa SSD* | 7 | 1% | 9% | 6% |
| Mid Murray (DC) | 8 | 1% | 0% | 1% |
| Northern Areas (DC) | 4 | 1% | 3% | 2% |
| Remainder SA LGAs | 90 | 16% | 16% | 19% |
| Interstate | 9 | 2% | 2% | 2% |

*Note: Based on place of usual residence.*
*Source: Australian Bureau of Statistics, 2011 Census of Population and Housing (Basic Community Profile), Cat. No. 2001.0 - 2011 Census Tables.*

## *3.5 EMPLOYMENT TRENDS*

### 3.5.1 Land Use

As shown in Map 3.1, the Goyder LGA is predominantly currently zoned for primary production. The town of Burra consists of commercial zoned uses along Market Street with a large historical zone in the centre of the town, with residential living and industrial uses to the north-west. The town of Eudunda is primarily residential with commercial uses located along the main road and adjacent industrial areas.

Data relating to the 'Counts of Australian Businesses' are released annually by the Australian Bureau of Statistics (ABS). The counts in this release are heavily influenced by entry and exits within Australia's small business sector, and we note that the scope of business counts is limited to businesses actively remitting in a GST role.

### 3.5.2 Number of Businesses

Table 3.11 and Chart 3.1 compares the change in the number of businesses within the Goyder LGA between 2010 and 2015 by employment size and industry division.

Key points to note from Table 3.11 and Chart 3.1 include:

- Goyder LGA had a total of 554 businesses in 2015, decreasing by 54 businesses since 2010.

- Businesses employing four or less employees accounted for 86% of total businesses in 2015, comprising 325 non-employing businesses and 150 businesses employing between one and four employees.

- Agriculture, Forestry and Fishing had the most businesses operating in Goyder LGA in 2015 (338 businesses or 61% of total businesses).

***Map 3.1 –Land Use***

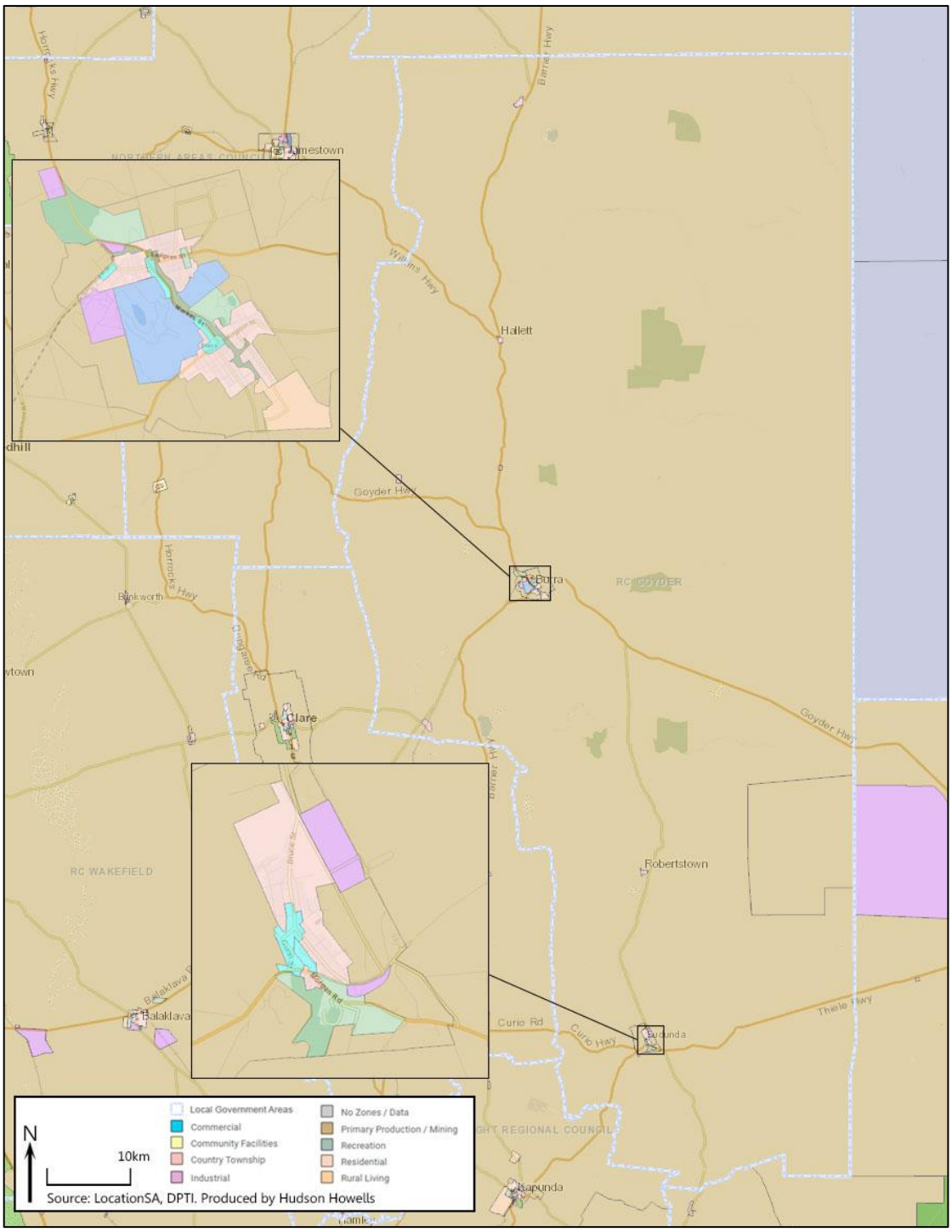
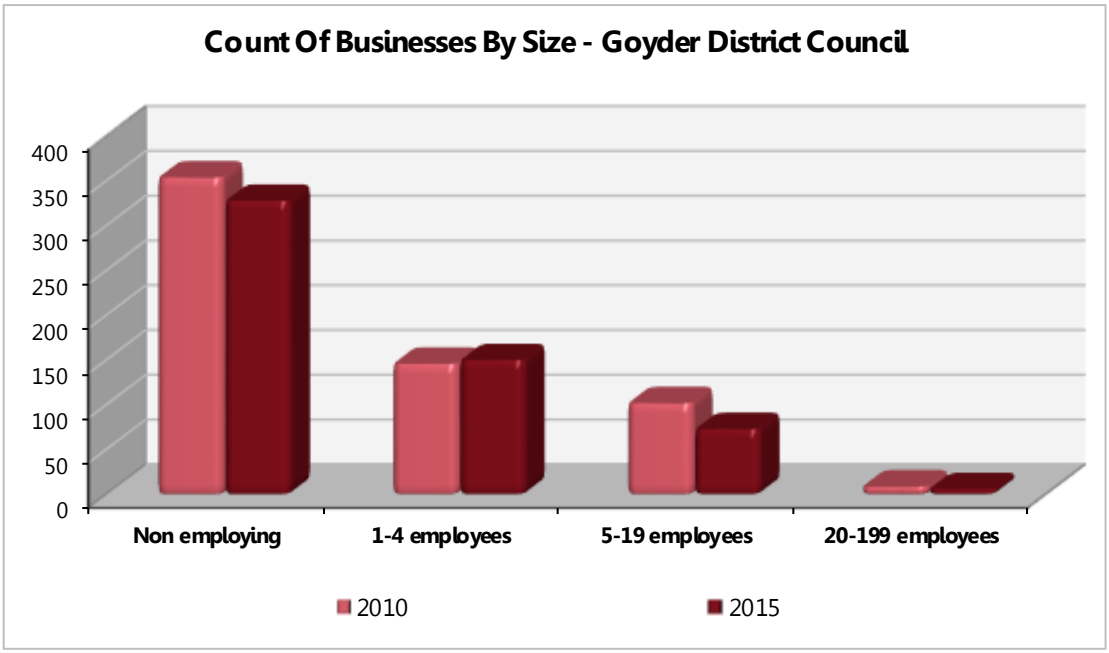


***Table 3.11 – Count of Business by Industry and Size in Goyder LGA, 2010 – 2015***

| | 4 or less employees | | | Total | | |
|---|---|---|---|---|---|---|
| **Industry** | **2010** | **2015** | **% change** | **2010** | **2015** | **% change** |
| Agriculture, Forestry and Fishing | 288 | 285 | -1% | 366 | 338 | -8% |
| Construction | 41 | 35 | -15% | 44 | 35 | -20% |
| Rental, Hiring & Real Estate Services | 32 | 31 | -3% | 32 | 31 | -3% |
| Transport, Postal and Warehousing | 31 | 28 | -10% | 31 | 31 | +0% |
| Retail Trade | 23 | 20 | -13% | 26 | 26 | +0% |
| Manufacturing | 3 | 10 | +233% | 9 | 17 | +89% |
| Accommodation and Food Services | 9 | 10 | +11% | 15 | 14 | -7% |
| Prof., Scientific and Technical Services | 10 | 14 | +40% | 10 | 14 | +40% |
| Financial and Insurance Services | 7 | 11 | +57% | 7 | 11 | +57% |
| Wholesale Trade | 9 | 6 | -33% | 12 | 9 | -25% |
| Administrative and Support Services | 9 | 3 | -67% | 9 | 3 | -67% |
| Elec., Gas, Water and Waste Services | 3 | 3 | +0% | 6 | 3 | -50% |
| Education and Training | 0 | 3 | - | 0 | 3 | - |
| Arts and Recreation Services | 4 | 0 | -100% | 7 | 0 | -100% |
| Mining | 6 | 0 | -100% | 6 | 0 | -100% |
| Health Care and Social Assistance | 3 | 0 | -100% | 6 | 0 | -100% |
| Other Services | 19 | 16 | -16% | 22 | 19 | -14% |
| *Total* | *497* | *475* | *-4%* | *608* | *554* | *-9%* |

*Note: Excludes 'Currently unknown'.*
*Source: Australian Bureau of Statistics, Counts of Australian Businesses, including Entries and Exits, Cat. No. 8165.0.*

***Chart 3.1 - Count of Business by Size in Goyder LGA, 2010 – 2015***




*Source: Australian Bureau of Statistics, Counts of Australian Businesses, including Entries and Exits, Cat. No. 8165.0.*

### 3.5.3 Business Turnover Levels

Table 3.12 and Chart 2.2 compares the change in the number of businesses within the Goyder LGA between 2010 and 2015 by level of turnover and industry division.

Key points to note from Table 5.2 and Chart 5.2 include:

- Nearly a quarter of all businesses within the Goyder LGA had an annual turnover over more than $500,000 (23%), including 5% or 26 businesses with an annual turnover of $2 million or more.

- The number of businesses within turnover ranges between 2010 and 2015 have decreased, with the exception of those businesses with turnover greater than $500,000 per annum.

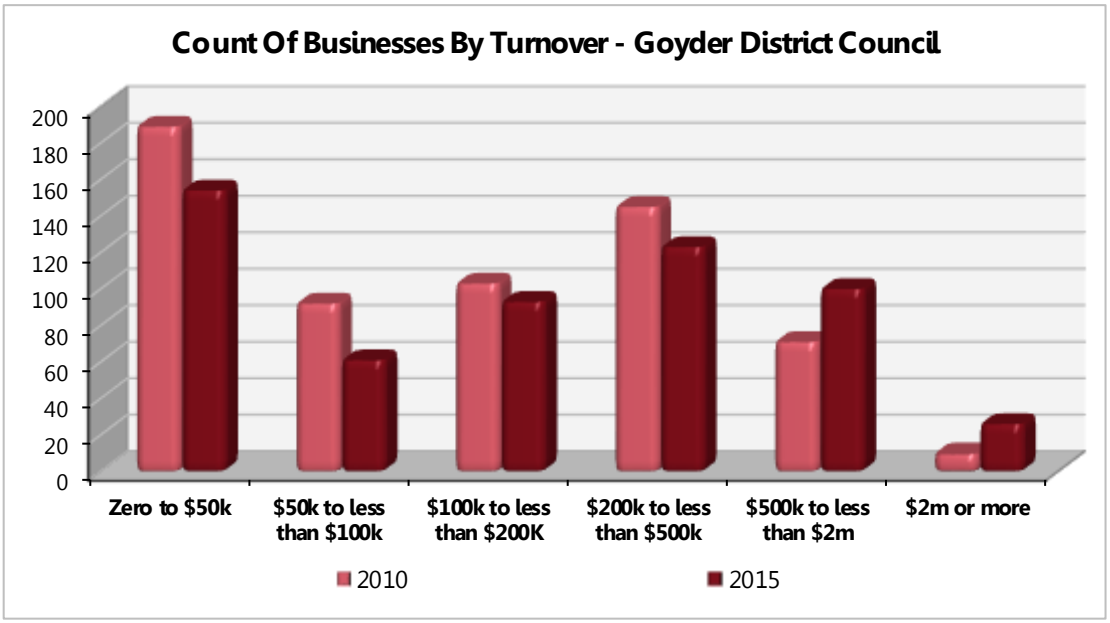
- Agriculture, Forestry and Fishing had the greatest number of businesses in the Goyder LGA with an annual turnover of more than $2 million in 2015 (16 businesses).

***Table 3.12 – Count of Business by Industry and Turnover in Goyder LGA, 2010 – 2015***

| | $200k+ turnover | | | Total | | |
|---|---|---|---|---|---|---|
| **Industry** | **2010** | **2015** | **% change** | **2010** | **2015** | **% change** |
| Agriculture, Forestry and Fishing | 132 | 163 | +23% | 358 | 337 | -6% |
| Construction | 7 | 12 | +71% | 36 | 37 | +3% |
| Rental, Hiring & Real Estate Services | 6 | 7 | +17% | 29 | 32 | +10% |
| Transport, Postal and Warehousing | 19 | 13 | -32% | 38 | 30 | -21% |
| Retail Trade | 23 | 18 | -22% | 42 | 25 | -40% |
| Manufacturing | 6 | 9 | +50% | 14 | 15 | +7% |
| Prof., Scientific and Technical Services | 3 | 4 | +33% | 9 | 15 | +67% |
| Accommodation and Food Services | 12 | 6 | -50% | 21 | 14 | -33% |
| Financial and Insurance Services | 0 | 0 | - | 5 | 11 | +120% |
| Wholesale Trade | 6 | 6 | +0% | 12 | 6 | -50% |
| Administrative and Support Services | 0 | 0 | - | 6 | 3 | -50% |
| Elec., Gas, Water and Waste Services | 0 | 0 | - | 3 | 3 | +0% |
| Mining | 0 | 3 | - | 0 | 3 | - |
| Public Administration and Safety | 0 | 0 | - | 0 | 3 | - |
| Education and Training | 0 | 0 | - | 0 | 3 | - |
| Arts and Recreation Services | 0 | 0 | - | 7 | 0 | -100% |
| Health Care and Social Assistance | 0 | 0 | - | 3 | 0 | -100% |
| Other Services | 6 | 8 | +33% | 15 | 17 | +13% |
| *Total* | *220* | *249* | *+13%* | *598* | *554* | *-7%* |

*Note: Excludes 'Currently unknown'.*
*Source: Australian Bureau of Statistics, Counts of Australian Businesses, including Entries and Exits, Cat. No. 8165.0.*

***Chart 3.2 - Count of Business by Turnover in Goyder LGA, 2010 – 2015***




Source: Australian Bureau of Statistics, Counts of Australian Businesses, including Entries and Exits, Cat. No. 81

## *3.6 TOWNSHIP SERVICES*

In addition to accommodation, workers locating temporarily to the Study Area will require a wide range of other convenience services, and the project will also need to source trade and other services from businesses located in the immediate region. This section provides an overview of the services located in the main townships in the Goyder region of the Study Area.

The Regional Council Goyder contains the townships of Burra, Eudunda, Hallett, Robertstown, and Terowie, in addition to a number of smaller localities.

Burra (154 kilometres north east of Adelaide) and Eudunda (103 kilometres north east of Adelaide) serve as the major service centres for the region and, in addition to Kapunda, will be sources of services available to support the proposed wind farm project. Burra is located approximately 70 kilometres north of the project site, while Eudunda is located approximately 20 kilometres north east of the site.

Burra offers a range of regional services including:

- Accommodation options including country hotel, motor inn, caravan park and self-contained cottages.
- Home hardware (Thrifty-Link).
- Hotels (5 including mount Bryan).
- Restaurants and cafes.
- Major banks and postal services.
- Medical and emergency services (Kapunda Hospital and medical practices).
- Main street retail.
- Automotive and mechanical services.
- Tourism and related services in Burra and the surrounding region.

- Recreation facilities including the Burra Regional Art Gallery, Golf Course, Swimming Pool, Lawn Bowls and Tennis Courts, Walking and Cycling Trails

Eudunda offers a range of regional services including:

- Accommodation options including country hotel (Eudunda and Light), motel and bed and breakfast.
- Hotels (2 – Eudunda and Light).
- Bank (1) and postal services.
- Hardware services.
- Main street retail and café services.
- Main street retail.
- Automotive and mechanical services.
- Tourism and related services in Eudunda and the surrounding region.
- Recreation facilities including Health and Fitness Centre, Swimming Pool, 9-Hole Golf Course and Walking Trails.

# 4 ECONOMIC IMPACT ASSESSMENT

The objectives of the economic impact assessment include:

- An economic assessment of the Twin Creek Wind Farm Project in terms of economic benefits to local communities of the LGA's of Goyder and Light, the broader region of Barossa and Lower North (ASBS regions) and also to the state of South Australia. It is recognised that transmission lines will travel through the Mid Murray Council region (to Truro) but there will be little socio economic impact on this region.

- An assessment of the associated benefits of offsetting carbon by displacing the need for further non-renewable generation development, such as coal or gas fired power stations.

In addition to the above, consideration is given in this assessment to the potential impact of the project on local property values.

This paper does not consider the impact of investment and supply conditions for renewable energies on the underlying energy market and prices. This is a complex issue and beyond the scope of this project.

## *4.1 Project Assumptions*

The economic modelling undertaken for this project is based on the following expenditure estimates supplied by the project proponent for construction and operation of the Twin Creek Wind Farm. These figures are indicative estimates for the purposes of an economic assessment:

- Total wind farm capacity of 183 megawatts.

- Total construction cost of $2 million per megawatt - $350 million apportioned over 3 years as follows:

    - Year 1 – 30%
    - Year 2 – 45%
    - Year 3 – 25%

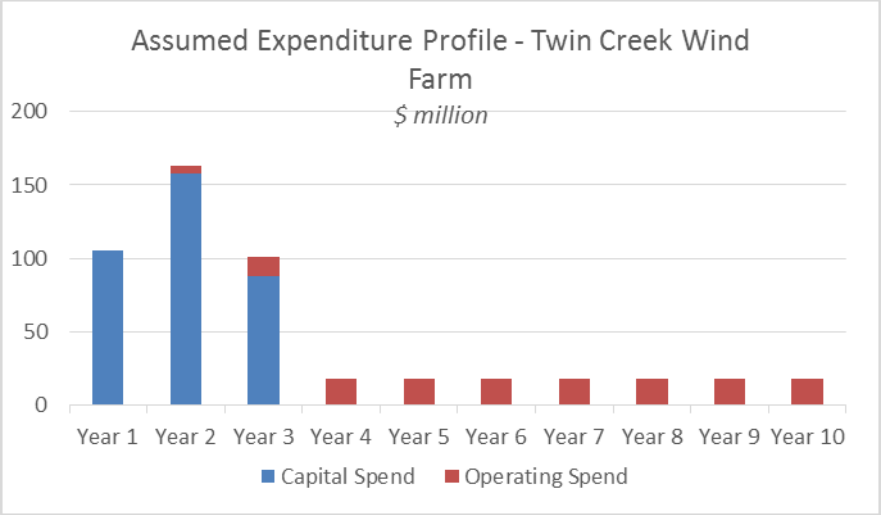
- The total construction cost of $350 million includes all construction and associated works, with assumptions as to the nature of the spend based on other studies undertaken by Hudson Howells as follows:

    - WTG supply & install (%) - 65.0%
    - U/g reticulation (%) - 6.0%
    - Civil works - 7.5%
    - Substation (%) - 6.0%
    - Network connection (%) - 14.0%
    - O&M compound & car parking (%) - 1.5%

- Annual operating costs assuming average utilisation are based on $103 per megawatt hour - $18.03 million per annum.

An indicative time line of the expenditure profile is provided in Chart 4.1 below.

***Chart 4.1***




## *4.2 Broad Project Methodology*

This economic impact assessment focuses on the effect of the Twin Creek Wind Farm Project on regional and local incomes and employment associated with the construction and operating phases of the project. This effect arises through the primary expenditure directly associated with the project, and then from further 'rounds' of indirect expenditure that this direct expenditure stimulates as it flows to supplying industries and into incomes and consumption.

The importance of the construction and operating expenditure identified above is that it will sustain turnover in local industry and will support local jobs and incomes. The use of economic impact assessments based on State and Regional Input Output Tables has been a prominent process[10] for translating directly created expenditure (a final demand stimulus) into jobs and incomes, and for establishing the extent of the flow-on impacts. Overall the methodology used here is similar that which has been used internationally in other jurisdictions to look at regional economic impacts of wind farms[11].

The use of these Input Output tables allows an assessment of the impact of a certain event or events (in this case the Twin Creek Wind Farm Project) on the incomes (value added or Gross State/Regional Product) and employment of a specified region or regions. This is consistent with national accounting frameworks.

The assessment for this project looks at the impact across 4 regions:

- The local impact – measured in terms of the contribution in the LGA's of Goyder and Light individually.

- The broader region, as defined by the ABS in its regional definitions of Barossa and Lower North.

- The state of South Australia – it should be noted that this region is inclusive of the regions above and the estimates of economic activity in the region are not additive to that of the state.

Table 4.1 illustrates the employment base of these regions, as estimated by the ABS (2011 census –place of work data), while Table 4.2 shows the proportional shares of employment by industry.

[10] Alternative economy wide models are available, including econometric models or CGE models. Input-Output models are general equilibrium models in that the impacts of one sector are considered across the broader economy, but they assume infinite elasticity of supply. The other models include the impact of resource constraints (under varying assumptions). The evidence suggests that at the regional and state geographic levels such constraints are minimal in a long run perspective – as capital and labour can flow relatively easily across borders, and as such input output provides an appropriate methodology.

[11] See for example Michael C. Slattery, Eric Lantz , Becky L. Johnson State and Local Economic Impacts from Wind Energy Projects: Texas Case Study, Energy Policy 39 (2011) 7930–7940

***Table 4.1 - Employment by Industry and Region***

| | Light LGA | Goyder LGA | Total - Light and Goyder | Barossa/ Lower North | Sth Aust |
|---|---|---|---|---|---|
| Agriculture, Forestry and Fishing | 682 | 442 | 1,124 | 3,624 | 27,675 |
| Mining | 27 | 5 | 32 | 112 | 9,205 |
| Manufacturing | 814 | 129 | 943 | 4050 | 76,386 |
| Electricity, Gas, Water and Waste Services | 17 | 32 | 49 | 179 | 9,832 |
| Construction | 264 | 48 | 312 | 897 | 53,574 |
| Wholesale Trade | 112 | 21 | 133 | 590 | 25,427 |
| Retail Trade | 177 | 120 | 297 | 1960 | 81,845 |
| Accommodation and Food Services | 199 | 72 | 271 | 1502 | 45,110 |
| Transport, Postal and Warehousing | 208 | 34 | 242 | 764 | 29,762 |
| Information Media and Telecommunications | 22 | 5 | 27 | 125 | 10,480 |
| Financial and Insurance Services | 20 | 7 | 27 | 257 | 21,903 |
| Rental, Hiring and Real Estate Services | 29 | 0 | 29 | 142 | 9,354 |
| Professional, Scientific and Technical Services | 125 | 25 | 150 | 504 | 40,133 |
| Administrative and Support Services | 53 | 24 | 77 | 640 | 24,696 |
| Public Administration and Safety | 92 | 44 | 136 | 684 | 51,712 |
| Education and Training | 456 | 113 | 569 | 1497 | 58,201 |
| Health Care and Social Assistance | 241 | 95 | 336 | 2091 | 99,275 |
| Arts and Recreation Services | 21 | 4 | 25 | 159 | 9,202 |
| Other Services | 121 | 39 | 160 | 624 | 28,499 |
| Inadequately described | 32 | 4 | 36 | 132 | 6,513 |
| Not stated | 3 | 0 | 3 | 14 | 440 |
| Not applicable | 0 | 0 | 0 | 0 | 0 |
| Total | 3,715 | 1,263 | 4,978 | 20,547 | 719,224 |

*Source: ABS Census 2011 (from ABS Web-site)*

***Table 4.2 - Share of Employment by Industry and Region***

| | Light LGA | Goyder (DC) | Total - Light and Goyder | Barossa/ Lower North | Sth Aust |
|---|---|---|---|---|---|
| Agriculture, Forestry and Fishing | 18.4% | 35.0% | 22.6% | 17.6% | 3.8% |
| Mining | 0.7% | 0.4% | 0.6% | 0.5% | 1.3% |
| Manufacturing | 21.9% | 10.2% | 18.9% | 19.7% | 10.6% |
| Electricity, Gas, Water and Waste Services | 0.5% | 2.5% | 1.0% | 0.9% | 1.4% |
| Construction | 7.1% | 3.8% | 6.3% | 4.4% | 7.4% |
| Wholesale Trade | 3.0% | 1.7% | 2.7% | 2.9% | 3.5% |
| Retail Trade | 4.8% | 9.5% | 6.0% | 9.5% | 11.4% |
| Accommodation and Food Services | 5.4% | 5.7% | 5.4% | 7.3% | 6.3% |
| Transport, Postal and Warehousing | 5.6% | 2.7% | 4.9% | 3.7% | 4.1% |
| Information Media and Telecommunications | 0.6% | 0.4% | 0.5% | 0.6% | 1.5% |
| Financial and Insurance Services | 0.5% | 0.6% | 0.5% | 1.3% | 3.0% |
| Rental, Hiring and Real Estate Services | 0.8% | 0.0% | 0.6% | 0.7% | 1.3% |
| Professional, Scientific and Technical Services | 3.4% | 2.0% | 3.0% | 2.5% | 5.6% |
| Administrative and Support Services | 1.4% | 1.9% | 1.5% | 3.1% | 3.4% |
| Public Administration and Safety | 2.5% | 3.5% | 2.7% | 3.3% | 7.2% |
| Education and Training | 12.3% | 8.9% | 11.4% | 7.3% | 8.1% |
| Health Care and Social Assistance | 6.5% | 7.5% | 6.7% | 10.2% | 13.8% |
| Arts and Recreation Services | 0.6% | 0.3% | 0.5% | 0.8% | 1.3% |
| Other Services | 3.3% | 3.1% | 3.2% | 3.0% | 4.0% |
| Inadequately described | 0.9% | 0.3% | 0.7% | 0.6% | 0.9% |
| Not stated | 0.1% | 0.0% | 0.1% | 0.1% | 0.1% |
| Not applicable | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Total | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

*Source: ABS Census 2011 (Sourced from ABS Web-site)*

The analysis develops estimates of economic impact for the regions based on indicative input-output tables developed for the regions above. These tables at the state level have been derived using the 2011/12 South Australian input output table as prepared for the State Government[12], and using the location quotient method (based on regional employment data for the relevant regions from the 2011 Census), adjusting for inflation. The tables for the Barossa and Lower North region also used the location quotient method, but are derived from the combined Barossa and Yorke and Mid North table from the RISE model, while the local table is based (using the location quotient method) on the regional table.

12 The RISE MODEL, as presented in Input-Output Tables for South Australia and its Regions 2011/12 Update: Technical Report A report to Department of the Premier and Cabinet, Prepared by EconSearch Pty Ltd, May 2013.

## *4.3 Economic Assessment*

This section details the economic impact assumptions and findings of the project assuming certain levels of direct supply from local industry. It is assumed that a significant component of the equipment is imported and much of the local spend being on transport and assembly.

### 4.3.1 Core Assumptions

Tables 4.3 and 4.4 below show the assumptions for capital and operating expenditure by category and source. The assumed distributions are based on the nature of the spend and specific assumptions regarding the expenditure profiles for the state, region and LGAs. It should be noted that the major assumption that impacts economic outcomes is the percentage of imported material. The distribution of local product to other sectors is not as critical (in an order of magnitude perspective).

Table 4.3 presents the assumptions in terms of the broad basis of expenditure (i.e. nature of expenditure). The payment to labour is also assumed to include commercial arrangements with respect to landowners impacted by the project – currently 24 landowners, 3 with wind turbine infrastructure (with 25 year lease payments), 6 with access roads (with 25 year lease payments), 14 with transmission lines (one off payment to purchase easement) and a $50,000 per annum voluntary community fund for each year of operation inflated with CPI (expected to be 25 years). The spend of the $350 million that occurs in the areas (including the state) is higher than some other studies as the project involves maximizing the commitment to local supply. The capital spend is $350 million. It is assumed that 15% of that will be spent in each of the local areas – some to construction contractors, some to light metal manufacturing, some to transport but most ($35 million over three years) to labour in the construction process. While the project mostly sits in the Light area, it is assumed that it will draw labour and services/inputs from across the two councils.

Table 4.4 extends the detail of the distribution to match the 18 sector Input Output Tables that have been developed for this project. The spend of labour wages and salaries is distributed based on the average consumption vector. The table also involves the conversion of these values from purchasers' prices to basic prices, as the raw data for construction etc. includes margins, taxes and subsidies. All monetary values in Input Output models are expressed as basic values. The prime differences between purchaser prices and basic values are that:

- Basic values exclude the cost of transport and wholesale and retail trade embedded in the purchase price (and allocate these to the transport and trade sectors).

- GST will be allocated to Gross Operating Surplus

The core assumptions to make the adjustments from purchaser price distributions to basic values are:

- The average value added in each of the industry sectors is extracted and then the GST component (at 10% - which is only paid on the value added) is deducted and separately identified – assumed to be spent equally on public administration, health and education.

- The purchaser price is adjusted for the average margin for wholesale, retail and transport sectors, as identified in national Input Output tables.

***Table 4.3 - Assumed Expenditure Distributions***

| | Capital | | | | Operating | | | |
|---|---|---|---|---|---|---|---|---|
| | Goyder | Light | Region | State | Goyder | Light | Region | State |
| Building Construction | 2.0% | 2.0% | 7.5% | 15.0% | 2.0% | 2.0% | 10.0% | 15.0% |
| Fabricated metals | 1.0% | 1.0% | 5.0% | 10.0% | 1.0% | 1.0% | 5.0% | 5.0% |
| Transport | 2.0% | 2.0% | 5.0% | 10.0% | 2.0% | 2.0% | 2.5% | 2.5% |
| Spend of Labour | 10.0% | 10.0% | 25.0% | 30.0% | 30.0% | 25.0% | 65.0% | 70.0% |
| Imports | 85.0% | 85.0% | 57.5% | 35.0% | 65.0% | 70.0% | 17.5% | 7.5% |
| | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

*Source: Assumptions*

***Table 4.4 - Assumed Expenditure Distributions in Basic Values***

| | Capital Spend | | | | Operating Spend | | | |
|---|---|---|---|---|---|---|---|---|
| | Goyder | Light | Region | State | Goyder | Light | Region | State |
| Agriculture, Forestry and Fishing | 0.1% | 0.1% | 0.2% | 0.3% | 0.2% | 0.2% | 0.5% | 0.7% |
| Mining | 0.0% | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% | 0.0% | 0.3% |
| Manufacturing | 1.2% | 1.5% | 6.0% | 12.8% | 1.7% | 2.3% | 8.1% | 12.8% |
| Electricity, Gas, Water and Waste Services | 0.1% | 0.1% | 0.3% | 0.7% | 0.3% | 0.1% | 0.7% | 1.7% |
| Construction | 1.9% | 1.9% | 7.0% | 14.1% | 1.9% | 1.9% | 9.4% | 14.1% |
| Wholesale Trade | 0.3% | 0.4% | 1.2% | 2.2% | 0.5% | 0.7% | 1.9% | 4.3% |
| Retail Trade | 0.6% | 0.3% | 1.6% | 2.7% | 1.8% | 0.8% | 4.1% | 6.2% |
| Accommodation and Food Services | 0.3% | 0.3% | 1.1% | 1.6% | 1.0% | 0.8% | 3.0% | 3.7% |
| Transport, Postal & Warehousing | 2.0% | 2.0% | 5.1% | 10.8% | 2.2% | 2.2% | 3.3% | 4.8% |
| Information Media & Telecommunications | 0.1% | 0.1% | 0.2% | 0.9% | 0.2% | 0.2% | 0.6% | 2.0% |
| Finance and Insurance Services | 0.1% | 0.1% | 0.4% | 1.7% | 0.2% | 0.2% | 1.2% | 4.0% |
| Ownership of Dwellings | 1.4% | 1.4% | 3.4% | 4.0% | 4.1% | 3.4% | 8.9% | 9.4% |
| Property and Business Services | 0.0% | 0.0% | 0.1% | 0.3% | 0.1% | 0.1% | 0.4% | 0.7% |
| Public Administration & Safety | 0.0% | 0.0% | 0.0% | 0.2% | 0.0% | 0.0% | 0.0% | 0.5% |
| Education & Training | 0.3% | 0.3% | 0.7% | 1.1% | 0.8% | 0.7% | 1.8% | 2.5% |
| Health care and social assistance | 0.2% | 0.2% | 0.8% | 1.4% | 0.7% | 0.5% | 1.8% | 2.5% |
| Arts and recreation services | 0.0% | 0.1% | 0.2% | 0.5% | 0.1% | 0.1% | 0.5% | 1.2% |
| Other Services | 0.1% | 0.1% | 0.3% | 0.7% | 0.4% | 0.3% | 0.8% | 1.7% |
| GST | 0.4% | 0.4% | 1.3% | 1.9% | 1.2% | 1.0% | 3.1% | 2.6% |
| **Total** | **9.1%** | **9.2%** | **30.1%** | **58.1%** | **17.4%** | **15.5%** | **49.9%** | **75.8%** |

*Source: Assumptions*

### 4.3.2 Modelling Results – State Level Outcomes

Tables 4.5 – 4.7 below show the results of using the resultant expenditure distribution as an exogenous shock to the Input Output Table for South Australia with the aggregated expenditures, in the context that they would represent an increase in final demand[13], and distributed as per Table 4.4 through the Input Output Table. Tables 4.5 and 4.6 show the detailed outcomes – with the level of activity generated by industry sector. Table 4.7 provides a summary of the outcomes.

The modelling indicates that the project will generate $209 million of value added[14] (incomes created or contribution to Gross State Product) in the State of South Australia over the period of construction and that this would happen over three years (allowing for lagged flow through effects). 1,447 person years[15] of employment would be supported – or an average of 480 jobs sustained per year over three years. Once operational the project is estimated to support annually $15.5 million of incomes, and support directly and indirectly of the order of 105 jobs per year.

[13] This analysis assesses the contribution of the project in isolation. It does not compare the project with other possible projects, and nor does it investigate the change in expenditure levels at existing energy providers, as this project takes on market share – although this is expected to be negligible given the fixed cost context of the industry.
[14] Contribution to Gross State or Regional Product (GSP/GRP) – and defined as the returns to labour and the returns to capital as per the national accounting framework.
[15] Person years are the number of full time annual job equivalents over the period of construction

***Table 4.5 - Estimates of Economic Activity by Sector Related to Aggregate Capital Spend for South Australia – Outcomes Over Life of Project***

*(Note employment should be interpreted as person years of employment rather than number of jobs at a point of time - See earlier definitions of person years of employment)*

| | Expend-iture ($m) | Value Added ($m) | | | Income ($m) | | | Employment (FTE's) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Direct | Induced | Total | Direct | Induced | Total | Direct | Induced | Total |
| Agriculture, Forestry and Fishing | $1.07 | $0.49 | $5.68 | $6.18 | $0.16 | $1.90 | $2.07 | 3 | 38 | 42 |
| Mining | $0.46 | $0.29 | $3.32 | $3.61 | $0.06 | $0.68 | $0.74 | 1 | 14 | 15 |
| Manufacturing | $44.94 | $12.84 | $12.89 | $25.73 | $8.69 | $8.72 | $17.41 | 115 | 116 | 231 |
| Electricity, Gas, Water and Waste Services | $2.57 | $1.10 | $4.60 | $5.70 | $0.38 | $1.60 | $1.98 | 4 | 18 | 22 |
| Construction | $49.24 | $12.65 | $4.81 | $17.46 | $10.93 | $4.16 | $15.09 | 109 | 42 | 151 |
| Wholesale Trade | $7.85 | $3.63 | $6.64 | $10.27 | $2.34 | $4.28 | $6.62 | 17 | 32 | 49 |
| Retail Trade | $9.46 | $5.38 | $8.36 | $13.74 | $3.83 | $5.95 | $9.79 | 71 | 111 | 182 |
| Accommodation and Food Services | $5.57 | $2.27 | $3.98 | $6.25 | $1.59 | $2.78 | $4.36 | 30 | 53 | 83 |
| Transport, Postal & Warehousing | $37.80 | $15.96 | $7.11 | $23.08 | $10.34 | $4.61 | $14.94 | 117 | 52 | 169 |
| Information Media & Telecommunications | $3.06 | $1.50 | $5.46 | $6.96 | $0.46 | $1.68 | $2.14 | 6 | 22 | 29 |
| Finance and Insurance Services | $6.02 | $4.05 | $19.41 | $23.46 | $1.87 | $8.97 | $10.84 | 9 | 44 | 53 |
| Ownership of Dwellings | $14.10 | $10.74 | $14.25 | $24.98 | $0.00 | $0.00 | $0.00 | 0 | 0 | 0 |
| Property and Business Services | $1.06 | $0.44 | $17.60 | $18.04 | $0.35 | $13.06 | $13.40 | 4 | 137 | 140 |
| Public Administration & Safety | $0.78 | $0.41 | $2.00 | $2.41 | $0.34 | $1.62 | $1.96 | 4 | 20 | 24 |
| Education & Training | $3.77 | $2.73 | $4.26 | $7.00 | $2.51 | $3.91 | $6.42 | 31 | 49 | 80 |
| Health care and social assistance | $4.77 | $3.14 | $4.31 | $7.45 | $2.94 | $4.03 | $6.97 | 37 | 51 | 88 |
| Arts and recreation services | $1.80 | $0.67 | $1.10 | $1.77 | $0.57 | $0.94 | $1.51 | 6 | 9 | 15 |
| Other Services | $2.48 | $1.21 | $3.75 | $4.96 | $1.10 | $3.42 | $4.52 | 18 | 56 | 73 |
| **Total** | **$196.79** | **$79.53** | **$129.53** | **$209.06** | **$48.46** | **$72.30** | **$120.76** | **584** | **862** | **1,447** |

*Source: Modelled Result*

***Table 4.6 - Estimates of Annual Economic Activity by Sector Related to Operating Spend for South Australia***

| | Expend-iture ($m) | Value Added ($m) | | | Income ($m) | | | Employment (FTE's) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Direct | Induced | Total | Direct | Induced | Total | Direct | Induced | Total |
| Agriculture, Forestry and Fishing | $0.14 | $0.06 | $0.37 | $0.44 | $0.02 | $0.12 | $0.15 | 0.4 | 2.5 | 2.9 |
| Mining | $0.06 | $0.04 | $0.21 | $0.25 | $0.01 | $0.04 | $0.05 | 0.2 | 0.9 | 1.1 |
| Manufacturing | $2.45 | $0.70 | $0.94 | $1.64 | $0.47 | $0.64 | $1.11 | 6.3 | 8.4 | 14.7 |
| Electricity, Gas, Water and Waste Services | $0.33 | $0.14 | $0.33 | $0.47 | $0.05 | $0.11 | $0.16 | 0.6 | 1.3 | 1.8 |
| Construction | $2.69 | $0.69 | $0.36 | $1.05 | $0.60 | $0.31 | $0.91 | 6.0 | 3.1 | 9.1 |
| Wholesale Trade | $0.82 | $0.38 | $0.44 | $0.82 | $0.24 | $0.28 | $0.53 | 1.8 | 2.1 | 3.9 |
| Retail Trade | $1.19 | $0.67 | $0.62 | $1.29 | $0.48 | $0.44 | $0.92 | 9.0 | 8.2 | 17.2 |
| Accommodation and Food Services | $0.71 | $0.29 | $0.27 | $0.56 | $0.20 | $0.19 | $0.39 | 3.8 | 3.6 | 7.5 |
| Transport, Postal & Warehousing | $0.91 | $0.38 | $0.45 | $0.83 | $0.25 | $0.29 | $0.54 | 2.8 | 3.3 | 6.1 |
| Information Media & Telecommunications | $0.39 | $0.19 | $0.39 | $0.58 | $0.06 | $0.12 | $0.18 | 0.8 | 1.6 | 2.4 |
| Finance and Insurance Services | $0.77 | $0.52 | $1.45 | $1.97 | $0.24 | $0.67 | $0.91 | 1.2 | 3.3 | 4.5 |
| Ownership of Dwellings | $1.80 | $1.37 | $0.99 | $2.36 | $0.00 | $0.00 | $0.00 | 0.0 | 0.0 | 0.0 |
| Property and Business Services | $0.14 | $0.06 | $1.18 | $1.24 | $0.04 | $0.92 | $0.97 | 0.5 | 9.7 | 10.1 |
| Public Administration & Safety | $0.10 | $0.05 | $0.13 | $0.18 | $0.04 | $0.10 | $0.15 | 0.5 | 1.3 | 1.8 |
| Education & Training | $0.48 | $0.35 | $0.30 | $0.65 | $0.32 | $0.27 | $0.59 | 4.0 | 3.4 | 7.4 |
| Health care and social assistance | $0.48 | $0.32 | $0.30 | $0.62 | $0.30 | $0.28 | $0.58 | 3.8 | 3.5 | 7.3 |
| Arts and recreation services | $0.23 | $0.09 | $0.08 | $0.16 | $0.07 | $0.07 | $0.14 | 0.7 | 0.7 | 1.4 |
| Other Services | $0.32 | $0.15 | $0.23 | $0.39 | $0.14 | $0.21 | $0.35 | 2.3 | 3.4 | 5.7 |
| **Total** | **$13.99** | **$6.45** | **$9.04** | **$15.49** | **$3.54** | **$5.08** | **$8.62** | **44.5** | **60.3** | **104.8** |

*Source: Modelled Result*

***Table 4.7 - Estimates of Economic Activity for South Australia***

| | Total GSP Impact (3 yrs) | Average Annual GSP Impact | Total Jobs Impact (Person Years - over 3 yrs) | Average Annual Jobs Impact |
|---|---|---|---|---|
| **Construction Phase** | | | | |
| Direct | $79.5 million | $26.5 million | 584 | 195 |
| Indirect | $129.5 million | $43.2 million | 862 | 287 |
| *Total* | *$209.1 million* | *$69.7 million* | *1,447* | *482* |
| **Operating Phase** | | | | |
| Direct | | $6.5 million | | 45 |
| Indirect | | $9 million | | 60 |
| *Total* | | *$15.5 million* | | *105* |

*Source: Modelled Result*

**Full Time Equivalent Jobs*

*Note – these numbers are rounded versions of the numbers in the tables above, as the modelling should be interpreted in terms of order of magnitude, but it means that not all numbers are exactly additive.*

It should be noted that the impact at the national level would be similar to that estimated for the State level, unless there are constraints in national labour and capital markets. Such constraints would reduce the level of impact, with the project drawing resources into South Australia and out of other states. If such constraints existed (i.e. at extended times with very low unemployment rates, or where the project might have significant effects on exchange rates) the national outcomes would be best modelled using a CGE model to allow for those constraints, but in the context of the current national economy, it is reasonable to assume the constraints are not severe

### 4.3.3 Modelling Results – Barossa-Lower North Region Outcomes

Tables 4.8 – 4.10 below show the results of applying the regional expenditures as per Table 4.4 above to the regional Input Output Table for the Barossa-Lower North Region. It should be noted these results are inclusive in the South Australia results.

Tables 4.8 and 4.9 show the detailed outcomes with the level of activity generated by industry sector, while Table 4.10 provides a summary of the outcomes.

From a regional perspective, the modelling indicates that the project will generate $64 million of value added (incomes created or contribution to Gross Regional Product) in the region over the period of construction and, again allowing for lagged flow through effects, this would happen over three years. 477 person years of employment would be supported, or again an average of 159 jobs sustained per year over three years. Once operational the project is estimated to support annually $6.2 million of incomes in the region, and support directly and indirectly (including the multiplier impact) approximately 44 jobs per year.

***Table 4.8 - Estimates of Economic Activity by Sector Related to Aggregate Capital Spend for the Barossa-Lower North Region – Outcomes Over Life of Project***

*(Note that employment should be interpreted as person years of employment rather than number of jobs at a point of time)*

| | Expend-iture ($m) | Value Added ($m) | | | Income ($m) | | | Employment (FTE's) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Direct | Induced | Total | Direct | Induced | Total | Direct | Induced | Total |
| Agriculture, Forestry and Fishing | $0.61 | $0.28 | $1.44 | $1.73 | $0.08 | $0.41 | $0.49 | 1.9 | 9.7 | 11.6 |
| Mining | $0.00 | $0.00 | $0.06 | $0.06 | $0.00 | $0.03 | $0.03 | 0.0 | 1.0 | 1.0 |
| Manufacturing | $20.98 | $5.62 | $1.58 | $7.20 | $3.17 | $0.89 | $4.06 | 38.3 | 10.7 | 49.0 |
| Electricity, Gas, Water and Waste Services | $0.88 | $0.38 | $0.77 | $1.15 | $0.14 | $0.28 | $0.41 | 1.8 | 3.7 | 5.5 |
| Construction | $24.62 | $6.25 | $0.75 | $7.00 | $5.46 | $0.65 | $6.11 | 60.8 | 7.3 | 68.1 |
| Wholesale Trade | $4.09 | $1.89 | $1.32 | $3.22 | $1.22 | $0.85 | $2.07 | 10.0 | 7.0 | 17.1 |
| Retail Trade | $5.66 | $3.22 | $1.69 | $4.91 | $2.29 | $1.20 | $3.50 | 47.8 | 25.1 | 72.9 |
| Accommodation and Food Services | $3.99 | $1.63 | $0.97 | $2.60 | $1.11 | $0.66 | $1.76 | 23.8 | 14.1 | 37.9 |
| Transport, Postal & Warehousing | $18.00 | $7.61 | $1.46 | $9.07 | $5.09 | $0.98 | $6.06 | 65.2 | 12.5 | 77.8 |
| Information Media & Telecommunications | $0.87 | $0.45 | $0.47 | $0.91 | $0.14 | $0.15 | $0.29 | 2.2 | 2.2 | 4.4 |
| Finance and Insurance Services | $1.57 | $1.08 | $2.19 | $3.28 | $0.46 | $0.92 | $1.38 | 2.7 | 5.4 | 8.1 |
| Ownership of Dwellings | $11.99 | $9.13 | $4.19 | $13.32 | $0.00 | $0.00 | $0.00 | 0.0 | 0.0 | 0.0 |
| Property and Business Services | $0.48 | $0.20 | $2.20 | $2.40 | $0.16 | $1.70 | $1.86 | 1.9 | 19.8 | 21.7 |
| Public Administration & Safety | $0.06 | $0.03 | $0.20 | $0.23 | $0.03 | $0.16 | $0.19 | 0.4 | 2.3 | 2.7 |
| Education & Training | $2.43 | $1.76 | $0.93 | $2.69 | $1.62 | $0.85 | $2.47 | 22.7 | 11.9 | 34.6 |
| Health care and social assistance | $2.94 | $1.95 | $0.91 | $2.86 | $1.83 | $0.86 | $2.69 | 26.2 | 12.3 | 38.6 |
| Arts and recreation services | $0.71 | $0.30 | $0.17 | $0.47 | $0.24 | $0.13 | $0.37 | 2.8 | 1.5 | 4.3 |
| Other Services | $1.11 | $0.49 | $0.71 | $1.20 | $0.45 | $0.65 | $1.10 | 9.0 | 13.1 | 22.1 |
| **Total** | **$100.98** | **$42.29** | **$22.00** | **$64.29** | **$23.48** | **$11.38** | **$34.86** | **317.6** | **159.8** | **477.4** |

*Source: Modelled Result*

***Table 4.9 - Estimates of Annual Economic Activity by Sector Related to Operating Spend for the Barossa-Lower North Region***

| | Expend-iture ($m) | Value Added ($m) | | | Income ($m) | | | Employment (FTE's) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Direct | Induced | Total | Direct | Induced | Total | Direct | Induced | Total |
| Agriculture, Forestry and Fishing | $0.09 | $0.01 | $0.15 | $0.16 | $0.00 | $0.05 | $0.05 | 0.3 | 0.8 | 1.1 |
| Mining | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | 0.0 | 0.1 | 0.1 |
| Manufacturing | $1.55 | $0.34 | $0.24 | $0.58 | $0.00 | $0.33 | $0.33 | 2.8 | 1.1 | 4.0 |
| Electricity, Gas, Water and Waste Services | $0.12 | $0.04 | $0.09 | $0.12 | $0.00 | $0.04 | $0.04 | 0.3 | 0.3 | 0.6 |
| Construction | $1.80 | $0.73 | -$0.18 | $0.55 | $0.00 | $0.47 | $0.48 | 4.4 | 0.9 | 5.3 |
| Wholesale Trade | $0.36 | $0.10 | $0.17 | $0.27 | $0.00 | $0.18 | $0.18 | 0.9 | 0.6 | 1.5 |
| Retail Trade | $0.78 | $0.22 | $0.39 | $0.61 | $0.00 | $0.43 | $0.43 | 6.6 | 2.4 | 9.0 |
| Accommodation and Food Services | $0.57 | $0.09 | $0.22 | $0.31 | $0.00 | $0.21 | $0.21 | 3.4 | 1.2 | 4.6 |
| Transport, Postal & Warehousing | $0.62 | $0.18 | $0.19 | $0.37 | $0.00 | $0.25 | $0.25 | 2.3 | 0.9 | 3.2 |
| Information Media & Telecommunications | $0.12 | $0.00 | $0.11 | $0.11 | $0.00 | $0.03 | $0.03 | 0.3 | 0.2 | 0.5 |
| Finance and Insurance Services | $0.22 | $0.08 | $0.30 | $0.37 | $0.00 | $0.16 | $0.16 | 0.4 | 0.5 | 0.9 |
| Ownership of Dwellings | $1.70 | $0.76 | $0.90 | $1.66 | $0.00 | $0.00 | $0.00 | 0.0 | 0.0 | 0.0 |
| Property and Business Services | $0.07 | $0.05 | $0.17 | $0.21 | $0.00 | $0.17 | $0.17 | 0.3 | 1.7 | 2.0 |
| Public Administration & Safety | $0.01 | $0.01 | $0.01 | $0.02 | $0.00 | $0.02 | $0.02 | 0.1 | 0.2 | 0.2 |
| Education & Training | $0.34 | $0.12 | $0.21 | $0.33 | $0.00 | $0.30 | $0.30 | 3.2 | 1.0 | 4.3 |
| Health care and social assistance | $0.35 | $0.14 | $0.17 | $0.31 | $0.00 | $0.29 | $0.29 | 3.1 | 1.1 | 4.2 |
| Arts and recreation services | $0.10 | $0.01 | $0.05 | $0.06 | $0.00 | $0.05 | $0.05 | 0.4 | 0.1 | 0.5 |
| Other Services | $0.16 | $0.00 | $0.12 | $0.12 | $0.00 | $0.11 | $0.11 | 1.3 | 0.9 | 2.2 |
| **Total** | **$8.96** | **$2.88** | **$3.29** | **$6.16** | **$0.02** | **$3.07** | **$3.09** | **29.9** | **14.1** | **44.0** |

*Source: Modelled Result*

***Table 4.10 - Estimates of Economic Activity for the Barossa-Lower North Region***

| | Total GSP Impact (3 yrs) | Average Annual GSP Impact | Total Jobs Impact (Person Years - over 3 yrs) | Average Annual Jobs Impact |
|---|---|---|---|---|
| **Construction Phase** | | | | |
| Direct | $42.3 million | $14.1 million | 318 | 106 |
| Indirect | $22 million | $7.3 million | 160 | 53 |
| *Total* | *$64.3 million* | *$21.4 million* | *477* | *159* |
| **Operating Phase** | | | | |
| Direct | | $2.9 million | | 30 |
| Indirect | | $3.3 million | | 14 |
| *Total* | | *$6.2 million* | | *44* |

*Source: Modelled Result*

*Note – these numbers are rounded versions of the numbers in the tables above, as the modelling should be interpreted in terms of order of magnitude, but it means that not all numbers are exactly additive.*

### 4.3.4 Modelling Results – LGA's of Goyder and Light

Tables 4.11 – 4.13 below show the results of applying the expenditures (as per Table 4.4) above to the local Input Output Table for the Regional Council of Goyder, while Tables 4.14 – 4.16 show the results for the Light Regional Council. Tables 4.11 and 4.12, and 4.14 and 4.15

show the detailed outcomes with the level of activity generated by industry sector, while Tables 4.13 and 4.16 provide a summary of the outcomes.

From a local perspective in the Regional Council of Goyder, the modelling indicates that the project will generate $18 million of value added (incomes created or contribution to Gross Regional Product), directly in the transport sector, but also a result of the impact of direct labour supplied. This occurs over the period of construction and, again allowing for lagged flow through effects, this would happen over three years. 130 person years of employment would be supported, or an average of 43 jobs sustained per year over three years. Once operational the project is estimated to support annually $1.8 million of incomes in the region, and support directly and indirectly (including the multiplier impact) approximately 12 jobs per year.

***Table 4.11 - Estimates of Economic Activity by Sector Related to Aggregate Capital Spend for the Regional Council of Goyder – Outcomes Over Life of Project***

*(Note that employment should be interpreted as person years of employment rather than number of jobs at a point of time)*

| | Expend-iture ($m) | Value Added ($m) | | | Income ($m) | | | Employment (FTE's) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Direct | Induced | Total | Direct | Induced | Total | Direct | Induced | Total |
| Agriculture, Forestry and Fishing | $0.25 | $0.11 | $0.33 | $0.44 | $0.03 | $0.09 | $0.13 | 0.8 | 2.2 | 3.0 |
| Mining | $0.00 | $0.00 | $0.01 | $0.01 | $0.00 | $0.01 | $0.01 | 0.0 | 0.1 | 0.2 |
| Manufacturing | $5.12 | $1.37 | $0.24 | $1.61 | $0.77 | $0.14 | $0.91 | 9.3 | 1.6 | 11.0 |
| Electricity, Gas, Water and Waste Services | $0.18 | $0.08 | $0.19 | $0.27 | $0.03 | $0.07 | $0.10 | 0.4 | 0.9 | 1.3 |
| Construction | $6.57 | $1.67 | $0.25 | $1.92 | $1.46 | $0.22 | $1.67 | 16.2 | 2.4 | 18.7 |
| Wholesale Trade | $1.47 | $0.68 | $0.20 | $0.88 | $0.44 | $0.13 | $0.56 | 3.6 | 1.0 | 4.6 |
| Retail Trade | $1.14 | $0.65 | $0.50 | $1.16 | $0.46 | $0.36 | $0.82 | 9.7 | 7.5 | 17.2 |
| Accommodation and Food Services | $1.14 | $0.47 | $0.19 | $0.66 | $0.32 | $0.13 | $0.44 | 6.8 | 2.8 | 9.6 |
| Transport, Postal & Warehousing | $7.14 | $3.01 | $0.28 | $3.30 | $2.02 | $0.19 | $2.21 | 25.9 | 2.4 | 28.3 |
| Information Media & Telecommunications | $0.33 | $0.17 | $0.08 | $0.25 | $0.05 | $0.02 | $0.08 | 0.8 | 0.4 | 1.2 |
| Finance and Insurance Services | $0.26 | $0.18 | $0.26 | $0.44 | $0.08 | $0.11 | $0.19 | 0.5 | 0.7 | 1.1 |
| Ownership of Dwellings | $4.80 | $3.65 | $1.11 | $4.76 | $0.00 | $0.00 | $0.00 | 0.0 | 0.0 | 0.0 |
| Property and Business Services | $0.17 | $0.00 | $0.41 | $0.41 | $0.06 | $0.28 | $0.34 | 0.7 | 3.3 | 3.9 |
| Public Administration & Safety | $0.02 | $0.01 | $0.06 | $0.07 | $0.01 | $0.05 | $0.06 | 0.1 | 0.7 | 0.8 |
| Education & Training | $0.97 | $0.52 | $0.43 | $0.95 | $0.65 | $0.23 | $0.87 | 9.1 | 3.2 | 12.2 |
| Health care and social assistance | $0.73 | $0.53 | $0.12 | $0.66 | $0.45 | $0.16 | $0.62 | 6.5 | 2.3 | 8.8 |
| Arts and recreation services | $0.20 | $0.13 | -$0.03 | $0.10 | $0.07 | $0.01 | $0.08 | 0.8 | 0.2 | 1.0 |
| Other Services | $0.44 | $0.19 | $0.22 | $0.41 | $0.18 | $0.19 | $0.37 | 3.6 | 3.9 | 7.5 |
| **Total** | **$30.92** | **$13.43** | **$4.86** | **$18.29** | **$7.07** | **$2.38** | **$9.45** | **94.7** | **35.6** | **130.3** |

*Source: Modelled Result*

***Table 4.12 - Estimates of Annual Economic Activity by Sector Related to Operating Spend for the Regional Council of Goyder***

| | Expend-iture ($m) | Value Added ($m) | | | Income ($m) | | | Employment (FTE's) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Direct | Induced | Total | Direct | Induced | Total | Direct | Induced | Total |
| Agriculture, Forestry and Fishing | $0.03 | $0.02 | $0.03 | $0.04 | $0.00 | $0.01 | $0.01 | 0.1 | 0.2 | 0.3 |
| Mining | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | 0.0 | 0.0 | 0.0 |
| Manufacturing | $0.43 | $0.12 | $0.02 | $0.14 | $0.07 | $0.01 | $0.08 | 0.8 | 0.1 | 0.9 |
| Electricity, Gas, Water and Waste Services | $0.02 | $0.01 | $0.02 | $0.03 | $0.00 | $0.01 | $0.01 | 0.1 | 0.1 | 0.1 |
| Construction | $0.36 | $0.09 | $0.02 | $0.11 | $0.08 | $0.02 | $0.09 | 0.9 | 0.2 | 1.1 |
| Wholesale Trade | $0.13 | $0.06 | $0.02 | $0.08 | $0.04 | $0.01 | $0.05 | 0.3 | 0.1 | 0.4 |
| Retail Trade | $0.15 | $0.08 | $0.04 | $0.13 | $0.06 | $0.03 | $0.09 | 1.3 | 0.6 | 1.9 |
| Accommodation and Food Services | $0.16 | $0.06 | $0.02 | $0.08 | $0.04 | $0.01 | $0.05 | 0.9 | 0.2 | 1.2 |
| Transport, Postal & Warehousing | $0.42 | $0.18 | $0.02 | $0.20 | $0.12 | $0.01 | $0.13 | 1.5 | 0.2 | 1.7 |
| Information Media & Telecommunications | $0.05 | $0.02 | $0.01 | $0.03 | $0.01 | $0.00 | $0.01 | 0.1 | 0.0 | 0.1 |
| Finance and Insurance Services | $0.04 | $0.02 | $0.03 | $0.05 | $0.01 | $0.01 | $0.02 | 0.1 | 0.1 | 0.1 |
| Ownership of Dwellings | $0.66 | $0.50 | $0.10 | $0.60 | $0.00 | $0.00 | $0.00 | 0.0 | 0.0 | 0.0 |
| Property and Business Services | $0.02 | $0.01 | $0.03 | $0.04 | $0.01 | $0.02 | $0.03 | 0.1 | 0.3 | 0.4 |
| Public Administration & Safety | $0.00 | $0.00 | $0.00 | $0.01 | $0.00 | $0.00 | $0.00 | 0.0 | 0.1 | 0.1 |
| Education & Training | $0.13 | $0.10 | $0.02 | $0.12 | $0.09 | $0.02 | $0.11 | 1.2 | 0.3 | 1.5 |
| Health care and social assistance | $0.10 | $0.07 | $0.01 | $0.08 | $0.06 | $0.01 | $0.08 | 0.9 | 0.2 | 1.1 |
| Arts and recreation services | $0.03 | $0.01 | $0.00 | $0.01 | $0.01 | $0.00 | $0.01 | 0.1 | 0.0 | 0.1 |
| Other Services | $0.06 | $0.03 | $0.02 | $0.04 | $0.02 | $0.01 | $0.04 | 0.5 | 0.3 | 0.8 |
| **Total** | **$2.79** | **$1.38** | **$0.40** | **$1.78** | **$0.63** | **$0.20** | **$0.82** | **8.9** | **2.9** | **11.8** |

*Source: Modelled Result*

***Table 4.13 - Estimates of Economic Activity for the Regional Council of Goyder***

| | Total GSP Impact (3 yrs) | Average Annual GSP Impact | Total Jobs Impact (Person Years - over 3 yrs) | Average Annual Jobs Impact |
|---|---|---|---|---|
| **Construction Phase** | | | | |
| Direct | $13.4 million | $4.5 million | 95 | 32 |
| Indirect | $4.9 million | $1.6 million | 36 | 12 |
| *Total* | *$18.3 million* | *$6.1 million* | *130* | *43* |
| **Operating Phase** | | | | |
| Direct | | $1.4 million | | 9 |
| Indirect | | $0.4 million | | 3 |
| *Total* | | *$1.8 million* | | *12* |

*Source: Modelled Result*

*Note – these numbers are rounded versions of the numbers in the tables above, as the modelling should be interpreted in terms of order of magnitude, but it means that not all numbers are exactly additive.*

From a local perspective in the Light Regional Council, the modelling indicates that the project will generate $20 million of value added (incomes created or contribution to Gross Regional Product), over the period of construction and, again allowing for lagged flow through effects, this would happen over three years. 146 person years of employment would be supported, or an average of 49 jobs sustained per year over three years. Once operational the project is estimated to support annually $2.3 million of incomes in the region, and

support directly and indirectly (including the multiplier impact) approximately 16 jobs per year.

***Table 4.14 Estimates of Economic Activity by Sector Related to Aggregate Capital Spend for the Light Regional Council – Outcomes Over Life of Project***

*(Note that employment should be interpreted as person years of employment rather than number of jobs at a point of time)*

| | Expend-iture ($m) | Value Added ($m) | | | Income ($m) | | | Employment (FTE's) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Direct | Induced | Total | Direct | Induced | Total | Direct | Induced | Total |
| Agriculture, Forestry and Fishing | $0.27 | $0.12 | $0.35 | $0.48 | $0.04 | $0.10 | $0.14 | 0.8 | 2.4 | 3.2 |
| Mining | $0.00 | $0.00 | $0.01 | $0.01 | $0.00 | $0.01 | $0.01 | 0.0 | 0.2 | 0.2 |
| Manufacturing | $4.48 | $1.20 | $0.53 | $1.73 | $0.68 | $0.30 | $0.98 | 8.2 | 3.6 | 11.8 |
| Electricity, Gas, Water and Waste Services | $0.38 | $0.17 | $0.11 | $0.27 | $0.06 | $0.04 | $0.10 | 0.8 | 0.5 | 1.3 |
| Construction | $7.00 | $1.78 | $0.33 | $2.11 | $1.55 | $0.29 | $1.84 | 17.3 | 3.2 | 20.5 |
| Wholesale Trade | $0.37 | $0.17 | $0.38 | $0.56 | $0.11 | $0.25 | $0.36 | 0.9 | 2.0 | 2.9 |
| Retail Trade | $2.26 | $1.29 | $0.28 | $1.57 | $0.92 | $0.20 | $1.12 | 19.1 | 4.2 | 23.3 |
| Accommodation and Food Services | $1.29 | $0.53 | $0.20 | $0.72 | $0.36 | $0.13 | $0.49 | 7.7 | 2.9 | 10.6 |
| Transport, Postal & Warehousing | $7.27 | $3.07 | $0.43 | $3.50 | $2.05 | $0.28 | $2.34 | 26.3 | 3.7 | 30.0 |
| Information Media & Telecommunications | $0.24 | $0.12 | $0.13 | $0.25 | $0.04 | $0.04 | $0.08 | 0.6 | 0.6 | 1.2 |
| Finance and Insurance Services | $0.30 | $0.21 | $0.29 | $0.49 | $0.09 | $0.12 | $0.21 | 0.5 | 0.7 | 1.2 |
| Ownership of Dwellings | $5.40 | $4.11 | $1.22 | $5.33 | $0.00 | $0.00 | $0.00 | 0.0 | 0.0 | 0.0 |
| Property and Business Services | $0.12 | $0.05 | $0.55 | $0.60 | $0.04 | $0.45 | $0.49 | 0.5 | 5.3 | 5.7 |
| Public Administration & Safety | $0.03 | $0.01 | $0.05 | $0.06 | $0.01 | $0.04 | $0.05 | 0.2 | 0.5 | 0.7 |
| Education & Training | $1.09 | $0.79 | $0.27 | $1.06 | $0.73 | $0.25 | $0.97 | 10.2 | 3.5 | 13.7 |
| Health care and social assistance | $0.93 | $0.61 | $0.16 | $0.78 | $0.58 | $0.15 | $0.73 | 8.3 | 2.2 | 10.5 |
| Arts and recreation services | $0.12 | $0.05 | $0.03 | $0.08 | $0.04 | $0.03 | $0.07 | 0.5 | 0.3 | 0.8 |
| Other Services | $0.47 | $0.21 | $0.23 | $0.44 | $0.19 | $0.21 | $0.41 | 3.8 | 4.3 | 8.1 |
| **Total** | **$32.02** | **$14.50** | **$5.56** | **$20.06** | **$7.48** | **$2.89** | **$10.37** | **105.7** | **40.1** | **145.8** |

*Source: Modelled Result*

***Table 4.15 - Estimates of Annual Economic Activity by Sector Related to Operating Spend for the Light Regional Council***

| | Expend-iture ($m) | Value Added ($m) | | | Income ($m) | | | Employment (FTE's) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Direct | Induced | Total | Direct | Induced | Total | Direct | Induced | Total |
| Agriculture, Forestry and Fishing | $0.04 | $0.02 | $0.03 | $0.05 | $0.01 | $0.01 | $0.02 | 0.1 | 0.2 | 0.4 |
| Mining | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | 0.0 | 0.0 | 0.0 |
| Manufacturing | $0.35 | $0.09 | $0.05 | $0.14 | $0.05 | $0.03 | $0.08 | 0.6 | 0.3 | 1.0 |
| Electricity, Gas, Water and Waste Services | $0.06 | $0.03 | $0.01 | $0.04 | $0.01 | $0.00 | $0.01 | 0.1 | 0.1 | 0.2 |
| Construction | $0.38 | $0.10 | $0.03 | $0.12 | $0.08 | $0.02 | $0.11 | 0.9 | 0.2 | 1.2 |
| Wholesale Trade | $0.06 | $0.03 | $0.04 | $0.06 | $0.02 | $0.02 | $0.04 | 0.2 | 0.2 | 0.3 |
| Retail Trade | $0.37 | $0.21 | $0.03 | $0.24 | $0.15 | $0.02 | $0.17 | 3.1 | 0.4 | 3.5 |
| Accommodation and Food Services | $0.21 | $0.09 | $0.02 | $0.11 | $0.06 | $0.01 | $0.07 | 1.3 | 0.3 | 1.5 |
| Transport, Postal & Warehousing | $0.43 | $0.18 | $0.04 | $0.22 | $0.12 | $0.02 | $0.14 | 1.5 | 0.3 | 1.9 |
| Information Media & Telecommunications | $0.04 | $0.02 | $0.01 | $0.03 | $0.01 | $0.00 | $0.01 | 0.1 | 0.1 | 0.2 |
| Finance and Insurance Services | $0.05 | $0.03 | $0.03 | $0.07 | $0.01 | $0.01 | $0.03 | 0.1 | 0.1 | 0.2 |
| Ownership of Dwellings | $0.89 | $0.67 | $0.12 | $0.80 | $0.00 | $0.00 | $0.00 | 0.0 | 0.0 | 0.0 |
| Property and Business Services | $0.02 | $0.01 | $0.05 | $0.06 | $0.01 | $0.04 | $0.05 | 0.1 | 0.5 | 0.6 |
| Public Administration & Safety | $0.00 | $0.00 | $0.00 | $0.01 | $0.00 | $0.00 | $0.01 | 0.0 | 0.0 | 0.1 |
| Education & Training | $0.18 | $0.13 | $0.03 | $0.16 | $0.12 | $0.03 | $0.14 | 1.7 | 0.4 | 2.0 |
| Health care and social assistance | $0.15 | $0.10 | $0.02 | $0.12 | $0.09 | $0.02 | $0.11 | 1.4 | 0.2 | 1.6 |
| Arts and recreation services | $0.02 | $0.01 | $0.00 | $0.01 | $0.01 | $0.00 | $0.01 | 0.1 | 0.0 | 0.1 |
| Other Services | $0.08 | $0.03 | $0.02 | $0.05 | $0.03 | $0.02 | $0.05 | 0.6 | 0.4 | 1.0 |
| **Total** | **$3.34** | **$1.76** | **$0.53** | **$2.29** | **$0.78** | **$0.27** | **$1.05** | **12.0** | **3.7** | **15.7** |

*Source: Modelled Result*

***Table 4.16 - Estimates of Economic Activity for the Light Regional Council***

| | Total GSP Impact (3 yrs) | Average Annual GSP Impact | Total Jobs Impact (Person Years - over 3 yrs) | Average Annual Jobs Impact |
|---|---|---|---|---|
| **Construction Phase** | | | | |
| Direct | $14.5 million | $4.8 million | 106 | 35 |
| Indirect | $5.6 million | $1.9 million | 40 | 13 |
| *Total* | *$20.1 million* | *$6.7 million* | *146* | *49* |
| **Operating Phase** | | | | |
| Direct | | $1.8 million | | 12 |
| Indirect | | $0.5 million | | 4 |
| *Total* | | *$2.3 million* | | *16* |

*Source: Modelled Result*

Note – these numbers are rounded versions of the numbers in the tables above, as the modelling should be interpreted in terms of order of magnitude, but it means that not all numbers are exactly additive.

In terms of racing the expenditures, using Light as the example - of the $350 million the assumptions above suggest that 15% will be spent in the region. But 10% of that is spent on regionally sourced labour, and as such much of what household income is spent on is imported into the region (and they also pay tax which is modelled as a leakage). From the IO table developed for this study for Light Regional Council only 42% is spend in the region the other 58% is imported (or taxes paid). The smaller the region, the higher this leakage. So therefore the actual expenditure in the region is only 9.2% of the total spend of $350 million (or $32.0 million as in Table 14.4).

This also explains the differences between Goyder and Light. Goyder is a smaller less contained region than Light and as such household consumption has more imports. Further because of that, it has slightly smaller multipliers. Therefore despite the assumptions being the same – the results are slightly higher for Light than for Goyder.

## *4.4 Additional Economic Impacts*

This report focusses primarily on the potential employment and income benefits of the proposed Twin Creek Wind Farm Project. Job creation is an important community benefit and, at the regional level, the level of job creation is dependent upon two key factors:

1. The amount of investment and operational activity that can be captured by the region; and

2. The preparedness of the region and its people to apply for and accept available job vacancies. Having suitably trained people and geared up companies will maximize regional employment and incomes.

Examples of jobs created in the construction phase include:

- Project developers
- Field engineers
- Environmental managers and consultants
- Legal support
- Administrative and office support
- Numerous construction-related positions
- Transportation managers
- Contract and sub-contract managers
- On-site quarry operation
- Project controls engineers
- Safety technicians

Examples of jobs created in the operational phase include:

- Project managers
- Project coordinators
- Production managers
- Wind turbine technicians
- Wind turbine maintenance
- Environmental consultants
- Administrative and office support

Wind farms generally can have positive and negative socio-economic impacts depending on a variety of factors and the specific communities being impacted by the developments. For example, farmers hosting turbines may receive positive financial benefits while other communities might be subject to visual impacts with financial implications. Other than employment and income generation, two of the possible externalities of wind farms that are often discussed are on property values and carbon emissions. These are considered below.

### 4.4.1 Property Values

Many studies by independent organisations around the world have failed to find any correlation between wind turbines and declining property values. Some studies found positive property value impacts associated with:

- Improved regional amenities and infrastructure including local roads, firefighting access roads, etc.
- Increased regional incomes, jobs and property demand (as assessed above).
- Additional rental income from hosting wind turbine generators.
- Provision of a drought-proofing income streams.
- Provision of post-retirement income for farmers.
- Improved biodiversity via less intensive farm activity.
- Prevention of land subdivision and slowing down the process of productive agricultural land changing to rural residential uses in the short to medium term with the shift caused by the additional income generated from the wind farm providing additional cash flows to supplement the underlying agricultural use..
- Erosion control and passive wind protection for stock from sub stations and turbine wind turbine generators structures.

A report on community acceptance of rural wind farms by the CSIRO's Science into Society found that rural landowners with wind farm infrastructure on their properties stood to gain from such benefits.[16]

For properties without wind farm infrastructures but in the line of sight of turbines, statistical evidence supports that property values do not perform worse than properties in comparable regions without wind turbines. In many cases, property values have actually gone up faster than values in the comparable regions.

[16] CSIRO report http://www.csiro.au/Organisation-Structure/Flagships/Energy-Transformed-Flagship/Exploring-community-acceptance-of-rural-wind-farms-in-Australia.aspx, reported in Wind Energy the Facts, Clean Energy Council, March 2013.

A study conducted by the South Australia Department of Lands looked at properties located near eight wind farms and found no evidence that wind turbines caused property values to drop. The report found that wind farms "do not appear to have negatively affected property values in most cases". The report also found that "no reductions in sale price were evident for rural properties or residential properties located in nearby townships with views of the wind farm".[17]

Internationally, a decade long study across nine different states in the US by the Lawrence Berkeley National Research Laboratory found no negative relationship between wind turbines and property values. The study found "neither the view of the wind facilities nor the distance of the home to those facilities is found to have any consistent, measurable, and statistically significant effect on home sales prices".[18]

Also, the University of New Hampshire's Impact of the Lempster Wind Power Project on Local Residential Property Values from January 2012 found no evidence that the project had an impact on property values in the region. The study also said "this is consistent with the near unanimous findings of other studies — based their analysis on arms-length property sales transactions — that have found no conclusive evidence of wide spread, statistically significant changes in property values resulting from wind power projects".[19]

While the above studies and evidence support that wind farms have no long term detrimental impact on overall property values, it must be recognised that over time many other factors impact property values such as general market conditions, population trends and the local property supply/demand balance.

There will be localised positive and negative impacts associated with wind farms depending on individual property locations and characteristics. Some may appreciate faster than market trends due to improved farm incomes from hosting wind turbine generators (more than offsetting the marginal loss of productive land) and improved access to infrastructure. Some may fail to keep pace with market trends due to perceptions of visual and noise impacts. Potential disruption during wind turbine generator assembly and infrastructure establishment

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[17] South Australia Department of Lands report http://www.lpi.South Australia.gov.au/__data/assets/pdf_file/0018/117621/t0L51WT8.pdf reported in Wind Energy the Facts, Clean Energy Council, March 2013.

[18] Lawrence Berkeley study, United States http://eetd.lbl.gov/ea/ems/reports/lbnl-2829e.pdf, reported in Wind Energy the Facts, Clean Energy Council, March 2013. This study was further confirmed in the August 2013 study by the Berkley National Laboratory "A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States" which used data for 50,000 home sales across the USA for homes from within 1 mile ot within 10 miles of a wind farm to conclude that "we find no statistical evidence that home values near turbines were affected in the post-construction or post-announcement/pre-construction periods"

[19] *Impact of the Lempster Wind Power Project on Local Residential Property Values*, January 2012 http://antrim-wind.com/files/2012/05/14B_lempster_property_value_impacts_final-copy-copy.pdf reported in Wind Energy the Facts, Clean Energy Council, March 2013

is also noted. However, the evidence supports no overall long term negative impact on property values associated with wind farm developments.

### 4.4.2 Carbon Emissions

Renewable wind energy generation has significant environmental benefits through carbon emissions reduction where it replaces coal or gas generated electricity. The debate in this area comes down conclusively on the carbon reduction benefits of wind farms relative to fossil fuels[20]

To estimate the value of this reduction it is assumed that the Twin Creek Wind Farm will have the following operating characteristics:

- Total wind farm capacity of up to 183 megawatts.
- Annual average utilisation rate of 40%[21].
- Total generation of 613 Gigawatt hours (Gwh) per annum.

It is conservatively assumed that when electricity is generated through coal fired stations, it produces 0.8 tonnes of carbon per megawatt hour[22] of electricity generated. So the generation of 613 Gwh per annum through coal generation would produce in the order of 0.491 million tonnes of carbon emissions. At a carbon price of $20 per tonne (historically conservative relative to international trading schemes, and much lower than what is expected in the longer term – but matching current prices[23]), the value of carbon emission savings therefore associated with the Twin Creek Wind Farm is estimated to be $9.8 million per annum or a net present value of $104million over a 20 year period (real discount rate of 7%).

