Fraser Earthmoving Construction Pty Ltd

ABN: 84 476 527 814

Howlong Sand and Gravel Expansion Project

Environmental Impact Statement

State Significant Development 17_8804

Prepared by:

R.W. CORKERY & CO. PTY. LIMITED

March 2020

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Environmental Impact Statement

for the

Howlong Sand and Gravel Expansion Project

State Significant Development 17_8804

Prepared for:

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March 2020

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Author's Certification

for the submission of an Environmental Impact Statement prepared in accordance with the *Environmental Planning and Assessment Act 1979.*

a) EIS prepared by:

name: Nicholas Warren

qualifications: B.Sc.,M.Bus, M.Env.Sc

address: Level 1, 12 Dangar Road
BROOKLYN NSW 2083

b) Development application by:

applicant name: Fraser Earthmoving Construction Pty Ltd

applicant address: Suite 4, Level 1, 574 – 576 Kiewa Street
ALBURY NSW 2640

c) Application Number: 17_8804

d) Address/land details: 4343 Riverina Highway, Howlong, NSW

Properties to be developed

Lot Number	Deposited Plan
173	753744
174	753744
174A	753744
231	753744
1	1039973
1	798291
3	113703
4	113703
1	741037
Two Unnamed Crown Roads	

e) Project Outline: The proposal involves the continued extraction of sand and gravel at the existing Howlong Sand and Gravel Quarry. Annual production would be a maximum of 300 000 tonnes per annum over a 30 year Project life.

f) Assessment of Environmental Impact: The assessment of environmental impacts of this project includes the matters referred to in the Secretary's Environmental Assessment Requirements provided to the Applicant on 7 November 2017 under Schedule 2, Part 2 of the *Environmental Planning and Assessment Regulation 2000.*

g) Declaration: I, Nicholas George Warren, hereby declare that I have overseen the preparation of the contents of this assessment and to the best of my knowledge:

i) this EIS has been prepared in accordance with the requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000;*

ii) the document contains all available information that is relevant to the environmental assessment of the proposed development; and

iii) that the information contained in the document is neither false nor misleading.

Signature: 

Name: Nicholas Warren

Date: 16/03/2020

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SPECIALIST CONSULTANT STUDIES COMPENDIUM
(Accompanying this Volume)

ACRONYMS

AAS	Audiometric & Acoustic Services
ACHCRs	Aboriginal Cultural Heritage Consultation Requirements
AEP	Annual Exceedance Probability
AES	Advanced Environmental Systems Pty Ltd
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ANZG	Australian and New Zealand Guidelines
BAL	Basic Auxiliary Left
BAM	Biodiversity Assessment Method
BCD	Biodiversity and Conservation Division
BDAR	Biodiversity Development Assessment Report
BoM	Bureau of Meteorology
CEO	Chief Executive Officer
DA	Development Application
DAWE	Department of the Agriculture, Water and the Environment
DECCW	Department of Environment, Climate Change and Water
DoEE	Department of Energy and Environment
DoP	Department of Planning
DPIE	Department of Planning, Industry and Environment
DRG	Division of Resources and Geoscience
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Reg	*Environmental Planning and Assessment Regulation 2000*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environmental Protection Licence
ESD	Ecologically Sustainable Development
GDE	Groundwater Dependent Ecosystems
LEP	Local Environmental Plan
LGA	Local Government Area
LALC	Local Aboriginal Land Council

MDBA	Murray Darling Basin Authority
MNES	Matters of National Environmental Significance
NGER Act	*National Greenhouse and Energy Reporting Act 2007* (Cth)
NNTT	National Native Title Tribunal
NPI	Noise Policy for Industry
NSW	New South Wales
NSW DPC	New South Wales Department of Premier and Cabinet
NT Act	*Native Title Act 1993*
NP&W Act	*National Parks and Wildlife Act 1974*
OEH	Office of Environment and Heritage
PNTL	Project Noise Trigger Level
PoEO Act	*Protection of the Environment Operations Act 1997*
RAP	Registered Aboriginal Parties
RBL	Rating Background Level
RMS	Roads and Maritime Services
RNP	Road Noise Policy
RWC	R.W. Corkery & Co. Pty Limited
SCSC	Specialist Consultant Studies Compendium
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SILO	Scientific Information for Land Owners
SOHI	Statement of Heritage Impact
SSD	State Significant Development
TAPM	The Air Pollution Model
TfNSW	Traffic for NSW
tpa	tonnes per annum
TSP	Total Suspended Particulates
TTPP	The Transport Planning Partnership Pty Ltd
VLAMP	Voluntary Land Acquisition and Mitigation Policy
WAL	Water Access Licence
WM Act	*Water Management Act 2000*
WSP	Water Sharing Plan

HOWLONG SAND AND GRAVEL EXPANSION PROJECT
SUMMARY OF KEY FACTS AND STATISTICS

Applicant	Fraser Earthmoving Construction Pty Ltd
Location	4343 Riverina Highway Howlong
Indicative Application Area	Extraction areas: - Stage 1 = 6.7ha - Stage 2 = 5.9ha - Stage 3 = 4.1ha - Stage 4 = 24.5ha Processing and stockpiling = 7.7ha Property area = 428.7ha Disturbance area = 56.5ha
Material Extracted	Sand and Gravel
Resource	9.5 million tonnes
Key Products	Various sand products, fill materials, road base and other products shaped to meet Client specifications.
Markets	Construction markets in NSW and Victoria
Project Life	30 years
Extraction Method	Standard free dig extraction or dredging at lower elevations
Extraction Rate	330 000tpa
Product Despatch	300 000tpa
Quarry Access	Use of existing 12m wide Quarry access road that intersects with the Riverina Highway
Product Despatch Levels (one load generates two movements)	No more than 40 laden loads per day (80 movements) No more than 6 laden loads per hour (12 movements)
Employment	10 full time employees and 25 indirectly employed heavy vehicle drivers

Hours of Operation (The nominated periods reflect the periods in which the activity(ies) could occur – they would not be undertaken continuously within these periods)

Activity	Proposed Hours
Extraction, Processing and Stockpiling	7:00am to 5:00pm - Monday to Saturday No operation on Sundays or public holidays
Sales and Product Despatch*	7:00am to 10:00pm - Monday to Friday. 7:00am to 12:00pm - Saturday. No operation on Sundays or public holidays
Maintenance	Monday to Sunday - 24hrs Only maintenance that is inaudible would be undertaken outside the hours of 7:00am to 5:00pm - Monday to Saturday
* Trucks may arrive at the Quarry from 6:30am.	

Capital Investment Value	$5.1 million

Executive Summary

Introduction

Fraser Earthmoving Construction Pty Ltd (the Applicant) is proposing to continue extraction, processing and product transport operations within an expended area at the Howlong Sand and Gravel Quarry (the Project). The Project would comprise an increase to the annual production rate to 300 000tpa and expansion into additional extraction areas. The existing Howlong Sand and Gravel Quarry (the Quarry) is located approximately 2.5km to the south-east of Howlong and approximately 25km west of Albury (**Figure ES-1**).

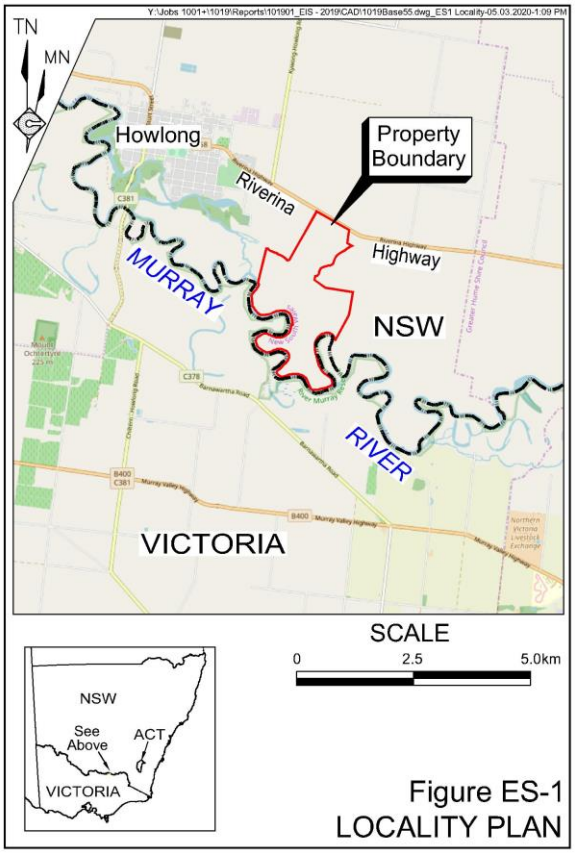


Figure ES-1
LOCALITY PLAN

The Project is classified as State Significant Development under Clause 7(1) of Schedule 1 of *State Environmental Planning Policy (State and Regional Development) 2011* as it would involve extraction from a total resource of more than five million tonnes. The Project Development Application will therefore require assessment under Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The consent authority for the Project will be the Minister for Planning, (or their delegate) unless determination by the Independent Planning Commission is triggered.

The land the subject of this application (referred to hereafter as the Quarry Site) is zoned within the *Corowa Shire Local Environmental Plan 2012* as E3 – Environmental Management with the access road on land zoned RU1 – Primary Production. Extractive industries are permissible with development consent within these zones.

It is noted that an approval from the Commonwealth Minister for the Environment will not be required under the Environment Protection and Biodiversity Conservation Act 1999 as the outcomes of ecological survey and assessment and correspondence from the then Commonwealth Department of the Environment and Energy (now DAWE) (dated 4 May 2018) indicate that the Project is not a controlled action under the EPBC Act.

The Applicant

The Applicant for the expansion of the Howlong Sand and Gravel Quarry is Fraser Earthmoving Construction Pty Ltd. The Applicant operates two quarries, the existing Howlong Sand and Gravel Quarry and the Berrigan Hard Rock Quarry, as well as providing earthmoving services to the Department of Defence at Puckapunyal.

Approvals Required

Based upon the current design of the Project and understanding of environmental issues, the Project would require the following Approvals to proceed.

- Development Consent from the Minister for Planning (or their delegate) or the Independent Planning Commission as the Project has been classified as a "State Significant Development" under Schedule 1 (7(a)) of the State Environmental Planning Policy (State and Regional Development) 2011.
- A variation to existing EPL 254 from the Environment Protection Authority (EPA), under Section 58 of the Protection of the Environment Operations Act (PoEO) 1997. EPL 254 would also be transferred under Section 54 of the PoEO Act from the landowner to the Applicant, who would assume responsibility for operations.

Reliance would also be placed on the existing water access licences held by the Applicant, noting that water use on the property would continue to be integrated with the irrigation activities.

Objectives

The Project would enable the Applicant to continue the efficient supply of sand and gravel resource to clients in the region for use in a range of construction projects, infrastructure development and road maintenance.

The Applicant's objectives in expanding the operations at the Howlong Sand and Gravel Quarry are as follows.

- Continue to provide a source of high-quality sand and gravel products to meet the needs of housing and construction markets in New South Wales and Victoria.
- Maximise the efficient recovery of the natural resource.
- To develop and operate the Quarry in a manner that is environmentally responsible and complies with all statutory requirements and reasonable community expectations.
- Continue to integrate the Quarry operation with the productive agricultural use of the land on which the Quarry is located as well as surrounding properties.
- To create a final landform that is safe, stable and provides for long-term nature conservation within the areas disturbed throughout the life of the Quarry.
- Achieve the above objectives in a cost-effective manner to ensure the Project is viable.

The Project

The current Quarry operations involve the production of no more than 30 000 tonnes per annum (tpa) of sand and gravel products using free dig techniques from two extraction areas.

The Project would continue extraction of sand and gravel resource using predominantly free dig techniques across four stages of development, commencing in the existing disturbed areas and progressively expanding to new areas in later stages, expanding production to 300 000tpa. Dredging may also be used in development of extraction stages. There would be no blasting for the development.

It is expected that operations would continue for a period of approximately 30 years and would provide fulltime employment for eight to ten persons.

Figure ES-2 displays the following principal components of the Project Development of four extraction stages including:

  - Continued development of the Stage 1 extraction area covering 6.7ha.
  - Continued development of the Stage 2 extraction area covering 5.9ha.
  - Development of a new Stage 3 extraction area covering 4.1ha and located to the south of the existing processing area.
  - Development of a new Stage 4 extraction area covering 24.5ha and located to the east of the existing processing area.

  Each stage of development would be extracted to an elevation no lower than 119m AHD (approximately 21m below ground level)

- A Processing and Stockpiling area located between Stage 2 and Stage 3 extraction areas, covering 7.7ha. This area has already been disturbed for existing operations. It includes predominantly screening and washing of raw materials and product stockpiles.
- A Quarry infrastructure area that includes an existing office and weighbridge, located east of Stage 2 extraction area.
- Two pump shed that would house the permanent pump infrastructure.
- The existing quarry access road and internal unsealed roads.
- Flood levees developed to an elevation of 142.7m AHD.

A total resource of 9.5 million tonnes would be extracted under the Project. The products that would be produced at the Quarry would remain the same as those currently being produced, including the following.

- Sand products for concrete production and eventual use in residential commercial and infrastructure construction.
- Fill materials – for bulk earthworks and landscaping.
- Road base – for road and other infrastructure construction and maintenance.
- Other products produced to meet client specifications and requirements

Transportation operations would be contracted, or trucks and drivers would be supplied by clients. Product despatch from the Quarry would be limited to no more than 40 laden loads per day (resulting in 80 truck movements). In addition, the Applicant has committed that no more than six laden loads would be despatched per hour.

Quarry products would be despatched by road using the existing Quarry Access Road and public road network, with all heavy vehicle access to and from the west via the Riverina Highway. The site entrance would be upgraded to comply with Austroads (2019) standards and include a Basic Auxiliary Left and Basic Auxiliary Right intersection. Transport activities would continue to predominantly require the use of 19m/26m Truck and Dog or B-Double vehicles

Rehabilitation

Rehabilitation would occur progressively as extraction stages are completed. The final landform would comprise the following (**Figure ES3**).

- Four open areas to be rehabilitated as permanent wetlands for habitat and biodiversity conservation.

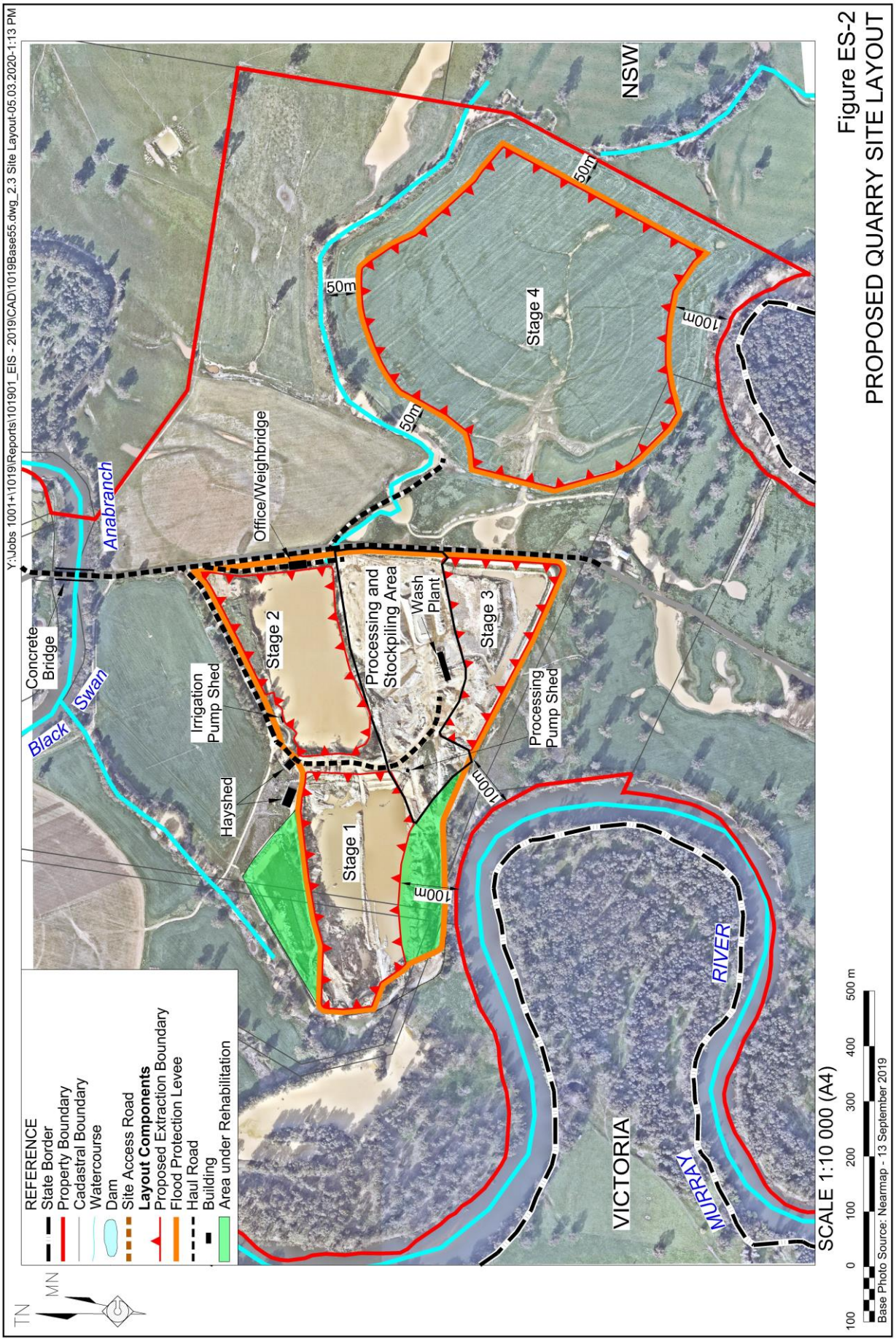
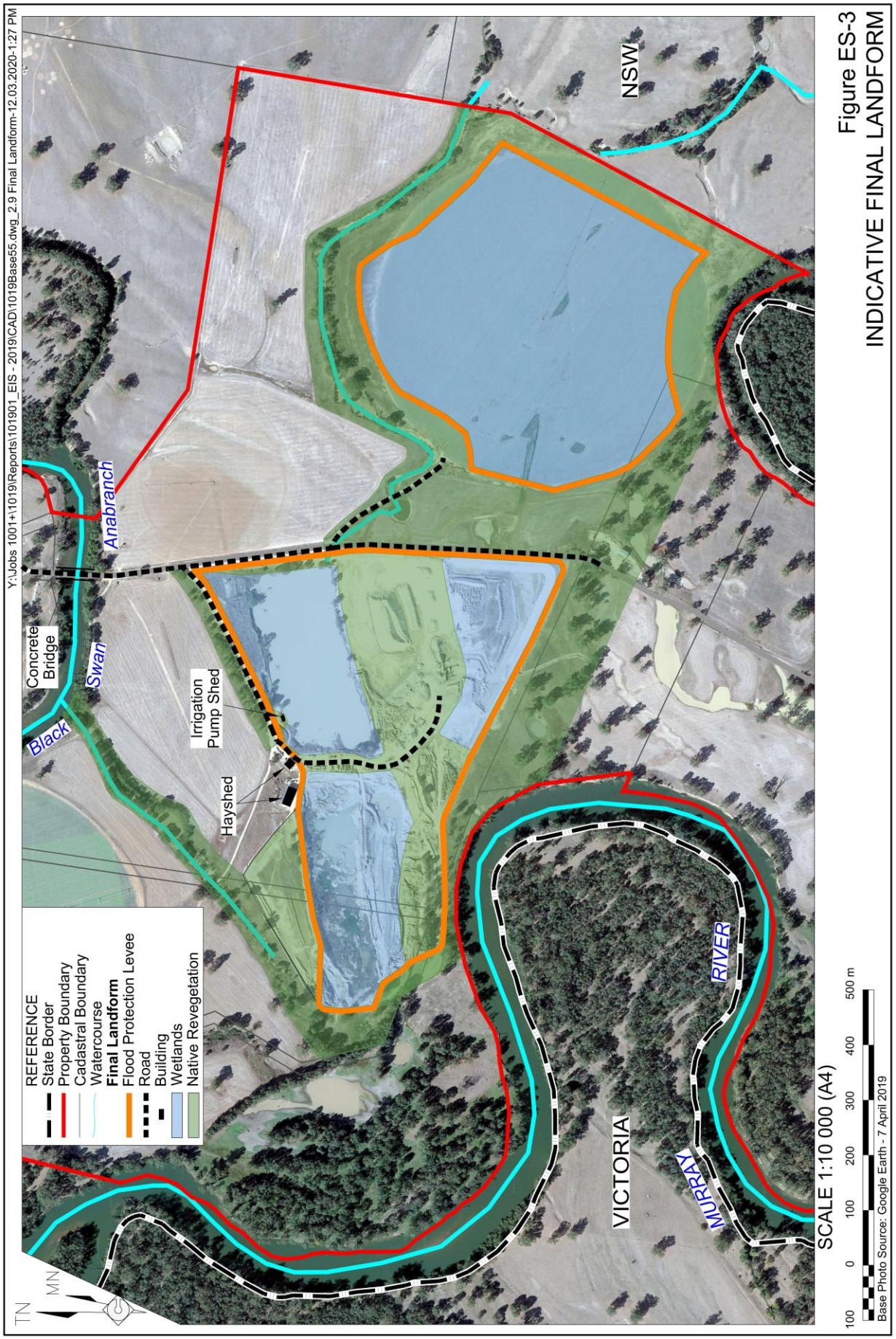


Figure ES-2
PROPOSED QUARRY SITE LAYOUT
Y:\Jobs 1001+\1019\Reports\101901_EIS - 2019\CAD\1019Base55.dwg_2.3 Site Layout-05.03.2020-1:13 PM
NSW
VICTORIA
Anabranch
Black Swan
Concrete Bridge
Irrigation Pump Shed
Hayshed
Office/Weighbridge
Stage 1
Stage 2
Stage 3
Stage 4
Processing and Stockpiling Area
Wash Plant
Processing Pump Shed
50m
100m
MURRAY RIVER
REFERENCE
State Border
Property Boundary
Cadastral Boundary
Watercourse
Dam
Site Access Road
Layout Components
Proposed Extraction Boundary
Flood Protection Levee
Haul Road
Building
Area under Rehabilitation
TN
MN
SCALE 1:10 000 (A4)
100 0 100 200 300 400 500 m
Base Photo Source: Nearmap - 13 September 2019


Y:\Jobs 1001+\1019\Reports\101901_EIS - 2019\CAD\1019Base55.dwg_2.9 Final Landform-12.03.2020-1:27 PM
Figure ES-3
INDICATIVE FINAL LANDFORM
NSW
VICTORIA
Anabranch
Swan
Black
Concrete Bridge
Irrigation Pump Shed
Hayshed
RIVER
MURRAY
REFERENCE
State Border
Property Boundary
Cadastral Boundary
Watercourse
Final Landform
Flood Protection Levee
Road
Building
Wetlands
Native Revegetation
TN
MN
SCALE 1:10 000 (A4)
100 0 100 200 300 400 500 m
Base Photo Source: Google Earth - 7 April 2019

- Areas within and surrounding the wetland areas would be revegetated with native vegetation.
- Levee banks surrounding the wetland areas.
- Unsealed internal access roads.

The progressive rehabilitation procedures would be integrated with a commitment to revegetate areas not disturbed by quarrying including riparian areas and areas between the Quarry and the Murray River.

The final land use would be a mixture of agriculture and nature conservation.

Consultation

Consultation associated with the Project included the following.

- Distribution of a leaflet and advertising in local media.
- A community consultation session on 2 March 2018.
- A social media campaign.
- Meetings with local Landcare groups.
- Aboriginal community consultation.
- Government agency consultation through the SEARs process, as well as one-on-one consultation with individual agencies.

Environmental Safeguards and Impacts

Traffic and Transport

Traffic levels for the Project during peak operations would be 26 light vehicle movements and 80 heavy vehicle movements on the busiest day. Four light vehicle movements and 12 heavy vehicle movements would occur in a peak hour.

The traffic assessment reviewed the public road network that would be used for Project traffic and assessed potential impacts 10 years into the future. With regards the Project's contribution to heavy vehicle traffic only, the Quarry is predicted to contribute a maximum of 18.3% of daily heavy vehicles on the Riverina Highway west of the Quarry (or approximately one in every five or six heavy vehicles) and 14.5% of heavy vehicle traffic on Sturt Street South of the Riverina Highway (or approximately one in every seven vehicles). This estimate is based on the traffic levels projected 10 years into the future for a peak day.

The assessment concluded that the existing road network would accommodate the proposed traffic levels with acceptable impacts to the capacity, efficiency and safety of the road network. The traffic assessment recommended that the intersection of the Quarry Access Road and the Riverina Highway be upgraded in accordance with the Austroads (2019) standards and that driver behaviour be managed in accordance with the Traffic Management Plan and Driver's Code of Conduct. The Applicant has accepted both of these recommendations.

Groundwater

The groundwater modelling undertaken by Water Technology (2020) has predicted that groundwater drawdown would not impact registered bore users. The Quarry operation would continue to draw water from the groundwater setting under licence, principally for irrigation practices. It is predicted that the extraction areas would become groundwater sinks, indicating that water would likely flow from the Murray River towards the Quarry Site as is currently experienced. It is unlikely that baseflow impacts to the Murray River would be noticeable in the context of daily flow volumes in the river or that water quality in the Murray River would be influenced by

groundwater flow towards the river. In addition, the groundwater modelling demonstrates that the strategy to continue managing groundwater inflows through irrigation practices would not result in significant impacts. Rather, these processes would have the benefit of flushing ponds to reduce salinisation. Impacts to terrestrial vegetation that is potentially groundwater dependant, including riparian vegetation along the banks of the Murray River, are not likely to occur. Potential impacts to the Murray River and downstream water users would not significantly change from existing operations given the flow volumes in the river, especially in summer when the flow is regulated by water release from the Hume Dam. Finally, potential impacts to groundwater quality would be mitigated through the proposed irrigation practices and the management of contamination risk through on-site practices.

The most substantial change to the groundwater setting would be the development of ponds in the final landform. These areas would require an ongoing licence entitlement to account for water removed for ongoing irrigation practices and evaporation (lower than that currently held by the Applicant). A schedule for pumping water for irrigation in the final landform has been presented that would minimise salinisation of the rehabilitated ponds. These practices would be formalised in a Riparian and Wetland Management Plan within the Water Management Plan.

Potential impacts to the groundwater setting would be mitigated and managed through the implementation of a Water Management Plan that would include a comprehensive monitoring program that would ensure advance identification of unexpected outcomes.

It is concluded that the Project would continue to operate with minimal impacts to the regional groundwater setting.

Surface Water

The existing Property is part of a portion of land that is effectively located on an island in the Murray River as it is bounded to the south by the Murray River and to the north by the Black Swan Anabranch. A 2.7m high levee will be constructed surrounding the operations.

A flood modelling assessment demonstrated that once the flood levees are constructed, flood incursion would not occur for events up to a 1% AEP storm (that is, one in every 100 years). Given that all operations would occur within a closed system, with no contributing catchment of clean water and there would be no discharge outside the levee banks, risks to water quality outside of the levees would be minimal. The Quarry Access Road would be regularly graded and maintained to ensure that it is not a source of sediment in the environment.

Management procedures would be established to minimise the potential for spills or contamination within the Quarry Site.

Operations would not draw on water from the Murray River or adjoining watercourses. In addition, the minor loss of rainfall runoff from within the 56.5ha catchment delineated by the levee banks would be minor in the context of the regulated and natural river flow levels. Therefore, there would be negligible impacts on water availability for downstream users.

As a result of the above, it is concluded that the Quarry would continue to operate with minimal risk of impact to surface water resources.

Noise

The existing Quarry is the only industrial noise source in the local environment. Surrounding properties and residences are rural in nature and therefore noise

experienced in the area includes birds and insects, farming activities and traffic on the Riverina Highway.

The predicted operational noise level results at each of the receivers for day, evening and night conditions wound not exceed the relevant criteria at any residence.

The predicted public road noise level results show that the road noise assessment criteria would be satisfied and that overall, only a minor increase to existing conditions of 1dB(A) during daytime operations is predicted along two sections of road. In practice, this increase in sound level is an imperceptible change.

Operational activities and Project-related traffic noise would not be likely to cause sleep disturbance.

As a result, it is concluded that the Quarry would continue to operate with minimal risk of adverse noise-related impacts.

Air Quality

The air quality environment at the Property is influenced by existing agricultural practices, traffic and rural roads and the existing Quarry operations.

The results of predictive dust dispersion modelling based on the operation of the Quarry at full capacity (330,000tpa) has concluded that the Project would comply with all impact assessment criteria for each relevant averaging period for TSP, $PM_{2.5}$, PM_{10}, and dust deposition. In addition, the Project would not increase the number of days above the 24-hour average criterion at the assessed receptors.

The Applicant would continue to implement appropriate operational and management measures to manage dust emissions.

As a result of the above, it is concluded that the Quarry would continue to operate with minimal risk of adverse air quality-related impacts.

Land Resources

The Property is located within the Murray Alluvium hydrogeological landscape which is characterised by alluvial floodplains, terraces and levees. The Quarry Site was assessed as comprising Class 4 land and soil capability with moderate to severe limitations for some land uses

The land resources assessment concluded that with adherence to the recommended soil and growth medium stripping, handling, stockpiling procedures and other management practices, together with appropriate rehabilitation practices, the Project would result in a minimal impact to soils and land capability.

The Project would not impact adversely on the agricultural potential of the land given the existing land uses and the prevalence of moderate capability soils within the Quarry Site.

As a result, it is concluded that the Project would continue to operate with minimal risk of adverse air quality-related impacts.

Biodiversity

The BDAR conducted by AES (2020b) concludes that impacts on biodiversity associated with the proposed development are insignificant for the following reasons.

- Sloane's Froglet (*Crinina sloanei*) has not been recorded at the existing Property and the existing extraction areas represent unsuitable habitat for this species.
- Impacts to other threatened species with potential to occur within the Property would be insignificant because:
- existing habitat within the proposed disturbance footprint has been subject to disturbance;
- proposed vegetation clearing would result in minimal disturbance of potential habitat areas; and

- potential habitat within and in the vicinity of the disturbance footprint would be retained where possible.
- The Quarry does not contain geological features that may provide habitat for threatened flora or fauna. However, once decommissioned and rehabilitated, extraction areas are likely to provide wetland habitat suitable for threatened and other species.
- The Applicant would backfill and reinstate a 100m buffer between extraction operations and the top bank of the Murray River. The Applicant would also revegetate riparian areas surrounding proposed disturbance areas. These activities would enhance local biodiversity values.
- The Quarry does not support 'core Koala habitat' under the *SEPP (Koala Habitat Protection) 2019.*
- The Project would not compromise any flight path integrity and would not impact the potential use of water resources of water features by native fauna. In fact, the creation of ponds through progressive rehabilitation may enhance these features.

As a result, it is concluded that the Project would continue to operate with minimal risk of adverse biodiversity-related impacts.

Cultural Heritage

The Aboriginal and Historic Cultural Heritage Assessment undertaken by AES (2020c) identified the following.

- A single Aboriginal site (Howlong 1) located outside the area of proposed disturbance. The Applicant has agreed to fence off this area to avoid inadvertent impact including from agricultural activities on the property.
- That historic herniate items surrounding the Property would not be adversely impacted by the Project.

As a result, it is concluded that the Project would continue to operate with minimal risk of adverse cultural heritage-related impacts.

Visibility

The visual assessment determined that vegetation, distance, intervening topography, and daytime only operating hours together with the proposed mitigation measures would continue to effectively screen the Quarry from local vantage points and residences for the life of the Project resulting in minimal visual and lighting impacts.

Public Safety and Hazards

The Applicant would ensure that all hydrocarbons are appropriately transported, stored and managed and that all activities with the potential to initiate bush fire are appropriately managed. As a result, it is concluded that the Project would continue to operate with minimal risk of adverse public safety and hazard-related impacts

Economic Impacts

The Project provides for the removal, processing and despatch of quality sand and gravel products to residential, commercial and infrastructure constructions markets in both NSW and Victoria. The Quarry consists a total of 9.5 million tonnes of sand and gravel resources. The extraction of this resource would assist to exert downward pressure on costs associated with construction material supply and influence market costs associated with construction and infrastructure projects. The Project would further assist in generating local employment and contribute to Local, Regional, State and National economies through flow-on effects.

Acknowledging any potential residual environmental and social impacts associated with the Project, it is concluded that the net economic benefits of the Project would outweigh the costs as the Project would:

- contribute towards the supply of sand and gravel products to markets in NSW and Victoria;
- provide ongoing employment opportunities directly and indirectly;
- contribute to the continued economic growth at local, regional, State and National levels through flow-on effects; and
- avoid, minimise and/or mitigate environmental and social impacts to the greatest extent practicable which in turn relates to the economic costs of the Project.

Social Impacts

A social impact assessment was conducted taking into account the existing social environment and stakeholder engagement to identify a range of potential social impacts of the Project.

The Quarry is located within the Federation LGA, 4km to east of Howlong on land owned by Nangunia Pty Ltd. There are four residences neighbouring the property that the Quarry is located within, all of which are greater than 1km distant from the current processing area. These properties are managed or owned businesses (e.g. Heritage Seeds) or are part of the wider Nangunia holding. The 'Scout Camp' is only occasionally occupied on weekends or school holidays by local scout groups. The Quarry is located well away from residential dwellings and locations where substantial human activity takes place. The ongoing operation is likely to draw employees and services from Howlong and potentially within Albury.

The existing social impacts experienced by the community influence the potential for and expectation of cumulative social impacts. The potential amenity impacts of the Project have been the subject of a comprehensive technical review that predicts that the Project would operate within acceptable criteria established in NSW guidelines and legislation. Residual social impacts are predicted to occur as a result to changes to local amenity which may influence the existing way of life for some stakeholders. In addition, the community values the local environmental features of the area and impacts to these features have social consequences.

The Project would create a range of social and economic benefits for the local community. Most of the identified negative environmental impacts would be unlikely to occur to the extent predicted based on the conservative approach to assessment undertaken or would be managed and mitigated by implementing appropriate operational safeguards. Two key benefits arising from the Project are that it:

- builds on the existing human capital in the community and thereby increases the overall resilience of the local community (e.g. due to fluctuations in agricultural production); and
- provides an additional source of sand and gravel for local markets and the broader, growing region.

Consequences of not Proceeding with the Project

The consequences of not proceeding with the Project include the following.

- The opportunity to establish secure access to and provide sand and gravel products to construction markets in both NSW and Victoria would be forgone.

- The opportunity to increase employment opportunities in the local area would be foregone. This would also impact on the economic activity of the local community and Federation LGA.
- Payments of elevated rates (to Federation Council), State and federal taxes would be foregone.
- The various adverse impacts attributed to the Project would not occur. It is considered that the level of predicted impacts arising from the Project are acceptable given the extent of mitigation measures integrated within the various aspects of the Project.
- The benefits of proceeding with the proposed expansion of the Howlong Sand and Gravel Quarry are considered to outweigh the predicted impacts on the environment that would result if the Project is approved.

Conclusion

The Project has been designed to address the issues raised by the community and all levels of government, as well as the principles of ecologically sustainable development. The Project provides for the expansion and continued operation of the Howlong Sand and Gravel Quarry in an environmentally responsible manner. The Project also incorporates a range of design and operational mitigation measures to ensure all relevant statutory goals and criteria, environmental objectives and reasonable community expectations are satisfied. Importantly, the environmental aspects of the Project have been comprehensively assessed and commitments made to ongoing management and monitoring of potential environmental impacts.

The key issues raised in community consultation concerned changes to the transportation activities and impacts to the Murray River, both of which have been subject to technical assessment by highly qualified professionals. It is predicted that transport operations for the Project would not have unacceptable impacts on the road network and that changes to traffic levels would not be noticeable in the context of existing road use. Similarly, changes to water flows in the river would not be noticed by downstream water users in the context of the daily flows in the river. All water use for the Project would be licenced and accounted for and potential impacts to water quality would be avoided by development of a closed system within flood levees.

It is notable that the Project would result in a range of benefits including the following.

- Groundwater inflows removed from the extraction areas and used for processing would mostly be re-used for the ongoing irrigation of cropping land on the Property (excluding small volumes lost for production). This provides for the beneficial use of the water twice.
- The Applicant has incorporated a comprehensive program of revegetation in rehabilitation planning in order to stabilise riparian areas within the Property and enhance the eventual use of the extraction areas as wetland habitat. Much of the revegetation activities would occur outside the disturbed areas for the Quarry.
- Although a relatively small operation, the Quarry would provide social and economic benefits through employment (directly and indirectly), local spending on consumables and maintenance and the distribution of this contribution through the local community. The Federation LGA

features predominantly agricultural industries and the development of a viable extractive industry operation would provide much needed economic diversity and another long-term independently owned and community-based business.

In conclusion, this document and the range of technical studies have demonstrated that the proposed Project would operate with minimal and manageable impacts on the biophysical environment while contributing to the demand for sand and gravel products required for the construction materials industry in both NSW and Victoria and providing positive economic and social outcomes. The result is a net benefit for the local community, the Federation Local Government Area and the State of NSW.

Section 1

Introduction

PREAMBLE

This section introduces the Howlong Sand and Gravel Expansion Project and provides:

- *an outline of the scope of the document;*
- *an introduction to the Applicant and the Quarry Site;*
- *relevant background information, including the history of the site, existing approvals, available resources and the range of quarry products to be produced;*
- *the format of the document; and*
- *the personnel involved in the design of the Project, document preparation and specialist consultant investigations and assessments.*

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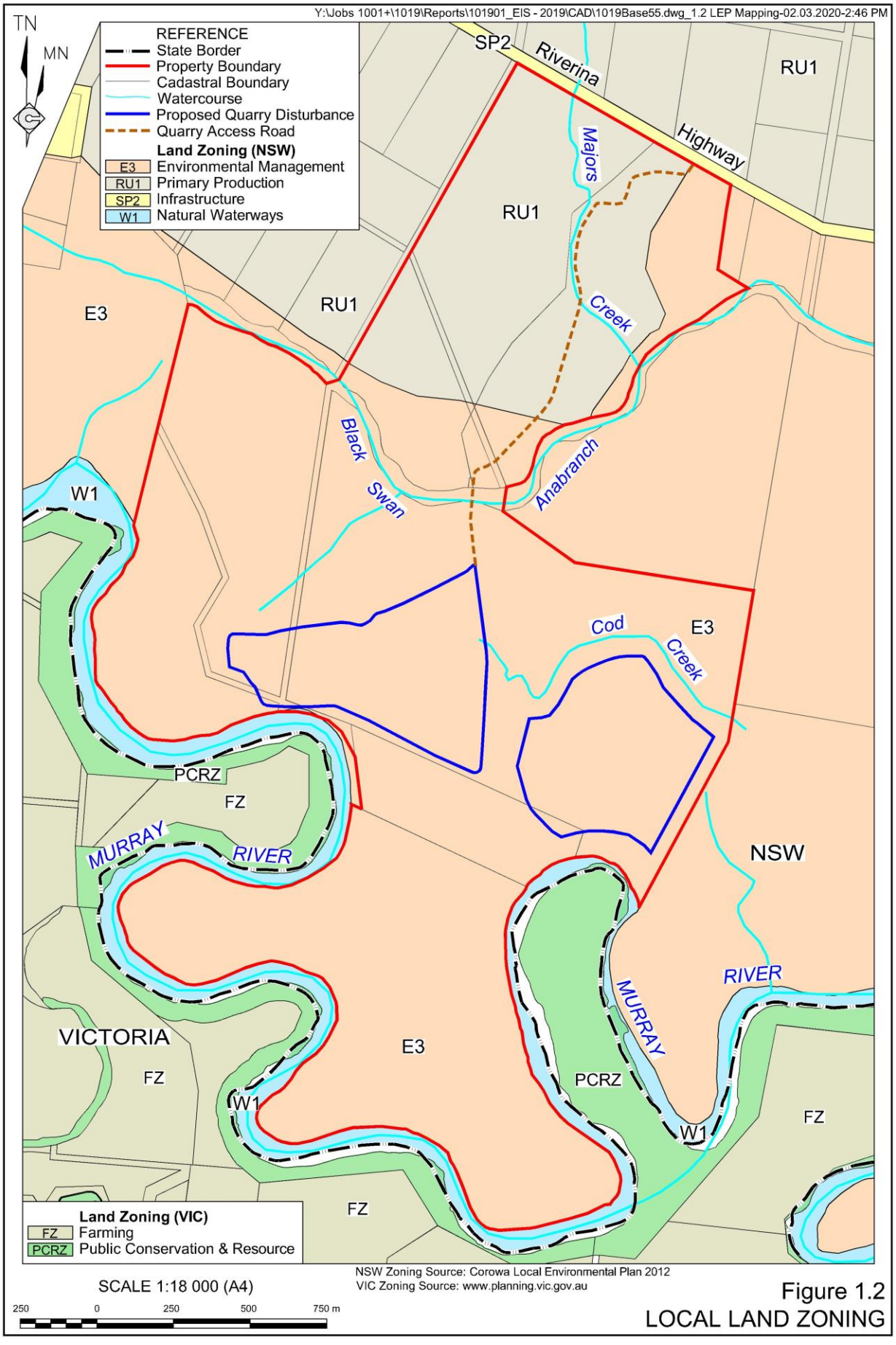
1.1 Scope

This *Environmental Impact Statement* (EIS) has been prepared by R.W. Corkery & Co. Pty Limited (RWC) on behalf of Fraser Earthmoving Construction Pty Ltd (the Applicant). This document has been prepared to accompany an application for development consent for the continuation and expansion of extraction, processing and product transport operations at the Howlong Sand and Gravel Quarry (the Project). The existing Howlong Sand and Gravel Quarry (the Quarry) is located approximately 2.5km to the south-east of Howlong and approximately 25km west of Albury (**Figure 1.1**).

The Quarry is currently operated under approval held by the landowner (Table Top Holdings Pty Ltd) that is limited by the conditions of Environmental Protection Licence (EPL) 254 that permits production of no more than 30 000 tonnes per annum (tpa) from extraction and processing activities within Lot 174, Lot 231 and Lot 174A DP 753744. All copies of the existing development consent have been lost to fire in the offices of the then Corowa Shire Council. However, it is recognised that the Quarry has been operating legally in this location for over 50 years. A copy of a letter noting the landowner's consent to the application is provided as **Appendix 1**.

The Project would principally comprise an increase to the annual production rate to 300 000tpa and expansion into additional extraction areas as well as the ongoing processing, stockpiling and transportation at the increased production intensity.

The land the subject of this application (referred to hereafter as the Quarry Site) is zoned E3-Environmental Management with the access road on land zoned RU1 – Primary Production and under the *Corowa Shire Local Environmental Plan 2012* (**Figure 1.2**). Extractive industries are permissible with development consent within these zones.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TN
MN
REFERENCE
State Border
Property Boundary
Cadastral Boundary
Watercourse
Proposed Quarry Disturbance
Quarry Access Road
Land Zoning (NSW)
E3 Environmental Management
RU1 Primary Production
SP2 Infrastructure
W1 Natural Waterways
SP2
Riverina
Highway
RU1
Majors
Creek
RU1
RU1
E3
Black
Swan
Anabranch
W1
Cod
Creek
E3
PCRZ
FZ
MURRAY
RIVER
NSW
RIVER
MURRAY
VICTORIA
FZ
E3
PCRZ
W1
W1
FZ
FZ
Land Zoning (VIC)
FZ Farming
PCRZ Public Conservation & Resource
SCALE 1:18 000 (A4)
250 0 250 500 750 m
NSW Zoning Source: Corowa Local Environmental Plan 2012
VIC Zoning Source: www.planning.vic.gov.au
Figure 1.2
LOCAL LAND ZONING

The Project is classified as State Significant Development under Clause 7(1) of Schedule 1 of *State Environmental Planning Policy (State and Regional Development) 2011* as it would involve extraction from a total resource of more than five million tonnes. The Project Development Application (DA) will therefore require assessment under Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The consent authority for the Project will be the Minister for Planning, (or their delegate) unless determination by the Independent Planning Commission is triggered.

This EIS outlines the Project and its resources, identifies the aspects of the environment that could be impacted by the Project and, for each aspect, provides a description of the existing environment and presents an assessment of residual impact. The assessment of environmental impacts is presented together with design and operational safeguards and mitigation measures to ensure the level of impact on the surrounding environment meets specified criteria, accepted industry standards or reasonable community expectations.

The environmental issues assessed and general content of this EIS reflect:

- the Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning, Industry and Environment (DPIE) on 7 November 2017 (**Appendix 3**);
- the issues raised by the Federation Council and other government agencies and authorities consulted during the preparation of the EIS (see Section 3.3);
- matters identified in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Reg.) and Section 4.15 of the EP&A Act; and
- the experience of RWC in the preparation of documentation for similar projects throughout NSW.

1.2 Approvals Required

Based upon the current design of the Project and understanding of the relevant environmental issues, the Project would require the following approvals to proceed.

- Development Consent from the Minister for Planning (or their delegate) of the Independent Planning Commission as the Project has been classified as a "State Significant Development" under Schedule 1 (7(a)) of the *State Environmental Planning Policy (State and Regional Development) 2011*.
- A variation to existing EPL 254 from the Environment Protection Authority (EPA), under Section 58 of the *Protection of the Environment Operations Act (PoEO) 1997*. EPL 254 would also be transferred under Section 54 of the PoEO Act from the landowner to the Applicant, who would assume responsibility for operations.
- A permit under the Roads Act will be required to undertake the proposed upgrade and sealing of the intersection of the Quarry Access Road and the Riverina Highway

Reliance would also be placed on the existing water access licences held by the Applicant (described in detail in Section 2.7), noting that water use on the property would continue to be integrated with the irrigation activities.

It is noted that an approval from the Commonwealth Minister for the Environment will not be required under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as the outcomes of ecological survey and assessment and correspondence from the Commonwealth Department of the Environment and Energy (dated 4 May 2018) (see Section 6.8.5) indicate that the Project is not a controlled action under the EPBC Act.

1.3 Format of the Document

The *Environmental Impact Statement* (EIS) has been compiled in eight sections with its format as follows.

Section 1: Introduction – introduces the Project, the Applicant, the Application Area and provides background information about the Project. The section also explains the key terminology used throughout this document and provides an overview of the approvals process. The section concludes with information on the management of investigations for the EIS.

Section 2: Project Description – describes the Applicant's objectives and introduces the approach adopted to the Project Site design and planning considerations. A description is provided of the proposed extraction, processing, transport and rehabilitation activities.

Section 3: Engagement – outlines consultation undertaken during the preparation of this document with regards to the range of matters raised by government agencies and stakeholders throughout the Project planning stages.

Section 4: Planning and Legislative Context – provides a description of the process used to identify and prioritise the key issues for assessment within this document with reference to the SEARs for the Project. This section also includes a review of the relevant legislation, planning issues, policies and guidelines.

Section 5: Environmental Setting – describes the environmental setting within and surrounding the Project Site. Emphasis is placed on providing information about the environmental features that would contribute to, or influence, the assessment of a wide range of other environmental parameters. Information is provided on the topography, geology, meteorology, land ownership and land use within and surrounding the Project Site.

Section 6: Assessment of Environmental Impacts – describes the specific environmental features of the Project Site and its surroundings that would or may be affected by the Project. Information on the existing environmental setting, the proposed design and operational safeguards and mitigation measures and residual impacts the Project may have following the implementation of these measures is presented for all relevant issues together with the proposed monitoring to demonstrate compliance with all operating limits and criteria.

Section 7: Summary of Environmental Management and Monitoring – provides a record of the full range of environmental management and monitoring measures that would be adopted when developing and operating the Project. The measures are designed to effectively manage, mitigate, guide and monitor the operation of the Project throughout its entire operational life.

Section 8: Evaluation of the Project – provides a conclusion to the document which justifies the proposal in terms of biophysical, economic and social considerations and identified the consequences of not proceeding with the Project.

Section 9: References – lists the various source documents referred to for information and data used during the preparation of the EIS.

Appendices: present the following additional information.

1. Landowner Consent for the Application
2. Estimate of Capital Investment Value for the Project – prepared by Ashby Chartered Accountants (February 2019)
3. The Secretary's Environmental Assessment Requirements (SEARs)
4. A summary of the coverage of the SEARs and matters identified for consideration in the correspondence submitted to DPIE by other State government agencies, Federation Council, and the community and where each matter is addressed in this document or a supporting Specialist Consultant report
5. Consultation Materials – prepared by Advanced Environmental Systems
6. Resource Assessment – prepared by Hanson Construction Materials in February 2018
7. Engineering Report – Bridge Load Rating Assessment – prepared by S.J. Street & Associates
8. Environmental Risk Assessment

The EIS is supported by a two volume, *Specialist Consultant Studies Compendium*, which incorporates eleven stand-alone reports prepared by specialist environmental consultancies who have been engaged by the Applicant to assess specific aspects of the Project. The assessments and order in which they are presented is as follows.

1. Traffic and Transport Assessment – The Transport Planning Partnership Pty Ltd
2. Groundwater Assessment – Water Technology Pty Ltd
3. Flood Risk Assessment – Water Technology Pty Ltd
4. Acoustic Setting Assessment – Audiometric & Acoustic Services
5. Noise Modelling Assessment – Octave Acoustics Pty Ltd
6. Air Quality Impact Assessment – Todoroski Air Sciences Pty Ltd
7. Land Resources Assessment - Advanced Environmental Systems Pty Ltd
8. Biodiversity Assessment Report - Advanced Environmental Systems Pty Ltd

9a. Aboriginal Cultural Heritage Assessment – Dr Timothy Stone

9b. Statements of Heritage Impacts – Realm Design

10. Visual Impact Statement - Advanced Environmental Systems

11. Social Impact Assessment – Dr Jonathon Howard

1.4 The Applicant and the Quarry Site

1.4.1 The Applicant

Fraser Earthmoving Construction Pty Ltd is a small family owned and operated business that has also provided quarrying and range maintenance services to the Department of Defence at Puckapunyal for over thirty years. This includes the remediation of roads at live firing ranges, with the majority of works are carried out in a live firing environment. During this time there have been no major incidents recorded.

In 2014 the Applicant became the operator of the existing Howlong Sand and Gravel Quarry, with production rates limited to 30,000 tonnes per year. During 2015 the Company a hard rock quarry at Berrigan NSW, a small quarry that is limited to 30,000m^3 per year.

The company currently employees eight personnel in the quarries located at Berrigan and Howlong NSW and, depending on works required, employs up to 30 personnel on Department of Defence sites.

1.4.2 The Application Area

The Application Area would incorporate operational areas and site access within the larger property owned by Table Top Holdings Pty Ltd and comprises all land the subject of the application for development consent.. The operational areas of the Quarry are managed under agreement by the Applicant. For the purpose of this EIS, the area included in the application is referred to as the Property.

The existing and proposed areas that would be disturbed for quarrying are referred to as the Quarry Site. **Figure 1.3** and **Table 1.1** present the land titles within the Property. It is noted that the Property also includes two unformed and unnamed road reserves, one that splits Lot 231 DP 753744 and the other on the eastern edge of the same lot. The reserve is currently used for existing operations.

Table 1.1
Quarry Site Land Titles

Lot	Deposited Plan	Lot	Deposited Plan
173	753744	1	1039973
174	753744	1	798291
174A	753744	3	113703
231	753744	4	113703
1	741037		

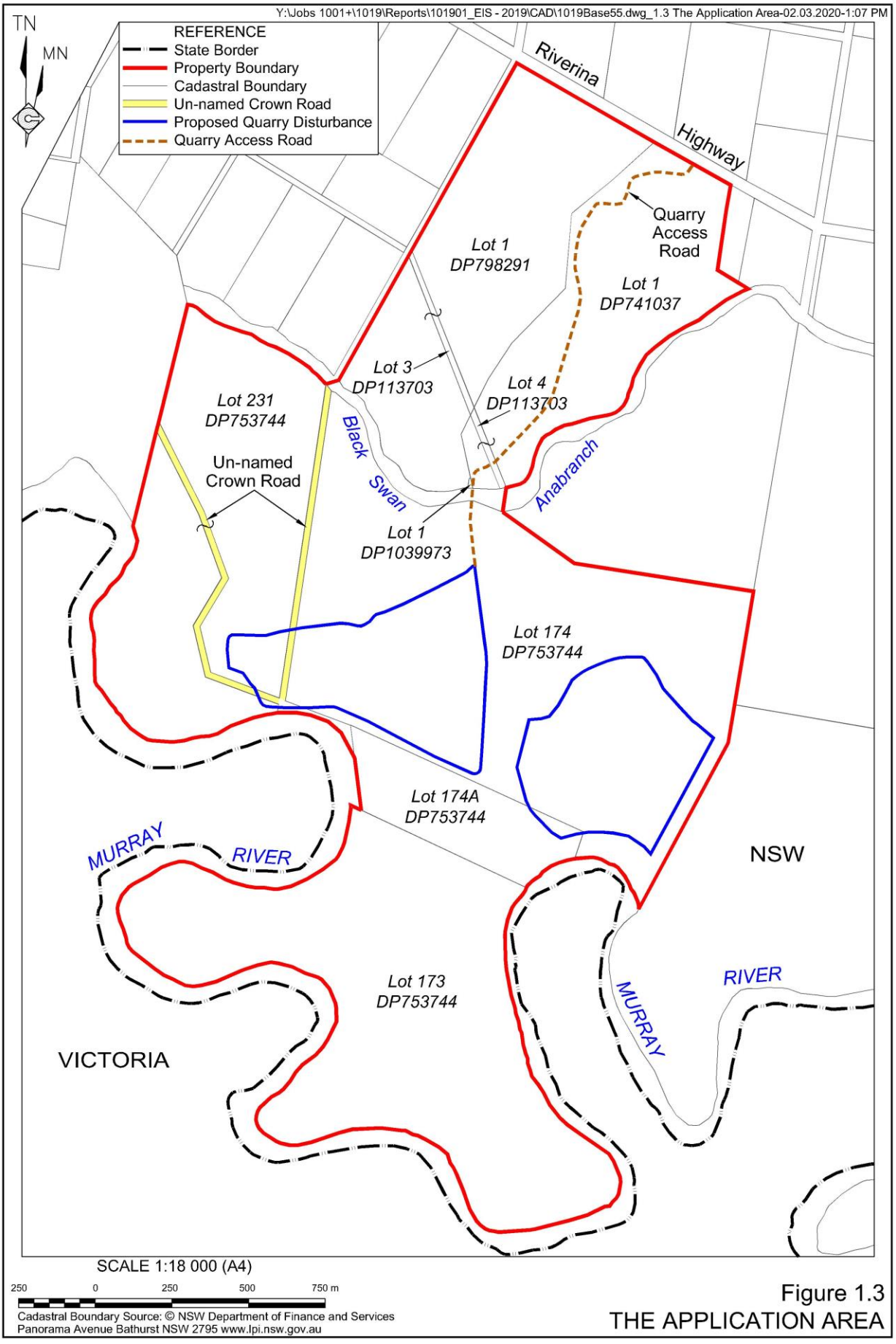

Figure 1.3
THE APPLICATION AREA

1.5 Background and Strategic Context

1.5.1 Site History

Quarrying operations have been undertaken at the Project Site for at least 50 years or since at least 1970. Prior to quarrying activities, the Quarry Site was utilised for agricultural activities including cropping and grazing consistent with the existing use of the remaining holdings of the landowner.

1.5.2 Resource Identification, Quarry Products and Markets

A program of drilling and core sample analysis was undertaken by Hanson Construction Materials in February 2018 to determine the nature and extent of the resource underlying the Quarry Site.

