Uungula Wind Farm

Appendix A

Updated Project Description

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Key Terms

Term	Definition
Ancillary Infrastructure	All wind farm infrastructure with the exception of WTGs and ESF, including but not limited to Collector Substation, Switching Station, permanent offices and site compounds, underground and overhead electricity transmission lines, Permanent Meteorological Masts, communication cables (includes control cables and earthing), water storage tank, hardstands and Internal Roads.
APZ	Asset protection zone.
Clearing	As defined in Part 5A of the *Local Land Services Act 2013* and does not include Pruning.
Construction	The construction of the Project, including but not limited to the construction of WTG, ESF, Ancillary Infrastructure but excluding Pre-construction Minor Works.
Development Consent	State significant development consent to carry out the Project granted by the consent authority under the *Environmental Planning and Assessment Act 1979*.
Development Corridor	The area generally bound by a buffer of 100 m radius around the Development Footprint as shown in Figure 1-2. For the absence of doubt, the oversail of WTGs may extend beyond this Development Corridor but will be within the Project Site.
Development Footprint	The extent of ground disturbance including but not limited to earthworks associated with Permanent Infrastructure and Temporary Facilities (other than Temporary Field Laydown Areas) in the Project Site. For the absence of doubt: • The oversail of WTGs may extend beyond the Development Footprint but will be within the Project Site. • Temporary Field Laydown Areas may occur outside the Development Footprint (refer to Temporary Field Laydown Areas definition).
Energy Storage Facility (ESF)	Compound for storing and discharging energy comprised of buildings, shipping containers and other infrastructure required to connect the ESF, WTGs, and Substations via underground and/or overhead cables.
External Road Upgrades	Upgrade of roads external to the Project Site and associated vegetation clearing and/or pruning, required to transport Project-related components and materials to and from the Project Site.
Ground Disturbance	Activities that cut into the existing ground surface. For the absence of doubt this does not include activities that occur on the ground surface including but not limited to driving vehicles on the ground, parking vehicles, placing infrastructure or materials such as stockpiles on the ground.

Term	Definition
Heavy Vehicle	Rigid vehicle over 8 tonnes GVM or has more than 2 axles. An articulated vehicle with three or more axles, or a vehicle configuration which does not require a permit from the National Heavy Vehicle Regulator.
Internal Roads	The roads established within the Project Site for the purposes of constructing, operating, maintaining and decommissioning the Project (sometimes referred to as 'tracks' or 'access tracks') and includes all waterway crossings).
Light Vehicle	Car or rigid truck to 8T GVM or bus to 12 seats.
Meteorological Masts	Temporary and permanent masts up to hub height of the WTGs and of a guyed, narrow lattice or tubular steel design and concrete footings of approximately 4 m^2 for each of the mast and guy wires. Guy wires may extend beyond 100 m from the base of the mast. The final number and location of the masts will be determined post-Development Consent, post-WTG selection and detailed design. The masts and the guy wires that secure them may need to be located outside of the Development Corridor, however they will remain within the Project Site.
Operation	Occurs when the entire wind farm is commissioned and formally handed over to the Project's owners. It does not include commissioning trials of equipment or use of Temporary Facilities.
OSOM	Over Size, Over Mass vehicle; vehicle configuration which requires a permit from the National Heavy Vehicle Regulator.
Permanent Infrastructure	Infrastructure that will remain on the Project site during for the operational phase of the Project, including WTGs, ESF and Ancillary Infrastructure.
Pre-construction Minor Works	Includes the following activities which are necessary to undertake detailed design and prepare for the commencement of construction: • Surveys. • Building/road dilapidation surveys. • Investigative drilling, excavation or salvage. • Minor clearing or translocation of native vegetation. • Establishing temporary site office and compounds. • Installation of environmental impact mitigation measures, fencing, enabling works, Meteorological Masts. • Flora and fauna investigations and pre-clearing surveys, inspections, specific habitat feature removal, relocation. • Establishing Project Site access points, minor access roads and minor adjustments to services/utilities, signage etc. including associated vegetation removal and heritage artefact salvage. • Upgrading Twelve Mile Road and Project Site entries.

Term	Definition
	• Intersection and road upgrades on the public road network.
Project	The Uungula Wind Farm described in this updated Project Description.
Project Site	The land required for the Project as shown in **Appendix C** and shown in Figure 1-1, and includes Crown land, Crown waterways, Crown roads and Council roads.
Pruning	The selective removal of certain parts of a tree or shrub such as branches, limbs or foliage.
Substations	Infrastructure required to collect the internal electrical reticulation to increase the voltage for transmission to connect to the grid. Typically includes include step-up transformers, an array of cable marshalling, busbars, switchgear and protection, various voltage and current transformers, operation and facilities building with parking, communication facilities and tower, diesel generator, lighting, a buried earth grid, lightning masts, power conditioning equipment, a reactive power control system, and other network equipment as required and agreed with TransGrid (or other transmission network system operator).
Temporary Field Laydown Areas	Areas that components may be placed on the ground in preparation for moving or relocating around the Project Site. These areas will mostly not require earthworks and therefore are outside of, and not included in the Development Footprint. They will occur within the Project Site.
Temporary Facilities	Facilities used for the construction, repowering and/or decommissioning of the Project, including but not limited to temporary site offices, amenities, and compounds, rock crushing facilities, concrete or asphalt batching plants, stockpiles and materials storage compounds, Temporary Field Laydown Areas, minor 'work front' construction access roads and temporary Meteorological Masts.
WTG	Wind Turbine Generator; turbines used for the generation of electricity by wind, including the tower, blades and all associated components.

1 The Proposal

1.1 Overview

The proposal is to construct, operate, and ultimately decommission and rehabilitate a commercial-scale wind farm indicatively producing 400 MW of clean energy to power the equivalent of 170,000 average NSW households each year. The inclusion of an ESF will allow for the Project to store and dispatch scheduled and reliable energy to and from the Project or the National Electricity Market (NEM).

The electricity generated and dispatched by the Project would provide significant carbon emission savings relative to the electricity from NSW coal powered generation.

In accordance with long-term strategic plans, the Project is located within the Central West REZ and has been developed through a comprehensive process that incorporates community and stakeholder advice to maximise positive social, economic and environmental outcomes while minimising adverse impacts and unintended consequences.

1.1.1 Project Elements

The Project is generally comprised of WTGs, ESF, Ancillary Infrastructure and Temporary Facilities identified in Table 1-1 and shown in Figure 1-1 and Figure 1-2. Detailed descriptions of each Project element are provided in the following sections and accompanying figures. An outline of the construction and operational phases of the Project are also provided, along with a timeframe detailing the proposed stages of activity.

Table 1-1: Project components and approximate dimensions

Project Components and Infrastructure	Approximate Dimensions[1]	Quantity
	WTGs	
WTG height	Up to 250 m	Up to 97
Rotor diameter	170 m	
Uppermost blade tip	250 m	
Lowermost blade tip	40 m – 80 m	
Tower (hub) height	125 m – 166 m	
WTG foundations	27 m diameter	
	ESF	
Compound	150 x 150 m	1
	Ancillary Infrastructure	
Hardstands	50 x 40 m	Up to 97
Internal Roads and drainage	9 m x 90 km	N/A
Substations	Up to 220 x 160 m	Up to 3
O&M Compounds	100 x 100 m	2
Overhead transmission lines (high voltage)	12 km external overhead cables (i.e. high voltage transmission lines from the Substation to the grid connection point) with easement width approximately 45-60 m.	N/A
Overhead transmission lines (medium to low voltage)	15 km internal overhead cables (i.e. transmission lines from the WTGs to the Substations) of easement width approximately 30 m.	N/A
Permanent Meteorological Masts (concrete footings for mast and guy wires)	Ten footings of 4 m^2 per mast	6
Underground transmission lines (medium to low voltage)	3 m x 90 km	N/A

[1] Areas and lengths stated ares approximate, subject to post-Development Consent, tender, contractor selection, optimisation, detailed design and procurement process.

Project Components and Infrastructure	Approximate Dimensions[1]	Quantity
Earthworks for Permanent Infrastructure (roads / hardstands) and for temporary facilities[2]	Subject to final design	N/A
Temporary Facilities		
Concrete (or asphalt) batching plants	50 x 100 m	3
Rock crushing facilities	50 x 100 m	3
Site compound and office	300 x 200 m	2
Stockpiles and materials storage compounds	Subject to construction requirements	
Temporary Field Laydown Areas	Subject to construction requirements	N/A
Temporary Meteorological Masts (concrete footing for mast and guy wires)	Ten footings of 4 m^2 per mast	12

[2] Noting that earthworks, whether for Permanent Infrastructure or Temporary Facilities, will be rehabilitated to stabilize soils however are all included in the Development Footprint (refer to Key Terms table).

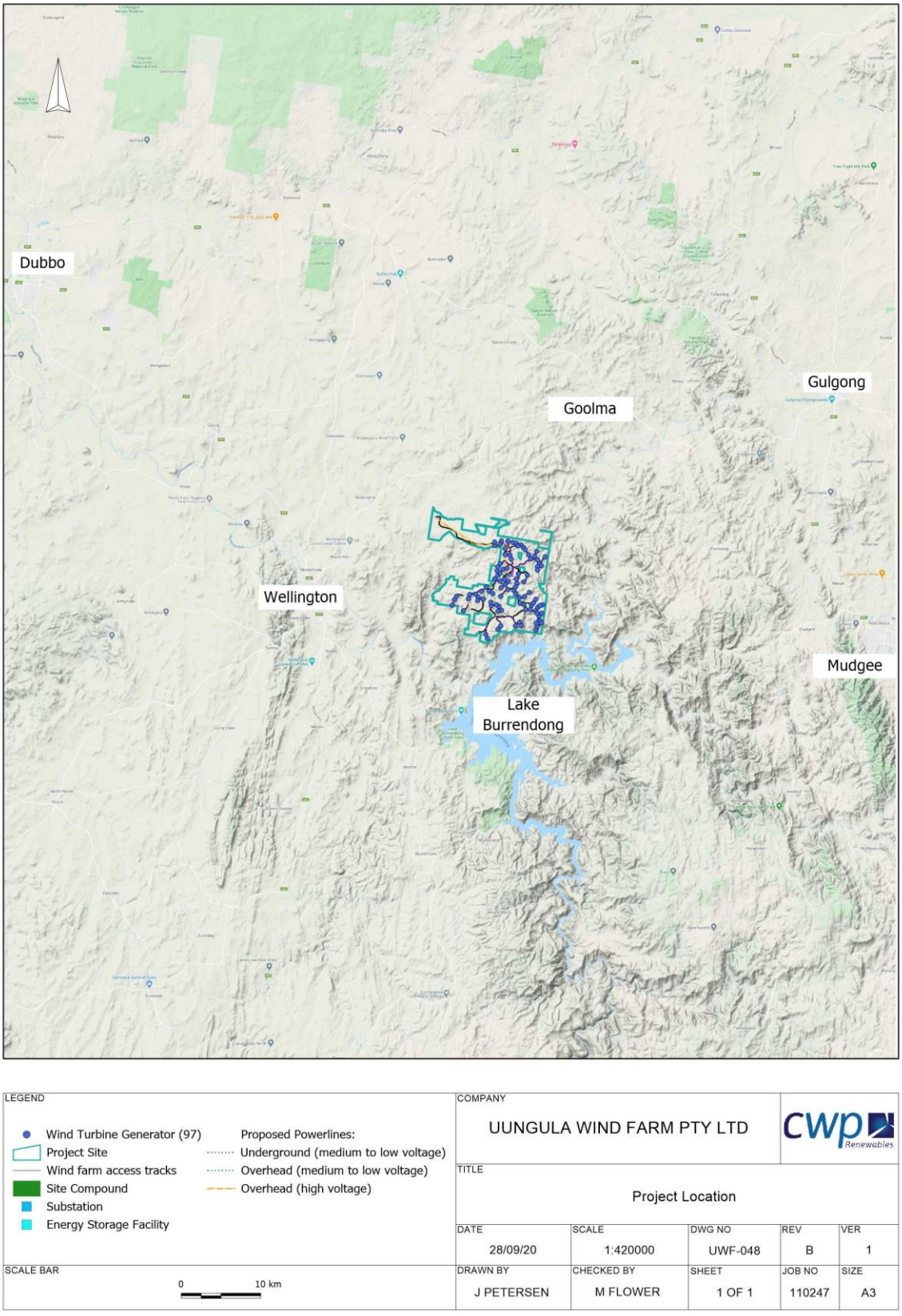

Figure 1-1: Project location

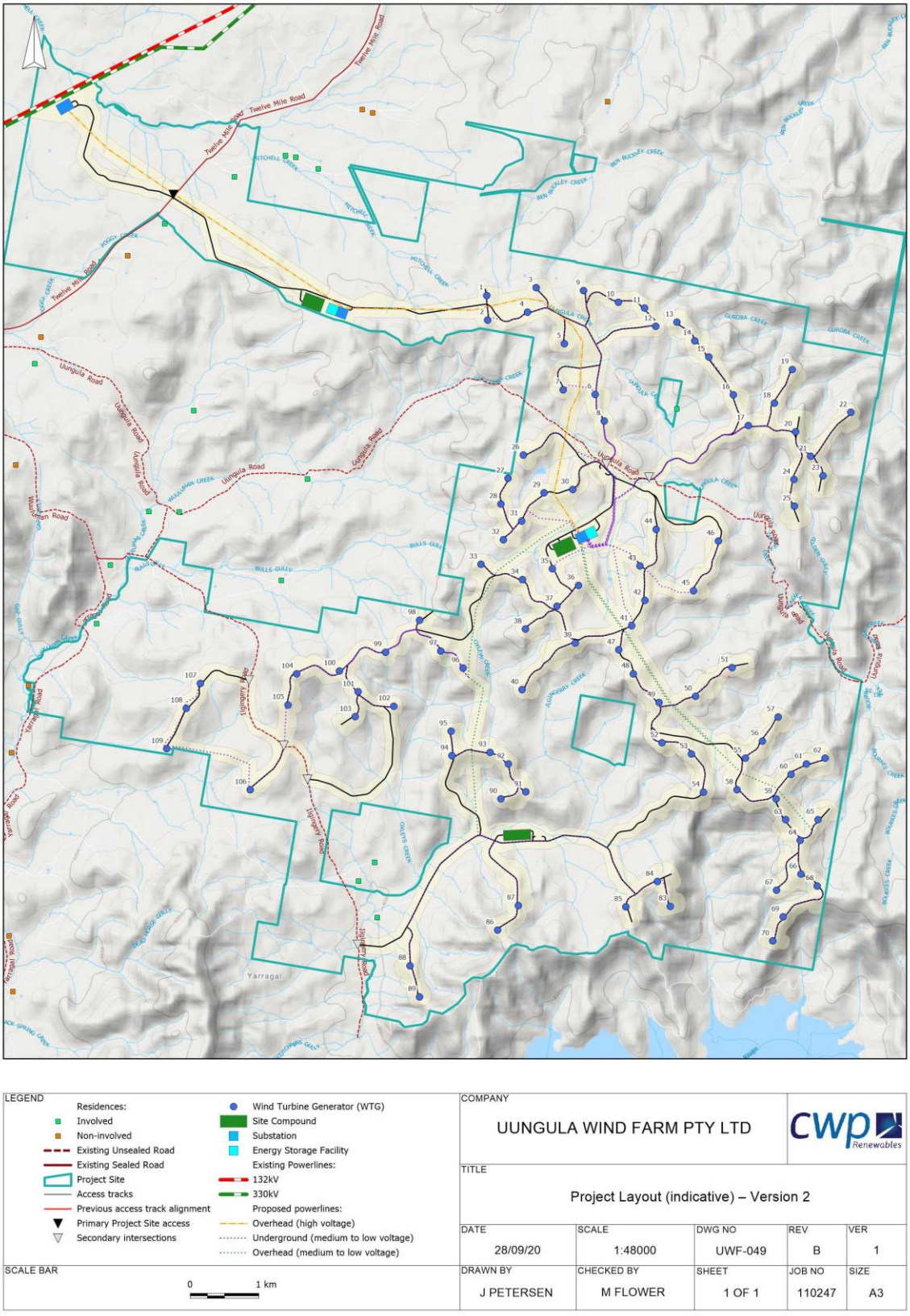

Figure 1-2: Project layout (indicative) – Version 2

1.1.2 Subdivision

1.1.2.1 TransGrid Subdivision(s)

TransGrid requires freehold title to the Substation lot(s) in order to proceed with the construction of the relevant electrical connections and infrastructure. Accordingly, this Development Application seeks consent for the creation of potentially three new lots (with an approximate area of 150 m by 150 m or 220 m by 160 m) by subdivision to enable ownership of the Substations to be transferred to TransGrid. TransGrid will obtain freehold title either through transfer, dedication or acquisition.