[20] The arguments re carbon emissions in wind versus fossil fuels generated electricity is summarized by Professor Barry Brooks (University of Adelaide) at http://bravenewclimate.com/2010/09/01/wind-power-emissions-counter/
[21] Defined as the actual output of the project relative to its maximum possible output

[22] Annual carbon emissions from the National Electricity Market fell by over 12 million tonnes (CO2-e) between June 2012 and May 2013. They fell by only around 1.5 million tonnes over the previous twelve-month period. Carbon pollution per megawatt-hour has also fallen: from 0.86 to 0.81 tonnes per unit of output, or a little over 5 per cent. Source: The Climate Institute – www.climateinstitute.org.au
[23] http://www.worldbank.org/en/programs/pricing-carbon cites "Royal DSM has put a so-called internal price on carbon of EUR50 per ton of CO2e. Sijbesma said this will 'future proof' the business by changing the mindset when reviewing large investment decisions". http://calcarbondash.org/ indicates a current price of US$13 per tonne (having fallen somewhat in the last few years)

# 5 CONCLUSION

This socio-economic impact assessment focuses on the effect of the Twin Creek Wind Farm Project on regional incomes and employment associated with the construction and operating phases of the project. This effect arises through the primary expenditure directly associated with the project, and then from further 'rounds' of indirect expenditure that this direct expenditure stimulates as it flows to supplying industries and into incomes and consumption.

The economic modelling for the project has been undertaken using indicative assumptions with respect to labour supply. The commitment of the project developers is that there will be prioritisation of local contractors wherever possible, but the modelling assumes that the wind turbine generators are imported from interstate or overseas, and the major local impact is based on transport and assembly.

From a **State perspective**, economic modelling indicates that the project will generate $209 million of value added (which is a net contribution to Gross State Product[24]) in the State of South Australia over the period of construction and that this would happen over three years (allowing for lagged flow through effects). 1,447 person years[25] of employment in South Australia would be supported – or an average of over 480[26] jobs sustained per year over three years. Once operational the project is estimated to support annually $15.5 million of value added in South Australia, and support directly and indirectly in the order of 105 jobs per year. The impact at the national level would be similar to the state level, unless there are constraints in national labour and capital markets with such constraints likely to be limited in the current macroeconomic environment.

From a **regional perspective**[27], the modelling indicates that the project will generate $64 million of value added (contribution to Gross Regional Product) in the region (Barossa and Lower North) over the period of construction and, again allowing for lagged flow through effects, this would happen over three years. 477 person years of employment would be supported, or an average of 159 jobs sustained per year over three years. Once operational the project is estimated to support annually $6.2 million of value added in the region, and support directly and indirectly (including the multiplier impact) approximately 44 jobs per year.

[24] Value added is the way in which economic activity is measured in the National Accounting system. At the national level this is equivalent to Gross Domestic Product (GDP) and is made up of returns to labour (wages and salary and taxes on labour) and returns to capital (gross operating surplus (or profits plus depreciation and financing costs) and company tax and GST). At the state level, the national accounts call this amount the Gross State Product.
[25] i.e. the number of full time equivalent annual jobs created over the period.
[26] 1,474÷3
[27] Regional in this context is defined as the ABS regions of the Barossa and Lower North.

From a **local perspective**[28], based on the assumptions used (which involve project drawing labour from both the Goyder and Light areas the modelling indicates that the project will generate:

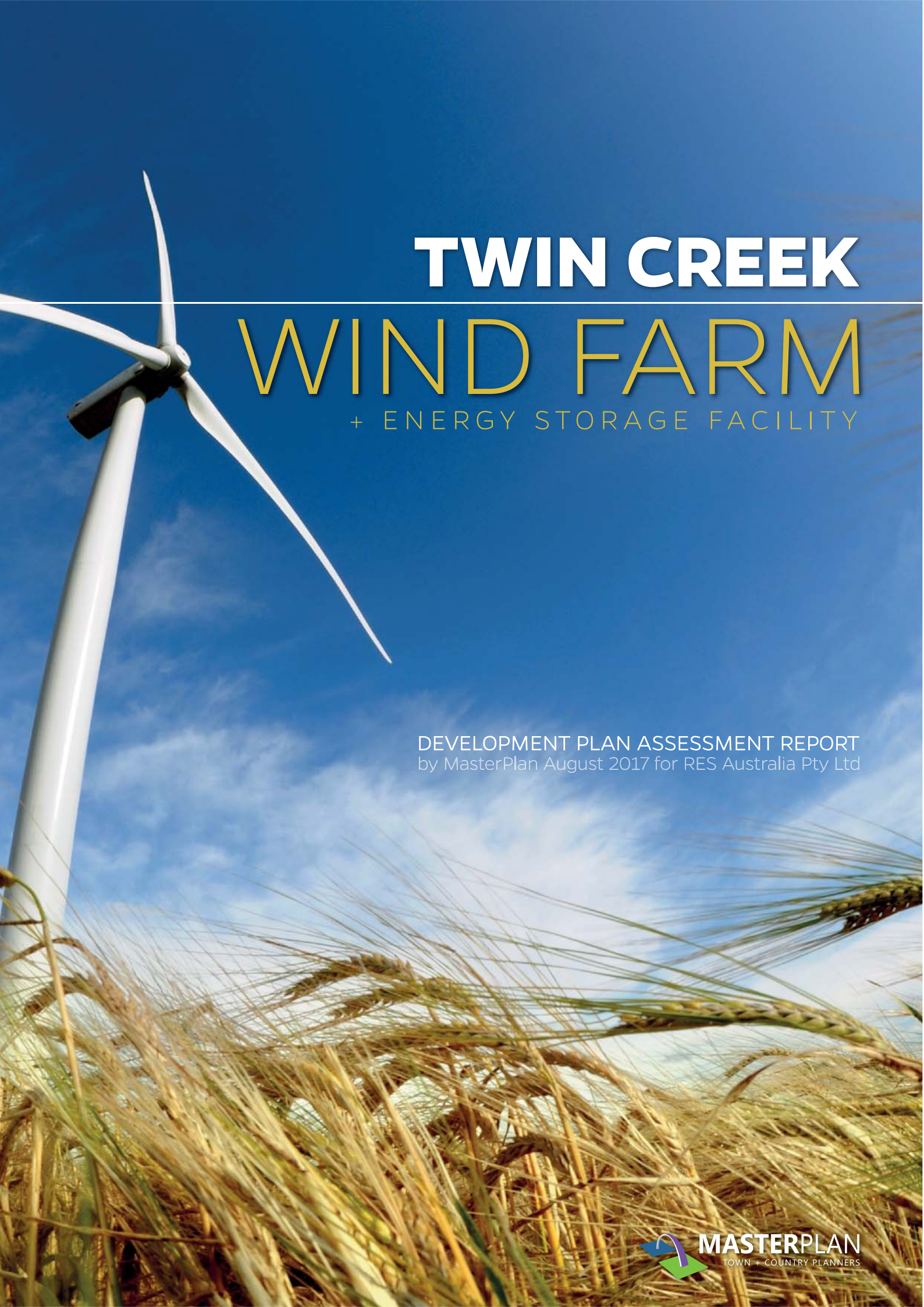
- $18 million of value added (contribution to Gross Regional Product) in the LGA of Goyder over the period of construction and, again allowing for lagged flow through effects, this would happen over three years. 130 person years of employment for local residents would be supported, or an average of 43 jobs sustained per year over three years. Once operational the project is estimated to support annually $1.8 million of value added in the region, and support directly and indirectly (including the multiplier impact) approximately 12 jobs per year.

- $20 million of value added (contribution to Gross Regional Product) in the LGA of Light over the period of construction over three years. 146 person years of employment for local residents would be supported, or an average of 49 jobs sustained per year over three years. Once operational the project is estimated to support annually $2.3 million of value added in the region, and support directly and indirectly (including the multiplier impact) approximately 16 jobs per year.

These outcomes are based on assumed levels of local supply, and where more of the activity can be retained in the region (while acknowledging the specialist nature of the construction itself), the more extensive the degree of regional economic activity.

Wind farms can have other positive and negative socio-economic impacts depending on a variety of factors and the specific communities being impacted by the developments. For example, farmers hosting turbines may receive positive financial benefits while other communities might be subject to visual impacts from windfarm infrastructure with no financial benefits. In addition to employment and income generation, property values and carbon emissions are socio-economic externalities of wind farms as measured in this report.

[28] Local in this context is the LGA's of Goyder and Light.



# TWIN CREEK

# WIND FARM

## + ENERGY STORAGE FACILITY

DEVELOPMENT PLAN ASSESSMENT REPORT
by MasterPlan August 2017 for RES Australia Pty Ltd

MASTERPLAN
TOWN + COUNTRY PLANNERS

# DEVELOPMENT PLAN ASSESSMENT REPORT

## PROPOSED TWIN CREEK WIND FARM AND ENERGY STORAGE FACILITY

FOR RES AUSTRALIA PTY LTD

MASTERPLAN
TOWN + COUNTRY PLANNERS

PREPARED BY
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## CONTENTS

## EXECUTIVE SUMMARY

The site of the Twin Creek Wind Farm and Energy Storage project is located across three local government areas, including the Light Regional Council, the Regional Council of Goyder and the Mid Murray Council. Infrastructure including wind turbine generators, on-site substation, operations and maintenance compound, temporary construction compounds (including temporary concrete batching plant) are located within the Light Regional Council and Regional Council of Goyder. The transmission line transverses from within the Light Regional Council area to the Mid Murray Council area, and terminates with a terminal substation east of Truro.

In each of the three Council areas, the site of the proposed development is within a Rural or Primary Production Zone. Within these zones, a *"wind farm and ancillary development such as substations, maintenance sheds, access roads and connecting power lines (including to the National Electricity Grid)"* is a consent land use.

More specifically, the site of the proposed Twin Creek Wind Farm is located within the following zones:

- Primary Production Zone, General Farming Policy Area 3, Light Regional Council Development Plan (consolidated 8 December 2016);
- Primary Production Zone, Goyder Council Development Plan (consolidated 24 November 2016); and
- Rural Zone, Hills Policy Area 14, Mid Murray Council Development Plan (consolidated 14 June 2017).

An assessment of the merits of the wind farm must be undertaken against the relevant provisions of each of the three Development Plans.

Following an assessment of the proposed development against the provisions of the Light Regional Council Development Plan, the Goyder Council Development Plan and the Mid Murray Council Development Plan, it is considered that the proposed development is not significantly at variance with the Development Plan.

The proposed Twin Creek Wind Farm and Energy Storage project adequately and appropriately addresses potential impacts, particularly those associated with noise, visual amenity, protection of flora and fauna, European and aboriginal heritage, and traffic movements in a manner sought by the Development Plan.

On balance, the proposed Twin Creek Wind Farm and Energy Storage project is a suitable form of development within the Primary Production and Rural Zone, that appropriately addresses potential impacts and thereby warrants the granting of Development Plan Consent.

## 1.0 INTRODUCTION

MasterPlan SA Pty Ltd has been engaged by RES Australia Pty Ltd (RES Australia) to undertake an assessment of the proposed Twin Creek Wind Farm and Energy Storage facility against the provisions of the Light Regional Council Development Plan, Goyder Council Development Plan and Mid Murray Council Development Plan. In preparing this report, the following development application documents, including the plans and reports listed below, have been reviewed:

*RES Australia Plans*

Figure 1: Location Plan – 03498D2212-01

Figure 2: Wind Map – 03498D2213-01

Figure 3: Site and Context Analysis (Two Pages) - 03498D2103-01
Page 1 - Wind Farm
Page 2 - Grid Route

Figure 4: Planning Overlays – 03498D2214-01

Figure 5: Landownership (Two Pages) – 03498D2525-01
Page 1 - Wind Farm
Page 2 - Grid Route

Figure 6: Proposed Turbine Locations – 03498D0002-01

Figure 7: House and Turbine Locations (Two Pages) – 03498D0202-01
Page 1 - Wind Farm
Page 2 - Grid Route

Figure 8: Infrastructure Drawing (Two Pages) – 03498D1002-01
Page 1 - Wind Farm
Page 2 - Grid Route

Figure 9: Design Response – 03498D2104-01
Page 1 - Wind Farm
Page 2 - Grid Route

Figure 10: Micro-siting Drawing – 03498D2215-01

Figure 11A: Proposed Construction Operations, Maintenance and Substations Areas – 03498D3501-02

Figure 11B: Proposed Terminal Station Site Plan – 03498D4001-01

Figure 12: Typical Operation and Maintenance Area – 03498D3502-01
Page 1 - General View
Page 2 - Operation and Maintenance Building
Page 3 - Office

Figure 13: Typical Temporary Construction Compound – 03498D3503-01

Figure 14: Typical Concrete Batching Plant – 03498D3504-01

Figure 15: Typical On-site Intermediary Collector Station – 03498D4005-01

Figure 16: Proposed Energy Storage Facility – 03498D3401-01

Figure 17: Proposed Cable Reticulation Layout – 03498D4301-01

Figure 18: On-site Cable Trench Typical Sections – 03498D4302-01

Figure 19: Typical Overhead Line Poles – 03498D4105-01

Figure 20: Typical Overhead Line Easement and Vegetation Clearance – 03498D4104-01

Figure 21: Preliminary Track Design – 03498D3802-01

Figure 22: Typical Turbine Foundation – 03498D3001-01

Figure 23: Typical Front and Side Elevations of a Wind Turbine – 03498D2301-01

Figure 24: Typical Crane Hardstand – 03498D3801-01

Figure 25: Typical Wind Monitoring Mast – 03498D5001-01

*Volume 1 – project summary including the following technical reports:*

1. Twin Creek Wind Farm Consultation Outcomes Report by GHD dated June 2017.

2. Twin Creek Wind Farm Flora and Fauna Assessment report by EBS Ecology (EBS) dated 28 June 2017.

3. Landscape Character and Probable Visual Effect Assessment by Wax Design and Dr Brett Grimm dated 29 June 2017.

4. Twin Creek Wind Farm Environmental Noise Assessment by Sonus dated June 2017.

5. Desktop Cultural Heritage Assessment Twin Creek Windfarm Report by EBS Heritage dated 14 March 2017.

6. Twin Creek Wind Farm Bushfire Management Plan by SA Bushfire Solutions dated June 2017.

7. Twin Creek Wind Farm Shadow Flicker and Blade Glint Assessment by DNV-GL dated 26 June 2017.

8. Twin Creek Wind Farm EMI Assessment by DNV-GL dated 26 June 2017.

9. Aviation Impact Statement, Qualitative Risk Assessment (QRA) and Obstacle Lighting Review by Ambidji Group Pty Ltd (Ambidji a division of Landrum and Brown Worldwide) dated 17 March 2017.

10. Traffic Impact Assessment by AECOM Australia Pty Ltd (AECOM) dated 26 June 2017.

11. Twin Creek Wind Farm Civil, Geology and Hydrology by AECOM Australia Pty Ltd (AECOM) dated 28 June 2017.

12. Socio-Economic Impact Assessment for the Twin Creek Wind Farm by Hudson Howells Strategic Management Consultants dated March 2017.

- relevant legislations, including the *Development Act 2003*, *Development Regulations 2008*, the *Planning, Development and Infrastructure Act 2016,* the *Environment Protection (Noise) Policy 2007* and Wind Farms Environmental Noise Guidelines (EPA July 2009);
- undertaken a site and locality inspection;
- reviewed the provisions of the Light Regional Council Development Plan (consolidated 8 December 2016);
- reviewed the provisions of the Goyder Council Development Plan (consolidated 24 November 2016);
- reviewed the provisions of the Mid Murray Council Development Plan (consolidated 14 June 2017);
- reviewed the Barossa Valley Character Preservation District General Registry Office Plan G42012 (June 2012);
- reviewed the Environment and Food Production Areas (GRO G17/2015); and
- reviewed the Central Local Government Region of South Australia Wind Farm Guidelines (2014).

## 2.0 DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed Twin Creek Wind Farm and Energy Storage project is to be located approximately 90 kilometres north-east of Adelaide within the mid north area of South Australia. The proposed development is located between the townships of Kapunda, Eudunda and Truro as identified in **Figure 1**.

# TWIN CREEK WIND FARM

## FIGURE 1

## LOCATION PLAN



**LEGEND**

- 275kV POWERLINE (ELECTRANET)
- LOCAL GOVERNMENT AREA BOUNDARY
- WIND FARM DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)

Clare and Gilbert Valleys Council

Light Regional Council

Regional Council of Goyder

Light Regional Council

Regional Council of Goyder

Mid Murray Council

Light Regional Council

Barossa Council

CURIO HIGHWAY

THIELE HIGHWAY

EUDUNDA ROAD

STURT HIGHWAY

MARRABEL ROAD

TARLEE ROAD

CLARE ROAD

WILDRED STREET

BAGOT WELL ROAD

MOSEY ROAD

CAMEL FARM ROAD

TRURO ROAD

EUDUNDA

KAPUNDA

TRURO

BUCHANAN

HANSBOROUGH

HAMILTON

WATERLOO PLAINS

ALLENDALE NORTH

NEALES FLAT

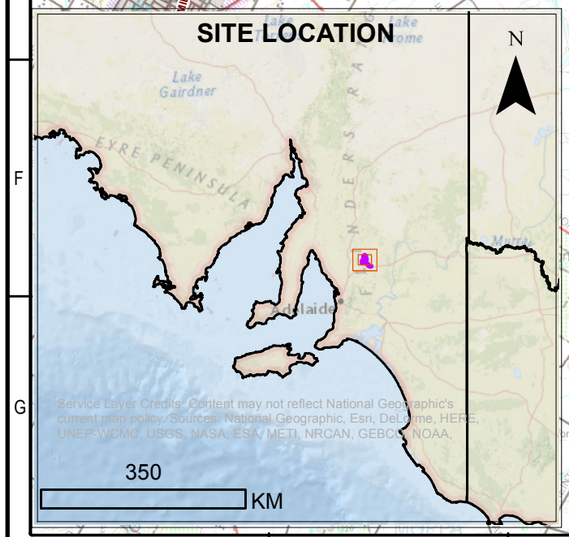
FRANKTON

DUTTON

KOONUNGA

NORTH MOUNT LOFTY RANGES

**SITE LOCATION**






0 1 2 4 6 8 10 km

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 25-06-2017 |
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**03498D2212-01**

**SCALE - 1:100,000 @ A3**

COORDS

GDA 1994 MGA Zone 54

**PLANNING PERMIT APPLICATION**



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The proposed development incorporates the following elements:

- up to 51 Wind Turbines Generators (WTG);
- a total installed wind capacity in the order of approximately 185MW;
- the development application is based on a candidate turbine - Vestas V136;
- turbines are three-bladed, semi-variable speed, pitch regulated machines with a rotor and nacelle mounted on a reducing cylindrical steel tower;
- overall height of turbines will be up to 180 metres at the blade tip. Development Plan Consent is sought for a wind turbine generator with a maximum overall height of 180 metres;
- based on the candidate turbine the indicative dimensions are approximately 112 metres to the hub, and blades are approximately 68 metres in length. The exact dimensions may alter with the selection of the final turbine mode;
- the WTG extend approximately 6.0 kilometres to 7.0 kilometres in a north-south direction, and approximately 5.0 kilometres in an east-west direction along the tablelands that form the wide ridgeline associated with Bald Hill and Long Hill situated within the Northern Mount Lofty Ranges;
- micro-siting for the wind turbine generators is sought, so that should environmental constraints or unacceptable ground conditions be identified during construction, these can be avoided;
- all infrastructure will be micro-sited within the 'infrastructure zone' and within the following parameters:

    - WTG to be located within 100 metres of their proposed locations and in accordance with the Micro-Siting Drawing provided in Volume 3;
    - tracks, hardstands and associated infrastructure to suit any micro-sited WTG locations;
    - substations, battery energy storage facility, or operation and maintenance compound within 100 metres of their proposed location;
    - overhead transmission line within the infrastructure zone.

    The final position of turbines and transmission lines within these corridors will be the subject of final design;

- each turbine would be placed within a hardstand area of approximately 90 metres by 45 metres;
- two meteorological masts with a height equivalent to the hub height of the final selected turbine. Based on the candidate turbine, this height will be approximately 112 metres;

- a network of internal tracks (5.0 metres to 7.0 metres in width, post construction) linking turbines and to provide access to and from public roads. The total length of track is approximately 49 kilometres. Where possible existing tracks are utilised and upgraded for access;
- approximately 49 kilometres of 33kV electrical cables (underground) linking turbines to the on-site substation;
- 275kV overhead transmission line for approximately 15 kilometres from the on-site substation;
- to the terminal substation and tee in to the Robertstown to Tungkillo 275 kW transmission line. Poles will be constructed with steel or concrete monopoles up to 35 metres high and spaced approximately 200 metres to 400 metres apart (or wider should terrain enable) depending on ground conditions;
- two substations, the first is within the wind farm infrastructure zone, on the south-eastern side of the development site near the wind farm access point. The second substation is the terminal substation, which is located adjacent the Sturt Highway east of the township of Truro at the 275kV tee in point;
- at the terminal substation the 275kV transmission towers will comprise lattice towers up to 45 metres high to tee into the existing transmission line;
- operations and maintenance facilities including office, control room, staff facilities, car park area for staff and visitors, and workshop;
- up to five temporary laydown and construction facilities;
- a mobile concrete batching plant within one of the temporary laydown and construction facilities;
- adjacent the operations and maintenance compound is the battery energy storage facility; and
- battery energy storage facility with an indicative capacity of 215MW. The facility includes up to 24 containerised energy storage enclosures (which house batteries, inverters, transformers, racking and associated electrical equipment), a control building and switch room.

The substation and operations and maintenance site is approximately 6.0 hectares in area. The substation and the permanent operations and maintenance facility for the wind farm is to be located on Section 278 in Certificate of Title Volume 5618, Folio 693. The compound is accessed from Mosey Road via an internal access road. The compound is setback approximately 1.8 kilometre from the road. All areas of the compound are to be fenced with 2.0 metre high security fencing. Screen vegetation planting will be undertaken around the perimeter of the compound. Plans of the indicative layout of the substation and operations and maintenance facility are incorporated in the development application documents (Volume 3).

A range of elements are contained within the construction operations and maintenance, battery storage and substation compound, including:

- operations and maintenance area identified on the plan as a 'utility zone' of approximately 0.8 hectares. This area comprises:
  - the office and staff facilities of approximately 200 square metres;
  - operations and maintenance building of 375 square metres;
  - bunded hazardous storage area;
  - car parking and communications tower (approximately 25 metres in height);
- battery storage compound of approximately 1.1 hectares. This area comprises:
  - 24 energy storage containers containing UL-listed batteries, inverters, transformers, racking and associated equipment, typically 12 to 15 metres in length, 2.5 metres in height and typically 0.5 metres FFL above natural ground;
  - associated transformers;
  - switch room;
  - control building;
  - car parking.
- construction laydown area up to approximately 2.9 hectares (with some of this area potentially being utilised for the substation);
- substation including switch room and control buildings of approximately 2.2 hectares. This area comprises:
  - 33kv switch room;
  - control building;
  - one permanent 275kV to 33kV substation with approximate dimensions of 75 metres x 85 metres.

A temporary mobile concrete batching plant within a compound of approximately 1.3 hectares (115 metres x 115 metres) is to be located immediately to the south west of the permanent construction operations and maintenance, battery storage and substation compound (if this material is not sourced off-site). This temporary concrete batching plant is located on the same property as the permanent construction operations and maintenance, battery storage and substation compound.

The need for on-site concrete batching plants will depend on the final selected civil contractor requirements. Any Environment Protection Authority (EPA) licence required for the operation of the plant would be sought by the contractor.

The temporary construction and laydown facilities are anticipated to be utilised during the 18 month to two year construction timeframe of the development, and may include the following sites:

- Section 278 in Certificate of Title Volume 5618, Folio 693 south east of WTG 9;
- Section 233 in Certificate of Title Volume 5293, Folio 931 between WTG 42 and 48;
- Section 126 in Certificate of Title Volume 5293, Folio 930 between WTG 51 and 17;
- Section 233 in Certificate of Title Volume 5293, Folio 931 between WTG 13 and 19; and
- Allotment 91 in Certificate of Title Volume 5506, Folio 92 adjacent the terminal substation.

The final number and location of these facilities will be determined as part of the final design of the wind farm, following selection of the construction contractor and establishing their requirements.

In addition to the substation within the wind farm infrastructure zone, as described in Section 1.5.2, a second substation is the terminal substation at the 275 kV tee in point. This substation is located adjacent the Sturt Highway east of the township of Truro on Allotment 91 in Certificate of Title Volume 5506, Folio 92.

The terminal substation is approximately 2.0 hectares and comprises:

- switch room;
- control building;
- one permanent substation;
- 2.0 metre high perimeter security fence;
- site entrance from the Sturt Highway; and
- screen vegetation landscaping.

The layout of the proposed wind farm is shown on the plans attached to this report, in **Attachment 1**. A detailed description of the wind farm is incorporated in Volume 1 of the application documents.

RES Australia are seeking a period of five years in which to substantially commence the development from the operative date and substantial completion to be extended to seven years from the operative date of the consent.

## 3.0 PROCEDURAL MATTERS

In accordance with Schedule 10(14) of the *Development Regulations 2008*, the Development Assessment Commission will be the relevant planning authority to assess the development application, as the proposed development is *"for the purposes of the provision of electricity generating plant with a generating capacity of more than 5 MW that is to be connected to the State's power system"*.

Assessment of the application will be undertaken against the relevant provisions of the Light Regional Council Development Plan, the Goyder Council Development Plan and the Mid Murray Development Plan.

The southern portion of the development is located within the Light Regional Council area and within the Primary Production Zone, General Farming Policy Area 3 (Light Regional Council Development Plan consolidated 8 December 2016). A *"wind farm and ancillary development such as substations, maintenance sheds, access roads and connecting power lines (including to the National Electricity Grid)"* is a consent land use within the Primary Production Zone, if it is located outside of the Barossa Valley Character Preservation District as defined by character preservation legislation.

The portion of the development within the Mid Murray Council area incorporates portion of the transmission line and terminal substation, and is located within the Rural Zone of the Mid Murray Council Development Plan. A *"wind farm and ancillary development such as substations, maintenance sheds, access roads and connecting power lines (including to the National Electricity Grid)"* is a consent land use within the Rural Zone, if it is located outside of the Barossa Valley Character Preservation District as defined by character preservation legislation.

All infrastructure associated with the Twin Creek Wind Farm and Energy Storage project is outside of the Barossa Valley Character Preservation District, and therefore a consent land use to be assessed on merit in respect to both the Light Regional Council and Mid Murray Council Development Plan.

A wind farm is neither a complying or a non-complying land use within the Primary Production Zone of the Goyder Council Development Plan, and therefore a consent land use to be assessed on merit.

In each of the three affected Development Plans, a wind farm is deemed to be a consent land use.

Portion of the project's infrastructure is located within the proposed Environment and Food Production Area, as gazetted in GRO Plan G17/2015. At this time, the provisions of the Development Plans do not reference this Environment and Food Production Area. However, Section 7 of the Planning, Infrastructure and Development Act 2016 (PDI Act) seeks to protect areas of rural, landscape, environmental or food production significance within Greater Adelaide from urban encroachment. Specifically, the provisions of the PDI Act seek to restrict land division for residential purposes. The development does not propose land division for residential purposes or promote urban encroachment. The land is well removed from settled urban areas and development. Therefore, the provisions of the PDI Act and the Environment and Food Production Area are not relevant to the assessment of the proposed development.

**Figure 4** of the application plans, entitled Planning Overlays and shown on the next page, illustrates the development with reference to the boundaries of the Council areas and land use zones.

### 3.1 Public Notification

Each of the three Development Plans contain the same procedural provision in relation to a wind farm. A wind farm in the Rural Zone of the Mid Murray Council Development Plan and the Primary Production Zones of the Light Regional Council Development Plan and the Goyder Council Development Plans is Category 2 for notification purposes.

The following kind of development is defined as Category 2 for notification purposes in each of the Council areas and outside of the Barossa Valley Protection District.

> **Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) where the base of all wind turbines is located at least 2000 metres from:**
>
> **(a) an existing dwelling or tourist accommodation that is not associated with the wind farm;**
> **(b) a proposed dwelling or tourist accommodation for which an operable Development Plan consent exists; and**
> **(c) the boundaries of any Airfield, Airport, Centre, Community, Fringe, Historic Conservation, Home Industry, Living, Mixed Use, Residential, Settlement, Tourist, Township or Urban Zone, Policy Area or Precinct or any Heritage Area (including within the area of an adjoining Development Plan)**
>
> **Wind monitoring mast and ancillary development**

The Twin Creek Wind Farm and Energy Storage development satisfies the Category 2 procedural criteria in the following manner:

- it is located outside of the Barossa Valley Protection District as defined by character preservation legislation;
- each wind turbine generator achieves a separation of 2,000 metres from all existing non-stakeholder dwellings or tourist accommodation;
- there are no proposed dwellings or tourist accommodation developments for which an operable Development Plan Consent exists within 2,000 metres of the base of a wind turbine generator;
- each wind turbine generator achieves a separation of 2,000 metres from any airfield, airport, centre, community, fringe, historic conservation, home industry, living, mixed use, residential, settlement, tourist, township or urban zone, policy area or precinct, or any heritage area; and
- the battery storage facilities are integrated with and ancillary to the wind farm.

# TWIN CREEK WIND FARM

## FIGURE 4

## PLANNING OVERLAYS



**LEGEND**

- 275kV POWERLINE (ELECTRANET)
- HERITAGE AGREEMENT AREAS (DPTI)

**DEVELOPMENT ZONES (DPTI)**

- CONSERVATION (Con)
- INDUSTRY (In)
- PRIMARY PRODUCTION (PrPro)
- RURAL (Ru)
- RURAL LIVING (TRURO) (RuL(Tr))
- SETTLEMENT (DUTTON) (S(Dut))
- TOWNSHIP (DEFERRED) T(D)
- TOWNSHIP (TRURO) (T(Tr))
- LOCAL GOVERNMENT AREA BOUNDARY
- WIND FARM DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)

SITE LOCATION

Service Layer Credits: Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA,

160 KM

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 25-06-2017 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER
03498D2214-01

SCALE - 1:90,000 @ A3

COORDS
GDA 1994 MGA Zone 54

PLANNING PERMIT APPLICATION



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0 1 2 4 6 8 km

## 3.2 Nature of the Development - Question of Industrial Activity

A question has been raised on other wind farm proposals in South Australia as to whether the wind farm is an 'industry'. Industry as defined in the *Development Regulations 2008* is:

> *"industry means the carrying on, in the course of a trade or business, of any process (other than a process in the course of farming or mining) for, or incidental to:*
>
> *(a) the making of any article, ship or vessel, or of part of any article, ship or vessel; or*
>
> *(b) the altering, repairing, ornamenting, finishing, assembling, cleaning, washing, packing, bottling, canning or adapting for sale, or the breaking up or demolition, of any article, ship or vessel; or*
>
> *(c) the getting, dressing or treatment of materials (and industrial will be construed accordingly);"*

The Environment, Resources and Development (ERD) Court in its determination of an appeal against a wind farm within the District Council of Grant (ERDC Number 106 of 2010, decision dated 17 June 2011) considered whether a wind farm was an industrial activity in the form of a general industry.

In considering this matter, the ERD Court stated that:

> *"50... we would view the process of making an article in the definition of 'industry' to contemplate and be limited to the production of something physical or tangible.*
>
> *51... accordingly, we do not regard the operation of a wind farm, where the activity in question is the conversion of wind energy into electrical energy, to be 'caught' by the definition in the Regulations."*

On this basis, the development is not deemed to be an industrial activity.

## 3.3 Time to Commence and Complete Development

Due to long lead times for detailed design, tendering for turbine supply, transmission connection modelling, commercial offtake agreement negotiations, and delivery and construction, RES Australia are seeking an extension of time in which to commence and complete the development.

Pursuant to Regulation 48(1) of the *Development Regulations 2008*, any consent or approval granted under Part 4 of the Development Act, will lapse at the expiration of 12 months from the operative date of the consent or approval. If the relevant development has been lawfully commenced within 12 months from the operative date of the approval, the approval will not lapse if it is substantially or fully completed within three years from the operative date of the approval.

The period prescribed to commence or complete a development may be extended by the relevant authority either when the relevant consent or approval is given or at a later time (Regulation 48(2)).

Requests for extensions of time in which to commence and complete developments are reasonably common for large developments which have numerous and complex issues to resolve.

RES Australia are seeking a period of five years in which to substantially commence the development from the operative date and substantial completion to be extended to seven years from the operative date of the consent.

In accordance with the Development Regulations, the request for an extended period of time in which to commence and complete the development can be determined by the relevant planning authority at the time the consent is given.

## 3.4 Referrals and Additional Requirements

### 3.4.1 Environment Protection Authority

Pursuant to Schedule 8 of the *Development Regulations 2008* a "*wind farm means an undertaking where one or more wind turbine generators (whether or not located on the same site) are used to generate electricity that is then supplied to another person for use at another place*".

The proposed development is consequently a wind farm in accordance with this definition. A wind farm is a form of development listed in Schedule 8(9) of the *Development Regulations 2008* requiring referral to the EPA. The planning authority in determining the application must have regard to the response of the EPA.

A referral to the Environment Protection Authority is also required pursuant to Schedule 8 – Part 2(11) of the *Development Regulations 2008* as the proposed temporary concrete batching plant constitutes an activity of major environmental significance, should the total capacity for production exceed 0.5 cubic metres per production cycle.

### 3.4.2 State Heritage

There are no places of State Heritage significance within the site of the development. Similarly, there are no places of State Heritage significance within the proximity of the development which would materially affect the context within which the State heritage place is situated. Consequently, the application does not require referral to the Minister administering the *Heritage Places Act 1993*.

### 3.4.3 Commissioner of Highways

Portion of the development, namely the terminal substation, is adjacent and gains access from the Sturt Highway, an arterial road and therefore the application requires referral to the Commissioner of Highways.

In addition, the nature of the movement along the arterial roads, particularly during the construction of the wind farm, is of interest to the Commissioner of Highways (Department of Planning, Transport and Infrastructure (DPTI)).

RES Australia has identified the need to liaise with DPTI and discussions have informed the development application, as outlined in the Traffic Impact Assessment report within Volume 2 of the application documents.

### 3.4.4 Office of the Technical Regulator

Pursuant to Schedule 5(12) of the *Development Regulations 2008* development in accordance with Schedule 10(14) must be accompanied by a certificate from the Technical Regulator *"certifying that the proposed development complies with the requirements of the Technical Regulator in relation to the security and stability of the State's power system"*. A certificate from the Technical Regulator has been issued that certifies that the proposed development complies with the "requirements" of the Technical Regulator.

### 3.4.5 Natural Resources Management Board

The development is not located within the Mount Lofty Ranges Water Protection Area or the River Murray Water Protection Area, and does not require formal referral to the Environment Protection Authority or the relevant authority under the *Natural Resources Management Act 2004*.

The planning authority may refer the application to the South Australian Murray-Darling Basin Natural Resources Management Board, and the Adelaide and Mount Lofty Ranges Natural Resources Management Board for comment.

### 3.4.6 Country Fire Service (CFS)

Both the Light Regional Council Development Plan and the Mid Murray Council Development Plan contain Bushfire Protection Area (BPA) maps of bushfire risk. The subject land is within the General Bushfire Risk area in both Development Plans.

Referral to the CFS is required for certain forms of development, particularly dwellings, tourist accommodation and other forms of habitable buildings in a High Bushfire Risk Area of a Bushfire Protection Area. Given the wind farm proposal does not involve any of these forms of development, formal referral to the CFS is not required. However, it is at the planning authority's discretion to refer the application to the CFS for comment.

RES Australia has identified the need to liaise with the CFS regarding bushfire management of the proposed development, based on the Bushfire Management Plan which forms part of the application documents.

## 3.5 Approvals Pursuant to Other Legislation

The nature and scale of a wind farm and energy storage project requires a range of approvals, licences and permits under various State and Commonwealth legislation. It is commonplace for wind farm developments to concurrently seek approval in relation to the following three pieces of legislation during the development approval process. In addition, further approvals, licenses and/or permits may be required under other legislation post approval and prior to construction.

### 3.5.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act is Commonwealth legislation that focuses on the protection of the environment, especially matters of national environmental significance. The submission and/or determination of an EPBC referral is independent of the development approval process.

RES Australia have identified the need to submit a referral to the Commonwealth department of the Environment, Water, Heritage and the Arts for consideration under the EPBC Act. This referral is to occur concurrently with the processing of the development application.

### 3.5.2 Aboriginal Heritage Act 1998

The *Aboriginal Heritage Act 1998* places a duty of care on RES Australia as proponents of the development to address the likelihood of any impact on heritage. It is understood that RES Australia have already undertaken extensive survey work of the site of the development in association with the local aboriginal community. This process is ongoing and RES Australia are aware of their responsibility pursuant to the *Aboriginal Heritage Act 1998*.

Approvals required pursuant to the *Aboriginal Heritage Act 1998* are independent of the development approval process.

### 3.5.3 Native Vegetation Act 1991

Any clearance of native vegetation will require approval under the *Native Vegetation Act 1991*. Approval for clearance of native vegetation is independent of the development approval process.

# 4.0 SITE OF THE DEVELOPMENT

Details of the site of the development, often referred to in specialist reports forming part of the development application, as 'the project boundary' or 'project area' or 'site boundary'. The site of the development with cadastre data is shown on Figure 5 of the application documents (Volume 3).

The site of the development takes the meaning of 'site' as defined in Schedule 1 of the *Development Regulations 2008*[1]. That is, the site means the area of land incorporated in the development, but is not necessarily the entire allotment. In this application, the 'site' of the development does comprise entire allotments and the area of the wind turbine generators and ancillary infrastructure, whilst the transmission line incorporates only a portion of some allotments, but still forms part of the site of the development.

The subject land and locality of the proposed wind farm is outlined below.

### 4.1 Description of the Site of the Development

Principally two families (with various ownership entities) are proposed to host the majority of the wind farm infrastructure, including wind turbine generators, battery energy storage, access roads, operation and maintenance buildings, on-site substation and temporary construction facilities (including temporary concrete batching plant). An additional 12 families (with various ownership entities) are proposed to host the transmission line and terminal substation.

**Attachment 2** tabulates the involved properties. The locations of the proposed wind turbine generators and other infrastructure is identified in a table in **Attachment 3**. These locations are also reflected on the mapping throughout the application documents.

The project boundary of the wind farm is estimated to be across approximately 5,600 hectares of the land. Of the total site area, approximately 2.0 percent of the land will be utilised for the wind farm development.

The on-site substation, energy storage, and operations and maintenance compound is approximately 6.0 hectares in area, and is located within Section 278 in Certificate of Title Volume 5618, Folio 693 adjacent Mosey Road.

The terminal substation is approximately 2.0 hectares in area and is located adjacent the Sturt Highway, within Allotment 91 in Certificate of Title Volume 5506, Folio 92.

Several of the properties listed in the table in Attachment 2 may not be proposed to contain specific wind farm or energy storage infrastructure at this time. These properties form part of the development site to provide the applicant with sufficient flexibility for future micro-siting of the wind turbine generators and transmission lines, as well as minor deviations of the access tracks, internal reticulation and services.

All dwellings within the site of the development are owned by involved landowners and noted as stakeholder dwellings on the plans accompanying the application.

---

[1] *Schedule 1, Development Regulations 2008 "site means the area of land (whether or not comprising a separate or entire allotment) on which a building is built, or proposed to be built, including the curtilage of the building, or in the case of a building comprising more than one separate occupancy, the area of land (whether or not comprising a separate or entire allotment) on which each occupancy is built, or proposed to be built, together with its curtilage:"*

The wind farm is located on the tablelands that form the wide ridgeline associated with Bald Hill and Long Hill situated within the Northern Mount Lofty Ranges. Detailed landscape and environmental assessments of the wind farm site have been undertaken by WAX Design and EBS Ecology, and these reports form part of Volume 2 of the application documents. The landform of the area is defined by numerous ridgelines that run north-south through the site creating a series of parallel ridges, wide open valleys, tablelands and isolated topographic features. It is noted however, that the development site is located within a modified landscape which contains the following elements:

- open agricultural landscape dominated by grazing and open paddocks;
- scattered areas of native vegetation, generally along road verges and creek lines;
- farm buildings including dwellings and other structures;
- a range of arterial, major local roads and minor local roads;
- former mines including Benita Copper and Newlands Barite mines;
- infrastructure electricity distribution/transmission lines; and
- a range of major regional and collector and local roads.

The environmental qualities of the development site are further described in detail in the Flora and Fauna Assessment Report (by EBS Ecology) which forms part of the application documents. The EBS Ecology report notes that during the 2015 field survey 59 native fauna species were recorded, including 2 amphibians, 5 reptile species, 3 mammals, 42 birds (6 exotic) and 7 bats (all native). One amphibian and two bird species of national or State conservation significance were identified:

- Pygmy Blue-Tongue Lizard (*Tiliqua adelaidensis*) nationally endangered;
- Rainbow Bee-Eater (*Merops ornatus*) nationally migratory; and
- Blue-Winged Parrot (*Neophema chrysostoma*) State vulnerable.

A sizeable proportion of the development site is considered a possible or likely habitat for the Pygmy Blue-Tongue Lizard (PBTL) due to the open grasslands, slopes and spider holes observed across the site. Areas considered unlikely to contain PBTLs are cropping, very steep, very rocky or areas with no evidence of spider holes. EBS Ecology have identified potential impacts on the PBTL from the development and have recommended a range of mitigation methods, including:

- utilising cropping areas as much as possible for wind turbine generators, infrastructure areas and access tracks;
- micro-siting of infrastructure including the transmission line, where possible, around possible PBTL;

- translocation of PBTL is being recommended to reduce potential impacts; and
- an EPBC referral will be submitted as part of this proposed development.

Two nationally threatened ecological communities, listed under the Environment Protection and Biodiversity Conservation (EPBC Act) 1999, were investigated and assessed for qualification within the project boundary. The listed ecological communities being:

- Iron-Grass (*Lomandra spp*) Natural Temperate Grassland of South Australia; and
- Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia.

21 sites were assessed within the *Lomandra* Grasslands across the development site, to confirm whether they qualified as the nationally listed threatened ecological community. One of the 21 sites assessed for the terminal substation qualified as a EPBC threatened ecological community. None of the other sites qualified as a threatened ecological community. 13 of the Iron-Grass sites and some of the Peppermint Box sites come under Condition Class C, which are considered degraded patches amenable to rehabilitation.

In general terms, the area in which the development is proposed is one of a pleasant open rural character, comprising a variety of natural and man-made features, although highly modified by agricultural activities which has over time resulted in clearance of native vegetation.

## 5.0 DESCRIPTION OF LOCALITY

The Wax Design Landscape and Visual Assessment report (contained in Volume 2 of the application documents) describes the locality as having four distinct landscape character areas which largely follow the four cardinal directions (north, east, south and west):

> *To the south of the subject land is the Northern Barossa Valley, which has a denser level of development and high quality agricultural landscape with a variety of visual interest created by the smaller lot sizes and variety of land uses (grazing, vineyards, animal husbandry). The Western Pastoral Lands and Ridgelines stretch along the western edge of the subject land and is defined by a more open agricultural landscape with rolling ridgelines. The site of the proposed wind turbine generators and to the north are the Central Tablelands, these are characterised by rolling land forms and valleys associated with the Northern Mount Lofty Ranges and have a typically open grass grazing land use with minimal vegetation. To the east of the subject land is Mount Rufus and associated north/south ridgelines which transition further west into the Western Murray River Plains, the ridgeline associated with Mount Rufus forms a distinct division between the subject land and the Murray River Plains.*

Wax notes that "*within this visually contained existing landscape character, the layout of the Twin Creek Wind Farm forms a single compact group of 51 wind turbines*" (Page 53).

A locality for the proposed development is difficult to accurately define, not only because of the combined height of the turbine and blades (up to 180 metres), but also because of the topography and the overall area covered by the proposal. Between the northernmost and southernmost turbines, there is approximately 7.0 kilometres (including spacing between turbines). There is approximately 5.0 kilometres between the most eastern and western turbine. The transmission line extends approximately 15 kilometres from the on-site substation to the Robertstown-Tungkillo transmission line and associated terminal substation adjacent the Sturt Highway east of Truro.

Within this locality, the prominent features/elements include:

- the townships of Kapunda, Truro, Eudunda and the areas of Koonunga, St Kitts and Dutton;
- open agricultural landscape dominated by grazing and open paddocks;
- areas of native vegetation, generally along ridgelines, road verges and creek lines;
- farm buildings including dwellings and other structures;
- the former Julia Creek Barite mine located close to the eastern boundary of the site;
- infrastructure including 275kV and 11kV electricity transmission lines; and
- a range of major regional and collector roads;
    - Thiele Highway;
    - Sturt Highway;
    - Truro Road;
    - Belvidere Road;
    - Eudunda Road;
- a range of minor roads, including:
    - Mosey Road;
    - Bagot Well Road;
    - Camel Farm Road;
    - Flagstaff Hill Road;
    - Teagle Road;
    - Weaver Road;
    - Noack Road;
    - Leakes Pass;
    - Holding Road;

- Travers Road;
- Ben Lomond Road.

The closest Department of Environment, Water and Natural Resources reserves to the proposed Twin Creek Wind Farm site are Kaiserstuhl Conservation Park (approximately 25 kilometres south) and Brookfield Conservation Park (approximately 32 kilometres east). Three existing Heritage Agreements under the *Native Vegetation Act 1991* are situated 4.0 kilometres south (Heritage Agreement No.287) and 6.0 kilometres east of the project area (Heritage Agreement 677 and 1314). These areas are outside of the site of the development.

The locality can broadly be defined around the extent to which the turbines may be visible, however this will vary from different positions and with varying degrees of clarity. The Zone of Theoretical Visual Influence (ZTVI) prepared by WAX Design, which is part of the application documents, illustrates the visibility of the wind turbine generators.

Landscape character varies throughout the locality, as is described by WAX Design (Section 5.9) in relation to the visual impact of the proposed development:

> *The layout of the proposed wind turbines will result in a single cluster of large infrastructure elements that form a concentrated visual effect in the rural landscape. Travelling through the landscape, the underlying topography of the surrounding ranges modifies views towards the proposed wind farm. The visibility of the proposed development changes due to the screening effects provided by the adjacent hills and ridgelines or areas of existing vegetation.*
>
> *The visual assessment undertaken from the seven selected viewpoints demonstrates that a variety of visual impacts will be experienced within the local (0-3km), sub-regional (3-10km) and regional (>10km) landscapes that surround the proposed wind farm site. To the north and south and from distance of greater than five kilometres the visual effect associated with the proposed development will result in wind turbines being seen behind local ridgelines and landforms. In these locations, the potential visual effect will result from visible sections of the hub and blades above the local topography and vegetation.*
>
> *The potential visual effect reduces over distance with the visual assessment recording the visual effect as slight at a distance more than ten kilometres, particularly to the northeast. This reflects the different landscape characters around the proposed development site and the significant landscape absorption and screening of the ridgelines and vegetation created by the local topography of the areas.*

*To the south, the distance between the proposed wind farm and the Barossa Valley provides significant management of the visual effect limiting the potential impact that the proposed wind farm may have on the Barossa Valley Character Preservation Zone and the associated areas of higher landscape amenity and cultural value.*

*Viewed from the east and west the proposed wind turbines will be seen situated on the elevated topography of the Central Tablelands. The scale of the proposed development in relation to the vertical scale of the underlined landscape is prominent due to number of visible wind turbines and the prominence of the tower, nacelle and blades in the landscape. Within five kilometres of the proposed wind farm, the screening provided by local ridgelines and vegetation belts is limited, and the majority of the wind farm is experienced as a visually prominent element in the rural landscape producing a degree of visual change in the order of 43% to 48% which is described as substantial. This substantial visual effect alters the underlying visual character and composition of the landscape through the introduction of new elements. Views will be altered but the sensitivity of the underlying landscape character to change is considered low.*

The extract from the WAX Design report quoted above is considered important in understanding the locality, and in the discussion of the impact of the proposed wind farm on the character and amenity of the locality. The assessment utilises the GrimKe matrix (refer Section 5.9) of the WAX Design report and extract below. This index provides a range of visual change from 'slight' through to 'extreme'. It is noted that the 'substantial visual effect' of the proposed development when viewed from the east and west is described in the GrimKe matrix as noticeable or clearly visible in the field of vision.

The following Table 3 is a summary of the classifications described in the GrimKe matrix which provides additional information on the potential visual impact used to describe each viewpoint.

| Percentage of Visual Change | Descriptive of Visual Impact | Descriptors – appearance in central vision field | Comments |
|---|---|---|---|
| 80-100% | **Extreme** | *Commanding, controlling the view* | *Extreme change in view: change very prominent involving total obstruction of existing view or change in character and composition of the landscape and view through loss of key elements or addition of new or uncharacteristic elements which significantly alter underlying landscape visual character and amenity. The sensitivity of the underlying landscape character to change is unable to accommodate or mitigate the introduction of development, and the visual effect is highly adverse.* |
| 60-80% | **Severe** | *Standing out, striking, sharp, unmistakable, easily seen* | *Severe change in view involving the obstruction of existing views or alteration to underlying landscape visual character through the introduction of new elements. Change may be different in scale and character from the surroundings and the wider setting or a severe change in the context of the existing landscape character. Resulting in a perceived adverse visual effect and an increase in proportional change to the underlying landscape visual character.* |
| 40-60% | **Substantial** | *Noticeable, distinct, catching the eye or attention, clearly visible, well defined* | *Substantial change in view: which may involve partial obstruction of existing view or alteration of underlying landscape visual character and composition through the introduction of new elements. Composition of the view will alter however the sensitivity of the underlying landscape character to change low, and it provides opportunities for mitigation, management and absorptions of the visual effect. View character may be partially changed through the introduction of features.* |
| 20-40% | **Moderate** | *Visible, evident, obvious* | *Moderate change in view: change will be distinguishable from the surroundings while composition, and underlying landscape visual character will be retained. The sensitivity of the existing landscape to change is low.* |
| 0-20% | **Slight** | *Lacking sharpness of definition, not obvious, indistinct, not clear, obscure, blurred, indefinite* | *Very slight change in view: change barely distinguishable from the surroundings. Composition and character of view substantially unaltered.* |

*Table 3: Classification of Visual Impacts*

In determining the character and amenity of the locality, the following extracts from *Taralga Landscape Guardians Inc v Minister for Planning and Anor ((2007) 161 LGERA 1, at para 1)* cited in the *ERDC No 106 of 2010 R Paltridge and Anor v District Council of Grant (June 2011 at para 25),* illustrates how a wind farm development can create disparate views that impact on the rural character:

> *"The insertion of wind turbines into a non-industrial landscape is perceived by many as a radical change which confronts their present reality. However those perceptions come in differing hues. To residents, such as members of Taralga Landscape Guardians Inc (the Guardians), the change is stark and negative. It would represent a blight and the confrontation is with their enjoyment of their rural setting.*
>
> *To others, however, the change is positive. It would represent an opportunity to shift from the societal dependence on high emission fuels to renewable energy sources. For them, the confrontation is beneficial - being one much needed step in policy settings confronting carbon emissions and global warming."*

## 6.0 DEVELOPMENT PLAN ASSESSMENT

The site of the proposed Twin Creek Wind Farm and Energy Storage project, including wind turbine generators, transmission lines, battery storage and other ancillary components, is located within the following zones:

- Primary Production Zone, General Farming Policy Area 3 and Light Regional Council Development Plan (consolidated 8 December 2016);
- Primary Production Zone and Goyder Council Development Plan (consolidated 24 November 2016); and
- Rural Zone, Hills Policy Area 14 and Mid Murray Council Development Plan (consolidated 14 June 2017).

The proposed development is assessed against the relevant provisions of each of the three Development Plans. Due to the extensive nature of the provisions of the three Development Plans relevant to the assessment of the proposed development, not all of them are quoted in this report. **Attachment 4** contains extracts of each of the Development Plans, which have been considered in the preparation of this assessment. Those provisions of the Development Plan quoted below are identified by the following abbreviations:

- Mid Murray Council Development Plan – MMDP;
- Goyder Council Development Plan – GDP; and
- Light Regional Council Development Plan – LDP.

An assessment of this application against the Development Plan requires the consideration of the following issues:

- land use;
- efficient energy generation;
- visual amenity;
- noise and infrasound;
- health and the precautionary principle;
- shadow flicker, reflection and blade glint;
- electromagnetic interference with telecommunications;
- impact on flora and fauna;
- soil erosion, water supply and stormwater management;
- traffic and access;
- aviation;
- indigenous and European heritage; and
- bushfire.

These matters are discussed and assessed below.

## 6.1 Land Use

The subject land is located entirely within the Primary Production Zone (GDP and LDP) and Rural Zone (MMDP). The objectives and the Desired Character Statement for each of the Primary Production and Rural Zones anticipate wind farm development:

| | |
|---|---|
| **LRC Objective 5:** | **Accommodation of wind farms and ancillary development.** |
| **GDP Objective 4:** | **Accommodation of wind farms and ancillary development.** |
| **MMDP Objective 2:** | **Accommodation of wind farms and ancillary development outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation.** |

No elements of the Twin Creek Wind Farm and Energy Storage project are located within the Barossa Valley Character Preservation District. Given the development is outside of the Preservation District, a wind farm is an expressly envisaged land use with the Primary Production and Rural Zones of the three Development Plans, as quoted by the above stated objectives.

Sustainable rural production predominantly in the form of grazing activities can continue within the site of the development, largely unaffected by the wind farm development. Although the wind farm transverses a large area, its footprint is relatively small. The wind turbine generators comprise a small footprint and in combination with the substations, access tracks, operational and maintenance compounds, and temporary compounds, will comprise approximately 2 percent of the total site area.

Following construction, it is common for the area surrounding the wind turbine generators to be reseeded with pasture that is then available for grazing or cropping (in suitable and accessible locations). The same is true for the temporary construction compounds, which are also removed post construction and rehabilitated to predevelopment agricultural use. This further reduces the already minimal area removed from productive capacity.

Each turbine is linked by an access track, which during construction is approximately 9.0 metres to 10 metres wide to accommodate the large and heavy vehicles required for construction. Wherever possible, the tracks follow existing farm access tracks to minimise intrusion into existing paddocks. Following the construction phase these access tracks are maintained, but at a reduced width of 5.5 metres to 7.0 metres.

Given many of the access tracks are located on elevated areas of poor pasture, the loss of land to primary production is considered minimal. Furthermore, the tracks and turbines are not fenced and therefore stock grazing within paddocks that accommodate wind turbine generators are not restricted in their movement.

Electricity generated by each of the wind turbine generators is collected via a series of underground 33kV cables, which then link to the on-site substation. The underground cabling is constructed within or adjacent the internal access tracks wherever possible. An overhead 275kV transmission line of approximately 15 kilometres extends in a south-east direction from the wind farm substation to the terminal substation, and tee in to the Robertstown to Tungkillo 275kV transmission line.

The combination of internal undergrounding of electricity infrastructure and designated corridors for overhead transmission lines does not significantly impact on the land available for primary production, particularly given the predominant land use within the area is grazing and animals continue to graze under electricity transmission lines.

The small site required for the on-site substation and operations and maintenance facilities, including the battery storage facility, is estimated to be 6.0 hectares, and is a minimal intrusion in the context of the overall land area. Similarly, the terminal substation is relatively small, being 2.0 hectares.

Temporary laydown and construction facilities will be rehabilitated and therefore be available for primary production purposes following construction. Wind turbine generators and ancillary infrastructure co-exist with primary production activities with other wind farms in South Australia, Australia and internationally. Given the principal land use within the site and the locality is dryland grazing and cropping, the minimal reduction in productive land is not a significant impediment to the continued achievement of sustainable primary production activities. Wind farms (and associated infrastructure) and dryland primary production activities can co-exist, and to this end the objectives of the Primary Production and Rural Zones for each of the three Development Plans are satisfied:

| | |
|---|---|
| **LRC Objective 1:** | **The long term continuation of primary production.** |
| **LRC Objective 2:** | **Economically productive, efficient and environmentally sustainable primary production.** |
| **LRC Objective 4:** | **Protection of primary production from encroachment by incompatible land uses and protection of scenic qualities of rural landscapes.** |
| **GDP Objective 1:** | **Economically productive, efficient and environmentally sustainable primary production.** |
| **GDP Objective 3:** | **Protection of primary production from encroachment by incompatible land uses and protection of scenic qualities of rural landscapes.** |
| **MMDP Objective 1:** | **Long-term operation and sustainability of rural production and primary industries.** |

In addition to the objectives, the Desired Character Statement in the Primary Production and Rural Zones of each of the three Development Plans contains the following statement (with minor variations) supporting wind farm and ancillary development:

> **Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) are envisaged within that part of the zone outside of the Barossa Valley Character Preservation district (as defined by Character Preservation legislation) and constitute a component of the desired character of this part of the zone.**
>
> **These facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence, components (particularly turbines) may need to be:**
>
> - **located in visually prominent locations such as ridgelines;**
> - **visible from scenic routes and valuable scenic and environmental areas; and**
> - **located closer to roads than envisaged by generic setback policy.**
>
> **This, coupled with the large scale of these facilities (in terms of both height and spread of components), renders it difficult to mitigate the visual impacts of wind farms to the degree expected of other types of development. Subject to implementation of management techniques set out by general/council wide policy regarding renewable energy facilities, these visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy.**

Within the Light Regional Council Development Plan, Primary Production Zone Desired Character Statement "*wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) are envisaged within the zone, excluding the area within the Barossa Valley Region Policy Area 2 and Precinct 19 Marananga Seppeltsfield Fringe …".* The proposed development is not sited within the Barossa Valley Region Policy Area 2 – Precinct 19 Marananga Seppeltsfield Fringe.

The development is located within the General Farming Policy Area 3 within the Light Regional Council Development Plan. No specific reference to wind farm development is contained in the objectives, desired character statement or principles of development control of the General Farming Policy Area.

Reference is contained within the Mid Murray Development Plan desired character statement to acceptable forms of development in the Rural Zone, other than where qualified by the provisions for the policy area. The transmission line and terminal substation elements of the proposed development are located within the Hills Policy Area 14 of the Mid Murray Council Development Plan.

It is noted that the Desired Character Statement for the Rural Zone specifically states that *"other than where qualified by the provisions for the policy areas, the following forms of development are acceptable in the Rural Zone"*. Since the acceptable land uses within the Rural Zone include wind farms and ancillary development and infrastructure to support acceptable uses, and neither policy area lists wind farms and infrastructure as unacceptable, the establishment of a wind farm is consistent with the intent of the zone and not in conflict with the provisions of the policy areas.

**MMDP – Rural Zone**

**<u>Other than where qualified by the provisions for the Policy Areas</u>, the following forms of development are acceptable in the Rural Zone:**

- **infrastructure to support acceptable uses …**
- **wind farm and ancillary development outside of the Barossa Valley Character Preservation District; and**
- **wind monitoring mast and ancillary development outside of the Barossa Valley Character Preservation District. …**

**MMDP - Hills Policy Area 14 - Desired Character Statement**

**Open grazing of the eastern hills face see Figures HF(HPA)/1 to 5 and very limited or no built form to preserve the eastern backdrop of the Murray Plains. The hills face is unsuitable to intensive agricultural uses which would change the existing open and exposed character of the land form. Low intensity uses like grazing of sheep should continue. These plantations on the hills face should be confined to gullies and water courses and building development should, in addition to meeting design criteria, be limited to very large holdings.**

**Behind the eastern face of the range a wider range of agricultural and horticultural uses are appropriate where built form, providing it relates to primary production, will be evident, but at low densities. These uses include grazing and animal keeping, cropping, viticultural and dairying.**

**MMDP Hills Policy Area**

**Objective 1:** **Retention of the open rural character as derived from large land holdings used for primary production and dispersed isolated built form.**

**MMDP Hills Policy Area**

**Objective 2:** **No building development on the eastern face of the Mount Lofty Ranges.**

The Hills Policy Area of the Mid Murray Council Development Plan seeks to protect the land from inappropriate intensive agriculture, horticulture and forestry, which may have adverse environmental impacts on the watercourse/gorge and hills within the area. The policy area lists land uses which are unacceptable and the proposed development does not involve any of these forms of development. It is further noted that the Desired Character Statement for the Rural Zone specifically states that *"other than where qualified by the provisions for the policy areas, the following forms of development are acceptable in the Rural Zone"*.

Since the acceptable land uses within the Rural Zone include wind farms and ancillary development and infrastructure to support acceptable uses, and neither policy area lists wind farms and infrastructure as unacceptable, the wind farm is consistent with the intent of the zone and not in conflict with the provisions of the policy areas.

Objective 2 of the Hills Policy Area seeks to ensure that no building development occurs on the eastern face of the Mount Lofty Ranges. The 'hills face' is further defined in the Mid Murray Development Plan. The proposed development is outside of the 'hills face'.

Within the Hills Policy Area there is inconsistency in the policies, as some provisions seek to limit buildings to allotments in excess of 200 hectares, whilst others seek to restrict buildings altogether on the eastern face of the ranges. This is further inconsistent with the Rural Zone provisions which acknowledge that wind turbine generators may be sited in visually prominent locations.

The development site is not within a policy area or precinct of the Primary Production Zone of the Goyder Development Plan. It is noted however, that the Desired Character Statement of the Primary Production Zone provides further guidance regarding design elements in determining whether or not a development proposal is in accord with the statement.

**GDP – Primary Production Zone – Desired Character Statement**

**When determining whether or not a development proposal is in accordance with the Desired Character, greater weight should be given to the following design elements:**

- **impact on the sustainability and viability of primary production uses;**
- **visual impact on the landscape character;**
- **impact on the freight network.**

As previously stated, the substantive land use of grazing and cropping can continue in conjunction with the wind farm project. Impacts on landscape character and the freight network are discussed further in the following sections of this assessment report. It is however noted, that the Desired Character Statement relating specifically to wind farms recognises that wind turbines may be visually prominent in the landscape. The visual prominence of wind farms and ancillary development is further recognised in Light Regional Council PDC 3 of the Primary Production Zone, PDC 4 of the Goyder Primary Production Zone and PDC 22 of the Mid Murray Council Development Plan.

**LDP Primary Production Zone**

**PDC 3 Wind farms and ancillary development should be located in areas which provide opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited:**

**(a) in visually prominent locations; and**
**(b) closer to roads than envisaged by generic setback policy.**

**GDP Primary Production Zone**

**PDC 4 Wind farms and ancillary development should be located in areas which provide opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited:**

**(a) in visually prominent locations; and**
**(b) closer to roads than envisaged by generic setback policy.**

**MMDP – Rural Zone - Building Development**

**PDC 22 Wind farms and ancillary development should be located in areas outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation which provide opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited:**

**(a) in visually prominent locations; and**
**(b) closer to roads than envisaged by generic setback policy.**

Effects of the proposed wind farm on flora and fauna, and landscape character have been extensively examined by specialist consultants, and their methodologies and findings are discussed in the following sections of this report.

In summary, wind farms are envisaged land uses within the Primary Production and Rural Zones. Given the minimal reduction in productive farming area, the proposal will not adversely effect the ongoing sustainability of primary production within the locality, and is unlikely to have an adverse impact on the principal function of the zone.

The visible nature of the wind farm and its associated infrastructure is expressly anticipated within the zone, and therefore the proposal does not offend the objectives and desired character statement relating to this aspect. Furthermore, the site of the wind farm is outside of the 'hills face' and the Barossa Valley Character Preservation District.

The development satisfies the Primary Production and Rural Zone provisions as it is an anticipated land use.

## 6.2 Efficient Energy Generation

Within the General section of all three Development Plans, there are provisions under the heading of 'Renewable Energy' (stated below and as MMDP Objective 99 and 100) that support renewable energy projects including wind farms and battery storage facilities, to harness natural resources and generate electricity that will benefit the community and the State.

**LDP and GDP - Renewable Energy**

**Objective 1:** **Development of renewable energy facilities that benefit the environment, the community and the state.**

**Objective 2:** **The development of renewable energy facilities, such as wind farms and ancillary development, in areas that provide opportunity to harvest natural resources for the efficient generation of electricity.**

RES Australia have determined through feasibility analysis that the Twin Creek Wind Farm and Energy Storage project provides an opportunity to harvest the natural wind resources of the region for efficient generation of electricity, and its subsequent storage and supply to the national grid. RES Australia has determined the subject land as an appropriate location for a wind farm, based on a variety of factors (wind speed, cut-in wind speed and capacity factor) along with the location and capacity to connect to the electricity grid.

The wind farm has a potential total generation capacity of 613 gigawatt hours (Gwh) of electricity per annum. This equates to 1.5 percent of the 2020 national Large-Scale Renewable Energy Target (LRET) of 41,000GWh expanded RET established by the Federal Government. An economic analysis undertaken by Hudson Howell, that at a "*conservative carbon price of $20 per tonne (historically conservative relative to international trading schemes and much lower than what is expected in the longer term – but matching current prices), the value of carbon emission savings associated with the Twin Creek Wind Farm is estimated to be $9.8 million per annum or a net present value of $104 million over a 20 year period (discount rate of 7% real)*".

Furthermore, the Hudson Howells Economic Impact Assessment Report, which forms part of the application documents, provides an estimate that the Twin Creek Wind Farm will generate $209 million of value to the State, as quoted below:

> *From a State perspective, economic modelling indicates that the project will generate $209 million of value added (which is a net contribution to Gross State Product 1) in the State of South Australia over the period of construction and that this would happen over three years (allowing for lagged flow through effects).*

*1,447 person years of employment in South Australia would be supported – or an average of over 4,803 jobs sustained per year over three years. Once operational the project is estimated to support annually $15.5 million of value added in South Australia, and support directly and indirectly in the order of 105 jobs per year. The impact at the national level would be similar to the state level, unless there are constraints in national labour and capital markets with such constraints likely to be limited in the current macroeconomic environment (Executive Summary).*

It is evident that the Twin Creek Wind Farm and Energy Storage project will have economic benefits to the local community and the State in general, in accordance with the Renewable Energy objectives of the Development Plans.

## 6.3 Visual Amenity

The three Development Plans recognise that due to the large scale of wind farms (in terms of both height and spread of components) that mitigating visual impacts are difficult. As stated in the Desired Character Statement of the Primary Production and Rural Zones, *"these visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy"*.

The Renewable Energy provisions of the Development Plans contain specific provisions relating to managing visual effects of wind farms, particularly LDP and GDP PDC 2 (General Section - Renewable Energy Facilities) and Mid Murray PDC 396.

**Wind Farms and Ancillary Developments**

**PDC 396 The visual impacts of wind farms and ancillary development (such as substations, maintenance sheds, access roads and wind monitoring masts) should be managed through:**

**(a) wind turbine generators being:**

**(i) setback at least 1,000 metres from non-associated (non-stakeholder) dwellings and tourist accommodation;**
**(ii) setback at least 2,000 metres from defined and zoned township, settlement or urban areas (including deferred urban areas);**
**(iii) regularly spaced;**
**(iv) uniform in colour, size and shape and blade rotation direction;**
**(v) mounted on tubular towers (as opposed to lattice towers);**

**(b) provision of vegetated buffers around substations, maintenance sheds and other ancillary structures.**

With reference to the principle of development control quoted above, the Twin Creek Wind Farm and Energy Storage project proposes to manage the visual impacts in the following manner:

- satisfy the minimum setback of 1,000 metres from all non-stakeholder dwellings. All of the non-stakeholder dwellings have a separation of in excess of 2.0 kilometres from the nearest wind turbine generator. It is noted that the nearest non-stakeholder dwelling (number 122) is approximately 2,052 metres from the nearest turbine in the proposed layout;
- no identified tourist accommodation facilities are within the locality of the wind farm. The nearest tourist accommodation occurs within the surrounding townships of Kapunda, Truro and Eudunda;
- all wind turbine generators are setback greater than 2,000 metres from the defined settlements;
- the wind turbine generators are to be constructed of tubular towers, all of which are proposed to be a uniform colour, size and shape. Design of the wind farm ensures that the blade rotation is also uniform;
- the operations and maintenance compound, incorporating the battery storage facility and on-site substation, is located approximately 1.8 kilometres from Mosey Road and further from the nearest non-stakeholder dwelling. The scale of the substation will be obvious in the predominantly rural landscape and will be mitigated by landscaping treatments;
- the temporary mobile concrete batching plant is proposed to be located adjacent the operations and maintenance compound, and will have similar setbacks to non-stakeholder dwellings and mitigated by landscaping treatments associated with the operations and maintenance compound;
- three other temporary construction compounds are located throughout the site (wind farm development area). These sites are generally centrally located in excess of 2.0 kilometres of any non-stakeholder dwelling. Views of these compounds during construction is considered to be minimal given the relatively low scale of the temporary buildings and the topography of the site; and
- the terminal substation and temporary construction compound is located adjacent the Sturt Highway. As sought by the principle of development control, the terminal substation is proposed to contain screen landscaping.

The three Development Plans place a high value upon the scenic qualities of rural landscapes, as stated in various elements of the desired character statements, objectives and principles of development control of the Primary Production and Rural Zones, along with the general provisions under the heading of Siting and Visibility.

**LDP – Primary Production Zone - Desired Character**

**Preservation of rural and landscape character with farming on large properties, designated areas for horticulture, limited additional dwellings, minimal non-agricultural development and retention of natural vegetation.**

**LDP - General Farming Policy Area 3 - Desired Character**

**… Development within the policy area that will retain the rural character comprising individual farm buildings in a landscape of undulating to rugged hills.**

**GDP – Primary Production Zone – Desired Character**

**New buildings will generally be associated with existing clusters of buildings and will be of complementary scale and massing to those buildings, while also being of appropriate dimensions to serve their intended function. New dwellings will generally be single storey and will include pitched roofs, verandas and porches to address climatic issues. Isolated new buildings, including large sheds, will be located and designed to blend with the existing landscape, with appropriate earthworks and building design to suit the natural landform. Other structures will be of a form that blends with, and does not detract from, the scenic qualities and function of the primary production area.**

**The open rural landscape is the dominant character element and new development will maintain that character, with new buildings appropriately sited, designed and screened by vegetation. New buildings will be constructed using materials and colours that blend with the rural landscape and are traditionally used within the rural environment including corrugated steel, stone and timber.**

**LDP PDC 12 and GDP PDC 8**

**Buildings should primarily be limited to farm buildings, a detached dwelling associated with primary production on the allotment and residential outbuildings that are:**

**(a) grouped together on the allotment and set back from allotment boundaries to minimise the visual impact of buildings on the landscape as viewed from public roads; and**
**(b) screened from public roads and adjacent land by existing vegetation or landscaped buffers.**

**MMDP Rural Zone - Vegetation and Landscape Character**

**Objective 5: Retention and maintenance of wetlands and existing native vegetation for its conservation, biodiversity, and habitat value and environmental management function.**

**Objective 6: Maintenance and enhancement of the landscape character.**

**MMDP Rural Zone - Landscape**

**PDC 4 Development should be designed and sited to respect and maintain the landscape character of an area which is of:**

- **(a) historical (including archaeological) significance;**
- **(b) scientific interest;**
- **(c) scenic value or natural beauty;**
- **(d) other heritage significance; or**
- **(e) conservation significance.**

**MMDP Rural Zone - Built Form and Design**

**Objective 21:** **Buildings and structures compatible with the environmental qualities, built form and character of the surrounding area and landscape.**

**MMDP Rural Zone - Policy Area Number 14 – Hills Policy Area**

**Objective 1:** **Retention of the open rural character as derived from large land holdings used for primary production and dispersed isolated built form.**

**Objective 2:** **No building development on the eastern face of the Mount Lofty Ranges.**

**PDC 3** **Dwellings and non-rural buildings shall not be located where they are prominently visible from a public road without extensive screening first established.**

**Siting and Visibility**

**LDP and GDP Objective 1 and MMDP Objective 54**

**LDP Objective:** **Protection of scenically attractive areas, particularly natural, rural and riverine landscapes.**

**GDP & MMDP:** **Protection of scenically attractive areas, particularly natural, rural and coastal landscapes.**

**Principles of Development Control**

**LDP and GDP PDC 1**

**Development should be sited and designed to minimise its visual impact on:**

**(a)** **the natural, rural or heritage character of the area;**
**(b)** **areas of high visual or scenic value, particularly rural and riverine areas; and**
**(c)** **views from public reserves, tourist routes and walking trails.**

**MMDP PDC 164**

**Development should be sited and designed to minimise its visual impact on:**

**(a)** **the natural, rural or heritage character of the area;**
**(b)** **areas of high visual or scenic value, particularly rural and riverine areas; and**
**(c)** **views from the River Murray, public reserves, tourist routes, walking trails and scenic routes that are identified in Map MiMu/1 (Overlay 2).**

**LDP PDC 3 and GDP PDC 3**

**Buildings outside of urban areas and in undulating landscapes should be sited in unobtrusive locations and in particular should be:**

**(a)** **sited below the ridgeline;**
**(b)** **sited within valleys or behind spurs;**
**(c)** **sited in such a way as to not be visible against the skyline when viewed from public roads; and**
**(d)** **set well back from public roads, particularly when the allotment is on the high side of the road.**

**MMDP PDC 166**

**Buildings outside of urban areas and in undulating landscapes should be sited in unobtrusive locations and in particular should be:**

**(a) sited below the ridgeline;**
**(b) sited within valleys or behind spurs;**
**(c) sited in such a way as to not be visible against the skyline when viewed from public roads, and the River Murray; and**
**(d) set well back from public roads, particularly when the allotment is on the high side of the road.**

**LDP PDC 5 and GDP PDC 4 and MMDP PDC 167**

**Buildings and structures should be designed to minimise their visual impact in the landscape, in particular:**

**(a) the profile of buildings should be low and the rooflines should complement the natural form of the land;**
**(b) the mass of buildings should be minimised by variations in wall and roof lines and by floor plans which complement the contours of the land; and**
**(c) large eaves, verandas and pergolas should be incorporated into designs so as to create shadowed areas that reduce the bulky appearance of buildings.**

The preservation of the rural landscape must be balanced against the recognition within the Primary Production and Rural Zones, that wind farm infrastructure by their nature will be visible, and that this visibility is acceptable in the pursuit of renewable energy facilities, as underlined below in the Desired Character Statement of the Primary Production and Rural Zones, and PDC in each of the Development Plans.

