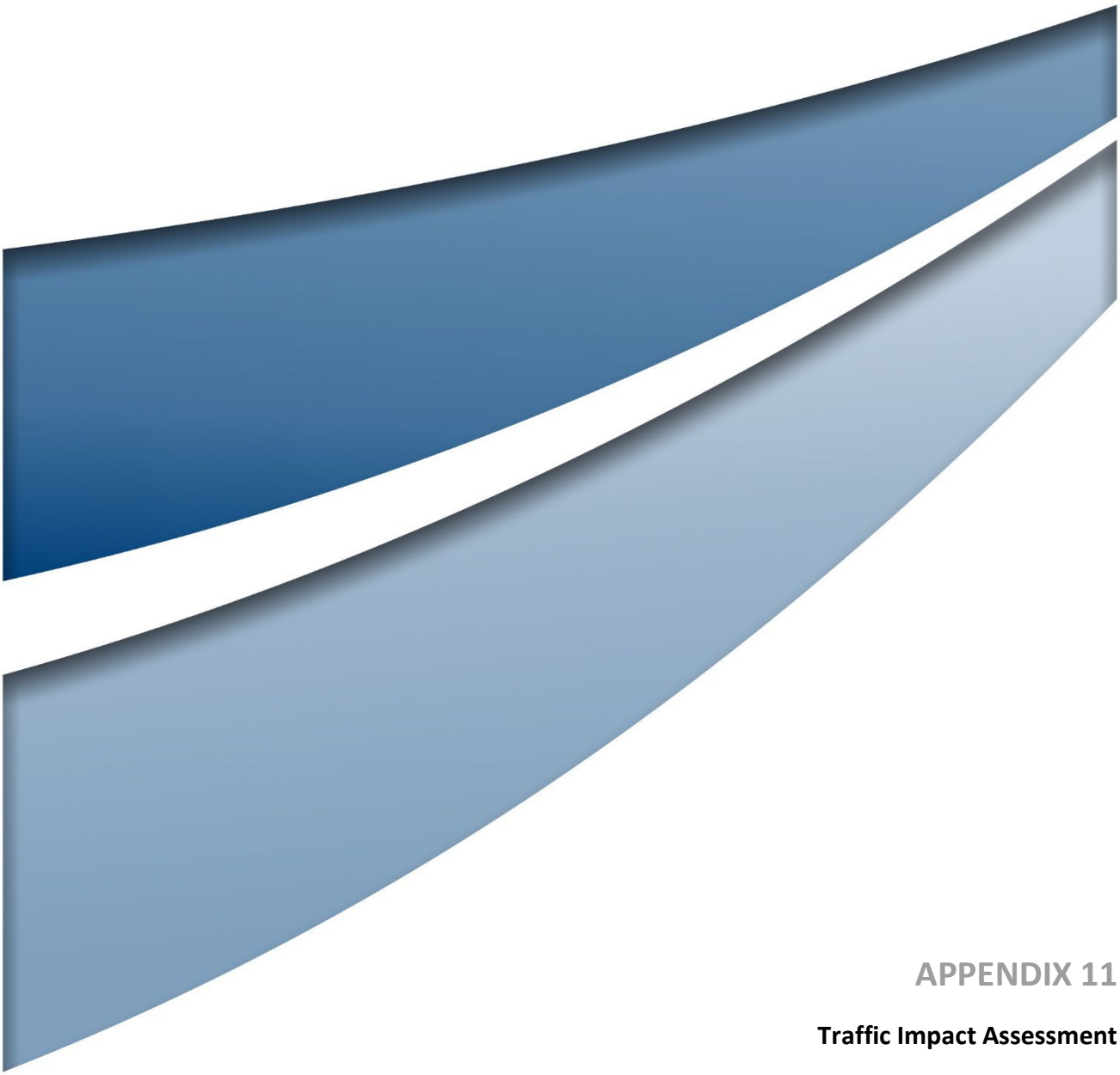

APPENDIX 11

Traffic Impact Assessment

constructive solutions

Civil | Structural | Environmental

Liverpool Range Quarry

Traffic Impact Assessment:

Prepared for

ARDG Deans Quarry Pty Limited

June 2024

Report prepared by Constructive Solutions Pty Ltd

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Project Name:	Liverpool Range Quarry
Project Number:	2024007
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1. Executive Summary

1.1 Project Overview

ARDG Deans Quarry Pty Limited (the 'Proponent') is seeking State Significant Development (SSD) Approval to construct and operate the Liverpool Range Quarry (the 'Quarry') near Cassilis, New South Wales (NSW). Construction materials will be required to support the development of the Liverpool Range Wind Farm (LRWF) and the Proponent is proposing the development of a nearby quarry for this sole purpose. Up to 2 million tonnes (Mt) of rock, gravel, and sand product is proposed to be produced / transported from the site over an approximate four (4) year construction period, with maximum production of approximately 700,000 tonnes per annum. The Quarry is proposed to be located off Rotherwood Road, approximately 10km north-west of the Cassilis township within the Upper Hunter Shire Council (UHSC) local government area (LGA). Road transport of quarry products would occur via Rotherwood Road on an 'as needed' basis. Transport of processed quarry material would be managed by the appointed civil contractor for the Liverpool Range Wind Farm (LRWF) only using vehicles from the wind farm approved heavy vehicle (HV) fleet and travelling only on existing approved LRWF project haulage routes.

1.2 Purpose of this Report

The proponent of the LRWF (Tilt Renewables) previously engaged Constructive Solutions Pty Ltd (CSPL) to prepare Traffic Impact Assessments to assess the potential traffic and transport impacts associated with the LRWF. This Traffic Impact Assessment ('the Quarry TIA") builds on the assessment and findings of the LRWF Supplementary TIA that was prepared by CSPL in September 2023 in support of the Response to Submissions (RTS) phase of the application to modify Development Consent SSD 6696 that was granted for the Project in 2018 (Mod-1 Application). Tilt Renewables has amended the Mod-1 Application to include the Temporary Workforce Accommodation (TWA) Facility. The assessment documents associated with this amendment include an Addendum TIA ("the LRWF Addendum TIA") to account for changes to the traffic model. An update to the Addendum TIA has also been published as an appendix to the Submissions Report for the amendment.

The Site Access Point (SAP) for the Quarry has been assessed based on estimated traffic volumes and turning movements in accordance with relevant Austroads guidelines. The intersection analysis determined that Basic Right (BAR) turn and Basic Left (BAL) turn treatments are required at the Quarry entrance (SAP ID#15) off Rotherwood Road with details of the analysis provided in **Section 5** of this report.

The key conclusions from this report in relation to the Quarry are as follows:

- A key principle of this Quarry TIA is that all haulage traffic generated by the Quarry forms part of the construction traffic of the LRWF Project (as would be the case for any haulage traffic from existing quarries located in the region). As the Quarry is solely for the purpose of the LRWF Project, any mitigation necessary to manage impacts of quarry haulage and light vehicle (LV) traffic on the Council's road assets would be undertaken by the LRWF Project, in accordance with Development Consent SSD 6696 (as modified). Accordingly, a requirement for the quarry to contribute towards road upgrades or maintenance (e.g. via a haulage levy or VPA) would not be appropriate as it would be effectively 'double-dipping'.
- Sourcing quarry products required for wind farm construction from the Quarry would result in a significant decrease in estimated wind farm construction traffic volumes on Vinegaroy Road between the intersections of the Golden Highway and Rotherwood Road as well as the broader public road network, compared to sourcing the materials from existing quarries located in Dubbo, Tamworth, Coonabarabran, Scone, etc.
- The Quarry would also result in an increase of approximately 60% in estimated LRWF Project construction traffic volumes along the generally low trafficked section of Rotherwood Road between the Vinegaroy Road intersection and the Quarry entrance, compared to a scenario where the required quarry materials are sourced from other existing quarries located elsewhere across the broader region.
- Sourcing quarry materials from within the LRWF Project area benefits overall road safety by removing quarry material deliveries from busier roads surrounding the wind farm. The LRWF

Project has a greater ability to increase road safety and reduce risk through the implementation of Public Road Upgrades, Traffic Management Plans (TMPs) and LRWF Project communications closer to the LRWF Project area. These measures are expected to effectively mitigate the road safety risks associated with quarry vehicle movements and other LRWF Project construction traffic.

- Sourcing materials from the Quarry would be expected to result in several benefits from a traffic and transport perspective, including:
    - **Improved road safety**, reduced driver fatigue will be improved with shorter commutes for haulage drivers between the wind farm work fronts and the Quarry compared to travelling from other main commercial quarries with the potential to supply the LRWF Project which are located in the Dubbo area, which has a return haulage distance of approximately 300km.

      If utilised by the LRWF for the supply of 2 Mt of product, the much shorter return haul to the LRWF Project from the Quarry would result in a reduction in the total haulage distance on the public road network by approximately 17,000,000 km, compared to the alternative of sourcing all quarry material from Dubbo.
    - **Improved road safety**, through reduced number of potential HV/LV interactions. Existing traffic is significantly lower on Rotherwood Road compared to Vinegaroy Road and the Golden Highway (refer to **Section 5.3** of this report), reducing vehicle interactions and the subsequent probability of road safety incidents with the public compared to higher traffic volume roads.
    - **Local Relationships**: most of the landholdings along Rotherwood Road are associated with the LRWF Project. This gives Tilt Renewables the ability to communicate associated traffic impacts more effectively along Rotherwood Road to mitigate safety incidents occurring when compared to residents further away from the LRWF Project area. There are only two landholdings which are not associated with the LWRF Project at this stage. The Proponent and Tilt Renewables have been in contact with these residences throughout the development of both the LRWF Project and the Liverpool Range Quarry project. Further consultation will continue with these landholders as the Quarry project progresses.
    - **Reduced HV fleet:** the HV haulage fleet size to accommodate the LRWF Project would be significantly reduced. This is due to the number of trips a single HV can complete in a day being increased by the substantially reduced trip distance and associated time required for travel while maintaining the rate of quarry material supply to the LRWF Project.

In accordance with the Development Consent granted for the LRWF Project, Tilt Renewables is required to undertake public road and intersection upgrade and repair treatments along the relevant road segments that are required to provide access into the LRWF Project site prior to their use by HV or oversize / over mass (OSOM) vehicles. It is noted that transport of materials from the Quarry would only occur on the approved construction haulage route of the LRWF Project and accordingly, the proposed upgrades and maintenance of public roads and intersections will also accommodate all Quarry haulage traffic.

Tilt Renewables will design and construct the required public road and intersection upgrades and repairs, based on the expected construction traffic volumes required to construct the LRWF Project, including consideration of all quarry haulage traffic. During the construction phase of the LRWF Project the maintenance of each relevant public road segment will be the responsibility of Tilt Renewables.