A resource estimate (provided as **Appendix 6**) identified the available resource. Subject to amendments to the proposed Project since the time of that assessment, it has been concluded that the Project would extract material from a total sand and gravel resource of approximately 9.5 million tonnes. Further information on the resource assessment is provided in Section 2.2.

The results of core sample analysis and material grading assessments indicated that underlying sand and aggregate material would be suitable for use in standard, premium and high-performance concrete production as well as standard and specialty sand products.

The Applicant has secured significant long-term contracts for Quarry products with product distributors servicing the construction industry. Additionally, the Project would supply sand and aggregates to agricultural operations and concrete batching plants located in the vicinity of the Quarry Site, including concrete batching plants located in Albury, Corowa and Wangaratta.

1.6 Existing Operations

The existing Quarry operations involve the production of no more than 30 000tpa of sand and gravel products with the following main components.

- Free dig extraction of the sand and gravel resource from within two extraction areas.
- Transport of raw material to the processing and stockpiling area for screening and washing to prepare it for despatch.
- Temporary stockpiling of materials.
- Loading and despatch of materials to road registered trucks for delivery to clients. Existing operations require approximately 10 truck loads per day at a maximum.
- Pumping of water under licence from the active extraction area to be used in processing and return of recycled water to the section extraction area where it is allowed to settle.
- Construction and maintenance of a series of levee banks.

- Ancillary use of demountable building.
- Rehabilitation planting in completed sections of the extraction area, on the constructed levee banks and riparian areas outside of operational areas.

Return water that is recycled from the processing activities is initially left to settle some of the sediment out of suspension before being pumped from the operational areas for use in irrigating the larger land holding of the landowner.

1.7 Existing Environment Management

The existing operations have been undertaken to ensure the continued viability of the operation and to preserve the amenity and environmental setting of the land holding. The landowner has required that environmental management consider risks to the Murray River and provide for proactive revegetation.

Given the size and age of the operation, the Quarry has to date operating under limited conditional requirements, however a due diligence approach has been assumed for all activities.

1.8 Management of Investigations

This EIS has been prepared by Mr Nicholas Warren (M.Env.Sc., M.Bus, B.Sc.), Principal Environmental Consultant, Mr Jack Flanagan (M.Env.Sc., B.Sc.), Environmental Consultant and Ms Fabliha Pritha (B.Eng. Env. (Hons)), Graduate Environmental Consultant all with RWC. Internal peer review of the document was undertaken by Mr Mitchell Bland (B.Sc (Hons), M.Econ.Geol, LLB (Hons)), Director/Principal Environmental Consultant of RWC.

Mr Greg Fraser and Mr Andrew McKimmie of the Applicant provided information in relation to design and operational planning for the existing and proposed activities and reviewed and approved this document for release.

A range of environmental investigations were initiated to identify and assess the environmental constraints associated with the Project. These studies were undertaken by a team of specialist consultants including the following key individuals and companies.

- **Part 1:** Road Transport Assessment
  The Transport Planning Partnership Pty Ltd
  Ms Penny Dalton – BE (Civil)(Hons) MIEAust CPEng
- **Part 2:** Groundwater Assessment
  Water Technology Pty Ltd
  Mr Nick Watkins – BAppSC (Applied Geology)
  Mr Rohan Baird – BEnvSc (Hons) (Hydrogeology)
- **Part 3:** Flood Risk Assessment
  Water Technology Pty Ltd
  Mr Ben Tate – BE (Hons), BSc, MIEAust, CPEng, NPER
  Mr Sebastien Barriere – BGeol and EnvSc. MA (Hydrotechnological and Environmental Project Management)

- **Part 4:** Acoustic Setting Assessment
  Audiometric & Acoustic Services
  Mr Scott Henderson – BEnv(Construction), Dip Des. Landscape Tech and Cert. Horticulture

- **Part 5:** Noise Modelling Assessment
  Octave Acoustics Pty Ltd
  Mr Rob Brown – BEng (Mechanical) (Hons)
  Mr Thomas Evans – BEng (Engineering Science) (Hons)

- **Part 6:** Air Quality Assessment
  Todoroski Air Sciences Pty Ltd
  Mr Philip Henschke – BSc (Physics and Ecology)

- **Part 7:** Land Resources Assessment
  Advanced Environmental Systems Pty Ltd
  Mr Peter Clinnick (BAgSci (Hons), M. ASSSI)

- **Part 8:** Biodiversity Development Assessment Report
  Advanced Environmental Systems Pty Ltd
  Mr Peter Clinnick (BAgSci (Hons), M. ASSSI), Accredited BAM Assessor (BAAS 18107)

- **Part 9a:** Aboriginal and Historic Cultural Heritage Due Diligence Assessment
  Advanced Environment Systems Pty Ltd
  Dr Tim Stone – BA (Hons), MSc, PhD
  Mr Peter Clinnick (BAgSci (Hons), M. ASSSI)

- **Part 9b:** Statements of Heritage Impact
  Realm Design
  Ms Janita Norman – BA (Indus Des), Grad Dip Cultural Heritage

- **Part 10:** Visual Impact Statement
  Advanced Environment Systems Pty Ltd
  Mr Peter Clinnick (BAgSci (Hons), M. ASSSI)
  Ms Monique Aarts – M. Sci. B. Ed. Dip. Water Operations

- **Part 11:** Social Impact Assessment
  Dr Jonathon Howard
  Dr Jonathon Howard – PhD, Grad Dip Bus Mgt, Grad Dip Nat Res, Grad Cert Leadership Mgt, B. Env. Sc.

Section 2

Description of the Project

PREAMBLE

This section describes the proposed ongoing and expanded operation of the Howlong Sand and Gravel Quarry including:

- *the objectives of the Project;*
- *an overview of proposed activities and the need for the Project;*
- *a review of local geology, resources and Quarry products;*
- *a description of the proposed extraction and processing activities to be undertaken within the Quarry Site;*
- *the proposed transportation activities including access to the Quarry Site, traffic types and levels and the major routes used by trucks.*
- *a description of infrastructure, utilities and services that would be located within the Quarry Site as well as proposed employment, hours of operation and Project life; and*
- *a description of the proposed rehabilitation of areas that would be disturbed within the Quarry Site throughout the life of the Project.*

The Project is described in sufficient detail to provide the reader with an overall understanding of the nature and extent of all activities proposed throughout the life of the Quarry, how the various activities would be undertaken and to enable an assessment of the potential impacts on the surrounding environment.

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2.1 Introduction

2.1.1 Objectives

The Project would enable the Applicant to continue the efficient supply of sand and gravel resource to clients in the region for use in a range of construction projects, infrastructure development and road maintenance.

The Applicant would operate the Quarry to meet the following objectives.

- To continue to provide a source of high-quality sand and gravel products to meet the needs of housing and construction markets in New South Wales and Victoria.
- To maximise the efficient recovery of the natural resource.
- To develop and operate the Quarry in a manner that is environmentally responsible and complies with all statutory requirements and reasonable community expectations.
- Continue to integrate the Quarry operation with the productive agricultural use of the land on which the Quarry is located as well as surrounding properties.
- To create a final landform that is safe, stable and provides for long-term nature conservation within the areas disturbed throughout the life of the Quarry.
- Achieve the above objectives in a cost-effective manner to ensure the Project is viable.

These objectives would be achieved through the following strategies.

- Careful design and planning of extraction operations that maximises the quality and quantity of available resource.
- Assessment of potential environmental impacts that is informed through an understanding of the local setting, potential risks and hazards and predictive assessment under worst-case conditions.
- Implementation of a range of management and monitoring activities that would proactively reduce the risk of impact while enabling the Applicant to react to adverse conditions or unexpected outcomes.
- Taking responsibility for transportation activities through implementation of a code of conduct for all drivers.
- Progressive rehabilitation that provides the Applicant with experience re-establishing vegetation in the local setting and improves the likely success of final closure strategies.

2.1.2 Overview of the Project

The key components of the Project for which development consent is being sought include the following.

- Ongoing extraction of sand and gravel resource using free dig techniques across four stages of development, commencing in the existing disturbed areas and progressively expanding to new areas in later stages.
- Production of no more than 300,000 tonnes per annum (tpa).
- Ongoing use of the existing screening equipment and wash plant to process raw materials to meet client specifications. Occasional use of mobile crushing plant (up to four times per year) to provide primary shaping of the select material before screening.
- Ongoing transportation of material from the Quarry, via Howlong, to various destinations. Transportation would be limited to a maximum of 40 laden loads per day.
- Progressive emplacement of overburden or fine materials in completed extraction cells and rehabilitation areas.
- Land previously disturbed within 100m of the Murray River would be regenerated.
- Progressive and final rehabilitation of the Quarry to develop a landform suitable for native vegetation conservation and as a wetland.
- Ongoing operation for a period of 30 years and associated employment of eight to ten personnel. Transportation operations would be contracted, or trucks and drivers would be supplied by clients.

2.2 Geology and Resource

2.2.1 Geological Setting

The Quarry Site is located within the Upper Murray Region between Albury and Corowa with the regional geology comprising Cainozoic sediments overlying Palaeozoic metamorphic rocks and granites. **Figure 2.1** presents the surface geology immediately surrounding the Quarry Site. The Quarry site is located within alluvium associated with the Murray River. The closest mapped geological cross-section is referred to as the Hermitage Section and is based on assessments completed for the Water Resources Commission in 1989 (Williams, 1989[1] NSW DoI, 2019 and DEW, 2009). **Figure 2.2** presents a conceptual model of the geological setting in the vicinity of the Quarry Site based on the Hermitage Section. The Cainozoic sediments underlying the Quarry site include the following.

- The Olney Formation, which is regionally limited and consists mostly of carbonaceous clay.

[1] Williams (1989) as presented in Department of Energy and Water (NSW) *Upper Murray Alluvium Groundwater Management Area 015: Albury to Corowa Groundwater Resources Status Report – 2008*. March 2009.

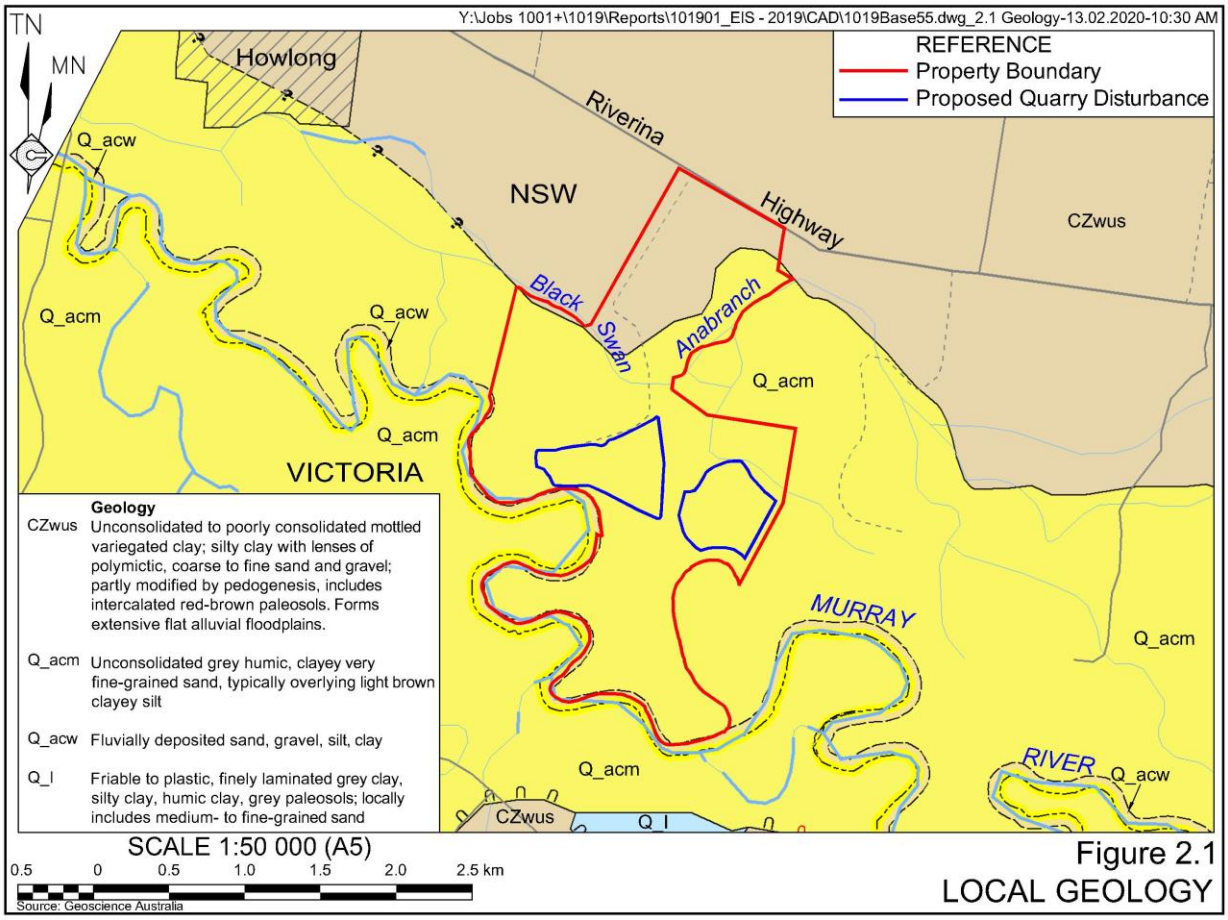

Figure 2.1
LOCAL GEOLOGY

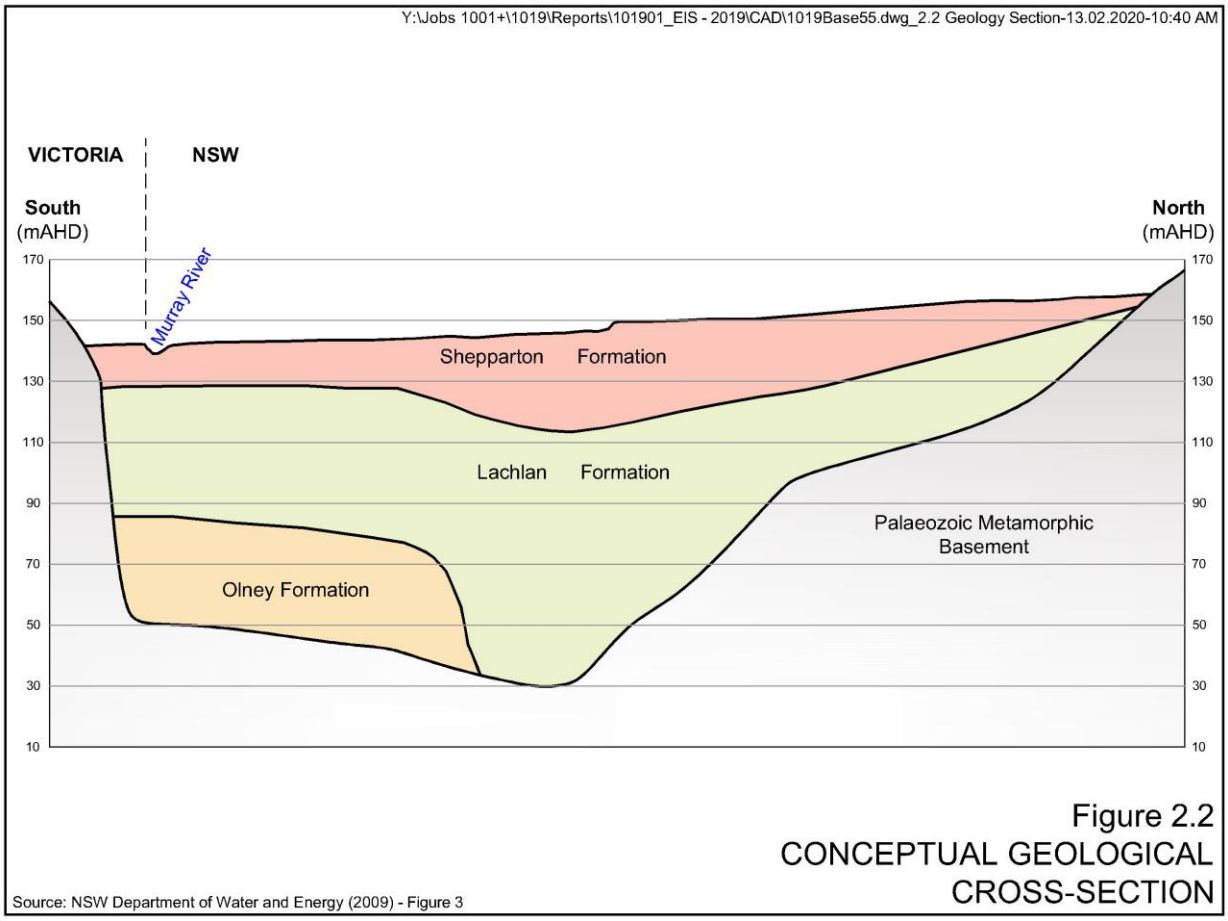

Figure 2.2
CONCEPTUAL GEOLOGICAL CROSS-SECTION

- The Lachlan Formation, which consists of mixed clay, fine sand to cobbles. Sand and gravel in this formation are almost entirely made of quartz.
- The Shepparton Formation, consists of clays and gravel fluviatile deposits and is approximately 80m deep from the surface. The formation is characterised by its brown and yellow colour. Thick sand and gravel layers occur in the lowest parts with clays generally located away from the path of the Murray River.

A Resource Assessment (Hanson, 2018) (provided as **Appendix 6**), considered that the Quarry site geology consisted of fluvial to lacustrine sand and gravel layers, interbedded with clay. This is consistent with the Coonambidgal Formation which is known to consist of alluvial floodplain deposits associated with the Upper Murray River.

2.2.2 Resource Assessment

A Resource Assessment was prepared by Hanson Construction Materials Pty Ltd for the sand resources within the Quarry Site in February 2018 based on the outcomes of an exploratory drilling program. The Resource Assessment is provided as **Appendix 6**. Core samples from 11 drill holes were graded to establish the ratio of course to fine sand materials. Detail on the outcomes of grading assessment is provided in **Appendix 6**.

As the resource assessment did not take into account the likely gravel resource, the estimation of the resource to be extracted has been updated and is presented in **Table 2.1** based on the following assumptions.

- Final depth of extraction – 21m below ground level (to 119m AHD).
- Existing ground level of 140m AHD.
- Allowance for a 100m buffer to the Murray River and 50m to other watercourses.
- 10% loss factor for fines and clay materials based on historic operational experience.
- Existing extraction in Stage 1 and Stage 2 to a depth of approximately 12m below ground level.
- Overall bench slope of 2H:3V with approximately 5m high faces.
- Specific density of in situ material of 1.8t/m^3.

Table 2.1
Resource Estimate

Stage	Area (ha)	Topsoil/Subsoil (m^3)*	Overburden (m^3)	Sand and Gravel (t)	Estimated Stage Life
1	6.7	Previously removed	49 523	598,572	2 years
2	5.9	Previously removed	51 335	528,193	1.5-2 years
3	4.1	100 000	70 504	901,645	2-3 years
4	24.5	600 000	244 013	7,436,346	22-23 years
Total	**41.7**	**700 000**	**415 374**	**9,464,756**	**27-30 years**
* Assume average 2.5m stripping depth.					
Source: RWC					

2.2.3 Products and Demand

The products that would be produced at the Quarry would remain the same as those currently being produced, including the following.

- Sand products for concrete production and eventual use in residential commercial and infrastructure construction.
- Fill materials – for bulk earthworks and landscaping.
- Road base – for road and other infrastructure construction and maintenance.
- Other products shaped to meet client specifications and requirements.

2.3 Quarry Site Layout and Design

Figure 2.3 presents the proposed Quarry Site layout and **Figure 2.4** presents the proposed progressive extraction and rehabilitation plan for the Quarry. The proposed Quarry would involve extraction within the existing extraction area and new extraction area, incorporating the following.

- The expansion of two existing extraction areas (Stage 1 – 6.7ha and Stage 2 – 5.9ha).
- Extraction within an approximately 4.1ha area to the south of the existing processing area that has already been disturbed for the existing operation (Stage 3).
- Extraction within an additional extraction area of approximately 24.5ha (Stage 4).
- The depth of extraction activities would be limited to a final elevation of 119m AHD, which is approximately 21m below the current ground level.
- The existing processing and stockpiling area (7.7ha) which includes predominantly screening and washing of raw materials and product stockpiles.
- The existing quarry access road and internal unsealed roads.
- A number of sheds that house pump infrastructure.
- Ancillary infrastructure, including a site office, weighbridge and car parking areas.
- Rehabilitation within an area of 2.3ha within Stage 1 which will be backfilled to re-establish a vegetated buffer of 100m from the Murray River.
- Revegetation and maintenance of riparian areas adjacent to the operational areas within the buffer area between the Murray River and the Quarry.
- Remediation of an existing private concrete bridge over the Black Swan Anabranch to improve safety.

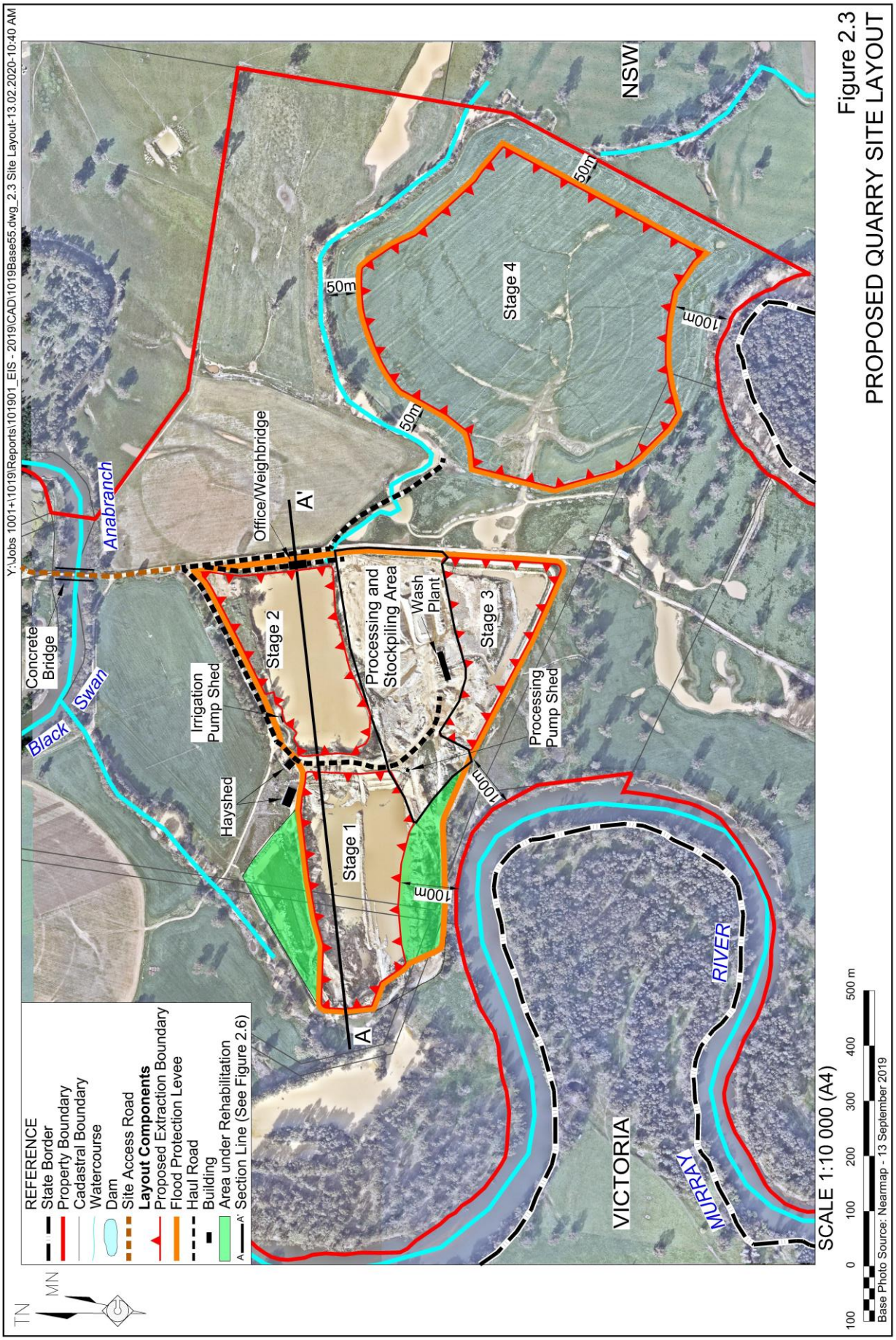
Figure 2.3
PROPOSED QUARRY SITE LAYOUT
Y:\Jobs 1001+\1019\Reports\101901_EIS - 2019\CAD\1019Base55.dwg_2.3 Site Layout-13.02.2020-10:40 AM
NSW
VICTORIA
Stage 1
Stage 2
Stage 3
Stage 4
Processing and Stockpiling Area
Wash Plant
Processing Pump Shed
Irrigation Pump Shed
Hayshed
Office/Weighbridge
Concrete Bridge
Anabranch
Black Swan
RIVER
MURRAY
50m
100m
A
A'
REFERENCE
State Border
Property Boundary
Cadastral Boundary
Watercourse
Dam
Site Access Road
Layout Components
Proposed Extraction Boundary
Flood Protection Levee
Haul Road
Building
Area under Rehabilitation
Section Line (See Figure 2.6)
TN
MN
SCALE 1:10 000 (A4)
100 0 100 200 300 400 500 m
Base Photo Source: Nearmap - 13 September 2019

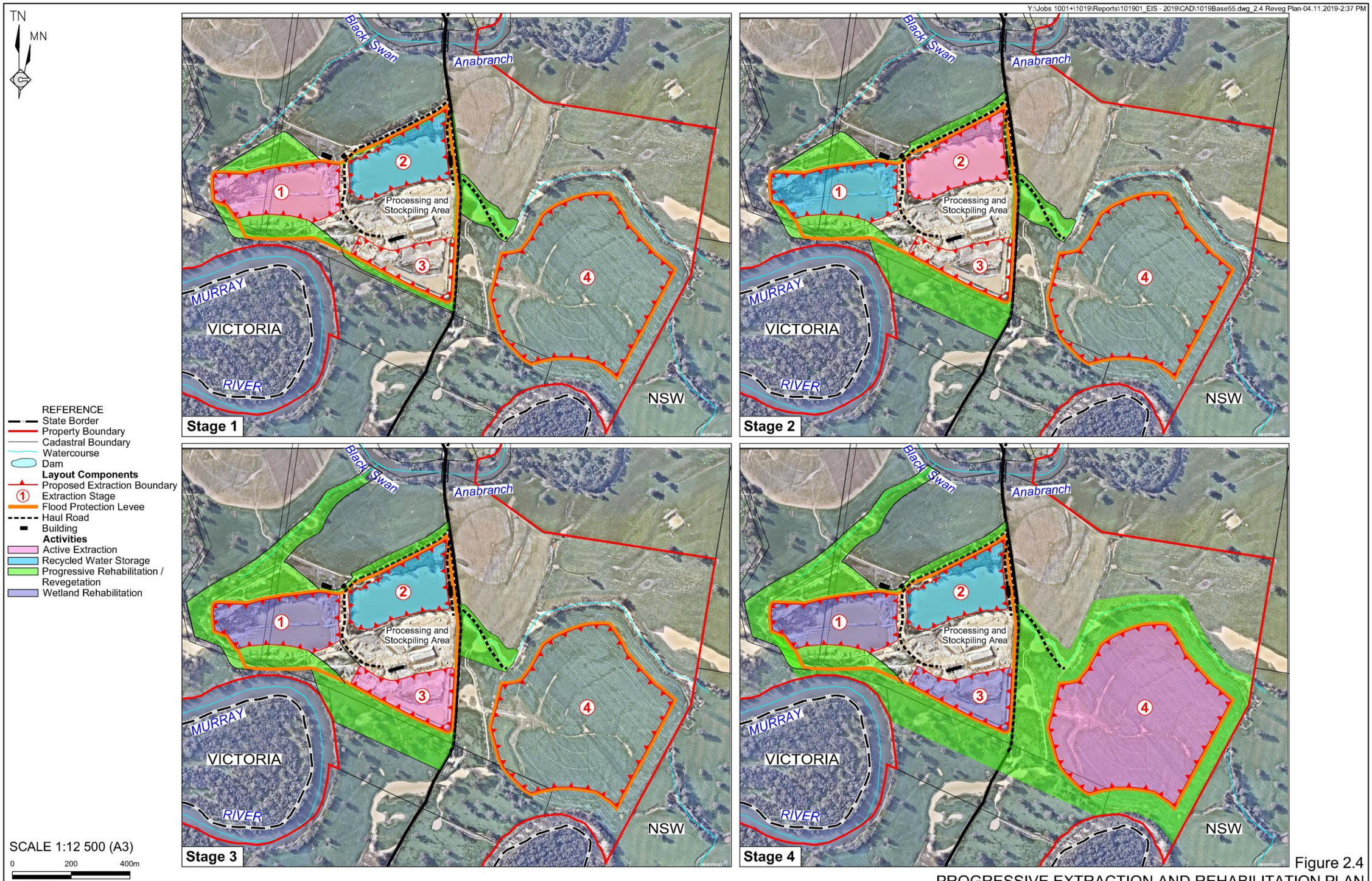

Figure 2.4
PROGRESSIVE EXTRACTION AND REHABILITATION PLAN

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2.4 Site Establishment

2.4.1 Introduction

A range of site establishment and construction activities would be undertaken within the Quarry Site to enable the development and expansion of the Quarry. The principal activities undertaken would be as follows.

1. The marking out of all component areas to be disturbed during the extension of the Quarry with highly visible permanent markers.
2. Progressive vegetation clearing and soil removal within the areas approved for disturbance.

Each of these activities is described in more detail in the following sections.

2.4.2 Component Mark Out

Upon the granting of approval, the Applicant would commission a surveyor to survey and physically mark out the approved areas of disturbance using appropriately labelled and highly visible permanent survey markers.

Stages 1 to 3 have been marked out under existing operations, with limits also established through the construction of the levee banks.

Survey markers would be positioned at the corners of the proposed Stage 4 extraction area at distances / spacing that allows visibility of the next marker.

2.4.3 Vegetation Clearing

There is limited vegetation clearing required for the ongoing operation with clearing of remaining trees lining the existing Stage 2 extraction area pond required for expansion of this component. In total, vegetation clearing would be less than 1ha.

The boundary of Stage 1 has been reduced to preserve existing habitat trees in the southwest corner of this area.

Vegetation would be cleared progressively within the defined areas of disturbance using an excavator. Following the removal of the mature trees, selected timber may be made available for use by the landowner or sale for the purposes of building timber, fencing materials or firewood. The remainder would be stockpiled for rehabilitation activities or mulched for placement on terminal benches.

2.4.4 Soil Removal

It is estimated that soil stripping would be undertaken to an average depth of 2.5m. Any soil, where present and recoverable, would be stripped and either stockpiled for future use in rehabilitation activities or directly transferred to an area to be revegetated. The act of stripping the soil, stockpiling and respreading would provide for adequate blending of the topsoil and subsoil recovered.

As far as practicable, soil stripping would be undertaken during periods to avoid forecast rainfall to potentially prevent higher levels of soil loss due to erosion. This would be particularly relevant for the period from December to February given the higher expected rainfall levels during that period. If clearing during these periods is unavoidable, additional practices would be undertaken to reduce the erosion risk, such as placement of silt-stop fencing at a location downslope that allows the installation of the fencing.

Soil that is not immediately applied to active rehabilitation areas would be stockpiled within the Quarry Site, most likely within the levee bank which would be seeded to establish a stabilising groundcover.

2.4.5 Levee Construction

The proposed locations of levee banks are displayed on **Figure 2.3**. Levee banks would be constructed to an elevation of 142.7m AHD to limit ingress during periods of flooding of the Murray River and associated watercourses. A typical profile of the levee bank is provided in **Figure 2.5**.

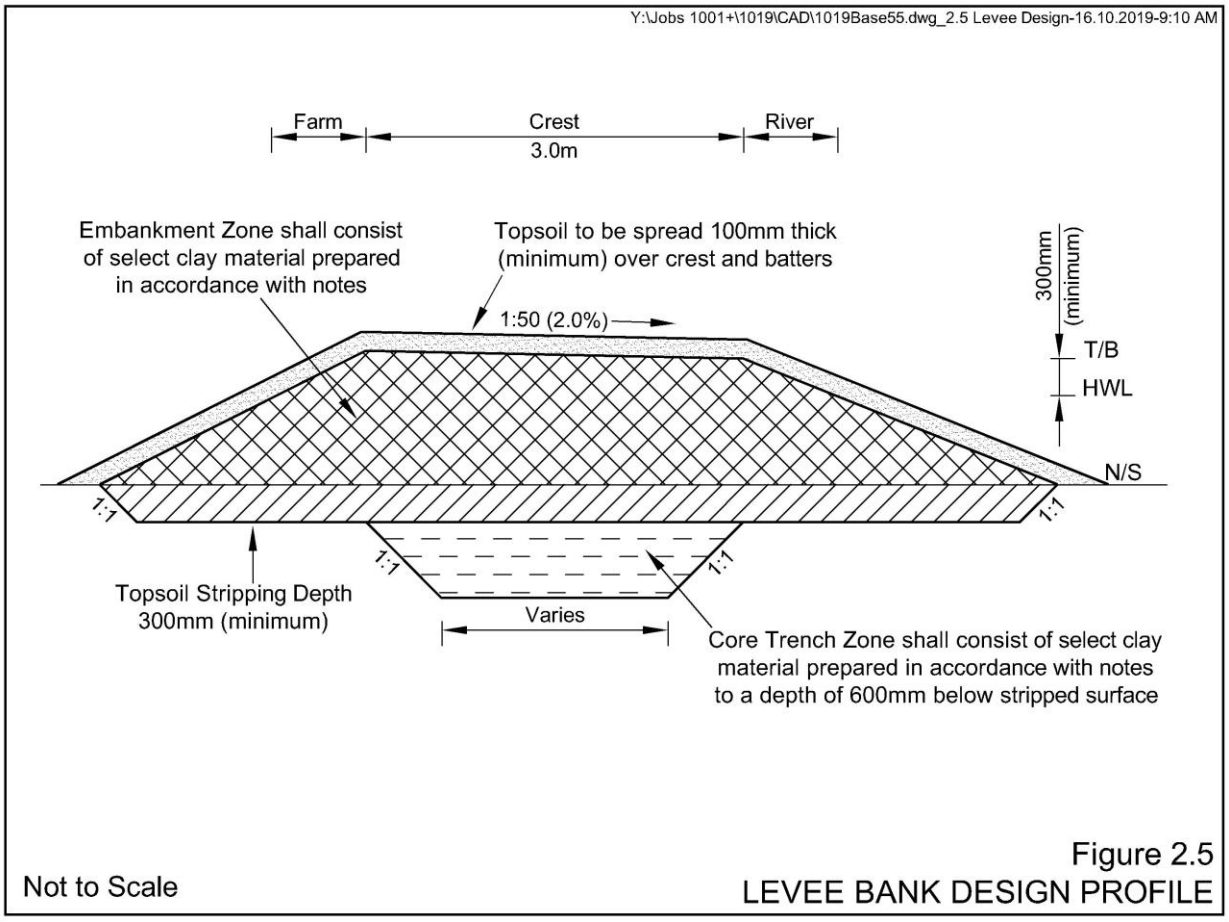


Figure 2.5
LEVEE BANK DESIGN PROFILE

The Applicant has commenced construction of a levee bank along the boundary of the existing disturbed area that includes extraction stages 1 to 3, the processing and stockpiling area, internal roads and the office and facilities area. A separate levee would be constructed along the boundary of Stage 4 when the Applicant is ready to commence operations in this area. An assessment of potential flooding impacts is presented in Section 6.2.

2.5 Extraction Operations

2.5.1 Introduction

Extraction operations would be undertaken in a similar manner to existing operations, namely using excavators, front-end loaders and haul trucks. This subsection presents information relating to the proposed extraction operations including design features, extraction methods, equipment used and extraction rates.

2.5.2 Extraction Methods

Extraction would be undertaken predominantly using standard dry extraction techniques. **Figure 2.6** presents a conceptual overview of the proposed extraction operations in Stage 1 and Stage 2. In summary, water seeping into the active extraction area would be pumped from the floor of the extraction area to the wash plant. Water used in processing would be returned to an inactive extraction pond from where coarse sediment would be permitted to settle and the water would then be used for irrigation on the landowner's property in line with current practices. It is anticipated that process water would be stored in Stage 2 during extraction within Stage 1, within the Stage 1 area during extraction for Stage 2 and then in Stage 2 during extraction activities in Stage 3 and Stage 4.

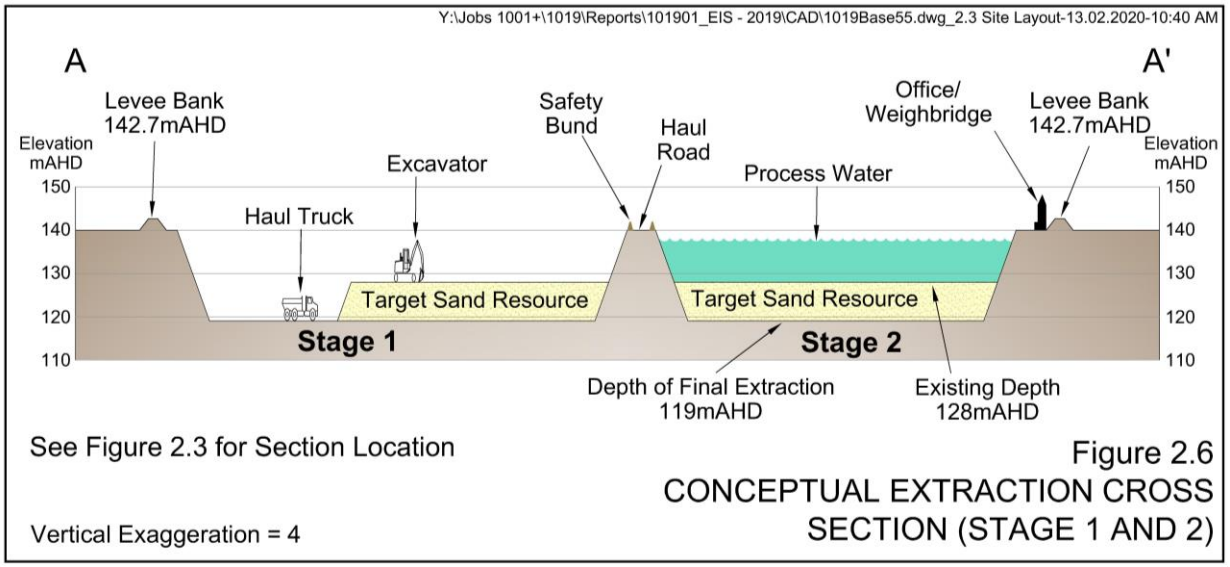


Figure 2.6
CONCEPTUAL EXTRACTION CROSS SECTION (STAGE 1 AND 2)

Overburden would continue to be removed in advance of extraction operations using either front-end loaders or excavators, supported by off-road haul trucks. This material would either be used to construct levee banks and internal safety bunds or stockpiled for eventual return to extracted areas during rehabilitation and shaping of the final landform.

Following the removal of overburden, the target sand resource would continue to be selectively extracted using an excavator and off-road haul trucks. Extracted material would continue to be transported to the processing and stockpiling area for processing.

Finally, the Applicant may amend extraction methods in the deepest sections of the extraction stages to include the use of a floating cutter and suction dredge, which would be connected to processing equipment via a dedicated pipeline and pump. Minor changes to the configuration of processing equipment would also be required. This extraction method would be implemented to better manage groundwater inflows to the extraction areas. Free dig extraction requires the active extraction area to be completely dewatered, allowing the maximum rate of groundwater inflow to the extraction stages. By contrast, dredging would permit water levels within in extraction stages to be higher than for free dig operations, reducing the rate of groundwater dewatering required for the extraction operations.

It is noted that dredging methods would remove the need for an hydraulic excavator and haul truck within the extraction area and a front-end loader to load the processing equipment. However, the dredge would be a noise source, albeit lower than the equipment to be used for free dig extraction. The Applicant may also use a hydraulic excavator to place peripheral materials into the ponds for extraction in areas where dredging is not practical. The use of a dredge would also remove the need to transport extracted material to the processing plant by haul truck, removing associated dust emissions.

There would be no blasting required for extraction processes.

It is therefore considered that the free dig methods are a worst-case scenario in terms of potential impacts from noise, air quality and water management and have been considered for the environmental assessment.

2.5.3 Extraction Rates

Up to 300,000t of products would be transported from the Quarry Site per year. The Applicant notes that the volume of material to be extracted to produce this quantity of sand products will depend on the quantity of silts and clay within the extracted materials. Previous experience is that the material contains between 8% and 10% of fines that are not suitable for sale and is separately stored as overburden or fines. As a result, in order to produce 300,000tpa of products, the Applicant anticipates that up to approximately 330 000t of material would be extracted each year.

2.5.4 Extraction Equipment

Operations currently require the use of the following mobile plant. The Applicant anticipates that the proposed extraction operations would continue to utilise the existing plant, with equipment occasionally replaced or upgraded, as required.

- 3 x mixed size excavators (currently Hitachi ZAXIS 250 and Hitachi ZAXIS 650).
- 3 x mixed size front-end loaders (currently Komatsu WA420, Komatsu WA500 and CAT 980).
- 3 x haul trucks (currently Hitachi AH400).
- 1 x water cart.
- Various light vehicles.

In addition, bulldozers or scrapers and other mobile plant may be used for extraction and/or rehabilitation operations.

2.6 Processing Operations

Processing operations would be undertaken in a similar manner to existing operations, namely material would be transported directly to the processing and stockpiling area from where it would be directly applied to processing equipment.

Processing would continue to require the following equipment which may be upgraded or replaced over the life of the Quarry with equipment of similar size and capacity. The equipment is fixed to a concrete slab in a single train.

- 1 x mobile screen e.g. McClosky S190 or equivalent.
- 1 x wash plan e.g. McClosky Sandstorm 620 or equivalent.

A mobile crushing unit is used occasionally to crush oversize material or to shape material to client specifications. It is used three to four times per year for less than one day for this purpose.

Water is supplied to the plant at a maximum rate of 139L/second (500m^3/hour) at a pressure of 250kPa and is used to wash aggregate and to supply the hydrocyclone for sand washing.

The resulting products would be stockpiled within the processing and stockpiling area until transported from the Quarry Site. Fine reject material separated through screening would be temporarily stockpiled for use in levee bank construction or returned to completed extraction areas. Stockpiles within the processing plant area would generally contain between 5 000t and 10 000t of aggregates and 20,000 tonnes of sand products awaiting despatch.

2.7 Site Water Demand

2.7.1 Water Sources

Figure 2.7 presents a schematic of water flow chart for the proposed operation.

The existing operation relies on water sourced under licence that is drawn into the extraction areas and pumped to the wash plant, with return water temporarily stored before being used for irrigation of the Applicant lucerne crop. The following water licences associated with the Upper Murray Groundwater Source of the *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources 2011* are held by the Applicant.

- Water Access Licence (WAL) 29975 – 500 shares
- Water Access Licence WAL 29969 – 568 shares
- Water Access Licence WAL 29930 – 890 shares
- Water Access Licence WAL 29915 – 1 500

A total of 3 458 shares are available within the Upper Murray Groundwater Source. These water access licences are currently associated with the Applicant's irrigation activities within the region and would be available for the Project water use requirements.

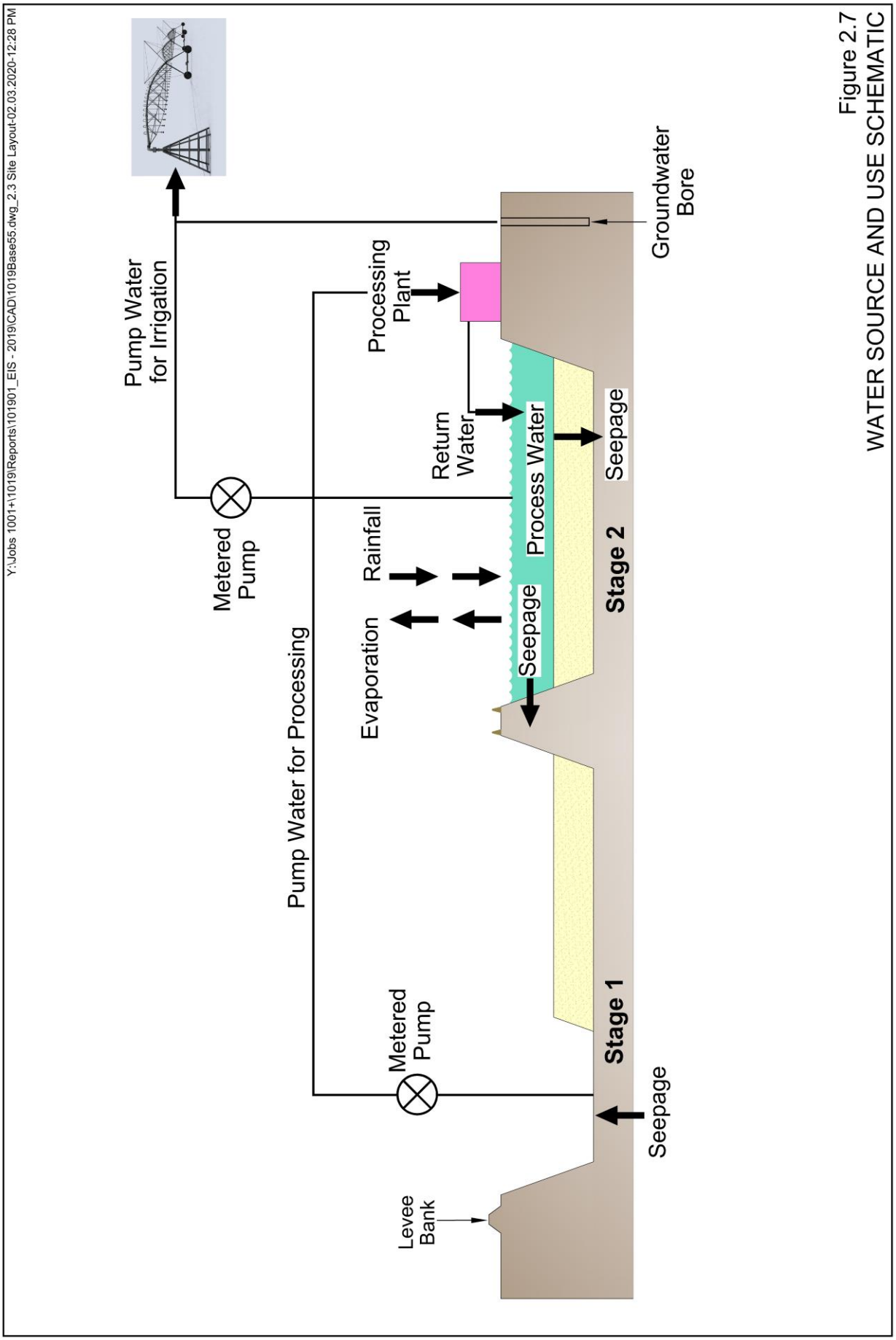


Figure 2.7
WATER SOURCE AND USE SCHEMATIC

Three registered groundwater bores are located in the vicinity of the Quarry (GW060154, GW500724 and GW500725). However, it has been confirmed that these are not active bores but are related to the excavation activities for the existing Quarry.

Water is also sourced through the following actions and natural processes.

- Seepage into active and dewatered extraction areas, with direct seepage from the alluvium once intersected. Based on a testing assessment undertaken at the Quarry, the daily flow of water into the dewatered extraction area is approximately 2.5ML/day (see Section 6.3.3.1).
- Water is also sourced though incident rainfall, which would be captured within the extraction areas. Give the sandy nature of the substrate it is not expected that rainfall on disturbed land would run off. Rather, this water would infiltrate the surface. Therefore, it is assumed that rainfall would only be captured when it falls on ponded areas. Rainfall that would be available within ponded areas for each stage is estimated based on progressive extraction presented in **Figure 2.4** as follows[2].
  - Stage 1 (rainfall captured within the existing Stage 2 pond) – 27.6ML/year.
  - Stage 2 (rainfall captured within the Stage 1 pond) – 38.6ML/year.
  - Stage 3 (rainfall captured within the Stage 1 and Stage 2 ponds) – 72.4ML/year.
  - Stage 4 (rainfall captured within the Stage 1, Stage 2 and Stage 3 ponds) – 96.2ML/year.

  Upon closure, it is estimated that on average, approximately 237.2ML would be captured from rainfall each year. As the extraction areas would be surrounded by a levee bank these areas would effectively have no contributing catchment. As a result, water captured in the extraction areas would be exempt from surface water licensing requirements.
- The Applicant may also source water from farm dams within the property if required. Based on the 425ha contiguous property area, the annul maximum harvestable right dam capacity is 27.6ML.

2.7.2 Water Usage

Total water use for Quarry operations is predicted to be no more than 99.3ML per annum incorporating water lost through:

- processing;
- moisture content of product despatched from the Quarry; and
- water required for dust suppression.

[2] Annual rainfall has been calculated based on review of historic rainfall data between 1971 and 2018 available from the SILO database. The annual average rainfall level over that time has been used for calculation (575.6mm/yr).

It is also noted that water would be lost via evaporation from extraction stages once these have naturally filled with water and become evaporative sinks.

The following presents a summary of the estimated water use requirements including evaporative losses for each stage of operations.

Processing Operations

The Applicant's current practice is to run the washing equipment at a rate of 300t/hr, requiring 500m^3/hr of water. Based on a maximum processing rate of 330 000tpa, the wash plant operates for 1 100 hours per annum, requiring 550ML per annum for processing.

Most of this water is separated from the sand during processing or drains from the product stockpiles. The Applicant estimates that 95% of this water is returned to the extraction areas following use and is recycled. Therefore a loss of 27.5ML/year has been assumed.

Product Moisture

A moisture content of the final product of 7% is assumed. This accounts for loss of 11.7ML/year that would exit the Quarry through product despatch.[3]

Dust Suppression

The water cart currently used at the Quarry has a capacity of 10,000L. The Applicant estimates that on average the water cart would be filled three times on operating days. Daily water cart

Evaporation

Evaporative losses would also need to be accounted for in licences for the Quarry. As with rainfall capture, evaporative losses would be expected from ponded areas only. Based on the progressive extraction presented in **Figure 2.4**, it is estimated that the following evaporation would occur from each stage, when operational[4].

- Stage 1 (evaporation within the existing Stage 2 pond, i.e. prior to expansion) – up to 73.1ML/year.
- Stage 2 (evaporation within the Stage 1 pond) – up to 102.3ML/year.
- Stage 3 (evaporation within the Stage 1 and Stage 2 ponds) – up to 191.7ML/year.
- Stage 4 (evaporation within the Stage 1, Stage 2 and Stage 3 ponds) – up to 254.6ML/year.
- Upon closure, a total of 627.9ML/year would be lost annually through evaporation when all ponds would contain water.

[3] Product moisture losses = 300,000tpa at a specific density of 1.8t/m^3 would require 166,667m^3 of material despatched of which 7% is 11,700m^3 or 11.7ML

[4] Evaporative losses have been calculated based on review of historic evaporation data between 1971 and 2018 available from the SILO database for the Property. The annual average evaporation level over that time has been used for calculation (1523.9mm/yr).

2.7.3 Water Balance

An important characteristic of the water balance for the Quarry is the ongoing irrigation of the landholding. Historically, water returned from processing activities has been drawn from the existing extraction areas for use to irrigate crops grown on the landholding, effectively ensuring that the beneficial use of that water occurs twice. This process would continue under the Project with the ongoing pumping of water from the extraction areas subsequently drawing water from the groundwater setting.

It is estimated that a maximum annual water use for irrigated cropping of 2 684ML would be required. This estimate is based on current irrigation practices and plans for future irrigation within the landholding (that is, approximately 22ML in a 24-hour period across four large and four small irrigation pivots initiated every three days on average). For the purpose of assessment an average or 7.3ML per day has been adopted. It is noted that should groundwater inflows exceed the water required for irrigation via the irrigation pivots used on the broader property, water would be used to irrigate revegetated areas within the property and may potentially be diverted to other nearby landholdings under agreement.

The draw of water for irrigation would be greater than that inflowing to the extraction areas due to extraction (see Section 6.3.3.3) and would cause additional water to flow into the extraction areas. As a result, the use of water for irrigation, quarry operations and that lost to evaporation would be naturally balanced by groundwater inflows to the extraction areas and captured rainfall (that is a zero-sum balance). Based on the water usage requirements and including irrigation, the estimated drawdown for each stage of operations and upon closure is summarised in **Table 2.2**. The calculated maximum harvestable right dam capacity of 27.6ML is not included in this summary as the Applicant is not considering building any dams to support water use requirements and this water would only be called upon if needed. Should this be required, it would result in a subsequent decreased reliance on groundwater inflow.

The assessment of dry and wet years for this water balance is not considered necessary as the water use requirements for the Project are much lower than that expected for irrigation demand. As the irrigation demand is not the subject of the application, there would be no limit on this water use other than in accordance with the licence entitlement. Therefore, during a wet year reliance on groundwater would be reduced and during a dry year, irrigation demand would be modified to match the licence entitlement. The dewatering of groundwater would be monitored to ensure that the use of groundwater did not exceed the licenced entitlement (see Section 6.3.4).

The data in **Table 2.2** indicates that the maximum inflow volumes would be required post-closure to balance water used for irrigation and that lost to evaporation from the completed extraction areas (that would be retained as ponds). A maximum of 3 075ML per annum would be required, mostly for irrigation use (87% of inflow total). This would be less than the licence entitlement held by the Applicant of 3 458 shares.

The outcomes of a numerical groundwater modelling assessment that assesses the predicted inflows from extraction taking into account the water demand for operations is presented in Section 6.3.

Table 2.2
Water Balance Summary

Water Source	ML	Water Use	ML	Balance (ML)
Stage 1				
Balancing Groundwater Inflow	2 777.0	Processing	27.5	
Rainfall	27.6	Moisture in Product	11.7	
		Dust Suppression	8.3	
		Evaporation	73.1	
		Irrigation	2 684.0	
Total	2 804.6		2 804.6	0.0
Stage 2				
Balancing Groundwater Inflow	2 795.1	Processing	27.5	
Rainfall	38.6	Moisture in Product	11.7	
		Dust Suppression	8.3	
		Evaporation	102.3	
		Irrigation	2 684.0	
Total	2 833.8		2 833.8	0.0
Stage 3				
Balancing Groundwater Inflow	2 850.8	Processing	27.5	
Rainfall	72.4	Moisture in Product	11.7	
		Dust Suppression	8.3	
		Evaporation	191.7	
		Irrigation	2 684.0	
Total	2 932.2		2 932.2	0.0
Stage 4				
Balancing Groundwater Inflow	2 890.0	Processing	27.5	
Rainfall	96.2	Moisture in Product	11.7	
		Dust Suppression	8.3	
		Evaporation	254.6	
		Irrigation	2 684.0	
Total	2 986.1		2 986.1	0.0
Post-Closure				
Groundwater Inflow	3074.5	Evaporation	627.9	0.0
Rainfall	237.2	Irrigation	2 684.0	
Total	3 311.9		3 311.9	

Source: RWC

2.8 Access, Traffic and Product Transportation

2.8.1 Access

The Quarry Site would continue to be accessed via the dedicated access road that enters the Riverina Highway. The road is approximately twelve metres wide on a graded surface. **Plate 2.1** displays the existing formation and condition of the road.

