

APPENDIX 2. ENVIRONMENTAL MANAGEMENT PLAN

Preliminary Documentation

Cabbage Tree Road Sand Quarry - (EPBC 2016-7852)



**DRAFT Environmental Management
Plan to be finalised following
approval**



Williamtown Sand Syndicate Pty Ltd

Williamtown Sand
Cabbage Tree Road, Williamtown

09 November 2016

DRAFT Environmental Management Plan to be finalised following approval

Williamtown Sand
Cabbage Tree Road, Williamtown

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Prepared for:

WILLIAMTOWN SAND SYNDICATE PTY LTD

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1. INTRODUCTION

This Environmental Management Plan (EMP) provides for the environmental management for the construction, operation and decommissioning of the proposed Williamtown Sand Quarry on Cabbage Tree Road, Williamtown (**Figure 1**).

This EMP has been structured with regard to ISO 14001:2015 *Environmental Management Systems*.

1.1 SCOPE

This EMP summarises the key management actions required and where necessary includes appendices for specific management actions. This document satisfies Conditions [to be inserted after determination] of the Project Approval (SSD 6125 - refer to **Appendix 1**) and associated permits and licences.

This document may also be used to support construction environmental management plans and traffic management plans that will be required to specifically guide activities that primarily occur during construction.

The management of the Offset Land (lands outside the Project Area) will be in accordance with the Biobanking Report (Kleinfelder, 2016) prepared consistent with Office of Environment and Heritage (OEH) and the biobanking statement assessment requirements.

The reporting periods and action timeframes for the implementation of this EMP are scheduled to operate from the commencement of construction following approval of the project, with reporting aligning to the anniversary date of the approval. Management actions have been designed for the expected eight year project life, however, if the project extends beyond eight years (within the 15 year Project Approval) the time frames will be adjusted accordingly.

Table 1: Management plan timing

Plan Year	Calendar Year
Years 1 – 2	January 2017 – October 2018
Years 3 – 4	January 2019 – January 2020
Years 5 – 6	January 2021 – January 2022
Years 7 – 8	January 2023 – January 2024
Closure	October 2025

Key details of the project are detailed below.

1.1.1 Project Overview

The key details of the project are shown within **Table 2** below with the general arrangement and resource extent shown by **Figure 2**.

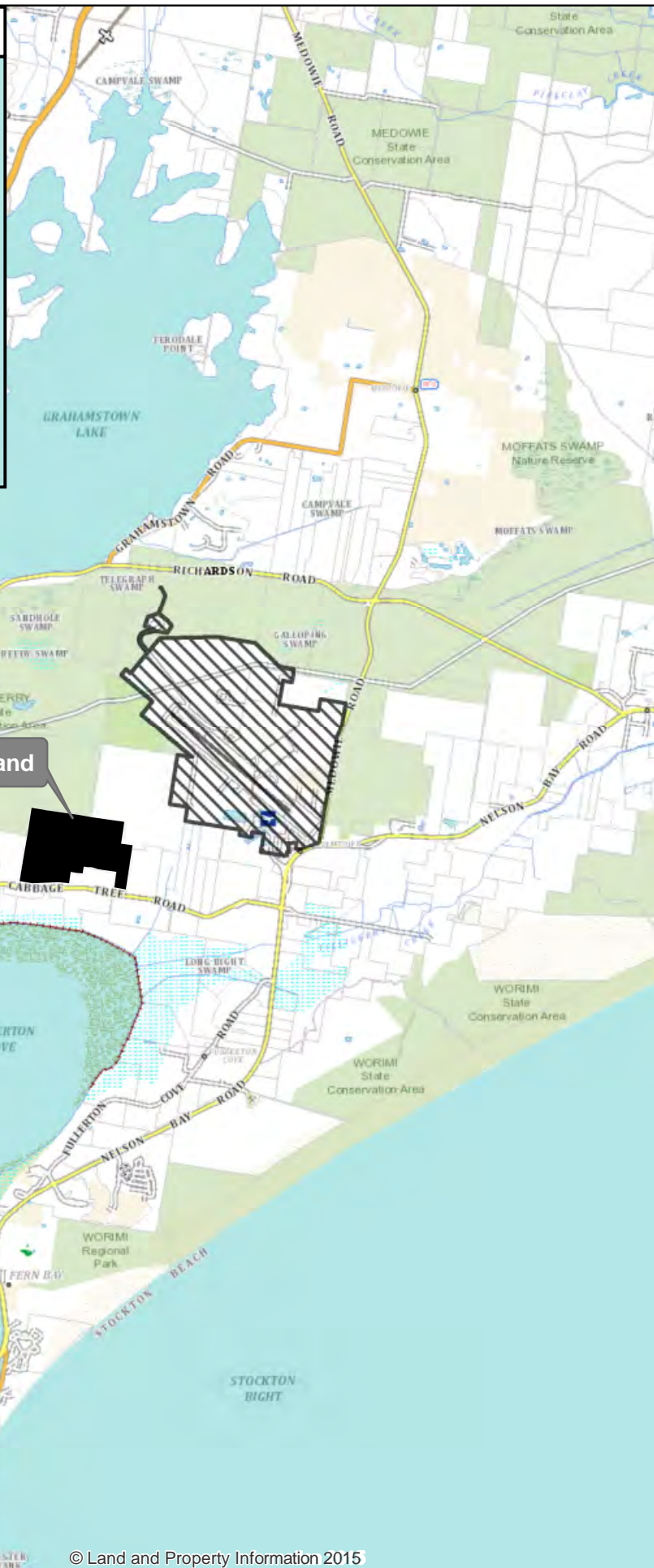
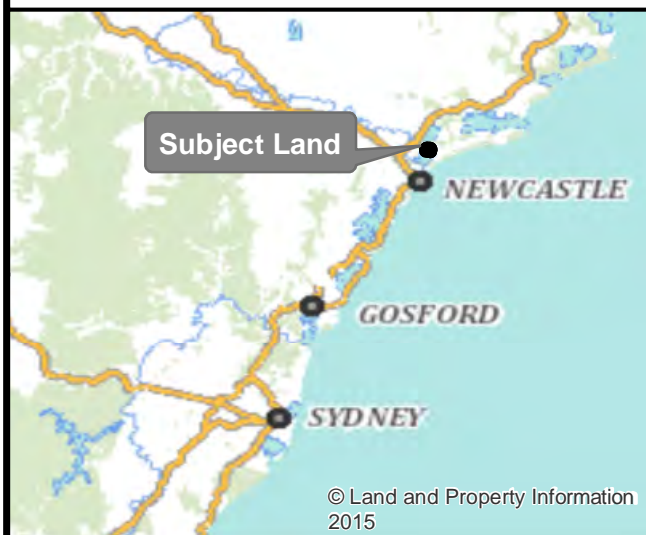
Table 2: Key Aspects of the Cabbage Tree Road Sand Project.

Aspect	Key Aspects of the Project
Key elements	Sand quarry extracting up to 530,000 tonnes per annum over 15 years including the construction of an intersection with Cabbage Tree Road, sealed and gravel access roads, site office, workshop and weighbridges. Progressive rehabilitation of quarried land returning to native vegetation communities with potential future use of the facilities area. Biodiversity Offset Strategy and EMP to mitigate and offset project impacts.
Location	398 Cabbage Tree Road, Williamtown, within the Port Stephens local government area.
Property Titles	Four titles within the Parish of Stockton, County of Gloucester including: <ul style="list-style-type: none"> • Lot 1 DP 224587 at 398 Cabbage Tree Road, Williamtown • Lot 121 DP 556403 at 282B Cabbage Tree Road, Williamtown. • Lot 11 DP 629503 at 282A Cabbage Tree Road, Williamtown. • Lot 1012 DP 814078 at 282 Cabbage Tree Road Williamtown.
Area	Total Project Area of approximately 42.3 hectares from a Subject Land Area of approximately 176.2 hectares.
Land Owner	Port Stephens Shire Council under lease to Williamtown Sand with royalty of up to \$17.5 million over the project life.
Proponent	Williamtown Sand Syndicate Pty Ltd
Project Life	Approval is sought to operate the quarry for a period of up to 15 years. At expected demand the quarry is estimated to have an eight year life, reduced to five years should demand require maximum extraction rates.
Resource and products	Approximately 3.25 Mt of sand, comprising the following products to be extracted from site by truck onto Cabbage Tree Road for transport to markets: <ul style="list-style-type: none"> • Raw fill sand. • Screened sand. • Sandy loam. • Concrete sand. • Glass sand (estimated at about 16% of total resource). The Project covers approximately 42.3 hectares (including access roads) with extraction to a depth of not more than 1m above the highest predicted groundwater level.
Production rate and Products	Up to 530,000 tonnes per annum.
Extraction method	<ul style="list-style-type: none"> • Excavator and/or bulldozer to clear vegetation and strip topsoil. • Bulldozer or grader to windrow sand. • Front-end loader to feed conveyors to convey sand to the processing plant. • Front-end loader and haul truck to convey sand when conveyor unsuitable.
Processing Methods	<ul style="list-style-type: none"> • Raw sand product extracted directly from face with no processing. • Sand fed into electrically powered screen. • Screened sand sold as product or fed to electrically powered air separator.

Aspect	Key Aspects of the Project
	<ul style="list-style-type: none"> Products stockpiled for loading directly into truck or fill bulker bags for removal from the site by truck.
Transport	<ul style="list-style-type: none"> Annual average daily truck movement of 63 laden trucks per day (126 movements), equating to average hourly truck movements of 5 laden trucks per hour (10 trips per hour). Up to 6 laden trucks per hour (12 trips per hour) during the hours of 5 am to 7 am. Up to a maximum of 10 laden trucks per hour (20 trips per hour) during hours of 7 am to 6 pm (i.e. all haulage hours excluding the morning peak). Up to 6 vehicles of employees would be expected to arrive from 5 am to 7 am and leave between 5 pm and 7 pm.
Water demand and supply	<ul style="list-style-type: none"> Water required for stockpile dust suppression and gravel haul road dust suppression.
	<ul style="list-style-type: none"> Water sourced from mains supply fed into the site from Cabbage Tree Road.
	<ul style="list-style-type: none"> Rainwater tanks at office and workshop area to collect rainwater from rooved areas for use in dust suppression.
	<ul style="list-style-type: none"> Water demand estimated at less than 140KL per annum.
	<ul style="list-style-type: none"> No groundwater use.
	<ul style="list-style-type: none"> No capture or storage of surface runoff.
Support facilities and utilities	<ul style="list-style-type: none"> Site office, workshop, stores, car parking.
	<ul style="list-style-type: none"> Power supply from local network.
	<ul style="list-style-type: none"> Water supply from local network.
Quarry Access	<p>Upgrade of existing property access to a left in left out intersection with deceleration and acceleration lanes. Internal speed limits of:</p> <ul style="list-style-type: none"> 40km/h from Cabbage Tree Road to the weigh bridge. 20km/h from weigh bridge to processing plant and extraction face.
Operating Hours	<p>Construction of intersection, access and workshop and office:</p> <ul style="list-style-type: none"> 7am to 6pm Monday to Friday. 8am to 1pm Saturday. No works on Sunday or public holidays. <p>Quarrying Operations:</p> <ul style="list-style-type: none"> 7:00am to 6:00pm Monday to Friday. 7:00am to 4:00pm on Saturday. No quarrying on Sunday or a Public Holiday. Sales and haulage activities: 5:00am to 6:00pm Monday to Friday. 7:00am to 4:00pm Saturday. No haulage on Sunday or a Public Holiday.
Employment	<p>Full time staff for up to six persons.</p> <p>Opportunities for approximately 20 contract and customer truck haulage operators.</p>
Community and amenity	<p>The following measures are proposed to mitigate and offset adverse impacts to the community:</p> <ul style="list-style-type: none"> Up to \$17.5 million over the project life in royalty payments to Port Stephens Council. A 20 m vegetated buffer from Cabbage Tree Road to minimise visual impacts for passing motorists and adjacent residents.

Aspect	Key Aspects of the Project
	<ul style="list-style-type: none"> • A 75m long road side buffer of retained vegetation along the sides on the access from Cabbage Tree Road. • Real time triggers on air quality monitors to manage potential air quality impacts. • Six monthly attended noise monitoring and noise model confirmation based on actual data prior to extraction of areas 8, 9 or 10 (estimated at Year 6).
Biodiversity Offset Strategy	<p>A biodiversity offset strategy that incorporates:</p> <ul style="list-style-type: none"> • The in-perpetuity conservation of the remaining subject land, through the establishment of a Biobank Site. • Purchase and retirement of additional Koala species credits, as required to meet credit requirements at the impact site. • Reinstatement of lost hollows with suitable nest boxes within rehabilitation area at a ratio of one to one. • Long term conservation and security of the majority of the rehabilitated lands.

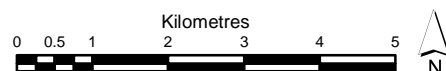
0 10 20 40 60 80 100 km



 Subject Land
 Williamtown RAAF Base

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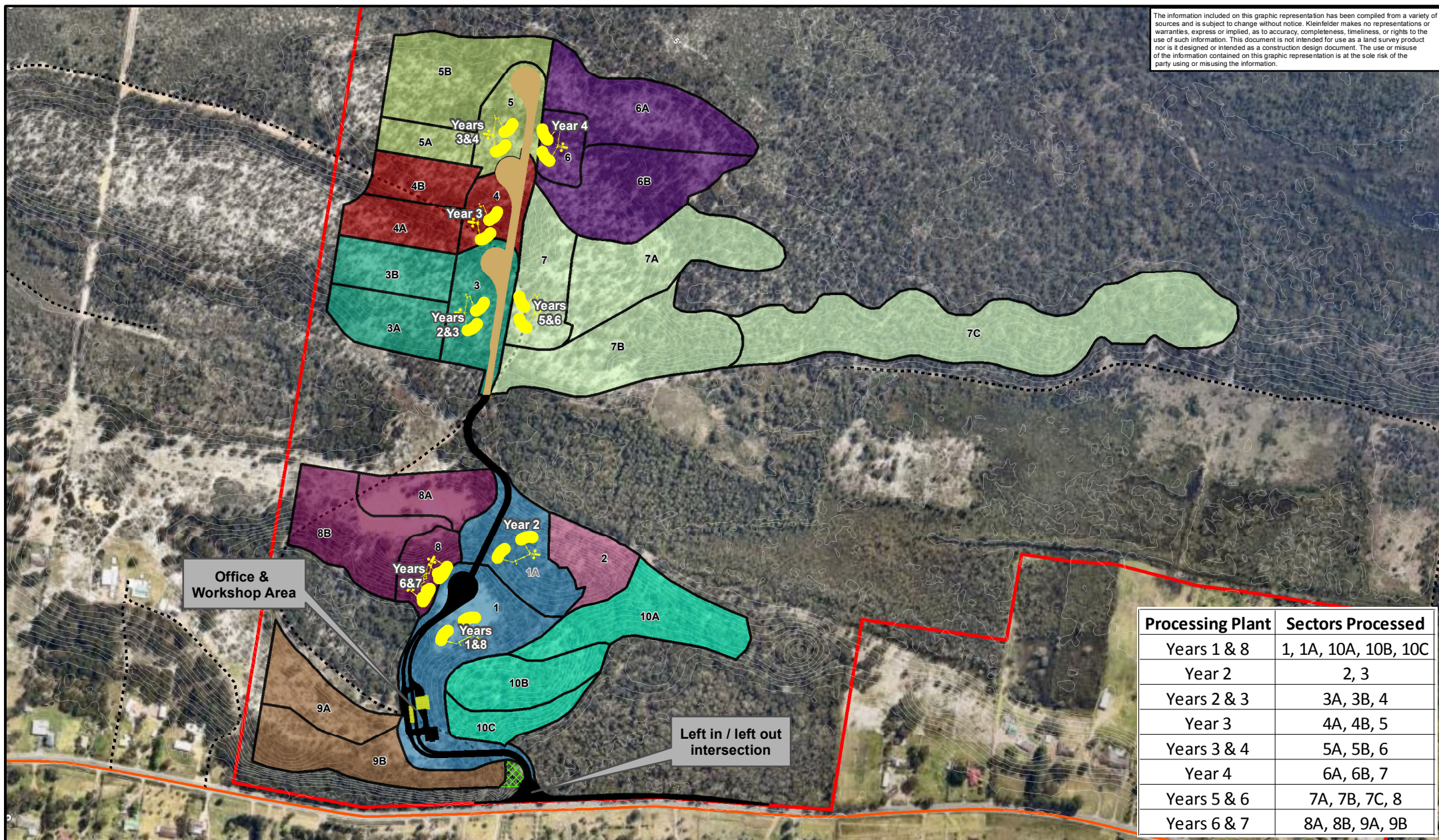
Location Plan

Williamstown Sand Syndicate
PFAS Response
Proposed Sand Quarry
Cabbage Tree Road, Williamstown

FIGURE:

—

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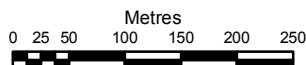


Legend

- Subject Land
- Road - gravel
- Road - sealed
- Track
- Contours (1m)
- Area Excluded from Resource

- Processing Plant & Infrastructure
- Arterial Road

- | Sector | |
|--------|----|
| 1 | 6 |
| 2 | 7 |
| 3 | 8 |
| 4 | 9 |
| 5 | 10 |



PROJECT REFERENCE: 20170448

DATE DRAWN: 18/10/2016 16:01 Version 1

DRAWN BY: gjoyce

DATA SOURCE:
LPI - 2016
Nearmap - 2016

Quarry Operations Plan

Williamtown Sand Syndicate
Response to Submissions
Proposed Sand Quarry
Cabbage Tree Road, Williamtown

FIGURE:

2

1.2 KEY TERMS AND DEFINITIONS

Table 3 defines the key terms and definitions used within this document.

Table 3: Key terms and definitions used within this document

Term	Definition
AEMR	Annual Environmental Management Report-
Biobank Site	Defined area located within the Subject Land, but excludes the Project Area and any other land within the Subject Land that is not incorporated into the Biobanking Agreement.
CCC	Community Consultative Community proposed to be created to facilitate regular meetings between Williamtown Sand Syndicate and local community.
DPE	NSW Department of Planning and Environment
DPI-Water	NSW Department of Primary Industries - Office of Water
EMS	Environmental Management <u>Strategy</u> – note the use of strategy distinct from system that would imply compliance with ISO 14001.
EP&A Act 1979	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPA	NSW Environment Protection Authority
EPBC Act 1999	Commonwealth <i>Environment Protection Biodiversity Conservation Act 1999</i>
EPL	Environmental Protection Licence issued under the PoEO Act 1997 and administered by the EPA.
OEH	NSW Office of Environment and Heritage
PoEO Act 1997	NSW <i>Protection of Environment Operations Act 1997</i>
Project Area	Also referred to as the Development Site within the Biobanking Offset Strategy. Covers the development footprint only, and is located within the Subject Land, comprising the resource area, access road to Cabbage Tree Road and the internal haul roads connecting the north and south resource deposits.
PSC	Port Stephens Council, owner of the subject land and lessor of the subject land to WSS.
Subject Land	Encompasses the full extent of the four contiguous properties including both the Project Area and Offset Lands described as follows: <ul style="list-style-type: none"> • Lot 1 DP 224587 – 282B Cabbage Tree Road, Williamtown. • Lot 121 DP 556403 – 282B Cabbage Tree Road, Williamtown. • Lot 11 DP 629503 – 282B Cabbage Tree Road, Williamtown. • Lot 1012 DP 814078, 282B Cabbage Tree Road, Williamtown.
WSS	Williamtown Sand Syndicate, the operator of the quarry.

2. PROJECT CONTEXT

This section describes the project background and key elements that have shaped the Project design.