As the LRWF Project extends from the UHSC LGA into Warrumbungle Shire Council (WSC) LGA, it is understood that Tilt Renewables is currently working with both Councils to finalise amendments to the executed VPA, which will, amongst other things, provide funds to be used by Councils to maintain the relevant public roads throughout the operations phase of the LRWF Project. Therefore, any VPA being negotiated between Tilt Renewables and each Council (which includes consideration of the impacts of construction haulage traffic associated with the LRWF), necessarily includes consideration of potential impacts on both Council's road networks that form the construction haulage route. Accordingly, a separate VPA for the Quarry to address traffic impacts is not warranted.

Ultimately, if utilised, the Quarry would result in a significant improvement (compared to the option of sourcing materials from more distant quarries) from a traffic and transport perspective. Potential traffic and transport impacts can be appropriately managed and mitigated through appropriate intersection design and compliance with TMPs as required under the LRWF Development Consent SSD 6696.

2. Introduction

2.1 Purpose of the Report

The purpose of this TIA is to assess the potential traffic and transport impacts associated with the proposed Liverpool Range Quarry (the 'Quarry') to be located off Rotherwood Road, approximately 10km north-west of the Cassilis township. The Quarry is proposed solely to support the construction of the LRWF Project.

2.2 Secretary's Environmental Assessment Requirements (SEARS)

The Secretary's Environmental Assessment Requirements (SEARs) for the Quarry project were published by the Department of Planning, Housing and Infrastructure (DPHI) on 27 March 2024. Each of the SEARs together with a reference to where they are addressed in this report, are outlined in **Table 1**. Consultation meetings were held with both UHSC and WSC at which traffic and transport matters were discussed, including the issue of road upgrades, ongoing maintenance requirements, contributions and VPA. Consultation was also held with TfNSW (Dubbo Regional Office) regarding the Quarry project. Details of this consultation are provided in the main EIS report for the Quarry project.

Table 1: SEARs Relating to Traffic and Transport Impacts (extracted from DPHI, 2024) Including References

SEARs Requirement	Reference Section
• Accurate predictions of the road traffic generated by the construction and operation of the development, including a description of the types of vehicles likely to be used for transportation of quarry products. • Assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and State road networks, detailing the nature of the traffic generated, transport routes, traffic volumes and potential impacts on local and regional roads. • Description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network (particularly the proposed transport routes) over the life of the development. • Evidence of any consultation with relevant roads authorities, regarding the establishment of agreed contributions towards road upgrades or maintenance. • Description of access roads, specifically in relation to nearby Crown roads and fire trails.	**Section 2** **Section 3** **Section 4**
• Review and address the SEPP (Resources and Energy) Part 2, regarding transporting of materials on public roads local and classified road.	**Section 2**
Detailed plans identifying the proposed location of any: • Project-related infrastructure within and outside of the project boundary. • Any other project-related structures within a road reserve. Include demarcation of local and classified road reserves. • Structures on the road network that could be sensitive to blasting (e.g.: bridges, pump stations, etc.).	**Section 2** **Section 3**
Traffic volumes including: • Existing background traffic based on traffic surveys undertaken at the intersection with the state classified road network and collected in accordance with AGtTM Part 3 with the relevant raw data provided with the TIA. • Project-related traffic primarily for peak of construction (worst-case scenario). • Projected cumulative traffic at peak of construction. • Inclusion of the growth rate applied to the year of peak of construction. • Assessment of the turn warrants within AGtTM Part 6. Applying the worst-case scenario base case (network AM/PM peak), annual growth rate, cumulative background and turning traffic occurring simultaneously at peak of the development for the project and utilising the AM/PM project peak hour during peak of construction. • Assess the Safe Intersection Sight Distance (SISD) in accordance with Part 4A of *Austroads Guide to Road Design* and TfNSW supplements at key intersections with state classified road network that form part of the routes. • Provide swept path analysis for the design vehicle in accordance with Austroads identifying the concurrent movements in all turn directions at the key intersections with the state classified road that form part of the project routes.	**Section 4** **Section 5** **Appendix 5**

SEARs Requirement	Reference Section
• Identify the necessary road network infrastructure upgrades that are required to cater for and mitigate the impact of project related traffic at the key state classified road intersections that form part of the project construction routes the required treatments must be informed by the requirements of this SEARs (for instance, road widening and/or intersection treatments). In this regard, strategic design drawing/s are to be submitted with the SSD application for any identified road infrastructure and access upgrades. Any identified road infrastructure upgrades will need to be to the satisfaction of TfNSW. Works must be appropriately designed in accordance with *Austroads Guide to Road Design* for the existing posted speed limit, including provision of Safe Intersection Sight Distance (SISD). • Project-related traffic for each phase or stage of the project, including during construction of Liverpool Range Wind Farm and for maintenance period. • Projected cumulative traffic (in particular Liverpool Range Wind Farm and any other projects the Liverpool Range Quarry will service) at commencement of operation, and a 10-year horizon post-commencement. • Projected traffic related to any other project outside of Liverpool Range Wind Farm.	
Traffic characteristics including: • Number and ratio of heavy vehicles to light vehicles. • Peak times for existing traffic. • Peak times for project-related traffic including commuter periods. • Proposed hours for transportation and haulage. • Interactions between existing and project-related traffic. • Identifying the design vehicle, OSOMs that can occur in accordance with the Class 1 NSW Operators Guide, shuttle buses and light vehicles. • Peak haulage campaign periods.	**Section 5**
• Capacity analysis using *Austroads Guide to Road Design* at intersections with classified (State) road/s, and where relevant, analysis of any other intersections along the proposed transport route/s.	**Section 5**
Cumulative impacts: • Identify projects that will have overlapping construction periods and assess the cumulative traffic impacts with emphasis on the following: • The cumulative impacts from traffic generated from quarry operations in terms of the origin-destination routes, access, AM/PM peaks, where there is overlap with other projects. • Cumulative impacts of heavy vehicle movements in terms of AM/PM peaks and routes where there is an overlap with other projects.	**Section 5**
Heavy vehicle routes: • National Heavy Vehicle Regulator (NHVR) approved routes identified on the Restricted Access Maps (RAV MAP) are to be utilised for the heavy vehicle routes for the proposed development. • Consideration for any future plans by Council to alter the road network that would provide options for an alternative route to the classified road network. Note, the proponent is encouraged to consult with Council to appropriately address this matter.	**Section 5**
Project schedule: • Hours and days of operation, number of shifts and start and end times, • Phases and stages of the project, including operation and decommissioning.	**Section 2**
The origins, destinations and routes for: • Commuter (employee and contractor) light vehicles and pool vehicles, • Heavy (haulage) vehicles.	**Section 5**
• Road safety assessment of key haulage route/s. **Note**, where road safety concerns are identified at a specific location along the proposed haulage routes, TfNSW suggests that the TIA be supported by a targeted Road Safety Audit undertaken by suitably qualified persons in accordance with the *Austroads Guidelines*.	
• Identify the necessary road network infrastructure upgrades that are required to cater for and mitigate the impact of project related traffic on both the local and classified road network for the development (for instance, road widening and/or intersection treatments). In this regard, strategic design drawing/s are to be submitted with the SSD application for any identified road infrastructure and access upgrades. Any identified road infrastructure upgrades will need to be to the satisfaction of TfNSW and Council. Works must be appropriately designed in accordance with *Austroads Guide to Road Design* for the existing posted speed limit, including provision of Safe Intersection Sight Distance (SISD).	**Appendix 4** **Appendix 5**

SEARs Requirement	Reference Section
• Proposed road facilities, access and intersection treatments are to be identified and be in accordance with *Austroads Guide to Road Design* including provision of Safe Intersection Sight Distance (SISD)	**Section 5**
• Consideration of the local climate conditions that may affect road safety during the life of the project (e.g. fog, wet and dry weather, icy road conditions).	**Section 5**
• The layout of the internal road network, parking facilities and infrastructure.	**Section 2**
• Impact on public transport (public and school bus routes) and consideration for alternative transport modes such as carpooling and shuttle buses during operations.	**Section 5**
• Identification and assessment of potential environmental impacts of the project, such as blasting, lighting, visual, noise, dust and drainage on the function and integrity of all affected public roads.	**Section 3**
• Controls for transport and use of any dangerous goods in accordance with *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development*, the *Australian Dangerous Goods Code* and *AS4452 Storage and Handling of Toxic Substances*.	**Section 5**
• A draft Traffic Management Plan (TMP) that could be implemented following approval of the EIS, in consultation with relevant Councils and TfNSW. The TMP would need to identify strategies to manage the impacts of project related traffic, including any community consultation measures for peak haulage and truck movement periods.	**Section 6**
Propose a draft Driver Code of Conduct for haulage operations which could include, but not be limited to: • Safety initiatives for haulage through residential areas and/or school zones. • An induction process for vehicle operators and regular toolbox meetings. • A public complaint resolution and disciplinary procedure.	**Section 6**

2.3 SEPP (Resources and Energy) Part 2

Part 2.22 of SEPP Resources and Energy relates to the considerations of a consent authority concerning transport issues of development applications for the purpose of mining of extractive industries. These are outlined below:

2.22 Transport

(1) Before granting consent for development for the purposes of mining or extractive industry that involves the transport of materials, the consent authority must consider whether or not the consent should be issued subject to conditions that do any one or more of the following—

(a) require that some or all of the transport of materials in connection with the development is not to be by public road,

(b) limit or preclude truck movements, in connection with the development, that occur on roads in residential areas or on roads near to schools,

(c) require the preparation and implementation, in relation to the development, of a code of conduct relating to the transport of materials on public roads.

(2) If the consent authority considers that the development involves the transport of materials on a public road, the consent authority must, within 7 days after receiving the development application, provide a copy of the application to—

(a) each roads authority for the road, and

(b) the Roads and Traffic Authority (if it is not a roads authority for the road).

Note—

Section 7 of the Roads Act 1993 specifies who the roads authority is for different types of roads. Some roads have more than one roads authority.

(3) The consent authority—

(a) must not determine the application until it has taken into consideration any submissions that it receives in response from any roads authority or the Roads and Traffic Authority within 21 days after they were provided with a copy of the application, and

(b) must provide them with a copy of the determination.

(4) In circumstances where the consent authority is a roads authority for a public road to which subsection (2) applies, the references in subsections (2) and (3) to a roads authority for that road do not include the consent authority.

This TIA and the associated Quarry project EIS provides information relevant to transport matters to assist the consent authority in making its determination in accordance with (among other considerations) the provisions of Part 2.22 of the SEPP.

2.4 Agency Consultation

2.4.1 Upper Hunter Shire Council / Warrumbungle Shire Council

Meetings were held with both Upper Hunter Shire Council (UHSC - 17/4/24) and Warrumbungle Shire Council (WSC - 17/4/24) during which, amongst other matters, potential traffic impacts of the Project on council's road assets were discussed and both Councils raised the matter of road levies/contributions. As detailed in **Section 1**, matters regarding responsibility for road upgrades and maintenance were discussed, with emphasis placed on the notion of the quarry being solely for the purpose of the LRWF; the Development Consent for the LRWF Project requiring Tilt Renewables to undertake all public road and intersection upgrade and repair treatments along the relevant road segments that are required to provide access into the LRWF Project site; that transport of materials from the Quarry would only occur on the approved construction haulage route of the LRWF Project and accordingly, the proposed upgrades and maintenance of public roads and intersections will also accommodate all Quarry haulage traffic.

