



lightsource bp

Goulburn River Solar Farm

Project Description

FINAL

December 2023



GOULBURN RIVER SOLAR FARM

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Prepared by Umwelt (Australia) Pty Ltd
on behalf of Lightsource bp

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1.0 Project Description

1.1 Project Overview

The Project involves the construction, operation and decommissioning of approximately 550 megawatt peak (MWp) of solar photovoltaic (PV) generation as well as a Battery Energy Storage System (BESS) with a maximum 1,030 MWp/2,060 megawatt hour (MWh) capacity. The Project will include a substation and connection to an existing 500 kilovolt (kV) transmission line which passes through the Project Area. The Project will include various associated infrastructure, including road repairs and upgrades to Ringwood Road, Wollara Road, and the Golden Highway intersection, temporary construction facilities, operation and maintenance buildings, internal access roads, civil works and electrical infrastructure to connect the Project to the existing transmission line.

The conceptual layout of the solar arrays (refer to Figure 1.2 of the Amendment Report (copied here in **Appendix 1**)) has been designed to maximise solar efficiency while also considering ecological, heritage and other site constraints.

Table 1.1 provides a summary of the key components of the Project.

Table 1.1 Project Summary

Project Element	Summary of the Project
Project Application Number	SSD-33964533
Project Description	<p>The Project includes the construction, operation, and decommissioning of the proposed 550 MWp solar farm, maximum 1,030 MWp/2,060 MWh capacity BESS, road repairs and upgrades and associated infrastructure (such as operations and maintenance buildings, temporary construction compound, security fencing), civil works (such as regrading, re-sheeting and culvert upgrades) and electrical infrastructure (including a new onsite substation and underground and overhead cabling) required to connect to the electricity transmission network. A 30 m telecommunications tower is also proposed. No subdivision is required for the Project as part of this development application, however the Project Area is intended to be subdivided to facilitate a biodiversity stewardship area (BSA).</p> <p>The Project's conceptual layout is provided to Figure 1.2 of the Amendment Report (copied here in Appendix 1).</p>
Project Location	2335 Wollara Road, Merriwa NSW, approximately 28 km south-west of Merriwa, within the Upper Hunter Local Government Area.
Project Area – Solar Farm Area	Approximately 1,996.5 ha.
Development Footprint	Approximately 792.19 ha and 8.1 km of road repairs and upgrades.
Schedule of Lands	Refer to Appendix 4 of the EIS.

Project Element	Summary of the Project
Solar Arrays	<p>Approximately 1 million bifacial solar panels on ground-mounted single axis tracking framework</p> <p>Row spacing: Maximum 5 m apart, depending on tracker configuration.</p> <p>Height: Average height approximately 3.1 m at full tilt, with a maximum of 4 m in some areas due to undulating site topography.</p>
Battery Storage	<p>The option to construct and operate a 450 MWp/900 MWh centralised BESS, a 580 MWp/1160 MWh decentralised BESS or a combined centralised and decentralised BESS with a total capacity of 1,030 MWp/2,060 MWh. Each proposed option has a discharge duration of two hours.</p> <p>There will be a 50 m APZ surrounding the centralised BESS facility security fencing.</p>
Electrical Reticulation	<p>Connection to existing 500 kV transmission line in south-eastern corner of Project Area. Additional cabling may also be required along the existing transmission line, connecting the site to the substation in Wollar. This would involve access along the existing easement and potential aerial cable instalment via helicopter. If any works to the existing transmission line between Wollar and the Project Area are required, this would be undertaken by Transgrid and is separate to this EIS.</p> <p>Power conversion units consisting of approximately 67 inverters.</p> <p>On-site substation covering approximately 4 ha, enclosed by security fencing.</p>
Telecommunications Tower	<p>Up to 30 m high, providing a secondary communications channel between the Project and Wollar and Bayswater substation. This will be capable of radio communications, located in the substation compound area.</p>
Temporary Construction Facilities	<p>Main construction site compound to include office amenities, parking, storage, and associated facilities.</p> <p>Laydown areas suitable for storing plant and equipment, solar panels and cable drums, and areas to support waste management activities.</p> <p>A temporary helipad for emergency response purposes during construction.</p>
Permanent Operational Facilities	<p>This would include the system control building, switch room and storage facilities, and car parking.</p>
Security Fencing, Lighting and CCTV	<p>Perimeter security fencing around the Development Footprint to a height of approximately 2.3 m plus CCTV and security lighting.</p>
Road repairs and Upgrades	<ul style="list-style-type: none"> • Road upgrades are required for the safe transportation of materials and personnel to the Project Area including. • Upgrades to culverts at the existing road crossings of Bow River and Killoe Creek located on Ringwood Road. • Realignment, widening and sealing of a 4.7 km section of Wollara Road. • Realignment, widening and sealing of 3.4 km of Ringwood Road, across two sections. • Upgrades at the Golden Highway and Ringwood Road intersection including vegetation removal, minor lane widening, addition of an acceleration lane and formalisation of the bus stop pullover area.

Project Element	Summary of the Project
Project Access	<p>Major solar components would be delivered via the Port of Newcastle, New England Highway, Golden Highway, Ringwood Road and Wollara Road from the north.</p> <p>Light vehicle access would generally occur from the north via Merriwa.</p> <p>Three access points to be provided along the western boundary of the Project Area, off Wollara Road. One point will be a permanent site access and the remaining two are emergency access points.</p>
Internal Access Tracks	<p>Approximately 49 km of unsealed access tracks of approximately 4 m width. A single main access road footprint of between 8 and 10 m width will connect Project areas and accommodate the proposed buried cable easements.</p>
Workforce	<p>Construction: Up to 350 direct jobs at the peak of construction with an average 250 jobs, aspirational target of 10% (35 jobs) sourced locally.</p> <p>Operation: Approximately 10 direct jobs. Aspirational target of all permanent roles based locally.</p>
Construction Hours	<p>Construction hours:</p> <ul style="list-style-type: none"> • Monday to Friday 6:00 am to 6:00 pm. • Saturday 6:00 am to 6:00 pm. • No works on Sundays or Public Holidays. <p>Approval is also sought to undertake activities which are inaudible at non-involved dwellings, emergency work, and deliveries and dispatches (where required by authorities for safety reasons) outside of standard construction hours.</p> <p>Road upgrades on Ringwood Road are proposed to be undertaken within standard construction hours.</p>
Operational Hours	24/7.
Construction Period	27 months.
Operational Period	40 years.
Capital Investment Value	Estimated \$880 million.

1.2 Project Area

The Project Area covers approximately 1,996.5 ha with a Development Footprint of approximately 792.19 ha, as shown in Figure 1.2 of the Amendment Report (copied here in **Appendix 1**). Access to the Development Footprint will be off Wollara Road via the existing driveway towards the southern end of the property's western boundary. Two secondary access points, also off Wollara Road, will be available towards the north of the property's western boundary for emergency use.

Emergency services and NPWS access will be maintained through the Project Area, to be used for emergencies only or on request.