2.1 ENVIRONMENT

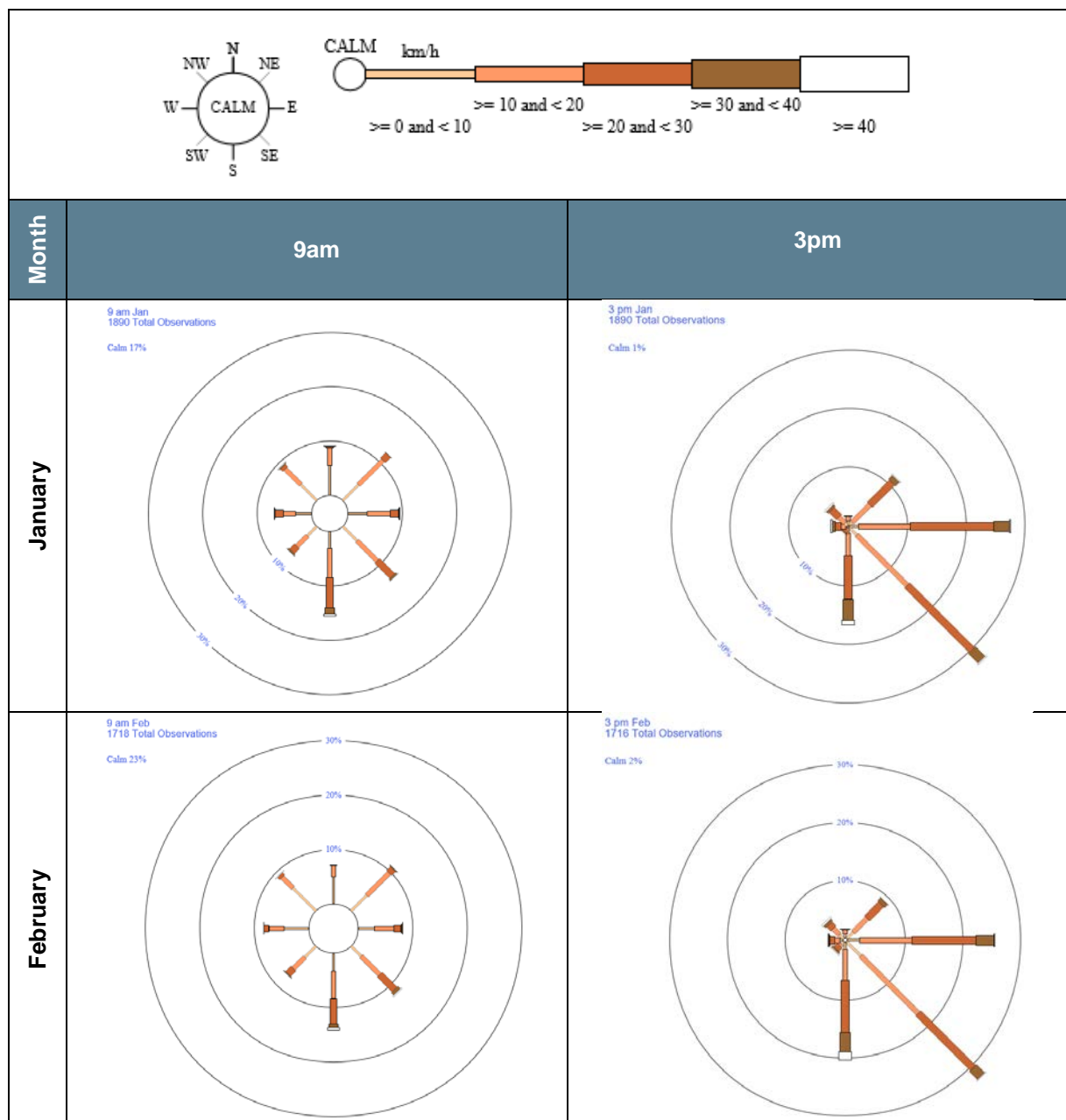
Key environmental attributes of the subject land and surrounds are:

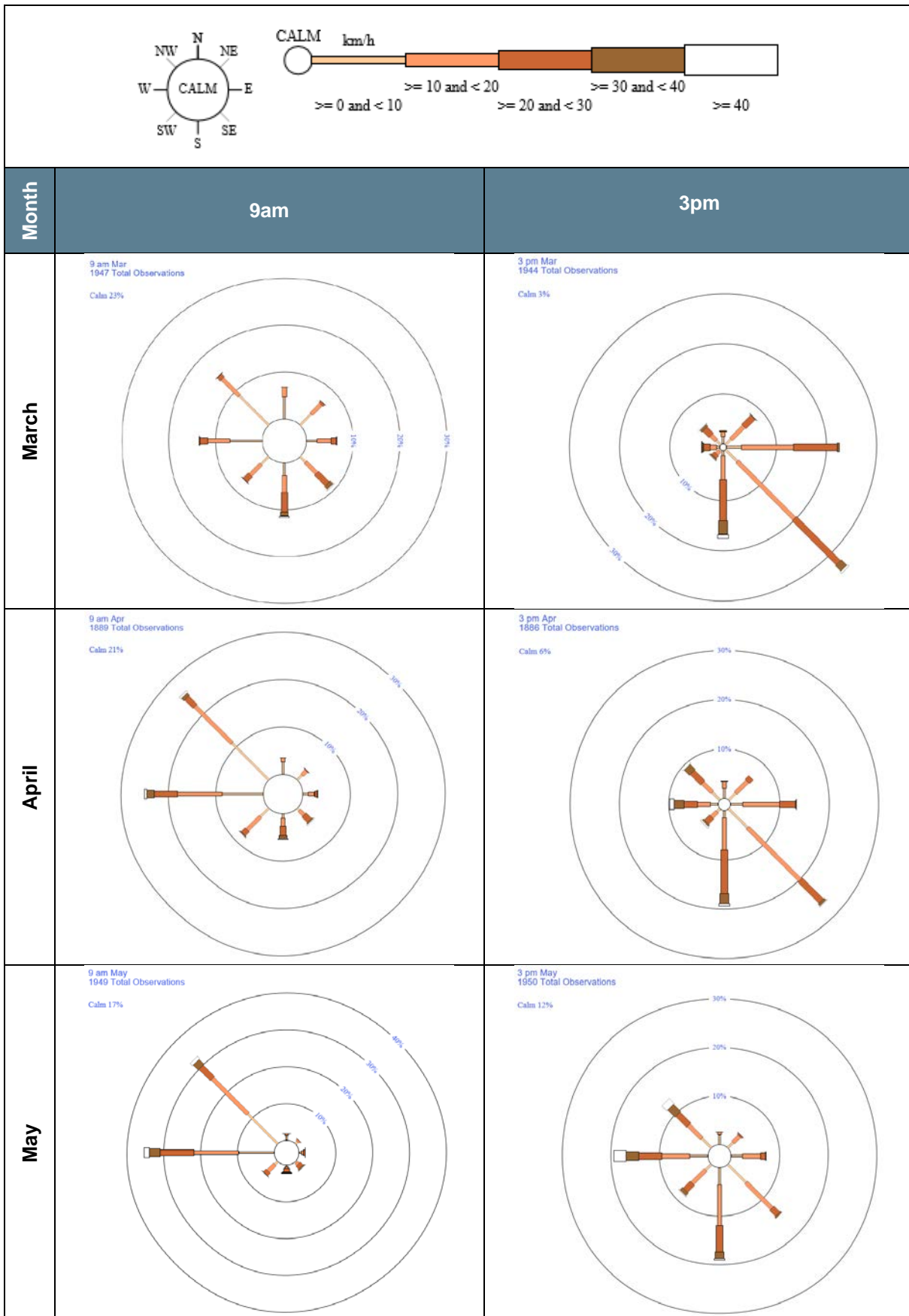
- The site is located on the southern margin of an inner coastal dune barrier system and involves the removal of vegetated Pleistocene age sand dunes that adjoin the Holocene age swamp and tidal margins of Fullerton Cove to the south (Umwelt 2015).
- Broadly the landform comprises a gently sloping plain from 3 m AHD in the south to 5.5 m AHD in the north with a two prominent sand dunes reaching up to 17 m AHD elevation, separated by low lying swamp area of 2 m AHD that drains to the east.
- The majority of the project is above the Tomago sand beds (a source for up to 25% of Newcastle's water supply) and as such is within the Hunter Water designated special area under the *Hunter Water Regulation 2010*.
- The subject land does not contain any defined natural drainage lines, suggesting vertical infiltration into the sand is dominant over runoff and horizontal movement of water.
- The area surrounding the Project Area is frequently water logged during high rainfall, with the groundwater close to the surface.
- The low lying Swamp mahogany – paperbark community is listed as an endangered ecological community protected under NSW legislation.
- The subject land contains preferred and supplementary Koala habitat.
- The project area and subject land comprises threatened flora Earp's Gum and Camfield's stringybark protected under State and Commonwealth legislation.
- Weather data is available at the Bureau of Meteorological Station located at the Williamtown Airport approximately 4 km to the north east of the northern portion of the site. **Table 4** provides an overview of the wind directions at Williamtown.
- Summer mornings have light variable winds that a slightly dominant from the south, until morning winds through Autumn strengthen from the north west and west and become dominant right through the year until November.
- Summer afternoon winds are typical of the coastal location with strong onshore winds from the south, south east and east. As winter approaches the winds from the west and north

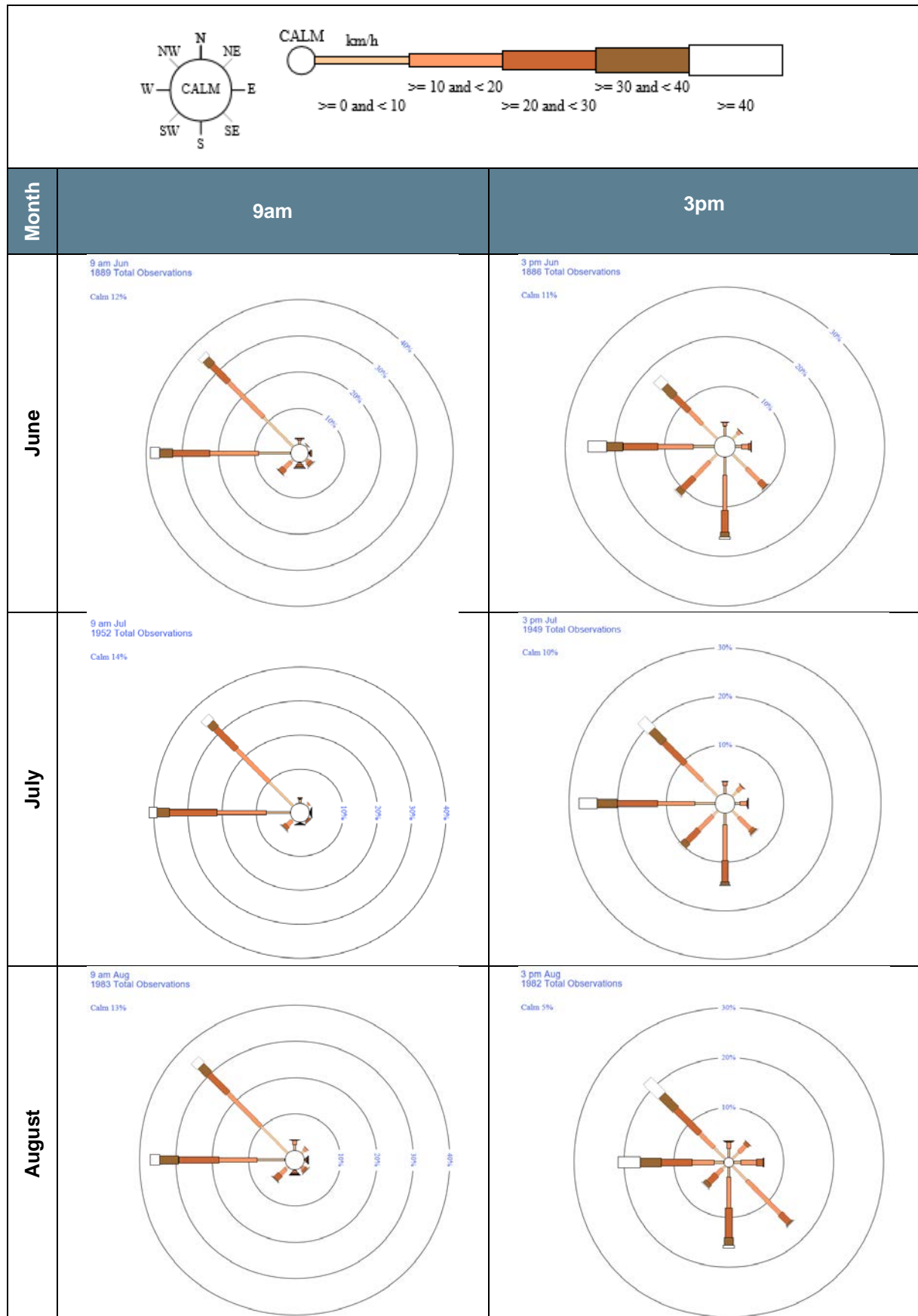
west increase, before these westerly and north westerly winds become dominant. By spring the south easterly wind direction again increases in the lead in to Summer.

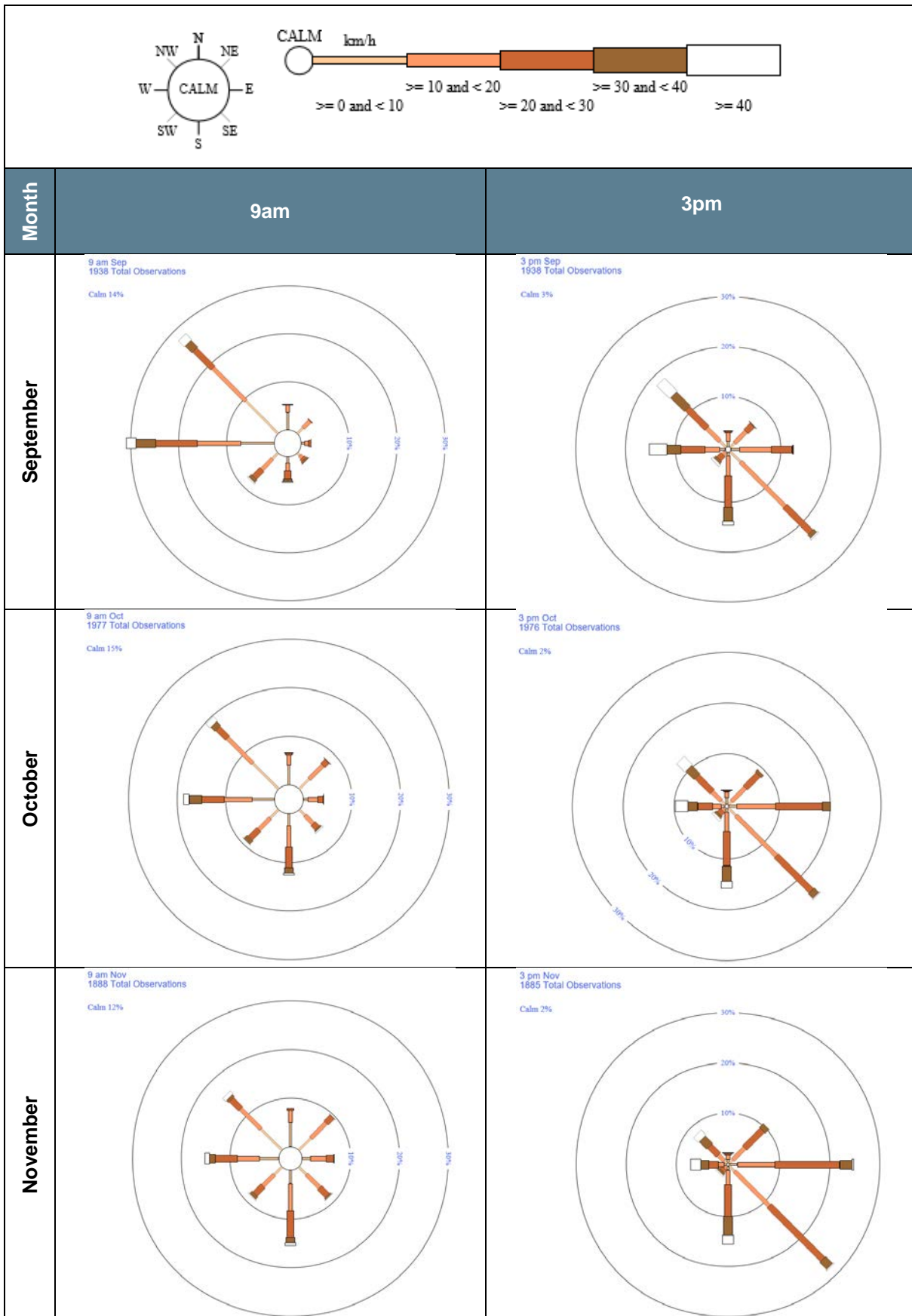
- The most sensitive time of year for the project is likely to be during winter where both morning and afternoon winds are from the north westerly direction.
- **Figure 3** illustrates long term average temperature, evaporation and rainfall data from the Williamtown Airport Bureau of Meteorological Station.
- Evaporation is highest during summer, and is greater than the rate of rainfall. During May June and July, the evaporation is similar to or less than the rainfall rate.
- The driest month on average is September, with the wettest in June.

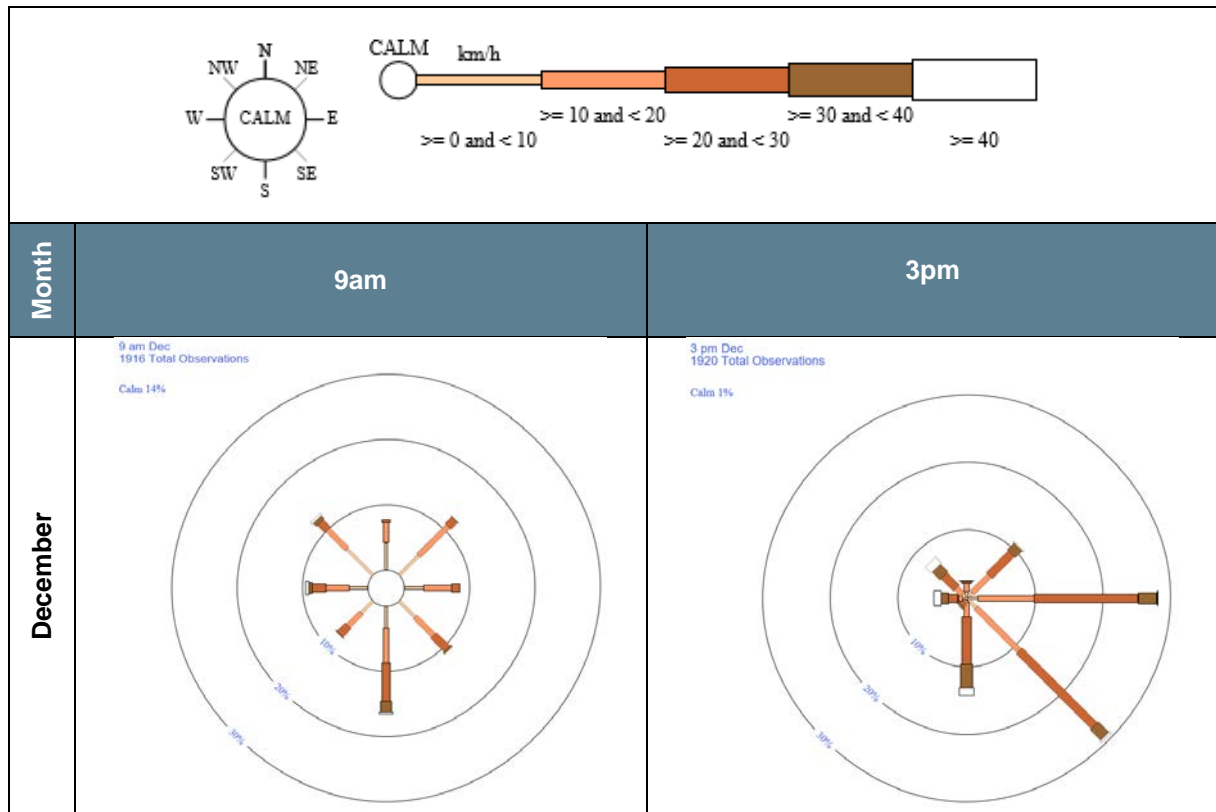
Table 4: Monthly wind roses 9am and 3pm at Williamtown Bureau of Meteorology Station