**MMDP Rural Zone – Desired Character Statement**

**Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) are envisaged within that part of the zone outside of the Barossa Valley Character Preservation district (as defined by Character Preservation legislation) and constitute a component of the desired character of this part of the zone.**

**These facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence, components (particularly turbines) may need to be:**

- **located in visually prominent locations such as ridgelines;**
- **visible from scenic routes and valuable scenic and environmental areas; and**
- **located closer to roads than envisaged by generic setback policy.**

**This, coupled with the large scale of these facilities (in terms of both height and spread of components), renders it difficult to mitigate the visual impacts of wind farms to the degree expected of other types of development. Subject to implementation of management techniques set out by general/council wide policy regarding renewable energy facilities, these visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy.**

**MMDP – Rural Zone - Building Development**

**PDC 22. Wind farms and ancillary development should be located in areas outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation which provide opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited:**

**(a) in visually prominent locations; and**
**(b) closer to roads than envisaged by generic setback policy.**

**LDP PDC 3 and GDP PDC 4**

**Wind farms and ancillary development should be located in areas which provide opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited:**

**(a) in visually prominent locations; and**
**(b) closer to roads than envisaged by generic setback policy.**

As outlined in previous sections of this report, a detailed visual assessment was undertaken by WAX Design. The following table provides an extract of the findings of the landscape assessment for each of the viewpoints:

| Viewpoint Number | Viewpoint Location | Description of Locality | Visual Effect |
|---|---|---|---|
| 1 | Kapunda-Truro Road, Ebenezer | Viewpoint 1 is located on the southern edge of the proposed wind farm along the east-west orientated Kapunda-Truro Road close to the intersection with Belvedere Road.<br>The viewpoint is typical of the landscape character of the northern Barossa Valley and represents the probable visual effect that will be experienced within this locality.<br>This productive landscape includes a range of farms, buildings and ancillary structures scattered through the landscape associated with the predominately agricultural land use.<br>Extensive belts of vegetation provide localised landscape amenity, and the rising landform of the Greenhill Ranges provides a degree of visual enclosure within the locality. The ridgelines associated with Bald Hill and St Kitts form a visual envelope and view shed to the north of the viewpoint. | The local ridgelines associated with Bald Hill and St Kitts provide a visual screen behind which the proposed development is located. The majority of the turbines will be completely screened from the viewpoint as well as the wider locality, reinforcing the visual separation that will be provided due to the landform and vegetation to the northern edge of the Barossa Valley. |

| Viewpoint Number | Viewpoint Location | Description of Locality | Visual Effect |
|---|---|---|---|
| 2 | Kaunda-Truro Road, Koonunga | Viewpoint 2 is located to the south-west of the proposed development along the Kapunda-Truro Road on the rise of a local ridgeline. The viewpoint location is typical of the transitioning landscape between the edge of the northern Barossa Valley, and the western pastoral lands and ridgelines. This viewpoint represents the visual effect that may be experienced by visitors and from dwellings to the south-west of the proposed development, particularly from elevated properties along Brewery Road and to the eastern edge of Kapunda.<br>The progressive agricultural development of the locality has resulted in a cleared landscape with little vegetation to the ridgelines. The open field boundaries and absence of tree coverage is typical to landscape areas to the north-east. | The proposed wind farm will form a defined cluster of large infrastructure elements visible on the ridgeline. It is anticipated that the layout of the wind farm will result in a series of prominent vertical elements extending above the ridgeline. The elevated location of the viewpoint results in an increased visibility of the proposed development which is representative of the worst case visual effect experienced within this locality. |
| 3 | Intersection of Bagot Well Road and Kapunda-Eudunda Road, Bagot Well | Viewpoint 3 is located to the western side of the proposed development at the intersection of Bagot Well Road and the Kapunda-Eudunda Road (Thiele Highway). The viewpoint represents the landscape character of the central tablelands, and the typical landscape associated with the eastern edge of Greenock Ranges and the lower lying undulating landscape between the ranges and tablelands.<br>This viewpoint represents the anticipated visual effect experienced from the northern outskirts of Kapunda as well as the Kapunda-Eudunda Road, and from elevated residential properties to the southwestern side of the wind farm. The land cover transitions from the dense field boundary and vegetated character of the Barossa Valley in the south-east to an open pastoral landscape with larger fields used for grazing and some arable cropping. | The uniform layout will create a defined visual effect resulting in a continuous cluster of vertical infrastructure located within the landscape. The interrelationship of the local topography will create a degree of variation to the base height of the turbines which in turn varies the potential visual prominence of individual wind turbines.<br>To the outskirts of Kapunda, local ridgelines provide a visual screen particularly from the local road corridors, and lower lying areas associated with the Kapunda-Eudunda and Kapunda-Truro Road intersection.<br>The degree of visibility is likely to increase from elevated locations and particularly residential properties to the northern ridgeline of Kapunda. From these viewpoints the visual effect will be similar to that experienced at Viewpoint 2. |

| Viewpoint Number | Viewpoint Location | Description of Locality | Visual Effect |
|---|---|---|---|
| | | | The layered positioning of the wind turbines and the dynamic rotation of the blades will increase the notability of the wind turbines and amplify the complexity of visual change. |
| 4 | Tablelands Road, south of Eudunda | Viewpoint 4 is located along Tablelands Road and represents the potential visual effect that will be experienced to the north of the wind farm, particularly around the southern outskirts of Eudunda. The viewpoint is typical of the undulating landscape character of the elevated central tablelands.<br>The landscape character surrounding the viewpoint is defined by an open agricultural landscape of grazing and cropping, and a general absence of vegetation apart from a few isolated trees. Numerous hills and localised ridgelines create a defined undulating landscape character typical of the locality. | The wind turbines form a distinct cluster of elements set just behind the ridgeline to the south. The uniform layout creates a dispersed visual effect along the horizon line. The wind turbines will appear layered in front and behind each other. Similar to other viewpoints, the layering of and rotation of the wind turbine blades will increase the complexity of the visual effect.<br>The setback of the wind farm in the landscape relative to other localised landforms provides a degree of visual mitigation in relation to the scale of the turbines from this viewpoint.<br>While the wind farm and associated turbines will be notable elements within the locality, the compact layout and screening provided by surrounding topography limits the visibility and potential visual effects. In this regard, the visual effect is notable, but limited to a narrow field of view. |
| 5 | Von Reiben Road, east of Eudunda | Viewpoint 5 is located on Von Reiben Road some 16 kilometres north-east of the proposed development. The viewpoint represents the potential visual effect with a degree of visual change that will be experienced to the northeast and east of the proposed development in relation to regional locations across the Murray Plains.<br>The low lying character of the viewpoint is typical of the Murray Plains with extensive views across the rural landscape of the plains. | The visual effect results from the partial visibility of the turbine blades as they rotate above the edge of the ridgeline. The majority of the turbines, turbine towers, hubs and nacelles will be screened by the local ridgeline which creates a defined visual enclosure around the proposed wind farm.<br>The potential for a slight visual effect is likely to be experienced from locations to the east of the proposed development. The visual effect is created by the flicking visibility of the turbine blades as they appear above and disappear behind the ridgeline. |

| Viewpoint Number | Viewpoint Location | Description of Locality | Visual Effect |
|---|---|---|---|
| | | The underlying land cover is typical of the area consisting of cropping and grazing with scattered belts of vegetation following field boundaries or creeks.<br>To the south-west is the elevated escarpment associated with Mount Rufus, Long Hill and the township of Eudunda. Prominent topographical features such as Mount Rufus are clearly visible along the horizon line. These landforms produce a defined undulating ridgeline in front of the proposed development. | It is anticipated that with varying climatic conditions the degree of visibility will be further reduced, and from other locations to the east of the development the wind farm may be completely screened. |
| 6 | Tablelands Road, south of Mount Rufus | Viewpoint 6 is located on Tablelands Road, south of Mount Rufus, and represents the potential visual effect that will be experienced from locations to the eastern edge of the wind farm development site.<br>The viewpoint is located on one of the many locally elevated hills that form the transitional landscape character between the central tablelands and the Mount Rufus ridgeline.<br>The locality of the viewpoint represents the landscape amenity that is provided by the undulating rural landscape and the combination of extensive vegetation belts, isolated trees, open arable land, isolated farm dwellings and panoramic views to distant ridgelines.<br>While the landscape represents a modified agricultural land use, the combination and arrangement of landscape and built form elements provide a degree of visual amenity and scenic value.<br>The elevation and isolated tree cover of the agricultural landscape results in panoramic views to the south-west and, to a lesser extent, the north. | From the viewpoint, the wind turbines form a distinct cluster of large visual elements within the landscape. The majority of the wind turbines are located on the ridgeline that defines the western edge of the field of view from this viewpoint. The visual effect is formed by the entire wind farm with the relative position of wind turbines 3, 4, 9, 10, 18 and 25 forming prominent visual elements within the cluster of wind turbines. The elevation and height of the wind turbines extend above the ridgelines and local landscape features.<br>While the visual effect of the wind turbines will be experienced as a distinct cluster, the location of the wind turbines on the ridgeline increase the resulting visual effect, disrupting distant views particularly to the east creating an additional degree of visual enclosure to the locality. The location of the on-site substation and the transmission line west of the turbine cluster provide additional infrastructure elements and reinforces the visual effect.<br>Overall the visual effect experienced at Viewpoint 6 is likely to have a greater magnitude due to the relative position of the viewpoint, wind turbines and associated infrastructure. |

| Viewpoint Number | Viewpoint Location | Description of Locality | Visual Effect |
|---|---|---|---|
| | | Views to the east are contained by local ridgelines associated with Mount Rufus and the southern extent of the ridgelines that continue towards the Barossa Valley. The rolling landscape contains belts of vegetation which increase in frequency and prominence towards the edge of the Barossa Valley further to the south. | The elevation of the wind turbines and limited screening provided by adjacent landscape features reinforces the vertical height of the wind turbines within the landscape. |
| 7 | Sturt Highway, east of Truro | Viewpoint 7 is located 5.0 kilometres outside Truro along the Sturt Highway. The viewpoint represents the anticipated visual effect that will be experienced to the south-east of the wind farm. The Sturt Highway provides an entrance gateway into the township of Truro.<br>Vehicles travelling along this highway are typically travelling at speeds of between 70 to 80 kilometres per hour. The existing landscape character of the viewpoint is typical of the local area with rolling undulating landforms predominantly grazed defining the land use character.<br>The landscape is punctuated by isolated trees that produce notable visual landscape markers. There is little screening within the wider landscape.<br>The topography of Mount Rufus and the extension of the north-south ridgeline form the dominant landscape feature which defines the horizon line and contains the field of view. | The turbines are seen as a distant cluster of elements located just below a series of ridgelines that define the complex topography of the local area.<br>The Greenock Ridge is visible as a prominent landscape element and backdrop to the viewpoint. The topographic significance and visual character of this element is retained. The presence of existing remnant vegetation to the ridgeline and scattered trees provides an additional screening that will reduce the visual effect.<br>Due to the compact nature of the layout, distance from the viewpoint as well as the interrelationship of the undulating ridgelines and local topography, result in a reduced visual effect that is characterised by glimpsed views of wind turbine blades and a limited number of nacelles.<br>Potential visual impacts on the surrounding landscape and Barossa Valley to the east remain limited due to the contained visual character that is formed by the local topography and isolated vegetation groups.<br>The 275kV transmission line will create an infrastructure corridor connecting the wind farm to the existing ElectraNet transmission line … will produce a fragmented visual effect across the existing rural landscape. |

| Viewpoint Number | Viewpoint Location | Description of Locality | Visual Effect |
|---|---|---|---|
| | | | There is an increased visual effect experienced of the transmission line from this location due to the close adjacency of this viewpoint to the proposed transmission corridor. It is only from locations adjacent to the proposed transmission line and over relatively short distances (less than 300 to 400 metres) that the visual effect increases. In other locations along this road corridor and within the locality the visual effect is decreased due to distance and the presence of the existing transmission corridor, which is of a similar scale and appearance. |
| 9 | Sturt Highway, east of Transmission Substation | Viewpoint 9 is located east of the transmission substation along the Sturt Highway. From viewpoint 9 the proposed wind farm will not be visible due to the local ridgelines, limiting the connectivity of the development form and extension of visual impact.<br>The intersection of the 132kV transmission line to the 275kV ElectraNet corridor is located south of the Sturt Highway, to which the transmission substation terminal is proposed. When viewed from close proximity, the transmission substation will be a dominant visual element in the locality. There will be an increase in the concentration of infrastructure elements experienced within the landscape due to its connection to two transmission lines.<br>The visual effect of the substation is increased due to its close proximity to the Sturt Highway.<br>However, due to the road alignment (which curves both before and after this location), local ridges and stands of vegetation along the road corridor, the substation will only be visible when travelling along a limited section of the highway. | To mitigate the potential visual effect of the substation along the road corridor, it is proposed that landscape treatments are provided to the perimeter of the substation in line with the considerations described in Section 5.11. Any screening will need to be undertaken in line with electrical code best practice to avoid potential disruption of supply.<br>Additional landscape treatments along the road corridor, such as an increase of roadside trees, could further fragment and partially screen the substation. Further refining the benching level of the development during the detailed design phase could allow the development to sit lower in the landscape and increase the effectiveness of landscape screening treatments. |

| Viewpoint Number | Viewpoint Location | Description of Locality | Visual Effect |
|---|---|---|---|
| | | Further to the south approximately 900 metres of the proposed substation terminal is a small existing quarry providing a scale of development to the locality. This is also combined with the existing 275kv transmission line which traverses across the field of view in a north-south orientation. | |

In conclusion, the visual assessment by WAX Design states:

> *The potential visual effect is most notable from the east and west with the proposed wind turbines situated on the ridges of the Central Tablelands. The scale of the proposed development in relation to the vertical scale of the underlined topography is prominent to visibility if individual wind turbines.*
>
> *From local and sub-regional locations within five kilometres of the proposed wind farm, the screening provided by local ridgelines and vegetation belts is limited, and the majority of the wind farm is visible. The resulting visual effect produces a degree of visual change in the order of 43% to 48% which is described as substantial with the visual character of the locality being altered. However, the sensitivity of the underlying landscape to change is low due to the agricultural character.*
>
> *Further away from the proposed development local ridgelines and tree belts create visual screens that fragment or remove the visual effects of the proposed wind turbines. The combination of topography and vegetation increases the screening reducing the degree of visual change that ranges from 23% to 33% and is describe as moderate.*
>
> *At distances of over ten kilometres, the degree of visual changes reduces significantly, and the degree of change is reduced to a range of 12% to 17%, particularly to the north east and south west and is described as slight.*
>
> *The associated infrastructure; substations and transmission line, will provide localised impacts to their immediate site localities. These visual effects will be limited to shorter distances (contained viewsheds) to the east and south east or Truro. There will be no visual effect from the township of Truro. Transient experiences will be witnessed along local roads within the south east of the regional site with a small section of the Sturt Highway being impacted by the substation terminal connection to the existing 275kv line. Depending on the viewpoint, local landforms will provide visual screening.*

*Furthermore the reduced vertical scale of the gantries and transmission pylons in contrast to the turbines, meaning the associated infrastructure will only slightly contribute to the overall level of visual change in the regional landscape. The visual assessment and visual effect interpolation mapping illustrated the relationship between distance and visual effect and the significance of local of ridgelines in reducing the visibility of the proposed wind farm in the wider locality. The visual effect is represented as bands of visual change radiating from the proposed wind farm. The consistency of the existing landscape character means that distance and visual absorption are the dominant variables in mitigating the visual effect.*

*Although, the visual effect is likely to be moderate to substantial within the local to subregional area, the containment of the effect can be attributed to the visual character of the landscape coupled with uniformity of the agricultural character, meaning that the proposed Twin Creek Wind Farm can be accommodated without significantly altering the underlying landscape character.*

The findings of the visual assessment report acknowledge that there will be visual change in the region of the wind farm, which is entirely consistent with the provisions of the Development Plan. Whilst the visual assessment indicates that the visual effect is likely to be moderate to substantial utilising the GrimKe matrix methodology, the likelihood of visual impact from wind farms is clearly anticipated in the Development Plans. Each of the Development Plans recognise that wind farm elements will be visible due to their spread and scale. The Desired Character Statement also notes that wind farm facilities may need to be located in valuable scenic and environmental areas, and be visible from scenic routes.

**Desired Character Statement (LDP, GDP, MMDP)**

**These facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence, components (particularly turbines) may need to be:**

- **located in visually prominent locations such as ridgelines;**
- **visible from scenic routes and valuable scenic and environmental areas; and**
- **located closer to roads than envisaged by generic setback policy.**

Within the Rural Zone, Hills Policy Area of the Mid Murray Council Development Plan the scenic qualities of the Eastern Mount Lofty Ranges are described. The Hills Policy Area seeks to protect the character and amenity of the hills by minimising building within these areas. As previously identified, it is apparent that the provisions of the policy areas that state that buildings should not be developed on the eastern face of the ranges are inconsistent with the underlying intent of the Rural Zone, which acknowledges that wind farms are anticipated within visually prominent locations. The policy area does not list wind farms as unacceptable forms of development in the Desired Character Statement. The overriding policy is to encourage wind farm development, acknowledging that there will be visual and hence character changes in the zones.

**Hills Policy Area**

**Desired Character Statement**

**The following forms of development are unacceptable in that part of the Hills Policy Area defined in Figures HF(HPA)/1 to 5 (additional to unacceptable uses for the Rural Zone:**

- **horticulture, particularly viticulture and olive production;**
- **forestry;**
- **buildings on allotments less than 200ha in size.**

**Objective 2: No building development on the eastern face of the Mount Lofty Ranges.**

**PDC 3 Dwellings and non-rural buildings shall not be located where they are prominently visible from a public road without extensive screening first established.**

As discussed previously in this report, there is an additional level of protection for the Eastern Mount Lofty Ranges as a result of the Barossa Valley Character Preservation District. Whilst the proposed development is not within the Preservation District, the existence of this district ensures that wind farms are not developed in that area. Therefore, a significant area of the Eastern Mount Lofty Ranges is protected from building and development, including the development of wind farms.

Wind farms by their nature and form will be visually dominant in the locality, as acknowledged in the provisions of the Development Plans. The visual effect of the proposal is considered acceptable and not fatal to the proposed development for the following reasons:

- the landscape of the locality has been modified;
- the underlying rural landscape is retained and can be readily viewed;
- the mid north region contains a number of operational wind farms, albeit not within close proximity to the subject land, and the proposed development is seen to be an appropriate form of development within the agricultural areas of the mid north region. This proposal will not introduce a new form of infrastructure or visual intrusion into the regional landscape;
- the locality contains a variety of natural landforms that provides ridges and valleys that assist in minimising the views of the proposed wind farm, transmission line and ancillary infrastructure. The wind turbines, transmission lines and terminal substation will come into and out of view depending on the location;
- the proposal is not expected to result in significant visual effects for the residents of the townships and settlements in the locality;

- the visual effect of the wind turbine generators and associated infrastructure has been assessed (by Wax Design) as moderate to substantial within the local and subregional area. As distances increase, the degree of visual change reduces significantly and in most areas is described as slight. The wind farm is not expected to be detrimental to the landscape and wider amenity of the region. There are no visually sensitive or scenic areas in the region;

- the access tracks are unlikely to be visually out of character or a dominant element in the wider rural landscape;

- transmission lines are likely to be viewed as an additional visual element in the landscape rather than a new element given the existence of other electricity infrastructure, including the 275kV line, within the locality;

- the terminal substation will only be visible when travelling along a limited section of the Sturt Highway due to the road alignment and local topography. The visibility of the substation will be mitigated by landscaping treatments adjacent the perimeter of the substation and adjacent the road corridor; and

- operation and maintenance facilities are sited in a manner to be viewed as additional infrastructure in a localised manner and appropriately screened.

## 6.4 Noise and Infrasound

Various provisions of the Development Plans establish that development should not detrimentally affect the amenity of a locality or cause unreasonable interference through a variety of potential impacts, including noise (LDP – Interface Between Land Use Objectives 1 and 2, PDC's 1, 2, 10 and 11; GDP – Interface Between Land Uses Objectives 1 and 2, PDC's 1, 2, 6 and 7; MMDP - Interface Between Land Uses Objectives 25 and 26 and PDCs 87, 93 and 94).

**LDP and GDP – Interface Between Land Uses**

**Objective 1:** **Development located and designed to prevent adverse impact and conflict between land uses.**

**Objective 2:** **Protect community health and amenity and support the operation of all desired land uses.**

**PDC 1** **Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following:**

**(a)** **the emission of effluent, odour, smoke, fumes, dust or other airborne pollutants;**
**(b)** **noise;**
**(c)** **vibration;**
**(d)** **electrical interference;**
**(e)** **light spill;**
**(f)** **glare;**
**(g)** **hours of operation; and**
**(h)** **traffic impacts.**

| | |
|---|---|
| **PDC 2** | **Development should be designed and sited to minimise negative impact on existing and potential future land uses considered appropriate in the locality.** |
| **LDP PDC 10** | **Development that emits noise (other than music noise) should include noise attenuation measures that achieve the relevant *Environment Protection (Noise) Policy* criteria when assessed at the nearest existing noise sensitive premises.** |
| **LDP PDC 11** | **Development with the potential to emit significant noise (e.g. industry) should incorporate noise attenuation measures that prevent noise from causing unreasonable interference with the amenity of noise sensitive premises.** |
| **GDP PDC 6** | **Development should be designed, constructed and sited to minimise negative impacts of noise and to avoid unreasonable interference.** |
| **GDP PDC 7** | **Development should be consistent with the relevant provisions each of the following documents:**<br>**(a) AS 2107 Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors;**<br>**(b) AS 3671 Acoustics - Road Traffic Noise Intrusion, Building Siting and Construction; and**<br>**(c) the current Environment Protection (Noise) Policy.** |
| **MMDP PDC 93** | **Development should be designed, constructed and sited to minimise negative impacts of noise and to avoid unreasonable interference.** |
| **MMDP PDC 94** | **Development should be consistent with the relevant provisions in the current Environment Protection (Noise) Policy.** |

Protection of sensitive users and minimising acoustic interference is also specifically sought by Objective 16 and Principle of Development Control 12 of the Rural Zone of the Mid Murray Council Development Plan.

**MMDP – Rural Zone**

| | |
|---|---|
| **Objective 16:** | **Protection of sensitive uses from external noise.** |
| **PDC 12** | **Development designed to minimise adverse acoustic impacts on adjoining uses which would be sensitive to acoustic interference.** |

In addition to the general provisions of the Development Plans (under the heading of Interface Between Land Uses) protecting amenity from potential interference, there are specific provisions in the Development Plan relating to wind farms. The Renewable Energy Facilities provisions require that excessive noise from wind farms should be avoided or minimised, as stated in LDP and GDP Objective 3 and PDC 3(b), and MMDP Objective 101 and PDC 399(b).

**Renewable Energy – LDP and GDP Objective 3 and MMDP Objective 101**

| | |
|---|---|
| **Objective:** | **Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.** |

**Renewable Energy - Wind Farms & Ancillary Developments LDP & GDP PDC 3 & MMDP PDC 399**

**PDC Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife: ...**

**(b) excessive noise; ...**

A detailed Environmental Noise Assessment of the proposed wind farm has been undertaken by Sonus and is included in the application documents. This assessment has been undertaken in accordance with the South Australian Environment Protection Authority *Wind Farms Environmental Noise Guidelines 2009 (SA Guidelines*).

The SA Guidelines were established to ensure a wind farm project did not unreasonably interfere with the acoustic amenity of the surrounding community and therefore to provide an objective assessment method for the purpose of comparison with the relevant Development Plan provisions.

Predictions of the noise from the wind farm and ancillary infrastructure have been made by Sonus for non-stakeholder (landowners without a commercial agreement with the wind farm) within the locality. The Sonus report (Section 5.7) lists the assessment criteria for a non-stakeholder dwelling:

> *The predicted equivalent noise level ($L_{Aeq,10}$), adjusted for tonality in accordance with these guidelines, should not exceed:*
>
> - *35 dB(A) at relevant receivers in localities which are primarily intended for rural living; or*
> - *40 dB(A) at relevant receivers in localities in other zones; or*
> - *the background noise ($L_{A90,10}$) by more than 5 dB(A),*
>
> *whichever is greater, at all relevant receivers for wind speed[2] from cut-in to rated power of the WTG and each integer wind speed in between.*
>
> *Where the wind farm noise exhibits a tonal characteristic, a 5 dB(A) penalty is to be applied to the criteria.*

In assessing the potential effects of the development, the most pertinent considerations are:

- does the wind farm (including wind turbine generators and other infrastructure) create excessive noise;
- does the wind farm avoid or minimise noise to nearby property owners and/or occupiers;

[2] Where wind speed is referenced in the Sonus report, it is taken to be the wind speed at the WTG hub height, in accordance with the SA Guidelines, unless specifically noted otherwise.

- will the wind farm comply with the current Environment Protection (Noise) Policy; and
- is the health and amenity of the community adequately protected?

In assessing these matters, it is noted:

- the developer has a general environmental duty pursuant to the *Environment Protection Act 1993;*
- the current Environment Protection (Noise) Policy specifically refers the assessment of wind farms to the *Wind Farms Environmental Noise Guidelines 2009 (SA Guidelines*) as the relevant standard;
- 'excessive noise' is a term used in the Development Plans particularly within the Renewable Energy Facilities PDC's and the SA EPA Wind Farms Environmental Noise Guidelines, although it is not defined by either of these documents. 'Excessive noise' has been interpreted here to mean noise that exceeds the criteria established by the SA Guidelines;
- the use of the terms 'avoid or minimise' is to be read as a disjunctive and that 'avoid' does not impose a higher standard than that of a containment to the acceptable level, in accordance with the discussion on this matter in Paltridge & Ors v District Council of Grant & Anor (2011) SAERDC 23 (17 June 2011) at paragraphs 39 to 41; and
- the wind farm and energy storage facility is located within a Primary Production and Rural Zone. The non-stakeholder dwellings in the locality of the proposed development are located within the same zones, albeit well separated.

In answer to the first three criteria, we defer to the Sonus Environmental Noise Assessment Report. Applying the relevant criteria an assessment was undertaken by Sonus of the noise at neighbouring dwellings within 5.0 kilometres of the wind turbine generators and proposed substations. Sonus notes that *"based on the predicted noise levels, the wind farm noise, including the WTGs, transformers and air conditioning units will comply with the criteria at all residences, for all wind speeds"*.

Sonus concludes (Section 7.0) that "*the predicted noise levels achieve the requirements of the Guidelines at all residences"*.

Given the technical nature of an acoustic assessment, we defer to the Sonus report and conclude that the proposed Twin Creek Wind Farm and Energy Storage project will satisfy the relevant provisions of each of the three Development Plans regarding noise. I further note that the Environment Protection Authority is a formal referral agency for a wind farm development application and the technical nature of the acoustic assessment undertaken by Sonus will be reviewed by that agency as part of the application process.

The fourth assessment matter is the protection of the health and amenity of the community. Concerns regarding the health impacts on humans living in the locality of wind farms have been widely canvassed over recent years.

One of the objectives of the Interface Between Land Uses provisions of the Development Plans seeks to "*protect community health and amenity*". Concerns raised on the impacts of wind farms on residents' health often relate to infrasound.

> **Interface Between Land Uses – LDP and GDP Objective 2 and MMDP Objective 26**
>
> **Objective:** **Protect community health and amenity and support the operation of all desired land uses.**

Infrasound is *"low frequency noise below the audible frequency range that manifests as a rattle in lightweight materials such as glass*" (SA EPA Wind Farms Environmental Noise Guidelines). Infrasound is not regulated either in the Development Plans or by the Guidelines. I note that the SA EPA Wind Farms Environmental Noise Guidelines state:

> *"Infrasound was a characteristic of some wind turbine models that has been attributed to early designs in which turbine blades were downwind of the main tower. The effect was generated as the blades cut through the turbulence generated around the downwind side of the tower.*
>
> *Modern designs generally have the blades upwind of the tower. Wind conditions around the blades and improved blade design minimise the generation of the effect. The EPA has consulted the working group and completed an extensive literature search but is not aware of infrasound being present at any modern wind farm site."*

Infrasound is also discussed in the Sonus Environmental Noise Assessment report (Section 6.2), which notes:

- *International studies have confirmed that the level and character of noise from modern WTGs are not different to the noise encountered from other natural and non-natural noise sources.*
- *… the level of infrasound from WTGs is no greater than naturally occurring levels of infrasound from sources such as waves breaking.*
- *A recent South Australian Government study by the Environment Protection Authority into infrasound (Infrasound levels near wind farms and in other environments, January 2013) provided findings which were consistent with the Sonus studies and a wide range of national and international peer reviewed studies, including:*
  - *the measured levels of infrasound from wind farms are well below the threshold of perception;*
  - *the measured infrasound levels around wind farms are no higher than levels measured at other locations where people live, work and sleep; and*

- *the characteristics of noise produced by wind farms are not unique and are common in everyday life.*

In relation to health impacts from wind farms, we note that this matter was extensively reviewed in the Environment, Resources and Development Court, including in the matter of *Paltridge & Ors v District Council of Grant & Anor (2011) SAERDC 23.*

In general terms, the appellants in this Paltridge matter argued that even at noise levels which otherwise meet the levels sought in the SA EPA Wind Farms Environmental Noise Guidelines, there still may be detrimental health effects. Evidence of health impacts of wind farms was provided by Dr Laurie and Professor Wittert, and the Court preferred the conclusions of Professor Wittert who concluded that:

> *"There is no credible evidence of a causal link, between the physical outputs of a turbine (or sets of turbines), at the levels that are described in the statement of Mr C Turnbull[3] and adverse effects on health"* (paragraph 120 SAERDC 23).

Furthermore, in the *Paltridge & Ors v District Council of Grant & Anor (2011) SAERDC 23* matter, the appellants sought to invoke the 'precautionary principle'. This principle dictates that measures to prevent or forestall damage (in this case to human health) should not be postponed, merely because of the lack of full scientific certainty as to the need for such measures. The ERD Court were referred by Professor Wittert to *Wind Turbines and Health - A Rapid Review of Evidence - National Health and Medical Research Council - July 2010*, which concluded that "*there are no direct pathological effects from wind farms and any potential impact on humans can be minimised by following existing planning guidelines*". At that time, the ERD Court accepted this as being the most up-to-date and reliable research on this issue, and accordingly considered there was no basis to invoke the precautionary principle.

Since 2011, the potential health impacts of wind farms has been further considered in numerous forums, including the Victorian Civil and Administrative Tribunal (VCAT), the NSW Planning Assessment Commission, through studies undertaken by the South Australian Environment Protection Authority[4] (EPA), a report by the Victorian Department of Health entitled "Wind Farms, Sound and Health", studies by the National Health and Medical Research Council, and other Environment, Resources and Development Court appeals. In particular, the:

- South Australian Environment Protection Authority "Waterloo Wind Farm Environmental Noise Study – November 2013" investigated the concerns of the community regarding noise from the Waterloo Wind Farm, with a focus on infrasound and low frequency noise;

[3] Mr Turnbull of Sonus Acoustics provided evidence on noise and infrasound to the ERD Court on behalf of the applicant in this matter.
[4] Infrasound levels near wind farms and in other environments – SA EPA – January 2013.

- Environment, Resources and Development Court (the ERD Court) decision on the Tru Energy Stony Gap wind farm *(Tru Energy Renewable Developments Pty Ltd v Regional Council of Goyder & Ors [2014] SAERDC 48 (4 November 2014))* considered evidence on health effects; and

- Australian Government – National Health and Medical Research Council (NHMRC) – Information Paper – Evidence on Wind Farms and Human Health – February 2015 provides a summary of evidence on possible health effects of wind farms in humans, including noise, shadow flicker and electromagnetic radiation.

The Waterloo Wind Farm Environmental Noise Study concluded (underlining emphasis added) that:

> *"This report presents results of noise monitoring program performed at six sites in the vicinity to Waterloo Wind Farm over approximately two months, at distances ranging between 1.3 and 7.6 km, covering a broad range of directions. Measurements of noise inside and outside of houses were undertaken at five sites. Additional monitoring equipment was deployed at two houses (Township and North sites) to acquire data in infrasound frequency range both inside and outside of the houses. <u>No evidence was found for the presence of excessive infrasound within the infrasound frequency range</u>.*
>
> *Nevertheless, it is possible that people who have a higher sensitivity to the lower frequencies in particular may detect these characteristics, and they may cause increased annoyance for those who have been aware of them for a prolonged period. Noise impact from the wind farm, where detectable, was found to comply with the conditions of the development approval and the baseline criterion of 40dB(A)."*

The Victorian Department of Health report concludes (at Page 19):

> *"There is no evidence that sound which is at inaudible levels can have a physiological effect on the human body. This is the case for sound at any frequency including infrasound."*

The VCAT decision on the Cherry Tree Wind Farm Pty Ltd (VCAT Reference No P2910/2012) was adjourned to await the completion of the South Australian Environment Protection Authority study regarding the effects of wind turbines at Waterloo wind farm in South Australia, which is the EPA study referenced above. Following review of the findings of the SA EPA study, VCAT concluded the following in relation to the potential deleterious health effects caused by noise or infrasound:

> *"43 In relation to a causal link the evidence points to an association, but does not establish causation. On the contrary the additional material submitted after the interim decision, being the views of NSW Health as reported in the Bodangora determination and the Victorian Department of Health publication, expressly state that there is no scientific evidence to link wind turbines with adverse health effects. These are the views of State authorities charged by statute with the protection of public health. These views must be respected.*

*44 There is certainly no compelling evidence, and indeed no expert evidence at all that was capable of being tested, that would justify the Tribunal adopting a view that is opposed to the clearly stated opinions of the public health authorities. Those opinions are underscored by the currently stated position of the NHMRC."*

In the ERD Court decision in relation to the Tru Energy Stony Gap wind farm, the evidence of Professor Wittert was accepted by the Court. Professor Witterts conclusions were summarised in the decision as follows:

*100 Professor Wittert's conclusions were as follows:*

*6. Conclusions*

*6.1 Wind farm noise and adverse health effects*

- *There is no evidence that audible noise resulting from the operation of wind turbines constitutes a significant risk to health in the majority of individuals provided the development is compliant with current guidelines (Appendix 9).*
- *Annoyance is acknowledged to occur in a generally small, but probably variable number of individuals and the extent to which this is problematic in a compliant wind farm may depend more on non-acoustic than acoustic factors.*
- *It is acknowledged that they are some particularly noise sensitive individuals, but it would seem to me to be surprising that their first awareness of this as adults would be in the context of exposure to wind turbines. However, I am not aware of any specific enquiry in this regard.*
- *The weight of evidence is that when adverse health effects occur they relate to annoyance and are mediated by psychological distress and or sleep disturbance.*
- *The extent to which this occurs and whether it manifests as psychological distress and or sleep disturbance and/or other adverse health effect is dependent on a number of other internal and external factors (attitude, visual amenity, nocebo effects, financial interest, et cetera).*

*6.2 Low-frequency noise and Infrasound and adverse health effects*

*6.2.1 Low-frequency noise*

- *The problem with LFN, as with high-frequency noise, relates to annoyance associated with audibility and the same range of moderating non-acoustic factors. There is no evidence that adverse health effects can be directly attributable to inaudible low-frequency sound emissions.*

*6.2.2 Infrasound*

- *There is no evidence that inaudible infrasound are associated with any significant physiological or pathophysiological consequences.*
- *There is no evidence that the level of infrasound produced by wind turbines constitutes a problem to health.*

*101 Professor Wittert also concluded that there is no consistent data to suggest that children, the elderly or pregnant women are more susceptible than others in the population to adverse health reactions to noise exposure.*

*102 Professor Wittert is an appropriately qualified and experienced expert. We accept his evidence.*

*103 There is no basis for the refusal of development plan consent to the proposed development on the grounds of health effects. The proposed development is consistent with Objectives 1 and 2 in the Interface between Land Uses section of the Development Plan.*

It is noted that in November 2014, the ERD Court in this matter concluded that there was no basis for refusal of the Stony Gap wind farm on grounds of health effects.

In February 2015, the National Health and Medical Research Council (NHMRC) – Information Paper – Evidence on Wind Farms and Human Health concluded that there is no consistent evidence that wind farms cause adverse health effects in humans, as quoted below from Section 6.4 of the report:

> *After careful consideration and deliberation, NHMRC concluded that there is no consistent evidence that wind farms cause adverse health effects in humans. This finding reflects the results and limitations of the direct evidence and also takes into account the relevant available parallel evidence on whether or not similar noise exposure from sources other than wind farms causes health effects. NHMRC found no direct evidence that exposure to wind farm noise affects physical or mental health. The few associations reported by individual studies may have been due to chance. The parallel evidence indicates that there is unlikely to be any significant effects on physical or mental health at distances greater than 1,500 m from wind farms.*

*NHMRC found consistent but poor quality direct evidence that wind farm noise is associated with annoyance. While the parallel evidence suggests that prolonged noise-related annoyance may result in stress, which may be a risk factor for cardiovascular disease, annoyance was not consistently defined in the studies and a range of other factors may have contributed to its reported association with wind farm noise.*

*The direct evidence of an association between wind farms and sleep disturbance is less consistent and also of poor quality. While chronic sleep disturbance is known to affect health, it was not objectively measured in the wind farm studies and may not have been sufficient to affect health. Parallel evidence suggests that sleep disturbance is unlikely at distances of more than 1,500 m from wind farms. The direct evidence on an association between proximity to wind farms and poorer quality of life is also less consistent and of poor quality. Measurement of quality of life is generally subjective and the studies did not explore whether the reported associations could be explained by other factors. Observation of associations between wind farms and these effects does not necessarily mean that wind farms caused them.*

*Given the poor quality of the evidence, bias of different kinds and confounding factors are possible explanations for the associations observed. When building a body of scientific evidence, it is difficult to establish absence of an outcome (ie a negative conclusion, such as that an exposure does not cause health effects). Thus lack of consistent evidence that wind farms affect human health may not mean that wind farms have no health effects. While parallel evidence indicates that significant health effects are unlikely at distances greater than 1,500 m, it might simply be that the research done has been of insufficient quality or statistical power to show an effect, particularly where the study has a small number of participants.*

On the basis of all information available through the SA ERD Court, VCAT, the SA EPA and the NHMRC, there is no scientific evidence that the proposed wind farm will adversely affect the health and amenity of the community. The proposed development is considered to protect community health and satisfies the provisions of the Development Plan.

### 6.5 Shadow Flicker, Reflection and Blade Glint

Renewable Energy principle of development control (LDP and GDP PDC 3 and MMDP 397) requires that wind farms should avoid or minimise shadowing, flickering, reflection or glint on nearby property owners and/or occupiers, road users and wildlife.

**Renewable Energy - Wind Farms & Ancillary Developments LDP & GDP PDC 3 & MMDP PDC 397**

**PDC 398 Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife:**

**(a) shadowing, flickering, reflection or glint;**

Shadow flicker is the modulation of light levels resulting from the periodic passage of a rotating wind turbine blade between the sun and an observer. The duration of shadow flicker experienced at a specific location can be determined using geometric analysis. A geometric analysis has been undertaken on the Twin Creek Wind Farm and Energy Storage project by Garrad Hassan Pacific Pty Ltd (DNV GL). A copy of the Shadow Flicker and Blade Glint Assessment forms part of the application documents.

Impact of shadow flicker has been assessed for the dwellings within the vicinity of the wind farm, utilising the Environment Protection and Heritage Council (EPHC) Draft National Wind Farm Development Guidelines. The Draft National Guidelines recommend that the modelled theoretical shadow flicker duration should not exceed 30 hours per year, and that the actual or measured shadow flicker duration should not exceed 10 hours per year.

The analysis of shadow flicker identified that Dwelling 147, which is a stakeholder dwelling, is predicted to experience a maximum theoretical shadow flicker duration of 29.3 hours per year. It is not predicted to experience theoretical shadow flicker duration in excess of the recommended limit of 30 hours per year within 50 metres of the dwelling.

No non-stakeholder dwellings are impacted by shadow flicker. On this basis, Renewable Energy PDC (LDP and GDP PDC 3, and MMDP 397) for nearby property owners/occupiers is satisfied.

It is noted that the National Health and Medical Research Council (NHMRC) Information Paper[5] states:

> *"There is insufficient direct evidence to draw any conclusions on an association between shadow flicker produced by wind turbines and health effects. Flashing lights can trigger seizures among people with a rare form of epilepsy called photosensitive epilepsy. From the parallel evidence, the risk of shadow flicker from wind farms triggering a seizure among people with this condition is estimated to be extremely low" (page 2).*

Renewable Energy PDC (LDP and GDP PDC 3(a), and MMDP 397(a)) seeks to minimise impact of shadow flicker and glint on road users. Impact on road users is discussed in the DNV GL, which concludes that "*shadow flicker impact on passing vehicles is not expected to be a problem for the proposed wind farm"* as the Draft National Guidelines state that "*there is negligible risk associated with the distraction of vehicle drivers who experience shadow flicker*".

[5] National Health and Medical Research Council (NHMRC) Information Paper: Evidence on Wind Farms and Human Health, February 2015.

Based on the conclusions of the shadow flicker assessment and the findings of the NHMRC, it is considered that shadow flicker is suitably minimised and unlikely to result in unreasonable adverse impacts on the amenity of the locality. On this basis, it is considered the relevant provisions of the Development Plans are satisfied for property owners/occupiers in the locality.

Blade glint refers to the regular reflection of the sun off one or more rotating turbine blades. Renewable Energy provisions (LDP and GDP PDC 3, and MMDP 397) seeks to ensure that glint is avoided or minimised. DNV GL note in their conclusions that *"blade glint is not likely to be an issue provided non-reflective coatings are used on the turbine blades."* Given RES Australia is committed to utilising non-reflective coating on the turbine blades, blade glint is minimised in accordance with the requirements of the Renewable Energy provision.

## 6.6 Interface Between Land Uses

The Twin Creek Wind Farm and Energy Storage project is contained wholly within the Primary Production Zones of the Light Regional Council and Goyder Council Development Plans and the Mid Murray Council Rural Zone.

General provisions of the Development Plans under the heading of Interface Between Land Uses seek to ensure development is appropriately located and designed to prevent adverse impacts and conflicts between land uses (as stated in LDP and GDP Objective 1 and PDC's 1 and 2, and MMDP Objective 25 and PDC's 87 and 88).

**Interface Between Land Uses - LDP and GDP Objective 1, MMDP Objective 25**

**Objective:** **Development located and designed to prevent adverse impact and conflict between land uses.**

**Principles of Development Control - LDP and GDP PDC 's 1 and 2, MMDP PDC 's 87 and 88**

**PDC** **Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following:**

- **(a) the emission of effluent, odour, smoke, fumes, dust or other airborne pollutants;**
- **(b) noise;**
- **(c) vibration;**
- **(d) electrical interference;**
- **(e) light spill;**
- **(f) glare;**
- **(g) hours of operation; or**
- **(h) traffic impacts.**

**PDC 88** **Development should be designed and sited to minimise negative impact on existing and potential future land uses considered appropriate in the locality.**

In addition, the general provisions of the Development Plan contain numerous provisions regarding the design, siting and appearance of buildings to minimise adverse impacts on adjoining land uses, and owners and occupiers of land.

Renewable Energy provisions of the Development Plans provide further criteria which need to be satisfactorily addressed as part of any development assessment of a wind farm. Some of the specific criteria, such as noise, electrical interference, glare, flora and fauna, and traffic effects are dealt with in detail in other sections of this assessment report. Other potential impacts are discussed below.

**Renewable Energy Facilities – LDP and GDP Objective 3, PDC's 3 and 4 and MMDP Objective 101, PDC's 395, 397 and 398**

**Objective:** **Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.**

**PDC** **Renewable energy facilities, including wind farms and ancillary development, should be:**

**(a)** **located in areas that maximise efficient generation and supply of electricity; and**
**(b)** **designed and sited so as not to impact on the safety of water or air transport and the operation of ports, airfields and designated landing strips.**

**PDC** **Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife:**

**(a)** **shadowing, flickering, reflection or glint;**
**(b)** **excessive noise;**
**(c)** **interference with television and radio signals and geographic positioning systems;**
**(d)** **interference with low altitude aircraft movements associated with agriculture;**
**(e)** **modification of vegetation, soils and habitats;**
**(f)** **striking of birds and bats.**

**PDC** **Wind turbine generators should be setback from dwellings, tourist accommodation and frequently visited public places (such as viewing platforms) a distance that will ensure that failure does not present an unacceptable risk to safety.**

### 6.6.1 Aviation and Aerial Agriculture

A detailed assessment of aviation activities in the location of the proposed wind farm has been undertaken by The Ambidji Group[6]. Renewable Energy Principle of Development Control 1(b) (LDP and GDP and MMDP PDC 396(b)) requires that a wind farm be designed and sited so as not to impact on the safety of air transport and the operation of ports, airfields and designated landing strips. Furthermore, Renewable Energy LDP and GDP2(d), and MMDP PDC 397(d) states that wind farms should avoid or minimise interference with low altitude aircraft associated with agriculture.

[6] Twin Creek Wind Farm - Aeronautical Impact Assessment Aviation Impact Statement Qualitative Risk Assessment and Obstacle Lighting Review by The Ambidji Group.

The findings of the aviation assessment report note the wind farm:

- will not be of operational significance to aircraft safety;
- will not require obstacle lighting;
- will not impact on aviation communications, navigation and surveillance equipment;
- will not impact on military restricted area which is designated for military flying operations and flights above 4,500 feet; and
- will not impact on defence communications equipment.

The conclusion of the aviation assessment undertaken is that with the tallest wind turbine generator at a tip height of 660.22 metres (2,166 feet) above the Australian Height Datum (AHD), the proposed Twin Creek Wind Farm does not interfere with any airspace procedures or aviation related communications, navigation or surveillance facilities for both civil or military aerodromes and airspace.

Given the extensive investigations undertaken in the aviation assessment and its conclusions, the wind farm is unlikely to impact on air safety of air transport. Furthermore, lighting of the turbines is not required for obstacle limitation purposes and therefore lighting from this component of the turbine will not impact on the amenity of the locality.

Principle LDP and GDP 2(d), and MMDP PDC 397(d) of the Renewable Energy Facility provisions of the Development Plans seeks to ensure that interference with low altitude aircraft movements associated with agriculture are avoided or minimised. In relation to the aerial agricultural application, the aviation assessment notes that the principal aerial agriculture operator in South Australia has indicated that they do not undertake extensive aerial application in the locality of the proposed wind farm. This comment is considered consistent with the pattern of land use within the locality, which is principally grazing activities within the elevated rocky land.

It is anticipated that aerial agriculture may be utilised on the plains where cropping activities are undertaken. The location of wind turbine generators, which are generally on elevated land along or adjacent the ridgelines, are therefore unlikely to adversely impact on aerial application on the cropping and grazing land to the east and west. Areas further south of the wind farm site and particularly those used for more intensive agriculture and horticulture within the Barossa Council area may also periodically utilise aerial agriculture applications. It is considered that the separation distance from these land uses and the wind farm will limit any potential interference.

Fixed wing aerial agriculture aircraft are utilised in aerial bushfire fighting throughout the State and were recently utilised in the locality of the wind farm, namely the area affected by the Pinery fires. Concerns are sometimes raised that installation of wind turbine generators limit the capacity of aerial fire fighting.

The CFS have a factsheet on the aerial fire-fighting[7], which discusses conditions and limitations to aerial fire-fighting, of which a wind turbine generator is only one obstruction to be considered. The factsheet notes that in some circumstances aircraft will not be utilised because risks caused by vertical obstructions exceed safe operating conditions. The factsheet notes that "*deployment of aircraft to any fire is made after consideration of many variable, risks, aircraft suitability and aircraft availability*" and is undertaken on a dynamic risk assessment basis.

It is noted that the provisions of the Development Plans do not specifically require aerial fire-fighting to be assessed. However, it is understood that RES Australia consultant (SA Bushfire Solutions) has endeavoured to consult, and will continue to engage with the CFS in relation to the proposed wind farm, and the preparation of a bushfire management plan as part of the operational procedures during the construction and operational phases of the wind farm and energy storage project.

On balance, given the land use pattern of the locality, the minimal use of aerial agriculture in the area and/or suitable separation from land uses that may use aerial agriculture application, it is unlikely the wind farm would adversely impact on aerial application for agriculture purposes. The impact of any wind farm on the future use of fixed wing aircraft for aerial fire-fighting is a matter for dynamic risk assessment at the time by the CFS.

### 6.6.2 Hours of Operation

There are two elements of the wind farm to consider in assessing the impact of the hours of operation on adjoining land uses and the amenity of owners and occupiers of land, firstly the construction phase and secondly the operational phase.

The construction phase of the project will occur over an 18 month to two year period. During this time, there will be considerable activity throughout the development site, involving extensive vehicle movements, construction of the turbines, operation and maintenance facilities, temporary laydown/ storage facilities, temporary concrete batching plant, access tracks and upgrading of public roads. This construction phase will be undertaken in accordance with relevant legislation, particularly the *Environment Protection Act 1993* to manage a range of potential environmental impacts, including noise, vibration and dust.

A draft Construction Environmental Management Plan (CEMP) is incorporated in the application documents, which contains a range of management practices in relation to the construction phase of the project. The draft CEMP indicates that operating hours of the plant during the construction phase will be limited to 7.00 am to 7.00 pm Monday to Saturday, with no work to occur on Sundays or public holidays without prior approval from the EPA/Council (subject to qualifications in the approved CEMP).

[7] South Australian CFS Factsheet – Understanding Aerial Fire-Fighting.

During the construction period of the wind farm, the proposal includes temporary laydown/storage and construction facilities. The location of these facilities will mean increased traffic around the area on local roads, and potential for noise and dust associated with these activities. There may be some adverse impact on the amenity of the non-stakeholder dwellings in the locality and the broader community. However, these impacts will be minimised by the short period of time in which they will be used (up to two years), and suitable management of these facilities in accordance with EPA legislation and the Construction Management Plans.

It is noted that one of the temporary construction facilities could incorporate a temporary concrete batching plant during the construction phase. Suitable separation distances are provided (a minimum of 200 metres for noise, in accordance with the EPA Guidelines for Separation Distances December 2007) between the batching plant and the nearest non-stakeholder dwelling. The separation distance between this temporary batching plant and the nearest residence (House 122) is in excess of 2.0 kilometres. The potential impacts on the adjoining dwelling and properties within the locality will be managed by a final Construction Environmental Management Plan, and in accordance with EPA legislation and license conditions.

Development of 275kV transmission lines adjacent to, or within the road reserves, which link the on-site substation to the terminal substation are likely to be viewed as an additional visual element in the landscape rather than a new element. Given the new overhead transmission lines would be viewed against the background of the hills and that this form of electricity infrastructure is commonplace in the wider locality, it is not considered this infrastructure will unreasonably affect the amenity of people living within the locality.

It is acknowledged that there may be some short-term impact on the amenity of owners and occupiers of land during the construction phase of the wind farm and energy storage project. However, the development does not preclude the envisaged land uses within the Primary Production and Rural Zones continuing. In this regard, the development satisfies the intent of the relevant objectives and principles of development control - Interface Between Land Uses and Renewable Energy facilities.

Post construction and during the operational phase of the wind farm, the wind turbine generators will operate 24 hours per day, seven days per week when wind conditions are conducive to the generation of electricity within the parameters of the selected wind turbine generator. Similarly, the battery energy storage facilities will operate continuously and be utilised to provide electricity to the grid as required and in accordance with its service/license conditions. Other than the visibility of the wind turbine generators and ancillary infrastructure, the potential impacts of continuous operation of the wind farm and energy storage facility on the locality are considered to be noise and lighting.

As discussed previously, there is no need for obstacle limitation lighting on the turbines. Furthermore, the acoustic assessment concludes that the noise levels from the wind farm will be compliant, and therefore the hours of operation are not a significant impediment to the ongoing use of adjoining land.

### 6.6.4 Mining

The Development Plans contain specific provisions relating to the protection of mineral reserves.

Two former mines are located within the site of the development, namely Benita Copper and Newlands Barite. A further mine, Julia Creek Barite, is located close to the eastern boundary of the site. Each of these mines are abandoned. The civil, geology and hydrology assessment undertaken by AECOM which forms part of the application documents contains further descriptions of these mines. Given the mines are abandoned, there is no likelihood of the proposed development having an adverse impact on mining exploration. Should mining exploration or any future mining activities occur, it is considered that they could co-exist, as they are not considered incompatible, thereby addressing the intent of the objective of the Development Plan relating to mining.

The civil, geology and hydrology assessment discusses the opportunity for the development site to accommodate borrow pits. The borrow pits that are suitable for producing aggregate for unsealed road construction could be sited within the majority of the main geological units (Yerelina siltstone/sandstone, Tarcowie siltstone and Pepuarta tillite). This report also notes that due to the higher quality demands on concrete aggregate, it is expected that off-site sources of concrete will be used.

Light Regional Council Development Plan contains a specific provision relating to borrow pits for road making (PDC 17 – General Section, Mineral Extraction). The exact location of the borrow pits are yet to be determined as these potential sources need to be laboratory tested to ensure they are of appropriate quality. Determination of the location of the borrow pits is likely to occur at the time of a construction contract being granted. Management of these borrow pits and their rehabilitation will be part of the CEMP. Given the separation of the development site (excluding transmission line and terminal substation) from any arterial road, it is unlikely the borrow pit will be visible.

**LDP PDC 17** **Borrow pits for road making materials should:**

**(a)** **be sited so as to cause the minimum effect on their surroundings; and**
**(b)** **not be located on land visible from arterial or scenic roads as shown on *Overlay Maps - Transport.***

### 6.6.5 Tourism Development

Tourist accommodation facilities within the locality of the proposed development are those generally contained within the townships of Kapunda, Eudunda and Truro. There are no known tourist accommodation facilities within 1,000 metres of a wind turbine generator. This separation is sought by the Renewable Energy (LDP and GDP PDC 2 and 4, and Mid Murray PDC 396 and 398) provisions to minimise visual impact and an appropriate separation to minimise unacceptable risk.

**PDC** **The visual impacts of wind farms and ancillary development (such as substations, maintenance sheds, access roads and wind monitoring masts) should be managed through:**

**(a)** **wind turbine generators being:**

**(i) setback at least 1000 metres from non-associated (non-stakeholder) dwellings and tourist accommodation; ...**

**PDC Wind turbine generators should be setback from dwellings, tourist accommodation and frequently visited public places (such as viewing platforms) a distance that will ensure that failure does not present an unacceptable risk to safety.**

## 6.7 Interference with Telecommunications and Electromagnetic Radiation

The potential for telecommunications interference associated with the development has been assessed by DNV GL Australia Pty Ltd (DNV GL) in the EMI Assessment report, which forms part of the application documents. The Interface Between Land Uses PDC LDP and GDP PDC 1, and MMDP PDC 87, seeks to ensure that development does not detrimentally affect the amenity of the locality through electrical interference.

Renewable Energy LDP and GDP PDC 3(c), and MMDP PDC 397(c) specifically relates to wind farms and requires that they should avoid or minimise interference with television and radio signals, and geographic positioning systems on nearby property owners/occupiers and road users.

**Interface Between Land Uses**

**PDC Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following: ...**

**(d) electrical interference; ...**

**Renewable Energy**

**PDC Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife:**

**(c) interference with television and radio signals and geographic positioning systems; ...**

As stated in EMI Assessment Report (Section 5), *"if not properly designed, wind farms have the potential to interfere with radiocommunications services. Two services that are most likely to be affected include television broadcast signals and fixed point-to-point microwave signals. Terrestrial broadcast signals are commonly used to transmit domestic television, while microwave links are used for line-of-sight connections for data, voice and video. The interference mechanisms are different for each of these and, hence, there are different ways to avoid interference".*

Constraints relating to potential interference with various communication networks were identified during the initial investigation and design phase of the project. The mapping incorporated in the development application illustrates the EMI exclusion areas and illustrates that the wind farm has been designed to avoid EMI exclusion areas.

The EMI assessment has found that the project has the potential to cause interference to digital television signals received at dwellings in the vicinity, and FM radio broadcasts to the west and north-west of the project. Potential EMI impacts on other services considered in the assessment, including meteorological radar, trigonometrical stations, CB radio and mobile phones, are either considered to be minor or have been assessed through consultation with the service operators.

The EMI report provides several mitigation options in the event of television interference (Section 5.14.5), including:

- *realigning the householder's television antenna more directly towards their existing transmitter;*
- *tuning the householder's antenna into alternative sources of the same television signal or a substitute signal;*
- *installing a more directional and/or higher gain antenna at the affected house;*
- *relocating the antenna to a less affected position;*
- *installing cable or satellite television at the affected house; and*
- *installing a television relay station.*

The EMI Assessment report (Section 5.13.2) proposes that "*if interference to FM radio signals is experienced, mitigation options include installing high-quality antennas and/or amplifiers at affected residences, increasing the broadcast signal strength from the Kapunda transmitting tower or the nearby Maitland or Hallett towers, moving the Kapunda tower to a new location more than 4 km from any turbine, or installing a signal repeater on the opposite side of the project*".

It is noted that the National Health and Medical Research Council (NHMRC) Information Paper – Evidence on Wind Farms and Human Health has investigated the health impacts of electromagnetic radiation from wind farms, and states (Page 2):

- *there is no direct evidence from which to draw any conclusions on an association between electromagnetic radiation produced by wind farms and health effects.*
- *extremely low-frequency electromagnetic radiation is the only potentially important electromagnetic emission from wind farms that might be relevant to health.*
- *limited evidence suggests that the level of extremely low-frequency electromagnetic radiation close to wind farms is less than average levels measured inside and outside suburban homes.*

- *there is no consistent evidence of human health effects from exposure to other sources of extremely low-frequency electromagnetic radiation at much higher levels than are present near wind farms.*

Based on information available, it is considered that the wind farm will have minimal adverse impact on telecommunications within the locality, and should interference occur, appropriate methods of mitigation are available. There is no evidence that electromagnetic radiation adversely impacts on human health. It is considered that the relevant provisions of the Development Plans requiring minimisation of potential interference are suitably addressed in the proposal.

## 6.8 Impact on Flora and Fauna

The Renewable Energy Facilities section of the Development Plans seeks the development of renewable energy facilities in appropriate locations, with those facilities sited, designed and operated in such a manner as to avoid or minimise adverse impacts on native vegetation, conservation, the natural environment, geological or natural heritage significance and wildlife (LDP and GDP Objective 3 and PDC 3, and MMDP Objective 101 and PDC 396).

**Renewable Energy**

**Objective:** **Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.**

**PDC** **Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife:**

**...**
**(e)** **modification of vegetation, soils and habitats;**
**(f)** **striking of birds and bats.**

In addition to the Renewable Energy provisions, there are provisions within the Primary Production and Rural Zones of each of the three Development Plans seeking to protect native vegetation, natural environments and landscape character. These provisions include:

**Light Regional Council Development Plan**

**Primary Production – Desired Character Statement**

**Preservation of rural and landscape character with farming on large properties, designated areas for horticulture, limited additional dwellings, minimal non-agricultural development and retention of natural vegetation.**

**Preservation of the extensive dune fields of sand and associated vegetation located in the vicinity of Ward Belt.**

**Protection of the Light, North Para and Gawler Rivers from incompatible development and pollution, and their recognition as natural resources of significant value to the district as a pleasant rural contrast to the surrounding countryside and a permanent supply of fresh water.**

**Primary Production – Objectives**

**Objective 4:** **Protection of primary production from encroachment by incompatible land uses and protection of scenic qualities of rural landscapes.**

**Primary Production - Form and Character**

**PDC 10** **Development should not occur within 500 metres of a national park, conservation park, wilderness protection area or significant stands of native vegetation if it will increase the potential for, or result in, the spread of pest plants.**

**PDC 13** **Native vegetation, including the full range of tree, understorey and groundcover species, should be retained and managed so as to maintain and enhance its environmental values and functions, including conservation, biodiversity and habitat, and minimisation of dry land salinity.**

**<u>Goyder Council Development Plan</u>**

**Primary Production Zone – Desired Character Statement**

**... Land of conservation and biodiversity significance will be protected from incompatible primary production activities ...**

**... The open rural landscape is the dominant character element and new development will maintain that character ...**

**Primary Production – Objectives**

**Objective 3:** **Protection of primary production from encroachment by incompatible land uses and protection of scenic qualities of rural landscapes.**

**Primary Production - Form and Character**

**PDC 12** **Development should not occur within 500 metres of a national park, conservation park, wilderness protection area or significant stands of native vegetation if it will increase the potential for, or result in, the spread of pest plants.**

**<u>Mid Murray Council Development Plan</u>**

**Rural Zone - Desired Character Statement**

**... The zone encompasses the eastern face of the Mount Lofty Ranges which contributes significantly to the district's visual qualities. The location and design of development on the hills face is therefore a matter of importance, as is the retention of remnant bushland and native vegetation for aesthetic and conservation purposes.**

**Rural Zone - Vegetation and Landscape Character**

**Objective 5:** **Retention and maintenance of wetlands and existing native vegetation for its conservation, biodiversity, and habitat value and environmental management function.**

**Objective 6:** **Maintenance and enhancement of the landscape character.**

**Rural Zone - Landscape**

**PDC 4 Development should be designed and sited to respect and maintain the landscape character of an area which is of:**

**(a) historical (including archaeological) significance;**
**(b) scientific interest;**
**(c) scenic value or natural beauty;**
**(d) other heritage significance; or**
**(e) conservation significance.**

The Development Plans contain extensive provisions (some of which are quoted below) under the headings of Natural Resources which relate to the retention, maintenance, preservation and protection of flora and fauna.

**Natural Resources**

**LDP and GDP Objective 1, MMDP Objective 62**

**Objective: Native flora, fauna and ecosystems protected, retained, conserved and restored.**

**LDP and GDP Objective 2, MMDP Objective 56**

**Objective: Protection of the quality, quantity of South Australia's surface waters, including inland, riverine and underground waters.**

**LDP and GDP Objective 3, MMDP Objective 57**

**Objective: The ecologically sustainable use of natural resources including soil and water resources (including underground water, surface water and watercourses as defined in the current Environment Protection (Water Quality) Policy).**

**LDP and GDP Objective 9, MMDP Objective 63**

**Objective: Restoration, expansion and linking of existing native vegetation to facilitate habitat corridors for ease of movement of fauna.**

**LDP and GDP Objective 10, MMDP Objective 64**

**Objective: Minimal disturbance and modification of the natural landform.**

**LDP and GDP Objective 12, MMDP Objective 66**

**Objective: Protection of areas prone to erosion or other land degradation processes from inappropriate development.**

**LDP and GDP PDC 1, MMDP PDC 172**

**PDC Development should be undertaken with minimum impact on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas.**

**LDP and GDP PDC 2, MMDP PDC 173**

**PDC Development should ensure that South Australia's natural assets, such as biodiversity, water and soil, are protected and enhanced.**

**LDP and GDP PDC 3, MMDP PDC 174**

**PDC Development should not significantly obstruct or adversely affect sensitive ecological areas such as creeks and wetlands.**

**LDP and GDP PDC 4, MMDP PDC 175**

**PDC Development should be appropriate to land capability and the protection and conservation of water resources and biodiversity.**

**Biodiversity and Native Vegetation**

**LDP 32, GDP PDC 30, MMDP PDC 202**

**PDC Development should retain existing areas of native vegetation and where possible contribute to revegetation using locally indigenous plant species.**

**LDP 33**

**PDC Development should be designed and sited to minimise the loss and disturbance of native flora and fauna.**

**GDP PDC 31, MMDP PDC 203**

**PDC Development should be designed and sited to minimise the loss and disturbance of native flora and fauna, including riparian and riverine animals and plants, and their breeding grounds and habitats.**

**LDP PDC 34, GDP PDC 32, MMDP PDC 204**

**PDC Native vegetation should be conserved and its conservation value and function not compromised by development if the native vegetation does any of the following:**

- **(a) provides an important habitat for wildlife or shade and shelter for livestock;**
- **(b) has a high plant species diversity or includes rare, vulnerable or endangered plant species or plant associations and communities;**
- **(c) provides an important seed bank for locally indigenous vegetation;**
- **(d) has high amenity value and/or significantly contributes to the landscape quality of an area, including the screening of buildings and unsightly views;**
- **(e) has high value as a remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture; and**
- **(f) is growing in, or is characteristically associated with a wetland environment.**

**LDP PDC 35, GDP PDC 33, MMDP PDC 205**

**PDC Native vegetation should not be cleared if such clearing is likely to lead to, cause or exacerbate any of the following:**

- **(a) erosion or sediment within water catchments;**
- **(b) decreased soil stability;**
- **(c) soil or land slip;**
- **(d) deterioration in the quality of water in a watercourse or surface water runoff;**
- **(e) a local or regional salinity problem; and**
- **(f) the occurrence or intensity of local or regional flooding.**

**LDP PDC 36**

**PDC Development should not destroy or impair the growth of:**

- **(a) native vegetation stands between Nain and the Belvidere survey beacon;**
- **(b) significant roadside vegetation across the district; and**
- **(c) native vegetation along watercourses.**

**LDP PDC 37, GDP PDC 34, MMDP PDC 206**

**PDC Development that proposes the clearance of native vegetation should address or consider the implications that removing the native vegetation will have on the following:**

- **(a) provision for linkages and wildlife corridors between significant areas of native vegetation;**
- **(b) erosion along watercourses and the filtering of suspended solids and nutrients from run-off;**
- **(c) the amenity of the locality; and**
- **(d) bushfire safety.**

**LDP PDC 38, GDP PDC 35, MMDP PDC 207**

**PDC Where native vegetation is to be removed, it should be replaced in a suitable location on the site with locally indigenous vegetation to ensure that there is not a net loss of native vegetation and biodiversity.**

**LDP PDC 39, GDP PDC 36, MMDP PDC 208**

**PDC Development should be located and occur in a manner which:**

- **(a) does not increase the potential for, or result in, the spread of pest plants, or the spread of any non-indigenous plants into areas of native vegetation or a conservation zone;**
- **(b) avoids the degradation of remnant native vegetation by any other means including as a result of spray drift, compaction of soil, modification of surface water flows, pollution to groundwater or surface water or change to groundwater levels; and**
- **(c) incorporates a separation distance and/or buffer area to protect wildlife habitats and other features of nature conservation significance.**

EBS Ecology (EBS) was engaged by RES Australia to assess the potential flora and fauna constraints for the proposed Twin Creek Wind Farm and Energy Storage project. The findings and recommendations made by EBS are contained in the 'Twin Creek Wind Farm Flora and Fauna Assessment Report' included in the application documents.

In discussing the impacts of the wind farm and energy storage project on the locality, it is noted that RES Australia have made several revisions of the wind turbine generators and infrastructure layout in response to recommendations of EBS Ecology.

The constraints map (Figure 9 – Design Response) included in the development application documents incorporate exclusion zones/areas around:

- nationally threatened ecological communities (or potential threatened ecological communities), including the Pygmy Blue-Tongue Lizard, Iron-Grass (*Lomandra spp*) and Peppermint Box (*Eucalyptus odorata*); and
- known Wedge-Tailed Eagle nests - 500 metre buffer applied for placement of turbines.

EBS Ecology recommends that the following sensitive areas should be avoided where possible:

- 500 metres of known nests of Wedge-Tailed Eagles;
- areas suitable to Pygmy Blue-Tongue Lizards;
- scattered woodland habitats;
- areas of Peppermint Box woodland;
- areas of Lomandra grasslands;
- areas of native vegetation with higher offset rating;
- significant roadside sites such as *Eucalyptus behriana* along Dutton Road; and
- scattered trees (including dead trees).

Where possible, avoidance of native vegetation has been embedded into the wind farm design, as shown on Figure 3 – Site and Context Analysis Plan and Figure 9 – Design Response (Volume 3 plans of application document). These plans illustrate the infrastructure being located to avoid, as far as practicable, areas of sensitive vegetation and fauna habitat. Where complete avoidance of native vegetation is not possible, RES Australia will endeavour to minimise the level of impact on native flora and fauna through micro-siting of infrastructure. Figure 10 – Micro-Siting Drawing, illustrates the turbine micro-siting area within the infrastructure zone. Some of the turbines micro-siting area is illustrated in an odd shape and this reflects the intent to avoid particular sensitive areas. RES Australia is committed to utilising existing access tracks and will avoid clearing individual trees, where possible.

The provisions of the Development Plans seek that impacts on flora, fauna and native vegetation, watercourses and the natural environment generally are minimised. As outlined in the EBS report, the design and siting of elements of the wind farm has addressed several of the environmental constraints of the site. The constraints are readily identified and addressed in the application plans.

Having reviewed the EBS Flora and Fauna Assessment report and the design layout of the infrastructure, it is considered that the proposal suitably minimises impacts on the natural environment in the manner discussed below.

### 6.8.1 Native Vegetation

The provisions of the Development Plans seek to protect native vegetation from clearance. However, there is recognition that if native vegetation must be cleared, it should be replaced in suitable locations on the site with locally indigenous vegetation, to ensure there is no net loss of native vegetation and biodiversity. A detailed analysis of native vegetation has been undertaken by EBS Ecology. Based on this analysis, the proposal minimises its effect on biodiversity, for the following reasons:

- the majority of wind turbine generators are in degraded areas of grassland;
- infrastructure ancillary to the wind farm and energy storage facilities are in degraded areas of grassland;
- intact native vegetation has been avoided in the layout of the wind farm and energy storage facilities; and
- the vegetation communities assessed in best condition (SEB scoring 6:1) within the development site are outside of the infrastructure zone, that is, will not accommodate wind turbine generators or associated infrastructure.

RES Australia are aware of their responsibilities under the *Native Vegetation Act 1991* to provide offsets for cleared vegetation. Several areas within the development site have been identified as potential offset areas to achieve significant environmental benefit (SEB). The extent and location of offsets will be confirmed as part of the Native Vegetation Clearance application and approval.

### 6.8.2 Flora and Fauna

Conservation of flora and fauna is promoted in the Development Plans. The design and siting of the wind farm seeks to minimise impacts on flora and fauna by retaining habitat, and establishing exclusion or buffer areas for various species.

There is extensive discussion in the EBS Ecology report in relation to specific flora and fauna, with the following noted:

- impact on Pygmy Blue-Tongue Lizards (PBTL) can be mitigated by:
    - utilising cropping areas as much as possible for wind turbine generators, infrastructure areas and access tracks;
    - micro-site infrastructure, including the transmission line around PBTL habitat;

- a translocation of PBTL from areas of less suitability is being recommended to increase the number of turbines being installed and reduce potential impacts on PBTL;

- woodland areas and scattered trees are important for the survival of many mammals, birds, reptiles and invertebrates;

- most of the bat species likely to occur within the development site forage within and around woodland vegetation. Interaction between such bat species and turbines can be reduced by implementing a buffer between turbines and wooded habitats; and

- a minimum 500 metre buffer is incorporated between turbines and Wedge-Tailed Eagles nest sites to minimise the likelihood of disturbance to nest sites and to individual birds.

Based on the conclusions reached by EBS Ecology, and the careful design and layout of the infrastructure, the proposal satisfactorily addresses the provisions of the Development Plan which seek to retain habitat and incorporate buffers to protect habitats.

### 6.8.3 Pest Plant Management

Provisions of the Development Plan state that development should not increase the potential for, or result in, the spread of pest plants. Management of weed species during construction and in the operational phase is incorporated in the Draft Construction Environmental Management Plan, which forms part of the application documents.

### 6.8.4 Flora and Fauna Summary

The proposed wind farm and energy storage project (including the transmission line) will require some clearance of native vegetation, however the majority of this clearance is vegetation of poor quality. Potential opportunities have already been identified for revegetation to achieve a significant environmental benefit to the development site and on this basis, the clearance of some native vegetation is not considered fatal to the proposal.

Furthermore, suitable buffers have been included around nesting sites of Wedge-Tailed Eagles to minimise disturbance to these species. RES Australia has incorporated a range of commitments in the development application which relate to managing and minimising impacts on the natural environment, particularly in the process of final design and placement of infrastructure, and during the construction phase. On balance, it is considered that the proposal adequately addresses the extensive provisions in the Development Plans in relation to conservation of the natural environment.

## 6.9 Water Resources and Water Quality

There are several watercourses within the wind farm development site, predominantly fed by rainfall and the majority are ephemeral.

An assessment of the hydrology of the development site has been undertaken by AECOM's Civil, Geology, Geotechnical and Hydrology Assessment, which forms part of the application documents. This report summarises the regional hydrology (Section 5.2) as:

> *Watercourses within the site area are predominantly fed by rainfall and are ephemeral, ceasing to flow in dry weather. The Light River flows along the western boundary of the site, entering from the north western corner and leaving at the south western corner. The Light River has a catchment of approximately 1820 km2. The majority of the catchment is used for dryland agriculture, with cereal and canola crops as well as livestock grazing.*
>
> *Freshwater Creek enters the site in the north eastern area, flows in a south westerly direction through the site and contributes the Light River approximately halfway along the western boundary of the site. The catchment for Freshwater Creek is approximately 34.66 km2 in size with approximately 20 km2 of the catchment within the site boundary. Spring Creek originates in the south east area of the site, flows west and contributes to the Light River just outside the south west corner of the site. The catchment for Spring Creek is approximately 9.26 km2.*
>
> *Other watercourses within the site originate from the ridge on the eastern side of the site and flow through naturally occurring valleys before contributing to the Light River, or Freshwater Creek or Spring Creek. The watercourses throughout the site have catchment sizes ranging from 1 km2 to over 30 km2 for Freshwater Creek.*
>
> *Some small farm dams were noted during the site visit as well as on topographical maps, which will capture some runoff.*

Due to the topography of the site, some access tracks and electricity infrastructure may cross watercourses. As part of the design, crossing of watercourses has been minimised, given difficulties created for manoeuvring of large vehicles and/or the desire to minimise additional physical infrastructure. Any crossing of a watercourse required to implement the project will be the subject of detailed design and addressed in the final CEMP.

The provisions in the general section of the Development Plans which relate to water quality, soil erosion, sloping land, water sensitive design and stormwater management, include:

> **Natural Resources – LDP and GDP Objectives 3, 4, 5, 6 and 7 and MMDP 57, 58, 59, 60 and 61**
>
> | | |
> |---|---|
> | **Objective:** | **The ecologically sustainable use of natural resources including soil and water resources (including underground water, surface water and watercourses as defined in the current Environment Protection (Water Quality) Policy).** |
> | **Objective:** | **Natural hydrological systems and environmental flows reinstated, and maintained and enhanced.** |
> | **Objective:** | **Development consistent with the principles of water sensitive design.** |

**Objective:** **Development sited and designed to:**

- **(a) protect natural ecological systems;**
- **(b) achieve the sustainable use of water;**
- **(c) protect water quality, including receiving waters;**
- **(d) reduce runoff and peak flows and prevent the risk of downstream flooding;**
- **(e) minimise demand on reticulated water supplies;**
- **(f) maximise the harvest and use of stormwater; and**
- **(g) protect stormwater from pollution sources.**

**Objective:** **Storage and use of stormwater which avoids adverse impact on public health and safety.**

**Natural Resources - LDP and GDP PDC's 3, 5 – 10, LDP PDC 14, GDP 17 and MMDP 174, 176- 180, and 188**

**PDC** **Development should not significantly obstruct or adversely affect sensitive ecological areas such as creeks and wetlands.**

**PDC** **Development should be designed to maximise conservation, minimise consumption and encourage re-use of water resources.**

**PDC** **Development should not take place if it results in unsustainable use of surface or underground water resources.**

**PDC** **Development should be sited and designed to:**

- **(a) capture and re-use stormwater, where practical;**
- **(b) minimise surface water runoff;**
- **(c) prevent soil erosion and water pollution;**
- **(d) protect and enhance natural water flows;**
- **(e) protect water quality by providing adequate separation distances from watercourses and other water bodies;**
- **(f) not contribute to an increase in salinity levels;**
- **(g) avoid the water logging of soil or the release of toxic elements;**
- **(h) maintain natural hydrological systems and not adversely affect:**
  - **(i) the quantity and quality of groundwater;**
  - **(ii) the depth and directional flow of groundwater; and**
  - **(iii) the quality and function of natural springs.**

**PDC** **Water discharged from a development site should:**

- **(a) be of a physical, chemical and biological condition equivalent to or better than its pre-developed state; and**
- **(b) not exceed the rate of discharge from the site as it existed in pre-development conditions.**

**PDC** **Development should include stormwater management systems to protect it from damage during a minimum of a 1-in-100 year average return interval flood.**

**PDC** **Development should have adequate provision to control any stormwater over-flow runoff from the site and should be sited and designed to improve the quality of stormwater and minimise pollutant transfer to receiving waters.**

**PDC Stormwater management systems should:**

**(a) maximise the potential for stormwater harvesting and re-use, either on-site or as close as practicable to the source;**
**(b) utilise, but not be limited to, one or more of the following harvesting methods:**

**(i) the collection of roof water in tanks;**
**(ii) the discharge to open space, landscaping or garden areas, including strips adjacent to car parks;**
**(iii) the incorporation of detention and retention facilities;**
**(iv) aquifer recharge.**

Once operational, the wind farm is unlikely to have adverse impacts on the watercourses within or downstream of the site of the development. The nature of the development does not require extraction of water, nor create waste in a manner that would adversely affect the natural systems of the watercourses. The exclusion to this is the operation and maintenance facilities that will require collection, use and disposal of wastewater. The plans which accompany the development application show an indicative layout of the operations and maintenance facilities, which includes on-site stormwater disposal.

It is anticipated that these facilities will be self-sufficient and not generate off-site impacts. The final design and layout, including on-site water collection and disposal, will be subject to further design and provided to the planning authority as part of the Building Rules Consent process. Detailed design of these facilities will be undertaken in accordance with the principles of water sensitive design and in accordance with the Construction Environmental Management Plan, a draft of which forms part of the application documents.

The construction of the wind farm has the potential to create impacts on watercourses and groundwater by erosion and landslip, through the earthworks associated with constructing or upgrading of access tracks, footings for the turbines, and site development for both temporary and permanent operation, and maintenance facilities. In addition, the temporary concrete batching plants with the construction facilities would require disposal of wastewater.

Water utilised during the construction phase may be sourced from the aquifer, however this will be subject to approval through other legislation. The option also exists to obtain water from an external source, and transport and store it within the construction facilities.

In order to protect watercourses, groundwater and the landform during the construction phase, the draft Construction Environmental Management Plan incorporates a number of practices, which include:

- utilising existing access tracks wherever practical;
- minimising vegetation clearance;
- retention of all contaminated stormwater and process wastewater on-site;
- locate stockpiles away from drainage lines and in areas least susceptible to wind erosion;

- effectively control surface runoff entering and leaving the site;
- design of crossing of watercourses in consultation with relevant authorities;
- truck and wheel wash facilities to be provided at exit points;
- all equipment wash down to be undertaken within an identified wash down area and contained within that area;
- the refuelling of vehicles or equipment shall not be conducted within 30 metres of a water body, watercourse or drainage channel; and
- all construction activities to be undertaken in accordance with the EPA Stormwater Pollution Prevention – Code of Practice for the Building and Construction Industry.

There will be a low risk of detrimental effect on water quality during construction, provided that work complies with a Construction Environment Management Plan (CEMP) incorporating a Soil Erosion and Drainage Management Plan for each element of the development. Potential impacts on natural features due to erosion and landslip can be minimised through appropriate management, utilising techniques already outlined in the draft CEMP.