Plate 2.1 Existing Quarry Access Road (reference: E1019A_76)

The access road crosses an existing concrete bridge over the Black Swan Anabranch. An assessment of the bridge condition by SJ Street & Associates and recommended repairs or maintenance be undertaken. That report is provided as **Appendix 7**. The assessment identified that the bridge would be suitable for use by heavy vehicles proposed for the Quarry operations (B-Double vehicles with a gross vehicle mass of 67.5t). A range of recommendations were made, including the following.

- Undertake annual Level 2 Bridge Condition inspections (e.g. AusSpan) and associated maintenance program
- Limit vehicle speed to a maximum of 5km/hr.
- Provide suitable signage on bridge approaches.
- Level out approaches in elevation and plan and provide rock beaching retention fill on edges to protect batter slopes from erosion.

- Abrasive sand blast all steelwork to Class 2.5 and paint with a two coat epoxy primer paint system.
- Realign and reclip precast concrete decking planks to edge steel beams- replace missing bolts and clips- all details hot dipped galvanized.
- Provide precast concrete bollards on the approaches each side to control vehicle alignment across the bridge.
- Install suitable low level guiderail each side such as low level pipe railing fixed back to deck, maximum height 1/3 of wheel height
- All work to be carried out by experienced tradesman to current Australian Standards.

The remedial works recommended by SJ Street & Associates would be undertaken prior to commencement of the Quarry expansion.

An internal speed limit of 40km/hr is maintained within the Quarry Site except in the vicinity of the existing concrete bridge over the Black Swan Anabranch over which vehicle speed is limited to 5km/hr.

2.8.2 Traffic Types and Levels

Transport activities would continue to predominantly require the use of 19m/26m Truck and Dog or B-Double vehicles, however smaller configurations or rigid vehicles may also be used from time to time.

Based on the outcomes of the engineering assessment of the existing concrete bridge, the maximum gross vehicle mass of 67.5t would be permitted at the Quarry. However, for the purpose of assessment, the average payload is assumed to be 45t per vehicle.

Product despatch from the Quarry would be limited to no more than 40 laden loads per day. During peak periods it would be anticipated that a maximum of six trucks would leave the Quarry in one hour, though these periods would not occur regularly. It should be noted that one laden load requires two movements or vehicle trips (that is, an inbound movement and an outbound movement). A range of ancillary transport movements would be required for the supply of consumables, technical services and other supplies. As these movements would not be regular, they are not included in the proposed traffic limits.

In addition, it is anticipated that light vehicle access to the Quarry would include 10 vehicles arriving at the Quarry and 10 vehicles departing each day. An additional three visitors may attend the Quarry on any given day.

As the property is also used for agricultural production, additional traffic may use the access roads to service these activities from time to time. Seasonal traffic levels will vary, especially during harvest periods.

2.8.3 Product Transport Routes

The proposed ongoing transport routes are presented in **Figure 2.8**. Due to restriction on the Riverina Highway to the east of the Quarry entrance (approaching Albury), all traffic will exit the Quarry by turning left onto the Riverina Highway. Heavy vehicles would enter Howlong (where the Riverina Highway is also known as Hawkins Street) with the majority of vehicles turning left at the intersection of the Riverina Highway and Sturt Street before moving on to River Road and into Victoria. From River Road trucks either travel east towards Albury and Wodonga, south towards Wangaratta and Benalla or west towards Rutherglen. Occasional deliveries may be required to Corowa via the Riverina Highway.

2.9 Infrastructure, Utilities and Services

2.9.1 Power and Lighting

Electricity is currently supplied to the Quarry Site via the 11Kv mains supply provided by a powerline that branches from the regional supply that follows the Riverina Highway. A generator is available at the existing Quarry in the event of any power interruptions.

There is no overhead lighting within the Quarry Site as hours of operation are generally restricted to daylight hours or periods when lighting on mobile equipment is sufficient.

2.9.2 Water Supply

There are no potable drinking water supplies to the Quarry Site with all drinking water imported, as needed.

Water for ablutions is sourced from a rainwater tank.

2.9.3 Fuels, Greases and Lubricants

Diesel fuel would continue to be stored on site in self-bunded above-ground tanks (nominally 60 000L in capacity) located on the causeway between Stage 1 and Stage 2.

Some greases and lubricants are stored on-site for regular maintenance requirements and are stored in tubes or 205 litre drums. These are stored in dedicated areas that are secured and bunded.

2.9.4 Sewage and Effluent Disposal

The Applicant would continue to use the existing septic tank system that is typically serviced monthly.

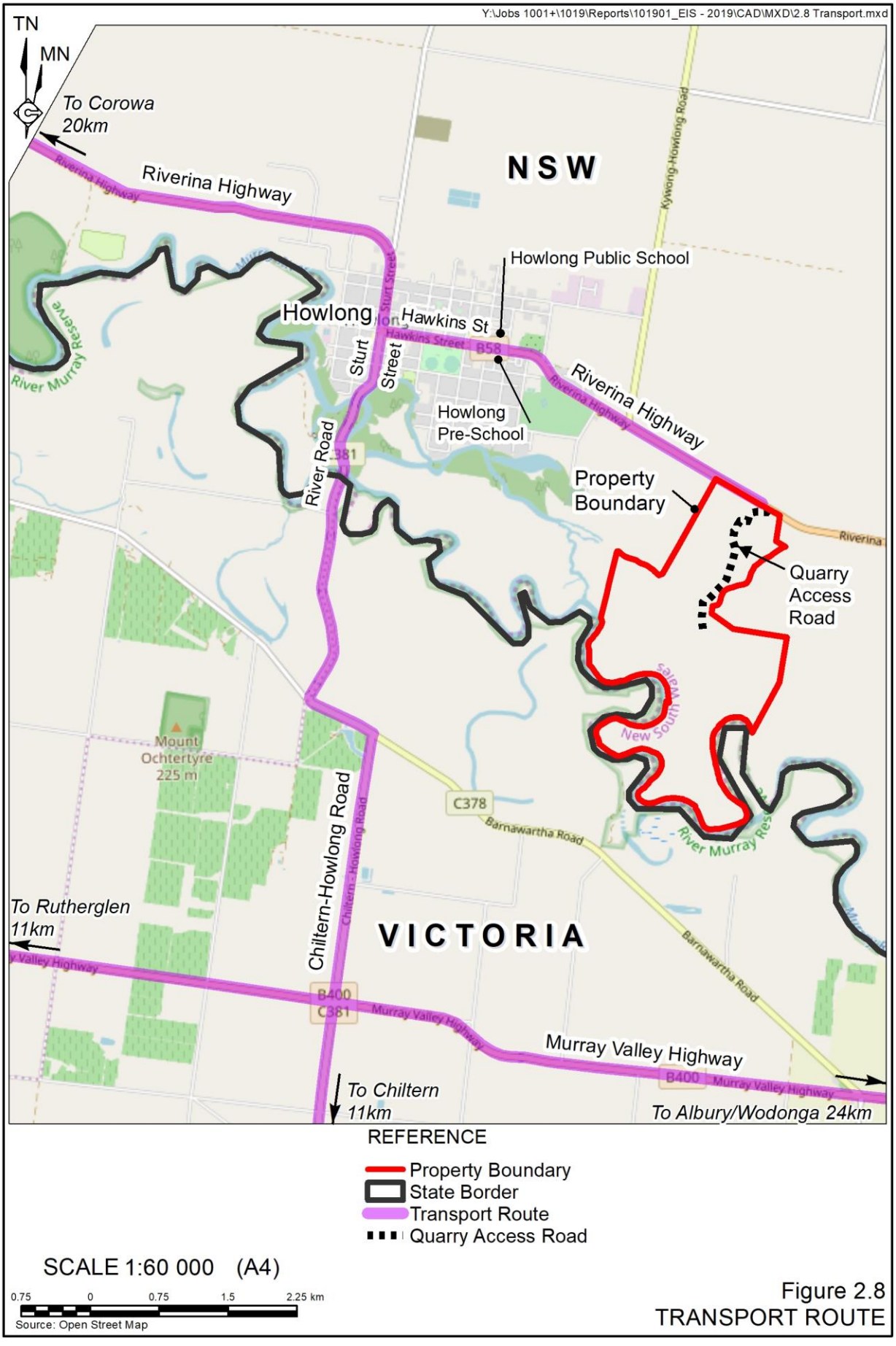


Figure 2.8
TRANSPORT ROUTE

2.10 Hours Of Operation and Project Life

2.10.1 Hours of Operation

The proposed hours of operation are presented in **Table 2.3**.

Table 2.3
Proposed Operating Hours

Activity	Proposed Hours
Extraction, Processing and Stockpiling	7:00am to 5:00pm - Monday to Saturday No operation on Sundays or public holidays
Sales and Product Despatch*	7:00am to 10:00pm - Monday to Friday. 7:00am to 12:00pm - Saturday. No operation on Sundays or public holidays
Maintenance	Monday to Sunday - 24hrs Only maintenance that is inaudible would be undertaken outside the hours of 7:00am to 5:00pm - Monday to Saturday
* Trucks may arrive at the Quarry from 6:30am as is current practice.	

Activities on a Saturday would only occur occasionally in response to client requests or in the event of an emergency.

2.10.2 Life of the Project

The Applicant is proposing that the Quarry would operate for an additional 30 years. It is expected that the identified resource would not be exhausted over that time. Although a maximum extraction rate of 300,000tpa is proposed, it is expected that the operation would experience peaks and troughs to demand over the life of the Quarry.

The Applicant notes that further reserves of sand exist at greater depth and adjacent to the nominated extraction area. As a result, a subsequent application may seek to further extend the life of the Quarry, in accordance with the legislative requirements that may operate at that time.

2.11 Waste Management

Table 2.4 presents the waste materials that may be produced within the Quarry Site, storage locations, and ultimate uses. In summary, the Project would not generate any production waste material with all by-products such as overburden of fine materials used for on-site construction or rehabilitation activities. Non-production wastes may be generated in small volumes. As there is no dedicated workshop area, equipment servicing would be undertaken by mobile operators who would bring the required oils and greases each day and remove and waste including scrap metal as it is generated.

Table 2.4
Waste Management

Material Type	Management	Final Use or Removal
Production Wastes		
Topsoil	Storage – within levee banks and shaped and revegetated as soon as practicable.	Levee banks retained in final landform
Clay and Fine Materials	Storage – within flood management structures and stockpiles.	Land reclamation, void fill, and shaping of the final landform.
Non-Production Wastes		
General waste (including food scraps)	Covered bins located within Site Office.	Collected on a regular basis by a licensed waste contractor and transported to a licensed waste disposal/recycling facility.
General Recyclables		
Waste oils and greases	Collected/removed as generated	Collected on a regular basis by a licensed waste contractor and transported to an appropriately licensed facility for recycling.
Batteries		
Tyres		
Scrap Steel/Metal		

2.12 Employment, Safety and Security

2.12.1 Employment

When operating, the Applicant currently employs eight people at the Quarry. This is anticipated to increase to ten full time employees under the Project. It is anticipated that all operational personnel would be sourced from and reside in the vicinity of the Quarry Site.

The Applicant will not employ road vehicle operators directly with all activities to be contracted or supplied by clients. The indirect employment of drivers and other maintenance and servicing contractors is considered likely to support an additional 25 full time equivalent positions.

2.12.2 Safety and Security

The Quarry Site is secured by locked gates outside of operating hours. The property on which the Quarry is located is fenced to restrict access by humans and cattle.

A series of safety bunds would be established along the access road in the vicinity of the extraction areas to limit potential risks associated with proximity to the road.

2.13 Rehabilitation

2.13.1 Rehabilitation Objectives

The Applicant's objectives for rehabilitation are centred on creating a final landform that is safe, secure, non-polluting, stable and suitable for biodiversity conservation. The specific objectives for the long-term rehabilitation program are to:

- provide a low maintenance, geotechnically stable and safe landform with minimal erosion;
- ensure there is no contamination in the final landform or waterbodies;
- revegetate areas disturbed for operations to recreate vegetation communities and natural ecosystems that are sustainable; and
- establish wetland areas that provide habitat for native fauna.

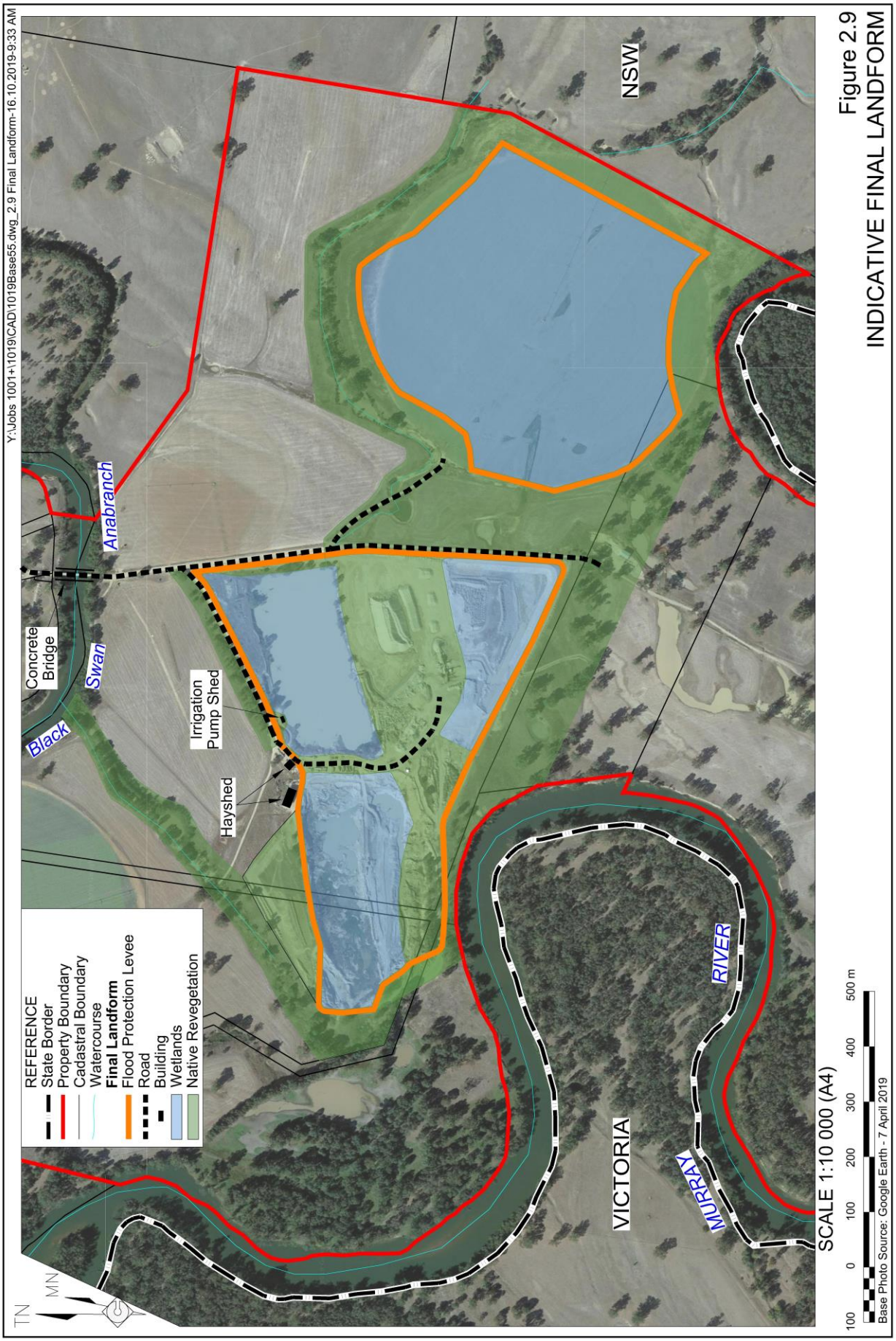
Areas inside the levee banks would remain operational for the majority of the Quarry life with completed extraction areas to be profiled to form wetlands. A program of revegetation of the existing farming land is proposed to provide suitable buffers to the Murray River and enhance biodiversity value of the land historically used for agriculture and improve connectivity in the local landscape. A primary objective for rehabilitation is therefore to restore the natural environment to an equal or better condition than existed pre-excavation, with the ultimate aim of achieving a net gain for the environment and local primary production. This would be achieved through careful planning, monitoring and evaluation of progressive and final rehabilitation activities.

2.13.2 Final Landform and Final Land Uses

Figure 2.9 displays the indicative final landform for Quarry following the completion of extraction activities within all operational stages. The final landform would comprise the following.

- Four open areas to be rehabilitated as permanent wetlands.
- Levee banks surrounding the wetland areas. The sides of the levee banks would be revegetated with the top of these structures limited to groundcover only so that it provides long-term vehicular access.
- Unsealed internal access roads would be retained.
- Areas within the surrounding the wetland areas would be revegetated with native vegetation as presented in **Figure 2.9**. This revegetation would focus on riparian areas.

This final landform is considered indicative as it is accepted that in 30 years' time, the land use preferences of stakeholders including the landowner, the Applicant and Federation Council may have changed. A Quarry Closure Plan would be prepared three years prior to closure that would establish strategies to achieve the proposed final land use and describe the outcomes of stakeholder consultation regarding land use preferences.


Y:\Jobs 1001+\1019\CAD\1019Base55.dwg_2.9 Final Landform-16.10.2019-9:33 AM
Figure 2.9
INDICATIVE FINAL LANDFORM
NSW
VICTORIA
Anabranch
Swan
Black
Concrete Bridge
Irrigation Pump Shed
Hayshed
MURRAY
RIVER
REFERENCE
State Border
Property Boundary
Cadastral Boundary
Watercourse
Final Landform
Flood Protection Levee
Road
Building
Wetlands
Native Revegetation
TN
MN
SCALE 1:10 000 (A4)
100 0 100 200 300 400 500 m
Base Photo Source: Google Earth - 7 April 2019

Novel closure land uses may be adopted depending on land use preferences at closure. Initial consideration of possible final land use has included using ponds as floating solar power farms which would have the benefit of reducing evaporation from the retained water body. The land may also be opened to the public as a recreational area. These final land uses would be subject to consultation and the necessary approvals at the time of closure.

2.13.3 Progressive Rehabilitation and Revegetation

Figure 2.4 presents the progressive revegetation program that would be implemented at the Quarry. Initial activities to be undertaken during Stage 1 of operations include backfilling an area to establish a 100m buffer between operational areas and the Murray River. Overburden and clay materials sourced within the Quarry would be progressively applied in the area.

The Applicant has also committed to a revegetation program outside of disturbed areas of the Quarry. As presented in **Figure 2.4**, this revegetation would focus on riparian areas formerly cleared for agricultural use and land between the Quarry and the Murray River. In addition, construction of levee banks would be complemented by initial revegetation with a groundcover followed by tubestock to stabilise the surface. Revegetation of existing levee banks is displayed in **Plate 2.2**.

Rehabilitation within the extraction areas would commence as extraction in various sections is completed. **Plate 2.3** displays existing profiling and revegetation within the Stage 1 extraction area. It is anticipated that the Stage 1 extraction area would be available for rehabilitation from Stage 3 of operations.

Once the final landform has been established in this location stabilising vegetation would be planted on upper benches. As the area naturally fills with water, revegetation trials along the banks would be undertaken to confirm the most successful species and methods. Successful outcomes would then be replicated in future rehabilitation. By the end of operational life, it is anticipated that rehabilitation within the Stage 1 and Stage 3 extraction areas would be completed. The Stage 2 extraction area would be profiled upon completion but would continue to be used to hold return water from processing through the life of the Quarry.

2.13.4 Long Term Rehabilitation

Upon closure of the Quarry, final rehabilitation would commence with decommissioning of all infrastructure and clean up, before profiling within operational areas and placement of a growth medium on final surfaces. Revegetation of the landform would be undertaken in accordance with the Quarry Closure Plan.

It is anticipated that the Stage 2 extraction area would continue to be used as a source of water for irrigation on the broader property, requiring that the pump shed remain in the landform.

Some internal roads would be retained for access as well as the top surface of the levee banks.

Rehabilitation within the Stage 4 extraction area would occur consistent with other rehabilitated extraction areas.

Plate 2.2 Revegetation on Levee Banks (reference: E1019A_020)

Plate 2.3 View of Existing Rehabilitation Profile and Revegetation (reference: E1019A_032)

2.13.5 Rehabilitation Methods and Procedures

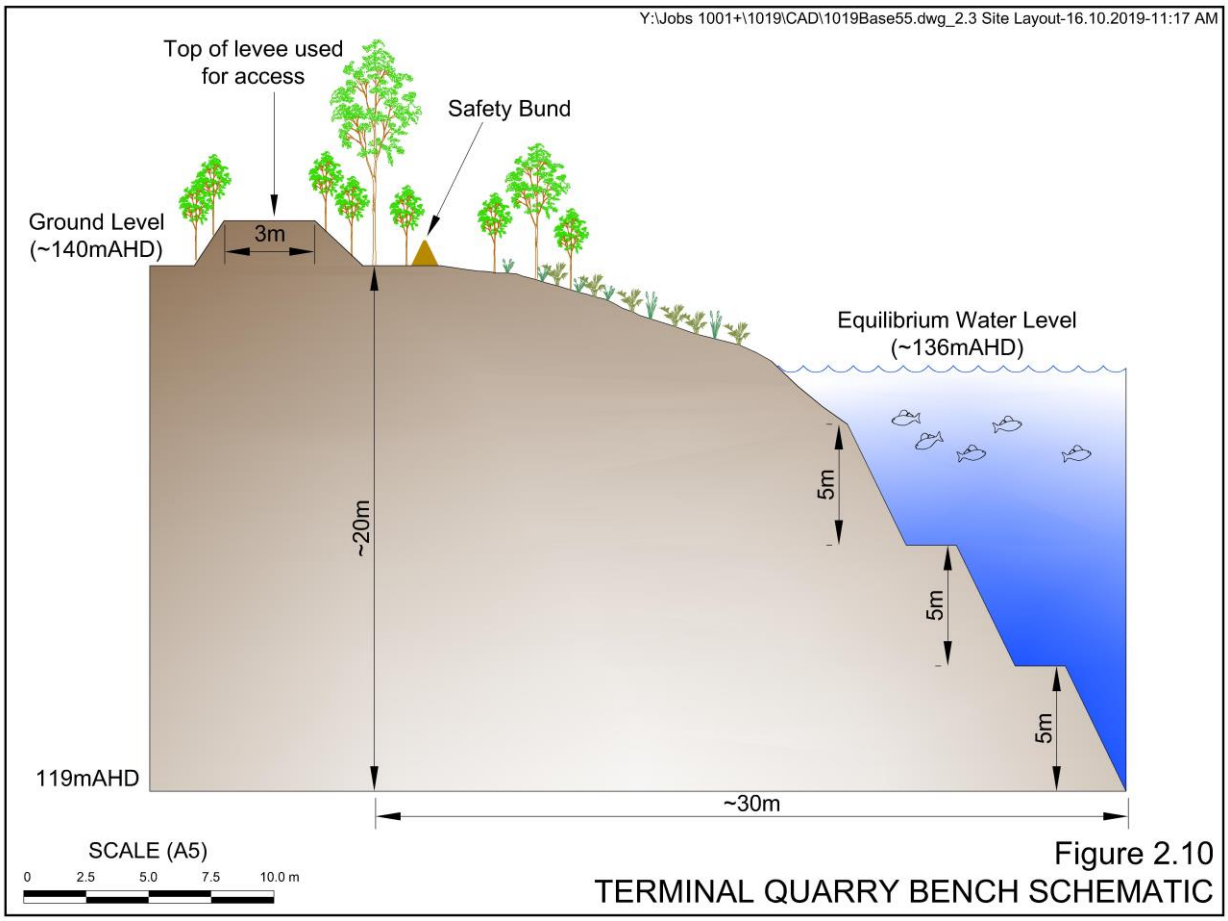
Decommissioning

Upon closure all infrastructure not required for the final land use would be removed. A contamination assessment would be undertaken to confirm that no unknown hydrocarbon contamination is present that may impact vegetation establishment.

Landform Development

Terminal benches within extraction areas would be profiled to stabilise the landform. Batters would be profiled to be generally consistent with **Figure 2.10**. The final profile would have the following indicative design features.

- Face height of approximately 5m and bench width of 2m.
- Overall slope of 1V:1H from the toe of the levee bank to the toe of the batters.
- The top bench would have a more gradual slope (in the order of 1V:5H) to encourage wetland flora establishment.



Historic experience at the Quarry has established that the proposed profile would remain stable upon closure and once ponds have reached an equilibrium water level. The hydraulic pressure of the water on the final landform once submerged would maintain stability. To ensure the long-term stability of the proposed profile once submerged, the Applicant would commission a

geotechnical review of the final extracted landform upon completion of the first section of Stage 1 to the final extraction depth of 119m AHD to confirm that the historical approach to bench stabilisation remains appropriate.

A water level of approximately 136m AHD is expected in final ponds based on historical experience at the Quarry. This water level would vary dependent on the season and flow in the Murray River. When the river is at the lowest flow (in winter,) the bed is exposed and is at a level of approximately 132m AHD, while at high flow the river level is estimated to be 139m AHD. The top bench that would be planted out with wetland flora would be established at 136m AHD to ensure that seasonal water level variations are accounted for in landform planning.

The edge of the wetland areas would be profiled to establish a suitable slope and water coverage to encourage wetland flora development. Debris in the form of coarse woody material would be placed in the waterbody where available to provide habitat for aquatic species.

Operational areas of the Quarry, including roads not retained in the final landform and the processing and stockpiling areas would be profiled to create a final landform suitable for native vegetation establishment. These areas would initially cross-ripped and covered with approximately 30cm of growth medium material.

Revegetation

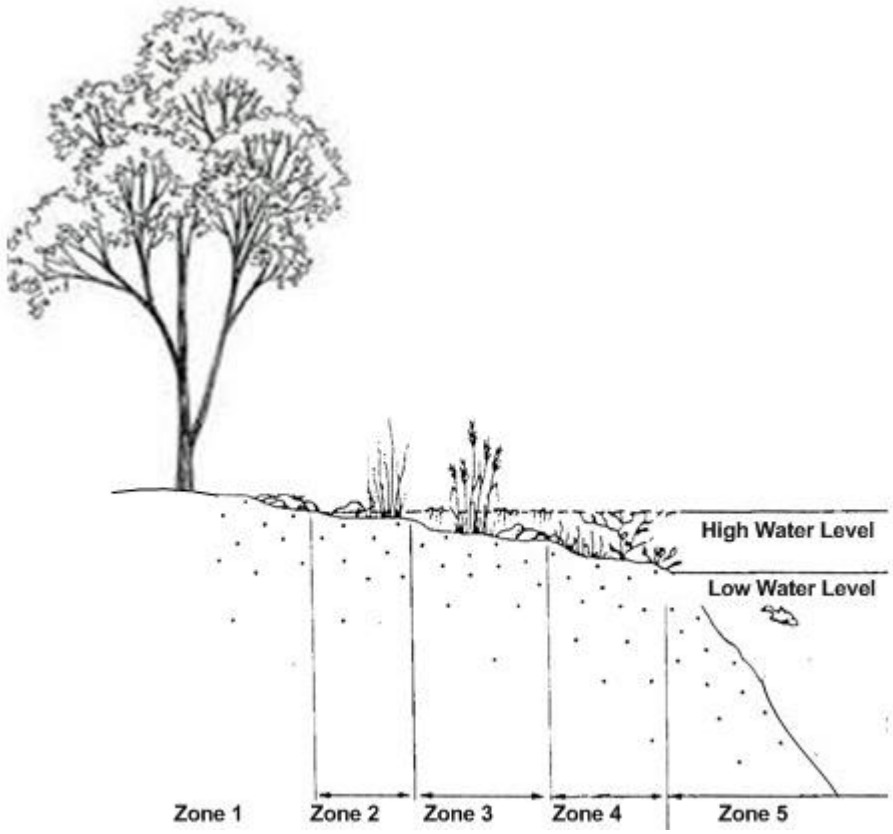
The Applicant has proactively commenced revegetation under existing operations to stabilise and improve the condition of riparian areas in the vicinity of the Quarry. It is likely that revegetation activities would initially involve natural establishment of a groundcover. It has been the experience of the Applicant that the overburden material is fertile and quickly establishes a natural cover. This process may be aided by direct seeding where necessary including seeding with herb, shrub and canopy species. Larger tree species are likely to be planted as tubestock as is current practice.

The effective growing period at the property is between May and November each year due to the relatively high temperatures, high evaporation rates and low rainfall that occurs during the remainder of the year. Revegetation whether for short-term ground stabilisation, or for final land use, would to be undertaken during this period, or a program of watering and fertilisation implemented to support plant growth.

Prior to significant revegetation campaigns, the Applicant would consult with the local Landcare group and Local Land Services in order to ensure that the proposed revegetation principles are consistent with current best practice implemented in the region.

Species Selection

Figure 2.11 presents a schematic of the intended wetland edge with planting zones identified to guide suitable species section from **Table 2.5**. It is noted that species in Zone 1 would planted across the remaining rehabilitated landform. Final species selection for revegetation campaigns would be done in consultation with Local Land Services and the local Landcare group.



(Source: Kent et al. 2002)

Figure 2.11
SCHEMATIC OF WETLAND EDGE

Table 2.5
Revegetation Species Selection

Common Name	Species Name	Planting Zone (see Figure 2.11)	Comments
Silver Wattle	*Acacia dealbata*	1	Shrub 4-5m high
River Cooba	*Acacia stenophylla*	1	Shrub to tree to 10m high
Lesser Joyweed	*Alternantheradenticulata*	1	Dense floating; mat
Moonah	*Melaleuca lanceolata*	1	Dense tree 5m high
Swamp Wallaby Grass	*Amphibromus spp.*	1, 2	Perennial grasses
Sneezeweed	*Centipeda spp.*	1, 2	Aromatic herbs
Dense Stonecrop	*Crassula colorata*	1, 2	Small annual
Nitre Goosefoot	*Chenopodium nitrariacetrm*	1, 2	Spiny shrub to 2m high
River Red Gum	*Eucalyptus camaldulensis*	1	Tree to 25m high
River bottlebrush	*Callistemon sieberi*	1	Shrub to 3m high
Common Rush	*Juncus usitatis*	1, 2	Perennial tussock 1.2m tall
Buttercup	*Ranunculus ssp.*	2	Perennial and annual herbs
Swamp Starwort	*Stellaria angustifolia*	1, 2	Trailing and climbing annual herb
Common Nardoo	*Marsilea drummondii*	2	Perennial, fern like fronds up to 20cm
Swamp Stonecrop	*Crassula helmsii*	2, 3	Creeping perennial 10cm tall
Common Spike-rush	*Eleocharis acuta*	2, 3	Slender perennial 60cm tall

Table 2.5 (Cont'd)
Revegetation Species Selection

Common Name	Species Name	Planting Zone (see Figure 2.11)	Comments
Knotweed Smartweed	*Persicaria spp.*	2, 3	Annual herbs
Giant Sedge	*Cyperus exaltatus*	3, 4	Robust tussock perennial 2m tall
Azolla	*Azolla spp.*	3, 4, 5	Free floating fern to 3cm long
Duckweed	*Lemna and Spirodela spp.*	3, 4, 5	Free floating and small
Water-milfoil	*Myriophyllum spp.*	3, 4, 5	Perennial 4m long
Swamp Lily	*Ottelia ovalifolia*	3, 4, 5	Floating leaves, stems to 1m
Giant Rush	*Junczrs ingens*	4	Perennial tussock 3m tall
Tall Spike-rush	*Eleocharis sphacelata*	4, 5	Erect perennial 2m tall
Source: Kent et al. 2002 (Native Vegetation Guide for the Riverina)			

2.13.6 Rehabilitation Performance Indicators, Completion Criteria and Monitoring

Indicative performance indicators, completion criteria and monitoring strategies for the progressive and final rehabilitation within the Quarry are presented in **Table 2.6**. The information in **Table 2.6** would be included in a *Biodiversity and Rehabilitation Management Plan* that would guide progressive rehabilitation and revegetation activities. This plan would also include a trigger action response plan to guide remedial action where it is required.

Table 2.6
Rehabilitation Completion Criteria, Performance Indicators and Monitoring Strategy

Objectives	Completion Criteria	Area (s)	Performance Indicator	Monitoring Strategy
Closure Planning				
• Final landform and land use is consistent with community and Government expectations	Final land use is defined and agreed by relevant stakeholders.	All	Final land use agreed and formalised in a Quarry Closure Plan.	Not Applicable
Decommissioning				
• To remove all infrastructure and waste from Quarry operations. • To remediate any contamination and ensure the area is non-polluting prior to commencement of the landform establishment phase.	Services are isolated, disconnected, removed and terminated. Infrastructure and associated buildings not required are demolished and removed. All internal roads, car parks and hardstands not required for the end land use/user are ripped and profiled. Contaminated sites are identified and remediated.	Operational Areas	Completed to the satisfaction of DPIE. Contaminated Sites Report (or equivalent) completed.	Visual survey and reporting on services and infrastructure to be completed. Soils tested and analysed as part of Contaminated Sites Report (or equivalent).

Table 2.6 (Cont'd)
Rehabilitation Completion Criteria, Performance Indicators and Monitoring Strategy

Objectives	Completion Criteria	Area (s)	Performance Indicator	Monitoring Strategy
Landform Establishment				
• To stabilise all disturbed areas and minimise erosion and dust generation. • To provide a low maintenance, geotechnically stable and safe landform suitable for the intended final land use. • To achieve the nominated design for each landform. • To blend the created landform with the surrounding.	The final landform achieves the nominated design of the EIS or subsequent Biodiversity and Rehabilitation Management Plan. Final landform does not pose a security or safety risk The rehabilitated area does not represent an erosion hazard.	Operational Areas Completed extraction areas	Terminal faces and benches are geotechnically stable. Ripped and profiled surface consistent with surrounding topography. Signage erected identifying 'deep void – no access'. Erosion does not exceed 0.3m (gully) deep.	Geotechnical survey and visual inspection following completion of landform establishment activities.
Growth Medium Development				
• To achieve a soil profile capable of sustaining the specified final land use.	Soil condition does not limit growth medium development and seed application success. Soil is spread to a depth of 10cm to 15cm on rehabilitated landscape	Operational Areas	pH levels are equivalent to that of the local setting. Soil depths as nominated.	Soil analyses at closure. Record of soil inventory.
Vegetation Establishment				
• To select and establish vegetation with the species diversity commensurate to wetland establishment. • To select and establish vegetation with the species diversity commensurate with vegetation communities in the locality • To re-instate ecological communities and establish wetlands. • To ensure that the ongoing viability of ecological communities are sustainable following the active management by the Applicant.	Appropriate native plant species used in rehabilitation. Appropriate native plant species richness is present for the restored ecological community. The established land form and vegetation is sustainable and consistent with the intended land use. There are no potential hazards that are not consistent with the intended land use. The soil pH is representative of the intended land use. Surface runoff from rehabilitated areas does not result in downstream pollution. Exotic weeds or vegetation is not competing or impacting on the intended land use. Feral pests are not competing or impacting on the intended land use.	All Areas	Species used are consistent with those presented in **Table 2.5**. At least 80% of species planted present in final landform. Establish areas of rehabilitation consistent with approval conditions. The site is free of safety or environmental hazards pH levels are equivalent to that of the local setting. Receiving waters affected by surface water runoff from rehabilitated areas have EC<1500µS/cm and a pH between 6.0 and 8.5. Noxious weeds are not present within rehabilitation or are considered to be consistent with analogue locations. Feral pests are not present within rehabilitation areas or are considered to be consistent with analogue locations.	Monitoring by ecologist or rehabilitation specialist. Visual inspection by Quarry personnel. Soil analyses. Monitoring of water quality within wetland areas.

Different rehabilitation activities would apply to different areas, for example, profiling and landform development would be required in both wetland and operational areas but a growth medium would only be applied to operational areas.

2.13.7 Rehabilitation Funding and Security

As rehabilitation would occur progressively it is not expected that the funding of rehabilitation activities would be a significant constraint to the operation. As a relatively small operation with minimal infrastructure, the costs associated with these processes would be mostly borne over the life of the Quarry.

Regardless of the above, the Applicant would be required provide a security to the DPIE in in the form of a bank guarantee that covers rehabilitation costs. The guarantee may be called upon by DPIE should the Applicant be unable to proceed with rehabilitation activities and the Government has to assume responsibility. The bank guarantee would be released only once the Applicant has completed rehabilitation to the satisfaction of the Secretary of DPIE.

Section 3

Stakeholder Engagement

PREAMBLE

This section describes the consultation undertaken with the local community, community groups and government agencies during the design and planning of the Project, as well as during the preparation of this Environmental Impact Statement.

The issues identified through consultation have been presented here. This information was used to identify the issues that required technical assessment for the Environmental Impact Statement.

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3.1 Introduction

Consultation activities for the Project were undertaken principally by Mr Peter Clinnick of Advanced Environmental Systems Pty Ltd in conjunction with the Applicant. The consultation activities have been undertaken in accordance with the specific requirements in the SEARs but have also relied upon the *Draft Environmental Impact Assessment Guidance Series - Community and Stakeholder Engagement (June 2017)* released by the then Department of Planning and Environment with particular attention to Appendix B of that guide.

Consultation outcomes have also been relied upon for the Social Impact Assessment for the Project that is provided as Part 11 of the *Specialist Consultant Studies Compendium*, with the outcomes of this assessment summarised in Section 6.14.

3.2 Community Consultation

Community consultation was undertaken principally in early 2018 in order that the feedback from the process was included in Project planning and design. Consultation focused on the following groups.

- Landowners adjacent to the Quarry site.
- The broader Howlong community – defined as those people living within and surrounding Howlong.
- Community groups, including local Landcare organisations

Consultation methods were varied in order that each of the identified groups would have the opportunity to participate in consultation. The following key activities were undertaken for the consultation program.

Leaflet distribution and advertisement

A brief summary of the Project was compiled and distributed with an invitation to contact Mr Clinnick to register for further consultation. The leaflet was distributed to 100 houses along the main thoroughfares in Howlong on 21 and 22 February 2018, as well being advertised in the following newspapers.

- Albury Border Mail – 15 and 22 February 2018.
- Corowa Free Press – 21 and 28 February 2018.

The advertisement was also made available at the Howlong Public Library and on the Federation Council website. A copy of the advertisement is provided in **Appendix 5**.

Community Consultation Session (March 2018)

In response to Project advertising, community members were invited to attend the Mechanics Hall in Howlong on 2 March 2018, with an open consultation session undertaken between 9:00am and 4:00pm. Three community members attended the session with the issues raised from these discussions presented as follows.

- **Traffic management**, including the need for dedicated turning lanes for access to the Quarry, concerns regarding debris on the road, number of trucks and the suitability of the current Quarry access intersection with the Riverina Highway.

General comments about the road environment included discussion on the possible Howlong bypass to the north, weight restrictions on some Howlong streets and the lack of dedicated crossings for school children.

- **Proximity to the Murray River**, including water quality in the river, need for discharge and potential structural issues associated with hydraulic pressures from the river. The community requested that water quality monitoring be undertaken.
- **Pollution controls / waste management**, including risks from contamination due to the need to store oils and diesel fuel and the subsequent risk of spills or leakage. Discussion regarding the need for appropriate employee training, spill kits and inspections has been incorporated into commitments included in this document.
- **Structural safety of the private bridge**.
- **Dust dispersion and dust controls**.
- **Noise generation** by operating equipment.
- **Consultation** practices for the Project were questioned with suggested use of the Howlong Community Facebook page.
- **Employment** for the Project.
- **Hours of operation**.
- **Long-term access** given historic changes to river flow was discussed, however it was agreed that these changes occur over long periods of time and would be unlikely to constrain the Project.

Social Media

Community discussion regarding the Project was initiated on the Howlong Community Facebook page from 1 March 2018. The key issues identified from online discussion included the following.

- The need for the proposed expansion to the operation.
- Traffic management through Howlong.
- Change in lifestyle for the community with examples of past proposals having a negative impact (the Cleanaway project).
- Insufficient information available for the community.
- Benefits of local employment opportunity and expansion of local industry.

Community Group Meetings

A meeting with the Corowa District Landcare Group was held at the Corowa Civic Hall on 6 March 2018. The Applicant presented an overview of the Project and the approvals process before taking questions. The following issues were raised at a meeting.

- Flooding impacts and the need for levee banks.
- Changes to natural drainage patterns within the property.

- Presence of sites of Aboriginal cultural heritage significance.
- Planning for revegetation with a preference that revegetation is progressive.
- The possibility of public access to the wetland areas during and post-quarrying.

The West Hume Landcare Group was contacted via email to engage the group on the proposed progressive revegetation plans. No formal feedback was provided excepting general interest in the group's involvement in the revegetation plans.

3.3 Aboriginal Stakeholder Consultation

Relevant stakeholders from the Aboriginal community were identified using a process generally consistent with the *Aboriginal Cultural Heritage Community Consultation Requirements for Proponents* (DECCW, 2010) (see Section 6.9.2.3). Initial investigations and advertising identified that the relevant Aboriginal party for the Quarry Site was the Albury and District Local Aboriginal Land Council (LALC).

Mr Sam Kirby, CEO of the Albury and District LALC at the time of the consultation activities, provided feedback throughout the preparation of the EIS and Aboriginal Cultural Heritage Assessment. Aboriginal representatives from the Albury and District LALC (Mr Kirby and Mr Troy McGrath) participated in archaeological field surveys.

3.4 Government Agency Consultation

Government agency consultation centred on the application for and review of the SEARs for the Project (presented in **Appendix 3**). A paraphrased copy of the requirements and where they have been addressed in the EIS and supporting assessments is provided in **Appendix 4**. Assessment requirements from Government agencies that were prepared with the SEARs were provided by the following Government agencies.

- Department of Industry – Crown Lands and Water (now Natural Resources Access Regulator).
- Division of Resources and Geoscience.
- Environment Protection Authority.
- Office of Environment and Heritage (now Biodiversity and Conservation Division).
- NSW Rural Fire Service.
- Roads and Maritime Services.

Ongoing consultation with Government agencies has been documented in a consultation register provided in **Appendix 5**. Consultation mostly involved clarification on assessment requirements and updates on the Project.

Site-specific assessment requirements provided by Government agencies generally related to the need to specific assessment of environmental risks associated with the proximity of the Quarry Site to the Murray River. Specific assessment requirements relating to the Murray River included the following.

- Assessment of potential impacts to biodiversity values inherent in remnant habitat trees, particularly River Red Gums, located in the buffer area between the Quarry and the Murray River.
- Potential for impact to aquatic ecosystems.
- Potential for impact to listed threatened flora and fauna with habitat in proximity to the Murray River.
- Potential for any discharge of water to the Murray River and proposed management of these events, if required.
- Potential for flooding impacts associated with the Murray River.
- Potential for Aboriginal cultural heritage sites to be present within 200m of the Murray River.

In addition, Roads and Maritime Services requested consideration of the need for a right turn treatment on the Riverina Highway, sealing and treatment of the access to the Quarry.

Each of these matters has been addressed in the assessments completed for the Project.

Section 4

Planning and Legislative Context

PREAMBLE

This section provides a review of the relevant legislation, planning documents and environmental guidelines and presents the context of the application with regards the requirements for assessment, review and the approvals, licences and permits that would apply to the Project.

Review of the legislative and planning context for the application provides an additional source of what are the key issues for assessment and matters that are required to be addressed in the EIS.

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4.1 Introduction

A range of Commonwealth and NSW Legislation, policies and guidelines apply to the Project. These documents were reviewed to identify any environmental aspects requiring consideration in the EIS. In addition, the SEARs identified a number of guideline documents that would potentially be of assistance during the preparation of the EIS (see **Appendix 3**). A brief summary of relevant legislation and planning instruments is provided in the following subsections. The application and relevance of planning instruments related to specific environmental issues have been addressed in Section 6 and/or the relevant Specialist Consultant assessments.

4.2 Commonwealth Legislation

4.2.1 Native Title Act

The *Native Title Act 1993* (NT Act) provides for the recognition and protection of native title rights and interests of Aboriginal and Torres Strait Islander peoples to land and waters according to their traditional laws and customs. It also establishes a mechanism to determine claims to native title. Native title rights and interests can only exist if they have not been extinguished by a prior valid grant of a right (such as the grant of freehold title) as such a right is inconsistent with the continuation of native title rights and interests.

A native title determination application (or native title claim) may be made pursuant to the NT Act. Upon lodgement of a native title claim, the National Native Title Tribunal (NNTT) is required to apply a registration test and either accept the native title claim for registration or reject it. The NNTT maintains a register of native title claims.

The Project is located on freehold land and no native title claims have been registered over the Quarry Site. As such, the NT Act will not be considered further in this document.

4.2.2 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) covers 'matters of national environmental significance'. Relevant matters of national environmental significance include:

- listed threatened species and ecological communities; and
- listed migratory species protected under international agreement.

Under the EPBC Act, if a project has the potential to have a significant impact on a MNES, it is required to be referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) for assessment as to whether it represents a 'controlled action' and therefore requires approval from the Commonwealth Minister for the Environment.

Ecological assessment for the Project has confirmed that the Project would not impact matters of national environmental significance and therefore a referral to the Commonwealth Minister for the Environment is not required.

4.2.3 National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* (Cth) (NGER Act) establishes a mandatory corporate reporting system for greenhouse gas emissions, energy consumption and production. Scope 1 and Scope 2 greenhouse gas emissions are required to be reported under the NGER Act once a threshold for a facility or corporate group has been exceeded.

The current facility threshold is:

- 25kt or more of greenhouse gases (CO2-e) (scope 1 and scope 2 emissions);
- production of 100TJ or more of energy; or
- consumption of 100TJ or more of energy.

The Applicant's is not likely reach these thresholds and therefore the NGER Act is not considered further.

Measures that would be implemented to limit greenhouse gas emissions as a result of the Project are discussed in Section 6.6.7.

4.3 NSW Legislative Context

4.3.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the framework for the assessment and approval of development in NSW and is administered by the Department of Planning, Industry and Environment (DPIE).

The EP&A Act aims to protect and conserve the environment through ecologically sustainable development. This is achieved through managing development to conserve resources, including agricultural land, natural areas, forests, minerals, water, and towns with the purpose of promoting social and economic welfare of the community and an enhanced environment.

Development consent is required under the EP&A Act for the purposes identified under the relevant Local Environment Plan (see Section 4.6). The Project may be classified as development which is permissible with development consent.

The Project is classified as State Significant Development as it satisfies criteria outlined in *State Environmental Planning Policy (State and Regional Development) 2011* (see Section 4.4.1).

The EP&A Act sets out the process for assessment of SSD applications. An EIS is required for all SSD development applications and must address the Secretary's Environmental Assessment Requirements (SEARs). The consent authority for the Project will be the Minister for Planning and Public Spaces (or their delegate.

Section 4.41 of the EP&A Act identifies that if development consent is granted for a SSD, the following potentially relevant authorisations for the Project are not required.

- An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*.

- A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000*.

4.3.2 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (PoEO Act) provides the framework for regulation and reduction of pollution and waste in NSW. The PoEO Act is regulated by the EPA, which will issue an Environment Protection Licence (EPL) for the scheduled activities listed in Schedule 1 of the PoEO Act.

The PoEO Act also requires immediate reporting of pollution incidents which cause or threaten to cause material harm to the environment. All holders of EPLs are required to prepare, implement and regularly test *Pollution Incident Response Management Plans*.

The Applicant holds EPL254 which was issued by the EPA on 26 April 2000 for the scheduled activities of land-based extractive activities and crushing, grinding or separating activities. Refer to Section 1.5 for further information on EPL254.

4.3.3 Water Management Act 2000

The *Water Management Act 2000* (WM Act) ensures the sustainable and integrated management of the State's water for the benefit of both present and future generations. The WM Act provides arrangements for controlling land-based activities that affect the quality and quantity of the State's water resources. It provides for four types of approval, namely:

- water use approval (Section 89) – which authorises the use of water at a particular location for a particular purpose;
- water management work approval (Section 90) – which authorises the construction and use of a specified water supply at a specified location;
- controlled activity approval (Section 91(2)) – which authorises activities on or under waterfront land (i.e. within 40m of waterfront land); and
- aquifer interference activity approval (Section 91(3)) – which authorises interference of an aquifer.

For controlled activities and aquifer interference activities, the WM Act requires that the activities avoid or minimise their impact on the water resource and land degradation, and where possible the land must be rehabilitated.

The Project would require approval for an aquifer interference activity, which authorises the holder to carry out specified activities that affect an aquifer such as activities that intersect groundwater or take water from an aquifer in the course of carrying out extraction below the regional groundwater table.

Water Access Licences

The WM Act requires that all extraction of surface water or groundwater must be accounted for under the rules of any relevant water sharing plans. The *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources 2011* applies to the Project.

Water Sharing Plans specify the rules and limitations on water use in the region that is the subject of the plan and provide for equitable distribution of water in accordance with the limits of the setting, taking into account environmental requirements. The use (or 'take') of water under a Water Sharing Plan must be approved and the volume (or 'share) of that use limited through a water access licence.

It is noted that water capture, storage and use is permitted provided it is in accordance with the Maximum Harvestable Rights Capacity of the land, which is directly related to the location and size of the land.

Aquifer Interference Policy

The NSW Government's *Aquifer Interference Policy* has been established under the WM Act to manage the water licensing and assessment processes for aquifer interference activities. The WM Act defines an aquifer interference activity as that which involves the:

- penetration of an aquifer;
- interference with water in an aquifer;
- obstruction of the flow of water in an aquifer;
- taking of water from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations; or
- disposal of water taken from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations.

The Project would involve aquifer interference activities through the development of extraction pits and take of water from the regional groundwater table through groundwater inflows into the pits.

The Policy defines an agreed set of 'minimal impact' considerations that have been taken into account when assessing the Project and the potential for harm to occur to an aquifer and its dependent ecosystems, culturally significant sites, connected surface water sources and to existing water users. The Policy requires that the aquifer impact assessment consider potential impacts on water table levels, water pressure, and water quality in different types of groundwater systems. The Project has been assessed against the Aquifer Interference Policy in Section 6.3.

4.3.4 Roads Act 1993

The *Roads Act 1993* (Roads Act) applies to public roads in NSW, and depending upon the type of road, is administered by Traffic for NSW (TfNSW) or local council. Consent is required under section 138 of the Roads Act for works or structures that disturb the surface of a public road or connect a road to a classified road.

It is not envisaged that it would be necessary to disturb the surface of any formed public roads. However, a permit under the Roads Act will be required to undertake the proposed upgrade and sealing of the intersection of the Quarry Access Road and the Riverina Highway (as far as the property gate). As the Riverina Highway is a State road, the Application would undertake the works in accordance with the Works Authorisation Deed entered into with TfNSW.

4.3.5 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NP&W Act) aims to manage and conserve nature, objects, places and features that have ecological and/or cultural value. The NP&W Act is administered by the Biodiversity and Conservation Division (BCD) of DPIE.

Aboriginal places and objects are protected under the NP&W Act. The BCD holds a database of information and records regarding Aboriginal objects whose existence and location have been reported, known as the Aboriginal Heritage Information Management System (AHIMS).

An Aboriginal Heritage Impact Permit (AHIP) is generally required for consent to destroy, deface or damage an Aboriginal object or Aboriginal place. However, under Section 4.41 of the EP&A Act, the requirement to obtain an AHIP under the NP&W Act does not apply to SSD once development consent is granted. Rather, the management of any sites would be undertaken in accordance with an Aboriginal Cultural Heritage Management Plan prepared in consultation with BCD and Aboriginal stakeholders.

4.4 NSW State Planning Context

4.4.1 State Environmental Planning Policy (State and regional Development) 2011

The *State Environmental Planning Policy (State and Regional Development) 2011* (State and Regional SEPP) was gazetted on 28 September 2011 and applies to all development applications made following that date which satisfy nominated criteria.

Under Clause 7 of Schedule 1 of the State and Regional Development SEPP, for a development for the purpose of extractive industry to be classified as State Significant, the Project must either:

- extract more than 500 000t of material per year;
- have a total resource (the subject of the development application) of more than 5 million tonnes; and/or
- extract from an environmentally sensitive area of state significance.

As the Project would have a total resource of approximately 9.4 million tonnes, it is considered State Significant Development (SSD).

Clause 11 of the State and Regional Development SEPP specifies that development control plans do not apply to SSD.

4.4.2 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) specifies matters requiring consideration in the assessment of any mining, petroleum production and extractive industry development. **Table 4.1** presents a summary of the matters that the determining authority need to consider when assessing a new or modified project (Part 3 – Clauses 12 to 17 of the Mining SEPP). Reference to where these matters are considered in the EIS is provided in **Table 4.1**.

Table 4.1
Application of SEPP (Mining, Petroleum Production and Extractive Industries) 2007

Relevant Clause	Description	EIS Section
12: Compatibility with other land uses	a) Consideration is given to:	
	i) the existing uses and approved uses of land in the vicinity of the development;	5.3.2
	ii) the potential impact on the preferred land uses (as considered by the consent authority) in the vicinity of the development; and	Various Section 6
	iii) any ways in which the development may be incompatible with any of those existing, approved or preferred land uses.	N/A
	b) The respective public benefits of the development and the existing, approved or preferred land uses are evaluated and compared.	Various Section 6
	c) Measures proposed to avoid or minimise any incompatibility are considered.	Various Section 6
12A: Consideration of voluntary land acquisition and mitigation policy	a) Consideration is given to any applicable provisions of the policy for the mitigation or avoidance of noise or particulate matter impacts outside the land on which the development is to be carried out; and b) any applicable provisions of the policy relating to the developer making an offer to acquire land affected by those impacts.	6.5 and 6.6
12AB: Non-discretionary development standards for mining	This clause applies only to mining-related development.	N/A
13: Compatibility with mining, petroleum production or extractive industry	a) Consideration is given to: i) existing and approved land uses in the vicinity of the development; ii) whether the development is likely to have a significant impact on current or future mining, petroleum production or extractive industry; and iii) ways in which the development may be incompatible with existing and approved land uses or current or future extraction or recovery activities. b) The public benefits of the development and any existing or approved mining, petroleum production or extractive industry must be evaluated and compared. c) Measures taken by the applicant to avoid or minimise any incompatibility are considered.	N/A

Table 4.1 (Cont'd)
Application of SEPP (Mining, Petroleum Production and Extractive Industries) 2007

Relevant Clause	Description	EIS Section
14: Natural resource and environmental management	1. Consideration is given to ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure:	
	a) impacts on significant water resources, including surface and groundwater resources, are avoided or minimised;	6.3 and 6.4
	b) impacts on threatened species and biodiversity are avoided or minimised; and	6.8
	c) greenhouse gas emissions are minimised and an assessment of the greenhouse gas emissions (including downstream emissions) of the development is provided.	6.6.9
15: Resource recovery	The efficiency of resource recovery, including the reuse or recycling of material and minimisation of the creation of waste, is considered.	2.7.2 (water reuse)
16: Transportation	1. The following transport related issued are considered.	
	a) The transport of some or all of the materials from the site by means other than public road.	N/A
	b) Limitation of the number of truck movements that occur on roads within residential areas or roads near to schools.	6.2
	c) The preparation of a driver's code of conduct for the transport of materials on public roads.	6.2.4
17: Rehabilitation	The rehabilitation of the land affected by the development is considered, including: a) the preparation of a plan that identifies the proposed end use and landform of the land once rehabilitated; b) the appropriate management of development generated waste; c) remediation of any soil contaminated by the development; and d) the steps to be taken to ensure that the state of the land does not jeopardize public safety, while being rehabilitated or at the completion of rehabilitation.	2.13

4.4.3 State Environmental Planning Policy (Primary Production and Rural Development) 2019

The aims of the 'Primary Production and Rural Development SEPP' include the facilitation of orderly economic use and development of lands for primary production, the reduction of land use conflicts and sterilisation of rural land and the identification of State significant agricultural land.