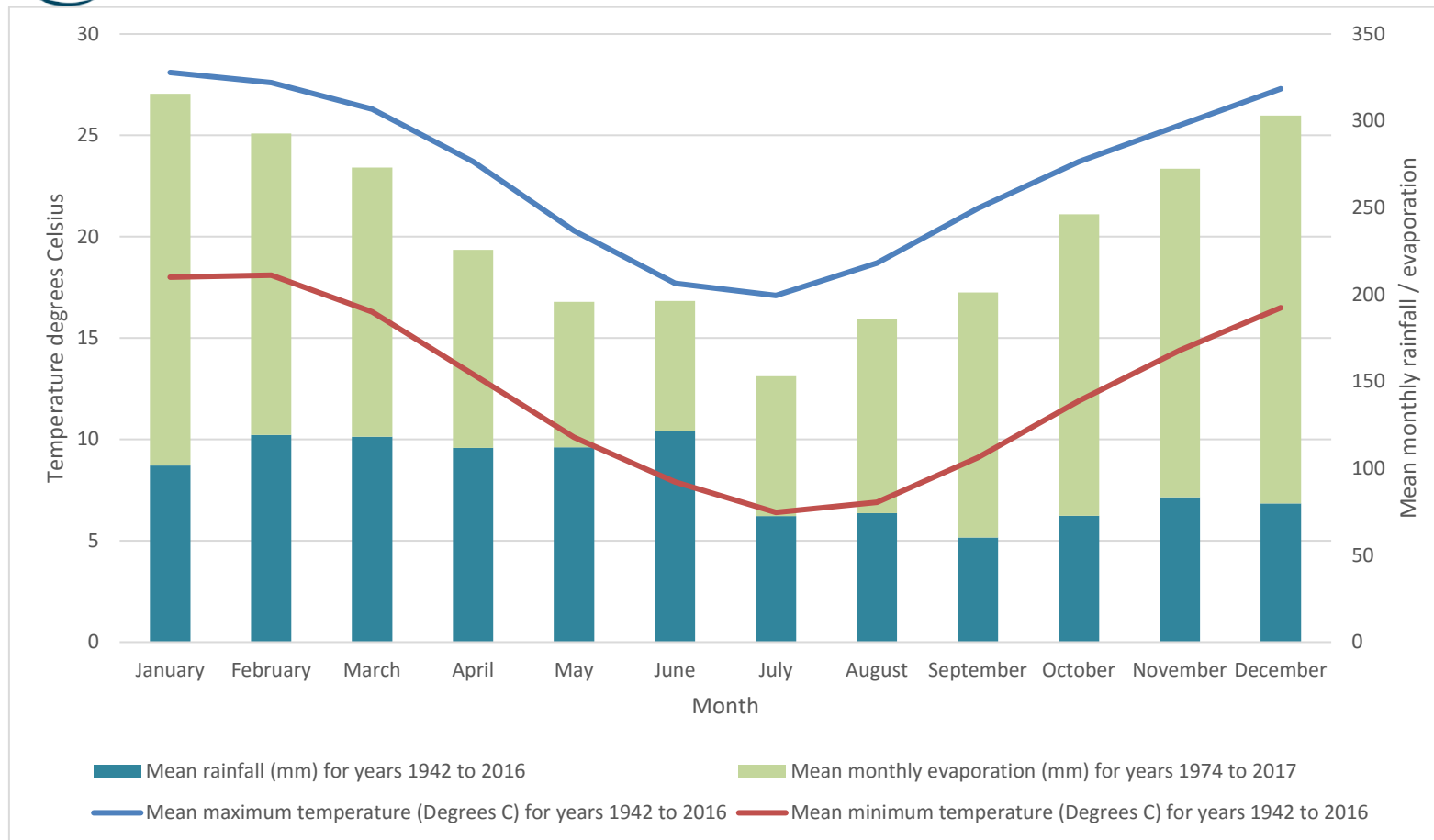


Figure 3: Monthly average rainfall, evaporation, minimum and maximum temperatures recorded at Williamtown Airport weather station

2.2 COMMUNITY

Dwellings surrounding the subject land comprise:

- No dwellings located to the north.
- East: closest dwelling is 244 m. 15 dwellings are located within within 1,000 m to the east and north of Cabbage Tree Road.
- South: closest dwelling is 61 m. 29 dwellings are located within 1,000 m to the south and south of Cabbage Tree Road.
- West: closest dwelling is 83 m. 24 dwellings located within 1,000m to the west and north of Cabbage Tree Road.
- Majority of dwellings located below 3 m AHD.
- The subject land and properties immediately surrounding the area are located within the red zone for the RAAF PFAS contamination. Noting a low concentration contamination plume extends over only a portion of the site and some residences south and east of the project.

2.3 REGULATORY

2.3.1 Approvals

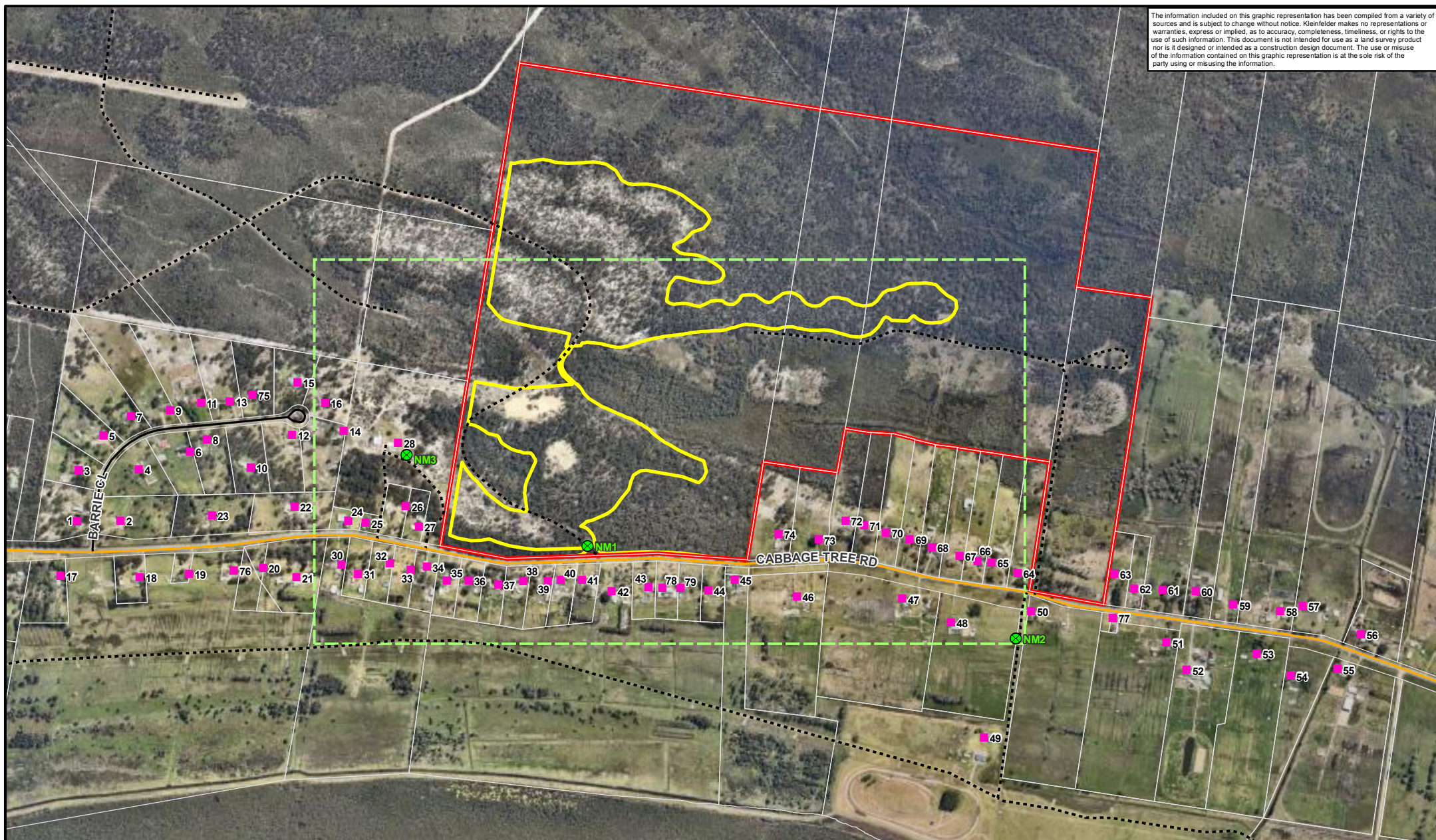
[To be completed following determination.]

2.3.2 Permits and Licences

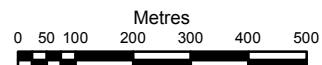
The following permits and licences are required to construct and operate the quarry:

- Permit under Section 138 of the *Roads Act 1993* from PSC / RMS.
- Environmental Protection Licence under the *Protection of Environment Operations Act 1997*. Pursuant to Schedule 1, Clause 16 “Crushing, grinding or separating” and Clause 19 “Extractive activities”.
- Hunter Water agreement to undertake extractive industries within the Tomago Special Area.
- Lease for the land with Port Stephens Council.

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Legend	
	Subject Land Boundary
	Project Area Boundary
	Noise Modelling Area (Receptors outside of this area not expected to be affected by noise)
✕	Noise Monitoring Point
■	Receptor
	Lot Boundary
	Arterial Road
	Local Road
	Track



PROJECT REFERENCE: 20170448
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 DRAWN BY: G.Joyce
 DATA SOURCE:
 LPI - 2016
 Nearmap - 2016

Subject Land and Receptors

Williamtown Sand Syndicate
 EMP
 Proposed Sand Quarry Cabbage
 Tree Road, Williamtown

FIGURE:

4

2.3.3 Consultation for Plan Development

[To be completed following consultation.]

Consultation required for the development of this document is expected to include the following stakeholders:

- NSW Planning & Environment.
- NSW Office of Environment & Heritage.
- NSW Department of Primary Industries – Office of Water.
- Port Stephens Council.
- Commonwealth Department of Environment.
- Community engagement undertaken during the project has resulted in the inclusion of various project design elements and control measures to be implemented.

Copies of correspondence by these stakeholders regarding the required content for this document is included within **Appendix 2**.

3. LEADERSHIP

Assignment of roles, responsibility and accountability ensures resources are appropriately used to implement, maintain and improve the project EMP. Environment, health and safety outcomes are a line management responsibility (a person or group of people who direct and control the organisation with direct responsibility and accountability for all aspects, operations, products and services). Specific responsibilities and accountabilities for the project will be assigned to personnel as defined in **Table 5**.

Table 5: Project roles and responsibilities

Role	Responsibilities
Board level management	Responsible for ensuring the required resources (monetary and people) are invested to implement this plan.
Quarry Manager	Reports directly to the Board. To authorise this plan. To provide the final authorised distribution of this management plan. Organise revisions of this EMP as required (Section 6).
Quarry Manager (or delegate)	Reports directly to the Board. Implement the management actions contained in this plan. Inclusion of all relevant records and monitoring results within the Annual Review. Ensure that all operations on site are undertaken in compliance with this management plan. Ensure all site personnel have received the appropriate training for their responsibilities. Provide feedback on the adequacy and effectiveness of this plan.
Staff and Contractors	Reports to the Quarry Manager or their delegate. Report any incidences or complaints immediately to the Quarry Manager or delegate. Ensure the implementation of this EMP with respect to their specific work practices. Act in accordance with the management procedures or protocols outlined in this plan. Ensure any potential or actual issues, including environmental incidents, are reported to the Quarry Manager or delegate in a timely manner.

3.1 ENVIRONMENTAL POLICY

Williamtown Sand is committed to providing a quality sand product, the protection of the environment, prevention of pollution and compliance with its EMP and its statutory obligations. This EMP will be reviewed annually to identify opportunities to enhance the environmental performance of Williamtown Sand's activities.

4. ENVIRONMENTAL ASPECTS

4.1 ENVIRONMENTAL ASPECTS

Table 6 provides a summary of the key activities, their resultant impacts (in broad terms) and the controls proposed to manage and reduce the impacts. Refer to the EIS and Response to Submissions for more detail on impacts and the assessment process.

Table 6: Summary of key activities, impacts and controls

Activity	Impacts	Controls
Intersection and facility construction	<ul style="list-style-type: none"> Vegetation clearing Fauna displacement Noise generation Traffic disruption Dust generation Erosion and sedimentation Disturbance of unknown Aboriginal heritage items 	<ul style="list-style-type: none"> Traffic Management Plan Construction Environmental Management Plan Aboriginal Cultural Heritage management plan
Operational extraction of sand and processing	<ul style="list-style-type: none"> Vegetation clearance Fauna displacement Noise generation Dust generation Disturbance of known and unknown Aboriginal heritage items Erosion, sedimentation and surface water runoff 	<ul style="list-style-type: none"> Clearing protocol Fauna management plan Stockpile management Maintain 1 m buffer to groundwater. Rehabilitation management plan Aboriginal Cultural Heritage Management Plan Offset Strategy Noise management plan Air quality management plan Groundwater management plan Surface water and erosion control plan
Road transport of sand	<ul style="list-style-type: none"> Road use conflict Additional traffic on roads Pre-opening truck arrival Noise generation 	<ul style="list-style-type: none"> Driver Code of conduct CCTV and weighbridge gates to limit haulage rate

4.2 COMPLIANCE OBLIGATIONS

Compliance obligations relevant to environmental management are included in the following documents:

- Project Approval dated XXXX (refer to Appendix X).
- EPL XXXXX (refer to Appendix X).
- PSC Lease (refer to Appendix X).

Management actions and performance measures have been developed to at a minimum meet those obligations [to be updated as necessary following determination].

5. MANAGEMENT ACTIONS AND CONTROLS

This section describes the relevant management actions and controls planned to be implemented for the project.

5.1 GENERAL MANAGEMENT MEASURES

5.1.1 Management Controls

To uphold the principles and commitments of the Environmental Policy, WSS' project environmental management measures will be implemented through the actions detailed in **Table 7** and assigned to the personnel as described in **Table 5**.

Table 7: General management measures

Item	Action	Trigger/Timing	Responsibility	Reporting
5.1.1.1	Review of Environmental Performance			
A	Williamstown Sand Syndicate Pty Ltd will prepare an Annual Environmental Management Report (AEMR) stating the environmental performance of the project to be distributed to stakeholders. See Section 7 for more details.	Annually	Quarry Manager	AEMR

Item	Action	Trigger/Timing	Responsibility	Reporting
5.1.1.2 Training and Competency				
A	Inductions and Training Staff and contractor inductions will include where relevant an overview of management measures and responsibilities and will include: <ul style="list-style-type: none"> • EMP requirements. • Environmental sensitivities. • Hazard and risk management. • Designated site access. • Waste management. • Spill response and management. • Heritage management and heritage finds protocol. • Weed and pathogen control. • Bushfire prevention. • Emergency response. • Incident reporting (environmental and safety). • Driver code of conduct. 	Ongoing	Quarry Manager	Training and Induction Register
B	The effectiveness of the induction and training program will be monitored and improvements implemented where identified.	Ongoing	Quarry Manager	NA

5.2 COMMUNITY RELATIONS

Positive community relations will be achieved through the implementation of effective communication and consultation mechanisms that will facilitate dialogue between WSS and the community.

5.2.1 Management Controls

Table 8: Community relations measures

Item	Action	Trigger/Timing	Responsibility	Reporting
5.2.1.1 Community Consultative Committee				
A	Establishment of a community consultative committee (CCC) to facilitate meetings with representatives of the local community.	Ongoing	Quarry Manager	Website Major outcomes reported in AEMR
B	Document CCC meeting agendas, issues raised, action items and close-out.	Ongoing	Quarry Manager	Major outcomes reported in AEMR
5.2.1.2 Feedback and Complaints				
A	A dedicated information contact phone number will be established prior to the commencement of construction and maintained throughout the life of the project.	Ongoing	Quarry Manager	AEMR
B	Feedback, enquiries and complaints received will be recorded in a consultation register that will be established prior to the commencement of construction and maintained throughout the life of the project.	Ongoing	Quarry Manager	AEMR

Item	Action	Trigger/Timing	Responsibility	Reporting
C	Complaints recorded in the consultation register will include details of complainant, WSS response and commitments to follow-up by whom and when will be detailed.	Ongoing	Quarry Manager	Summary included in AEMR Consultation Register
5.2.1.3 Consultation and Information Dissemination				
A	Consultation with immediate neighbours via an annual site open day.	Annually	Quarry Manager	AEMR Website
B	Community information newsletters providing awareness of: Project progress. <ul style="list-style-type: none"> Operating hours, contact information and details of how to provide feedback. Ways in which further information can be sought. Details of breaches of any development approval and licence conditions and WSS response and corrective actions. 	Bi-annually	Quarry Manager	AEMR Website
5.2.1.4 Website				
A	Website to include: <ul style="list-style-type: none"> Contact numbers. Copies of community newsletters. Details of annual open days. Copies of minutes from Community Consultative Committee. Copies of approvals. Copies of licences. 	Ongoing	Quarry Manager	Public

5.3 ACCESS, FENCING, GATES AND SIGNAGE

Fencing, gates and signage management will exclude unauthorised vehicle access, ensure access is restricted to dedicated tracks, reduce potential for vehicle strike for native fauna by limiting their access to Cabbage Tree Road, limit incidental vehicle access to adjoining offset areas and the quarry and notify the presence of the quarry operation and the offset areas.

The Project Area and adjoining lands currently contain numerous fences and access tracks in various states of functionality. Access roads vary from those in poor repair to being overgrown to those in good condition with a gravel surface.

This section does not provide specification for the design of the intersection with Cabbage Tree Road. The design of that intersection will be consistent with RMS requirements.

5.3.1 Management Controls

Table 9: Access, fencing, gates and signage management measures

Item	Action	Trigger/Timing	Responsibility	Reporting
5.3.1.1 Access Tracks/Gates				
A	Redundant access tracks to be removed when no longer required for bushfire control, rehabilitation maintenance, resource access or haulage.	As required	Quarry Manager	Map of access roads locations updated where changed and distributed to all personnel.
B	The main access gate adjacent to Cabbage Tree Road, and any other installed gates that provide access to surrounding lands will be locked when the quarry is not operating. A key will be provided to PSC, Hunter Water, NPWS, and the RFS.	Daily	Quarry Manager	Nil

Item	Action	Trigger/Timing	Responsibility	Reporting
5.3.1.2 Fencing				
A	<p><u>Koala exclusion fence</u></p> <ul style="list-style-type: none"> Construct a Koala exclusion fence on the Subject Land boundary adjoining Cabbage Tree Road for Lot 1 DP 224587 to limit movement of Koalas from the site onto Cabbage Tree Road. Construct a Koala exclusion fence from the site entry to the weighbridge (where speed limit is 40 km/h). The exclusion fence is to be installed with regard to the design specifications outlined in the <i>Koala Sensitive Design Guideline</i> (DEHP 2012). One-way fauna gate installed along the fence for circumstances where fauna is trapped on the road side of the fence. Total of four gates; two along Cabbage Tree Road (one on either side of the site entrance) and two along the internal access road (one on either side of the road). 	During construction	Quarry Manager	Nil
C	A ticketing system will be connected between the boom gate and exit weigh bridge. The boom gate will be configured to only operate within the quarry operating hours and will be linked to peak traffic generation rates shown in Section 5.15.3 . Video surveillance will also be erected at the weighbridge for security and ticket cross checks.	Ongoing	Quarry Manager	Nil
D	Construct a security fence around the office and workshop compound, including security measures to manage and limit unlawful activity.	During construction	Quarry Manager	Nil
E	Progressively delineate the perimeter of the active resource area that will prevent incidental access into Offset Lands and not impede the movement of, or be a danger to, native fauna (e.g., rope barricade, or equivalent).	During construction	Quarry Manager	Map of delineated areas and gate locations.
F	Remove or repair old internal fences.	Year 2	Quarry Manager	Map of fence lines and gate locations updated where fencing changed.