The layout of the solar arrays and associated infrastructure would be entirely contained within the Development Footprint. The Project also includes road repairs which are located outside of the Project Area. These encompass parts of Ringwood Road (including culverts at two waterway crossings), Wollara Road and the intersection of Golden Highway and Ringwood Road. Works on the two culverts and the intersection are required to support Project construction traffic, whilst other road improvements are in response to feedback and represent part of a community benefit offered by the Project. All road upgrades will improve safety outcomes for both the Project and the broader community.

The works on Wollara Rd and Ringwood Road are contained to the road reserve and landowners' consent from Upper Hunter Shire Council has been obtained, refer to Appendix B of the Amendment Report. The upgrades to the intersection of the Golden Highway and Ringwood Road require works which will be largely contained within the road reserve, but which will encroach into the cadastral boundary of Lot 1 DP34496 (outside of the existing fence-line). The formalisation of the bus stop on Ringwood Road at the intersection with Golden Highway will be contained within Lot 7303 DP 1146691; refer to Appendix D of the Amendment report.

The Project Area has been subject to land clearing, grazing, cropping and pasture improvement, and as such, the Development Footprint supports a mosaic of exotic vegetation. Despite these long-running land management practices, the Project Area still supports areas of biodiversity value, including derived native grasslands in a range of conditions, scattered paddock trees, areas of thinned woodland and forest, and areas of intact woodland and forest, providing habitat for threatened vegetation communities and species. The presence of these biodiversity values has been a key driver for the design of the Development Footprint in order to maximise the avoidance of impacts (refer to Section 6.2 of the EIS and Part B of the Amendment Report). The presence of one Aboriginal heritage item, seven potential culturally significant trees (four outside of the Development Footprint) and historic heritage feature (Slab Hut) have also contributed to the placement of the final Development Footprint. Key heritage constraints are shown in Figure 1.7 of the Addendum Aboriginal Cultural Heritage Assessment. Dams, waterways and flooding potential were another key consideration for Project design.

The Project has been designed through a comprehensive process that incorporates community and other stakeholder feedback to maximise positive social, economic and environmental outcomes, while minimising environmental and social impacts.

1.3 Physical Layout and Design

1.3.1 Solar Arrays

The Project would involve the installation of approximately one million bifacial PV solar panels across the Project Area, providing an estimated 550 MWp capacity. The panels would be arranged in a series of rows approximately 5 m apart, positioned to maximise the solar resources available. The solar arrays would be installed through pile driving on ground-mounted single axis tracking framing, in rows configured in a north-south direction. The panels would move throughout the day from east to west, tracking the sun. The tracking system is estimated to have a tracking range of 120 degrees, or ≤ 60 degrees from the horizontal position.

The standard dimensions of PV solar panels are up to 2.4 m tall by 1.3 m wide, which provides a surface area of approximately 3 m² per PV solar panel. PV solar panels are designed for maximum light absorptivity and constructed of solar glass with anti-reflective surface treatment. The PV modules would have a height of approximately 3.1 m at full tilt, with a maximum of 4 m in some areas due to undulating topography throughout the Project Area.



Photo 1.1 Example of Solar Panels (Umwelt, 2021)



Photo 1.2 Example of Typical Single Axis Tracking System

1.3.2 Onsite Electrical Reticulation and Substation

The solar arrays would be connected to the onsite substation via a network of underground cables which are buried in trenches (up to one metre deep and 0.3 m wide). The electricity generated by the Project would be directed via these cables to the inverters. The number of inverters would be dependent on the final detailed design; however, it is estimated that approximately 140 inverters grouped in blocks of two would be required. The inverters change the direct current (DC) electricity generated into alternating current (AC), so that it is in a useable form to transport across the grid. In addition to this, power transformers would be required to step up voltage to the solar farm reticulation voltage, medium voltage switchgear and communication and ancillary equipment.

The Project would include an onsite substation, to be in the south-eastern corner of the Project Area (refer to Figure 1.2 of the Amendment Report (copied here in **Appendix 1**). The substation would include a range of electrical equipment to manage and control the supply of electricity (up to 10 m in height) and a lightning rod up to 18 m in height. The substation would include an elevated busbar, switch room, lightning protection system, circuit breakers, disconnectors, current transformers, voltage transformers, and a 500 kV transformer. The anticipated footprint of the substation is approximately 4 ha.

The substation would connect via overhead lines to the existing 500 kV transmission line that passes through the south-eastern corner of the Project Area. This transmission line is owned and operated by Transgrid, and the Project will connect directly to the national grid through this transmission line.

A transmission tower will be installed in the southeastern portion of Project Area as depicted in Figure 1.4 of the Amendment Report (copied here in **Appendix 1**), adjacent to the existing 500 kV transmission line easement. The transmission tower would be constructed at a height of approximately 65 m, in line with existing transmission towers within the Project Area.

1.3.3 Battery Energy Storage System (BESS)

The Project is considering three BESS options including a centralised BESS, a decentralised BESS or the option for both a centralised and decentralised BESS system combined.

The centralised system would include a BESS with a capacity of up to 450 MWp/900 MWh. The BESS would most likely comprise of a lithium phosphate iron battery system, to be housed in a series of outdoor containers, aggregated in one central location. The BESS would be located adjacent the substation in the south-eastern corner of the Project Area.

The decentralised system would include a BESS with a capacity of up to 580 MWp/1160 MWh. The decentralised BESS option involves 560 individual 6.1 m (i.e., 20 foot) battery containers and DC-DC converters, and associated infrastructure situated next to the PV inverter stations located throughout the solar arrays. The layout of the centralised and decentralised options is shown in Figure 3.5 and Figure 3.6 respectively of the Amendment Report (copied here in **Appendix 1**).

The third option would include both centralised and decentralised BESS units, with a combined BESS capacity of 1,030 MWp/2,060 MWh.

1.3.4 Access, Parking and Security Fencing

Three access points are to be provided along the western boundary of the Project Area off Wollara Road, as shown in Figure 1.2 of the Amendment Report (copied here in **Appendix 1**). The two northern-most access points would be provided for emergency access only, with primary access provided through the southernmost point (the existing access point for the property).

Major solar components would be delivered to the Port of Newcastle and transported to the Project Area by truck via the New England Highway and through to the Golden Highway, Ringwood Road and Wollara Road. All vehicles will travel from the north and enter the Project Area from the southern entrance off Wollara Road through the primary access point. Construction vehicles would be restricted to a left in and left out movement at the Golden Highway and Ringwood Road intersection, facilitated by the use of an existing vehicle turning area on Barnett Street which will allow for return traffic towards Merriwa.

Landowners consent has been obtained refer Appendix B of the Amendment Report.

Approximately 49 km of internal wet weather access roads would be constructed to provide access to the various areas of the site for construction as well as to facilitate on-going operations and maintenance.

Internal access roads would be constructed of compacted gravel and predominantly 4 m wide. The main access track footprint will be 8 to 10 m wide in order to accommodate transformer delivery to the substation, allow for the safe delivery, unloading and installation of key components, and allow for the subterranean transmission corridors which will be used as part of the internal reticulation network. These subterranean transmission corridors will travel parallel to selected internal access roads.

During construction, a suitable number of parking spaces will be available within the temporary laydown areas. The indicative location of laydown areas is illustrated in Figure 1.2 of the Amendment Report (copied here in **Appendix 1**).