With regard to State significant agricultural land and as described in Clause 10, the objectives of the Primary Production and Rural Development SEPP are:

a) "to identify State significant agricultural land and to provide for the carrying out of development on that land,

b) to provide for the protection of agricultural land:

i) *that is of State or regional agricultural significance;*

ii) *that may be subject to demand for uses that are not compatible with agriculture; and*

iii) *if the protection will result in a public benefit."*

The Project is considered with respect to these aims.

- The land that would be affected by the Project has not been identified as State significant agricultural land under Schedule 1 of the Primary Production and Rural Development SEPP.
- The operation of the existing Quarry has not conflicted with surrounding agricultural operations.
- The proposed final landform (wetlands and native vegetation) would not limit surrounding agricultural land uses.
- The employment and local economic stimulus that would be generated by the Project are likely to be of greater public benefit than that currently afforded by agricultural activities which currently occur within the Stage 4 extraction area (remaining areas have been previously disturbed for extractive industry use).

Based on the above, the Primary Production and Rural Development SEPP is not considered further in the EIS.

4.4.4 State Environmental Planning Policy (Infrastructure) 2007

The aim of the 'Infrastructure SEPP' is to facilitate the effective delivery of infrastructure across NSW. The proposed Project qualifies as a traffic generating development with relevant size or capacity under Schedule 3 of the Infrastructure SEPP. In accordance with Clause 104, before determining the development application, the consent authority must refer the Project to the TFNSW.

In accordance with Clause 104(3b), in determining the development application the consent authority must take into consideration:

i) *any submission that TFNSW provides in response to that notice within 21 days after the notice was given (unless, before the 21 days have passed, TFNSW advises that it will not be making a submission), and*

ii) *'the accessibility of the site concerned, including:*

a) the efficiency of movement of people and freight to and from the site and the extent of multi-purpose trips, and

b) the potential to minimise the need for travel by car and to maximise movement of freight in containers or bulk freight by rail, and

iii) *any potential traffic safety, road congestion or parking implications of the development.*

Proposed access to the Quarry (via the existing road) is presented in Section 2.8 and the intersection of this road with the Riverina Highway is assessed in Section 6.2 and the Road Transport Assessment. The proposed transportation route is considered the most efficient given the existing limitations on roads approaching Albury. Transportation by rail is not possible for this Project.

4.4.5 State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

Hazardous and offensive industries, and potentially hazardous and offensive industries, relate to industries that, without the implementation of appropriate impact minimisation measures, would (or potentially would) pose a significant risk in relation to the locality, to human health, life or property, or to the biophysical environment.

In accordance with SEPP 33, the hazardous materials to be held or used within the Quarry Site are required to be identified and classified in accordance with the risk screening method contained within Appendix 4 of *Applying SEPP 33* (DoP, 2011). Hazardous materials are defined within that document as substances falling within the classification of the *Australian Code for the Transportation of Dangerous Goods by Road and Rail* (Dangerous Goods Code) (Department of Infrastructure, Transport, Regional Development and Local Government, 2009).

The Applicant notes that the only potentially hazardous goods that would be used or stored within the Quarry Site would be diesel fuel (Class 3 C1) and other hydrocarbons in addition to lubricating oils and greases (Class 3 C2).

As small quantities of diesel fuel would be stored in a separate bunded container, they are not considered to be potentially hazardous and DoP (2011) does not require these to be considered further.

4.4.6 State Environmental Planning Policy No. 44 – Koala Habitat Protection and State Environmental Planning Policy– Koala Habitat Protection 2019

At the time that the SEARs for the Project were received and the assessments undertaken for the Project, SEPP 44 was the relevant State policy regarding Koala habitat protection. This policy will be repealed on 1 March 2020 and replaced with the SEPP Koala Habitat Protection 2019. Both of these SEPPs aim to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline. The SEPP Koala Habitat Protection 2019 updates the definition of core Koala habitat and the Koala feed tree species present in the various Koala management areas. The SEPP Koala Habitat Protection 2019 therefore has a broader definition of koala habitat recognising the variety of trees and locations that provide habitat for the species.

The Federation Local Government Area is listed under Schedule 1 of the SEPP Koala Habitat Protection 2019 as an area within the known distribution the species and that therefore could provide habitat for Koalas. This is consistent with SEPP 44 which prompted ecological field surveys that included searches for Koala or traces of past habitation.

Ecological field surveys of the Property did not record any sightings or traces of Koala habitation and it is concluded that the area is not 'core Koala habitat'. This SEPP is therefore not considered further.

4.4.7 State Environmental Planning Policy No. 55 – Remediation of Land

SEPP 55 requires that consent for any development cannot be granted unless the consent authority has considered whether the land is contaminated. As the areas proposed for disturbance within the Quarry Site have previously been used only for sand extraction and agricultural operations, the Applicant is satisfied that no contaminated land occurs within the Quarry Site. This SEPP is therefore not considered further in this document.

4.5 Local Planning Issues

The Project would be located on land entirely within the Federation Council Local Government Area (LGA). The Federation Council LGA formed in 2016 following the merger of the former Corowa Shire LGA and Urana Shire LGA and a Local Environmental Plan has not yet been prepared for the LGA. It is therefore most appropriate to consider the *Corowa Local Environmental Plan 2012* (Corowa LEP) which encompasses the former Corowa LGA, representing the land upon which the Project would be located.

Zoning

The Quarry Site is situated within land zoned as RU1 – Primary Production under the Corowa LEP (**Figure 1.2**). The objectives of zone RU1 – Primary Production are as follows.

- *"To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones."*

The Project is also situated within land zoned as E3 – Environmental Management under the Corowa LEP (**Figure 1.2**). The objectives of zone E3 – Environmental Management are as follows.

- *"To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values.*

- *To provide for a limited range of development that does not have an adverse effect on those values.*
- *To ensure development is compatible with the flood hazard and riparian corridor of the Murray River."*

Extractive industries are permissible with consent in both of these zones. It is not expected that the Project would compromise achievement of these objectives. The Quarry would provide for beneficial use of the natural resources within the Quarry Site.

Land use in the vicinity of the Quarry is presented in Section 5.3.2. It is not anticipated that the Project would result in land use conflicts with the surrounding agricultural operations as these have operated side-by-side for over 50 years with no issue.

The Project has been designed to limit potential risks associated with its proximity to the Murray River. This includes maintaining a 100m buffer from the bank of the river and constructing levee banks at an elevation that would minimise flooding of operational areas.

Flood Planning

Clause 7.2(1) of Part 7 of the Corowa LEP identifies the following objectives with regards to flood planning.

- *"To minimise the flood risk to life and property associated with the use of land.*
- *To allow development on land that is compatible with the land's flood hazard, taking into account projected changes as a result of climate change.*
- *To avoid significant adverse impacts on flood behaviour and the environment."*

A review of the Corowa LEP Flood Planning Map – Sheet FLD_009 and Sheet FLD_009A confirms that a large portion of the Quarry Site is located on land identified as being within the Flood Planning Area (**Figure 4.1**).

As noted above, the Quarry has been designed with flood levees surrounding operational areas which would limit flood water incursion. Section 6.4 provides an assessment of potential flood impacts and outlines management and mitigation measures identified as part of the Project.

Heritage

Clause 5.10(1) of Part 5 of the Corowa LEP identifies the following objectives with regards to heritage conservation.

- *"To conserve the environmental heritage of Corowa.*
- *To conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views.*
- *To conserve archaeological sites.*
- *To conserve Aboriginal objects and Aboriginal places of heritage significance."*

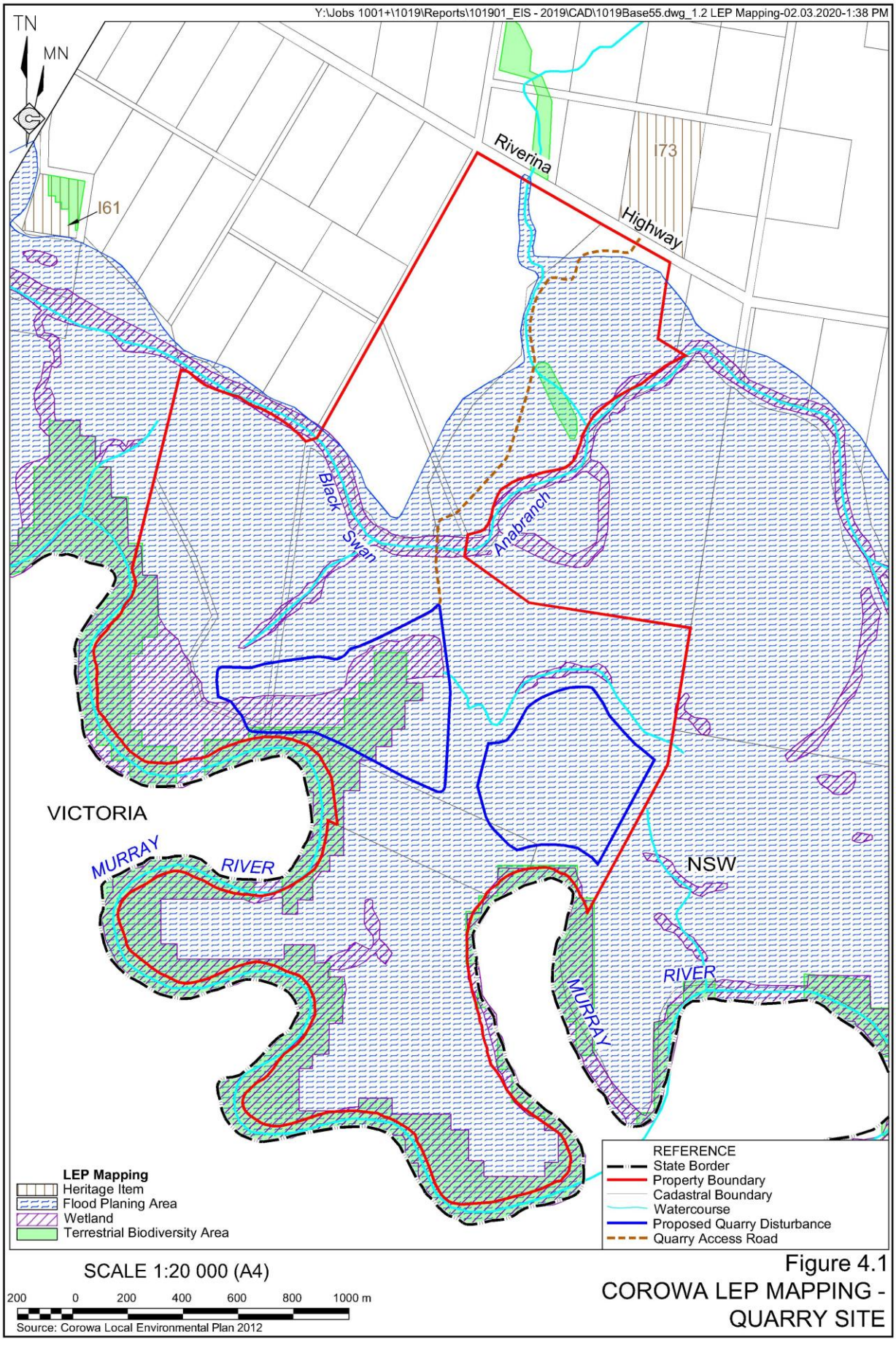

Figure 4.1
COROWA LEP MAPPING - QUARRY SITE

A review of Corowa LEP Map – Sheet HER_009 and Sheet HER_009A indicated that, while no heritage items occur within the Quarry Site, one heritage item listed under Schedule 2 of the Corowa LEP is situated adjacent to the Property on the northern side of the Riverina Highway (**Figure 4.1**). This heritage item, item number I73, is identified under Schedule 2 of the Corowa LEP as 'Homestead, garden and outbuildings – "Wyseworth".

It is not anticipated that the Project would impact the preservation of heritage values associated with the Wyseworth property. Section 6.10 provides details of the assessment of this local heritage feature.

Biodiversity

Clause 7.4 of Part 7 of the Corowa LEP identifies one objective with regards to terrestrial biodiversity, which is to maintain terrestrial biodiversity by:

- *"protecting native fauna and flora;*
- *protecting the ecological processes necessary for their continued existence, and*
- *encouraging the conservation and recovery of native fauna and flora and their habitats."*

A review of Corowa LEP Map – Sheet BIO_009 and Sheet BIO_009A confirms that the Quarry Site contains areas identified as "Biodiversity" (**Figure 4.1**).

The Project would require clearing of isolated trees on the banks of the existing extraction areas. All other areas planned for disturbance is cropping land. The Applicant would regenerate areas between the Quarry and the Murray River under the Project and undertake an expanded revegetation program that would enhance local environmental values. Section 6.8 provides further information on the outcomes of the assessment of risks and potential impacts to biodiversity values and outlines management and mitigation measures identified as part of the Project.

Wetlands

Clause 7.4 of Part 7 of the Corowa LEP identifies one objective with regards to wetlands, which is "to ensure that wetlands are preserved and protected from the impacts of development."

A review of Corowa LEP Map – Sheet WET_009 and Sheet WET_009A confirms that the Quarry Site contains areas identified as "Wetland" (**Figure 4.1**). Mapped wetland areas predominantly capture the riparian areas along the Murray River but also include areas within the existing Quarry Site that have been disturbed for the construction of ponds for water management.

Section 6.4 provides further information with regards to surface water management in the Quarry Site and outlines management and mitigation measures identified as part of the Project.

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Section 5

Local Environmental Setting

PREAMBLE

This section describes the local environmental setting within and surrounding the Property. Emphasis is placed upon providing information about the environmental setting and the features that would contribute to or influence the assessment of a wide range of other environmental parameters. Information is provided on the local topography and drainage, meteorology, land ownership and land uses.

5.1 Local Topography and Drainage

The topography and drainage of the Property is presented in **Figure 5.1**.

The Property is located on the Murray River floodplain. As a result, the local topography is characterised as relatively flat with marginally higher land to the southeast of the Property to the south of the Murray River. The elevation of the disturbance area within the Property ranges from 140m AHD to 141m AHD.

The Property is located adjacent to the Murray River, which is one of the most iconic rivers in Australia. The Murray River has its headwaters in the Australian Alps and flows along the NSW and Victorian border to South Australia. Water from the river has historically supported the agricultural development of the inland plains of NSW and Victoria, being an important source of water for irrigation. It also supports a range of native vegetation, which provides habitat for native species, including threatened species. The Murray River experiences seasonal variations to streamflow, which is also regulated through release of water from the Hume Dam. Murray River streamflow may vary from approximately 2 000ML/day in winter to 18 000ML/day in summer.

In the vicinity of the Property, local watercourses have formed an anabranching system, with creeks branching from the Murray River and flowing back in further downstream. The Black Swan Anabranch passes through the Property and the Murray River passes to the south, effectively forming an island on which the existing and proposed Quarry areas are located. Vehicular access to the Quarry area is available via a concrete bridge within the Property.

There are many cut-off meanders and billabongs throughout the Murray River floodplain, formed from old river courses. Some of these support riparian vegetation. Several such watercourses are located in the vicinity of the Property and generally hold water following periods of rainfall, with evidence of groundwater connection when river levels are high. The floodplain is well defined and in large floods becomes inundated.

5.2 Meteorology

5.2.1 Introduction

Meteorological conditions have the potential to influence a range of Project-related impacts on surrounding residences and the environment. This subsection provides a brief overview of the meteorological conditions surrounding the Property, focusing particularly on those aspects of the climate that are likely to influence the potential Project-related environmental impacts.

Temperature and rainfall data were obtained from Bureau of Meteorology (BoM) weather station at Rutherglen Research Station (Site No. 082039) is presented in **Table 5.1**. The Rutherglen Research weather station is located approximately 17.4 km southwest of the Site. Temperature data has been recorded since 1912 and rainfall data since 1913 at the station.

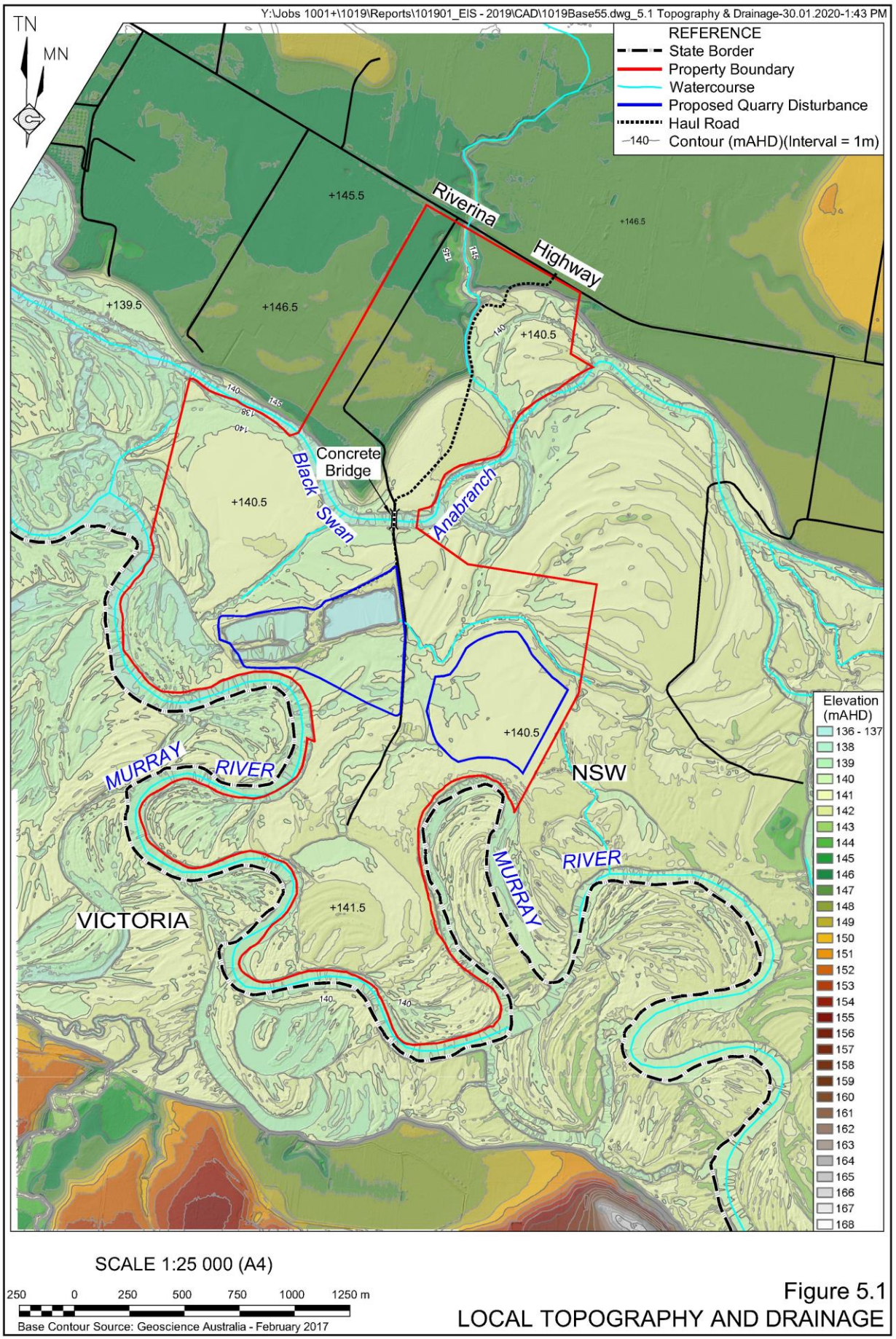

Figure 5.1
LOCAL TOPOGRAPHY AND DRAINAGE

Table 5.1
Monthly Meteorological Data

	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Temperature (C°) – Rutherglen Research (Site No. 082039) (1912 to 2020)													
Mean maximum temperature	31.5	30.8	27.4	22.0	17.0	13.4	12.4	14.0	17.2	21.1	25.5	29.3	21.8
Mean minimum temperature	13.8	13.9	11.0	7.1	4.3	2.5	2.1	2.7	4.1	6.2	8.7	11.5	7.3
Rainfall (mm)													
Mean rainfall	36.4	37.8	38.5	39.5	51.8	56.4	61.1	60.2	53.7	57.4	45.0	44.5	584.8
No. of days rainfall ≥ 1mm	3.9	3.6	4.0	5.1	7.1	8.3	9.6	9.7	7.6	7.2	5.5	4.8	76.4
9 am conditions - Relative Humidity & Wind Speed													
Mean R.H. (%) (1913-2010)	53	57	62	73	85	88	88	84	77	69	62	55	71
Mean W.S (km/h) (1939-2010)	14.4	12.1	11.9	9.8	7.8	7.3	8.4	11.2	13.4	14.4	15.5	14.8	11.8
3 pm conditions - Relative Humidity & Wind Speed													
Mean R.H. (%) (1974-2010)	27	31	34	43	57	67	68	61	57	48	38	30	47
Mean W.S (km/h) (1975-2010)	17.7	14.8	14.9	13.0	11.8	12.0	12.9	14.9	16.1	16.4	17.3	18.7	15.0
Source: Bureau of Meteorology - Rutherglen Research (Site No. 082039)													

5.2.2 Temperature and Humidity

Temperature data show that January is the warmest month with a mean maximum temperature of 31.5°C and mean minimum temperature of 13.8°C. July is the coldest month with mean maximum temperature of 12.4°C and a mean minimum temperature of 2.1°C.

Relative humidity varies notably across the year. Mean 9:00am relative humidity ranges from 53% in January to 88% in June and July. Mean 3:00pm relative humidity levels range from 27% in January to 68% in July.

5.2.3 Rainfall

The annual average rainfall is 584.8mm with an average of 76.4 days per year during which rainfall occurs. Rainfall is higher during the colder months of the year and declines during the warmer months. July is the wettest month with an average rainfall of 61.1mm over 9.6 days and January is the driest month with an average rainfall of 36.4mm over 3.9 days.

5.2.4 Wind

Annual and seasonal wind roses sourced from the Rutherglen Research weather station are presented in **Figure 5.2**. Winds from the southwest and west are particularly prominent in all seasons, with north-easterly winds also common in winter. Winds from the southeast are rare in all seasons.

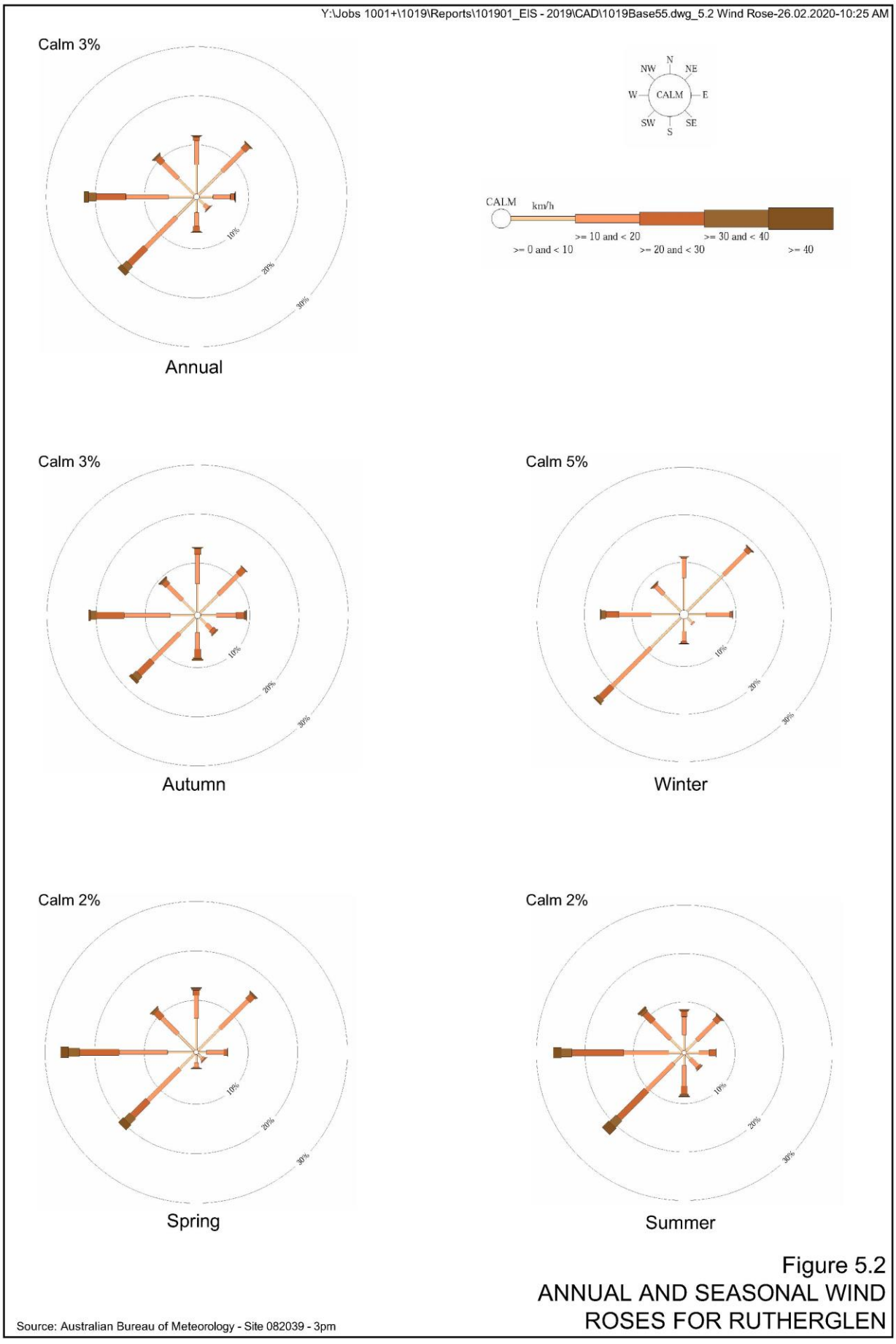

Figure 5.2
ANNUAL AND SEASONAL WIND ROSES FOR RUTHERGLEN

5.3 Surrounding Residences and Land Uses

5.3.1 Surrounding Residences

Figure 5.3 displays residences and land uses surrounding the Property. A total of five non-Project related residences and/or sensitive revivers are located within 2km of the centre of the Quarry disturbance, including two Crown Land lots and the Camp Nelson Scout Camp.

5.3.2 Land Uses

The Property is used for the extraction of sand and gravel and for agricultural production (**Figure 5.3**). Other areas surrounding the Property are predominantly used for agricultural production with the exception of Camp Nelson Scout Camp, which is used for recreational purposes on weekends and during school holidays.

The Project would not result in changes to commercial agricultural land uses surrounding the Property. Potential indirect impacts resulting from noise and air quality impacts in the surrounding environment are discussed in Sections 6.5 and 6.6, respectively. As described in Section 2.13, it is proposed to rehabilitate the Property such that it may be suitable for native vegetation conservation and as a wetland.

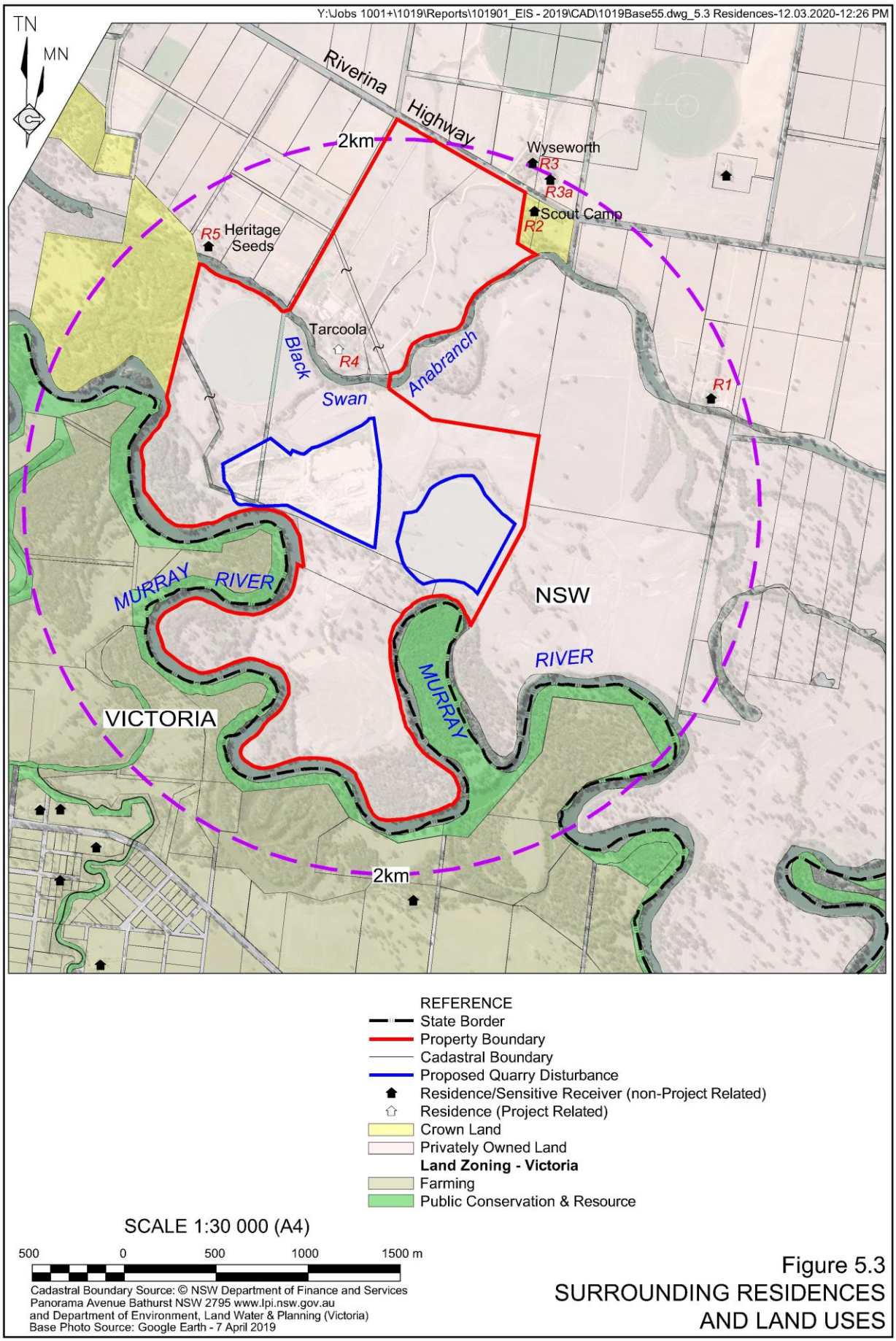

Figure 5.3
SURROUNDING RESIDENCES AND LAND USES

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Section 6

Assessment of Environmental Impacts

PREAMBLE

This section of the EIS presents the outcomes of assessments undertaken for the Project.

For each issue identified for assessment, the specific environmental features of the Quarry Site and its surrounds that would or may be affected by the Project are described. Information on existing conditions are used to identify potential risks and impacts. An assessment of each issue is presented followed by the proposed safeguards and controls that would be implemented to avoid, mitigate or manage potential impacts associated with the Project. A concluding assessment for each issue is provided taking into account the implementation of these measures.

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6.1 Prioritisation of Environmental Issues

The prioritisation of the key environmental issues, and hence their general order of presentation in this document, has been established through reference to the following.

- The environmental risk assessment presented in **Appendix 8**.
- The information provided through engagement processes described in Section 3 including consultation with the local community, Aboriginal community and Government agencies.
- The results of the review of relevant legislation, planning issues, policies and guidelines presented in Section 4.
- Review of the local setting and any identified constraints or land use conflicts identified in Section 5.
- The experience of RWC in assembling Environmental Impact Statements for similar projects.

The environmental issues identified by this process include the following.

1. Traffic and Transportation
2. Groundwater
3. Surface Water
4. Noise
5. Air Quality
6. Land Resources
7. Biodiversity
8. Cultural Heritage
9. Visibility
10. Public Safety and Hazards
11. Economic
12. Social

It is noted that the positioning of the economic and social assessments within the above order is not a direct consequence of the prioritisation assessment. Rather, from the assessment of the risk sources, potential consequences and nature of the existing environment, it was apparent that the majority of other environmental issues identified included actual or perceived social risks and, as such, it was appropriate that these issues be addressed following the discussion of the various contributing environmental issues.

6.2 Traffic and Transport

6.2.1 Introduction

A Road Transport Assessment for the Project was undertaken by The Transport Planning Partnership (TTPP) with the assessment report provided as Part 1 of the *Specialist Consultant Studies Compendium* (SCSC). The outcomes of that assessment are presented in this subsection with the report hereafter referred to as TTPP (2020).

The risk assessment undertaken for the Project (**Appendix 8**) identifies key risk sources with the potential to result in traffic and transportation impacts. These risk sources and the assessed risk of impacts after the adoption of standard mitigation measures are as follows.

- Increased traffic levels on the public road network resulting in inconvenience to commuters and accelerated pavement deterioration (Low).

- Increased traffic levels on the public road network resulting in increased risk of vehicle accidents (Low).
- Increased traffic resulting in reduced amenity of local area (noting presence of nearby traffic on the Riverina Highway) (Low).
- Increased traffic resulting in the risk of death or injury to native animals on the public network leading to loss of species in the local area (Low).

The SEARs for the Project require an assessment of matters relating to 'traffic and transport' that includes the following.

- 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.
- A detailed assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and State road network (as identified above).
- A description of the measures that would be implemented to mitigate any impacts, including concept plans of any proposed upgrades, developed in consultation with the relevant road and rail authorities (if required).

The SEARs for the Project are provided in **Appendix 3** and a summary of the requirements and reference to where the assessment matters have been addressed in the EIS is provided in **Appendix 4**.

Additional requests for assessment of traffic-related matters was provided by the Division of Resources and Geoscience (DRG) and Roads and Maritime Service that were generally consistent with the SEARs. These matters have been summarised in **Appendix 4** and a reference to where they have been addressed in the EIS is provided. It is also noted that feedback from community consultation raised concerns regarding changes to traffic conditions in Howlong.

6.2.2 Existing Transport Environment

6.2.2.1 The Existing Road Network

The transport route proposed for the Project would not change from those routes currently used for transportation operations (**Figure 6.1**).

The following roads and intersections have been considered for assessment as the principal route for access to and from the Quarry.

- The Quarry Access Road and its intersection with the Riverina Highway.
- The Riverina Highway to the west of the intersection with the Quarry Access Road.
- Sturt Street and River Road.
- The intersection of the Riverina Highway (Hawkins Street) with Sturt Street (which continues north as the Riverina Highway).

Figure 6.1
TRANSPORTATION ROUTE

The Quarry Access Road

The Applicant has constructed a Quarry Access Road for existing operations that provides vehicular access to the existing Quarry from the Riverina Highway. It is an unsealed private road, constructed to an average width of 12m that provides for two-way travel. The sign-posted speed limit on the road is 40 km/hr for a distance of approximately 1.3km from the intersection with the Riverina Highway at which point the speed limit reduces to 15km/hr in proximity to the landowner's residence. Approximately 1.6km from the intersection, the road crosses the Black Swan Anabranch via a single-lane concrete bridge. The speed limit on the bridge is 5km/hr. All speed limits on the southern side of the Black Swan Anabranch are 10km/hr.

The intersection of the Quarry Access Road and the Riverina Highway is a basic four-way rural access intersection. Traffic levels at this intersection have not warranted auxiliary turning lanes or localised road widening. The northern approach at this intersection provides access to the rural property on the northern side of the Riverina Highway. Access to the Wyesworth Homestead and the Camp Nelson Scout Camp are to the east of the Quarry Access Road. TTPP (2020) state that sight distances at the intersection of the Quarry Access Road and the Riverina Highway are suitable for the sign-posted speed limit.

The Riverina Highway

The Riverina Highway is a State road in the vicinity of the Property and is generally aligned in an east-west direction between Albury and as far west as Deniliquin. The road is a two-lane highway, providing for travel in both direction with sealed shoulders. In the vicinity of the Property, the sign posted speed limit is 100km/hr. The speed limit decreases to 50km/hr within Howlong where the road is known as Hawkins Street (approach from the east) and Sturt Street (approach from the north). At the intersection of Hawkins Street and Sturt Street the Riverina Highway continues north as Sturt Street as it leaves Howlong towards Corowa. The road branches to the northwest 5km from Corowa towards Berrigan.

The intersection of the Riverina Highway and Sturt Road is a four-way intersection. TTPP (2020) state that sight distances at the intersection are suitable for the sign-posted speed limit (50km/hr).

Sturt Street and River Road

Sturt Street to the south of the Riverina Highway is a regional road and is aligned north-south. The road connects the Riverina Highway to River Road to the south. Sturt Street is a two-lane road, providing for travel in both direction with sealed shoulders. The road has a speed limit of 100km/hr. River Road crosses the Black Swan Anabranch and the Murray River before entering Victoria where it is known as Chiltern-Howlong Road.

Other Roads

It is noted that once vehicles cross the Murray River to the south of the village of Howlong, they would predominantly travel via the Chiltern-Howlong Road and the Murray Valley Highway towards Albury. However, vehicles may also travel towards Rutherglen and further south towards Wangaratta and Benalla if required for customer deliveries.

6.2.2.2 Existing Traffic Levels

TTPP (2020) has sourced data on historic traffic volumes from RMS monitoring records for the Riverina Highway and River Road from 2010 and 2011 (see **Table 6.1**).

In addition, traffic surveys for the Project were undertaken for a 7-day period in March 2018 (13 March 2018 to 19 March 2018) and September 2019 (23 September 2019 to 30 September 2019). A summary of the data is presented in **Table 6.2**.

Table 6.1
Historic Traffic Levels

Location	Monitoring Station ID	Period	Weekday Average	Daily Average
Riverina Highway (16.5km east of the Quarry)	95042	1 January to 29 May 2011	2 352	2 509
Riverina Highway (7km west of the Quarry)	95045	5 June to 22 June 2010	1 626	1 675
River Road (5km west of the Quarry)	95467	1 January 2011 to 4 December 2011	1 631	1 730
Source: TTPP (2020) – Table 3.1				

Table 6.2
Traffic Survey Results

	Daily Average Vehicles (all days)	Weekday Average Vehicles	Percentage Heavy Vehicles (weekday)	Weekday AM Peak Hour (Traffic Level)	Weekday PM Peak Hour (Traffic Level)
Quarry Access Road (September 2019)	25	33	22.5%	6:00am to 7:00am (5)	1:00pm to 2:00pm (4)
Riverina Highway east of the Quarry Access Road (March 2018)	2915	3121	N/A	N/A	N/A
Riverina Highway west of the Quarry Access Road (September 2019)	2849	3157	10.3%	8:00am to 9:00am (264)	4:00pm to 5:00pm (289)
Sturt Street south of Riverina Highway (September 2019)	2015	2118	20.9%	10:00am to 11:00am (142)	5:00pm to 6:00pm (190)
Source: TTPP (2020) – Modified after Table 3.2, 3.3 and 3.4					

Review of the data indicates that weekday traffic on the transport route is higher on weekdays and as the majority of Quarry-related traffic would be produced on these days, the assessment has relied upon this data (resulting in a more conservative outcome). Approximately 10.3% of total traffic on the Riverina Highway are heavy vehicles, whilst for Sturt Street south of Howlong this is higher at 20.9%. This is possibly caused by additional traffic entering Howlong from the west and using River Road to enter Victoria. Heavy vehicles approaching Albury from the west would also be prevented from using the Riverina Highway east of Howlong due to weight restrictions on this section of the road.

The peak hours for traffic on the roads do not align indicating different uses for these roads for the majority of traffic. The peak traffic levels were also generally higher in the evenings.

6.2.2.3 Road Safety

TTPP (2020) reviewed road crash information obtained from the Centre for Road Safety (NSW) and Crash Statistics Vic Roads (Victoria) for the period from 2014 to 2018. The data provided the following relevant crash records.

- A total of 10 crashes were recorded along the Riverina Highway west of the Quarry Access Road and on Sturt Street. Two of these crashes involved heavy vehicles. Most crashes involved rear-end accidents with one crash involving a light vehicle striking a pedestrian.
- A total of 6 crashes were recorded along the Riverina Highway west of Howlong. No heavy vehicles were involved in these crashed with most involving light vehicles leaving the carriageway.
- Five crashes were recorded on Chiltern-Howlong Road to the south of Howlong. No details were provided on the nature of these accidents.

6.2.2.4 Local Features of the Road Network

There is a school zone on the Riverina Highway east of the intersection with Sturt Street that is associated with the Howlong Public School and Howlong Preschool (**Figure 6.1**). Speed limits are reduced to 40km/hr (from the sign-posted 50km/hr) within this zone during morning and afternoon periods on school days.

A private bus service (Route 915) and public bus route (1) provided by Public Transport Victoria, stop at bus stops adjacent to the Howlong Public School on both sides of Hawkins Street. These stops may also be used for the Howlong Preschool.

6.2.3 Predicted Changes to the Transport Environment

The principal change to the transport environment that would occur under the Project would be an increase in daily traffic levels associated with the proposed increase to the rate of production. As described in Section 2.8.2, the traffic levels from the Quarry would increase from the maximum experienced under existing operations of 4 laden loads per day (8 movements) to a maximum of 40 laden loads per day (80 movements). While this represents a 10-fold increase in proposed Quarry-related traffic, the Quarry traffic is expected to remain a small proportion of total traffic on the road network.

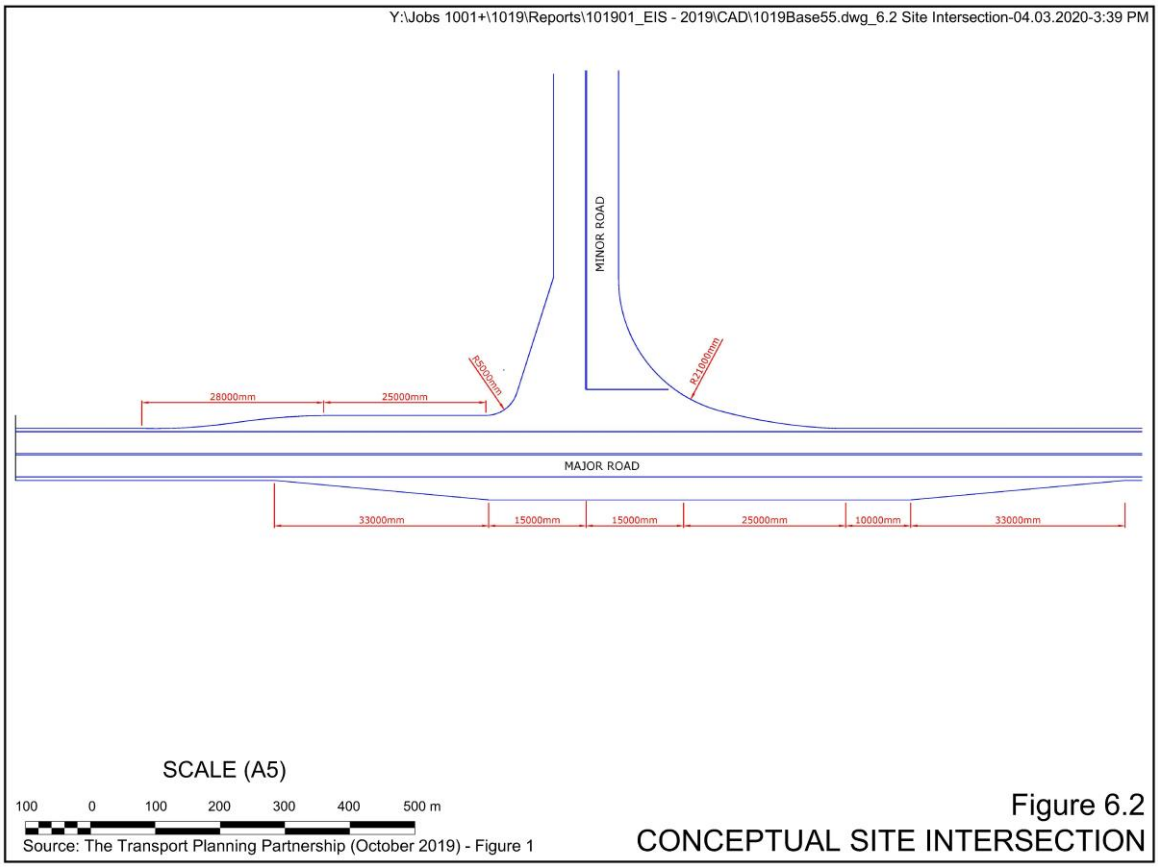
The transportation route would not change for the Project. The proposed intensification of transport operations is likely to increase the rate of road degradation and the appearance of signs of wear such as deformations, potholes and edgewear.

The increased traffic levels also have the potential to increase risks to road safety. However, while it is proposed to increase total traffic, the maximum hourly traffic levels would not significantly change from that currently experienced.

6.2.4 Management and Mitigation Measures

6.2.4.1 Design Features

TTPP (2020) identified that the proposed traffic levels and the speed of traffic on the Riverina Highway (100km/hr) warrant the minimum preferred treatment for rural roads at the intersection of the Quarry Access Road and Riverina Highway in accordance with the Austroads (2019) standards. This would include Basic Auxiliary Left (BAL) and Basic Auxiliary Right treatments. The BAL treatment would involve a widened shoulder for traffic entering the Quarry from the east while the BAR treatment would require a widened shoulder on the Riverina Highway (opposite the Quarry access) to allow through vehicles to pass. A preliminary concept plan for the intersection is presented in **Figure 6.2**.



As the intersection works would be required at the intersection with the Riverina Highway, which is a State road, the Applicant would enter into a Works Authorisation Deed with Roads and Maritime Services (RMS) for the works. It is anticipated that this upgrade works would be completed within 12 months of commencement of operations.

6.2.4.2 Operational Safeguards and Management Measures

The Applicant would implement the following operational safeguards to ensure that other motorists on the Riverina Highway and surrounding roads would be minimally impacted by the traffic generated by the Project.

- The Applicant would prepare a detailed *Traffic Management Plan*, following the receipt of development consent, to safely manage traffic impacts during all stages of the Project.

- The Applicant would require all truck drivers travelling to and from the Quarry to sign a Driver's Code of Conduct that clearly outlines the Applicant's expectations of each driver whilst travelling to and from the Quarry on public roads e.g. all loads would be required to be covered and all road rules would be strictly complied with, including school zone speed restrictions.
- A stopping point and one-way signage would be constructed to direct traffic using the private bridge over the Black Swan Anabranch.
- Road registered heavy vehicles would be requested to follow a one-way route within the Quarry (generally anti-clockwise) to minimise conflict with other heavy vehicles.
- Communication between Project-related heavy vehicle truck drivers and other heavy vehicle drivers on the public road network would be encouraged in the event of a traffic incident.
- Rapid response to traffic incidents would be prioritised to minimise traffic impacts.

6.2.5 Assessment of Impacts

6.2.5.1 Road Safety

TTPP (2020) identified that the existing intersection of the Quarry Access Road with the Riverina Highway provides satisfactory Safe Intersection Site Distances in both the eastbound and westbound directions for the road condition and speed of vehicles (a minimum of 248m to allow a reaction time of 2.0s where there is a level surface).

It was also identified that there is nothing in the road crash history (Section 6.2.2.3) of the locality that indicates causation factors associated with existing road network that would be exacerbated by the proposed increase to traffic levels.

6.2.5.2 Other Road Users

It is not anticipated that the proposed traffic levels of six heavy vehicle loads in a peak hour (12 movements) would increase risks for other road users, in particular those road users in the vicinity of the school or for private bus services.

The preparation of a Drivers Code of Conduct that identifies sensitive locations for drivers to be aware of when transporting materials would limit the risk of road use conflict.

6.2.5.3 Cumulative Traffic Impacts

TTPP (2020) identified the following traffic levels for the Project during peak operations.

- 26 light vehicle movements and 80 heavy vehicle movements on the busiest day.
- 4 light vehicle movements and 12 heavy vehicle movements in a peak hour.

All heavy vehicle traffic would travel from the Quarry to the west towards the village of Howlong. No heavy vehicles are permitted to enter Albury along the Riverina Highway from the west. Light vehicle traffic (for employees and visitors) would enter the Quarry from either direction.

TTPP (2020) reviewed projected traffic levels under a 'no project' scenario as well as under the Project scenario, assuming 10 years' background traffic growth at a rate of 1%. **Table 6.3** presents the cumulative traffic levels under the Project and Quarry contribution to total traffic.

Table 6.3
Projected Cumulative Traffic Levels and Quarry Contribution

	No Project Scenario Peak (Daily/Hourly)	Project Scenario Peak (Daily/Hourly)	Percentage Change (Daily/Hourly)	Quarry Alone (Daily/Hourly)	Percentage Contribution (Daily/Hourly)
Riverina Highway	3486 / 319	3553 / 333	1.9% / 4.4%	93 / 16	2.6% / 4.8%
Sturt Street South of the Riverina Highway	2334 / 210	2401 / 224	2.9% / 6.7%	93 / 16	4.0% / 7.6%
Source: TTPP (2020) – Modified after Table 4.2 and Table 4.3					

With regards the Project's contribution to heavy vehicle traffic only, the Quarry is predicted to contribute a maximum of 18.3% of daily heavy vehicles on the Riverina Highway west of the Property (or approximately one in every five or six heavy vehicles) and 14.5% of heavy vehicle traffic on Sturt Street South of the Riverina Highway (or approximately one in every seven vehicles). This estimate is based on the traffic levels projected 10 years into the future for a peak day.

TTPP (2020) also assessed the predicted impacts of the Project on the capacity and efficiency of the road network in the vicinity of Howlong and identified that there would be only a minor change to road congestion caused by a possible one or two second delay (determined as the percentage of time spent following) and no change to the midblock level of service on these roads.

The projected performance of the intersection of the Quarry Access Road and the Riverina highway was assessed using SIDRA INTERSECTION 8.0. The results indicate that the intersection is predicted to continue to operate with a good level of service indicating minimal delays for vehicles entering or exiting the Quarry.

6.2.5.4 Road Condition and Maintenance

Given the minor change to total traffic projected for the Project, it is not considered necessary for any upgrades or additional works to be completed on the public road network (excluding the intersection upgrade for the Quarry Access Road which would predominantly involve works on private land). It is expected that any wear on the public road network would be consistent with the projected life and performance of the roads and therefore maintenance and upgrade of these roads would be accounted for in the RMS planning for management of the network.

6.2.5.5 Conclusion

TTPP (2020) has reviewed the public road network that would be used for Project traffic and assessed potential impacts 10 years into the future. The assessment concluded that the existing road network would accommodate the proposed traffic levels with acceptable impacts to the

capacity, efficiency and safety of the road network. TTPP (2020) has recommended that the intersection of the Quarry Access Road and the Riverina Highway be upgraded in accordance with the Austroads (2019) standards and that driver behaviour be managed in accordance with the Traffic Management Plan and Driver's Code of Conduct. The Applicant has accepted all of these of these recommendations.

6.3 Groundwater

6.3.1 Introduction

A Groundwater Assessment for the Project was prepared by Water Technology Pty Ltd and is provided as Part 2 of the *Specialist Consultant Studies Compendium*. The outcomes of the assessment are presented in this section with the report hereafter referred to as Water Technology (2020).

The risk assessment undertaken for this Project (**Appendix 8**) identified key risk sources with the potential to result in groundwater impacts. These risk sources and the assessed risk of impacts after the adoption of standard mitigation measures are as follows.

- Interception of the local groundwater system resulting in reduced groundwater availability for existing groundwater users (Low).
- Reduction in groundwater flows subsequently reducing baseflow to the Murray River (Medium).
- Reduction in groundwater flows subsequently reducing baseflow that is relied upon by riparian or aquatic ecosystems (Low).
- Reduction in groundwater flows subsequently reducing baseflow that is relied upon by downstream water users (Low).
- Impacts to groundwater dependent ecosystems (GDEs) due to reduced groundwater flow (Low).
- Contamination of groundwater from on-site activities (Medium).

The SEARs for the Project require an assessment of matters relating to 'water' with matters relating to groundwater including the following.

- Identification of any licensing requirements or other approvals under the *Water Management Act 2000*;
- Demonstration that water for the construction and operation of the development can be obtained from an appropriately authorised and reliable supply in accordance with the operating rules of any relevant Water Sharing Plan (WSP).
- A description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant WSP or water source embargo.
- A detailed consideration of maintenance of an adequate buffer between all excavations at the highest predicted regional groundwater table;

- An assessment of the likely impacts on the quality and quantity of existing groundwater resources;
- An assessment of the likely impacts of the development on aquifers, watercourses, riparian land, water-related infrastructure, and other water users.
- A detailed description of the proposed groundwater management system, groundwater monitoring program and other measures to mitigate groundwater impacts.

In addition, requests from Department of Industry included assessment of the following.

- Assessment of impacts on groundwater sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems.
- Measures proposed to reduce and mitigate these impacts.
- Proposed groundwater monitoring activities and methodologies.

The following subsections present the outcomes of the Groundwater Assessment undertaken by Water Technology (2020) and cover the existing hydrogeological environment, the methodology used for assessment, an overview of proposed management and mitigation of groundwater-related impacts including the proposed groundwater monitoring program and a summary of potential residual environmental impacts.

6.3.2 The Existing Environment

Water Technology (2020) undertook a comprehensive desktop review of available groundwater data for the Upper Murray in order to develop an understanding of the likely groundwater setting in the vicinity of the Quarry. Publicly available data from NSW government groundwater management documents were also relied upon for hydrogeological data[1].

The existing Quarry is located in the Murray River floodplain within the eastern catchment of the Murray Alluvium Hydrogeological Landscape. The local area is a depositional environment comprised of alluvial floodplains, constructed flood-runners, ox-bows and levees. The landscape consists of Quaternary channel and floodplain sediments comprising sand, gravel and clay with small areas of windblown sand. Topsoil structure has in places been impacted by agricultural practices with the most common land degradation occurring through streambank erosion and compaction due to vehicular traffic.

The aquifers in this area have been described as generally unconfined with groundwater flow occurring through unconsolidated alluvial sediments (Muller et al 2015). As a result, the hydraulic conductivity and transmissivity are generally high and recharge is also estimated to be high. Groundwater flow paths are generally short and loosely follow topographic catchments. Water quality in the groundwater setting is typically fresh to marginal. In the vicinity of the

[1] Principally Muller et al. (2015). Hydrogeological Landscapes for the Eastern Murray Catchment. Office of Environment and Heritage, Sydney, NSW and Kulatunga N, (2009), Upper Murray Alluvium, Groundwater Management Area 015: Albury to Corowa, Groundwater Resources Status Report – 2008.

Quarry, Water Technology (2020) has assumed that alluvial sediments are up to 140m deep and extend beyond the broader property boundary. The geological setting, from the near surface downwards comprises of the following strata.

- The Coonambidgal Formation that contains sandy silt and would contain the water table.
- The Shepparton Formation that contains clays to gravels and exhibit low to medium transmissivity.
- The Lachlan Formation that consists of clays, sand and gravel, is generally deeper and exhibits higher transmissivity rates.
- The Olney Formation the contains interbedded sand and clay.

Water Technology (2020) have assumed a range of hydrogeological properties for assessment based on previous research in the Upper Murray catchment that are summarised in **Table 6.4**.