Maps identifying the potential TransGrid Subdivision(s) are included as Figure 1-3, Figure 1-4 and Figure 1-5. The potential Substations lot and resultant lots are also outlined in Table 1-2. TransGrid has not yet settled on the final preferred connection configuration. Accordingly, this application seeks consent for all of the TransGrid Subdivision options on the basis that any or all Substations will be constructed. Selection of the final connection configuration will be completed as part of the pre-construction final layout plan and prior to the application for the subdivision certificate under Part 6 of the EP&A Act.

No existing dwellings are located on the Substation lots or the residual lots. The size of the final residual lot will depend on the final connection configuration that is chosen i.e. whether one, two or all three of the Substations are progressed. Depending on which of the options are progressed, the residual lot(s) may contain the other Permanent or Temporary Facilities.

Table 1-2: Potential substations lot subdivision and resultant lots

Substations Options	Lot	DP	Lot Size (ha)	Substation Lot Size (ha)	Residual Lot Size (ha)
1	2	586633	563	3.52	559.48
2	120	754290	337	2.25	334.75
3	80	750778	16	2.25	13.75

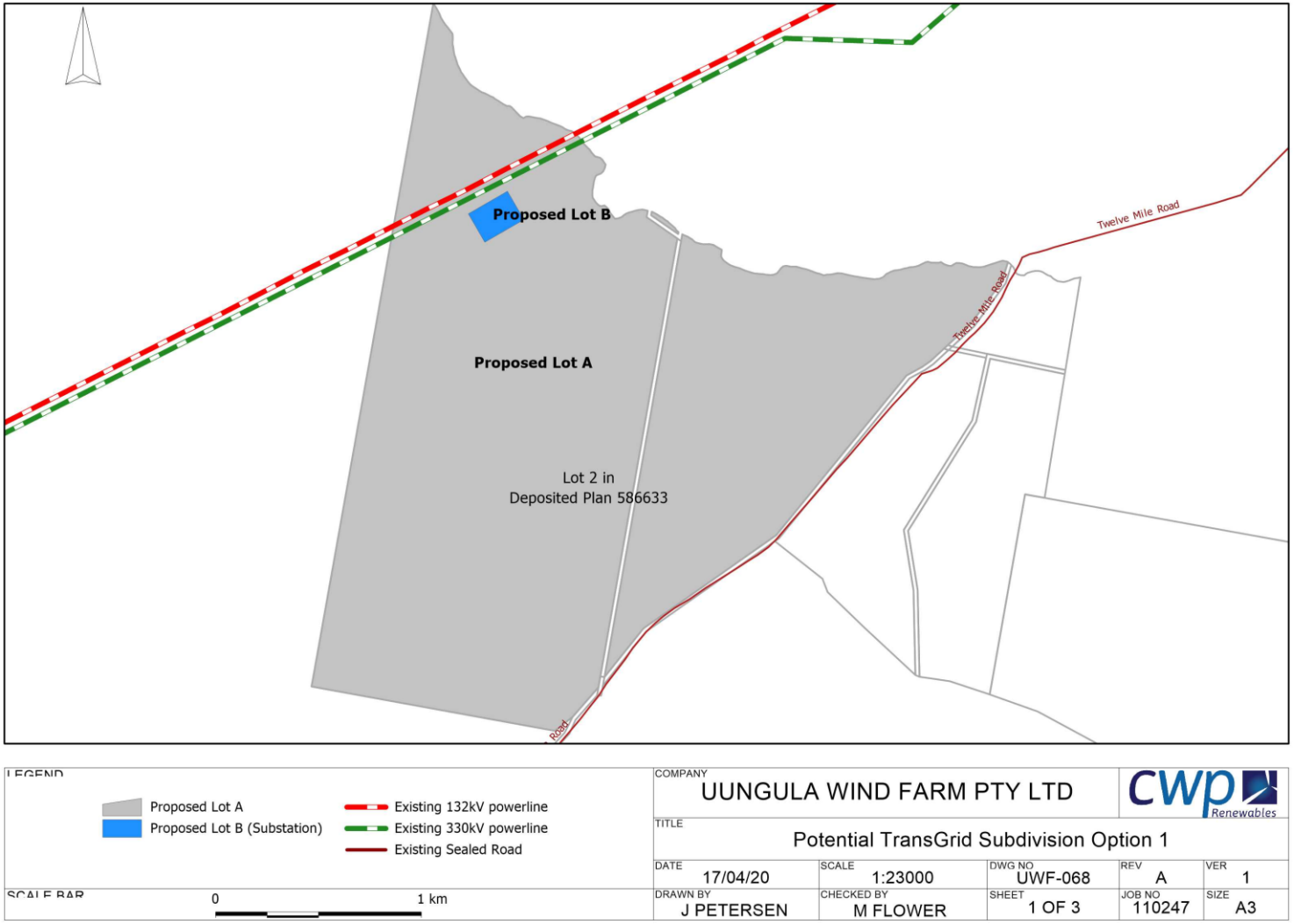

Figure 1-3: Potential TransGrid subdivision option one

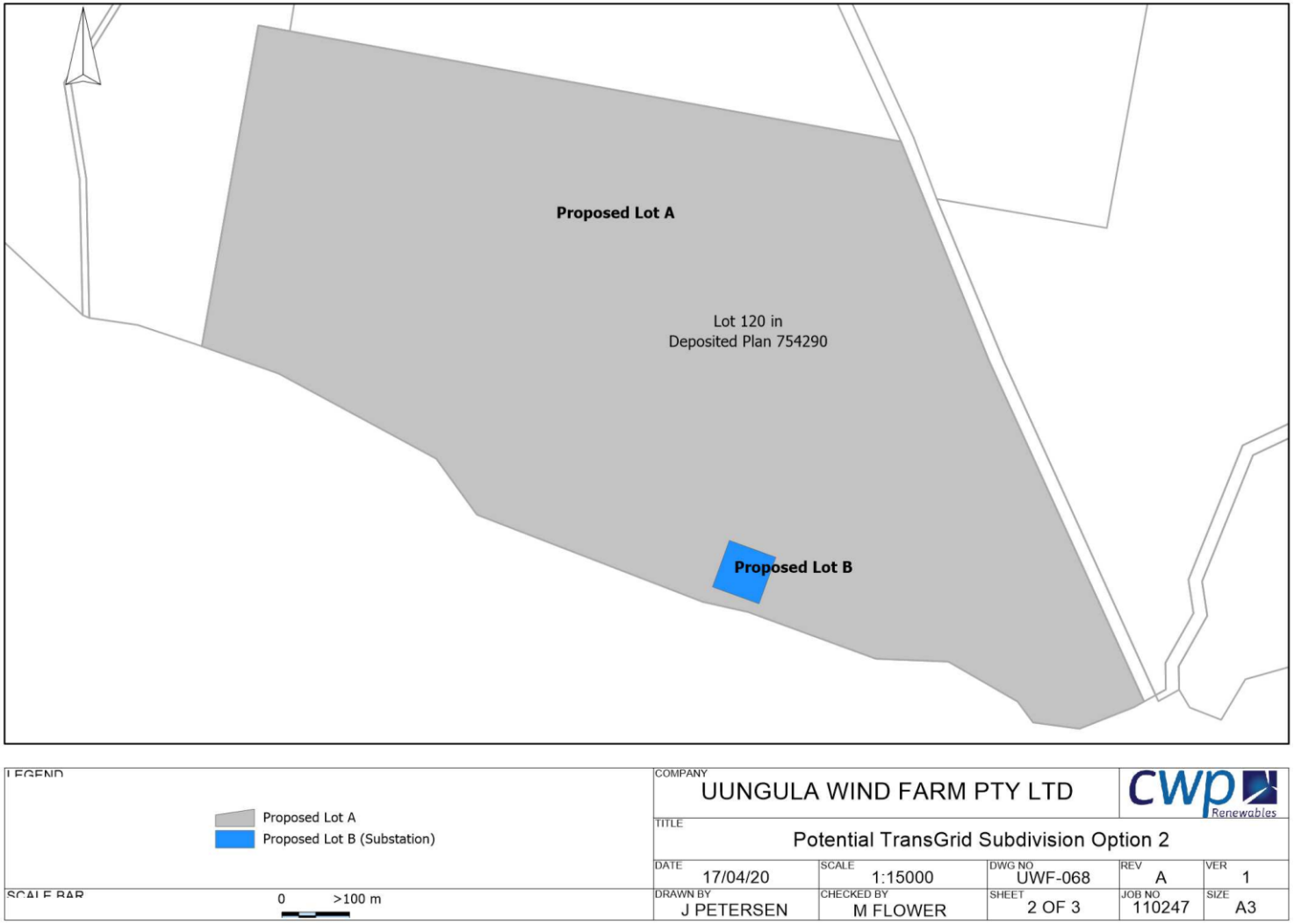

Figure 1-4 Potential TransGrid subdivision option two

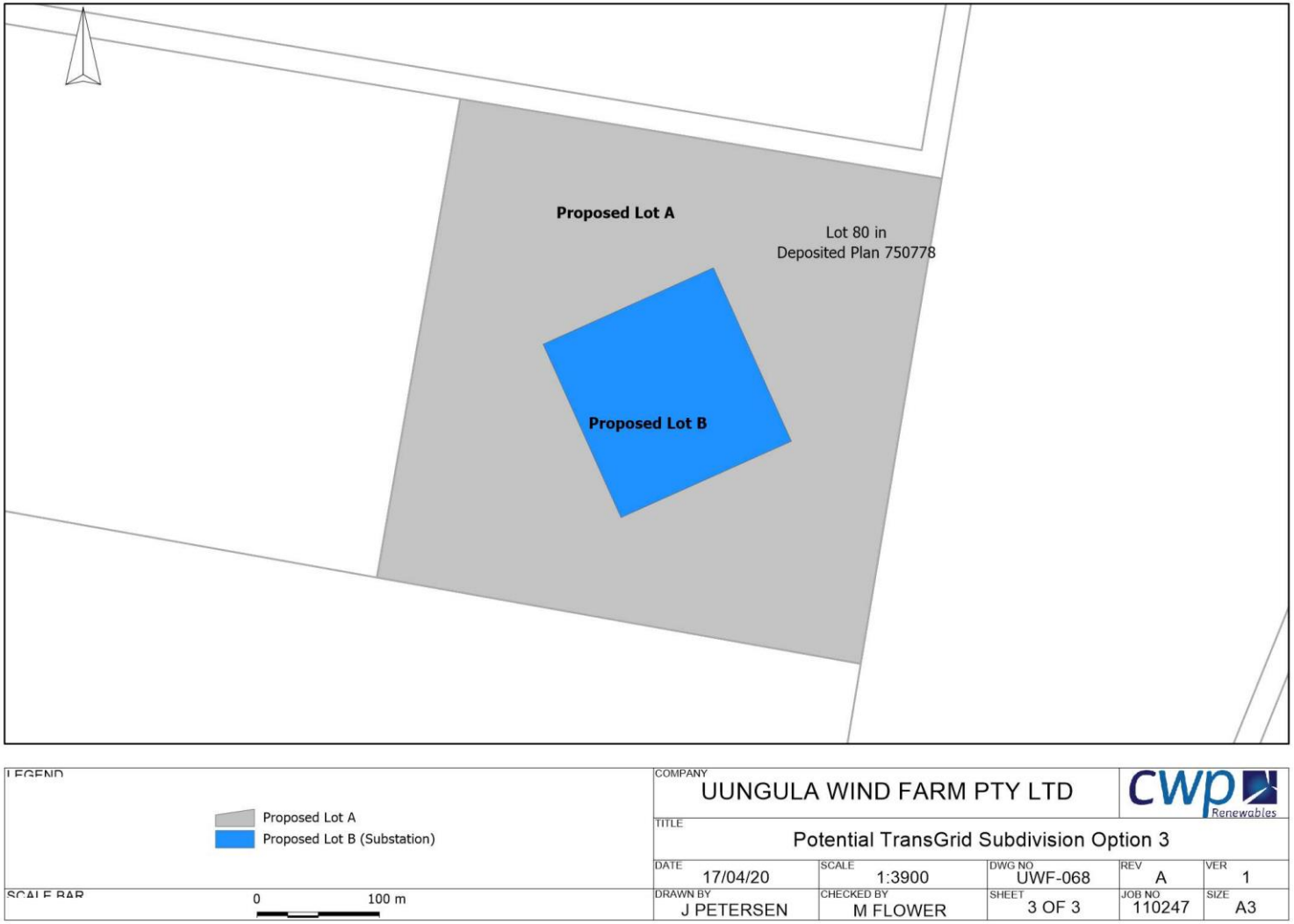

Figure 1-5 Potential TransGrid subdivision option three

1.1.2.2 Lease Subdivision

The Project extends over several adjoining properties. This means that, in order to finance and carry out the Project, the Proponent requires separate long-term leases (with durations in excess of five years) to be granted by each of the registered proprietors over parts of existing lots where the WTGs will be constructed.

In addition to the leases required for the WTGs, a long-term lease is also required for the proposed overhead transmission line (shown in orange on Figure 1-2) to connect the Substations. Figure 1-6 and Figure 1-7 show maps of the indicative lease subdivision across the Project Site.

The intent of a Lease Subdivision is administrative in nature. It is merely the legal mechanism to enable the Project to be carried out. It does not change the nature or scope of the Project. There will be no actual subdivision of the relevant titles to create new freehold lots or which could give rise to any new dwelling entitlements. Therefore, a Lease Subdivision does not result in any fragmentation of agricultural land and/or create potential land use conflicts.

1.1.2.3 Requirement for development consent

Development consent is required for the subdivision of land for lease purposes. "Development" for the purposes of the EP&A Act includes the "subdivision of land" (section 1.5(1)(b) EP&A Act). The definition of "subdivision of land" in Section 6.2 of the EP&A Act means the "division of land into two or more parts that after the division would be obviously adapted for separate occupation, use or disposition". The division may be affected by any agreement, dealing, plan or instrument rendering different parts of the land available for separate occupation, use or disposition. This includes the grant of a lease of a part of a lot.

The definition of "subdivision of land" also includes the procuring of registration in the office of the Registrar-General of a plan of subdivision within the meaning of section 195 of the *Conveyancing Act 1919* (Conveyancing Act). Section 195 of the Conveyancing Act specifies that "plan of subdivision" includes any plan that shows the division of land.

1.1.2.4 Interaction with the Conveyancing Act

Further, under section 23F(2) of the Conveyancing Act, the Registrar-General may refuse to register a "transaction", including the lease of part of an existing lot for a period exceeding five years, unless it is shown on a "current plan" and the boundaries of each part into which the land is divided follows the boundaries of an existing lot. The exception to the application of section 23F, in section 23G(e) of

the Conveyancing Act for a "transaction" that comprises the lease of a building, will not apply to the location of the WTGs the subject of this application as they will not have been constructed at the time the options to each of the leases are required to be exercised.

As the long-term leases arising as a result of the landowner agreements will be over parts of existing lots and will exceed five years, the Registrar-General will not register the leases unless the relevant lots are deemed to be subdivided so that the leases are for the whole of each 'lot'. That a lease of part of an existing lot of land for greater than five years creates a subdivision under the Conveyancing Act is explained in the Registrar-General's Guidelines for Lease of Land. The proposed subdivision plans are shown in Figure 1-6 and Figure 1-7.

The Proponent has set out below an assessment of permissibility of the Lease Subdivision within the planning framework. The consent authority can take comfort that the Lease Subdivision is permissible and will not create any fragmentation of agricultural land.

1.1.2.5 Registration

Once the leases are granted, they will be registered on title with NSW Land Registry Services (LRS). As the leases will exceed five years, the Registrar-General will not register them unless the relevant lots are deemed to be subdivided so that the leases are for the whole of each 'lot' (Conveyancing Act, section 23F(2)). To satisfy this requirement, deposited plans for lease purposes must be created to show the boundaries of the leased areas.

The leased areas for the WTGs will be circular shaped sites to accommodate dimensions of the WTGs (in particular the extent of the rotor) and centred on the location of each WTG. The deposited plans for lease purposes will also identify easements for access and services connecting to each WTG.

The lease area for the proposed overhead transmission line will be in a standard form as identified in Table 1-2 above and in the location identified in Figure 1-2.