The perimeter of the Development Footprint would be enclosed by security fencing (no security fencing is proposed around the Project Area boundary), approximately 2.3 m high, subject to final design. The Project is committing to avoid use of barbed wire, to minimise the risk of harm to wildlife. The security fencing would involve casting concrete footings for posts and installing fencing mesh. Fencing will restrict public access to the Development Footprint and is required under *Australian Standard (AS) 1725.2010 Parts 1-5*. CCTV cameras and security lighting would also be provided around the onsite substation, maintenance buildings and offices and the full length of the perimeter of the Development Footprint.

1.3.5 Operations and Maintenance Facility

A permanent operations monitoring and maintenance facility would be constructed to support the ongoing operation of the solar farm. The operation and maintenance facility would be used on an ongoing basis to support maintenance and repair activities. This would include an office with staff amenities (kitchenette, toilets, showers), car park, workshop/shed and laydown/temporary storage area. The facility would have a footprint of approximately 10 ha (refer to Figure 1.2 of the Amendment Report (copied here in **Appendix 1**)).

1.3.6 Construction Workforce

The Project would generate approximately 350 jobs during the peak months of the construction period. Onsite workforce numbers would vary from month to month, depending on the intensity of the proposed works at the time. The workforce would include licensed electrical trade personnel, mechanical and electrical trades assistants, machinery operators, riggers, and labourers.

Lightsource bp aims to hire 10% (or 35 FTE positions) local labour for construction, and source local sub-contractors and suppliers. It is envisaged that the majority of the local workforce would be residing in towns within one hour's drive from the site (i.e., Merriwa, Mudgee, Gulgong and Rylstone). The majority of the non-local workforce during the peak construction phase are proposed to be housed in a temporary workforce accommodation facility in Merriwa.

1.3.7 Road Repairs and Upgrades

The Project would require road repairs and upgrades on Ringwood Road, Wollara Road and the intersection of Golden Highway and Ringwood Road, which are located outside the Project Area. Roadworks will be completed prior to the commencement of construction of the solar farm. The location of these road repairs and upgrades are provided in Figure 3.2, Figure 3.3 and Figure 3.4 of the Amendment Report (copied here in **Appendix 1**) and the detailed designs are provided in Appendix D of the Amendment Report.

Upgrades to culverts at existing road crossings of Bow River and Killoe Creek located on Ringwood Road. The culvert upgrades will include:

- Installing culverts designed to accommodate two-way heavy vehicles, including B doubles and various farm machinery.

- Culvert width 7 m (3.5 m lane width) sealed carriageway with suitable guardrail and signage and associated drainage works.
- Stockpile site to be located on disturbed land within the road reserve in consultation with the Upper Hunter Shire Council.
- Temporary side track at both locations to facilitate access during construction (also within road reserve).

Upgrades to Wollara and Ringwood Roads including:

- Upgrades to culverts at the existing road crossings of Bow River and Killoe Creek located on Ringwood Road.
- Widening and resealing of 1.8 km of Ringwood Road between Bow River and Killoe Creek.
- Realignment, widening and sealing 1.6 km section of Ringwood Road between Killoe Creek and Binks Road
- Realignment, widening and sealing a 4.7 km unpaved section of Wollara Road between the Goulburn River National Park boundary and 1621 Wollara Road. No upgrades are proposed in the portion of Wollara Road within the Goulburn River National Park.
- These upgrades will include eight (8) m bitumen-sealed formation with a minimum of 500 millimetre (mm) unsealed shoulders. The horizontal and vertical alignment of the proposed road will ensure safe sight distance and an improved road network for the users.
- The proposed Wollara Road and Ringwood Road upgrades are illustrated on Figure 3.3 of the Amendment Report (copied here in **Appendix 1**) below.

Upgrades to the intersection of the Golden Highway and Ringwood Road in line with Austroads Safe Intersection Site Distance (SISD) standards. These upgrades would include:

- Pruning and removal of vegetation and select trees on the western side of the intersection on Lot 1 DP34496. Currently estimated at six (6) established trees.
- The construction of a 325 m acceleration/merge lane to allow vehicles to safely turn left onto the Golden Highway from Ringwood Road.
- Realignment of the existing low voltage power line to provide clearance to the acceleration lane (if required and subject to detailed design).
- Extension of the existing Golden Highway westbound and Ringwood Road left-in deceleration lane taper to 30 m and widening of the intersection.
- Pruning of vegetation on the eastern side of the intersection, wholly within the road reserve.
- Formalisation of the informal bus stop on Ringwood Road at the intersection with Golden Highway (Lot 7303 DP1146691).
- The proposed Golden Highway and Ringwood Road upgrades are illustrated on Figure 3.2 and Figure 3.3 of the Amendment Report below (copied here in **Appendix 1**).

1.3.8 Site Preparation and Earthworks

The first stages of construction within the Development Footprint would include:

- Site survey, based on initial geotechnical investigations and LIDAR data, to confirm infrastructure positioning and placement.
- Ongoing geotechnical investigations to confirm the ground conditions.
- Biosecurity controls (e.g., weed spraying) prior to ground disturbance commencing.
- Construction of internal access tracks for accessing the site from the local road network and car parking, including creek crossings (i.e., small culverts and bed level crossings).
- Installation of temporary construction fencing around work areas and boundary fencing.
- Establishment of temporary construction compounds, site facilities and laydown areas for construction materials and equipment (refer to Section 1.4.4 of the EIS).
- Preliminary earthworks and installation of environmental controls including erosion and sediment control structures.
- Identification and establishment of no-go zones around sensitive biodiversity and heritage features as required.

The need for heavy earthworks and compaction will be minimised as much as practicable, although some grading and levelling is likely to be required for the substation and BESS.

1.3.9 Temporary Construction Facilities

To facilitate construction of the Project, a range of temporary buildings and facilities will be required within the compound area. Temporary staff amenities would be designed to accommodate the number of workers at the peak of the construction period, and include:

- Car parking.
- Staff offices.
- Control room.
- Lunchroom and first aid room.
- Toilet and shower facilities.
- Water tanks.
- Covered walkways.
- Covered storage area.
- Associated data, water, and electrical reticulation.
- Emergency helipad (as part of site compound).

1.3.10 Infrastructure Installation

The construction and commissioning phase of the Project is anticipated to involve the following works:

- Installation of steel posts and framing system to support the solar panels, which would be driven or screwed into the ground to a depth of approximately 1.5 to 2.4 m depending on geotechnical conditions.
- Installation of PV panels.
- Installation of permanent fencing and security.
- Preparation of foundations for the permanent buildings, BESS and on-site substation.
- Installation of underground cabling (trenching and installation of power conversion stations).
- Construction of site operations and maintenance facility.
- Establishment of the BESS.
- Construction of the onsite substation and associated grid connection infrastructure.
- Construction of the Project transmission tower.
- Testing and commissioning of infrastructure.
- Removal of temporary construction facilities.
- Revegetation of disturbed areas.

It is expected that some of these construction tasks would occur concurrently. It is noted that the solar arrays would be sited above the ground and existing ground cover would be maintained underneath, to facilitate potential sheep grazing across the site and maintain biodiversity values.