## 6.10 Sloping Land and Soil Erosion

The site of the development contains numerous ridgelines and valleys. To construct the wind farm a number of these ridgelines will be accessed by new or upgraded existing access tracks.

Soil erosion and slope stability is discussed in AECOM's Civil, Geology, Geotechnical and Hydrology Assessment, which forms part of the application documents. As stated below, this report summarises the slope stability and erosion (Section 7.3, 7.5 and 7.6) as:

> *Slope Stability*
>
> *No evidence of significant existing landslides was observed at the site during this study, however, slope stability assessment was beyond the scope of the current study.*
>
> *If significant thicknesses of new cuts or fills are required for access road construction, the stability of such earthworks must be assessed.*
>
> *The stability of turbine footings in close proximity to steep slopes must also be assessed, particularly where the rock mass is highly fractured or has unfavourably orientated defects.*

*Erosion*

*Considerable erosion of the relatively thin soil cover was observed across the site, especially adjacent to creeks. The soil erosion had resulted in the accumulation of significant quantities of sediment in some creek beds.*

*Any new excavations that expose the soil profile must be provided with protection from erosion, and mitigation measures such as silt fences may be required down gradient of active earthworks areas to avoid fouling the natural creeks.*

*Future Geotechnical Investigations*

*A staged approach to future geotechnical investigations is recommended, with initial test pitting recommended at each turbine location to assess the near-surface rock strength, weathering, fracture spacing and the orientation of the main rock defects at each proposed turbine site. Similar investigations at key points along proposed access road tracks and at the proposed substation site should also be performed.*

The Natural Resources provisions of the Development Plans, along with the provisions relating to sloping land, seek to prevent erosion and landslip, whilst minimises visual impacts, as stated below:

**Natural Resources – Soil Conservation LDP PDC's 44-47, GDP 40 -43, MMDP 212-215**

**PDC Development should not have an adverse impact on the natural, physical, chemical or biological quality and characteristics of soil resources.**

**PDC Development should be designed and sited to prevent erosion.**

**PDC Development should take place in a manner that will minimise alteration to the existing landform.**

**PDC Development should minimise the loss of soil from a site through soil erosion or siltation during the construction phase of any development and following the commencement of an activity.**

**Sloping Land – LDP and GDP – Objective 1, MMDP 96**

**Objective: Development on sloping land designed to minimise environmental and visual impacts and protect soil stability and water quality.**

**Sloping Land – LDP and GDP PDC's 1-5 and MMDP PDC's 380-384**

**PDC Development and associated driveways and access tracks should be sited and designed to integrate with the natural topography of the land and minimise the need for earthworks.**

**PDC Development and associated driveways and access tracks, including related earthworks, should be sited, designed and undertaken in a manner that:**

**(a) minimises their visual impact;**
**(b) reduces the bulk of the buildings and structures;**

**(c) minimises the extent of excavation and fill;**
**(d) minimises the need for, and the height of, retaining walls;**
**(e) does not cause or contribute to instability of any embankment or cutting;**
**(f) avoids the silting of watercourses;**
**(g) protects development and its surrounds from erosion caused by water run-off;**
**(h) incorporates roof lines which complement the natural slope of the land (refer to the figure below*):**
***(note figures not included in this extract)**

**PDC Driveways and access tracks across sloping land should be accessible and have a safe, all-weather trafficable surface.**

**PDC Development sites should not be at risk of landslip.**

**PDC Development on steep land should include site drainage systems to minimise erosion and avoid adverse impacts on slope stability.**

The Development Plan requires development on sloping land to minimise environmental and visual impact, and protect soil stability and water quality. As discussed above, addressing soil erosion and maintaining water quality are matters to be addressed during construction and can be adequately managed by practices outlined in the CEMP.

As outlined in the draft CEMP and discussed in the civil engineering report accompanying the application, access tracks will align with existing tracks wherever possible, minimise the clearance of native vegetation, and avoid areas of higher native vegetation, control stormwater discharge, be constructed of gravelled surfaces, and be reduced in width from 9.0 metres to 10 metres, to 5.5 metres to 7.0 metres post construction.

The WAX Design report (Section 5.12) discusses the impact of access tracks in the visual assessment of the proposed wind farm and notes that "*while the proposed tracks will appear as new development post construction, they do not appear out of character with the wider rural landscape. The track surface will be crushed rock sourced either on site or from a local supplier. Overtime, the track material is likely to dull and weather naturally which will reduce the associated visual effect. … the visual effect of the track is described as negligible and will diminish over time*".

Earthworks are a significant component of the construction of the wind farm, both in terms of access tracks and turbine construction. It is acknowledged that during the construction of the wind farm appropriate management will need to be in place to minimise the impact on sloping land. These practices, in draft form, are contained in the CEMP that accompanies the application documents and address the intent of the provisions of the Development Plan to minimise environmental harm.

## 6.11 Air Quality

The potential impacts on air quality are generally those associated with the construction phase of the project, particularly movement of vehicles and earthworks required in constructing access tracks, trenching and preparing each wind turbine site, which is likely to create a risk of causing a dust nuisance.

Minimisation of dust during the construction phase is addressed in the draft Construction Environmental Management Plan (CEMP) and the need to undertake the development pursuant to the developers' duty of care under the *Environment Protection Act 1993,* and relevant EPA policies and guidelines.

In addition, a Construction Traffic Management Plan will be prepared prior to construction to identify the route for vehicles and any specific mitigation required, ie management of potential fugitive material during transportation, operation of equipment to control exhaust emissions and a procedure for complaints. Mitigation methods identified to date include identification of routes to avoid (wherever possible) residential land uses, all vehicles and equipment will be operated and maintained to comply with regulatory standards for exhaust emissions, construction site roads watered down, spray down with water pavement materials and aggregates before transporting, and covering any loads of dust generating or odorous materials entering or leaving site. These practices are satisfactory in meeting the intent of the Development Plans in relation to minimising nuisance in relation to air quality.

**Interface Between Land Uses – LDP and GDP PDC 1(a) and MMDP 87(a)**

**PDC 1 Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following:**

**(a) the emission of effluent, odour, smoke, fumes, dust or other airborne pollutants;**

**Interface Between Land Uses – LDP Air Quality – LDP PDC 14**

**PDC 14 Development with the potential to emit harmful or nuisance-generating air pollution should incorporate air pollution control measures to prevent harm to human health or unreasonable interference with the amenity of sensitive uses within the locality.**

**MMDP - Rural Zone**

**Objective 15: Prevention of environmental nuisance or harm resulting from odour and other airborne particles.**

**PDC 15 Development should have regard to the possible impacts in terms of air quality both in terms of odour and air borne particles (eg dust) on:**

**(a) horticulture and viticulture;**
**(b) residential and tourist accommodation; and**
**(c) sensitive industries.**

**PDC 16 Development likely to result in the emission of odour, or other airborne particles, should minimise environmental nuisance or harm external to the site as a result of that emission.**

## 6.12 Road Traffic and Access

As outlined in the relevant provisions of the Development Plans, there are various policies in relation to traffic and access, including the provision of safe and efficient movement from public roads, minimising visual impacts of internal access tracks, ensuring that the wind farm does not interfere with airfields, that the landform is not altered significantly, and any potential impacts on flora and fauna. Matters of landform, visual amenity, and impacts on flora and fauna have been discussed in previous sections of this report.

The key issue with regard to traffic and transport relate to the additional vehicles accessing the proposed wind farm site during its construction, and to a considerably lesser degree during operation. It is acknowledged that the proposed wind farm construction period will have an effect on the daily activities of the local community due to potentially increased traffic delays and noise. This will primarily be on the adjacent landowners and the centres of Truro, Kapunda, Eudunda and the area of Koonunga.

A detailed Traffic Impact Assessment has been undertaken by AECOM and is included in the development application documents. This assessment report gives particular consideration to the transportation of the proposed wind farm components (including nacelles, hubs, blades, modularised tower sections and substation transformers) on account of the size and weight of these components during the 18 to 24 month construction period. The report (Section 6) notes that "*the traffic generated during the construction phase represents the greatest demand for the site, occurring over the assumed 18 month period. Overall, it is estimated that there will be 175,000 one-way vehicle trips, comprised of:*

- *1,500 over dimensional and over mass trips;*
- *32,000 truck trips; and*
- *53,000 car trips.*

The above listed trips however, will occur over a minimum 18 month period. When broken down to average trips per day, the effects on the road network are shown to be acceptable given the capacity and status of the road network. The average daily trips are "*an approximate daily volume of 7 over dimensional or over mass vehicles, 60 heavy vehicles and 140 car trips*".

In assessing the impacts of the proposed development against the provisions of the Development Plans, the two phases of the development must be considered. As stated by AECOM, there will be impacts on the road network during the construction phase (up to a two year period), however during the operational phase, which is expected to be 25 to 30 years, there is very little ongoing impact anticipated.

There are several provisions of the Development Plans which seek to ensure safe and convenient movement of people and goods, including the Rural Zone PDC 20, and Movement of People and Goods Objectives 14 and 16, and a range of principles of development control as quoted below.

**Transportation and Access – LDP and GDP – Objectives 2, 3 and 5**

**Objective 2: Development that:**

**(a) provides safe and efficient movement for all motorised and non-motorised transport modes;**
**(b) ensures access for vehicles including emergency services, public infrastructure maintenance and commercial vehicles;**
**(c) provides off-street parking; and**
**(d) is appropriately located so that it supports and makes best use of existing transport facilities and networks.**

**Objective 3:** **A road hierarchy that promotes safe and efficient transportation in an integrated manner throughout the State.**

**Objective 5:** **Safe and convenient freight movement throughout the State.**

**LDP - Objective 6:** **Development that discourages heavy vehicle movements through major town centres.**

**Transportation and Access – LDP and GDP – PDC's 1**

**PDC 1** **Land uses arranged to support the efficient provision of sustainable transport networks and encourage their use.**

**Transportation and Access - Movement Systems**

**LDP PDC 2** **Development should be integrated with existing transport networks, particularly major rail and road corridors as shown on Location Maps and Overlay Maps - Transport, and designed to minimise its potential impact on the functional performance of the transport networks.**

**GDP PDC 2** **Development should be integrated with existing transport networks, particularly major rail and road corridors as shown on Overlay Maps Go/1, Go/2, Go/3, Go/4, Go/6, Go/7, Go/8, Go/9, Go/10 and Go/11 - Transport, and designed to minimise its potential impact on the functional performance of the transport networks.**

**Transportation and Access - Movement Systems LDP & GDP PDC's 8, 11 and 13**

**PDC 8** **Development should provide safe and convenient access for all anticipated modes of transport including cycling, walking, public and community transport, and motor vehicles.**

**PDC 11** **Development should discourage commercial and industrial vehicle movements through residential streets and adjacent other sensitive land uses such as schools.**

**PDC 13** **Development should make sufficient provision on site for the loading, unloading and turning of all traffic likely to be generated.**

**Transportation and Access - Access LDP PDC's 23, 24, and 30 and GDP PDC's 21, 22 and 27**

**PDC** **Development should have direct access from an all-weather public road.**

**PDC** **Development should be provided with safe and convenient access which:**

- **(a)** **avoids unreasonable interference with the flow of traffic on adjoining roads;**
- **(b)** **accommodates the type and volume of traffic likely to be generated by the development or land use and minimises induced traffic through over-provision; and**
- **(c)** **is sited and designed to minimise any adverse impacts on the occupants of and visitors to neighbouring properties.**

**PDC** **Driveways, access tracks and parking areas should be designed and constructed to:**

- **(a)** **follow the natural contours of the land;**
- **(b)** **minimise excavation and/or fill;**
- **(c)** **minimise the potential for erosion from run-off;**
- **(d)** **avoid the removal of existing vegetation; and**
- **(e)** **be consistent with Australian Standard AS 2890 Parking facilities.**

**MMDP - Movement of People and Goods**

**Objective 14:** **Safe and efficient movement of people and goods by road.**

**The primary and secondary road network serving local and district traffic is shown on Map MiMu/1 (Overlay 1).**

**Objective 16:** **Free flow of traffic on roads by minimising interference from adjoining development.**

**Principles of Development Control**

**PDC 34** **Development liable to generate traffic volumes which cannot safely and conveniently be accommodated on the existing or proposed road system should not be undertaken.**

**PDC 37** **Development should include an appropriate provision on the site to enable the parking, loading, unloading, turning and fuelling of vehicles and pedestrian or cycle movement in a safe and convenient manner. Shared parking areas or sites located elsewhere other than on site should only be provided where such an arrangement is to be benefit of the community.**

**PDC 38** **The construction of access ways onto public roads should:**

**(a)** **not interfere with or restrict drainage channels or watercourses; and**
**(b)** **be located in a safe and convenient location.**

**PDC 39** **Driveways, access tracks and parking areas should:**

**(a)** **follow the natural contours of the land;**
**(b)** **follow the geometric pattern of plantings;**
**(c)** **be designed and constructed with a minimum amount of excavation and/or fill;**
**(d)** **be designed and constructed to minimise the potential for erosion from run-off; and**
**(e)** **not involve the removal of existing vegetation.**

**PDC 40** **Development should not be undertaken if the design and location of access points will create unsafe conditions or cause interference with the free flow of traffic on any adjoining road.**

Although final routes for vehicle movements during the construction phase of the project require further consultation, agreement and relevant approvals by the Department of Planning, Transport and Infrastructure and Councils, the following practices have already been identified to minimise the impact of the additional traffic movement in the locality:

- utilisation of major highways/roads from Adelaide including Sturt Highway, Thiele Highway and Truro Road that are currently designated as heavy vehicle transport;
- minimise noise associated with a significant number of slow moving vehicles around towns and settlements in consultation with the residents as part of the Traffic Management Plan (TMP);
- avoid town centres as a direct access route;

- minimise heavy vehicle access along the school bus route(s) during the scheduled bus operating hours;
- upgrade a number of roads along the preferred route to meet required standards, which may include:
  - sealing of shoulders at various intersections;
  - upgrading or introduction of appropriate directional and warning signage to warn of heavy vehicle movements;
  - upgrading of guard rails, culverts and similar infrastructure on some specific local roads; and
  - surface treatment and widening of some specific local roads, should they be selected as part of the delivery route of wind farm components.
- designated delivery periods, delivery routes and access points to the site for all materials and equipment supplied for different locations around the site;
- designated speed limits and load limits specified for heavy vehicle routes;
- designated reserve areas on the construction site for parking, turning, loading and unloading;
- appropriate traffic controls and management on-site to ensure that vehicles use the designated site access tracks and do not travel off these tracks;
- appropriate traffic controls and management on-site to ensure that vehicles use the designated wash down areas if applicable;
- an inspection and maintenance program for the selected access routes and site tracks, to ensure these are kept in an adequate and safe condition; and
- controls and management measures to ensure farm stock (sheep and cattle) are not able to escape from the site through access points during construction operations.

During the construction phase of the wind farm there is potential for impacts on the safe and convenient movement of people and goods in the region. This construction period is estimated to be up to two years. During this phase of the development it is important that the potential impacts are minimised. It is considered that the preferred route (and alternatives) along with the practices already identified in the Traffic Assessment Report and briefly outlined above, along with the preparation of a detailed Traffic Management Plan prior to construction commencing, would satisfy the intent of the Development Plan in providing safe and convenient movement of goods and people in the locality of the development.

Post construction and during the operational phase of the wind farm, it is unlikely that the proposal will adversely effect the road network, or the safe and convenient movement of people and goods.

The need for appropriate management of traffic movements is acknowledged and these will be addressed further as part of a Traffic Management Plan to be authorised by the Councils and the Department of Planning, Transport and Infrastructure. On this basis, it is considered that the proposal adequately addresses the requirements of the Development Plan regarding road traffic and transportation.

## 6.13 Heritage

The Development Plan contains numerous provisions relating to protection of places of heritage significance, both Aboriginal and European. There are no places of State or local heritage significance within the site of the development listed in the three Development Plans.

All three of the Development Plans contain reference to minimising the impact of development on areas of heritage significance. Both the Goyder Development Plan and Mid-Murray Development Plan contain specific provisions relating to cultural heritage, with specific reference within the MMDP regarding areas of aboriginal heritage.

MMDP Conservation Objective 69 states that:

**Objective 66:** **Conservation of land, buildings, structures and other items of significant historical, social and architectural or other Aboriginal or European heritage significance.**

**The region contains buildings and sites of European historic and cultural interest, and Aboriginal burial grounds and camp sites important to the study of archaeology and anthropology. The area north of the Marne River contains examples of Aboriginal and early European settlement, and the eastern escarpment of the Mount Lofty Ranges, north of Palmer, contains sites of early settlement, historic relics and unusual granite tors. These and other geological sites should be protected for education and research purposes and to provide historic links with the past.**

**Policy Area Number 14 – Hills Policy Area**

**Objective 3:** **Conservation and enhancement of the importance of the area for Aboriginal heritage.**

Mid Murray Development Plan Structure Plan Map MiMd/1 (Overlay 2) illustrates a range of aboriginal historic sites, none of which are around the Truro area.

**GDP Objective 1:** **The conservation of areas, places and their settings of indigenous and non-indigenous cultural significance.**

**GDP PDC 1** **Development should conserve and not adversely impact on the cultural or natural significance of places, areas, artefacts and shipwrecks that display any of the following values:**

**(a) aesthetic;**
**(b) anthropological;**
**(c) archaeological;**
**(d) architectural;**

**(e) ecological;**
**(f) economic;**
**(g) educational;**
**(h) geological;**
**(i) historic;**
**(j) palaeontologic;**
**(k) scientific;**
**(l) social; and**
**(m) speleological.**

EBS Heritage have prepared a 'Desktop Cultural Heritage Assessment Twin Creek Wind Farm Report' which forms part of the development application documents. The report notes that there are no entries for known aboriginal sites located within the project area or a 1.0 kilometre radius (Register of Aboriginal Sites and Objects, DSD-AAR).

On the basis that there are no items of heritage significance or known aboriginal sites, the proposal is unlikely to detract from the heritage and cultural significance of the locality, and thereby complies with the relevant provisions of the Development Plans.

### 6.14 Bushfire

The Light Regional Council Development Plan and the Mid Murray Council Development Plan contains Bushfire Protection Area (BPA) maps of bushfire risk. The Goyder Development Plan does not contain BPA maps. The site of the development is within the General Bushfire Risk area in both Development Plans. The proposed development does not involve construction of dwellings, tourist accommodation and other forms of habitable buildings in a High Bushfire Risk Area of a Bushfire Protection Area, which is sought to be avoided by the provisions of the Development Plan.

As discussed in Section 6.6.1, development of wind farms often results in concerns being raised about the impacts on fixed wing aircraft for aerial bushfire fighting. It is understood that wind turbines are treated as a vertical obstruction in a similar manner to overhead electricity infrastructure, and the decision as to whether to fight a fire aerially is determined on a dynamic risk assessment basis by the CFS and the aerial operator.

It is noted that the provisions of the Development Plans do not specifically require aerial fire-fighting to be assessed. However, it is understood that RES Australia consultant (SA Bushfire Solutions) has endeavoured to consult and will continue to engage with the CFS in relation to the proposed wind farm, and the preparation of a bushfire management plan as part of the operational procedures during the construction and operational phases of the wind farm and energy storage project.

RES Australia are aware of their duty of care in relation to bushfire management. SA Bushfire Solutions have prepared a Bushfire Management Plan and this will continue to be developed in consultation with the CFS.

The Bushfire Management Plan, which is contained within the development application documents, contains extensive recommendations for both the construction and operational phase of the project to minimise bushfire risk, including:

- emergency response procedures;
- consideration of the construction activities and schedule considering fire risks;
- vegetation management on-site;
- access requirements for equipment, vehicles and machinery;
- induction and training of on-site personnel;
- provision of adequate fire-fighting equipment at construction sites and at the operating wind farm;
- shutting down of turbines if the components reach critical temperatures or if directed by the CFS in the case of a nearby wildfire; and
- ongoing liaison, cooperation and consultation with the CFS and other key emergency stakeholders.

It is considered that these measures form a suitable approach to fire-fighting on the subject land, satisfying the intent of the Development Plan.

**Hazards- LDP and GDP – Objective 3**

**Objective 3: Development should minimise the threat and impact of bushfires on life and property.**

**MMDP – Bushfire Protection**

**Objective 97: Development should minimise the threat and impact of bushfires on life and property while protecting the natural and rural character.**

**Objective 98: Buildings and the intensification of non-rural land uses directed away from areas of high bushfire risk.**

**Principles of Development Control**

**LDP: PDC's 24-29**

**PDC 24 The following bushfire protection principles of development control apply to development of land identified as General, Medium and High bushfire risk areas as shown on the *Bushfire Protection Area BPA Maps - Bushfire Risk*.**

**PDC 25 Development in a Bushfire Protection Area should be in accordance with those provisions of the *Minister's Code: Undertaking development in Bushfire Protection Areas* that are designated as mandatory for Development Plan Consent purposes.**

**PDC 26** **Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:**

- **(a) vegetation cover comprising trees and/or shrubs;**
- **(b) poor access;**
- **(c) rugged terrain;**
- **(d) inability to provide an adequate building protection zone; and**
- **(e) inability to provide an adequate supply of water for fire-fighting purposes.**

**PDC 29** **Buildings and structures should be designed and configured to reduce the impact of bushfire through using designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings.**

**GDP PDC's 6, 7 and 8**

**PDC 6** **Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:**

- **(a) vegetation cover comprising trees and/or shrubs;**
- **(b) poor access;**
- **(c) rugged terrain;**
- **(d) inability to provide an adequate building protection zone; and**
- **(e) inability to provide an adequate supply of water for fire-fighting purposes.**

**PDC 7** **Buildings and structures should be designed and configured to reduce the impact of bushfire through using designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings.**

**PDC 8** **Habitable buildings should have a dedicated water supply comprising a minimum of 22,000 litres available at all times for fire-fighting which is located adjacent to the building or in another convenient location on the allotment accessible to fire fighting vehicles.**

**MMDP PDC's 388, 391 and 395**

**PDC 387** **Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:**

- **(a) vegetation cover comprising trees and/or shrubs;**
- **(b) poor access;**
- **(c) rugged terrain;**
- **(d) inability to provide an adequate building protection zone; or**
- **(e) inability to provide an adequate supply of water for fire-fighting purposes.**

**PDC 390** **Buildings and structures should be designed and configured to reduce the impact of bushfire through using simple designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings.**

**PDC 394** **Development in a Bushfire Protection Area should be in accordance with those provisions of the Minister's Code: Undertaking development in Bushfire Protection Areas that are designated as mandatory for Development Plan Consent purposes.**

## 6.15 Summary of Development Plan Assessment

In summary, the proposed wind farm and ancillary components, including energy storage, has substantial planning merit when assessed against the relevant provisions of the Light Regional Council Development Plan, the Goyder Council Development Plan and the Mid Murray Council Development Plan. The planning merits are:

- a wind farm and ancillary development is an envisaged land use within the Primary Production and Rural Zones;
- the site of the development is outside of the Barossa Valley Character Preservation District;
- retention of the principal and underlying land use of the locality, that is primary production;
- the proposal is unlikely to adversely affect aerial agriculture within the locality;
- the development is a renewable energy facility that provides a benefit to the community and the State;
- the siting and design of the wind farm and energy storage facilities adequately minimise the effect on the natural environment;
- the proposal contains suitable methodology for minimising and managing impacts on Pygmy Blue-Tongue Lizards;
- the development does not adversely affect safety of water or air transport;
- the minimum setback of 1,000 metres to all non-associated (non-stakeholder) dwellings for a wind turbine generator is exceeded by the development which incorporates a minimum 2,000 metre setback;
- there are no known tourist accommodation facilities within the locality (that is, within 1,000 metres of the nearest wind turbine generator);
- there are no townships, settlements or urban zones within 2,000 metres of any wind turbine generators;
- predicated noise levels are compliant with relevant noise criteria for sensitive receivers;
- the turbines are designed to minimise glare/blade glint;
- the wind farm is compliant with guidelines for theoretical and actual shadow flicker to owners and occupiers of non-stakeholder dwellings;

- the proposal contains suitable methodology that minimises impacts such as dust, noise and vibration through the construction phase;
- the proposal contains suitable methodology for managing traffic movements, particularly during construction;
- the proposal contains suitable methodology for minimising the visual effect of the infrastructure (other than wind turbine generators) via new vegetation planting in appropriate locations;
- the proposal contains suitable methodology for minimising and managing impacts of EMI; and
- the proposal contains suitable methodology for managing bushfire risks.

## 7.0 CONCLUSION

Following an assessment of the proposed development against the three Development Plans, it is our considered opinion that the proposed development is not significantly at variance with the Development Plans.

A wind farm and ancillary infrastructure is an envisaged land use within the Primary Production and Rural Zones. A wind farm is not listed as an 'unacceptable' land use within the Hills Policy Area of the Mid Murray Council Development Plan. The Primary Production and Rural Zones acknowledge that a wind farm will be located in visually prominent locations. The development is consistent with the intent of the zone and not in conflict with the provisions of the policy areas.

The proposed Twin Creek Wind Farm and Energy Storage project adequately and appropriately addresses potential effects, particularly those associated with noise, protection of flora and fauna, European and Aboriginal heritage, and traffic movements in a manner sought by the Development Plan.

On balance, the proposed Twin Creek Wind Farm and Energy Storage project is a suitable form of development within the Primary Production and Rural Zones that suitably addresses potential effects, and thereby warrants the granting of Development Plan Consent.

**Julie Jansen** **FPIA, CPP**
BA, BA(Hons), GDURP

14 August 2017

# ATTACHMENT 1

**Plans**

# TWIN CREEK WIND FARM

## FIGURE 1

## LOCATION PLAN



**LEGEND**

- 275kV POWERLINE (ELECTRANET)
- LOCAL GOVERNMENT AREA BOUNDARY
- WIND FARM DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)

Clare and Gilbert Valleys Council
Light Regional Council
Regional Council of Goyder
Light Regional Council
Regional Council of Goyder
Mid Murray Council
Light Regional Council
Barossa Council

CURIO HIGHWAY
MARRABEL ROAD
THIELE HIGHWAY
EUDUNDA ROAD
TARLEE ROAD
CLARE ROAD
WILDRED STREET
BAGOT WELL ROAD
CAMEL FARM ROAD
MOSEY ROAD
TRURO ROAD
STURT HIGHWAY

EUDUNDA
KAPUNDA
TRURO

SITE LOCATION



350 KM

0 1 2 4 6 8 10 km

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 25-06-2017 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER
03498D2212-01

SCALE - 1:100,000 @ A3

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# TWIN CREEK WIND FARM

## FIGURE 2

## WIND MAP



**LEGEND**

SITE BOUNDARY (20170616)

**PREDICTED WIND SPEED AT 80m a.g.l.**

6.3 — >8.5

NOTES:

-WRF MESOCALE MODELLING RESULTS COMBINED WITH MS3DJH MICROSCALE FLOW MODEL AT 50m HORIZONTAL RESOLUTION;

-TAKEN FROM RES MESOSCALE MODELLING RESULTS.

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 20170625 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER

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SCALE - 1:1,500,000 @ A3

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0 15 30 60 90 120 150 km

NOTE:
- CONSTRAINTS USED FOR LAYOUT DESIGN PAUStwc025;
- ACMA DATABASES; SPECTRA AND RADCOM FROM MARCH 15th 2016 SHOWN IN THIS DRAWING;
- FRENEL ZONES HAVE BEEN CALCULATED ONLY FOR POINT TO POINT LINKS CROSSING OR ADJACENT TO THE WIND FARM BOUNDARY;
- NEAREST ASSOCIATED STAKEHOLDER DWELLING NO. 75 FROM WTG 49 (1283m);
- NEAREST NON-STAKEHOLDER DWELLING NO. 122 FROM WTG 3 (2052m);
- HOUSE LAYOUT (DAUStwc005_20170428) HAS BEEN VALIDATED
TO THE EXTENT OF:
- - 5km FROM WIND TURBINES AND;
- - 2km FROM TRANSMISSION GRID ALIGNMENT.
- - NON-SURVEYED HOUSES HAVE BEEN MAPPED

# TWIN CREEK WIND FARM

## FIGURE 3

## SITE AND CONTEXT ANALYSIS PLAN WIND FARM



**LEGEND**

**HOUSE LAYOUT (DAUStwc005_20170428)**
- HOUSE (NON ASSOCIATED STAKEHOLDER)
- HOUSE (ASSOCIATED STAKEHOLDER)
- NOT SURVEYED
- SHED

**OCCUPATION STATUS**
- OCCUPIED
- UNOCCUPIED
- HOUSE SETBACK 1260m
- HOUSE SETBACK 2050m
- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)
- LOCAL GOVERNMENT AREA BOUNDARY

**TRANSMITTER (EAUStwc001)**
- TRANSMITTER (EAUStwc001)
- SAPN RADIO COMMS LINKS POINT TO MULTI-POINT (SECOND FRESNEL ZONE + 65m BUFFER (EAUStwc001a))
- LINK SECOND FRESNEL ZONE (EAUStwc001) + 65m BUFFER
- WATER COURSE 80m SETBACK (GA - 2006)
- PBTL OBSERVATIONS 20m SETBACK (EBS_20170215)

**VEGETATION CLASSIFICATION (EBS_20170620)**
- AUSTROSTIPA SP. GRASSLANDS
- CROPPING
- EUCALYPTUS CAMALDULENSIS SSP. CAMALDULENSIS CREEKLINES
- EUCALYPTUS LEUCOXYLON +/- EUCALYPTUS POROSA OPEN WOODLAND
- EUCALYPTUS ODORATA WOODLAND
- EUCALYPTUS POROSA +/- EUCALYPTUS ODORATA +/- EUCALYPTUS GRACILIS OPEN WOODLAND
- JUNCUS SPP. (RUSH) AND JUNCUS PALLIDUS (PALE RUSH) SEDGELAND +/- PHRAGMITES AUSTRALIS (COMMON REED)
- LOMANDRA EFFUSA + AUSTROSTIPA SP. GRASSLANDS
- PASTURE GRASSLAND / EXOTIC GRASSLAND
- PLANTED SPECIES
- WEDGE-TAILED EAGLE NEST (EBS_20151127)
- WEDGE-TAILED EAGLE NEST 500m SETBACK

**SLOPE DEGREES - LiDAR SURVEY**
0 - 12 | 12 - 15 | >15

PAGE 1 OF 2

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 25-06-2017 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

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0 0.5 2 3 4 5 KM

NOTE:
- CONSTRAINTS USED FOR LAYOUT DESIGN PAUStwc025;
- ACMA DATABASES; SPECTRA AND RADCOM FROM MARCH 15th 2016 SHOWN IN THIS DRAWING;
- FRENEL ZONES HAVE BEEN CALCULATED ONLY FOR POINT TO POINT LINKS CROSSING OR ADJACENT TO THE WIND FARM BOUNDARY;
- NEAREST ASSOCIATED STAKEHOLDER DWELLING NO. 75 FROM WTG 49 (1283m);
- NEAREST NON-STAKEHOLDER DWELLING NO. 122 FROM WTG 3 (2052m);
- HOUSE LAYOUT (DAUStwc005_20170428) HAS BEEN VALIDATED
TO THE EXTENT OF:
- - 5km FROM WIND TURBINES AND;
- - 2km FROM TRANSMISSION GRID ALIGNMENT.
- - NON-SURVEYED HOUSES HAVE BEEN MAPPED

# TWIN CREEK WIND FARM

## FIGURE 3

## SITE AND CONTEXT ANALYSIS PLAN GRID ROUTE



**LEGEND**

**HOUSE LAYOUT (DAUStwc005_20170428)**
- HOUSE (NON ASSOCIATED STAKEHOLDER)
- NOT SURVEYED
- SHED

**OCCUPATION STATUS**
- OCCUPIED
- UNOCCUPIED
- HOUSE SETBACK 2050m
- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)
- LOCAL GOVERNMENT AREA BOUNDARY

**TRANSMITTER (EAUStwc001)**
- TRANSMITTER (EAUStwc001)
- SAPN RADIO COMMS LINKS POINT TO MULTI-POINT (SECOND FRESNEL ZONE + 65m BUFFER (EAUStwc001a))
- LINK SECOND FRESNEL ZONE (EAUStwc001) + 65m BUFFER
- WATER COURSE 80m SETBACK (GA - 2006)
- PBTL OBSERVATIONS 20m SETBACK (EBS_20170215)

**VEGETATION CLASSIFICATION (EBS_20170620)**
- AUSTROSTIPA SP. GRASSLANDS
- CROPPING
- EUCALYPTUS CAMALDULENSIS SSP. CAMALDULENSIS CREEKLINES
- EUCALYPTUS LEUCOXYLON +/- EUCALYPTUS POROSA OPEN WOODLAND
- EUCALYPTUS LEUCOXYLON SSP. PRUINOSA MIXED SHRUBLAND/GRASSLAND
- EUCALYPTUS ODORATA WOODLAND
- JUNCUS SPP. (RUSH) AND JUNCUS PALLIDUS (PALE RUSH) SEDGELAND +/- PHRAGMITES AUSTRALIS (COMMON REED)
- LOMANDRA EFFUSA + AUSTROSTIPA SP. GRASSLANDS
- PASTURE GRASSLAND / EXOTIC GRASSLAND
- PLANTED SPECIES
- WEDGE-TAILED EAGLE NEST (EBS_20151127)
- WEDGE-TAILED EAGLE NEST 500m SETBACK

**SLOPE DEGREES - LiDAR SURVEY**
0 - 12 | 12 - 15 | >15

PAGE 2 OF 2

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|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 25-06-2017 |
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0 0.4 0.8 1.6 2.4 3.2 4 KM

# TWIN CREEK WIND FARM

## FIGURE 4

## PLANNING OVERLAYS



**LEGEND**

- 275kV POWERLINE (ELECTRANET)
- HERITAGE AGREEMENT AREAS (DPTI)

**DEVELOPMENT ZONES (DPTI)**

- CONSERVATION (Con)
- INDUSTRY (In)
- PRIMARY PRODUCTION (PrPro)
- RURAL (Ru)
- RURAL LIVING (TRURO) (RuL(Tr))
- SETTLEMENT (DUTTON) (S(Dut))
- TOWNSHIP (DEFERRED) T(D)
- TOWNSHIP (TRURO) (T(Tr))
- LOCAL GOVERNMENT AREA BOUNDARY
- WIND FARM DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)

SITE LOCATION

Service Layer Credits: Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA,

160 KM

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 25-06-2017 |
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0 1 2 4 6 8 km

# TWIN CREEK WIND FARM

## FIGURE 5

## LANDOWNERSHIP WIND FARM



**LEGEND**

- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)

**LANDOWNERS**

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- THE CROWN

NOTES:

CADASTRALBOUNDARY_2015_20170531 SHOWN IN THIS DRAWING,

PAGE 1 OF 2

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 28-06-2017 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER

03498D2525-01

SCALE - 1:55,000 @ A3

COORDS

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0 0.5 1 2 3 4 5 km

# TWIN CREEK WIND FARM

## FIGURE 5

## LANDOWNERSHIP GRID ROUTE



**LEGEND**

- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)

**LANDOWNERS**

- 2
- 3
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22

NOTES:

CADASTRALBOUNDARY_2015_20170531 SHOWN IN THIS DRAWING,

PAGE 2 OF 2

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 28-06-2017 |
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TEL +61 (0)2 8440 7400
EMAIL: info-australia@res-group.com

0 0.5 1 2 3 4 5 km

| TURBINE ID | EASTING m | NORTHING m | ELEVATION m |
|---|---|---|---|
| T1 | 321026 | 6200205 | 388.3 |
| T2 | 321360 | 6200955 | 376.0 |
| T3 | 322403 | 6200826 | 437.6 |
| T4 | 321993 | 6201019 | 435.0 |
| T5 | 321620 | 6201367 | 412.5 |
| T6 | 320952 | 6201223 | 373.5 |
| T7 | 319882 | 6201452 | 349.2 |
| T8 | 320250 | 6201090 | 329.1 |
| T9 | 322950 | 6201222 | 432.2 |
| T10 | 322538 | 6201521 | 435.6 |
| T11 | 322022 | 6201882 | 412.5 |
| T12 | 322572 | 6201943 | 406.3 |
| T13 | 322322 | 6202456 | 380.3 |
| T14 | 320971 | 6202391 | 348.6 |
| T15 | 320036 | 6202498 | 341.0 |
| T16 | 320224 | 6203111 | 349.6 |
| T17 | 321816 | 6202690 | 392.0 |
| T18 | 323643 | 6202084 | 428.0 |
| T19 | 323292 | 6202686 | 425.3 |
| T20 | 322886 | 6202903 | 407.0 |
| T21 | 322371 | 6203086 | 425.9 |
| T22 | 321826 | 6203111 | 391.6 |
| T23 | 321590 | 6203414 | 403.6 |
| T24 | 320666 | 6204049 | 353.0 |
| T25 | 324225 | 6202148 | 432.1 |
| T26 | 323887 | 6202670 | 450.8 |
| T27 | 323772 | 6203076 | 437.2 |
| T28 | 322719 | 6203537 | 442.3 |
| T29 | 322046 | 6203820 | 423.0 |
| T30 | 321713 | 6204052 | 405.6 |
| T31 | 321308 | 6204303 | 420.7 |
| T32 | 321201 | 6204679 | 384.1 |
| T33 | 324338 | 6203141 | 454.0 |
| T34 | 323586 | 6203550 | 424.7 |
| T35 | 322782 | 6204095 | 454.6 |
| T36 | 322249 | 6204368 | 452.7 |
| T37 | 321973 | 6204642 | 418.3 |
| T38 | 324342 | 6203539 | 480.2 |
| T40 | 324060 | 6203843 | 446.3 |
| T42 | 323325 | 6204676 | 426.9 |
| T43 | 322719 | 6204664 | 453.5 |
| T44 | 323646 | 6204246 | 424.6 |
| T45 | 323837 | 6204811 | 439.4 |
| T46 | 323611 | 6205227 | 447.1 |
| T47 | 323205 | 6205593 | 469.9 |
| T48 | 323115 | 6205082 | 461.5 |
| T49 | 322641 | 6205411 | 422.7 |
| T50 | 321133 | 6203686 | 364.0 |
| T51 | 321050 | 6202928 | 347.4 |
| T52 | 321374 | 6201812 | 355.8 |
| T53 | 323112 | 6202183 | 414.7 |

MGA ZONE 54 - DATUM GDA 94

0 0.5 1 2 3 4 5 km

# TWIN CREEK WIND FARM

## FIGURE 6

## PROPOSED TURBINE LOCATIONS



**LEGEND**

- TURBINE LAYOUT (PAUStwc025)
- DEVELOPMENT AREA (20170613)
- WIND FARM SITE BOUNDARY (20170616)

NOTES:

- SUBJECT TO FINAL DESIGN;
- TURBINES MAY BE MICROSITED IN ACCORDANCE WITH FIGURE 10.

| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

DRAWING NUMBER

03498D0002-01

SCALE - 1:40,000 @ A3

COORDS

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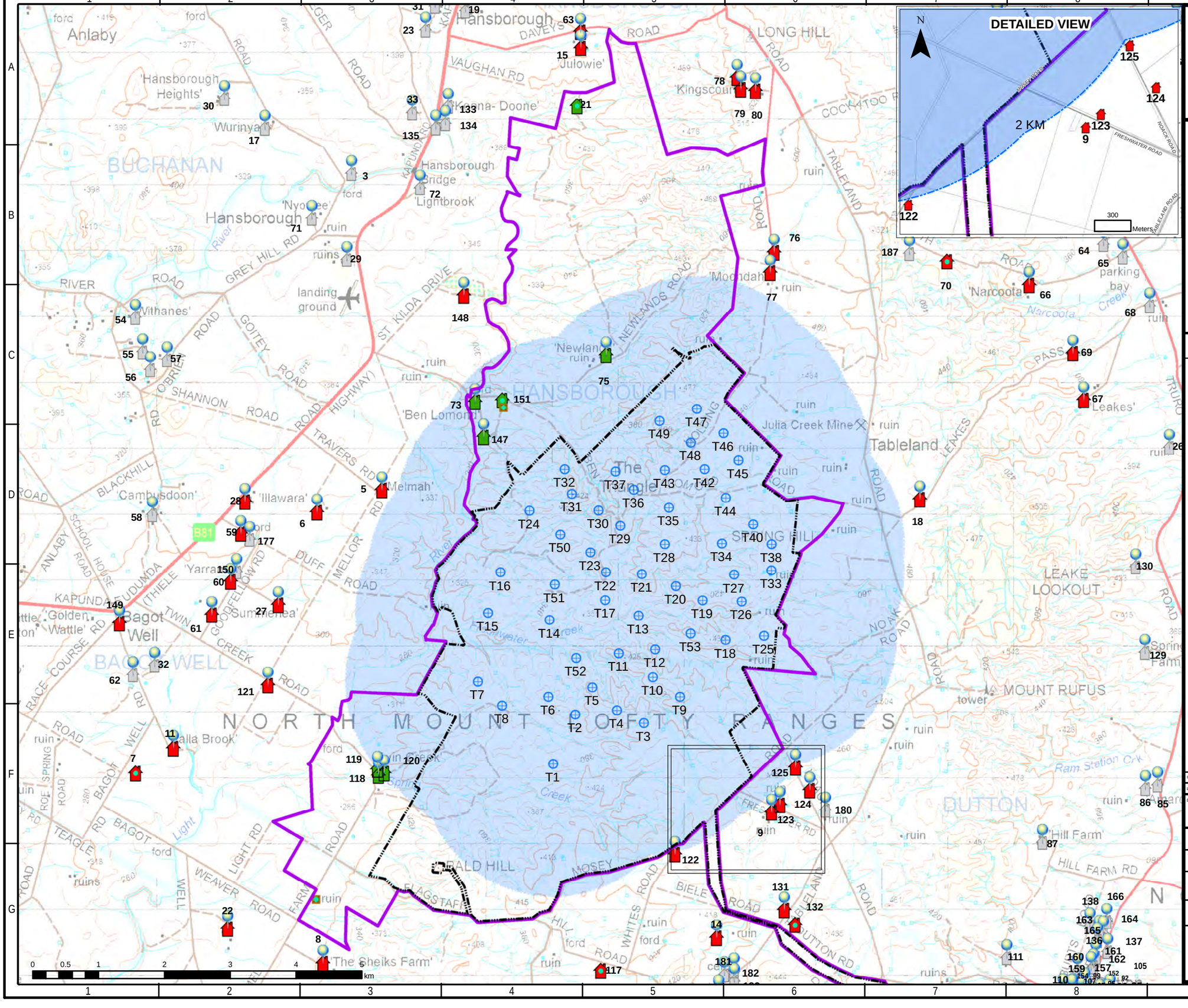


# TWIN CREEK WIND FARM

## FIGURE 7

## HOUSE AND TURBINE LOCATIONS WIND FARM



**LEGEND**

- TURBINE LAYOUT (PAUStwc025)

**HOUSE LAYOUT (DAUStwc005_20170428)**

- HOUSE (NON ASSOCIATED STAKEHOLDER)
- HOUSE (ASSOCIATED STAKEHOLDER)
- HOUSE (NOT SURVEYED)
- SHED

**OCCUPATION STATUS**

- OCCUPIED
- UNOCCUPIED
- DEVELOPMENT AREA (20170613)
- WIND FARM SITE BOUNDARY (20170616)
- 2 KM WIND TURBINE SETBACK

NOTES:

NEAREST ASSOCIATED STAKEHOLDER DWELLING NO. 75 FROM WTG 49 (1283m);
- NEAREST NON-STAKEHOLDER DWELLING NO. 122 FROM WTG 3 (2052m);
- HOUSE LAYOUT (DAUStwc005_20170428) HAS BEEN VALIDATED TO THE EXTENT OF:
-- 5km FROM WIND TURBINES AND;
-- 2km FROM TRANSMISSION GRID ALIGNMENT.
--NOT-SURVEYED HOUSES HAVE BEEN MAPPED THROUGH A DESKTOP ASSESSMENT;

PAGE 1 OF 2

| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

DRAWING NUMBER

**03498D0202-01**

SCALE - 1:55,000 @ A3

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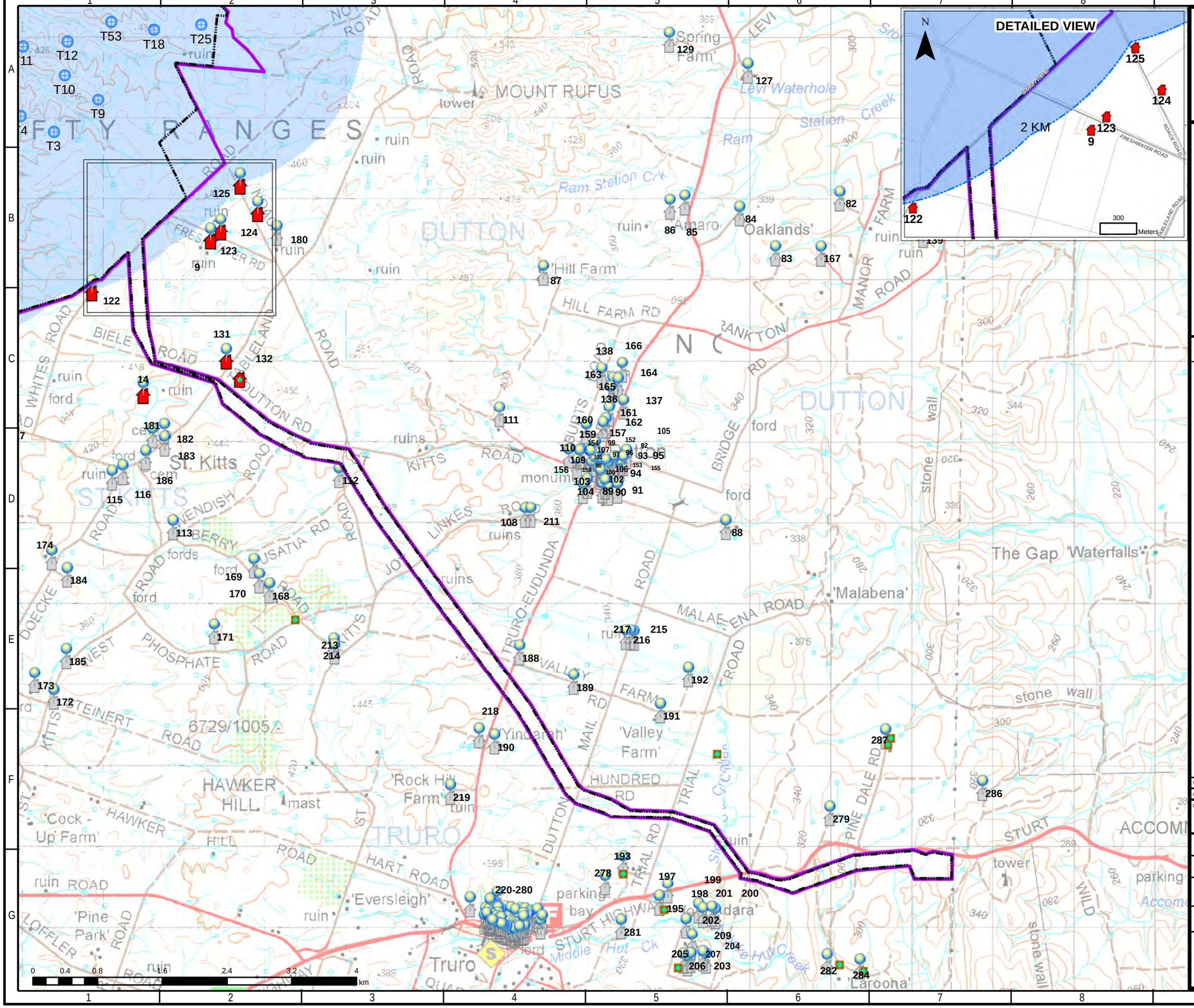


# TWIN CREEK WIND FARM

## FIGURE 7

## HOUSE AND TURBINE LOCATIONS GRID ROUTE



**LEGEND**

- TURBINE LAYOUT (PAUStwc025)

**HOUSE LAYOUT (DAUStwc005_20170428)**

- HOUSE (NON ASSOCIATED STAKEHOLDER)
- HOUSE (NOT SURVEYED)
- SHED

**OCCUPATION STATUS**

- OCCUPIED
- UNOCCUPIED
- DEVELOPMENT AREA (20170613)
- WIND FARM SITE BOUNDARY (20170616)
- 2 KM WIND TURBINE SETBACK

NOTES:

NEAREST ASSOCIATED STAKEHOLDER DWELLING NO. 75 FROM WTG 49 (1283m);
- NEAREST NON-STAKEHOLDER DWELLING NO. 122 FROM WTG 3 (2052m);
- HOUSE LAYOUT (DAUStwc005_20170428) HAS BEEN VALIDATED TO THE EXTENT OF:
-- 5km FROM WIND TURBINES AND;
-- 2km FROM TRANSMISSION GRID ALIGNMENT.
--NOT-SURVEYED HOUSES HAVE BEEN MAPPED THROUGH A DESKTOP ASSESSMENT;

PAGE 2 OF 2

| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

DRAWING NUMBER

03498D0202-01

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NOTES:

- SUBJECT TO FINAL DESIGN;
- RES INTERNAL X-INFRASTRUCTURE05_APPROVED_20170324 SHOWN IN THIS DRAWING;
-RES INTERNAL X-GRIDROUTE07_APPROVED_20170613 SHOWN IN THIS DRAWING
- OPERATION AND MAINTENANCE COMPOUND IS LOCATED 1.8 KM FROM MOSEY ROAD;
- SEE FIGURE 11A FOR SUBSTATION DETAILED VIEW;
- SEE FIGURE 11B FOR TERMINAL STATION DETAILED VIEW.

# TWIN CREEK WIND FARM

## FIGURE 8

## INFRASTRUCTURE WIND FARM



**LEGEND**

- TURBINE LAYOUT (PAUStwc025)
- PROPOSED ACCESS ROADS
- HARDSTAND
- PROPOSED AREA FOR BATTERY STORAGE
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED CONSTRUCTION COMPOUND AND MATERIAL LAYDOWN AREA
- PROPOSED SUBSTATION
- PROPOSED OPERATION AND MAINTENANCE AREA
- WIND FARM INFRASTRUCTURE ZONE
- PRINCIPAL SITE ENTRANCE
- PROPOSED PERMANENT MAST LOCATION
- GRID ROUTE
- GRID ROUTE EASEMENT 50m
- GRID ROUTE INVESTIGATION CORRIDOR
- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)



| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

DRAWING NUMBER: 03498D1002-01

SCALE - 1:30,000 @ A3

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0 0.3 0.6 1.2 1.8 2.4 3 km

NOTES:

- SUBJECT TO FINAL DESIGN;
- RES INTERNAL X-INFRASTRUCTURE05_APPROVED_20170324 SHOWN IN THIS DRAWING;
-RES INTERNAL X-GRIDROUTE07_APPROVED_20170613 SHOWN IN THIS DRAWING
- OPERATION AND MAINTENANCE COMPOUND IS LOCATED 1.8 KM FROM MOSEY ROAD;
- SEE FIGURE 11A FOR SUBSTATION DETAILED VIEW;
- SEE FIGURE 11B FOR TERMINAL STATION DETAILED VIEW.

# TWIN CREEK WIND FARM

## FIGURE 8

## INFRASTRUCTURE GRID ROUTE



**LEGEND**

- TURBINE LAYOUT (PAUStwc025)
- PROPOSED ACCESS ROADS
- HARDSTAND
- PROPOSED AREA FOR BATTERY STORAGE
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED CONSTRUCTION COMPOUND AND MATERIAL LAYDOWN AREA
- PROPOSED SUBSTATION
- PROPOSED OPERATION AND MAINTENANCE AREA
- WIND FARM INFRASTRUCTURE ZONE
- PRINCIPAL SITE ENTRANCE
- GRID ROUTE
- GRID ROUTE EASEMENT 50m
- GRID ROUTE INVESTIGATION CORRIDOR
- TERMINAL STATION ACCESS TRACKS
- AREA FOR INTERFACES ASSET
- TERMINAL STATION
- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)



| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

DRAWING NUMBER

03498D1002-01

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0 0.4 0.8 1.6 2.4 3.2 4 km

# TWIN CREEK WIND FARM

## FIGURE 9

## DESIGN RESPONSE WIND FARM



**VEGETATION CLASSIFICATION (EBS_20170620)**

**VEG_DESCRIPTION**

- AUSTROSTIPA SP. GRASSLANDS
- CROPPING
- EUCALYPTUS LEUCOXYLON +/- EUCALYPTUS POROSA OPEN WOODLAND
- EUCALYPTUS POROSA +/- EUCALYPTUS ODORATA +/- EUCALYPTUS GRACILIS OPEN WOODLAND
- JUNCUS SPP. (RUSH) AND JUNCUS PALLIDUS (PALE RUSH) SEDGELAND +/- PHRAGMITES AUSTRALIS (COMMON REED)
- LOMANDRA EFFUSA + AUSTROSTIPA SP. GRASSLANDS
- PASTURE GRASSLAND / EXOTIC GRASSLAND
- PLANTED SPECIES
- WEDGE-TAILED EAGLE NEST (EBS_20151127)
- WEDGE-TAILED EAGLE NEST 500m SETBACK
- PBTL OBSERVATIONS 20m SETBACK (EBS_20170215)

NOTES:
- CONSTRAINTS USED FOR LAYOUT DESIGN PAUStwc025;
- ACMA DATABASES; SPECTRA AND RADCOM FROM MARCH 15th 2016 SHOWN IN THIS DRAWING;
- FRENEL ZONES HAVE BEEN CALCULATED ONLY FOR POINT TO POINT LINKS CROSSING OR ADJACENT TO THE WIND FARM BOUNDARY;
- NEAREST ASSOCIATED STAKEHOLDER DWELLING NO. 75 FROM WTG 49 (1283m);
- NEAREST NON-STAKEHOLDER DWELLING NO. 122 FROM WTG 3 (2052m);
- RES INTERNAL X-INFRASTRUCTURE05_ APPROVED_20170324 SHOWN IN THIS DRAWING;
-RES INTERNAL X-GRIDROUTE07_ APPROVED_20170613 FROM SITE ENTRANCE;
- OPERATION AND MAINTENANCE COMPOUND IS LOCATED 1.8 KM FROM MOSEY ROAD;
- HOUSE LAYOUT (DAUStwc005_20170428) HAS BEEN VALIDATED
TO THE EXTENT OF:
- - 5km FROM WIND TURBINES AND;
- - 2km FROM TRANSMISSION GRID ALIGNMENT.
- - NON-SURVEYED HOUSES HAVE BEEN MAPPED

**LEGEND**

- TURBINE LAYOUT (PAUStwc025)
- PROPOSED ACCESS ROADS
- HARDSTAND
- PROPOSED AREA FOR BATTERY STORAGE
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED CONSTRUCTION COMPOUND AND MATERIAL LAYDOWN AREA
- PROPOSED SUBSTATION
- PROPOSED OPERATION AND MAINTENANCE AREA
- WIND FARM INFRASTRUCTURE ZONE
- PRINCIPAL SITE ENTRANCE
- PROPOSED PERMANENT MAST LOCATION
- GRID ROUTE
- GRID ROUTE EASEMENT 50m
- GRID ROUTE INVESTIGATION CORRIDOR
- SITE BOUNDARY (20170616)
- DEVELOPMENT AREA (20170613)
- LOCAL GOVERNMENT AREA BOUNDARY

**HOUSE LAYOUT (DAUStwc005_20170428)**

- HOUSE (NON ASSOCIATED STAKEHOLDER)
- HOUSE (ASSOCIATED STAKEHOLDER)
- HOUSE (NOT SURVEYED)
- SHED

**OCCUPATION STATUS**

- OCCUPIED
- UNOCCUPIED
- HOUSE SETBACK 1260m
- HOUSE SETBACK 2050m
- COMMS LINKS POINT TO POINT
- SAPN RADIO COMMS LINKS POINT TO MULTI-POINT (SECOND FRESNEL ZONE + 65m BUFFER (EAUStwc001a))
- RADIO COMMS LINK SETBACK (SECOND FRESNEL ZONE + 65m BUFFER (EAUStwc001))
- WATER COURSE (250K MAPPING)
- WATER COURSE 80m SETBACK (GA - 2006)



| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

DRAWING NUMBER
03498D2104-01

SCALE - 1:30,000 @ A3

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0 0.3 0.6 1.2 1.8 2.4 3 KM

# TWIN CREEK WIND FARM

## FIGURE 9

## DESIGN RESPONSE GRID ROUTE



**VEGETATION CLASSIFICATION (EBS_20170620)**
**VEG_DESCRIPTION**
- AUSTROSTIPA SP. GRASSLANDS
- CROPPING
- EUCALYPTUS CAMALDULENSIS SSP. CAMALDULENSIS CREEKLINES
- EUCALYPTUS LEUCOXYLON +/- EUCALYPTUS POROSA OPEN WOODLAND
- EUCALYPTUS LEUCOXYLON SSP. PRUINOSA MIXED SHRUBLAND/GRASSLAND
- EUCALYPTUS ODORATA WOODLAND
- JUNCUS SPP. (RUSH) AND JUNCUS PALLIDUS (PALE RUSH) SEDGELAND +/- PHRAGMITES AUSTRALIS (COMMON REED)
- LOMANDRA EFFUSA + AUSTROSTIPA SP. GRASSLANDS
- PASTURE GRASSLAND / EXOTIC GRASSLAND
- PLANTED SPECIES
- WEDGE-TAILED EAGLE NEST (EBS_20151127)
- WEDGE-TAILED EAGLE NEST 500m SETBACK
- PBTL OBSERVATIONS 20m SETBACK (EBS_20170215)

NOTES:
- CONSTRAINTS USED FOR LAYOUT DESIGN PAUStwc025;
- ACMA DATABASES; SPECTRA AND RADCOM FROM MARCH 15th 2016 SHOWN IN THIS DRAWING;
- FRENEL ZONES HAVE BEEN CALCULATED ONLY FOR POINT TO POINT LINKS CROSSING OR ADJACENT TO THE WIND FARM BOUNDARY;
- NEAREST ASSOCIATED STAKEHOLDER DWELLING NO. 75 FROM WTG 49 (1283m);
- NEAREST NON-STAKEHOLDER DWELLING NO. 122 FROM WTG 3 (2052m);
- RES INTERNAL X-INFRASTRUCTURE05_ APPROVED_20170324 SHOWN IN THIS DRAWING;
-RES INTERNAL X-GRIDROUTE07_ APPROVED_20170613 FROM SITE ENTRANCE;
- OPERATION AND MAINTENANCE COMPOUND IS LOCATED 1.8 KM FROM MOSEY ROAD;
- HOUSE LAYOUT (DAUStwc005_20170428) HAS BEEN VALIDATED TO THE EXTENT OF:
- - 5km FROM WIND TURBINES AND;
- - 2km FROM TRANSMISSION GRID ALIGNMENT.
- - NON-SURVEYED HOUSES HAVE BEEN MAPPED

**LEGEND**
- TURBINE LAYOUT (PAUStwc025)
- PROPOSED ACCESS ROADS
- HARDSTAND
- PROPOSED AREA FOR BATTERY STORAGE
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED CONSTRUCTION COMPOUND AND MATERIAL LAYDOWN AREA
- PROPOSED SUBSTATION
- PROPOSED OPERATION AND MAINTENANCE AREA
- WIND FARM INFRASTRUCTURE ZONE
- PRINCIPAL SITE ENTRANCE
- GRID ROUTE
- GRID ROUTE EASEMENT 50m
- GRID ROUTE INVESTIGATION CORRIDOR
- TERMINAL STATION ACCESS TRACKS
- AREA FOR INTERFACES ASSET
- TERMINAL STATION
- SITE BOUNDARY (20170616)
- DEVELOPMENT AREA (20170613)
- LOCAL GOVERNMENT AREA BOUNDARY

**HOUSE LAYOUT (DAUStwc005_20170428)**
- HOUSE (NON ASSOCIATED STAKEHOLDER)
- HOUSE (NOT SURVEYED)
- SHED

**OCCUPATION STATUS**
- OCCUPIED
- UNOCCUPIED
- HOUSE SETBACK 2050m
- TRANSMITTER (EAUStwc001)
- COMMS LINKS POINT TO POINT
- SAPN RADIO COMMS LINKS POINT TO MULTI-POINT (SECOND FRESNEL ZONE + 65m BUFFER (EAUStwc001a))
- RADIO COMMS LINK SETBACK (SECOND FRESNEL ZONE + 65m BUFFER (EAUStwc001))
- WATER COURSE (250K MAPPING)
- WATER COURSE 80m SETBACK (GA - 2006)



| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

DRAWING NUMBER
03498D2104-01

SCALE - 1:40,000 @ A3

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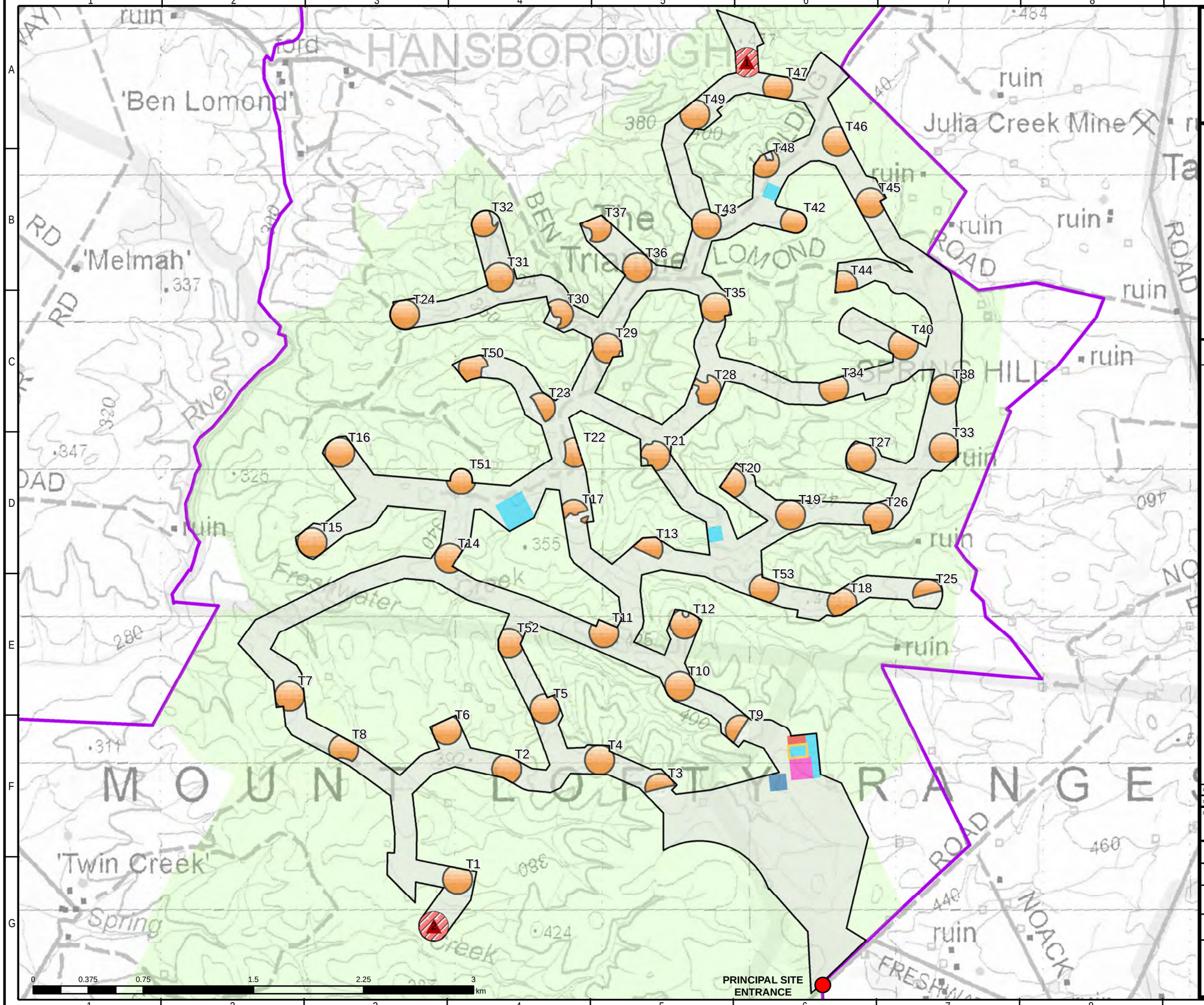
0 0.4 0.8 1.6 2.4 3.2 4 KM




TWIN CREEK
WIND FARM

FIGURE 10

MICROSITING
DRAWING



**LEGEND**

- TURBINE MICROSITING AREA (PAUStwc025)
- PERMANENT MAST MICROSITING AREA
- PRINCIPAL SITE ENTRANCE
- PROPOSED AREA FOR BATTERY STORAGE
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED CONSTRUCTION COMPOUND AND MATERIAL LAYDOWN AREA
- PROPOSED SUBSTATION
- PROPOSED OPERATION AND MAINTENANCE AREA
- WIND FARM INFRASTRUCTURE ZONE
- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)

NOTES:

- SUBJECT TO FINAL DESIGN;

- MICROSITING AREA BASED ON A 100m RADIUS FROM TURBINE AND MAST CENTRE POINT, CONTAINED WITHIN \THE WIND FARM INFRASTRUCTURE ZONE;

-RES INTERNAL X-INFRASTRUCTURE05_APPROVED_20170324 SHOWN IN THIS DRAWING.

| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

DRAWING NUMBER
03498D2215-01

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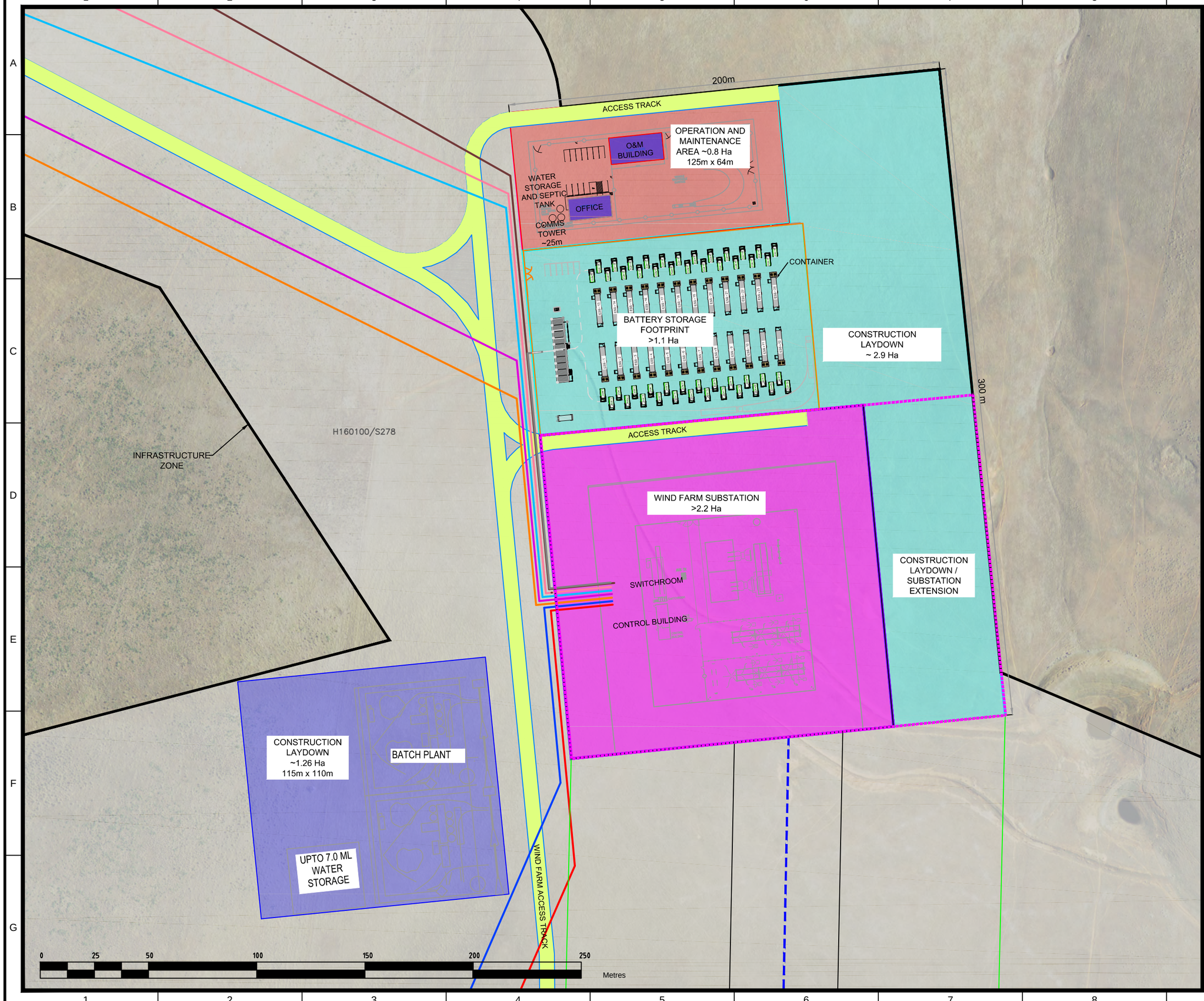


# TWIN CREEK WIND FARM

## FIGURE 11A

## PROPOSED CONSTRUCTION OPERATIONS, MAINTENANCE AND SUBSTATION AREAS

LEGEND

- PROPOSED OPERATION AND MAINTENANCE AREA
- PROPOSED SUBSTATION
- PROPOSED WIND FARM CONSTRUCTION LAYDOWN AREA
- PROPOSED TEMPORARY MOBILE BATCHING PLAN
- PROPOSED BATTERY STORAGE AREA
- ACCESS TRACKS
- INFRASTRUCTURE ZONE
- COLLECTOR GROUP CABLING
- OVER HEAD GRID CONNECTION
- GRID 50m EASEMENT
- GRID INVESTIGATION CORRIDOR

NOTES

LAYOUTS AND DIMENSIONS ARE INDICATIVE ONLY TO SHOW GENERAL ARRANGEMENT CONCEPTS AND ALL DETAILS ARE SUBJECT TO FINAL DESIGN;

SECURITY FENCING MAY BE PLACED;

RES INTERNAL X-INFRASTRUCTURE05_APPROVED_20170324 SHOWN IN THIS DRAWING;

RES INTERNAL X-GRIDROUTE07_APPROVED_20170613 SHOWN IN THIS DRAWING;

OPERATION AND MAINTENANCE COMPOUND IS LOCATED 1.8KM FROM MOSEY ROAD;

INFRASTRUCTURE IS LOCATED IN LOT SECTION 278 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS CERTIFICATE OF TITLE - VOLUME 5618 FOLIO 693 .

| | | | |
|---|---|---|---|
| INFRA DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER

03498D3501-02

SCALE - AS SHOWN @A3

COORDS

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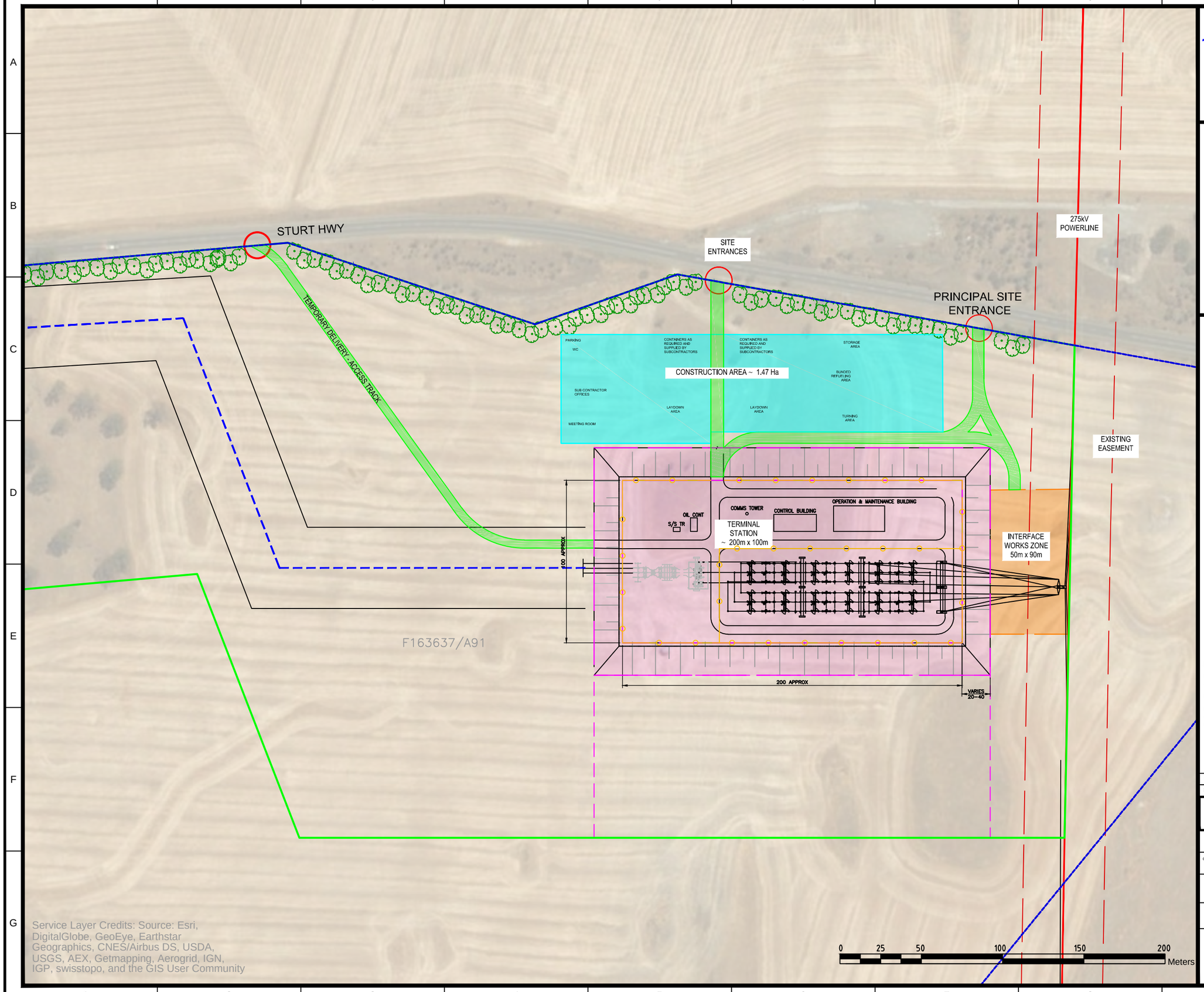


# TWIN CREEK WIND FARM

## FIGURE 11B

## PROPOSED TERMINAL STATION SITE PLAN

LEGEND

- CONNECTION ASSET GRID ROUTE
- CONNECTION ASSET EASEMENT 50m
- INVESTIGATION CORRIDOR
- EXISTING 275kV POWERLINE
- EXISTING 275kV POWERLINE 50m EASEMENT
- PROPOSED TERMINAL SUB-STATION
- PROPOSED TEMPORARY CONSTRUCTION COMPOUND AND WORKS ZONE
- PROPOSED 275kV INTERFACE WORKS ZONE
- TERMINAL STATION ACCESS ROADS
- LAND BOUNDARY
- INDICATIVE PERMANENT FENCE LOCATIONS
- SITE ENTRANCE
- PROPOSED VEGETATION SCREENING (A) POST CONSTRUCTION

NOTES

LAYOUTS AND DIMENSIONS ARE INDICATIVE ONLY TO SHOW GENERAL ARRANGEMENT CONCEPTS AND ALL DETAILS ARE SUBJECT TO FINAL DESIGN;

RES INTERNAL X-GRIDROUTE07_APPROVED_20170613 SHOWN IN THIS DRAWING;

FINAL LOCATIONS (WITHIN THE CONFINES OF THE INVESTIGATION CORRIDOR) OF CONSTRUCTION AREA AND TERMINAL SUB-STATION AREA IS SUBJECT TO FINAL DESIGN;

ALLOTMENT 91 FILED PLAN 163637 IN THE AREA NAMED TRURO HUNDRED OF JELLICOE, CERTIFICATE OF TITLE - VOLUME 5506 FOLIO 92. .

| | |
|---|---|
| INFRA DWG 03498D4101-05 | APPD DATE 25-06-2017 |
| LAYOUT DWG N/A | T-LAYOUT NO. N/A |

DRAWING NUMBER

03498D4001-01

SCALE - AS SHOWN @A3

COORDS

MGA ZONE 54 - DATUM GDA 94

PLANNING PERMIT APPLICATION



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760 PACIFIC HWY
CHATSWOOD, NSW 2067
TEL: +61 (0)2 8440 7400
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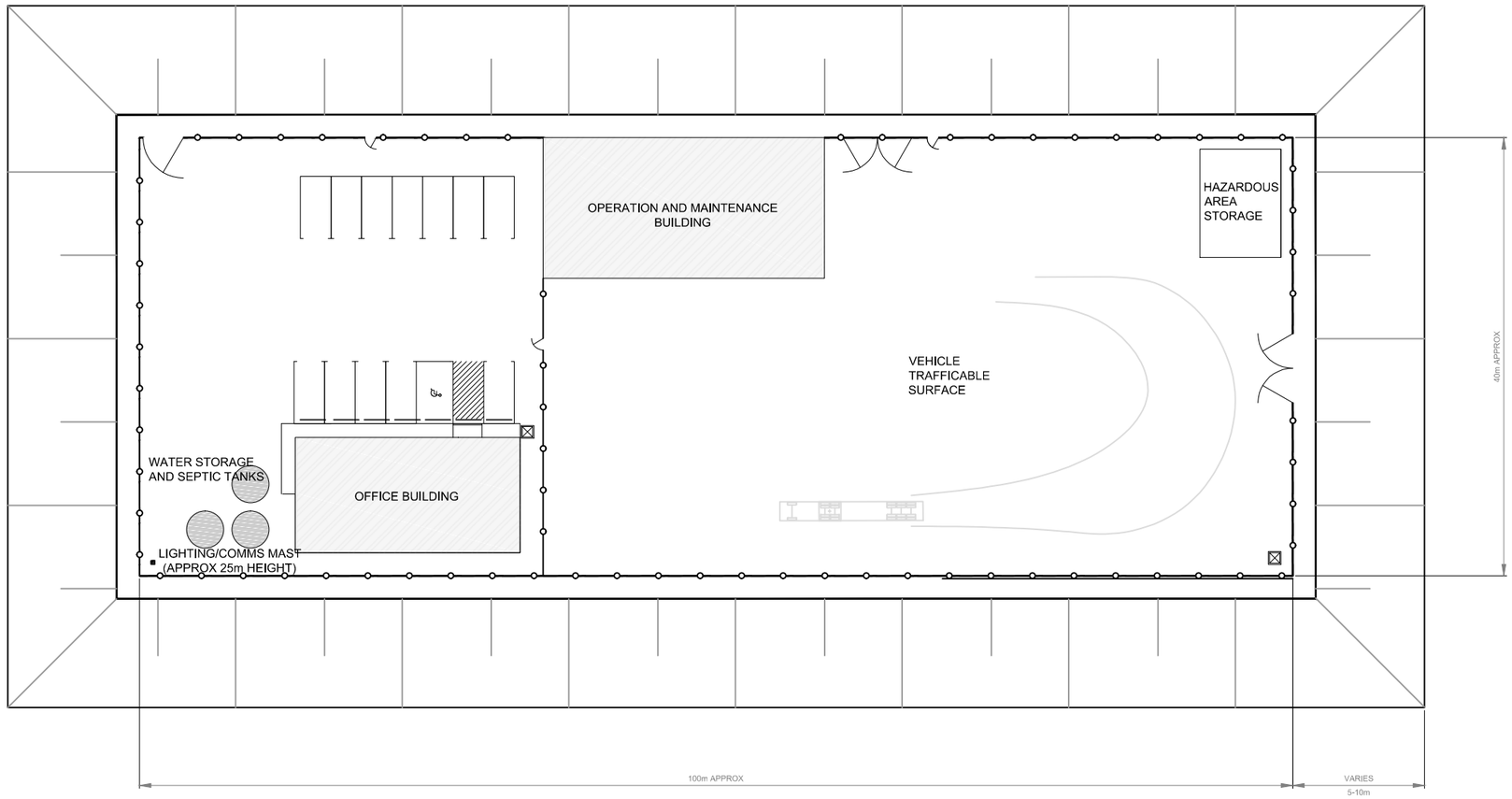


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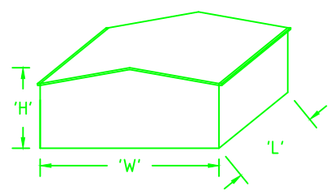


# TWIN CREEK WIND FARM

## FIGURE 12

## TYPICAL OPERATIONS AND MAINTENANCE AREA

NOTES

LANDSCAPING TO BE UNDERTAKEN IN ACCORDANCE WITH LANDSCAPE AND VISUAL IMPACT ASSESSMENT REPORT;

BUILDINGS TO COMPLY WITH AUSTRALIAN STANDARDS, BCA AND LOCAL COUNCIL REQUIREMENTS;

OFFICE AND MAINTENANCE BUILDING ROOF AREA TO BE UTILIZED FOR RAINWATER CATCHMENT;

BUILDING ARE NOT WITHIN A FLOOD ZONE BUT THE SURROUNDING GROUND DRAINAGE NETWORK SHALL BE DESIGNED TO WITHSTAND A 1:100 YEAR STORM FLOW AT THE SITE;

LAYOUTS AND DIMENSIONS ARE INDICATIVE ONLY TO SHOW GENERAL ARRANGEMENT CONCEPTS AND ALL DETAILS ARE SUBJECT TO FINAL DESIGN;

TO BE LOCATED IN A SECURED FENCED AREA;

BUILDING COLOUR MUST NOT UNREASONABLY CONTRAST WITH SURROUNDING LANDSCAPE.

