APPENDIX A PROJECT DESCRIPTION

UPDATED PROJECT DESCRIPTION

3.1 Overview

The Project involves the construction, operation and commissioning of a wind farm with up to 65 wind turbine generators (WTG), together with associated and ancillary infrastructure, as detailed in Figure 3-1 to Figure 3-5.

The Project has been revised and refined over time in response to the outcomes of community consultation and following exhibition of the EIS and subsequent regulatory and community submissions and engagement and ongoing design and constructability assessments.

The Project consists of the following key components:

- up to 65 WTGs, each with:
  - a generating capacity of approximately 6 MW;
  - three blades mounted to a rotor hub on a tubular steel tower, with a combined height of blade and tower limited to a maximum tip height of 230 m AGL;
  - a gearbox and generator assembly housed in a nacelle; and
  - adjacent hardstands for use as crane pads and assembly and laydown areas;
- decommissioning of three current monitoring masts and installation of up to 10 new monitoring masts for power testing (the up to five previously proposed in the EIS and an additional five now proposed). Five of the new monitoring masts will be located close to a WTG location and five will be placed on the same location as a WTG prior to its installation and removed shortly before WTG installation. They will have a maximum height of approximately 150 m AGL, equivalent to the hub height of the installed WTGs. The exact number and locations of the monitoring masts will be defined at the detailed design stage. These masts assist in verifying the performance of the WTGs during operation of the Project.
- a centrally located 330 kV electrical substation, including transformers, insulators, switchyard and other ancillary equipment;
- an operations and maintenance facility located either adjacent to the BESS / substation, or within the compound area between WTGs 55 and 56;
- a battery energy storage system (BESS) of approximately 100 MW/400 MWh (4 hours of storage of 100 MW of power);
- aboveground and underground 33 kV electrical reticulation and fibre optic cabling connecting the WTGs to the onsite substation (following site access tracks where practicable) (connection lines);
- a 330 kV single circuit twin conductor overhead transmission line (transmission line) to connect the onsite substation to the existing 330 kV TransGrid Liddell to Tamworth overhead transmission line network, located approximately 24 km west of the substation;
- a switching station to connect the Project to the 330 kV TransGrid Liddell to Tamworth line and enable the Project to connect to the gird. The switching station will also be located approximately 24 km west of the substation, or approximately 13.5 km from the WTG Project Area;
- an internal private access road network (combined total length of approximately 40 km) connecting the WTGs and other Project infrastructure to the public road network; and
- upgrades to local roads and crossings required for the delivery, installation and maintenance of WTG components and associated materials and structures.

The following temporary elements will be required during construction of the Project:

- temporary site buildings and facilities for construction contractors / equipment, including two compounds, site offices, car parking and amenities for the construction workforce;

- two temporary concrete batching plants to supply concrete for WTG footings and substation construction works, with the option to use any construction laydown area with the exception of the laydown areas along Morrisons Gap Road;
- earthworks for access roads, WTG platforms and foundations, potentially including controlled blasting in certain areas;
- potentially rock crushing facilities for the generation of suitable aggregates for concrete batching and/or sized rock for access road and hardstand construction;
- up to seven laydown areas for the temporary storage of construction materials, plant, and equipment construction;
- external water supply for concrete batching and construction activities;
- the transport, storage and handling of fuels, oils and other hazardous materials for construction and operation of wind farm infrastructure; and
- beneficial reuse of materials won from the development footprint during cut and fill and WTG foundation excavation for use in roads, hardstands and foundation material.

The Project also includes the subdivision of land to create two new lots for:

- the substation, Operations & Maintenance (O&M) facility and battery storage; and
- the switchyard.

Please refer to the indicative plans contained in Figure 3-6 and Figure 3-7 showing the currently proposed lots the subject of the subdivision. These remain subject to further detailed design and discussions with the relevant landholder and TransGrid. The Project also includes any deemed subdivision, including subdivision for lease purposes, arising from the grant of leases for any other Project infrastructure components including turbines and the substation.

The key Project components are discussed in further detail below.

3.2 Project Components and Layout

3.2.1 Overview

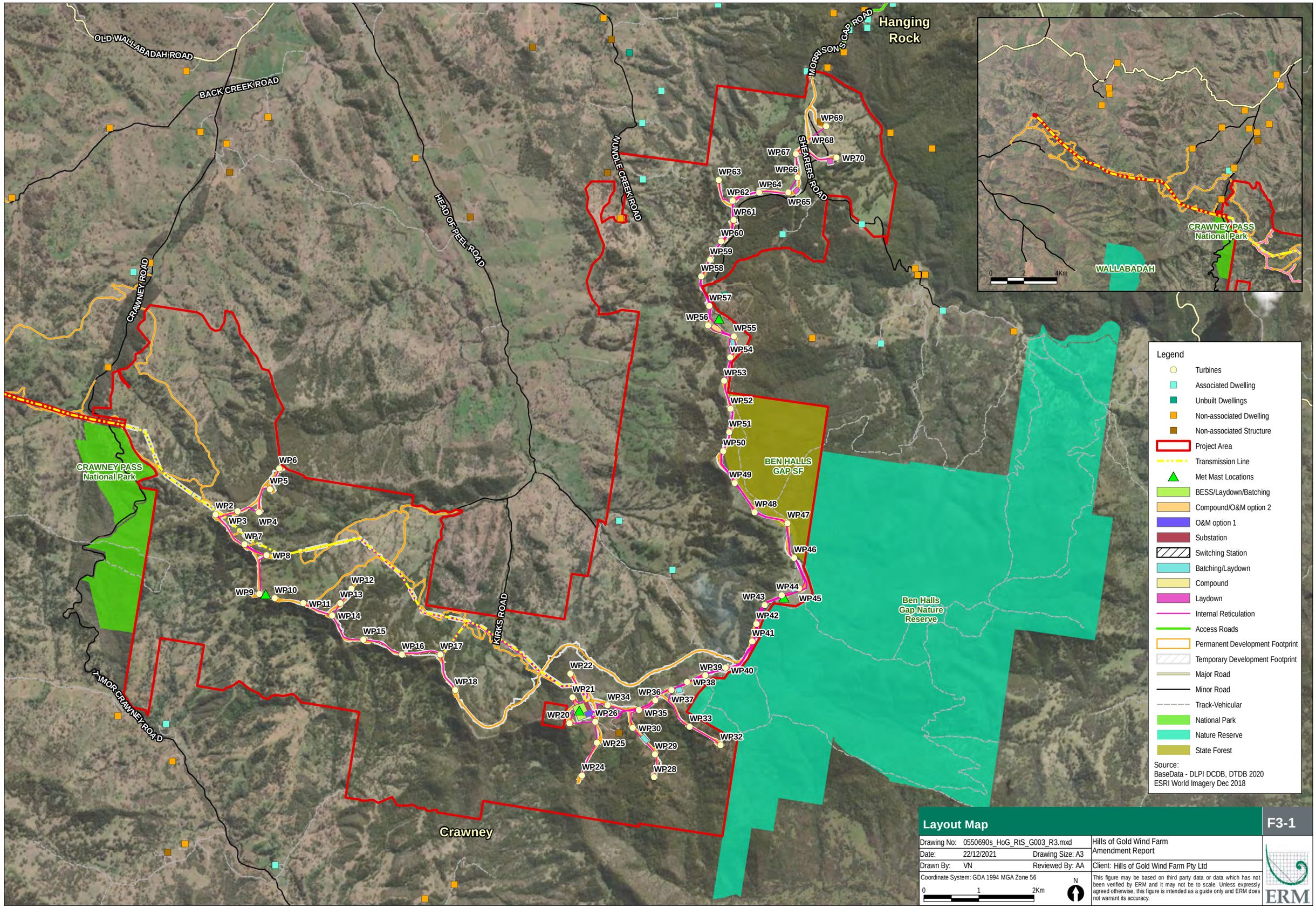
The proposed Project layout including the WTGs, access roads and supporting infrastructure is shown in Figure 3-1 to Figure 3-5. This layout remains subject to ongoing detailed design and micrositing subject to the restrictions outlined below.

The proposed layout of Project infrastructure was developed based on consultation with the community and relevant land owners. The proposed layout is intended to:

- maximise exposure to the wind resource through suitable positioning of WTGs onsite including elevated locations along the ridgeline and suitable spacing between WTGs to account for wind sector management; and
- minimise environmental impacts and protect sensitive areas identified through specialists assessments discussed in the later sections of the EIS (including but not limited to biodiversity, heritage, visual and noise related issues).

3.2.2 Iterative Design Process

The layout of the Project and siting of WTGs and other key infrastructure components has been subject to an ongoing iterative design and siting process, taking into account issues raised during ongoing community engagement and in response to regulatory and community submissions as well as the findings of the further environmental assessments completed and considerations of civil engineering and wind generation constraints and opportunities. This is discussed in detail in Chapter 5 of the EIS and the Submissions Report.