1.3.11 Construction Hours

The construction phase is expected to be undertaken over approximately 27 months from the commencement of site establishment works. It is anticipated that construction works would commence in mid-2024.

1.3.11.1 Solar Farm Site Construction Hours

It is anticipated that construction works would be undertaken both during and outside standard construction hours (as defined by the Interim Construction Noise Guideline (ICNG) (Department of Environment and Climate Change, 2009). Proposed construction hours are:

- 6:00 am to 6:00 pm – Monday to Friday.
- 6:00 am to 6:00 pm – Saturday.
- Sunday and Public Holidays – no works to be completed.

Exceptions to these hours may occur, however would be limited to activities with low noise generation, where practicable, which would be assessed on a case-by-case basis prior to commencement of those activities.

An indicative timeline for the Project phases is outlined in **Table 1.2**.

Table 1.2 Indicative Timing

Phase	Approximate Commencement	Approximate Duration
Construction & Commissioning	2024	27 months
Operation	2026	40 years
Decommissioning ¹	2064	8 months

1.3.11.2 Road Repairs and Upgrades Construction Hours

Construction hours for the road repairs and upgrades will be undertaken within the ICNG standard hours as there are sensitive receivers closer to these works than that of the solar farm site. Proposed construction hours are:

- 7:00 am to 6:00 pm – Monday to Friday.
- 8:00 am to 1:00 pm – Saturday.
- Sunday and Public Holidays – no works to be completed.

The construction of the road repairs and upgrades package is estimated to require three (3) months to be delivered prior to primary construction works commencing on the Solar Farm. Road repairs and upgrades are anticipated to occur in 2024 and are accounted for within the 27 months of the construction period.

1.3.12 Construction Traffic

During the peak of the construction period, the majority of personnel would travel to the Project Area on a daily basis via shuttle buses to be provided from a temporary workforce accommodation facility in Merriwa, requiring approximately 15 two-way shuttle bus trips per day. Assuming some of the other personnel would carpool (at a rate of 1.2 people per private vehicle) there would also be approximately 60 two-way light vehicle trips per day. Although many of the shuttle buses and light vehicle traffic would travel to the site from the north, some movement of locally-based personnel via light vehicles from the south is also anticipated.

Heavy vehicle transportation would be restricted to accessing the site from the north. It is anticipated that 55 two-way heavy vehicle trips per day would be required during the peak construction period. There are expected to be approximately six (6) oversize overmass vehicle movements during the construction period, which will be under traffic management.

¹ After the operational period the solar farm would either be decommissioned, removing all infrastructure, and returning the site to its existing pre-solar agricultural land capability, or repurposed with new PV equipment subject to additional technical feasibility and planning consents.

As noted in Section 1.3.4 of the EIS, all Project construction vehicles will be limited to a left in left out manoeuvre at the intersection of Ringwood Road and Golden Highway. Construction vehicles will be diverted to a privately owned vehicle turning area on Barnett Street.

Mobilisation to site would be expected to occur for the first three months of the Project delivery timeframe and heavy vehicle movements during this period are anticipated to include:

- Delivery of infrastructure including temporary offices and associated equipment, power generation equipment, ablutions.
- Delivery of equipment and machinery for civil construction, clearing (if required) and general site establishment.
- Delivery of structural components and some PV equipment.

More intense construction would be expected to follow during months 3 to 20, to achieve mechanical completion with the following heavy vehicle movements:

- Delivery of equipment and machinery for structural, electrical, and civil construction activities.
- Ongoing delivery of PV and electrical equipment including deliveries of major equipment such as inverters, switchgear, transformers etc.
- Trucks for removal of waste.

Following mechanical completion, the site will move into a commissioning phase estimated to occur during months 20 to 27 where both equipment deliveries and the workforce would be significantly reduced. During commissioning, most of the traffic would be expected to be light vehicles for personnel movement.

Construction traffic generated during the road repairs and upgrades along Ringwood Road, Wollara Road and the Golden Highway and Ringwood Road intersection upgrade are anticipated to be lower than the number of vehicles generated during the construction of the Solar Farm site. Impacts from these works in general are considered low, given the low volume of traffic on this road.

A detailed assessment of traffic movements and transport routes is provided in Section 6.9 of the EIS and Section 7.1 of the Amendment Report.

1.4 Operations and Maintenance

Once fully operational, activities will include:

- Routine visual inspections, general maintenance and cleaning operations of the solar arrays and substation, as required.
- Vegetation management including potential sheep grazing and the use of seeding or armouring (i.e., jute mesh) to avoid erosion.
- 24-hour site security response.
- Replacement of equipment and infrastructure, as required.

- Pest and vermin control.
- Livestock operations.

During the operational phase of the Project, it is anticipated that a workforce of up to 10 FTE personnel would be required, and traffic movements would be restricted to light vehicles for routine operations and maintenance.

1.5 Decommissioning

The Project is expected to operate for 40 years or more. After the initial 40-year operating period, the solar farm would either be decommissioned, removing all infrastructure, and returning the site to its existing pre-solar agricultural land capability, or repurposed with new PV equipment subject to additional technical feasibility and planning consents.

At the end of the useful life of the asset, decommissioning would involve the mobilisation of a workforce and additional temporary facilities, and the subsequent removal of equipment and infrastructure. At this time, it is expected that significant movements of light vehicles and trucks for transporting waste would occur. The decommissioning phase would be expected to last less than eight months.

During decommissioning, works would include:

- Removal of solar arrays, including the foundation posts, and sorting and packaging of all materials for removal from the site and recycling and/or reuse.
- Removal of all site amenities and equipment, and recycling and/or reuse of materials wherever practicable.
- Removal and recycling of posts and cabling and removal of security fencing including small concrete footings, unless otherwise useable for livestock operations.

1.6 Services and Utility Supply

1.6.1 Water

The Project would require a water supply during the construction, operational and decommissioning phases.

During construction, water would primarily be used for the establishment of hard-stand areas and dust suppression. The associated water demand would likely be in the order of 11.26 megalitres (ML) for the 27-month construction period. Water for construction would be sourced from commercial suppliers in the nearby region (via water trucks) and farm dams located within the Project Area. Water sources would be determined prior to the commencement of construction in consultation with suppliers and landholders. Town water supplies will be generally avoided for use in construction but may be used where appropriate and available. It is anticipated that during construction 3,000 L would be used on site daily at the operations and maintenance facility.

During operations, it is expected that approximately 3 ML of water per year would be required for ongoing maintenance activities such as fire mitigation and for livestock grazing within the Development Footprint.

Panel cleaning is expected to require 8 ML per year noting washing of the panels would not require any detergent or cleaning agents. Road maintenance works that require water usage are anticipated to require 2 ML per year.

Potable water supplies would be required for staff amenities. Rainwater would be collected onsite through tanks across the Project Area with supply supplemented by water trucks.

1.6.2 Electricity

Access to electricity during operational activities would be via a dedicated low voltage feeder from the substation, battery backup is provided for essential services at the Operation and Maintenance Facility (O&M Facility). During construction electricity access would be via the local distribution network or alternatively a diesel generator when required.