It was also clarified that it is understood that Tilt Renewables is currently working with both Councils to finalise amendments to the executed VPA, which will, amongst other things, provide funds to be used by Councils to maintain the relevant public roads throughout the operations phase of the LRWF Project and that as accordingly, a separate VPA for the Quarry to address traffic impacts is not warranted.

2.4.2 TfNSW

A meeting was held with Transport for NSW (TfNSW) on 31 May 2024 during which the potential traffic impacts of the project were discussed. In summary, TfNSW raised matters related to use of the Golden Highway / Vinegaroy Road intersection for mobilisation and this matter is addressed in **Section 3**.

2.5 LRWF Project Background

The LRWF Project is an approved large scale renewable energy project that is owned by Tilt Renewables Australia Pty Ltd as trustee for Liverpool Range Wind Farm Project Trust (Tilt Renewables). The LRWF Project is authorised under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) by State Significant Development Consent SSD-6696 (LRWF Consent), which was granted on 27 March 2018 by a delegate of the Minister for Planning (Approved Project).The LRWF Project is located approximately 6km east of the township of Coolah, NSW and extends across the Warrumbungle, Upper Hunter and Mid-Western LGAs. The LRWF Project is located within, and forms a key component of, the Central-West Orana (CWO) Renewable Energy Zone (REZ) declared under the *Electricity Infrastructure Investment Act 2020* (NSW) (refer to **Figure 1**).

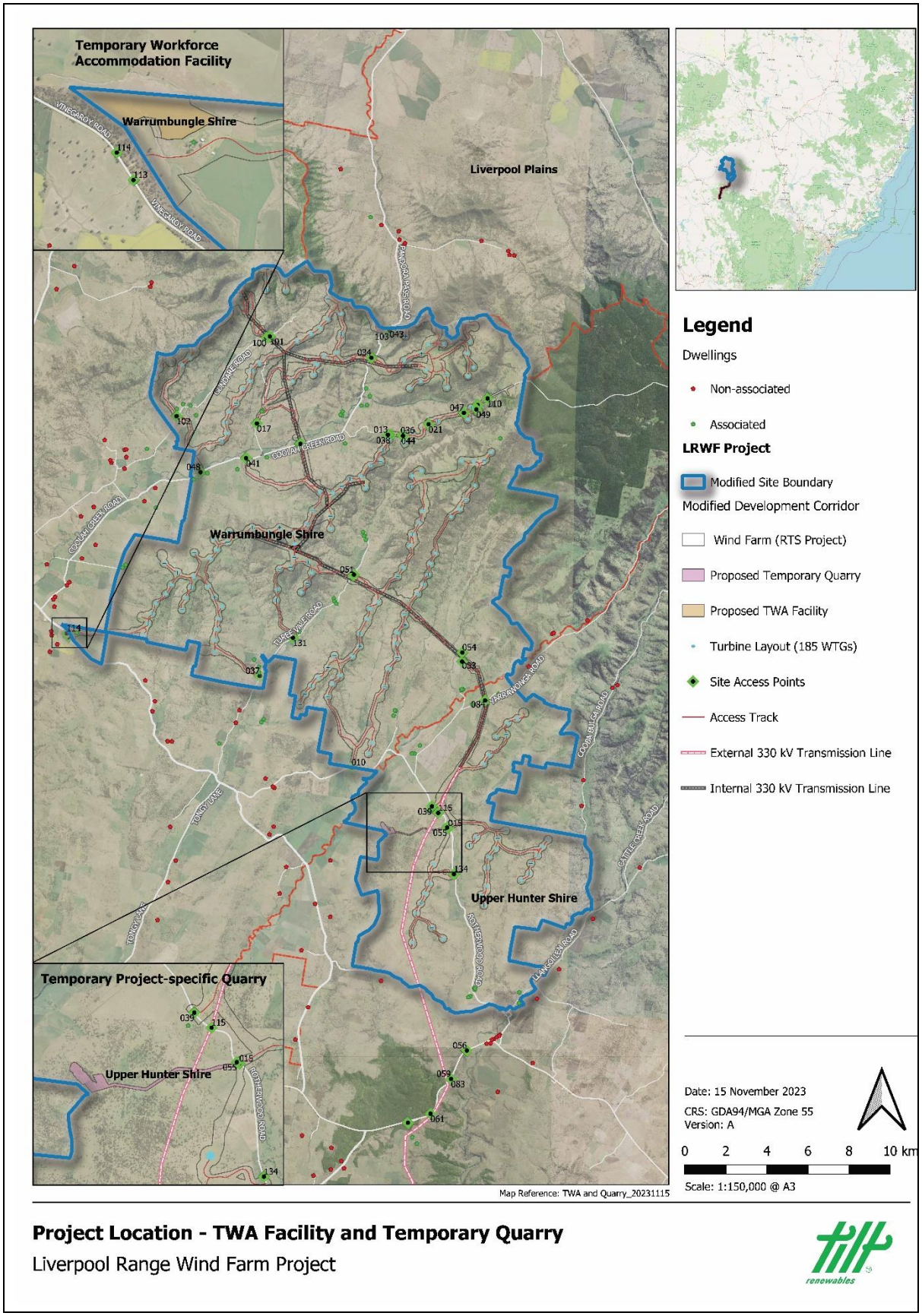
Tilt Renewables has applied to modify the LRWF Consent (Mod-1 Application). The Mod-1 Application is currently being assessed by the NSW Department of Planning, Housing and Infrastructure Environment (DPHI) (formerly Department of Planning and Environment (DPE)).

Following public exhibition of the Mod-1 Application in September/October 2022, and as part of the Response to Submissions (RTS) phase of the Mod-1 Application, Tilt Renewables made various changes to the LRWF Project such that 185 turbines (reduced from 220 turbines) and a maximum blade

tip height of 215m (reduced from 250m) are now proposed (referred to as the RTS Project). To assess the traffic and transport aspects of the RTS Project, CSPL was engaged to prepare the LRWF Supplementary TIA (refer **Appendix 1**) which was lodged with DPE in September 2023.

Tilt Renewables has also amended the Mod-1 Application to include a TWA Facility as ancillary use associated with the LRWF Project. The assessment documents for this amendment includes the LRWF Addendum TIA (refer **Appendix 2**). An Update to the Addendum TIA has also been published as an appendix to the Submissions Report for the amendment. The update to the Addendum TIA is available on the Major Projects website through the NSW Planning Portal at the link below:

https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=EXH-67001459%2120240410T091635.276%20GMT



Project Location - TWA Facility and Temporary Quarry

Liverpool Range Wind Farm Project

Figure 1: LRWF Project Location

The structure of this Quarry TIA is summarised in **Table 2**.

Table 2: Report Structure

Section	Summary
Section 2	Provides background to the LRWF Project Mod-1 Application and introduces the proposed Project-specific quarry ('the Quarry").
Section 3	Provides an outline of the Quarry operations.
Section 4	Provides a summary of the traffic generation model used to inform the LRWF Supplementary TIA which was prepared for the RTS Project for Tilt Renewables. This provides context for the analyses undertaken in this Quarry TIA and outlines how the traffic distribution changes by sourcing quarry materials internal to the LRWF Project area.
Section 5	Provides the intersection analysis to determine the required turn treatments off Rotherwood Road.
Section 6	Sets out the key conclusions of this Quarry TIA.

2.6 Proposed Quarry

The Quarry is proposed to be located within the LRWF project area off Rotherwood Road approximately 10km north-west of the Cassilis township within the UHSC LGA, as shown in **Figure 2**. Key features of the Quarry are illustrated on **Figure** and summarised as follows:

- Main extraction area ("Main Pit") covering an area of approximately 3.2ha from where a high-quality basalt resource would be drilled, blasted and extracted, prior to processing. The Main Pit would be developed to a floor level of approximately 675m AHD, with extraction undertaken as two benches with nominal height of 12.5m.
- Satellite extraction area ("Borrow Pit") covering an area of approximately 1.9ha, 250m to the southeast of the Main Pit. Highly weathered rock and clay would be extracted from the Borrow Pit by dozer/excavator, prior to being transported by truck to the main processing area for blending with rock from the Main Pit. The Borrow Pit would be developed to a floor level of approximately 660m AHD.
- Processing and stockpiling area covering an area of approximately 2ha adjacent to the southern edge of the Main Pit. Processing of extracted rock would be undertaken in this area using mobile crushing and screening equipment, with finished quarry products transferred to discrete stockpiles. As the pit face progresses, processing/stockpiling will occur in pit (i.e.: below the ground surface), further shielding operations.
- Operational areas (peripheral to the above areas) covering an area of approximately 7.1ha. These areas would accommodate internal temporary administration (mobile crib room/toilet facilities), peripheral topsoil bunds, access tracks, LV parking, and surface water management controls.
- Sealed access road linking the operational areas with Rotherwood Road (up to 8m wide road surface with 1m wide shoulders). The access road corridor would be approximately 2.9km long and have a width of 15 – 20m to allow for micro-siting of the final running surface (approximately 7 m wide, plus shoulders) and be used by road haulage trucks. It would contain several passing bays (30m wide x 50m long) and have a disturbance footprint of approximately 5.4ha. Approximately 40m of the access road crosses an unnamed Crown Road. Transport of processed quarry material would be managed by the appointed civil contractor for the LRWF project on an 'as needs' basis during the LRWF project construction period.
- Annual production from the Project is anticipated to be up to 700,000 tpa during the construction phases of the LRWF project. Total production from the Quarry over the 3- 4 year LRWF project construction period is estimated to be up to 2Mt. .
- It is not proposed to construct a weighbridge, as extraction quantities will be calculated by belt/loader scales and cross referenced with topographic survey taking account of rock density. All materials produced by the quarry will supply the LRWF Project only.

- At the completion of quarry operations, the site will be rehabilitated in consultation with the landowner to determine an appropriate, safe and stable landform(s) that can facilitate ongoing rural activities.
- Stabilisation of the processing and stockpiling area. To be returned to pre-disturbance existing condition in consultation with the landowner (e.g.: re-seeded with appropriate pasture grass).

The Quarry is proposed to operate from Monday to Friday (7am to 6pm - single shift) and Saturday 8am and 1pm – single shift) with minor non-operational works such as maintenance activities to be undertaken outside these hours, as necessary. No operations are proposed on Sundays/Public holidays apart from maintenance activities as required.

The Quarry is seeking approval to supply approximately 2 Mt of rock, gravel, and sand product solely to the LRWF Project over an approximately 4-year construction program. The construction phase of the Quarry is expected to take up to 2–3 months, with operations (i.e.: crush/screen/stockpile/loading) commencing thereafter for the duration of the LRWF construction program. Decommissioning will commence following completion of operations and is expected to take 1–2 months.

CSPL has been engaged to complete this Quarry TIA to assess the traffic implications of utilising a localised quarry.