Layout Map

F3-1

Drawing No:	0550690s_HoG_RtS_G003_R3.mxd		Hills of Gold Wind Farm Amendment Report
Date:	22/12/2021	Drawing Size: A3	
Drawn By:	VN	Reviewed By: AA	Client: Hills of Gold Wind Farm Pty Ltd

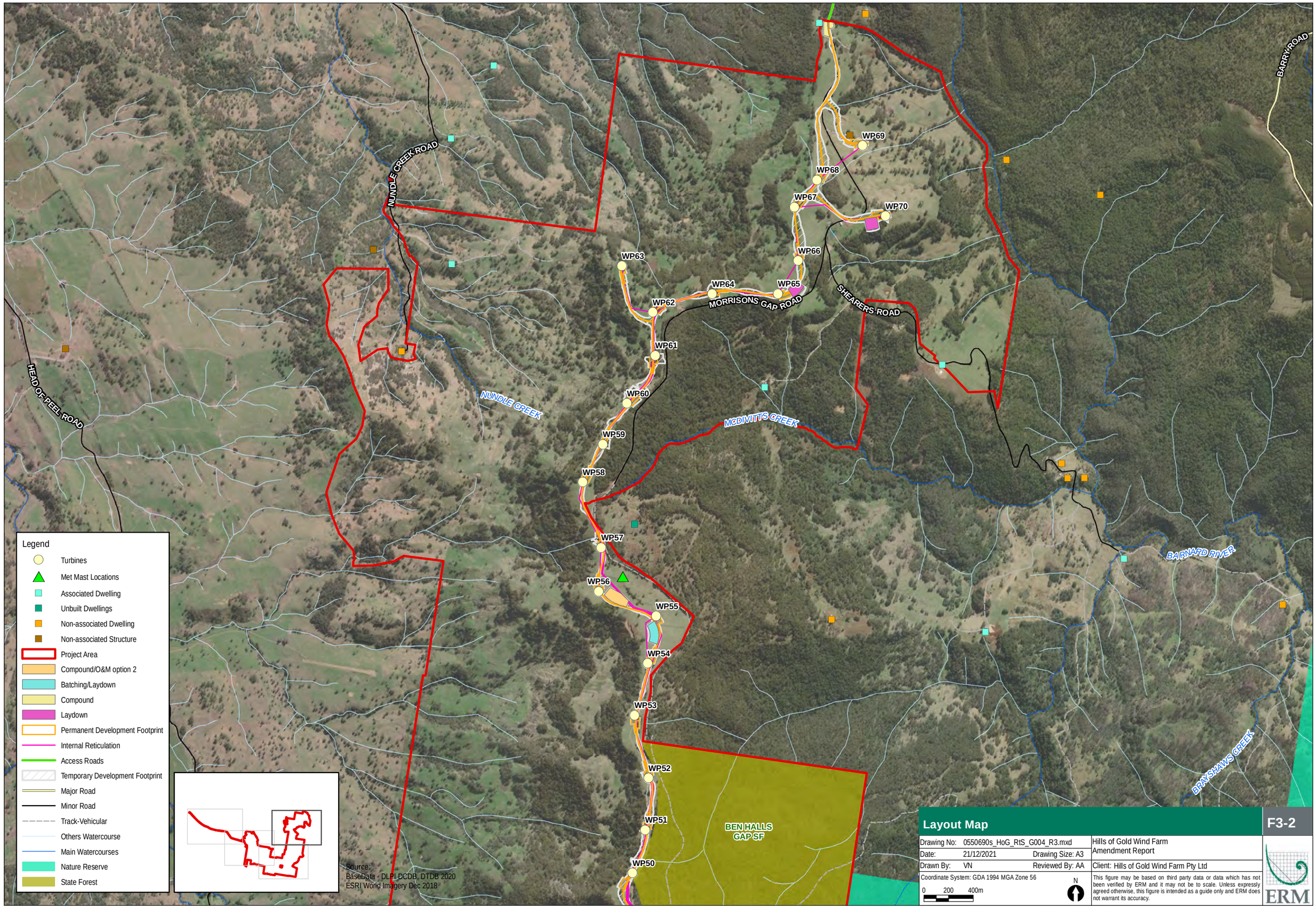
Coordinate System: GDA 1994 MGA Zone 56

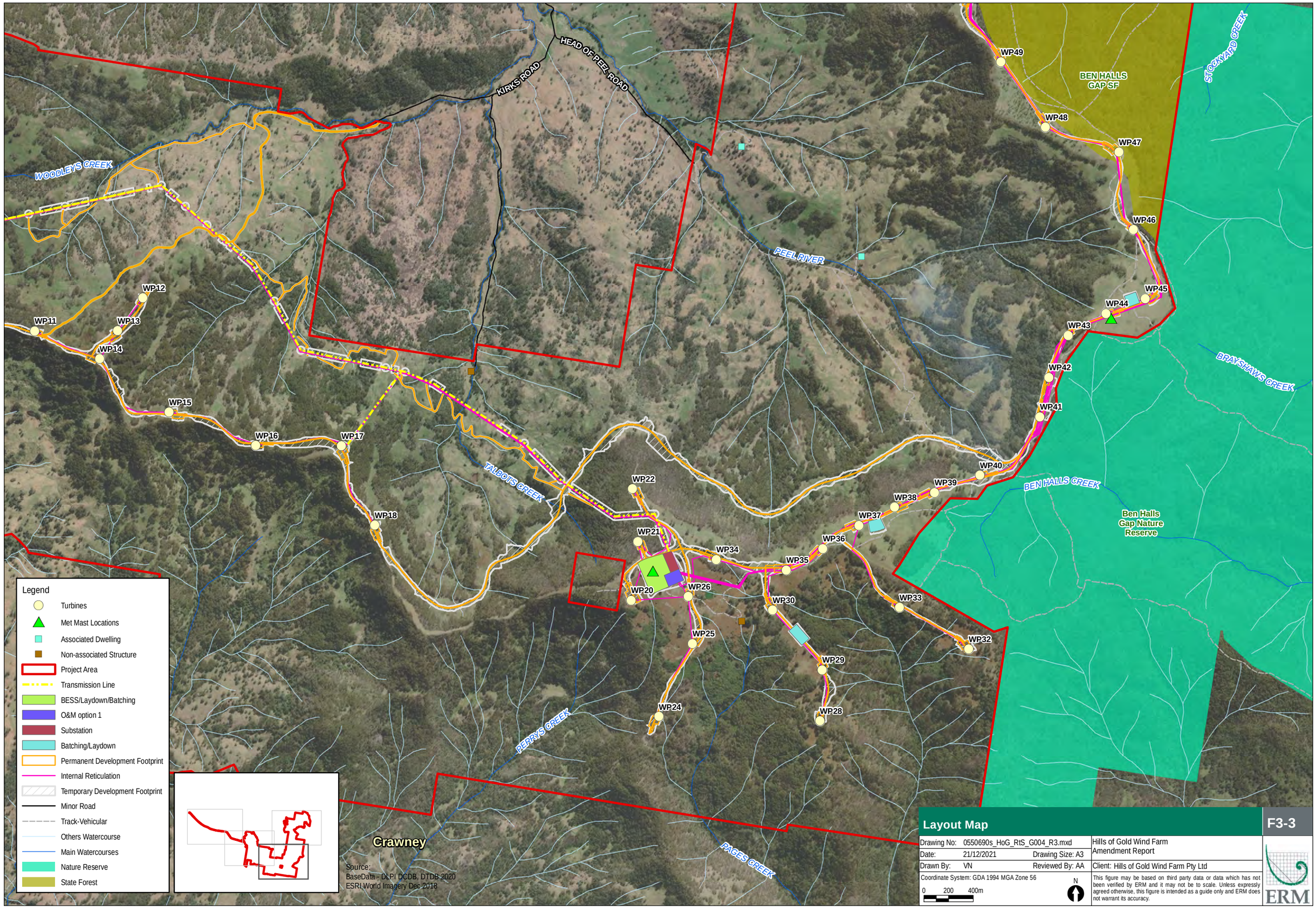
0 1 2Km

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM


NUNDLE CREEK ROAD
BARRY ROAD
HEAD OF PEEL ROAD
NUNDLE CREEK
MORRISONS GAP ROAD
SHEARERS ROAD
MCDIVITT'S CREEK
BARNARD RIVER
BRAYSHAWS CREEK
BEN HALLS GAP SF
WP50
WP51
WP52
WP53
WP54
WP55
WP56
WP57
WP58
WP59
WP60
WP61
WP62
WP63
WP64
WP65
WP66
WP67
WP68
WP69
WP70
Legend
Turbines
Met Mast Locations
Associated Dwelling
Unbuilt Dwellings
Non-associated Dwelling
Non-associated Structure
Project Area
Compound/O&M option 2
Batching/Laydown
Compound
Laydown
Permanent Development Footprint
Internal Reticulation
Access Roads
Temporary Development Footprint
Major Road
Minor Road
Track-Vehicular
Others Watercourse
Main Watercourses
Nature Reserve
State Forest
Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018
Layout Map
F3-2
Drawing No: 0550690s_HoG_RtS_G004_R3.mxd
Hills of Gold Wind Farm
Amendment Report
Date: 21/12/2021
Drawing Size: A3
Drawn By: VN
Reviewed By: AA
Client: Hills of Gold Wind Farm Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56
N
0 200 400m
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM



Layout Map

F3-3

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Date:	21/12/2021	Drawing Size: A3	
Drawn By:	VN	Reviewed By: AA	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

ERM

BACK CREEK
WOMBRAMURRA CREEK
LIMESTONE OAKY CREEK
RYANS OAKY CREEK
OAKY CREEK
PEEL RIVER
CRAWNEY PASS National Park
CRAWNEY ROAD
TIMOR CRAWNEY ROAD
WOODLEYS CREEK
WHITES CREEK
WP2
WP3
WP4
WP5
WP6
WP7
WP8
WP9
WP10
WP11
WP12
WP13
WP14
WP15
WP16
WP17

Legend
- Turbines
- Met Mast Locations
- Non-associated Dwelling
- Project Area
- Transmission Line
- Permanent Development Footprint
- Internal Reticulation
- Temporary Development Footprint
- Minor Road
- Track-Vehicular
- Others Watercourse
- Main Watercourses
- National Park