Electricity requirements during operation would include lighting at ancillary infrastructure (office, workshop, amenities, and parking), power for internal office facilities and appliances, and onsite security systems. Electricity generated by the solar farm would be used for most activities during operations via a dedicated low voltage feeder from the substation, except for maintenance of the inverters during the night which would involve a small amount of auxiliary load being supplied from the grid.

1.6.3 Telecommunications

A telecommunications tower (approximately 30 m in height) would be installed within the Project Area in the substation compound area to support the Project and to facilitate communications between the solar farm site and nearby Transgrid substation. In addition, the telecommunications tower would provide radio communications coverage to the Project Area and wider region.

1.6.4 Sewer

There is no sewer access in the Project Area. Therefore, construction amenity facilities would be pumped out via tanker and delivered to the nearest sewage treatment facility, or as agreed with Upper Hunter Shire Council during construction.

It is likely that a septic system would be installed for the operational amenities. This would be constructed and managed in accordance with the relevant Council requirements. This would be in accordance with the Upper Hunter Shire Council Liquid Trade Waste Regulation Policy 2016.

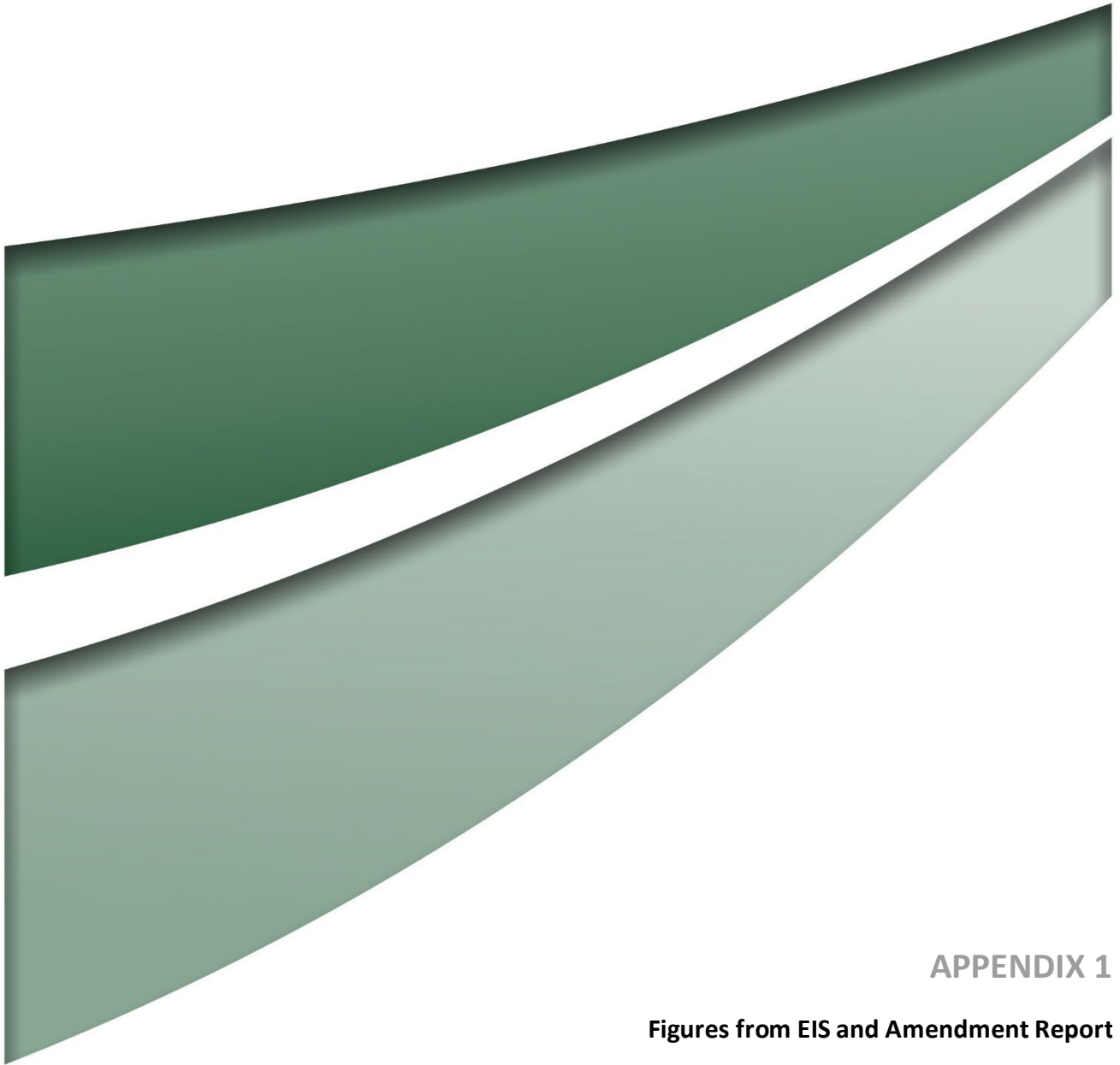
1.7 Environmental Management

Lightsource bp would develop and implement an Environmental Management Strategy (EMS) as part of the Project to provide the strategic framework for environmental management. The EMS would:

- Incorporate a Construction Environmental Management Plan (CEMP), Operational Environmental Management Plan (OEMP) and Decommissioning and Rehabilitation Environmental Management Plan (DREMP), including all required sub-plans, protocols, management, and mitigation measures proposed in this EIS.
- Identify all relevant statutory approvals.

- Establish roles, responsibilities, authority, and accountability of all key personnel involved in the environmental management of the Project.
- Establish procedures for consulting with the local community and relevant agencies about the operation and environmental performance of the Project.
- Establish procedures for handling of complaints, disputes, non-compliances, and emergency response.