Table 6.4
Assumed Hydrogeological Properties

Hydrogeologic Properties	**Assumed**
Aquifer Type	Unconfined; Perching above clay-rich layers
Hydraulic Conductivity	10-2 to >10 m/day
Aquifer Transmissivity	2 to >100 m2/day
Specific Yield	5 to >15%
Hydraulic Gradient	<10%
Groundwater Salinity	EC <1 600 µS/cm
Depth to Water Table	<8 m
Source: Water Technology (2020) – Table 2.1	

Extraction would occur mostly within the Shepparton Formation to a depth that would comprise approximately 25% of the combined unit (Shepparton and Lachlan Formations). Extraction is not estimated to reach the Lachlan Formation.

The groundwater setting is estimated to be recharged via river seepage, rainfall and to a lesser extent irrigation infiltration with Katunga (2009) summarising annual recharge balances for the Upper Murray Alluvium at that time as follows.

- Rainfall infiltration - 9 700ML/annum.
- River leakage - 33 600ML/annum.
- Irrigation infiltration – 15 300ML/annum.

Katunga (2009) also recorded groundwater entitlements estimated at 41 125ML/annum (excluding stock and domestic bores) with 95% of this allocation directed to irrigation. Estimated usage of these entitlements peaked at 16 000ML in 2006/2007.

Available data on monitored Murray River and regional groundwater levels indicates that in the vicinity of the river, groundwater is responsive to peak flow periods, coinciding with water releases from the Hume Dam. Further from the river a seasonal relationship is evident with groundwater levels more reliant on rainfall. This relationship is demonstrated through review of the cumulative derivation from mean rainfall (see Section 2.3 of Water Technology, (2020)) that

indicates the strongest correlations are in bores distant from the river, while the closest bores have lower correlation to rainfall. During winter, the water level in the river drops by as much as 2.5m to where it appears there is very little flow. Historical experience at the Quarry also indicates that water inflows diminish during these periods. This data suggests that the Murray River highly connected with the aquifer system.

Water Technology (2020) also reviewed available regional data from nested piezometers installed in the Shepparton Formation and the Lachlan Formation that indicated the two aquifers are hydraulically connected and there is likely vertical flow of groundwater between these units. Several bores that were reviewed indicated a reduced potential flow from the Lachlan Formation indicating that this formation may be subject to higher levels of regional groundwater development for irrigation extraction.

6.3.3 Assessment Methodology

6.3.3.1 Groundwater Modelling

Water Technology (2020) considered the water balance assessment (see Section 2.7) in considering the draw on water resources coincident with the groundwater inflows to the extraction areas as they are dewatered. It is noted that in 2018 site personnel undertook an assessment of inflows in Stage 1 over a 26 day period measuring water level changes manually each day and estimating inflows to the extraction stage. It has been estimated that inflows comprised 2.5ML/per day at this location. This rate of inflow has been adopted by Water Technology (2020) for modelling purposes.

In addition to estimates of inflows, Water Technology (2020) also relied upon estimated irrigation water requirements for the property on which the Quarry is located. Historically, inflows to the extraction stages have been used to supply water for irrigation purposes. For the purpose of assessment, an average of 7.3ML per day is assumed to be diverted to irrigation use. In reality, irrigation would occur every three days with approximately 22ML required for each three day period. The estimate of irrigation requirements is based on the configuration of irrigation pivots within the broader property. The Applicant may also use water to irrigate revegetated or rehabilitated areas within the vicinity of the property (as described in Section 2.7). The landowners of neighbouring properties have also enquired about the use of available water to irrigate their properties. These options may be considered if irrigation demand changes in the future so that the balance of groundwater inflows is maintained.

A numerical groundwater model was developed using MODFLOW-96 (Harbaugh and McDonald, 1996) on the PMWIN platform (Chiang and Kinzelbach, 1998) by applying the available hydrogeological, river and climate data. The model extent comprised the following.

- A length parallel to the river valley of 12km and a width of 10km.
- Model cells sizes ranging from $100m^2$ distant from the Quarry and $50m^2$ in the vicinity of the Quarry (the middle of the model domain).
- Two layers were developed to represent the Shepparton Formation and the Lachlan Formation with varying aquifer parameters.
- River cells were used in the model to represent the Murray River channel and the Black Swan Anabranch.

For the purpose of modelling, the following climatic characteristics were applied.

- Long term monthly average evaporation and rainfall were adopted from the SILO data source over the period 1971 to 2018.
- Evapotranspiration was applied to the width of the river valley at an annual rate of 1 524mm with an extinction depth of 3m.
- Areal recharge (percolated from rainfall) was applied to the model at a rate equivalent to 3% of the long-term average annual rainfall of 576mm.

6.3.3.2 Model Calibration

The model was calibrated following an initial five-year steady state period against river and hydrograph data available for the period from 2013 to 2018 (existing conditions). The model predicted an inflow rate of 2.3MLper day which closely correlates with the assessed inflows of 2.5ML/per day. It is noted that calibration relied upon available regional data. Given the correlation of modelled and measured inflows, Water Technology (2020) considered the model to be fit for purpose to determine dewatering volumes and the extent of any drawdown impacts on the groundwater setting and regional groundwater users.

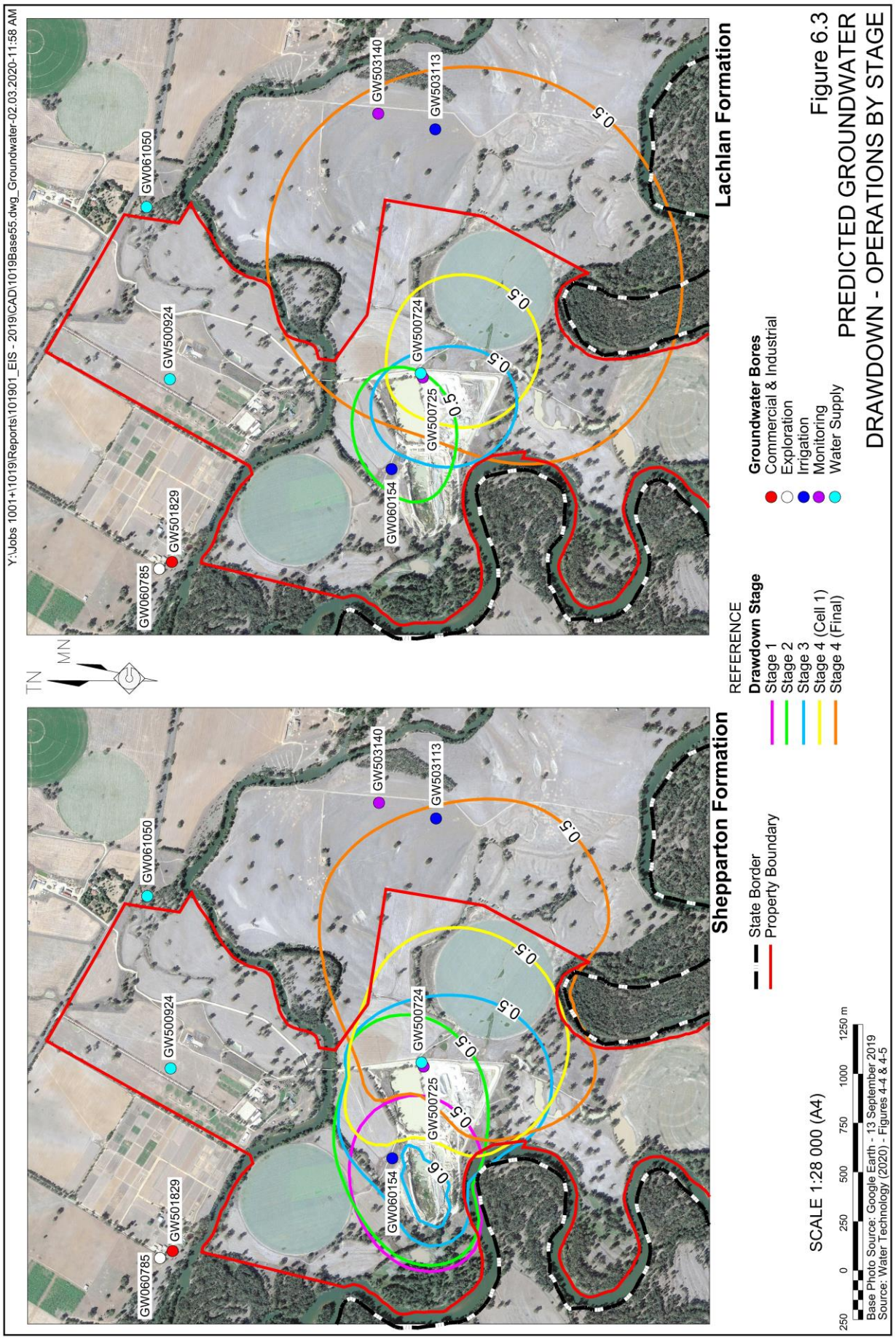
6.3.3.3 Modelling Results

The groundwater model was run for the period from 2020 to 2050 during progressive development of extraction stages (see Section 2.3). Extraction Stage 4 was modelled as discreet stages comprising 100m wide sub-stages consistent with the proposed extraction schedule (see **Figure 2.3**). This approach was selected to minimise the area actively being dewatered at any one time. However, in order to assess potential impacts, the model also included extraction with the entire Stage 4 extraction area open and dewatered, noting that this approach is unlikely given it would not be possible until the end of Stage 4 and would operational impractical given the necessary management of large volumes of water.

The following estimated groundwater inflows were obtained:

- Stage 1 expansion over 2 years – 7.2ML per day.
- Stage 2 expansion over 2 years – 4.1ML per day.
- Stage 3 excavation over 3 years – 3.2ML per day.
- Stage 4 excavation over 23 years – 3.8ML per day to 7.8ML per day
- Stage 4 at completion if completely dewatered – 10ML per day.

Water Technology (2020) modelled groundwater drawdown impacts at the end of each extraction stage (in both the Shepparton Formation and the Lachlan Formation) and confirmed that predicted drawdown within the Shepparton Formation would not extend beyond the property boundary due to the presence of the Murray River and the Black Swan Anabranch and that the Lachlan Formation is not intercepted, but would experience minor localised drawdown. **Figure 6.3** presents the predicted drawdown during operations in the Shepparton and Lachlan formations.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Lachlan Formation
Shepparton Formation
GW061050
GW503140
GW503113
GW500924
GW500724
GW500725
GW060154
GW501829
GW060785
0.5
0.6
TN
MN
REFERENCE
State Border
Property Boundary
Drawdown Stage
Stage 1
Stage 2
Stage 3
Stage 4 (Cell 1)
Stage 4 (Final)
Groundwater Bores
Commercial & Industrial
Exploration
Irrigation
Monitoring
Water Supply
SCALE 1:28 000 (A4)
250 0 250 500 750 1000 1250 m
Base Photo Source: Google Earth - 13 September 2019
Source: Water Technology (2020) - Figures 4-4 & 4-5
Figure 6.3
PREDICTED GROUNDWATER
DRAWDOWN - OPERATIONS BY STAGE

6.3.3.4 Interaction of Irrigation and Operational Demand with Groundwater Inflow

Progressive extraction for each stage would require dewatering of active areas and management of inflows on-site. The Applicant has committed not to discharge water to the Murray River, a circumstance that has been avoided for historic operations by using groundwater from the extraction areas for irrigation within the surrounding property.

It is noted that the predicted dewatering is in most cases lower than the combined estimated operational demand and irrigation demand. **Table 6.5** presents a review of the expected inflows, demand and expected balancing required. Given that water demand (rather than inflows) would be higher in most cases, the expected demand is the determinant of annual water use requirements for the purpose of licencing. This applies to all stages of development except in the worst-case development of Stage 4 which is considered unlikely to occur.

Table 6.5
Groundwater Dewatering and Water Demand Comparison

Stage	Dewatering Volume (ML/day)	Irrigation Demand (ML/day)	Operational Demand (ML/day)[1]	Total Demand (ML/day)	Balance Required (ML/day)	Annual Water Take (ML)[2]
1	7.2	7.3	0.4	7.7	-0.5	2 777
2	4.1	7.3	0.5	7.8	-3.7	2 795
3	3.2	7.3	0.6	7.9	-4.7	2 851
4 (one cell)	3.8	7.3	0.7	8.0	-4.2	2 890
4 (two cells)	7.8	7.3	0.7	8.0	-0.2	2 890
4 (whole)[3]	10	7.3	1.1	8.4	1.6	3 650

Notes: 1 – Includes water for processing, product moisture loss, dust suppression and evaporation balanced by rainfall.
2 – The highest of dewatering or total demand multiplied by 365
3 – Worst case scenario that would not occur under the Project.

Source: Water Technology (2020) – Modified after Table 4.2

To balance water demand during each stage, water would be drawn from completed ponds to make up expected demand (see Section 4.3 of Water Technology (2020)). In the event that irrigation demand is not as high as expected and the dewatering volume exceeds irrigation demand, the Applicant would use the water to irrigate rehabilitated or revegetated areas within the Property (see Section 2.3) or may reach an arrangement with neighbouring properties to share water for irrigation on those properties.

The Applicant currently removes water for irrigation from the Stage 2 extraction area via a dedicated pump. This procedure would be continued under the Project, with water drawn from active extraction areas and diverted to a dedicated section of the Stage 2 extraction area from where it would be available for irrigation. As extraction within each stage is completed, the completed stage would be allowed to refill to form a natural pond that would be rehabilitated as a wetland. Water would be selectively pumped from completed ponds in order that the draw on groundwater resources continues in each pond and water would continue to enter the ponds through the aquifer replacing water pumped for irrigation. The continual refreshing of the water would assist to maintain low salinity levels.

6.3.3.5 Post-Extraction Recovery and Salt Balance

As each stage is completed the water levels would recover in response to groundwater and rainwater inflow that would be balanced by removal of water for irrigation or other use and evaporation. Water Technology (2020) modelled long-term pond recovery levels and salinity with varying groundwater inflow rates. Average rainfall and evaporation data were used as inputs and extraction area geometries were estimated based on a final excavation level of 119m AHD, batter slopes of 2:1 (V:H) and surface areas as described in the staged development. The results demonstrate that pond levels recover and stabilise within two years.

The groundwater model was extended to include a 50-year period following completion of the quarry operations. The extraction areas were assigned a hydraulic conductivity of 1,000 m/d and specific yield of 1.0 to simulate open waterbodies. During this period a nett discharge was applied to each extraction area equivalent to net evaporation plus the following assumed on-going irrigation extractions.

- Stage 1 – 1.10 ML per day.
- Stage 2 – 1.10 ML per day.
- Stage 3 – 1.10 ML per day.
- Stage 4 – 4.05 ML per day.

The sequence of irrigation pumping from the extraction stages would ensure regular refreshing of water resource and limit the possibility of the ponds developing into salt sinks.

Post-extraction drawdown due to water drawn for irrigation and natural evaporation is predicted in the vicinity of the extraction stages but remains limited to the boundaries of the Murray River and the Black Swan Anabranch. **Figure 6.4** presents the predicted drawdown in the Shepparton and Lachlan formations post-extraction. In summary, no privately-owned bores would be impacted post-extraction due to the rehabilitated landform. Due to the continued extraction of water for irrigation, the salinity of the ponds would be maintained at between 500mg/L and 600mg/L based on an assumed starting groundwater salinity of 450mg/L.

6.3.4 Management and Mitigation Measures

The following subsection provides a summary of additional management, mitigation and contingency measures that would be expanded in the groundwater management component of the broader Water Management Plan that would be prepared prior to the commencement of operations under the Project in consultation with DPIE and NRAR.

The following management and mitigation measures would be implemented to reduce risks to the groundwater setting.

- Utilise groundwater removed from extraction stages for irrigation of agricultural activities on the Property or neighbouring properties
- Continue to balance water levels and irrigation demand in extraction stages as these are progressively developed.

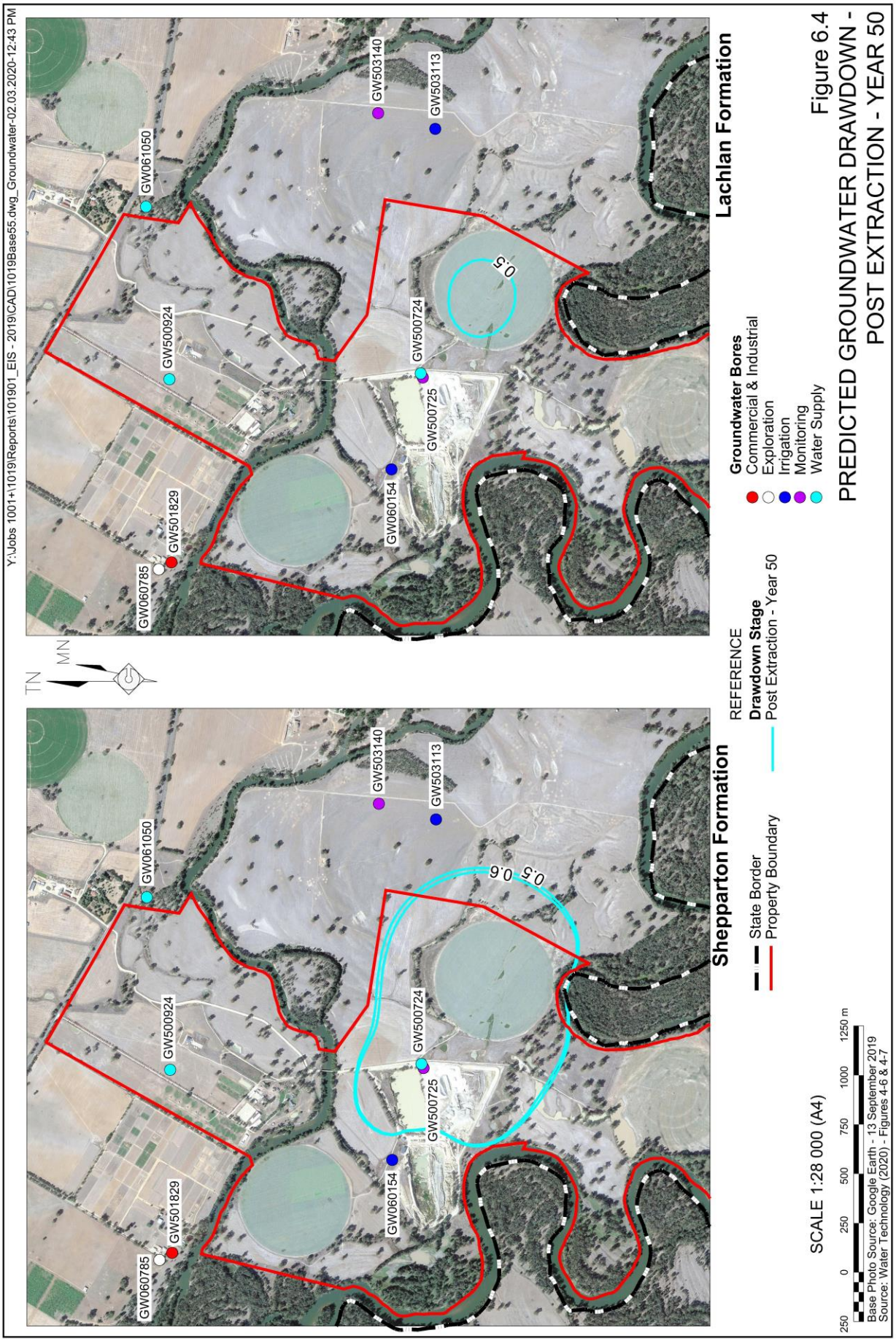

Figure 6.4
PREDICTED GROUNDWATER DRAWDOWN - POST EXTRACTION - YEAR 50

- Implement a comprehensive groundwater monitoring program as described in **Table 6.6** and at locations presented in **Figure 6.5**.
- Compare groundwater monitoring results to trigger levels provided in the ANZ Guidelines (ANZG, 2018) and thresholds for further investigation, until sufficient data is available to indicate site-specific trigger values.
- Provide for compensatory measures should monitoring indicate results have exceeded trigger levels including:
  - an investigation of impacts to privately-owned water bores and groundwater availability.
  - provision of compensatory measures for the effected landowner including the supplementary water from on-site supply or remedial measures for bore operation.
  - notification of impacts to the relevant Government authority and reporting on the incident.

Table 6.6
Groundwater Monitoring

Parameter	Monitoring Frequency	Reporting
Dewatering Volumes Including flow meter records and hours for all water pumped from the extraction stages.	When pumping	Annually
Groundwater Level Monitoring A groundwater monitoring network would be established comprising five bores located up gradient and down gradient of extraction to provide information on groundwater levels.	Monthly	Annually
Groundwater Quality Monitoring Groundwater quality monitoring would occur within the groundwater monitoring bore network. The details of the analytes and frequency of monitoring would be set out in the Water Management Plan, although initially it is proposed to monitor the following. • pH • Electrical conductivity • Total suspended solids • Oil and grease. • Total nitrogen	Quarterly, reduced to bi-annual once trigger levels have been established (nominally after 2 years)	Annually

Monitoring bores for the groundwater monitoring program would be installed and monitoring commenced once the locations for these bores are approved in a Water Management Plan.

A post-extraction irrigation schedule has been recommended in Section 6.3.3.5 in order to balance salinity in the rehabilitated ponds. Post-extraction management of the ponds would be described in a Riparian and Wetland Management Plan that would be prepared for the Quarry to guide the integration of the rehabilitated wetlands and ongoing irrigation requirements.

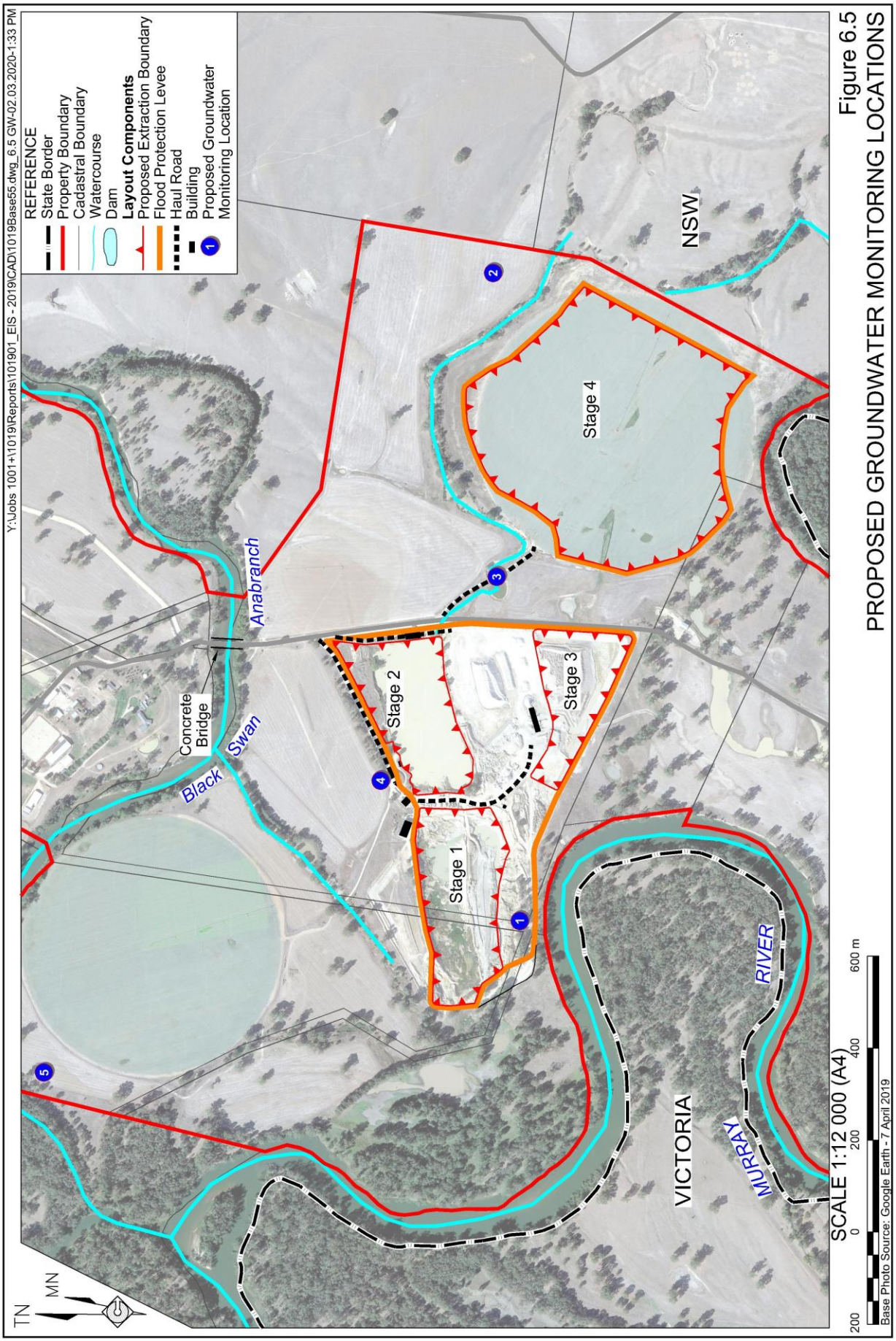

Figure 6.5
PROPOSED GROUNDWATER MONITORING LOCATIONS

6.3.5 Assessment of Impacts

6.3.5.1 Groundwater Users

The groundwater modelling undertaken by Water Technology (2020) indicates that groundwater drawdown would be limited by the Murray River and Black Swan Anabranch and therefore would not extend beyond the property boundary and would not impact privately-owned groundwater bores.

Groundwater bores registered within the property boundary may be impacted, however it is understood that these bores no longer exist or comprise the existing extraction areas.

6.3.5.2 Groundwater Dependent Ecosystems

Review of the *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources* (2011) indicates that no high priority Groundwater Dependent Ecosystems (GDEs) occur within the Quarry. In addition, data from the Australian GDE Atlas published by the National Water Commission (2012) has been assessed to identify potential GDE locations near the Quarry and indicate that riparian vegetation along the Murray River are considered to have a moderate potential to be groundwater dependent. This vegetation would not be disturbed by the Quarry operation and as groundwater flow gradient would be from the river towards the Quarry, no changes to the water available to this vegetation is likely to occur. However, there may be a localised impact adjacent to the extraction stages, depending on the reliance of vegetation on groundwater flows. This would not impact vegetation within 10m of the river. There are no subterranean ecosystems identified within the area considered for assessment.

The numerical groundwater model does not predict cross river impacts due to the bounding of drawdown by the Murray River and Back Swan Anabranch. Therefore, vegetation on the southern bank of the Murray River is not predicted to experience significant drawdown effects.

6.3.5.3 Water Quality

The most significant long-term impact to the hydrogeological setting would be the development of four ponds in the final landform that would be subject to natural evaporation and continued draw for irrigation. This development would increase the rate of inflow from the Upper Murray Hydrogeological Landscape driven by water removal from the ponds. Any ongoing loss of water would need to be accounted for in groundwater use entitlements in perpetuity.

As the ponds would become evaporative sinks, it is possible that as groundwater flow continues towards the pond, the pond salinity would gradually increase. However, it is proposed that water would continue to be drawn from the ponds for irrigation on the broader property, thereby reducing the levels of stored salt in the ponds. Due to the extraction of water for irrigation, the salinity of the extraction areas would be maintained at between 500mg/L and 600mg/L for an assumed starting salinity of 450mg/L. Should irrigation cease on the property, the levee banks that withhold floodwaters from the ponds would be deliberately breached in selected areas to allow flood flows to enter the ponds, thus reinstating natural processes. If flooding does occur, the ponds would be flushed with a negligible impact on water quality.

Potential groundwater contamination resulting from operational activities would be managed on-site through careful controls applied for all hydrocarbon storage, vehicle maintenance and spill risks and management.

6.3.5.4 Potential Impacts to the Murray River

Water Technology (2020) considered the potential impacts on the Murray River associated with extraction activities within 100m of the river bank, the depth of extraction and likely changes to the groundwater setting. The following general conclusions are presented in Water Technology (2020).

- A worst-case assessment of groundwater inflows and drawdown on the groundwater setting indicates that peak inflows of 10ML/day would need to be managed. This volume of inflow is 0.5% of the minimum (winter) daily river flow at Howlong and approximately 0.1% of the average minimum daily flow based on records from 2019. Given there is already an existing draw of water from the Quarry for irrigation activities, the change in dewatering volumes is likely to be much lower than the maximum predicted outcomes. Should all of the water that is entering the extraction stages originate from the Murray River, it would not result in significant changes to the availability of water to downstream users.
- The results of numerical groundwater modelling undertaken by Water Technology (2020) indicate that with the ongoing draw of water for irrigation and water lost through natural evaporation, water levels within the extraction areas would be below the river level. Therefore, it is unlikely that water stored in the extraction areas would flow to the Murray River (i.e. the flow gradient is from the river to the extraction area). As a result, there would be no change to flow contributions (baseflow) to the river and no change to water quality as a result of groundwater flows between the river and the extraction areas.

One of the Applicant's commitments for the Project is to reinstate a 100m buffer between the existing Stage 1 extraction area and the Murray River. Water Technology (2020) investigated the hydrogeological impacts of reinstatement of the buffer using predominantly clays and overburden removed from extraction stages. The materials would be selected to maintain the stability of the reinstated areas. It is accepted that an engineered backfilling process would be required. Given the small scale of the works, Water Technology (2020) concluded that minor changes to hydraulic connectivity due to the compaction of materials used for construction would be unlikely to significantly change groundwater flow patterns. While ponding of water around the structure may occur, this is likely to be minor. It is also noted that extraction within Stage 1 would occur over two years, after which time the extraction area would refill with groundwater providing additional stability.

6.3.6 Water Licencing

The following annual licence allocations within the Upper Murray Groundwater Source would be needed to cover the anticipated groundwater inflows that would result from operations and irrigation requirements.

- Stage 1 extraction over 2 years – 2 777ML per year.
- Stage 2 extraction over 2 years – 2 795 ML per year.
- Stage 3 extraction over 3 years – 2 851ML per year.
- Stage 4 extraction over 23 years – 2 890ML per year.

It is noted that these estimates are based on an irrigation demand of 2 684ML per year which is not associated with water demand for extraction operations but ongoing agricultural activities on the Property.

An inflow of 3 650ML per year has been assessed to provide an indication of the worst-case scenario should the whole of Stage 4 be excavated at once. Given the operational difficulties associated with dewatering such a large area, this would be unlikely, however has been assessed by Water Technology (2020).

Post-extraction, the Applicant would also need to account for both ongoing irrigation water use and evaporative losses from the rehabilitated ponds in their water license entitlements. An annual allocation of 3 075ML per year would be needed to cover the on-going irrigation (2 684ML per year) and the anticipated nett evaporation (391ML per year) after taking into account average rainfall patterns.

As described in Section 2.7, the Applicant currently holds sufficient licence allocations to account for predicted inflows and ongoing irrigation use. Groundwater dewatering would be reported each year and assessed against modelling predictions and the available licence allocation. Should the groundwater source be subject to any embargoes in the future, groundwater inflows would be managed at reduced levels by a decrease in irrigation demand and through reduction to the area actively being extracted to reduce dewatering for extraction. The current extraction stages have been designed for efficiency, however these active areas may be reduced to limit groundwater inflows as a remedial measure, if required.

6.3.7 Conclusion

The groundwater modelling undertaken by Water Technology (2020) has predicted that the groundwater drawdown impacts of the operation would be confined to the broader property and would not impact registered bore users. In addition, the groundwater modelling demonstrates that the strategy to continue managing groundwater inflows through irrigation practices would not result in significant impacts, with all groundwater take within the licenced entitlement. Impacts to groundwater dependant ecosystems are not predicted to occur. Potential impacts to the Murray River and downstream water users would not significantly change from existing operations. Finally, potential impacts to groundwater quality would be mitigated through the proposed irrigation practices (for potential salinisation) and the potential for contamination would be managed on site.

The most substantial change to the groundwater setting would be the development of ponds in the final landform. These areas would require an ongoing licence entitlement to account for water removed for ongoing irrigation practices and evaporation. A schedule of pumping for irrigation has been presented that would minimise salinisation of the rehabilitated ponds.

Potential impacts to the groundwater setting would be mitigated and managed through a Water Management Plan that includes a comprehensive monitoring program.

It is concluded that the Project would continue to operate with minimal impacts to the regional groundwater setting.

6.4 Surface Water

6.4.1 Introduction

A Flood Risk Assessment for the Project was prepared by Water Technology Pty Ltd and is provided as Part 3 of the *Specialist Consultant Studies Compendium*. The outcomes of the assessment are presented in this section with the report hereafter referred to as Water Technology (2019).

The risk assessment undertaken for this Project (**Appendix 8**) identified key risk sources with the potential to result in surface water impacts. These risk sources and the assessed risk of impacts after the adoption of standard mitigation measures are as follows.

- Discharge of dirty or contaminated water to the Murray River causing poor water quality in the river and impacts to natural environment or other water users (Low).
- Contaminated water within the Quarry Site impacting soil resources (Low).
- Natural flooding events damaging infrastructure located within the floodplain (Medium)
- Changes to flood behaviour due to Quarry infrastructure in the floodplain with subsequent increased flood risk or impact downstream (Medium).
- The capture of water within the flood levees that would otherwise have runoff to the natural environment reducing the availability of surface water to the natural environment and to other water users.

The SEARs for the Project require an assessment of matters relating to ‘water’ with matters relating to surface water including the following.

- Aa detailed site water balance, including a description of site water demands, water disposal methods (inclusive of volume and frequency of any water discharges), water supply infrastructure and water storage structures.
- Identification of any licensing requirements or other approvals under the *Water Management Act 2000.*
- Demonstration that water for the construction and operation of the development can be obtained from an appropriately authorised and reliable supply in accordance with the operating rules of any relevant Water Sharing Plan (WSP).

- An assessment of any likely flooding impacts of the development.
- An assessment of the likely impacts on the quality and quantity of existing surface water resources, including a detailed assessment of proposed water discharge quantities and quality against receiving water quality and flow objectives.
- An assessment of the likely impacts of the development on aquifers, watercourses, riparian land, water-related infrastructure, and other water users.
- A detailed description of the proposed water management system (including sewage), water monitoring program and other measures to mitigate surface water impacts;

In addition, requests from Department of Industry included assessment of the following.

- A detailed and consolidated site water balance.
- Assessment of impacts on surface water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, and riparian land.
- Measures proposed to reduce and mitigate these impacts.
- Proposed water monitoring activities and methodologies.

The following subsections present a summary of the existing hydrological environment and presents the outcomes of the Flood Risk Assessment undertaken by Water Technology (2019). An overview of proposed management and mitigation of surface water-related impacts including the proposed water monitoring program is provided, followed by an assessment of potential residual environmental impacts.

6.4.2 The Existing Environment

The existing surface water environment has been described in Section 5.1 in relation to the local watercourses and drainage features that surround the Quarry Site. The existing Property is part of a portion of land that is effectively located on an island in the Murray River as it is bounded to the south by the Murray River and to the north by the Black Swan Anabranch. Small ephemeral drainage lines are present in the vicinity of the Quarry Site including an unnamed watercourse to the north of the existing Stage 1 operations and the watercourse to the north of the proposed Stage 4 extraction area that is known locally as Cod Creek. The locations of these local drainage features are presented in **Figure 6.6**.

Surface water quality monitoring was undertaken by Mr Peter Clinnick of AES on 3 June 2019 at several locations within the Property. The results of the monitoring (both laboratory and field assessment) is presented in **Table 6.7** with the sample locations presented in **Figure 6.6.** For comparison, **Table 6.7** also includes reported data on water quality in the Murray River at Albury (MDBA, 2019).

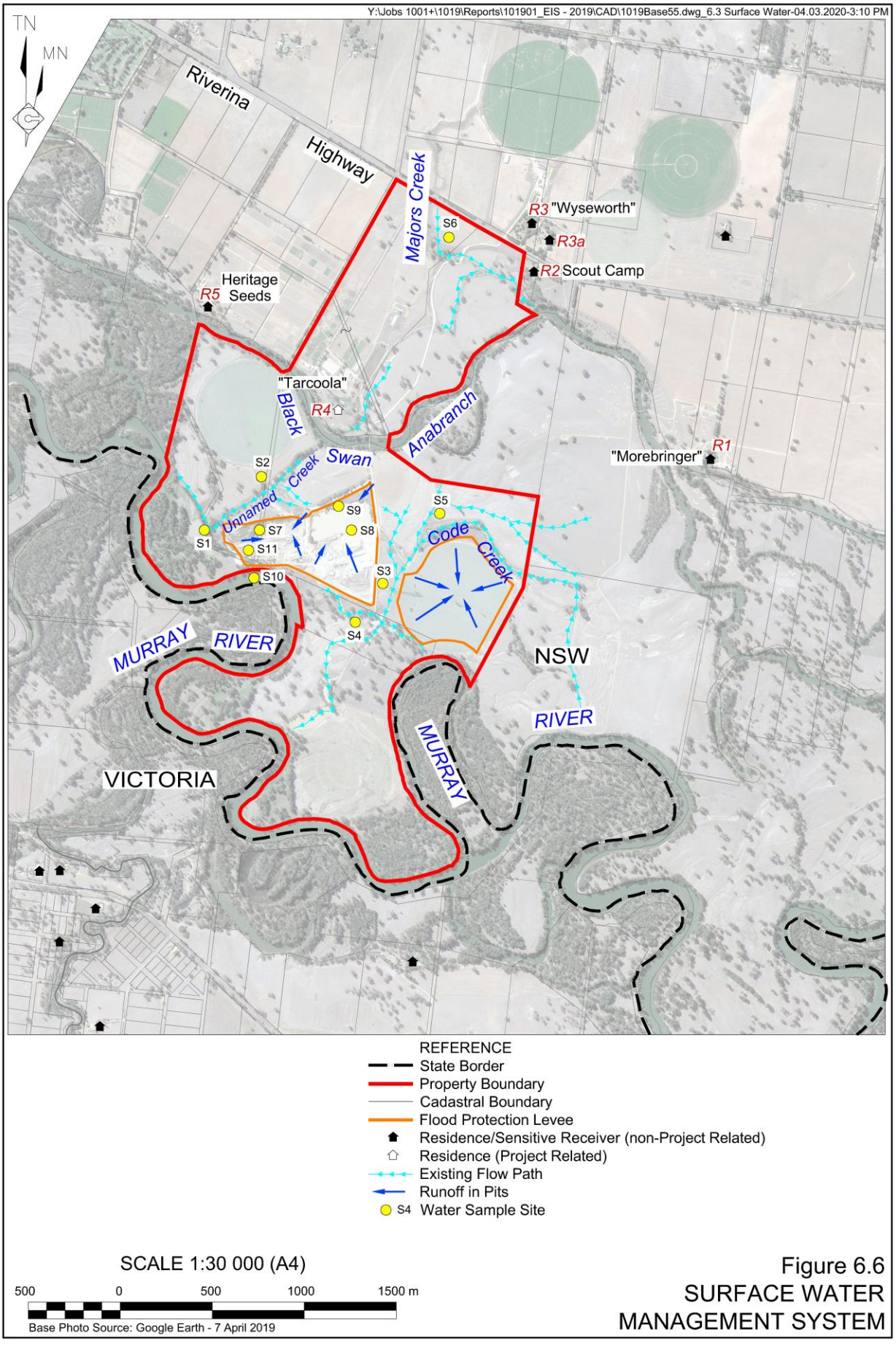

Figure 6.6
SURFACE WATER MANAGEMENT SYSTEM

Table 6.7
Surface Water Monitoring Results (June 2019)

Sample Point	Location	Water Quality Parameter			
		pH	Dissolved Oxygen (% Saturation)	Electrical Conductivity (µS/cm)	Turbidity (NTU)
ANZ Guideline[1]		**6.5 – 8.0**	**85 – 100**	**125 - 2200**	**6-50**
Murray River (2007 – 2012)[2]		**7.1-7.9**	**48-106**	**20-87**	**2-26**
Laboratory Assessment					
S1	Lagoon west of Stage 1	6.9	8.8	93	1 500
S2	Unnamed Watercourse Northeast of Stage 1	7.0	8.5	100	1 500
S3	Flood runner between Stage 3 and Stage 4	7.3	5.8	250	670
S4	Farm Dam south of Stage 3	7.0	8.7	110	1 900
S5	Cod Creek	7.2	9.0	99	1 700
S6	Major's Creek	7.5	7.3	170	160
S10	Murray River	7.3	N/C	50	2
S11	Stage 1	7.4	N/C	52	13
Field Assessment					
S7	Stage 1 - surface	6.8	N/C	99	300
S8	Stage 2 (north)	7.0	N/C	100	1 000[3]
S9	Stage 2 (south)	5.5	N/C	75	4 000[3]

Notes: 1. ANZ Guideline (2018) – default triggers for lowland rivers on Southeastern Australia
2. Source: MDBA (2019)
3. Result after dilution in the field required to generate a recording (likely underestimate).

Source: AES (2019)

The results indicate that the pH level is generally consistent across all sample locations and would satisfy the ANZ Guidelines (2018) except at location S9 which was taken on the southern bank of the Stage 2 extraction area. The results also generally indicate that site samples were relatively low in dissolved oxygen and exhibited high turbidity relative to the Murray River samples. The site samples were also slightly more saline than the river samples, but all were below the levels common in Victorian highlands of Victoria (125µS/cm). These results are consistent with water captured in ephemeral or low level ponds and the level of disturbance expected from a disturbed system. It is noted that watercourses outside the Quarry-related disturbance areas exhibited high turbidity which was noted in field recordings as due to stock access to the watercourses or the presence of runoff from irrigated surfaces.

As noted in Section 2.4.5, the disturbance area for the Quarry operations would be surrounded by a flood levee that has been designed to exclude a 1 in 100 year flood event and would be constructed to an elevation of 142.7m for this purpose. Construction of this levee has commenced under existing approved operations as a flood safety measure. As a result of the flood levee construction, the Quarry currently operates and is proposed to continue operating in a closed system that would limit the flow of water from outside the disturbed areas into the operating areas of the Quarry and would likewise, restrict the movement of any internal surface water runoff, should it occur. Water would be captured within the closed system would fall on disturbed land and would be captured for pollution control and would most likely be used for processing or irrigation (as described in Section 2.7). **Figure 6.6** presents the proposed location of flood levees.

6.4.3 Potential Impacts to Surface Water Resources

The following potential impacts may result from the Project.

- Flood incursion of operating areas.
- Changes to water quality within the Murray River or other watercourses in the vicinity of the Property.
- Reduction to water availability for downstream water users.
- Contamination of water resources by operational activities.

Geomorphological impacts to the Black Swan Anabranch during upgrades to the bridge crossing the watercourse.

6.4.4 Flood Risk Assessment Methodology

Water Technology (2019) assessed the potential flooding impacts of the following design storm events under both existing (no expansion) and proposed Project conditions.

- 5% Annual Exceedance Probability (AEP) Storm (1 in 20 years).
- 2% AEP Storm (1 in 50 years).
- 1% AEP Storm (1 in 100 years).
- 0.5% AEP Storm (1 in 200 years).
- 0.2% AEP Storm (1 in 500 years).
- Probable maximum flood.

Inflows rates were adopted from a 2012 flood frequency analysis undertaken by GHD on 130 years of streamflow records at the Doctors Point gauge (409017) on the Murray River (southeast of Albury). The data correlated well with the rapid flood frequency analysis provided by the Bureau of Meteorology for the same gauge. The Doctors Point gauge location was used as the upstream boundary for the hydraulic model. **Table 6.8** presents the inflow levels adopted for the flood risk assessment for each design storm event based on the analysis in GHD (2012).

Table 6.8
Floodwater Inflow Assumptions

Design Flood AEP	Total Inflow (m^3/s)
5%	1 678
2%	2 737
1%	2 894
0.5%	3 819
0.2%	5 093
Probable maximum flood	14 900
Source: Water Technology (2019) – Table 2.1	

Flood levels and depths at eight reporting locations were modelled. The proposed Project conditions incorporated flood levees constructed to an elevation of 142.7m AHD which were retrospectively incorporated to ensure the flood incursion would be restricted for storm events up to the 1% AEP level.

- Hydraulic modelling was undertaken of the Murray River, Black Swan Anabranch and Common Creek that connects the Murray River and Black Swan Anabranch to the northwest of the Quarry Site. The modelling methodology involved the following.
  - Developing a standalone one-dimensional MIKE 11 model of the entire Black Swan Anabranch, Common Creek and Murray River within the study area.
  - Developing a two-dimensional MIKE 21 model of the floodplain.
  - Linking the 1D and 2D models along the waterways to describe overflowing from the waterways onto the floodplain and back to the rivers.

More detailed information on the hydraulic modelling methods are presented in Section 3 of Water Technology (2019).

6.4.5 Flood Modelling Results

The modelling results demonstrate that under existing conditions, flood incursion would occur for a 5% AEP storm event but that once the flood levees are constructed, flood incursion would not occur for events up to a 1% AEP storm (that is, one in every 100 years). Water levels for a 1% AEP event would vary between 142.67m AHD and 141.83m AHD with an apparent increase in flood levels to the east of the Quarry Site and decrease to the west of the Quarry site between existing the proposed conditions due to the presence of the levees. Flooding impacts for the 1% AEP storm event under existing and Project conditions are displayed in F**igure 6.7**.

The results of modelling indicate that water levels could result in a minor increase in water levels up to 4km upstream of the site. The calculated increase in maximum water levels varies from a peak of 30cm at the Quarry Site, gradually reducing to 5cm, approximately 3km east of the Quarry Site with variations depending on the event considered.

The flood modelling has also confirmed that the extent of flooding events would not change as a result of the Project due flooding being confined to the floodplain.

6.4.6 Management and Mitigation Measures

Based on the outcomes of the flood risk assessment, following the construction of the flood levees around the proposed disturbance areas for the Quarry, no further mitigation would be required for flooding impacts.

The Applicant would implement the following management and mitigation measures to minimise the potential for surface water-related impacts through the operational life of the Project.

- Prepare and implement a Water Management Plan including a description of surface water management procedures.

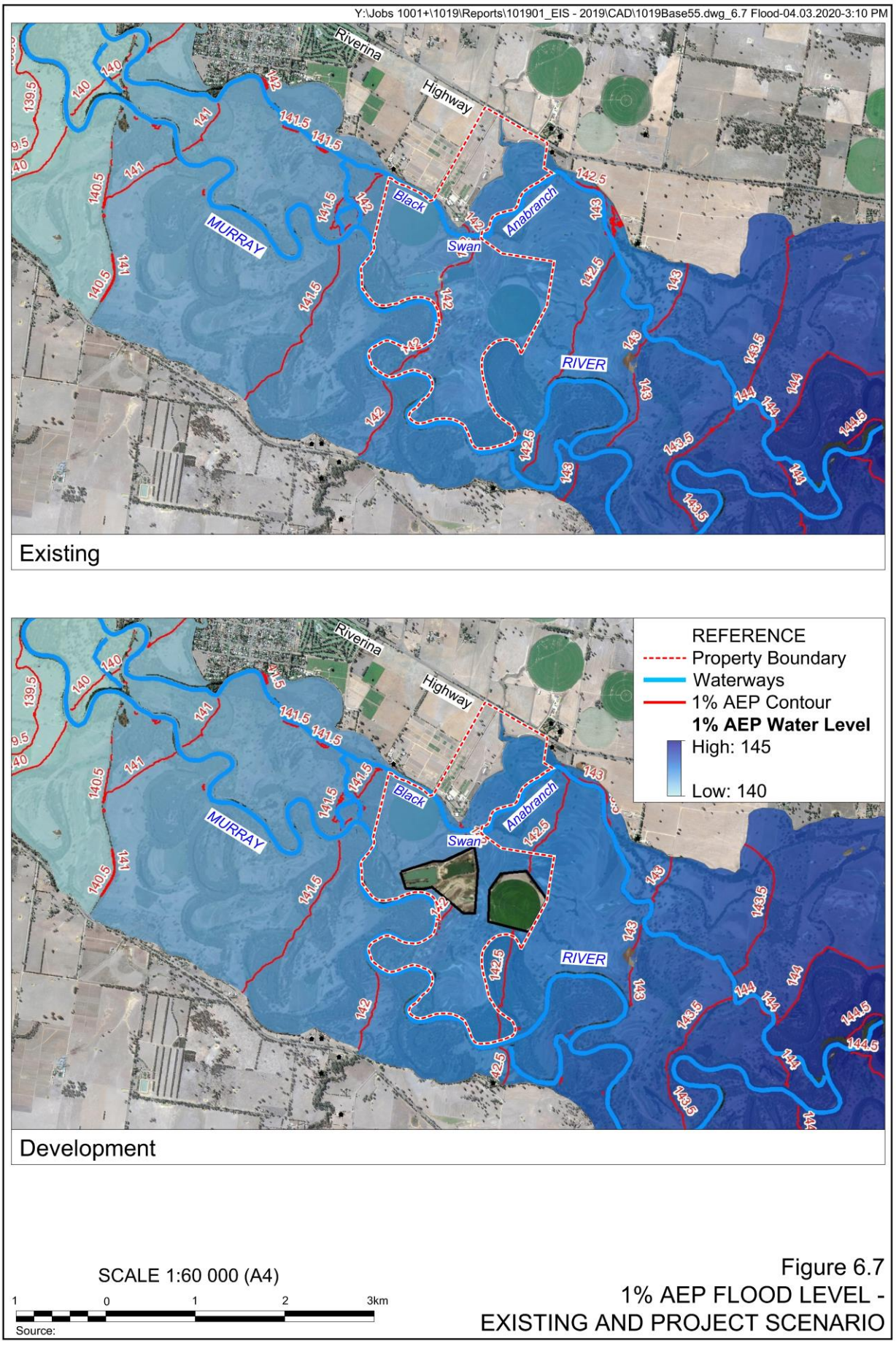

Figure 6.7
1% AEP FLOOD LEVEL - EXISTING AND PROJECT SCENARIO

- Ensure that no water collected within the Quarry Site is discharged to any nearby watercourse. All water would be used for processing, irrigation or on site dust suppression or would be stored and allowed to evaporate.
- Ensure that all fuel and chemical storage is bunded to 110% of the size of the largest receptacle in accordance with the relevant Australian Standards (currently *AS 1940:2017 The storage and handling of flammable and combustible liquids*).

6.4.7 Monitoring

In order to demonstrate compliance and manage water resources within the Property, a program of surface water monitoring would be implemented over the life of the Project.

As described in Section 6.3, for the life of the Project, the Applicant would monitor the volume of water removed from extraction stages, used for irrigation and would provide estimates of water used for processing, dust suppression and that lost as moisture content in product. These volumes would be reported in the Annual Review document.

In addition, monitoring of surface water quality in each extraction stage would occur every six months, with results compared to a sample from the Murray River in the vicinity of the Quarry. **Table 6.9** presents a summary of the surface water quality monitoring program.

Table 6.9
Surface Water Quality Monitoring Program

Monitoring Location and Extraction Stages (once commenced)	Frequency	Parameter
Murray River (at S10 – see **Figure 6.6**)	Every 6 Months	• pH • Electrical Conductivity • Suspended Solids • Oil and Grease

6.4.8 Assessment of Impacts

Risks to surface water resources have been assessed for the Project as follows.

- The flood risk assessment and hydraulic modelling prepared by Water Technology (2019) demonstrates that once the flood levees are constructed, the risk of flood incursion to operations would be reduced to a probability of less than one in every 100 years.
- Given that all operations would occur within a closed system, with no contributing catchment of clean water and there would be no discharge outside the levee banks, risks to water quality outside of the Quarry Site areas enclosed by the levees would be minimal. The Quarry Access Road would be regularly graded and maintained to ensure that it is not a source of sediment in the environment.
- Management procedures would be established to minimise the potential for spills or contamination within the Quarry Site.

- Operations would not draw on water from the Murray River or adjoining watercourses. In addition, the minor loss of rainfall runoff from within the 56.5ha catchment delineated by the levee banks would be minor in the context of the regulated and natural river flow levels[2]. Therefore, there would be negligible impacts on water availability for downstream users.
- The proposed upgrade to the bridge over the Black Swan Anabranch would not require modifications to the foundations of the bridge and therefore impacts to the structural stability of the bank of the Black Swan Anabranch would be avoided.

As a result of the above, it is concluded that the Quarry would continue to operate with minimal risk of impact to surface water resources.

6.5 Noise

6.5.1 Introduction

Technical noise assessments undertaken for the Project include an assessment of background noise conditions prepared by Audiometric & Acoustic Services (AAS) and a predictive noise modelling assessment was undertaken by Octave Acoustics (Octave) for both operational noise and road traffic noise generation. These assessment reports are provided as Parts 4 and 5 of the *Specialist Consultant Studies Compendium* respectively and are hereafter referred to as AAS (2020) and Octave (2019).

The risk assessment undertaken for the Project (**Appendix 8**) identifies key risk sources with the potential to result in noise impacts. These risk sources and the assessed risk of impacts after the adoption of standard mitigation measures are as follows.

- Noise generated from extraction and processing plant resulting in noise levels that cause annoyance and/or distractions and adverse effects on physical or mental health (Low).
- Relocation of and/or reduction of local native fauna species due to noise disturbance from extraction and processing plant (Low).
- Noise from trucks transporting quarry products off site resulting in annoyance and/or disturbance to neighbours and adverse effects on physical and/or mental health (Low).
- Community or regulatory scrutiny from noise levels (Medium).

The SEARs for the Project require an assessment of matters relating to 'noise' that includes the following.

- A detailed assessment of the likely construction, operational and off-site transport noise impacts of the development in accordance with the Interim Construction Noise Guideline, NSW Noise Policy for Industry and the NSW Road Noise Policy respectively and having regard to the Voluntary Land Acquisition and Mitigation Policy.

[2] Between March 2019 and February 2020 flows in the Murray River at Corowa varied between 2 203ML/day in June 2019 (unregulated) and 15 891ML/day in September 2019 (regulated by flows from the Hume Dam).

- A summary of the proposed reasonable and feasible mitigation measures that would be implemented to minimise noise emissions.
- The proposed monitoring and management measures, in particular real-time and attended noise monitoring.

The SEARs for the Project are provided in **Appendix 3** and a summary of the requirements and reference to where the assessment matters have been addressed in the EIS is provided in **Appendix 4**.

Additional requests for assessment of noise-related matters were made by the Environment Protection Authority (EPA) and the Division of Resources and Geoscience (DRG) that were generally consistent with the SEARs. These matters have been summarised in **Appendix 4** and a reference to where they have been addressed in the EIS is provided. It is also noted that feedback from community consultation raised concerns regarding operational noise.

6.5.2 Study Area

In order to assess potential impacts from operational activities, Octave (2019) predicted operational noise levels at three receivers (R2, R4 and R5) in the vicinity of the Quarry. Noise levels at R4 have been included in the assessment, however it is noted that the residence is project-related. R2 is the location of the Camp Nelson Scout Camp with the property owned by the State of NSW. This location is used infrequently on weekends only. The study area for the assessment of road traffic noise considered each stretch of road along the transport route from the Property to River Road, with noise levels also assessed at four receivers along the route (R6 to R9). The noise assessment locations are presented in **Figure 6.8** and listed in **Table 6.10**.