Item	Action	Trigger/Timing	Responsibility	Reporting
5.3.1.3 Signage				
A	Install signage at main entrance on Cabbage Tree Road to advise of the following: <ul style="list-style-type: none"> • Development name and description. • Contact number for general and emergency enquiries. • Site safety requirements (e.g., PPE, evacuation routes and muster points). 	At commencement of construction	Quarry Manager	Nil
B	Install fauna signage at main entrance and either side of corridor reminding drivers of the presence of wildlife and to adhere to site speed limits.	At commencement of construction	Quarry Manager	Nil
C	Install signage on perimeter of Project Area on adjoining access roads advising the presence of the offset area.	At commencement of construction	Quarry Manager	Nil
D	Install signage on perimeter of site adjoining access roads advising the presence of the operational quarry.	At commencement of construction	Quarry Manager	Nil
E	Install speed limit signage on quarry access roads.	At commencement of construction	Quarry Manager	Nil

5.3.2 Performance and Completion Criteria

Table 10 outlines the performance and completion criteria applicable to fencing in the Project Area and surrounds.

Table 10: Access, traffic, fencing, gates and signage performance and completion criteria

Action	Performance Criteria					Completion Criteria
	Years 0 – 2	Years 3 – 4	Years 5 – 6	Years 7 - 8	Closure	
Completion of actions specified above.	As required	As required	As required	As required	-	Evidence of completed actions recorded by photographic evidence.
Map location of all fences, gates and access tracks on or leading into the Project Area.	Year 1	Access tracks reviewed and map updated.	Access tracks reviewed and map updated.	Access tracks reviewed and map updated.	-	Reviews and mapping completed.
Remove redundant fences and access roads. Redundant access roads are rehabilitated.	Year 2	Redundant fences and roads removed as defined by mapping.	Redundant fences and roads removed as defined by mapping.	Redundant fences and roads removed as defined by mapping.	-	Redundant fencing and roads removed.
Primary access roads are maintained suitable for a Category 1 tanker.	Inspected and maintained annually	Inspected and maintained annually	Inspected and maintained annually	Inspected and maintained annually	Access road meets completion criteria.	Primary access roads meet required standard. Unsealed roads meet the following: <ul style="list-style-type: none"> • Width: 4 m. • Grade: Less than 15 degrees. • Cross slope: Less than 5 degrees (28 cm over 4 m width). • Clearance height: 4.5 m. • Curves: Minimum turning radius of 6 m.

Action	Performance Criteria					Completion Criteria
	Years 0 – 2	Years 3 – 4	Years 5 – 6	Years 7 - 8	Closure	
						<ul style="list-style-type: none"> • Passing bay: At 500 m intervals where possible. • Dead ends: 12 m minimum turning radius. Clearance on road side: Clear of dead trees and other vegetation that may be hazardous during fire management activities.
Secondary access roads are maintained suitable for Category 7 tanker.	Inspected and maintained annually	Inspected and maintained annually	Inspected and maintained annually	Inspected and maintained annually	Access road meets completion criteria.	Unsealed roads meet the following: <ul style="list-style-type: none"> • Width: 3.5m. • Grade: Less than 20 degrees. • Clearance height: 3.5m. All other measures as per Category 1 tracks.
Minor access roads suitable for Category 9 vehicles (e.g. four-wheel drive).	Inspected and maintained annually	Inspected and maintained annually	Inspected and maintained annually	Inspected and maintained annually	Access road meets completion criteria.	Road passable by four wheel drive vehicle.

Action	Performance Criteria					Completion Criteria
	Years 0 – 2	Years 3 – 4	Years 5 – 6	Years 7 - 8	Closure	
Install new fences and gates where needed, as defined by mapping.	Year 2	-	-	-	-	Fences and gates installed. Keys given to RFS, NPWS, Hunter Water and PSC.
Inspections of fencing conducted during monitoring, maintenance conducted as required.	Completed annually	Completed annually	Completed annually	Completed annually	-	Annual inspection and planned maintenance completed.
Signage is erected: <ul style="list-style-type: none"> • Business signage • Fauna signage • Quarry operation signage • Offset signage 	Signage erected	Signage present is	Signage present is	Signage present is	Business Signage removed	Signage erected and maintained for duration of BOMP.

5.4 TRAFFIC

The impact of the additional traffic from the development was assessed as part of the EIS and reviewed by the RMS. The assessment determined the proposed traffic from the development combined with the existing traffic levels will not result in unacceptable levels of service on the road. In addition, a road safety audit was conducted on the road to determine the existing road condition and measures to improve safety with the introduction of vehicles from the project.

Roads and Maritime Services have determined that Cabbage Tree Road has a maximum capacity of 1,480 vehicles per hour to maintain a Level of Service of C. Current conditions have traffic levels reaching 627 vehicles during morning peak hour and 1,006 vehicles during afternoon peak hour. The development will result in a maximum of 10 additional trucks per hour. If accounting for return trips along Cabbage Tree Road the development will result in an increase of 20 vehicles per hour. This calculates to 1.4% of total road capacity, a potential increase of 3.2% for peak morning traffic or an increase of 2% for afternoon peak traffic. As these figures account for peak haulage rates, operational traffic is likely to be substantially less. These increases also assume that a new consumer, not currently seeking sand from the area, purchases sand from the proposed quarry. In practice, this is unlikely, as with any market there is likely to be competition with consumers changing suppliers accordingly.

5.4.1 Management Controls

Traffic management controls from the compliance obligations are detailed within **Table 11**.

Table 11: Operational traffic management measures

Item	Action	Trigger/Timing	Responsibility	Reporting
5.4.2 Construction				
A	Traffic control plans prepared by an accredited person are to be approved by the RMS prior to implementation by an accredited person for the construction of the quarry intersection.	Prior to construction	Quarry Manager	Part of the CEMP
B	<p>The quarry intersection and associated acceleration and deceleration lanes will have the following signage installed (subject to approval by RMS).</p> <ul style="list-style-type: none"> • “No Stopping zones”. • Digital signage stating if quarry is opened or closed to avoid truck entry and idling at entry if gate is closed. • Quarry approach and need to limit air breaking. • Speed limit signage for 40 km/h entering site before intersection. • Sign-on gate: in the event of arriving prior to gate being open turn off vehicle immediately. 	Installed during construction and updated as necessary	Quarry Manager in Consultation with Roads and Maritime Services	Register of monthly / post major rainfall inspections.
5.4.3 Operation				
A	<p>Speed limit signage within the site as follows:</p> <ul style="list-style-type: none"> • 40 km/h between Cabbage Tree Road and the incoming weighbridge. • 20km/h from the weighbridge to the processing plant / stockpiles. 	Installed on completion of construction	Quarry Manager	Nil
B	<p>Williamtown Sand Syndicate Pty Ltd will implement a Driver Code of Conduct signed by all drivers during their site induction and will allow Williamtown Sand Syndicate Pty Ltd to strictly enforce the access requirements and penalise non complying drivers, the Driver Code of Conduct will include but is no limited to the following:</p> <ul style="list-style-type: none"> • Quarry operating times. 	Ongoing	Quarry Manager	<p>Driver Code of Conduct</p> <p>Provided to all potential customers and contractors prior to opening</p>

Item	Action	Trigger/Timing	Responsibility	Reporting
	<ul style="list-style-type: none"> Proposed digital signs prior to deceleration lane stating status of quarry being open or close subject to RMS approval. This will mitigate early arrivals to the quarry. No stopping signage for extent of site for deceleration lane to deter early arrivals. Pre booking of high demand slots between 0500 and 0700 which are anticipated to be limited, these slots are likely to be pre-booked. Any unexpected truck turning up on site will have to wait on-site prior to exiting the site in the allocated slots. Quarry approach and need to limit air breaking. Respect our neighbours internal signage on exit of quarry. Sign-on gate: in the event of arriving prior to gate being open turn off vehicle immediately. UHF radio contact to quarry manager for enquiries prior approach to the quarry. 			
C	Peak traffic generation limits from the site are as follows: <ul style="list-style-type: none"> 6 laden trucks per hour (12 trips per hour) during the hours of 5 am to 7 am. 10 laden trucks per hour (20 trips per hour) during hours of 7 am to 6 pm. No haulage on Sundays or Public Holidays. 	Ongoing	Quarry Manager	Nil
D	Incoming trucks will be weighed on entry to the site via a weigh bridge at the site office complex and again on leaving the site where product weight and tickets will be generated and recorded for each load.	Ongoing	Quarry Manager	Incoming and outgoing truck movements recorded.
E	Boom gate on outgoing weigh bridge linked to peak haulage rates. CCTV system to be installed on outgoing weigh bridge to provide compliance assessment of haulage numbers.	Ongoing	Quarry Manager	Haulage numbers and tonnage transported published within AEMR



5.5 WEED CONTROL

Noxious weeds listed under the *Noxious Weeds Act 1993* within the Project Area are required to be controlled and further, WSS will control other environmental weeds emanating from activities in the Project Area.

The majority of the Subject Land has a low abundance of weeds. Within the Project Area weeds are restricted to areas within and adjoining the southern resource area and south eastern fringe of the northern resource area, within areas that have previously been disturbed and access tracks.

A list of environmental weeds species identified within the Subject Land is provided in **Table 12**. This list will form the basis of a target weed species list for the project. Other noxious or potential environmental weeds identified during the works will also be targeted. Not all target species are listed Noxious Weeds within Port Stephens control area or are listed as Weeds of National Significance, but have been identified as environmental weeds within the subject site due to their dominance.

Table 12: Environmental Weeds within the Subject Land

Family	Scientific Name	Common Name	Control Class (<i>Noxious Weeds Act 1993</i>)	WoNS
Recorded within the Project Area				
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	Class 4	Yes
Poaceae	<i>Eragrostis curvula</i>	African Love Grass	Class 4*	-
Poaceae	<i>Melinis repens</i>	Red Natal Grass	-	-
Verbenaceae	<i>Lantana camara</i>		Class 4*	
Additional Species Recorded Outside the Project Area (Offset Area)				
Asteraceae	<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i>	Bitou Bush	Class 4	Yes
Fabaceae – Mimosoideae	<i>Acacia saligna</i>	Golden Wreath Wattle	-	-
Pinaceae	<i>Pinus elliotii</i>	Slash Pine	-	-

Family	Scientific Name	Common Name	Control Class (<i>Noxious Weeds Act 1993</i>)	WoNS
Pinaceae	<i>Pinus radiata</i>	Radiata Pine	-	-
Poaceae	<i>Andropogon virginicus</i>	Whisky Grass	-	-
Poaceae	<i>Axonopus fissifolius</i>	Narrow-leaved Carpet Grass	-	-
Poaceae	<i>Setaria sphacelata</i>	South African Pigeon Grass	-	-

* Species listed under the *Noxious Weeds Act 1994* but not applicable to Port Stephens control area.

The high cover and abundance of exotic grasses within previously disturbed areas is likely the result of their introduction during past rehabilitation activities. Due to the abundance of these weeds in previously disturbed areas, complete eradication within the Project Area is unlikely. As such the management of topsoil and planting of canopy species are likely to be the most effective control measures.

The principle aim of weed control for the project is to limit the spread of weeds (environmental and noxious weeds) from activities in the Project Area to adjoining conservation lands, and degrading the quality of proposed quarry rehabilitation. The adjoining conservation lands include:

- Lot 15 DP 1081085 located to the west of the Project Area that is subject to a Biobanking Agreement. Like the Project Area, a large portion of this lot was also subject to sand mining in the late 1970s.
- The Tilligerry State Conservation Area (SCA) shares a section of approximately 200 m with the western side of the resource area. A 50 m buffer separates the Project Area and this land.
- Biobank Land within the Subject Land outside the Project Area.

5.5.1 Management Controls

Pursuant to the project approval, commitments within the EIS and responses to submissions, weed control measures are outlined in **Table 13**.

Table 13: Weed management measures

Item	Action	Trigger/Timing	Responsibility	Reporting
A.	<u>Vehicles and access tracks</u> <ul style="list-style-type: none"> All machinery used on the site will be cleaned of all soil and organic matter prior to entering the Project Area. Road registered haulage vehicles will be required to remain on the formed access roads. Vehicle access to the rehabilitation will be restricted to authorised personnel. Once access tracks are no longer required they will be revegetated to minimise their potential as weed vectors. 	Ongoing	Quarry Manager	Nil
B.	<u>Weed-infested topsoil handling</u> Pre-clearing surveys: <ul style="list-style-type: none"> Pre-clearance survey to record approximate cover and abundance of environmental weeds within each area to be cleared. Where infestations of environmental weeds occur they will be delineated prior to clearing to allow for separate stockpiling and distribution. For practicality purposes during clearing and topsoil stripping, weed infestations greater than 100 m² (i.e. 10 m x 10 m) will be delineated. 	Prior to clearing of each sector	Quarry Manager	Key details included in AEMR
	<ul style="list-style-type: none"> Topsoil containing environmental weeds (as delineated in pre-clearance) will not be blended or stockpiled with "clean" topsoil. Topsoil containing environmental weeds will be redistributed within the area in which it was stripped and will not be transported to any other sectors. The extent of respread topsoil with environmental weeds to be delineated, recorded and subject to the rehabilitation measures described in Section 5.20. 	When clearing, stockpiling and resspreading topsoil.		
C.	<u>Inspections</u> During monitoring of the rehabilitation, annual monitoring will be conducted to identify any weeds, including non-local native species within the site. Inspections will include the outer perimeter of the current disturbance (i.e. interface with conservation areas) and the verges of internal access roads.	During monitoring of each sector	Quarry Manager	Key details included in AEMR

Item	Action	Trigger/Timing	Responsibility	Reporting
D.	Weed control Weed management will be conducted by a suitably qualified contractor with a focus on the recommendations made as a result of rehabilitation monitoring and inspections. Control of weeds will predominantly be through manual removal to limit the use of chemicals. Chemical controls will only be utilised where there are significant outbreaks.	When required, as identified during monitoring events	Quarry Manager	Key details included in AEMR

5.5.2 Performance and Completion Criteria

Table 14 outlines the performance and completion criteria applicable to weed control.

Table 14: Weed control performance and completion criteria

Action	Performance Criteria					Completion Criteria
	Years 0 – 2	Years 3 – 4	Years 5 – 6	Years 7 – 8	Closure	
Rehabilitated land monitoring for weeds (Sectors 1 – 7)	Annual weed monitoring completed including a review of the effectiveness of the weed control activity, reporting to include map of occurrences and recommendations for management.				Meets completion criteria	On closure, rehabilitated land to have less than 5% cover of environmental weeds on average across Sectors 1 – 7, with no noxious weeds.
Rehabilitated land monitoring for weeds (Sectors 8 and 9)						The cover of environmental weeds is less than that prior to extraction.
Where previously unrecorded weeds to the site are identified during monitoring, identify likely vector and control actions required.	Within 2 months of monitoring, vectors for unrecorded weeds are identified. Weed controls are updated and implemented as required.				Nil	Weed controls updated and implemented as required
Weed control activity.	Weed control undertaken consistent with survey recommendations by suitably qualified contractor/personnel.				Nil	Weed controls undertaken are recorded

5.6 VERTEBRATE PEST MANAGEMENT

Under the *Rural Lands Protection Act 1998*, there are requirements for landholders to continually suppress and destroy pest animals on their lands. Pests (and non-native fauna species) recorded during surveys on the Subject Land included:

- House mouse.
- Black rat.
- Dog.
- European rabbit.
- Horse.

Pests of particular note are dogs and cats that are capable of predation of native wildlife, while European rabbit may present a risk to rehabilitation success. These pests are likely to be a combination of both feral and domestic pests recorded on the Subject Land and were not noted for their particular abundance or damage generated. Port Stephens Council included a requirement for the lessee to manage pests on the subject land particularly within the wildlife corridor area located between the northern and southern resource areas. Management is to include the capture and return of domestic pets to owners where identifiable or to an animal shelter where identification is not possible.

5.6.1 Management Controls

Vertebrate pest management controls from the compliance obligations are detailed within **Table 15**.

Table 15: Vertebrate pest management measures

Item	Action	Trigger/Timing	Responsibility	Reporting
A	All putrescible waste bins to be securely covered and removed from the site on a weekly basis to remove potential food source for vermin.	Ongoing	Quarry Manager	AEMR annual waste generation
B	<p>Undertake monitoring for presence of pests through one of the following methods:</p> <ul style="list-style-type: none"> Conducting searches and spotlighting, and mapping evidence of pest species across Project Area (e.g. rabbit warrens, pig scratching, evidence of wild dogs). Installing remote motion sensing camera traps at a minimum of five locations across the Project Area for a two-week period. <p>The presence of domestic or wild cats and dogs within the central wildlife corridor (consistent with PSC lease conditions) should be included within the program.</p>	Annually	Quarry Manager	Summary of results in AEMR
C	Recording of incidental observations for evidence of pests and where suspected to be domestic and (if considered safe to do so) are to be captured and reported to PSC and returned to the owner if known or animal shelter if unknown.	Opportunistically	Quarry Manager	Summary of results in AEMR
D	<p>Where detected during monitoring, implement a pest control program to reduce vertebrate pest numbers where there is potential for impacts on native wildlife and rehabilitation. The program is to have regard for the presence of domestic animals and return these to the owners where captured. The vertebrate pest control program is to be conducted:</p> <ul style="list-style-type: none"> In consultation with the LLS and adjoining landholders. In accordance with Humane Pest Animal Control: Codes of Practice (DPI 2014). By suitably qualified and experienced personnel. Other control methods such as shooting or trapping can also be used if deemed necessary or appropriate with advice from OEH or the LLS. Given the proximity of residential properties baiting programs may not be appropriate. 	Within three months of an observation with potential for impacts.	Quarry Manager	Summary of results in AEMR

5.6.2 Performance and Completion Criteria

Table 16 outlines the performance and completion criteria applicable to vertebrate pest control.

Table 16: Vertebrate pest performance and completion criteria

Action	Performance Criteria					Completion Criteria
	Years 0 – 2	Years 3 – 4	Years 5 – 6	Years 7 - 8	Closure	
Above management controls implemented as required.	Actions completed				Nil	Nil
Pest monitoring undertaken.	Annual monitoring survey completed.				Nil	Annual surveys completed, survey to include map of occurrences and recommendations for management.
Pest control program undertaken as per management.	Pest control undertaken consistent with survey recommendations by suitably qualified and experienced contractor.				Nil	Pest controls undertaken are recorded.

5.7 EROSION, SEDIMENT CONTROL AND SOIL MANAGEMENT

The objective of erosion and sediment control and soil management is to:

- Minimise topsoil movement to allow soils to stabilise with vegetation during rehabilitation.
- Avoid sedimentation from Project Area into adjoining vegetation and the Biobank Lands.
- Minimise offsite transport of suspended sediment.
- Limit edge effects from changes in water quality and sedimentation runoff from the Project Area.
- Provide for the classification and management of any potentially contaminated sands (e.g. discoloured or odorous) or potential asbestos containing material intersected during extraction.

See **Section 5.8** for hydrocarbon controls relating to operations.

5.7.1 Management Controls

Controls within the Approval, Licences and Project Statement of Commitments are detailed in **Table 17**.

Table 17: Erosion, sediment control and soil management measures are defined below.

Item	Action	Trigger/Timing	Responsibility	Reporting
5.7.2 Construction				
A	A construction environmental management plan (CEMP) including erosion and sedimentation controls will be prepared and implemented for all construction activities proposed.	Prior to commencement of Project construction	Quarry Manager	CEMP
B	Erosion and sediment control plans (ESCP) to be prepared and implemented with all internal road construction activities.	Prior to internal road construction	Quarry Manager	ESCPs

Item	Action	Trigger/Timing	Responsibility	Reporting
C	Vegetation and soil excavated during the initial block construction will be stockpiled (vegetation and then topsoil) within an area adjacent to the processing plant. The initial area of cleared vegetation and topsoil will be used to supplement other extraction areas over the life of the project that are deficient in organic matter.	During construction/Ongoing	Quarry Manager	Nil
D	During excavation of each new extraction zone, vegetation and topsoil cleared will be laid over the previous extracted zone to encourage regrowth and rehabilitation.	Ongoing	Quarry Manager	Nil
5.7.3 Operation				
A	Install erosion and sediment controls on-site as required in accordance with the Erosion and Sediment Control Regional Policy (PSC, 2002b) and the Code of Practice for Managing Urban Stormwater – Soils and Construction (Landcom, 2004).	At commencement of project	Quarry Manager	Nil
B	Maintain erosion and sediment controls as required and consistent with the Code of Practice for Managing Urban Stormwater – Soils and Construction (Landcom, 2004).	Monthly / post major rainfall inspections.	Quarry Manager	Register of monthly / post major rainfall inspections.
C	Maintain a bund at the downslope side of each of the extraction areas to contain any sediment and runoff that may be generated from disturbed areas on site.	During extraction of block.	Quarry Manager	Nil
D	Maintain a low level bund around the silty loam stockpile to limit potential for offsite transport and spread.	During establishment of processing areas	Quarry Manager	Nil
E	Final landform batters with edge of Project Boundary not to exceed 4H (horizontal) to 1V (vertical), 4H:1V.	During rehabilitation	Quarry Manager	Completion Report
F	Disturbance of potentially contaminated soils or potential hazardous building materials or pipe (e.g. fibre cement containing asbestos) must be reported to the quarry manager immediately and no further disturbance of area to continue. Quarry manager to determine need for formal classification.	As required	Quarry Manager	AEMR

Item	Action	Trigger/Timing	Responsibility	Reporting
5.7.4 Monitoring				
A	Erosion and sediment controls will be monitored to ensure performance is maintained.	Monthly and after significant rainfall	Quarry Manager	Register of monthly / post major rainfall inspections.
C	The post extraction landform must be surveyed on completion of the primary site rehabilitation works and the results presented in the form of plans to demonstrate compliance with the extraction limit of 1 m above highest predicted groundwater level.	Ongoing	Quarry Manager	AEMR

5.7.5 Performance and Completion Criteria

The performance and completion criteria applicable to both are described below in **Table 18**.