A key principle of this Quarry TIA is that all haulage traffic generated by the Quarry forms part of the construction traffic of the LRWF Project (as would be the case for any haulage traffic from existing quarries located in the region). Therefore, this Quarry TIA builds on the assessment and findings of the LRWF Supplementary TIA and LRWF Addendum TIA that was prepared by CSPL for Tilt Renewables in 2023. This Quarry TIA assesses the potential traffic and transport impacts associated with the construction and operation of the Quarry. As the Quarry is solely for the purpose of the LRWF Project, the traffic assessment is considered against the LRWF Project's traffic modelling and the mitigations necessary to manage quarry haulage and LV traffic that will be undertaken by the LRWF Project.

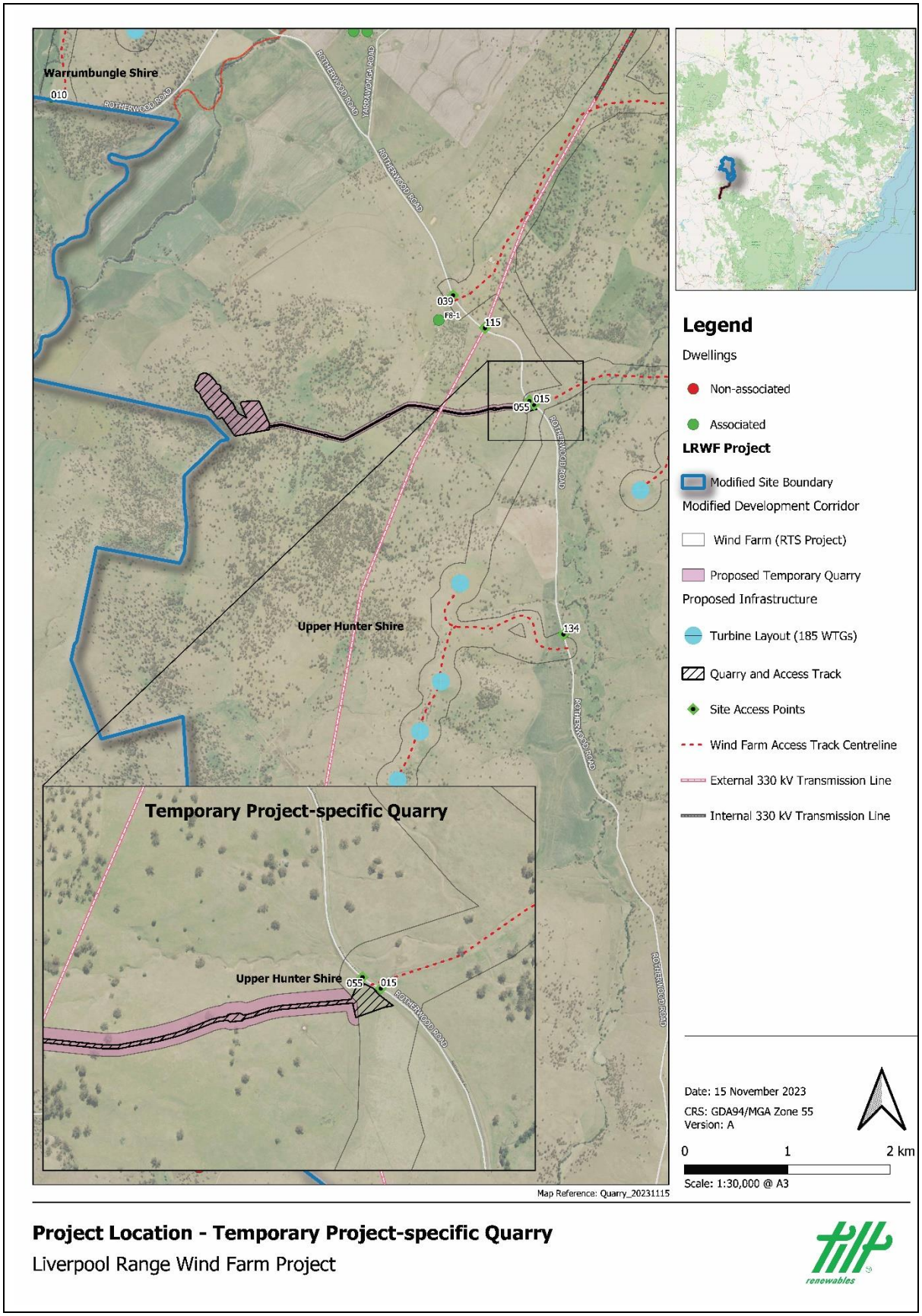


Figure 2: Proposed Quarry Location

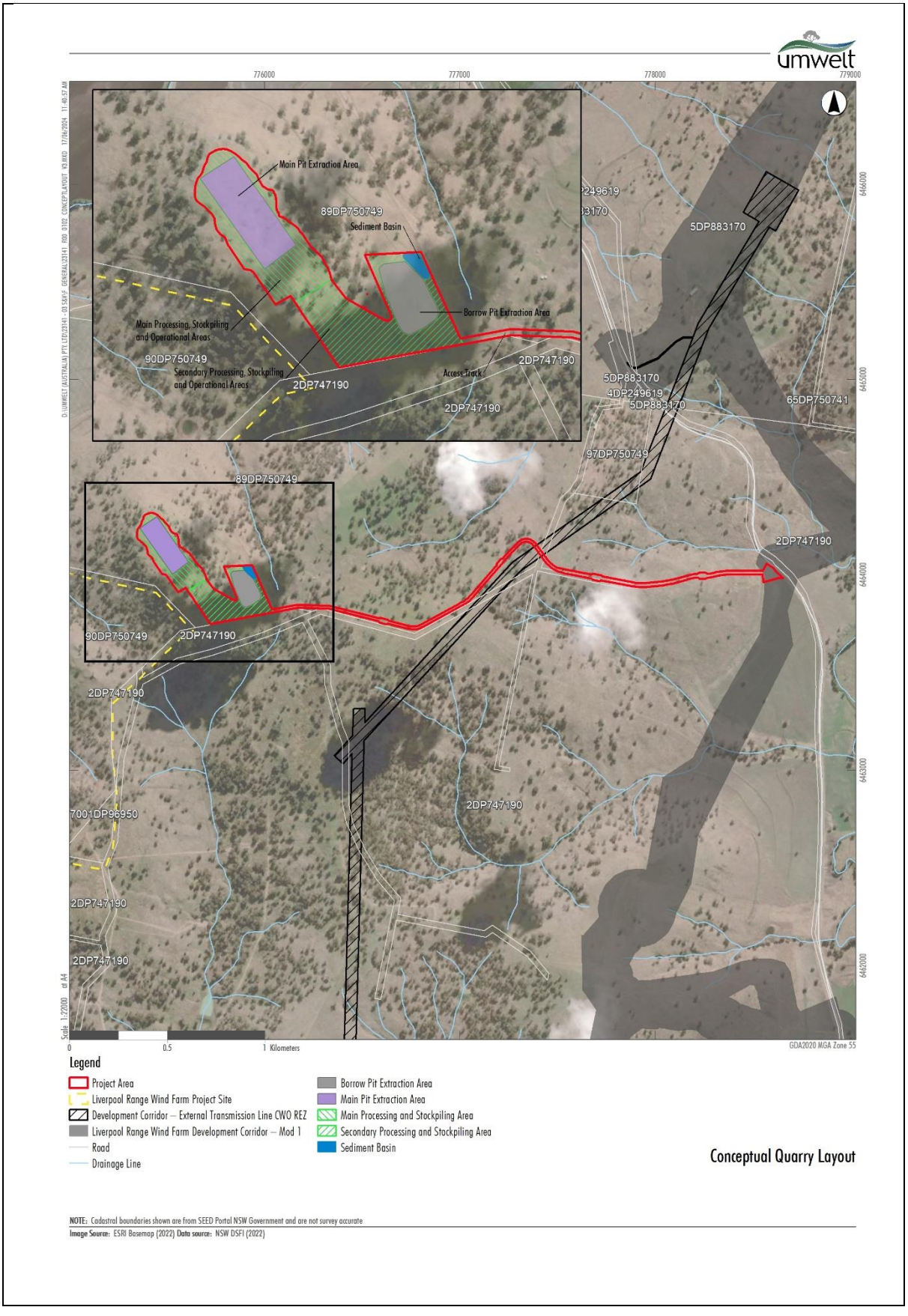


Figure 3: Conceptual Quarry Layout

3 Quarry Operations

3.1 Mobilisation of Plant and Equipment

The initial establishment of the Quarry will be undertaken by accessing the Quarry site through the landowner's existing property entrance off Rotherwood Road and internal farm tracks, to deliver the crushing plant and other initial mobile plant and equipment. Mobilisation would occur via the Golden Highway, Vinegaroy Road and Rotherwood Road and be limited to the crushing and screening plant, mobile plant and site infrastructure (e.g.: demountable office/crib room, self-bunded fuel storage, containers). The number of mobilisation movements is estimated at approximately 20-30 vehicles over the site establishment period and includes typical vehicle types and plant as listed in **Table 3**. An alternative route for mobilisation from the Golden Highway, Black Stump Way, Vinegaroy Road and Rotherwood Road was considered, however, the heigh restriction (4.8 m) on the Coolaburragundy River bridge at Coolah would prevent use of this route.

Table 3: Typical Quarry Plant and Equipment

Plant Item	Anticipated Delivery Vehicle	Vehicle Category
Blasthole Rig	Low Loader	HV
Dozer	Low Loader	HV
Dump Truck	Low Loader	-
Excavator/s	Low Loader	HV
Mobile Cone Crusher	Low Loader	HV
Mobile Jaw Crusher	Low Loader	HV
Mobile Screen	Low Loader	HV
Mobile VSI Barmac Crusher	Low Loader	HV
Pug Mill	Low Loader	HV
Water Cart	N/A	-
Wheel Loader	Low Loader	HV
Mobile Office/Crib Room	Low Loader	HV
Containers (noise bunding and storage) and Fuel Storage	Semi Trailer	HV

Mobilisation of the Quarry related plant and equipment will be completed under escort where required with movements to site to occur outside of the AM and PM peak hour periods, specifically when accessing the intersection of the Golden Highway and Vinegaroy Road.

The intersection between the Golden Highway and Vinegaroy Road has been assessed for OSOM vehicle swept paths as part of the Supplementary TIA (**Appendix 1**) including a 90m long blade transportation vehicle combination which did not require any pavement widening to accommodate the turning manoeuvre. It is therefore considered that sufficient pavement width exists at this intersection to accommodate the less critical swept path of a standard low loader transportation combination (HV category).

As the quarry is required to be operational before any significant construction works occur for the LRWF, mobilisation of Quarry related plant and equipment is not expected to overlap with mobilisation for LRWF construction and will not coincide with OSOM vehicle movements associated with the LRWF. Similarly, demobilisation will occur after turbine construction has occurred and is unlikely to significantly conflict with demobilisation of LRWF construction activities due to the quarry being required to the end of the construction period to cover LRWF public road maintenance/repair works associated with the LRWF construction.