The leases will be registered on the existing titles only and will not subdivide the underlying titles to create new titles. The reason that the long-term leases are not registered over the whole of the existing lots is to allow the current registered proprietors to continue to maintain control over the majority of their land, and use that land, for ongoing agricultural purposes.

Once a lease is registered, the title search will state that a lease over a windmill site, together with an easement of access and services as shown on the deposited plan, has been granted to the Proponent.

Following the expiry or earlier termination of the leases, a landowner may request that LRS remove the lease from their title.

1.1.2.6 Permissibility of subdivision

The Project Site is zoned RU1 Primary Production under the Wellington LEP 2012. Subdivision is permissible with development consent under the LEP (clause 2.6).

Clause 4.1(3) of the LEP requires that any resulting lot be of a specified minimum size shown on the Lot Size Map. The applicable minimum lot sizes under the LEP are 400 ha and 2,000 ha. The Proponent has undertaken an analysis below of the TransGrid Subdivision and Lease Subdivision against the objectives of cl 4.1 of the LEP.

The Proponent notes, however, that section 4.38(3) of the EP&A Act allows development consent to be granted to the Project despite the development being partly prohibited by an environmental planning instrument (which includes an LEP). Accordingly, under the applicable statutory framework, regardless of the controls set out in the LEP, consent for subdivision can be granted.

Table 1-3: LEP Provisions and subdivision

LEP Provision	Lease Subdivision Analysis	TransGrid (Substation) Subdivisions(s)
Clause 4.1 (Minimum subdivision lot size) (1) The objectives of this clause are as follows:		
(a) minimise the cost to the community of— (i) fragmented and isolated development of rural land, and (ii) providing, extending and maintaining public amenities, infrastructure and services,	(a) This objective is not relevant as the Lease Subdivision: (i) will not result in the fragmented and isolated development of rural land; and (ii) will not impose any cost to the community for the provision, extension or maintenance of public amenities, infrastructure and services.	(a) There is no expected cost to the community from the TransGrid Subdivision(s): (i) the TransGrid Subdivision(s) will result in minimal, if any, additional fragmentation and isolated development of rural land to the impacts of the Project as a whole. (ii) the TransGrid Subdivision(s) alone will not require the provision, extension or maintenance of public amenities, infrastructure and services.
(b) to ensure that the character and landscape setting of an area is protected and enhanced by any development	(b) This consideration is not relevant because the Lease Subdivision will not affect the character and landscape setting of the area.	(b) The TransGrid Subdivision(s) will have minimal, if any, additional effect on the character and landscape setting of the area to the impacts of the Project as a whole.
(c) to ensure development is undertaken on appropriately sized parcels of land commensurate with available services (including any associated sewerage management systems) and responds to any topographic, physical or environmental constraints,	(c) This consideration is not relevant as the Lease Subdivision will not result in any actual subdivision of the relevant titles. The subdivision of land would create leasehold lots of appropriate size to meet the needs of the Project.	(c) TransGrid will be the registered proprietor of the new lot(s) and there is no intention for any future development to be carried out on that lot. Access to the existing transmission line is one of the key considerations in identifying the options for the Substation(s). The topographic, physical and environmental constraints of the location options have also been considered.

LEP Provision	Lease Subdivision Analysis	TransGrid (Substation) Subdivisions(s)
(d) to ensure sufficient land area to promote high levels of residential amenity	(d) This consideration is not relevant as the Lease Subdivision will not result in any actual subdivision of the relevant titles.	(d) The TransGrid Subdivision(s) only involves a small parcel(s) of land and therefore is not expected to affect the amount of land area available for residential amenity.
(e) to ensure that subdivision and lot sizes result in a practical and efficient layout to meet the intended use and provide ease of access and connectivity.	(e) This consideration is not relevant as the Lease Subdivision will not result in any actual subdivision of the relevant titles.	(e) The TransGrid Subdivision(s) and lot size will meet the intended use of the land as a Substation(s). Ease of access has been considered in identifying the location options, and it will be one of the key considerations in choosing the final location of the proposed substation. As TransGrid will be the registered proprietor of the new lot there is no intention for any future development to be carried out on that lot.

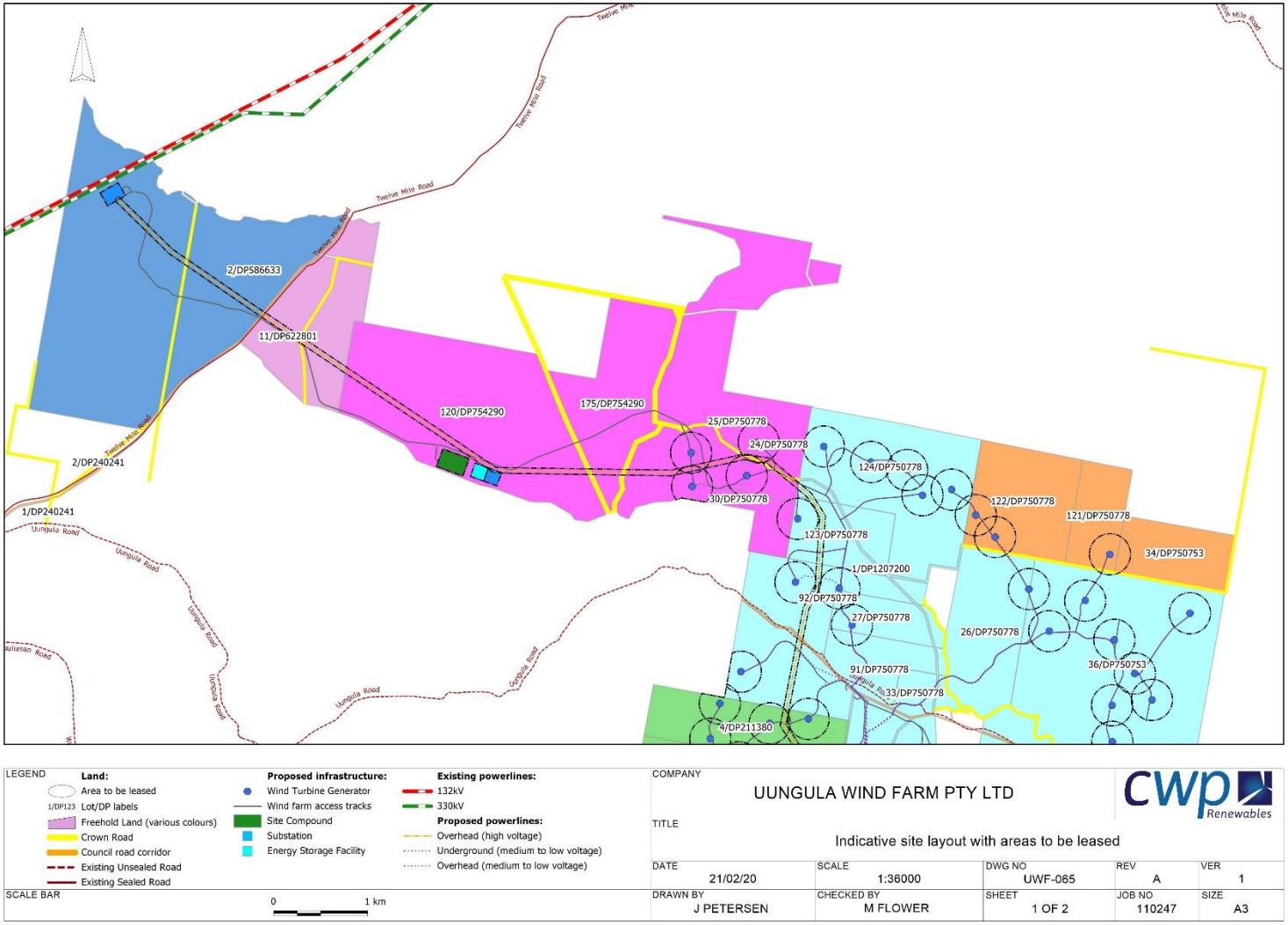

Figure 1-6: Indicative lease subdivision map (part one)

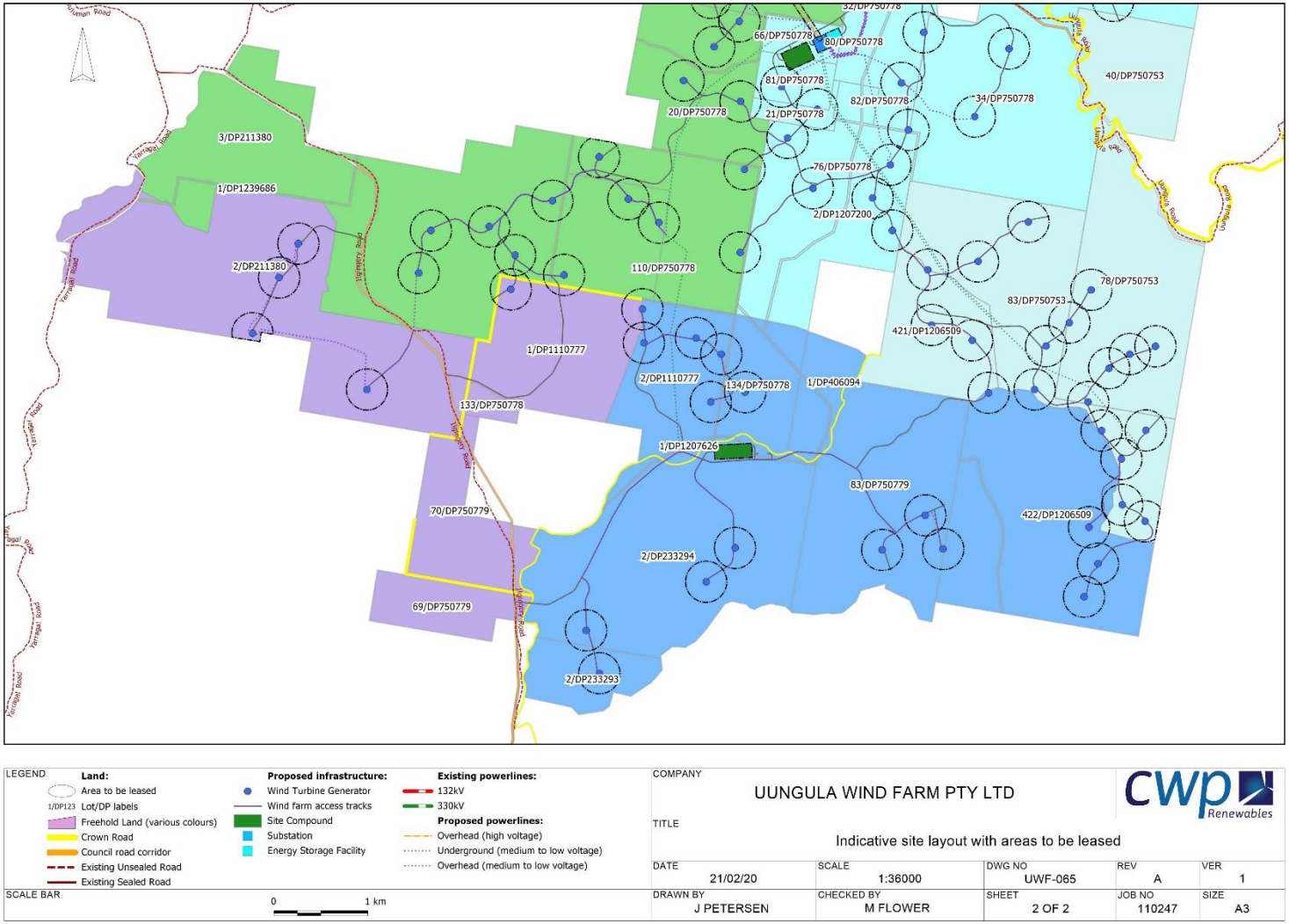

Figure 1-7: Indicative lease subdivision map (part two)

1.1.3 Site Access

The Project Site will be accessed from the public road network at the following locations during construction and operation:

1. Primary Project Site entry off Twelve Mile Road, approximately 17 km east of Wellington (by road). This will be the sole access point for Oversize and/or Overmass (OSOM) vehicles and the main access point for Heavy and Light Vehicles; and
2. Secondary intersections and cross-over locations along Uungula and Ilgingery Roads. These secondary access points will facilitate the routes of Internal Roads throughout the Project Site required for construction and operational vehicles.

1.1.3.1 Site Access Limitations and Exceptions

To limit impacts to road users and the surrounding community, it is proposed that:

1. The primary Project Site entry will only be accessed from a westerly direction (from Goolma road along Twelve Mile Road), except to allow local service and/or resource suppliers located east of the primary Project Site entry along Twelve Mile Road the opportunity to participate in the Project. For clarity, access to the Project Site by all OSOM, Heavy and Light Vehicles travelling on Goolma Road will only be via the western end of Twelve Mile Road. No 'short cuts' will be permitted from Goolma Road to the Project Site from the east via Twelve Mile Road (eastern part), Gunnegalderie Road, Uamby Road, Gorries Lane or other roads connecting to the eastern end of Twelve Mile Road.

   Therefore, an exception is sought to not prohibit Heavy and Light Vehicles to use Twelve Mile Road east of the primary Project Site entry should service and/or resource suppliers be identified. The reasons this exception is sought is to allow for the potential situation where an employee of the Project (be they an employee, contractor, sub-contractor, etc.) or a commercially licensed provider of resources to the Project (quarry products, water carting, etc.), who lives and/or operates their business along the minor road network east of the primary Project Site entry point to use the public road network to access the primary Project Site entry without having to go out to Goolma Road and drive to the western end to access the primary Project Site entry;
2. A short section of Ilgingery Road will be used during construction and operational activities for OSOM, Heavy and Light Vehicles, which for the absence of doubt, will gain access via the primary Project Site entry and Internal Roads, to access a small number of WTGs at the

western edge of the layout.

3. The sections of Uungula, Wuuluman and Ilgingery Roads linking the Project back to Twelve Mile Road will not be used by the Project during the post-Development Consent, construction or operational periods for any vehicles, except to:
    a. undertake Pre-construction Minor Works;
    b. construct intersection upgrades on Uungula Road and Ilgingery Road;
    c. undertake dust suppression;
    d. utilise the secondary intersections and cross overs identified above to facilitate construction and operational vehicles;
    e. provide emergency egress and access, if required; and
    f. procure resources from licensed operators which are located along these roads.

Project Site access points would be gated and secured, and appropriate warning signs erected. Access routes and points for Project transport have been discussed and assessed in the relevant impact assessment sections of the EIS (Biodiversity (Section 8.4); Traffic and Transport (Section 8.5); and Heritage (Section 8.7)).

1.1.3.2 OSOM Vehicle Transport Route from Port of Entry

As the nearest seaport to the Project Site is the Port of Newcastle, it is the most likely port of entry for shipped Project components, so assessment was undertaken of the vehicle transport from that port. However, the port of entry will not be known until post-Development Consent tender, contractor selection, optimisation, detailed design and procurement process is complete, and as such an alternative port may need to be used. OSOM vehicle transport to the Project Site from the Port of Newcastle has been assessed in a route study contained in Section 8.5 of the EIS. It is notable that although future commercial procurement decisions will largely determine the most suitable port of entry, other ports of entry can be used which would then link with the studied route. The route from the Port of Newcastle for OSOM vehicle transport would be via:

- Industrial Drive;
- Pacific Highway;
- John Renshaw Drive;
- Hunter Expressway;
- New England Highway;

- Golden Highway (a detour around the Denman Bridge from the corner of Golden Highway and Denman Road via Bengalla and Wybong Roads may be required for any vehicles exceeding 5.6 m in height although at this stage no vehicles are proposed exceeding this height);
- Saxa Road (formerly Cobbora Road);
- Mitchell Highway;
- Goolma Road; and
- Twelve Mile Road.

Due to various road network and land use constraints, the preferred road transport route for OSOM on approach to the Project Site is via Dunedoo on the Golden Highway then left turn south onto Saxa Road, left turn south east onto Mitchell Highway, left turn north onto Goolma Road, right turn onto Twelve Mile Road (entering at the relocated Goolma Road intersection approximately 400m north of current location (refer to Figure 1-8) to the primary Project Site entry.