Table 18: Erosion performance and completion criteria

Actions	Performance Criteria (X notes action completed in period)					Completion Criteria
	Years 0 – 2	Years 3 – 4	Years 5 – 6	Years 7 – 8	Closure	
Controls completed as shown in above table.	X	X	X	X		
CEMP developed prior to construction activities and implemented.	X	Nil	Nil	Nil	Nil	Plans implemented and controls removed on completion / when stabilised.

Actions	Performance Criteria (X notes action completed in period)					Completion Criteria
	Years 0 – 2	Years 3 – 4	Years 5 – 6	Years 7 - 8	Closure	
ESCP for internal roads (north of Office and Workshop) developed and implemented.	X	X	X	Nil	Nil	Plans implemented and controls removed on completion / when stabilised.
Inspection of Project Area for signs of erosion (and sedimentation).	Erosion inspections completed annually. Areas of erosion where present recorded and management proposed. Sedimentation from project activities to areas outside the Project Area are assessed for remedial options in conjunction with Offset Land manager.				The whole project area is surveyed for erosion.	Erosion management actions implemented. No erosion present that compromises the ecological values, safety or long term stability of the landform.
Erosion management where recommended by annual inspection/ incidental observations.	Management actions implemented within 6 months of inspection.				Nil	All identified erosion management requirements are included within current management schedule.

5.8 WATER MANAGEMENT

5.8.1 Management Controls

Water Management controls from the compliance obligations are detailed within **Table 19**.

Table 19: Site water management measures

Item	Action	Trigger/Timing	Responsibility	Reporting
A	<p>This section of the EMP will be revised and updated on determination of the project to ensure management measures proposed adequately reflect the requirements of the Conditions of Consent.</p> <p>The revised section will be prepared in consultation with the NSW EPA, NSW Water and Hunter Water for approval by NSW DPE.</p>	<p>Prior commencement of operations</p>	Quarry Manager	Final Water Management Section of EMP
5.8.1.1 Water Use				
A	Water for potable use and dust suppression will be drawn from Hunter Water's reticulated water supply at Cabbage Tree Road. No groundwater will be extracted or utilised.	Ongoing	Quarry Manager	Annual HWC water usage reported in AEMR
5.8.1.2 Surface Water				
A	Surface water will be contained onsite through incorporation of bunds around the perimeter of the resource area. Most of the bunds will be created as a result of the extraction process being topographically lower than the adjacent surfaces. The bund will also be incorporated into the access road through a trafficable mound that ensures all surface water within the resource area must percolate vertically into the groundwater.	Ongoing	Quarry Manager	Nil
B	Rainwater will be captured from the workshop and office roofed area and reused for dust suppression.	Ongoing	Quarry Manager	Nil

Item	Action	Trigger/Timing	Responsibility	Reporting
C	All impervious areas will be shaped such that water sheds to infiltration areas constructed in areas adjoining rehabilitated sections.	Ongoing	Quarry Manager	Nil
5.8.1.3 Groundwater				
A	WSS will consult with DPI Water with regards to the locations of and construction of proposed monitoring points, installation of loggers and selection of sampling points.	Prior to construction	Quarry Manager	Final Water Management Section of EMP
B	WSS will install monitoring wells, so that monitoring can be performed immediately up and down gradient of the main extraction areas after destruction of existing bores.	As required if monitoring bore removed	Quarry Manager	Final Water Management Section of EMP
C	Data loggers will be installed in monitoring wells to continuously monitor and provide additional data for input to the groundwater model.	Prior to construction	Quarry Manager	Final Water Management Section of EMP
D	Trigger levels for monitoring will be developed in consultation with DPI Water to ensure the groundwater table is not intersected.	Prior to construction	Quarry Manager	Final Water Management Section of EMP
E	Management protocols for PFAS for sub-water table disturbance during construction.	Prior to construction	Quarry Manager	Final Water Management Section of EMP
5.8.1.4 Groundwater Modelling				
A	WSS will update the groundwater model every two years from commencement of quarry activities to determine maximum predicted groundwater level along with updated topography showing the progress of the quarry.	Every 2 years	Quarry Manager	AEMR

Item	Action	Trigger/Timing	Responsibility	Reporting
B	The quarry floor height will be reviewed every two against the revised groundwater model (refer to Rehabilitation section for establishing the adopted level), unless trigger levels determine a review is required.	Every 2 years	Quarry Manager	AEMR
5.8.1.5 Tomago Sandbeds Aquifer				
A	No equipment maintenance will occur within Tomago Sandbeds Special Area.	Ongoing	Quarry Manager	Nil

5.9 HYDROCARBON CONTROLS

5.9.1 Management Controls

Hydrocarbon controls from the compliance obligations are detailed within **Table 20**.

Table 20: Management Controls for Hydrocarbons

Item	Action	Trigger/Timing	Responsibility	Reporting
5.9.1.1 Operations				
A	If obvious signs of contamination such as discoloured or odorous soils are encountered during site set-up and extraction, work will stop in the vicinity of the area and, if safe to do so, samples will be taken for analysis	Ongoing	Quarry Manager	AEMR
B	A fully bunded and undercover hardstand for fuel, hydrocarbon and chemical storage will be constructed outside of the Tomago Sandbeds Special Area.	Ongoing	Quarry Manager	Nil
C	Personnel to be trained in spill containment and response procedures.	Ongoing	Quarry Manager	Training and Induction Register
D	Hazardous material stored onsite will be kept to the minimum practicable amount.	Ongoing	Quarry Manager	Nil
E	Spill response kits will be kept and maintained onsite.	Ongoing	Quarry Manager	Nil
F	Processing plant area (moved around the site based on resource area) installed on site will include: <ul style="list-style-type: none"> • A bunded parking area for the overnight parking of the bull dozer. • If power via electrical mains supply is unavailable, diesel generators will be required. If used, diesel generators will: <ul style="list-style-type: none"> ○ Be located within a bunded area. ○ Include an internal double skinned and self bunded diesel storage tank. 	Ongoing	Quarry Manager	Nil

Item	Action	Trigger/Timing	Responsibility	Reporting
	<ul style="list-style-type: none"> Be refuelled as required within the bunded refill area. Be returned to the Office and Workshop Compound on conclusion of operations each Saturday. This is proposed in the context of reducing the risk of vandalism over the weekend, and limiting risks (e.g. electrical and diesel) associated with the daily transport of the generator to and from processing plant area. 			
G	Mobile equipment installed on site will: <ul style="list-style-type: none"> Be refuelled at a lined and bunded refuelling area. Include spill control kits. Operators trained in the use and maintenance of spill control kits. Return of all mobile equipment at end of each day to Office and Workshop Compound (excluding the bull dozer). 	Ongoing	Quarry Manager	Nil
H	Electric screen and air separator installed on site will include bunding under the electric screen and air separator plant to capture hydraulic leaks.	Ongoing	Quarry Manager	Nil
I	Refuelling of equipment will be undertaken over a bunded concrete pad by a registered contractor. No fuel or diesel will be stored on site contained in plant and equipment. Oils and grease will be stored in a bunded area.	Ongoing	Quarry Manager	Nil
5.9.1.2 Tomago Sandbeds Special Area				
A	Mobile plant used in the extraction process will be refuelled outside of the Tomago Sandbeds Special Area, including: <ul style="list-style-type: none"> Pneumatic tyred loaders (2x full time) Dump Trucks (campaign usage as required for extraction area 7C). Sales truck (Daily). Trailer mounted diesel generator to power processing plant interim or back up in the event electricity is not available.	Ongoing	Quarry Manager	Nil
B	All diesel powered pneumatic tyred mobile plant will be removed from the Tomago Sandbeds Special Area at the end of each day's operation, including: <ul style="list-style-type: none"> Loaders x 2 (daily) Dump trucks (campaign usage as required for extraction area 7C). 	Ongoing	Quarry Manager	Nil

Item	Action	Trigger/Timing	Responsibility	Reporting
	<ul style="list-style-type: none"> Sales trucks (daily) Trailer mounted diesel generator (where used) This plant will be stored within fenced area with CCTV and back to base security at the Office and Worksoop area located outside the Special Area.			
C	When plant and equipment is not operating, pressure will be removed from hydraulic lines and hydraulic fluid returned to the tank. The tank will be banded to 110% of capacity.	Ongoing	Quarry Manager	Nil
D	The tracked plant will be refuelled on a fully banded and lined hardstand. The following plant that are permitted to be refuelled on the fully banded and lined hardstand area within the Tomago Sandbeds Special area include: <ul style="list-style-type: none"> 1 x Dozer (Maximum of 3 campaigns of 2 weeks each, 42 days per year). 1x Excavator (Maximum of 3 campaigns of 2 weeks each, 42 days per year). 	Ongoing	Quarry Manager	Nil
5.9.1.3 Spill Response				
A	Any hydrocarbon spills on site will include the following response: <ul style="list-style-type: none"> Immediate deployment of spill control kits. Notifications of relevant stakeholders (e.g. EPA and HWC) consistent with the Pollution Incident Response Management Plan (PIRMP) for any spills estimated to be greater than 30 L. Recovery of all contaminated sands or gravels regardless of size for collection and offsite disposal at a licenced waste facility. 	Following Spill	Quarry Manager	As per PIRMP
5.9.1.4 Monitoring				
A	Appropriate maintenance schedules for plant and equipment must be followed to detect and repair leaks.	Ongoing	Quarry Manager	Register of equipment maintenance

5.9.2 Performance Evaluation

Table 21 outlines the performance and completion criteria applicable to hydrocarbon control.

Table 21: Hydrocarbon control performance and completion criteria

Action	Performance Criteria					Completion Criteria
	Years 0 – 2	Years 3 – 4	Years 5 – 6	Years 7 - 8	Closure	
Above management controls implemented as required.	Actions completed				Meets completion criteria	On closure, no residual contamination remains within the Project Area.

5.10 GREENHOUSE GAS AND ENERGY

The Greenhouse Gas Protocol (WRI/WBCSD 2004) illustrates the three categories for reporting emissions of greenhouse gases. These include:

- **Scope 1 emissions:** direct emissions which occur from sources owned or controlled by the reporting entity, over which they have a high level of control (such as fuel use).
- **Scope 2 emissions:** are those generated by the use of electricity supplied to the reporting entity by a third party, such as a power station. These emissions can be easily tracked and physically at the source of the power.
- **Scope 3 emissions:** are indirect emissions that are caused by the actions of the reporting entity but occur at sources from another entity. For this project Scope 3 emissions would include the use of diesel for trucks from third parties and those using the product of Cabbage Tree Road Quarry.

The amended project design has adopted an electrical equipment fleet where feasible that is expected to result in the reduction of diesel combustion in the local area by 50,000L per annum. Further, the peak annual production rate from the project has also been reduced from 600,000 tonnes to 530,000 tonnes. This will also contribute to reduce local diesel combustion.

By maintaining an effective real-time monitoring system, the project will be able to manage the emissions from the project. The system will ensure the existing air quality plus any contributions from the project do not exceed the air quality criteria.

5.10.1 Management Controls

Greenhouse Gas and Energy controls from the compliance obligations are detailed within **Table 22**.

Table 22: Greenhouse Gas and Energy management measures

Item	Action	Trigger/Timing	Responsibility	Reporting
A	<ul style="list-style-type: none"> Record diesel and electricity by the operations. Review of opportunities to improve energy efficiency. 	Ongoing	Quarry Manager	AEMR
B	<p>On site diesel efficiency will continue to improve based upon the following measures:</p> <ul style="list-style-type: none"> Scheduling activities so that equipment and vehicle operation is optimised. The quarry fleet will continue to be replaced by more efficient equipment over the life of the project, where replaced. Fuel use efficiency will be an important factor in selecting quarry fleet. Resource recovery will be optimised within the constraints of the Project. Machines will be working to their upper design performance. Optimising machine performance is key performance indicator for operators. Fleet will be serviced and maintained to OEM specifications. 	Ongoing	Quarry Manager	Nil

5.10.2 Performance Evaluation

Table 23 outlines the performance and completion criteria applicable to greenhouse gas and energy management.

Table 23: Greenhouse gas and energy performance and completion criteria

Action	Performance Criteria					Completion Criteria
	Years 0 – 2	Years 3 – 4	Years 5 – 6	Years 7 - 8	Closure	
Above management controls implemented as required.	Actions completed				Nil	Nil
Reporting	Annual reporting completed				Nil	Annual reporting completed, with efficiency measures implemented during reporting period described.

5.11 WASTE

5.11.1 Management Controls

Waste management controls from the compliance obligations are detailed within **Table 24**.

Table 24: Waste Management Controls

Item	Action	Trigger/Timing	Responsibility	Reporting
A	Application to Port Stephens Council for installation of effluent management system.	During construction (prior to construction of ablutions and effluent management system).	Quarry Manager	Application to PSC
5.11.1.1 Plant				
A	All wastes generated by Cabbage Tree Road Quarry will be managed by the way of Council collection services or via appropriately licensed waste contractors.	Ongoing	Quarry Manager	Waste tracking documentation
B	The on-site pumping system must be located and constructed in accordance with Port Stephens Councils <i>Development Assessment Framework</i> for on-site sewerage.	During Construction	Quarry Manager	AEMR
C	No onsite disposal of waste will occur.	Ongoing	Quarry Manager	Nil
D	Scrap metal will be deposited into a dedicated receptacle for periodic collection and recycling.	Ongoing	Quarry Manager	Waste tracking documentation
E	Diesel fuel will be stored within self-bunded above ground tank and all refuelling will be undertaken on a bunded and covered hardstand area.	Ongoing	Quarry Manager	Nil
F	During excavation any foreign materials encountered will signal an immediate stop work in the proximate area until the nature of the object/s can be determined. In the case of uncovered potential asbestos sheeting or	Ongoing	Quarry Manager	AEMR

Item	Action	Trigger/Timing	Responsibility	Reporting
	pipe laboratory testing may be required to determine if asbestos fibres are present in the surrounding sand.			
G	Where excavation is to occur below the quarry floor, an excavation specific spoil and water management procedure is to be developed to manage PFAS contaminated soil and groundwater and/or acid sulphate soils.	As required	Quarry Manager	Protocol for PFAS Management
5.11.1.2 Monitoring				
A	All waste oil will be collected and stored in containers within a covered and bunded area, and will be removed from the site by an appropriately licensed contractor with all relevant waste tracking documentation completed.	Ongoing	Quarry Manager	Waste tracking documentation
B	All oil filters will be separately stored in containers with a covered bunded area, and will be removed from the site by an appropriately licensed contractor with all relevant waste tracking documentation completed.	Ongoing	Quarry Manager	Waste tracking documentation
C	Silt will be periodically removed from the various silt control structures and used in progressive rehabilitation of the site	Ongoing	Quarry Manager	Waste tracking documentation
C	All office paper and general waste originating from the office, amenities building and packaging from routine equipment and vehicle maintenance consumables will be placed in appropriate containers for collection by council or a licensed contractor for disposal/ recycling at an appropriate waste management facility.	Ongoing	Quarry Manager	Waste tracking documentation
D	Wastewater from the amenities, workshop and laboratory will be collected in a pump-out system and transported off-site by a licensed contractor.	Ongoing	Quarry Manager	Waste tracking documentation

Item	Action	Trigger/Timing	Responsibility	Reporting
E	All waste tyres will be removed by the supplier of replacement tyres.	Ongoing	Quarry Manager	Waste tracking documentation

5.11.2 Performance Evaluation

Table 25 outlines the performance and completion criteria applicable to waste management.

Table 25: Waste management control and completion criteria

Action	Performance Criteria					Completion Criteria
	Years 0 – 2	Years 3 – 4	Years 5 – 6	Years 7 - 8	Closure	
Above management controls implemented as required.	Actions completed				Nil	Nil
All waste materials are disposed of in accordance with EPA regulations at licenced facilities	X	X	X	X	Nil	Annual reporting completed, with waste tracking documentation complete.

5.12 AIR QUALITY

It is proposed to regulate air quality emissions from the project using a real-time continuous air quality monitoring system that will allow the quarry to suspend activities onsite to ensure the project does not cause additional exceedances of the criteria. The operation of the quarry occurs in the context of existing air quality levels that on occasion exceed the adopted criteria. The OEH air quality monitoring network, 24 hour average concentrations exceed the criteria of $50 \mu\text{g}/\text{m}^3$, are shown below:

- Stockton station – 28 days (2013), 26 days (2014), 61 days (12 months to October 2016).
- Newcastle station – 4 days (2013), 2 days (2014), 2 days (12 months to October 2016).
- Beresfield station – 5 days (2013), 0 days (2014), 1 day (12 months to October 2016).

Over the last 12 months the average 24 hour average concentration has been:

- Stockton station – $35.4 \mu\text{g}/\text{m}^3$.
- Newcastle station – $21.3 \mu\text{g}/\text{m}^3$.
- Beresfield station – $18.7 \mu\text{g}/\text{m}^3$.

The continuous air quality monitoring and meteorological system proposed for the quarry will include trigger levels that will ensure the project does not cause an exceedance of the cumulative 24-hour average PM_{10} criterion of $50 \mu\text{g}/\text{m}^3$. Where winds are blowing directly toward receptors this may include the temporary suspension of quarrying activities. The project alone is unlikely to result in an exceedance of the 24 hour PM_{10} criterion at any residence.

5.12.1 Management Controls

Air Quality controls from the compliance obligations are detailed within **Table 26**.

Table 26: Air quality management measures

Item	Action	Trigger/Timing	Responsibility	Reporting
A	This section of the EMP will be revised and updated on determination of the project to ensure management measures proposed adequately reflect the requirements of the Conditions of Consent. The revised section will be prepared in consultation with the NSW EPA for approval by NSW DPE.	Prior to commencement of operations	Quarry Manager	Final Air Quality Section of this EMP.
5.12.1.1 Dust suppression measures				
A	Bitumen seal access road through to the boundary for the southern boundary of the northern resource area.	During Construction	Quarry Manager	Nil
B	Utilise water carts or a sprinkler system for dust suppression of exposed areas and haul roads.	Ongoing	Quarry Manager	Record water volume used and publish in AEMR.
C	Water sprays will be incorporated into transfer points where higher levels of moisture are acceptable, such as conveyer transfers to product and reject stockpiles.	Ongoing	Quarry Manager	Record water volume used and publish in AEMR.
5.12.1.2 Monitoring				
A	Install a suitable continuous air quality monitoring network.	Ongoing	Quarry Manager	Updated to website monthly. Results published in AEMR.
B	WSS will install a meteorological station to allow quarry personnel to access instantaneous wind speed and direction data and also generate site specific meteorological data records.	Ongoing	Quarry Manager	Summary in AEMR.