MAX OPERATION AND MAINTENANCE BUILDING DIMENSIONS

W = 15 m
L = 25 m
H = 7.5 m

MAX OFFICE DIMENSIONS

W = 10 m
L = 20 m
H = 7.5 m



| | | | |
|---|---|---|---|
| INFRA DWG | N/A | APPD DATE | |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER

03498D3502-01

SCALE - 1:500 @A3

COORDS

N/A

PLANNING PERMIT APPLICATION



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# Attachment 2

**Land within the Site of the Development**

**Table 1 - WIND FARM – LAND PARCEL AND INFRASTRUCTURE INFORMATION**

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5293 FOL 933 | ALLOTMENT 3<br>FILED PLAN 158974<br>IN THE AREA NAMED<br>HANSBOROUGH<br>HUNDRED OF JULIA CREEK | INFRASTRUCTURE ZONE | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 934 | ALLOTMENT 10<br>FILED PLAN 158975 IN THE AREA<br>NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | TURBINE 50,<br>HARDSTAND<br>ACCESS TRACK,<br>INFRASTRUCTURE ZONE<br>CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 934 | ALLOTMENT 11<br>FILED PLAN 158975 IN THE AREA<br>NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | TURBINE 29,<br>HARDSTAND,<br>ACCESS TRACK,<br>INFRASTRUCTURE ZONE,<br>CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 934 | ALLOTMENT 6<br>FILED PLAN 158975 IN THE AREA<br>NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | TURBINE 24,<br>HARDSTAND,<br>ACCESS TRACK,<br>INFRASTRUCTURE ZONE,<br>CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 934 | ALLOTMENT 8<br>FILED PLAN 158975 IN THE AREA<br>NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | TURBINE 31, TURBINE 32,<br>HARDSTAND,<br>ACCESS TRACK,<br>INFRASTRUCTURE ZONE,<br>CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 934 | ALLOTMENT 9<br>FILED PLAN 158975 IN THE AREA<br>NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | TURBINE 30,<br>HARDSTAND,<br>ACCESS TRACK,<br>INFRASTRUCTURE ZONE,<br>CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 926 | ALLOTMENT 12<br>FILED PLAN 158976 IN THE AREA<br>NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | TURBINE 47,<br>HARDSTAND,<br>PERMANENT MET MAST,<br>ACCESS TRACK,<br>INFRASTRUCTURE ZONE,<br>CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 926 | ALLOTMENT 13<br>FILED PLAN 158976 IN THE AREA<br>NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | TURBINE 48, TURBINE 49,<br>HARDSTANDS,<br>ACCESS TRACK,<br>INFRASTRUCTURE ZONE,<br>CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 926 | ALLOTMENT 14<br>FILED PLAN 158976 IN THE AREA<br>NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | TURBINE 43,<br>HARDSTAND,<br>ACCESS TRACK,<br>INFRASTRUCTURE ZONE,<br>CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 926 | ALLOTMENT 15<br>FILED PLAN 158976 IN THE AREA<br>NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | TURBINE 36, TURBINE 37,<br>HARDSTAND,<br>ACCESS TRACK,<br>INFRASTRUCTURE ZONE,<br>CABLES. | REGIONAL COUNCIL OF GOYDER |

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5293 FOL 930 | SECTION 122 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 16, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 930 | SECTION 123 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 23, TURBINE 51, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 930 | SECTION 124 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 21, TURBINE 22, TURBINE 17, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 930 | SECTION 125 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 11, TURBINE 13, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 930 | SECTION 126 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | ACCESS TRACK, CONSTRUCTION COMPOUND, MATERIAL LAYDOWN AREA, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 930 | SECTION 127 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 14, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 930 | SECTION 128 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 15, HARDSTAND, ACCESS TRACK INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 930 | SECTION 129 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | INFRASTRUCTURE ZONE, ACCESS TRACKS, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 927 | SECTION 218 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 927 | SECTION 219 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 42, HARDSTAND, ACCESS TRACK, CONSTRUCTION COMPOUND, MATERIAL LAYDOWN AREA, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5293 FOL 927 | SECTION 220 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 45, TURBINE 46, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 931 | SECTION 232 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 28, TURBINE 35, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 931 | SECTION 233 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 12, TURBINE 20, HARDSTAND, ACCESS TRACK, CONSTRUCTION COMPOUND, MATERIAL LAYDOWN AREA, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 931 | SECTION 234 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 19, TURBINE 53, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 931 | SECTION 235 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | INFRASTRUCTURE ZONE, ACCESS TRACK, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 928 | SECTION 236 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 34, TURBINE 40, TURBINE 44, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 928 | SECTION 237 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 38, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 928 | SECTION 238 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 928 | SECTION 239 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 27, TURBINE 33, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 928 | SECTION 240 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 18, TURBINE 26, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5964 FOL 335 | SECTION 241 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5964 FOL 335 | SECTION 242<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | TURBINE 25, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | REGIONAL COUNCIL OF GOYDER |
| VOL 5964 FOL 335 | SECTION 243<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5618 FOL 689 | SECTION 272<br>HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | TURBINE 9, TURBINE 10, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 706 | ALLOTMENT 91<br>FILED PLAN 199399 IN THE AREAS NAMED BAGOT WELL AND ST KITTS<br>HUNDRED OF BELVIDERE | ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 693 | SECTION 278<br>HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS | ACCESS TRACK, BATTERY ENERGY STORAGE FACILITY, CONCRETE BATCHING PLANT AREA, CONSTRUCTION COMPOUND MATERIAL LAYDOWN AREA, OPERATIONS AND MAINTENANCE FACILITY, SUBSTATION, INFRASTRUCTURE ZONE, OVERHEAD LINE, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 688 | SECTION 283<br>HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 688 | SECTION 284<br>HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS | ACCESS TRACK, INFRASTRUCTURE ZONE, OVERHEAD LINE, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5390 FOL 991 | ALLOTMENT 91<br>FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL<br>HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5390 FOL 991 | ALLOTMENT 92<br>FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL<br>HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5390 FOL 991 | ALLOTMENT 93<br>FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL<br>HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5390 FOL 991 | ALLOTMENT 94 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5390 FOL 991 | ALLOTMENT 95 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5390 FOL 991 | ALLOTMENT 96 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5390 FOL 991 | ALLOTMENT 97 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5390 FOL 991 | ALLOTMENT 98 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5390 FOL 991 | ALLOTMENT 104 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA | ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5390 FOL 991 | ALLOTMENT 105 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 699 | SECTION 258 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | INFRASTRUCTURE ZONE, ACCESS TRACK, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 695 | SECTION 263 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | INFRASTRUCTURE ZONE, ACCESS TRACK, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 696 | SECTION 265 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | TURBINE 7, TURBINE 8, HARDSTANDS, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | LIGHT REGIONAL COUNCIL |

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5618 FOL 701 | SECTION 267<br>HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | TURBINE 6, TURBINE 52, HARDSTANDS, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 703 | SECTION 268<br>HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | TURBINE 1 HARDSTAND, PERMANENT MAST, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 697 | SECTION 269<br>HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | TURBINE 2, TURBINE 5 HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 700 | SECTION 270<br>HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | INFRASTRUCTURE ZONE, ACCESS TRACK, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 687 | SECTION 271<br>HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | TURBINE 4 HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 692 | SECTION 273<br>HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | TURBINE 3 HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 691 | SECTION 285<br>HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS | ACCESS TRACK, PRINCIPAL SITE ENTRANCE, INFRASTRUCTURE ZONE, OVERHEAD LINE, CABLES. | LIGHT REGIONAL COUNCIL |
| VOL 5865 FOL 275 | ALLOTMENT 25<br>FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5488 FOL 108 | SECTION 159<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5625 FOL 166 | ALLOTMENT 24<br>FILED PLAN 217158 IN THE AREA NAMED BAGOT WELL<br>HUNDRED OF BELVIDERE | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5293 FOL 930 | SECTION 121<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 926 | ALLOTMENT 18<br>FILED PLAN 158976 IN THE AREA NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5865 FOL 275 | ALLOTMENT 19<br>FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 926 | ALLOTMENT 17<br>FILED PLAN 158976<br>IN THE AREA NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5618 FOL 694 | SECTION 251<br>HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 704 | ALLOTMENT 91 FILED PLAN 217083 IN THE AREAS NAMED KOONUNGA AND ST KITTS<br>HUNDRED OF BELVIDERE | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5488 FOL 108 | SECTION 288<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5488 FOL 108 | SECTION 157<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5764 FOL 914 | SECTION 327<br>HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5293 FOL 934 | ALLOTMENT 4 FILED PLAN 158975 IN THE AREA NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5390 FOL 991 | ALLOTMENT 103 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL<br>HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5290 FOL 269 | SECTION 160<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5618 FOL 694 | SECTION 255<br>HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5865 FOL 276 | SECTION 206<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5290 FOL 267 | SECTION 208<br>HUNDRED OF JULIA CREEK<br>IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5865 FOL 275 | ALLOTMENT 23<br>FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5290 FOL 269 | SECTION 164<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5618 FOL 690 | SECTION 249<br>HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5290 FOL 269 | SECTION 162<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5618 FOL 702 | SECTION 257<br>HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 708 | ALLOTMENT 571<br>FILED PLAN 176643 IN THE AREA NAMED BAGOT WELL<br>HUNDRED OF BELVIDERE | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5625 FOL 166 | ALLOTMENT 20 FILED PLAN 217158<br>IN THE AREA NAMED BAGOT WELL<br>HUNDRED OF BELVIDERE | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5290 FOL 269 | SECTION 167<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5618 FOL 694 | SECTION 254<br>HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5865 FOL 275 | ALLOTMENT 20<br>FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5618 FOL 705 | ALLOTMENT 569 FILED PLAN 176641 IN THE AREA NAMED ST KITTS<br>HUNDRED OF BELVIDERE | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5531 FOL 406 | SECTION 103<br>HUNDRED OF BELVIDERE IN THE AREA NAMED KOONUNGA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5625 FOL 166 | ALLOTMENT 23<br>FILED PLAN 217158 IN THE AREA NAMED BAGOT WELL<br>HUNDRED OF BELVIDERE | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5390 FOL 991 | ALLOTMENT 99<br>FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL<br>HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5804 FOL 478 | SECTION 252<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5488 FOL 108 | ALLOTMENT 2 FILED PLAN 10717 IN THE AREA NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5878 FOL 290 | ALLOTMENT 1 FILED PLAN 160535 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5625 FOL 166 | ALLOTMENT 22 FILED PLAN 217158 IN THE AREAS NAMED BAGOT WELL AND ST KITTS HUNDRED OF BELVIDERE | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5390 FOL 991 | ALLOTMENT COMPRISING PIECES 102 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5390 FOL 991 | ALLOTMENT COMPRISING PIECES 101 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5760 FOL 565 | SECTION 206 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5293 FOL 934 | ALLOTMENT 5 FILED PLAN 158975 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5826 FOL 797 | ALLOTMENT 572 FILED PLAN 176644 IN THE AREA NAMED BAGOT WELL HUNDRED OF BELVIDERE | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5865 FOL 275 | ALLOTMENT 21 FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5760 FOL 535 | SECTION 509 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5488 FOL 108 | SECTION 156 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5865 FOL 275 | ALLOTMENT 26 FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5625 FOL 166 | ALLOTMENT 25 FILED PLAN 217158 IN THE AREA NAMED ST KITTS HUNDRED OF BELVIDERE | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5488 FOL 108 | SECTION 291 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 932 | SECTION 209 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5293 FOL 926 | ALLOTMENT 16<br>FILED PLAN 158976 IN THE AREA NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5293 FOL 926 | ALLOTMENT 17<br>FILED PLAN 158976 IN THE AREA NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5865 FOL 275 | ALLOTMENT 22<br>FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5625 FOL 166 | ALLOTMENT 21<br>FILED PLAN 217158 IN THE AREA NAMED BAGOT WELL<br>HUNDRED OF BELVIDERE | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 707 | ALLOTMENT 102<br>FILED PLAN 214685 IN THE AREA NAMED KOONUNGA<br>HUNDRED OF BELVIDERE | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5290 FOL 269 | SECTION 163<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5390 FOL 991 | ALLOTMENT 100<br>FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL<br>HUNDREDS OF BELVIDERE AND KAPUNDA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5488 FOL 108 | SECTION 290<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5488 FOL 108 | SECTION 289<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5290 FOL 269 | SECTION 169<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5618 FOL 698 | SECTION 279<br>HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5672 FOL 368 | SECTION 179<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5290 FOL 269 | SECTION 166<br>HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5531 FOL 407 | SECTION 100<br>HUNDRED OF BELVIDERE IN THE AREA NAMED KOONUNGA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5293 FOL 934 | ALLOTMENT 7<br>FILED PLAN 158975 IN THE AREA NAMED HANSBOROUGH<br>HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5531 FOL 405 | SECTION 105 HUNDRED OF BELVIDERE IN THE AREA NAMED KOONUNGA | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5488 FOL 108 | SECTION 155 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5865 FOL 275 | ALLOTMENT 24 FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5290 FOL 267 | SECTION 207 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5290 FOL 269 | SECTION 165 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5618 FOL 694 | SECTION 250 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5290 FOL 269 | SECTION 161 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |
| VOL 5618 FOL 694 | SECTION 250 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL | NO INFRASTRUCTURE PLANNED | LIGHT REGIONAL COUNCIL |
| VOL 5293 FOL 930 | SECTION 129 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH | NO INFRASTRUCTURE PLANNED | REGIONAL COUNCIL OF GOYDER |

**Table 2 - GRID CONNECTION – LAND PARCEL AND INFRASTRUCTURE INFORMATION**

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5618 FOL 693 | SECTION 278 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS | OVERHEAD LINE | LIGHT REGIONAL COUNCIL |
| VOL 5618 FOL 688 | SECTION 284 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS | OVERHEAD LINE | LIGHT REGIONAL COUNCIL |
| VOL 5264 FOL 963 | SECTION 290 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS | OVERHEAD LINE | LIGHT REGIONAL COUNCIL |
| VOL 5663 FOL 19 | SECTION 287 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS | OVERHEAD LINE | LIGHT REGIONAL COUNCIL |

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5476 FOL 305 | SECTION 190<br>HUNDRED OF BELVIDERE<br>IN THE AREA NAMED ST KITTS | OVERHEAD LINE | LIGHT REGIONAL COUNCIL |
| VOL 5486 FOL 562 | ALLOTMENT 100<br>DEPOSITED PLAN 48414<br>IN THE AREA NAMED ST KITTS<br>HUNDRED OF BELVIDERE | OVERHEAD LINE | LIGHT REGIONAL COUNCIL |
| VOL 5486 FOL 561 | ALLOTMENT 99<br>DEPOSITED PLAN 48414<br>IN THE AREA NAMED ST KITTS<br>HUNDRED OF BELVIDERE | OVERHEAD LINE | LIGHT REGIONAL COUNCIL |
| VOL 5274 FOL 160 | SECTION 314<br>HUNDRED OF BELVIDERE<br>IN THE AREA NAMED ST KITTS | OVERHEAD LINE | LIGHT REGIONAL COUNCIL |
| VOL 5146 FOL 519 | SECTION 581 HUNDRED OF BELVIDERE<br>IN THE AREA NAMED ST KITTS | OVERHEAD LINE | LIGHT REGIONAL COUNCIL |
| VOL 6124 FOL 753 | ALLOTMENT 1<br>DEPOSITED PLAN 36071<br>IN THE AREA NAMED ST KITTS<br>HUNDRED OF BELVIDERE | OVERHEAD LINE | LIGHT REGIONAL COUNCIL |
| VOL 5616 FOL 778 | SECTION 319<br>HUNDRED OF BELVIDERE<br>IN THE AREA NAMED ST KITTS | OVERHEAD LINE | LIGHT REGIONAL COUNCIL |
| VOL 5616 FOL 778 | SECTION 83<br>HUNDRED OF DUTTON<br>IN THE AREA NAMED DUTTON | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5616 FOL 778 | SECTION 85<br>HUNDRED OF DUTTON<br>IN THE AREA NAMED DUTTON | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5640 FOL 955 | SECTION 87<br>HUNDRED OF DUTTON<br>IN THE AREA NAMED TRURO | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5517 FOL 458 | SECTION 37<br>HUNDRED OF DUTTON<br>IN THE AREA NAMED TRURO | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5485 FOL 579 | SECTION 38<br>HUNDRED OF DUTTON<br>IN THE AREA NAMED TRURO | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5485 FOL 733 | SECTION 36<br>HUNDRED OF DUTTON<br>IN THE AREA NAMED TRURO | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5503 FOL 860 | SECTION 34<br>HUNDRED OF DUTTON<br>IN THE AREA NAMED TRURO | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5322 FOL 638 | ALLOTMENT 1<br>DEPOSITED PLAN 44123<br>IN THE AREA NAMED TRURO<br>HUNDRED OF DUTTON | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5812 FOL 749 | SECTION 51<br>HUNDRED OF DUTTON<br>IN THE AREA NAMED TRURO | OVERHEAD LINE | MID MURRAY COUNCIL |

| VOLUME AND FOLIO | ALLOTMENT/SECTION AND FILED/HUNDRED PLAN | INFRASTRUCTURE | LOCAL GOVERNMENT AREA |
|---|---|---|---|
| VOL 5810 FOL 208 | ALLOTMENT 682<br>FILED PLAN 209058<br>IN THE AREA NAMED TRURO<br>HUNDRED OF JELLICOE | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5315 FOL 264 | SECTION 221<br>HUNDRED OF JELLICOE<br>IN THE AREA NAMED TRURO | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5652 FOL 492 | ALLOTMENT 1<br>DEPOSITED PLAN 48415<br>IN THE AREA NAMED TRURO<br>HUNDRED OF JELLICOE | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5950 FOL 567 | SECTION 218<br>HUNDRED OF JELLICOE<br>IN THE AREA NAMED TRURO | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5950 FOL 564 | ALLOTMENT 106<br>DEPOSITED PLAN 65817<br>IN THE AREA NAMED TRURO<br>HUNDRED OF JELLICOE | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5947 FOL 941 | ALLOTMENT 110<br>DEPOSITED PLAN 65818<br>IN THE AREA NAMED TRURO<br>HUNDRED OF JELLICOE | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5304 FOL 717 | ALLOTMENT 94<br>FILED PLAN 163638<br>IN THE AREA NAMED TRURO<br>HUNDRED OF JELLICOE | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5360 FOL 970 | ALLOTMENT 101<br>FILED PLAN 174415<br>IN THE AREA NAMED TRURO<br>HUNDRED OF JELLICOE | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 6157 FOL 823 | ALLOTMENT 118<br>FILED PLAN 174416<br>IN THE AREA NAMED TRURO<br>HUNDRED OF JELLICOE | OVERHEAD LINE | MID MURRAY COUNCIL |
| VOL 5506 FOL 92 | ALLOTMENT 91<br>FILED PLAN 163637<br>IN THE AREA NAMED TRURO<br>HUNDRED OF JELLICOE | OVERHEAD LINE, TERMINAL SUBSTATION, ACCESS TRACK, VEGETATIVE SCREENING, ELECTRICAL INFRASTRUCTURE. | MID MURRAY COUNCIL |

# ATTACHMENT 3

**Location of Wind Turbine Generators and Infrastructure**

| WTG Ref Number | Easting (MGA Z54) | Northing (MGA Z54) |
|---|---|---|
| T1 | 321026 | 6200205 |
| T2 | 321360 | 6200955 |
| T3 | 322403 | 6200826 |
| T4 | 321993 | 6201019 |
| T5 | 321620 | 6201367 |
| T6 | 320952 | 6201223 |
| T7 | 319882 | 6201452 |
| T8 | 320250 | 6201090 |
| T9 | 322950 | 6201222 |
| T10 | 322538 | 6201521 |
| T11 | 322022 | 6201882 |
| T12 | 322572 | 6201943 |
| T13 | 322322 | 6202456 |
| T14 | 320971 | 6202391 |
| T15 | 320036 | 6202498 |
| T16 | 320224 | 6203111 |
| T17 | 321816 | 6202690 |
| T18 | 323643 | 6202084 |
| T19 | 323292 | 6202686 |
| T20 | 322886 | 6202903 |
| T21 | 322371 | 6203086 |
| T22 | 321826 | 6203111 |
| T23 | 321590 | 6203414 |
| T24 | 320666 | 6204049 |
| T25 | 324225 | 6202148 |
| T26 | 323887 | 6202670 |
| T27 | 323772 | 6203076 |
| T28 | 322719 | 6203537 |
| T29 | 322046 | 6203820 |
| T30 | 321713 | 6204052 |
| T31 | 321308 | 6204303 |
| T32 | 321201 | 6204679 |
| T33 | 324338 | 6203141 |

| WTG Ref Number | Easting (MGA Z54) | Northing (MGA Z54) |
|---|---|---|
| T34 | 323586 | 6203550 |
| T35 | 322782 | 6204095 |
| T36 | 322249 | 6204368 |
| T37 | 321973 | 6204642 |
| T38 | 324342 | 6203539 |
| T40 | 324060 | 6203843 |
| T42 | 323325 | 6204676 |
| T43 | 322719 | 6204664 |
| T44 | 323646 | 6204246 |
| T45 | 323837 | 6204811 |
| T46 | 323611 | 6205227 |
| T47 | 323205 | 6205593 |
| T48 | 323115 | 6205082 |
| T49 | 322641 | 6205411 |
| T50 | 321133 | 6203686 |
| T51 | 321050 | 6202928 |
| T52 | 321374 | 6201812 |
| T53 | 323112 | 6202183 |

### Location of Key Sites

| SITE TYPE | TITLE REFERENCE |
|---|---|
| OPERATIONS & MAINTENANCE FACILITY | S278 VOL 5618 FOL 693 H160100 |
| CONSTRUCTION COMPOUND AND MATERIAL LAYDOWN AREAS | S278 VOL 5618 FOL 693 H160100 (MAIN)<br>S233 VOL 5293 FOL 931 H160300 (SMALL 1)<br>S126 VOL 5293 FOL 930 H160300 (SMALL 2)<br>A91 VOL 5506 FOL 92 F163637 (TERMINAL) |
| BATTERY STORAGE | S278 VOL 5618 FOL 693 H160100 |
| ON-SITE SUBSTATION | S278 VOL 5618 FOL 693 H160100 |
| TERMINAL SUBSTATION | A91 VOL 5506 FOL 92 F163637 |

# ATTACHMENT 4

**Extracts of Light Regional Council Development Plan Dated 8 December 2016**

**Extracts of Goyder Council Development Plan Dated 24 November 2016**

**Extracts of the Mid Murray Council Development Plan Dated 14 June 2017**

## RELEVANT PROVISIONS OF LIGHT REGIONAL COUNCIL DEVELOPMENT PLAN

## DEVELOPMENT PLAN DATED 8 DECEMBER 2016

## PRIMARY PRODUCTION ZONE

**Desired Character**

Preservation of rural and landscape character with farming on large properties, designated areas for horticulture, limited additional dwellings, minimal non-agricultural development and retention of natural vegetation.

Preservation of the extensive dune fields of sand and associated vegetation located in the vicinity of Ward Belt.

Protection of the Light, North Para and Gawler Rivers from incompatible development and pollution, and their recognition as natural resources of significant value to the district as a pleasant rural contrast to the surrounding countryside and a permanent supply of fresh water.

Preservation of the white quartz sand reserves occurring north of Freeling and the brick clays west of Freeling as significant mineral resources.

Development that takes into consideration the limited physical and social infrastructure such as all-weather roads, public utilities and community facilities in the area.

Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) are envisaged within the zone, excluding the area within the Barossa Valley Region Policy Area 2 and Precinct 19 Marananga Seppeltsfield Fringe, and constitute a component of this part of the zone's desired character. These facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence, components (particularly turbines) may need to be:

- located in visually prominent locations such as ridgelines
- visible from scenic routes and valuable scenic and environmental areas
- located closer to roads than envisaged by generic setback policy.

This, coupled with the large scale of these facilities (in terms of both height and spread of components), renders it difficult to mitigate the visual impacts of wind farms to the degree expected of other types of development. Subject to implementation of management techniques set out by general / council wide policy regarding renewable energy facilities, these visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy.

**Primary Production Zone - Objectives**

**Objective 1:** The long term continuation of primary production.

**Objective 2:** Economically productive, efficient and environmentally sustainable primary production.

**Objective 3:** Allotments of a size and configuration that promote the efficient use of land for primary production.

**Objective 4:** Protection of primary production from encroachment by incompatible land uses and protection of scenic qualities of rural landscapes.

**Objective 5:** Accommodation of wind farms and ancillary development.

**Objective 6:** Development that contributes to the desired character of the zone.

**Principles of Development Control**

**Land Use**

**PDC 1** The following forms of development are envisaged in the zone:

- commercial forestry except where it is located within Precinct 18 Kapunda Fringe
- dairy farming except where it is located within the Seppeltsfield Winery Policy Area 5
- farming
- farm building
- horticulture where it is located within Barossa Valley Region Policy Area 2, Precinct 16 Horticulture or Precinct 17 Market Garden
- light industry and service industry associated with the processing, packaging and distribution of produce where it is located within General Farming Policy Area 3
- small scale tourist accommodation (including through the diversification of existing farming activities and conversion of farm buildings)
- wind farm and ancillary development outside of the Barossa Valley Region Policy Area 2 and Precinct 19 Marananga Seppeltsfield Fringe
- wind monitoring mast and ancillary development outside of the Barossa Valley Region Policy Area 2 and Precinct 19 Marananga Seppeltsfield Fringe
- winery where it is located within the Barossa Valley Region Policy Area 2.

**PDC 2** Development listed as non-complying is generally inappropriate.

**PDC 3** Wind farms and ancillary development should be located in areas which provide opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited:

(a) in visually prominent locations
(b) closer to roads than envisaged by generic setback policy.

**PDC 6** Non-agricultural development should be limited to maximise farm productivity and horticultural productivity and prevent incremental erosion of the existing landscape character.

**Form and Character**

**PDC 9** Development should not be undertaken unless it is consistent with the desired character for the zone.

**PDC 10** Development should not occur within 500 metres of a national park, conservation park, wilderness protection area or significant stands of native vegetation if it will increase the potential for, or result in, the spread of pest plants.

**PDC 11** Development should provide an access way of at least 3 metres wide that provides access for emergency vehicles to the rear of the allotment.

**PDC 12** Buildings should primarily be limited to farm buildings, a detached dwelling associated with primary production on the allotment and residential outbuildings that are:

(a) grouped together on the allotment and set back from allotment boundaries to minimise the visual impact of buildings on the landscape as viewed from public roads
(b) screened from public roads and adjacent land by existing vegetation or landscaped buffers.

**PDC 13** Native vegetation, including the full range of tree, understorey and groundcover species, should be retained and managed so as to maintain and enhance its environmental values and functions, including conservation, biodiversity and habitat, and minimisation of dry land salinity.

**PROCEDURAL MATTERS**

**Complying Development**

Complying developments are prescribed in schedule four of the *Development Regulations 2008*.

**Non-complying Development**

Development (including building work, a change in the use of land, or division of an allotment) for the following is non-complying:

| Form of Development | Exceptions |
|---|---|
| Wind farm and ancillary development such as substations, maintenance sheds, access roads and connecting power lines (including to the National Electricity Grid) located within the Barossa Valley Character Preservation District as defined by *Character Preservation legislation* | Except a wind turbine within the Barossa Valley Character Preservation District as defined by Character Preservation legislation where the turbine generates power to be used wholly for activities to be located on the property upon which the turbine is situated and the turbine does not exceed 10 metres in height. |
| Wind monitoring mast located within the Barossa Valley Character Preservation District as defined by Character Preservation legislation | |

**Public Notification**

Categories of public notification are prescribed in schedule 9 of the *Development Regulations 2008*.

Further, the following forms of development are designated:

| Category 1 | Category 2 |
|---|---|
| | Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid), outside of the following:<br><br>(a) Barossa Valley Region Policy Area 2 |

(b) Roseworthy College Policy Area 4

(c) Seppeltsfield Winery Policy Area 5

(d) Township Fringe Policy Area 6

where the base of all wind turbines is located at least 2000 metres from:

(i) an existing dwelling or tourist accommodation that is not associated with the wind farm

(ii) a proposed dwelling or tourist accommodation for which an operable development plan consent exists

(iii) the boundaries of any Airfield, Airport, Centre, Community, Fringe, Historic Conservation, Home Industry, Living, Mixed Use, Residential, Settlement, Tourist, Township or Urban Zone, Policy Area or Precinct or any Heritage Area (including within the area of an adjoining Development Plan).

Wind monitoring mast and ancillary development outside of the following:

(a) Barossa Valley Region Policy Area 2

(b) Roseworthy College Policy Area 4

(c) Seppeltsfield Winery Policy Area 5

(d) Township Fringe Policy Area 6.

## General Farming Policy Area 3

**Desired Character**

A policy area for farming on large properties, predominantly for cereal cropping and grazing with designated areas for horticulture and market gardening.

Development within the policy area that will retain the rural character comprising individual farm buildings in a landscape of undulating to rugged hills.

**Objectives**

**Objective 1** A policy area primarily for primary production, including horticulture in designated areas.

**Objective 4** Development that contributes to the desired character of the policy area.

**Principles of Development Control**

**Land Use**

**PDC 1** The following forms of development are envisaged in the policy area:

- farming
- horticulture within Precinct 16 Horticulture or Precinct 17 Market Garden
- light industry and service industry associated with the processing, packaging and distribution of produce
- small-scale tourist development in association with wineries, farms and local heritage places.

**PDC 3** Commercial development should be limited to the handling, storage, packing or wholesaling of primary produce and non-residential tourism.

**PDC 11** Sand extraction should only occur on those dunes already cleared of native vegetation. Operations should occur progressively, with the number of leases restricted, and mining should commence from near the Gawler River, and extend in a northward direction. Old workings should be rehabilitated and there should be only enough area open at any one time to allow the sand to be extracted efficiently.

**Form and Character**

**PDC 12** Development should not be undertaken unless it is consistent with the desired character for the policy area.

## GENERAL PROVISIONS

**BUILDING NEAR AIRFIELDS**

**Objectives**

**Objective 1** Development that ensures the long-term operational, safety, commercial and military aviation requirements of airfields (airports, airstrips and helicopter landing sites) continue to be met.

**Principles of Development Control**

**PDC 1** The height and location of buildings and structures should not adversely affect the long-term operational, safety, commercial and military aviation requirements of airfields.

**PDC 2** Buildings or structures should not protrude through obstacle limitation surfaces (OLS) defined by aviation authorities.

**PDC 3** Development in the vicinity of airfields should not create a risk to public safety, in particular through any of the following:

(a) lighting glare
(b) smoke, dust and exhaust emissions
(c) air turbulence
(d) storage of flammable liquids
(e) attraction of birds

(f) reflective surfaces (e.g. roofs of buildings, large windows)
(g) materials that affect aircraft navigational aids.

**PDC 4** Outdoor lighting within 6 kilometres of an airport should be designed so that it does not pose a hazard to aircraft operations.

**DESIGN AND APPEARANCE**

**Objectives**

**Objective 1** Development of a high architectural standard that responds to and reinforces positive aspects of the local environment and built form.

**Objective 2** Roads, open spaces, buildings and land uses laid out and linked so that they are easy to understand and navigate.

**Principles of Development Control**

**PDC 1** The design of a building may be of a contemporary nature and exhibit an innovative style provided the overall form is sympathetic to the scale of development in the locality and with the context of its setting with regard to shape, size, materials and colour.

**PDC 2** Buildings should be designed and sited to avoid creating extensive areas of uninterrupted walling facing areas exposed to public view.

**PDC 3** Buildings should be designed to reduce their visual bulk and provide visual interest through design elements such as:

(a) articulation
(b) colour and detailing
(c) small vertical and horizontal components
(d) design and placing of windows
(e) variations to facades.

**PDC 5** Building form should not unreasonably restrict existing views available from neighbouring properties and public spaces.

**PDC 6** Transportable buildings and buildings which are elevated on stumps, posts, piers, columns or the like, should have their suspended footings enclosed around the perimeter of the building with brickwork or timber, and the use of verandas, pergolas and other suitable architectural detailing to give the appearance of a permanent structure.

**PDC 8** The external walls and roofs of buildings should not incorporate highly reflective materials which will result in glare.

**PDC 16** Development should be designed and sited so that outdoor storage and service areas are screened from public view by an appropriate combination of built form, solid fencing or landscaping.

**PDC 17** Outdoor lighting should not result in light spillage on adjacent land.

**Building Setbacks from Road Boundaries**

**PDC 19** The setback of buildings from public roads should:

(a) be similar to, or compatible with, setbacks of buildings on adjoining land and other buildings in the locality
(b) contribute positively to the streetscape character of the locality
(c) not result in or contribute to a detrimental impact upon the function, appearance or character of the locality.

**ENERGY EFFICIENCY**

**Objectives**

**Objective 1** Development designed and sited to conserve energy.

**Objective 2** Development that provides for on-site power generation including photovoltaic cells and wind power.

**Principles of Development Control**

**PDC 1** Development should provide for efficient solar access to buildings and open space all year around.

**PDC 2** Buildings should be sited and designed:

(a) to ensure adequate natural light and winter sunlight is available to the main activity areas of adjacent buildings
(b) so that the open spaces associated with the main activity areas face north for exposure to winter sun.

**On-site Energy Generation**

**PDC 3** Development should facilitate the efficient use of photovoltaic cells and solar hot water systems by:

(a) taking into account overshadowing from neighbouring buildings
(b) designing roof orientation and pitches to maximise exposure to direct sunlight.

**PDC 4** Public infrastructure and lighting, should be designed to generate and use renewable energy.

**HAZARDS**

**Objectives**

**Objective 1** Maintenance of the natural environment and systems by limiting development in areas susceptible to natural hazard risk.

**Objective 2** Development located away from areas that are vulnerable to, and cannot be adequately and effectively protected from the risk of natural hazards.

**Objective 6** Development located to minimise the threat and impact of bushfires on life and property.

**Objective 8** The environmental values and ecological health of receiving waterways and marine environments protected from the release of acid water resulting from the disturbance of acid sulphate soils.

**Objective 9** Protection of human health and the environment wherever site contamination has been identified or suspected to have occurred.

**Objective 10** Appropriate assessment and remediation of site contamination to ensure land is suitable for the proposed use and provides a safe and healthy living and working environment.

**Objective 11** Minimisation of harm to life, property and the environment through appropriate location of development and appropriate storage, containment and handling of hazardous materials.

**Principles of Development Control**

**PDC 1** Development should be excluded from areas that are vulnerable to, and cannot be adequately and effectively protected from, the risk of natural hazards

**PDC 2** Development located on land subject to hazards as shown on the *Overlay Maps - Development Constraints* should not occur unless it is sited, designed and undertaken with appropriate precautions being taken against the relevant hazards.

**PDC 3** There should not be any significant interference with natural processes in order to reduce the exposure of development to the risk of natural hazards.

**Flooding**

**PDC 4** Development should not occur on land where the risk of flooding is likely to be harmful to safety or damage property.

**PDC 5** Development should not be undertaken in areas liable to inundation by tidal, drainage or flood waters unless the development can achieve all of the following:

(a) it is developed with a public stormwater system capable of catering for a 1 in 100 year average return interval flood event
(b) buildings are designed and constructed to prevent the entry of floodwaters in a 1 in 100 year average return interval flood event.

**PDC 7** Development, including earthworks associated with development, should not do any of the following:

(a) impede the flow of floodwaters through the land or other surrounding land
(b) occur on land where the risk of flooding is unacceptable having regard to personal and public safety and to property damage
(c) increase the potential hazard risk to public safety of persons during a flood event
(d) aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood
(e) cause any adverse effect on the floodway function
(f) increase the risk of flooding of other land
(g) obstruct a watercourse.

**PDC 12** Development should not occur where access by emergency vehicles or essential utility service vehicles would be prevented by a 1-in-100 year average return interval flood event.

**Bushfire**

**PDC 24** The following bushfire protection principles of development control apply to development of land identified as General, Medium and High bushfire risk areas as shown on the *Bushfire Protection Area BPA Maps - Bushfire Risk*.

**PDC 25** Development in a Bushfire Protection Area should be in accordance with those provisions of the *Minister's Code: Undertaking development in Bushfire Protection Areas* that are designated as mandatory for Development Plan Consent purposes.

**PDC 26** Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:

(a) vegetation cover comprising trees and/or shrubs
(b) poor access
(c) rugged terrain
(d) inability to provide an adequate building protection zone
(e) inability to provide an adequate supply of water for fire-fighting purposes

**PDC 29** Buildings and structures should be designed and configured to reduce the impact of bushfire through using designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings

**Salinity**

**PDC 34** Development should not increase the potential for, or result in an increase in, soil and water salinity.

**Containment of Chemical and Hazardous Materials**

**PDC 40** Hazardous materials should be stored and contained in a manner that minimises the risk to public health and safety and the potential for water, land or air contamination.

**PDC 41** Development that involves the storage and handling of hazardous materials should ensure that these are contained in designated areas that are secure, readily accessible to emergency vehicles, impervious, protected from rain and stormwater intrusion and other measures necessary to prevent:

(a) discharge of polluted water from the site
(b) contamination of land
(c) airborne migration of pollutants
(d) potential interface impacts with sensitive land uses.

**Landslip**

**PDC 42** Development, including associated cut and fill activities, should not lead to an increased danger from land surface instability or to the potential of landslip occurring on the site or on surrounding land.

**PDC 43** Development on steep slopes should promote the retention and replanting of vegetation as a means of stabilising and reducing the possibility of surface movement or disturbance.

**PDC 44** Development in areas susceptible to landslip should:

(a) incorporate split level designs to minimise cutting into the slope
(b) ensure that cut and fill and heights of faces are minimised
(c) ensure cut and fill is supported with engineered retaining walls or are battered to appropriate grades
(d) control any erosion that will increase the gradient of the slope and decrease stability
(e) ensure the siting and operation of an effluent drainage field does not contribute to landslip
(f) provide drainage measures to ensure surface stability is not compromised
(g) ensure natural drainage lines are not obstructed.

**INFRASTRUCTURE**

**OBJECTIVES**

**Objective 1** Infrastructure provided in an economical and environmentally sensitive manner.

**Objective 2** The visual impact of infrastructure facilities minimised.

**Objective 3** The efficient and cost-effective use of existing infrastructure.

**Principles of Development Control**

**PDC 1** Development should only occur where it has access to adequate utilities and services, including:

(a) electricity supply
(b) water supply
(c) drainage and stormwater systems
(d) effluent disposal systems
(e) formed all-weather public roads
(f) telecommunications services
(g) gas services.

**PDC 3** Development should only occur only where it provides, or has access to, relevant easements for the supply of infrastructure.

**PDC 7** In areas where no reticulated water supply is available, buildings whose usage is reliant on a water supply should be equipped with an adequate and reliable on-site water storage system.

**PDC 9** Electricity infrastructure should be sited and designed to minimise its visual and environmental impacts.

**PDC 10** Utilities and services, including access roads and tracks, should be sited on areas already cleared of native vegetation. If this is not possible, their siting should cause minimal interference or disturbance to existing native vegetation and biodiversity.

**PDC 11** Utility buildings and structures should be grouped with non-residential development where possible.

**PDC 12** Development in proximity to infrastructure facilities should be sited and be of a scale to ensure adequate separation to protect people and property.

**PDC 13** Incompatible uses should not encroach upon the easements of infrastructure corridors for existing and proposed transmission lines.

**PDC 15** Provision should be made for new transmission and distribution substations and overhead major electricity line corridors (having a capacity greater than or equal to 33kV) in areas which have the required buffer distance to protect people and allow for adequate access.

**PDC 17** Utility services (excluding transmission lines with a capacity greater than or equal to 33 kV) should be placed underground, with ridgelines and visually sensitive open landscapes being avoided.

**PDC 18** If located above-ground, utility structures should be constructed of materials that have low light reflecting surfaces; and blend with the surrounding landscape.

**PDC 19** Development should not compromise the viability of existing transmission line corridors and substation sites.

**INTERFACE BETWEEN LAND USES**

**OBJECTIVES**

**Objective 1** Development located and designed to prevent adverse impact and conflict between land uses.

**Objective 2** Protect community health and amenity and support the operation of all desired land uses.

**Objective 3** Protect desired land uses from the encroachment of incompatible development.

**PRINCIPLES OF DEVELOPMENT CONTROL**

**PDC 1** Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following:

(a) the emission of effluent, odour, smoke, fumes, dust or other airborne pollutants
(b) noise
(c) vibration
(d) electrical interference
(e) light spill
(f) glare
(g) hours of operation
(h) traffic impacts.

**PDC 2** Development should be designed and sited to minimise negative impact on existing and potential future land uses considered appropriate in the locality.

**PDC 5** Sensitive uses likely to conflict with the continuation of lawfully existing developments and land uses considered appropriate for the zone should not be developed or should be designed to minimise negative impacts.

**PDC 8** Outdoor lighting should be designed and installed in accordance with *Australian Standard AS 4282 Control of the obtrusive effects of outdoor lighting*.

**Noise Generating Activities**

**PDC 10** Development that emits noise (other than music noise) should include noise attenuation measures that achieve the relevant *Environment Protection (Noise) Policy* criteria when assessed at the nearest existing noise sensitive premises.

**PDC 11** Development with the potential to emit significant noise (e.g. industry) should incorporate noise attenuation measures that prevent noise from causing unreasonable interference with the amenity of noise sensitive premises.

**Air Quality**

**PDC 14** Development with the potential to emit harmful or nuisance-generating air pollution should incorporate air pollution control measures to prevent harm to human health or unreasonable interference with the amenity of sensitive uses within the locality.

**Rural Interface**

**PDC 18** Existing primary production and mineral extraction should not be prejudiced by the inappropriate encroachment of sensitive uses such as urban development.

**PDC 19** Development that is adjacent to land used for primary production (within either the zone or adjacent zones) should include appropriate setbacks and vegetative plantings designed to minimise the potential impacts of chemical spray drift and other impacts associated with primary production.

**MINERAL EXTRACTION**

**OBJECTIVES**

**Objective 2** Protection of mineral deposits against intrusion by inappropriate forms of development.

**Objective 4** Mining operations undertaken with minimal adverse impacts on the environment and on the health and amenity of adjacent land uses.

**Objective 5** Minimisation of the impacts from mining activities upon the existing groundwater level and the quality of groundwater resources.

**Objective 6** Mining operations that make adequate provision for site rehabilitation.

**Principles of Development Control**

**PDC 1** Known reserves of economically-viable mineral deposits should be kept free of development that may inhibit their future exploitation.

**PDC 2** Development in proximity to mining operations should not be allowed where it may be exposed to adverse impacts resulting from mining activities.

**PDC 5** Access to land used for mining should be sited and designed to accommodate heavy-vehicle traffic and ensure the safety of all road users.

**PDC 6** Mining operations should:

(a) ensure that minimal damage is caused to the landscape
(b) minimise the area required for operations, and provide for the progressive reclamation of disturbed areas
(c) minimise disturbance to natural hydrological systems.

**PDC 9** No new loam pits should be opened, and further loam extraction should be contained within existing pits.

**PDC 10** There should be no mineral extraction or loam mining within 200 metres of the centre lines of the Light, Gawler or North Para Rivers.

**Separation Treatments, Buffers and Landscaping**

**PDC 11** Mining development should be sited, designed and sequenced to protect the amenity of surrounding land uses from environmental nuisance such as dust or vibration emanating from mining operations.

**PDC 12** Mining operations that are likely to impact upon the amenity of the locality should incorporate a separation distance and/or mounding/vegetation between the mining operations (including stockpiles) and adjoining allotments to help minimise exposure to those potential impacts.

**PDC 17** Borrow pits for road making materials should:

(a) be sited so as to cause the minimum effect on their surroundings
(b) not be located on land visible from arterial or scenic roads as shown on *Overlay Maps - Transport*.

**NATURAL RESOURCES**

**Objectives**

**Objective 1:** Retention, protection and restoration of the natural resources and environment.

**Objective 2:** Protection of the quality and quantity of South Australia's surface waters, including inland, riverine and underground waters.

**Objective 3:** The ecologically sustainable use of natural resources including soil and water resources (including underground water, surface water and watercourses as defined in the current Environment Protection (Water Quality) Policy).

**Objective 4:** Natural hydrological systems and environmental flows reinstated, and maintained and enhanced.

**Objective 5:** Development consistent with the principles of water sensitive design.

**Objective 6:** Development sited and designed to:

(a) protect natural ecological systems
(b) achieve the sustainable use of water
(c) protect water quality, including receiving waters
(d) reduce runoff and peak flows and prevent the risk of downstream flooding
(e) minimise demand on reticulated water supplies
(f) maximise the harvest and use of stormwater
(g) protect stormwater from pollution sources.

**Objective 7:** Storage and use of stormwater which avoids adverse impact on public health and safety.

**Objective 8:** Native flora, fauna and ecosystems protected, retained, conserved and restored.

**Objective 9:** Restoration, expansion and linking of existing native vegetation to facilitate habitat corridors for ease of movement of fauna.

**Objective 10:** Minimal disturbance and modification of the natural landform.

**Objective 11:** Protection of the physical, chemical and biological quality of soil resources.

**Objective 12:** Protection of areas prone to erosion or other land degradation processes from inappropriate development.

**Objective 13:** Protection of the scenic qualities of natural and rural landscapes.

**Principles of Development Control**

**PDC 1** Development should be undertaken with minimum impact on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas.

**PDC 2** Development should ensure that South Australia's natural assets, such as biodiversity, water and soil, are protected and enhanced.

**PDC 3** Development should not significantly obstruct or adversely affect sensitive ecological areas such as creeks and wetlands.

**PDC 4** Development should be appropriate to land capability and the protection and conservation of water resources and biodiversity.

**Water Sensitive Design**

**PDC 5** Development should be designed to maximise conservation, minimise consumption and encourage re-use of water resources.

**PDC 6** Development should not take place if it results in unsustainable use of surface or underground water resources.

**PDC 7** Development should be sited and designed to:

(a) capture and re-use stormwater, where practical
(b) minimise surface water runoff
(c) prevent soil erosion and water pollution
(d) protect and enhance natural water flows
(e) protect water quality by providing adequate separation distances from watercourses and other water bodies
(f) not contribute to an increase in salinity levels
(g) avoid the water logging of soil or the release of toxic elements
(h) maintain natural hydrological systems and not adversely affect:

(i) the quantity and quality of groundwater
(ii) the depth and directional flow of groundwater
(iii) the quality and function of natural springs.

**PDC 8** Water discharged from a development site should:

(a) be of a physical, chemical and biological condition equivalent to or better than its pre-developed state
(b) not exceed the rate of discharge from the site as it existed in pre-development conditions.

**PDC 9** Development should include stormwater management systems to protect it from damage during a minimum of a 1-in-100 year average return interval flood.

**PDC 10** Development should have adequate provision to control any stormwater over-flow runoff from the site and should be sited and designed to improve the quality of stormwater and minimise pollutant transfer to receiving waters.

**PDC 11** Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater discharges from the site to ensure the carrying capacities of downstream systems are not overloaded.

**PDC 12** Development should include stormwater management systems to minimise the discharge of sediment, suspended solids, organic matter, nutrients, bacteria, litter and other contaminants to the stormwater system.

**PDC 13** Stormwater management systems should preserve natural drainage systems, including the associated environmental flows.

**PDC 14** Stormwater management systems should:

(a) maximise the potential for stormwater harvesting and re-use, either on-site or as close as practicable to the source
(b) utilise, but not be limited to, one or more of the following harvesting methods:

(i) the collection of roof water in tanks
(ii) the discharge to open space, landscaping or garden areas, including strips adjacent to car parks
(iii) the incorporation of detention and retention facilities
(iv) aquifer recharge

**Water Catchment Areas**

**PDC 19** Development should ensure watercourses and their beds, banks, wetlands and floodplains are not damaged or modified and are retained in their natural state, except where modification is required for essential access or maintenance purposes.

**PDC 20** No development should occur where its proximity to a swamp or wetland will damage or interfere with the hydrology or water regime of the swamp or wetland.

**PDC 21** A wetland or low-lying area providing habitat for native flora and fauna should not be drained, except temporarily for essential management purposes to enhance environmental values.

**PDC 22** Along watercourses, areas of remnant native vegetation, or areas prone to erosion, that are capable of natural regeneration should be fenced off to limit stock access.

**PDC 23** Development such as cropping, intensive animal keeping, residential, tourism, industry and horticulture, that increases the amount of surface run-off should include a strip of land at least 20 metres wide measured from the top of existing banks on each side of a watercourse that is:

(a) fenced to exclude livestock
(b) kept free of development, including structures, formal roadways or access ways for machinery or any other activity causing soil compaction or significant modification of the natural surface of the land

(c) revegetated with locally indigenous vegetation comprising trees, shrubs and other groundcover plants to filter runoff so as to reduce the impacts on native aquatic ecosystems and to minimise soil loss eroding into the watercourse.

**PDC 24** Development resulting in the depositing of an object or solid material in a watercourse or floodplain or the removal of bank and bed material should not:

(a) adversely affect the migration of aquatic biota
(b) adversely affect the natural flow regime
(c) cause or contribute to water pollution
(d) result in watercourse or bank erosion
(e) adversely affect native vegetation upstream or downstream that is growing in or adjacent to a watercourse

**PDC 25** The location and construction of dams, water tanks and diversion drains should:

(a) occur off watercourse
(b) not take place in ecologically sensitive areas or on erosion prone sites
(c) provide for low flow by-pass mechanisms to allow for migration of aquatic biota
(d) not negatively affect downstream users
(e) minimise in-stream or riparian vegetation loss
(f) incorporate features to improve water quality (eg wetlands and floodplain ecological communities)
(g) protect ecosystems dependent on water resources
(h) ensure stock water and provide alternative watering points
(f) provide spillways designed to allow passage of high flows without causing structural damage to the dam or soil erosion within the spillway or spillway discharge area.

**PDC 27** The design, construction and location of levees, weirs, retaining walls, bridges and culverts should:

(a) provide for the needs of ecosystem
(b) minimise the impact or risk of flooding
(c) not cause or increase watercourse erosion.

**PDC 29** Areas for activities such as loading and unloading, wash down of vehicles, plant or equipment, or storage of waste refuse bins in commercial or industrial developments should be paved and bunded to exclude stormwater run-off from external sources.

**PDC 30** Development should comply with the current *Environment Protection (Water Quality) Policy*.

**PDC 31** Development bordering a watercourse defined on the 1:50 000 SA Government topographic map should be set-back from the banks at least the following distances to provide for the protection and enhancement of riparian areas:

(a) 50 metres for detached dwellings, residential outbuildings, tourist accommodation, farm buildings (eg implement and storage sheds but excluding all animal husbandry buildings), septic tanks or other domestic waste water treatment facilities
(b) 50 metres for all buildings associated with industrial, animal husbandry or commercial uses and household waste water disposal areas
(c) 100 metres for industrial or intensive animal husbandry waste water disposal areas
(d) in townships where there is a satisfactory waste water disposal scheme and a stormwater treatment scheme, commercial development may be set-back 25 metres from the watercourse provided the area adjacent to the watercourse is suitably landscaped and protected from the impacts of the development.

**Biodiversity and Native Vegetation**

**PDC 32** Development should retain existing areas of native vegetation and where possible contribute to revegetation using locally indigenous plant species.

**PDC 33** Development should be designed and sited to minimise the loss and disturbance of native flora and fauna.

**PDC 34** Native vegetation should be conserved and its conservation value and function not compromised by development if the native vegetation does any of the following:

(a) provides an important habitat for wildlife or shade and shelter for livestock
(b) has a high plant species diversity or includes rare, vulnerable or endangered plant species or plant associations and communities
(c) provides an important seed bank for locally indigenous vegetation
(d) has high amenity value and/or significantly contributes to the landscape quality of an area, including the screening of buildings and unsightly views
(e) has high value as a remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture
(f) is growing in, or is characteristically associated with a wetland environment.

**PDC 35** Native vegetation should not be cleared if such clearing is likely to lead to, cause or exacerbate any of the following:

(a) erosion or sediment within water catchments
(b) decreased soil stability
(c) soil or land slip
(d) deterioration in the quality of water in a watercourse or surface water runoff
(e) a local or regional salinity problem
(f) the occurrence or intensity of local or regional flooding.

**PDC 36** Development should not destroy or impair the growth of:

(a) native vegetation stands between Nain and the Belvidere survey beacon
(b) significant roadside vegetation across the district
(c) native vegetation along watercourses.

**PDC 37** Development that proposes the clearance of native vegetation should address or consider the implications that removing the native vegetation will have on the following:

(a) provision for linkages and wildlife corridors between significant areas of native vegetation
(b) erosion along watercourses and the filtering of suspended solids and nutrients from runoff
(c) the amenity of the locality
(d) bushfire safety
(e) the net loss of native vegetation and other biodiversity.

**PDC 38** Where native vegetation is to be removed, it should be replaced in a suitable location on the site with locally indigenous vegetation to ensure that there is not a net loss of native vegetation and biodiversity.

**PDC 39** Development should be located and occur in a manner which:

(a) does not increase the potential for, or result in, the spread of pest plants, or the spread of any nonindigenous plants into areas of native vegetation or a conservation zone
(b) avoids the degradation of remnant native vegetation by any other means including as a result of spray drift, compaction of soil, modification of surface water flows, pollution to groundwater or surface water or change to groundwater levels
(c) incorporates a separation distance and/or buffer area to protect wildlife habitats and other features of nature conservation significance.

**PDC 40** Development should promote the long-term conservation of vegetation by:

(a) avoiding substantial structures, excavations, and filling of land in close proximity to the trunk of trees and beneath their canopies
(b) minimising impervious surfaces beneath the canopies of trees
(c) taking other effective and reasonable precautions to protect both vegetation and the integrity of structures and essential services.

**PDC 43** Non native vegetation should be conserved and its value and function not compromised by development, where it:

(a) has scenic, historical or scientific significance or interest
(b) screens buildings or unsightly views
(c) provides shade or acts as a windbreak
(d) assists in the prevention of soil erosion.

**Soil Conservation**

**PDC 44** Development should not have an adverse impact on the natural, physical, chemical or biological quality and characteristics of soil resources.

**PDC 45** Development should be designed and sited to prevent erosion.

**PDC 46** Development should take place in a manner that will minimise alteration to the existing landform.

**PDC 47** Development should minimise the loss of soil from a site through soil erosion or siltation during the construction phase of any development and following the commencement of an activity.

## ORDERLY AND SUSTAINABLE DEVELOPMENT

### OBJECTIVES

**Objective 1** Orderly and economical development that creates a safe, convenient and pleasant environment in which to live.

**Objective 2** Development occurring in an orderly sequence and in a compact form to enable the efficient provision of public services and facilities.

**Objective 3** Development that does not jeopardise the continuance of adjoining authorised land uses.

**Objective 4** Development that does not prejudice the achievement of the provisions of the Development Plan.

**Objective 5** Development abutting adjoining Council areas having regard to the policies of that Council's Development Plan.

### Principles of Development Control

**PDC 1** Development should not prejudice the development of a zone for its intended purpose.

**PDC 2** Land outside of townships and settlements should primarily be used for primary production and conservation purposes.

**PDC 3** The economic base of the region should be expanded in a sustainable manner.

**PDC 6** Development should be located and staged to achieve the economical provision of public services and infrastructure, and to maximise the use of existing services and infrastructure.

**PDC 7** Where development is expected to impact upon the existing infrastructure network (including the transport network), development should demonstrate how the undue effect will be addressed.

## RENEWABLE ENERGY FACILITIES

**Objective 1:** Development of renewable energy facilities that benefit the environment, the community and the state.

**Objective 2:** The development of renewable energy facilities, such as wind farms and ancillary development, in areas that provide opportunity to harvest natural resources for the efficient generation of electricity.

**Objective 3:** Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.

### Principle of Development Control

**PDC 1** Renewable energy facilities, including wind farms and ancillary development, should be:

(a) located in areas that maximize efficient generation and supply of electricity; and
(b) designed and sited so as not to impact on the safety of water or air transport and the operation of ports, airfields and designated landing strips.

**Wind Farms and Ancillary Developments**

**PDC 2** The visual impacts of wind farms and ancillary development (such as substations, maintenance sheds, access roads and wind monitoring masts) should be managed through:

(a) wind turbine generators being:

(i) setback at least 1000 metres from non-associated (non-stakeholder) dwellings and tourist accommodation;
(ii) setback at least 2000 metres from defined and zoned township, settlement or urban areas (including deferred urban areas);
(iii) regularly spaced;
(iv) uniform in colour, size and shape and blade rotation direction;
(v) mounted on tubular towers (as opposed to lattice towers);

(b) provision of vegetated buffers around substations, maintenance sheds and other ancillary structures

**PDC 3** **Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife:**

(a) shadowing, flickering, reflection or glint;
(b) excessive noise;
(c) interference with television and radio signals and geographic positioning systems;
(d) interference with low altitude aircraft movements associated with agriculture;
(e) modification of vegetation, soils and habitats;
(f) striking of birds and bats.

**PDC 4** Wind turbine generators should be setback from dwellings, tourist accommodation and frequently visited public places (such as viewing platforms) a distance that will ensure that failure does not present an unacceptable risk to safety.

**SITING AND VISIBILITY**

**Objectives**

**Objective 1** Protection of scenically attractive areas, particularly natural, rural and riverine landscapes.

**Principles of Development Control**

**PDC 1** Development should be sited and designed to minimise its visual impact on:

(a) the natural, rural or heritage character of the area
(b) areas of high visual or scenic value, particularly rural and riverine areas
(c) views from public reserves, tourist routes and walking trails.

**PDC 2** Buildings should be sited in unobtrusive locations and, in particular, should:

(a) be grouped together
(b) where possible be sited in such a way as to be screened by existing vegetation when viewed from public roads.

**PDC 3** Development should be designed to ensure that corridors to views and features of significance are maintained.

**PDC 4** Buildings outside of urban areas and in undulating landscapes should be sited in unobtrusive locations and in particular should be:

(a) sited below the ridgeline
(b) sited within valleys or behind spurs
(c) sited in such a way as to not be visible against the skyline when viewed from public roads
(d) set well back from public roads, particularly when the allotment is on the high side of the road.

**PDC 5** Buildings and structures should be designed to minimise their visual impact in the landscape, in particular:

(a) the profile of buildings should be low and the rooflines should complement the natural form of the land
(b) the mass of buildings should be minimised by variations in wall and roof lines and by floor plans which complement the contours of the land
(c) large eaves, verandas and pergolas should be incorporated into designs so as to create shadowed areas that reduce the bulky appearance of buildings.

**PDC 6** The nature of external surface materials of buildings should not detract from the visual character and amenity of the landscape.

**PDC 7** The number of buildings and structures on land outside of urban areas should be limited to that necessary for the efficient management of the land.

**PDC 8** Driveways and access tracks should be designed and constructed to blend sympathetically with the landscape and to minimise interference with natural vegetation and landforms, and be surfaced with dark materials.

**PDC 9** Development should be screened through the establishment of landscaping using locally indigenous plant species:

(a) around buildings and earthworks to provide a visual screen as well as shade in summer, and protection from prevailing winds
(b) along allotment boundaries to provide permanent screening of buildings and structures when viewed from adjoining properties and public roads
(c) along the verges of new roads and access tracks to provide screening and minimise erosion.

**PDC 10** Buildings should be set-back the following minimum distances from public roads within the rural areas:

| **Road type** | **Set-back** |
|---|---|
| Primary arterial | 50 metres |
| Secondary arterial | 30 metres |
| Local and other roads | 20 metres |

| | |
|---|---|
| All roads in the **Barossa Valley Region Policy Area 2** | 100 metres |

**SLOPING LAND**

**Objectives**

**Objective 1** Development on sloping land designed to minimise environmental and visual impacts and protect soil stability and water quality.

**Principles of Development Control**

**PDC 1** Development and associated driveways and access tracks should be sited and designed to integrate with the natural topography of the land and minimise the need for earthworks.

**PDC 2** Development and associated driveways and access tracks, including related earthworks, should be sited, designed and undertaken in a manner that:

(a) minimises their visual impact
(b) reduces the bulk of the buildings and structures
(c) minimises the extent of excavation and fill
(d) minimises the need for, and the height of, retaining walls
(e) does not cause or contribute to instability of any embankment or cutting
(f) avoids the silting of watercourses
(g) protects development and its surrounds from erosion caused by water run-off
(h) incorporates roof lines which complement the natural slope of the land (refer to the figure below*):

*(note figures not included in this extract)

**PDC 3** Driveways and access tracks across sloping land should be accessible and have a safe, all-weather trafficable surface.

**PDC 4** Development sites should not be at risk of landslip.

**PDC 5** Development on steep land should include site drainage systems to minimise erosion and avoid adverse impacts on slope stability.

**PDC 6** Steep sloping sites in unsewered areas should not be developed unless the physical characteristics of the allotments enable the proper siting and operation of an effluent drainage field suitable for the development intended.

**PDC 7** The excavation and/or filling of land outside townships and urban areas should:

(a) be kept to a minimum and be limited to a maximum depth or height no greater than 1.5 metres so as to preserve the natural form of the land and the native vegetation
(b) only be undertaken in order to reduce the visual impact of buildings, including structures, or in order to construct water storage facilities for use on the allotment
(c only be undertaken if the resultant slope can be stabilised to prevent erosion
(d) result in stable scree slopes which are covered with top soil and landscaped so as to preserve and enhance the natural character or assist in the re-establishment of the natural character of the area.

## TRANSPORTATION AND ACCESS

### Objectives

**Objective 2** Development that:

(a) provides safe and efficient movement for all motorised and non-motorised transport modes
(b) ensures access for vehicles including emergency services, public infrastructure maintenance and commercial vehicles
(c) provides off street parking
(d) is appropriately located so that it supports and makes best use of existing transport facilities and networks.

**Objective 3** A road hierarchy that promotes safe and efficient transportation in an integrated manner throughout the State.

**Objective 4** Provision of safe, pleasant, accessible, integrated and permeable pedestrian and cycling networks.

**Objective 5** Safe and convenient freight movement throughout the State.

**Objective 6** Development that discourages heavy vehicle movements through major town centres.

### Principles of Development Control

#### Land Use

**PDC 1** Land uses arranged to support the efficient provision of sustainable transport networks and encourage their use.

#### Movement Systems

**PDC 2** Development should be integrated with existing transport networks, particularly major rail and road corridors as shown on Overlay Maps Go/1, Go/2, Go/3, Go/4, Go/6, Go/7, Go/8, Go/9, Go/10 and Go/11 - Transport, and designed to minimise its potential impact on the functional performance of the transport networks.

**PDC 8** Development should provide safe and convenient access for all anticipated modes of transport including cycling, walking, public and community transport, and motor vehicles.

**PDC 11** Development should discourage commercial and industrial vehicle movements through residential streets and adjacent other sensitive land uses such as schools.

**PDC 13** Development should make sufficient provision on site for the loading, unloading and turning of all traffic likely to be generated.

**PDC 14** Parking, loading and manoeuvring areas for commercial vehicles should be developed in accordance with *Australian Standards 2890.2 Commercial Vehicles facilities*.

#### Access

**PDC 23** Development should have direct access from an all weather public road.

**PDC 24** Development should be provided with safe and convenient access which:

(a) avoids unreasonable interference with the flow of traffic on adjoining roads
(b) accommodates the type and volume of traffic likely to be generated by the development or land use and minimises induced traffic through over-provision
(c) is sited and designed to minimise any adverse impacts on the occupants of and visitors to neighbouring properties.

**PDC 30** Driveways, access tracks and parking areas should be designed and constructed to:

(a) follow the natural contours of the land
(b) minimise excavation and/or fill
(c) minimise the potential for erosion from run-off
(d) avoid the removal of existing vegetation
(e) be consistent with Australian Standard AS 2890 Parking facilities.

**Access for People with Disabilities**

**PDC 31** Development should be sited and designed to provide convenient access for people with a disability.

**Vehicle Parking**

**PDC 32** Development should provide off-street vehicle parking and specifically marked accessible car parking places to meet anticipated demand in accordance with *Table Lig/2 - Off Street Vehicle Parking Requirements* unless all the following conditions are met:

(a) the site is located in a designated area as shown on Concept Plan Map Lig/14 (Kapunda District Centre Carpark Fund)
(b) an agreement is reached between the Council and the applicant for a reduced number of parking spaces
(c) a financial contribution is paid into the Council Car Parking Fund specified by the Council, in accordance with the gazetted rate per car park.

**PDC 33** Sufficient vehicle parking spaces should be provided on the site of or on a site nearby a development and have regard to the anticipated parking demand, availability of on-street parking, shared usage of other parking areas and safety.

**PDC 34** Development should be consistent with Australian Standard AS 2890 Parking facilities.

**PDC 36** Vehicle parking areas should be sited and designed in a manner that will:

(a) facilitate safe and convenient pedestrian linkages to the development and areas of significant activity or interest in the vicinity of the development
(b) include safe pedestrian and bicycle linkages that complement the overall pedestrian and cycling network
(c) not inhibit safe and convenient traffic circulation
(d) result in minimal conflict between customer and service vehicles
(e) avoid the necessity to use public roads when moving from one part of a parking area to another
(f) minimise the number of vehicle access points to public roads
(g) avoid the necessity for backing onto public roads
(h) where reasonably possible, provide the opportunity for shared use of car parking and integration of car parking areas with adjoining development to reduce the total extent of vehicle parking areas and the requirement for access points
(i) not dominate the character and appearance of a centre when viewed from public roads and spaces

(j) provide landscaping that will shade and enhance the appearance of the vehicle parking areas.

**PDC 39** Parking areas that are likely to be used during non daylight hours should provide floodlit entrance and exit points and site lighting directed and shaded in a manner that will not cause nuisance to adjacent properties or users of the car park.

**PDC 40** Parking areas, including driveways and loading/unloading areas should be sealed or paved in order to minimise dust and mud nuisance.

**PDC 41** To assist with stormwater detention and reduce heat loads in summer, vehicle parking areas should include soft (living) landscaping.

**PDC 42** Parking areas should be line-marked to indicate parking bays, movement aisles and direction of traffic flow.

**WASTE**

**Objectives**

**Objective 1** Development that, in order of priority, avoids the production of waste, minimises the production of waste, reuses waste, recycles waste for reuse, treats waste and disposes of waste in an environmentally-sound manner.

**Objective 2** Development that includes the treatment and management of solid and liquid waste to prevent undesired impacts on the environment including, soil, plant and animal biodiversity, human health and the amenity of the locality.

**Principles of Development Control**

**PDC 1** Development should be sited and designed to prevent or minimise the generation of waste (including wastewater) by applying the following waste management hierarchy in the order of priority as shown below:

(a) avoiding the production of waste
(b) minimising waste production
(c) reusing waste
(d) recycling waste
(e) recovering part of the waste for re-use
(f) treating waste to reduce the potentially degrading impacts
(g) disposing of waste in an environmentally sound manner.

**Waste Treatment Systems**

**PDC 11** Development that produces any effluent should be connected to an approved waste treatment system which may include sewage, community wastewater management systems, or on-site wastewater treatment and disposal methods.

**PDC 12** The methods for, and siting of, effluent and waste storage, treatment and disposal systems should minimise the potential for environmental harm and adverse impacts on:

(a) the quality of surface and groundwater resources
(b) public health
(c) the amenity of a locality
(d) sensitive land uses.

**PDC 13** Waste treatment should only occur where the capacity of the treatment facility is sufficient to accommodate likely maximum daily demands including a contingency for unexpected high flows and breakdowns.

**PDC 14** Any on-site wastewater treatment system/reuse system or effluent drainage field should be located within the allotment of the development that it will service.

**PDC 15** A dedicated on-site effluent disposal area should not include any areas to be used for, or could be reasonably foreseen to be used for, private outdoor open space, driveways, car parking or outbuildings.

**PDC 16** The spreading or discharging of treated liquid or solid waste onto the ground should only occur where the disposal area consists of soil and vegetation that has the capacity to store and use the waste without contaminating soil or surface or ground water resources or damaging crops.

MASTERPLAN
TOWN + COUNTRY PLANNERS

# RELEVANT PROVISIONS OF GOYDER COUNCIL DEVELOPMENT PLAN

## DEVELOPMENT PLAN DATED 24 NOVEMBER 2016

## PRIMARY PRODUCTION ZONE

### Desired Character

### Function

The region will support a more sustainable approach to primary production with rural production forming the core focus of the region. Sustainable land management practices will see long-term improvement in the quality of the environment and the economic activity of this region. Incompatible development will be restricted to support the ongoing function of primary production, with the division of land restricted to maintain large allotments and the construction of new dwellings and other structures limited to only being developed where they are associated with, and essential to, primary production activities. The townships of Eudunda (Bunker Site), Robertstown and Hallett contain necessary infrastructure for the storage, handling and transportation of agricultural and other commodities, which are an integral part of the rural economy, and should be protected from encroachment by incompatible activities. Alternative rural uses and value-adding enterprises that attract employment and economic development to the district will be developed in conjunction with the bulk handling activities in the Zone, but located sensitively to protect good quality land and to take advantage of existing infrastructure networks. Land of conservation and biodiversity significance will be protected from incompatible primary production activities and will be enhanced with tourism facilities to add to the diversity of the region's employment and economy.

Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) are envisaged within the zone and constitute a component of the zone's desired character. These facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence, components (particularly turbines) may need to be:

- located in visually prominent locations such as ridgelines;
- visible from scenic routes and valuable scenic and environmental areas; and
- located closer to roads than envisaged by generic setback policy.

This, coupled with the large scale of these facilities (in terms of both height and spread of components), renders it difficult to mitigate the visual impacts of wind farms to the degree expected of other types of development. Subject to implementation of management techniques set out by general / council wide policy regarding renewable energy facilities, these visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy.

### Pattern of Development

Large allotments will be maintained to prevent the reduced viability of primary production and the amalgamation of allotments will increase to maintain commercially viable farm sizes. New development in the primary production areas will be in the form of a range of different types of primary production, as well as appropriate value-adding uses. Alternative primary production uses and value-adding uses that are not directly reliant on good quality land will be located to avoid the sterilization of quality land, to minimise adverse impacts on sensitive uses and areas, as well as to take advantage of existing infrastructure including freight networks. On land of conservation and biodiversity significance, eco-tourism and nature based tourism accommodation may be appropriate where it is located in close proximity to scenic routes, trails and conservation parks.

Development ancillary to primary production, such as farm dwellings and outbuildings including large sheds, will be developed in appropriate locations to minimise the visual impact as well as the operational impact on the primary production use. The development and location of new dwellings will be restricted to prevent further impacts on the operation of primary production uses. Existing minor settlements will be accommodated but further development within them will be limited to prevent issues with the provision of services and the potential impacts on the surrounding productive land. New dwellings and other structures will be set well back from all boundaries, apart from within existing minor settlements where the existing pattern of development should be followed.

**Public Realm**

The public road network throughout the primary production areas will serve multiple functions, acting as a freight network, tourist drives, droving of stock, people movement routes, transportation of farm machinery and as biodiversity corridors. The scenic qualities of the public routes and views across the primary production area will remain attractive and generally unobstructed by inappropriate development, including excessive advertising signage. The nature and appearance of road reserves will vary across the primary production area depending on the role the road plays. Freight routes will maintain wide, open reserves with limited driveway access points. Road reserves will generally be kept clear of obstructions for the movement of farm machinery. Special tourist drives, particularly to conservation parks, will include vegetation corridors of biodiversity significance. Areas of conservation and biodiversity significance will be protected from inappropriate new development.

**Built Form**

New buildings will generally be associated with existing clusters of buildings and will be of complementary scale and massing to those buildings, while also being of appropriate dimensions to serve their intended function. New dwellings will generally be single storey and will include pitched roofs, verandas and porches to address climatic issues. Isolated new buildings, including large sheds, will be located and designed to blend with the existing landscape, with appropriate earthworks and building design to suit the natural landform. Other structures will be of a form that blends with, and does not detract from, the scenic qualities and function of the primary production area.