Table 6.10
Noise and Assessment Locations

Receiver	Assessment Type	Address	Description
MP1	Monitoring	4343 Riverina Highway	Within associated property between Quarry operations and residence
R2	Operational Noise	4271 Riverina Highway	Camp Nelson Scout Camp
R4	Operational Noise	4343 Riverina Highway	Project-related residence
R5	Operational Noise	4421 Riverina Highway	Heritage Seeds (Howlong Research Station)
R6	Road Noise	4580 Riverina Highway	A[1] – Riverina Highway from the Quarry Access Road to Holbeach Street
R7	Road Noise	85-87 Hawkins Street	B[1] – Riverina Highway (Hawkins St) from Holbeach Street to Sturt Street
R8	Road Noise	89 Sturt Street	C[1] – Sturt Street from Hawkins Street to Black Swan Anabranch
R9	Road Noise	131 Sturt Street	D[1] – Sturt Street from Hawkins Street to Wilson Street
Note 1: refers to road section shown in Figure 6.8			
Source: After Octave (2019) and AAS (2020)			

Figure 6.8
NOISE ASSESSMENT LOCATIONS

6.5.3 The Existing Environment

6.5.3.1 Meteorological Environment

The atmospheric conditions most relevant to noise assessments are temperature inversions and gentle winds. As night time operations would not be a feature of the Project, temperature inversions have not been considered. The *NSW Noise Policy for Industry* (NPI) (EPA, 2017) states that wind effects need to be assessed where source to receiver winds (at 10m height) of 3m/s or below occur for 30% or more of the time in any season in any assessment period. Winds experienced at the Property are generally from the southwest or northeast. In order that a conservative approach be applied to the operational assessment, the modelling has assumed a prevailing wind in the direction of each residence from the Property.

6.5.3.2 Acoustic Environment

The existing Quarry is the only industrial noise source in the local environment. Surrounding properties and residences are rural in nature and therefore noise experienced in the area includes birds and insects, farming activities and traffic on the Riverina Highway. To the east and west of the Property are rural properties used for agricultural production. This type of land use is not a significant noise source in the environment, excluding harvest periods when additional equipment and road vehicles are present. To the south of the Quarry is the Murray River which may attract wildlife including birds. To the north of the Quarry is the Riverina Highway, a State road connecting Albury and Deniliquin. There are also rural properties to the north of the Riverina Highway in the vicinity of the Quarry.

Monitoring of existing noise levels was undertaken by AAS (2020) between 2 July 2019 and 10 July 2019 at location MP1 (see **Figure 6.8**). This location was used as a conservative representation of noise levels for the operational noise assessment locations (R2, R4 and R5).

The background level recorded and the Rating Background Level (RBL) assumed for each period (daytime, evening and night in accordance with the NSW *Noise Policy for Industry* (NPI)) is presented in **Table 6.11**.

Table 6.11
Background Noise and Assumed Rating Background Levels

Period	Median Background Level (dB)	Rating Background Level (dB)
Daytime (7:00am – 6:00pm)	33	35
Evening (6:00pm – 10:00pm)	35	33*
Night (10:00pm – 7:00am)	36	33*
* RBL modified to median daytime background levels to account for wildlife noise during these periods.		
Source: AAS (2020) - Modified after Table 5		

The recorded median daytime background noise level was 33dB(A), which reflects the quiet rural environment that the Quarry is located in. This level is less than the assumed minimum rating background level (RBL) of 35dB(A) adopted by the NSW *Noise Policy for Industry* (NPI). Accordingly, the RBL adopted by the noise assessment was adjusted to 35dB(A) to ensure that the assessment is conservative. The recorded noise levels in the evening and night periods was higher than the daytime. This is expected to be due to greater levels of bird and insect activity.

As a result, the RBL has been modified to the median daytime noise level to ensure a conservative approach to the assessment.

6.5.4 Criteria for Assessment

The NPI sets out the procedure to determine the noise assessment criteria which are relevant to an industrial development. If it is predicted that any development is likely to cause the noise assessment criteria to be exceeded at existing residences, management measures would be required to reduce the predicted noise level of the Project to a level below the relevant noise assessment criteria. This subsection describes the criteria identified under the NPI and applicable to the noise assessment for the Project.

Project Noise Trigger Levels

The project noise trigger level (PNTL) provides a benchmark or objective for assessing the potential noise-related impacts associated with the Project. The PNTL is developed using two criteria.

- Intrusiveness Criteria: this criterion limits the degree of change that a new noise source introduces to the existing environment. The NPI considers the intrusiveness of an industrial noise source to be acceptable if the noise generated by the new noise source does not exceed the RBL by 5dB(A).
- Amenity Criteria: this criterion aims to limit continuing increases in noise levels from the application of the intrusiveness criterion in isolation (i.e. the combined industrial noise sources should remain below the recommended amenity noise level for a noise amenity area, as nominated by the NPI).

The PNTL is subsequently derived from the lower (that is, the more stringent) value of the intrusive noise level and the amenity noise level. The PNTL for the operational noise assessment of the Project are presented in **Table 6.12**.

Table 6.12
Operational Noise Assessment Criteria

Period	Rating Background Level (dB)	Project Intrusiveness Noise Level ($L_{Aeq,15min}$ dB(A))	Amenity Noise Levels ($L_{Aeq,15min}$ dB(A))	Project Noise Trigger Levels ($L_{Aeq,15min}$ dB(A))
Day (7:00am – 6:00pm)	35	40	45	40
Evening (6:00pm – 10:00pm	33	38	40	38*
Night (10:00pm – 7:00am	33	38	35	35*
* It is noted the PNTL for R2 would be greater than assumed for assessment as the property is closer to the Riverina Highway which would impact background noise levels.				
Source: AAS (2020) – modified after Table 6, Table 7 and Table 8				

Traffic Noise Levels

Noise from vehicle movements associated with an industrial source such as a Quarry is assessed in accordance with the NPI when the vehicles are on privately owned land. When the vehicles are on a public road, the Road Noise Policy (RNP) (DECCW, 2011) applies. Traffic noise from

the Project has therefore been assessed against the PNTL of the NPI whilst vehicles are within the Property, and against the criteria in the RNP when vehicles are on the public road network. **Table 6.13** presents the road transport noise criteria assumed for the Project.

Table 6.13
Road Transport Noise Assessment Criteria

Road Category	Project Type	Day[1]	Night[1]
Freeway / arterial / sub arterial roads	Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	60dB(A) $L_{eq(15hr)}$ (external)	55dB(A) $L_{eq(9hr)}$ (external)
Note 1: Road Noise Policy periods – Day = 7:00am to 10:00pm, Night = 10:00pm to 7:00am			
Source: RNP (2011) – Table 3			

6.5.5 Management and Mitigation Measures

Recognising that the Project would alter the local noise climate, the following design features, operational controls and management measures would be implemented by the Applicant. These measures would be described in the Environmental Management Strategy for the Quarry.

Design Features

- A 2.7m high levee bank would be constructed around the Quarry disturbance area to limit water ingress during periods of flooding of the Murray River (see Section 2.4.5). The levee bank would also attenuate operational noise associated with extraction activities, as modelled by Octave (2019).

Operational Safeguards, Controls and Management Measures

- All mobile equipment would be fitted with standard muffling apparatus.
- The existing processing plant is located adjacent to Stages 1 to 3, which are surrounded by a levee bank (**Figure 2.3**). The occasional use of a mobile crusher would also occur inside levee banks.
- Frequency modulated reversing alarms would be used on all mobile equipment.
- Internal roads would be well maintained to minimise body noise from empty trucks.

Additional operational safeguards to be adopted by the Applicant would include:

- restricting noise-generating activities to the nominated hours of operation;
- regular maintenance of all equipment;
- maintenance of dialogue with surrounding landowners to ensure any concerns over operational noise are addressed; and
- implementation if a complaints protocol to document complaints and to guide investigation and response procedures.

The above safeguards and controls have been incorporated into the noise modelling developed for the Project by Octave (2019) to assess the likely change to local noise levels.

Traffic Noise

Whilst the movement of heavy vehicles from the Quarry is already a feature of local roads, the Applicant would implement the following safeguards and controls to minimise the potential for any increase in overall noise levels.

- Transport operations would adhere to the approved hours of operation.
- The Applicant would refuse entry to poorly maintained vehicles, or those reported to generate excessive noise levels.
- The Applicant would ensure all truck drivers comply with a Drivers Code of Conduct outlining procedures for reducing noise impacts when travelling to and from the Property and whilst on site.

6.5.6 Assessment Methodology

6.5.6.1 Operational Noise

A 3D noise model of the Quarry Site and its surrounds was developed by Octave (2019) using CadnaA noise calculation software. The model calculates noise propagation considering a range of physical factors (wind, geometrical spreading, topography, reflection, absorption and barrier effects) and the sound power level of equipment listed in **Table 6.14**. A detailed description of the methodology is provided in Section 2.2 of Octave (2019).

Table 6.14
Noise Sources and Sound Power Levels

Item	Lw dB(A) $_{Leq(15min)}$
Wash Plant	93
17t Screen	109
209kW Loader	107
232kW 39t Loader	108
Diesel Generator	92
350kW 36t Truck	109
128kW 23t Truck	104
66kW 14t Excavator	97
Water Tanker	107
309kW 37t Dump Truck	111
Source: Octave (2019) – after Table 7	

All equipment was modelled as running simultaneously in various locations within the Property over the anticipated operational life cycle of the Quarry. Four operational scenarios were modelled, one for each of the extraction Stages 1 through 4 as described in Section 2.5 and illustrated on **Figure 2.4**. The use of the mobile crusher was excluded from the modelling as it would only be used on three or four occasions per year and its contribution to noise in the local environment would be therefore be limited (Octave, 2019).

A predictive model was developed for daytime operations (7:00am to 5:00pm), covering extraction operations, load and haul, processing, product loading and despatch. However, vehicle loading and product despatch may occur between 7:00am and 10:00pm and vehicles may also arrive at the Quarry from 6:30am, but would not be loaded until after 7:00am. Therefore, predictive models were also developed for vehicle noise on the Quarry Access Road under evening (5:00pm to 10:00pm) and night (6:30am to 7:00am) conditions assuming the maximum rate of vehicle movements described in Section 6.2, and assuming that all other equipment in the Property was inactive.

6.5.6.2 Road Traffic Noise

A 3D noise model of the Riverina Highway and the town of Howlong was developed using CadnaA noise calculation software, implementing the road traffic noise algorithms and noise model inputs described in Sections 2.1 and 2.1.1 of Octave (2019). The four road sections designated A to D are shown on **Figure 6.8** were modelled. The results were calibrated against the noise levels measured by AAS in July 2019 (AAS, 2020). This resulted in correction factors being applied to the modelled results for the night-time period and for road sections A and B, as detailed in Section 2.1.2 of Octave (2019). Models were developed for current and proposed operations.

6.5.7 Assessment of Impacts

6.5.7.1 Operational Noise

Octave (2019) modelled each Quarry stage independently (Stage 1 to Stage 4), incorporating extraction and processing operations as well as heavy vehicle traffic on the Quarry Access Road. As Quarry operations would be limited to daytime activities only (7:00am to 5:00pm but heavy vehicles may be loaded and despatched from the site between 7:00am and 10:00pm, the loading and despatch activities were separately modelled with extraction and processing inactive for prediction of evening noise generation. In addition, it is noted that heavy vehicles may also arrive at the Quarry from 6:30am and therefore noise generation has been considered against night-time noise criteria.

Operational noise modelling for each extraction stage predicted the same noise level result at each receiver. This is not surprising given that the Processing Plant would be the major contributor to noise emissions at the Quarry and the location of that plant would not change over the operational life of the Quarry. The results suggest that the daytime noise impact at each receiver is not sensitive to the location of extraction operations within the Property. Further details on the modelling results is provided in Section 2.2.1 of Octave (2019).

The maximum predicted noise level result at each of the receivers, taking into account the extraction, processing and vehicles loading and despatch are presented in **Table 6.15**. The modelled outcomes for Stage 2 considered to be representative of the worst-case outcomes (as operating equipment would be closest to residential receivers) is presented in **Figure 6.9**. **Figure 6.9** also provides the locations of operating equipment (noise sources) applied for modelling.

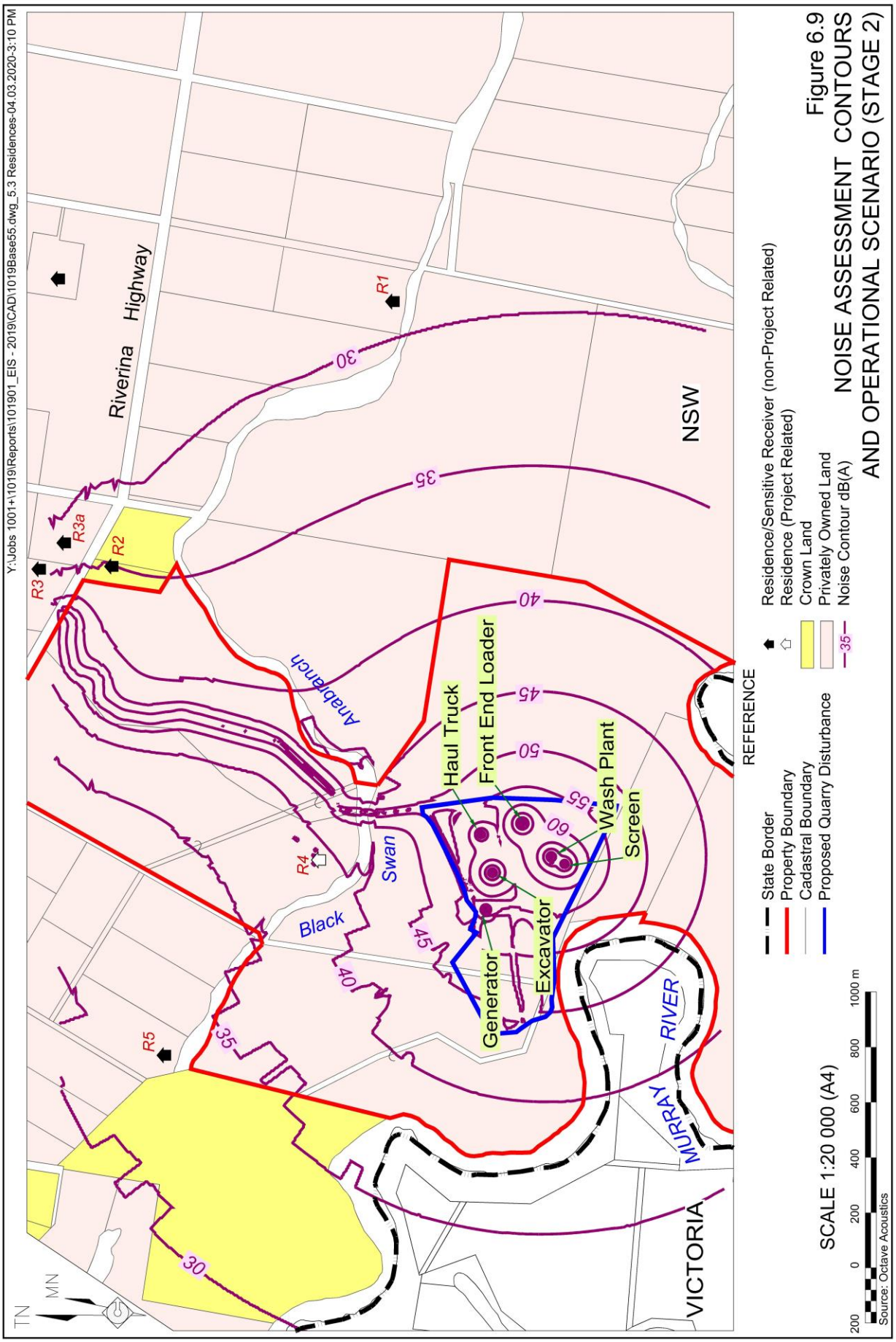

Figure 6.9
NOISE ASSESSMENT CONTOURS
AND OPERATIONAL SCENARIO (STAGE 2)

Table 6.15
Predicted Operational Noise Levels (All Operations)

Receiver	Predicted Noise Levels (dB(A)$_{LAeq}$)	
	Day[1] / Evening[2]	
	Maximum Predicted Noise Level	Most Stringent Criteria
R2 (Camp Nelson Scout Camp)	36	>38
R4[3] (4343 Riverina Highway)	38	38
R5 (Heritage Seeds)	33	38
Note 1: 7:00am to 5:00pm Note 2: 5:00pm to 10:00pm Note 3: R4 is a Project-related residence		
Source: Octave (2019) after Tables 8 to 11		

It is noted that during the evening period (6:00pm to 10:00pm) only truck loading and despatch would be occurring. Therefore, the predicted outcomes (which include other operations) are highly conservative. The maximum predicted noise level result for evening and night-time operations are presented in **Table 6.16**. In all cases the predicted noise levels are below the criteria levels.

Table 6.16
Predicted Operational Noise Levels (Internal Quarry Traffic Only)

Receiver	Predicted Noise Levels (dB(A)$_{LAeq)}$	
	Night[2]	
	Maximum Predicted Noise Level	Trigger Level
R2 (Camp Nelson Scout Camp)	31	>35
R4[3] (4343 Riverina Highway)	34	35
R5 (Heritage Seeds)	21	35
Note 1: 5:00pm to 10:00pm Note 2: 6:30am to 7:00am Note 3: R4 is a Project-related residence		
Source: Octave (2019) after Tables 8 to 13		

6.5.7.2 Public Road Traffic Noise

The predicted road noise levels under current and proposed conditions are presented in **Table 6.17**. The results show that under both existing and proposed scenarios, the predicted noise satisfies the assessment criteria. The Project would result in a negligible increase in road noise with a minor increase of 1dB(A) during daytime operations predicted at receivers R8 and R9 on road sections C (Sturt Street from Hawkins Street to Black Swan Anabranch) and D (Sturt Street from Hawkins Street to Wilson Street) respectively (**Figure 6.8**). In practice, a 1dB(A) increase in sound level is an imperceptible change.

Table 6.17
Predicted Road Noise Levels, dB(A)

Receiver / Road Section[1]	Current		Proposed		Criteria	
	Day Maximum (LAeq 15hr)	Night Maximum (LAeq 9hr)	Day Maximum (LAeq 15hr)	Night Maximum (LAeq 9hr)	Day (LAeq 15hr)	Night (LAeq 9hr)
R6 and Riverina Hwy from Subject Site entry to Holbeach St	60	55	60	55	60	55
R7 and Riverina Hwy/Hawkins St from Holbeach St to Sturt St	58	53	58	54	60	55
R8 and Sturt St from Hawkins St to Black Swan Anabranch	58	54	59	54	60	55
R9 and Sturt St from Hawkins St to Wilson St	58	54	59	54	60	55
Note 1: See **Figure 6.8**						
Source: Octave (2019) – after Tables 4 to 6						

6.5.7.3 Maximum Noise Levels and Sleep Disturbance

Operational noise that may be generated during the night-time period would include trucks arriving at the Quarry between 6:30am and 7:00am on operational days. It is concluded that operational noise would not be likely to cause sleep disturbance at the closest privately-owned residences.

The RNP provides indicative guidance on the road traffic generated maximum short-term internal noise levels that may cause sleep disturbance. Internal noise levels should be limited to 50dB(A) to 55dB(A) to limit the potential to awaken people from sleep. Accounting for a façade with open windows (a 10dB allowance) the external noise levels should therefore not exceed 60dB(A) to 65dB(A). AAS (2020) measured L_{Amax} noise levels of between 63dB(A) to 83dB(A) during the night-time period. Therefore, existing noise levels already exceed this indicative criteria. However, as the night-time traffic generated by the Project would involve only three trucks arriving at the Quarry between 6:30am and 7:00am, it is not likely that impacts to local residents along the transport route would occur.

6.5.7.4 Voluntary Land Acquisition and Mitigation Policy Assessment

The rights of landowners in relation to the predicted impacts of State significant extractive industry development are described in the *Voluntary Land Acquisition and Mitigation Policy* (VLAMP) (NSW Government, 2018). VLAMP lists five different levels of noise impact and recommended actions to ameliorate these impacts. The VLAMP also provides for the consideration of vacant lands that may be developed in the future under existing planning controls.

The noise modelling completed by Octave (2019) (see **Figure 6.9**) identified that none of the assessed receivers would experience noise levels that exceed the assessment criteria or that are greater than 5dB above the project amenity level. In addition, no vacant land in the vicinity of the Quarry would experience noise levels above the assessment criteria over the most affected 25% of the land. Hence, no recommended actions are required under the VLAMP considerations.

6.5.8 Monitoring

Attended noise monitoring would be conducted for the Project every six months for the first two years of operations at the Quarry to determine compliance with the noise criteria, confirm the results of the predictive modelling and to inform management decisions relating to further noise mitigation works, should the need arise. Attended monitoring is required to enable the noise source(s) being recorded to be identified. Monitoring locations and details of the proposed monitoring program would be determined during the preparation of the Quarry's Environmental Management Strategy. All noise monitoring results would be posted on the Applicant's website and included in each *Annual Review*.

6.5.9 Conclusion

The predicted operational noise level results at each of the receivers for day, evening and night conditions are all below the project noise trigger levels. As a result, the operational noise levels of the Project are not anticipated to exceed the relevant criteria at any residence.

The predicted public road noise level results show that the road noise assessment criteria would be satisfied and that overall, only a minor increase to existing conditions of 1dB(A) during daytime operations is predicted along two sections of road. In practice, this increase in sound level is an imperceptible change.

Operational activities and Project-related traffic noise would not be likely to cause sleep disturbance.

6.6 Air Quality

6.6.1 Introduction

An Air Quality Impact Assessment for the Project was undertaken by Todoroski Air Sciences Pty Ltd. The resulting report is provided as Part 6 of the *Specialist Consultant Studies Compendium*. The outcomes of that assessment are presented in this subsection with the report hereafter referred to as Todoroski (2020).

The risk assessment undertaken for the Project (**Appendix 8**) identifies key risk sources with the potential to result in air quality impacts. These risk sources and the assessed risk of impacts after the adoption of standard mitigation measures are as follows.

- Emissions of TSP/PM10/PM2.5/Deposited dust from extraction and processing operations, stockpiles, exposed surfaces and from vehicle movements resulting in resulting in health and/or amenity impacts on nearby privately-owned residences and other sensitive receivers (Low).
- Deposition of dust in surface water bodies and surrounding native vegetation resulting in exceedances in surface water quality parameters and reduced condition of local vegetation or value as fauna habitat (Low).
- Generation of gaseous emissions from vehicles and fixed and mobile plant resulting in further contribution to the greenhouse effect (Medium).

- Dispersion of respirable silica within dust from extraction and processing operations, stockpiles and exposed surfaces resulting in adverse health impacts such as respiratory disease (Low).

The SEARs for the Project require the EIS to include an assessment of the following potential impacts of the Project on Air Quality.

- A detailed assessment of potential construction and operational impacts, in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*, and with a particular focus on dust emissions including $PM_{2.5}$ and PM_{10} and having due regard to the *Voluntary Land Acquisition and Mitigation Policy*.
- An assessment of potential dust and other emissions generated from processing, operational activities and transportation of quarry products.
- Reasonable and feasible measures to minimise dust and emissions.
- Monitoring and management measures, in particular, real-time air quality monitoring.

The SEARs for the Project are provided in **Appendix 3** and a summary of the requirements and reference to where the assessment matters have been addressed in the EIS is provided in **Appendix 4**.

The assessment requirements identified by the Environment Protection Authority (EPA) were also considered during the preparation of the air quality assessment. A summary of the requirements are listed within **Appendix 4** together with a record of where each requirement is addressed in the EIS.

The following subsections provide a summary of the air quality impact assessment and describe the operational safeguards and management measures that would be implemented by the Applicant.

6.6.2 Residences Assessed

The air quality assessment considered potential impacts associated with predicted dust dispersion at the five closest sensitive receptors in the vicinity of the Property. **Figure 6.8** displays the locations of the residences assessed (R1 to R5) in the air quality assessment.

6.6.3 The Existing Environment

6.6.3.1 Air Quality Environment

The air quality environment at the Property is influenced by existing agricultural practices, traffic and rural roads and the existing Quarry operations.

As background dust data for the Property is not available, the existing air quality experienced in the area surrounding the Property was estimated by examining measurements obtained by NSW Department of Environment, Energy and Science. As the Property is not located in close

proximity to any air quality monitoring stations, Todoroski (2020) considered available data from the nearest air quality monitors located at Albury and Wagga Wagga, which are approximately 28 km and 119 km, respectively, from the Property. Data available from the monitoring station in Albury for PM_{10} and $PM_{2.5}$ was considered to be most representative of conditions at the Property.

Monitoring data from the 2013 calendar year was used as this calendar period corresponds to the period of meteorological modelling used in this assessment. In comparison to the Property, Albury is a more densely populated urban centre and would likely have a higher influence of anthropogenic sources which contribute to the overall air quality level.

In the absence of on-site and regional data for total suspended particulates (TSP) and deposited dust, Todoroski (2020) applied estimates of the annual average background TSP and deposited dust concentrations have been determined from the generally understood relationship between PM_{10}, TSP and deposited dust concentrations and the measured PM_{10} levels. This relationship assumes that an annual average PM_{10} concentration of 25µg/m^3 corresponds to a TSP concentration of 90µg/m^3 and dust deposition value of 4.0g/m^2/month. This assumption is based on the NSW EPA air quality impact criteria.

Table 6.18 presents a summary of the background air quality used in the air quality impact assessment.

Table 6.18
Background Air Quality

Pollutant	Averaging Period	Value
PM_{10}	24-hour	Hourly varying
	Annual	15.8µg/m^3
$PM_{2.5}$	24-hour	Hourly varying
	Annual	7.3µg/m^3
TSP	Annual	56.9µg/m^3
Dust Deposition	Monthly	2.5g/m^2/month
Source: Modified after Todoroski (2020) – Section 4.3.3.3		

6.6.4 Potential Sources of Air Contaminants

The following potential sources of operational emissions were considered by Todoroski (2020).

- Excavator loading topsoil to haul truck
- Hauling to material emplacement at topsoil stockpiles
- Loading sand/gravel material truck
- Hauling to sand/gravel to stockpile
- Unloading sand/gravel to stockpile
- Loading sand/gravel to crusher
- Rehandle processed sand/gravel material at stockpiles
- Loading processed sand/gravel material to haul truck
- Hauling product sand/gravel material offsite.
- Wind erosion across the whole site
- Exhaust emissions

- Crushing sand/gravel material
- Screening sand/gravel material
- Unloading processed sand/gravel material to stockpile
- Unloading processed sand/gravel material
- Rehandling processed sand/gravel material
- Loading processed sand/gravel material

6.6.5 Criteria for Assessment

Table 6.19 presents the air quality criteria listed in the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2017a) which were adopted for the Project. It is noted that the criteria are based on reducing any potential impacts to human health and amenity.

Table 6.19
Air Quality Assessment Criteria

Pollutant	Averaging Period	Impact	Criterion
TSP	Annual	Total	90µg/m^3
PM_{10}	Annual	Total	25µg/m^3
	24 hour	Total	50µg/m^3
$PM_{2.5}$	Annual	Total	8µg/m^3
	24 hour	Total	25µg/m^3
Deposited dust	Annual	Incremental	2g/m^2/month
		Total	4g/m^2/month
Source: Todoroski (2020) – Table 3.1			

6.6.6 Assessment Methodology

A dispersion modelling assessment for the Project was completed by Todoroski (2020) using the NSW EPA approved CALPUFF atmospheric dispersion modelling system and The Air Pollution Model (TAPM). Information relating to the local topography and meteorological conditions including wind patterns were included in the modelling.

CALPUFF is an advanced "puff" air dispersion model which can deal with the effects of complex local terrain on the dispersion meteorology over the entire modelling domain in a three-dimensional, hourly varying time step. The CALPUFF modelling system includes three main components: CALMET, CALPUFF and CALPOST and a large set of pre-processing programs designed to interface the model to routinely available meteorological and geophysical datasets.

TAPM was applied to the available data to generate a 3D upper air data file for use in CALMET. CALMET is a meteorological model that develops hourly wind and temperature fields on a three-dimensional gridded domain. Associated two-dimensional fields such as mixing height, surface characteristics, and dispersion properties are also included in the file produced by CALMET.

CALMET generated meteorological data was extracted and graphically represented as windroses and graphs of the temperature, wind speed, mixing height and stability classification over the modelling period.

Todoroski (2020) assessed 24-hour average $PM_{2.5}$ and PM_{10} using the Level 2 Contemporaneous Assessment Method provided in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2017a). In this approach the measured background levels for each day over a representative year are added to the corresponding predicted incremental dust level from the Quarry to establish the number of additional days (if any) in a representative year when the criteria would be exceeded as a result of the proposed changes. Todoroski (2020) applied 2013 dust monitoring data sources from the Albury monitoring station for assessment in order that the assumed background levels could be aligned with meteorological period used for modelling.

Modelling Scenarios

Emissions from each operational activity of the Project were represented by a series of volume sources and were included in the CALPUFF model via an hourly varying emission file (Todoroski 2020). Meteorological conditions associated with dust generation, such as wind speed, and levels of dust generating activities were considered in calculating the hourly varying emission rate for each source. Extraction operations within the Stage 1 extraction area were modelled as this stage would require equipment to operate in closest proximity to privately-owned residences.

It should be noted that as a conservative measure, the effect of the precipitation rate (rainfall) in reducing dust emissions has not been considered in the assessment. An assessment of the impacts of activities at the Property was undertaken to characterise the likely day-to-day operation of the Project. This assessment took into consideration an extraction rate of 330,000tpa as it is assumed that 10% of material would be lost as waste in processing.

6.6.7 Management and Monitoring Measures

To ensure activities associated with the project have a minimal effect on the surrounding environment and at privately-owned residences, it is recommended that appropriate operational and management measures should be implemented where feasible and reasonable. Proposed management measures include the following. Some of these measures such as watering of roads and stockpiles have been incorporated in modelling.

General

- Activities to be assessed during adverse weather conditions and modified as required (e.g. modify activity where reasonable levels of dust cannot be maintained using the available means).
- Check weather forecasts prior to undertaking material handling or processing.
- Switch off engines of on-site vehicles and plant when not in use.
- Vehicles and plant are to be fitted with pollution reduction devices where practicable.

- Vehicles are to be maintained and serviced according to manufacturer's specifications.
- Visual monitoring of activities is to be undertaken to identify dust generation and dusty operations are to be adjusted or stopped should excessive dust be generated.

Exposed areas / stockpiles

- The extent of exposed surfaces and stockpiles is to be kept to a minimum.
- Exposed areas and stockpiles are either to be covered or are to be dampened with water as far as is practicable if dust emissions are visible, or there is potential for dust emissions outside operating hours.
- Minimise dust generation by undertaking rehabilitation earthworks when topsoil and subsoil stockpiles are moist and/or wind speed is below 10 m/s.
- Reduce drop heights from loading and handling equipment where practical.
- Dampen material when excessively dusty during handling.

Hauling activities

- Any hardstand on-site or public roads to be swept/cleaned regularly as required etc.
- Restrict vehicle traffic to designated routes.
- Enforcement of on-site speed limits.
- Covered all vehicle loads when travelling off-site.

Greenhouse Gas Emissions

- Minimise diesel consumption as much as is practical.
- Reduce truck idling within the Quarry Site.
- Optimise haul routes where possible to reduce the distance of travel and therefore diesel consumption.
- Optimise electricity consumption within the Quarry Site.

The Applicant would include these measures as a component of the Environmental Management Strategy for the Quarry, including trigger action response protocols.

6.6.8 Assessment of Impacts

An assessment of the incremental and total (cumulative) $PM_{2.5}$ and PM_{10} impacts was undertaken in general accordance with the methods outlined in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA, 2017). The cumulative (total) impact is defined as the modelling impact associated with the operation of the project combined with the estimated ambient background levels.

Table 6.20 presents the predicted incremental $PM_{2.5}$ and PM_{10} concentrations that would for each sensitive receptor location due to the proposed operation.

Table 6.20
Air Quality Assessment Results – Incremental Impact

Residence	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/month)
	24-hour average	Annual average	24-hour average	Annual average	Annual average	Annual average
Criteria	**-**	**-**	**-**	**-**	**-**	**2.0**
R1 (Morebringer)	0.4	<0.1	2.6	0.3	0.6	<0.1
R2 (Camp Nelson Scout Camp)	0.8	0.1	6.4	0.8	2.1	0.1
R3 (Wyseworth)	0.8	0.1	5.9	0.6	1.5	0.1
R4 (4343 Riverina Highway)	1.2	0.2	8.5	1.3	3.2	0.1
R5 (Heritage Seeds)	0.5	<0.1	3.1	0.3	0.6	<0.1
Source: Todoroski (2020) – Table 6.1						

The predicted cumulative annual average $PM_{2.5}$, PM_{10}, TSP and dust deposition levels due to the Project with the estimated background levels are presented in **Table 6.21.** A Level 2 contemporaneous assessment approach where the measured background levels are added to the day's corresponding predicted dust level from the Project has been applied for the assessment of cumulative $PM_{2.5}$ and $PM_{10.}$ The results in **Table 6.21** indicate that all of the assessed sensitive receptors are predicted to experience levels below the relevant criteria for each of the assessed dust metrics. In addition, the outcomes of contemporaneous assessment (presented in detail in Appendix D of Todoroski (2020)) demonstrate that the Project does not increase the number of days above the 24-hour average criterion at the assessed receptors.

Table 6.21
Air Quality Assessment Results – Cumulative Impact

Residence	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/month)
	Annual average			
Criteria	8.0	25.0	90.0	4.0
R1 (Morebringer)	7.3	16.1	57.5	2.5
R2 (Camp Nelson Scout Camp)	7.4	16.6	59.0	2.6
R3 (Wyseworth)	7.4	16.4	58.4	2.6
R4 (4343 Riverina Highway)	7.5	17.1	60.1	2.6
R5 (Heritage Seeds)	7.3	16.1	57.5	2.5
Source: Todoroski (2020) – Table 6.2				

6.6.9 Greenhouse Gas Assessment

Three scopes of greenhouse gases are relevant for assessment of operational activities, including the following.

- Scope 1 emissions are direct (or point-source) emissions that relate to emissions per unit of activity at the point of emission release (i.e. fuel use, energy use, manufacturing process activity, mining activity, on-site waste disposal, etc.). Direct emissions from the Project would be generated through the use of diesel fuel on site and for transportation activities.

- Scope 2 emissions are indirect emissions associated with the generation of the electricity purchased and consumed by an organisation. Scope 2 emissions are physically produced by the burning of fuels (coal, natural gas, etc.) at the power station. Indirect emissions would be generated by the Project through the production of electricity used to power site facilities and the processing equipment.
- Scope 3 emissions are a consequence of the activities of the company but occur from sources not owned or controlled by the company. Some examples of Scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services. These emissions would include emissions related to the extraction and transport of fuels, and the use of fuels in employee transport.

The Applicant is aware of the importance of reducing greenhouse gas emissions where possible in ongoing operations. Given the small scale of the operation it is considered that the Project would generate a fraction of the NSW and National greenhouse gases emitted each year. Regardless, the Applicant is committed to minimising diesel and electricity usage, where practical and improving the emissions from on-site equipment through scheduled maintenance programs.

6.6.10 Monitoring

The key components of the Applicant's management of environmental performance for air quality would involve monitoring dust levels through the following methods.

- Installation of deposited dust gauges on the Property boundary closest to where the neighbours are located.
- Visual monitoring of day to day dust plumes and levels to guide adaptive management.
- Maintenance of a complaints protocol and regular engagement with neighbours to seek local feedback.

6.6.11 Conclusion

The results of predictive dust dispersion modelling undertaken by Todoroski (2020) has concluded that the Project is predicted to comply with all impact assessment criteria for each relevant averaging period for TSP, $PM_{2.5}$, PM_{10}, and dust deposition. The operation of the Quarry assessed at full capacity (300,000tpa) does not increase the number of days above the 24-hour average criterion at the assessed receptors.

The assessment demonstrates that even using conservative assumptions the Project can operate without causing any significant air quality impact at residential receivers in the surrounding environment.

6.7 Land Resources

6.7.1 Introduction

A Land Resources Assessment for the Project was undertaken by Advanced Environmental Systems Pty Ltd. The resulting report is presented as Part 7 of the *Specialist Consultant Studies Compendium* and is hereafter referred to as AES (2020a).

The risk assessment undertaken for the Project (**Appendix 8**) identifies key risk sources with the potential to result in impacts upon land resources. These risk sources and the assessed risk of impacts after the adoption of standard mitigation measures are as follows.

- Land preparation activities, which reduces the soil resources available to undertake appropriate rehabilitation program (Low).
- Degradation of soil resources as a result of stockpiling which leads to reduced standard of revegetation (Low).
- Erosion as a result of vegetation clearing, from stockpiles or following soil replacement during rehabilitation, which leads to increased erosion on final landform (Low).

The SEARs for the Project identified Land Resources as a key issue requiring that the EIS include a detailed assessment of:

- potential impacts on soils and land capability (including erosion and land contamination) and the proposed mitigation, management and remedial measures (as appropriate);
- potential impacts on landforms (topography), paying particular attention to the long term geotechnical stability of any new landforms; and
- the compatibility of the development with other land uses in the vicinity of the development in accordance with the requirements in Clause 12 of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries)* 2007, paying particular attention to the agricultural land use in the region.

The following sub-sections present a summary of the land resources for the Quarry Site, identifying specific constraints and opportunities that might affect the operation and rehabilitation of the Project. It is noted that details regarding the final landform and final land uses are provided in Section 2.13.2.

6.7.2 Site Soils

6.7.2.1 Hydrogeological Landscape

The Property is located within the Murray Alluvium hydrogeological landscape which is characterised by alluvial floodplains, terraces and levees. Soils within the hydrogeological landscape typically comprise unconsolidated Quaternary channel and flood plain sediments including sand, gravel and clay (OEH, 2015).

6.7.2.2 Soil Structure

The Murray Alluvium hydrogeological landscape has been exposed within the existing extraction area as a result of the existing operation of the Quarry. A representative site at the southwestern corner of the Quarry was identified by AES in order to assess the soil structure and collect samples for chemical testing.

Table 6.22 presents a summary of the soil morphology at the sample site to a depth of approximately 10m. The soil was identified as an Epipedal, Episodic Yellow Vertosol.

Table 6.22
Soil Morphology Summary

Horizon and depth (cm)	Texture	Colour	Dispersion	Slaking	Field Notes
A1 0-26	Light clay	10 YR 5/6 Yellowish brown	Low	Low	Some orange mottles
B1 26-110	Silty clay	10 YR 6/4 Light Yellowish brown	Moderate	Moderate	Ironstone nodules 2-3mm, Peds 4-5cm
B2 110-175	Light clay	10 YR 6/6 Brownish yellow	Low	High	10% orange mottles Peds 5-8cm
B3 175-275	Medium clay	10 YR 5/4 Brownish yellow	Moderate	Low	More friable than B2, holding vegetation 5% orange-brown mottles
C1 275-350	Clayey Fine / coarse sand	7.5 YR 5/6 Strong brown	Low	Moderate	Slightly moist Fine sands
C2 350 -10m	Coarse sand/gravel	10 YR 5/6 Yellowish brown	Low	Moderate	Slightly moist Gravel 5-20mm
Source: AES (2020a) – modified after Table 1					

The topsoil (A Horizon) at the sample site extends to approximately 25cm beneath the surface. The topsoil has been assessed as having a high propensity for cracking upon drying in summer, largely due to the high proportion of clay minerals (e.g. kaolinite and illite) in the soil profile. It is noted that although this shrink-swell factor allows water to reach subsoil horizons in the autumn and winter months, it also shears plant roots and allows for rapid drying of the soil profile.

The subsoil at the sample site is typically brownish yellow and extends from approximately 25cm to 350cm beneath the surface. The subsoils principally consist of clays and fine to coarse sands. Coarse sands and gravels extend from approximately 350cm to 10m below the surface.

6.7.2.3 Soil Chemical Attributes

Soil samples from the different soil horizons at the sample site were sent to SWEP Analytical Laboratories Pty Ltd for testing in order to identify key chemical attributes. The full results of these analyses are included as Appendix 1 of AES (2020a). A summary of the key results of the chemical analyses are presented below.

- **Electrical Conductivity (EC)**

  EC is used as a measure of soil salinity which can influence the ability of plants to extract moisture from the pores between soil particles. The topsoil and underlying

subsoil down to 110cm below the surface was found to be non-saline. Subsoil from 110cm to 175cm was found to exhibit slightly saline characteristics. Subsoil from 175cm to 350cm was non-saline.

- **Soil pH**

  Soil pH is the measure of alkalinity or acidity and is an important determinant of plant nutrient availability. The topsoil at the sample site was found to be slightly acidic (5.7) with subsoils varying from slightly alkaline (8.2) to neutral (7.0).

- **Cation Exchange Capacity**

  The topsoil and subsoils at the sample site were found to have a moderate cation exchange capacity. A moderate to high cation exchange capacity is generally beneficial for plant production.

- **Exchangeable Sodium**

  The exchangeable sodium percentage was found to be high in the topsoil and very high in the subsoils up to approximately 275cm beneath the surface. High sodicity can prevent good soil structural development. This may be reflected in the slaking and dispersion characteristics identified in the B1 horizon which may enhance the vertical movement of water.

- **Calcium / Magnesium Ratio**

  Calcium and magnesium are important to plant growth with an ideal ratio of between two- and four-parts calcium to one-part magnesium. The results from the soil assessed at the sample site indicate that calcium levels are low.

- **Available Phosphorous and Nitrogen**

  Available phosphorus and nitrogen are important nutrients in plant growth and performance. Both phosphorus and nitrogen levels were extremely low in the soil samples tested. Substantial addition of both nutrients would be required to bring the soil to a productive condition for agricultural pasture and crops.

6.7.2.4 Soil Drainage and Permeability

Readily available water holding capacity was not assessed in detail in AES (2020a). However, based on the soil textures (see **Table 6.22**), the water storage capacity is likely to be substantial. It is noted that the amount of water actually available to plants from these soils would be limited due to the very small pore size.

The extent, duration and impact of waterlogging is determined by how quickly water enters and leaves the soil by deep percolation, lateral flow or evapotranspiration. The Vertosol soils within the Quarry Site typically show signs of waterlogging or perched water tables for more than three months of the year.

6.7.2.5 Soil Erodibility

Moderate infiltration rates and limited hydraulic conductivities throughout the soil profile indicate that runoff could potentially occur in high intensity or continuous low-intensity rainfall events. Whilst sediment production is possible, the characteristically gentle slopes within the Quarry Site and the detention of sediment in grassed areas would limit the spread of sediment. It is noted that flood events could potentially dislodge and transport soil during overland flow events, however, this would occur at a regional scale wherever soil is exposed.

6.7.2.6 Soil Contamination

Past land uses within the Quarry Site have principally been restricted to very low intensity grazing and some cropping, with minimal use of fertilizer. There are no records of pesticides or herbicides having been previously used on site and no evidence of contamination by oil or other hydrocarbon products.

6.7.3 Land Capability Assessment

The Quarry Site's Land and Soil Capability (LSC) is assessed by considering its biophysical features and individual hazards (OEH, 2012). The Quarry Site has been assessed as comprising Class 4 LSC with moderate to severe limitations for some land uses that need to be consciously managed to prevent soil and land degradation. These limitations could potentially be overcome by specialised management practices with high levels of knowledge, expertise, inputs, investment and technology (OEH 2012). The Quarry Site and its soils are not prime agricultural land.

6.7.4 Management and Mitigation Measures

The Applicant would implement the following management and mitigation measures throughout the life of the Project to minimise the potential for unacceptable soil and land capability-related impacts.

- Clearly mark areas for stripping and stockpiling.
- Strip soil from all areas of disturbance and store in stockpiles no more than 2m high for future rehabilitation activities or transfer soil directly to areas to be revegetated.
- As far as practicable, refrain from stripping or placing soil during wet conditions.
- Implement erosion control measures (e.g. silt-stop fencing) at downslope locations if clearing during wet periods is unavoidable.
- Use water carts or sprinklers to suppress dust from excavators, trucks and stockpiles to minimise wind erosion during periods with wind speeds in excess of 10m/s.
- Mix gypsum and lime with soils prior to revegetation to improve soil quality, as required.
- Ensure that the soil stockpile surfaces have a surface that is as 'rough' as possible, in a micro-scale, to assist in surface water runoff control and seed retention and germination.

- Spread seed of a suitable cover crop on all soil stockpiles to facilitate revegetation.
- Signpost the soil stockpile and limit operation of machinery on the stockpile to minimise compaction and further degradation of soil structure.
- Rip or scarify all areas to be respread with topsoil to allow the respread material to be keyed into the underlying material.

6.7.5 Assessment of Impacts

Adherence to the recommended soil and growth medium stripping, handling, stockpiling procedures and other management practices, together with appropriate rehabilitation practices would result in a minimal impact to soils and land capability within the Site. The Project would not impact adversely on the agricultural potential of the land given the existing land uses and the prevalence of moderate capability soils within the Quarry Site.

6.8 Biodiversity

6.8.1 Introduction

A Biodiversity Development Assessment Report (BDAR) for the Project was undertaken by Advanced Environmental Systems Pty Ltd (AES). The resulting report is presented as Part 8 of the *Specialist Consultant Studies Compendium* and is hereafter referred to as AES (2020b).

A risk assessment was undertaken for this Project (**Appendix 8**) identifies key risk sources with the potential to result in biodiversity impacts. These risk sources and the assessed risk of impacts after the adoption of standard mitigation measures are as follows.

- Clearing of vegetation communities around the Quarry Site leading to reduction in local biodiversity, local or regional reduction in distribution of threatened species, populations and EECs (Low).
- Indirect effects of Project impacts (e.g. noise, dust, lighting) resulting in reduced local biodiversity (Low).

The SEARs for the Project, presented in full as **Appendix 3**, require the EIS to include an assessment of the following potential impacts of the Project on biodiversity.

- Accurate predictions of any vegetation clearing on site.
- A detailed assessment of the likely biodiversity impacts of the development, paying particular attention to threatened species, populations and ecological communities and groundwater dependent ecosystems, and having regard to the *NSW Biodiversity Offsets Policy for major Projects*, and the *Biodiversity Assessment Method*.
- A strategy to offset any residual impacts of the development in accordance with the *NSW Biodiversity Offsets Policy for Major Projects*, including evidence that the appropriate type and quantum of offsets will be available.

The assessment requirements identified by the Office of Environment and Heritage (now the Biodiversity Conservation Division (BCD)) were also considered during the preparation of the BDAR.

The SEARs for the Project are provided in **Appendix 3** and a summary of the requirements and reference to where the assessment matters have been addressed in the EIS is provided in **Appendix 4**.

The following subsections provide a summary of the BDAR assessment and describe the operational safeguards and management measures that would be implemented by the Applicant.

6.8.2 Assessment Methodology

The BDAR was completed principally with reference to the following resources and guidelines.

- *Biodiversity Assessment Method* (OEH, 2017).
- *Biodiversity Assessment Method Calculator* (OEH, 2019).
- BioNet Vegetation Classification (OEH 2018).

A range of additional information sources, correspondence and personal communications were included in the assessment with a complete list of resources provided in Section 1.2 of AES (2020b)

The Study Area for the BDAR assessment included the disturbance footprint of proposed Project, encompassing the Stage 1, 2 and 3 extraction areas and processing and stockpiling area (approximately 27.04ha) and the proposed Stage 4 extraction area (approximately 26.45ha) (**Figure 2.3**). The disturbance footprint for the proposed development represents a total area of 53.49ha, with an additional 40.80ha surrounding the disturbance footprint representing areas to be rehabilitated and revegetated (**Figure 2.4**). Flora and fauna surveys undertaken for the assessment were conducted both within and surrounding the disturbance footprint areas.

6.8.2.1 Desktop and Field Assessments

The desktop assessment included a review of relevant biodiversity values maps, threatened species databases, and State and Commonwealth environmental classifications.

Flora and fauna surveys within and surrounding the Study Area were undertaken by AES (2020b) between 1 February 2018 and 12 October 2018 and included the following survey methods (**Figure 6.10**).

- Establishment of a surrogate Biodiversity Assessment Method (BAM) vegetation integrity plot adjacent to the existing Stage 1 extraction area. A surrogate plot was necessary as there was not sufficient vegetation within the Property to permit calculations.
- Flora survey transects (meander on foot).
- Assessments of large trees (>30cm diameter at 1.3m height), with parameters including height, trunk diameter, canopy diameter, percentage foliage cover and hollow presence recorded.

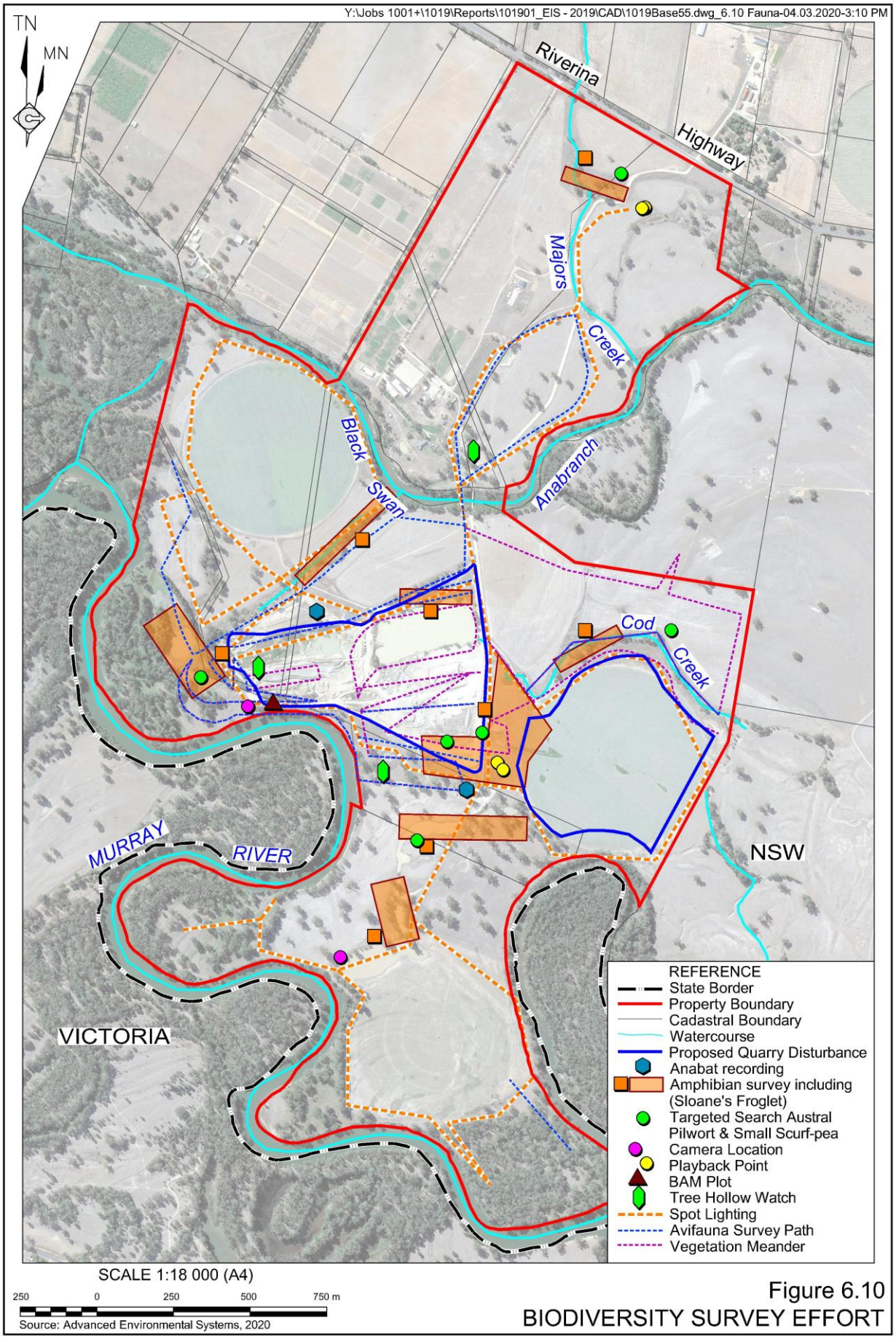

Figure 6.10
BIODIVERSITY SURVEY EFFORT

- Recordings of frog calls, including amplified speaker playback.
- Recording of bat calls, with analysis undertaken by Balance! Environmental (2018).
- Examination of tracks and scats.
- Active daylight fauna searches including direct observation and habitat searches under logs and rocks.
- Spotlight searches of wetland areas and trees during night periods.
- Camera trapping using two fixed infrared cameras over a period of three weeks.

Targeted surveys were undertaken for threatened species including:

- Superb Parrot (*Polytelis swainsonii*);
- Sloane's Froglet (*Crinia Sloanei*);
- Spotted Tail Quoll (*Dasyurus maculatus*); and
- Austral Pillwort *(Pilularia novae-hollandiae*).

A range of additional flora and fauna were included incidentally in survey activities. Additionally, consultation was undertaken with both Local Land Services and local Landcare personnel as well as biodiversity experts in order to determine the likelihood of threatened species occurrence at the Property.

6.8.2.2 Assessments of Significance

Assessments of the significance of impacts were undertaken by AES (2020b) for threatened species and communities listed under the NSW *Biodiversity Conservation Act 2016* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) recorded during the site survey or for which potential habitat occurs in the Study Area.

Likelihood of occurrence within the Study Area was considered for listed species, populations, communities and migratory species identified from database searches conducted during the desktop assessment.

6.8.3 Existing Ecological Setting

6.8.3.1 Habitat

The Study Area is located within:

- the Murray Fans subregion of the Riverina Bioregion; and
- the Murray Channels and Floodplains Mitchell Landscape.

No areas of outstanding biodiversity value are mapped within 10km of the Property (AES, 2020b). The Murray River is a 6th Order stream with 50m buffer of vegetation in most places. It is therefore considered a State Significant Biodiversity Link in accordance with the Framework for Biodiversity Assessment (OEH, 2014)

The existing Stage 1 and 2 extraction areas within the disturbance footprint are intermittently filled with water as a consequence of rainfall runoff and groundwater seepage. These areas therefore represent artificial ephemeral wetlands within the Study Area and may provide habitat for aquatic species. Additionally, a hay shed and pump shed (**Figure 2.3**) are present within the Property and may provide artificial roosting habitat for bird or bat species.

The Murray River floodplain and associated remnant vegetation represents a terrestrial and aquatic wildlife corridor and therefore a source of habitat connectivity in the vicinity of the proposed development. Extensive vegetation clearing in the region associated with the establishment of agricultural land uses has resulted in the fragmentation of terrestrial habitat and reduced connectivity between the riparian corridor and other remnant vegetation patches (AES, 2020b).

The disturbance footprint is bounded on its southern and northern sides by the Murray River and the Black Swan Anabranch respectively. Flood runners and drainage lines in the vicinity of the Property, including Major's Creek which is crossed by the Quarry Access Road and Cod Creek located close to the proposed Stage 4 extraction area, provide ephemeral wetland habitat following rainfall and flood events.

The Quarry does not support 'core Koala habitat' as considered under the State Environmental Planning Policy (SEPP) 44-Koala Habitat Protection or the SEPP (Koala Habitat Protection) 2019 (that commences from 1 March 2020 and after which time SEPP 44 is repealed).

6.8.3.2 Vegetation Communities

AES (2020b) used aerial photography, publicly available vegetation mapping and field survey confirmation to identify the following four vegetation Plant Community Types (PCTs) within a 1.5km radius of the Property.

- PCT 5 – River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina.
  - Low-good condition, covers approximately 27% (369ha) of the 1.5km radius area.
- PCT 5 (Derived) - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina.
  - Very poor condition, represented by scattered paddock trees, covers <1% (5ha) of the 1.5km radius area.
- PCT 76 – Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone.
  - Very poor condition, represented by scattered paddock trees and pasture, covers <1% (5ha) of the 1.5km radius area.
- PCT 165 – Derived corkscrew grassland/forbland on sandplains and plains of the semi-arid (warm) climate zone.
  - Very poor condition, dominated by introduced pasture species, covers <1% of the 1.5km buffer area.