Item	Action	Trigger/Timing	Responsibility	Reporting
5.12.1.3 Trigger Response Framework				
A	<p>Quarry operations will be subject to a staged shutdown of equipment based on rolling 24 hour average PM₁₀ concentrations, PM₁₀ concentration spikes and adverse background air quality and meteorological conditions. Indicative completion criteria are set out below, it important to note that these triggers will be adapted and refined as the project progresses.</p> <ol style="list-style-type: none"> Review operations and ensure water dust suppression is active (haul roads and stockpile sprays). Conduct where SMS alert: <ol style="list-style-type: none"> Where wind is directed toward surrounding residences, that is the weather station indicates winds are blowing from the quadrants west (270 degrees), through North (0 degrees) to East 90 degrees. From the continuous PM₁₀ monitor shows rolling PM₁₀ 24 hour average exceeds the average background concentration of 22 µg/m³. No topsoil stripping or dozer push to occur where: <ol style="list-style-type: none"> Wind is directed toward surrounding residences; AND Rolling PM₁₀ 24 hour average exceeds 35 µg/m³. No sand processing to occur where: <ol style="list-style-type: none"> Wind is directed toward surrounding residences; AND Rolling PM₁₀ 24 hour average exceeds 40 µg/m³. If levels continue to increase after two hours, suspend sand extraction from the face where: <ol style="list-style-type: none"> Wind is directed toward surrounding residences; AND Rolling PM₁₀ 24 hour average exceeds 42.5 µg/m³. If levels continue to increase after two hours, suspend loading trucks (no machinery operating): <ol style="list-style-type: none"> Wind is directed toward surrounding residences; AND 	Continuous	Quarry Manager	Summary of the effectiveness of trigger response mechanisms provided in the AEMR.

Item	Action	Trigger/Timing	Responsibility	Reporting
	j) Rolling PM ₁₀ 24 hour average exceeds 45 µg/m ³ .			
5.12.1.4 Compliance Evaluation				
A	<p>In the event the Trigger Response Framework fails to maintain levels below criteria, monitoring results are to be assessed for compliance using the following protocol:</p> <ol style="list-style-type: none"> 1. Results above 24 hour average PM₁₀ criteria of 50 µg/m³. 2. Is wind direction in the preceding three hours toward receptors and the monitoring location? If No, unlikely to be due to project, suspend extraction activities until levels drop below 48 µg/m³. Sales can continue. If Yes continue to Step 3. 3. Are regional levels also elevated as per the OEH monitoring network? 4. Does the quarry monitoring network show upstream and downstream air quality levels are above criteria? If Yes, unlikely to be due to project, suspend extraction activities until levels drop below 48 µg/m³. If No continue to Step 5. 5. Exceedance directly related to activities onsite. Non-compliance has occurred. 6. Review activities onsite and develop actions to mitigate future non-compliance. 	<p>When exceedance of air quality criteria measured.</p> <p>DPE notified within 24 hours where non-compliance identified.</p>	Quarry Manager	Results included within AEMR Incident Notification
B	If noncompliance is demonstrated, additional monitoring will be undertaken within one week following implementation of additional mitigation controls.	Following non-compliance.	Quarry Manager	Results included within AEMR DPE notified where non-compliance identified.

5.13 NOISE

The area around the Project Site is rural in nature, comprising an arterial road, Cabbage Tree Road which becomes Tomago Road to the west, impacting all assessed receivers to some degree. The runway at Newcastle Airport carries both commercial and Air Force aircraft and is a significant noise source in the area.

Ambient noise levels were measured near the Receptor 28 residence at 442 Cabbage Tree Road, (location NM2) from 17 June to 3 May, 2016 at Receptor 28, located approximately 200 m east of the end of Barrie Close, approximately 240 m north of Cabbage Tree Road. The monitoring and analysis of data consistent with the Industrial Noise Policy (INP) has determined a background level of 41 dB(A)_{L90}. This level is supported by monitoring undertaken in June-July 2011 for a different, now approved project in which the background level was 42 dB(A)_{L90}. On the basis of this analysis the adopted intrusiveness criteria are:

- Day (7am – 6pm) 46 dB(A)_{Leq(15minute)}.
- Evening (6pm – 10pm) 40 dB(A)_{Leq(15minute)}.
- Night (10pm – 7am) 37 dB(A)_{Leq(15minute)}.

Construction noise was assessed against the NSW EPA Interim Construction Noise Guideline (ICNG 2009), where it was determined that no residence would be considered “highly noise affected” (75 dBA_{Leq(15minute)}), with worst case noise levels assessed at 62 dBA_{Leq(15minute)}.

Noise impacts from the project were assessed and concluded:

- Noise monitoring has established a daytime background noise level of 41 dB(A), L90.
- No predicted exceedances of noise criterion during extraction, processing and transportation activities.
- Exceedance of noise criterion for a brief period at some receivers if dozer used to clear trees in some areas.
- Above exceedances mitigated by the use of the excavator instead of the dozer for tree clearing in these critical areas.

- Noise monitoring to be conducted during critical periods where tree clearing is occurring in Areas 8b, 9b and 10c which are closest to residences.

5.13.1 Management Controls

Noise management controls from the compliance obligations are detailed within **Table 27**.

Table 27: Noise management measures

Item	Action	Trigger/Timing	Responsibility	Reporting
5.13.1.1 Controls				
A	<p>This section of the EMP will be revised and updated on determination of the project to ensure management measures proposed adequately reflect the requirements of the Conditions of Consent.</p> <p>The revised section will be prepared in consultation with the NSW EPA for approval by NSW DPE.</p>	Prior commencement to operations	Quarry Manager	Revision and approval of this document.
5.13.1.2 Construction				
A	<p>The following management measures will be employed during construction activities:</p> <ul style="list-style-type: none"> The proponent will inform potentially noise affected residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details. All feasible and reasonable work practices will be implemented where possible to meet the noise affected level. Construction personnel will be made aware of the requirement to minimise noise, and to implement best practice operating techniques to minimise noise. Consideration should be given to operating low noise emission plant where possible. 	During Construction	Quarry Manager	Nil

Item	Action	Trigger/Timing	Responsibility	Reporting
5.13.1.3 Operations				
A	<ul style="list-style-type: none"> Operational noise mitigation measures will include: Areas 8, 9 and 10 will be extracted last to retain the natural sound attenuation of the sand dunes for as long as possible. Extraction orientation will, where feasible, maintain the sand face between the operating plant and the nearest dwelling. Use of a dozer for operational material push up will be restricted to areas within the northern resource area and only used in the southern resource area where monitoring determines noise criteria will not be exceeded at dwellings. All dozers operating within the southern resource area will be restricted to first gear in reverse to minimise associated track noise. All equipment frequently used onsite will be fitted with a BBS-Tek "backalarm" broadband reversing alarms or similar. All plant is to be positioned on each pad with regard to minimising the potential for offsite noise at the surrounding dwellings. Diesel generators used for backup power will be positioned such that the exhaust is generally directed to the north. 	Ongoing	Quarry Manager	Nil
5.13.1.4 Monitoring				
A	<p>The following monitoring is recommended for the construction phase of the project:</p> <ul style="list-style-type: none"> Attended noise monitoring at the potentially most affected residences at commencement, or during the highest noise emitting period, of each construction activity. If noncompliance is demonstrated, additional monitoring will be undertaken within one week following implementation of additional mitigation controls. Vibration monitoring at the potentially most affected residences at commencement, or during the highest vibration emitting period, of Cabbage Tree Road intersection construction activity. 	During estimated 12 week construction phase.	Quarry Manager	Results included within AEMR DPE notified where exceedance identified.

Item	Action	Trigger/Timing	Responsibility	Reporting
B	Detailed dilapidation reporting will also be undertaken at all properties within a 300 m radius of quarrying activities and/or intersection works where access is provided to undertake the reporting prior to the commencement of any works. Each property owner will be provided a copy of the dilapidation report for their property.	Prior to commencement of any work within a 300 m radius of private dwelling	Quarry Manager	Dilapidation Report
C	<p>The following monitoring is recommended for the operational phase of the Project:</p> <ul style="list-style-type: none"> Attended noise monitoring at the potentially most affected residences at commencement, or during the highest noise emitting period, of each phase of the Project. These phases should include: <ul style="list-style-type: none"> Clearing and stripping in Areas 1, 3, 7, 8, 9, 10. Extraction and processing works in Areas 1, 8, 9, 10. Periodic attended monitoring with a frequency of one day per quarter unless targeted monitoring is already scheduled in that quarter. 	Quarterly, unless targeted monitoring scheduled.	Quarry Manager	<p>Results included within AEMR</p> <p>DPE notified where non-compliance identified.</p> <p>Results on website within two weeks of receiving report.</p>
5.13.1.5 Compliance Evaluation				
A	<p>Attended monitoring results are to be assessed for compliance using the following protocol:</p> <ul style="list-style-type: none"> Results above intrusiveness criteria. Do standard weather conditions apply (as per INP)? If non-standard weather conditions apply, undertake follow-up monitoring. Are the results considered to be directly related to activities onsite or are they from an unrelated source? If related to activities onsite and standard weather conditions apply a non-compliance has occurred. 	When exceedance of noise criteria identified.	Quarry Manager	<p>Results included within AEMR</p> <p>DPE notified within 24 hours where non-compliance identified.</p>
B	If noncompliance is demonstrated, additional monitoring will be undertaken within one week following implementation of additional mitigation controls.	Following non-compliance.	Quarry Manager	<p>Results included within AEMR</p> <p>DPE notified where non-compliance identified.</p>

Item	Action	Trigger/Timing	Responsibility	Reporting
5.13.1.6 Corrective Actions and Continuous Improvement				
A	<p>Where monitoring or complaints suggest the project is unable to achieve these noise goals the proponent will undertake the following sequence of investigations and controls:</p> <ul style="list-style-type: none"> • Review the details of the noise level exceedances, the weather, operational activities at the time and the nature of the noise exceedance. • If due to failure or equipment or to follow operational procedures, undertake corrective actions to prevent recurrence. • If exceedance not as a result of failure, review and refine procedures. • If operational practices cannot be improved, consult with the residents of impacted dwellings to discuss potential mitigation measures, this may include: <ul style="list-style-type: none"> ◦ Double glazing of windows or similar improvements to dwellings. ◦ Erection of a noise barrier (on resident's property or near source). ◦ Provide compensation to allow receptor to seek relief from noise emissions. 	Complaints and non-compliance.	Quarry Manager	AEMR, reported on website within 2 weeks.
B	Attended noise monitoring at representative dwellings will be carried out during normal operations and the results compared with the predicted model results. The model may be recalibrated to allow noise levels for the remaining scenarios to be more accurately predicted.	Prior commencement to of Sector 8.	Quarry Manager	Noise Model Review Report

5.14 HERITAGE

Aboriginal and historic heritage assessments completed for the project concluded that the risk of harm to artefacts or heritage sites is negligible on the basis that the site contains artefacts scattered at a low density, is not *in situ* and is represented both locally and regionally. Management strategies for known items of Aboriginal Heritage and items uncovered during construction and operation of the project are outlined herein.

Consultation with members of the community (neighbours) indicated that the foundations of a World War 2 Royal Australian Air Force radar installation may be located within the site. On-site investigations did not successfully locate the installation. If the installation remains (i.e. was not removed by past silica mining) it is unlikely to present a significant item of historical heritage value due to the removal of the rest of the structure. Notwithstanding, management of potential heritage items is included.

5.14.1 Management Controls

Aboriginal and Historical management controls from the compliance obligations are detailed within **Table 28**.

Table 28: Heritage management measures

Item	Action	Trigger/Timing	Responsibility	Reporting
5.14.2 Aboriginal Heritage				
A	<p>An Aboriginal Cultural Heritage Management Plan (ACHMP) will be developed in consultation with the relevant Aboriginal stakeholders and OEH prior to the commencement of the Project. The ACHMP will address the following matters:</p> <ul style="list-style-type: none"> A protocol for managing any archaeological material exposed during the course of operations. Recommendations for the ongoing management of the study area. 	<p>Prior commencement of project</p>	<p>Quarry Manager</p>	<p>ACHMP</p>

Item	Action	Trigger/Timing	Responsibility	Reporting
B	All staff and contractors will undergo site induction incorporating Aboriginal cultural awareness and be made aware of statutory legislation protecting sites and places of significance.	Ongoing	Quarry Manager	Induction and training register
C	Management of any artefacts will be undertaken in consultation with Aboriginal stakeholder groups in accordance with the ACHMP.	Ongoing	Quarry Manager	Artefact management form
5.14.3 Historical Heritage				
A	Footings associated with the former World War II radar station will be subject to photographic archival recording of footings and survey of its location prior to disturbance by a qualified archaeologist.	Prior to disturbance of footings – expected within Sector 1A or 2.	Quarry Manager	Radar Station Archival Report
B	Should unexpected heritage items be discovered during the Project and are likely to be disturbed by the Project, all works in the immediate area will cease and a qualified archaeologist or heritage consultant will provide an assessment and, if necessary, the Heritage Branch, Department of Planning will be notified.	On disturbance of unexpected heritage item.	Quarry Manager	Summary in AEMR Reported to DPE

5.14.4 Performance Measures

Table 29 outlines the performance and completion criteria applicable for the management of heritage matters.

Table 29: Heritage control and completion criteria

Action	Performance Criteria					Completion Criteria
	Years 0 – 2	Years 3 – 4	Years 5 – 6	Years 7 - 8	Closure	
Above management controls implemented as required.	Actions completed				Meets completion criteria	On closure, no avoidable harm to previously unrecorded heritage material occurred during the operation of the project

5.15 VISUAL AMENITY

5.15.1 Management Controls

Visual amenity management controls from the compliance obligations are detailed within **Table 24**.

Table 30: Visual Amenity Management Controls

Item	Action	Trigger/Timing	Responsibility	Reporting
5.15.2 Construction				
A	All structures with the potential to be visible from off site will be finished in non-reflective natural tones which blend with natural vegetation.	During construction	Quarry Manager	Nil
B	Any required lighting will be directed downwards in accordance with relevant Australian Standards (AS 4282- Control of Obtrusive Effects of Outdoor Lighting).	During construction	Quarry Manager	Nil

Item	Action	Trigger/Timing	Responsibility	Reporting
5.15.3 Operation				
A	Maintain a 20 m vegetated buffer along the southern boundary of the operation between the resource area and Cabbage Tree Road.	During removal of Sector 9	Quarry Manager	Nil
B	Exclude resource extraction, thus maintaining a vegetated screen, for the first 75m of the access road from Cabbage Tree Road, as shown by Response to Submissions Figure 3.	During construction	Quarry Manager	Nil
C	Areas of disturbance are kept to the minimum practicable at any one point.	Ongoing	Quarry Manager	Nil
D	Undertake rehabilitation of disturbed areas as soon as practicable.	Ongoing	Quarry Manager	Nil

5.15.4 Performance Measures

Table 16 outlines the performance and completion criteria applicable for visual amenity management.

Table 31: Heritage control and completion criteria

Action	Performance Criteria					Completion Criteria
	Years 0 – 2	Years 3 – 4	Years 5 – 6	Years 7 - 8	Closure	
Above management controls implemented as required.	Actions completed				Meets completion criteria	Final landform and rehabilitation of site as described in Section 5.20

5.16 BIODIVERSITY OFFSETS

Biodiversity Offsets are managed in accordance with the NSW Biobanking Framework.

5.17 FIRE MANAGEMENT AND HAZARDS

The project is located within bushfire prone land with neighbouring residential properties and as such, activities within the Project Area will have regard to the risks of fire ignition and implement control mechanisms to reduce the risk to as low as reasonably practicable.

5.17.1 Management Controls

Management controls for hazards and fire management across for the project are detailed in **Table 32**.

Table 32: Fire management measures

Item	Action	Trigger/Timing	Responsibility	Reporting
A	Consultation with the Rural Fire Service on fire management controls.	Prior to construction	Quarry Manager	Nil
5.17.1.1 Ignition Controls				
A	Review bushfire danger ratings and when total fire bans are in place prior to undertaking clearing activities or other hot works onsite. Postpone activity where feasible or increase preparedness through having a fire tanker on standby.	Prior to undertaking clearing activities.	Quarry Manager	Nil
B	All mobile machinery and fixed plant to include on-board fire extinguishers.	At all times.	All	Nil
5.17.1.2 Asset Protection				
A	Maintain a 40 m asset protection zone (APZ) around the office and workshop area.	At all times.	Quarry Manager	Nil
B	Maintain access roads and mapping of those tracks as per Section 5.2 .	At all times.	Quarry Manager	Nil

Item	Action	Trigger/Timing	Responsibility	Reporting
5.17.1.3 Plant				
A	All dangerous goods will be stored in accordance with dangerous goods storage requirements and relevant Australian Standards.	Ongoing	Quarry Manager	Nil
5.17.1.4 Monitoring				
A	Procedures for refuelling and servicing of all plant and equipment will be undertaken in a manner to prevent spills and protect drinking water catchment from potential contamination. These procedures will be detailed in the EMS to be prepared for the site operations.	Ongoing	Quarry Manager	Nil

5.17.2 Performance Criteria

Table 33 outlines the performance and completion criteria applicable to bushfire management in the Project Area and surrounds.

Table 33: Fire management performance and completion criteria

Action	Performance Criteria					Completion Criteria
	Years 1 – 2	Years 3 – 4	Years 5 – 6	Years 7 - 8	Closure	
Completion of actions specified above.	As required	As required	As required	As required	40 m APZ around infrastructure area.	40 m APZ around infrastructure area.

5.18 REHABILITATION AND ECOLOGY

5.18.1 Objectives

The objectives of the following management controls are to:

- Limit the impacts of the works on locally occurring fauna species within the extraction area during clearing.
- Progressively re-establish native vegetation after sand extraction and completion of landform rehabilitation.

The rehabilitation sets out to achieve a standard of tree and shrub growth, and recovery in species richness and abundance, as close as possible to that of the original vegetation, within the limits of current best practice techniques, final landform and a reasonable period of post-extraction monitoring. To achieve the rehabilitation aim, the management controls will aim at re-establishing:

- Stable and sustainable native vegetation cover, free of significant erosion.
- The original vegetation community type, or similar due, to the lowered post-extraction landform.
- The structural components and dominant species of vegetation, comparable with pre-extraction vegetation at similar elevations.
- Similar species composition to pre-extraction at similar elevations.

Efforts will also be made to re-establish all other structural components of the vegetation including canopy, sub-canopy, understorey, groundcover, hollows and logs, though not necessarily in the same proportions as pre-extraction vegetation at similar elevations, and within the above limits.