**Building Materials / Character**

The open rural landscape is the dominant character element and new development will maintain that character, with new buildings appropriately sited, designed and screened by vegetation. New buildings will be constructed using materials and colours that blend with the rural landscape and are traditionally used within the rural environment including corrugated steel, stone and timber.

**Key Design Elements**

When determining whether or not a development proposal is in accordance with the Desired Character, greater weight should be given to the following design elements:

- impact on the sustainability and viability of primary production uses;
- visual impact on the landscape character;
- impact on the freight network.

**Primary Production Zone - Objectives**

**Objective 1:** Economically productive, efficient and environmentally sustainable primary production.

**Objective 2:** Allotments of a size and configuration that promote the efficient use of land for primary production.

**Objective 3:** Protection of primary production from encroachment by incompatible land uses and protection of scenic qualities of rural landscapes.

**Objective 4:** Accommodation of wind farms and ancillary development.

**Objective 5:** Development that contributes to the desired character of the zone.

**Principles of Development Control**

**Land Use**

**PDC 1** **The following forms of development are envisaged in the zone:**

- tourist accommodation, including through the diversification of existing farming activities and conversion of farm buildings
- farming
- intensive animal keeping (especially within Enterprise Policy Area 2)
- wind farm and ancillary development
- wind monitoring mast and ancillary development.

**PDC 2** Development listed as non-complying is generally inappropriate and not acceptable unless it can be demonstrated that it does not undermine the objectives and principles of the Development Plan.

**PDC 4** Wind farms and ancillary development should be located in areas which provide opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited:

(a) in visually prominent locations
(b) closer to roads than envisaged by generic setback policy.

**PDC 8** Buildings should primarily be limited to farm buildings, a detached dwelling associated with primary production on the allotment and residential outbuildings that are:

(a) grouped together on the allotment and set back from allotment boundaries to minimise the visual impact of buildings on the landscape as viewed from public roads
(b) screened from public roads and adjacent land by existing vegetation or landscaped buffers.

**Form and Character**

**PDC 10** Development should not be undertaken unless it is consistent with the desired character for the zone.

**PDC 11** Structures and buildings should generally be set back a minimum of 30 metres from all road boundaries.

**PDC 12** Development should not occur within 500 metres of a national park, conservation park, wilderness protection area or significant stands of native vegetation if it will increase the potential for, or result in, the spread of pest plants.

**Land Division**

**PDC 13** Land division involving boundary realignments should only occur where the number of resulting allotments of less than 100 hectares is not greater than the number that existed prior to the realignment.

### PROCEDURAL MATTERS

#### Complying Development

Complying developments are prescribed in schedule four of the *Development Regulations 2008*.

#### Public Notification

Categories of public notification are prescribed in schedule 9 of the *Development Regulations 2008*.

Further, the following forms of development are designated:

| Category 1 | Category 2 |
|---|---|
| | Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) where the base of all wind turbines is located at least 2000 metres from:<br><br>(a) an existing dwelling or tourist accommodation that is not associated with the wind farm<br><br>(b) a proposed dwelling or tourist accommodation for which an operable development plan consent exists<br><br>(c) the boundaries of any Airfield, Airport, Centre, Community, Fringe, Historic Conservation, Home Industry, Living, Mixed Use, Residential, Settlement, Tourist, Township or Urban Zone, Policy Area or Precinct or any Heritage Area (including within the area of an adjoining Development Plan)<br><br>Wind monitoring mast and ancillary development |

## GENERAL PROVISIONS

### DESIGN AND APPEARANCE

#### Objectives

**Objective 1** Development of a high architectural standard that responds to and reinforces positive aspects of the local environment and built form.

**Objective 2** Roads, open spaces, buildings and land uses laid out and linked so that they are easy to understand and navigate.

**Principles of Development Control**

**PDC 2** The design of a building may be of a contemporary nature and exhibit an innovative style provided the overall form is sympathetic to the scale of development in the locality and with the context of its setting with regard to shape, size, materials and colour.

**PDC 3** Buildings should be designed and sited to avoid creating extensive areas of uninterrupted walling facing areas exposed to public view.

**PDC 4** Buildings should be designed to reduce their visual bulk and provide visual interest through design elements such as:

(a) articulation
(b) colour and detailing
(c) small vertical and horizontal components
(d) design and placing of windows
(e) variations to facades.

**PDC 6** Building form should not unreasonably restrict existing views available from neighbouring properties and public spaces.

**PDC 7** Transportable buildings and buildings which are elevated on stumps, posts, piers, columns or the like, should have their suspended footings enclosed around the perimeter of the building with brickwork or timber, and the use of verandas, pergolas and other suitable architectural detailing to give the appearance of a permanent structure.

**PDC 8** The external walls and roofs of buildings should not incorporate highly reflective materials which will result in glare.

**PDC 15** Development should be designed and sited so that outdoor storage and service areas are screened from public view by an appropriate combination of built form, solid fencing or landscaping.

**PDC 16** Outdoor lighting should not result in light spillage on adjacent land.

**Building Setbacks from Road Boundaries**

**PDC 18** The setback of buildings from public roads should:

(a) be similar to, or compatible with, setbacks of buildings on adjoining land and other buildings in the locality
(b) contribute positively to the streetscape character of the locality
(c) not result in or contribute to a detrimental impact upon the function, appearance or character of the locality.

**ENERGY EFFICIENCY**

**Objectives**

**Objective 1** Development designed and sited to conserve energy and minimise waste.

**Principles of Development Control**

**PDC 1** Development should provide for efficient solar access to buildings and open space all year around.

**PDC 2** Buildings should be sited and designed so that the open spaces associated with the main activity areas face north for exposure to winter sun.

**PDC 3** Buildings should be sited and designed to ensure adequate natural light and winter sunlight is available to the main activity areas of adjacent buildings.

**PDC 4** Roof pitches should facilitate the efficient use of solar hot water services and photovoltaic cells.

**PDC 5** Development should be designed to minimise consumption of non-renewable energy through designing the roof of buildings with a north facing slope to accommodate solar collectors.

**PDC 6** Public infrastructure, including lighting and telephones, should be designed to generate and use renewable energy.

**HAZARDS**

**Objectives**

**Objective 1** Maintenance of the natural environment and systems by limiting development in areas susceptible to natural hazard risk.

**Objective 2** Development located away from areas that are vulnerable to, and cannot be adequately and effectively protected from the risk of natural hazards.

**Objective 3** Development located to minimise the threat and impact of bushfires on life and property.

**Objective 6** The environmental values and ecological health of receiving waterways and marine environments protected from the release of acid water resulting from the disturbance of acid sulphate soils.

**Objective 7** Protection of human health and the environment wherever site contamination has been identified or suspected to have occurred.

**Objective 8** Appropriate assessment and remediation of site contamination to ensure land is suitable for the proposed use and provides a safe and healthy living and working environment.

**Objective 9** Minimisation of harm to life, property and the environment through appropriate location of development and appropriate storage, containment and handling of hazardous materials.

**Principles of Development Control**

**PDC 1** Development should:

(a) be excluded from areas that are vulnerable to, and cannot be adequately and effectively protected from, the risk of natural hazards
(b) be sited, designed and undertaken with appropriate precautions being taken against fire, flood, coastal flooding, storm surge, landslip, earthquake, toxic emissions or other hazards such as vermin
(c) not occur on land where the risk of flooding is likely to be harmful to safety or damage property.
(d) be designed and sited to minimise environmental nuisance or harm resulting from biological, chemical or fire hazard, energy emission or explosion.

**PDC 2** There should not be any significant interference with natural processes in order to reduce the exposure of development to the risk of natural hazards.

**Flooding**

**PDC 4** Development should not be undertaken in areas liable to inundation by tidal, drainage or flood waters unless the development can achieve all of the following:

(a) it is developed with a public stormwater system capable of catering for a 1 in 100 year average return interval flood event
(b) buildings are designed and constructed to prevent the entry of floodwaters in a 1 in 100 year average return interval flood event.

**PDC 5** Development, including earthworks associated with development, should not do any of the following:

(a) impede the flow of floodwaters through the land or other surrounding land
(b) occur on land where the risk of flooding is unacceptable having regard to personal and public safety and to property damage
(c) increase the potential hazard risk to public safety of persons during a flood event
(d) aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood
(e) cause any adverse effect on the floodway function
(f) increase the risk of flooding of other land
(g) obstruct a watercourse.

**Bushfire**

**PDC 6** Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:

(a) vegetation cover comprising trees and/or shrubs
(b) poor access
(c) rugged terrain
(d) inability to provide an adequate building protection zone
(e) inability to provide an adequate supply of water for fire-fighting purposes

**PDC 7** Buildings and structures should be designed and configured to reduce the impact of bushfire through using designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings

**PDC 8** Habitable buildings should have a dedicated water supply comprising a minimum of 22 000 litres available at all times for fire fighting which is located adjacent to the building or in another convenient location on the allotment accessible to fire fighting vehicles.

**Salinity**

**PDC 13** Development should not increase the potential for, or result in an increase in, soil and water salinity.

**Containment of Chemical and Hazardous Materials**

**PDC 19** Hazardous materials should be stored and contained in a manner that minimises the risk to public health and safety and the potential for water, land or air contamination.

**PDC 20** Development that involves the storage and handling of hazardous materials should ensure that these are contained in designated areas that are secure, readily accessible to emergency vehicles, impervious, protected from rain and stormwater intrusion and other measures necessary to prevent:

(a) discharge of polluted water from the site
(b) contamination of land
(c) airborne migration of pollutants
(d) potential interface impacts with sensitive land uses.

**Landslip**

**PDC 21** Development, including associated cut and fill activities, should not lead to an increased danger from land surface instability or to the potential of landslip occurring on the site or on surrounding land.

**PDC 22** Development on steep slopes should promote the retention and replanting of vegetation as a means of stabilising and reducing the possibility of surface movement or disturbance.

**PDC 23** Development in areas susceptible to landslip should:

(a) incorporate split level designs to minimise cutting into the slope
(b) ensure that cut and fill and heights of faces are minimised
(c) ensure cut and fill is supported with engineered retaining walls or are battered to appropriate grades
(d) control any erosion that will increase the gradient of the slope and decrease stability
(e) ensure the siting and operation of an effluent drainage field does not contribute to landslip
(f) provide drainage measures to ensure surface stability is not compromised
(g) ensure natural drainage lines are not obstructed.

**HERITAGE CONSERVATION**

**Objectives**

**Objective 1** The conservation of areas, places and their settings of indigenous and non-indigenous cultural significance.

**Principles of Development Control**

**PDC 1** Development should conserve and not adversely impact on the cultural or natural significance of places, areas, artefacts and shipwrecks that display any of the following values:

(a) aesthetic
(b) anthropological
(c) archaeological
(d) architectural
(e) ecological
(f) economic
(g) educational
(h) geological
(i) historic
(j) palaeontologic
(k) scientific
(l) social
(m) speleological

(n) spiritual
(o) technological.

**INFRASTRUCTURE**

**Objectives**

**Objective 1** Infrastructure provided in an economical and environmentally sensitive manner.

**Objective 2** Infrastructure, including social infrastructure, provided in advance of need.

**Objective 3** Suitable land for infrastructure identified and set aside in advance of need.

**Objective 4** The visual impact of infrastructure facilities minimised.

**Objective 5** The efficient and cost-effective use of existing infrastructure.

**Principles of Development Control**

**PDC 2** Development should only occur only where it provides, or has access to, relevant easements for the supply of infrastructure.

**PDC 6** In areas where no reticulated water supply is available, buildings whose usage is reliant on a water supply should be equipped with an adequate and reliable on-site water storage system.

**PDC 8** Electricity infrastructure should be sited and designed to minimise its visual and environmental impacts.

**PDC 10** Utilities and services, including access roads and tracks, should be sited on areas already cleared of native vegetation. If this is not possible, their siting should cause minimal interference or disturbance to existing native vegetation and biodiversity.

**PDC 11** Utility buildings and structures should be grouped with non-residential development where possible.

**PDC 12** Development in proximity to infrastructure facilities should be sited and be of a scale to ensure adequate separation to protect people and property.

**INTERFACE BETWEEN LAND USES**

**Objectives**

**Objective 1** Development located and designed to prevent adverse impact and conflict between land uses.

**Objective 2** Protect community health and amenity and support the operation of all desired land uses.

**Principles of Development Control**

**PDC 1** Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following:

(a) the emission of effluent, odour, smoke, fumes, dust or other airborne pollutants
(b) noise

(c) vibration
(d) electrical interference
(e) light spill
(f) glare
(g) hours of operation
(h) traffic impacts.

**PDC 2** Development should be designed and sited to minimise negative impact on existing and potential future land uses considered appropriate in the locality.

**PDC 5** Sensitive uses likely to conflict with the continuation of lawfully existing developments and land uses considered appropriate for the zone should not be developed or should be designed to minimise negative impacts.

**Noise**

**PDC 6** Development should be designed, constructed and sited to minimise negative impacts of noise and to avoid unreasonable interference.

**PDC 7** Development should be consistent with the relevant provisions each of the following documents:

(a) AS 2107 Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors
(b) AS 3671 Acoustics - Road Traffic Noise Intrusion, Building Siting and Construction
(c) the current Environment Protection (Noise) Policy

**MINERAL EXTRACTION**

**Objectives**

**Objective 2** Protection of mineral deposits against intrusion by inappropriate forms of development.

**Objective 4** Mining operations undertaken with minimal adverse impacts on the environment and on the health and amenity of adjacent land uses.

**Objective 5** Minimisation of the impacts from mining activities upon the existing groundwater level and the quality of groundwater resources.

**Objective 6** Mining operations that make adequate provision for site rehabilitation.

**Principles of Development Control**

**PDC 1** Known reserves of economically-viable mineral deposits should be kept free of development that may inhibit their future exploitation.

**PDC 2** Development in proximity to mining operations should not be allowed where it may be exposed to adverse impacts resulting from mining activities.

**PDC 5** Access to land used for mining should be sited and designed to accommodate heavy-vehicle traffic and ensure the safety of all road users.

**PDC 6** Mining operations should:

(a) ensure that minimal damage is caused to the landscape
(b) minimise the area required for operations, and provide for the progressive reclamation of disturbed areas
(c) minimise disturbance to natural hydrological systems.

**Separation Treatments, Buffers and Landscaping**

**PDC 7** Mining development should be sited, designed and sequenced to protect the amenity of surrounding land uses from environmental nuisance such as dust or vibration emanating from mining operations.

**PDC 8** Mining operations that are likely to impact upon the amenity of the locality should incorporate a separation distance and/or mounding/vegetation between the mining operations (including stockpiles) and adjoining allotments to help minimise exposure to those potential impacts.

**PDC 13** Borrow pits for road making materials should:

(a) be sited so as to cause the minimum effect on their surroundings
(b) not be located on land within the Township Fringe Policy Area 1 (as shown on Policy Area Maps Go/6, Go/7, Go/10 and Go/11) if equivalent resources are available within other areas within the Development Plan boundary.

**NATURAL RESOURCES**

**Objectives**

**Objective 1:** Retention, protection and restoration of the natural resources and environment.

**Objective 2:** Protection of the quality and quantity of South Australia's surface waters, including inland, riverine and underground waters.

**Objective 3:** The ecologically sustainable use of natural resources including soil and water resources (including underground water, surface water and watercourses as defined in the current Environment Protection (Water Quality) Policy).

**Objective 4:** Natural hydrological systems and environmental flows reinstated, and maintained and enhanced.

**Objective 5:** Development consistent with the principles of water sensitive design.

**Objective 6:** Development sited and designed to:

(a) protect natural ecological systems
(b) achieve the sustainable use of water
(c) protect water quality, including receiving waters
(d) reduce runoff and peak flows and prevent the risk of downstream flooding
(e) minimise demand on reticulated water supplies
(f) maximise the harvest and use of stormwater
(g) protect stormwater from pollution sources.

**Objective 7:** Storage and use of stormwater which avoids adverse impact on public health and safety.

**Objective 8:** Native flora, fauna and ecosystems protected, retained, conserved and restored.

**Objective 9:** Restoration, expansion and linking of existing native vegetation to facilitate habitat corridors for ease of movement of fauna.

**Objective 10:** Minimal disturbance and modification of the natural landform.

**Objective 11:** Protection of the physical, chemical and biological quality of soil resources.

**Objective 12:** Protection of areas prone to erosion or other land degradation processes from inappropriate development.

**Objective 13:** Protection of the scenic qualities of natural and rural landscapes.

**Principles of Development Control**

**PDC 1** Development should be undertaken with minimum impact on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas.

**PDC 2** Development should ensure that South Australia's natural assets, such as biodiversity, water and soil, are protected and enhanced.

**PDC 3** Development should not significantly obstruct or adversely affect sensitive ecological areas such as creeks and wetlands.

**PDC 4** Development should be appropriate to land capability and the protection and conservation of water resources and biodiversity.

**Water Sensitive Design**

**PDC 5** Development should be designed to maximise conservation, minimise consumption and encourage re-use of water resources.

**PDC 6** Development should not take place if it results in unsustainable use of surface or underground water resources.

**PDC 7** Development should be sited and designed to:

(a) capture and re-use stormwater, where practical
(b) minimise surface water runoff
(c) prevent soil erosion and water pollution
(d) protect and enhance natural water flows
(e) protect water quality by providing adequate separation distances from watercourses and other water bodies
(f) not contribute to an increase in salinity levels
(g) avoid the water logging of soil or the release of toxic elements
(h) maintain natural hydrological systems and not adversely affect:

(i) the quantity and quality of groundwater
(ii) the depth and directional flow of groundwater
(iii) the quality and function of natural springs.

**PDC 8** Water discharged from a development site should:

(a) be of a physical, chemical and biological condition equivalent to or better than its pre-developed state

(b) not exceed the rate of discharge from the site as it existed in pre-development conditions.

**PDC 9** Development should include stormwater management systems to protect it from damage during a minimum of a 1-in-100 year average return interval flood.

**PDC 10** Development should have adequate provision to control any stormwater over-flow runoff from the site and should be sited and designed to improve the quality of stormwater and minimise pollutant transfer to receiving waters.

**PDC 11** Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater discharges from the site to ensure the carrying capacities of downstream systems are not overloaded.

**PDC 13** Development should include stormwater management systems to minimise the discharge of sediment, suspended solids, organic matter, nutrients, bacteria, litter and other contaminants to the stormwater system.

**PDC 16** Stormwater management systems should preserve natural drainage systems, including the associated environmental flows.

**PDC 17** Stormwater management systems should:

(a) maximise the potential for stormwater harvesting and re-use, either on-site or as close as practicable to the source
(b) utilise, but not be limited to, one or more of the following harvesting methods:

(i) the collection of roof water in tanks
(ii) the discharge to open space, landscaping or garden areas, including strips adjacent to car parks
(iii) the incorporation of detention and retention facilities
(iv) aquifer recharge

**Water Catchment Areas**

**PDC 20** Development should ensure watercourses and their beds, banks, wetlands and floodplains are not damaged or modified and are retained in their natural state, except where modification is required for essential access or maintenance purposes.

**PDC 21** No development should occur where its proximity to a swamp or wetland will damage or interfere with the hydrology or water regime of the swamp or wetland.

**PDC 22** A wetland or low-lying area providing habitat for native flora and fauna should not be drained, except temporarily for essential management purposes to enhance environmental values.

**PDC 23** Along watercourses, areas of remnant native vegetation, or areas prone to erosion, that are capable of natural regeneration should be fenced off to limit stock access.

**PDC 24** Development such as cropping, intensive animal keeping, residential, tourism, industry and horticulture, that increases the amount of surface run-off should include a strip of land at least 20 metres wide measured from the top of existing banks on each side of a watercourse that is:

(a) fenced to exclude livestock

(b) kept free of development, including structures, formal roadways or access ways for machinery or any other activity causing soil compaction or significant modification of the natural surface of the land
(c) revegetated with locally indigenous vegetation comprising trees, shrubs and other groundcover plants to filter runoff so as to reduce the impacts on native aquatic ecosystems and to minimise soil loss eroding into the watercourse.

**PDC 25** Development resulting in the depositing of an object or solid material in a watercourse or floodplain or the removal of bank and bed material should not:

(a) adversely affect the migration of aquatic biota
(b) adversely affect the natural flow regime
(c) cause or contribute to water pollution
(d) result in watercourse or bank erosion
(e) adversely affect native vegetation upstream or downstream that is growing in or adjacent to a watercourse
(f) increase the risk of flooding (upstream or downstream).

**PDC 26** The location and construction of dams, water tanks and diversion drains should:

(a) occur off watercourse
(b) not take place in ecologically sensitive areas or on erosion prone sites
(c) provide for low flow by-pass mechanisms to allow for migration of aquatic biota
(d) not negatively affect downstream users
(e) minimise in-stream or riparian vegetation loss
(f) incorporate features to improve water quality (eg wetlands and floodplain ecological communities, sediment basins and indigenous aquatic vegetation)
(g) protect ecosystems dependent on water resources
(h) ensure water capture is within sustainable limits.

**PDC 28** Development should comply with the current *Environment Protection (Water Quality) Policy*.

**PDC 29** Development within the Water Management Area designated on *Concept Plan Map Go/2 - Development Constraints - Water Management Areas* should not adversely affect the quality or quantity of the water resource.

**Biodiversity and Native Vegetation**

**PDC 30** Development should retain existing areas of native vegetation and where possible contribute to revegetation using locally indigenous plant species.

**PDC 31** Development should be designed and sited to minimise the loss and disturbance of native flora and fauna, including riparian and riverine animals and plants, and their breeding grounds and habitats.

**PDC 32** Native vegetation should be conserved and its conservation value and function not compromised by development if the native vegetation does any of the following:

(a) provides an important habitat for wildlife or shade and shelter for livestock
(b) has a high plant species diversity or includes rare, vulnerable or endangered plant species or plant associations and communities
(c) provides an important seed bank for locally indigenous vegetation
(d) has high amenity value and/or significantly contributes to the landscape quality of an area, including the screening of buildings and unsightly views
(e) has high value as a remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture

(f) is growing in, or is characteristically associated with a wetland environment.

**PDC 33** Native vegetation should not be cleared if such clearing is likely to lead to, cause or exacerbate any of the following:

(a) erosion or sediment within water catchments
(b) decreased soil stability
(c) soil or land slip
(d) deterioration in the quality of water in a watercourse or surface water runoff
(e) a local or regional salinity problem
(f) the occurrence or intensity of local or regional flooding.

**PDC 34** Development that proposes the clearance of native vegetation should address or consider the implications that removing the native vegetation will have on the following:

(a) provision for linkages and wildlife corridors between significant areas of native vegetation
(b) erosion along watercourses and the filtering of suspended solids and nutrients from runoff
(c) the amenity of the locality
(d) bushfire safety
(e) the net loss of native vegetation and other biodiversity.

**PDC 35** Where native vegetation is to be removed, it should be replaced in a suitable location on the site with locally indigenous vegetation to ensure that there is not a net loss of native vegetation and biodiversity.

**PDC 36** Development should be located and occur in a manner which:

(a) does not increase the potential for, or result in, the spread of pest plants, or the spread of any nonindigenous plants into areas of native vegetation or a conservation zone
(b) avoids the degradation of remnant native vegetation by any other means including as a result of spray drift, compaction of soil, modification of surface water flows, pollution to groundwater or surface water or change to groundwater levels
(c) incorporates a separation distance and/or buffer area to protect wildlife habitats and other features of nature conservation significance.

**PDC 37** Development should promote the long-term conservation of vegetation by:

(a) avoiding substantial structures, excavations, and filling of land in close proximity to the trunk of trees and beneath their canopies
(b) minimising impervious surfaces beneath the canopies of trees
(c) taking other effective and reasonable precautions to protect both vegetation and the integrity of structures and essential services.

**Soil Conservation**

**PDC 40** Development should not have an adverse impact on the natural, physical, chemical or biological quality and characteristics of soil resources.

**PDC 41** Development should be designed and sited to prevent erosion.

**PDC 42** Development should take place in a manner that will minimise alteration to the existing landform.

**PDC 43** Development should minimise the loss of soil from a site through soil erosion or siltation during the construction phase of any development and following the commencement of an activity.

**ORDERLY AND SUSTAINABLE DEVELOPMENT**

**OBJECTIVES**

**Objective 1** Orderly and economical development that creates a safe, convenient and pleasant environment in which to live.

**Objective 2** Development occurring in an orderly sequence and in a compact form to enable the efficient provision of public services and facilities.

**Objective 3** Development that does not jeopardise the continuance of adjoining authorised land uses.

**Objective 4** Development that does not prejudice the achievement of the provisions of the Development Plan.

**Objective 5** Development abutting adjoining Council areas having regard to the policies of that Council's Development Plan.

**Principles of Development Control**

**PDC 1** Development should not prejudice the development of a zone for its intended purpose.

**PDC 2** Land outside of townships and settlements should primarily be used for primary production and conservation purposes.

**PDC 3** The economic base of the region should be expanded in a sustainable manner.

**PDC 6** Development should be located and staged to achieve the economical provision of public services and infrastructure, and to maximise the use of existing services and infrastructure.

**PDC 7** Where development is expected to impact upon the existing infrastructure network (including the transport network), development should demonstrate how the undue effect will be addressed.

**RENEWABLE ENERGY FACILITIES**

**Objectives**

**Objective 1:** Development of renewable energy facilities that benefit the environment, the community and the state.

**Objective 2:** The development of renewable energy facilities, such as wind farms and ancillary development, in areas that provide opportunity to harvest natural resources for the efficient generation of electricity.

**Objective 3:** Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.

**Principle of Development Control**

**PDC 1** Renewable energy facilities, including wind farms and ancillary development, should be:

(a) located in areas that maximize efficient generation and supply of electricity; and
(b) designed and sited so as not to impact on the safety of water or air transport and the operation of ports, airfields and designated landing strips.

**Wind Farms and Ancillary Developments**

**PDC 2** The visual impacts of wind farms and ancillary development (such as substations, maintenance sheds, access roads and wind monitoring masts) should be managed through:

(a) wind turbine generators being:

(i) setback at least 1000 metres from non-associated (non-stakeholder) dwellings and tourist accommodation;
(ii) setback at least 2000 metres from defined and zoned township, settlement or urban areas (including deferred urban areas);
(iii) regularly spaced;
(iv) uniform in colour, size and shape and blade rotation direction;
(v) mounted on tubular towers (as opposed to lattice towers);

(b) provision of vegetated buffers around substations, maintenance sheds and other ancillary structures

**PDC 3** Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife:

(a) shadowing, flickering, reflection or glint;
(b) excessive noise;
(c) interference with television and radio signals and geographic positioning systems;
(d) interference with low altitude aircraft movements associated with agriculture;
(e) modification of vegetation, soils and habitats;
(f) striking of birds and bats.

**PDC 4** Wind turbine generators should be setback from dwellings, tourist accommodation and frequently visited public places (such as viewing platforms) a distance that will ensure that failure does not present an unacceptable risk to safety.

**SITING AND VISIBILITY**

**Objectives**

**Objective 1** Protection of scenically attractive areas, particularly natural, rural and coastal landscapes.

**Principles of Development Control**

**PDC 1** Development should be sited and designed to minimise its visual impact on:

(a) the natural, rural or heritage character of the area
(b) areas of high visual or scenic value, particularly rural areas
(c) views from public reserves, tourist routes and walking trails.

**PDC 2** Buildings should be sited in unobtrusive locations and, in particular, should:

(a) be grouped together
(b) where possible be sited in such a way as to be screened by existing vegetation when viewed from public roads.

**PDC 3** Buildings outside of urban areas and in undulating landscapes should be sited in unobtrusive locations and in particular should be:

(a) sited below the ridgeline
(b) sited within valleys or behind spurs
(c) sited in such a way as to not be visible against the skyline when viewed from public roads
(d) set well back from public roads, particularly when the allotment is on the high side of the road.

**PDC 4** Buildings and structures should be designed to minimise their visual impact in the landscape, in particular:

(a) the profile of buildings should be low and the rooflines should complement the natural form of the land
(b) the mass of buildings should be minimised by variations in wall and roof lines and by floor plans which complement the contours of the land
(c) large eaves, verandas and pergolas should be incorporated into designs so as to create shadowed areas that reduce the bulky appearance of buildings.

**PDC 5** The nature of external surface materials of buildings should not detract from the visual character and amenity of the landscape.

**PDC 6** The number of buildings and structures on land outside of urban areas should be limited to that necessary for the efficient management of the land.

**PDC 7** Driveways and access tracks should be designed and constructed to blend sympathetically with the landscape and to minimise interference with natural vegetation and landforms, and be surfaced with dark materials.

**PDC 8** Development should be screened through the establishment of landscaping using locally indigenous plant species:

(a) around buildings and earthworks to provide a visual screen as well as shade in summer, and protection from prevailing winds
(b) along allotment boundaries to provide permanent screening of buildings and structures when viewed from adjoining properties and public roads
(c) along the verges of new roads and access tracks to provide screening and minimise erosion.

**SLOPING LAND**

**Objectives**

**Objective 1** Development on sloping land designed to minimise environmental and visual impacts and protect soil stability and water quality.

**Principles of Development Control**

**PDC 1** Development and associated driveways and access tracks should be sited and designed to integrate with the natural topography of the land and minimise the need for earthworks.

**PDC 2** Development and associated driveways and access tracks, including related earthworks, should be sited, designed and undertaken in a manner that:

(a) minimises their visual impact
(b) reduces the bulk of the buildings and structures
(c) minimises the extent of excavation and fill
(d) minimises the need for, and the height of, retaining walls
(e) does not cause or contribute to instability of any embankment or cutting
(f) avoids the silting of watercourses
(g) protects development and its surrounds from erosion caused by water run-off.

**PDC 3** Driveways and access tracks across sloping land should be accessible and have a safe, all-weather trafficable surface.

**PDC 4** Development sites should not be at risk of landslip.

**PDC 5** Development on steep land should include site drainage systems to minimise erosion and avoid adverse impacts on slope stability.

**PDC 7** The excavation and/or filling of land outside townships and urban areas should:

(a) be kept to a minimum and be limited to a maximum depth or height no greater than 1.5 metres so as to preserve the natural form of the land and the native vegetation
(b) only be undertaken in order to reduce the visual impact of buildings, including structures, or in order to construct water storage facilities for use on the allotment
(c) only be undertaken if the resultant slope can be stabilised to prevent erosion
(d) result in stable scree slopes which are covered with top soil and landscaped so as to preserve and enhance the natural character or assist in the re-establishment of the natural character of the area.

**TRANSPORTATION AND ACCESS**

**Objectives**

**Objective 2** Development that:

(a) provides safe and efficient movement for all motorised and non-motorised transport modes
(b) ensures access for vehicles including emergency services, public infrastructure maintenance and commercial vehicles
(c) provides off street parking
(d) is appropriately located so that it supports and makes best use of existing transport facilities and networks.

**Objective 3** A road hierarchy that promotes safe and efficient transportation in an integrated manner throughout the State.

**Objective 4** Provision of safe, pleasant, accessible, integrated and permeable pedestrian and cycling networks.

**Objective 5** Safe and convenient freight movement throughout the State.

**Principles of Development Control**

**Land Use**

**PDC 1** Land uses arranged to support the efficient provision of sustainable transport networks and encourage their use.

**Movement Systems**

**PDC 2** Development should be integrated with existing transport networks, particularly major rail and road corridors as shown on Overlay Maps Go/1, Go/2, Go/3, Go/4, Go/6, Go/7, Go/8, Go/9, Go/10 and Go/11 - Transport, and designed to minimise its potential impact on the functional performance of the transport networks.

**PDC 8** Development should provide safe and convenient access for all anticipated modes of transport including cycling, walking, public and community transport, and motor vehicles.

**PDC 11** Development should discourage commercial and industrial vehicle movements through residential streets and adjacent other sensitive land uses such as schools.

**PDC 13** Development should make sufficient provision on site for the loading, unloading and turning of all traffic likely to be generated.

**Access**

**PDC 21** Development should have direct access from an all weather public road.

**PDC 22** Development should be provided with safe and convenient access which:

(a) avoids unreasonable interference with the flow of traffic on adjoining roads
(b) accommodates the type and volume of traffic likely to be generated by the development or land use and minimises induced traffic through over-provision
(c) is sited and designed to minimise any adverse impacts on the occupants of and visitors to neighbouring properties.

**PDC 27** Driveways, access tracks and parking areas should be designed and constructed to:

(a) follow the natural contours of the land
(b) minimise excavation and/or fill
(c) minimise the potential for erosion from run-off
(d) avoid the removal of existing vegetation
(e) be consistent with Australian Standard AS 2890 Parking facilities.

**Access for People with Disabilities**

**PDC 28** Development should be sited and designed to provide convenient access for people with a disability.

**Vehicle Parking**

**PDC 29** Development should provide off-street vehicle parking and specifically marked disabled car parking places to meet anticipated demand.

**PDC 30** Development should be consistent with Australian Standard AS 2890 Parking facilities.

**PDC 31** Vehicle parking areas should be sited and designed in a manner that will:

(a) facilitate safe and convenient pedestrian linkages to the development and areas of significant activity or interest in the vicinity of the development
(b) include safe pedestrian and bicycle linkages that complement the overall pedestrian and cycling network
(c) not inhibit safe and convenient traffic circulation
(d) result in minimal conflict between customer and service vehicles
(e) avoid the necessity to use public roads when moving from one part of a parking area to another
(f) minimise the number of vehicle access points to public roads
(g) avoid the necessity for backing onto public roads
(h) where reasonably possible, provide the opportunity for shared use of car parking and integration of car parking areas with adjoining development to reduce the total extent of vehicle parking areas and the requirement for access points
(i) not dominate the character and appearance of a centre when viewed from public roads and spaces
(j) provide landscaping that will shade and enhance the appearance of the vehicle parking areas.

**PDC 34** Parking areas that are likely to be used during non daylight hours should provide floodlit entrance and exit points and site lighting directed and shaded in a manner that will not cause nuisance to adjacent properties or users of the car park.

**PDC 35** Parking areas should be sealed or paved in order to minimise dust and mud nuisance.

**PDC 36** Stormwater from parking areas should be collected for reuse, with overflow discharged to the Council stormwater system.

**PDC 37** Parking areas should be line-marked to indicate parking bays, movement aisles and direction of traffic flow.

**WASTE**

**Objectives**

**Objective 1** Development that, in order of priority, avoids the production of waste, minimises the production of waste, reuses waste, recycles waste for reuse, treats waste and disposes of waste in an environmentally-sound manner.

**Objective 2** Development that includes the treatment and management of solid and liquid waste to prevent undesired impacts on the environment including, soil, plant and animal biodiversity, human health and the amenity of the locality.

**Principles of Development Control**

**PDC 1** Development should be sited and designed to prevent or minimise the generation of waste (including wastewater) by applying the following waste management hierarchy in the order of priority as shown below:

(a) avoiding the production of waste
(b) minimising waste production
(c) reusing waste

(d) recycling waste
(e) recovering part of the waste for re-use
(f) treating waste to reduce the potentially degrading impacts
(g) disposing of waste in an environmentally sound manner.

**Waste Treatment Systems**

**PDC 12** Development that produces any effluent should be connected to an approved waste treatment system which may include sewage, community wastewater management systems, or on-site wastewater treatment and disposal methods.

**PDC 13** The methods for, and siting of, effluent and waste storage, treatment and disposal systems should minimise the potential for environmental harm and adverse impacts on:

(a) the quality of surface and groundwater resources
(b) public health
(c) the amenity of a locality
(d) sensitive land uses.

**PDC 14** Waste treatment should only occur where the capacity of the treatment facility is sufficient to accommodate likely maximum daily demands including a contingency for unexpected high flows and breakdowns.

**PDC 15** Any domestic waste treatment system or effluent drainage field should be located within the allotment of the development that it will service.

**PDC 16** A dedicated on-site effluent disposal area should not include any areas to be used for, or could be reasonably foreseen to be used for, private outdoor open space, driveways, car parking or outbuildings.

**PDC 17** The spreading or discharging of treated liquid or solid waste onto the ground should only occur where the disposal area consists of soil and vegetation that has the capacity to store and use the waste without contaminating soil or surface or ground water resources or damaging crops.

**RELEVANT PROVISIONS OF MID MURRAY COUNCIL DEVELOPMENT PLAN**

**DEVELOPMENT PLAN CONSOLIDATED 14 JUNE 2017**

## RURAL ZONE

**Desired Character**

The zone is the location of the majority of dry land agricultural production within the Council area but it also includes irrigated orchards, vegetables, vineyards and pasture where there is access to water supplies for irrigation. The processing of agricultural product is envisaged which, subject to compliance with environmental criteria, could include value-adding enterprises such as packing and processing works and wineries. Other forms of small-scale industry may be appropriate in association with existing residential development, on allotments which are not suited to primary production, or as an adjunct to an existing primary production operation.

Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) are envisaged within that part of the zone outside of the Barossa Valley Character Preservation district (as defined by Character Preservation legislation) and constitute a component of the desired character of this part of the zone. These facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence, components (particularly turbines) may need to be:

- located in visually prominent locations such as ridgelines;
- visible from scenic routes and valuable scenic and environmental areas; and
- located closer to roads than envisaged by generic setback policy.

This, coupled with the large scale of these facilities (in terms of both height and spread of components), renders it difficult to mitigate the visual impacts of wind farms to the degree expected of other types of development. Subject to implementation of management techniques set out by general/council wide policy regarding renewable energy facilities, these visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy.

The Zone adjoins the River Murray and agricultural uses in the vicinity of the River must be managed to ensure that the River's water quality does not further deteriorate through accelerated groundwater inflows, irrigation run-off, chemical over-spray, erosion and siltation and other impacts. Due to the potential for adverse impacts on areas of native vegetation, olive production should be sufficiently separated from environmentally sensitive areas such as the Murray River and Conservation Zones.

The Zone encompasses the eastern face of the Mount Lofty Ranges which contributes significantly to the district's visual qualities. The location and design of development on the hills face is therefore a matter of importance, as is the retention of remnant bushland and native vegetation for aesthetic and conservation purposes. New landscaping or agro-forestry plantings should not change the bold and exposed character of the Hills Face. The use of local native species should be used in preference to introduced species for these purposes.

The zone's rural and natural character lends itself to tourism activities, such as the interpretation of the natural environment, the sale or sampling of produce and on-farm tourism which will enhance the value of local production and add to the quality and range of experiences available to the visitor in the region. These value-added activities however should not be undertaken in a way which would prejudice the long-term operation of primary production.

Scenic vehicular routes transverse and define the zone. Land adjoining a defined scenic route or which can be viewed from the routes, should only be developed to enhance their function.

Other than where qualified by the provisions for the Policy Areas, the following forms of development are acceptable in the Rural Zone:

- farming and farm buildings;
- horticulture particularly viticulture, vegetable and fruit production and associated storage and processing buildings;
- irrigated pasture;
- residential use providing it is associated with farming, horticulture, viticulture;
- infrastructure to support acceptable uses;
- tourist accommodation associated with existing farm dwellings;
- tourism development associated with the natural environment;
- uses which aid interpretation of natural areas and the region's natural heritage;
- intensive animal keeping providing specified separation distances can be achieved;
- land-based aquaculture providing specified separation distance can be achieved;
- land extensive uses to support urban areas such as waste disposal or waste treatment;
- wind farm and ancillary development outside of the Barossa Valley Character Preservation District; and
- wind monitoring mast and ancillary development outside of the Barossa Valley Character Preservation District.

The following forms of development are unacceptable in the Rural Zone:

- retail apart from the sale of farm produce;
- urban residential;
- industry and commercial not associated with farming, horticulture, or viticulture excluding small scale home industry on an allotment of which its size, existing use and land capability do not support economic primary production;
- outdoor advertising other than information signage, or relative to the sale of produce from the land on which the sign is sited; and
- olive plantation within 1km of the River Murray Zone (apart from the Primary Production Policy Area) and Conservation Zone.

**Rural Zone - Objectives**

**Sustainable Industry**

**Objective 1:** Long-term operation and sustainability of rural production and primary industries.

**Objective 2:** Accommodation of wind farms and ancillary development outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation.

**Stormwater**

**Objective 3:** Maintenance of natural hydrological systems and environmental flows.

**Objective 4:** Surface run-off designed to protect property and life and environmental quality.

**Vegetation and Landscape Character**

**Objective 5:** Retention and maintenance of wetlands and existing native vegetation for its conservation, biodiversity, and habitat value and environmental management function.

**Objective 6:** Maintenance and enhancement of the landscape character.

**Soil**

**Objective 7:** Protection and maintenance of:

(a) the physical, chemical and biological quality of soil resources;
(b) the quantity of soil resources;
(c) the natural processes of sediment transfer.

**Air Quality**

**Objective 15:** Prevention of environmental nuisance or harm resulting from odour and other airborne particles.

**Noise Pollution**

**Objective 16:** Protection of sensitive uses from external noise.

**Hazard Minimisation**

**Objective 17:** Prevention of environmental nuisance or harm resulting from a biological, chemical or fire hazard, energy emission or explosion.

**Built Form and Design**

**Objective 20:** Rural dwellings or value-adding enterprises which does not preclude horticulture, irrigated pasture, and dairying development.

**Objective 21:** Buildings and structures compatible with the environmental qualities, built form and character of the surrounding area and landscape.

**Infrastructure**

**Objective 22:** Economic provision of infrastructure in an environmentally sensitive manner.

**Objective 23:** Development provided with an adequate level of appropriate services and infrastructure without excessive cost to the community.

**Land Division**

**Objective 24:** Allotments suited to their proposed use.

**Principles of Development Control**

**Form of Development**

**PDC 1** Development should not be undertaken unless it is consistent with the desired character and acceptable forms of development for the zone and the relevant policy area.

**Stormwater**

**PDC 2** No adverse impact on natural hydrological systems and environmental flows.

*Design Techniques (ONE WAY of meeting requirements of the principle of development control)*

*2.1 Modifications to the landform are not located closer than 50 metres to the bank of a watercourse identified on a current series 1:50 000 SA Government topographic map.*

*2.2 The quality of water leaving the site, be of a physical, chemical and biological condition equivalent to or better than pre-development conditions.*

*2.3 The rate of discharge from the site shall not exceed the rate of discharge from the site in the pre-development condition for all storm durations up to and including storms having an ARI of 100 years.*

**PDC 3** Stormwater from buildings and ground areas managed in a manner which minimises impact on natural drainage systems by:

(a) preventing soil erosion or siltation;
(b) minimising the entry of pollutants; and
(c) mitigating peak flows.

*Design Techniques (ONE WAY of meeting requirements of the principle of development control)*

*3.1 In relation to P3(c) on-site drainage systems shall incorporate a system to the approval of the relevant authority, to detain and treat first flush storm run-off before discharge from the site. A detention volume equivalent to the run-off from a 1 year ARI, 2 hour duration storm, discharged gradually over a period of 24 hours is acceptable.*

**Landscape**

**PDC 4** Development should be designed and sited to respect and maintain the landscape character of an area which is of:

(a) historical (including archaeological) significance;
(b) scientific interest;
(c) scenic value or natural beauty;
(d) other heritage significance; or
(e) conservation significance.

**Soil**

**PDC 5** Development should not have an adverse impact on the natural, physical, chemical or biological quality and characteristics of soil resources.

**PDC 6** Development should minimise the loss of soil from a site through soil erosion or siltation both:

(a) during the construction phase; and
(b) following commencement of an activity.

*Design Techniques (ONE WAY of meeting requirements of the principle of development control)*

*6.1 Erosion and sediment control measures such as grade furrows, contour banks, catch/diversion drains, level spreaders, revegetation, hay bale barriers, filter fences, sediment traps and basins are implemented during the construction phase to prevent silt or sediment leaving the subject land.*

**PDC 7** Development should not result in alterations to the landform or drainage patterns which will impede natural processes of sediment transfer.

**Flooding**

**PDC 11** Structures (apart from purpose built flood control levels), including fencing and the filling of land should:

(a) not impede the flow of flood waters or change the pattern of movement of floodwaters; and
(b) when feasible, mitigate any existing impediments to floodwaters.

*Design Techniques (ONE WAY of meeting requirements of the principle of development control)*

*11.1 Structures, including fencing (post and wire (strand) fencing), and the filling of land does not take place within the 100 year flood plain of a watercourse.*

**Noise Pollution**

**PDC 12** Development designed to minimise adverse acoustic impacts on adjoining uses which would be sensitive to acoustic interference.

*Design Techniques (ONE WAY of meeting requirements of the principle of development control)*

*12.1 The noise levels associated with the development do not exceed the following guideline noise levels at the nearest noise sensitive receiver:*

| *Type of receiver [7]* | *Guideline Noise Level LAeqdB(A)[8]* | | *Guideline Noise Level LAmaxdB(A)[8]* | |
|---|---|---|---|---|
| | *Day[9]* | *Night[9]* | *Day[9]* | *Night[9]* |
| *Rural Living* | *45* | *35* | *60* | *50* |
| *Rural Living/Primary Industry Interface [10]* | *50* | *40* | *65* | *55* |
| *Primary Industry* | *55* | *45* | *70* | *60* |

*[7] Specific criteria must be developed where the type of receiver can not be classified in accordance with the uses in the table*
*[8] The LAeq and the LAmax are the equivalent and maximum A weighted noise levels respectively as generally defined in Australian Standard AS1055-199720. The LAeq shall be adjusted for noise characteristics. Where meteorological conditions exist that will regularly affect the noise level associated with the proposed development, the LAeq shall take account of this influence.*
*[9] The day period is 7am to 10pm. The night period is 10pm to 7am.*

*[10] Taken to mean where a Rural Zone and a Rural Living Zone (or similar) in which a receiver is located interface. The 'Interface' classification will also apply to a purely residential use located in a Rural Zone.*
*[11] Design Technique 12.2 defines the information that the proponent needs to provide to satisfy the principle where the guideline noise levels will be exceeded. It is expected an acoustic engineer (eligible for membership of both the Australian Acoustical Society and the Institution of Engineers Australia) will be required to provide the information.*

*12.2 The proposal may exceed Design Technique 12.1 and satisfy principle 12 where the planning authority is of the opinion that all reasonable and practicable steps have been taken by the noise source to prevent any adverse impacts resulting from noise. In determining whether all reasonable and practicable steps have been taken by the noise source, the planning authority may consider, amongst other things(11)):*
*(a) the amount by which the predicted noise level exceeds the criteria under Design Technique 12.1;*
*(b) the duration and frequency of occurrence that the noise exceeds the criteria under Design Technique 12.1(12);*
*(c) the various types of use in the vicinity of the receiver;*
*(d) the primary intention of the zone in which the receiver is located as provided by the relevant Development Plan;*
*(e) the primary intention of the zone in which the noise source is located as provided by the relevant Development Plan;*
*(f) the presence of ambient noise at the receiver of similar character, duration or frequency of occurrence to the noise exceeding the criteria under Design Technique 12.1(13);*
*(g) the presence of alternatives to the process which is generating noise, where those alternatives:*
*(i) result in a similar outcome; and*
*(ii) result in lower noise levels at the receiver; and*
*(iii) are successfully used by a class of persons undertaking activities of a same or similar kind;*
*(h) the extent of the area and number of receivers exposed to the noise that exceeds the criteria under Design Technique 12.1;*
*(i) the economic benefits and social worth of the activity;*
*(j) the financial implications of the noise reduction steps as they relate to class of persons undertaking activities of the same or a similar kind;*
*(k) the likelihood of successful application of the noise reduction steps*

**Air Quality**

**PDC 14** Landscaping includes bushfire protection features to minimise risk of damage to buildings and property and assist in preventing or slowing spread of fire

**PDC 15** Development should have regard to the possible impacts in terms of air quality both in terms of odour and air borne particles (eg dust) on:

(a) horticulture and viticulture;
(b) residential and tourist accommodation; and
(c) sensitive industries.

*Design Techniques (ONE WAY of meeting requirements of the principle of development control)*

*15.1 Control measures include: provision of separation distances; enclosing the source; venting and stack heights; arresters and pavement heights.*

**PDC 16** Development likely to result in the emission of odour, or other airborne particles, should minimise environmental nuisance or harm external to the site as a result of that emission.

**Built Form and Design**

**PDC 17** Outdoor lighting should not cause nuisance.

**PDC 18** Buildings and structures which have:

(a) a design scale, appearance and site to enhance the positive environmental qualities, built form and character of the locality;
(b) a site which is unobtrusive and screened from public roads and adjoining properties by:

(i) natural landforms;
(ii) existing vegetation;
(iii) planting of appropriate vegetation;

(c) a requirement for minimal excavation or filling of land;
(d) a requirements for minimal removal of existing vegetation; and
(e) sites which are grouped together.

*Design Techniques (ONE WAY of meeting requirements of the principle of development control)*

*18.1 In relation to P18 (c) excavation and/or filling associated with any building or structure is limited to no greater than 1.5 metres below or above natural ground level.*
*18.2 In relation to P18 (b) (iii) landscaping associated with new buildings:*
*(a) comprises random plantings of a variety of indigenous tree and shrub species at spacing of 4-5 metres;*
*(b) consists of some species with a mature tree height equivalent or greater than the height of proposed buildings and structures;*
*(c) extends around the proposed buildings and structures for a minimum width of 10 metres; and*
*(d) does not increase the bushfire hazard by ensuring:*
*(i) no overhang to buildings; and*
*(ii) set-back of vegetation from building equivalent to the expected mature height of vegetation.*
*18.3 In relation to P18 (e) buildings are not separated by a distance of greater than 15 metres.*

**PDC 19** The external appearance and design of buildings and structures visible from a public road or waterway should minimise their visual obtrusiveness by:

(a) reducing the building's profile;
(b) reducing the mass of buildings into smaller components by variations in wall and roof lines; and
(c) using eaves, verandahs and similar techniques to create shadowed areas.

*Design Techniques (ONE WAY of meeting requirements of the principle of development control)*
*For Industry:*

*19.1 Any chain mesh fencing to be plastic coated coloured black and set-back 2.0 metres from the road and residential property boundary.*
*19.2 The maximum height of any building or ancillary structure is 12.0 metres.*
*19.3 Maximum unarticulated length of building to a street frontage 30 metres (punctuation by windows, canopies, verandahs or walk offsets is considered to be adequate).*
*19.4 Maximum unarticulated length of office or administration component is 15 metres.*

**PDC 20** Sites should be provided with a safe and convenient means of access which:

(a) avoids unreasonable interference with the flow of traffic on adjoining roads;
(b) accommodates all types and the volume of traffic likely to be generated by the development or land use; and
(c) is located and designed to minimise any adverse impact on the occupants of visitors to neighbouring properties.

**Building Development**

**PDC 22** Wind farms and ancillary development should be located in areas outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation which provide opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited:

(a) in visually prominent locations;
(b) closer to roads than envisaged by generic setback policy.

**PDC 23** Buildings should not be designed and sited so as not to be visually obtrusive.

*Design Techniques (ONE WAY of meeting requirements of the principle of development control)*

*23.1 Visibility can be measured by mapping sightlines.*

**Land Division**

**PDC 25** Creation of additional allotments should not occur other than to excise a dwelling that existed at 26 June 2003.

*Design Techniques (ONE WAY of meeting requirements of the principle of development control)*

*25.1 Excising of a dwelling from an existing rural property should have regard to the minimum allotment size for a dwelling in the relevant Policy Area, as well as conditions relative to separation distances to Primary Production.*

**PDC 26** Allotments including realignment of existing allotments should be located and be of size and configuration which:

(a) takes account of environmental features and site constraints;
(b) provides sufficient space in appropriate locations for the siting of buildings, structures and associated services and infrastructure;
(c) protects native vegetation;
(d) is able to satisfactorily accommodate an appropriate use of the land (existing or proposed) consistent with land use policies for the Rural Zone; and
(e) ensures existing dwellings are on allotments of 36 hectares.

**Separation Distance to Primary Production**

**PDC 27** Siting of dwellings should not limit the use for primary production which requires chemical spraying.

Design Techniques (ONE WAY of meeting requirements of the principle of development control)

*27.1 The separation distance[1] between a detached dwelling and primary production should be:*

*open ground: 300m*
*Advisory Note:*
*[1] A separation distance is the minimum horizontal distance between the curtilage of the dwelling and the primary production land use on adjoining land. The balance of the land not used for a dwelling can be included in calculating the separation distance.*

**Rock Harvesting**

**PDC 37** Rock harvesting should not be undertaken:

(a) within 500 metres of Scenic or Secondary or Primary Arterial Roads;
(b) within 20 metres of native vegetation;
(c) on land slopes greater than 20 percent; 1 in 5; 12 degrees; and
(d) where rocks are an important habitat for native fauna.

**PDC 38** No rock stock piles should be established with 500 metres of Scenic, or Secondary or Arterial Roads.

**Conservation**

**PDC 43** Rural development that does not degrade the conservation value of adjoining Conservation Zones

**Complying Development**

**PDC 44** The following kinds of development are complying in the Rural Zone:

- Farming (subject to no removal of native vegetation)

**Non-complying Development**

**PDC 45** The following kinds of development are non-complying in the Rural Zone:

Land division except for the purpose of realigning of allotment boundaries without creating an additional allotment or excising a dwelling on an additional allotment where that dwelling existed as at 26 June 2003.

Wind farm and ancillary development such as substations, maintenance sheds, access roads and connecting power lines (including to the National Electricity Grid) located within the Barossa Valley Character Preservation District as defined by Character Preservation legislation.

Wind monitoring mast located within the Barossa Valley Character Preservation District as defined by Character Preservation legislation.

And in addition, within the Marne Watercourse Policy Area 13 and Hills Policy Area 14, all kinds of development other than those listed below are non-complying.

Land division where no additional allotments are created, either partly or wholly, and where the development of the proposed allotments does not result in a greater risk of pollution of surface or underground waters than would the development of the existing allotments, and provided a suitable site for a detached dwelling is available which will comply with the criteria specified in criteria (a) to (g) inclusive specified in Design Technique 10.1

"wind farm and ancillary development such as substations, maintenance sheds, access roads and connecting power lines (including to the National Electricity Grid) located outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation"

"wind monitoring mast located outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation"

**Public Notification**

**PDC 46** For the purposes of public notification, the following activities are assigned Category 1:

- Farming and farm buildings
- Horticultural and associated processing and storage buildings
- Viticultural and associated processing and storage buildings
- Irrigated pasture
- Dwelling, providing it is associated with farming, horticulture, viticulture
- Infrastructure to support acceptable uses
- Tourist accommodation associated with existing farm dwellings
- Tourism development associated with the natural environment
- Uses which aid interpretation of natural areas and the region's natural heritage
- Land extensive uses to support urban areas such as waste disposal or waste treatment
- Public service installations

**PDC 47** For the purposes of public notification, the following activities are assigned Category 2:

Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) located outside of the Barossa Valley Protection District as defined by Character Preservation legislation where the base of all wind turbines is located at least 2000 metres from:

(a) an existing dwelling or tourist accommodation that is not associated with the wind farm
(b) a proposed dwelling or tourist accommodation for which an operable development plan consent exists
(c) the boundaries of any Airfield, Airport, Centre, Community, Fringe, Historic Conservation, Home Industry, Living, Mixed Use, Residential, Settlement, Tourist, Township or Urban Zone, Policy Area or Precinct or any Heritage Area (including within the area of an adjoining Development Plan)

Wind monitoring mast and ancillary development located outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation.

## Rural Zone – Policy Area Number 14 – Hills Policy Area

**Background**

The eastern face of the Mount Lofty Ranges, and the ranges themselves, are a dramatic and attractive landscape feature of the Council area and region generally. Development Policies are structured to encourage suitable rural uses and limit built form on the face of the ranges.

**Desired Character**

Open grazing of the eastern hills face see Figures HF(HPA)/1 to 5 and very limited or no built form to preserve the eastern backdrop of the Murray Plains. The hills face is unsuitable to intensive agricultural uses which would change the existing open and exposed character of the land form. Low intensity uses like grazing of sheep should continue. These plantations on the hills face should be confined to gullies and water courses and building development should, in addition to meeting design criteria, be limited to very large holdings.

Behind the eastern face of the range a wider range of agricultural and horticultural uses are appropriate where built form, providing it relates to primary production, will be evident, but at low densities. These uses include grazing and animal keeping, cropping, viticultural and dairying.

The following forms of development are unacceptable in that part of the Hills Policy Area defined in Figures HF(HPA)/1 to 5 (additional to unacceptable uses for the Rural Zone:

- horticulture, particularly viticulture and olive production;
- forestry;
- buildings on allotments less than 200ha in size.

**Objectives - Rural Zone – Policy Area Number 14 – Hills Policy Area**

**Objective 1:** Retention of the open rural character as derived from large land holdings used for primary production and dispersed isolated built form.

**Objective 2:** No building development on the eastern face of the Mount Lofty Ranges.

**Objective 3:** Conservation and enhancement of the importance of the area for Aboriginal heritage.

**Principles of Development Control - Rural Zone – Policy Area Number 14 – Hills Policy Area**

**PDC 1** Development should not be undertaken unless it is consistent with the desired character for the policy area.

**PDC 3** Dwellings and non-rural buildings shall not be located where they are prominently visible from a public road without extensive screening first established.

**PDC 4** The excavation and/or filling of land should:

(a) be kept to a minimum so as to preserve the natural form of the land and the native vegetation;
(b) only be undertaken in order to reduce the visual impact of buildings, including structures, or in order to construct water storage facilities for use on the allotment; and
(c) result in stable scree slopes which are covered with top soil and landscaped so as to preserve and enhance the existing character of the Policy

## COUNCIL-WIDE PROVISIONS

### Form of Development

**Objective 1:** Orderly development with the economic extension of services and facilities in accordance with Structure Plan for the District Map MiMu/1 (Overlay 2).

Orderly development achieves economy in the provision of public utilities, and is conducive to the creation of the a safe, convenient and pleasant environment in which to live. Orderly development contributes to the retention of rural land for the purposes of primary production, recreation, and water and nature conservation.

**Objective 2:** Townships, Service Centres and Settlements contained within defined outer boundaries.

**Objective 7:** Development safe from natural or man-made hazards and to be compatible with land capability.

The risk to life and property caused by natural and man-made hazards including flooding, land slip, bushfire, industrial explosion or discharge is an important consideration. The capability of land in terms of terrain, soil, geology, erosion potential and land use to support a proposed development is an important consideration before allowing the development to proceed. Development should not lead to deterioration in the quality of surface or underground water.

**Objective 8:** Maintenance and promotion of a diverse local economy.

Sufficient land and infrastructure needs to be available to accommodate economic growth in the region, particularly in the areas of tourism, horticulture and industry. Development providing job opportunities to boost local employment is a high priority.

**Objective 9:** Satisfaction of the social, economic and cultural needs of the community.

### Principles of Development Control

**PDC 1** Orderly Development in accordance with the Structure Plan Maps MiMu/1 (Overlay 1) and Enlargements A to M and MiMu/1 (Overlay 2).

**PDC 5** Development which is incompatible with other uses within the locality of the proposed development should not be undertaken.

### Movement of People and Goods

**Objective 14:** Safe and efficient movement of people and goods by road.

The primary and secondary road network serving local and district traffic is shown on Map MiMu/1 (Overlay 1).

**Objective 15:** Provision of a system of scenic routes serving the district and their protection from inappropriate development.

The district's scenic routes are shown on Map MiMu/1 (Overlay 1).

**Objective 16:** Free flow of traffic on roads by minimising interference from adjoining development.

**Principles of Development Control**

**PDC 34** Development liable to generate traffic volumes which cannot safely and conveniently be accommodated on the existing or proposed road system should not be undertaken.

**PDC 37** Development should include an appropriate provision on the site to enable the parking, loading, unloading, turning and fuelling of vehicles and pedestrian or cycle movement in a safe and convenient manner. Shared parking areas or sites located elsewhere other than on site should only be provided where such an arrangement is to be benefit of the community.

**PDC 38** The construction of access ways onto public roads should:

(a) not interfere with or restrict drainage channels or watercourses; and
(b) be located in a safe and convenient location.

**PDC 39** Driveways, access tracks and parking areas should:

(a) follow the natural contours of the land;
(b) follow the geometric pattern of plantings;
(c) be designed and constructed with a minimum amount of excavation and/or fill;
(d) be designed and constructed to minimise the potential for erosion from run-off; and
(e) not involve the removal of existing vegetation.

**PDC 40** Development should not be undertaken if the design and location of access points will create unsafe conditions or cause interference with the free flow of traffic on any adjoining road.

*Design Techniques (Design Techniques illustrate ONE WAY of satisfying the associated principle of development control)*

*40.1 In place of direct access to arterial roads use service roads or access to local roads.*
*40.2 Where there is direct access to arterial roads development should allow all vehicles to enter and exit the site in a forward direction.*

**PDC 41.** Development involving the erection of a building with public access should make suitable provision for access by the disabled.

**Public Utilities**

**Objective 17:** New development serviced with adequate public infrastructure commensurate with projected demands at the cost of the proponent.

**Principles of Development Control**

**PDC 42** Provision and maintenance of utility services and easements should be undertaken in such a way that any existing or potentially adverse visual or environmental effects are minimised.

**PDC 43** Infrastructure required for development should:

(a) be able to be economically provided;
(b) be of a sufficient standard, design and capacity to accommodate the proposed development;
(c) not have a detrimental impact on the environment qualities and the amenity of the area;

(d) not necessitate the removal of native vegetation;
(e) not increase the level of risk to public health;
(f) be provided at full cost to the developer without public subsidy;
(g) not compromise the level of service to other existing users; and
(h) not be at risk of damage by flood waters

**PDC 44** Development should only be undertaken where demands placed on essential services such as water supply, common effluent drains or electricity can be met by existing facilities or their expansion.

**PDC 46** In rural areas where there is no reticulated or indirect mains water supply, development should have an independent water supply of a nature, design, quality and capacity that can be demonstrated as suitable for meeting the ongoing requirements of the development, particularly for domestic, livestock and fire protection purposes.

**PDC 47** Stormwater discharge points should be located and constructed so as to prevent soil erosion.

**PDC 48** Development should incorporate on-site stormwater harvesting where possible and residential development should be designed so that as much rainwater as possible is retained on-site through the collection of roof run-off in rainwater tanks and provision of:

(a) at least one tank of 10 000 litre capacity per dwelling; or
(b) in the absence of a reticulated supply, tanks should be capable of storing the upper limit of anticipated annual run-off.

**PDC 49** Stormwater systems should be designed with structures to minimise the entry of pollutants such as sediment, pesticides and herbicides, bacteria, animal wastes and oil and grease into drainage systems.

**PDC 50** Stormwater systems should be located and designed to minimise the hydraulic impact of discharges on streams by mitigating peak flows and providing erosion protection at entry points.

**PDC 51** Stormwater drainage systems should preserve rather than eliminate natural drainage systems.

**Appearance of Land and Buildings**

**Objective 18:** Amenity of localities not impaired by the appearance of land, buildings and structures including landscape.

Buildings or structures should be sited and designed displaying regard to physical setting qualities and existing built form. In the River Murray Valley in particular buildings should conform to standards covering such matters as building materials, maintenance and colouring, and tree planting.

**Objective 19:** Development of a high architectural standard that responds to and reinforces positive aspects of the local environment and built form.

**Objective 20:** Roads, open spaces, buildings and land uses laid out and linked so that they are easy to understand and navigate.

**Design and Appearance**

**Principles of Development Control**

**PDC 53** Development, including alterations and additions to buildings, should not be undertaken unless it involves a high standard of design with regard to external appearance, building materials, colours, siting and landscaping, so as to preserve and enhance the character of the locality or desired future character of an Area.

**PDC 54** The design of a building may be of a contemporary nature and exhibit an innovative style provided the overall form is sympathetic to the scale of development in the locality and with the context of its setting with regard to shape, size, materials and colour.

**PDC 55** Development should not be undertaken unless:

(a) it conforms with the desired future character of an Area; and
(b) it is sited so as to protect scenic views from public roads or reserves, and is not located on visually-significant ridgelines.

**PDC 56** Buildings should be designed and sited to avoid creating extensive areas of uninterrupted walling facing areas exposed to public view.

**PDC 57** Buildings should be designed to reduce their visual bulk and provide visual interest through design elements such as:

(a) articulation;
(b) colour and detailing;
(c) small vertical and horizontal components;
(d) design and placing of windows; and
(e) variations to facades.

**PDC 58** Where a building is sited on or close to a side boundary, the side boundary wall should be sited and limited in length and height to minimise:

(a) the visual impact of the building as viewed from adjoining properties; and
(b) overshadowing of adjoining properties and allow adequate sun light to neighbouring buildings.

**PDC 59** Building form should not unreasonably restrict existing views available from neighbouring properties and public spaces.

**PDC 60** Transportable buildings and buildings which are elevated on stumps, posts, piers, columns or the like, should have their suspended footings enclosed around the perimeter of the building with brickwork or timber, and the use of verandas, pergolas and other suitable architectural detailing to give the appearance of a permanent structure.

**PDC 61** The external walls and roofs of buildings should not incorporate highly reflective materials that will result in glare.

**PDC 62** Structures located on the roofs of buildings to house plant and equipment should form an integral part of the building design in relation to external finishes, shaping and colours.

**PDC 64** Development should provide clearly recognisable links to adjoining areas and facilities.

**PDC 65** Buildings, landscaping, paving and signage should have a coordinated appearance that maintains and enhances the visual attractiveness of the locality.

**PDC 66** Development should be landscaped in a manner that:

(a) visually screens unattractive buildings and enhances desirable views;
(b) screens car parking areas from pedestrian areas;
(c) provides shade, and softens the effect of large areas of paved surface;
(d) enhances privacy;
(e) creates a buffer between incompatible development; and
(f) integrates the elements of streetscape.

**PDC 69** Development should be designed and sited so that outdoor storage, loading and service areas are screened from public view by an appropriate combination of built form, solid fencing and/or landscaping.

**PDC 70** Trees, other vegetation and earth mounding should be retained or provided as part of the development where the environment will be visually improved by such a provision.

**PDC 71** Development involving the use of materials or structures which are unsightly, or in a poorly-maintained or dilapidated condition, should not be undertaken.

**PDC 72** Development having areas for storage of refuse, plant, equipment, machinery or materials, or car parking or service purposes should not be undertaken unless such areas are sited and suitably screened from view from public roads and adjoining allotments by fencing or landscaping

**PDC 73** Outdoor lighting should not result in light spillage on adjacent land.

**PDC 75** Development should take place in a manner which will minimise alteration to the existing land form.

**PDC 76** Excavation and earthworks should take place in a manner that is not extensively visible from surrounding localities.

**PDC 77** Driveways and access tracks to properties should be designed and constructed to blend sympathetically with the landscape and to minimise interference with natural vegetation and landforms.

**PDC 78** Buildings or structures should be sited unobtrusively and be of a character and design which will blend naturally with the landscape.

**PDC 79** No development should impair:

(a) the natural character of the Mount Lofty Ranges; or
(b) the skyline of the Mount Lofty Ranges.

**PDC 80** Set-backs from allotment boundaries in townships and settled areas should achieve a satisfactory relationship with adjacent development and the streetscape. Adequate space for landscaping, where necessary should be provided.

**PDC 81** The setback of buildings from public roads should:

(a) be similar to, or compatible with, setbacks of buildings on adjoining land and other buildings in the locality, accepting that wind farms and ancillary development may need to be located closer to road boundaries;
(b) contribute positively to the streetscape character of the locality; and
(c) not result in or contribute to a detrimental impact upon the function, appearance or character of the locality.

**Interface Between Land Uses**

**Objective 25:** Development located and designed to prevent adverse impact and conflict between land uses.

**Objective 26:** Protect community health and amenity and support the operation of all desired land uses.

**Principles of Development Control**

**PDC 87** Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following:

(a) the emission of effluent, odour, smoke, fumes, dust or other airborne pollutants;
(b) noise;
(c) vibration;
(d) electrical interference;
(e) light spill;
(f) glare;
(g) hours of operation; or
(h) traffic impacts.

**PDC 88** Development should be designed and sited to minimise negative impact on existing and potential future land uses considered appropriate in the locality.

**PDC 91** Sensitive uses likely to conflict with the continuation of lawfully existing developments and land uses considered appropriate for the zone should not be developed or should be designed to minimise negative impacts.

**Noise**

**PDC 93** Development should be designed, constructed and sited to minimise negative impacts of noise and to avoid unreasonable interference.

**PDC 94** Development should be consistent with the relevant provisions in the current Environment Protection (Noise) Policy.

**Rural Interface**

**PDC 95** The potential for adverse impacts resulting from rural development should be minimised by:

(a) not locating horticulture or intensive animal keeping on land adjacent to townships; and
(b) maintaining an adequate separation distance between horticulture or intensive animal keeping and townships, other sensitive uses and, where desirable, other forms of primary production.

**PDC 96** Traffic movement, spray drift, dust, noise, odour, and the use of frost fans and gas guns associated with primary production activities should not lead to unreasonable impact on adjacent land users.

**PDC 97** Existing primary production uses and mineral extraction should not be prejudiced by the inappropriate encroachment of sensitive uses such as urban development.

**Mineral Extraction**

**Objective 36:** Mining operations undertaken with minimal adverse impacts on the environment and on the health and amenity of adjacent land uses.

**Objective 37:** Minimisation of the impacts from mining activities upon the existing groundwater level and the quality of groundwater resources.

**PDC 127** Development in proximity to mining operations should not be undertaken where it may be exposed to adverse impacts resulting from mining activities.

**PDC 138** Borrow pits for road making materials should:

(a) be sited so as to cause the minimum effect on their surroundings;

(b) not be located in the River Murray Zone – Primary Production Policy Area if equivalent resources are available within other areas within the Development Plan boundary;

(c) not be located in the River Murray Zone if it is located on land visible from arterial or scenic roads as shown on Structure Plan Map MiMu/1 (Overlay 2).

**Rural Development**

**Objective 51:** Retention of rural areas for agricultural and pastoral purposes.

**Objective 52:** Maintenance of the character of rural areas.

Rural areas should be retained primarily for agricultural and pastoral purposes and horticultural use where natural resources such as groundwater supplies and surface catchments are not adversely affected. Conservation of bushland and wildlife are also important considerations. The design and siting of buildings in rural areas should be compatible with the object of conserving rural character.

The use of rural land for residential use should be discouraged because it diminishes rural character; makes the provision of public services uneconomic; increases land values with consequential upward pressure on rates and taxes; and contributes to land use conflicts which has the effect of limiting the right to farm.

The removal of primary production from rural areas also places greater dependence upon the diminishing fertile areas. It is in the community interest therefore as much agricultural land as possible be retained in primary production and without residential incursions other than where residential use is required to manage land.

**Siting and Visibility**

**Objective 54:** Protection of scenically attractive areas, particularly natural, rural and riverine landscapes.

**Principles of Development Control**

**PDC 164** Development should be sited and designed to minimise its visual impact on:

(a) the natural, rural or heritage character of the area;
(b) areas of high visual or scenic value, particularly rural and riverine areas;
(c) views from the River Murray, public reserves, tourist routes, walking trails and scenic routes that are identified in Map MiMu/1 (Overlay 2).

**PDC 165** Buildings should be sited in unobtrusive locations and, in particular, should:

(a) be grouped together; and
(b) where possible be located in such a way as to be screened by existing vegetation when viewed from public roads and especially the River Murray.

**PDC 166** Buildings outside of urban areas and in undulating landscapes should be sited in unobtrusive locations and in particular should be:

(a) sited below the ridgeline;
(b) sited within valleys or behind spurs;
(c) sited in such a way as to not be visible against the skyline when viewed from public roads, and the River Murray; and
(d) set well back from public roads, particularly when the allotment is on the high side of the road.

**PDC 167** Buildings and structures should be designed to minimise their visual impact in the landscape, in particular:

(a) the profile of buildings should be low and the rooflines should complement the natural form of the land;
(b) the mass of buildings should be minimised by variations in wall and roof lines and by floor plans which complement the contours of the land; and
(c) large eaves, verandahs and pergolas should be incorporated into designs so as to create shadowed areas that reduce the bulky appearance of buildings.

**PDC 168** The nature of external surface materials of buildings should not detract from the visual character and amenity of the landscape.

**PDC 169** The number of buildings and structures on land outside of urban areas should be limited to that necessary for the efficient management of the land.

**PDC 170** Driveways and access tracks should be designed and surfaced to blend sympathetically with the landscape and to minimise interference with natural vegetation and landforms.

**PDC 171** Development should be screened through the establishment of landscaping using locally indigenous plant species:

(a) around buildings and earthworks to provide a visual screen as well as shade in summer, and protection from prevailing winds;
(b) along allotment boundaries to provide permanent screening of buildings and structures when viewed from adjoining properties and public roads; and
(c) along the verges of new roads and access tracks to provide screening and minimise erosion.

**Natural Resources**

**Objective 55:** Retention, protection and restoration of the natural resources and environment.

**Objective 56:** Protection of the quality and quantity of South Australia's surface waters, including inland, riverine and underground waters.

**Objective 57:** The ecologically sustainable use of natural resources including soil and water resources (including underground water, surface water and watercourses as defined in the current Environment Protection (Water Quality) Policy).

**Objective 58:** Natural hydrological systems and environmental flows reinstated, and maintained and enhanced.

**Objective 59:** Development consistent with the principles of water sensitive design.

**Objective 60:** Development sited and designed to:

(a) protect natural ecological systems
(b) achieve the sustainable use of water
(c) protect water quality, including receiving waters
(d) reduce runoff and peak flows and prevent the risk of downstream flooding
(e) minimise demand on reticulated water supplies
(f) maximise the harvest and use of stormwater
(g) protect stormwater from pollution sources.

**Objective 61:** Storage and use of stormwater which avoids adverse impact on public health and safety.

**Objective 62:** Native flora, fauna and ecosystems protected, retained, conserved and restored.

**Objective 63:** Restoration, expansion and linking of existing native vegetation to facilitate habitat corridors for ease of movement of fauna.

**Objective 64:** Minimal disturbance and modification of the natural landform.

**Objective 65:** Protection of the physical, chemical and biological quality of soil resources.

**Objective 66:** Protection of areas prone to erosion or other land degradation processes from inappropriate development.

**Objective 67:** Protection of the scenic qualities of natural and rural landscapes.

**Principles of Development Control**

**PDC 172** Development should be undertaken with minimum impact on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas.

**PDC 173** Development should ensure that South Australia's natural assets, such as biodiversity, water and soil, are protected and enhanced.

**PDC 174** Development should not significantly obstruct or adversely affect sensitive ecological areas such as creeks and wetlands.

**PDC 175** Development should be appropriate to land capability and the protection and conservation of water resources and biodiversity.

**Water Sensitive Design**

**PDC 176** Development should be designed to maximise conservation, minimise consumption and encourage re-use of water resources.

**PDC 177** Development should not take place if it results in unsustainable use of surface or underground water resources.

**PDC 178** Development should be sited and designed to:

(a) capture and re-use stormwater, where practical
(b) minimise surface water runoff
(c) prevent soil erosion and water pollution
(d) protect and enhance natural water flows
(e) protect water quality by providing adequate separation distances from watercourses and other water bodies
(f) not contribute to an increase in salinity levels
(g) avoid the water logging of soil or the release of toxic elements
(h) maintain natural hydrological systems and not adversely affect:

(i) the quantity and quality of groundwater
(ii) the depth and directional flow of groundwater
(iii) the quality and function of natural springs.

**PDC 179** Water discharged from a development site should:

(a) be of a physical, chemical and biological condition equivalent to or better than its pre-developed state
(b) not exceed the rate of discharge from the site as it existed in pre-development conditions.

**PDC 180** Development should include stormwater management systems to protect it from damage during a minimum of a 1-in-100 year average return interval flood.

**PDC 181** Development should have adequate provision to control any stormwater over-flow runoff from the site and should be sited and designed to improve the quality of stormwater and minimise pollutant transfer to receiving waters.

**PDC 182** Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater discharges from the site to ensure the carrying capacities of downstream systems are not overloaded.

**PDC 184** Development should include stormwater management systems to minimise the discharge of sediment, suspended solids, organic matter, nutrients, bacteria, litter and other contaminants to the stormwater system.

**PDC 187** Stormwater management systems should preserve natural drainage systems, including the associated environmental flows.

**PDC 188** Stormwater management systems should:

(a) maximise the potential for stormwater harvesting and re-use, either on-site or as close as practicable to the source
(b) utilise, but not be limited to, one or more of the following harvesting methods:

(i) the collection of roof water in tanks
(ii) the discharge to open space, landscaping or garden areas, including strips adjacent to car parks
(iii) the incorporation of detention and retention facilities
(iv) aquifer recharge

**Water Catchment Areas**

**PDC 191** Development should ensure watercourses and their beds, banks, wetlands and floodplains are not damaged or modified and are retained in their natural state, except where modification is required for essential access or maintenance purposes.

**PDC 192** No development should occur where its proximity to a swamp or wetland will damage or interfere with the hydrology or water regime of the swamp or wetland.

**PDC 193** A wetland or low-lying area providing habitat for native flora and fauna should not be drained, except temporarily for essential management purposes to enhance environmental values.

**PDC 194** Along watercourses, areas of remnant native vegetation, or areas prone to erosion, that are capable of natural regeneration should be fenced off to limit stock access.