The Twelve Mile Road intersection with Goolma Road is proposed in a location approximately 400m north of current location (refer to Figure 1-8) in order to satisfy the standards required by the Roads Authorities (Transport for NSW and Dubbo Regional Council). The intersection will be upgraded generally in accordance with the layout shown in the amended preliminary intersection design which includes the minor realignment of the western end of Twelve Mile Road into the currently gazetted (but not formed) road reserve (refer to Figure 1-8 for the general layout plan and to Submissions Report Appendix F TMR/Goolma Road Intersection Preliminary Upgrade Design - Version 2 for the amended preliminary intersection design). The turning radius of the OSOM and Heavy Vehicles as well as the acceleration and deceleration lanes required for additional safety requires the crossing of some freehold land lots on the north and south of the currently gazetted (but not formed) road reserve. It is anticipated the existing Twelve Mile Road intersection with Goolma Road and the western end current alignment will be decommissioned and rehabilitated subject to the directions of the Roads Authorities.

This layout and design is subject to detailed design and investigations which may identify constraints which may shape the layout and design. The intersection upgrade will occur as part of the External Road Upgrades prior to the commencement of construction.

Figure 1-8: Twelve Mile Road Western End Realignment and New Goolma Road Intersection Location

LEGEND

- Gazetted Road Reserve (currently unformed)
- Cadastral Boundary
- Twelve Mile Rd & Goolma Rd Intersection Upgrade (proposed)
- Twelve Mile Rd & Goolma Rd Intersection Upgrade (as proposed in EIS)
- Existing Twelve Mile Rd Realignment & Goolma Rd Intersection to be Closed
- Public Road

COMPANY	UUNGULA WIND FARM PTY LTD			
TITLE	Twelve Mile Road Western End Realignment and New Goolma Road Intersection			
DATE: 29 OCT 2020	SCALE: 1:4100	DWG NO: UWF-120	REV: A	VER: 1
DRAWN BY: B KRONENBERG	CHECKED BY: M FLOWER	SHEET: 1 OF 1	JOB NO: 110247	SIZE: A3

Further, a proposed Twelve Mile Road preliminary upgrade design has been prepared which includes earthworks which may be required considering the OSOM vehicle requirements (included in the EIS as Appendix N). A WTG blade transport modelling exercise has been undertaken along Twelve Mile Road proposed upgraded alignment to analyse how an OSOM vehicle carrying a blade suited to the Project parameters may negotiate the proposed Twelve Mile Road preliminary upgrade design. This allows an analysis of the areas where the road pavement may require alteration (such as extension) to allow the wheel-to-ground contact for a vehicle to turn a corner, associated earthworks, and where the vegetation adjacent the road will require either pruning or clearing to allow the passage of the blade which oversails outside the line of wheel-to-ground contact.

This area of wheel-to-ground contact and blade oversail plus an additional area of 5 m outside of that on both sides, combined with the area of proposed earthworks has been considered as the area of impact forming part of the External Road Upgrades required on Twelve Mile Road for the Project. The final road design, and extent of pruning and clearing for the External Road Upgrades, is subject to the post-Development Consent process which includes tender, contractor selection, optimisation, detailed design and procurement process undertaken where applicable in consultation with the Dubbo Regional Council and Transport for NSW. It is intended that the final road design for the External Road Upgrades will remain within the impacts assessed in the EIS. The impacts associated with this are analysed in the relevant sections of the EIS (Biodiversity (Section 8.4); Traffic and Transport (Section 8.5); and Heritage (Section 8.7)).

The inclusion of an additional 5 m area beyond the modelled wheel-to-ground contact and blade oversail extent combined with the required earthworks is considered as a worst-case scenario, especially considering that along straight stretches of road there will be minimal need to undertake earthworks on the pavement edges or clear the vegetation adjacent the road within that additional area on both sides of the OSOM vehicle.

1.1.3.3 Vehicle Routes, Upgrades and Timing

OSOM, Heavy and Light Vehicle routes will be further defined during the post-Development Consent period in the preparation of the Traffic Management Plan (TMP) and in consultation with Transport for NSW and Dubbo Regional Council. Design, consultation and timing regarding road upgrades are outlined in Table 1-4.

Table 1-4: Road and intersection upgrades required

Road / Intersection	Upgrade	Timing	Consultation
Twelve Mile Road intersection with Goolma Road	External Road Upgrades Construct in accordance with Roads Authority agreed design (generally in accordance with the plans submnitted as part of the EIS subject to detailed design), the Austroads Guide to Road Design as amended by the supplements adopted by Transport for NSW.	During Pre-construction Minor Works and prior to commencement of construction	Transport for NSW and Dubbo Regional Council
Twelve Mile Road	External Road Upgrades Construct in accordance with Roads Authority agreed design (generally in accordance with the plans submnitted as part of the EIS subject to detailed design), the Austroads Guide to Road Design as amended by the supplements adopted by Transport for NSW.	During Pre-construction Minor Works and prior to commencement of construction	Dubbo Regional Council
Primary Project Site entry	Construct intersection in accordance with the Austroads Guide to Road Design as amended by the supplements adopted by Transport for NSW	During Pre-construction Minor Works and prior to commencement of construction	Dubbo Regional Council
Secondary Project Site entries	Construct intersection in accordance with the Austroads Guide to Road Design as amended by the supplements adopted by Transport for NSW	During Pre-construction Minor Works and prior to commencement of construction	Dubbo Regional Council
OSOM vehicle transport route from port of entry to the Project Site	External Road Upgrades	Prior to OSOM vehicle transport	Transport for NSW and relevant Council

Further details relating to safe access considerations and potential road infrastructure upgrades to be considered are discussed in the EIS Section 8.5 (Traffic and Transport).

1.1.4 Resource Requirements

Resource requirements are typical of any new development site, including the provision of cement, aggregate, sand, asphalt, water and road base material. Cement for foundations will be sourced by the civil construction company selected to construct the Project by the Proponent. This may be sourced locally or from alternative suppliers. Aggregate and sand will be sourced locally and as close to the Project Site where it is practicable to do so, including recycling material excavated from foundations and earthworks where possible. If it is decided to pursue the establishment of a local quarry, then this will be separately assessed and approved under the relevant planning instrument. Both aggregate and sand will be required to prepare the high strength concrete to pour WTG foundations. Aggregate will be required to dress the WTG sites and provide a low resistivity apron around the ESF and Substations.

Water requirements will be met in accordance with the provisions of the *Water Management Act 2000* (WM Act) by sourcing water from within the locality where practicable and from a licensed supplier. If it is not practicable to source water locally, then it will be brought to the Project Site by licensed external water suppliers under contract to the Project. It is estimated that in the order of 15.0 mega litres (ML) of water would be required to produce the quantity of concrete required for gravity foundations, which can be considered the maximum amount of water required for use in concrete batching.

In addition, it is estimated that a further 80 ML of water would be required for road construction and dust suppression activities during construction. This estimated volume would service all new and upgraded on-site internal road construction and dust suppression activities, including those associated with the unsealed public roads. The water volumes provided above are reasonable with regard to the types of activities proposed, however they are estimates and not limits. Prevailing weather conditions during the period of construction, temperature in particular, will affect the volume of water required.

Road base material will be required for construction of Internal Roads to WTG sites, the ESF and the Substations. Part of the road base requirement may be sourced from material extracted from WTG foundations and any cut and fill from road, underground cable or other civil construction, with the remainder sourced on-site (subject to separate assessment and approvals being obtained) or imported to the Project Site. Where additional material is required, material will be sourced from a suitably approved quarry. Topsoil cleared during the construction phase will be used for rehabilitation, and rock excavated from WTG foundation preparations will be used for road base, back fill for foundations and / or erosion control purposes as far as practicable.

Any waste, such as packaging associated with component deliveries, will be classified in accordance with the Environment Protection Authority's (EPA) *Waste Classification Guidelines* and disposed of appropriately in accordance with procedures which will be contained in an Environmental Management Strategy (EMS).

Procurement of resources required for the Project will be determined during the post-Development Consent tender, contractor selection, optimisation, detailed design and procurement processes and the construction period. These resources may be sourced from locations local to the Project and may require the use of public roads not described in Section 1.1.3. Although the source of resources for construction is a commercial procurement decision which will occur post-Development Consent. The routes used to move the resources through the surrounding towns and road network will be along the major road network and standard heavy vehicle road network, or alternatively along routes permitted by the resource supplier's permitting and approvals process. Therefore, flexibility is required in the Development Consent to preserve the opportunity to source locally any of the above resources and to provide the ability to further define road routes for Heavy and Light Vehicles. This will be addressed in the Project TMP.

1.1.5 Project Design Variations

The Project described is indicative only and subject to a detailed design process. The indicative layout has been prepared based on the best knowledge available at the time, by applying the avoidance hierarchy approach.

Although 97 WTGs are proposed, commercial considerations and technological advancements may require fewer than 97 WTGs to be constructed and operated, at the discretion of the Proponent. All 97 WTG locations have been included in this EIS in order to assess worst-case impacts and to allow the flexibility to determine the optimal project layout within the limits of the Development Consent, generally in accordance with this EIS, post-Development Consent.

Since the Project was announced, it has been through multiple design iterations as a result of the environmental assessments undertaken for the Project. The resulting design of the Project in this EIS is a product of the Proponent's commitment to avoid environmental impacts and mitigate any remaining impacts to the maximum extent possible. This EIS has considered the worst-case impacts for the resultant Project elements to ensure that the Project can be constructed, operated, maintained and decommissioned within the limits of a typical wind farm Development Consent, and generally in accordance with this EIS.

If Development Consent is granted, preferred suppliers will be selected following a tender and contractor selection process. Each piece of equipment is uniquely different and can include bespoke specifications such as transport vehicle turning radii, access and exit gradients and crane requirements. The final design will only be known following selection of Project components and the completion of the detailed design by the construction contractor post-Development Consent. The ability to micro-site the WTGs, the ESF, Ancillary Infrastructure and Temporary Facilities post-Development Consent is required to enable optimisation of the Project and minimisation of impacts.

Optionality is also provided for in the location of compounds and electrical design (as shown in Figure 1-2) because the selection of the locations of compounds is subject to the post-Development Consent tender, contractor selection, optimisation, detailed design and procurement process. This EIS and Development Application is made on the basis of each of those areas shown can be interchangeable with others should the optimisation process direct that a piece of infrastructure would be more efficiently interchanged with another. All areas have therefore been considered in the Development Footprint and subjected to the impact assessment process.

The locations of some Project elements are not known at this stage and will be subject to the detailed design and construction phase programming. These are described in the relevant section and include (but are not limited to) the Meteorological Masts (both temporary and permanent and including the location of their power supply cables) and the Temporary Field Laydown Areas. Those will be located within the Project Site with impact avoidance and minimisation guiding their placement.

1.1.5.1 Micro-siting Criteria

WTGs, ESF, Ancillary Infrastructure and Temporary Facilities will be micro-sited post-Development Consent during the optimisation, detailed design and construction phase programming. Final micro-siting may not occur until during the construction period, immediately prior to the activity or construction of that Project element. Any micro-siting will be undertaken to meet the following criteria:

- On-ground impacts are to remain within the Development Corridor shown in Figure 1-2 (excluding Meteorological Masts and Temporary Field Laydown Areas which may be outside the Development Corridor but will remain within the Project Site);
- No WTG is moved more than 100 m from the relevant Geographical Positioning System (GPS) coordinates shown in Appendix D; and
- The micro-sited location of the WTG, ESF, Ancillary Infrastructure or Temporary Facilities would not result in any non-compliance with the Development Consent once granted.

1.1.6 Project Timeline

It is anticipated that works will commence within one to five years of Development Consent being granted. The timing of construction will principally be driven by additional permits and authorisations, post-Development Consent tender, contractor selection, optimisation, detailed design and procurement processes and a final investment decision. Staging of the Project is also a consideration as discussed below. An indicative Project timeline is presented in Table 1-5 below.

Table 1-5: Anticipated project timeline

Phase	Approximate Duration
Construction	24-30 months
Operation	30 years
Maintenance	Annual and ongoing
Repowering or Decommissioning	At completion of Project life

1.1.7 Staging

It is intended that the Project may be constructed, operated, re-powered and/or decommissioned in stages of various sizes or permutations within the parameters of the Development Consent. Staging would be determined post-Development Consent tender, contractor selection, optimisation, detailed design and procurement processes.

1.1.8 Community Engagement

Prior to the commencement of construction activities, a program of community awareness initiatives will be implemented. Information will be disseminated to the local community through the Community Consultative Committee (CCC), the Project website, local newspapers and direct mail to advise the community of the nature of pending construction activities, their timing and potential impacts. Contact details will be provided for individuals to gain further information or, if desired, to express concerns or complaints.

Updates on the progress of construction works and relevant impacts will be provided during the construction period. The CCC will be available to guide and inform the Proponent on matters of interest to the community and will provide an additional forum for communication between stakeholders. Ongoing consultation activities following lodgement of this EIS are described in Section 6 of the EIS.

1.1.9 Environmental Management

Prior to the commencement of construction, the Proponent will prepare an EMS to the satisfaction of the Secretary of the Department of Planning, Industry and Environment (DPIE) for the Project. The construction contractor will prepare an Environmental Management Plan (EMP) that will outline environmental management measures and procedures to be implemented during construction. This will include plans to address:

- Water quality;
- Air quality;
- Heritage;
- Biodiversity;
- Noise and vibration;
- Environmental incident response and notification;
- Traffic;
- Waste;
- Contamination (including unexpected finds);
- Storage of chemicals, oils and fuels;
- High risk activities; and
- Training and induction.

Prior to the commencement of commissioning of any WTG, the Proponent will prepare a Bird and Bat Adaptive Management Plan (BBAMP) to the satisfaction of the Secretary, in accordance with the usual Development Consent conditions for a development of this nature.

Subject to the Development Consent conditions, within two years after construction commencement the Proponent will retire the required biodiversity offset credits in consultation with the relevant NSW or Commonwealth Government agencies and according to the requirements of the relevant legislation.

Further information on these management plans (and requirements) is provided in the sections below (noting that the Development Conset conditions will prevail over the statements made below).

1.1.9.1 Environmental Management Strategy

The EMS will:

- provide the strategic framework for environmental management of the development;

- identify the statutory approvals that apply to the development;
- describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development; and
- describe the procedures that would be implemented to inform the community, handle, manage and respond to complaints and address emergencies.

The Proponent will implement the approved EMS during construction and operation of the Project.

1.1.9.2 Biodiversity Management Plan

The BMP will be prepared in consultation with the Biodiversity Conservation Division (BCD) within DPIE and will include a description of the measures that would be implemented for:

- minimising the amount of native vegetation clearing;
- minimising the loss of key fauna habitat and impacts on fauna on-site;
- rehabilitating and revegetating temporary disturbance areas;
- controlling weeds and feral pests; and
- a detailed program to monitor and report on the effectiveness of these measures.

The Proponent will implement the approved BMP during construction and operational phases of the Project.

1.1.9.3 Cultural Heritage Management Plan

Prior to the commencement of construction, the Proponent will prepare a Cultural Heritage Management Plan (CHMP) to the satisfaction of the Secretary. This plan will:

- be prepared by a suitably qualified and experienced person whose appointment has been endorsed by the Secretary;
- be prepared in consultation with the BCD within DPIE and Aboriginal stakeholders;
- include a description of the measures that would be implemented for:
    - protecting relevant Aboriginal heritage items identified in the Heritage Assessment and any items located outside the Project disturbance area;
    - minimising and managing the impacts of the development on relevant heritage items identified in the Heritage Assessment;
    - a contingency plan and reporting procedure if:
        - Aboriginal heritage items outside the approved disturbance area are damaged;
        - previously unidentified Aboriginal heritage items are found; or

    - Aboriginal skeletal material is discovered;
  - ensuring workers on-site receive suitable heritage inductions prior to carrying out any development on-site, and that records are kept of these inductions;
  - ongoing consultation with Aboriginal stakeholders during the implementation of the plan; and
- a program to monitor and report on the effectiveness of these measures and any heritage impacts of the project.

The Proponent will implement the approved CHMP during construction and operational phases of the Project.

1.1.9.4 Traffic Management Plan

Prior to the commencement of construction, the Proponent will prepare a TMP for the Project in consultation with Transport for NSW and Dubbo Regional Council, and to the satisfaction of the Secretary. This plan will:

- detail the measures that would be implemented to:
  - minimise traffic safety impacts of the development and disruptions to local road users during the construction and decommissioning of the development, including:
  - consideration of potential interaction with other State Significant Development in the local area in consultation with the applicant(s) of that(those) project(s);
  - temporary traffic controls, including detours and signage;
  - notifying the local community about Project-related traffic impacts;
  - minimising potential conflict between Project-related traffic and:
    - rail services;
    - stock movements;
    - school buses, in consultation with local schools;
  - implement measures to minimise development-related traffic on the public road network outside of standard construction hours;
  - identify construction traffic transport routes;
  - implement measures to minimise dirt tracked onto the sealed public road network from Project-related traffic;
  - ensuring loaded vehicles entering or leaving the Project Site have their loads covered or contained;
  - providing sufficient parking on-site for all Project-related traffic;

- responding to any emergency repair requirements or maintenance during construction and/or decommissioning;
- a traffic management system for managing over dimensional vehicles; and
- comply with the traffic conditions in the Development Consent;

- a driver's code of conduct that addresses:
  - travelling speeds;
  - fatigue management;
  - procedures to ensure that drivers to and from the Project Site adhere to the designated OSOM and Heavy Vehicle routes;
  - procedures to ensure that drivers to and from the Project Site implement safe driving practices; and
  - include a detailed program to monitor and report on the effectiveness of these measures and the code of conduct.