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018

Layout Map

F3-4

Drawing No:	0550690s_HoG_RtS_G004_R3.mxd		Hills of Gold Wind Farm Amendment Report
Date:	21/12/2021	Drawing Size: A3	
Drawn By:	VN	Reviewed By: AA	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56
0 200 400m
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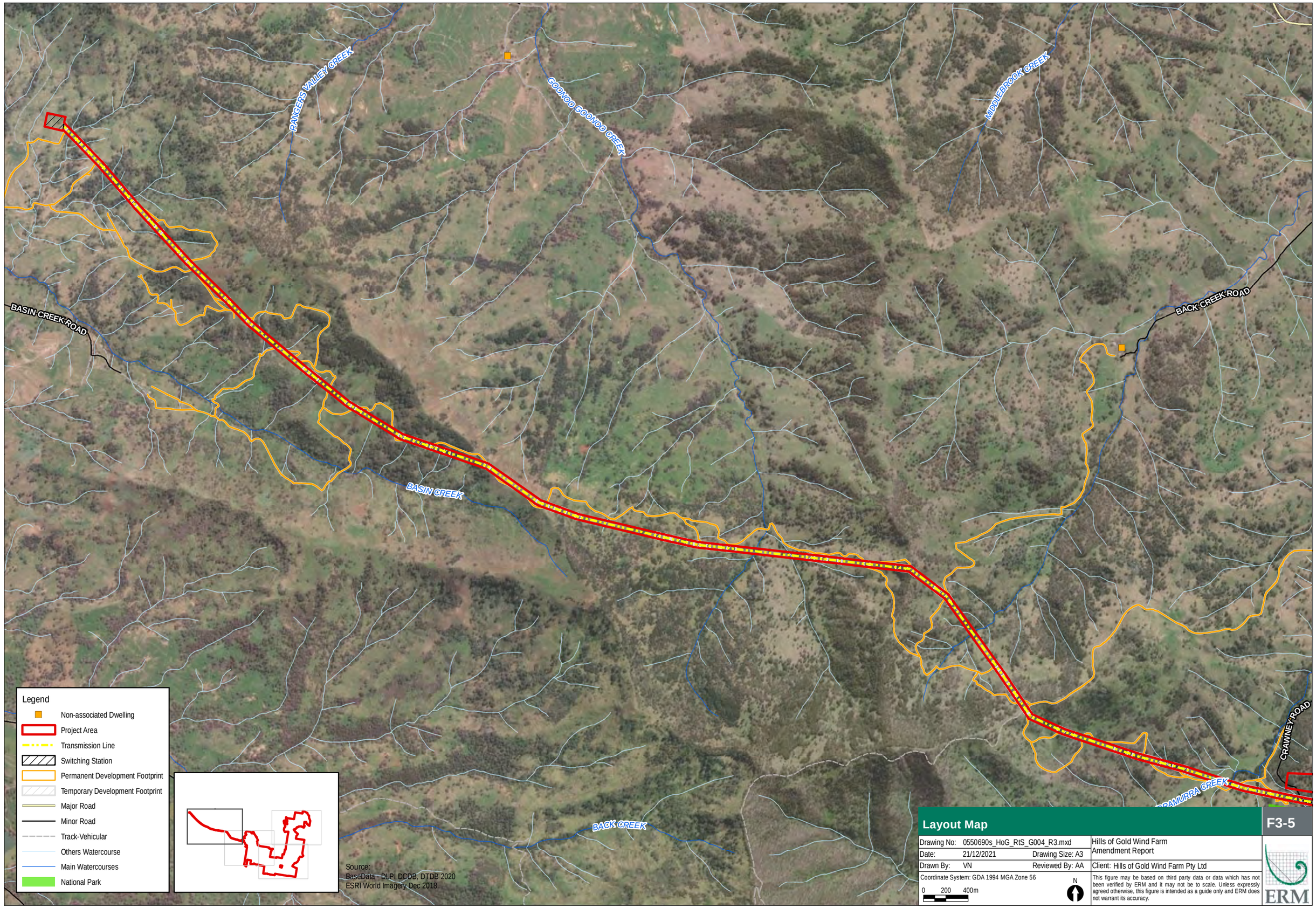
ERM



Layout Map

F3-5

Drawing No:	0550690s_HoG_RtS_G004_R3.mxd		Hills of Gold Wind Farm Amendment Report
Date:	21/12/2021	Drawing Size: A3	
Drawn By:	VN	Reviewed By: AA	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

ERM

Legend

- Transmission Line
- Project Area
- BESS/Laydown/Batching
- O&M
- Substation
- Cadastre

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018

Indicative Subdivision Plan
Substation, BESS and O&M Facility

F3-6

Drawing No:	0550690s_HoG_RtS_G005_R1.mxd		Hills of Gold Wind Farm Amendment Report
Date:	21/12/2021	Drawing Size: A3	
Drawn By:	VN	Reviewed By: AA	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 20 40m

N

ERM

Legend

Project Area

Transmission Line

Switching Station

Cadastre

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018

Indicative Subdivision Plan - Switching Station

F3-7

Drawing No:	0550690s_HoG_RtS_G026_R0.mxd		Hills of Gold Wind Farm Amendment Report
Date:	21/12/2021	Drawing Size: A3	
Drawn By:	VN	Reviewed By: AA	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 20 40m

N

ERM

3.2.3 Wind Turbine Generators

The Project will involve the construction and operation of up to 65 WTGs within the Project Area. The WTG model for the Project is yet to be selected, with a range of models currently under consideration. Based on current technology, the selected model is expected to have a generation capacity of approximately 6.0 MW. The selected WTG model will be in compliance with the relevant building standards and codes, including:

- IEC WT 01:2001 System for Conformity Testing and Certification of Wind Turbines — Rules and procedures;
- IEC 61400-1:2005 Wind turbines Part 1: Design requirements;
- IEC 61400-12-1:2005 Wind turbines Part 12-1;
- IEC 61400-23 Wind turbine generator systems – Part 23;
- IEC 62305-1/3/4 Protection against lightning; and
- IEC 61400-4:2012 Wind turbines — Part 4: Design requirements for wind turbine gearboxes.

The dimensions of the WTG components including blade length, and hub and blade tip heights will vary depending on the final model selected. In order to provide flexibility in selecting the WTG model, the WTG dimensions adopted for assessment for the Project are the largest of the model options being considered for the Project. The assessed dimensions are as follows:

- a WTG with a rotor diameter of up to 170 m (blade length of up to 83.5 m); and
- an overall tip height of 230 m.

Each WTG consists of a tower, nacelle, rotor hub, and blades. The WTGs will have a matt white or light grey finish. To achieve visual consistency through the landscape, the Project will include:

- uniformity in the colour, design, height and rotor diameter;
- use simple muted colours and non-reflective materials to reduce visibility and avoid drawing the eye;
- blades, nacelle and towers are to appear as the same colour; and
- avoidance of unnecessary lighting, signage, logos etc.

Typical components of a turbine are detailed in Figure 3-8.

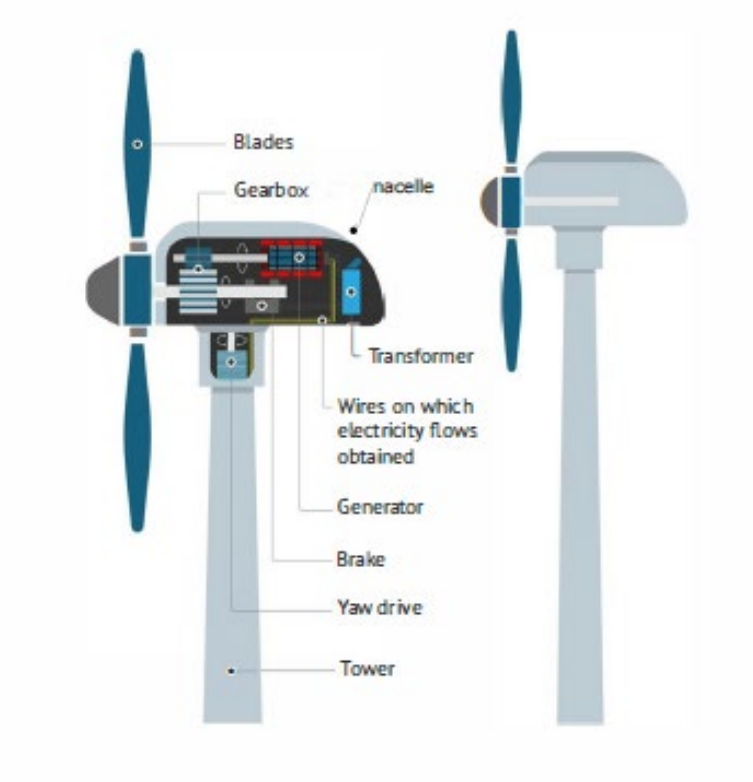


Figure 3-8 Wind Turbine Components

The process of installing the WTGs is outlined in Section 3.3.6. The central coordinates, maximum elevation and siting of the WTG locations are provided in Table 3-1.

Table 3-1 WTG Coordinates

WTG No.	Easting (m)*	Northing (m)*	Elevation (m AHD)
WP2	316,660.03	6,502,869.95	1,259.58
WP3	317,061.85	6,502,922.86	1,254.73
WP4	317,449.24	6,502,903.10	1,199.66
WP5	317,646.58	6,503,320.59	1,142.29
WP6	317,817.55	6,503,696.30	1,171.94
WP7	317,184.44	6,502,322.26	1,185.67
WP8	317,588.55	6,502,126.60	1,167.52
WP9	317,453.03	6,501,426.24	1,153.01
WP10	317,732.46	6,501,347.19	1,160.41
WP11	318,250.90	6,501,255.87	1,127.11
WP12	319,126.27	6,501,524.18	1,131.47
WP13	318,924.10	6,501,258.68	1,161.78
WP14	318,777.79	6,501,032.55	1,161.32
WP15	319,341.13	6,500,599.04	1,118.49

WTG No.	Easting (m)*	Northing (m)*	Elevation (m AHD)
WP16	320,042.27	6,500,328.81	1,069.75
WP17	320,736.01	6,500,326.42	1,169.63
WP18	321,007.07	6,499,684.84	1,130.55
WP20	323,082.52	6,499,076.73	1,410.87
WP21	323,138.00	6,499,550.96	1,408.27
WP22	323,095.63	6,499,977.32	1,372.69
WP24	323,308.03	6,498,134.15	1,255.08
WP25	323,580.76	6,498,725.93	1,366.02
WP26	323,545.96	6,499,107.04	1,391.79
WP28	324,612.56	6,498,100.25	1,344.47
WP29	324,632.30	6,498,514.80	1,333.74
WP30	324,229.06	6,498,998.42	1,341.85
WP32	325,818.83	6,498,681.89	1,319.68
WP33	325,257.99	6,499,019.08	1,335.65
WP34	323,773.15	6,499,406.10	1,405.23
WP35	324,341.67	6,499,321.57	1,358.82
WP36	324,635.24	6,499,495.05	1,365.77
WP37	324,927.95	6,499,682.67	1,341.41
WP38	325,216.99	6,499,831.37	1,336.23
WP39	325,542.57	6,499,948.69	1,332.41
WP40	325,908.20	6,500,088.91	1,282.26
WP41	326,393.75	6,500,561.99	1,317.79
WP42	326,467.50	6,500,880.59	1,325.20
WP43	326,624.18	6,501,222.00	1,373.12
WP44	326,929.63	6,501,399.61	1,380.36
WP45	327,248.68	6,501,519.80	1,383.04
WP46	327,153.19	6,502,076.91	1,343.31
WP47	327,034.82	6,502,705.02	1,351.78
WP48	326,439.48	6,502,905.66	1,375.71
WP49	326,079.13	6,503,433.76	1,373.30
WP50	325,872.15	6,504,011.02	1,329.44
WP51	325,975.23	6,504,359.62	1,325.48
WP52	326,001.77	6,504,778.28	1,336.07
WP53	325,887.63	6,505,288.79	1,311.58
WP54	325,995.06	6,505,707.10	1,316.17