Turbine component related OSOM mobilisation will occur on the public roads and site access roads in accordance with the wind farm construction staging requirements.

The material won from the Quarry will be used to build the access track back to Rotherwood Road, which will then be used to supply material to the LRWF Project's various work fronts. Apart from mobilisation requiring standard HVs only, there are no OSOM movements expected on the Quarry road.

The access track design will be typical of the Wind Farm Access Track details prepared by Tilt Renewables, although will be spray sealed. These designs include typical cross sections and stormwater management details at a preliminary level and are included in **Appendix 3**.

The detailed design will be undertaken prior to construction of the access track.

3.2 Quarry Operations

Transport of processed quarry material would be managed by the appointed civil contractor for the LRWF Project on an 'as needs' basis using only vehicles from the LRWF Project approved heavy vehicle fleet and travelling only on existing approved haulage routes of the LRWF Project. For the purpose of traffic generation, these vehicles are assumed to be truck and dog combinations (33 tonne payload). Whilst the Quarry is a separate operation, trucks hauling quarry materials to the LRWF will be confined to the approved LRWF construction haulage route and will therefore remain within the LRWF Project extents. Thus, any conditions of consent related to Quarry traffic (outside of the quarry operations area) would be managed by Tilt Renewables in accordance with its Development Consent.

Other than truck movements associated with the delivery of quarry equipment prior to operations commencing and deliveries of fuel and other consumables, the quarry will not generate any additional truck movements. The quarry will require 4 – 6 staff at anyone time and accordingly, would generate between 8 – 12 LV movements related to staff travel to/from site each day.

3.3 Public Road Upgrades

In accordance with the Development Consent granted for the LRWF Project, Tilt Renewables is required to undertake public road and intersection upgrade and repair treatments along the relevant road segments that are required to provide access into the LRWF Project site prior to their use by HV or OSOM vehicles. It is noted that transport of materials from the Quarry would only occur on the approved construction haulage route of the LRWF Project and accordingly, the proposed upgrades and maintenance of public roads and intersections undertaken by Tilt Renewables will also accommodate all Quarry haulage traffic.

Tilt Renewables will design and construct the required public road and intersection upgrades and effect the repair treatments. The maintenance of the roads by Tilt Renewables will continue from commencement of construction through to the last OSOM movement relative to the public road used for access.

The Quarry entrance design is as proposed by Tilt Renewables (refer LRWF Supplementary TIA) to accommodate Quarry traffic entering and leaving the site. The design and approval of the Quarry entrance (SAP ID#015 – refer to **Figure 2**) will have regard to other wind farm construction traffic using Rotherwood Road and the proposed SAP for the LRF on the opposite side of the road (SAP ID#055 – refer to **Figure 2**).

A typical SAP detail prepared for the LRWF Project is relevant for SAP ID#15 and is included in **Appendix 4**.

The key roles and responsibilities of Tilt Renewables and the relevant road authority related to the public road and intersection upgrade and repair treatments are described in Section 7 of the LRWF Supplementary TIA.

The agreed road and intersection upgrades, treatments and maintenance for Vinegaroy Road from the Golden Highway to Rotherwood Road and for Rotherwood Road between Vinegaroy Road and the Quarry entrance (SAP ID#15) is summarised in **Table 4**.

Vinegaroy Road and Rotherwood Road have been divided into sections of road (segments) requiring the same treatment to provide the required standard (i.e.: road widening) and to target similar defects (i.e.: stabilised patching to target pavement deformation and potholes). **Table 4** also summarises the existing road conditions which informs the proposed road upgrade and repair treatments.

Table 4: Summary of Vinegaroy Road and Rotherwood Road Proposed Upgrades and Treatments

Asset	Seg ID	Existing Road Conditions		Primary Upgrade/Repair Treatment (Note 1) (Note 2)	Design Pavement Width Adopted (m)
Vinegaroy Road -	10	Sealed 7.5m wide	Minor road failures	Minor stabilised patching to target road failures.	7.5 (existing)
	20	Sealed	Minor road failures	Shoulder widening to provide 8.0m wide pavement.	8.0

Asset	Seg ID	Existing Road Conditions		Primary Upgrade/Repair Treatment (Note 1) (Note 2)	Design Pavement Width Adopted (m)
Golden Highway to Rotherwood Road		6.2m wide			
	30	Sealed 8.6m wide	Minor road failures	Moderate stabilised patching to target road failures.	8.6 (existing)
	40	Sealed 8.0m wide	Minor road failures	Moderate stabilised patching to target road failures.	8.0 (existing)
	50	Sealed 6.6m wide	Very poor / failed pavement	Pavement Rehabilitation, widen to *Austroads Standard*	8.0
	60	Sealed 8.0m wide	Minor road failures	Shoulder reconstruction to 8.0m wide sealed pavement.	8.0
Rotherwood Road - Vinegaroy Road to Quarry Entrance (SAP ID#15)	10	Sealed 4.5m wide	Minor road failures	Shoulder widening and gravel sheet to provide 7.2m wide unsealed pavement.	7.2
	20	Sealed 5.0m wide	Minor road failures		7.2
	30	Sealed 4.5m wide	Major road failures		7.2
	40	Sealed 4.5m wide	Major road failures		7.2
	50	Sealed 4.5m wide	Major road failures		7.2
	60	Sealed 4-5m wide	Poor / failing pavement	Shoulder widening to provide 6.2m wide pavement.	6.2
	70	Unsealed 6-9m wide	Rough surface Loss of gravel.	Gravel resheet to provide 6.2m pavement.	6.2

Note 1: In addition to the primary upgrade/repair treatments, general pavement repairs will be completed on existing road failures across all road segments.

Note 2: Tilt Renewables will be responsible for completing regular maintenance activities for the duration of the wind farm construction period, relevant to the roads in use by construction traffic.

The detailed design of all intersections will have regard to the heavy vehicle and OSOM movements associated with the LRWF. The Quarry project would not result in any changes to traffic using proposed SAPs or other LRWF approved haulage route intersections considered under the LRWF MOD-1 Application other than the Vinegaroy Road and the Golden Highway intersection (reduction in HV traffic) and the Vinegaroy Road and Rotherwood Road intersection. The intersection assessments were completed in the LRWF Supplementary TIA Report and revised in the LRWF Addendum TIA Report with consideration given to TWA traffic and quarry material traffic to determine the turn treatments to accommodate the peak hour traffic demand. These assessments had assumed quarry product material would be sourced from alternative quarry sources, with all quarry product required for the LRWF being transported to the LRWF via the Golden Highway (i.e. from a Dubbo quarry). The outcomes of the assessments are summarised in **Table 5**.

Table 5: Proposed Intersection Upgrades

Road Asset	Intersecting Road	Intersection Turn Treatment
Vinegaroy Road	Rotherwood Road	BAR / BAL (Note 1)
Golden Highway	Vinegaroy Road	CHR(S) / BAL (Note 2)

Note 1: The outcome from the analysis included in the LRWF Supplementary TIA and the LRWF Addendum TIA for this intersection determined that BAR and BAL turn treatments are required

	however, from previous discussions between WSC and Tilt Renewables, WSC have indicated that the minimum requirement would be a CHR(S) / BAL.
Note 2:	The outcome from the analysis included in the LRWF Supplementary TIA and the LRWF Addendum TIA for this intersection determined that BAR and BAL turn treatments are required however, from previous correspondence between TfNSW and Tilt Renewables, TfNSW have indicated that the minimum requirement could be a CHR(S) / AUL(S).

With the inclusion of the Quarry and the resulting reduction in wind farm construction traffic turning at the intersection of the Golden Highway and Vinegaroy Road, the CHR(S) / BAL turn treatment is considered to be sufficient in catering for the movements. The Rotherwood Road and Vinegaroy Road intersection assessed BAR / BAL turn treatment is also deemed sufficient due to the reduced number in right hand turn movements from Vinegaroy Road into Rotherwood Road. While there will be increased right hand turn movements from Vinegary Road into Rotherwood Road associated with the Quarry, this does not warrant a change in intersection performance. The detailed design of this intersection will need to have regard to the increased number of heavy vehicle turning movements through this intersection and this may warrant additional pavement strengthening. **Section 5** of this report details the assessment and **Table 12** summarises the percentage change in HV movements.

The intersections and SAPs located along Rotherwood Road as listed in **Table 6** are shown to have increased vehicle movements as a result of the Quarry:

Table 6: Rotherwood Road Intersections

Rotherwood Road Intersection	Intersection Turn Treatment
E-cluster entrance (SAP ID#10)	Typical SAP Design
Northfolk Road	BAR / BAL (Note 1)
Yarrawonga Road	BAR / BAL (Note 1)
Note 1: The outcome from the analysis for these intersections determined that BAR and BAL turn treatments were sufficient, from previous discussions between WSC and Tilt Renewables, WSC have indicated that the minimum requirement would be a BAR / BAL.	

These intersections have not been analysed as the increased vehicle movements relate to additional vehicles passing through the intersections but the number of vehicles turning from Rotherwood Road onto the respective minor roads remains unchanged (primarily the turn treatment warrant assessment considers the vehicle movements from the major road to the minor road).

3.4 Demobilsation of Plant and Equipment

Once construction of the LRWF Project has been completed, demobilsation of all plant and equipment will occur via the Quarry access track to Rotherwood Road, Vinegaroy Road and the Golden Highway. Demobilisation vehicle movements and strategy will be similar to mobilisation to site as described in **Section 3.1** of this report and will be limited to the same plant, equipment and site infrastructure as per **Table 3**. The number of demobilisation movements is estimated at approximately 20-30 vehicles over the site decommissioning period.

Similar to mobilisation of the Quarry related plant and equipment, demobilisation will be completed under escort where required with movements from site to occur outside of the AM and PM peak hour periods, specifically when accessing the intersection of the Golden Highway and Vinegaroy Road.

The Golden Highway and Vinegaroy Road intersection swept path assessment for OSOM vehicles as per the Supplementary TIA is considered to be sufficient to accommodate the less critical swept path of a standard low loader transportation combination (HV category).

OSOM demobilisation will occur on the public roads and site access roads in accordance with the construction staging requirements. There are no OSOM movements expected on the Quarry Road.

The landowner has requested that the access track to the Quarry be retained and accordingly, the site access at Rotherwood Road is also proposed to be retained.

3.5 Impacts on Public Roads

Assessments of potential impacts of quarry operations related to noise, air quality, blasting and drainage are detailed in the EIS. All assessments completed indicate that the quarry can operate well within applicable criteria limits set by the NSW EPA.

With respect to blasting, an assessment of potential impacts on Rotherwood Road (which is located a minimum distance of 2,500m from the Main Pit) concluded that that the maximum estimated vibration exposure is 0.5mm/s, which is well below the specified vibration criteria for roads and bridges of 100mm/s.