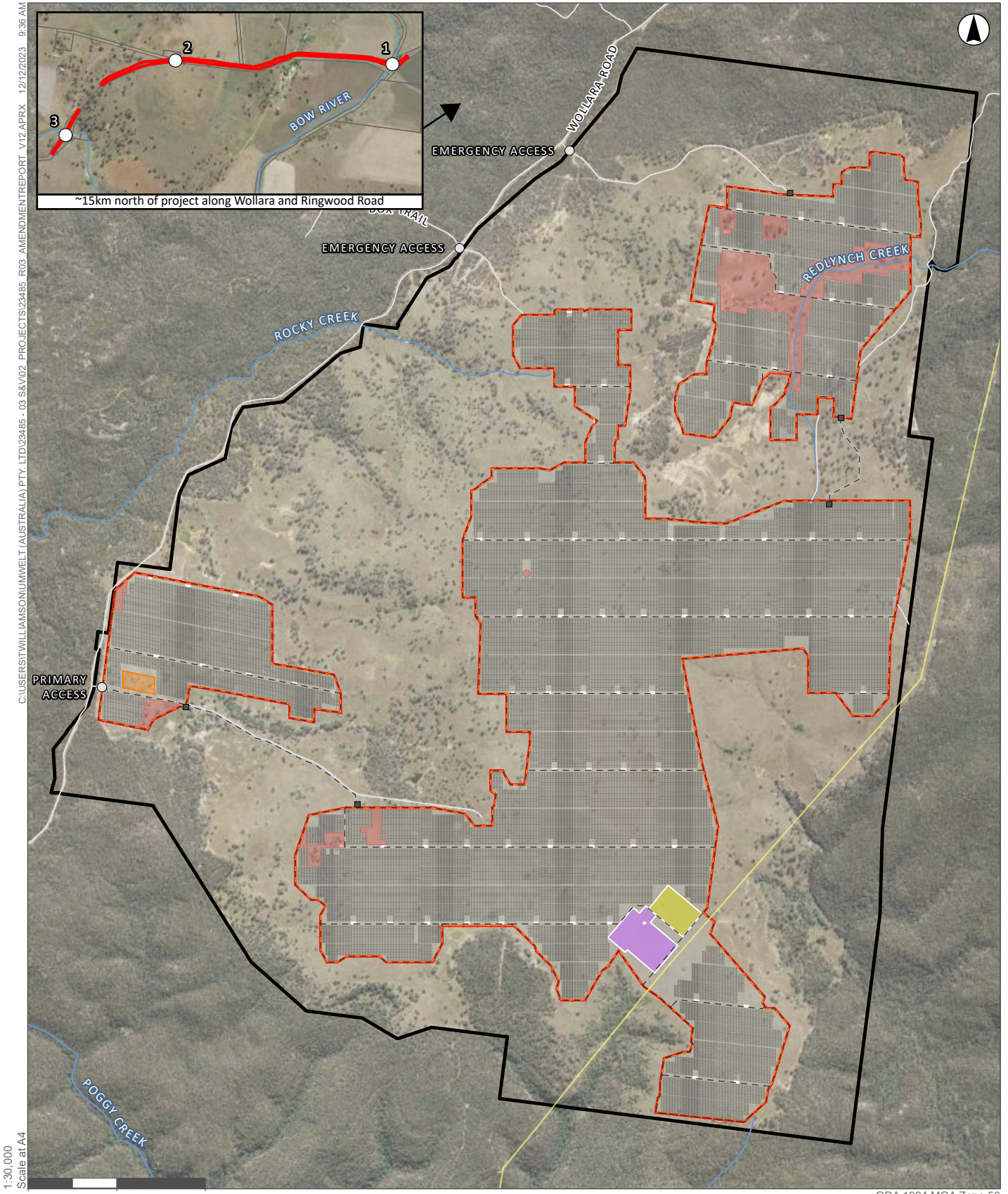
Appendix C of the Amendment Report provides a consolidated summary of the management measures that would be implemented during the construction and operation of the Project to manage, mitigate and/or monitor potential impacts identified within this EIS.



APPENDIX 1

Figures from EIS and Amendment Report

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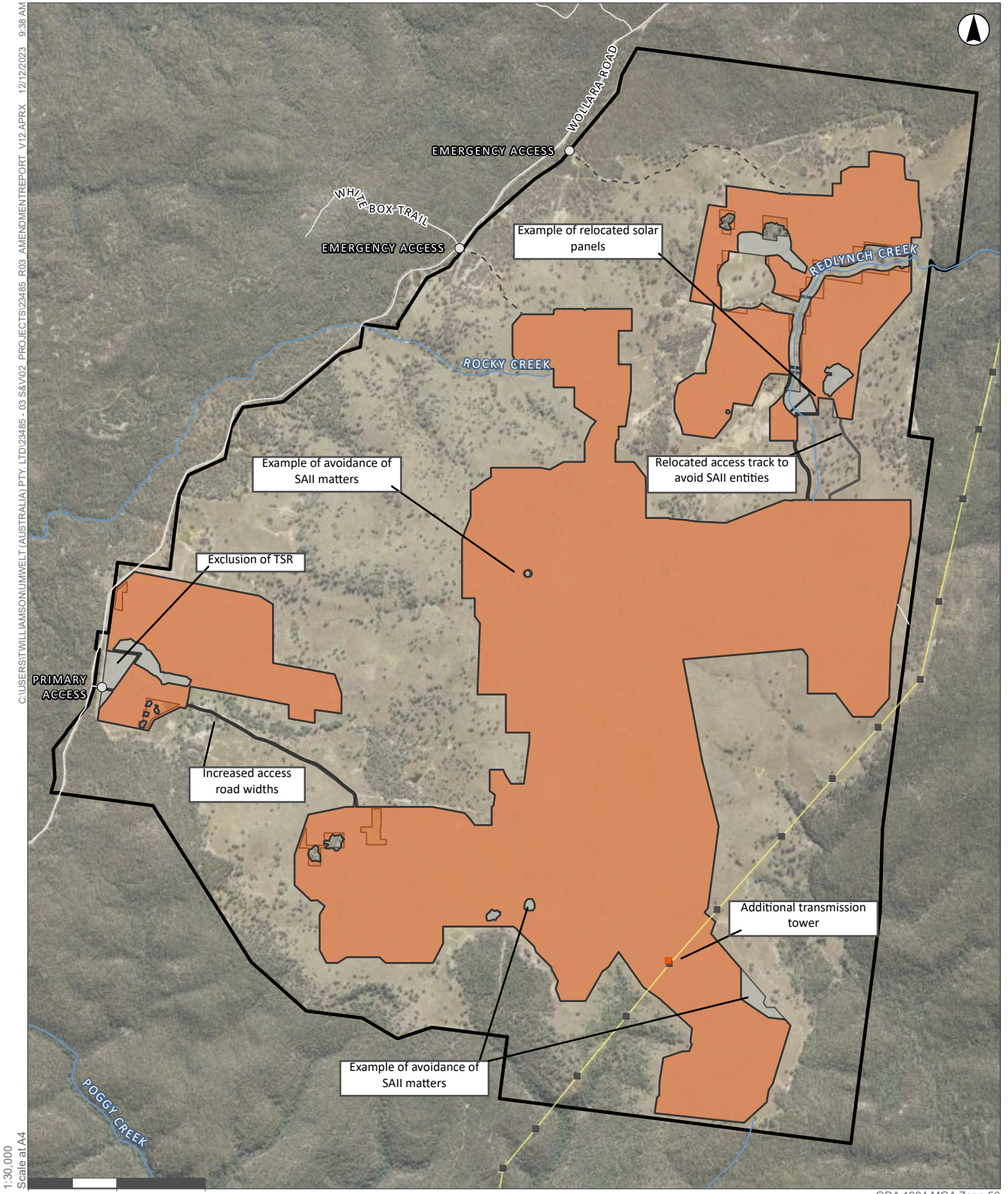


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- Legend**
- Gate
 - Access Points
 - Electricity Transmission Line
 - - - Proposed Access Tracks
 - Watercourse
 - Roads and Tracks
 - Security Fence
 - ▭ Project Area
 - ▭ Road Upgrades Area
 - ▭ Fire Break
 - ▭ Battery Energy Storage System
 - ▭ Substation
 - ▭ Inverters
 - ▭ Compound Area
 - ▭ Exclusion Zones - Environmentally Sensitive Areas
 - ▭ Development Footprint
 - ▭ Solar Panel Footprint