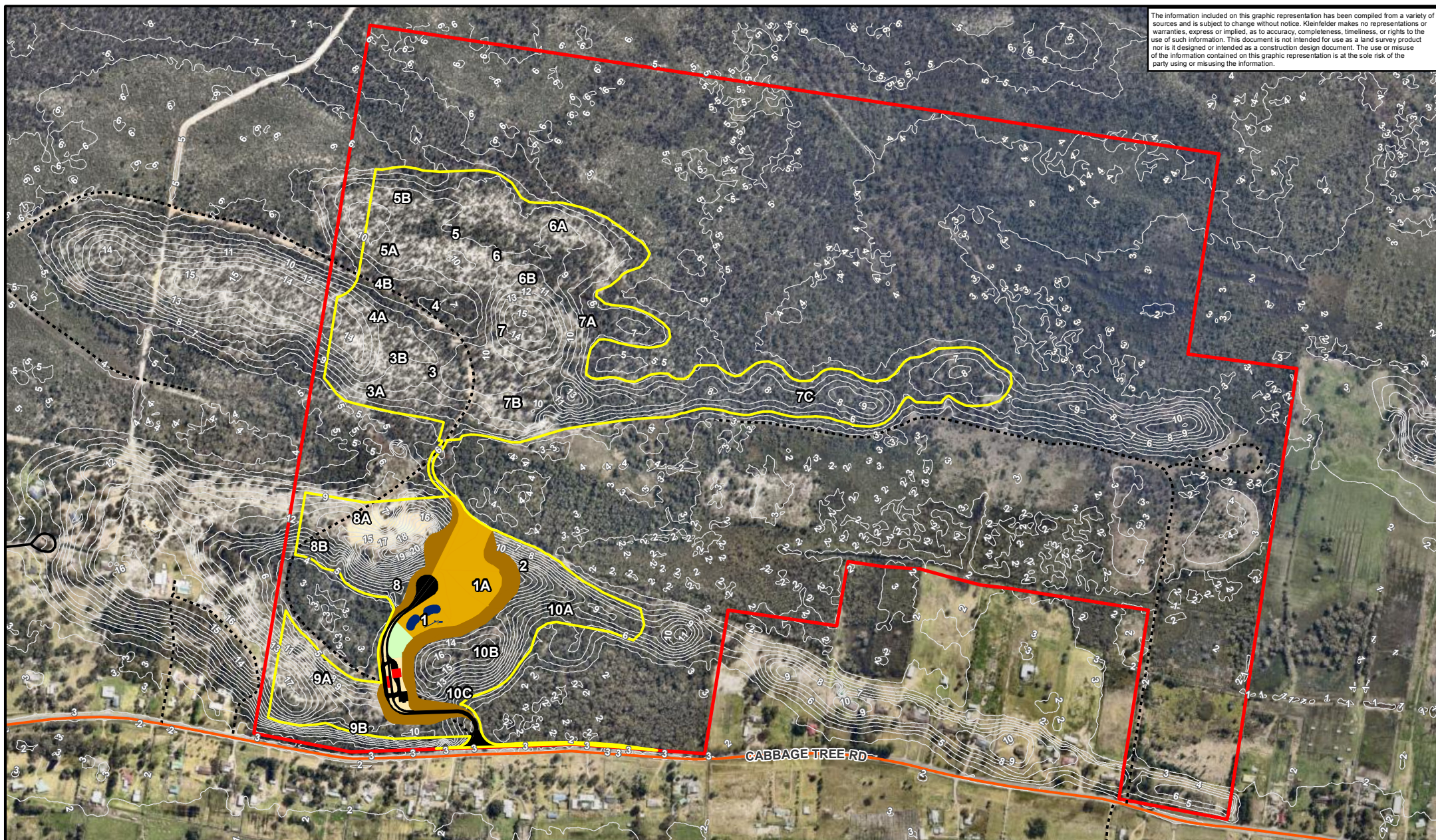
5.18.2 Rehabilitation Plan

The apparently successful rehabilitation methods adopted by Sibelco for the rehabilitation on the Tanilba Northern Dune have been adapted where practical to suit the rehabilitation of this sand mine. The methodologies used by Sibelco have proved effective in the rehabilitation of similar communities on the same substrate.

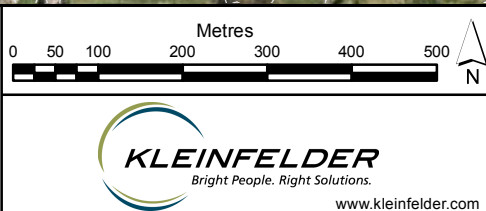
5.18.2.1 Stages of Rehabilitation

The quarrying within the extraction area would utilise progressive rehabilitation methods. This would involve direct topsoil transfer onto exhausted areas to aid in revegetation from the topsoil seedbank and stabilise disturbed areas (outlined in **Section 5.18.3.7**). Progressive rehabilitation plans are shown in **Figure 5** to **Figure 9**.

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Legend			
	Subject Land		Year 1 Quarry Progress
	Project Area		Extracted
	Arterial Road		Batter
	Local Road		<2 Year-old Rehab
	Track		Processing Plant
	Contours (1m)		

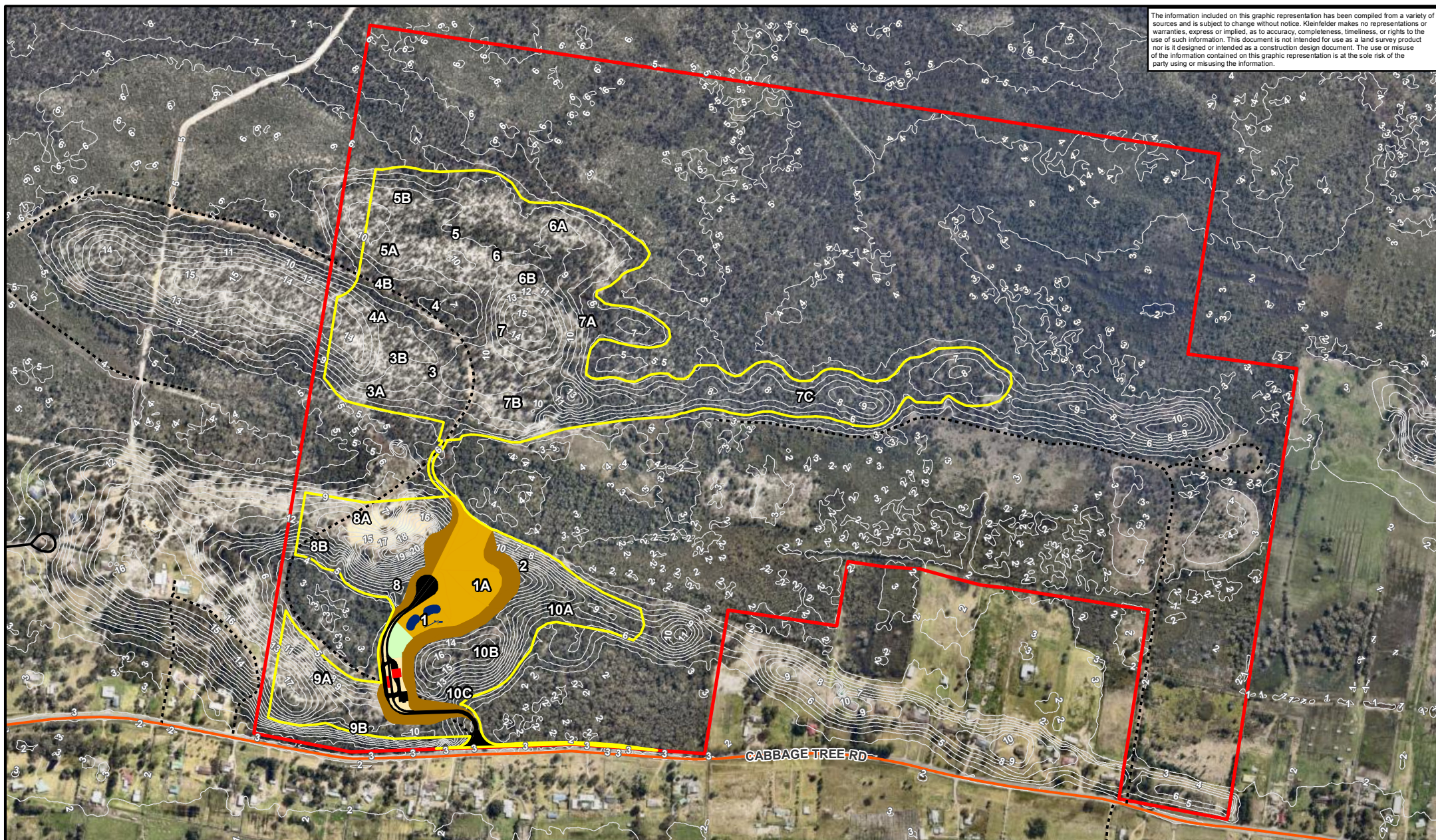


PROJECT REFERENCE: 20170448
DATE DRAWN: 2/09/2016 16:20 Version 3
DRAWN BY: gjoyce
DATA SOURCE: LPI - 2016 Nearmap - 2016

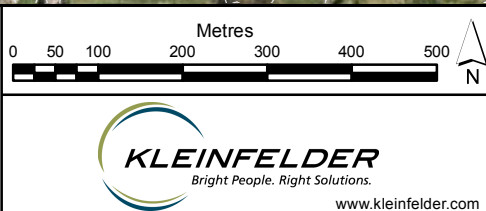
Quarry Progress Plan Year 1
Williamtown Sand Syndicate EMP Proposed Sand Quarry Cabbage Tree Road, Williamtown

FIGURE: 5

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Legend			
	Subject Land		Project Area
	Arterial Road		Extracted
	Local Road		Batter
	Track		<2 Year-old Rehab
	Contours (1m)		Building
			Landscaping
			Not Extracted
			Road - sealed
			Processing Plant

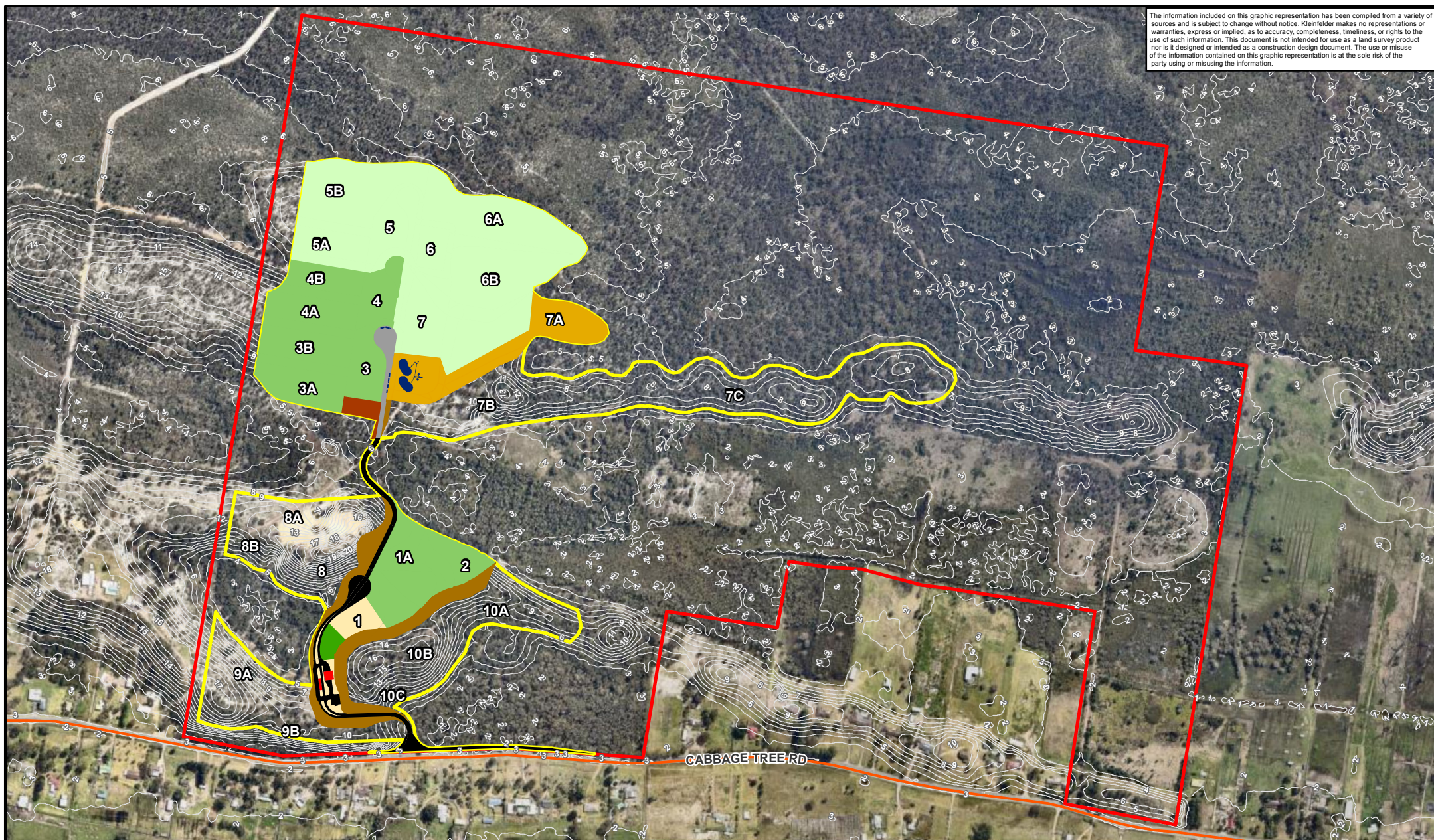



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Quarry Progress Plan Year 1
Williamtown Sand Syndicate EMP Proposed Sand Quarry Cabbage Tree Road, Williamtown

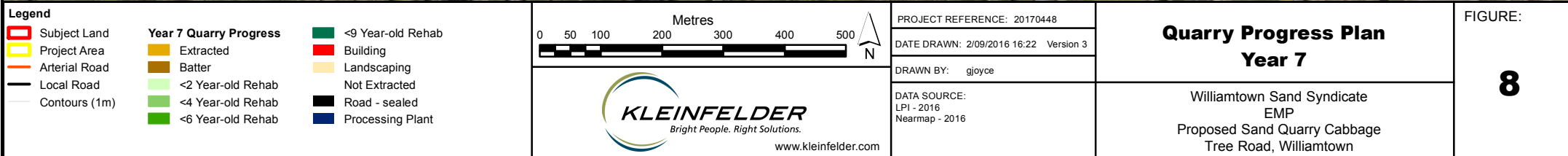
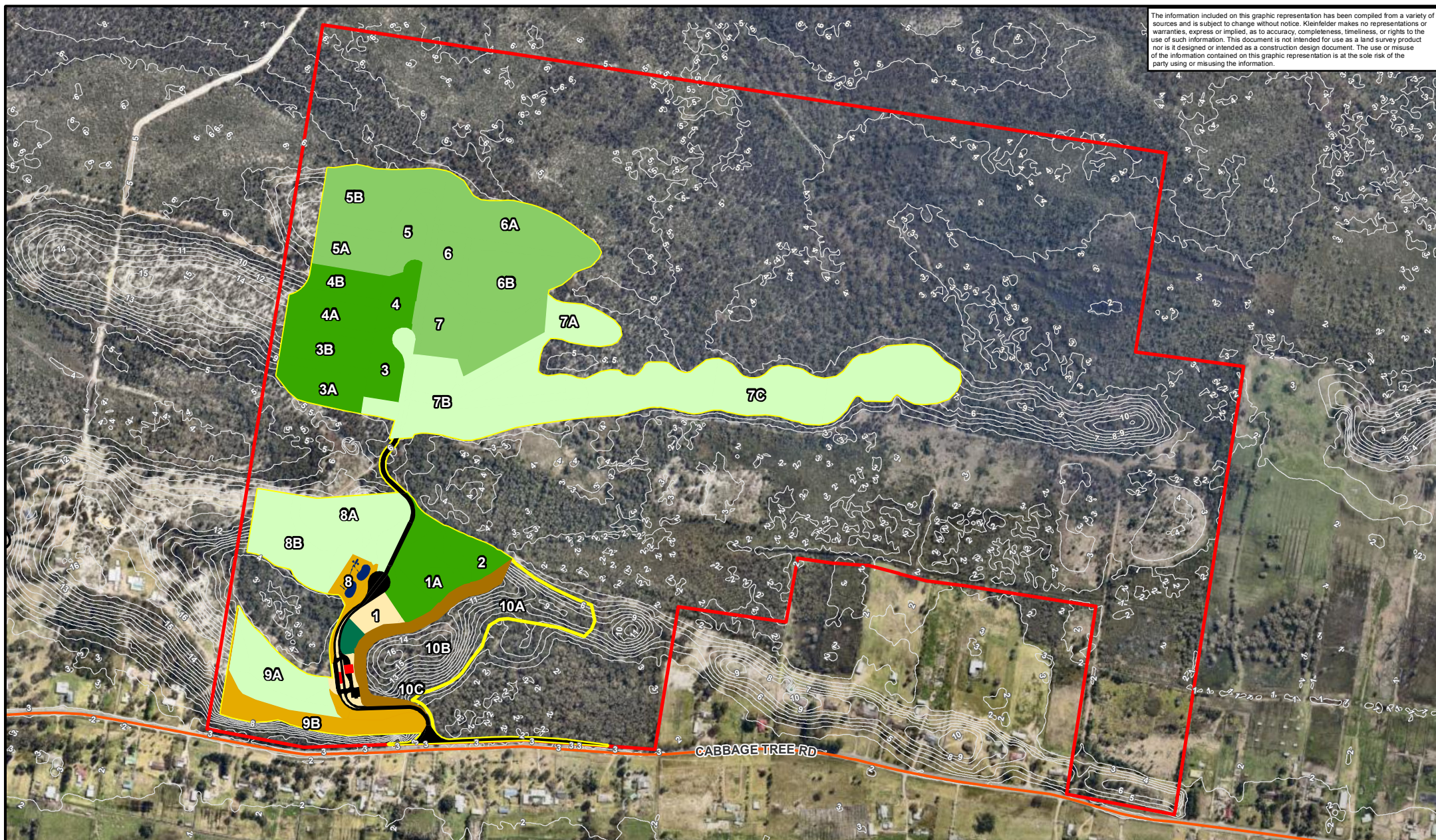
FIGURE: 5

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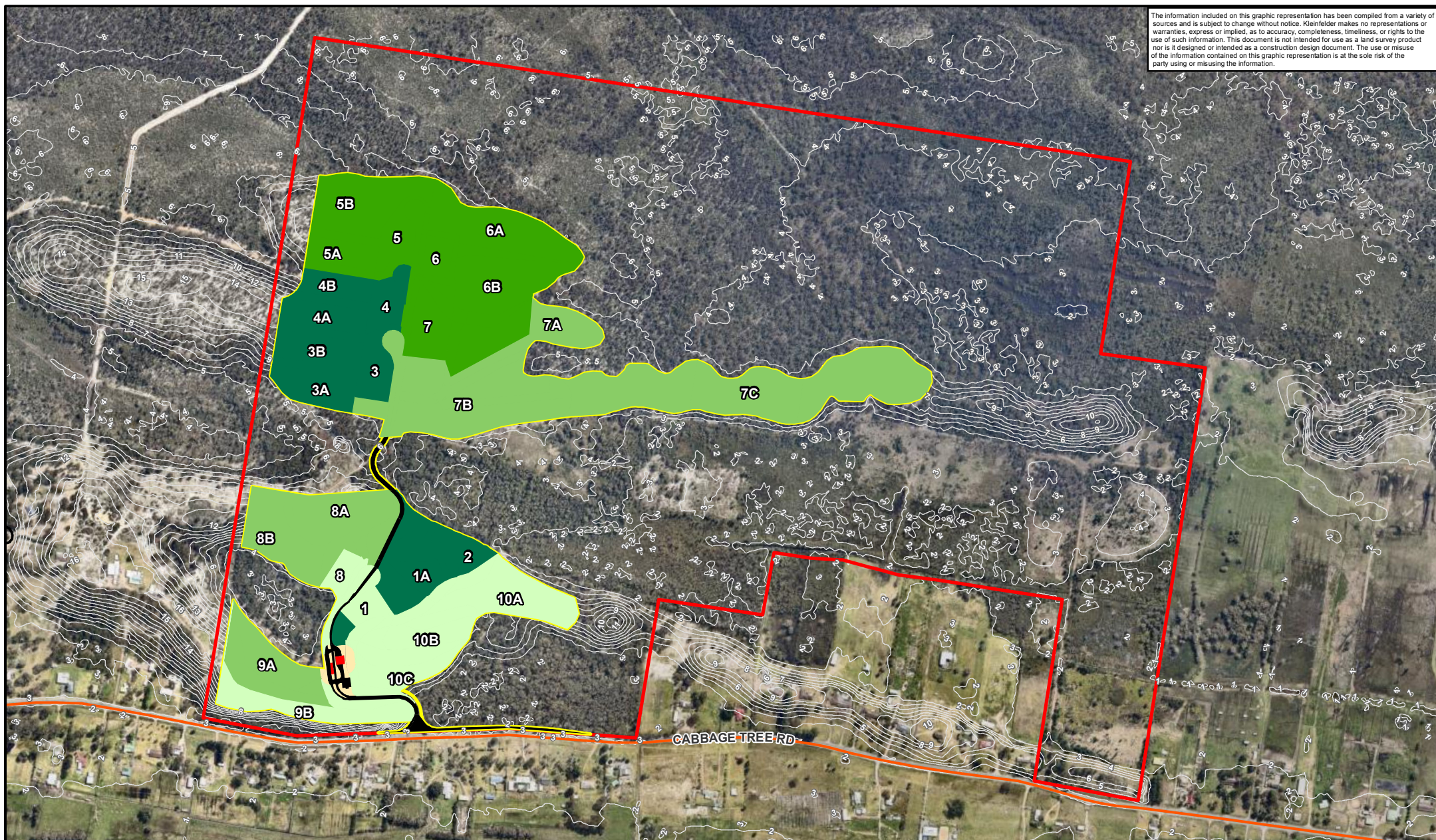


Legend <div><div><div>Subject Land</div><div>Project Area</div><div>Arterial Road</div><div>Contours (1m)</div></div><div>Year 5 Quarry Progress<div>Extracted</div><div>Batter</div><div>Stockpile</div><div><2 Year-old Rehab</div><div><4 Year-old Rehab</div></div><div><div><6 Year-old Rehab</div><div>Building</div><div>Landscaping</div><div>Not Extracted</div><div>Road - gravel</div><div>Road - sealed</div><div>Processing Plant</div></div></div>	<div>0 50 100 200 300 400 500 Metres</div> <div> Bright People. Right Solutions. www.kleinfelder.com</div>	<div>PROJECT REFERENCE: 20170448</div> <div>DATE DRAWN: 2/09/2016 16:21 Version 3</div> <div>DRAWN BY: gjoyce</div> <div>DATA SOURCE: LPI - 2016 Nearmap - 2016</div>	<div>Quarry Progress Plan Year 5</div> <div>Williamtown Sand Syndicate EMP Proposed Sand Quarry Cabbage Tree Road, Williamtown</div>	<div>FIGURE:</div> <div>7</div>
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<p>Legend</p> <ul style="list-style-type: none"> Subject Land Project Area Arterial Road Local Road Contours (1m) <p>Year 9 Quarry Progress</p> <ul style="list-style-type: none"> <2 Year-old Rehab <4 Year-old Rehab <6 Year-old Rehab <9 Year-old Rehab Building Landscaping Road - sealed 	<p>Metres</p> <p>0 50 100 200 300 400 500</p> <p>KLEINFELDER Bright People. Right Solutions. www.kleinfelder.com</p>	<p>PROJECT REFERENCE: 20170448</p> <p>DATE DRAWN: 2/09/2016 16:23 Version 3</p> <p>DRAWN BY: gjoyce</p> <p>DATA SOURCE: LPI - 2016 Nearmap - 2016</p>	<p>Quarry Progress Plan Year 9</p> <p>Williamtown Sand Syndicate EMP Proposed Sand Quarry Cabbage Tree Road, Williamtown</p>	<p>FIGURE:</p> <p>9</p>
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5.18.2.2 Final Landform and Vegetation

The rehabilitation area will be suitable for HU860: Smooth-barked Apple – Blackbutt – Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Smooth-barked Apple – Blackbutt Forest) and HU851: Scribbly Gum - Wallum Banksia - Prickly-leaved Paperbark heathy coastal woodland on coastal lowlands (Coastal Sand Wallum Woodland-Heath). Canopy species of the adjoining HU938: Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Swamp Mahogany – Paperbark Swamp Forest) will supplement rehabilitation in areas where this community adjoins the rehabilitation area.