1.1.9.5 Bird and Bat Adaptive Management Plan

Prior to the commissioning of any WTGs, the Proponent will prepare a BBAMP for the Project in consultation with the BCD within DPIE, and to the satisfaction of the Secretary. This plan will include:

- a detailed description of the measures that would be implemented on-site for minimising bird and bat strike during operation of the development;
- trigger levels for further investigation of the potential impacts of the project on particular bird or bat species or populations;
- an adaptive management program that would be implemented if the development is having an adverse impact on a particular threatened or 'at risk' bird and/or bat species or populations;
- a detailed program to monitor and report on:
  - the effectiveness of these measures;
  - any bird and bat strikes on-site; and
- provisions for a copy of all raw data collected as part of the monitoring program to be submitted to the BCD within DPIE and the Secretary.

1.1.9.6 Biodiversity Offsets

This EIS contains a conservative calculation of the biodiversity offset credits required to address the impacts associated with the Development Footprint. Noting that the Project is subject to micro-siting,

detailed design, and potentially staging, the biodiversity offset credits are provided as indicative only, and are not presented as a proposed credit requirement.

As outlined in this EIS, the proposed Biodiversity Offsets Strategy (BOS) for the Project is to acquire and retire all ecosystem and species credits. The EIS outlines the Project's approach to achieve the required biodiversity offsets using the calculated biodiversity offsets according to the relevant legislation. The biodiversity offset credit liability will be recalculated using the BioBanking Credit Calculator for Major Projects (BBCC) during the period post-Development Consent based on the impacts of the final Development Footprint, once the detailed design is available. It is noted that if no FBA credits are available as matching credits in the market, credits calculated by the BBCC following assessment under the FBA will require determination of reasonable equivalent credits as determined by the current Biodiversity Offset Scheme under the *Biodiversity Conservation Act 2016* (BC Act), determined by the Biodiversity Assessment Method (BAM).

The Proponent is considering the proposed BOS for the Project and the final BOS to be delivered for the Project will include one of the following offsetting options under the FBA:

- Securing land (land-based offset)
    - Preliminary BOS assessment identifies some suitable offset lands and their potential biodiversity credit yield using available vegetation and habitat mapping and condition assumptions. Further investigation is required to refine and validate vegetation mapping to determine the offset potential for proposed offset lands to be chosen, however, the presence and area (ha) of equivalent vegetation communities indicates that land-based offsets will provide a viable mechanism to secure and retire the required biodiversity offset credits.
    - The final offset strategy, including the mechanism to provide for the long-term security of the offset area will be discussed and agreed upon between DPIE and the Proponent.
    - Once a suitable offset has been identified the following will be provided to DPIE:
        - Description of the proposed offset property
        - The mechanism proposed to secure the offset for biodiversity outcomes
        - Ecosystem credit summary
        - Species credits
        - Management actions to improve biodiversity values.
- Securing required credits through the open credit market, and/or
- Payments to the Biodiversity Conservation Fund (established under the BC Act). One of the key functions of the NSW Biodiversity Conservation Trust (BCT) is to secure land-based offsets on

behalf of developers who pay into the Biodiversity Conservation Fund (BCT, 2018). Through this process the BCT is able to combine offset obligations and funds to establish strategic, larger and more viable offset sites in NSW (NSW Government, 2018).

1.2 Wind Turbine Generators

The global WTG market continues to develop rapidly with a trend towards larger, higher capacity factor WTGs, enabling a lower levelised cost of energy. Market trends and forecasts from WTG manufacturers indicate that WTGs entering the Australian market in 2021 will rise to up to 240-250 m from the ground to upper blade tip. The Project is therefore designed to accommodate a contemporary WTG of up to 250 m in height varying in generation capacity. By way of example, the Vestas V126 3.6 MW machine as installed at Sapphire Wind Farm near Inverell, NSW was the largest WTG in Australia in 2016 standing at a tip height of 200 m and is expected to be superseded by larger models by 2021.

The WTGs will be three-bladed, semi-variable speed, pitch-regulated machines with the rotor and nacelle mounted on a tower with an internal ladder or lift. The WTGs would be installed at final locations to be confirmed within a 100 m micro-siting buffer of the proposed locations identified in Appendix D.

The EIS assumes a rotor of 170 m diameter, however the actual rotor selected may be larger in size, depending on the model of WTG selected. Similarly tower heights vary across a range of WTG models, and while it is expected that the selected model would have a tower (hub) height of between 125 and 166 m, this may vary.

Figure 1-9 below displays a picture of the 200 m tall WTGs installed at Sapphire Wind Farm, detailing the component parts.

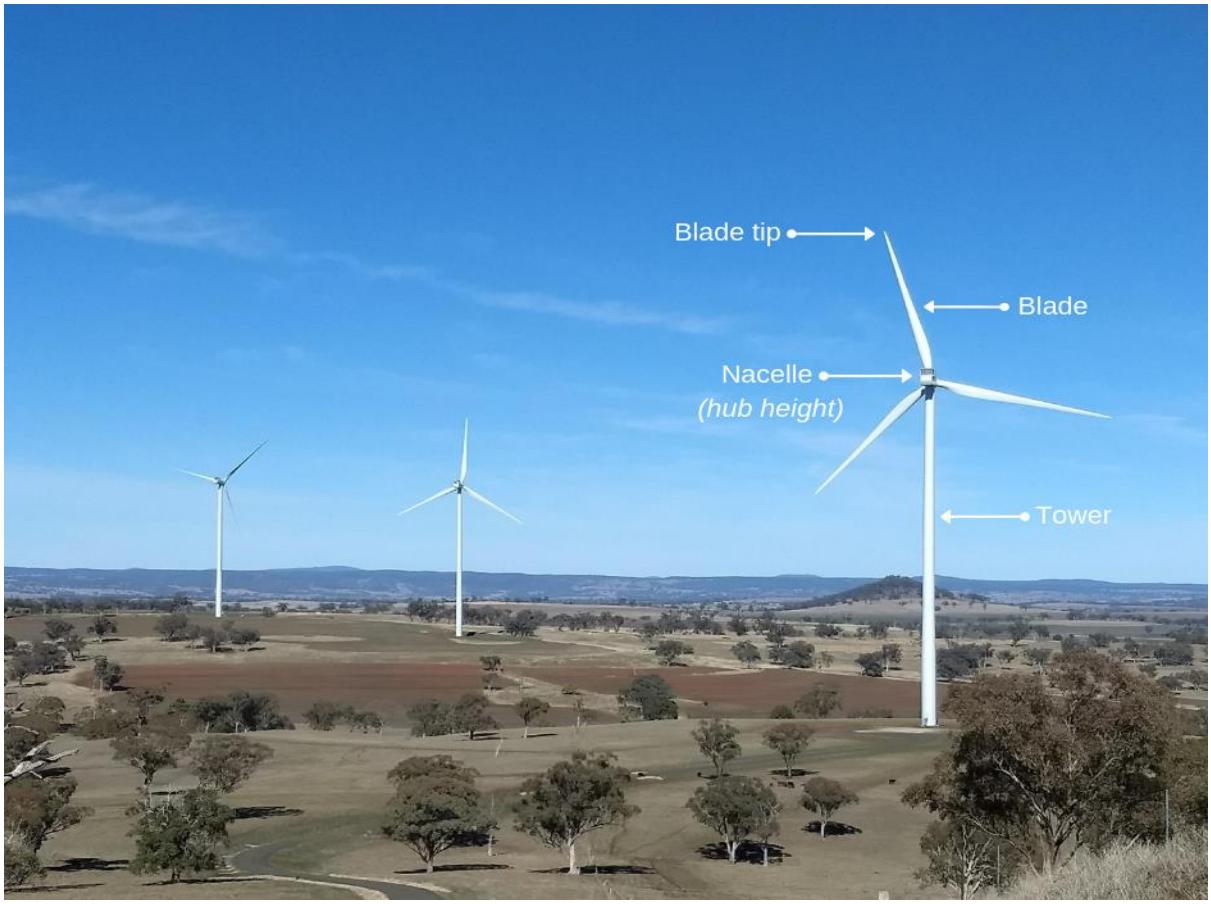

Figure 1-9: Components of a WTG as shown at Sapphire Wind Farm

1.2.1 Foundations

Two types of foundation for the WTGs will be considered pending geotechnical investigation of the ground conditions across the Project Site. The following examples are based on a typical foundation design, but final WTG selection and geological surveys will dictate which is to be used.

Slab (gravity) foundations involve the excavation of ground material to a depth of approximately 2.5 m (subject to geotechnical surveys). Once poured and cured, a foundation is backfilled with material excavated from the same location with any excess fill material made available for reuse on-site. Slab foundations involve the installation of shuttering and steel reinforcement, followed by the pouring of concrete (refer to Figure 1-10 (left) for an example of a conventional gravity foundation).

If slab plus rock anchor foundations are required, the construction of the foundation for each WTG would involve the excavation ground material plus drilling of rock anchor piles to a depth determined by geotechnical surveys. Refer to Figure 1-10 (right) for an example of a conventional rock anchor foundation).

Figure 1-10: Typical gravity (left) and rock anchor (right) foundations

It is necessary for detailed geotechnical surveys to be carried out pre-construction to determine the foundation type per WTG. It is feasible that more than one type of WTG foundation may be required for the Project, which will be determined during the detailed design phase following the assessment of the individual WTG locations. New WTGs are continually entering the market and it is possible that variations to these conventional foundation designs could occur prior to final WTG selection.

The excavation required for both types of foundations will be approximately 27m x 27m and would be undertaken by mechanical equipment and may require low-level blasting where firm rock is encountered. Blasting would be undertaken by qualified personnel subject to relevant statutory requirements and approvals, and in accordance with relevant guidelines for blasting in proximity to neighbouring dwellings.

1.2.2 Towers

The supporting tower structure of a WTG is typically comprised of a reducing cylindrical tower made out of either a welded steel shell or a concrete steel hybrid, fitted with an internal ladder and lift. A range of tower heights are under consideration with the final selection subject to competitive tender. Typically, towers to accommodate the proposed maximum blade tip height of 250 m have base diameters of 6 m and 3 m at the top. Conventional towers will typically be manufactured and transported to the Project Site in four to seven sections for on-site assembly (refer to Figure 1-11 or an example of a typical WTG tower including nacelle). Atop the tower sits the nacelle to which the hub is mounted, and the three blades are attached to the hub. For the purposes of this EIS, the centre point of the hub height is considered equal to the tower height. The Project is designed to include a hub height of 125 – 166 m.

Figure 1-11: Example of a WTG tower with the nacelle mounted at Sapphire Wind Farm

1.2.3 Nacelle

The nacelle is the housing constructed of steel and fibreglass (refer to Figure 1-12 for an example of a typical nacelle) that is mounted on top of the tower and is typically around 15 – 18 m long, 4.5 m high and 4.5 m wide (depending on the WTG model). It encloses the gearbox, generator, transformers (model dependant), motors, brakes, electronic components, wiring and hydraulic and lubricating oil systems. Weather monitoring equipment located on top of the nacelle will provide data on wind speed and direction for the automatic operation of the WTG. CASA require the Project to install aviation hazard lighting on WTGs at an intensity not lower than 200 candelas. The amount required, their locations across the layout, and their operating conditions will be confirmed through an Aviation Hazard analysis undertaken in consultation with CASA post-Development Consent..

Figure 1-12: Example of a nacelle for a 3.6 MW WTG at Sapphire Wind Farm

1.2.4 Rotor

The WTG rotor drives the generator within the nacelle producing electrical output. In general, a larger rotor enables greater generation capacity, however site-specific wind conditions influence the rotor selected for installation at any given wind farm.

WTGs of the size considered in this EIS begin to generate energy at wind speeds in the order of 3.5 to 4 metres per second (m/s) (13 kilometres per hour (kph)) and shut down (for safety reasons) in wind speeds greater than 25 m/s (90 kph). WTG blades are typically made from glass fibre reinforced with epoxy or plastic attached to a steel hub and include lightning rods for the entire length of the blade. The blades typically rotate at about 12 revolutions per minute (rpm) at low wind speeds and up to 18 rpm at higher wind speeds.

The Project is designed to include rotors of approximately 170 m with an individual swept area of approximately 22,698 m^2. (i.e. 2,201,706 m^2 for 97 WTGs of rotors this diameter). However, it is possible that larger rotors will be required depending on the specifications of blades on the market at the time of construction. If so the selected WTGs would remain within the 250 m tip height envelope and overall swept area for the Project would not exceed the limit identified and assessed in Table 1-1, which would be achieved with the installation of fewer WTGs.

1.2.5 Blades

Blade lengths of 73.5 m in a single piece construction are currently in production, however longer blades can be expected as WTG technology develops further and especially with the introduction of multi-piece blade construction. Multi-piece blades will greatly improve transport logistics and reduce traffic and transport impacts. Whether the Project installs single or multi-piece blades is dependent on detailed design and the Project's engineering and procurement processes which will not be undertaken until after the Project would receive Development Consent. To allow for the advancements in available blade lengths within the assessed impacts, this EIS has used a blade and hub section, that makes a rotor of 170 m in diameter. An example of a single piece blade at the Sapphire Wind Farm is shown in Figure 1-13.

Uppermost blade tip comprises the highest point of the WTG when in a vertical position. Recent advances in WTG technology have meant that WTGs with blade tip heights of 200 m are currently operating in NSW with larger WTGs of 250 m available for the market. Lowermost blade tip refers to the height between the ground and the lowest point of rotor when in operation. This EIS conservatively assumes a lowermost blade clearance of 40 m above the ground based on a 170 m rotor installed on a 125 m tower.

Figure 1-13: A single piece blade approximately 62 m long at Sapphire Wind Farm

1.2.6 Generator Transformer

WTGs produce electricity at low voltage which is then stepped up to medium voltage (33 kV or greater) by a transformer located in either the nacelle, within the base of the tower, or adjacent to the base of the tower on a concrete pad. Figure 1-14 shows an example of a transformer located outside of the tower. The footprint of the transformer is marginal as it would sit on the WTG footing and/or the hardstand assembly area.

Figure 1-14: Example of a generator transformer located outside of the tower at Boco Rock wind farm

The generator transformer may be oil-filled or a dry type depending on the WTG. Where oil-filled transformers are used, appropriate measures will be incorporated to prevent any oil loss and contain any spill within a bunded area. The volume of oil used for generator transformers is in the order of 1,000 litres (L). The output from each of the WTGs will be directed via medium voltage (33 kV or greater) underground and overhead transmission lines that link to the Substations or ESF.

1.3 Energy Storage Facility

An ESF forms part of the Project which would consist of infrastructure designed to store and discharge energy. Storage of energy can add significant benefits to renewable generation because it allows for the dispatch of energy in accordance with market demand and overcomes potential issues associated with intermittency of output. The electrical capacity of the ESF has been considered nominally as 150 MWh as an indicative capacity but it is not intended as an upper limit.

The technology used (i.e. the type of energy storage) is not yet decided and the most commercially suitable type will be deployed for use in the Project depending on the detailed design and financial

modelling process. A range of technologies have been considered, including lithium-ion, lead acid, sodium sulphur, sodium or nickel hydride, electrochemical technology (i.e. flow batteries), cryogenic storage and compressed air.

The ESF will consist of buildings, shipping containers, or other infrastructure and will connect to the WTGs and Substations via underground and/or overhead cables.

Possible stand-alone locations of the ESF have been identified on Figure 1-2 and assessed within this EIS. One or more of these locations may be utilised for optimal construction and operation of the Project. Section 8.6 of the EIS includes an assessment of hazards and risks associated with the Project, including ESF technology. The ESF will have a suitable fire detection and suppression system based on the most appropriate for the technology (e.g. Novec 1230 or equivalent for lithium-based batteries). Security fencing, lighting and a 20 m asset protection zone (APZ) will be incorporated into the final design layout if battery-based storage technology is used.