FIGURE 1.2
EIS Project - Development Footprint and Internal Layout



1:30,000
Scale at A4

- Legend**
- Existing Tower
 - New Tower
 - Access Points
 - Electricity Transmission Line
 - Watercourse
 - Roads and Tracks
 - - - Emergency Access Tracks
 - ▭ Project Area
 - ▭ Development Footprint (EIS)
 - ▭ Development Footprint (Amended Project)

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FIGURE 1.4
Summary of the Proposed Amendments to Development Footprint

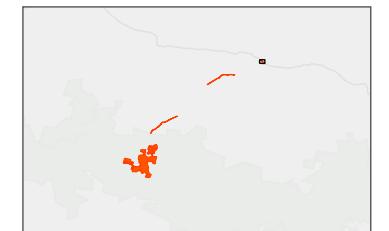
FIGURE 3.2
Amended Project -
Golden Highway and Ringwood
Road Intersection Upgrade

Legend

- Lot Boundary
- Waterbodies
- Road Upgrade Development Footprint



NOTE: Development Footprint comprises ground disturbance works within the road reserve and vegetation clearing/pruning on adjacent land



Meters

Scale: 1:0 at A4
 GDA2020 MGA Zone 56





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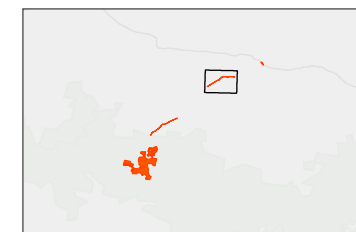


FIGURE 3.3

**Amended Project -
Wollara Road and Ringwood
Road Upgrades**

Legend

-  Watercourse
-  Lot Boundary
-  Waterbodies
-  Road Upgrade Development Footprint



Meters

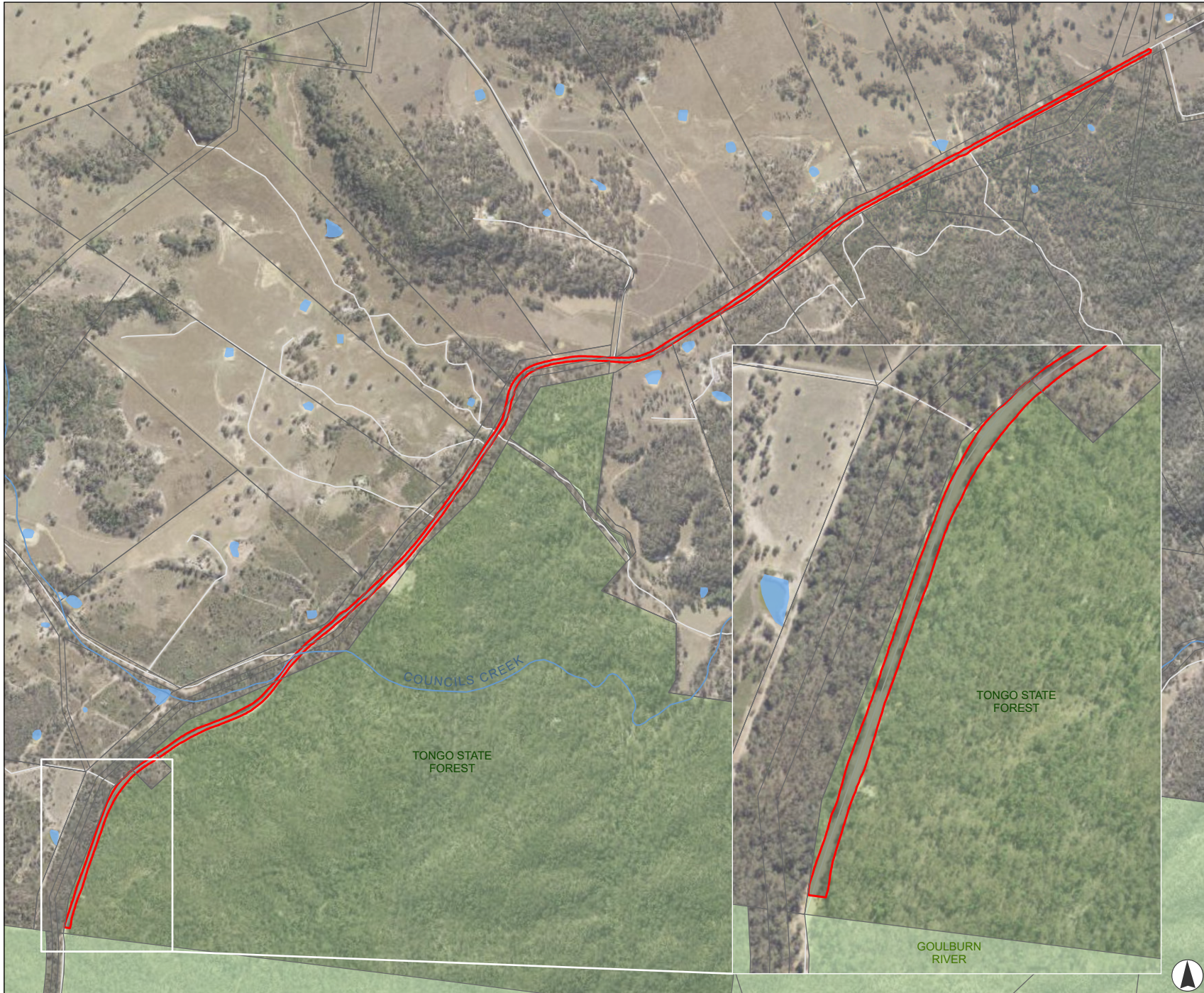
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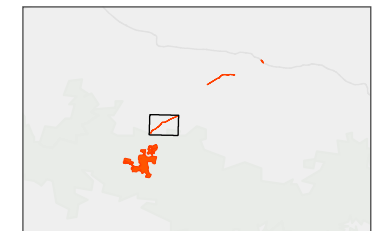
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FIGURE 3.4
Proposed Section of Road Sealing along Wollara Road



- Legend**
- Watercourse
 - Lot Boundary
 - NSW National Parks
 - NSW State Forests
 - Waterbodies
 - Road Upgrade Development Footprint