Vegetation within the disturbance footprint and the ecological study area were mapped by AES (2020b) as one of five communities as follows (**Figure 6.11**).

- PCT 5 (Derived) - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina.
- Planted eucalypts and exotic species.
- Native and introduced grasses and forbs.
- Irrigated Lucerne.
- Disturbed land.

Areas of PCT 5 (Derived) within the Quarry Site were assessed by AES (2020b) as having an existing vegetation integrity score of 39.1 based on a surrogate BAM plot that was established to the south of the Stage 1 extraction area.

6.8.3.3 Threatened Species

Threatened species identified within a 10km radius of the Study Area following database searches undertaken by AES (2020b) are presented in **Table 6.23**. In summary, records for a total of 19 threatened bird species, 8 mammal species, 1 amphibian species and 2 flora species are present within the search area or are known to utilise habitat associated within PCT 5.

AES (2020b) identified no threatened ecological communities within the search area, however the Murray River Aquatic Community is listed as an endangered ecological community by the Department of Industry – Water.

No threatened flora or fauna was identified within the Property during the field surveys. A comprehensive summary of the ecological field survey results is presented in Section 3.3 of AES (2020b). In summary the following were identified from the surveys.

- 26 flora species of which 13 were native and 26 were exotic species.
- 34 native bird species (including the Noisy Miner - *Manorina melanocephala*).
- Six native frog species.
- One species of reptile.
- Three native mammals.
- Nine species of native bat (and a further four species that could not be positively identified from recordings of bat calls). One inconclusive recording was made that may potentially indicate the presence of the Eastern Bent-winged Bat (*Miniopterus irianae oceanensis*).
- Three species of exotic fauna including two mammals and one bird species.

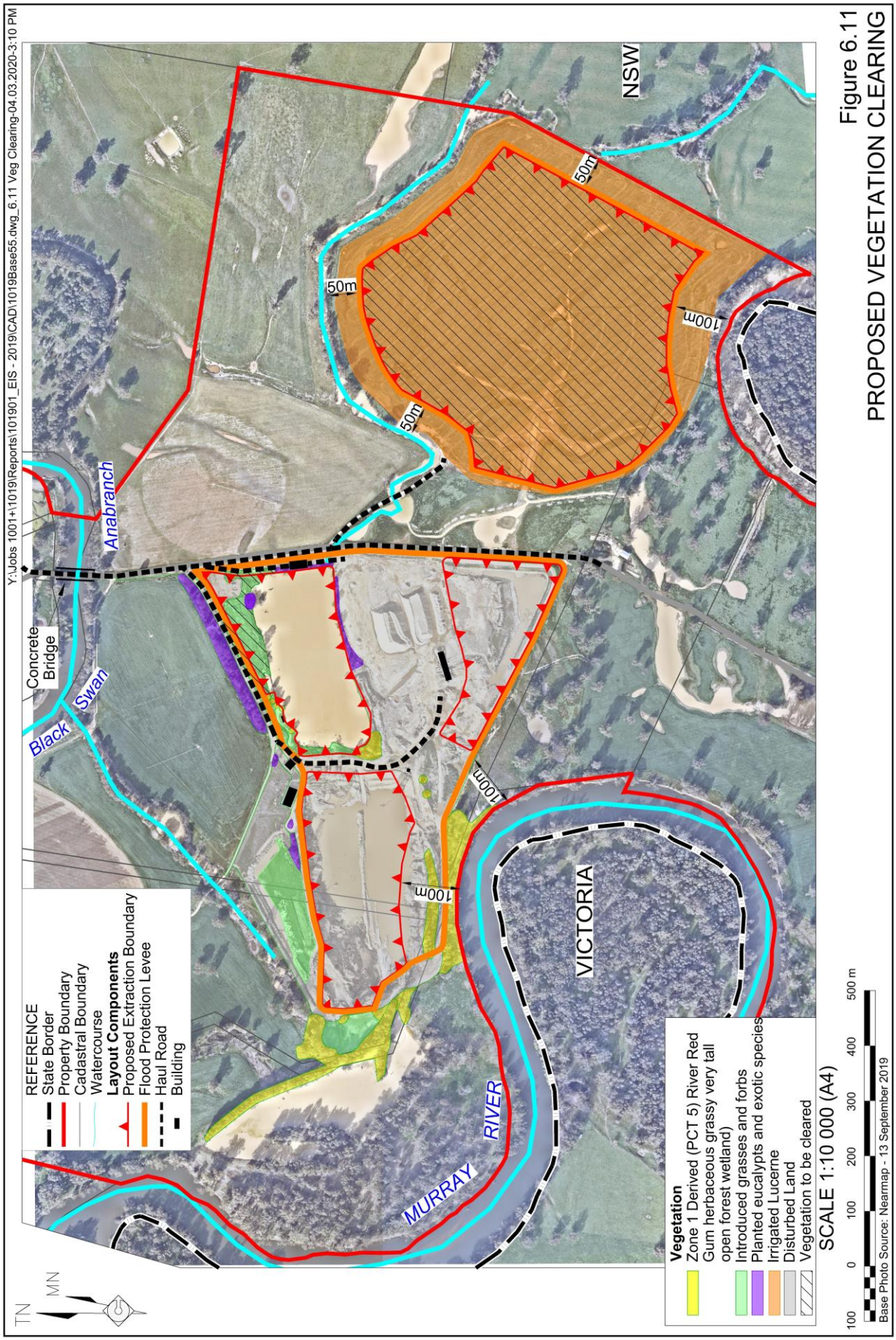

Figure 6.11
PROPOSED VEGETATION CLEARING

Table 6.23
Threatened flora species recorded within a 10km radius of the Study Area

Species		Status		Credit Species[1]
Common Name	**Scientific Name**	**NSW**	**Commonwealth**	
Birds				
Australian Painted Snipe	*Rostratula australis*	Endangered	Endangered	E
Diamond Firetail	*Stagonopleura guttata*	Vulnerable	-	E
Dusky Woodswallow	*Artamus cyanopterus*	Vulnerable	-	E, S
Flame Robin	*Petroica phoenicea*	Vulnerable	-	E
Freckled Duck	*Stictonetta naevosa*	Vulnerable	-	E
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	Vulnerable	-	E
Little Eagle	*Hieraaetus morphnoides*	Vulnerable	-	E, S
Little Lorikeet	*Glossopsitta pusilla*	Vulnerable	-	E
Painted Honeyeater	*Grantiella picta*	Vulnerable	Vulnerable	E
Powerful Owl	*Ninox strenua*	Vulnerable	-	E
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	Vulnerable	-	E
Regent Honeyeater	*Anthochaera phrygia*	Critically endangered	Critically endangered	E
Scarlet Robin	*Petroica boodang*	Vulnerable	-	E
Square-tailed Kite	*Lophoictinia isura*	Vulnerable	-	E
Superb Parrot	*Polytelis swainsonii*	Vulnerable	Vulnerable	E, S
Swift Parrot	*Lathamus discolor*	Vulnerable	Endangered	E
Turquoise Parrot	*Neophema pulchella*	Vulnerable	-	E
Varied Sittella	*Daphoenositta chrysoptera*	Vulnerable	-	E
White bellied Sea Eagle	*Haliaeetus leucogaster*	Vulnerable	-	E, S
Mammals				
Brush-tailed Phascogale	*Phascogale tapoatafa*	Vulnerable	-	
Eastern Bentwing Bat	*Miniopterus Schreibersii oceanensis*	Vulnerable	-	S
Koala	*Phascolarctos cinereus*	Vulnerable	Vulnerable	
Little Pied Bat	*Chalinolobus picatus*	Vulnerable	-	E
Southern Myotis	*Myotis macropus*	Vulnerable	-	
Spotted-tailed Quoll	*Dasyurus maculatus*	Vulnerable	Endangered	S
Squirrel Glider	*Petaurus norfolcensis*	Vulnerable	-	S
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	Vulnerable	-	
Amphibians				
Sloane's Froglet	*Crinia Sloanei*	Vulnerable	Endangered	S
Flora				
Austral Pillwort	*Pilularia novae- hollandiae*	Endangered	-	S
Small Scurf Pea	*Cullen parvum*	Endangered	-	S

Note 1: Ecosystem Credit Species (E) and Species Credit Species (S) identified by AES (2020b) as having potential to occur within the Study Area.

Source: Advanced Environmental Systems Pty Ltd (2020b) – After Tables 8 – 13.

Targeted surveys undertaken for the Superb Parrot (*Polytelis swainsonii*), Sloane's Froglet (*Crinia Sloanei*), Spotted Tail Quoll (*Dasyurus maculatus*) and Austral Pillwort (*Pilularia novae-hollandiae*) failed to identify these threatened species within the proposed disturbance areas for the Quarry.

AES (2020b) confirmed that the Project would not constitute a key threatening process, as listed in the EPBC Act or are likely to have a significant impact on nationally threatened species or communities.

6.8.3.4 Paddock Trees

AES (2020b) identified 43 large trees within the Property that would be classified as Paddock Trees. Individual trees were assessed for parameters including tree height, tree diameter, canopy diameter, percent foliage cover, hollows, logs on the ground (length diameter and hollows where present), ground cover and any intermediate species present.

6.8.4 Management and Mitigation Measures

The Applicant would implement the following management and mitigation measures to ensure that the proposed development would not have an adverse impact on biodiversity.

- The Stage 1, 2, 3 and 4 extraction areas would be progressively rehabilitated to form permanent wetlands and provide suitable habitat and foraging areas for aquatic species, birds and bats.
- A Riparian and Wetland Management Plan would be developed for the Quarry to guide the integration of the created wetlands and natural wetlands and riparian areas in the vicinity of the disturbance area.
- Revegetation activities would be undertaken using species representative of PCT 5 where appropriate and would extend existing nesting and foraging habitat.
- A 2.7m high flood levee would be constructed to provide protection up to the 1:100 year flood level, minimising potential water quality issues associated with runoff from the development.

6.8.5 Assessment of Impacts

Correspondence received from the Commonwealth Department of the Environment and Energy (now DAWE) (dated 4 May 2018), confirmed that based on the data presented the Project did not require referral as a controlled action under the EPBC Act. AES (2020b) has confirmed that a referral was not necessary for the Project based on the outcomes of survey and assessment.

AES (2020b) identified potential impacts to biodiversity as including the following.

- extraction area development and use of processing, stockpiling and loading areas;
- bridge refurbishment, including noise and dust from trucks and processing;
- clearing of small vegetation patches and isolated trees;
- construction of new levee banks;
- infill of part of Stage 1 to form part of the 100 m Murray River buffer; and
- the use of the Quarry Access Road.

It is noted that the majority of potential impacts are indirect in nature as vegetation clearing for the Project (total of 1.1ha) would include predominantly introduced grasses and forbes with only two Red gums (no hollows) cleared in the vicinity of the Stage 2 extraction area. All other red gums would be retained for the Project. The existing lucerne paddock would be removed for development of Stage 4 of extraction,

The BDAR concludes that impacts on biodiversity associated with the proposed development are insignificant for the following reasons (AES, 2020b).

- Sloane's Froglet (*Crinina sloanei*) has not been recorded at the existing Property and the existing extraction areas represent unsuitable habitat for this species.
- Impacts other threatened species with potential to occur within the Property would be insignificant as:
  - existing habitat within the proposed disturbance footprint, including existing extraction areas and lucerne crop, has been subject to disturbance associated with past agricultural activities and is considered to be of low value for foraging and nesting activities;
  - proposed vegetation clearing would result in minimal disturbance of potential habitat areas;
  - potential habitat within and in the vicinity of the disturbance footprint would be retained where possible;
  - low numbers (one inconclusive recording which potentially indicate the presence of the Eastern Bent-winged Bat (*Miniopterus irianae oceanensis*) indicate that this species is not abundant in the vicinity of the Quarry Site;
- The Quarry does not contain geological features that may provide habitat for threatened flora or fauna and although the extraction areas are man-made structures, once filled with water they may potentially provide habitat.
- The Project includes the rehabilitation of land in the vicinity of the Murray River in order to reinstate a 100m buffer between operations and the river. The Project also includes a comprehensive revegetation plan for riparian areas in the vicinity but outside of proposed disturbance areas. This activity would enhance local biodiversity values.
- The Quarry does not support 'core Koala habitat' as considered under the *State Environmental Planning Policy (SEPP) 44 - Koala Habitat Protection* or the *SEPP (Koala Habitat Protection) 2019* (that commences from 1 March 2020 and after which time SEPP 44 is repealed).
- The Project would not compromise any flight path integrity and would not impact the potential use of water resources of water features by native fauna. In fact, the creation of ponds through progressive rehabilitation may enhance these features.

6.8.6 Biodiversity Offsetting

The Biodiversity Assessment Method (BAM) provides for proposed clearing of isolated or scattered vegetation through a streamlined assessment module for clearing paddock trees (Appendix 1 of the BAM). AES (2020b) identified that two isolated Red Gum trees (*Eucalyptus camaldulensis*) would be cleared for the Project with the remaining areas representing previously disturbed land this has been impacted by exotic species. As a result, it has been determined that two ecosystem credits (PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland

on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina) would be required to offset the residual impact to two Class 3 Paddock Trees (*Eucalyptus camaldulensis*).

In addition to the above, proposed rehabilitation and revegetation activities would improve the long-term biodiversity value of the Property and result in net positive outcomes for species which utilise habitat in the vicinity of the proposed development.

Should approval be granted, the Applicant would consult with the Biodiversity Conservation Division on the best approach to satisfy the assessed ecosystem credits requirements.

6.9 Cultural Heritage

6.9.1 Introduction

An Aboriginal and Historic Cultural Heritage Assessment for the Project was undertaken by Advanced Environmental Systems Pty Ltd with the assessment report provided as Part 9a of the *Specialist Consultant Studies Compendium*. The outcomes of that assessment are presented in this subsection with the report hereafter referred to as AES (2020c). A Statement of Heritage Impact (SOHI) has been provided by Realm Design that considers the visual impact of the proposed operation on the heritage values of nearby heritage items. The SOHI is hereafter referred to as (Realm, 2020).

The risk assessment undertaken for the Project (**Appendix 8**) identifies key risk sources with the potential to result in Aboriginal cultural and historic heritage impacts. These risk sources and the assessed risk of impacts after the adoption of standard mitigation measures are as follows.

- Unauthorised destruction of known Aboriginal and historic heritage sites (Low).
- Unauthorised destruction of unknown Aboriginal and historic heritage sites within approved disturbance areas (Low).

The SEARs for the Project require an assessment of matters relating to 'heritage' that includes the following.

- An assessment of the potential impacts on Aboriginal heritage (cultural and archaeological), including evidence of appropriate consultation with relevant Aboriginal communities/parties and documentation of the views of these stakeholders regarding the likely impact of the development on their cultural heritage; and
- Identification of historic heritage in the vicinity of the development and an assessment of the likelihood and significance of impacts on heritage items, having regard to the relevant policies and guidelines

The SEARs for the Project are provided in **Appendix 3** and a summary of the requirements and reference to where the assessment matters have been addressed in the EIS is provided in **Appendix 4**.

Additional requests for assessment of heritage-related matters was provided by the Office of Environment and Heritage that were generally consistent with the SEARs. These matters have been summarised in **Appendix 4** and a reference to where they have been addressed in the EIS is provided.

This subsection describes the existing cultural heritage context and the results of desktop assessment of the area surrounding the Property. It also describes the results of Aboriginal consultation and subsequent field investigations undertaken for the Project. Potential risks to cultural heritage are identified along with recommended management and mitigation measures.

6.9.2 Aboriginal Cultural Heritage

6.9.2.1 Ethnohistory

The ethnohistorical record of the Albury-Wodonga region does not have much information about the Aboriginal communities who occupied the area at the time of contact with Europeans. The first British visitors were the explorers Hume and Hovell who sighted the Murray River in 1824. Although they were impressed by the forests and the abundance of fish and bird life, they wrote little about the Aborigines. The only evidence of Aboriginal activity they saw around Albury was ‘smoke’.

The original inhabitants of the Albury-Wodonga region north of the Murray River were the Jeithi people. The inhabitants to the south included the Kwatkwat and Duduroa groups. With the spread of European pastoralism in the 1830s it would appear that the Jeithi were displaced, not only by settlers, but also by Wiradjuri Aborigines who had lost their lands further to the north. These Aboriginal communities continued to live traditionally in the area until the 1860s, but in ever decreasing numbers. Ultimately, they succumbed to violence, dispossession and disease.

Despite these profound historical changes, Aboriginal people still maintain a significant presence in the Albury-Wodonga region. The rural city and surrounds is largely a resettlement area for Aboriginal people from other parts of the country. While few of these people trace their ancestry directly to the Albury-Wodonga region they do have strong links with the land and a genuine concern for the protection of cultural heritage sites in the local area. For this reason, it is important that local Aboriginal people continue to be consulted with regard to local land management decisions.

6.9.2.2 Archaeological Setting

Howlong is located on the Riverine Plain which is a part of the Murray Basin. The types of cultural heritage sites recorded on the Murray River are open campsites, quarry sites, freshwater shell middens, earth mounds, carved trees, scarred trees, burial grounds, stone arrangements, ceremonial grounds, and sacred sites.

Open campsites are one of the most commonly occurring types of Aboriginal sites in the region and previous archaeological investigations undertaken in the Albury-Wodonga region suggest that the sites most likely to be encountered in the Property will be open campsites.

Open campsites are represented by scatters of stone artefacts exposed on the ground surface. The remains of fire hearths may also be associated with the artefacts. are almost invariably located near permanent or semi-permanent water sources. Local topography is also important in that campsites tend to occur on level, well-drained ground elevated above the local water source.

In the Howlong area, open campsites are concentrated along the Murray River and its tributaries (in particular, on terraces and dunes) and around the margins of lakes and wetlands. In rare instances, open campsites which were used over a long period of time may accumulate sediments and become stratified. That is, there may be several layers of occupation buried one on top of the other.

6.9.2.3 Stakeholder Consultation

Consultation with the Aboriginal community was undertaken in compliance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010). Aboriginal consultation is regulated under Clause 80C of the *National Parks and Wildlife Regulation 2009*, which consists of four stages.

Stage 1 – Notification of Project Proposal and Registration of Interest

In accordance with the processes outlined for Stage 1 in the Aboriginal Cultural Heritage Consultation Requirements (ACHCRs), letters were sent on 24 May 2018 to the Albury OEH Office, the Registrar of Aboriginal Land Owners NSW, the Native Title Tribunal, Native Title Services Corporation Limited, the Federation Council and Murray Local Land Services requesting the identification of interested Aboriginal groups. An advertisement was published in the Southern Riverina News inviting expressions of interest from Aboriginal Stakeholders.

Mr Sam Kirby of the Albury and District Local Aboriginal Land Council registered with AES on 19 April 2018.

Stage 2 – Presentation of Information about the Proposal Project

This stage requires project information to be provided to the registered Aboriginal stakeholders and may involve an archaeological field survey. This was provided through fieldwork undertaken on 9 February 2018 by archaeologist Mr Tim Stone with the assistance of Mr Sam Kirby and Mr Troy McGrath from the Albury and District Local Aboriginal Land Council. AES soil scientist Peter Clinnick also participated in the field survey.

Stage 3 – Gathering Information about Cultural Significance

This stage involves gathering information regarding cultural significance of the proposed development site. The aim is to facilitate a process by which Aboriginal community stakeholders can have input into the heritage assessment methodology and management options and provide information on the cultural significance of Aboriginal objects or places.

Information was gathered during the archaeological field survey and consultation with the Aboriginal stakeholders during the field survey.

Stage 4 – Review of Draft Cultural Heritage Assessment Report

The Registered Aboriginal Parties (RAPs) were invited to comment on the draft report. A preliminary draft of the ACHAR was provided to Mr Kirby for review and comment on 23 March 2018. In his role as CEO of the Albury and District LALC, Mr Kirby responded that the LALC did not have any objection to the Project provided that the site identified as Howlong 1 was not disturbed during the course of the Project (see Appendix 3 of AES, 2020c).

6.9.2.4 Survey Results

An archaeological field survey was undertaken on 9 February 2018 by archaeologist Mr Tim Stone with the assistance of Mr Sam Kirby and Mr Troy McGrath from the Albury and District Local Aboriginal Land Council. AES soil scientist Peter Clinnick also participated in the field survey. The methods and extent of the field survey is presented in 9.2 of AES (2020c).

One Aboriginal site was located during the archaeological survey 200m north of the Stage 4 extraction area of the Project. The site (Howlong 1) is displayed on **Figure 6.12** and is an open campsite represented by a scatter of eight quartz artefacts and a 'meta/sed' core recorded on the bank of a flood channel. The distribution of artefacts follows the north south orientation of the dune crest over a distance of 70m. The eight artefacts were all flakes or flaked pieces <2cm. The Site would not be disturbed under the Project.

No artefacts, sites or areas of Aboriginal cultural value were identified within the Quarry Site.

6.9.3 Historic Cultural Heritage

6.9.3.1 Available Local History

The Property is located on the Murray River floodplain, bounded by the Murray River and the Riverina Highway, 2.5 km southeast of Howlong. Howlong's colonial origin can be traced to 1836 when NSW surveyor-general Major Mitchell set up a camp on the southern bank of the Murray before crossing the river as part of his Australia Felix expedition. The town was surveyed in 1854 and town blocks went on sale in 1856.

Today, Howlong is an agricultural town and acts as a service centre for the surrounding rural areas. Given the long agricultural history of the area, Howlong is recognised for its heritage buildings and relics, which are attractions for visiting tourists.

6.9.3.2 Desktop Review and Field Survey

A desktop review of listed non-Indigenous heritage sites was undertaken on 28 January 2020 by RWC and included the following databases.

- Australian Heritage Database
- NSW State Heritage Register
- Corowa LEP 2012

Three sites of historic heritage significance were identified from the desktop research in the vicinity of the Property and are listed below and displayed in **Figure 6.12**.

- Wyseworth (homestead, garden and outbuildings)
- Cemetery
- Old Flour Mill

A search for historic heritage items were included in field survey undertaken on 9 February 2018 by Dr Timothy Stone and representatives of AES and the Albury and District Local Aboriginal Land Council. The field survey did not identify any sites of historic heritage significance within the Property. Janita Norman of Realm Design visited the Quarry on 14 May 2018 and did not identify any building structures or remains that may be of historic heritage significance.

The Wyseworth property is the closest to the Quarry and consists of two houses 100m apart and is located 100m north of the Riverina Highway. Realm (2020) reviewed views of the Quarry from several vantage points in the vicinity of the Wyseworth property and concluded that Quarry would not impact on the homestead, garden or outbuildings as it is not visible from the Riverina Highway due to vegetation screening, distance, siting and topography. The property is located approximately 1.5km from the Quarry extraction boundary, . The Cemetery and Old Flour Mill are located 1.6km and 2.5km away from the Quarry extraction boundary respectively. These three sites of historic heritage significance will not be impacted by the Proposal.

A total of nine sites of historic heritage significance are present in the town of Howlong as identified in **Figure 6.12.** AES (2020c) state that these sites would not be impacted by the operations of the Quarry.

6.9.4 Management and Mitigation Measures

Management and mitigation measures that would be implemented for the Project include the following.

- Fencing off of the Howlong 1 artefact scatter to avoid inadvertent disturbance.
- Implementation of an unexpected find protocol (**Table 6.24**).
- All relevant personnel, contractors and subcontractors would be made aware of the legal obligations for Aboriginal cultural heritage under the *National Parks and Wildlife Act 1974* through an on-site toolbox talk or induction.

Cultural heritage management protocols for the operation would be described in an *Environmental Management Strategy*.

The Applicant is aware that under Section 86 of the *National Parks and Wildlife Act 1974* it is an offence to harm or desecrate Aboriginal object or Aboriginal places and under Section 89A of the *National Parks and Wildlife Act 1974* it is an offence to be aware of the location of an Aboriginal object and not notify the authorities of the location.

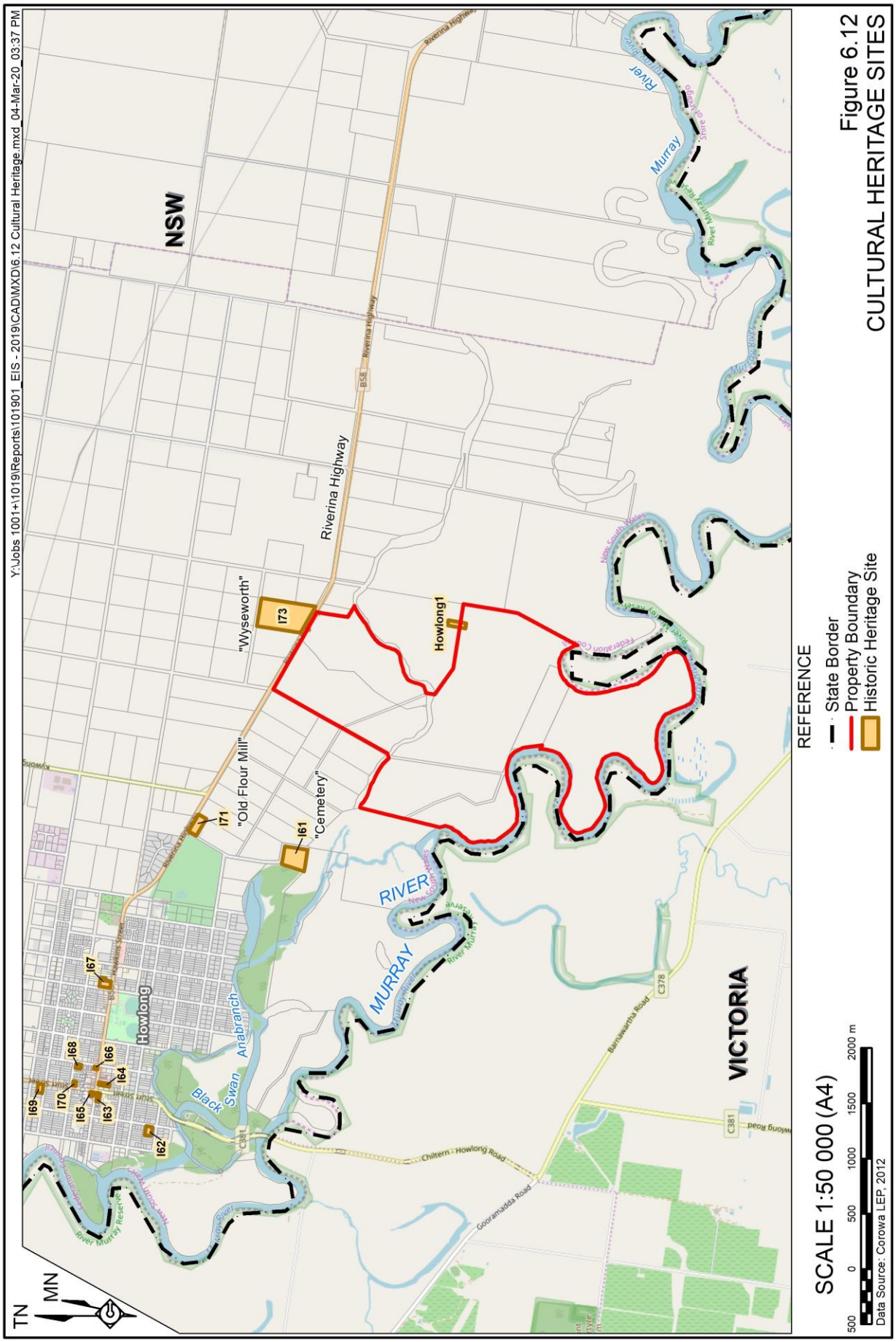
Figure 6.12
CULTURAL HERITAGE SITES
Y:\Jobs 1001+\1019\Reports\101901_EIS - 2019\CAD\MXD\6.12 Cultural Heritage.mxd_04-Mar-20_03:37 PM
NSW
VICTORIA
Riverina Highway
"Wyseworth"
"Old Flour Mill"
"Cemetery"
Howlong1
I73
I71
I61
I67
I68
I66
I64
I69
I70
I65
I63
I62
Howlong
Anabranch
Black Swan
RIVER
MURRAY
Murray River
Chiltern - Howlong Road
Gooramadda Road
Barnawartha Road
C381
C378
C381
REFERENCE
State Border
Property Boundary
Historic Heritage Site
SCALE 1:50 000 (A4)
500 0 500 1000 1500 2000 m
Data Source: Corowa LEP, 2012
TN
MN

Table 6.24
Unexpected Find Protocol

Action / Observation	Notification / Reporting	Timing
Identification		
Material observed, and work ceased in the vicinity of the object.	Quarry Manager notified.	Immediately upon identification.
A 10m buffer area around the artefact is cordoned off to prevent access.	None	Immediately upon identification.
Skeletal Remains		
Material is human remains	Notification given via phone to: • NSW Police • BCD • DPIE	Immediately upon identification.
Commission an archaeologist to assess remains in consultation with Registered Aboriginal Stakeholders	Notification given via phone/letter/email to Registered Aboriginal Stakeholders.	Once remains are identified as of Aboriginal origin.
	Management strategy and reporting prepared in consultation with BCD and Registered Aboriginal Stakeholders if remains are of Aboriginal origin.	As agreed with relevant parties.
Artefactual Material		
Material is artefactual	Notification given via phone to the BCD and DPIE	Immediately upon identification.
Commission an archaeologist to undertake an assessment of the material in consultation with the Registered Aboriginal Stakeholders.	If the item is suspected to be Aboriginal in origin, notification would be given via phone/letter/email to Registered Aboriginal Stakeholders	Once material is confirmed to be of Aboriginal origin.
	Outcomes to be notified to the BCD and DPIE	To be confirmed with BCD.
Implement recommendations of assessment in consultation with the Registered Aboriginal Stakeholders	Documentation to be prepared by archaeologist describing the outcomes of assessment. Outcomes to be notified to the BCD and DPIE	To be confirmed with authorities and Registered Aboriginal Stakeholders (if relevant).
Re-Commence Extraction Works		
Approval in writing is given by the NSW Police or BCD to recommence works in the affected area.	Notification given to the following groups. • Registered Aboriginal Parties. • BCD • DPIE	Once outcomes of management strategies or assessment are resolved, or material is formally identified to not be artefactual.

6.9.5 Assessment of Impacts

The Project would not impact the archaeological record as no known sites of Aboriginal or historic cultural heritage significance would be disturbed. As there were no areas of cultural significance in the Quarry Site, no assessment of significance was required. One site of cultural significance (Howlong 1) was found 200m north of Stage 4. Disturbance for the Quarry operations would not disturb Howlong 1, however, the Applicant has agreed to fence off this area to avoid inadvertent impact including from agricultural activities on the property.

Ongoing implementation of training and an unexpected find protocol would ensure potential impacts to unknown sites is avoided, where possible and would therefore not have any Aboriginal and historic cultural heritage-related impacts.

The Quarry would not be visible from the Riverina Highway and therefore would not impact the heritage values of the Wyseworth property. The traffic levels from the Quarry would increase from the maximum experienced under existing operations of 4 laden loads per day (8 movements), to a maximum of 40 laden loads per day (80 movements). The Quarry traffic is expected to remain a small proportion of total traffic on the road network. Hence even though Wyseworth is located adjacent to the highway, the increased traffic is not expected to impact the heritage value due to Quarry operations. Similarly, trucks passing the Old Flour Mill are not expected to significantly impact the heritage values or community experience of this location. The Howlong Cemetery would not be impacted by Quarry operations.

6.10 Visibility

6.10.1 Introduction

A Visual Impact Assessment for the Project was undertaken by Advanced Environmental Systems Pty Ltd with the assessment report provided as Part 10 of the *Specialist Consultant Studies Compendium*. The outcomes of that assessment are presented in this subsection with the report hereafter referred to as AES (2020d). In addition, a Statement of Heritage Impact (SOHI) provided by Realm Design considered the visual impact of the proposed operation on the heritage values of nearby heritage items. The SOHI is hereafter referred to as (Realm, 2020).

The SEARs for the Project require an assessment of matters relating to 'visual amenity' that includes "*a detailed assessment of the likely visual impacts of the development on private landowners in the vicinity of the development and key vantage points in the public domain, paying particular attention to any new landforms, and to minimising the lighting impacts of the development*".

The risk assessment undertaken for the Project (**Appendix 8**) identifies key risk sources with the potential to result in visibility impacts. These risk sources and the assessed risk of impacts occurring after the adoption of standard mitigation measures are as follows.

- Visibility of the quarry from local residences and vantage points from the Murray River resulting in decreased visual amenity of local setting (Low).
- Visibility of the quarry from the Highway leading to decrease in visual amenity observed by motorists (Low).

The SEARs for the Project are provided in **Appendix 3** and a summary of the requirements and reference to where the assessment matters have been addressed in the EIS is provided in **Appendix 4**.

This subsection describes the existing visual environment around and within the Property. Potential visual and lighting impacts at private residences and key vantage points in the public domain are discussed along with recommended management and mitigation measures.

6.10.2 The Existing Visual Landscape

The Quarry is located on the Murray River floodplain, approximately 1.5km south of the Riverina Highway. The land surrounding and including the Property is currently used for cropping, cattle grazing, lucerne production and the existing sand and gravel extraction. A total of five sensitive receptors have been identified near the Property, three of which are non-Project related residences and one is a Scout Camp (**Figure 6.13**).

"Morebringer" (R1) is a farming property located approximately 1.27km to the northeast, the Scout camp (R2) at 1.44km, "Wyseworth" (R3) with two homes 100 m apart, at 1.66km to the north, "Tarcoola" at 550m and Heritage Seeds, another farming property, at 1.17km to the northwest of the Property. There are no residences to the south or west within 2km.

The Murray River reserve borders the south of the Property, with the area being used for passive recreational purposes (fishing and boating). Surrounding lands are also used for agriculture, including irrigated cropping and cattle grazing.

Within the Property, the Applicant has commenced construction of a levee bank along the boundary of the existing disturbed area that includes extraction stages 1 to 3, the processing and stockpiling area, internal roads and the office and facilities area. A separate levee would be constructed on the boundary of Stage 4 along the riparian corridor of the Murray River when the Applicant is ready to commence operations in this area.

6.10.3 Changes to the Visual Amenity of the Site

Figure 2.4 displays the progressive extraction and rehabilitation plan for the Project which includes the expansion of the current two extraction areas (Stage 1 and 2), followed by further extraction in the area south of the existing processing plant (Stage 3), and finally expansion of extraction to an additional area (Stage 4). The remaining trees lining the Stage 2 extraction area would be removed. In total, vegetation clearing would be less than 1ha. The levee banks once completed would be approximately 2.7m above the natural ground level with the outer surface revegetated with a mixture of native grass and tree species.

6.10.4 Management and Mitigation Measures

It is acknowledged that glimpses of the existing Quarry are possible from residences and the public road network. To ensure visual impacts from the extraction areas, Quarry infrastructure, and the stockpile site is further minimised, the Operator would implement the following measures.

- Extensive areas of trees would be planted beside the levees surrounding the Quarry Site.
- The infrastructure would be painted an appropriate colour to blend in with the surrounding.

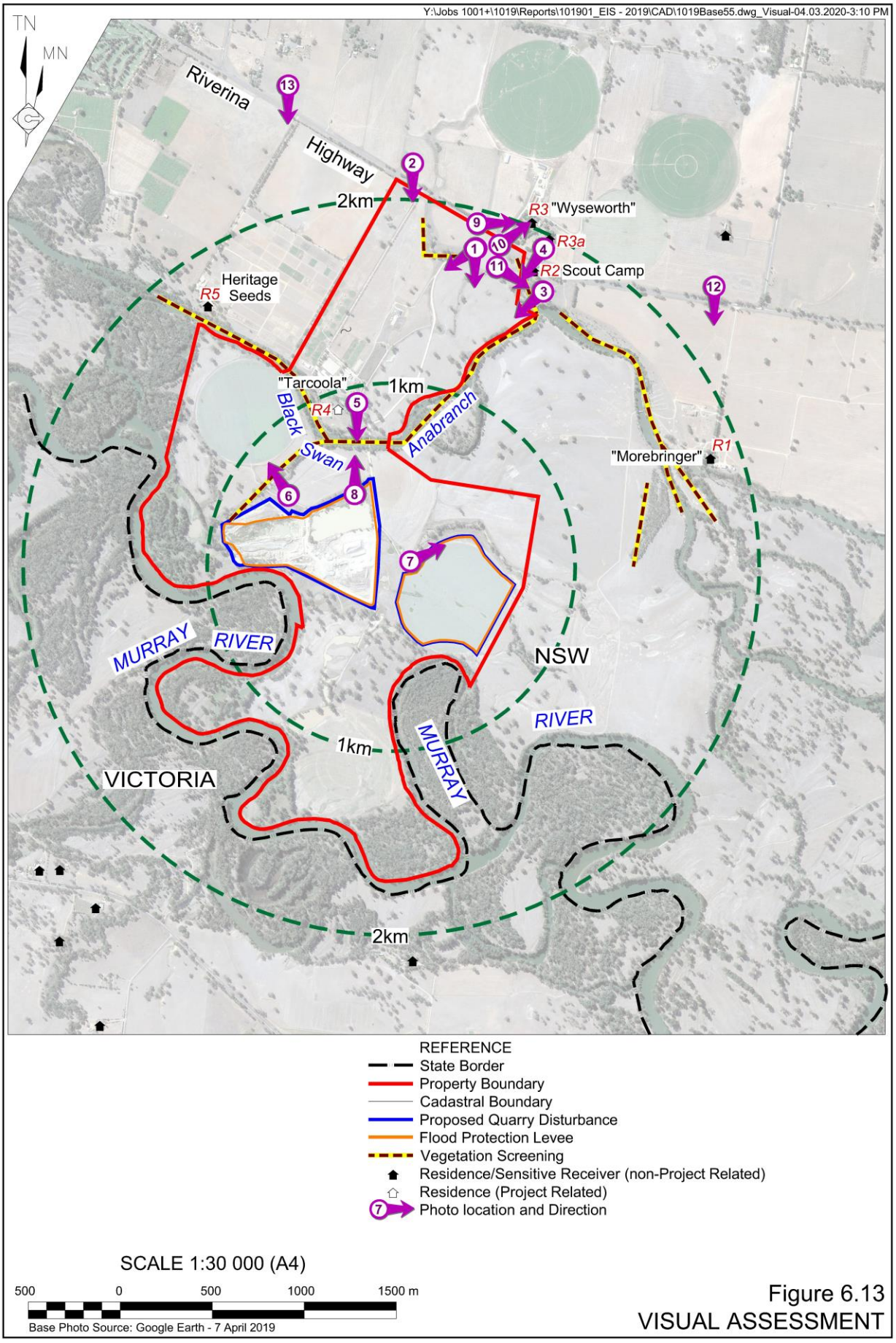

Figure 6.13
VISUAL ASSESSMENT

6.10.5 Assessment of Impacts

The visual assessment undertaken by AES (2020d) noted that "Tarcoola" (R4) would be the only nearby receptor that may have interspersed view of the Quarry and that only during winter when deciduous trees are bare. This residence is Project-related.

Both the assessments by AES (2020d) and Realm (2020) note that each of the remaining three non-Project related residences and the Scout Camp do not have views of the disturbance area due to existing trees, distance, siting and topography. Occasional glimpses of the Quarry stockpiling areas are possible from the Riverina Highway however these are mostly obscured by vegetation with clear views also limited by distance to the road. It is therefore considered unlikely that glimpses of the Quarry would distract drivers and create public safety risks.

The "Morebringer" (R1) property has clumps of trees around the house and a bank of riparian vegetation located 100m to 300m from the residence along the Black Swan Anabranch, all of which will provide substantial visual screening of the Quarry Site. The Scout Camp (R2) only has views of the Quarry Access Road and all other views of the Quarry are obscured by topography and vegetation. The Quarry is not visible from "Wyseworth" (R3), which consists of two residences north of the Riverina Highway with potential views obscured by vegetation, distance, siting and topography. Heritage Seeds (R5), has riparian vegetation and remnant paddock trees, which provide sufficient visual screening of the Quarry Site. All sensitive receptors other than 'Tarcoola" are over 1 km away from the Quarry Site.

Since the Quarry is a daytime operation, it is anticipated that there would be no impact from lighting effects on private landowners in the vicinity, key vantage points in the public domain, agriculture operations, and wildlife. There is currently external general movement sensored utility lighting on the staff facilities for safety purposes which are not used in Quarry operations.

It is considered that vegetation, distance, intervening topography, and daytime only operating hours together with the proposed mitigation measures would continue to effectively screen the Quarry from local vantage points and residences for the life of the Project resulting in minimal visual and lighting impacts.

6.11 Public Safety Hazards

6.11.1 Introduction

The SEARs for the Project require an assessment of the likely risks of the Project to public safety, paying particular attention to potential bushfire risks and the transport, handling and use of any hazardous or dangerous goods". The specific hazard-related impacts that may result because of the Project and therefore require an assessment relate primarily to:

- the handling, storage and disposal of hydrocarbons (see Section 6.12.2); and
- potential for bush fire (see Section 6.12.3).

6.11.2 Handling Storage and Disposal of Hydrocarbons

In order to minimise the potential for hydrocarbon contamination, the following controls and safeguards would be implemented.

- Hydrocarbons and hazardous materials would only be purchased from licensed suppliers for the transport of dangerous goods in accordance with *Dangerous Goods (Road and Rail Transport) Act 2008 No 95.*
- Diesel is likely to be brought to site for refuelling as needed, however any diesel stored at the Quarry would be stored in a self-bunded container and in accordance with *AS 1940 – 2017 The Storage and Handling of Flammable and Combustible Liquids*, or an updated or replacement standard.
- Hydrocarbon waste would be disposed of by a licenced waste contractor to a licenced waste facility.
- Hydrocarbon spill kits would be appropriately located within the demountable office to ensure spill response and clean up can be carried out immediately following the detection of any spills.
- In the event of a hydrocarbon leak or spill, the Applicant would implement the following spill management procedure.
  - Phase 1 – Source Control: isolate the source of spill or leak and stop the leak either by maintenance or placing the leaking item within or over the fuel/oil storage area.
  - Phase 2 – Recovery: recover as much as possible at the source by pumping free hydrocarbon from the surface and excavating hydrocarbon-contaminated materials. Contaminated materials would be stockpiled on site under cover and on an impermeable surface, e.g. a high-density polyethylene sheet.
  - Phase 3 – Remediation: transport the contaminated material to a facility licensed to accept and treat hydrocarbon contaminated material.
- Spills or leaks of other pollutants would be handled in accordance to the relevant Safety Data Sheet.

6.11.3 Bush Fire Hazard

Vegetation on the Property is limited to small patches and isolated trees. The Property is mostly surrounded by cropped paddock land. Quarry infrastructure is limited to the Office, Weighbridge, Pump Sheds, Haysheds and Processing Plant. Fuel loads in the Property are very minimal and hence the bush fire hazard is very low in the area. For a bush fire to occur, three factors must be present. These three factors are oxygen, fuel, and an ignition source. Sources of ignition are likely to fall into one of the four categories:

- Quarry-related activities;
- external ignition sources;
- electricity transmission lines; and
- lightning

The Applicant would prepare an internal emergency management protocol to guide bush fire risk reduction and response in the event of a fire.

6.12 Economic Impacts

6.12.1 Introduction

The risk assessment undertaken for the Project (**Appendix 8**) identifies key risk sources with the potential to result in economic impacts. These risk sources and the assessed risk of impacts after the adoption of standard mitigation measures are as follows.

- Improvement of economic well-being with the LGA due to increase in local employment (Positive Impact).
- Downward pressure on regional infrastructure and construction projects from supply of sand and gravel aggregates (Positive Impact).

The SEARs request an assessment of the following economic impacts related to the Project.

- *The significance of the resource.*
- *The costs and benefits of the Project; identifying whether the development as a whole would result in a net benefit to NSW including consideration of fluctuation in commodity markets and exchange rates; and*
- *the demand for the provision of local infrastructure and services;*

The following qualitative assessment of the economic impacts and benefits of the Project was undertaken by R.W. Corkery & Co. Pty Limited. A review of relevant management measures and commitments to achieve worthwhile, positive economic impacts is also provided.

6.12.2 Significance of the Resource

The significance of the approximately 9.5 million tonnes of sand and gravel within the Quarry Site is best described in terms of the benefits to the regional supply of construction materials. A benefit of the Project would be the provision of an increased supply of quality sand and gravel products to the construction markets in both NSW and Victoria. While there are other suppliers of sand in the local area, most are small in nature and would not be capable of supplying the volumes required for concrete manufacture in the regional centres of Albury / Wodonga and in Benalla where pre-cast concrete operations occur that supply larger urban centres such as Melbourne. The significance of the resource, whilst minor in the context of the whole of NSW and Victoria, would contribute positively to the overall supply of sand and gravel products in the local area.

The property is adjacent to the Riverina Highway that follows the Murray River between Albury and Deniliquin. Supply into Victoria is also possible via Howlong. The proximity of the Site to the Riverina Highway would allow for transportation costs to be minimised and sand and gravel products to be delivered at competitive rates. In addition, the Applicant is an independent Company and would increase competition in the region which would be reflected in the market prices for material and flow on to costs associated with infrastructure and construction projects within NSW and Victoria.

Local Economic Profile

The Federation Local Government Area (LGA) supports a large number of businesses with the major industries including agricultural focused operations such as the Riverlea pork production and processing facilities, agriculture machinery sales and services and food processors as well as a munitions factory, freight transport companies and local tourism, retail and trade businesses.

Federation Council have commission .id consulting Pty Ltd to collate economic statistics on the Federation LGA[3]. The available data indicates that local businesses are estimated to support over 5 900 local jobs and an annual Gross Regional Product greater than $660 million. Key industries of employment in the Federation LGA include agriculture (18.6%), food product manufacturing (9.8%) and food and beverage services (8.6%). Of the 1 352 businesses registered in the Federation LGA in 2018, 457 of these were within the category of Agriculture, Forestry and Fishing industry with the majority of these agriculture based. In 2018 there were only three businesses listed under the mining category which would include extractive industries.

The Albury-Wodonga Regional Economic Development Strategy 2018-2022 (NSW DPC 2018) considers the surrounding local government areas as a single cross-border economic region that incorporates.

- Albury City Council
- Federation Council
- Greater Hume Shire Council
- Wodonga Council (Victoria)
- Indigo Shire Council (Victoria)

The inter-relation of these local government areas is driven by the number of workers commuting to different regions to work[4]. The Albury-Wodonga Regional Economic Development Strategy 2018-2022 indicates that in contrast to the Federation LGA, the broader region supports health care and social assistance and manufacturing and retail and trade which is consistent with the more densely populated centre (Albury/Wodonga) (NSW DPC 2018). Mining and extractive industries are not a feature of the economic development strategies for the region. The following are the key components of the *Albury-Wodonga Regional Economic Development Strategy 2018-2022* (NSW DPC 2018).

1. Support and grow agribusiness and softwoods industries throughout the region.
2. Grow the transport and logistics sector.
3. Continue to develop and grow the tourism sector and the visitor economy.
4. Grow the healthcare sector through the development of a health precinct in the region.
5. Attract and retain talent to sustain the supply of skilled workers by improving liveability throughout the region.
6. Capitalise on the region's opportunity to be a special economic zone.

[3] http://economy.id.com.au/federation

[4] It is estimated that more than 30% of the population in the Albury LGA commute outside the LGA for work (NSW DPC 2018, page 4).

The Project would not limit the achievement of these objectives and it may be argued that it would provide additional diversity in employment and economic development for the region.

6.12.3 Cost Benefit Analysis

6.12.3.1 Introduction

It is recognised that a number of economic costs and benefits would be associated with the Project. These would principally relate to the following key areas which are considered in more detail in the following subsections.

- Effects relating to direct and indirect operational employment.
- Flow-on effects relating to non-labour expenditure during operations.
- Tax revenues to both State and Federal Governments and rates to Federation Council.
- The supply of construction materials to the Upper Murray Region.
- Residual environmental and social impacts.

6.12.3.2 Operational Employment

When operating, the Applicant currently employs eight people at the Quarry. The increase in production up to 300,000tpa is anticipated to increase the number of employees to 10 full time employees. The Applicant will not employ road vehicle operators directly with all activities to be contracted or supplied by clients. The indirect employment of drivers and other maintenance and servicing contractors is considered likely to support an additional 25 full time equivalent positions.

It is anticipated that all operational personnel would reside in Howlong, Corowa or Albury. Increased employment would have flow-on effects through the payment of wages and the subsequent purchase of housing or payment of rent, groceries and spending of disposable income in the Federation LGA.

It is anticipated that the average annual wage for the quarry workforce would be approximately $75,000 which would equate to an average payroll for the on-site personnel of $750,000 each year and $1,875,000 for transport operators indirectly. The anticipated flow-on effects generated by wage expenditure at Local (multiplier = 2.0), State (multiplier = 2.2) and National (multiplier = 2.5) levels have been conservatively estimated as follows[5].

- Local flow-on effects ($1.5 million per annum directly and $3.8 million per annum indirectly).
- State flow-on effects ($1.7 million per annum directly and $4.1 million per annum indirectly).

[5] Flow on effect multipliers have been conservatively estimated for the Project noting that input output multipliers used by the Australian Bureau of Statistics are generally higher for the 'mining' industry https://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/FFD0BAE851EDCB8BCA2570C9007ECE04/$File/52460+-+Information+Paper+-+Introduction+to+Input+Output+Multipliers.pdf .

- National flow-on effects ($1.9 million per annum directly and $4.7 million per annum indirectly).

Assuming an average of 10 full time equivalent positions, the payments/wages to employees would directly contribute $22.5 million into local and regional economies over the life of the Project. Flow-on effects over the life of the Project would equate to an estimated $159.0 million (Local), $174 million (State), and $198 million (National) for both direct and indirect benefits.

6.12.3.3 Operational Materials and Equipment Expenditure

The operation of the Project would require the ongoing purchase of materials, consumables, equipment and services by the Applicant. These costs would largely comprise costs associated with the maintenance and/or replacement of mobile equipment (e.g. excavators, bulldozers etc.), mobile crushing plant equipment, consumables (e.g. fuel, etc.) and services not included under wages (e.g. environmental monitoring etc.). These costs would be ongoing throughout the life of the Project and are estimated at approximately $1.6 million per year.

The flow-on effects generated by expenditure on operational materials, equipment and services at Local (multiplier = 1.5), State (multiplier = 2.0) and National (multiplier = 2.5) levels over the life of the Project have been estimated as follows.

- Local flow-on effects ($2.4 million)
- State flow-on effects ($3.2 million)
- National flow-on effects ($4.0 million)

It is noted that material and equipment purchases would be sourced from the Federation LGA wherever possible to enhance flow-on effects within the local area.

6.12.3.4 Tax Revenue

The Applicant would pay payroll tax to the State of NSW and income tax to the Federal government. A proportion of income taxes would be effectively received by the State of NSW and the local community through the Federal funding of infrastructure, health and education services. Increased rates would be payable by the landowner to Federation Council throughout the life of the Quarry.

The payment of taxes and rates may vary over the life of the Project depending on the ability of the Applicant to maximise the volume of material sold to clients. The production of the sand and gravel resource is not prone to market fluctuation based due to commodity price or exchange rate impacts other than where those fluctuations impact the construction and infrastructure development industries. It is not considered likely that an over-supply of sand and gravel would occur over the life of the Project.

6.12.3.5 Economic Costs

Section 6 of the EIS outlines the environmental impacts that are likely to result from the Project. Whilst potential impacts of the Project have been avoided, minimised and/or mitigated as far as practicable, it is acknowledged that there may be some minor economic costs associated with

residual impacts to the natural environment and for the local community. Residual impacts of the Project include the generation of dust and operational noise as well as potential changes to water resources and wear on the road network that could impact the attractiveness of the local area to tourists and residents.

Comprehensive predictive assessments have been undertaken during the preparation of the EIS to predict and demonstrate potential cumulative impacts. The outcomes of these assessments have confirmed that the Project and surrounding quarry operations would cumulatively operate within the criteria established within the relevant guidelines and legislation.

In addition to costs associated with residual environmental impacts, a range of social impacts may result from the operation. These impacts are described in more detail in Section 6.13. Residual social impacts may also have a cost if they result in lost employment opportunities, impacts to property values, increased health management costs and impacts to tourism. It is not expected that significant economic impacts would result from any residual social impacts of the Project.

6.12.4 Demand

The Applicant has existing contract arrangements with Hanson Construction Materials Pty Ltd for the supply of quarry products for the production of concrete throughout Albury and Wodonga. In addition, manufacturing of pre-cast concrete structures has been progressively increasing to supply infrastructure development in Melbourne and the Quarry would be strategically located to supply sand resources for this purpose. In addition, the Quarry would continue to supply sand and gravel through the Federation LGA and the Shire of Indigo for local road construction and maintenance or as needed.

6.12.5 Management and Mitigation Measures

In addition to the environmental mitigation measures and management procedures identified throughout Section 6 and summarised in Section 7, the Applicant would implement the following management and mitigation measures to ensure that economic benefits to the Federation LGA arising from the Project are maximised and adverse impacts are minimised.

- Where appropriate, give preference when engaging new employees to candidates who live within the Federation LGA over candidates with equivalent experience and qualifications based elsewhere.
- Encourage and support participation of locally-based employees and contractors in appropriate training or education programs that would provide skills and qualifications that may be of use at the Quarry (and potentially elsewhere within the extractive, mining or related industries).
- Give preference, where practicable, to suppliers of equipment, services or consumables located within the Federation LGA.

6.12.6 Conclusion

The Project provides for the extraction, processing and despatch of quality sand and gravel products to meet the needs of housing and construction markets in New South Wales and Victoria. The extraction of this resource would assist to exert downward pressure on costs associated with construction material supply and influence market costs associated with construction and infrastructure projects. The Project would further assist in generating local employment and contribute to local, regional, state and National economies through flow-on effects.

It is concluded that the net economic benefits of the Project would outweigh the costs as the Project would:

- contribute towards the supply of sand and gravel products to markets in NSW and Victoria;
- provide ongoing employment opportunities directly and indirectly;
- contribute to the continued economic growth at local, regional, State and National levels through flow-on effects; and
- avoid, minimise and/or mitigate environmental and social impacts to the greatest extent practicable which in turn relates to the economic costs of the Project.

6.13 Social Impacts

6.13.1 Introduction

A Social Impact Assessment for the Project has been prepared by Dr Jonathon Howard and is hereafter referred to as Howard (2020). The Social Impact Assessment (SIA) is provided as Part 11 of the *Specialist Consultant Studies Compendium*.

The SEARs request an assessment of social impacts related to the Project to address those issues that may affect or concern people, whether directly or indirectly. Any real or perceived impacts of the Project may have social consequences and therefore the assessment of these impacts needs to look beyond technical assessment.

The risk assessment undertaken for the Project (**Appendix 8**) identifies key risk sources with the potential to result in social impacts. It is noted that other environmental risks, such as air, noise, visual etc, may also have social implications / impacts. These risk sources have been assessed throughout the respective sections of the EIS. Risk sources specifically relating to social impacts and the assessed risk of impacts after the adoption of standard mitigation measures are as follows.

- Improvement of economic well-being within the LGA due to increase in employment (Positive Impact).
- Change in local community structure as a result of income disparity (Low).
- Inability of existing services and infrastructure to meet needs of community (Low)
- Changes to an individual's experience of a place or of their home due to impacts associated with local amenity such as traffic, noise, visual or dust impacts (Low).