With respect to light spill, the Quarry will not operate at night and as such, notwithstanding its distance from the nearest road, there are no issues related to light spill which would impact road safety. The Visual Impact Assessment prepared for the quarry concluded that the potential visual impact of the Quarry from three public road viewpoints was negligible and it is therefore considered unlikely that it would present a distraction for drivers along Rotherwood Road or Vinegaroy Road, the latter which is located over 4000m from the quarry and shielded by terrain and vegetation

As such, the Quarry and its operations are unlikely to adversely affect the function and integrity of any public roads.

4 Overview of the Traffic Generation Model

The following section provides a summary of the traffic generation model used to inform the Wind Farm TIAs including the key assumptions adopted as well as the intersection analyses undertaken. This provides important high-level context of the vehicle movements used for the analysis undertaken in **Section 5** of this report. Detailed breakdown of the assumptions and methodology used are provided in the LRWF Supplementary TIA.

4.1 Previous Development of the Traffic Model

The LRWF Supplementary TIA assumed a quarry located off Rotherwood Road in the southern portion of the LRWF Project site and assessed the anticipated HV and LV movements.

The LRWF Addendum TIA provided an update to account for a proposed TWA Facility and assumed that quarry material would be sourced from Dubbo, NSW.

This Quarry TIA makes use of the findings and assessment contained within the LRWF Supplementary TIA and LRWF Addendum TIA. The traffic model from the LRWF Addendum TIA has been updated for this Quarry TIA to reflect the inclusion of both the TWA Facility and the Quarry vehicle movements.

4.2 Wind Farm Traffic Generation Model

Tilt Renewables developed a traffic generation model based on recent wind farm construction experience which calculates the anticipated overall one-way vehicle movements needed to construct the LRWF Project. The traffic generation model includes all anticipated vehicle types including LVs and a range of HV and OSOM vehicles which are needed to deliver the turbine and transformer components to the LRWF Project site. The traffic generation model was used to inform the LRWF Supplementary TIA, LRWF Addendum TIA and this Quarry TIA, and considers the start and end locations for each vehicle type, delivery and distribution of the materials, mobilisation of construction equipment and required construction worker vehicle movements for each LRWF Project phase. The overall one-way vehicle movements for the LRWF were calculated to be 214,634, as shown in **Table 7**.

While the overall movements do not change between each TIA scenario, the origin and destination assumptions do change and as a result, the distribution of this traffic over the local road network is impacted.

The construction works for the LRWF Project can be split into two distinct categories namely, Public Road Upgrades and Wind Farm Construction. A summary of the traffic volumes associated with the construction of the LRWF Project is provided in **Table 7**.

Table 7: Construction Traffic Volumes (One-way Trips) – Project-specific Quarry and TWA Facility

Total Vehicle Movements – One-way Trips	HV	OSOM	LV	Total
Total Estimated Traffic for the Project	102,938	2,253	109,443	214,634
Estimated traffic for Public Road Upgrade Works	27,183	0	8,550	35,733
Estimated traffic for Wind Farm Construction Works	75,756	2,253	100,893	178,901

For the purpose of this Quarry TIA, it is assumed that the TWA Facility is included and comparison is made between the traffic generation model for the LRWF Addendum TIA (i.e.: materials supply from a quarry based near Dubbo, NSW).

The changes in traffic distribution for the assessed for sourcing LRWF construction material from the Quarry relative the LRWF Addendum TIA scenario are set out in **Table 8**.

Table 8: Comparison of Wind Farm Construction Vehicle Distribution Scenarios

Vehicle Type	Vehicle Origin and Destination	
	Coolah TWA/The Quarry	Coolah TWA/The External Quarry
OSOM	- Port of Newcastle to Site Entrance	- Port of Newcastle to Site Entrance
LV	- 5% Golden Highway East to Site Entrance - 5% Golden Highway West to Site Entrance - 90% Coolah TWA to Site Entrance	- 5% Golden Highway East to Site Entrance - 5% Golden Highway West to Site Entrance - 90% Coolah TWA to Site Entrance
HV	- 17% Golden Highway East/West to Site Entrance - 13% Golden Highway East/West to Batch Plant - **43% Rotherwood Road – The Quarry to Site Entrance** - 27% Batch Plant to Site Entrance	- 17% Golden Highway East/West to Site Entrance - 13% Golden Highway East/West to Batch Plant - **43% Golden Highway West - External Quarry (Dubbo) to Site Entrance** - 27% Batch Plant to Site Entrance
Note: "Site Entrance" refers to all wind farm construction site access points.		

5 Traffic Impact Assessment

5.1 Quarry Specific Traffic Generation

Tilt Renewables estimates that approximately 1.75 Mt of rock, gravel and sand product will be required for wind farm construction and public road upgrades for the LRWF Project, at a peak transport of 700,000 tpa, for which approval is being sought. The traffic generation model used to inform the LRWF Supplementary TIA assumed all quarry product as described in **Table 9** is sourced from a temporary Project-specific quarry located off Rotherwood Road over a 4-year construction program.

Based on a typical haulage vehicle for quarry product being a truck and dog with a 33 tonne pay load, approximately 53,000 one-way HV movements will be required to transport approximately 1.75 Mt of quarry product over the 4-year construction program.

If the volume of rock, gavel and stand production was to increase to 2.00 Mt, an increase of 15%, this may result in approximately 60,500 one-way HV movements. This increase over a 4-year program makes a minor impact to this TIA in terms of estimated peak volumes and their turn warrant treatments. it is not expected that this increase impacts the findings of this TIA. When the detailed design of the LRWF Project progresses, and traffic demand is more accurately forecasted this can be reviewed further for any impacts.

No changes are required to the traffic generation model used to inform the LRWF Supplementary TIA to account for the inclusion of the temporary Project-specific quarry as this was already assumed (the only change made included the LV traffic distribution due to the TWA located near Coolah).

Tilt Renewables has since prepared an updated traffic generation model for its LRWF Addendum TIA which assumes quarry material is sourced near Dubbo, NSW. This model is used to compare outcomes of each scenario.

Table 9: Estimated Total Demand of Quarry Material

Activity	Tonnes
Public Road Upgrades	292,320 (Note 1)
On-site Access Track	574,564
Hardstands	356,108
Foundations	363,951
Cable Installation	67,008
Substations	60,564
Transmission Line	29,328
TOTAL	**1,743,842**

Note 1: Estimated quantity of gravel material required for the public road upgrades/repairs based on current treatments negotiated with UHSC and WSC.

5.1.1 Key Traffic Movement Assumptions

The peak daily one-way vehicle movements calculated for this section of Rotherwood Road (LRWF F-cluster Substation entrance (SAP ID#39) to the Quarry entrance (SAP ID#15)/LRWF F-cluster entrance (SAP ID#55) used in the analysis consists of all associated wind farm construction traffic/vehicle movements including material haulage HV movements.

It should be noted that the SAP ID#55 entrance is located to the north west and opposite of the Quarry entrance (SAP ID#15) as shown in **Figure 2**. Both entrances are treated as separate intersections in the analysis and to provide a worst case scenario. The assumptions surrounding the traffic distribution does not split the traffic between the relevant SAPs and the analysis therefore considers the total peak daily one-way vehicle movements at each intersection.

The key traffic movement assumptions used in the assessment for this Quarry TIA are listed below and are considered to be conservative:

- HV traffic distribution is:
    - 95% of the daily traffic travels east along Rotherwood Road from the Vinegaroy Road intersection and will turn right into the Quarry entrance (SAP ID#15). Of this 95% distribution, 25% will travel during the AM peak hour.
    - 5% of the daily traffic travels west from the LRWF F-cluster entrance (SAP ID#134) and will turn left into the Quarry entrance (SAP ID#15). Of this 5% distribution, 25% will travel during the AM peak hour.
- LV traffic distribution is:
    - 5% of the daily traffic travels east along Rotherwood Road from the Vinegaroy Road intersection and will turn right into the Quarry entrance (SAP ID#15). Of this 5% distribution, 95% will travel during the AM peak hour.
    - 85% of the daily traffic travels east along Rotherwood Road from the Vinegaroy Road intersection and will turn left into the LRWF F-cluster entrance (SAP ID#55). Of this 85% distribution, 95% will travel during the AM peak hour.
    - 10% of the daily traffic travels east along Rotherwood Road from the Vinegaroy Road intersection and will drive past SAP ID#15 and SAP ID#55. Of this 10% distribution, 95% will travel during the AM peak hour.
- No OSOM vehicles will be accessing the Quarry site and will drive past the entrance.

The peak daily one-way LRWF Project vehicle movements over the duration of the 4-year construction program, which includes vehicle movements related to the supply of quarry product has been calculated at 153 vehicle movements per day (vm/d) along Rotherwood Road at the Quarry entrance. The 153vm/d consists of 118 HVs, 29 LVs and 6 OSOM movements per day during the peak of wind farm construction for this section of road (week 54 to week 114 of the anticipated 200-week construction period - refer **Table 10**). OSOM vehicles will use SAP ID#55 to access LRWF F-cluster which is located to the north east and opposite to the Quarry entrance SAP ID#15. The one-way vehicle movements per day for the various weeks divided into the different construction phases for the Quarry are provided in **Table 10**.

The 29 LV movements include Quarry staff (4-6 persons) which will access the site daily approaching from either the north or the south on Rotherwood Road.

Table 10: Updated Peak LRWF Daily Construction Traffic Volumes incorporating Quarry and TWA Facility at Coolah

Road Segments	Total One-way Vehicle Movements			Grand Total	Number of One-way Vehicle Movements per Day (vm/d) (Note 1)						
	HV	OSOM	LV		Week 0 - 40	Week 40 - 54	Week 54 - 114 (Note 2)	Week 114 - 119	Week 119 - 134	Week 134 - 169	Week 169 - 201
Vinegaroy Road											
Golden Highway to Rotherwood Road	33,369	2,253	22,275	57,898	26	68	105	59	30	13	6
Rotherwood Road to Turee Vale Road	61,413	1,649	42,253	105,314	47	123	191	107	54	23	11
Turee Vale Road to D1-cluster entrance (SAP ID#113/114)	44,078	998	59,953	105,028	47	123	190	107	54	23	11
D1-cluster entrance (SAP ID#113/114) to Coolah Creek Road	40,340	828	62,645	103,813	47	122	188	106	53	23	11
Rotherwood Road											
Vinegaroy Road to E-cluster entrance (SAP ID#10)	58,225	605	30,763	89,593	40	105	162	91	46	19	10
E-cluster entrance (SAP ID#10) to F-cluster Substation entrance (SAP ID#39)	57,852	366	20,280	78,498	35	92	142	80	40	17	9
F-cluster Substation entrance (SAP ID#39) to the Quarry entrance (SAP ID#15) / F-cluster entrance (SAP ID#55)	64,042	366	20,280	84,688	38	99	**153**	86	43	18	9
Proposed Quarry entrance (SAP ID#15) / F-cluster entrance (SAP ID#55) to F-cluster entrance (SAP ID#134)	8,472	171	11,142	19,785	9	23	36	20	10	4	2
Turee Vale Road											
Vinegaroy Road to D17-cluster entrance (SAP ID#37)	18,147	651	28,385	47,183	21	55	85	48	24	10	5
D17-cluster entrance (SAP ID#37) to D28-cluster entrance (SAP ID#131)	14,409	482	23,382	38,272	17	45	69	39	20	8	4