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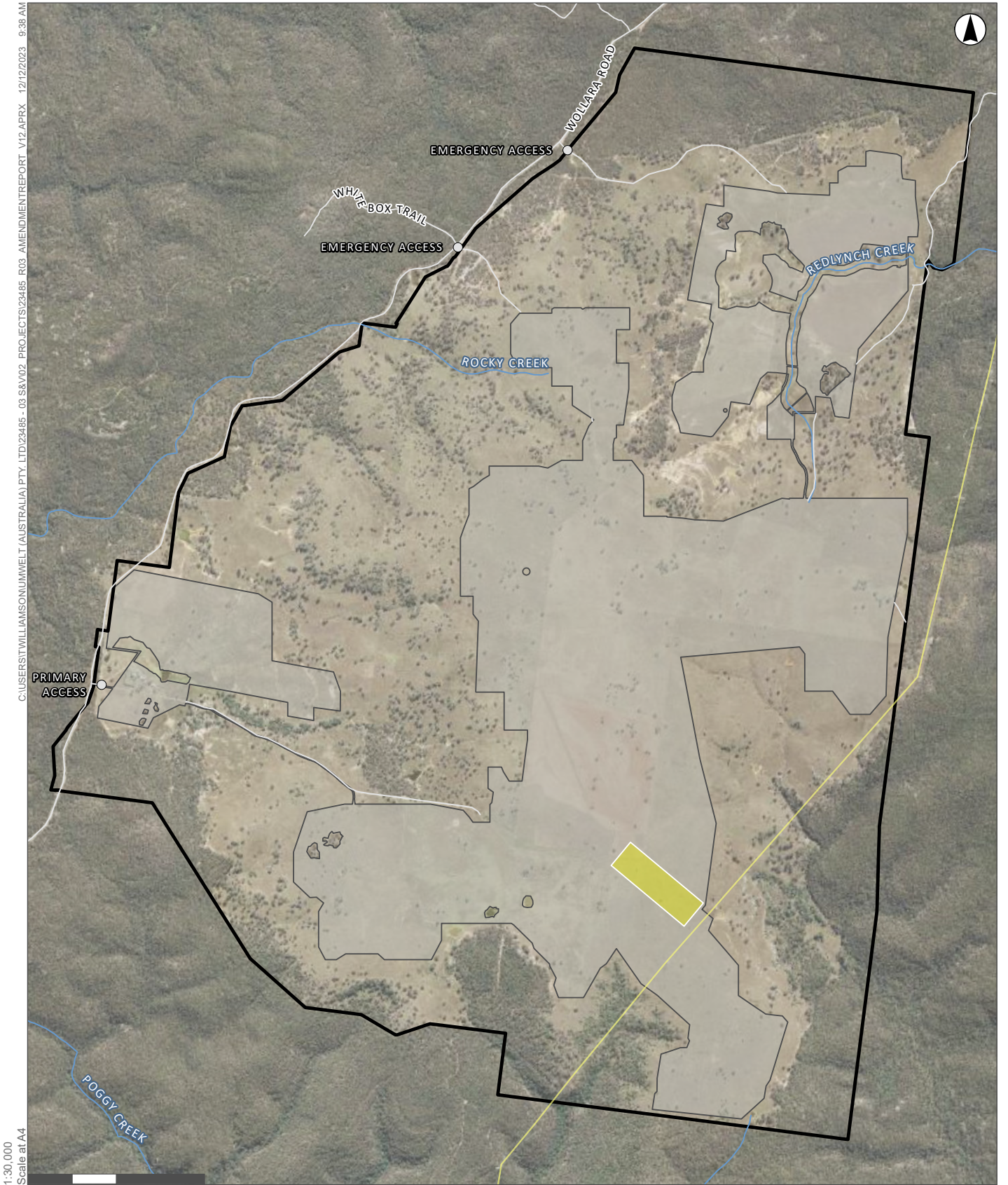
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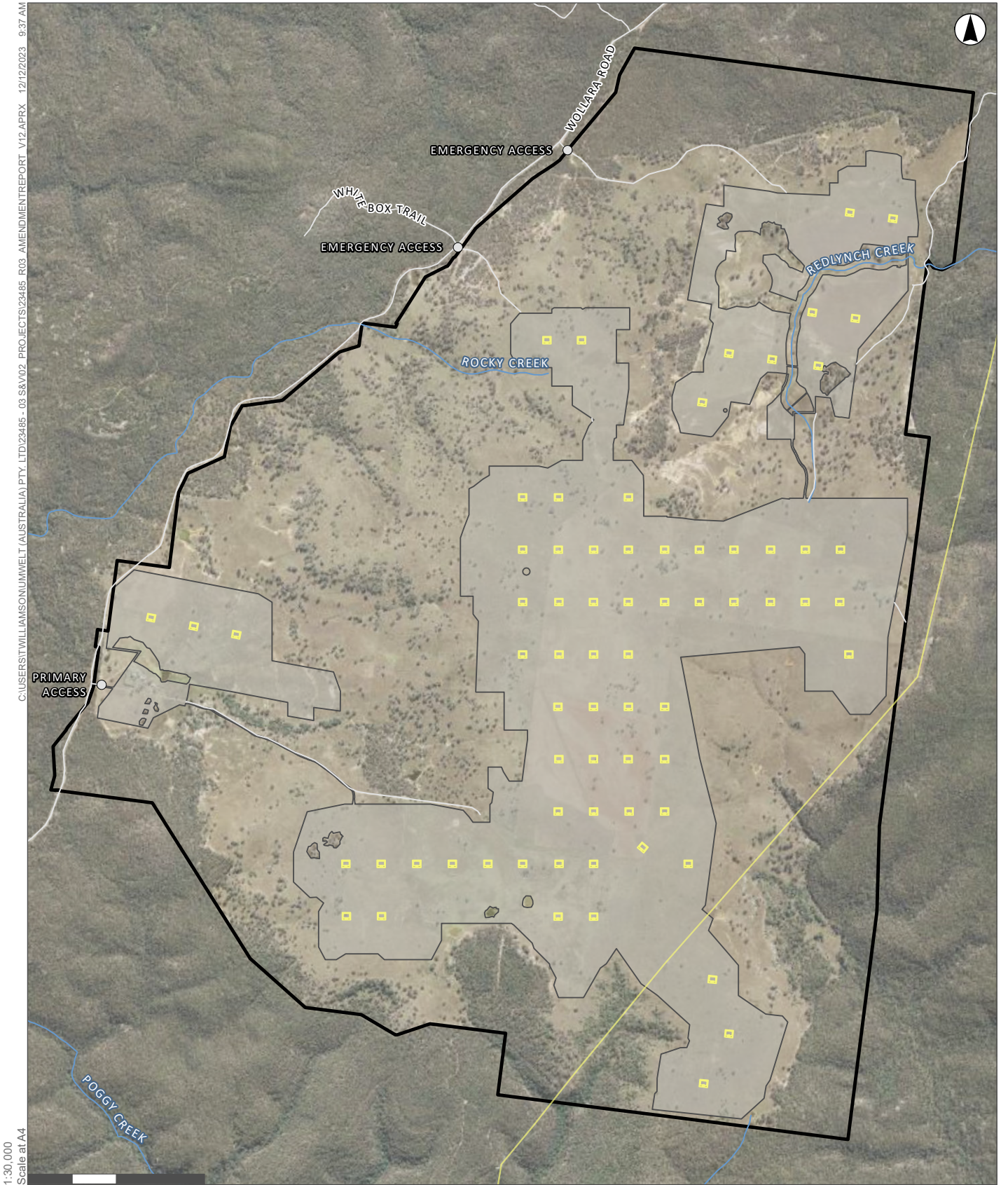
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- Legend**
- Access Points
 - Electricity Transmission Line
 - Watercourse
 - Roads and Tracks
 - ▭ Project Area
 - ▭ Proposed Centralised BESS
 - ▭ Development Footprint (Amended Project)

FIGURE 3.5
Proposed Centralised BESS
Layout

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- Legend**
- Access Points
 - Proposed Decentralised BESS
 - Electricity Transmission Line
 - Watercourse
 - Roads and Tracks
 - Project Area
 - Development Footprint (Amended Project)

FIGURE 3.6

Proposed Decentralised BESS Layout