WTG No.	Easting (m)*	Northing (m)*	Elevation (m AHD)
WP55	326,064.00	6,506,091.80	1,318.91
WP56	325,597.43	6,506,290.32	1,296.25
WP57	325,618.03	6,506,644.82	1,291.57
WP58	325,468.55	6,507,176.88	1,294.46
WP59	325,632.77	6,507,482.55	1,276.79
WP60	325,827.07	6,507,813.57	1,241.83
WP61	326,056.20	6,508,201.73	1,213.55
WP62	326,035.87	6,508,550.51	1,240.46
WP63	325,787.51	6,508,927.48	1,194.22
WP64	326,518.50	6,508,699.39	1,249.24
WP65	327,050.47	6,508,701.46	1,267.58
WP66	327,215.07	6,508,969.01	1,259.71
WP67	327,184.58	6,509,402.79	1,251.14
WP68	327,366.55	6,509,622.76	1,245.47
WP69	327,737.18	6,509,901.34	1,187.56
WP70	327,921.58	6,509,330.63	1,212.26

** Coordinate System is GDA 1994 MGA Zone 56*
AHD = Australian Height Datum
Reference to WP versus WTG are interchangeable for the purposes of the Project and refer to wind turbine generators

Towers and Foundations

The wind turbine tower is constructed of composite metals and consists of 4 to 7 segments supporting the wind turbine nacelle, rotor hub and blades. Each tower will be mounted on a concrete foundation approximately 25 m in diameter located adjacent to a constructed all weather hardstand area. The exact type of foundation to be utilised will be based on the results of geotechnical surveys undertaken during the detailed design phase and prior to commencement of construction at each WTG site.

General interest has been received regarding the typical types of turbine foundations used for wind turbines. The three common types of foundations used for wind turbines are Gravity Foundations, Rock Anchors and Pile Foundations or a combination of these three depending on geotechnical conditions.

The most common type of foundation is the Gravity Foundation in which an area is excavated suitable to support the burying of a “pedestal” design of concrete and reinforced steel sufficient to create a gravity foundation. These are typically 3-5 m deep and 25 m in diameter. The volume can be between 500-900 m^3 depending on the turbine, geotechnical conditions and other environmental factors. A cross section of a typical gravity foundation is shown in Figure 3-9.

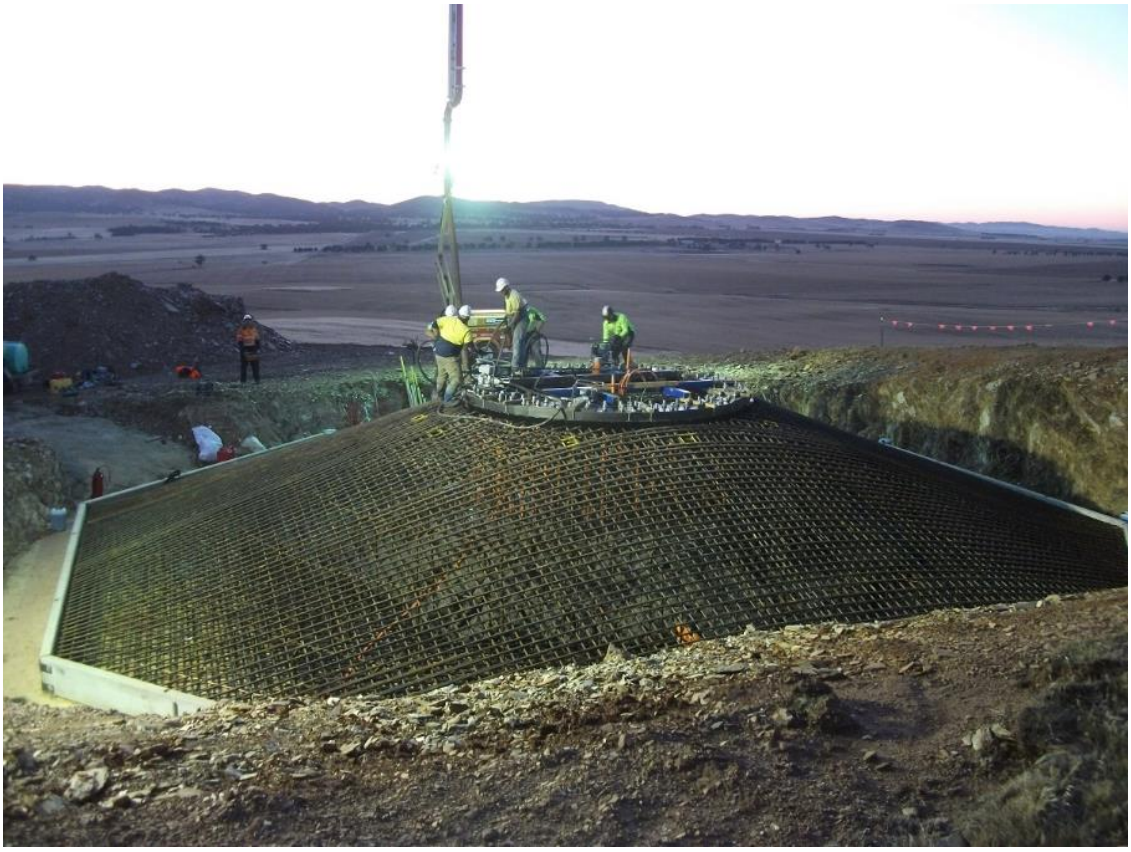


Figure 3-9 Typical Gravity Foundation for a Wind Farm (ENGIE Willogoleche Wind Farm in construction)

A gravity foundation is then covered so that only the tower section is visible above ground as shown in Figure 3-10:

Figure 3-10 Typical Wind Farm Tower Foundation

Nacelle

The nacelle is the housing that sits on the top of the turbine tower and accommodates the generator, control systems, pitch and yaw drives. The nacelle may also include the transformer and gearbox (if used) and is typically constructed of fibreglass. Oil containment and sound insulation are provided for within each nacelle.

Wind Turbine Rotor

The rotor, which includes the hub that connects the blades to the gearbox, is the portion of the WTG that captures the energy from the wind. The energy captured by the rotating blades is transferred to a generator housed within the nacelle. Blades are generally made of fibreglass reinforced with epoxy and carbon fibre. The rotor is controlled by a central wind turbine control unit (microprocessor). The microprocessor controls the rotational speed of the rotor and the pitch of the blades, therefore enabling the rotor to maximise energy production from the wind resource and ensure the safe and reliable operation of the WTG. When wind speeds get too high the microprocessor controls the pitch of the blades to stop the WTG rotating, which minimises wear on the components from operating at too high wind speeds.

Each WTG will have a transformer located in either within the nacelle or mounted external to the WTG on the hardstand area. The transformer is required to 'step-up' the voltage of the electricity produced by each WTG to the onsite distribution voltage of 33 kV. Each WTG will be connected to the onsite substation via a network of aboveground and underground electricity and communication cables.

Obstacle Lighting

The Project may require obstacle lighting at night time or during periods of reduced visibility. Whilst the Aviation Impact Assessment (Aviation Projects, 2020) provided in Appendix H of the EIS concluded that the Project will not require obstacle lighting to maintain an acceptable level of aviation safety, the Civil Aviation Safety Authority (CASA) may potentially require lighting where turbines exceed 150 m in tip height, as has been the case for other wind farm developments in NSW.

Ongoing consultation with CASA has confirmed the use of steady low intensity lighting (200 candela) night lighting rather than medium intensity and confirmation of acceptance of an Obstacle Lighting Plan, provided in Appendix J of the Amendment Report. Based on this consultation, the potential night lighting requirements for the Project may include:

- two steady red low intensity obstacle lights on WTGs, with a minimum intensity of 200 candela, in accordance with the CASA endorsed Obstacle Lighting Plan;
- mounting of the light fixtures sufficiently above the surface of the nacelle so that the lights are not obscured by the rotor hub, and are at a horizontal separation to ensure an unobstructed view of at least one of the lights by a pilot approaching from any direction; and
- individual wind turbines to be lit in accordance with the obstacle lighting plan.

Night lighting will be operated in accordance with CASA requirements.

The Landscape and Visual Impact Assessment (refer Chapter 11 and Appendix F of the EIS) and the Addendum Landscape and Visual Assessment Report (Appendix G of the Amendment Report) assesses the impact of night lighting.

3.2.4 Electrical Reticulation

Transmission Line

A 330 kV single circuit twin conductor overhead transmission line connection is proposed to connect the onsite substation to the existing 330 kV overhead transmission line network, a length of approximately 24 km.

The proposed 330 kV transmission line is anticipated to comprise a steel pole structure, around 50 m high and spaced up to 150 m - 1,000 m apart. The conductors (wires) will be aluminium and will be designed to be a minimum of 9 m above the ground at maximum operating temperature.

The poles will generally require a concrete pier for the foundation and it will be necessary to establish 'construction pads' adjacent to the towers. A crane pad of approximately 10 m x 10 m will be established for the crane assembly and a second steel lay down area for the steel assembly prior to erection. The laydown area will typically be around 20 m x 10 m

Each circuit will include three pairs of conductors, orange balls for visual identification and an earth shield wire, protecting the line from lighting strikes.

Vehicle access to the transmission line will be via Basin Creek Road to the switching station site, with access to the construction sites along the transmission line proposed to be from Crawney Road via local access roads, as shown in Figure 3-4 and Figure 3-5.