1.4 Ancillary Infrastructure

Ancillary Infrastructure refers to all wind farm infrastructure with the exception of WTGs and ESF, including Substations, O&M compounds (including offices and car park), underground and overhead electricity transmission lines, permanent Meteorological Masts, hardstands and Internal Roads.

1.4.1 Substations

Substation infrastructure will be required to collect the internal electrical reticulation to increase the voltage for transmission to connect to the grid. This may be constructed as a stand-alone facility or as a combined facility co-located with other compounds at any or each of the locations shown in Figure 1-2. It will include electrical componentry and buildings designed to appropriate industry standards and will include security systems to exclude people and livestock such as fencing and external lighting. The Substation auxiliary equipment may be powered by a low voltage distribution line from the local distribution network if feasible. The electrical infrastructure has been designed to minimise the visual impact of the Project by siting the infrastructure away from residences and surrounding public viewpoints as far as practical whilst maintaining the practical and operational needs of the infrastructure.

Substation locations have been chosen to minimise access distance and electrical losses, and to reduce their visibility from surrounding public viewpoints (see Figure 1-2) and optionality is included in the design because the Substations configuration, location and final layout will be developed in

consultation with the Network Service Provider (TransGrid) during detailed design (although some consultation has occurred already). A detailed electrical design will be undertaken by an appointed contractor and delivered in accordance with relevant electrical standards in consultation with TransGrid and other relevant authorities. Three potential locations have been identified for the Substations, which are at a minimum distance of 2 km from any nearby residences. Following construction, and if warranted, raised earthwork perimeters and / or small areas of native tree planting may be undertaken to screen any parts of the Substations that are visible from sensitive receptors based on the results of the relevant impact assessment. Emergency backup power for the Substations will be supplied by an on-site diesel generator and/or batteries to maintain network communications and electrical protection capability.

The Substations will occupy an area of up to approximately 220 m by 160 m or 3.52 ha. The potential locations assessed for the Substations have considered the provision for a 20 m APZ surrounding the infrastructure and a 3 m high security fence.

The typical substation arrangement will include step-up transformers, an array of cable marshalling, busbars, switchgear and protection, various voltage and current transformers, operation and facilities building with parking, communication facilities and tower, diesel generator, lighting, a buried earth grid, lightning masts, power conditioning equipment, a reactive power control system, and other network equipment as agreed with TransGrid. The Substations will require a standalone power supply from either the local distribution network, or an on-site generator. The ground surface within the Substations enclosure will be covered partly with a layer of crushed rock and partly by concrete slabs. As the transformer(s) may each contain a significant volume of oil, provision will be made in the design for containment of any oil that may leak or spill from the transformers (potential impacts are discussed further in the EIS Section 8.9.3 and Section 8.10.3). This would involve constructed concrete bunds around each transformer and a spill oil retention basin or oil / water separator.

1.4.2 Operations and Maintenance Compound

One or more O&M compounds will be established for the day to day operation of the Project and would take up an area of approximately 100 x 100 m or 1 ha (at the indicative locations shown in Figure 1-2 as ‘Site Compounds’). Three potential locations for the compounds have been identified in Figure 1-2, with construction access only via Twelve Mile Road (with exceptional considerations discussed in Section 0) and operational access from Uungula Road or Ilgingery Road. Each O&M compound may include lay down areas, site operations facilities and services buildings, workshop, storage, parking and other facilities for operations staff (see Figure 1-15 and Figure 1-16; Figure 1-17

shows an indicative layout). The buildings of the operations compound will house office space, toilet, kitchen, communications equipment, meeting room and routine maintenance stores.

Figure 1-15: Sapphire Wind Farm O&M compound (foreground) shown in front of the 33 kV substation (aerial view)

Figure 1-16: Sapphire Wind Farm O&M compound ground level view

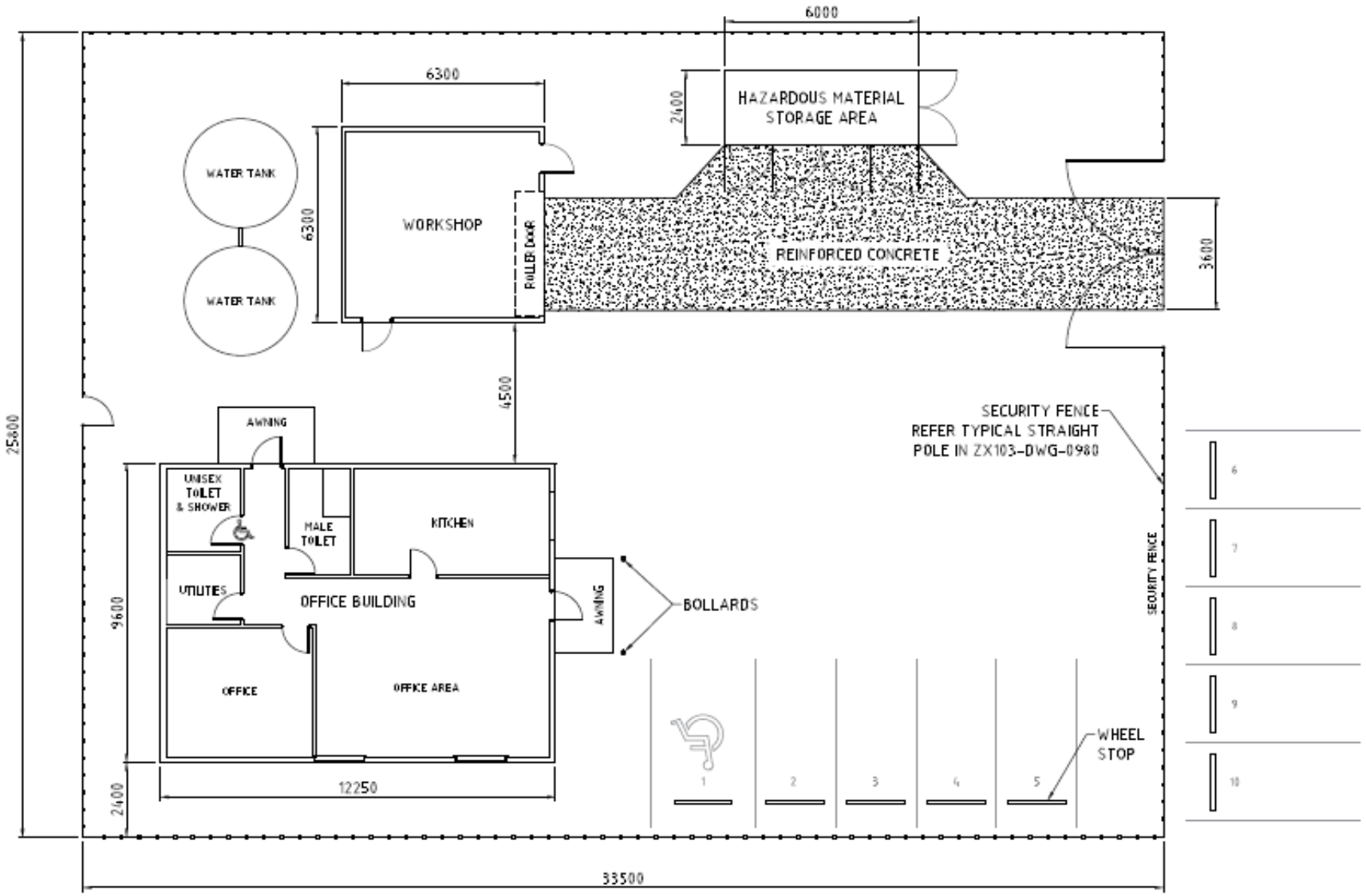

Figure 1-17: Typical O&M facility layout

1.4.3 Transmission Lines

A series of underground and overhead transmission lines and optic fibre cables are proposed to facilitate the transfer of energy and communications between the WTGs and the substation(s) and then finally to the grid connection point at the existing 330 kV transmission line(s) running in approximately east-west located within the northern part of the Project Site as shown in Figure 1-1. The electricity produced by each WTG is typically generated at low voltage, but transformed from low voltage to medium voltage by a transformer generally located within or adjacent to each WTG.

Sections of the proposed overhead transmission lines may need to be placed underground subject to local conditions and design functionality and conversely sections of the proposed underground transmission lines may need to be placed overhead subject to local conditions and final designs and design functionality. The typical easements for the various overhead and underground lines vary depending on voltage and are shown in Table 1-6. Voltages ranging from 33 kV to 330 kV may be constructed in single or double-circuit configurations depending on the WTG selected for the Project and any staging considerations.

1.4.3.1 Overhead Transmission Lines

Overhead transmission lines (and the poles/towers supporting them) vary in height depending on the local topology, conductor selection, operating voltage and span length along with other design considerations. Typical dimensions values are shown in Table 1-6 although final figures may deviate from these typical figures depending on site constraints, operational and functional parameters. The Project is working closely with landowners to ensure impacts of overhead transmission lines are mitigated where possible. The required easement width may vary due to terrain and alignment, such as to accommodate sharp changes in direction. Figure 1-18 and Figure 1-19 show the typical overhead transmission line configurations which could be constructed for the Project.

Table 1-6: Indicative transmission line specifications

Voltage	Approximate Easement Width	Approximate Height of Pole/Tower	Typical Span Distance (Pole to Pole)
330 kV	60 m	35-50 m	200 – 300 m
132 kV	45 m	35-50 m	200 – 300 m
66 kV	30 m	30 m	150 – 250 m
33 kV	30 m	20 m	150 m

Figure 1-18: Double-circuit overhead 33 kV transmission line

Figure 1-19: Example of double-circuit overhead 330 kV transmission line adjacent to a new single-pole substation tie-in

New transmission poles/towers will be predominately of timber, steel or concrete construction with composite or porcelain insulatorsFinal details of pole numbers, spacing and location to be determined during the detailed design phase. Overhead transmission lines will be demarcated for aviation safety using orange marker balls or similar visible demarcation (to the extent permissible for functional reasons and within operational parameters).

1.4.3.2 Underground Transmission Lines

The underground electrical cables will often follow the general layout of the Internal Roads because by their nature they link all the Project elements together (like the Internal Roads), however they may not be directly adjacent to the Internal Roads due to design and construction efficiency. They will be located during the period following engineering, procurement, and construction (EPC) contract tendering and award when detailed design is undertaken according to the micro-siting criteria. Underground cables will be laid in accordance with the relevant standards and specifications at the time of construction, with the typical depth of approximately 0.9 m as shown in Figure 1-20. The cables will be trenched or dug, installed and backfilled (refer to Figure 1-21).

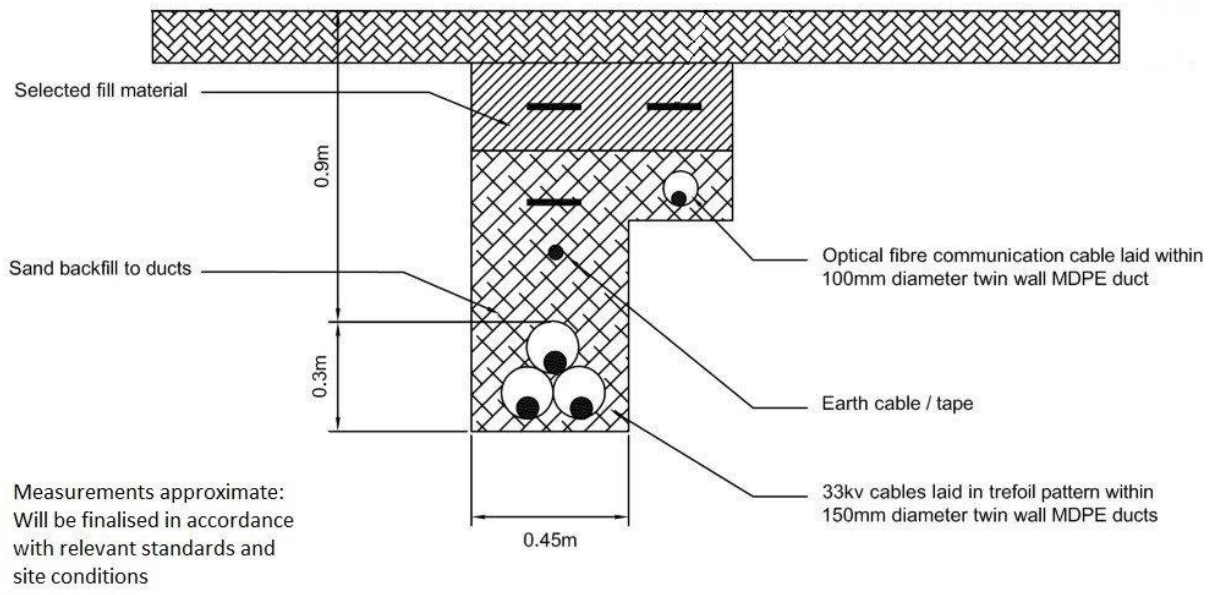

Figure 1-20: Indicative cable trench design[3]

[3] Indicative design only.

Figure 1-21: Laying underground transmission line within the road network

For the purposes of this EIS, an electrical design has been prepared which considers the expected transmission line impacts of the Project. This EIS is based on the largest likely separation distance between the Substations and the existing 330 kV transmission line and therefore the longest likely 330 kV overhead easement. The final electrical layout will minimise vegetation clearing and avoid potential erosion and heritage sites, and will also depend on the ease of excavation, ground stability and cost.

Underground transmission cables (including control cables and earthing (refer section below)) crossings of watercourses will be designed and constructed considering:

- Managing Urban Stormwater: Soils and Construction (Landcom, 2004) manual, or its latest version;
- Controlled activities on waterfront land – Guidelines for watercourse crossings on waterfront land (DPI Water, 2012); and
- Controlled Activities: Guidelines for laying pipes and cables in watercourses on waterfront land (DPI Water, 2012).

1.4.3.3 Control Cables and Earthing

Computerised controls within and between the WTGs, the ESF, Substations and the O&M compound(s) automatically control the Project. Recording systems will monitor wind conditions and energy output at each of the WTGs and ESF. Remote 24 hr monitoring and control of the Project will

also be employed. Control cables will consist of optic fibre, optical ground wire, twisted pair or multi-core cable and will be located underground within the clusters of WTGs or attached to the overhead transmission lines. No additional impact is considered as the cabling will be paired with the transmission lines. The installation of buried earthing conductors and electrodes will also be required throughout the project. These earthing conductors are often installed in the same trench as other cables to minimise project disturbance. Final locations of earthing conductors will be defined during detailed design..

1.4.4 Permanent Meteorological Masts

Approximately six permanent Meteorological Masts, up to hub height of the WTGs, will be installed on-site. The purpose of these masts is to provide necessary information on the performance monitoring of the WTGs. The permanent Meteorological Masts would be of a guyed, narrow lattice or tubular steel design with concrete footings of approximately 4 m^2 for the mast and guy wires. Guy wires may extend beyond 100 m from the base of the Meteorological Mast. Figure 1-22 shows both typical Meteorological Masts designs.

Figure 1-22: Tubular (left) and lattice (right) wind monitoring masts

Locations for these masts are yet to be determined and will be influenced by the final WTG selection. For functional reasons they must be near to a selected few WTGs but separated from those WTGs by a distance allowing accurate wind measurements. To overcome those separation requirements and select locations for the Meteorological Masts that provide the functionality required the masts and the guy wires that secure them may need to be located outside of the Development Corridor, however they will remain within the Project Site. The mast locations will be identified on the post-Development

Consent plans provided to the Secretary (whether prior to, or during construction of the Project), with coordinates also provided to the relevant aviation authorities prior to their erection, and 'as built' locations confirmed to those authorities within one month of the installation of any permanent Meteorological Mast. The top 1/3 of the Meteorological Masts will be painted in alternating colour banding (typically red and white but may vary depending on industry standards and practices).

Permanent Meteorological Masts will require a low voltage cable connection for power and a communications cable to be laid. The trench required for this will be approximately 1 m in width and would come directly from the closest WTG.

1.4.5 Hardstands

Hardstands are required adjacent to each WTG location for the assembly, erection, maintenance, repowering and/or decommissioning of a WTG. Indicative hardstand dimensions are 50 m x 40 m, however, is likely to vary dependent on detailed design, topography, construction methods and chosen WTGs. Hardstands will be surfaced with pavement material to required load-bearing specifications, maintained throughout the construction and operational life of the Project and used principally for construction and periodic maintenance of the Project. Surrounding the hardstand is an area of disturbance included in the Development Footprint which is not a hardstand area but will be used for WTG component laydown and crane structure assembly (among other WTG erection and construction related activities) as well as cut and fill. Figure 1-23 shows a typical hardstand area adjacent to a WTG footing.