Road Segments	Total One-way Vehicle Movements			Grand Total	Number of One-way Vehicle Movements per Day (vm/d) (Note 1)						
	HV	OSOM	LV		Week 0 - 40	Week 40 - 54	Week 54 - 114 (Note 2)	Week 114 - 119	Week 119 - 134	Week 134 - 169	Week 169 - 201
D28-cluster entrance (SAP ID#131) to E17-cluster entrance (SAP ID#132)	10,488	323	14,567	25,378	11	30	46	26	13	6	3
Coolah Creek Road											
Vinegaroy Road to A&B-cluster entrance (SAP ID#48)	30,197	828	42,322	73,347	33	86	133	75	38	16	8
A&B-cluster entrance (SAP ID#48) to Burgess entrance (SAP ID#41)	24,046	681	34,073	58,800	26	69	106	60	30	13	6
Burgess entrance (SAP ID#41) to State Forest Road	22,171	474	29,305	51,950	23	61	94	53	27	11	6
State Forest Road											
C-cluster entrance (SAP ID#13) to C-cluster entrance (SAP ID#133)	3,684	0	5,668	9,352	4	11	17	10	5	2	1
Pandora Road and Pandora Pass Road											
Coolah Creek Road to C-cluster entrance (SAP ID#34)	12,713	474	21,957	35,144	16	41	64	36	18	8	4
C-cluster entrance (SAP ID#34) to B-cluster entrance (SAP ID#103)	6,782	267	12,420	19,468	9	23	35	20	10	4	2

Note 1: Weekly number of one-way trips per day for a 6-day working week.

Note 2: The peak number of one-way vehicle movements occur from week 54 to week 114 for the wind farm construction program.

5.2 Quarry Entrance Intersection Assessment

The location of the intersection on Rotherwood Road to cater for the Quarry is shown in **Figure 2** (on page 6 of this report).

The warrant assessment is used to determine the turn treatments required to cater for the anticipated traffic as per the traffic generation model inclusive of local background traffic. The background traffic used in the assessment was based on traffic count data provided by WSC. It should be noted that background traffic will not use the intersection to access the Quarry and is accounted for in the assessment as through traffic which also impacts on the resulting intersection turn treatment.

Considering that the local Annual Average Daily Traffic (AADT) along Rotherwood Road for February 2017 was surveyed to average 43 vehicles per day, an assumed growth rate of 1.0% was applied to determine the Annual Average Daily Traffic for 2026 (the peak period of construction). The applied growth rate is consistent with the Golden Highway Corridor Strategy (published in October 2016) with an annual growth of between 1.0-2.0% across the region. It is also considered conservative as Rotherwood Road is a local road and on the basis that several Transport for NSW (TfNSW) traffic count stations in the region reflected zero growth in the area. **Table 11** summarises the background traffic used and the assumptions incorporated in the analyses.

Table 11: Rotherwood Road Background Traffic

Location	AADT [5] 2017	AADT [1] 2023	Peak Hour (vph) [3]	AADT [1] [2] 2026	Peak Hour (vph) [3]
Rotherwood Road – LRWF Substation Entrance (SAP ID# 39) to the Quarry Entrance (SAP ID #15) [4] [5]	43	46	5	47	5

Note 1: 2023 – existing background traffic using 1.0 % growth rate factor.

Note 2: 2026 – maximum daily construction traffic.

Note 3: Refer (AGTM) *Austroads Part 6, Figure 3.25 notes – "Where peak hour volumes or peak hour percentages are not available, assume that the design peak hour volume equals 8% to 10% of the AADT for urban situations and that the design hour volume equals 11% to 16% of AADT for rural situations "* **Adopt 11% given low traffic volumes in this rural location.**

Note 4: Assume similar traffic numbers as per the start of Rotherwood Road near Vinegaroy Road intersection.

Note 5: February 2017 traffic count data as provided by WSC.

In addition to the local background traffic, the Quarry entrance intersection was evaluated for the AM peak hour traffic inward movements (which are greater than the PM peak hour movements) from Rotherwood Road with the peak daily wind farm construction traffic of 153vm/d which includes the worker LV distribution for the proposed TWA.

The AM peak hour construction related traffic demand requires the intersection to have basic right-turn (BAR) and basic left-turn (BAL) treatment as per the analysis summarised in **Figure 4**.

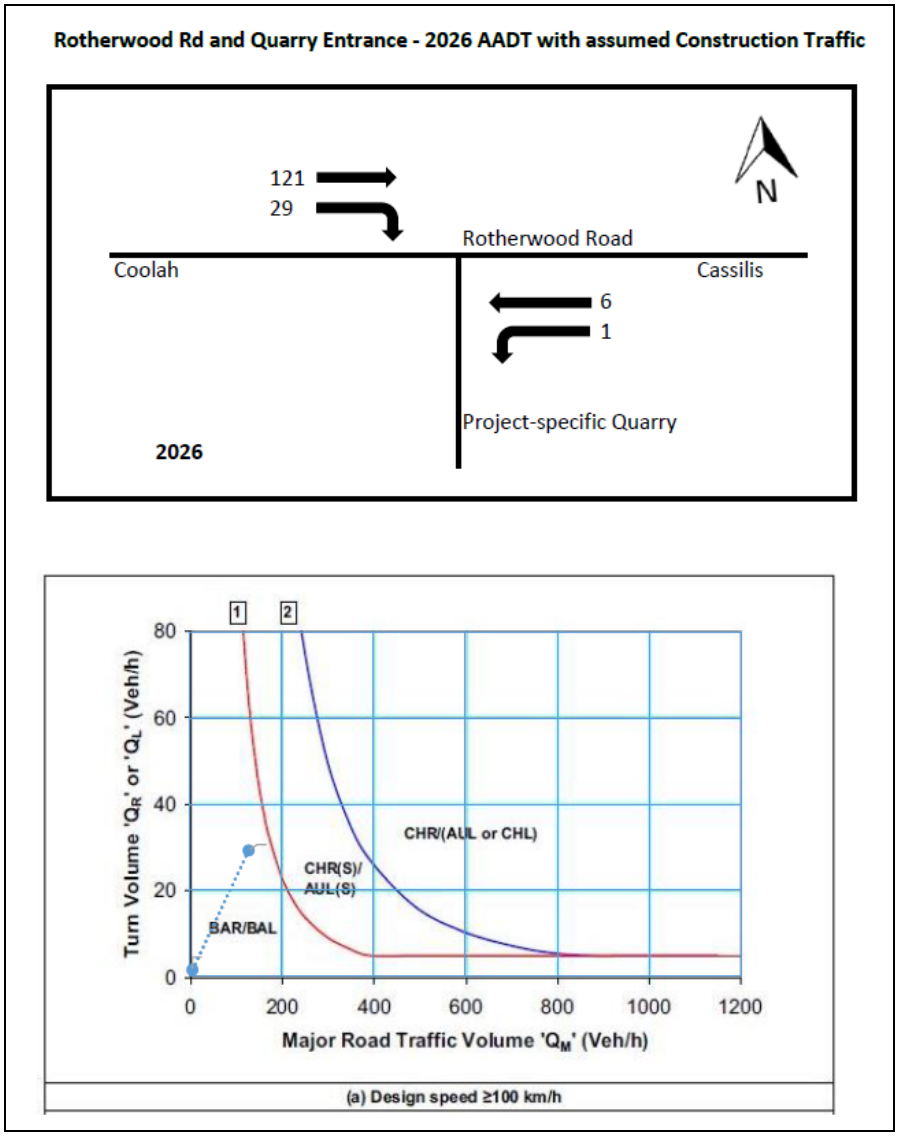


Figure 4: Analysis Outcome

5.3 Comparative Traffic Movement Scenario (Quarry Products Sourced in Broader Region)

The LRWF Addendum TIA currently assumes that material is to be sourced from existing regional quarry site(s) near Dubbo, NSW. The main quarries with the potential to supply the LRWF Project are located in the Dubbo area, which has a return haulage distance of approximately 300km.

Assuming that all quarry material is to be sourced from Dubbo (i.e.: south of the Golden Highway), the following changes in HV traffic volumes are estimated and set out in **Table 12**.

5.4 Public Transport

Under the LRWF Traffic Management Plan (TMP), special consideration will be provided to public transport and school bus routes impacted by the wind farm construction traffic. Further detailed traffic generation estimates and vehicle movement plans including trip origins/destinations will be developed by the Balance of Plant (BOP) Contractor with impacts to the public transport services revised. Site specific TMPs will then be implemented accordingly to cater for the public transport services impacted by the wind farm. Rotherwood Road currently has a single school bus terminating at the Yarrawonga Road intersection which may change based on the number of school aged children living in the area during the construction period.

5.5 Hazardous Materials

A preliminary risk screening was undertaken for the Quarry project in accordance with Chapter 3 of the *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP) and is presented in the EIS. Based on the estimated quantities listed in the assessment, none of the hazardous materials to be stored at the Quarry are above screening thresholds and a Preliminary Hazard Analysis is not required. Vehicle movements for the transport of hazardous materials to the Quarry will also be well below transportation screening thresholds.

It is noted that explosives and explosive precursors will not be stored at the Quarry and therefore do not trigger screening requirements. The transport of these materials to and from the site are the responsibility of the relevant drill and blast contractor.

Table 12: Comparison of HV Movements for the Quarry and External Quarry as Origin of Materials

Road Sections	Overall LRWF Project HV Movements			
	External Quarry (Dubbo)	The Quarry	Difference	% Change
Vinegaroy Road - Golden Highway to Rotherwood Road	***72,373***	***33,369***	***-39,004***	***-54%***
Vinegaroy Road - Rotherwood Road turnoff to Turee Vale Road	61,413	61,413	0	0%
Vinegaroy Road - Turee Vale Road turnoff to D1-cluster entrance (SAP ID#113/114)	44,078	44,078	0	0%
Vinegaroy Road - D1-cluster entrance (SAP ID#113/114) to Coolah Creek Road	40,340	40,340	0	0%
Rotherwood Road – Vinegaroy Road to E-cluster entrance (SAP ID#10)	***29,154***	***58,225***	***29,071***	***100%***
Rotherwood Road - E-cluster entrance (SAP ID#10) to F-cluster substation entrance (SAP ID#39)	***20,390***	***57,852***	***37,462***	***184%***
Rotherwood Road - F-cluster substation entrance (SAP ID#39) to Proposed Quarry entrance (SAP ID# 15) / F-cluster (SAP ID# 55)	***21,673***	***64,042***	***42,369***	***195%***
Rotherwood Road - Proposed Quarry entrance (SAP ID# 15) / F-cluster (SAP ID# 55) to F-cluster entrance (SAP ID# 134)	8,472	8,472	0	0%
Turee Vale Road – Vinegaroy Road to D17-cluster entrance (SAP ID#37)	18,147	18,147	0	0%
Turee Vale Road - D17-cluster entrance (SAP ID#37) to D28-cluster entrance (SAP ID#131)	14,409	14,409	0	0%
Turee Vale Road - D28-cluster entrance (SAP ID#131) to E17-cluster entrance (SAP ID#132)	10,488	10,488	0	0%
Coolah Creek Road – Vinegaroy Road to A&B-cluster entrance (SAP ID# 48)	30,197	30,197	0	0%
Coolah Creek Road - A&B-cluster entrance (SAP ID# 48) to Burgess entrance (SAP ID#41)	24,046	24,046	0	0%
Coolah Creek Road - Burgess entrance (SAP ID#41) to State Forest Road)	22,171	22,171	0	0%
State Forest Road – C-cluster entrance (SAP ID# 13) to C-cluster entrance (SAP ID#133)	3,684	3,684	0	0%
Pandora Pass Road - Coolah Creek Road to C-cluster entrance (SAP ID#34)	12,713	12,713	0	0%
Pandoras Pass Road - C-cluster entrance (SAP ID#34) to B-cluster entrance (SAP ID#103)	6,782	6,782	0	0%
Note: This table includes LRWF Project HV movements which are not specific to the quarry in order to assess impact to the project traffic and requirements to manage HV movements under that consent.				