Examples of the typical steel pole structures proposed for the transmission line are detailed in Figure 3-11.

Figure 3-11 Typical Steel Pole Structures, Transmission Line

Easements

The 330 kV transmission line will be designed and constructed to meet relevant Australian standards.

The transmission line will be centred on a 60 m wide easement. For the safe operation of the transmission line, certain activities will be restricted where necessary within the easement area such as planting and growing trees, construction of buildings, or erection of antennae or masts. The ongoing use of the land for agricultural purposes such as grazing will not be affected by the transmission line.

Onsite Substation

It is proposed that a new 33 kV/330 kV substation compound will be constructed onsite with approximate dimensions of 70 m by 160 m. The primary purpose of the substation will be the reception, transformation and transmission of electrical power and energy. The electrical substation will house a series of transformers, switch gear, and ancillary equipment for the transformation and distribution of energy. The transformers and radiators in the electrical substation will be located on foundations and will be surrounded by concrete bunds and/or collection sumps designed with sufficient capacity to retain 110% of the oil contained within each transformer.

The indicative location of the substation is identified in the wind farm layout plan provided at Figure 3.1. An image of a typical wind farm substation is provided at Figure 3-12.

Figure 3-12 Typical Substation - Gullen Range Wind Farm 33/330kV Substation

(Photo courtesy of Gullen Range Wind Farm)

Battery Energy Storage System (BESS)

The Project includes the installation of a lithium-ion battery energy storage system (BESS). A 5.4 ha footprint area has been set aside for the installation of the BESS. Given the substantive advances in battery storage technologies over time, the exact storage capacity cannot be confirmed at this time, however, it is anticipated that the BESS will have a capacity of approximately 100 MW/400 MWh. This would allow the optimisation of the Hills of Gold Wind Farm in the NEM.

The major components of the BESS will be batteries, inverters, transformers, heating ventilation air conditioning and fire protection. The specific design details for the BESS will not be finalised until the completion of the detailed design stage of the Project but will not exceed the specifications provided in the SEPP 33 screening assessment discussed in Chapter 13 and Appendix L of the EIS and the Preliminary Hazard Analysis in Appendix L of the Amendment Report. An image of a typical BESS is provided in Figure 3-13.

Figure 3-13 Typical Battery Energy Storage System

33 kV Cable and Fibre Optic Network

Each of the 65 WTGs will be connected to the onsite substation via a 33 kV electrical cable and fibre optic network. Whilst the electrical reticulation network will be finalised during the detailed design phase, it is anticipated that the aboveground and underground cabling will generally be located adjacent to the footprint of the internal access roads. However, some deviations away from the access roads may be required given potential topographical or other constraints. The currently identified extent of deviations proposed is included in Figure 3-1 and Figure 3-3. Any deviations will avoid areas of heritage and ecological significance and will remain within the micrositing allowances of the Project. The trenching for underground electrical cabling will be approximately 1 m wide per circuit by 1.5 m deep, located within a works area of approximately 5 m to accommodate the excavator and stockpiling of spoil and bedding sand. Trenches will be progressively backfilled during the course of the construction works. The aboveground cabling will have orange balls for visual identification if necessary.

Switching Station

A switching station with approximate dimensions of 165 m by 120 m for physical electrical components will be constructed to connect the Project transmission line to the existing 330 kV TransGrid Liddell to Tamworth overhead transmission line network. The switching station will have a permanent footprint of approximately 2 ha. The location of the switching station is identified in the wind farm layout plan provided at Figure 3.1 and 3.5. An image of a typical wind farm switching station is provided in Figure 3-14.

Figure 3-14 Typical Switching Station – Gullen Range Wind Farm 330 kV Switching Station

(Photo courtesy of Gullen Range Wind Farm)

3.2.5 Crane Pads and Assembly Areas

A hardstand will be constructed adjacent to the base of each WTG to enable the assembly and erection of the tower, nacelle and blade components. The final design will depend on the topography of the surrounding land. Each crane pad will consist of crushed rock hardstand of an area between 0.38 ha and 0.53 ha depending on pad design (Figure 3-15).

Sixteen (16) out of the up to 65 WTG's pad areas will be designed based on a 'Just in time' (JIT) delivery concept. The JIT pad does not require a blade laydown area reducing the area of disturbance per pad by approximately 0.15 ha. Various centralised laydown areas have been considered across the Project Area to allow for nacelle-blade assembly and temporary storage. Once nacelle-blade assembly has occurred at the centralised area, units are transported to the hardstand at each WTG location for erection.

This JIT concept has been adopted to further reduce the biodiversity impacts of the Project.

Figure 3-15 details (A) preliminary design of a simplified hardstand layout including blade pad and access road, and (B) simplified laydown layout without blade laydown area (JIT pad).

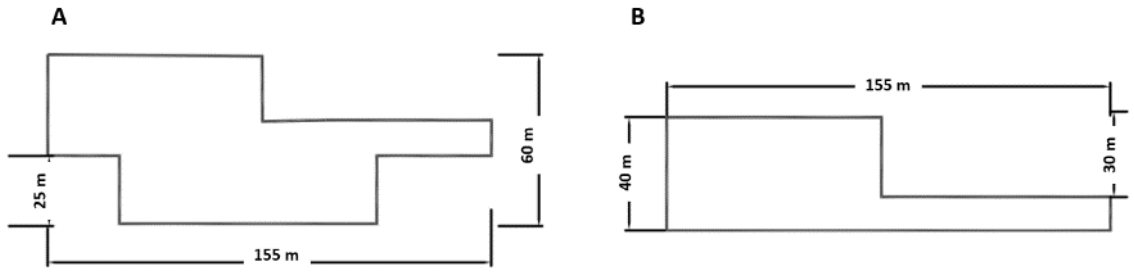


Figure 3-15 Typical Laydowns

Whilst it is anticipated that the majority of crane pads will remain in situ to allow for future maintenance or removal of the WTGs, there may be the opportunity to apply a top soil layer to the laydown portions to allow grazing activities to resume while the turbines are not in use.

3.2.6 Site Access from Nundle

Site access will be via Morrisons Gap Road, located to the north east of the Project Area. This Tamworth Regional Council road is unsealed for approximately 3 km prior to the Project Area. Emergency access will be provided via Head of Peel Road.

The location of the Project access point and transport routes of infrastructure are shown in Figure 3.19.

Transport of wind farm components to the Project Area is discussed in Section 3.3.4

3.2.7 Internal Access Roads

The construction and maintenance of the Project will require construction of up to approximately 40 km of private access roads within the Project Area. The roads will provide ongoing access to the WTGs and other Project infrastructure including the transmission line. Where practicable, the internal road network will be aligned on the route of existing farm or other access roads. The internal roads will be up to 5.5 m wide (with approximately 1.5 m shoulders on either side), with localised widening where required to support transportation of the WTG components.

The Development Footprint (area of disturbance) has been based on preliminary concept civil design for roads and hardstands, including likely cut and fill requirements, batters, cable runs and drainage which is subject to the abovementioned specifications.

Within the BDAR (updated assessment in Appendix D of the Amendment Report), it has been assumed that the area of impact for roads, drainage, adjacent underground cable runs and cut and fill batters will have an average width of disturbance of 39.87 m (to accommodate drainage and cabling) and a total length of approximately 40 km. These assumptions were adopted as the conservative worst case and are expected to be able to be improved in detailed design (refer Appendix D of the Amendment Report).

Included within the internal road network proposed for both construction and ongoing use is the ‘Transverse Track’, which provides internal road access between WTG 18 to WTG 40 to overcome topography challenges for road construction between WTG 18 and WTG 20.

The proposed internal road network is shown in Figures 3-1 to Figure 3-5.

3.2.8 Permanent Operations and Maintenance Facility

A permanent site operations and maintenance facility (O&M), approximately 120 m by 220 m will be constructed to provide for all operations and maintenance activities associated with the Project. Two optional locations for the siting of the facility are proposed, Option 1 being adjacent to the substation / BESS, or Option 2 being at the compound between WTG 55 and WTG 56. An example O&M facility is provided in Figure 3-16. Car parking facilities will also be provided for employee and service vehicles.

During operations, approximately 16 permanent staff will occupy these premises. Whilst most activity is anticipated to occur during business hours Monday to Friday, access to the Project Area will be required on a 24 hour basis, seven days a week.

Figure 3-16 Example O&M Facility – Willogoleche Wind Farm

(Photo courtesy of ENGIE)

3.2.9 Meteorological Monitoring Masts

The Project includes the decommissioning of the three current monitoring masts and installation of up to 10 new monitoring masts for power testing. Five of the new monitoring masts will be located close to a WTG location and five will be placed on the same location as a WTG prior to its installation and removed shortly before WTG installation. They will have a maximum height of approximately 150 m AGL, equivalent to the hub height of the installed WTGs. The exact number and locations of the monitoring masts will be defined at the detailed design stage. These masts assist in verifying the performance of the WTGs during operation of the Project.

The monitoring masts consist of a buried concrete base foundation and guy wires which are attached to buried anchor points. In accordance with the recommendations of the Aviation Impact Assessment, these will be marked using three dimensional coloured objects attached to the wire or cables (for example spheres or pyramids) if necessary (refer to Appendix H of the EIS).

3.2.10 Micrositing

The proposed layout remains indicative and subject to ongoing detailed design, which will incorporate detailed geotechnical investigations and selection of the final wind turbine model.

In order to facilitate refinement of the layout during the detailed design process, an allowance for micrositing of WTGs by up to 100 m radius from the locations identified in this Amendment Report is sought. Other Project infrastructure components, including cabling and access tracks, may also be microsited within the Project Area subject to ensuring that micrositing does not result in any greater impacts than assessed and complies with all conditions imposed on any development consent granted for the Project. The BESS, substation, switching station and O&M facility will not be microsited within the identified flame zone.

Final layout documentation will be prepared and submitted to DPIE prior to commencement of construction.