- Negative impacts to way of life and in extreme cases community interactions and cohesion due to impacts associated with local amenity such as traffic, noise, visual or dust impacts (Low).
- Change of social activities in local communities and impact on feelings of well-being derived from associated location due to proximity of quarry to local and neighbouring properties (Low).
- Reduction in land values as result of perceived / loss of land values arising from quarry's operation (Low).
- Feeling that the community has no control over matters that directly affect their lives (Low).
- Loss of income due to detrimental impacts to agricultural resources (Low).

The SEARs for the Project require an assessment of matters relating to 'social and economic' that includes the following.

- A detailed assessment of the likely social impacts of the development on the local and regional community in accordance with the *Social impact assessment guideline for State significant mining, petroleum production and extractive industry development*.

The SEARs for the Project are provided in **Appendix 3** and a summary of the requirements and reference to where the assessment matters have been addressed in the EIS is provided in **Appendix 4**.

The following subsections have been drawn from Howard (2020) and provide a summary of the social context and the impacts that may result from the Project, with an emphasis on matters raised during consultation with local community members and government agencies.

6.13.2 Stakeholder Identification

A stakeholder and community consultation plan was developed to identify the key community stakeholders and present those stakeholders with information about the Project. The plan also allowed stakeholders to provide feedback and identify any issues or concerns that they may have. The consultation plan was focused on the landowners adjacent to the Project and individuals within the local community with an interest in the Project, as detailed in Section 2.3 of Howard (2020). The following key stakeholder groups were identified for the Project.

- State and Commonwealth Government authorities.
- The landowner.
- Neighbouring landholders / businesses.
- Service providers and local businesses associated with the Quarry.
- Aboriginal stakeholders, individuals, communities and associations.
- Relevant local community and environment groups.

- The Howlong community.
- The regional centre of Albury/Wodonga.
- Federation LGA community.

Further details on the stakeholder and community consultation undertaken for the Project is provided in Section 3.

6.13.3 Existing Social Context

6.13.3.1 Local Residences

The land surrounding the Property is zoned for environmental management and is largely used for grazing and cropping. The Quarry is located on low lying land and is visually isolated from the neighbouring properties and the Riverina Highway by large remnant red gums and riparian vegetation on the Black Swan Anabranch.

The Quarry's neighbouring residences are labelled R1 to R5 in **Figure 6.8** and are described below.

- R1 'Morebringer' – this property is about 1.5km east-northeast of the Quarry and is a historic double-brick homestead with frontages to Palour Creek and Lesters Lagoon. It consists of 328ha of river flats and 526ha of higher tier country. Approximately 400ha of this land is cropped for canola, wheat, and barley, with the rest for grazing on a share farming basis.

- R2 'Scout Camp' – this site is about 1.5km northeast of the Quarry and is occasionally occupied on weekends or school holidays by local scout groups.

- R3 'Wyseworth' – this 433ha property with house and farm is situated north of the Riverina Highway. The property has a site manager and the land has been managed for dairy and irrigated lucerne production for the last 5 years. The 'Wyseworth' homestead, garden and outbuildings have cultural heritage significance to the local area of Federation Council. The property is owned by Fraser Earthmoving Construction Pty Ltd (the Applicant).

- R4 'Tarcoola' – this residence and property is owned by Nangunia Pty Ltd (Nangunia). The Quarry is located on this property and Nangunia has agreed to allow 'unfettered access and control' to the Project and has provided 'full and unconditional support' for the Project (see **Appendix 1**). 'Tarcoola' is separated from the Quarry by the Black Swan Anabranch.

- R5 Heritage Seeds Pty Ltd – this company is one of Australia's largest seed companies. The site at Howlong has a strong research and development focus with significant programs being conducted trials of new grasses including Ryegrass, Lucerne, Cocksfoot, Cereals and Clover for use as fodder crops, forage cereals, field crops and turf and amenity grasses.

6.13.3.2 Nearby Towns and Urban Centres

Howlong

Howlong is located on the northern bank of the Murray River, 4km west of the Quarry (**Figure 1.1**). The township includes residential, commercial and industrial land uses that are surrounded by rural areas to the west, north and east. The waterway to the south is an important recreational and tourist attraction, providing a range of water skiing, canoeing, swimming, and camping opportunities in the summer. The town had an official population of 2 777 recorded in the 2016 census, with a median age of 47, 49.9% of which were male and 50.1% were female. Howlong has become an important inland township that services the smaller villages of the area with a range of stores that meet most of the everyday needs of the people of the area.

Albury

The City of Albury is also located on the northern bank of the Murray River, 25km to the east of the Quarry (**Figure 1.1**). It is a major regional centre with a population of over 50 000 recorded in the 2016 census. Local government is the responsibility of the Albury City Council. The city is separated from its twin city in Victoria, Wodonga, by the Murray River. Together, the two cities form an urban area with a population almost 100 000, over 80% of which are Australian born and speak English at home.

Albury serves as a major administrative centre for the agricultural communities around the area. It is the home of the Norske Skog newsprint paper mill which processes the pine logs from the mountains to the east and it is a major processing centre of the Australian Taxation Office, plus several other secondary industries.

6.13.3.3 Local Government Areas (LGA)

Federation LGA

The Quarry is in the southeast section of Federation LGA, which extends from the Murray River in the South to Boree Creek in the north covering an area of 5 685km^2. The key towns are Howlong, Corowa, and Mulwala. Federation LGA was formed in 2016 from the merger of the Corowa and Urana Shires. At the time of its establishment it had an estimated population of 12 600 (Howard, 2020).

The economic profile for the region indicates much of the land in the north is used for cropping and grazing. Key industries include a piggery feedlot and abattoir, agriculture machinery sales and services, food processors, grain storage, a munitions factory, numerous freight transport companies, and tourism. Federation Council's economy supports almost 1 300 businesses and over 5 000 local jobs. Gross Regional Product is equivalent to $524 million annually.

Greater Hume LGA

Greater Hume LGA is located immediately east of Federation LGA, adjacent to the Hume, Olympic and Riverina Highways. The LGA was formed in 2004 incorporating Culcairn Shire, the majority of Holbrook Shire, and part of Hume Shire. Major towns include Holbrook and Culcairn. The LGA had an estimated population of 10 378 as at 2015. The LGA covers an area of 5 929 km² and features steep, vegetated terrain in the east and low rolling hills and plains in the west. Much of the land is used for cropping and grazing.

Jindera is located 21km east-northeast of the Quarry and is the fastest growing town in the Greater Hume LGA. Jindera's population at the 2016 Census was 2 222 and it is located within a short commute to Albury. The availability of residential and industrial land, quality services and its proximity to Albury-Wodonga has contributed to making Jindera a popular and viable alternative for many families.

Albury LGA

The City of Albury covers 305.9km^2 north of the Murray River. The City has a strong economy, provides a range of educational facilities, good medical and health services, a vibrant cultural and artistic scene, and a variety of leisure and recreational opportunities. The LGA's economy supports 4 573 businesses and a labour force of close to 30 000 and the Gross Regional Product is over $4 billion (Howard, 2020).

6.13.4 Existing Demographic Profile

The social profile of the region is described in detailed in Section 3 of Howard (2020) and a baseline profile summary is presented in Section 3.10 of that document. The key trends and demographic characteristics identified in this summary are outlined below.

The Quarry is located within the Federation LGA, 4km to east of Howlong on land owned by Nangunia Pty Ltd. There are four residences neighbouring the property that the Quarry is located within, all of which are greater than 1km distant from the current processing area (labelled R1 to R3 and R5, **Figure 6.8**). These properties are managed or owned businesses (e.g. Heritage Seeds) or are part of the wider Nangunia holding. The 'Scout Camp' is only occasionally occupied on weekends or school holidays by local scout groups. The Quarry is located well away from residential dwellings and locations where substantial human activity takes place.

Howlong has a stable but aging population that is relatively old compared to the wider population. However, some young families have moved into the district, possibly due to its proximity to Albury, for working opportunities. Most people live in a privately owned 2-3 bedroom house and are of Australian or English origin. Most of the population of Howlong have not undertaken further study at university and work in labouring as technicians, or as tradesman in agriculture, forestry or fishing, manufacturing or construction. Household income is lower than the national average, but not significantly different to the region.

Albury is the largest regional centre closest to the Quarry. Albury has a strong economy, provides a range of educational facilities, good medical and health services, a vibrant cultural and artistic scene, and a variety of leisure and recreation opportunities. It also provides a range of housing and lifestyle opportunities for any new workers employed at the Quarry.

One of the main economic benefits of the Project is the creation of jobs that provide benefits to employees and the broader community. The types of jobs potentially available at the Quarry, namely labouring and transport, are well suited to the existing community profile because they match the skill profile of the existing population. The Quarry could provide alternate employment opportunities when seasonal conditions reduce regional agricultural production. When the region experiences a decline in agricultural production, the Project could provide Howlong with a buffer against economic downturn. As a result, the Project could contribute to the community's cohesion, social capital, and resilience.

Strategic planning documents identify that the community would like to retain its quality of life in a growing, progressive and prosperous community that provides a rural/country lifestyle underpinned by a diversified economy. The Project is consistent with this vision and meets an identified need for sand and gravel in the construction industry. However, it will be important that the various components of the supply chain (e.g. haulage) do not disrupt the community's aspirations.

6.13.5 Issues Identified in Stakeholder Consultation

Section 3 provides a summary of the methods used for stakeholder engagement and the consultation undertaken with the community, Aboriginal stakeholders and government agencies. Issues identified by the government agencies are listed in the SEARs, which are tabulated in **Appendix 4** and cross-referenced to the relevant EIS section. Issues raised by the remaining stakeholders are described in detail in Sections 4.7 and 4.8 of Howard (2020). A summary of those issues is provided in the remainder of this subsection.

Feedback from the community acknowledged the benefits of the Project, while also expressing some concerns about possible impacts. Overall, community interest in the Project was not particularly high. Neighbours raised no concerns about the increase in production from an existing use, and most other groups wanted to know that their issues and/or concerns would be addressed by the assessment phase of the EIS. The proposed expansion of the Quarry has not generated any significant opposition, probably due to the enterprise being part of the community for over 60 years.

The community also appreciated the benefits attributed to increased business and employment opportunities. The anticipated employment of 8 direct staff and the increase in other ancillary business opportunities were perceived as beneficial outcomes of the Project.

Increased haulage on the Riverina Highway through the centre of Howlong was an issue for some members of the community. Community discussion about this issue focussed on:

- an appreciation that the Riverina Highway forms the main street of Howlong and that traffic needs to use it; and
- whether the number of additional trucks was a significant increase to the overall traffic volume.

The discussion around this issue on social media suggested an underlying context may have been a previous proposal to build a composting plant on the edge of town. This had made the community wary of any new proposal and whether it might affect the ‘existing way of life’ in Howlong.

The public meetings and community group consultation also raised several issues about the Project and its impact on the natural environment, particularly the relationship/interaction between the Quarry and the Murray River, including the following.

- The impact of flooding on the Quarry (see Section 6.4).
- The risk of chemical contamination of the river (see Section 6.4.3).

- How the Quarry would manage any discharge into the river (see Section 6.3.3 – there would be no need to discharge water to the river).
- The overall impacts on native flora and fauna (see Section 6.8).

The revegetation and rehabilitation plans for the Property were perceived as a positive outcome of the Project.

6.13.6 Assessment of Social Impacts

The outcomes of the scoping phase of the SIA, the review of existing socio-economic context and the outcomes of community engagement have been used to inform the evaluation of potential social impacts. Potential impacts were evaluated by considering the current perception of impacts from the local community and the unmitigated Project outcomes. These matters are described in detail in Sections 5.2 and 5.3 of Howard (2020). The impact characteristics are summarised in terms of the extent, duration, severity and sensitivity of each impact in **Table 6.25**.

Table 6.25
Social Impact Characteristics

Social Impact Matter	Stakeholder Issues	Extent	Duration	Severity	Sensitivity
Amenity	Visual amenity, air quality, noise and truck movements.	Most impacts do not extend beyond the Property and only potentially affect neighbours. Increased truck numbers amount to 1.6% of existing traffic.	Ongoing during business hours.	The nature of change remains the same as existing use and frequency would increase.	Neighbours have stated that they have no concerns.
Access	Increased haulage, access via a private road and bridge.	Impacts occur at property boundary as trucks enter Riverina Highway.	Ongoing during business hours.	No significant increase in the number of trucks entering and leaving the Property.	Riverina Highway is capable of handling additional trucks.
Heritage	Legal and moral obligation to manage and conserve heritage sites.	No known historic cultural heritage sites in the area. One Aboriginal artefact scatter outside the footprint of the Project. 'Wyseworth' homestead is visually isolated and remote from Quarry.	Impact to artefact scatter unlikely during development and operational phases.	Artefact scatter would not be disturbed during operations.	No concerns expressed by LALC or owner of 'Wyseworth'.
Social Licence	Community awareness of the Project and options for community engagement.	Concern / wariness expressed by various community members.	Likely to be ephemeral based on recent history of other proposed developments and landholder views that the Project is an extension of existing use.	Community recognition of existing use. Trust would be built with time and effort.	Unique or unexpected activity may increase community focus on activities at the Quarry.

Table 6.25 (Cont'd)
Social Impact Characteristics

Social Impact Matter	Stakeholder Issues	Extent	Duration	Severity	Sensitivity
Natural Environment	Range of issues of concern including vegetation management and interaction of the Project with the Murray River.	Impacts may occur to biophysical assets and may extend beyond the Property. Values assigned to these assets are connected to lifestyle and therefore span a broad section of the local community.	Negative impacts could occur during Project life and could be short or medium term. Likely positive impact during rehabilitation and post-extraction phases.	Negative impacts unlikely due to the proposed mitigation measures outlined in the EIS.	Widely held assets or values could be disturbed.

The existing social impacts experienced by the community influence the potential for and expectation of cumulative social impacts. The potential amenity impacts of the Project have been the subject of a comprehensive technical review that predicts that the Project would operate within acceptable criteria established in NSW guidelines and legislation. Residual social impacts are predicted to occur as a result to changes to local amenity which may influence the existing way of life for some stakeholders. In addition, the community values the local environmental features of the area and impacts to these features have social consequences.

6.13.7 Management and Mitigation Measures

The management and mitigation measures relating to specific environmental impacts of the Project are detailed throughout Section 6 of this EIS. A range of standard social mitigation and ongoing community engagement activities would be implemented for the Project to address potential residual social impacts including the following.

- Establish and support a Community Consultative Committee with meetings to be held twice a year.
- A complaints management protocol would be established so that complaints are recorded, addressed by the appropriate person and feedback provided to the complainant in a timely manner.
- A Community and Stakeholder Engagement Plan would be developed in consultation with the local community and would describe ongoing consultation commitments.
- A Drivers Code of Conduct would be developed and implemented to guide driver behaviour.

Mitigation and management measures in addition to the standard mitigation measures described above include the following.

- A range of social performance criteria would be established in a Community and Stakeholder Engagement Plan and performance against these criteria would be reported in each Annual Review. These criteria would include but not be limited to the following.
  - The number and nature of complaints received.
  - The number of employees and, where appropriate, the number of employees living locally.
  - Compliance with criteria relating to social amenity.
  - The number of traffic incidents or near misses.
  - An overview of community engagement activities undertaken throughout the year including open days or other opportunities to familiarise the community with operations.

6.13.8 Conclusion

The Project would create a range of social and economic benefits for the local community. Most of the identified negative environmental impacts would be unlikely to occur or could be managed and mitigated implementing appropriate operational safeguards. Two key benefits arising from the Project are that it:

1. builds on the existing human capital in the community and thereby increases the overall resilience of the local community (e.g. due to fluctuations in agricultural production); and
2. provides an additional source of sand and gravel for local markets and the broader, growing region.

It is recommended that mechanisms for on-going liaison with the community be implemented to ensure the Applicant maintains and increases its reputation as a 'good corporate citizen' in the community.

Section 7

Summary of Environmental Management and Monitoring Measures

PREAMBLE

This section has been compiled to record the full range of environmental management and monitoring measures that would be adopted when developing and operating the Quarry. These measures are designed to effectively manage, mitigate, guide and monitor its operation of the Quarry throughout its entire operational life.

The measures are presented in tabular form and record the respective actions and timing.

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Table 7.1
Proposed Environmental Management and Monitoring Measures

Action		Timing
1.	**Traffic and Transport**	
1.1	Upgrade the existing concrete bridge as recommended by SJ Street & Associates (**Appendix 7**).	Prior to the commencement of operations
1.2	Upgrade the intersection of the Quarry Access Road and the Riverina Highway to a Basic Auxiliary Left (BAL) and Basic Auxiliary Right in accordance with Austroads (2019) and as indicated in the conceptual design prepared by TTPP (2020).	
1.3	Prepare and implement a detailed Traffic Management Plan, incorporating a Driver's Code of Conduct, to safely manage any traffic impacts during all stages of the Project.	
1.4	Require all truck drivers travelling to and from the Quarry to sign a Driver's Code of Conduct that clearly outlines the Applicant's expectations of each driver whilst travelling to and from the Quarry on public roads.	
1.5	Construct a stopping point and one-way signage to direct traffic using the private bridge over the Black Swan Anabranch.	
1.6	Maintain the Quarry Access Road to ensure it is suitable for use and is not causing unnecessary impacts (noise and sediment generation).	Throughout the life of the Project
1.7	Request road registered heavy vehicles to follow a one-way route within the Quarry (generally anti-clockwise) to minimise conflict with other heavy vehicles.	
1.8	Encourage communication between Project-related heavy vehicle truck drivers and other heavy vehicle drivers on the public road network in the event of a traffic incident.	
1.9	Prioritise rapid response to traffic incidents.	
2.	**Groundwater**	
2.1	Prepare and implement a Water Management Plan for the Project that incorporates groundwater management procedures.	Prior to the commencement of operations
2.2	Continue to utilise groundwater removed from extraction stages for irrigation of agricultural activities on the Property or neighbouring properties.	Throughout and following the life of the Project
2.3	Continue to balance water levels and irrigation demand in extraction stages as these are progressively developed.	Throughout the life of the Project
2.4	Implement a comprehensive groundwater monitoring program as described in the Water Management Plan.	
2.5	Compare groundwater monitoring results to trigger levels provided in the ANZ Guidelines (ANZG, 2018) and thresholds for further investigation, until sufficient data is available to indicate site-specific trigger values.	
2.6	Should monitoring indicate results have exceeded trigger levels, initiate contingency responses including: • an investigation of impacts to privately-owned water bores and groundwater availability; • provision of compensatory measures for the effected landowner including the supplementary water from on-site supply or remedial measures for bore operation; and • notification of impacts to the relevant Government authority and reporting on the incident.	

Table 7.1 (Cont'd)
Proposed Environmental Management and Monitoring Measures

Action		Timing
3.	**Surface Water**	
3.1	Construct a 2.7m high levee bank around the Quarry disturbance area to limit water ingress during periods of flooding.	Prior to the commencement of operations
3.2	Prepare and implement a Water Management Plan for the Project that incorporates surface water management procedures.	Prior to the commencement of operations
3.3	Ensure that no water collected within the Quarry Site is discharged to any nearby watercourse. All water would be used for processing, irrigation, on site dust suppression or would be stored and allowed to evaporate.	Throughout and following the life of the Project
3.4	Ensure that all fuel and chemical storage is bunded to 110% of the size of the largest receptacle in accordance with the relevant Australian Standards (currently *AS 1940:2017 The storage and handling of flammable and combustible liquids*).	Throughout the life of the Project
4.	**Noise**	
4.1	Fit all mobile equipment with standard muffling apparatus.	Throughout the life of the Project
4.2	Use frequency modulated reversing alarms on all mobile equipment.	
4.3	Maintain internal roads to minimise body noise from empty trucks.	
4.4	Restrict noise-generating activities to the nominated hours of operation.	
4.5	Maintain vehicles according to manufacturer's specifications.	
4.6	Maintain dialogue with surrounding landowners to ensure any concerns over operational noise are addressed.	
4.7	Implementation of a complaints protocol to document complaints and to guide investigation and response procedures.	
4.8	Ensure that all activities are undertaken within the approved hours of operation.	
4.9	Refuse entry to poorly maintained vehicles, or those reported to generate excessive noise levels.	
4.10	Ensure all truck drivers comply with a Drivers Code of Conduct outlining procedures for reducing noise impacts when travelling to and from the Property and whilst on site.	
5.	**Air Quality**	
5.1	Check weather forecasts prior to undertaking material handling or processing and assess activities planned or during adverse weather conditions and modify as required.	Throughout the life of the Project
5.2	Use water carts or sprinklers to suppress dust from excavators, trucks and stockpiles to minimise wind erosion during periods with wind speeds in excess of 10m/s.	
5.3	Switch off engines of on-site vehicles and plant when not in use.	
5.4	Fit vehicles and plant with pollution reduction devices where practicable.	
5.5	Maintain vehicles according to manufacturer's specifications.	
5.6	Adjust or cease operations should excessive dust be generated.	
5.7	Keep the extent of exposed surfaces and stockpiles to a minimum.	
5.8	Cover or dampen exposed areas and stockpiles with water as far as is practicable if dust emissions are visible, or there is potential for dust emissions outside operating hours.	

Table 7.1 (Cont'd)
Proposed Environmental Management and Monitoring Measures

Action		Timing
5.	**Air Quality (Cont'd)**	
5.9	Minimise dust generation by undertaking rehabilitation earthworks when topsoil and subsoil stockpiles are moist and/or wind speed is below 10m/s.	
5.10	Reduce drop heights from loading and handling equipment, where practical.	
5.11	Sweep/clean any hardstand areas, internal on-site or public roads, as required.	
5.12	Restrict vehicle traffic to designated routes.	
5.13	Enforce on-site speed limits.	
5.14	Cover all vehicle loads when travelling off-site.	
6.	**Land Resources**	
6.1	Clearly mark areas for stripping and stockpiling.	Throughout the life of the Project
6.2	Strip soil from all areas of disturbance and store in stockpiles no more than 2m high for future rehabilitation activities or transfer soil directly to areas to be revegetated.	
6.3	Refrain from stripping or placing soil during wet conditions as far as practicable.	
6.4	Implement erosion control measures (e.g. silt-stop fencing) at downslope locations if clearing during wet periods is unavoidable.	
6.5	Use water carts or sprinklers to suppress dust from excavators, trucks and stockpiles to minimise wind erosion during periods with wind speeds in excess of 10m/s.	
6.6	Mix gypsum and lime with soils prior to revegetation to improve soil quality, as required.	
6.7	Ensure that the soil stockpile surfaces have a surface that is as 'rough' as possible, in a micro-scale, to assist in surface water runoff control and seed retention and germination.	
6.8	Spread seed of a suitable cover crop on all soil stockpiles to facilitate revegetation.	
6.9	Signpost the soil stockpiles and limit operation of machinery on the stockpiles to minimise compaction and further degradation of soil structure.	
6.10	Rip or scarify all areas to be respread with topsoil to allow the respread material to be keyed into the underlying material.	
7.	**Biodiversity**	
7.1	Reinstate a 100m buffer between extraction areas and the Murray River and rehabilitated the reinstate land.	During Stage 1 and Stage 2 of operations.
7.2	Rehabilitate Stage 1, 2, 3 and 4 extraction areas to form permanent wetlands and provide suitable habitat and foraging areas for aquatic species, birds and bats.	Throughout and following the life of the Project
7.3	Prepare and implement a Riparian and Wetland Management Plan to guide the integration of the created natural wetlands and natural wetlands and riparian areas in the vicinity of the disturbance area.	Prior to the closure of the Quarry
7.4	Undertake revegetation activities using species representative of PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina where appropriate and extend existing nesting and foraging habitat.	Prior the commencement of operations

Table 7.1 (Cont'd)
Proposed Environmental Management and Monitoring Measures

Action		Timing
8.	**Cultural Heritage**	
8.1	Fence off the Howlong 1 artefact scatter to avoid inadvertent disturbance.	Prior the commencement of operations
8.2	Prepared and implement an unexpected find protocol.	
8.3	Educate all relevant personnel, contractors and subcontractors regarding their legal obligations in relation to Aboriginal cultural heritage under the *National Parks and Wildlife Act 1974* through an on-site toolbox talk or induction.	
9.	**Visibility**	
9.1	Plant extensive areas of trees beside the levees surrounding the Quarry Site to provide additional tree screening.	Throughout and following the life of the Project
9.2	Paint the infrastructure an appropriate colour to blend in with the surrounding.	Throughout the life of the Project
10.	**Public Safety Hazards**	
10.1	Purchase hydrocarbons and hazardous materials only from licensed suppliers for the transport of dangerous goods in accordance with *Dangerous Goods (Road and Rail Transport) Act 2008 No 95.*	Throughout the life of the Project
10.2	Store diesel in a self-bunded container and in accordance with *AS 1940 – 2017 The Storage and Handling of Flammable and Combustible Liquids*.	
10.3	Dispose any hydrocarbon waste using a licenced waste contractor and a licenced waste facility.	Throughout and following the life of the Project
10.4	Appropriately locate hydrocarbon spill kits to ensure spill response and clean up can be carried out immediately following the detection of any spills.	Throughout the life of the Project
10.5	Handle spills or leaks of other pollutants in accordance to the relevant Safety Data Sheet.	
11.	**Economic**	
11.1	Give preference when engaging new employees to candidates who live within the Federation LGA over candidates with equivalent experience and qualifications based elsewhere.	Throughout the life of the Project
11.2	Encourage and support participation of locally-based employees and contractors in appropriate training or education programs that would provide skills and qualifications that may be of use at the Quarry (and potentially elsewhere within the extractive, mining or related industries).	
11.3	Give preference, where practicable, to suppliers of equipment, services or consumables located within the Federation LGA.	
12.	**Social**	
12.1	Establish and support a Community Consultative Committee with meetings to be held twice a year.	Prior to the commencement of operations and throughout the life of the Project
12.2	Develop a Community and Stakeholder Engagement Plan in consultation with the local community and describe ongoing consultation commitments.	Prior to the commencement of operations

Table 7.1 (Cont'd)
Proposed Environmental Management and Monitoring Measures

Action		Timing
12.	**Social (Cont'd)**	
12.3	Establish a complaints management protocol so that complaints are recorded, addressed by the appropriate person and feedback provided to the complainant in a timely manner.	Throughout the life of the Project
12.4	Review performance of the Community and Stakeholder Engagement Plan against the following criteria in the Annual Review. • The number and nature of complaints received. • The number of employees and, where appropriate, the number of employees living locally. • Compliance with criteria relating to social amenity. • The number of traffic incidents or near misses.	

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Section 8

Evaluation and Justification of the Project

PREAMBLE

This section concludes the assessment of the proposed Howlong Sand and Gravel Expansion Project. The Project is evaluated based on the residual risks posed and in consideration of ecologically sustainable development (ESD) principles.

A justification for the Project is provided based on the predicted residual impacts of the Project, and the likely economic and social benefits that would be generated. This section concludes with a review of how each of the Objects of the Environmental Planning and Assessment Act 1979 are satisfied by the Project together with the consequences of the Project not proceeding.

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8.1 Introduction

In order to conclude the EIS, it is a requirement of Clause 7(1)(f) of the *Environmental Planning and Assessment Regulation 2000***,** that the Project is evaluated and justified through consideration of the principles of ecologically sustainable development, as well as biophysical, economic and social matters.

The evaluation of the Project is undertaken by firstly assessing the identified environmental risks posed to the local environment by the proposed activities (**Appendix 8** – **Table A8.4**) and then considering the implementation of the commitments for controls, safeguards or mitigation measures outlined in Section 6 and summarised in Section 7. The Project has also been evaluated against the principles of Ecologically Sustainable Development (ESD) in order to provide further guidance as to the acceptability of the Project.

Section 8.3, which presents the justification of the Project, revisits the predicted residual impacts on the biophysical environment, considers the economic and social benefits which would be provided and assesses the consequences of not proceeding with the Project.

8.2 Evaluation of the Project

8.2.1 Location and Design of the Project

The Quarry Site is an existing extractive industry operation with established processes for management of water resources, product extraction, processing and stockpiling, and transportation. The location of future extraction stages has been selected to avoid impacts to native vegetation (that is, no native vegetation would be removed for Stage 3 and Stage 4 extraction areas). Historically, operations have occurred without conflict with neighbouring land uses and the assessment of impacts presented in Section 6 predicts this would continue under the Project. Consultation with neighbouring land owners indicates few concerns over ongoing operation with queries regarding water use and transportation addressed in the EIS.

The Applicant commissioned R.W. Corkery and Co. Pty Limited and a team of specialist consultants to investigate and advise upon the most effective way to allow the Howlong Sand and Gravel Quarry to continue operating and to expand extraction, processing and product transport operations, while mitigating any environmental impacts and augmenting social and economic benefits that could arise from the Project. Key elements of the Project design that have been influenced by environmental factors include the following.

- A 2.7m high levee bank would be constructed around the Quarry Site to ensure that operations occur within a closed system and that flood incursion would be prevented for all flood events up to a 1 in 100 year flood event. It would also ensure that surface water is captured and is not discharged to the outside environment.
- Operational procedures are designed to allow for the progressive extraction of materials and the use of the completed extraction areas for water storage and creation of wetland habitat.

- The water management system has been designed so that the water that is currently licenced for irrigation purposes is also used for processing operations, ensuring that the maximum benefit is obtained from extraction of that water.
- Sections of existing extraction areas within 100m of the high bank of the Murray River would be rehabilitated to create a suitable buffer to the river and riparian habitat for biodiversity.
- Revegetation of land adjacent to the Murray River would ensure that riparian habitat and connectivity is restored and maximised.
- The extraction areas have been limited to land previously disturbed by either extractive operations or agriculture. Disturbance of native vegetation has been limited to approximately 1.1ha.

The Project, as presented, would result in the development and operation of the Howlong Quarry in an environmentally and socially responsible manner that also satisfies the cost efficiencies required by the Applicant to ensure the operation remains viable.

8.2.2 Residual Environmental Risk and Impacts

Potential environmental risks and impacts of the proposed activities were identified during the design of the Project with mitigation measures developed to achieve an acceptable level of impact. **Appendix 8** provides a compilation of the environmental risks assessed for the issues raised in the SEARs and identified during community consultation.

The following provides a brief summary of key environmental risks (i.e. those given a "medium" risk rating following the adoption of relevant mitigation measures) and describes how these have been avoided or mitigated and how the residual impacts would be managed. No potential impact of high risk has been identified for this Project.

It is noted that one of the key issues raised in community consultation was the impact from changes to transport operations. Given the low level of traffic proposed for the operation (no more than six laden loads per hour), the changes to traffic levels are considered to represent a low risk of impact. This conclusion is supported by the assessment prepared by TTPP (2020), included as Part 1 of the SCSC.

- Dust or noise emissions could potentially lead to community complaints and increased regulatory and community scrutiny.

  The assessment of potential air quality impacts (Todoroski 2020) and noise (operational and traffic) impacts (Octave, 2019) concluded that at all the assessed operational stages, the Project would comply with the air quality criteria and noise assessment criteria at all residences. Road traffic noise may increase by 1db, however this change in noise level is not perceptible by the average human ear.

  To ensure activities associated with the project have a minimal effect on the surrounding environment and at privately-owned residences, operational and management measures summarised in Section 7 would be implemented.

- Greenhouse gas emissions from vehicles and fixed and mobile plant will contribute to the greenhouse effect.

  The Project would generate only a tiny fraction of the greenhouse gas emissions generated in NSW and Australia each year. The Applicant would seek to minimise greenhouse gas emissions over the life of the Project though efficiencies with diesel and electricity usage. In addition, proposed rehabilitation operations would result in offsetting a portion of those emissions.

- Discharge of dirty or contaminated water leading to temporary sedimentation pollution of downstream waters and local waterways resulting in detrimental effects to flora and fauna.

  Given that all operations would occur within a closed system, with no contributing catchment of clean water and there would be no discharge to waterways outside the levee banks, risks to water quality would be minimal. In addition, monitoring of surface water quality in each extraction stage would occur every six months, with results compared to a sample from the Murray River in the vicinity of the Quarry.

- Changes to the landscape from Quarry operations and flooding could potentially damage infrastructure and pose threat to human life.

  A 2.7m high levee bank around the Quarry disturbance area would be constructed to reduce the risk of flood incursion to operations to a probability of less than one in every 100 years. Finally, the flood modelling undertaken by Water Technology (2019) indicated that the Project could result in a minor increase in water levels up to 4km upstream of the site, but that the modelled increases were small, between 30cm close to the Quarry, reducing to 5cm 4km upstream.

- Reductions in groundwater flow leading to reduced baseflow to the Murray River and other receiving systems.

  The groundwater modelling undertaken by Water Technology (2020) indicates that groundwater drawdown would be bounded by the Murray River and Black Swan Anabranch and therefore would not impact privately-owned groundwater bores. The extraction areas would be groundwater sinks, with flow from the extraction areas to the Murray River and Black Swan Anabranch unlikely to occur. Any drawdown experienced in the vicinity of the Murray River would be a small percentage of average daily flow in the river and would not result in a noticeable impact to environmental and licenced water users downstream. All groundwater extracted would be extracted under licence and, as a result, the use of water would be consistent with community expectations.

- Contamination from on-site activities could potentially cause seepage of contaminated materials to regional groundwater.

  Operations have historically been managed to limit the potential for contamination of water resources. This has been particularly important to the Applicant given that water within the Quarry Site is used to irrigate the

surrounding property. The Applicant would continue to mitigate potential contamination on-site through best practice storage and handling of hydrocarbons and carefully managed maintenance processes.

- Initiation of bush fire due to on-site activities causing property damage and impacts on production and destruction and damage of native flora and fauna.

  Vegetation on the Property is limited to small patches and isolated trees. The Property is mostly surrounded by cropped paddock land. Quarry infrastructure is limited to the Office, Weighbridge, Pump Sheds, Haysheds and Processing Plant. Fuel loads in the Property are very minimal and works are primarily undertaken within disturbed areas. As a result, the bush fire hazard associated with the Project has been minimised to the maximum extent practicable.

8.2.3 Ecologically Sustainable Development Principles

8.2.3.1 Introduction

Sustainable practices by industry, all levels of government and the community are recognised to be important for the future prosperity and well-being of the world. The principles of Ecologically Sustainable Development (ESD) that have been recognised for over two decades were based upon meeting the needs of the current generation while conserving our ecosystems for the benefit of future generations. In order to achieve sustainable development, recognition needs to be placed upon the integration of both short-term and long-term environmental, economic, social and equitable objectives.

Each of the sustainable development principles has been considered throughout the design of the Project. The following subsections draw together the features of the Project that reflect the four principles of ESD, namely:

- the precautionary principle;
- the principle of social equity;
- the principle of the conservation of biodiversity and ecological integrity; and
- the principle for the improved valuation and pricing of environmental resources.

8.2.3.2 Precautionary Principle

The precautionary principle requires consideration of two aspects of environmental assessment, firstly if there is a threat of serious and irreversible environmental damage, and secondly that precautions to prevent these risks should only be dismissed if there is full scientific certainty regarding the likely outcome(s). During the planning phase for the Project, and throughout the preparation of the *Environmental Impact Statement*, the Applicant has engaged specialist consultants to examine the existing environment, predict possible impacts and recommend controls, safeguards and/or mitigation measures in order to ensure that the level of impact satisfies statutory requirements or reasonable community expectations.

The proposed environmental safeguards, controls and mitigation measures that would be implemented are summarised in Section 7.

Examples of matters relating to the precautionary principle that were considered during the various stages of the design of the Project are discussed as follows.

- The process involved in environmental impact assessment for the Project has involved a risk assessment of potential environmental outcomes, preliminary constraints review, design and planning for the Project to address potential constraints, comprehensive assessment of the Project as proposed and final review of environmental outcomes and commitments to ongoing management, review and reporting of environmental performance.
- The groundwater and flood risk assessments were undertaken by Water Technology Pty Ltd, a recognised expert in assessing water-related impacts associated with development. Water Technology developed models for groundwater and flooding-related impacts, and these were used to both design aspects of the Project, as well as to assess the likely significance of impacts associated with it.
- The noise assessment was prepared by Audiometric & Acoustic Services and Octave Acoustics and the air quality assessment by Todoroski Air Sciences Pty Ltd, all recognised experts in their fields. In each case, models using industry recognised techniques were developed to accurately predict Project related impacts.
- The biodiversity assessment was undertaken by Advanced Environmental Systems Pty Ltd using the Biodiversity Assessment Methodology, a recognised, transparent and repeatable methodology for assessing likely biodiversity-related impacts associated with proposed development.

In each case, these recognised experts determined that the Project would not result in unacceptable adverse impacts based on robust, scientifically proven assessment methodologies.

On the basis of what is known with regards to environmental risks, the Applicant has committed to preventative measures to reduce potential impacts, as much as is reasonable. Environmental monitoring and reporting would be implemented to track trends in environmental outcomes/performance and guide adaptive management practices. In this regard, the Applicant has acknowledged where scientific uncertainty exists and has committed to proactive management of residual environmental risks.

8.2.3.3 Social Equity

Social equity embraces value concepts of justice and fairness so that the basic needs of all sectors of society are met and there is a fair distribution of costs and benefits to the community. Social equity includes both inter-generational (between generations) and intra-generational (within generations) equity considerations. Equity within generations requires that the economic and social benefits of the development be distributed appropriately among all members of the community. Equity between generations requires that the non-material well-being or "quality of life" of existing and future residents of the local community would be maintained throughout and beyond the life of the Project.

Both elements of social equity are addressed through the principal objectives for the Project, design of the Project itself and the implementation of operational safeguards to mitigate any short-term or long-term environmental impacts. These components of the Project ensure supply of a necessary resource for the current generation while not adversely impacting on the ability of future generations to meet their needs or presenting a situation where the benefits of the Project are experienced now but impacts remain for future generations.

The Project has been designed to maintain inter-generational equity, i.e. in recognition that progressive and post-project rehabilitation would be undertaken to create a final landform suited to future use by a subsequent enterprise that would also provide ongoing economic and social benefits. The Project has also been designed with the objective to ensure the continued use of surrounding land for agricultural purposes throughout and beyond the life of the Project.

The principle of social equity has also been addressed throughout the design of the Project. The Howlong Sand and Gravel Quarry would contribute to the economic activity of the local and regional community through the generation of employment, and increased demand for local goods and services through flow-on effects. As such, the benefits of the Project would be distributed throughout the local community. The Project was also designed such that elements of the existing environment available to this generation, including water and existing local biodiversity would continue to be available to future generations.

8.2.3.4 Conservation of Biological Diversity and Ecological Integrity

The protection of biodiversity and maintenance of ecological processes and systems are central goals of sustainability. It is important that developments do not threaten the integrity of the ecological system as a whole or the conservation of threatened species in the short- or long-term. Details of how the Project has been designed to achieve compliance with these principles are set out below.

- The Project involves clearing of two native trees (River Red Gum) that are adjacent to the existing Stage 2 extraction area. All other vegetation that would be removed is not native or is a cropped Lucerne paddock.
- No threatened flora or fauna was identified in comprehensive ecological field surveys and therefore it is concluded that no threatened flora and fauna or their habitat would be impacted for the Project.
- The Applicant would backfill and revegetate those sections of the existing extraction areas within 100m of the high bank of the Murray River, as well as other sections of the Property to provide for habitat and connectivity for threatened and other species. The revegetation would also stabilise riparian areas in the vicinity of the Murray River and the Black Swan Anabranch.
- The Applicant would progressively rehabilitate completed sections of the extraction areas to create a wetland habitat for species that rely upon wetlands for breeding and foraging.

Due to the limited extent of direct impact and beneficial revegetation and progressive rehabilitation, it is considered that the Project is consistent with this principle.

8.2.3.5 Improved Valuation and Pricing of Environmental Resources

The issues that form the basis of this principle relate to the acceptance that only by appropriately valuing environmental resources can they be balanced with economic imperatives for development. The key elements of this principle include:

- the concept that the "polluter pays", that is, those that generate pollution and waste should pay the costs for abatement or containment; and
- environmental costs should be valued appropriately and considered over the entire life cycle, including end use and waste management.

The Applicant would ensure that the Project was a nil discharge site and that no offsite pollution would occur. In addition, the Applicant would ensure that all resources extracted, including water and sand resources, are used in the most efficient manner practicable to maximise the value of those resources. It is notable that a key aspect of the Project is the recycling of water used for processing, principally for irrigation within the Property. This process effectively permits two beneficial uses of the water resources, for the production of a sand and gravel product and for irrigating crops.

The planning process in NSW requires that applicants adequately consider, assess and value the potential environmental outcomes of development. Through multi-agency input to the assessment requirements, the priorities of all levels of government are considered and included in assessment. By taking this approach the relevant agency(ies) determine the value that should be placed on the environmental resources within NSW.

8.3 Justification of the Project

8.3.1 Introduction

In assessing whether the development and operation of the Project is justified, consideration has been given both to biophysical and economic and social factors including the predicted residual impacts on the local and wider environment and the potential benefits of the Project. When considering the predicted residual impacts, a review of the proposed mitigation measures was also undertaken to determine the emphasis placed on impact minimisation and the incorporation of the principles of ESD. This section also considers the consequences of the Project not proceeding.

8.3.2 Biophysical Considerations

Traffic and Transport

TTPP (2020) has reviewed the public road network that would be used for Project traffic and assessed potential impacts 10 years into the future.

During peak operations, the Project would result in 26 light vehicle movements (13 return trips) and 80 heavy vehicle movements (40 return trips) on the busiest day and 4 light vehicle movements and 12 heavy vehicle movements in a peak hour. With regards the Project's contribution to heavy vehicle traffic only, the Quarry is predicted to contribute a maximum of 18.3% of daily heavy vehicles on the Riverina Highway west of the Property (or approximately one in every five or six heavy vehicles) and 14.5% of heavy vehicle traffic on Sturt Street South of the Riverina Highway (or approximately one in every seven vehicles).

TTPP (2020) concluded that the existing road network would accommodate the proposed traffic levels with acceptable impacts to the capacity, efficiency and safety of the road network. TTPP (2020) has recommended that the intersection of the Quarry Access Road and the Riverina Highway be upgraded in accordance with the Austroads (2019) standards and that driver behaviour be managed in accordance with the Traffic Management Plan and Driver's Code of Conduct. The Applicant has accepted all of these of these recommendations.

Groundwater

The groundwater modelling undertaken by Water Technology (2020) has predicted that groundwater drawdown would not impact registered bore users. The Quarry operation would continue to draw water from the groundwater setting under licence, principally for irrigation practices. It is predicted that the extraction areas would become groundwater sinks, indicating that water would likely flow from the Murray River towards the Quarry Site as is currently experienced. It is unlikely that baseflow impacts to the Murray River would be noticeable in the context of daily flow volumes in the river or that water quality in the Murray River would be influenced by groundwater flow towards the river. In addition, the groundwater modelling demonstrates that the strategy to continue managing groundwater inflows through irrigation practices would not result in significant impacts. Rather, these processes would have the benefit of flushing ponds to reduce salinisation. Impacts to terrestrial vegetation that is potentially groundwater dependant, including riparian vegetation along the banks of the Murray River, are not likely to occur. Potential impacts to the Murray River and downstream water users would not significantly change from existing operations given the flow volumes in the river, especially in summer when the flow is regulated by water release from the Hume Dam. Finally, potential impacts to groundwater quality would be mitigated through the proposed irrigation practices and the management of contamination risk through on-site practices.

The most substantial change to the groundwater setting would be the development of ponds in the final landform. These areas would require an ongoing licence entitlement to account for water removed for ongoing irrigation practices and evaporation (lower than that currently held by the Applicant). A schedule for pumping water for irrigation in the final landform has been presented that would minimise salinisation of the rehabilitated ponds. These practices would be formalised in a Riparian and Wetland Management Plan within the Water Management Plan.

Potential impacts to the groundwater setting would be mitigated and managed through the implementation of a Water Management Plan that would include a comprehensive monitoring program that would ensure advance identification of unexpected outcomes.

It is concluded that the Project would continue to operate with minimal impacts to the regional groundwater setting.

Surface Water

Risks to surface water resources have been assessed as follows.

- The flood risk assessment and hydraulic modelling prepared by Water Technology (2019) demonstrates that once the flood levees are constructed to a height of approximately 2.7m, the risk of flood incursion to operations would be reduced to a probability of less than one in every 100 years.

- Given that all operations would occur within a closed system, with no contributing catchment of clean water and there would be no discharge outside the levee banks, risks to water quality outside of the proposed levees would be minimal. The Quarry Access Road would be regularly graded and maintained to ensure that it is not a source of sediment in the environment.
- Management procedures would be established to minimise the potential for spills or contamination within the Quarry Site.
- Operations would not draw on water from the Murray River or adjoining watercourses. In addition, the minor loss of rainfall runoff from within the 56.5ha catchment delineated by the levee banks would be minor in the context of the regulated and natural river flow levels. Therefore, there would be negligible impacts on water availability for downstream users.
- The proposed upgrade to the bridge over the Black Swan Anabranch would not require modifications to the foundations of the bridge and therefore impacts to the structural stability of the bank of the Black Swan Anabranch would be avoided.

As a result, it is concluded that the Project would continue to operate with minimal risk of impact to surface water resources.

Noise

Predictive noise modelling assessment conducted by Octave (2019) indicates that the predicted operational noise levels are not anticipated to exceed the relevant criteria at any residence.

The predicted public road noise level results show that the road noise assessment criteria would be satisfied and that overall, only a minor increase to existing conditions of 1dB(A) during daytime operations is predicted along two sections of road. In practice, this increase in sound level is an imperceptible change.

Operational activities and Project-related traffic noise would not be likely to cause sleep disturbance.

As a result, it is concluded that the Project would continue to operate with minimal risk of adverse noise-related impacts.

Air Quality

The results of predictive dust dispersion modelling undertaken by Todoroski (2020) based on the operation of the Quarry at full capacity has concluded that the Project would comply with all impact assessment criteria for each relevant averaging period for TSP, $PM_{2.5}$, PM_{10}, and dust deposition.

The Applicant would continue to implement appropriate operational and management measures to manage dust emissions.

As a result, it is concluded that the Project would continue to operate with minimal risk of adverse air quality-related impacts.

Land Resources

The Land Resources Assessment undertaken by AES (2020a) indicates that with adherence to the recommended soil and growth medium stripping, handling, stockpiling procedures and other management practices, together with appropriate rehabilitation practices, the Project would result in a minimal impact to soils and land capability.

The Project would not impact adversely on the agricultural potential of the land given the existing land uses and the prevalence of moderate capability soils within the Quarry Site.

As a result, it is concluded that the Project would continue to operate with minimal risk of adverse land resource-related impacts.

Biodiversity

The BDAR conducted by AES (2020b) concludes that impacts on biodiversity associated with the proposed development are insignificant for the following reasons.

- Sloane's Froglet (*Crinina sloanei*) has not been recorded at the existing Property and the existing extraction areas represent unsuitable habitat for this species.
- Impacts to other threatened species with potential to occur within the Property would be insignificant because:
  - existing habitat within the proposed disturbance footprint has been subject to disturbance;
  - proposed vegetation clearing would result in minimal disturbance of potential habitat areas; and
  - potential habitat within and in the vicinity of the disturbance footprint would be retained where possible.
- The Quarry does not contain geological features that may provide habitat for threatened flora or fauna. However, once decommissioned and rehabilitated, extraction areas are likely to provide wetland habitat suitable for threatened and other species.
- The Applicant would backfill and reinstate a 100m buffer between extraction operations and the top bank of the Murray River. The Applicant would also revegetate riparian areas surrounding proposed disturbance areas. These activities would enhance local biodiversity values.
- The Quarry does not support 'core Koala habitat' under the *SEPP (Koala Habitat Protection) 2019*.
- The Project would not compromise any flight path integrity and would not impact the potential use of water resources of water features by native fauna. In fact, the creation of ponds through progressive rehabilitation may enhance these features.

As a result, it is concluded that the Project would continue to operate with minimal risk of adverse biodiversity-related impacts.

Cultural Heritage

The Aboriginal and Historic Cultural Heritage Assessment undertaken by AES (2020c) identified the following.

- A single Aboriginal site (Howlong 1) located outside the area of proposed disturbance. The Applicant has agreed to fence off this area to avoid inadvertent impact including from agricultural activities on the property.
- That historic heritage items in the vicinity of the Property would not be adversely impacted by the Project.

As a result, it is concluded that the Project would continue to operate with minimal risk of adverse cultural heritage-related impacts.

Visibility

The visual assessment undertaken by AES (2020d) and Realm (2020) determined that vegetation, distance, intervening topography, and daytime only operating hours together with the proposed mitigation measures would continue to effectively screen the Quarry from local vantage points and residences for the life of the Project resulting in minimal visual and lighting impacts.

Public Safety and Hazards

The Applicant would ensure that all hydrocarbons are appropriately transported, stored and managed and that all activities with the potential to initiate bush fire are appropriately managed. As a result, it is concluded that the Project would continue to operate with minimal risk of adverse public safety and hazard-related impacts

8.3.3 Economic and Social Considerations

Economic Considerations

The Project provides for the extraction, processing and despatch of quality sand and gravel products to meet the needs of housing and construction markets in New South Wales and Victoria. The extraction of this resource would assist to exert downward pressure on costs associated with construction material supply and influence market costs associated with construction and infrastructure projects. The Project would further assist in generating local employment and contribute to local, regional, state and National economies through flow-on effects.

It is concluded that the net economic benefits of the Project would outweigh the costs as the Project would:

- contribute towards the supply of sand and gravel products to markets in NSW and Victoria;
- provide ongoing employment opportunities directly and indirectly;
- contribute to the continued economic growth at local, regional, State and National levels through flow-on effects; and
- avoid, minimise and/or mitigate environmental and social impacts to the greatest extent practicable which in turn relates to the economic costs of the Project.

Social Considerations

The Project would create a range of social benefits for the local community. Most of the identified potential negative environmental impacts would be unlikely to occur to the extent predicted based on the conservative approach to assessment undertaken. Residual risks would be managed and mitigated by implementing appropriate operational safeguards.

Key benefits arising from the Project include:

- building on the existing human capital in the community and thereby increasing the overall resilience of the local community, particularly with relation to fluctuations in agricultural production; and
- providing for an additional source of sand and gravel for local markets and the broader, growing region.

The Applicant would continue to engage with the community through the CCC to ensure that where adverse impacts are identified they are promptly mitigated or removed.

8.3.4 Objects of the Environmental Planning & Assessment Act 1979

Table 8.1 identifies the objects of the EP&A Act and confirms that each would be satisfied by the Project and this EIS.

Table 8.1
Objects of the EP&A Act

Object	EIS Coverage
The objects of this Act are as follows:	
a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,	Section 6 addresses the various biophysical considerations related to the project. In each case, it has been concluded that the Project-related impacts would not exceed relevant criteria or reasonable community expectations. In addition, the Project would ensure the most efficient use of the State's sand and water resources possible, in particular ensuring that all water extracted is used for both processing operations and irrigation of agricultural land. Finally, the Applicant would implement a range of comprehensive management measures to minimise the potential for adverse environmental outcomes.
b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,	Section 8.2.3 reviews and confirms the Project would be undertaken in accordance with the principles of ecologically sustainable development which embrace relevant economic / environmental and social considerations.

Table 8.1 (Cont'd)
Objects of the EP&A Act

Object	EIS Coverage
c) to promote the orderly and economic use and development of land,	The Project has been designed to produce sand and gravel products at a rate expected to satisfy demand whilst permitting for progressive rehabilitation of the extraction areas. Section 6.12 and 6.13 confirms that the Project would provide a net benefit to the local and regional economy and the final landform would be suitable for a range of subsequent uses.
d) to promote the delivery and maintenance of affordable housing,	The Project would provide a necessary material required for the construction of infrastructure, including housing, and would help support a lower construction cost, thereby assisting housing affordability in the areas surrounding the Property.
e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,	Section 6.8 demonstrates the significant effort to be taken to minimise the impacts of the Project on local and regional biodiversity. Residual ecological impacts (though minor) would be offset in accordance with the Biodiversity Offset Scheme.
f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),	Sections 6.9 outlines the results of the survey with respect to Aboriginal cultural and historic heritage. No Aboriginal sites have been identified within the proposed areas of disturbance. Given the ongoing implementation of an unexpected finds protocol, impacts to Aboriginal cultural heritage would be negligible. Similarly, Section 6.9 assesses the anticipated impacts to historic heritage and determined that Project-related impacts would be negligible.
g) to promote good design and amenity of the built environment,	No additional built structures are proposed.
h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,	All existing structures within the Quarry would be constructed to appropriate standards.
i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,	This is not a matter relevant to the application, however, it is expected that the EIS would be reviewed by Federation Council and the Applicant would respond to any concerns.
j) to provide increased opportunity for community participation in environmental planning and assessment.	The Applicant has consulted with the community throughout preparation of the EIS and will continue to do so during the assessment of and following determination of the application.

8.4 Consequences of not Proceeding with the Project

The consequences of not proceeding with the Project include the following.

i) The opportunity to establish secure access to and provide sand and gravel products to construction markets in both NSW and Victoria would be forgone.

ii) The opportunity to increase employment opportunities in the local area would be foregone. This would also impact on the economic activity of the local community and Federation LGA.

iii) Payments of elevated rates (to Federation Council), State and federal taxes would be foregone.

iv) The various adverse impacts attributed to the Project that are identified throughout Section 6 of this document would not occur. It is considered that the level of predicted impacts arising from the Project are acceptable given the extent of mitigation measures integrated within the various aspects of the Project.

v) The benefits of proceeding with the proposed expansion of the Howlong Sand and Gravel Quarry are considered to outweigh the predicted impacts on the environment that would result if the Project is approved.

8.5 Conclusion

The Project has been designed to address the issues raised by the community and all levels of government, as well as the principles of ecologically sustainable development. The Project provides for the expansion and continued operation of the Howlong Sand and Gravel Quarry in an environmentally responsible manner. The Project also incorporates a range of design and operational mitigation measures to ensure all relevant statutory goals and criteria, environmental objectives and reasonable community expectations are satisfied. Importantly, the environmental aspects of the Project have been comprehensively assessed and commitments made to ongoing management and monitoring of potential environmental impacts.

The key issues raised in community consultation concerned changes to the transportation activities and impacts to the Murray River, both of which have been subject to technical assessment by highly qualified professionals. It is predicted that transport operations for the Project would not have unacceptable impacts on the road network and that changes to traffic levels would not be noticeable in the context of existing road use. Similarly, changes to water flows in the river would not be noticed by downstream water users in the context of the daily flows in the river. All water use for the Project would be licenced and accounted for and potential impacts to water quality would be avoided by development of a closed system within flood levees.

It is notable that the Project would result in a range of benefits including the following.

- Groundwater inflows removed from the extraction areas and used for processing would mostly be re-used for the ongoing irrigation of cropping land on the Property (excluding small volumes lost for production). This provides for the beneficial use of the water twice.
- The Applicant has incorporated a comprehensive program of revegetation in rehabilitation planning in order to stabilise riparian areas within the Property and enhance the eventual use of the extraction areas as wetland habitat. Much of the revegetation activities would occur outside the disturbed areas for the Quarry.

- Although a relatively small operation, the Quarry would provide social and economic benefits through employment (directly and indirectly), local spending on consumables and maintenance and the distribution of this contribution through the local community. The Federation LGA features predominantly agricultural industries and the development of a viable extractive industry operation would provide much needed economic diversity and another long-term independently owned and community-based business.

In conclusion, this document and the range of technical studies have demonstrated that the proposed Project would operate with minimal and manageable impacts on the biophysical environment while contributing to the demand for sand and gravel products required for the construction materials industry in both NSW and Victoria and providing positive economic and social outcomes. The result is a net benefit for the local community, the Federation Local Government Area and the State of NSW.

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Section 9

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