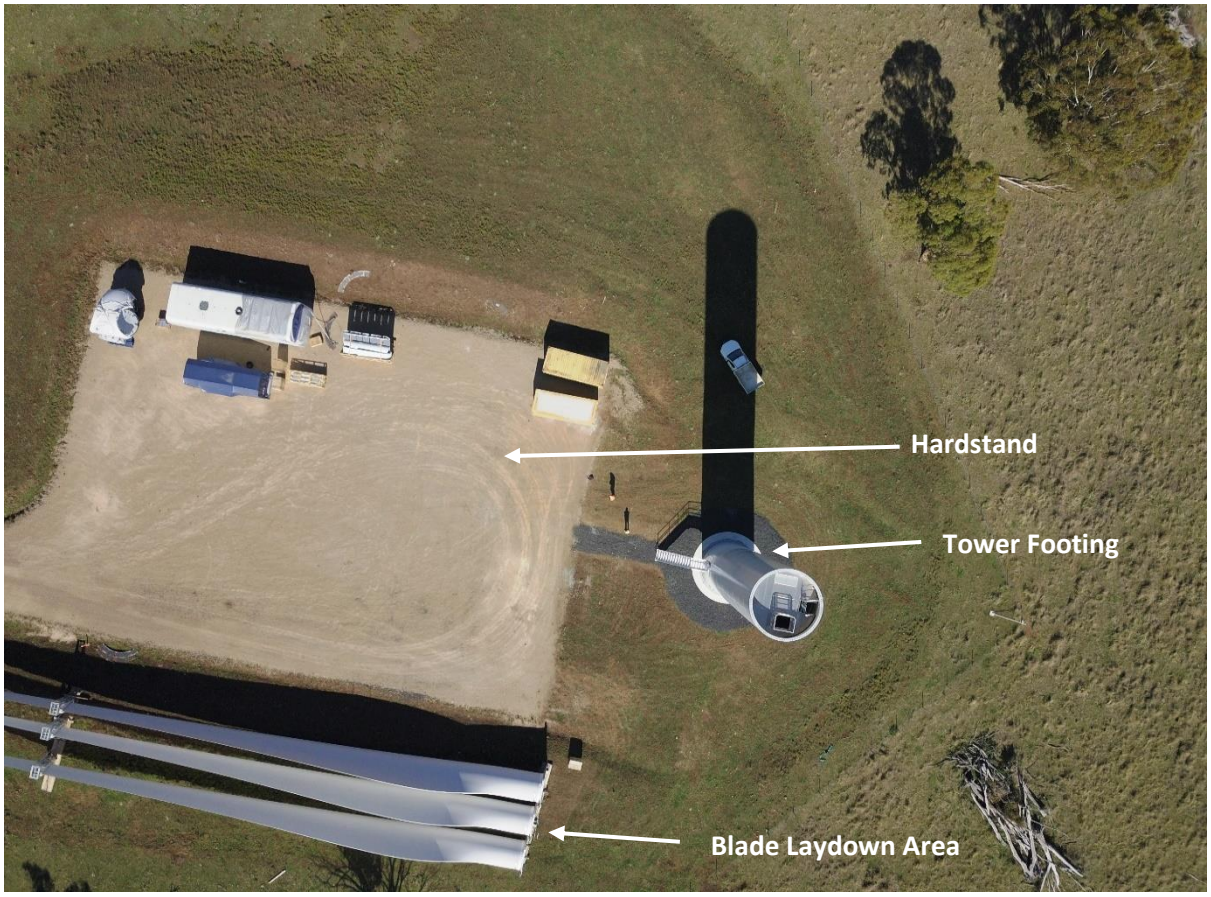

Figure 1-23: Hardstand, tower footing and blade laydown area at Sapphire Wind Farm

1.4.6 Internal Roads

Internal Roads will be established within the Project Site for the construction, operation, repowering and/or decommissioning of the Project, from the public road access locations, WTGs, the ESF, Substations and other permanent and Temporary Facilities. Internal Roads have been planned to follow existing farm tracks where practicable and have an approximate pavement width of 6 m, in addition to an adjacent drain and cut and fill batters. All Internal Roads will require a full or partial upgrade to accommodate the construction traffic loads, as well as for maintenance purposes during operation. Access to the Project Site on Project roads would be restricted from public access. The indicative internal road network is approximately 90 km in length (refer to Figure 1-2).

Construction of the internal road network will require earthworks for safely transporting Project components into position. Preliminary civil engineering designs have been created to inform the area-based impact assessments (such as in the EIS Biodiversity Section 8.4). Detailed civil engineering designs will be prepared following contract award to the chosen EPC contractor for the Internal Roads network, cut and fill batters and embankments to stabilise the Internal Roads as well as drainage

structures and suitable erosion and sediments control structures. Some steep sections of Internal Roads may need to be surfaced with asphalt to enable haulage of heavy WTG components.

Small culverts may also be required to be constructed where internal access roads cross streams. The location of the proposed waterway crossings are set out in the EIS Appendix E.

Detailed design and construction requirements of the road crossings of waterways (where required) will be undertaken post-Development Consent in consideration of:

- Managing Urban Stormwater: Soils and Construction (Landcom, 2004) manual, or its latest version;
- Policy and Guidelines for Fish Friendly Waterway Crossings (NSW DPI, 2004); and
- Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull and Witheridge, 2003).

1.4.7 Other Permanent Ancillary Infrastructure

1.4.7.1 Utility Services

The Project will be connected to TransGrid's transmission network and when not generating will draw a minor amount of electricity from the grid. Backup and emergency power at the Substations may be supplied by a local distribution line, on-site batteries and/or a standalone diesel generator. Two separate and independent telephone communications facilities (e.g. optic fibre and microwave or mobile phone) will be required to be installed between the Substations as required by the AEMO to enable safe remote monitoring and control of the Project. Mobile telephone coverage is available on most of the ridgelines and plateaus with limited or no service available on the majority of the valley floor. Although the Project will not rely on this form of communication, it can be assumed that members of the construction, operation and maintenance teams will communicate using both mobile telephones and radios.

Operational water requirements will be provided to the proposed facilities and auxiliary services building from a storage tank designed to collect water from roof drainage and augmented by potable water delivered by tankers. An approved septic system or composting system will be installed to treat minor quantities of wastewater, subject to securing the relevant authorisation. The Proponent will be responsible for classification and removal of all other wastes from the Project Site to an approved landfill facility.

1.4.7.2 Signage

Traffic signage required as part of traffic safety during construction will be installed by the contractor, in compliance with relevant regulations and in accordance with any permits obtained for traffic management.

Signage will be erected at critical locations from the outset of construction, directing all vehicles associated with the construction site to the Project Site office. Additional signage would be located close to the Project Site, providing information about the Project, the companies involved and essential safety information and telephone numbers.

Consultation with Dubbo Regional Council and Transport for NSW will be initiated to determine final signage locations.

1.5 Temporary Facilities

Temporary Facilities will consist of site offices and compounds, rock crushing facilities, concrete or asphalt batching plants, stockpiles and materials storage compounds, Temporary Field Laydown Areas, minor 'work front' construction access roads and temporary Meteorological Masts. The location of Temporary Facilities is described in the following subsections.

Areas used for Temporary Facilities will be removed and rehabilitated to pasture if not part of the permanent Project infrastructure except in the case that the host landholder requests they remain in situ. The Project will obtain agreement with the landholder that they accept the responsibility for the infrastructure including ongoing maintenance so as to not create unsafe, unstable, or polluting infrastructure.

1.5.1 Site Offices and Compounds

The construction phase will require temporary infrastructure such as portable field offices, toilet facilities and parking bays within the temporary construction compound locations. Arrangements will be made for power and communications at the site office during the construction period. Temporary construction compounds will be typical of that used at construction sites; noting they will not include accommodation facilities. Three potential locations for construction compounds have been initially identified in Figure 1-2, all with access directly from Twelve Mile Road, Uungula Road or Ilgingery Road.

Alternative locations may be sought subject to project staging detailed design and construction programming. If alternative locations for any of the temporary site offices and compounds are sought, then the selection criteria for Temporary Facilities will be considered to determine suitable locations. The final locations will be determined in accordance with the Development Consent conditions and subsequent management plans and shown on the Final Layout Plans.

Main temporary site office facilities will be approximately 75 x 75 m located within the construction compound area of approximately 150 m by 200 m, a combined area of approximately 3 ha (an example layout is shown in Figure 1-24). The area will be fully fenced with sufficient access to allow vehicle movement, storage of materials and containers, and office facilities. An area approximately 100 m x 100 m will be retained for permanent use during the life of the Project as an operations compound which will include a site office, workshop, storage, parking and facilities for operational staff. Building fit-out will include power, lighting, air-conditioning, security, fire detection, and communication systems as required.

A small portable field office (or offices) may be required at the main site entry for a brief period at the commencement of construction to act as a temporary facility until the main site entry intersection on Twelve Mile Road is complete, and until the main internal access road is established to link that entry point and the temporary construction compound further south east into the Project Site. The same may be required on the northern side of Twelve Mile Road when the intersection and access road are being constructed between Twelve Mile Road and the existing 330 kV transmission lines. The timing of constructing the intersection and main access roads on either side of Twelve Mile Road may or may not be concurrent depending on the detailed design and construction programming. Similarly, a small portable field office (or offices) may be required adjacent to the Substations, should contracting arrangements dictate that two (or more) main contractors are appointed to build the wind farm infrastructure separate to the Substations. Furthermore, portable temporary offices and amenities will be required at construction work fronts. These areas are not shown on Figure 1-2 as their location is uncertain however they will remain within the Development Corridor. Therefore, flexibility is sought to allow for all portable field offices described to be established.

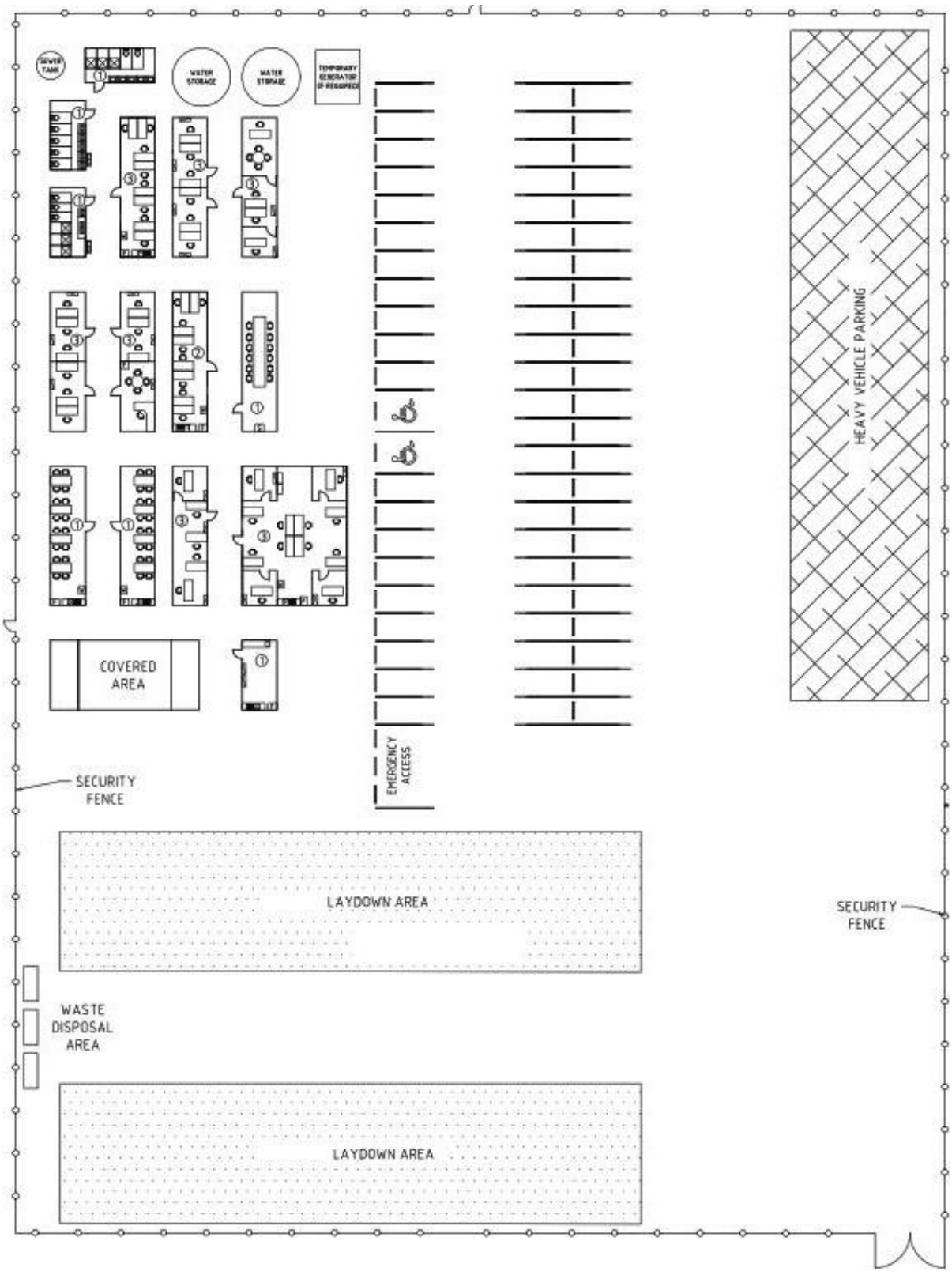

Figure 1-24: Example wind farm construction site offices and compounds

1.5.2 Rock Crushing and Concrete or Asphalt Batching Plants

Temporary rock crushing and concrete or asphalt batching plants are proposed to process aggregate and concrete for the WTG foundations, electrical infrastructure and Internal Roads, as well as asphalt if required for Internal Roads. Following detailed geotechnical site investigations and the final Project layout, accurate estimates of materials to be processed by these facilities will be calculated. If the extraction and processing thresholds exceed Schedule 1 of the *Protection of the Environment Operations Act 1997* (POEO Act), an Environmental Protection Licence (EPL) will be obtained from the EPA for the operation of rock crushing or concrete batching facilities.

A typical on-site concrete batching plant facility would occupy an area of approximately 100 m by 100 m and likely consist of a trailer-mounted concrete mixer, cement bins, sand and aggregate stockpiles and a storage container for various equipment and tools. Similarly, an on-site asphalt batching plant facility would occupy an area of approximately 50 m by 100 m and likely consist of a plug-mill mixing chamber, aggregate dryer, bitumen tanks, aggregate bins and a storage container for various equipment and tools. A rock crusher would occupy an area of approximately 50 m by 100 m and consist of a tracked mobile crushing unit, conveyor belts, feeder and engine. Each facility is sized for the use of front-end loaders, delivery of materials and entry and exit of vehicles and have sufficient storage are for materials for five days batching.

Suitable locations for such facilities are not identified as they will be dependent on detailed design and construction programming. Their locations will be selected in accordance with the Development Consent, giving consideration to noise, amenity, biodiversity, traffic management and heritage. Specific operational requirements have been identified in the relevant EA and further managed via the construction environmental management plan. Some temporary rock crushing may occur throughout the Project Site using mobile plant if required following excavation of rock material to reuse in the immediate area and maximise construction efficiency.

1.5.3 Stockpiles and Materials Storage Compounds

Stockpiling of materials will be undertaken to maximise construction efficiencies and minimise waste being exported from the Project Site. Stockpiles will be established and utilised adjacent to excavations for WTG foundations, Internal Roads, compounds and laydown areas for the duration of construction. Stockpile and storage requirements have been identified in the relevant EA and are further managed via the construction phase environmental management documentation and plans. Fuel is typically stored in double bunded trans tank at the construction compound and trucked to plant in the field.

1.5.4 Laydown Areas

Laydown areas may be required adjacent to WTG locations, site compounds and Internal Roads for the storage and assembly of WTG components and equipment. The use of laydown areas can reduce the logistical complications of just-in-time deliveries and reduce traffic impacts by de-coupling the WTG component delivery timeframe from the erection schedule. Hardstands and crane or equipment assembly areas will be used wherever possible to minimise impacts, however in some instances separate laydown areas will be required.

Temporary Field Laydown Areas are those where components may be placed on the ground in preparation for moving or relocating around the Project Site. These are not yet identified and will be dependent on detailed design and construction programming. They will be selected to best avoid environmental constraints identified in this EIS and will occur within the Development Corridor.