3.2.11 Temporary Facilities

Construction of the Project will require a range of temporary buildings and facilities for construction personnel and equipment, including a construction compound (including site offices, car parking, and amenities for the construction work force), mobile concrete batching plants, laydown and storage areas for the temporary storage of construction materials, plant, equipment and wind turbine components, and temporary power supply for construction. An example concrete batching plant is provided in Figure 3-17.

Figure 3-17 Example Concrete Batching Plan – Willogoleche Wind Farm

(Photo courtesy of ENGIE)

The indicative location of temporary facilities and activities associated with the construction of the Project are outlined in Figures 3-1 to Figure 3-5.

3.3 Project Construction

3.3.1 Duration and Staging

Construction activities will be progressive across the Project Area over a period of approximately 18 – 24 months. Subject to confirming of any staging requirements, the anticipated timing of key Project milestones is presented in Figure 3-18.

Construction, operation and decommissioning of the Project may be staged and early works entered into in response to market drivers and specific construction work packages. Where staging is required:

- each of the strategies, plans and programs required by the conditions of consent will be submitted on a progressive basis for each stage of the Project, where appropriate;
- DPIE and Councils will be notified in accordance with any relevant conditions of the development consent; and
- details of final staging and early works timing will be confirmed prior to the construction of each stage.

The Proponent has advised that the construction is likely to be staged with early works awarded shortly after any development approval to commence design, council approvals and road upgrades and associated works.

In addition, construction of the BESS may be included as a subsequent stage to the Project construction timeline based on market demand and the fast-changing economics of battery storage. If so, allowances will be made during the construction of the main wind farm Substation and O&M Facility such that the BESS can be added at a future point in time. The assessments consider a worst case assumption that the BESS is constructed within the Project schedule.

3.3.2 Construction Hours

Construction of the Project will generally be undertaken in accordance with the DECC (2009) *Interim Noise Construction Noise Guideline*, with the hours of work being:

- Monday to Friday: 7.00am-6.00pm;
- Saturday: 8.00am-1.00pm; and
- no works on Sunday or public holidays.

Some out of hours work may be required, including for:

- logistics and safety requirements imposed by relevant regulatory authorities (e.g. NSW Police);
- weather conditions such as high winds during the day necessitating WTG crane lifts at night;
- temperature conditions requiring concrete pours during the early morning; and
- extended concrete pours into the evening to complete a foundation.

If a need to work outside the recommended standard hours of construction is identified, these would carried out in accordance with the Noise Management Plan to be prepared for the Project.

3.3.3 Construction Workforce

It is anticipated that during construction up to 211 full time equivalent (FTE) direct construction jobs will be generated based on modelled estimates outlined in the Socio-Economic Assessment in Appendix R of the Amendment Report.

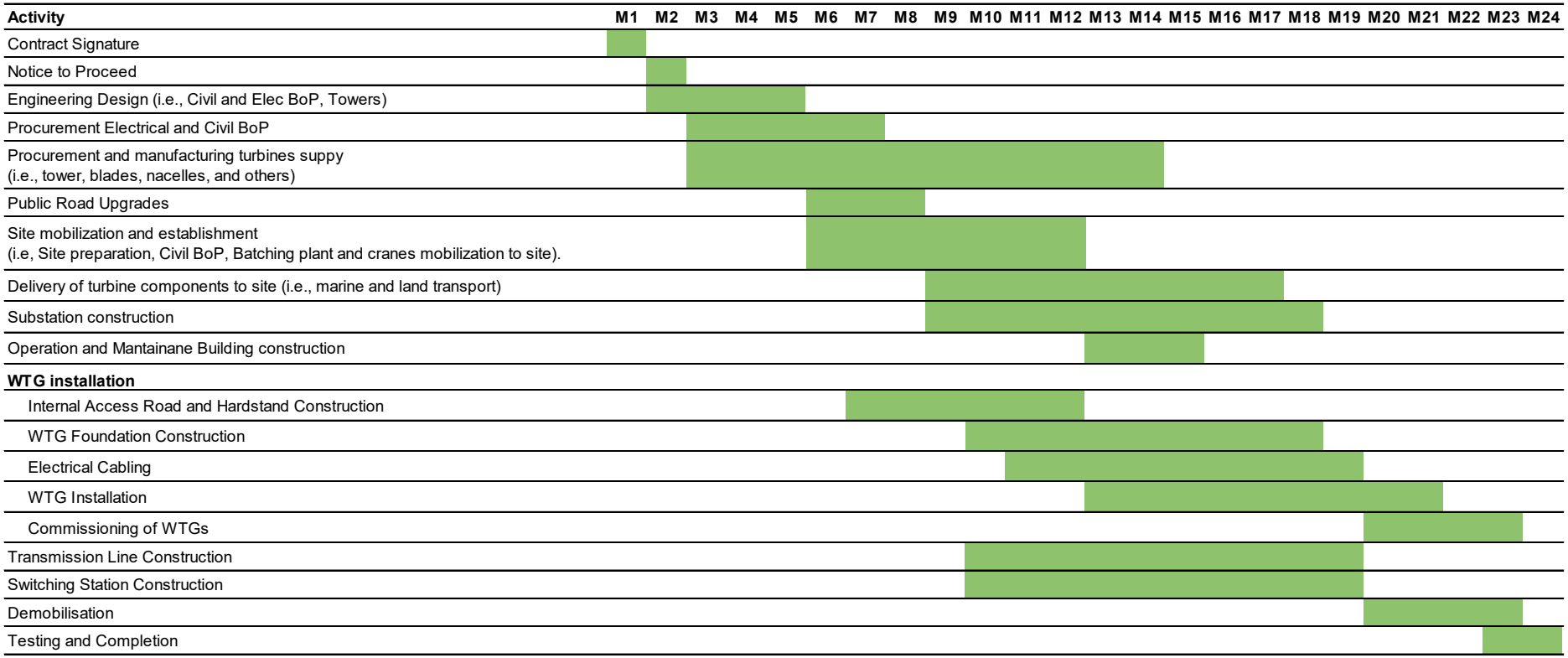


Figure 3-18 Anticipated Approximate Timeline for Construction Phase of the Project

3.3.4 Transportation

3.3.4.1 Oversized Overmass Load Transportation

The Project will include the delivery to the Project Area of the components of the wind turbines and electrical equipment including among other things:

- blades;
- tower sections;
- nacelles;
- substation and switching station components; and
- cabling.

To facilitate transportation and ease of installation, the WTG tower will be manufactured in up to seven sections. Due to the size of the WTG components, the truck and trailer configurations to transport the components are classified as Restricted Access Vehicles (RAVs). RAVs require permits that specify the designated route for travel, the number of escorts required and the time in which the RAVs can travel through certain road zones.

It is proposed that oversized and over mass loads will be transported from the Port of Newcastle to the Project Area. Transportation of the components is forecast to be undertaken over a period of approximately nine months. A detailed Traffic Management Plan will be implemented for the transportation of individual items.

The proposed transport routes are detailed in Figure 3.19. The proposed routes are:

- Route 1 (blade and loads over 5.2 m) – via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Denman Road, Bengalla Road, Wybong Road, Kayuga Road, Invermein Street, Stair Street, Dartbrook Road, New England Highway, Lindsays Gap Road, Nundle Road, Crosby Street, Oakenville Street, Old Hanging Rock Road, Barry Road, Morrisons Gap Road.
- Route 2 (loads up to 5.2 m) – via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Bell Street, Victoria Street, Market Street, New England Highway, Lindsays Gap Road, Nundle Road, Crosby Street, Oakenville Street, Old Hanging Rock Road, Barry Road, Morrisons Gap Road.
- Route 3 (loads over 5.2 m) – via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Denman Road, Thomas Mitchell Drive, New England Highway, Bell Street, Victoria Street, Market Street, New England Highway, Lindsays Gap Road, Nundle Road, Crosby Street, Oakenville Street, Old Hanging Rock Road, Barry Road, Morrisons Gap Road.
- Route 4 (standard loads) – via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Lindsays Gap Road, Nundle Road, Crosby Street, Oakenville Street, Old Hanging Rock Road, Barry Road, Morrisons Gap Road.

The Project component by route are detailed in Table 0-2.

Table 0-2 Project Component Transport Routes

Blades	Heavy - Over 5.2 m Height	Heavy - Under 5.2 m Height		Standard
100% Route 1	100% Route 3	Option 1 100% Route 2	Option 2 50% Route 2 and 50% 3	100% Route 4
Blades (root section)	Hubs	Nacelle with Drivetrain Out	Nacelle with Drivetrain Out	Other (2 x 40ft Shipping Container per WTG)
Blades (tip section)	Tower Sections	Drivetrain	Drivetrain	Sub station
	Transformers			Switching Station
	Nacelles with Drivetrain in			Overhead cabling
				Underground cabling
				Battery System
				Mobile concrete Batch Plant

This is further detailed in in the Addendum Traffic and Transport Assessment and updated Route Assessment provided in Appendix H and I of the Amendment Report respectively.

In summary, the RAV route from the Port of Newcastle to the Project Area would involve accessing the New England Highway, via Industrial Drive with bypasses of the Singleton and Muswellbrook townships before departing the New England Highway at Lindsay Gap Road near Wallabadah. This general route was used to provide access for RAVs for the Sapphire Wind Farm located further north and has therefore already been subject to a number of modifications to accommodate the RAV movements associated with other wind farm developments.

At Lindsay Gap Road the RAV transport continues through to Nundle Road and the village of Nundle and to Barry Road and Morisons Gap Road to access to the Project Area.

3.3.4.2 Other Vehicles

Heavy vehicles will be required to transport materials and equipment associated with the Project construction. It is anticipated that heavy vehicles will consist of vehicles up to and including 19.0 m long semi-trailers and B-Doubles (standard vehicles) and 'truck and dogs', concrete trucks and water tankers. The presence of the temporary concrete batching plant will reduce the number of external concrete truck movements to and from the Project Area.

Light vehicles comprising light trucks for smaller deliveries and cars, four-wheel drives and utility vehicles attributed to Project personnel will also access the Project Area during construction and operation of the Project.