**PDC 195** Development such as cropping, intensive animal keeping, residential, tourism, industry and horticulture, that increases the amount of surface run-off should include a strip of land at least 20 metres wide measured from the top of existing banks on each side of a watercourse that **is:**

(a) fenced to exclude livestock
(b) kept free of development, including structures, formal roadways or access ways for machinery or any other activity causing soil compaction or significant modification of the natural surface of the land
(c) revegetated with locally indigenous vegetation comprising trees, shrubs and other groundcover plants to filter runoff so as to reduce the impacts on native aquatic ecosystems and to minimise soil loss eroding into the watercourse.

**PDC 196** Development resulting in the depositing of an object or solid material in a watercourse or floodplain or the removal of bank and bed material should not:

(a) adversely affect the migration of aquatic biota
(b) adversely affect the natural flow regime
(c) cause or contribute to water pollution
(d) result in watercourse or bank erosion
(e) adversely affect native vegetation upstream or downstream that is growing in or adjacent to a watercourse
(f) increase the risk of flooding (upstream or downstream).

**PDC 197** The location and construction of dams, water tanks and diversion drains should:

(a) occur off watercourse
(b) not take place in ecologically sensitive areas or on erosion prone sites
(c) provide for low flow by-pass mechanisms to allow for migration of aquatic biota
(d) not negatively affect downstream users
(e) minimise in-stream or riparian vegetation loss
(f) incorporate features to improve water quality (eg wetlands and floodplain ecological communities, sediment basins and indigenous aquatic vegetation)
(g) protect ecosystems dependent on water resources
(h) ensure water capture is within sustainable limits.

**PDC 199** Development should comply with the current *Environment Protection (Water Quality) Policy*.

**PDC 200** Development within the Water Management Areas designated on Map MiMu/1 (Overlay 3) should not adversely affect the quality or quantity of the water resource.

**PDC 201** Unsewered development outside of townships should be located at least 100 metres from the River Murray and/or other significant watercourses; development connected to a common effluent drainage scheme outside of township areas should not be located closer than 25 metres to any watercourse.

**Biodiversity and Native Vegetation**

**PDC 202** Development should retain existing areas of native vegetation and where possible contribute to revegetation using locally indigenous plant species.

**PDC 203** Development should be designed and sited to minimise the loss and disturbance of native flora and fauna, including riparian and riverine animals and plants, and their breeding grounds and habitats.

**PDC 204** Native vegetation should be conserved and its conservation value and function not compromised by development if the native vegetation does any of the following:

(a) provides an important habitat for wildlife or shade and shelter for livestock
(b) has a high plant species diversity or includes rare, vulnerable or endangered plant species or plant associations and communities
(c) provides an important seed bank for locally indigenous vegetation
(d) has high amenity value and/or significantly contributes to the landscape quality of an area, including the screening of buildings and unsightly views
(e) has high value as a remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture
(f) is growing in, or is characteristically associated with a wetland environment.

**PDC 205** Native vegetation should not be cleared if such clearing is likely to lead to, cause or exacerbate any of the following:

(a) erosion or sediment within water catchments
(b) decreased soil stability
(c) soil or land slip
(d) deterioration in the quality of water in a watercourse or surface water runoff
(e) a local or regional salinity problem
(f) the occurrence or intensity of local or regional flooding.

**PDC 206** Development that proposes the clearance of native vegetation should address or consider the implications that removing the native vegetation will have on the following:

(a) provision for linkages and wildlife corridors between significant areas of native vegetation
(b) erosion along watercourses and the filtering of suspended solids and nutrients from runoff
(c) the amenity of the locality
(d) bushfire safety
(e) the net loss of native vegetation and other biodiversity.

**PDC 207** Where native vegetation is to be removed, it should be replaced in a suitable location on the site with locally indigenous vegetation to ensure that there is not a net loss of native vegetation and biodiversity.

**PDC 208** Development should be located and occur in a manner which:

(a) does not increase the potential for, or result in, the spread of pest plants, or the spread of any nonindigenous plants into areas of native vegetation or a conservation zone
(b) avoids the degradation of remnant native vegetation by any other means including as a result of spray drift, compaction of soil, modification of surface water flows, pollution to groundwater or surface water or change to groundwater levels
(c) incorporates a separation distance and/or buffer area to protect wildlife habitats and other features of nature conservation significance.

**PDC 209** Development should promote the long-term conservation of vegetation by:

(a) avoiding substantial structures, excavations, and filling of land in close proximity to the trunk of trees and beneath their canopies
(b) minimising impervious surfaces beneath the canopies of trees
(c) taking other effective and reasonable precautions to protect both vegetation and the integrity of structures and essential services.

**Soil Conservation**

**PDC 212** Development should not have an adverse impact on the natural, physical, chemical or biological quality and characteristics of soil resources.

**PDC 213** Development should be designed and sited to prevent erosion.

**PDC 214** Development should take place in a manner that will minimise alteration to the existing landform.

**PDC 215** Development should minimise the loss of soil from a site through soil erosion or siltation during the construction phase of any development and following the commencement of an activity.

***Conservation***

**Objective 69:** Conservation of land, buildings, structures and other items of significant historical, social and architectural or other Aboriginal or European heritage significance.

The region contains buildings and sites of European historic and cultural interest, and Aboriginal burial grounds and camp sites important to the study of archaeology and anthropology. The area north of Marne River contains examples of Aboriginal and early European settlement, and the eastern escarpment of the Mount Lofty Ranges, north of Palmer, contains sites of early settlement, historic relics and unusual granite tors. These and other geological sites should be protected for education and research purposes and to provide historic links with the past.

**PDC 216** Development liable to impair the character or nature of buildings, relics and sites of heritage, archaeological, scientific or agricultural importance should not be undertaken.

**PDC 217** Development adjacent to, or near, buildings of heritage, cultural, scientific or visual significance, should not be undertaken if it would significantly detract from the appearance of the building or the character of the locality.

**Principles of Development Control**

**PDC 216** Development liable to impair the character or nature of buildings, relics and sites of heritage, archaeological, scientific or agricultural importance should not be undertaken.

**PDC 217** Development adjacent to, or near, buildings of heritage, cultural, scientific or visual significance, should not be undertaken if it would significantly detract from the appearance of the building or the character of the locality.

**PDC 218** Individual buildings or groups of buildings should be conserved and, where possible, restored which are of special:

(a) architectural merit, significance or interest
(b) visual interest
(c) historical significance or heritage value
(d) scientific interest.

**Hazards**

**Objective 87:** Maintenance of the natural environment and systems by limiting development in areas susceptible to natural hazard risk.

**Objective 88:** Development located away from areas that are vulnerable to, and cannot be adequately and effectively protected from the risk of natural hazards.

**Objective 89:** Protection of human health and the environment wherever site contamination has been identified or suspected to have occurred.

**Objective 90:** Appropriate assessment and remediation of site contamination to ensure land is suitable for the proposed use and provides a safe and healthy living and working environment.

**Objective 91:** Minimisation of harm to life, property and the environment through appropriate location of development and appropriate storage, containment and handling of hazardous materials.

**Principles of Development Control**

**PDC 370** Development should be excluded from areas that are vulnerable to, and cannot be adequately and effectively protected from, the risk of hazards.

**PDC 371** There should not be any significant interference with natural processes in order to reduce the exposure of development to the risk of natural hazards.

**PDC 372** Parts of the Mid Murray Council contain naturally occurring elevated concentrations of some chemical compounds in the soils due to local geological factors. Where this has been confirmed, the use and development of the land should be undertaken in accordance with the recommendations contained within the relevant Audit Report.

**Flood Protection**

**Objective 92:** Protection of life and property from the effects of flooding.

Development in floodplains of the River Murray Valley and Marne Valley increases the risk of both life and property. Areas known to be subject to occasional flooding should be kept free of new development or developed to protect property whilst development itself should not impede the flow of flood waters.

**Objective 93:** Prevention of development which could lead to a potential hazard in the event of a major flood.

Control of all development within floodplains is necessary to ensure that hazards are not created.

**Principles of Development Control**

**PDC 219** Development should not occur on land where the risk of flooding is likely to be harmful to safety or damage property.

**PDC 220** Development should not be undertaken in areas liable to inundation by drainage or flood waters unless the development can achieve all of the following:

(a) it is developed with a public stormwater system capable of catering for a 1 in 100 year average return interval flood event;
(b) buildings are designed and constructed to prevent the entry of floodwaters in a 1 in 100 year average return interval flood event**.**

**PDC 221** Development, including earthworks associated with development, should not do any of the following:

(a) impede the flow of floodwaters through the land or other surrounding land;
(b) increase the potential hazard risk to public safety of persons during a flood event;
(c) aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood;
(d) cause any adverse effect on the floodway function;
(e) increase the risk of flooding of other land;
(f) obstruct a watercourse.

**Sloping Land**

**Objective 96:** Development on sloping land designed to minimise environmental and visual impacts and protect soil stability and water quality.

**Landslip**

**Principles of Development Control**

**PDC 376** Land that is at risk from landslip should not be developed.

**PDC 377** Development in areas susceptible to landslip should:

(a) incorporate split level designs to minimise cutting into the slope;
(b) ensure that cut and fill and heights of faces are minimised;
(c) ensure cut and fill is supported with engineered retaining walls or are battered to appropriate grades;
(d) control any erosion that will increase the gradient of the slope and decrease stability;
(e) ensure the siting and operation of an effluent drainage field does not contribute to landslip;
(f) provide drainage measures to ensure surface stability is not compromised; and
(g) ensure natural drainage lines are not obstructed.

**PDC 378** Development, including associated cut and fill activities, should not lead to an increased danger from land surface instability or to the potential of landslip occurring on the site or on surrounding land.

**PDC 379** Development on steep slopes should promote the retention and replanting of vegetation as a means of stabilising and reducing the possibility of surface movement or disturbance.

**Sloping Land**

**PDC 380** Development and associated driveways and access tracks should be sited and designed to integrate with the natural topography of the land and minimise the need for earthworks.

**PDC 381** Development and associated driveways and access tracks, including related earthworks, should be sited, designed and undertaken in a manner that:

(a) minimises their visual impact;
(b) reduces the bulk of the buildings and structures;
(c) minimises the extent of cut and/or fill;
(d) minimises the need for, and the height of, retaining walls;
(e) does not cause or contribute to instability of any embankment or cutting;
(f) avoids the silting of watercourses; and
(g) protects development and its surrounds from erosion caused by water run-off.

**PDC 382** Driveways and access tracks across sloping land should be accessible and have a safe, all-weather trafficable surface.

**PDC 383** Development sites should not be at risk of landslip.

**PDC 384** Development on steep land should include site drainage systems to minimise erosion and avoid adverse impacts on slope stability of the site and adjoining land.

**PDC 385** Steep sloping sites in unsewered areas should not be developed unless the physical characteristics of the allotments enable the proper siting and operation of an effluent drainage field suitable for the development intended.

**PDC 386** The cutting and/or filling of land outside townships and urban areas should:

(a) be kept to a minimum and be limited to a maximum depth or height no greater than 1.5 metres so as to preserve the natural form of the land and the native vegetation;
(b) only be undertaken in order to reduce the visual impact of buildings, including structures, or in order to construct water storage facilities for use on the allotment;
(c) only be undertaken if the resultant slope can be stabilised to prevent erosion; and
(d) result in stable scree slopes which are covered with top soil and landscaped so as to preserve and enhance the natural character or assist in the re-establishment of the natural character of the area.

**Bushfire Protection**

Bushfire Protection Objectives apply to the General, Medium and High Bushfire Risk areas shown on Bushfire Protection Area Figures MiMu(BPA)/1 to 9, except where exempted.

**Objective 97:** Development should minimise the threat and impact of bushfires on life and property while protecting the natural and rural character.

**Objective 98:** Buildings and the intensification of non-rural land uses directed away from areas of high bushfire risk.

**Principles of Development Control**

**PDC 387** Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:

(a) vegetation cover comprising trees and/or shrubs;
(b) poor access;
(c) rugged terrain;
(d) inability to provide an adequate building protection zone; or
(e) inability to provide an adequate supply of water for fire-fighting purposes.

**PDC 390** Buildings and structures should be designed and configured to reduce the impact of bushfire through using simple designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings.

**PDC 394** Development in a Bushfire Protection Area should be in accordance with those provisions of the Minister's Code: Undertaking development in Bushfire Protection Areas that are designated as mandatory for Development Plan Consent purposes.

**Renewable Energy**

**Objective 99:** Development of renewable energy facilities that benefit the environment, the community and the state.

**Objective 100:** The development of renewable energy facilities, such as wind farms and ancillary development, in areas that provide opportunity to harvest natural resources for the efficient generation of electricity.

**Objective 101:** Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.

**Principle of Development Control**

**PDC 395** Renewable energy facilities, including wind farms and ancillary development, should be:

(a) located in areas that maximize efficient generation and supply of electricity; and
(b) designed and sited so as not to impact on the safety of water or air transport and the operation of ports, airfields and designated landing strips.

*Wind Farms and Ancillary Developments*

**PDC 396** The visual impacts of wind farms and ancillary development (such as substations, maintenance sheds, access roads and wind monitoring masts) should be managed through:

(a) wind turbine generators being:

(i) setback at least 1000 metres from non-associated (non-stakeholder) dwellings and tourist accommodation;
(ii) setback at least 2000 metres from defined and zoned township, settlement or urban areas (including deferred urban areas);
(iii) regularly spaced;
(iv) uniform in colour, size and shape and blade rotation direction;
(v) mounted on tubular towers (as opposed to lattice towers);

(b) provision of vegetated buffers around substations, maintenance sheds and other ancillary structures

**PDC 397** Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife:

(a) shadowing, flickering, reflection or glint;
(b) excessive noise;
(c) interference with television and radio signals and geographic positioning systems;
(d) interference with low altitude aircraft movements associated with agriculture;
(e) modification of vegetation, soils and habitats;
(f) striking of birds and bats.

**PDC 398** Wind turbine generators should be setback from dwellings, tourist accommodation and frequently visited public places (such as viewing platforms) a distance that will ensure that failure does not present an unacceptable risk to safety.


# TWIN CREEK WIND FARM

DEVELOPMENT APPLICATION FOR
DEVELOPMENT PLAN CONSENT
JUNE, 2017

## VOLUME 3

FIGURES AND PHOTOMONTAGES

# VOLUME III FIGURES & PHOTOMONTAGES
# CONTENTS

# TWIN CREEK WIND FARM

## FIGURE 1

## LOCATION PLAN



**LEGEND**

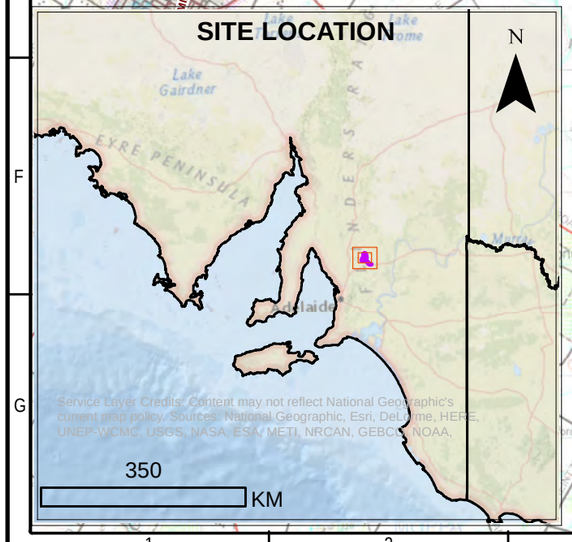
- 275kV POWERLINE (ELECTRANET)
- LOCAL GOVERNMENT AREA BOUNDARY
- WIND FARM DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)

Clare and Gilbert Valleys Council
Light Regional Council
Regional Council of Goyder
Light Regional Council
Regional Council of Goyder
Mid Murray Council
Light Regional Council
Barossa Council

CURIO HIGHWAY
MARRABEL ROAD
THIELE HIGHWAY
EUDUNDA ROAD
TARLEE ROAD
CLARE ROAD
WILDRED STREET
BAGOT WELL ROAD
CAMEL FARM ROAD
MOSEY ROAD
TRURO ROAD
STURT HIGHWAY

EUDUNDA
KAPUNDA
TRURO
HAMILTON
BUCHANAN
HANSBOROUGH
NEALES FLAT
FRANKTON
DUTTON
NORTH MOUNT LOFTY RANGES

**SITE LOCATION**






0 1 2 4 6 8 10 km

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 25-06-2017 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER
03498D2212-01

SCALE - 1:100,000 @ A3

COORDS
GDA 1994 MGA Zone 54

PLANNING PERMIT APPLICATION



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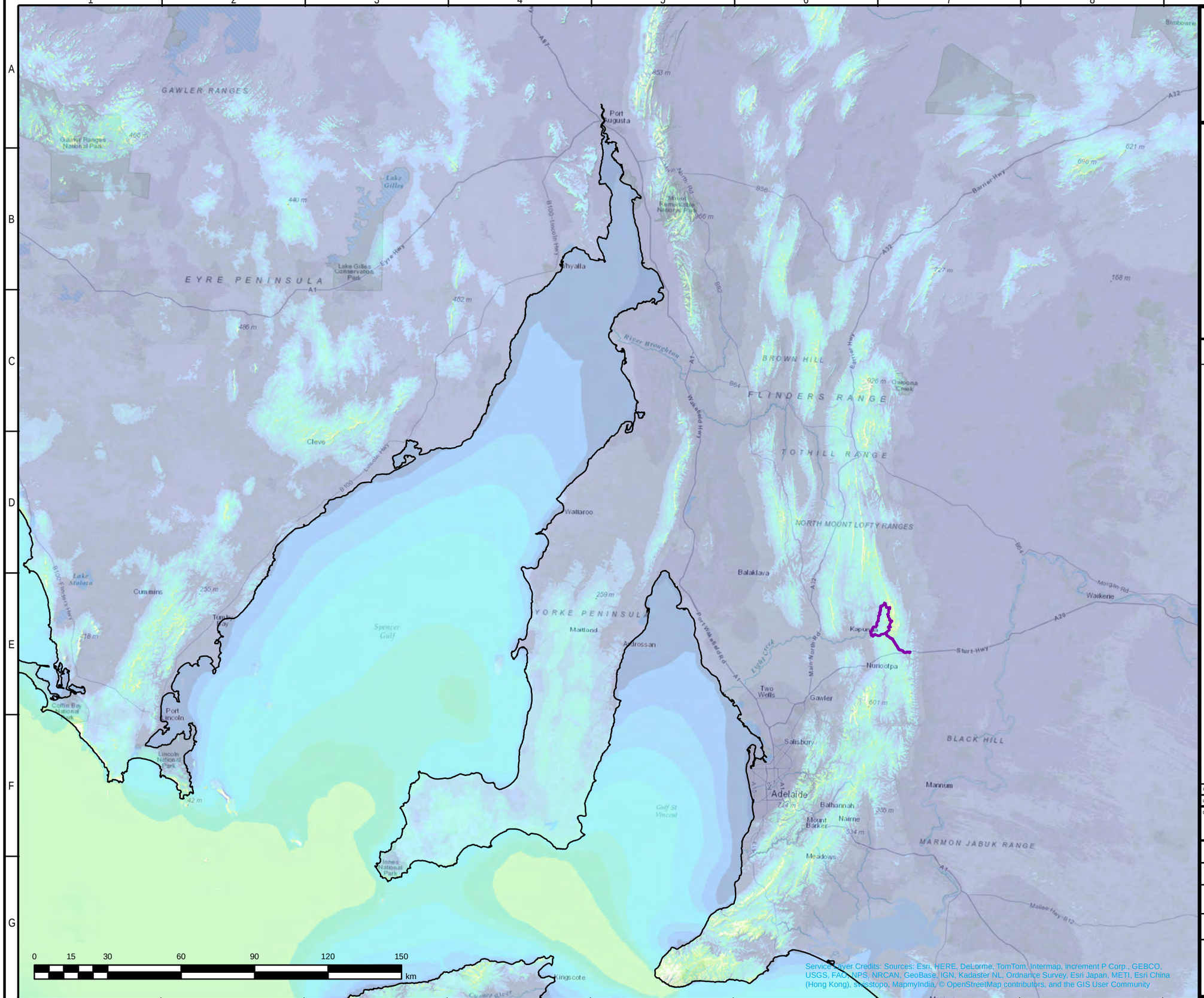


# TWIN CREEK WIND FARM

## FIGURE 2

## WIND MAP



**LEGEND**

SITE BOUNDARY (20170616)

**PREDICTED WIND SPEED AT 80m a.g.l.**

6.3 — <8.5

NOTES:

-WRF MESOCALE MODELLING RESULTS COMBINED WITH MS3DJH MICROSCALE FLOW MODEL AT 50m HORIZONTAL RESOLUTION;

-TAKEN FROM RES MESOSCALE MODELLING RESULTS.

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 20170625 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER

03498D2213-01

SCALE - 1:1,500,00@ A3

COORDS

GDA 1994 South Australia Lambert

PLANNING PERMIT APPLICATION



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NOTE:
- CONSTRAINTS USED FOR LAYOUT DESIGN PAUStwc025;
- ACMA DATABASES; SPECTRA AND RADCOM FROM MARCH 15th 2016 SHOWN IN THIS DRAWING;
- FRENEL ZONES HAVE BEEN CALCULATED ONLY FOR POINT TO POINT LINKS CROSSING OR ADJACENT TO THE WIND FARM BOUNDARY;
- NEAREST ASSOCIATED STAKEHOLDER DWELLING NO. 75 FROM WTG 49 (1283m);
- NEAREST NON-STAKEHOLDER DWELLING NO. 122 FROM WTG 3 (2052m);
- HOUSE LAYOUT (DAUStwc005_20170428) HAS BEEN VALIDATED
TO THE EXTENT OF:
- - 5km FROM WIND TURBINES AND;
- - 2km FROM TRANSMISSION GRID ALIGNMENT.
- - NON-SURVEYED HOUSES HAVE BEEN MAPPED

# TWIN CREEK WIND FARM

## FIGURE 3

## SITE AND CONTEXT ANALYSIS PLAN WIND FARM



**LEGEND**

**HOUSE LAYOUT (DAUStwc005_20170428)**
- HOUSE (NON ASSOCIATED STAKEHOLDER)
- HOUSE (ASSOCIATED STAKEHOLDER)
- NOT SURVEYED
- SHED

**OCCUPATION STATUS**
- OCCUPIED
- UNOCCUPIED
- HOUSE SETBACK 1260m
- HOUSE SETBACK 2050m
- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)
- LOCAL GOVERNMENT AREA BOUNDARY

**TRANSMITTER (EAUStwc001)**
- TRANSMITTER (EAUStwc001)
- SAPN RADIO COMMS LINKS POINT TO MULTI-POINT (SECOND FRESNEL ZONE + 65m BUFFER (EAUStwc001a))
- LINK SECOND FRESNEL ZONE (EAUStwc001) + 65m BUFFER
- WATER COURSE 80m SETBACK (GA - 2006)
- PBTL OBSERVATIONS 20m SETBACK (EBS_20170215)

**VEGETATION CLASSIFICATION (EBS_20170620)**
- AUSTROSTIPA SP. GRASSLANDS
- CROPPING
- EUCALYPTUS CAMALDULENSIS SSP. CAMALDULENSIS CREEKLINES
- EUCALYPTUS LEUCOXYLON +/- EUCALYPTUS POROSA OPEN WOODLAND
- EUCALYPTUS ODORATA WOODLAND
- EUCALYPTUS POROSA +/- EUCALYPTUS ODORATA +/- EUCALYPTUS GRACILIS OPEN WOODLAND
- JUNCUS SPP. (RUSH) AND JUNCUS PALLIDUS (PALE RUSH) SEDGELAND +/- PHRAGMITES AUSTRALIS (COMMON REED)
- LOMANDRA EFFUSA + AUSTROSTIPA SP. GRASSLANDS
- PASTURE GRASSLAND / EXOTIC GRASSLAND
- PLANTED SPECIES
- WEDGE-TAILED EAGLE NEST (EBS_20151127)
- WEDGE-TAILED EAGLE NEST 500m SETBACK

**SLOPE DEGREES - LiDAR SURVEY**
0 - 12 | 12 - 15 | >15

PAGE 1 OF 2

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 25-06-2017 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

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03498D2103-01

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0 0.5 2 3 4 5 KM

NOTE:
- CONSTRAINTS USED FOR LAYOUT DESIGN PAUStwc025;
- ACMA DATABASES; SPECTRA AND RADCOM FROM MARCH 15th 2016 SHOWN IN THIS DRAWING;
- FRENEL ZONES HAVE BEEN CALCULATED ONLY FOR POINT TO POINT LINKS CROSSING OR ADJACENT TO THE WIND FARM BOUNDARY;
- NEAREST ASSOCIATED STAKEHOLDER DWELLING NO. 75 FROM WTG 49 (1283m);
- NEAREST NON-STAKEHOLDER DWELLING NO. 122 FROM WTG 3 (2052m);
- HOUSE LAYOUT (DAUStwc005_20170428) HAS BEEN VALIDATED
TO THE EXTENT OF:
- - 5km FROM WIND TURBINES AND;
- - 2km FROM TRANSMISSION GRID ALIGNMENT.
- - NON-SURVEYED HOUSES HAVE BEEN MAPPED

# TWIN CREEK WIND FARM

## FIGURE 3

## SITE AND CONTEXT ANALYSIS PLAN GRID ROUTE



**LEGEND**

**HOUSE LAYOUT (DAUStwc005_20170428)**
- HOUSE (NON ASSOCIATED STAKEHOLDER)
- NOT SURVEYED
- SHED

**OCCUPATION STATUS**
- OCCUPIED
- UNOCCUPIED
- HOUSE SETBACK 2050m
- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)
- LOCAL GOVERNMENT AREA BOUNDARY

**TRANSMITTER (EAUStwc001)**
- TRANSMITTER (EAUStwc001)
- SAPN RADIO COMMS LINKS POINT TO MULTI-POINT (SECOND FRESNEL ZONE + 65m BUFFER (EAUStwc001a))
- LINK SECOND FRESNEL ZONE (EAUStwc001) + 65m BUFFER
- WATER COURSE 80m SETBACK (GA - 2006)
- PBTL OBSERVATIONS 20m SETBACK (EBS_20170215)

**VEGETATION CLASSIFICATION (EBS_20170620)**
- AUSTROSTIPA SP. GRASSLANDS
- CROPPING
- EUCALYPTUS CAMALDULENSIS SSP. CAMALDULENSIS CREEKLINES
- EUCALYPTUS LEUCOXYLON +/- EUCALYPTUS POROSA OPEN WOODLAND
- EUCALYPTUS LEUCOXYLON SSP. PRUINOSA MIXED SHRUBLAND/GRASSLAND
- EUCALYPTUS ODORATA WOODLAND
- JUNCUS SPP. (RUSH) AND JUNCUS PALLIDUS (PALE RUSH) SEDGELAND +/- PHRAGMITES AUSTRALIS (COMMON REED)
- LOMANDRA EFFUSA + AUSTROSTIPA SP. GRASSLANDS
- PASTURE GRASSLAND / EXOTIC GRASSLAND
- PLANTED SPECIES
- WEDGE-TAILED EAGLE NEST (EBS_20151127)
- WEDGE-TAILED EAGLE NEST 500m SETBACK

**SLOPE DEGREES - LiDAR SURVEY**
0 - 12 | 12 - 15 | >15

PAGE 2 OF 2

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 25-06-2017 |
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0 0.4 0.8 1.6 2.4 3.2 4 KM

# TWIN CREEK WIND FARM

## FIGURE 4

## PLANNING OVERLAYS



**LEGEND**

- 275kV POWERLINE (ELECTRANET)
- HERITAGE AGREEMENT AREAS (DPTI)

**DEVELOPMENT ZONES (DPTI)**

- CONSERVATION (Con)
- INDUSTRY (In)
- PRIMARY PRODUCTION (PrPro)
- RURAL (Ru)
- RURAL LIVING (TRURO) (RuL(Tr))
- SETTLEMENT (DUTTON) (S(Dut))
- TOWNSHIP (DEFERRED) T(D)
- TOWNSHIP (TRURO) (T(Tr))
- LOCAL GOVERNMENT AREA BOUNDARY
- WIND FARM DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)

SITE LOCATION

Service Layer Credits: Content may not reflect National Geographic's current map policy. Sources: National Geographic, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA,

160 KM

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 25-06-2017 |
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0 1 2 4 6 8 km

# TWIN CREEK WIND FARM

## FIGURE 5

## LANDOWNERSHIP WIND FARM



**LEGEND**

- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)

**LANDOWNERS**

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- THE CROWN

NOTES:

CADASTRALBOUNDARY_2015_20170531 SHOWN IN THIS DRAWING,

PAGE 1 OF 2

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 28-06-2017 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER

03498D2525-01

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0 0.5 1 2 3 4 5 km

# TWIN CREEK WIND FARM

## FIGURE 5

## LANDOWNERSHIP GRID ROUTE



**LEGEND**

- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)

**LANDOWNERS**

- 2
- 3
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22

NOTES:

CADASTRALBOUNDARY_2015_20170531 SHOWN IN THIS DRAWING,

PAGE 2 OF 2

| | | | |
|---|---|---|---|
| INFRAS DWG | N/A | APPD DATE | 28-06-2017 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

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0 0.5 1 2 3 4 5 km

| TURBINE ID | EASTING m | NORTHING m | ELEVATION m |
|---|---|---|---|
| T1 | 321026 | 6200205 | 388.3 |
| T2 | 321360 | 6200955 | 376.0 |
| T3 | 322403 | 6200826 | 437.6 |
| T4 | 321993 | 6201019 | 435.0 |
| T5 | 321620 | 6201367 | 412.5 |
| T6 | 320952 | 6201223 | 373.5 |
| T7 | 319882 | 6201452 | 349.2 |
| T8 | 320250 | 6201090 | 329.1 |
| T9 | 322950 | 6201222 | 432.2 |
| T10 | 322538 | 6201521 | 435.6 |
| T11 | 322022 | 6201882 | 412.5 |
| T12 | 322572 | 6201943 | 406.3 |
| T13 | 322322 | 6202456 | 380.3 |
| T14 | 320971 | 6202391 | 348.6 |
| T15 | 320036 | 6202498 | 341.0 |
| T16 | 320224 | 6203111 | 349.6 |
| T17 | 321816 | 6202690 | 392.0 |
| T18 | 323643 | 6202084 | 428.0 |
| T19 | 323292 | 6202686 | 425.3 |
| T20 | 322886 | 6202903 | 407.0 |
| T21 | 322371 | 6203086 | 425.9 |
| T22 | 321826 | 6203111 | 391.6 |
| T23 | 321590 | 6203414 | 403.6 |
| T24 | 320666 | 6204049 | 353.0 |
| T25 | 324225 | 6202148 | 432.1 |
| T26 | 323887 | 6202670 | 450.8 |
| T27 | 323772 | 6203076 | 437.2 |
| T28 | 322719 | 6203537 | 442.3 |
| T29 | 322046 | 6203820 | 423.0 |
| T30 | 321713 | 6204052 | 405.6 |
| T31 | 321308 | 6204303 | 420.7 |
| T32 | 321201 | 6204679 | 384.1 |
| T33 | 324338 | 6203141 | 454.0 |
| T34 | 323586 | 6203550 | 424.7 |
| T35 | 322782 | 6204095 | 454.6 |
| T36 | 322249 | 6204368 | 452.7 |
| T37 | 321973 | 6204642 | 418.3 |
| T38 | 324342 | 6203539 | 480.2 |
| T40 | 324060 | 6203843 | 446.3 |
| T42 | 323325 | 6204676 | 426.9 |
| T43 | 322719 | 6204664 | 453.5 |
| T44 | 323646 | 6204246 | 424.6 |
| T45 | 323837 | 6204811 | 439.4 |
| T46 | 323611 | 6205227 | 447.1 |
| T47 | 323205 | 6205593 | 469.9 |
| T48 | 323115 | 6205082 | 461.5 |
| T49 | 322641 | 6205411 | 422.7 |
| T50 | 321133 | 6203686 | 364.0 |
| T51 | 321050 | 6202928 | 347.4 |
| T52 | 321374 | 6201812 | 355.8 |
| T53 | 323112 | 6202183 | 414.7 |

MGA ZONE 54 - DATUM GDA 94

0 0.5 1 2 3 4 5 km

# TWIN CREEK WIND FARM

## FIGURE 6

## PROPOSED TURBINE LOCATIONS



**LEGEND**

- TURBINE LAYOUT (PAUStwc025)
- DEVELOPMENT AREA (20170613)
- WIND FARM SITE BOUNDARY (20170616)

NOTES:

- SUBJECT TO FINAL DESIGN;
- TURBINES MAY BE MICROSITED IN ACCORDANCE WITH FIGURE 10.

| | | | |
|---|---|---|---|
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| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

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03498D0002-01

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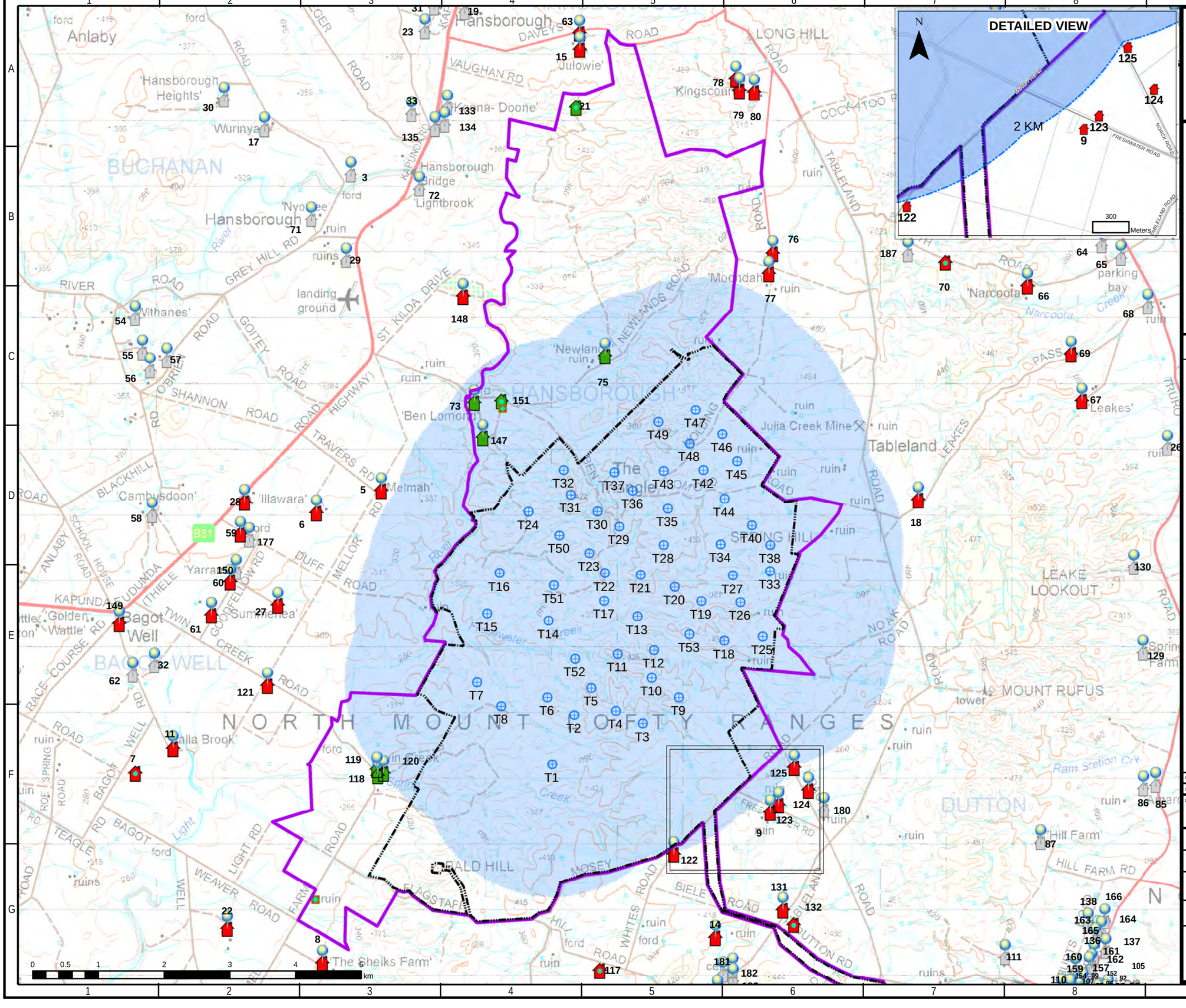


# TWIN CREEK WIND FARM

## FIGURE 7

## HOUSE AND TURBINE LOCATIONS WIND FARM



**LEGEND**

- TURBINE LAYOUT (PAUStwc025)

**HOUSE LAYOUT (DAUStwc005_20170428)**

- HOUSE (NON ASSOCIATED STAKEHOLDER)
- HOUSE (ASSOCIATED STAKEHOLDER)
- HOUSE (NOT SURVEYED)
- SHED

**OCCUPATION STATUS**

- OCCUPIED
- UNOCCUPIED
- DEVELOPMENT AREA (20170613)
- WIND FARM SITE BOUNDARY (20170616)
- 2 KM WIND TURBINE SETBACK

NOTES:

NEAREST ASSOCIATED STAKEHOLDER DWELLING NO. 75 FROM WTG 49 (1283m);
- NEAREST NON-STAKEHOLDER DWELLING NO. 122 FROM WTG 3 (2052m);
- HOUSE LAYOUT (DAUStwc005_20170428) HAS BEEN VALIDATED TO THE EXTENT OF:
-- 5km FROM WIND TURBINES AND;
-- 2km FROM TRANSMISSION GRID ALIGNMENT.
--NOT-SURVEYED HOUSES HAVE BEEN MAPPED THROUGH A DESKTOP ASSESSMENT;

PAGE 1 OF 2

| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

DRAWING NUMBER

03498D0202-01

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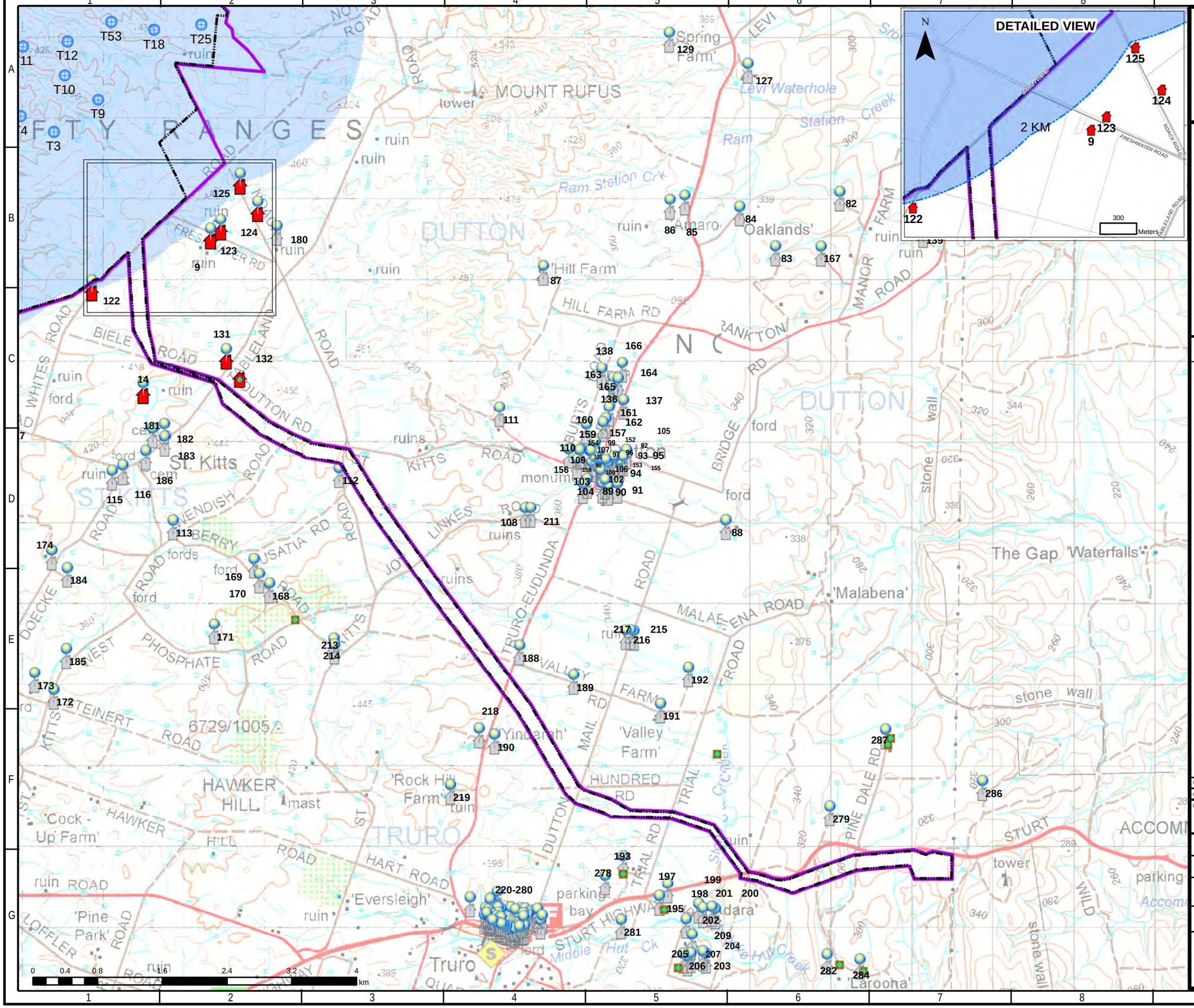


# TWIN CREEK WIND FARM

## FIGURE 7

## HOUSE AND TURBINE LOCATIONS GRID ROUTE



**LEGEND**

- TURBINE LAYOUT (PAUStwc025)

**HOUSE LAYOUT (DAUStwc005_20170428)**

- HOUSE (NON ASSOCIATED STAKEHOLDER)
- HOUSE (NOT SURVEYED)
- SHED

**OCCUPATION STATUS**

- OCCUPIED
- UNOCCUPIED
- DEVELOPMENT AREA (20170613)
- WIND FARM SITE BOUNDARY (20170616)
- 2 KM WIND TURBINE SETBACK

NOTES:

NEAREST ASSOCIATED STAKEHOLDER DWELLING NO. 75 FROM WTG 49 (1283m);
- NEAREST NON-STAKEHOLDER DWELLING NO. 122 FROM WTG 3 (2052m);
- HOUSE LAYOUT (DAUStwc005_20170428) HAS BEEN VALIDATED TO THE EXTENT OF:
-- 5km FROM WIND TURBINES AND;
-- 2km FROM TRANSMISSION GRID ALIGNMENT.
--NOT-SURVEYED HOUSES HAVE BEEN MAPPED THROUGH A DESKTOP ASSESSMENT;



| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

DRAWING NUMBER

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NOTES:

- SUBJECT TO FINAL DESIGN;
- RES INTERNAL X-INFRASTRUCTURE05_APPROVED_20170324 SHOWN IN THIS DRAWING;
-RES INTERNAL X-GRIDROUTE07_APPROVED_20170613 SHOWN IN THIS DRAWING
- OPERATION AND MAINTENANCE COMPOUND IS LOCATED 1.8 KM FROM MOSEY ROAD;
- SEE FIGURE 11A FOR SUBSTATION DETAILED VIEW;
- SEE FIGURE 11B FOR TERMINAL STATION DETAILED VIEW.

# TWIN CREEK WIND FARM

## FIGURE 8

## INFRASTRUCTURE WIND FARM



**LEGEND**

- TURBINE LAYOUT (PAUStwc025)
- PROPOSED ACCESS ROADS
- HARDSTAND
- PROPOSED AREA FOR BATTERY STORAGE
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED CONSTRUCTION COMPOUND AND MATERIAL LAYDOWN AREA
- PROPOSED SUBSTATION
- PROPOSED OPERATION AND MAINTENANCE AREA
- WIND FARM INFRASTRUCTURE ZONE
- PRINCIPAL SITE ENTRANCE
- PROPOSED PERMANENT MAST LOCATION
- GRID ROUTE
- GRID ROUTE EASEMENT 50m
- GRID ROUTE INVESTIGATION CORRIDOR
- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)



| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

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0 0.3 0.6 1.2 1.8 2.4 3 km

NOTES:

- SUBJECT TO FINAL DESIGN;
- RES INTERNAL X-INFRASTRUCTURE05_APPROVED_20170324 SHOWN IN THIS DRAWING;
-RES INTERNAL X-GRIDROUTE07_APPROVED_20170613 SHOWN IN THIS DRAWING
- OPERATION AND MAINTENANCE COMPOUND IS LOCATED 1.8 KM FROM MOSEY ROAD;
- SEE FIGURE 11A FOR SUBSTATION DETAILED VIEW;
- SEE FIGURE 11B FOR TERMINAL STATION DETAILED VIEW.

# TWIN CREEK WIND FARM

## FIGURE 8

## INFRASTRUCTURE GRID ROUTE



**LEGEND**

- TURBINE LAYOUT (PAUStwc025)
- PROPOSED ACCESS ROADS
- HARDSTAND
- PROPOSED AREA FOR BATTERY STORAGE
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED CONSTRUCTION COMPOUND AND MATERIAL LAYDOWN AREA
- PROPOSED SUBSTATION
- PROPOSED OPERATION AND MAINTENANCE AREA
- WIND FARM INFRASTRUCTURE ZONE
- PRINCIPAL SITE ENTRANCE
- GRID ROUTE
- GRID ROUTE EASEMENT 50m
- GRID ROUTE INVESTIGATION CORRIDOR
- TERMINAL STATION ACCESS TRACKS
- AREA FOR INTERFACES ASSET
- TERMINAL STATION
- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)



| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

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0 0.4 0.8 1.6 2.4 3.2 4 km

# TWIN CREEK WIND FARM

## FIGURE 9

## DESIGN RESPONSE WIND FARM



**VEGETATION CLASSIFICATION (EBS_20170620)**

**VEG_DESCRIPTION**

- AUSTROSTIPA SP. GRASSLANDS
- CROPPING
- EUCALYPTUS LEUCOXYLON +/- EUCALYPTUS POROSA OPEN WOODLAND
- EUCALYPTUS POROSA +/- EUCALYPTUS ODORATA +/- EUCALYPTUS GRACILIS OPEN WOODLAND
- JUNCUS SPP. (RUSH) AND JUNCUS PALLIDUS (PALE RUSH) SEDGELAND +/- PHRAGMITES AUSTRALIS (COMMON REED)
- LOMANDRA EFFUSA + AUSTROSTIPA SP. GRASSLANDS
- PASTURE GRASSLAND / EXOTIC GRASSLAND
- PLANTED SPECIES
- WEDGE-TAILED EAGLE NEST (EBS_20151127)
- WEDGE-TAILED EAGLE NEST 500m SETBACK
- PBTL OBSERVATIONS 20m SETBACK (EBS_20170215)

NOTES:
- CONSTRAINTS USED FOR LAYOUT DESIGN PAUStwc025;
- ACMA DATABASES; SPECTRA AND RADCOM FROM MARCH 15th 2016 SHOWN IN THIS DRAWING;
- FRENEL ZONES HAVE BEEN CALCULATED ONLY FOR POINT TO POINT LINKS CROSSING OR ADJACENT TO THE WIND FARM BOUNDARY;
- NEAREST ASSOCIATED STAKEHOLDER DWELLING NO. 75 FROM WTG 49 (1283m);
- NEAREST NON-STAKEHOLDER DWELLING NO. 122 FROM WTG 3 (2052m);
- RES INTERNAL X-INFRASTRUCTURE05_ APPROVED_20170324 SHOWN IN THIS DRAWING;
-RES INTERNAL X-GRIDROUTE07_ APPROVED_20170613 FROM SITE ENTRANCE;
- OPERATION AND MAINTENANCE COMPOUND IS LOCATED 1.8 KM FROM MOSEY ROAD;
- HOUSE LAYOUT (DAUStwc005_20170428) HAS BEEN VALIDATED
TO THE EXTENT OF:
- - 5km FROM WIND TURBINES AND;
- - 2km FROM TRANSMISSION GRID ALIGNMENT.
- - NON-SURVEYED HOUSES HAVE BEEN MAPPED

**LEGEND**

- TURBINE LAYOUT (PAUStwc025)
- PROPOSED ACCESS ROADS
- HARDSTAND
- PROPOSED AREA FOR BATTERY STORAGE
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED CONSTRUCTION COMPOUND AND MATERIAL LAYDOWN AREA
- PROPOSED SUBSTATION
- PROPOSED OPERATION AND MAINTENANCE AREA
- WIND FARM INFRASTRUCTURE ZONE
- PRINCIPAL SITE ENTRANCE
- PROPOSED PERMANENT MAST LOCATION
- GRID ROUTE
- GRID ROUTE EASEMENT 50m
- GRID ROUTE INVESTIGATION CORRIDOR
- SITE BOUNDARY (20170616)
- DEVELOPMENT AREA (20170613)
- LOCAL GOVERNMENT AREA BOUNDARY

**HOUSE LAYOUT (DAUStwc005_20170428)**

- HOUSE (NON ASSOCIATED STAKEHOLDER)
- HOUSE (ASSOCIATED STAKEHOLDER)
- HOUSE (NOT SURVEYED)
- SHED

**OCCUPATION STATUS**

- OCCUPIED
- UNOCCUPIED
- HOUSE SETBACK 1260m
- HOUSE SETBACK 2050m
- COMMS LINKS POINT TO POINT
- SAPN RADIO COMMS LINKS POINT TO MULTI-POINT (SECOND FRESNEL ZONE + 65m BUFFER (EAUStwc001a))
- RADIO COMMS LINK SETBACK (SECOND FRESNEL ZONE + 65m BUFFER (EAUStwc001))
- WATER COURSE (250K MAPPING)
- WATER COURSE 80m SETBACK (GA - 2006)

PAGE 1 OF 2

| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
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DRAWING NUMBER

**03498D2104-01**

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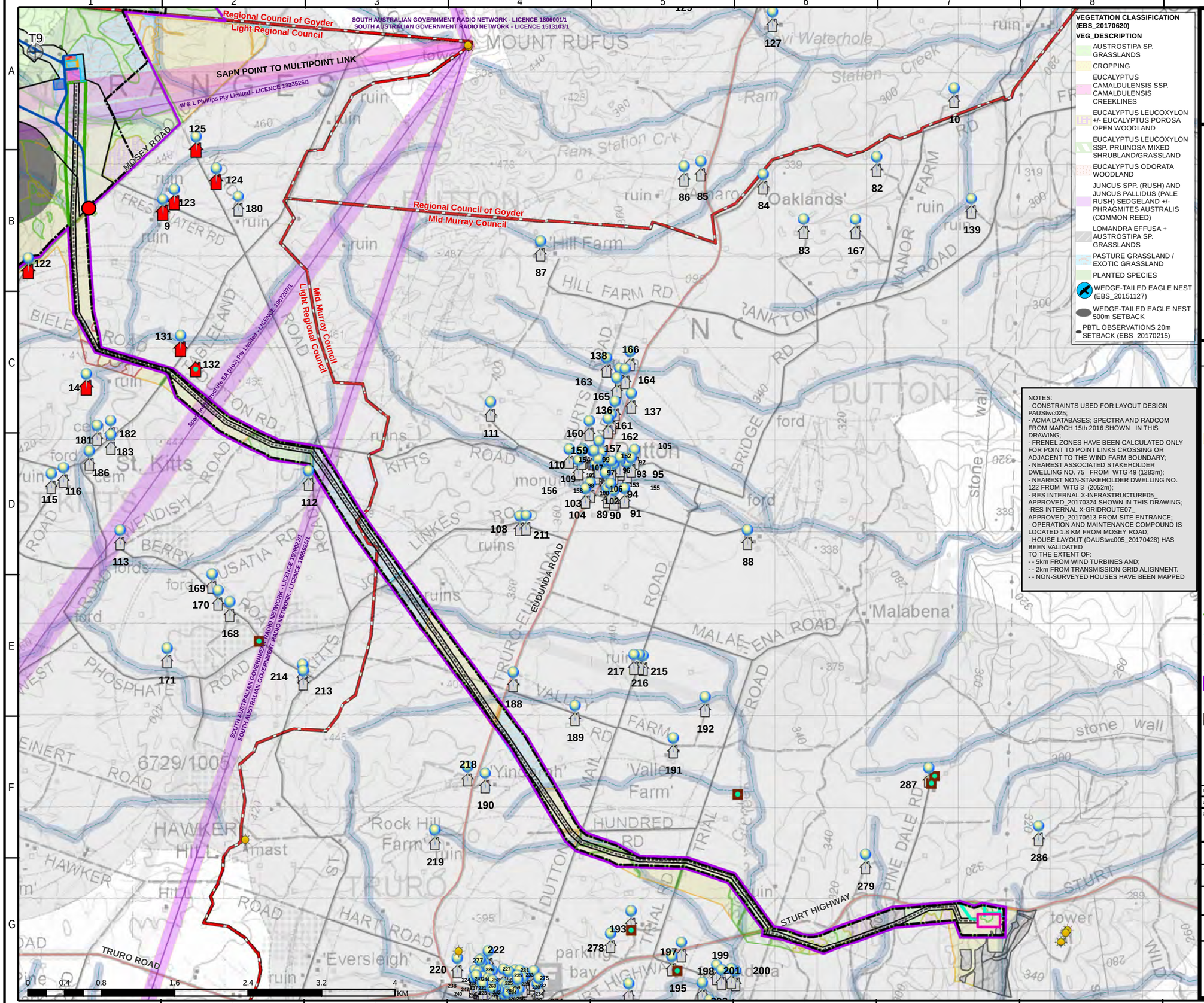
0 0.3 0.6 1.2 1.8 2.4 3 KM




**VEGETATION CLASSIFICATION (EBS_20170620)**

**VEG_DESCRIPTION**

- AUSTROSTIPA SP. GRASSLANDS
- CROPPING
- EUCALYPTUS CAMALDULENSIS SSP. CAMALDULENSIS CREEKLINES
- EUCALYPTUS LEUCOXYLON +/- EUCALYPTUS POROSA OPEN WOODLAND
- EUCALYPTUS LEUCOXYLON SSP. PRUINOSA MIXED SHRUBLAND/GRASSLAND
- EUCALYPTUS ODORATA WOODLAND
- JUNCUS SPP. (RUSH) AND JUNCUS PALLIDUS (PALE RUSH) SEDGELAND +/- PHRAGMITES AUSTRALIS (COMMON REED)
- LOMANDRA EFFUSA + AUSTROSTIPA SP. GRASSLANDS
- PASTURE GRASSLAND / EXOTIC GRASSLAND
- PLANTED SPECIES
- WEDGE-TAILED EAGLE NEST (EBS_20151127)
- WEDGE-TAILED EAGLE NEST 500m SETBACK
- PBTL OBSERVATIONS 20m SETBACK (EBS_20170215)

NOTES:
- CONSTRAINTS USED FOR LAYOUT DESIGN PAUStwc025;
- ACMA DATABASES; SPECTRA AND RADCOM FROM MARCH 15th 2016 SHOWN IN THIS DRAWING;
- FRENEL ZONES HAVE BEEN CALCULATED ONLY FOR POINT TO POINT LINKS CROSSING OR ADJACENT TO THE WIND FARM BOUNDARY;
- NEAREST ASSOCIATED STAKEHOLDER DWELLING NO. 75 FROM WTG 49 (1283m);
- NEAREST NON-STAKEHOLDER DWELLING NO. 122 FROM WTG 3 (2052m);
- RES INTERNAL X-INFRASTRUCTURE05_ APPROVED_20170324 SHOWN IN THIS DRAWING;
-RES INTERNAL X-GRIDROUTE07_ APPROVED_20170613 FROM SITE ENTRANCE;
- OPERATION AND MAINTENANCE COMPOUND IS LOCATED 1.8 KM FROM MOSEY ROAD;
- HOUSE LAYOUT (DAUStwc005_20170428) HAS BEEN VALIDATED TO THE EXTENT OF:
- - 5km FROM WIND TURBINES AND;
- - 2km FROM TRANSMISSION GRID ALIGNMENT.
- - NON-SURVEYED HOUSES HAVE BEEN MAPPED

# TWIN CREEK WIND FARM

## FIGURE 9

## DESIGN RESPONSE GRID ROUTE



**LEGEND**

- TURBINE LAYOUT (PAUStwc025)
- PROPOSED ACCESS ROADS
- HARDSTAND
- PROPOSED AREA FOR BATTERY STORAGE
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED CONSTRUCTION COMPOUND AND MATERIAL LAYDOWN AREA
- PROPOSED SUBSTATION
- PROPOSED OPERATION AND MAINTENANCE AREA
- WIND FARM INFRASTRUCTURE ZONE
- PRINCIPAL SITE ENTRANCE
- GRID ROUTE
- GRID ROUTE EASEMENT 50m
- GRID ROUTE INVESTIGATION CORRIDOR
- TERMINAL STATION ACCESS TRACKS
- AREA FOR INTERFACES ASSET
- TERMINAL STATION
- SITE BOUNDARY (20170616)
- DEVELOPMENT AREA (20170613)
- LOCAL GOVERNMENT AREA BOUNDARY

**HOUSE LAYOUT (DAUStwc005_20170428)**

- HOUSE (NON ASSOCIATED STAKEHOLDER)
- HOUSE (NOT SURVEYED)
- SHED

**OCCUPATION STATUS**

- OCCUPIED
- UNOCCUPIED
- HOUSE SETBACK 2050m
- TRANSMITTER (EAUStwc001)
- COMMS LINKS POINT TO POINT
- SAPN RADIO COMMS LINKS POINT TO MULTI-POINT (SECOND FRESNEL ZONE + 65m BUFFER (EAUStwc001a))
- RADIO COMMS LINK SETBACK (SECOND FRESNEL ZONE + 65m BUFFER (EAUStwc001))
- WATER COURSE (250K MAPPING)
- WATER COURSE 80m SETBACK (GA - 2006)



| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

DRAWING NUMBER
03498D2104-01

SCALE - 1:40,000 @ A3

COORDS
GDA 1994 MGA Zone 54

PLANNING PERMIT APPLICATION



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TWIN CREEK
WIND FARM

FIGURE 10

MICROSITING
DRAWING



**LEGEND**

- TURBINE MICROSITING AREA (PAUStwc025)
- PERMANENT MAST MICROSITING AREA
- PRINCIPAL SITE ENTRANCE
- PROPOSED AREA FOR BATTERY STORAGE
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED CONSTRUCTION COMPOUND AND MATERIAL LAYDOWN AREA
- PROPOSED SUBSTATION
- PROPOSED OPERATION AND MAINTENANCE AREA
- WIND FARM INFRASTRUCTURE ZONE
- DEVELOPMENT AREA (20170613)
- SITE BOUNDARY (20170616)

NOTES:

- SUBJECT TO FINAL DESIGN;

- MICROSITING AREA BASED ON A 100m RADIUS FROM TURBINE AND MAST CENTRE POINT, CONTAINED WITHIN \THE WIND FARM INFRASTRUCTURE ZONE;

-RES INTERNAL X-INFRASTRUCTURE05_APPROVED_20170324 SHOWN IN THIS DRAWING.

| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

DRAWING NUMBER
03498D2215-01

SCALE - 1:25,000 @ A3

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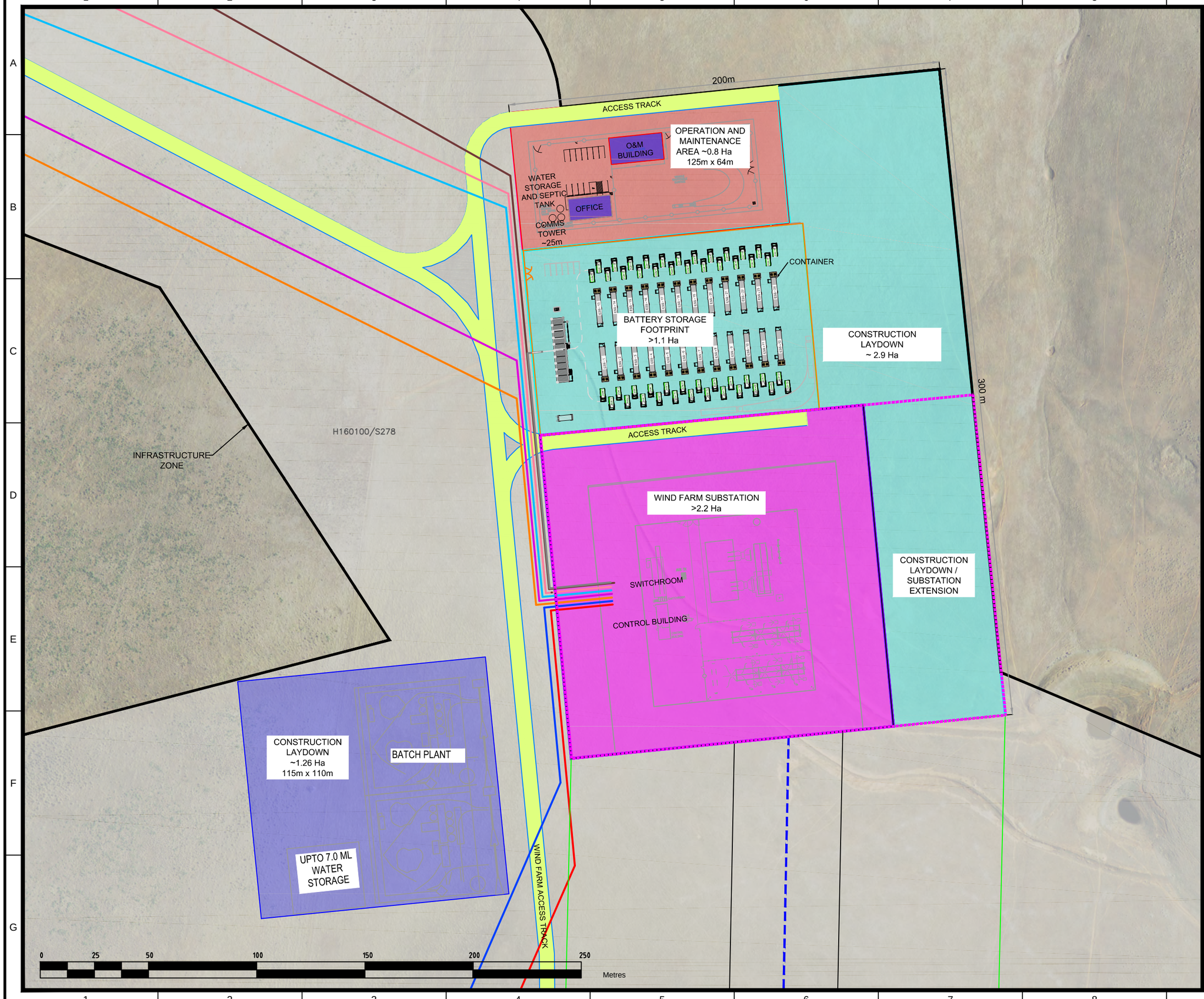
PRINCIPAL SITE ENTRANCE

0 0.375 0.75 1.5 2.25 3 km




# TWIN CREEK WIND FARM

## FIGURE 11A

## PROPOSED CONSTRUCTION OPERATIONS, MAINTENANCE AND SUBSTATION AREAS

LEGEND

- PROPOSED OPERATION AND MAINTENANCE AREA
- PROPOSED SUBSTATION
- PROPOSED WIND FARM CONSTRUCTION LAYDOWN AREA
- PROPOSED TEMPORARY MOBILE BATCHING PLAN
- PROPOSED BATTERY STORAGE AREA
- ACCESS TRACKS
- INFRASTRUCTURE ZONE
- COLLECTOR GROUP CABLING
- OVER HEAD GRID CONNECTION
- GRID 50m EASEMENT
- GRID INVESTIGATION CORRIDOR

NOTES

LAYOUTS AND DIMENSIONS ARE INDICATIVE ONLY TO SHOW GENERAL ARRANGEMENT CONCEPTS AND ALL DETAILS ARE SUBJECT TO FINAL DESIGN;

SECURITY FENCING MAY BE PLACED;

RES INTERNAL X-INFRASTRUCTURE05_APPROVED_20170324 SHOWN IN THIS DRAWING;

RES INTERNAL X-GRIDROUTE07_APPROVED_20170613 SHOWN IN THIS DRAWING;

OPERATION AND MAINTENANCE COMPOUND IS LOCATED 1.8KM FROM MOSEY ROAD;

INFRASTRUCTURE IS LOCATED IN LOT SECTION 278 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS CERTIFICATE OF TITLE - VOLUME 5618 FOLIO 693 .

| | | | |
|---|---|---|---|
| INFRA DWG | 03498D1001-05 | APPD DATE | 27-06-2017 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER

03498D3501-02

SCALE - AS SHOWN @A3

COORDS

MGA ZONE 54 - DATUM GDA 94

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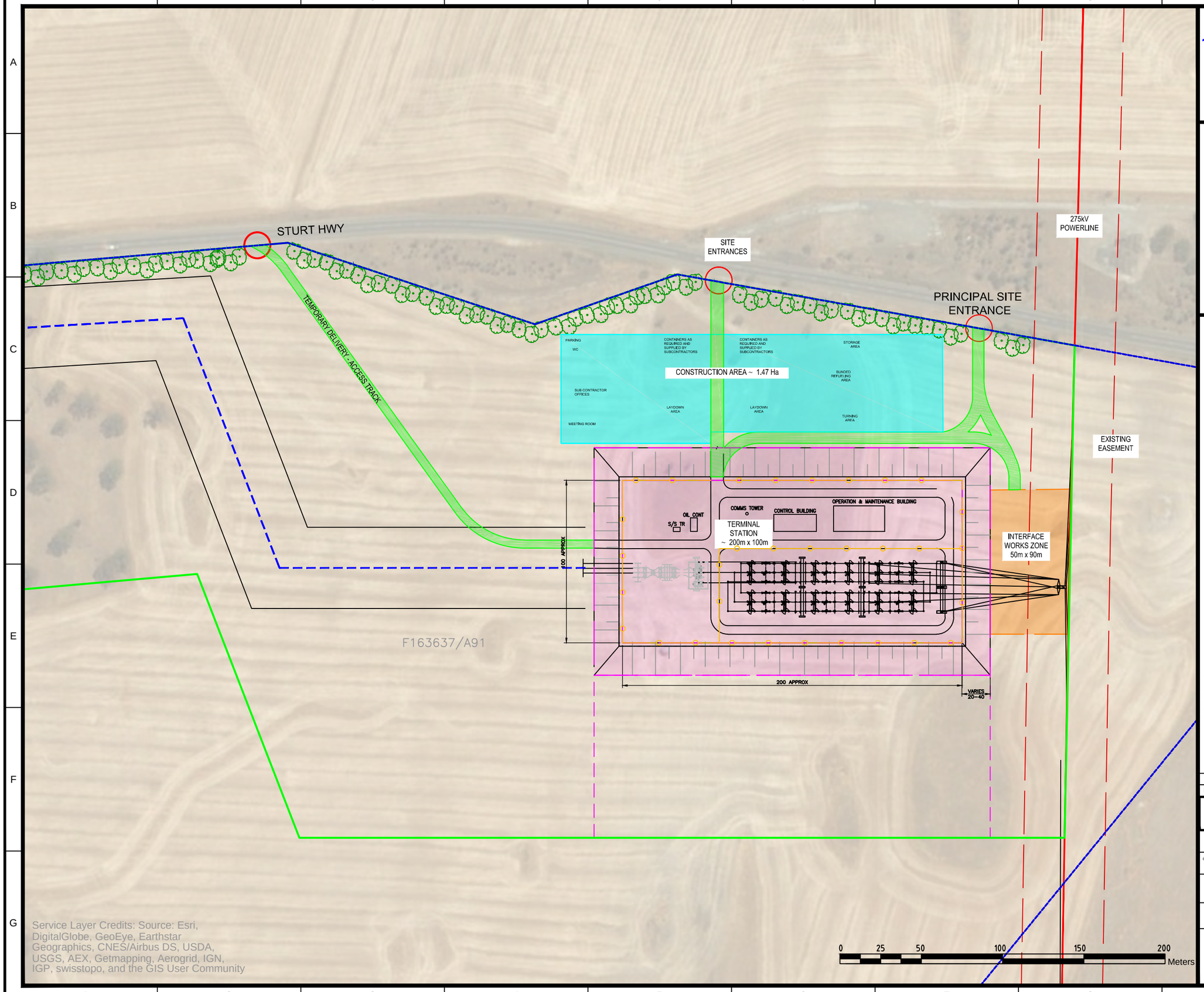


# TWIN CREEK WIND FARM

## FIGURE 11B

## PROPOSED TERMINAL STATION SITE PLAN

### LEGEND

- CONNECTION ASSET GRID ROUTE
- CONNECTION ASSET EASEMENT 50m
- INVESTIGATION CORRIDOR
- EXISTING 275kV POWERLINE
- EXISTING 275kV POWERLINE 50m EASEMENT
- PROPOSED TERMINAL SUB-STATION
- PROPOSED TEMPORARY CONSTRUCTION COMPOUND AND WORKS ZONE
- PROPOSED 275kV INTERFACE WORKS ZONE
- TERMINAL STATION ACCESS ROADS
- LAND BOUNDARY
- INDICATIVE PERMANENT FENCE LOCATIONS
- SITE ENTRANCE
- PROPOSED VEGETATION SCREENING (A) POST CONSTRUCTION

NOTES

LAYOUTS AND DIMENSIONS ARE INDICATIVE ONLY TO SHOW GENERAL ARRANGEMENT CONCEPTS AND ALL DETAILS ARE SUBJECT TO FINAL DESIGN;

RES INTERNAL X-GRIDROUTE07_APPROVED_20170613 SHOWN IN THIS DRAWING;

FINAL LOCATIONS (WITHIN THE CONFINES OF THE INVESTIGATION CORRIDOR) OF CONSTRUCTION AREA AND TERMINAL SUB-STATION AREA IS SUBJECT TO FINAL DESIGN;

ALLOTMENT 91 FILED PLAN 163637 IN THE AREA NAMED TRURO HUNDRED OF JELLICOE, CERTIFICATE OF TITLE - VOLUME 5506 FOLIO 92. .

| | |
|---|---|
| INFRA DWG 03498D4101-05 | APPD DATE 25-06-2017 |
| LAYOUT DWG N/A | T-LAYOUT NO. N/A |

DRAWING NUMBER

03498D4001-01

SCALE - AS SHOWN @A3

COORDS

MGA ZONE 54 - DATUM GDA 94

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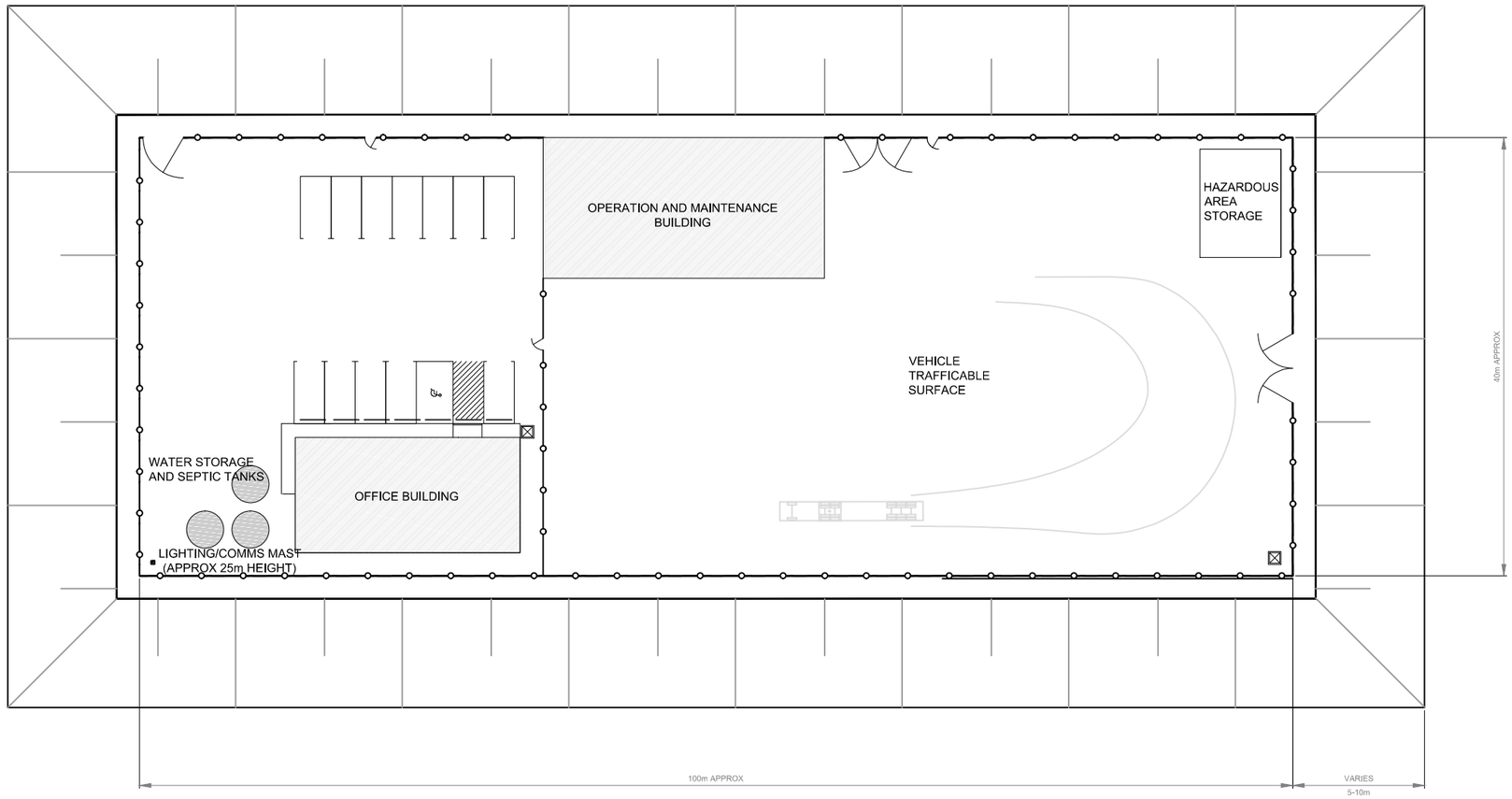
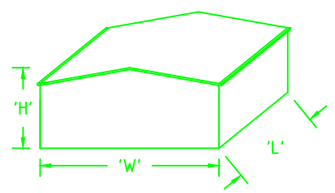



0 12.5 25 m

1:500




# TWIN CREEK WIND FARM

## FIGURE 12

## TYPICAL OPERATIONS AND MAINTENANCE AREA

NOTES

LANDSCAPING TO BE UNDERTAKEN IN ACCORDANCE WITH LANDSCAPE AND VISUAL IMPACT ASSESSMENT REPORT;

BUILDINGS TO COMPLY WITH AUSTRALIAN STANDARDS, BCA AND LOCAL COUNCIL REQUIREMENTS;

OFFICE AND MAINTENANCE BUILDING ROOF AREA TO BE UTILIZED FOR RAINWATER CATCHMENT;

BUILDING ARE NOT WITHIN A FLOOD ZONE BUT THE SURROUNDING GROUND DRAINAGE NETWORK SHALL BE DESIGNED TO WITHSTAND A 1:100 YEAR STORM FLOW AT THE SITE;

LAYOUTS AND DIMENSIONS ARE INDICATIVE ONLY TO SHOW GENERAL ARRANGEMENT CONCEPTS AND ALL DETAILS ARE SUBJECT TO FINAL DESIGN;

TO BE LOCATED IN A SECURED FENCED AREA;

BUILDING COLOUR MUST NOT UNREASONABLY CONTRAST WITH SURROUNDING LANDSCAPE.