Table 12 shows the impacts of introducing the Quarry compared to an external quarry (i.e.: Dubbo) which includes:

- A reduction of traffic on Vinegaroy Road between the Golden Highway and Rotherwood Road by approximately 54% of the total HV traffic volumes;
- An increase in traffic on Rotherwood Road between Vinegaroy Road and the Quarry entrance (SAP ID#15) ranging between 100% to 195%; and
- No other wind farm access roads are impacted with HV movements remaining unchanged.

Traffic data was provided to Tilt Renewables from UHSC for the Golden Highway and from WSC for Rotherwood Road and Vinegaroy Road. **Table 13** sets out a comparison of the existing traffic numbers extrapolated to current and future dates assuming a 1% growth rate.

Table 13: Existing Traffic Numbers

Location	AADT [5]-[8]	AADT [1]	Peak Hour (vph) [3]	AADT [2]	Peak Hour (vph) [3]
	2017-2022	2023		2026	
Golden Highway (near Merriwa)	2094 [5]	2179	240	2245	247
Golden Highway (between Ulan Road and Merotherie Road)	930 [6]	939	103	968	106
Vinegaroy Road	445 [7]	454	50	468	51
Rotherwood Road – LRWF Substation Entrance (SAP ID# 39) to the Quarry Entrance (SAP ID #15) [4]	43 [8]	46	5	47	5

Note 1: 2023 – existing background traffic using 1.0 % growth rate factor.

Note 2: 2026 – maximum daily construction traffic using 1.0% growth rate factor.

Note 3: Refer (AGTM) *Austroads Part 6, Figure 3.25 notes – "Where peak hour volumes or peak hour percentages are not available, assume that the design peak hour volume equals 8% to 10% of the AADT for urban situations and that the design hour volume equals 11% to 16% of AADT for rural situations". "* **Adopt 11% given low traffic volumes in this rural location.**

Note 4: Assume similar traffic numbers as per the start of Rotherwood Road near Vinegaroy Road intersection.

Note 5: 2019 traffic count data as provided by UHSC.

Note 6: October 2022 traffic data as provided by Tilt Renewables.

Note 7: 2021 traffic data as provided by WSC.

Note 8: February 2017 traffic data as provided by WSC.

When compared to the peak LRWF Project traffic generated shown in **Table 10**, **Table 13** shows that the traffic on the Golden Highway and Vinegaroy Road is significantly higher than that of Rotherwood Road. Therefore, sourcing quarry materials from within the LRWF Project area effectively transfers the quarry component of LRWF construction traffic from the higher volume (and therefore higher risk) regional road network to the lower volume (and therefore lower risk) existing approved haul route of the LRWF Project. This allows greater control of the HV traffic movements and therefore safety, given it will operate in strict accordance with the LRWF Traffic Management Plans (TMPs).

It also has the effect of reducing the total/return haulage distance between the quarry site and the LRWF Project on the public road network by approximately 17,000,000km (assuming 2Mt supply), when comparing the Quarry location to the alternative of sourcing quarry material from Dubbo.

In addition, assuming a LRWF Project demand of 2,000 tonnes per day, sourcing quarry materials from within the LRWF Project area would require a fleet of five (5) HV's, compared to thirty-two (32) HVs needed to meet the daily demand if all quarry materials are sourced from Dubbo. This has the added effect of reducing strain on haul fleet and associated workforce resources that are required for other renewable energy projects in the Central West-Orana REZ and more broadly on the demand for these resources in the wider region.

The LRWF Project requires a substantial quantity of materials over a 4-year period which would reduce the availability of essential materials used in many Local and State Government road and infrastructure projects. The increased demand in key materials could have financial impacts by having more competitive prices and reduced availability, particularly in gravels and haulage.

6 Conclusion and Recommendations

The Proponent is seeking to establish a Project-specific Quarry ("the Quarry") that would supply approximately 2 Mt of rock, gravel, and sand product over an approximately 4-year construction program associated with the LRWF Project. The Quarry is proposed to be located off Rotherwood Road, approximately 10km north of the Cassilis township within the UHSC LGA.

It is anticipated that the peak material demand for the LRWF Project will be approximately 700,000 tpa. Estimates of LV and HV traffic associated with the operation of the Quarry were based on the LRWF Project construction schedule (i.e.: construction material demand) provided to the Proponent by Tilt Renewables based on previous wind farm project delivery experience.

The SAP for the Quarry has been assessed based on estimated traffic volumes and turning movements in accordance with relevant Austroads guidelines. The intersection analysis determined that BAR and BAL turn treatments are required at the Quarry entrance (SAP ID#15) off Rotherwood Road with details of the analysis provided in **Section 5** of this report.

The key conclusions from this report in relation to the Quarry are as follows:

- A key principle of this Quarry TIA is that all haulage traffic generated by the Quarry forms part of the construction traffic of the LRWF Project (as would be the case for any haulage traffic from existing quarries located in the region). As the Quarry is solely for the purpose of the LRWF Project, any mitigation necessary to manage impacts of quarry haulage and light vehicle (LV) traffic on the Council's road assets would be undertaken by the LRWF Project, in accordance with Development Consent SSD 6696 (as modified). Accordingly, a requirement for the quarry to contribute towards road upgrades or maintenance (e.g. via a haulage levy or VPA) would not be appropriate as it would be effectively 'double-dipping'.
- Sourcing quarry products required for wind farm construction from the Quarry would result in a significant decrease in estimated wind farm construction traffic volumes on Vinegaroy Road between the intersections of the Golden Highway and Rotherwood Road as well as the broader public road network, compared to sourcing the materials from existing quarries located in Dubbo, Tamworth, Coonabarabran, Scone, etc.
- The Quarry would also result in an increase of approximately 60% in estimated LRWF Project construction traffic volumes along the generally low trafficked section of Rotherwood Road between the Vinegaroy Road intersection and the Quarry entrance, compared to a scenario where the required quarry materials are sourced from other existing quarries located elsewhere across the broader region.
- Sourcing quarry materials from within the LRWF Project area benefits overall road safety by removing quarry material deliveries from busier roads surrounding the wind farm. The LRWF Project has a greater ability to increase road safety and reduce risk through the implementation of Public Road Upgrades, TMPs and LRWF Project communications closer to the LRWF Project area. These measures are expected to effectively mitigate the road safety risks associated with quarry vehicle movements and other LRWF Project construction traffic.
- Sourcing materials from the Quarry would be expected to result in several benefits from a traffic and transport perspective, including:
    - **Improved road safety**, reduced driver fatigue will be improved with shorter commutes for haulage drivers between the wind farm work fronts and the Quarry compared to travelling from other main commercial quarries with the potential to supply the LRWF Project which are located in the Dubbo area, which has a return haulage distance of approximately 300km.

      If utilised by the LRWF for the supply of 2 Mt of product, the much shorter return haul to the LRWF Project from the Quarry would result in a reduction in the total haulage distance on the public road network by approximately 17,000,000 km, compared to the alternative of sourcing all quarry material from Dubbo (the most likely alternate source of material).
    - **Improved road safety**, through reduced number of potential HV/LV interactions. Existing traffic is significantly lower on Rotherwood Road compared to Vinegaroy Road and the Golden Highway (refer to **Section 5.3** of this report), reducing vehicle

interactions and the subsequent probability of road safety incidents with the public compared to higher traffic volume roads.

- **Local Relationships**: most of the landholdings along Rotherwood Road are associated with the LRWF Project. This gives Tilt Renewables the ability to communicate associated traffic impacts more effectively along Rotherwood Road to mitigate safety incidents occurring when compared to residents further away from the LRWF Project area. There are only two landholdings which are not associated with the LWRF Project at this stage. The Proponent and Tilt Renewables have been in contact with these residences throughout the development of both the LRWF Project and the Quarry project. Further consultation will continue with these landholders as the Quarry project progresses.
- **Reduced HV fleet:** the HV haulage fleet size to accommodate the LRWF Project would be significantly reduced. This is due to the number of trips a single HV can complete in a day being increased by the substantially reduced trip distance and associated time required for travel while maintaining the rate of quarry material supply to the LRWF Project.

Ultimately, the Quarry would result in a significant improvement (compared to the option of sourcing materials from more distant quarries) from a traffic and transport perspective. Potential traffic and transport impacts can be appropriately managed and mitigated through appropriate intersection design and compliance with TMPs as required under the LRWF Consent.

The following recommendations are made to ensure transport impacts of the Quarry project are minimised:

1. Given that haulage of materials from the Quarry (irrespective of location) is the responsibility of and will be managed by the LRWF proponent or its principal contractor, the Quarry needs to operate in accordance with the TMP prepared for the LRWF Project.
2. Similarly, all drivers hauling quarry materials will act in accordance with the TMP prepared for the LRWF Project.

7 References

1. Liverpool Range Wind Farm Supplementary Traffic Impact Assessment and Response to Road Authority Submissions Report prepared by Constructive Solutions Pty Ltd dated November 2023. Also referred to as the ***LRWF Supplementary TIA***.
2. Liverpool Range Wind Farm Update to the Addendum Traffic Impact Assessment: Temporary Workforce Accommodation Facility Report prepared by Constructive Solutions Pty Ltd dated March 2024. Also referred to as the ***LRWF Addendum TIA***.
3. Austroads (2020), 'Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management'.

Appendix 1: LRWF – Supplementary TIA

Liverpool Range Wind Farm Supplementary Traffic Impact Assessment and Response to Road Authority Submissions Report, November 2023

Appendix 2: LRWF – Addendum TIA

Liverpool Range Wind Farm Update to the Addendum Traffic Impact Assessment: Temporary Workforce Accommodation Facility Report, April 2024

Appendix 3: LRWF – Access Track Typical Design

Appendix 4: LRWF – Typical SAP Design

Appendix 5: SAP ID#15 – Safe Intersection Sight Distance (SISD)

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