3.3.5 Road Upgrades

Public road upgrades would be required to cater for the delivery of blades, nacelles and towers. The upgrades are required to ensure sufficient space for oversized vehicles passage, including intersection widening, trimming and removal of vegetation, removable signs and infrastructure, and the relocation of overhead wires. The upgrades have been identified based on the largest blade length option, being 83.5 m. The upgrades required are discussed further in the updated Route Assessment undertaken by RJA (2021), provided in Appendix I of the Amendment Report and summarised in Table 3-3. The general areas of public roads requiring upgrades are shown in Table 3-3 and Figure 3.20 and remain subject to further detailed design and assessment.

Table 3-3 Proposed Road Upgrades

ID	Type*	Location	Works
Port of Newcastle to Lindsays Gap Road			
14 - 15	RU	Mayfield # 4 Port Storage Area; Mayfield # 4 Berth; Mayfield # 4 onto Selwyn Street	Additional hardstand required and fence relocated
27	RU	Selwyn Street onto Industrial Drive (via George Street)	Signs need to be made removable, traffic signals relocated and additional hardstand.
38	RU	John Renshaw Drive onto the Hunter Expressway	May require additional hardstand on the Hunter Expressway.
39	RU	New England Highway onto Golden Highway at Whittingham	Signs need to be made removable
40 - 41	RU	Golden Highway through Jerrys Plains village	Signs need to be made removable and additional hardstand required
42	RU	Golden Highway to Denman Road	Additional hardstand required and signs made removable
43 - 44	RU	Denman Road onto Bengalla Road	Additional hardstand required and signs made removable
16	RU	Wybong Road onto Kayuga Road	Signs to be made removable, additional hardstand and adjustment of fences on private land. See Turnbull Engineering Report in Appendix P of the Amendment Report for detailed design.
17 - 18	RU	Invermein Street onto Dartbrook Mine Access Road	Signs made removable and additional hardstand including culvert extension required
19	RU	Dartbrook Road	Additional hardstand required, and signs made removable
20	RU	Dartbrook Road to New England Highway	Signs to be made removable and some hardstand added
New England Highway to Nundle via Lindsays Gap Road			
21	RU	New England Highway and Lindsays Gap Road	Additional hardstand required, and signs made removable
3	BU	Goonoo Goonoo Creek Bridge	Bridge needs widening and upgrading for loads with axles exceeding 3.5 m
4	BU	Middlebrook Creek Bridge	4.5 m clearance, bridge may need upgrading
22	RU	Lindsays Gap Road to Nundle Road	Requires some intersection widening and additional hardstand, signs made removable and a power pole relocation. Layover.
Nundle to the Project Area via Morisons Gap Road			
23	RU	Oakenville Street and Old Hanging Rock Road	Requires fence relocation, additional hardstand removable signage and guardrail relocation. Barry Road Layover – It has been identified that an area at the base of the hill where additional road shoulder may need to be constructed to provide a staging area for trucks about to negotiate the gradient up to Hanging Rock. This would be used if multiple prime movers are required.

ID	Type*	Location	Works
24 / 25	RU	Nundle to Hanging Rock via Barrys Road	Barrys Road has a section of road known as the Devils Elbows. The existing hairpin corners are impassable for the blades, towers and motors. A detour of the Devilis Elbow has been assessed and amended alignment proposed for all loads. The proposed concept alignment for Devil's Elbow is detailed in the Turnbull Engineering Report is provided in Appendix P of the Amendment Report. To the west and east of the Devils Elbows the road will need to be widened on a few corners, this would installation of laybys. Barry Road Layover – It has been identified that an area at the base of the hill where additional road shoulder may need to be constructed to provide a staging area for trucks about to negotiate the gradient up to Hanging Rock. This would be used if multiple prime movers are required.
26	RU	Barrys Road onto Morrisons Gap Road	Requires additional widening and hardstand, fence relocation and removal of trees. See Turnbull Engineering Report in Appendix P of the Amendment Report for detailed design.
28	RU	Morrisons Gap Road	Requires upgrade with widening 5.5m width and widening on bends and clearing vegetation on bends. The Proponent is also proposing to seal Morrisons Gap Road to improve road safety and the amenity of local residents.

** Type Abbreviations: GU: General Upgrade; RU: Road Upgrade; BU: Bridge Upgrade; TTPP: TTPP Swept Path Design; CC: Creek Crossing*

Legend

- Project Area
- Layby
- Internal Roads
- All Components
- Route 1 - Blades and loads over 5.2m
- Route 2 - Loads up to 5.2m
- Route 3 - Loads over 5.2m
- Route 4 - Standard Loads

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Street Map

OSOM Road Transport Route

F3-19

Drawing No:	0550690s_HoG_RtS_G006_R4.mxd		Hills of Gold Wind Farm Amendment Report
Date:	21/12/2021	Drawing Size: A3	
Drawn By:	VN	Reviewed By: AA	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

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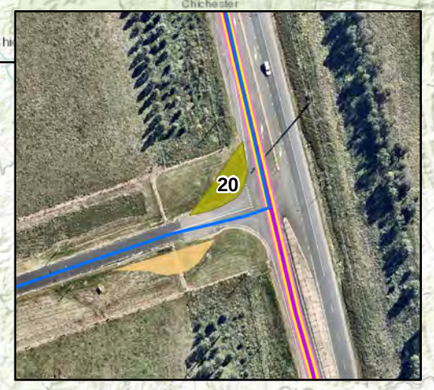

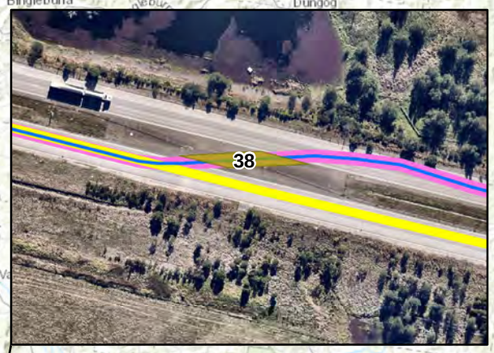

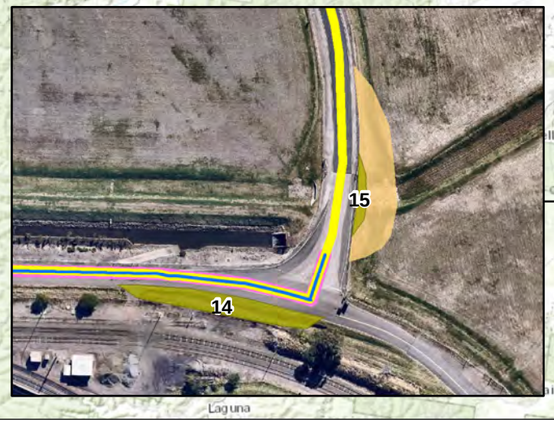

Legend

Upgraded Road Footprint

- Permanent Footprint
- Temporary Footprint

Transport Route

- Route 1 - Blades and loads over 5.2m
- Route 2 - Loads up to 5.2m
- Route 3 - Loads over 5.2m
- Route 4 - Standard Loads

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018
Nearmap Imagery 2021

Road Modifications and Upgrades

F3-20a

Drawing No:	0550690s_HoG_RtS_G019_R1.mxd		Hills of Gold Wind Farm Amendment Report
Date:	21/12/2021	Drawing Size: A3	
Drawn By:	VN	Reviewed By: AA	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

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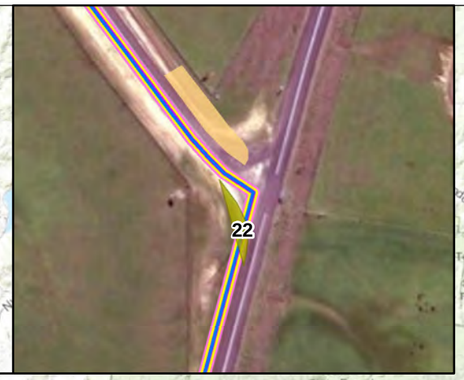

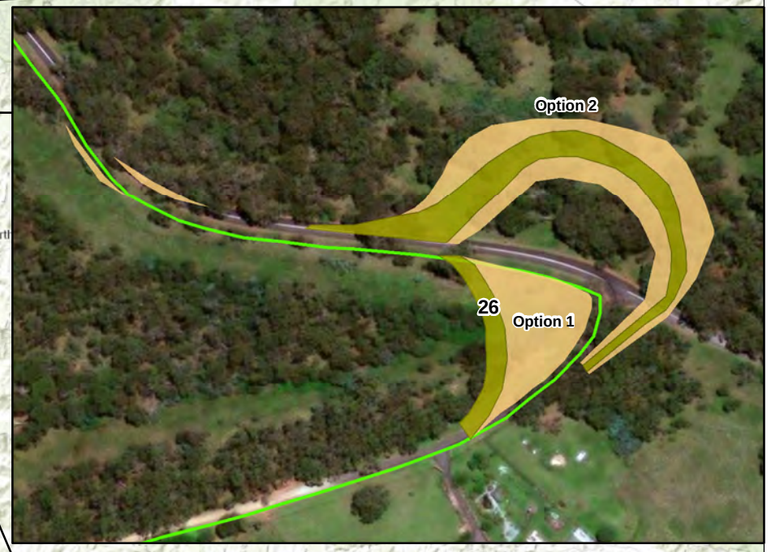

Legend

Project Boundary

Upgraded Road Footprint

Permanent Footprint

Temporary Footprint

Transport Route

All Components

Route 1 - Blades and loads over 5.2m

Route 2 - Loads up to 5.2m

Route 3 - Loads over 5.2m

Route 4 - Standard Loads

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018

Road Modifications and Upgrades

F3-20b

Drawing No:	0550690s_HoG_RtS_G020_R3.mxd		Hills of Gold Wind Farm Amendment Report
Date:	21/12/2021	Drawing Size: A3	
Drawn By:	VN	Reviewed By: AA	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 5 10Km

N

ERM

3.3.6 WTG installation

Excavation will be carried out with mechanical equipment for the WTG foundations. The exact design of the WTG foundations will depend on localised geotechnical conditions and the final type of foundation adopt, however will likely consist of concrete gravity foundation based footings. Topsoil and spoil from excavation will be stockpiled for reuse to backfill over the foundation and for vegetation rehabilitation of the Project Area. Excess materials will be utilised at other parts of the Project Area or exported offsite for beneficial reuse at an approved location.