MAX OPERATION AND MAINTENANCE BUILDING DIMENSIONS

W = 15 m
L = 25 m
H = 7.5 m

MAX OFFICE DIMENSIONS

W = 10 m
L = 20 m
H = 7.5 m



| | | | |
|---|---|---|---|
| INFRA DWG | N/A | APPD DATE | |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER

03498D3502-01

SCALE - 1:500 @A3

COORDS

N/A

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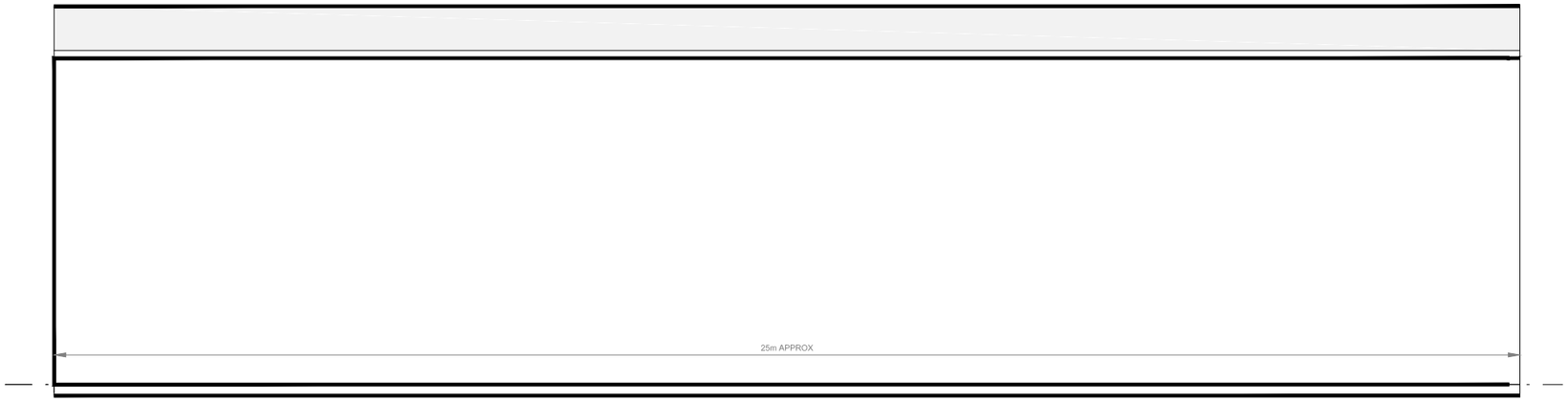
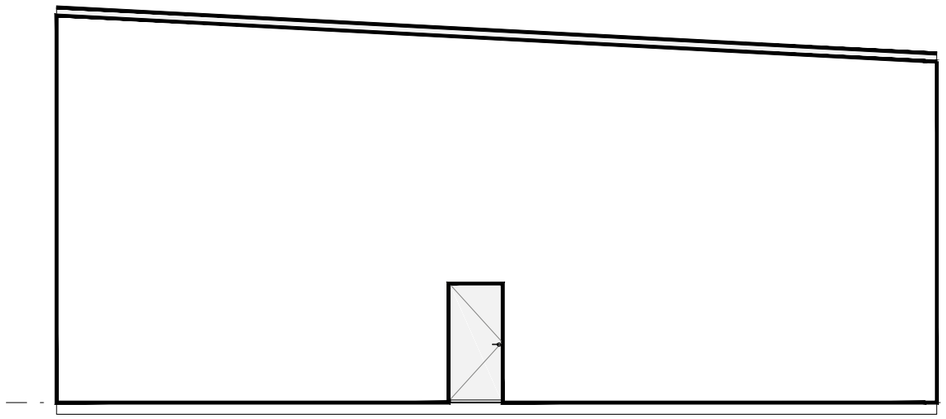
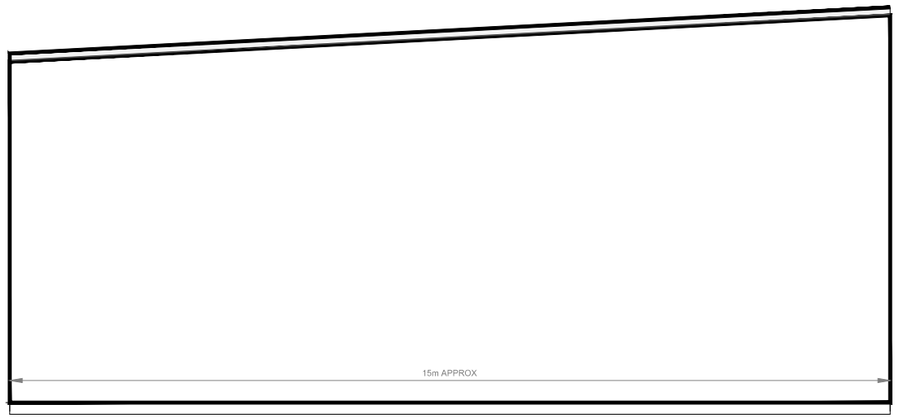


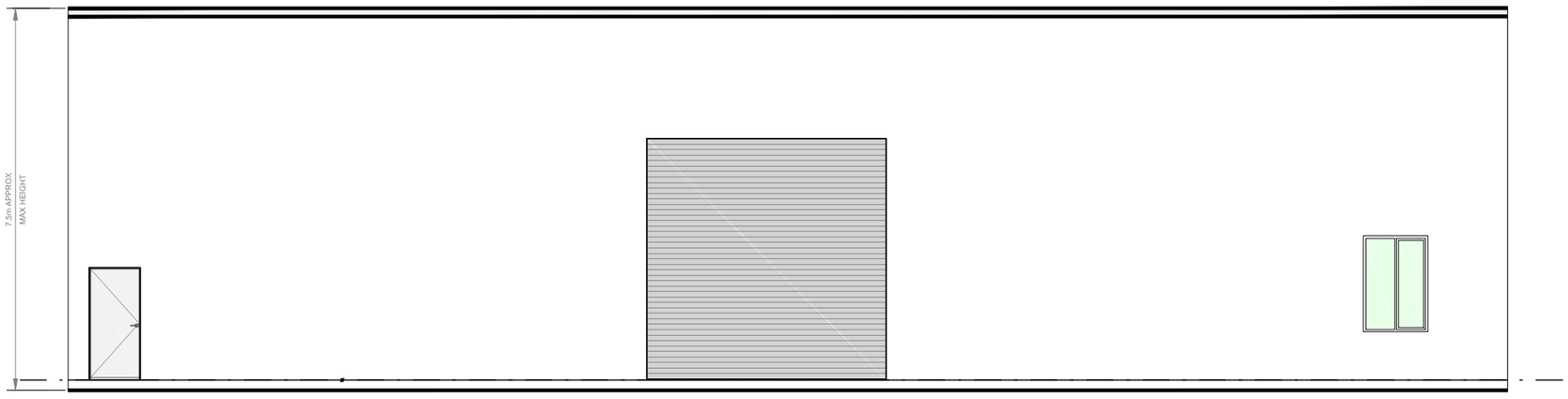

REAR ELEVATION



RIGHT ELEVATION



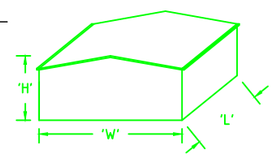

LEFT ELEVATION




FRONT ELEVATION

0 2.5 5 m

1:100




# TWIN CREEK WIND FARM

## FIGURE 12

## TYPICAL OPERATIONS AND MAINTENANCE AREA

## O&M BUILDING

NOTES

LANDSCAPING TO BE UNDERTAKEN IN ACCORDANCE WITH LANDSCAPE AND VISUAL IMPACT ASSESSMENT REPORT;

BUILDINGS TO COMPLY WITH AUSTRALIAN STANDARDS, BCA AND LOCAL COUNCIL REQUIREMENTS;

OFFICE AND MAINTENANCE BUILDING ROOF AREA TO BE UTILIZED FOR RAINWATER CATCHMENT;

BUILDING ARE NOT WITHIN A FLOOD ZONE BUT THE SURROUNDING GROUND DRAINAGE NETWORK SHALL BE DESIGNED TO WITHSTAND A 1:100 YEAR STORM FLOW AT THE SITE;

LAYOUTS AND DIMENSIONS ARE INDICATIVE ONLY TO SHOW GENERAL ARRANGEMENT CONCEPTS AND ALL DETAILS ARE SUBJECT TO FINAL DESIGN;

TO BE LOCATED IN A SECURED FENCED AREA;

BUILDING COLOUR MUST NOT UNREASONABLY CONTRAST WITH SURROUNDING LANDSCAPE.

MAX OPERATION AND MAINTENANCE BUILDING DIMENSIONS

W = 15 m
L = 25 m
H = 7.5 m



| | |
|---|---|
| INFRA DWG N/A | APPD DATE |
| LAYOUT DWG N/A | T-LAYOUT NO. N/A |

DRAWING NUMBER
03498D3502-01

SCALE - 1:500 @A3

COORDS
N/A

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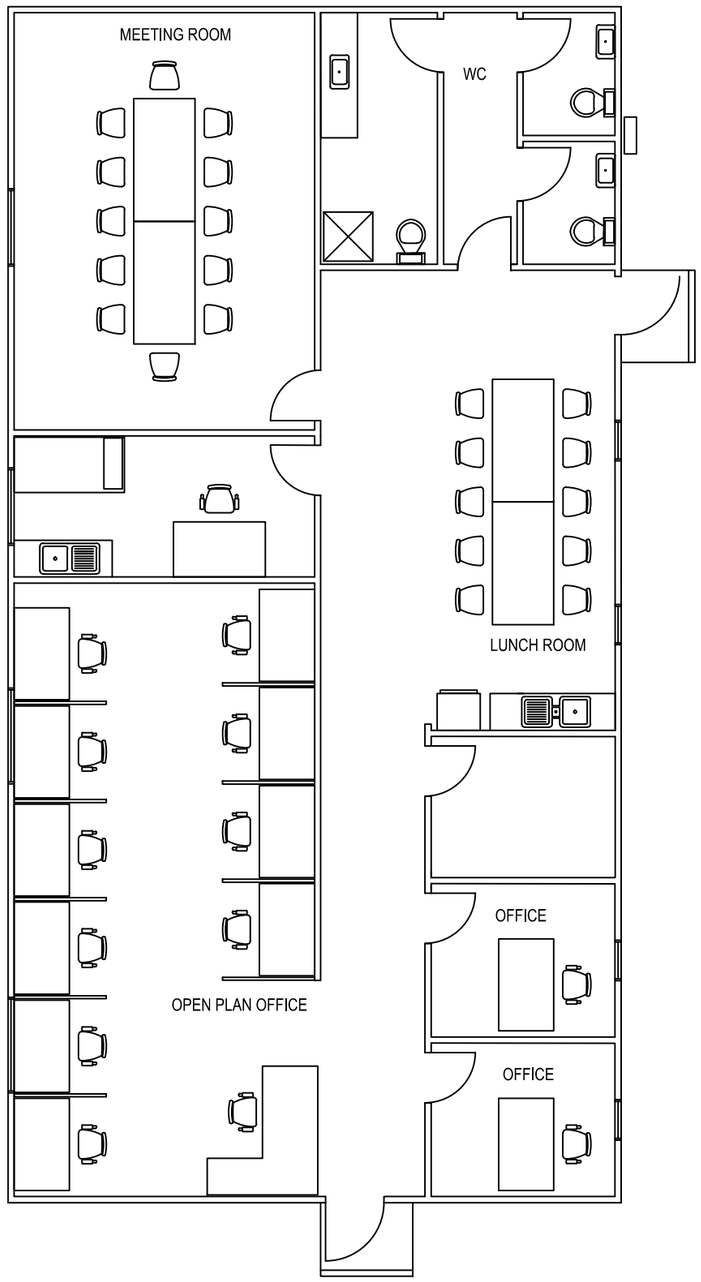
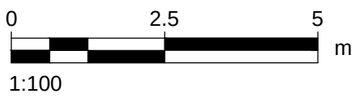
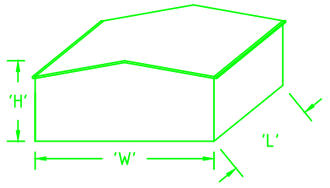
FLOOR PLAN
OFFICE




# TWIN CREEK WIND FARM

## FIGURE 12

## TYPICAL OPERATIONS AND MAINTENANCE AREA

## OFFICE

NOTES

LANDSCAPING TO BE UNDERTAKEN IN ACCORDANCE WITH LANDSCAPE AND VISUAL IMPACT ASSESSMENT REPORT;

BUILDINGS TO COMPLY WITH AUSTRALIAN STANDARDS, BCA AND LOCAL COUNCIL REQUIREMENTS;

OFFICE AND MAINTENANCE BUILDING ROOF AREA TO BE UTILIZED FOR RAINWATER CATCHMENT;

BUILDING ARE NOT WITHIN A FLOOD ZONE BUT THE SURROUNDING GROUND DRAINAGE NETWORK SHALL BE DESIGNED TO WITHSTAND A 1:100 YEAR STORM FLOW AT THE SITE;

LAYOUTS AND DIMENSIONS ARE INDICATIVE ONLY TO SHOW GENERAL ARRANGEMENT CONCEPTS AND ALL DETAILS ARE SUBJECT TO FINAL DESIGN;

TO BE LOCATED IN A SECURED FENCED AREA;

BUILDING COLOUR MUST NOT UNREASONABLY CONTRAST WITH SURROUNDING LANDSCAPE.

MAX OFFICE DIMENSIONS
W = 10 m
L = 20 m
H = 7.5 m



| | | | |
|---|---|---|---|
| INFRA DWG | N/A | APPD DATE | |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER
03498D3502-01

SCALE - 1:500 @A3

COORDS
N/A

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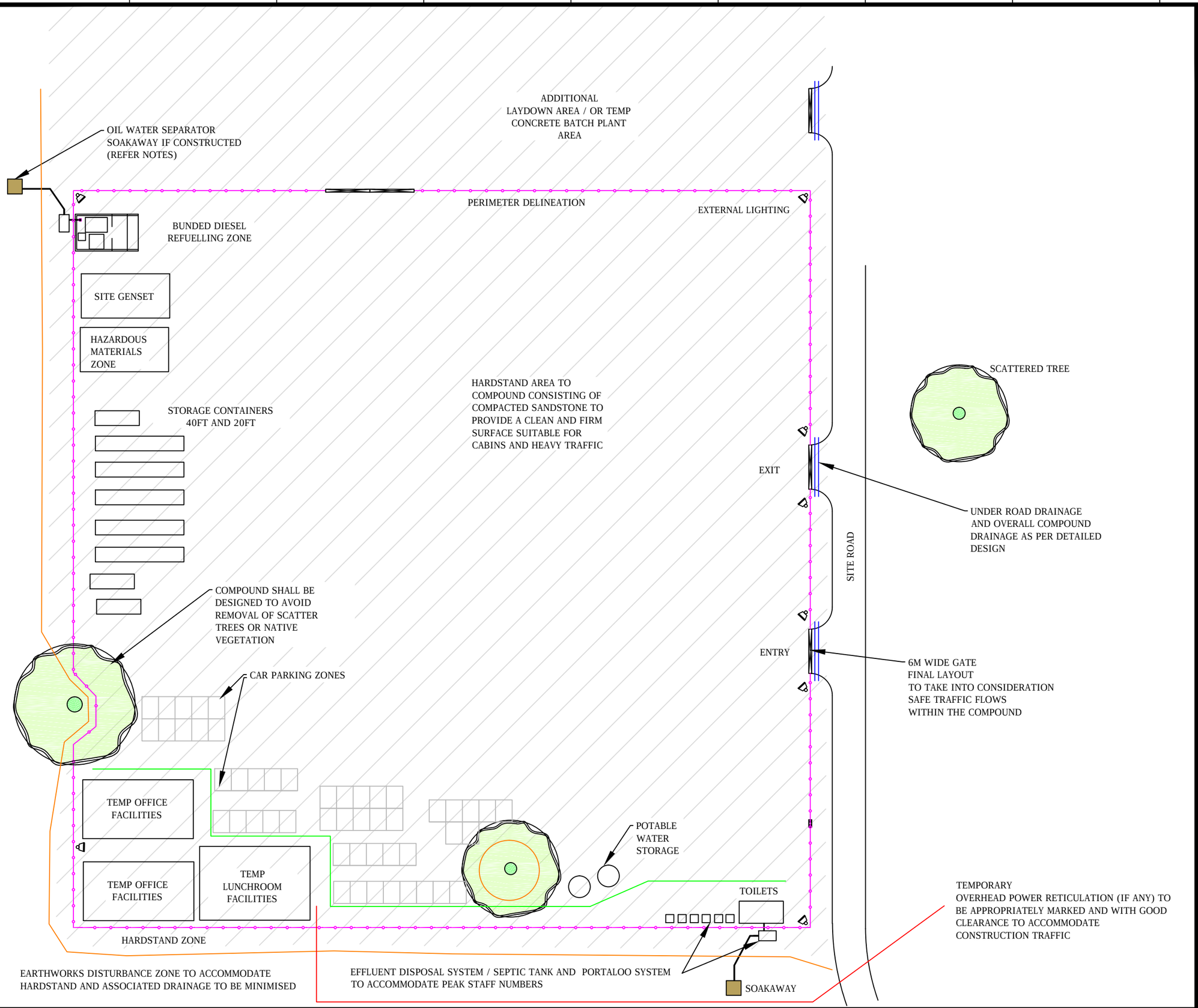


# TWIN CREEK WIND FARM

## FIGURE 13

## TYPICAL TEMPORARY CONSTRUCTION COMPOUND

LEGEND

- OPTIONAL SECURITY FENCE
- HARDSTAND / SANDSTONE GRAVEL AREA
- POSSIBLE SOAKAWAY
- TEMP OVERHEAD POWER LINE

NOTES

COMPOUND EQUIPMENT AND FACILITIES ARE INDICATIVE, BUT SHALL BE CONSTRUCTED ACCORDING TO THE PRINCIPLES NOTED ON THIS PLAN AND AS PER THE APPROVED MANAGEMENT PLANS, INCLUDING:

1. SEDIMENT AND EROSION MANAGEMENT PLAN
2. HAZARDOUS WASTE MANAGEMENT PLAN
3. ENVIRONMENTAL MANAGEMENT PLAN

REFUELLING ZONE FOR STAFF VEHICLES SHALL BE BUND PROTECTED AND RUN OFF AREA SHALL BE TREATED VIA SEPARATOR AND / OR BY CERTIFIED TANKER REMOVAL AS PER MANAGEMENT PLANS, STATUTORY REQUIREMENTS AND OTHER BEST PRACTICE GUIDELINES.

FOR INDICATIVE LOCATION OF SATELLITE CONSTRUCTION COMPOUNDS REFER TO FIGURE 8;

COMPOUNDS MAY BE LOCATED AT: SECTION 278 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS CERTIFICATE OF TITLE - VOLUME 5618 FOLIO 693;

SECTION 126 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH CERTIFICATE OF TITLE - VOLUME 5293 FOLIO 930;

SECTIONS 219 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH CERTIFICATE OF TITLE - VOLUME 5293 FOLIO 927;

SECTIONS 233 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH CERTIFICATE OF TITLE - VOLUME 5293 FOLIO 931.

| | | | |
|---|---|---|---|
| INFRA DWG | N/A | APPD DATE | 27-06-2017 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER

03498D3503-01

SCALE - N.T.S @A3

COORDS N/A

PLANNING PERMIT APPLICATION



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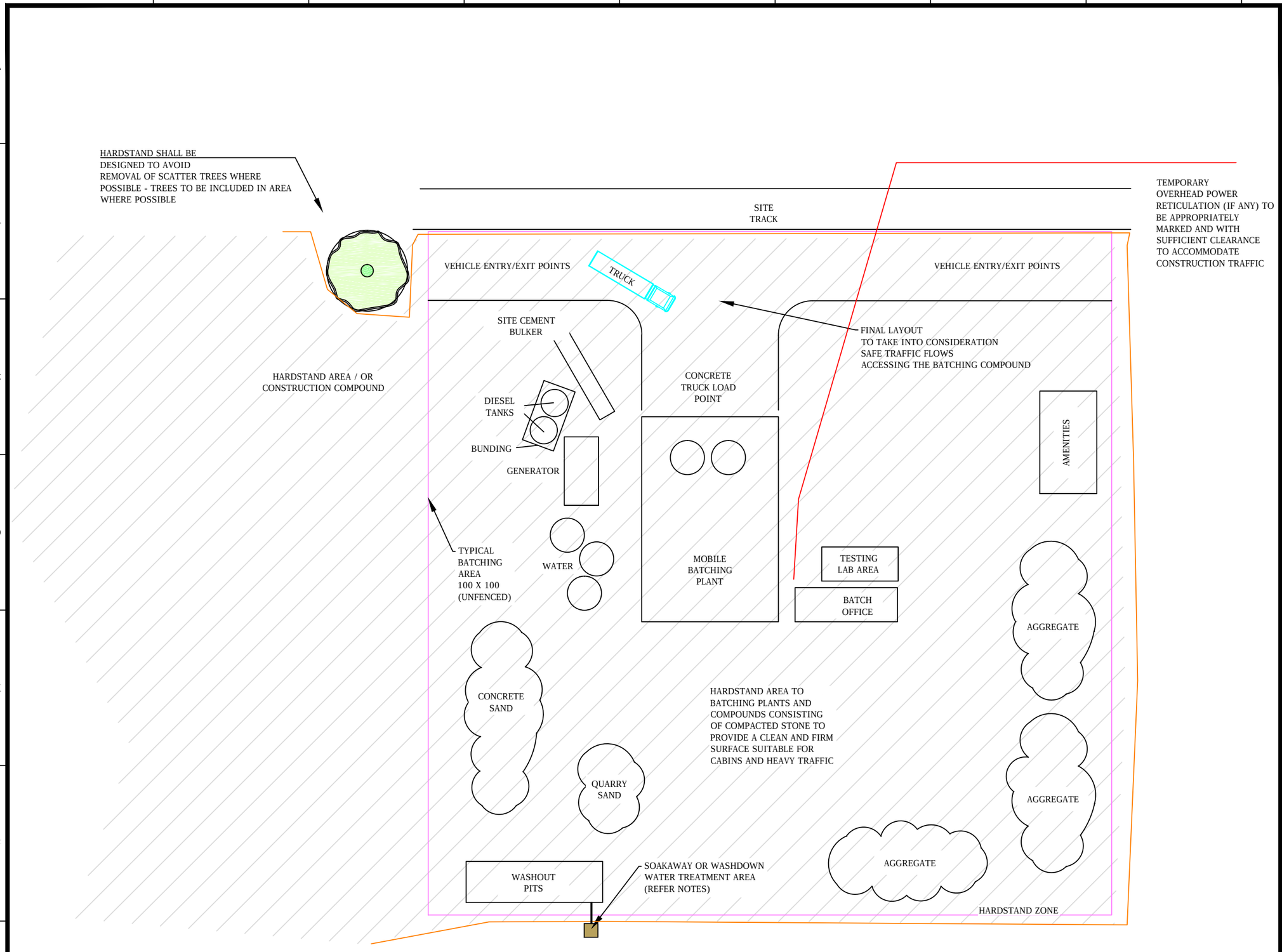


# TWIN CREEK WIND FARM

## FIGURE 14

## TYPICAL CONCRETE BATCHING PLANT

LEGEND

- TYPICAL BATCHING AREA
- HARDSTAND / GRAVEL AREA
- TEMP OVERHEAD POWER LINE

NOTES

COMPOUND EQUIPMENT AND FACILITIES ARE INDICATIVE, BUT SHALL BE CONSTRUCTED ACCORDING TO THE PRINCIPALS NOTED ON THIS PLAN AND AS PER THE APPROVED MANAGEMENT PLANS, INCLUDING:

1. SEDIMENT AND EROSION MANAGEMENT PLAN
2. CONSTRUCTION AND ENVIRONMENTAL MANAGEMENT PLAN
3. ENVIRONMENTAL MANAGEMENT PLAN

CONCRETE TRUCK WASHOUT ZONE RUN OFF SHALL BE TREATED VIA RETENTION SETTLEMENT POND AS PER MANAGEMENT PLANS, STATUTORY REQUIREMENTS OR OTHER BEST PRACTICE GUIDELINES.

FOR LOCATION OF BATCHING PLANT COMPOUNDS REFER TO FIGURE 8;

BATCHING PLANT MAY BE LOCATED AT SECTION 278 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS CERTIFICATE OF TITLE - VOLUME 5618 FOLIO 693.

| | | | |
|---|---|---|---|
| INFRA DWG | N/A | APPD DATE | 27-06-2017 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER

03498D3504-01

SCALE - N.T.S @A3

COORDS N/A

PLANNING PERMIT APPLICATION



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EMAIL: info-australia@res-ltd.com

PHOTO OF A TYPICAL ONSITE COLLECTOR STATION

PHOTO OF A TYPICAL ONSITE SWITCHING CONTROL BUILDING

# TWIN CREEK WIND FARM

## FIGURE 15

## TYPICAL ON SITE INTERMEDIARY COLLECTOR STATION

NOTES

- SUBJECT TO DETAILED DESIGN;

- FACILITY LOCATED IN A SECURED COMPOUND WITH FENCING TO APPROX. 2.5m HEIGHT.

| | |
|---|---|
| INFRA DWG N/A | APPD DATE 27-06-2017 |
| LAYOUT DWG N/A | T-LAYOUT NO. N/A |

DRAWING NUMBER

03498D4005-01

SCALE - N.T.S @A3

COORDS

N/A

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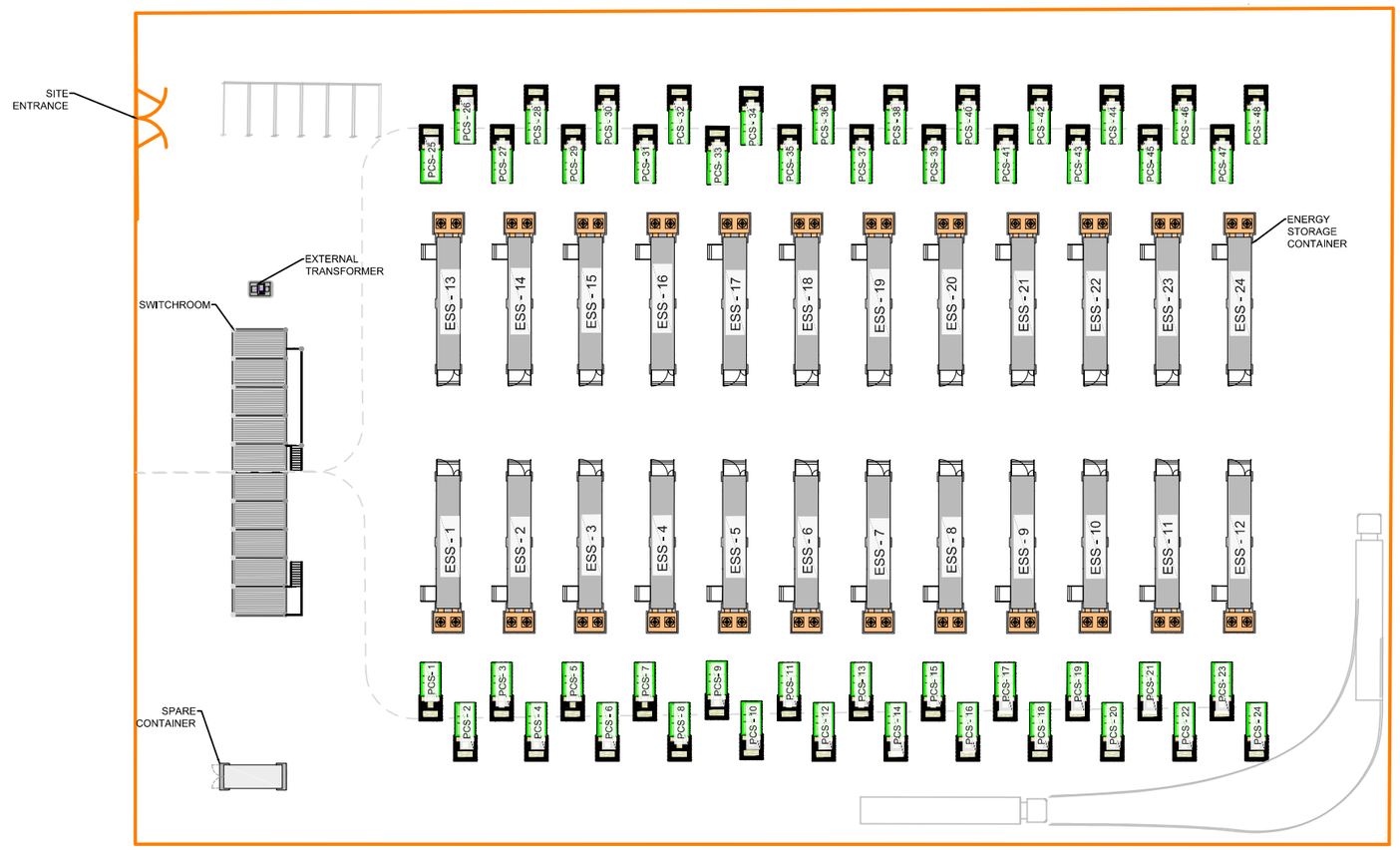
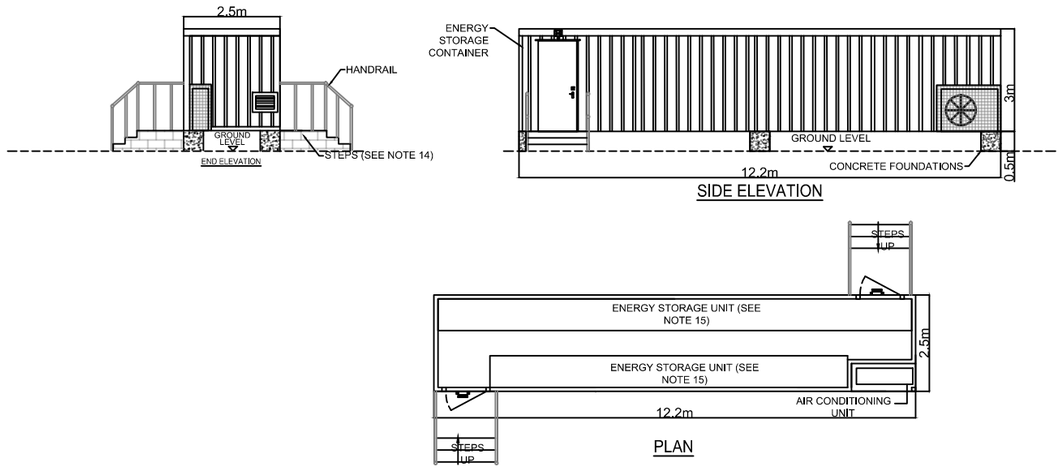



TYPICAL ENERGY STORAGE CONTAINER

TYPICAL ENERGY STORAGE CONTAINER




# TWIN CREEK WIND FARM

## FIGURE 16

## PROPOSED ENERGY STORAGE FACILITY

**LEGEND**

- POWER CONVERSION SYSTEM - PCS
- TRANSFORMER
- AUXILIARY TRANSFORMER
- STORAGE AREA
- DOOR
- PASSIVE INFRARED LIGHTING (PLAN)
- PASSIVE INFRARED LIGHTING (ELEVATION)

NOTES

1. STORAGE SITE BOUNDARY APPROXIMATE 1.1 HAs;
2. SUBJECT TO FINAL DESIGN AND LICENCING REQUIREMENTS
3. SITE TO BE ENCLOSED AROUND PERIMETER BY 2m SECURITY FENCING;
4. CAR PARK FOR UP TO SIX VEHICLES TO BE PROVIDED;
5. ALL DIMENSIONS ARE APPROXIMATE;
10. ALL CABLING TO BE UNDERGROUND OR ON CABLING TRAY;
11. FOUNDATIONS ARE INDICATIVE AND SUBJECT TO ACTUAL ELECTRICAL EQUIPMENT DETAILS;
12. DOOR AND STEPS POSITIONS ARE INDICATIVE AND SUBJECT TO DETAILED DESIGN;
13. APPROXIMATE FINISHED FLOOR LEVEL 0.5m ABOVE EXISTING GROUND LEVEL;
14. STEPS TO BE EITHER CONSTRUCTED ON SITE FROM MASS CONCRETE OR MASONRY BLOCKS OR PREFABRICATED OFF SITE AND INSTALLED ON SITE FOLLOWING POSITIONING OF THE STORAGE UNIT;
15. THE LOCATION AND SIZE OF ENERGY STORAGE UNIT WITHIN THE CONTAINER TO BE DETERMINED AT DETAILED DESIGN STAGE;
16. EXTERNAL COLOUR OF ENERGY STORAGE UNIT MUST NOT UNREASONABLY CONTRAST WITH SURROUNDING LANDSCAPE;
17. FIRE SUPPRESSION SYSTEM INTERNAL TO CONTAINER;
18. ENERGY STORAGE FACILITY LOCATED WITHIN SECTION 278 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS CERTIFICATE OF TITLE - VOLUME 5618 FOLIO 693;
19. CONTAINER-INVERTER CONFIGURATION WILL BE DEFINED DURING THE DETAILED DESIGN. ENERGY STORAGE CAPACITY SUBJECT TO LICENCING REQUIREMENTS.

| | |
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| INFRA DWG 03498D1001-05 | APPD DATE 28-06-2017 |
| LAYOUT DWG N/A | T-LAYOUT NO. N/A |

DRAWING NUMBER

03498D3401-01

SCALE - N.T.S. A3

COORDS

N/A

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NOTES:

- SUBJECT TO FINAL DESIGN;
- RES INTERNAL X-INFRASTRUCTURE05_APPROVED_20170324 SHOWN IN THIS DRAWING;
-RES INTERNAL X-GRIDROUTE07_APPROVED_20170613 SHOWN IN THIS DRAWING;
-RES INTERNAL -X-ELECTRICAL_DESIGN_20170403 SHOWN IN THIS DRAWING;
- SEE FIGURE 18 FOR TYPICAL TRENCH CROSS SECTION.

# TWIN CREEK WIND FARM

## FIGURE 17

## PROPOSED CABLE RETICULATION LAYOUT



**LEGEND**

- TURBINE LAYOUT (PAUStwc025)
- CABLING - COLLECTOR GROUP 1
- CABLING - COLLECTOR GROUP 2
- CABLING - COLLECTOR GROUP 3
- CABLING - COLLECTOR GROUP 4
- CABLING - COLLECTOR GROUP 5
- CABLING - COLLECTOR GROUP 6
- CABLING - COLLECTOR GROUP 7
- CABLING - ENERGY STORAGE
- PROPOSED ACCESS ROADS
- HARDSTAND
- PROPOSED AREA FOR BATTERY STORAGE
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED CONSTRUCTION COMPOUND AND MATERIAL LAYDOWN AREA
- PROPOSED SUBSTATION
- PROPOSED OPERATION AND MAINTENANCE AREA
- WIND FARM INFRASTRUCTURE ZONE
- PRINCIPAL SITE ENTRANCE
- PROPOSED PERMANENT MAST LOCATION
- OVERHEAD GRID ROUTE
- GRID ROUTE EASEMENT 50m
- GRID ROUTE INVESTIGATION CORRIDOR
- DEVELOPMENT AREA (20170613)
- WIND FARM SITE BOUNDARY (20170616)

| | | | |
|---|---|---|---|
| INFRAS DWG | 03498D1001-05 | APPD DATE | 28-06-2017 |
| LAYOUT DWG | 03498D0001-05 | T-LAYOUT NO. | PAUStwc025 |

DRAWING NUMBER

03498D4301-01

SCALE - 1:25,000 @ A3

COORDS

GDA 1994 MGA Zone 54

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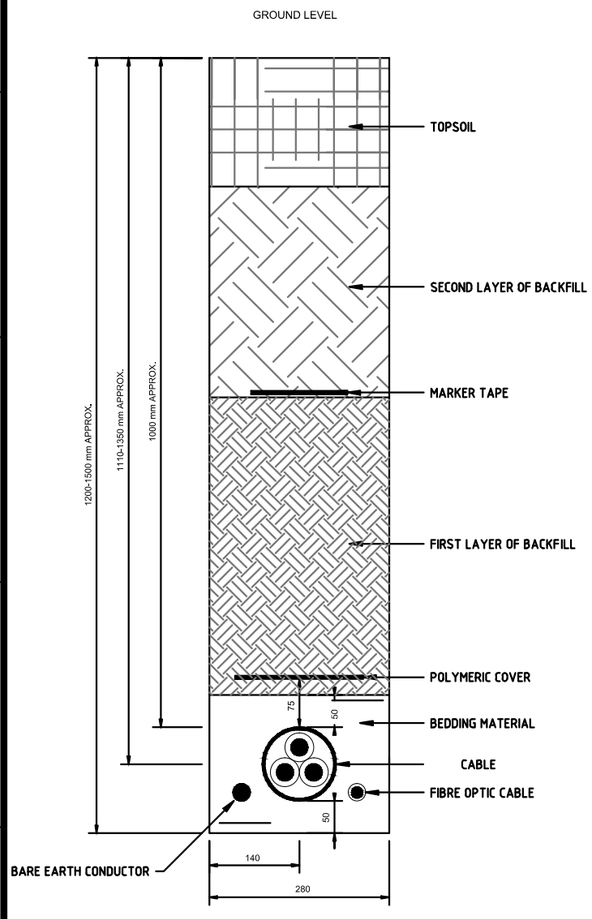
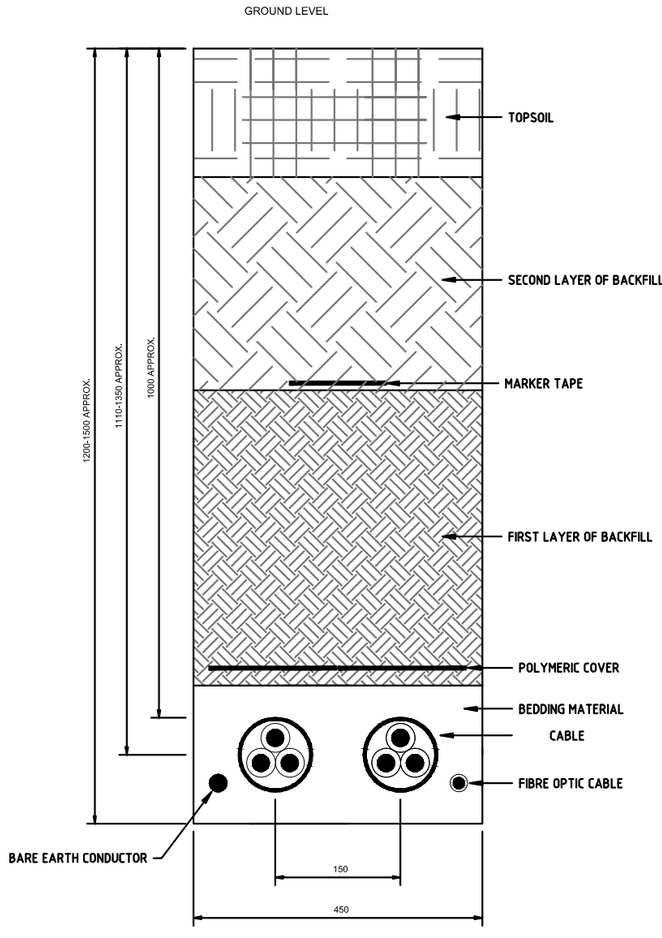
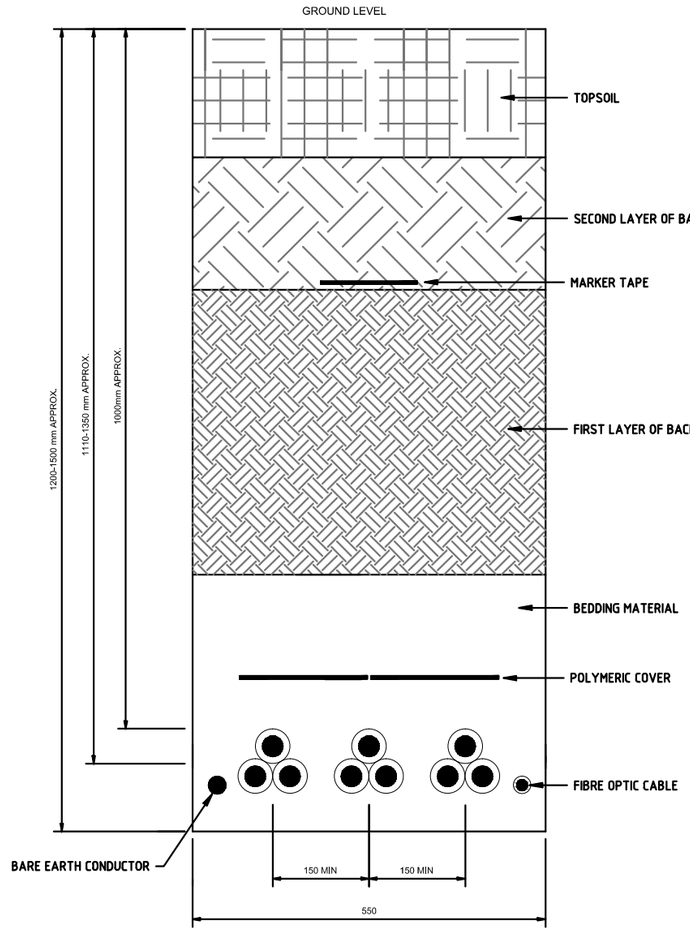
0 0.3 0.6 1.2 1.8 2.4 3 km




# TWIN CREEK WIND FARM

## FIGURE 18

## ONSITE CABLE TRENCH TYPICAL SECTIONS

NOTES:

1. NUMBER OF CABLES PER TRENCH AND ASSOCIATED TRENCH DEPTHS AND WIDTHS WILL BE SUBJECT TO DETAILED DESIGN;
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.

| | |
|---|---|
| INFRA DWG N/A | APPD DATE 28-06-2017 |
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COORDS
N/A

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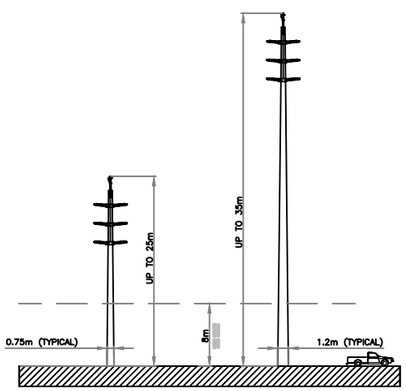
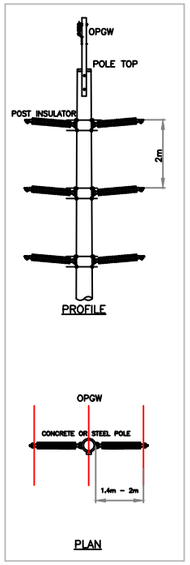


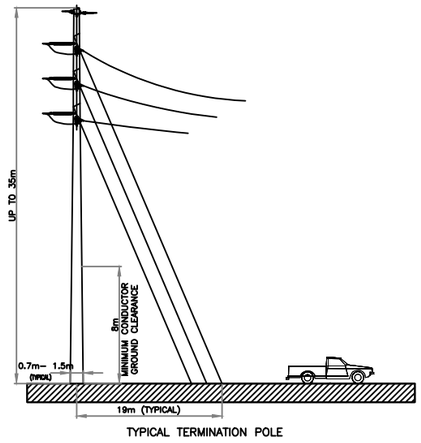

TYPICAL 20m INTERMEDIATE POLE (NOTE 1)

TYPICAL 35m INTERMEDIATE POLE (NOTE 2)

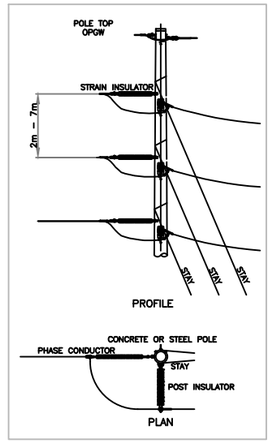



PLAN AND PROFILE VIEWS

TYPICAL PHOTO – DOUBLE CIRCUIT POLE



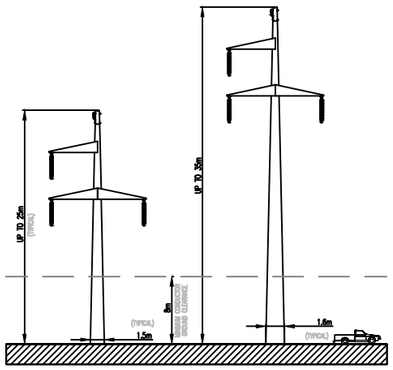

TYPICAL TERMINATION POLE

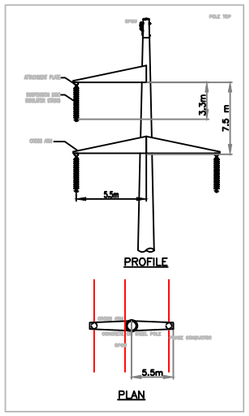



POLE TOP PLAN & PROFILE VIEWS

SITE PHOTO – STEEL POLE

2 TYPICAL TERMINATION POLE

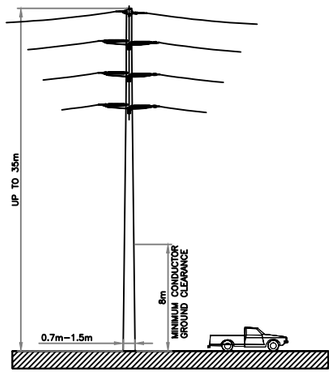


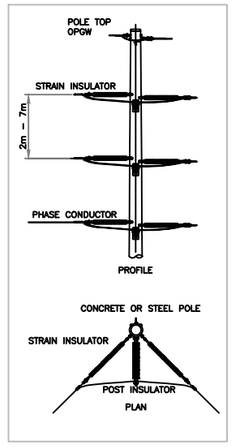

PLAN AND PROFILE VIEWS

TYPICAL PHOTO – SINGLE CIRCUIT POLE

1 INTERMEDIATE POLE




TYPICAL STRAIN POLE




POLE TOP PLAN & PROFILE VIEWS

3 TYPICAL STRAIN POLE

# TWIN CREEK WIND FARM

## FIGURE 19

## TYPICAL OVERHEAD LINE POLES

LEGEND

GROUND LEVEL

NOTES:

1. POLE HEIGHT BASED UPON TYPICAL SPAN LENGTH OF 200m UP TO 25m;
2. POLE HEIGHT BASED UPON TYPICAL SPAN LENGTH OF 400m UP TO 35m;
3. SPAN LENGTH, OTHER MEASUREMENTS, ANGLE AND INSULATOR LOCATION, POLE WIDTH AND HEIGHT INCLUDING POLE MATERIALS USED ARE INDICATIVE ONLY AND MAY VARY ACCORDING TO DETAILED DESIGN;
4. OPTICAL FIBRE GROUNDWIRE (OPGW) IS SHOWN. OPGW IS AN EARTHING WIRE COMBINED WITH COMMUNICATION CABLES;
5. NUMBER OF POLES, CIRCUITS AND INSULATORS ARE SUBJECT TO DETAILED DESIGN.

| | |
|---|---|
| INFRA DWG N/A | APPD DATE 28-06-2017 |
| LAYOUT DWG N/A | T-LAYOUT NO. N/A |

DRAWING NUMBER

03498D4105-01

SCALE - N.T.S. @A3

COORDS N/A

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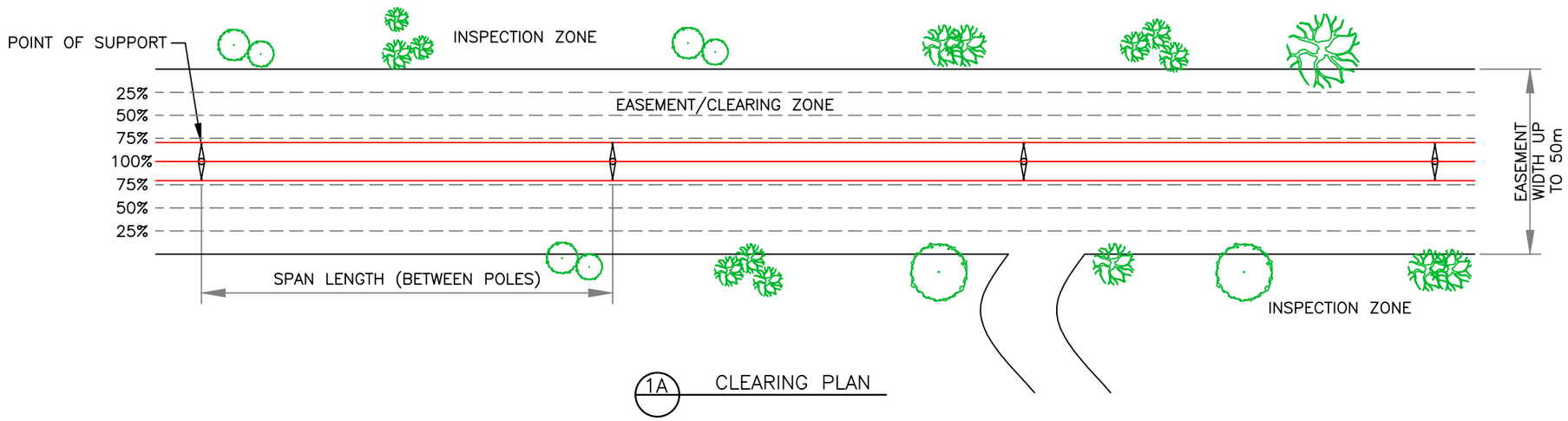
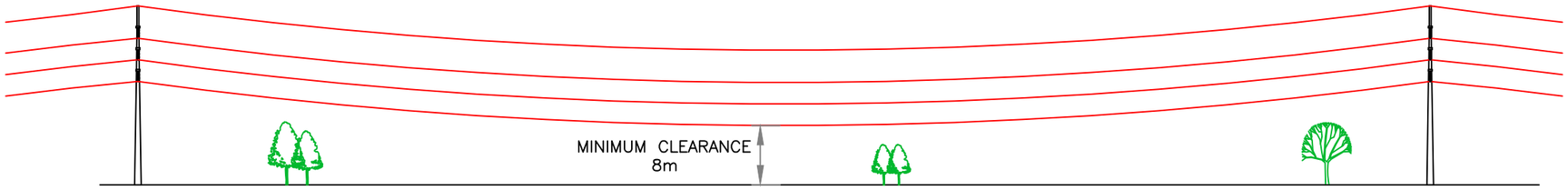
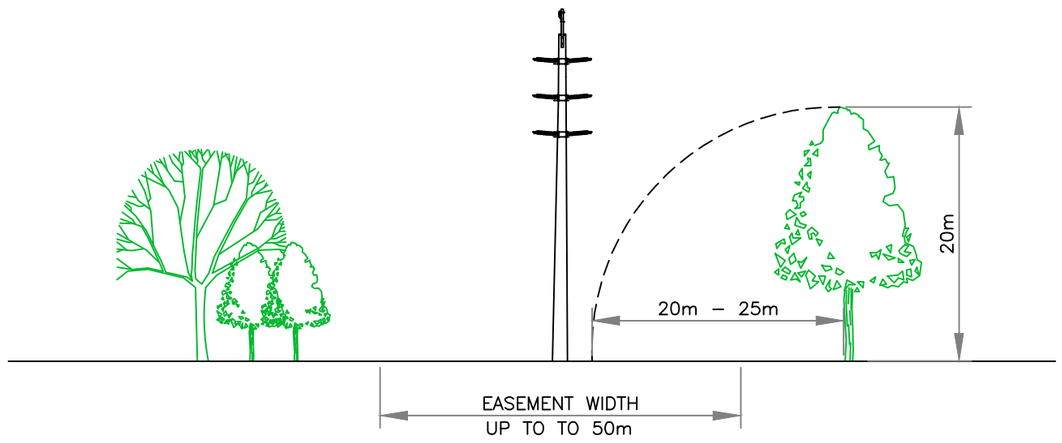



1A CLEARING PLAN




1B PROFILE




2 TALL TREES OUTSIDE THE EASEMENT – SEE NOTE 4

3 TYPICAL PHOTO – EASEMENT CLEARANCE

# TWIN CREEK WIND FARM

## FIGURE 20

## TYPICAL OVERHEAD LINE EASEMENT AND VEGETATION CLEARANCE

NOTES

1. CLEARING OF TREES AND OTHER VEGETATION FROM TRANSMISSION LINE EASEMENTS IS REQUIRED TO PROTECT THE SECURITY OF THE LINES AND PREVENT BUSHFIRE HAZARDS.
2. WITHIN THE INSPECTION ZONE, ON EACH SIDE OF THE CLEARING ZONE, REMOVAL IS REQUIRED OF ALL PLANTS THAT ARE LIABLE TO BREAK OR BE BLOWN ONTO THE LINE. TALL TREES ARE TO BE NO CLOSER TO POWERLINES THAN A DISTANCE EQUAL TO THEIR MATURE HEIGHTS [REF 2] ;
3. ALL DETAILS SUBJECT TO FINAL DESIGN;
4. VEGETATION AROUND TRANSMISSION LINES CAN CAUSE POWER OUTAGES, DAMAGE TO THE LINES, OR THE RISK OF FIRE START.

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| INFRA DWG | N/A | APPD DATE | 28-06-2017 |
| LAYOUT DWG | N/A | T-LAYOUT NO. | N/A |

DRAWING NUMBER
03498D4104-01

SCALE - N.T.S. @A3

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N/A

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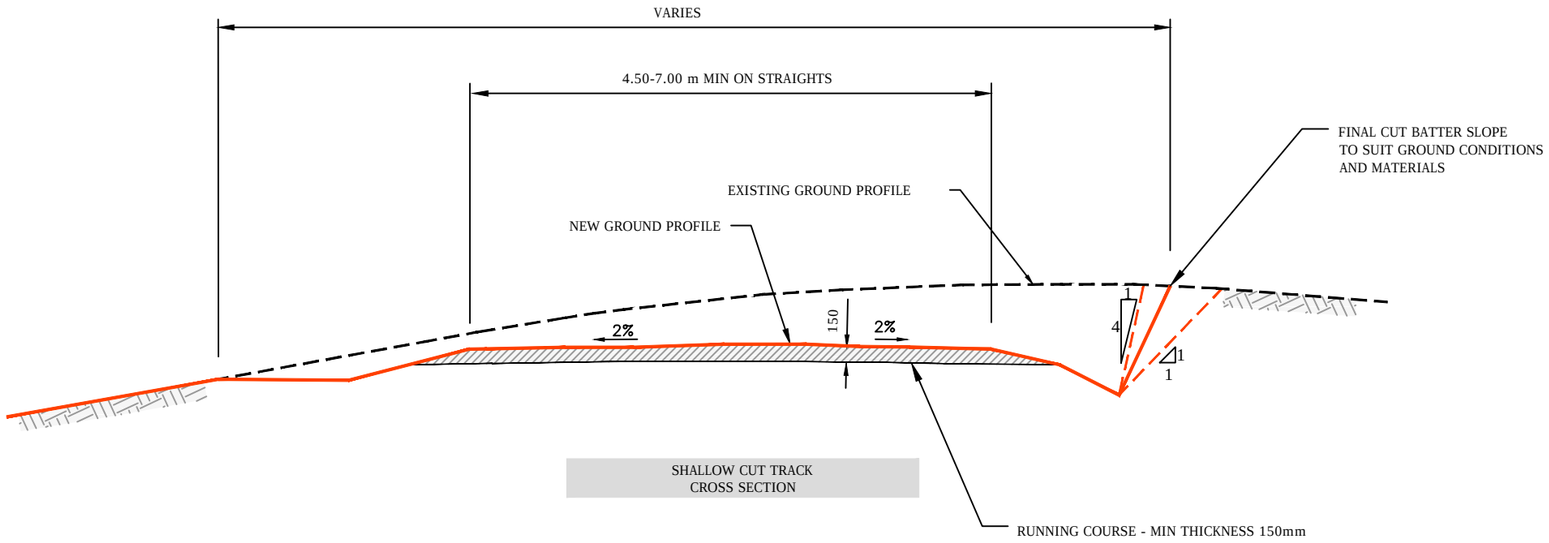
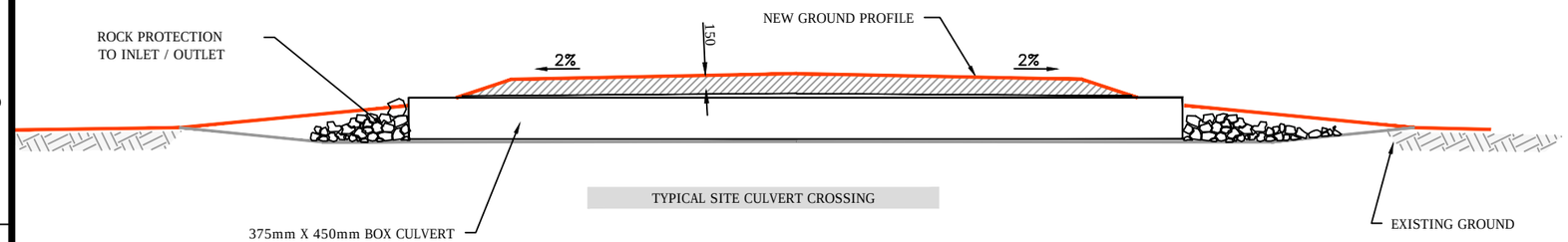
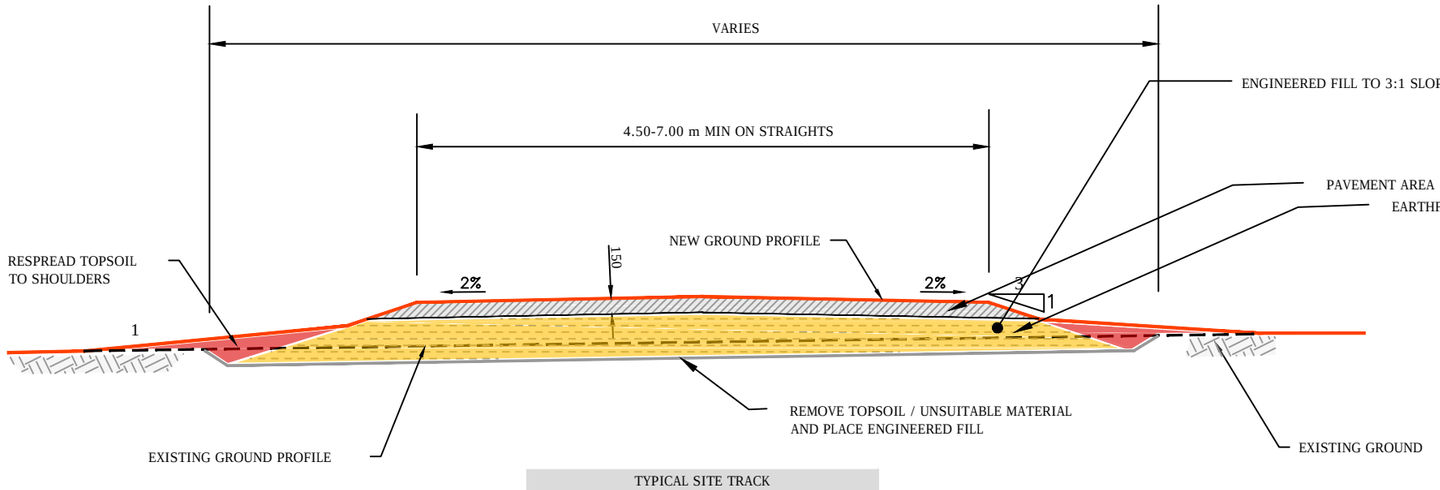



SHALLOW CUT TRACK
CROSS SECTION




TYPICAL SITE CULVERT CROSSING




TYPICAL SITE TRACK
CROSS SECTION

# TWIN CREEK WIND FARM

## FIGURE 21

## PRELIMINARY TRACK DESIGN

LEGEND

- EXISTING GROUND PROFILE
- FINISHED GROUND PROFILE
- FINSHED GROUND ALTERNATIVES
- ENGINEERED FILL
- CRUSHED STONE PAVEMENT
- EXISTING GROUND
- RESPREAD TOPSOIL

NOTES

GENERAL SITE ROAD DETAILS SHOWN, WHERE POSSIBLE AREAS OF FILL TO BE AVOIDED, ADDITIONAL WIDENING OF TRACK REQUIRED ON CORNERS AND PASSING BAYS TO ACCOMMODATE TRAFFIC;

ADDITIONAL TEMPORARY TRACK WIDENING MAY BE REQUIRED FOR CRANE MOVEMENTS. WIDENED ZONES TO BE REMOVED AT THE DISCRETION OF THE REGULATING AUTHORITY;

ALL MEASUREMENTS ARE INDICATIVE BUT FINAL DESIGN WILL BE IN ACCORDANCE WITH WHAT IS SHOWN.

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| INFRA DWG N/A | APPD DATE 28-06-2017 |
| LAYOUT DWG N/A | T-LAYOUT NO. N/A |

DRAWING NUMBER

03498D3802-01

SCALE - N.T.S. @A3

COORDS

N/A

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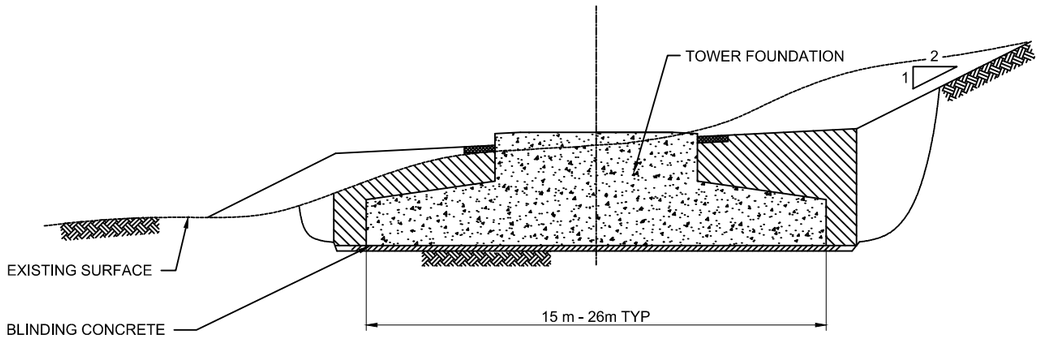
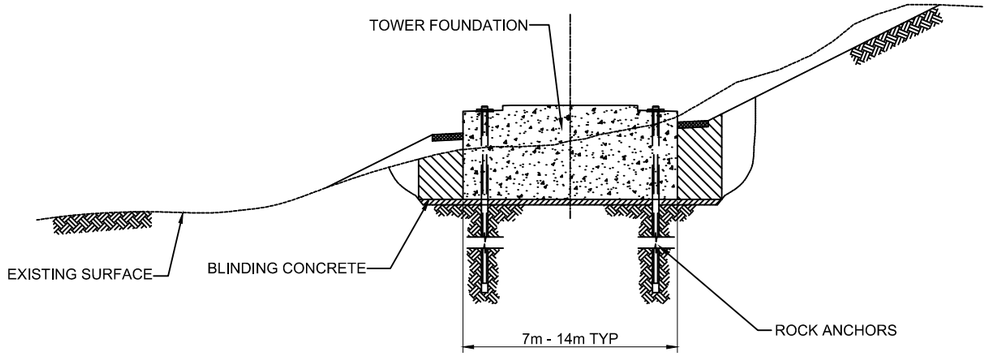



TYPICAL GRAVITY FOUNDATION
N.T.S




TYPICAL ROCK ANCHORED FOUNDATION
N.T.S

# TWIN CREEK WIND FARM

## FIGURE 22

## TYPICAL TURBINE FOUNDATION

NOTES:

DIMENSIONS AND DETAILS ARE INDICATIVE ONLY AND MAY VARY DUE TO SPECIFIC TURBINE OR GROUND CONDITIONS;

PRELIMINARY DESIGN ONLY. SUBJECT TO CHANGE FOLLOWING GEOTECHNICAL INVESTIGATION AND DETAILED DESIGN;

INDICATIVE DIMENSIONS ARE IN METRES;

BACKFILL MAY BE RAISED TO PROVIDE ADDITIONAL SUPPORT TO FOUNDATION DEPENDING ON FINAL DESIGN REQUIREMENT.

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| INFRA DWG N/A | APPD DATE 28-06-2017 |
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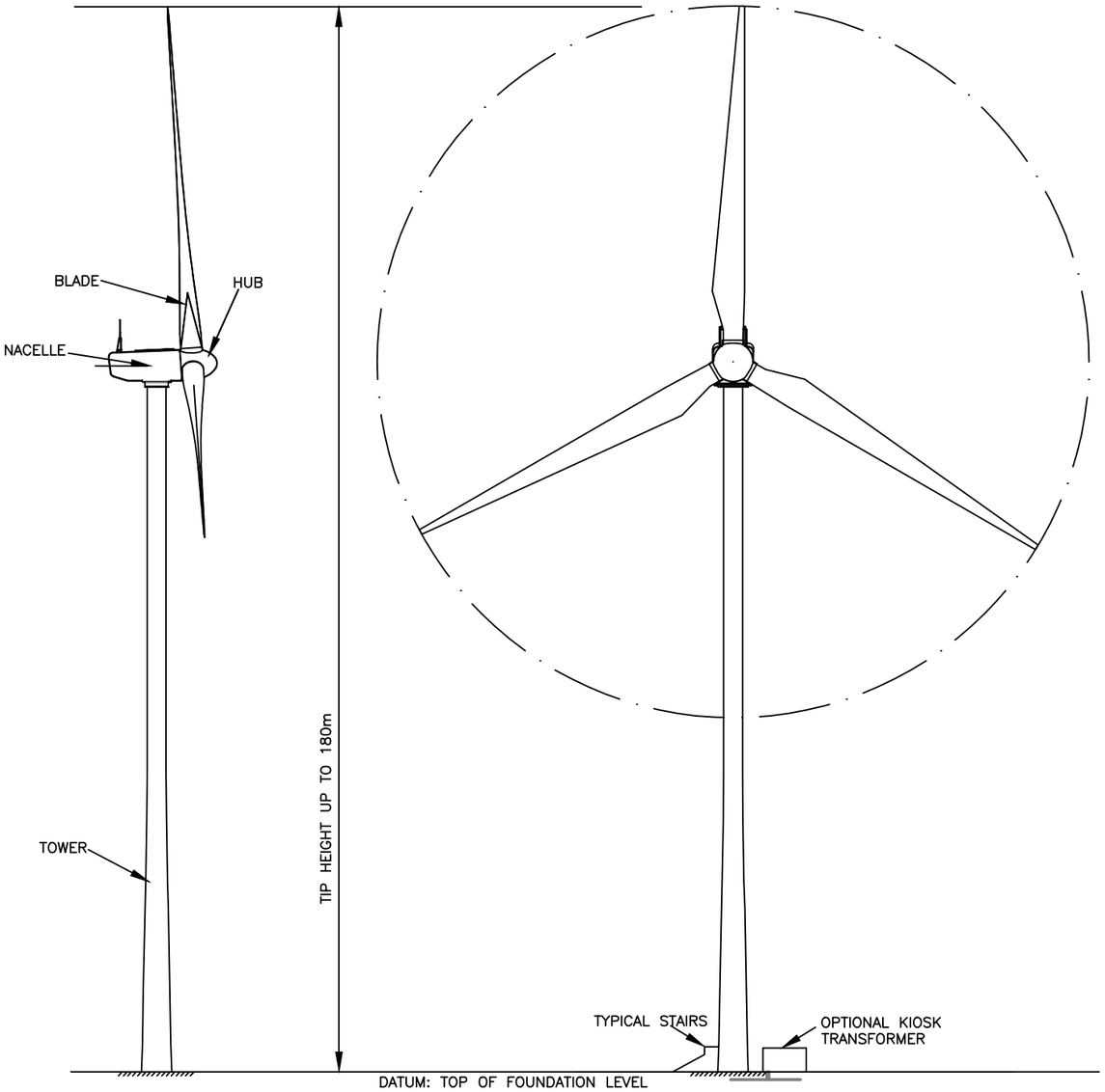


SIDE VIEW

FRONT VIEW

PHOTOGRAPH OF TYPICAL TURBINE

# TWIN CREEK WIND FARM

## FIGURE 23

## TYPICAL FRONT AND SIDE ELEVATION OF A WIND TURBINE

NOTES

1. TIP HEIGHT WILL NOT EXCEED 180m FROM TOP OF FOUNDATION LEVEL;
2. TOWERS WILL BE TUBULAR ;
3. NUMBER OF ROTOR BLADES IS THREE ;
4. TOWERS, NACELLES AND ROTOR BLADES TO BE OF A NON REFLECTIVE FINISH AND COLOUR;
5. EXTERNAL STAIRS SUBJECT TO FINAL DESIGN.

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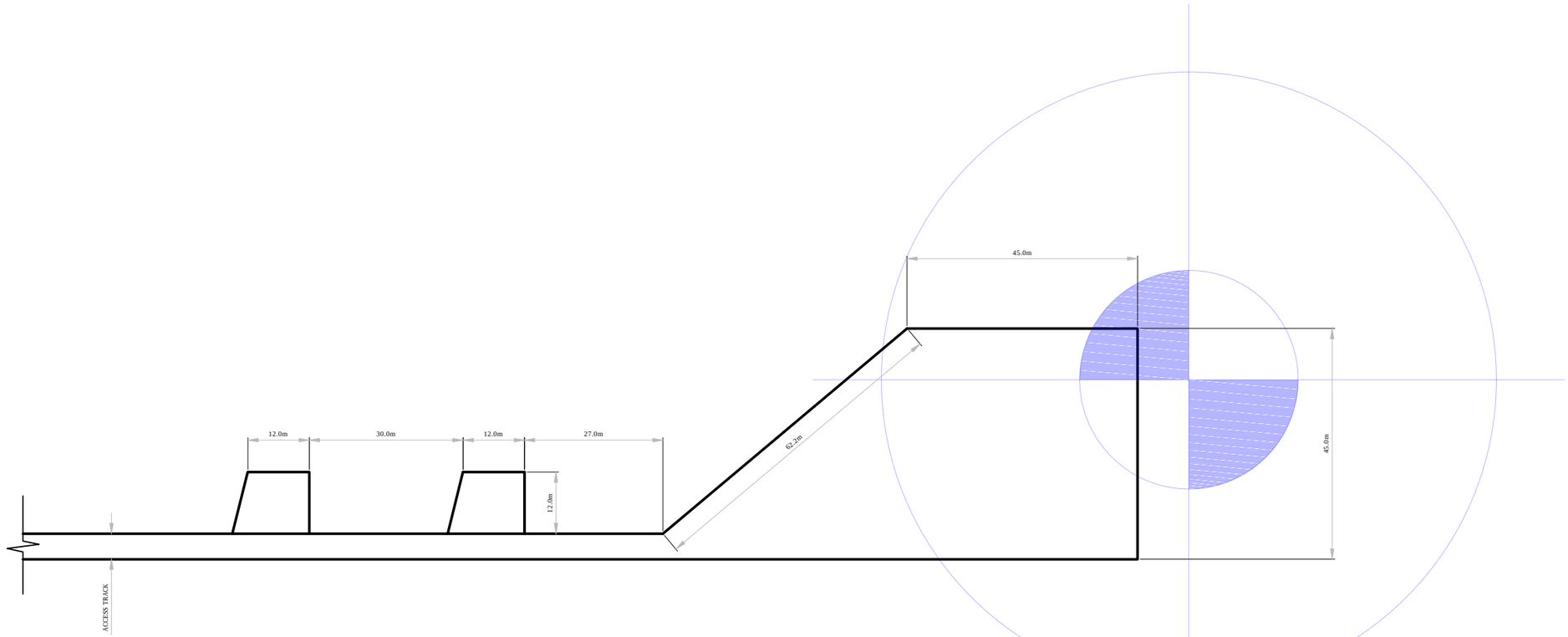


# TWIN CREEK WIND FARM

## FIGURE 24

## TYPICAL CRANE HARDSTAND

NOTES

SUBJECT TO FINAL DESIGN;

EXAMPLE CRANE ARRANGEMENT INDICATIVE - FINAL SIZE AND SHAPE OF PAD TO SUIT PROJECT SPECIFIC CRANE, TOTAL AREA OF HARDSTAND AND EARTHWORKS WORKING ZONE TO BE MINIMISED TO REDUCE IMPACTS, ANY ADDITIONAL HARDSTAND AREA BEYOND PERMITTED 3,400m2 MAY REQUIRE REMOVAL POST CONSTRUCTION;

ALL HARDSTANDS TO BE CONSTRUCTED IN CRUSHED ROCK / SANDSTONE;

ALL HARD STANDING AREAS TO BE BUILT UP FROM HARD UNDERLYING MATERIAL TO BE SUITABLE TO SUPPORT CRANE OUTRIGGERS.

| | | | |
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DRAWING NUMBER

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COORDS

N/A

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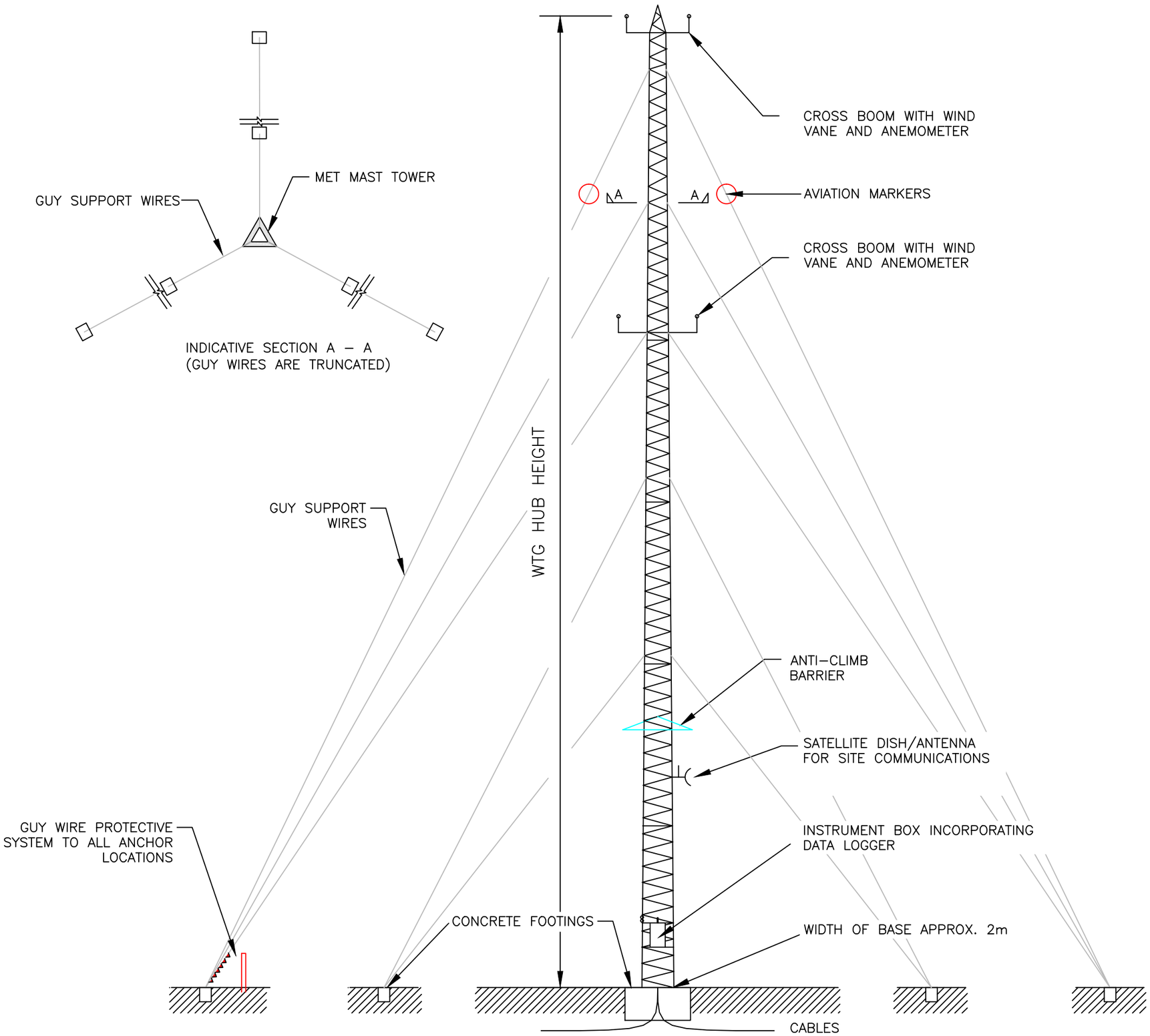


# TWIN CREEK WIND FARM

## FIGURE 25

## TYPICAL METEOROLOGICAL MAST

NOTES

KEY FEATURES OF PERMANENT MET MAST SHOWN - FINAL DESIGN DETAILS TO BE CONFIRMED;

FOR NUMBER AND LOCATIONS OF MET MASTS WITHIN THE WIND FARM REFER TO FIGURE 8;

TRUSS TOWER MADE FROM GALVANISED STEEL;

NUMBER OF GUY WIRE FOOTINGS MAY BE ONE ,TWO OR THREE PER SIDE (DOUBLE FOOTING POINT PER SIDE IS SHOWN HERE) - GUY WIRE PROTECTIVE SYSTEM SHALL BE BOLLARDS, FENCE OR FLAGS AS APPROPRIATE AND AGREED WITH LANDOWNERS;

MEASUREMENT HEIGHT MAY BE APPROX. HUB HEIGHT OF THE WIND TURBINE;

AVIATION MARKERS MAY BE USED ON GUY WIRES;

CABLES FOR FIBER OPTIC CONNECTION MAY BE PLACED UNDERGROUND;

MASTS MAY BE LOCATED AT: SECTION 268 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL CERTIFICATE OF TITLE VOLUME 5618 FOLIO 703;

AND ALLOTMENT 12 FILED PLAN 158976 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK CERTIFICATE OF TITLE VOLUME 5293 FOLIO 926.

| | | | |
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