1.5.5 Minor 'Work Front' Construction Access Roads

Construction roads, tracks, or even Light Vehicle movements over farmland areas, may be required to facilitate some parts of the Project including, for example, the erection of overhead transmission lines, work front construction and maintaining environmental management measures. Construction roads that are not required for the ongoing operation and maintenance works of the Project they will be removed and rehabilitated on completion of the construction phase, and in accordance with landowner preferences and environmental controls.

1.5.6 Temporary Meteorological Masts

There are currently four temporary Meteorological Masts installed within the Project Site which are being used to collect data for the Project. Two are 60 m guyed tubular masts, one is a 100 m guyed lattice mast, and the last is a 160m guyed lattice mast. It is expected that additional temporary Meteorological Masts will be installed within the Project Site prior to the start of construction of the Project. The Proponent is seeking approval for the existing and future temporary masts installed at the Project Site as part of the Development Consent. The top 1/3 of the Meteorological Masts will be painted in alternating colour banding (typically red and white but may vary depending on industry standards and practices).

Up to two temporary Meteorological Masts, up to the hub height of the WTGs, will be installed for each permanent Meteorological Mast (approximately 12 in total) during the construction period to calibrate and verify the data collected from the permanent Meteorological Masts. These will be

installed at locations within the Project Site, usually (but not always) at a selection of proposed WTG locations ahead of construction. Final locations will be determined during detailed design and because they are usually located at proposed WTG locations, they are subject to the WTG micro-siting process. They are typically removed when construction of the WTG at that location is commenced.

Temporary Meteorological Masts will require a low voltage cable connection for power and a communications cable to be laid. The trench required for this will be approximately 1 m in width and would come directly from the closest WTG.

1.6 Project Phases

This section provides a description of the various phases of the Project lifecycle which would commence with the receipt of the Development Consent.

1.6.1 Pre-Construction

1.6.1.1 Detailed Design and Contract Development

Once all required permits and approvals have been obtained, secondary approvals will be acted upon including approval of the EMS and associated management plans, and application for an EPL and other relevant authorisations. A tender process will be undertaken in parallel to procure bids for the supply and installation of WTGs and the ESF, as well as design and construction of the Ancillary Infrastructure and Temporary Facilities. This process will consider each tenderer's record of environmental management and compliance performance to ensure that they are able to achieve the required specification of works.

Once the preferred contractors are selected, final construction and procurement contracts will be negotiated. The Project EMS, approved management plans and other permits or licences will be incorporated into the contract specifications for the construction works and equipment supply to ensure the Project is delivered in accordance with the Development Consent. The selected contractor will be required to adhere to the EMS, associated management plans and other permits or licences in addressing their component of the Project works.

1.6.1.2 Pre-construction Minor Works

Prior to the commencement of Construction, Pre-construction Minor Works will take place to further inform the detailed design and prepare the Project Site for construction and will involve the

establishment of some Temporary Facilities. Pre-construction Minor Works include the following activities:

- Surveys;
- Building/road dilapidation surveys;
- Investigative drilling, excavation or salvage;
- Minor clearing or translocation of native vegetation;
- Establishing temporary site office and compounds;
- Installation of environmental impact mitigation measures, fencing, enabling works, and Meteorological Masts;
- Flora and fauna investigations and pre-clearing surveys, inspections, specific habitat feature removal, and relocation;
- Establishing Project Site access points, minor access roads and minor adjustments to services/utilities, signage etc. including associated vegetation removal and heritage artefact salvage;
- Upgrading Twelve Mile Road and Project Site entries; and
- Intersection and road upgrades on the public road network.

1.6.2 Final Investigation Decision

When all Project contracts are agreed, and conditions precedents (which may include to conditions in contracts, the Development Consent, and finance arrangements) are satisfied, a Final Investment Decision will be made. At this point, all contracts will be contemporaneously executed, and the Project will move towards the construction phase.

During this period, site mobilisation activities may commence (or continue if already commenced under Pre-construction Minor Works) and extensive detailed design activities commence.

1.6.3 Construction Works

Construction works will commence following provision of detailed design inputs, which may be staged. Construction includes all physical works to enable the operation, including, but not limited to, the construction and installation of WTGs, construction and installation of the ESF, construction of Ancillary Infrastructure and establishment or construction of any Temporary Facilities which were not already established as part of the Pre-construction Minor Works.

1.6.3.1 Working Hours

Unless the Secretary approves otherwise, the Project will only undertake construction or decommissioning activities between:

- 7 am to 6 pm Monday to Friday; and
- 8 am to 1 pm Saturdays.

Notwithstanding works undertaken outside these hours may occur under certain conditions, for for emergency works, delivery of certain materials, in accordance with *Environmental Planning and Assessment (COVID-19 Development – Construction Work Days) Order 2020* or where agreement from the Secretary has been provided.

Certain activities will require work to be conducted outside normal work hours to prevent damage to concrete tower bases and trenches, to reduce the safety risk of open trenches and to reduce the risk of tower self-oscillation. Some examples of these activities include:

- **Concrete Pours:** Concrete work is to be carried out as a continuous process (once bases are prepared) for some 8-12 hours per base. This activity includes the operation of the concrete/asphalt batching plants. Weather conditions play a major role; the concrete can only be placed at temperatures between 5 and 35°C (specification) and not during rain periods. Once bases have been prepared it is essential that concrete is poured immediately to prevent any damage that may be caused by rain or prolonged exposure;
- **In-ground Electrical Works:** Once electrical trenches have been excavated it is important that cables are laid and trenches backfilled as soon as practicable so as to avoid damage to the trenches (and surrounding areas) due to exposure to the elements. Safety issues, for people, livestock and native animals, are reduced on early backfill of trenches; and
- **WTG Installation:** WTG Installation is intended to fit into the six-day working week. However, when erecting the tower, once the top of the tower is attached, the nacelle must go on without delay due to the risk of tower self-oscillation. Unfavourable weather can cause delays in mounting the nacelle. Continuing this work outside of standard construction hours will ensure that there is no risk to people, property and the surrounding environment from tower self-oscillation. The Project area is naturally a high wind area and as such Sunday work may be needed to make up for high wind days during the week.

The Proponent seeks approval to undertake construction activities outside the normal approved working hours without the approval of the Secretary, subject to the works meeting the following criteria:

- activities that are inaudible at non-associated residences;
- the delivery of materials requested by the NSW Police Force or other authorities for safety reasons;
- emergency work to avoid the loss of life, property and/or material harm to the environment; or
- in accordance with *Environmental Planning and Assessment (COVID-19 Development – Construction Work Days) Order 2020*.

1.6.3.2 Road Upgrades

With the exception of the OSOM vehicle transport route, the road upgrades will be undertaken prior to the commencement of construction to the satisfaction of the relevant roads authorities. The External Road Upgrades for the OSOM vehicle transport route from port of entry to the Project Site will be undertaken prior to OSOM vehicle transport (Table 1-4). Works will be undertaken by a suitably qualified contractor subject to the relevant authorisation. Site establishment and construction works may be undertaken in parallel with the road upgrades subject to preparation, approval and implementation of the TMP in consultation with the relevant road authorities.

1.6.3.3 Temporary Facilities

Construction of the Temporary Facilities will be undertaken during Pre-construction and Construction phases. Works will include the erection of temporary infrastructure such as a portable field office, toilet facilities and parking bays within the temporary construction compound, establishment of the rock crushing and batching plant facilities, stockpiles and materials storage as well as Temporary Field Laydown Areas. Arrangements will be made for power and communications at the site office during the construction period.

Temporary concrete or asphalt batching plant and rock crusher facilities will be established based on concrete pour optimisation to minimise vehicle movements, once the final Project layout is determined. Stockpiles, materials storage and laydown areas will be established to meet the needs of the final project layout to be constructed.

1.6.3.4 Ancillary Infrastructure

Internal Roads

Internal Roads, turning heads and hardstands will be established using heavy earthworks machinery (generally early in the construction program) to excavate the Internal Roads and hardstand areas to a depth determined under the relevant standards, prior to the laying of a compacted gravel. Material excavated on-site for WTG and compound foundations and internal road alignments will be crushed on-site and used for road base or aggregate subject to meeting the relevant functional specification.

Overhead Transmission Lines

Construction of the proposed overhead transmission lines requires the following works to be undertaken in accordance with an appropriate environmental management plan:

- site establishment including the provision of access;
- centreline surveying and service location;
- easement preparation, including the lopping and / or removal of trees;
- excavation and transmission pole erection; and
- conductor and earth wire stringing (including pilot wire).

Equipment to be used during line construction would typically include (but not be limited to):

- Semi-trailer for transportation of transmission poles, wires and other materials;
- 20 tonne crane;
- Pole borer;
- Wire spooler/brake;
- Telehandler;
- Dozer;
- Elevated work platform (EWP);
- Drone; and
- Concrete trucks.

Complex line construction methods including helicopter installation and blasting of transmission pole foundations may be required in areas of very complex terrain. However, the majority of the proposed overhead transmission line locations can be readily accessed during construction via cleared agricultural land, following negotiations with landholders. In some cases, track creation or enhancement may be required where access cannot be gained or is not considered adequate to support machinery utilised during the construction of the transmission line. A number of creek crossings may also be required to support the required machinery. Crossings not required for future maintenance activities will be decommissioned following the completion of construction works. Those

that are required for ongoing use during operations will be designed and constructed in accordance with relevant guidelines.

Underground Transmission Lines

During WTG and Electrical Compound base construction, the underground transmission lines would be installed. This would involve the cutting or excavation of trenches for the laying of the underground transmission lines that link the Project components. The general procedure for the laying of underground transmission lines will be as follows:

- preparation work, including installation of gates / temporary removal of fences, as required;
- use of an excavator or rock saw to dig a trench;
- material excavated is stored adjacent to the trench for subsequent back-filling;
- laying of bundled cables within a bed of protective sand;
- placement of tape warning of the presence of electrical cables at the required depth; and
- backfilling and consolidation of previously excavated material in accordance with engineering specifications.

All trenches would be marked with warning tape and backfilled once the cables were in-situ.

A number of creek crossings may also be required to support the required machinery. Crossings not required for future maintenance activities will be decommissioned following the completion of construction works. Those that are required for ongoing use during operations will be designed and constructed in accordance with relevant guidelines.

During construction, Temporary Field Laydown Areas will be positioned along the proposed transmission line route to store bedding sand and hard equipment such as transmission poles and cable drums. No fuel, oil or chemicals will be stored at these locations. Minimal clearing will be required for the construction of overhead transmission lines.

Other Electrical Infrastructure

The ESF and Substations will either be constructed as separate compounds, or as combined compounds. Clearing and excavations will be undertaken, and reinforced concrete foundations will be constructed to support electrical infrastructure and buildings. Infrastructure required within the yard will include transformers, switchgear, power conditioning equipment, energy storage technology, switch room, cabling, backup generators and other necessary infrastructure. The Substations will be designed and constructed in line with AS2067 and any other relevant technical, electrical and planning

standards. On-site trafficked areas would be limited to areas at the site entrance and surrounding the switch room and control building. The Electrical Compound areas would be finished with 20mm blue metal.

1.6.3.5 Wind Turbine Generators

Excavation of the WTG foundations will be undertaken to prepare the area for concrete pouring and WTG installation. Each foundation would be excavated, blinding layer of concrete placed, shuttering and steel reinforcement would be put in place and concrete poured to form the base in-situ. The upper surface of each base would finish approximately 0.5 m to 1 m below ground level with either a central reinforced concrete plinth to support the tower, or a base steel tower section set into the concrete.

If rock anchor foundations are required, the construction of the foundation for each WTG would involve less excavation. The rock anchor cores are drilled into the bedrock prior to concrete pour. The rock anchor tendons are grouted into place, stressed and secured once the concrete has cured sufficiently. Steel form shuttering and steel reinforcement would then be put in place and concrete poured to form the base in-situ. The upper surface of each base would finish at ground level with either a central reinforced concrete plinth to support the tower, or a base steel tower section set into the concrete.

The WTG components are delivered to the site progressively using OSOM truck and trailer combinations. Erection of WTGs is generally a two-stage process with the base and first two tower sections lifted into place. This generally takes one day to complete. Once this has been completed various minor works are undertaken before the remaining tower sections, nacelle, generator, hub and blades are lifted into place. This can take three days to complete depending on the prevailing weather conditions.

Both mobile cranes and tower crane methods are considered appropriate for this Project.

1.6.4 Commissioning

Pre-commissioning checks will be carried out on the high voltage electrical equipment prior to connection to the TransGrid transmission network. When the Project's electrical system has been energised, the WTGs and ESF will be commissioned and put into service. WTGs are commissioned sequentially enabling some WTGs to commence operation prior to the completion of wind farm construction. For the purposes of this EIS the commissioning phase is considered to commence during construction and will end once the final WTG and Electrical Compound has been fully commissioned.

1.6.5 Operations and Maintenance

Once operational, the Project would be monitored both by on-site staff and through remote monitoring. Aspects of the Project operation to be dealt with by on-site staff would include safety management (Figure 1-25), environmental condition monitoring, landowner management, routine servicing, malfunction rectification and site visits. Those functions to be overseen by remote monitoring include WTG and ESF performance assessment, Project reporting, remote resetting and maintenance co-ordination. Pro-active computer control systems monitor the performance of the WTGs and ESF ensure that any issues are dealt with by on-site staff or contractors, as appropriate.

Figure 1-25: Example of safety management for on-site staff

Maintenance staff will be on-site throughout the year, making routine checks of the WTGs, ESF and Ancillary Infrastructure on an ongoing basis. Major planned servicing would be carried out approximately twice a year on each WTG. Each major service visit would potentially involve a number of service vehicle (two technicians per vehicle) on-site. Maintenance staff will work within the O&M Compound and throughout the Project Site during normal operation.

On-site maintenance will require permanent access to the WTGs and ESF to address technical and mechanical servicing requirements. Replacement of major components, such as WTG blades, may

require the use of cranes and ancillary equipment. This can result in a WTG being offline for several weeks whilst the appropriate equipment and materials are sourced.

Management of regrowth and existing vegetation will be necessary within the overhead transmission line corridors to reduce the threat of fire and physical damage to the transmission line, and to allow access for maintenance vehicles. This will be carried out using mechanical, manual and chemical clearing methods prior to construction activities commencing and as part of ongoing maintenance activities for the duration of the Project.

Following construction of the overhead transmission line, maintenance will most likely be limited to yearly inspections in a 4WD vehicle to check the integrity of the transmission poles and other associated infrastructure. Occasionally, access by medium and heavy vehicles may be required to repair or maintain overhead transmission line components. Access will be gained via dedicated on-site Internal Roads within the overhead transmission line corridor.

Asset management is intended to be carried out by CWP Asset Management Pty Ltd ACN 143 399 179, unless commercial or other arrangements change. All Project and construction management will comply with the appropriate company's Quality Assurance System and EMS, or equivalent, ensuring that relevant procedures, statutory requirements and operational standards are met. The Substations and other elements of the connection infrastructure will be operated by TransGrid, and therefore separate operational EMPs will be prepared.

1.6.6 Repowering

After approximately 30 years of operation (or sooner if deemed economically viable) the Project may be repowered, utilising contemporary equipment. Repowering would extend the life of the Project for a further 30 years. Some or all of the Project equipment may be repowered depending on the economics at the time. Repowering would require the equivalent transportation and installation equipment and facilities used during the initial construction. Further details relating to repowering are outlined in Section 8 of the EIS.

1.6.7 Decommissioning

At the end of the operational life of the Project, all above ground infrastructure will be dismantled and removed from the Project Site. This may not include the connection infrastructure which may be essential to be retained. WTG tower bases would be cut back to below ploughing level or topsoil built

up over the foundation to achieve a similar result. The land will be returned to near prior condition and use. A compressor and rock crusher may be needed to carry out the cutting work.

Internal Roads, if not required for ongoing farming purposes or fire access, would be removed and the Project Site reinstated as close as possible to its original condition and use. Access gates, if not required for farming purposes, would also be removed. Individual landowners will be involved in any discussion regarding the removal or hand-over of infrastructure on their property.

The underground transmission lines are buried below ploughing depth and contain no harmful substances. Further, removing them would involve further unnecessary vegetation disturbance. Accordingly, they would be left in the ground and only recovered if economically and environmentally viable. Terminal connections would be cut back to below ploughing levels.

All decommissioning work would be the responsibility of the Project owner and provision for this has been included in the lease arrangements agreed with the landowners. Further details relating to decommissioning are outlined in Section 8 of the EIS.

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