The towers, nacelles and blades will be lifted off delivery trucks using mobile cranes. Cranes will then assist in the assembly of the rotor and the installation of the towers, nacelles and rotors and blades.

3.3.7 Temporary Mobile Concrete Batch Plant

Two temporary mobile concrete batch plants are proposed for the WTG foundations and also potentially for other structures including buildings, the substation switching station foundations, bunding and culverts. The two batch plants will be located at any of the WTG laydown areas, with the exception of laydowns along Morrisons Gap Road, and will be utilised at various periods during construction works as required. Each concrete batch plant is likely to include a slump stand, water tanks and stockpiles of gravel and sand, and may also include rock crushing facilities depending on the source materials used for construction. Whilst the exact details of the facilities will be determined during the detailed design phase, typically the area required for the plant and storage of materials will be approximately 100 m by 100 m at each of the two proposed locations. The batching plant will be bunded to contain runoff and potential contaminants.

Materials for the plant will be primarily sourced from an external supplier to be determined during the procurement phase of the Project. It is anticipated the cement will be stored in a silo adjacent to the batching process machinery. Concrete agitators will transfer the concrete from the batch plant to the WTG foundation locations.

3.3.8 Resource Requirements

Construction materials including gravel, aggregate and sand will be required for the concrete batch plant and construction of hardstands to support Project infrastructure, including internal access roads and installation of electrical cabling. It is anticipated that the road formation will be constructed using a cut and fill balance with excavated materials used for the final hardstand surfaces of the roads, crane pads and laydown areas. However, this will need to be confirmed upon geotechnical testing of the excavated material prior to works commencing. Otherwise gravel, along with aggregate and sand for concrete batching will be sourced externally from existing operating quarries. The Project will undertake ‘crushing, grinding or separating’ works at an estimated annual capacity of 475,000 tonnes per annum during construction.

There are a number of existing quarries located within approximately 80 km of the Project Area, including quarries located at Tamworth, Willow Tree, Currabubula, Ardglen and Crawney Road. The Traffic Impact Assessment has considered vehicle transport of aggregates from roads in these localities for the purposes of the traffic assessment. Construction materials will be transported to the Project Area by trucks and stockpiled within the laydown areas and at the concrete batch plants.

Water supply for the concrete batch plants, dust suppression and other construction activities will also be required onsite. It is anticipated that water required for construction will be supplied from existing onsite dams or bores (subject to seasonal availability, harvestable rights and water licencing requirements) or alternatively from other licenced water sources (subject to approval). Water will only be obtained from sources licenced under the Water Management Act and / or under harvestable rights.

3.3.9 Temporary Site Office, Car Parking and Storage

A temporary construction site office will be erected and maintained for the duration of the construction phase. In addition, temporary contractor parking and facilities and equipment laydown and storage areas are proposed with the indicative locations shown in Figure 3-2 and 3-5.

3.3.10 Temporary Construction Car Park and Pedestrian Crossing

A pedestrian crossing and temporary construction car park will be established in Nundle subject to further consultation with Tamworth Regional Council.

3.3.11 Post Construction Site Rehabilitation

The Project Area will be progressively rehabilitated throughout the course of construction. When construction is completed, all temporary plant and equipment will be removed, and disturbed areas will be revegetated and rehabilitated in consultation with involved landholders hosting infrastructure. Adequate sediment, soil and erosion controls will be put in place during ground disturbing works and rehabilitation activities in accordance with the *Managing Urban Stormwater: Soils and Construction-Volume 1* (The 'Blue Book') (Landcom, 2004).

Post construction rehabilitation requirements and processes will be detailed in the Environmental Management Strategy (EMS) to be prepared prior to commencement of construction of the Project, and undertaken in accordance with any relevant conditions of the development consent for the Project. Figure 3.21 provides examples of rehabilitation following underground cable installation at the Biala Wind Farm. Figure 3.22 provides examples of rehabilitation of road batters and verges at the Biala Wind Farm.

Figure 3.21 Examples of Rehabilitation following Underground Cable Installation – Biala Wind Farm
(Photos courtesy of BJCE (Australia) Pty Ltd)

Figure 3.22 Examples of Rehabilitation of Road Batters and Verges – Biala Wind Farm

(Photos courtesy of BJCE (Australia) Pty Ltd)

3.4 Development Footprint

The Development Footprint for the Project is approximately 300 ha, which includes the Permanent and Temporary Development Footprints:

- The Permanent Development Footprint is the area of land that will be subject to permanent alteration as a result of installation and operation of Project infrastructure until the Project is decommissioned at its end of life. The Permanent Development Footprint is approximately 100 ha (of the 300 ha total footprint) and is comprised of:
  - WTG foundations;
  - crane pads;
  - permanent access roads, including the transverse track;
  - transmission line and transmission line access roads;
  - substation, switching station and other facilities; and
  - road upgrades required for the transport haul route;
- Temporary Development Footprint (the area of land that will be temporarily disturbed during construction of the Project and rehabilitated following construction) covers approximately 200 ha (of the 300 ha total Development Footprint) and is comprised of:
  - access road construction batters;
  - underground electrical cable footprint;
  - concrete batching plants;
  - transmission line temporary access roads; and
  - laydown and assembly areas adjacent to the crane hardstand and WTG foundation.

It should be noted that the impact assessment has been undertaken based an estimated total worst case Development Footprint which combines the Temporary Development Footprint and the Permanent Development Footprint, notwithstanding that temporary impacted areas will be rehabilitated at completion of construction. The estimated total development footprint for the key Project components is outlined in Table 3-4.

Table 3-4 Estimated Development Footprint of Key Project Components

Project Component		Permanent Footprint (ha)	Temporary Footprint (ha)[2]	Estimated Total Footprint (ha)[1]
Wind Farm (WF)	WTGs including crane pad assembly areas and asset protection zones	40.67	6.52	47.19
	Internal access roads [3,4,5]	19.13	121.39[6]	140.52
	Operations and maintenance building	2.88	0	2.88
	Substation	1.16	0	1.16
	BESS	5.38	0	5.38
	Temporary facilities: parking, storage / laydown areas and batching plants	0	6.61	6.61
	Wind monitoring masts	0.002	0	0.002
Total WF		69	135	204
Transmission Line (TL)	Transmission line [7]	0.16	63.82[8]	63.98
	Switching station	2.03	0	2.03
	Transmission line access roads	21.10	0	21.10
Total TL		**23**	**64**	**87**
Transport route (TR)	Transport route upgrades	7.73	1.47[9]	9.2
Total TR		**8**	**1.47**	**9**
Total WF + TL + TR		**100**	**200**	**300**

Notes:

1. *Estimated total footprint includes temporary footprint areas.*
2. *Temporary footprint areas are areas that will be rehabilitated after completion of construction.*
3. *Internal access road calculation includes internal roads between hardstands and transverse track.*
4. *Calculation of 41 km with assumption the road will accommodate drainage, internal 33 kV underground cable runs, and cut & fill batters*
5. *Underground 33 kV electrical reticulation network will generally be located within the disturbance footprint of the access road network.*
6. *Temporary areas to be rehabilitated include cut and fill, roads Asset Protection Zones (APZ) and buffer for underground cabling.*
7. *330 kV transmission line is 24 km of 60 m easement and 33 kV aboveground power line is 2.46 km of 15 m easement.*
8. *It has been estimated that 90% of the 330kV easement can be rehabilitated using native grasses.*
9. *It is estimated that 50% of the transport route upgrades will be rehabilitated with native grass.*

3.5 Project Operation

Upon commissioning, the Project will be operational 24 hours per day, seven days per week. The Project will be controlled by a remote supervisory control and data acquisition (SCADA) from a control room located within the permanent site operations and maintenance facility. Where required, assistance from an offsite SCADA engineering team may be sought. The SCADA system will allow remote operation of all WTGs with the ability to shutdown individual or all WTGs if required. The SCADA system also allows the Project to operate at optimal capacity by synchronising with the internal WTG control systems to alter rotor speed and blade pitch to depending on wind conditions.

3.5.1 Operational and Maintenance Workforce

Regular maintenance will be undertaken on WTGs and other plant and equipment by internal and specialised contractors throughout the operation of the Project. It is anticipated that up to 28 FTE technical personnel and maintenance staff will be employed during operation.

Circumstances may arise where unplanned equipment failure occurs due to environmental events or other factors. The majority of repairs can be undertaken during routine maintenance; however, WTG components requiring replacement would need to be undertaken using a crane in a similar manner to their installation. In addition, replacement of WTGs may occur throughout the operational life of the Project as improved technologies become available.

3.6 Decommissioning and Rehabilitation

The WTGs have an expected operating life between 25-35 years, at the end of which there are three main options for consideration:

- continue the use of the site as a wind farm using the existing WTGs (subject to condition of equipment);
- replace the WTGs with technology current at that time and continue the use of the site as a wind farm for a further term (subject to agreement with landowners); or
- decommission the Project and remove the WTGs and associated infrastructure in accordance with the Environmental Management Strategy.

When decommissioning is required:

- key stakeholders including landholders will be consulted;
- all above ground structures not required for the ongoing agricultural use of the land (some access tracks, for example, may be required to be retained by the landholder to enable ongoing access), including the WTGs and substation will be removed and the land rehabilitated to ensure it can be returned to agricultural use; and
- below ground infrastructure, including the WTG foundations and hardstands to a depth less than 500 mm will be removed. All other infrastructure below 500 mm will be left in situ and covered in clean fill material, with the area adequately graded to reflect the slope of the surrounding area and to mitigate the risk of soil erosion.

It is anticipated that the decommissioning and rehabilitation phase would take up to 18 months to complete, with the Project Area being returned, as far as practicable, to its condition prior to the commencement of construction.

The Environmental Management Strategy will include measures for Decommissioning and Rehabilitation in accordance with any project approval requirements.

The Proponent has entered long-term lease agreements with the associated landholders for the construction and operation of the Project. The terms of these agreements make express provision for the Proponent's decommissioning obligations. Until decommissioning is complete, licence fees are also payable to the associated landholders. Therefore, there is a strong incentive for the wind farm owner to properly complete decommissioning when required.