The Smooth-barked Apple – Blackbutt Forest community occurs across the majority of the extraction area. Remnant areas occur in the south, and with revegetated areas of the previously mined lands associated with mineral sands mining of the late 1970s and early 1980s, in the north. Only a very small area of the Coastal Sand Wallum Woodland-Heath community occurs within the quarry footprint. However, based on the elevation of the final landform, areas of the rehabilitation may be more suitable for this community.

Landscaping Areas will include species composition and structure that will aim to establish native ground cover and shrub species that are consistent with requirements for fuel loads within Asset Protection Zones (e.g. maintained, minimal wood debris, discontinuous patches of the shrub layer, no canopy species within 10 m of building and where present do not have connected canopy with adjoining vegetation).

Temporary batters will be established within future resource areas during construction. These batters represent a relatively narrow band (approximately 20 m width) located between existing vegetation and rehabilitated areas. It is proposed to provide temporary stabilisation of the batters using tube stock, mulching, geotextile or similar. The temporary stabilisation efforts will reduce wind exposure and limit dust generation.

The final land form plan and indicative vegetation community distribution is provided in **Figure 10**. Error! Reference source not found.

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Rehabilitated Area (Final Landform Surface >1m above Highest Groundwater)

- Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
- Indicative transition zone with adjoining vegetation communities
- Managed Asset Protection Zone

Existing Plant Community Type

- HU917 - Wallum Banksia-Monotoca scoparia heath on coastal sands of the Central Coast and lower North Coast
- HU860 - Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
- HU851 - Scribbly gum - Wallum Banksia - Prickly-leaved Paperbark heathy coastal woodland on coastal lowlands
- HU865 - Parramatta red gum - Fern-leaved banksia - Melaleuca sieberi swamp woodland of the Tomaree Peninsula
- HU938: Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
- HU938: Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
- HU938: Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
- HU948 - Wallum Bottlebrush - leptocarpus tenax - Baloskion pallens Wallum Sedge heath of the lower North Coast
- Excluded

Legend

- Subject Land
- Project Area
- Arterial Road
- Track
- Local Road
- Contours (1m)
- Highest Predicted Groundwater Level (metres)
- Infrastructure Pads/Buildings
- Road - sealed
- Landscaping



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DRAWN BY: G.Joyce

DATA SOURCE:
LPI - 2016
Nearmap - 2016

Final Landform and Rehabilitation

Williamtown Sand Syndicate
EMP
Proposed Sand Quarry Cabbage
Tree Road, Williamtown

FIGURE:

10

5.18.3 Management Controls

Table 34: Ecology and rehabilitation management measures

Item	Action	Trigger/Timing	Responsibility	Reporting
5.18.3.1 Seed Collection				
A.	<ul style="list-style-type: none"> Seed will be collected by appropriately qualified contractor in advance of clearing activities for species determined likely to require direct seeding or propagation, and determined to be required for direct seeding and propagation based on monitoring results. 	Annually, during appropriate season for target species	Quarry Manager	Nil
B.	<ul style="list-style-type: none"> Seed will be stored under appropriate conditions. 	At all times	Quarry Manager	Nil
5.18.3.2 Pre-Clearing Survey				
A	<ul style="list-style-type: none"> Confirmation of resource boundaries and extent of clearing. Habitat trees (containing hollows or nests) within the clearing area will be clearly marked using flagging tape or spray paint. Habitat trees are to be felled using the procedure outlined in Section 5.18.3.6. Habitat trees (containing hollows or nests) within 3 m of the resource boundary will be marked for avoidance, including the delineation of the tree drip line to limit compaction and excavation that may affect the tree. Areas of noxious weeds or environmental weeds will be marked to avoid mixing of weed containing road with weed-free topsoil (see Section 5.18.3.7). The following surveys will be conducted within the area proposed for removal within a one day period: <ul style="list-style-type: none"> Nocturnal surveys will be conducted the night before clearing, and diurnal surveys will be conducted the morning of clearing, prior to commencement; and The procedure for when a Koala is identified within the clearing area is outlined below. All clearing will be supervised by a suitable qualified ecologist. 	Prior to clearing each sector	Quarry Manager	Nil

Item	Action	Trigger/Timing	Responsibility	Reporting
	<ul style="list-style-type: none"> Any occupied trees will be clearly marked and will be left during clearing (Section 5.18.3.4). Where a Koala is identified in a tree, the procedure outlined below will be followed. 			
5.18.3.3 Koala Protocol				
A.	<p>The following procedure will be used if a Koala is identified as occupying a tree within the proposed clearing area. The aim of this capture and relocation procedure is to ensure that no Koalas are harmed during the vegetation clearing activities within the extraction area:</p> <ul style="list-style-type: none"> The individual will be captured prior to the commencement of clearing. The individual will be given a veterinary check for any disease or illness and a monitoring device will be attached (remote tracker). Any Koalas captured will be relocated into an area of retained vegetation adjacent to where it was originally located. All individuals will be monitored for a three-month period post relocation. Where any Koalas are identified and captured for re-location, the following will be reported on: <ul style="list-style-type: none"> Location identified within the disturbance area, and location of relocation; Movement of the Koala will be mapped for the three-month period; Any instances where the Koala enters areas proposed for future clearing will be identified, and the need for further monitoring/action determined. If there is the potential for the individual to occur within areas of future vegetation clearing, a plan to ensure the individual is not impacted will be developed; and The health of the individual will be checked at the end of the three-month period and any impacts (i.e. dog attacks, vehicle strikes, bushfire impacts, or disease) will be identified. 	During clearing, if a Koala is identified	Quarry Manager	AEMR
5.18.3.4 Vegetation Clearing				
A.	<ul style="list-style-type: none"> A fully qualified, experienced and licenced ecologist will supervise clearing and encourage movement of any displaced animals into adjoining vegetation. 	During clearing	Quarry Manager	Summary of species relocated, including records of death or injury

Item	Action	Trigger/Timing	Responsibility	Reporting
				due to clearing in AEMR
B.	<ul style="list-style-type: none"> Clearing will be undertaken predominantly by bulldozer and may be conducted in conjunction with topsoil removal. Vegetation should be cleared in a way that maintains habitat linkages and allows fauna living in or near the clearing site to move safely from the site to adjacent areas: <ul style="list-style-type: none"> Clearing should occur towards connecting vegetation. The direction of clearing should also ensure that fauna are directed away from Cabbage Tree Road and the quarry spine road. Sequential clearing should not create an 'island' of habitat that is isolated from adjoining habitat by roads or cleared and disturbed areas. Habitat trees will be left to stand for a period of two nights (see Section 5.18.3.6). Any trees identified as occupied during pre-clearing surveys will be left during clearing activities. If after two days the fauna species has not self-relocated the soft-felling procedure for habitat trees will be followed. Once the fauna species has relocated No clearing should occur during the early evening or at night (when fauna species are most likely to be on the move and are more vulnerable to injury). Plants that are suitable for brush matting (and may be vulnerable to dropping seed during clearing) will be cut ahead of the quarry face and stockpiled on weed-matting or similar to ensure seed is not "lost" during clearing and can then be spread over topsoiled areas. Large organic debris, and where possible, other vegetation cleared from the operational area will be stockpiled and spread on rehabilitated areas immediately after re-distribution of topsoil. Vegetation stockpiling should maintain a minimum 10 m cleared asset protection zone around the stockpile to minimise fire risk in adjoining vegetation. 	During clearing	Quarry Manager	Area cleared reported in AEMR
5.18.3.5 Fauna Displacement Protocol				
A.	Displacement of fauna may occur as part of the clearing process. All clearing will be supervised by a suitable qualified, experienced and licenced ecologist, the following protocol should be followed in case of an injured animal:	During clearing	Quarry Manager	Summary of species relocated, including records of death or injury

Item	Action	Trigger/Timing	Responsibility	Reporting
	<ul style="list-style-type: none"> If possible any fauna fleeing the clearing area should be captured and relocated or directed to a safe area outside the extraction zone during the tree removal process. All fauna are to be handled in such a way as to prevent injury to the animal or the handler. Once the animal is safely handled it should be relocated or caged in a hessian bag or box and released at an appropriate time of day. Any microbats or other nocturnal species captured during the tree removal process should be held in cotton or hessian bags and released at dusk on the same day as capture if possible. If any animal is injured during the construction process, a veterinarian should be contacted immediately for professional advice on the best course of action. If any native animal is injured during other operational/ construction processes while an ecologist, environmental representative or animal handler is not present, they must be contacted immediately. 			due to clearing in AEMR
5.18.3.6 Habitat Tree Removal				
A.	<p>Habitat trees will be removed according to the following protocol:</p> <ul style="list-style-type: none"> Hollow bearing trees will be left standing for two nights after the surrounding vegetation has been cleared to encourage any native fauna species utilising the habitat hollows to self-relocate. The actual felling of any habitat trees will be attended by a suitably experienced fauna ecologist in order to ensure the safety of any fauna found to be in the hollows. On all occasions, trees having potential habitat hollows will be 'soft felled' by an experienced machine operator. The recommended soft felling procedure is as follows: <ul style="list-style-type: none"> The hollow-bearing tree is given several moderate nudges with an excavator to give a warning to any occupying native fauna. The hollow-bearing tree is then surveyed and native fauna given an opportunity to self-relocate before the tree is actually felled. The hollow-bearing tree is soft felled with the rate of the tree's fall controlled by the machinery operator to minimise impact. All hollows will be inspected for fauna and if any are found, the animal should be relocated at an appropriate time of day (i.e. dusk for nocturnal species). If the animal is injured, it will be taken to a local veterinarian. 	During clearing of habitat trees	Quarry Manager	Summary of species relocated, including records of death or injury due to clearing in AEMR

Item	Action	Trigger/Timing	Responsibility	Reporting
	<ul style="list-style-type: none"> ○ Suitable medium and large hollows should be cut from the tree at least one metre beyond the deepest point of the hollow and then stored in a dry safe place in size related categories for replacement in rehabilitated areas. • The number and size of hollows within each habitat tree will be recorded after each habitat is felled. This information will inform the nest box installation works that will occur post extraction (Section 5.18.3.9). 			
5.18.3.7 Topsoil Stripping and Placement				
A.	Areas of 'weed contaminated' topsoil: <ul style="list-style-type: none"> • Areas delineate for weed management are to be stripped, stockpiled and moved separately to other topsoils to avoid weed spread. • Topsoil containing environmental weeds (as delineated in pre-clearance) will not be blended or stockpiled with "clean" topsoil. • Topsoil containing environmental weeds will be redistributed from the area in which it was stripped and will not be transported to any other sectors. The extent of respread topsoil with environmental weeds to be delineated and recorded. 	Before and during topsoil removal and redistribution	Quarry Manager	AEMR
B.	Areas of 'clean' topsoil: <ul style="list-style-type: none"> • Topsoil is to be transferred and respread directly over the previous mined area as soon as it is mined out and no longer required for access (exhausted area). • Once an area is exhausted and becomes available for rehabilitation the floor of the mined area will be ripped, if it is hard and impenetrable, prior to redistribution of topsoil. • Direct topsoil transfer from an area ahead of the mining face, to the recently exhausted area, will be utilised to facilitate the natural regeneration of plant species and limit the degradation of soil microbes. 	During removal topsoil and redistribution	Quarry Manager	Records of rehabilitation progress will be reported in AEMR
C.	<ul style="list-style-type: none"> • Strip topsoil to 100 mm minimum depth (having regard to final landform floor levels of the quarried area needing to meet the required 1 m above groundwater). 	During removal topsoil and redistribution	Quarry Manager	Nil
D.	<ul style="list-style-type: none"> • Where topsoil is stripped at more than 150 mm thickness, topsoil to be stripped in two paths and re-laid in correct order. 			Nil
E.	<ul style="list-style-type: none"> • Avoiding stockpiling topsoil enabling direct transfer to rehabilitation areas where feasible. 			Nil

Item	Action	Trigger/Timing	Responsibility	Reporting
F.	<ul style="list-style-type: none"> Minimising stripping depths to avoid seed burial, and taking two strips where possible ensuring respreading is sequential. 			Depth and area of topsoil stripping reported in AEMR.
G.	<ul style="list-style-type: none"> If a hard or indurated layer is present on the floor of the quarried area, the floor will be ripped prior to topsoil respreading. 	Prior to topsoil placement	Quarry Manager	Nil
H.	<ul style="list-style-type: none"> Respread topsoil to a minimum thickness of 100 mm, noting the need to achieve a final land form of 1 m above groundwater). 	During topsoil placement	Quarry Manager	Nil
5.18.3.8 Operational Levels and Final Landform				
A.	<ul style="list-style-type: none"> Quarry floor levels to be established on weekly basis. 	Weekly	Quarry Manager	AEMR
B.	<ul style="list-style-type: none"> Quarry floor levels to be reviewed on completion of quarrying to confirm required topsoil strip depth. 	On completion of sector	Quarry Manager	AEMR
C.	<ul style="list-style-type: none"> Independent registered surveyor to undertake audit 	3 months	Quarry Manager	AEMR
D.	<ul style="list-style-type: none"> Operational floor of quarry to be no less than 0.7 m above highest predicted groundwater level. Level relative to thickness of topsoil removal, i.e. if topsoil stripping is less than 0.3 m than the operational floor level must be increased accordingly such that replacement of topsoil achieves final landform requirement of 1 m above highest predicted groundwater level. 	At all times	Quarry Manager	AEMR
E.	<ul style="list-style-type: none"> Final landform, including topsoil to be not less than 1 m above highest predicted groundwater level. 	Upon completion of final landform shaping	Quarry Manager	AEMR
5.18.3.9 Nest Box Installation				
A.	<ul style="list-style-type: none"> Hollows will be replaced with nest boxes at a ratio of 1:1 within the rehabilitation area. Nest box design will be selected to replace the natural size of removed hollows. The number and type of nest boxes to be installed will be determined for surveys of hollow-bearing trees felled during clearing (see Section 5.18.3.6). 	As required	Quarry Manager	AEMR

Item	Action	Trigger/Timing	Responsibility	Reporting
	<ul style="list-style-type: none"> Nest boxes will be installed on wooden poles at an approximate height of 3 m within the rehabilitation area. 			
5.18.3.10 Placement of woody debris and brush matting				
A.	<ul style="list-style-type: none"> Where possible individual plant species (especially <i>Leptospermum</i>, <i>Melaleuca</i> and <i>Eucalyptus</i> species) will be harvested when they are bearing mature seed rather than immediately prior to clearing. Bradysporous (seed retaining) species are best harvested and spread in autumn whereas geosporous (seed shedding) species are best harvested immediately prior to annual seed release in late spring. Experienced and qualified contractors to coordinate seed collection. 	Annually in autumn and late spring.	Quarry Manager	Nil
B.	<ul style="list-style-type: none"> Distribution of all stockpiled vegetation will occur following the respreading of topsoil up to a maximum of 20% ground cover by woody debris (greater than 10 cm diameter). The re-laid vegetation will comprise branches and timber of all sizes including leaves and stems of shrubs and grasses. The placement of large timber should have regard to its orientation for the purpose of the capture of wind-blown sand and delay of runoff. Generally, this means an orientation along the north-east to south-west vectors, perpendicular to dominant onshore and off-shore winds. 	During placement of woody debris and brush matting.	Quarry Manager	Nil
5.18.3.11 Direct Seeding				
A.	<ul style="list-style-type: none"> Common pioneer species (i.e. <i>Acacia</i> species and <i>Actinotus helianthi</i>) and others will usually regenerate from topsoil or brush matting and direct seeding is not required. Where monitoring shows a deficiency in a particular species they will be introduced through direct seeding. 	Where monitoring shows failure of species to regenerate by topsoil or brush matting.	Quarry Manager	Nil
B.	<ul style="list-style-type: none"> Locally sourced seed will be used, and will be sown in the soil rather than broadcast. Harvesting of mature seed and direct sowing into re-topsoiled areas at the most appropriate time of year (usually autumn or spring) will be undertaken for species that typically do not readily regenerate from the soil seedbank, such as <i>Eucalyptus</i>, <i>Angophora</i>, <i>Banksia</i> and <i>Xanthorrhoea</i>. 	Annually in autumn and late spring as required.	Quarry Manager	Summary of seeding undertaken including timing, location and

Item	Action	Trigger/Timing	Responsibility	Reporting
				species sown reported in AEMR.
5.18.3.12 Propagation and Replanting				
A.	<p>The focus of propagation is to:</p> <ul style="list-style-type: none"> Introduce to the rehabilitation the dominant structural species that have difficulty establishing from topsoil, brush matting, or direct seeding or recalcitrant species. Provide advanced species that are desired for establishment in strategic locations or densities to achieve the revegetation objectives. Propagation will be undertaken by a local wholesale nursery. 	Where monitoring shows failure of species to regenerate by direct seeding or other means.	Quarry Manager	Summary of species provided to nursery for propagation reported in AEMR.
B.	<ul style="list-style-type: none"> Where targeted species do not regenerate through the topsoil seedbank or direct seeding, tubestock will be planted within the rehabilitation. Planted tubestock will be watered to ensure for initial establishment. 	In autumn (for optimum success), as required	Quarry Manager	Summary of species planted and location reported in AEMR.
5.18.3.13 Transplanting				
A.	<ul style="list-style-type: none"> Transplanting of will be a valuable method of revegetation for certain species (outlined in Table 35). The plants will be excavated with a front-end loader (or similar) retaining as much soil around the roots as possible The plant will then be moved to a prepared hole, water in where possible. For mature <i>Xanthorrhoea</i> species (Grass Trees), these will be burnt (where weather and conditions permit). Burning the shirt of dead leaves and some of the lower green leaves is important to stimulate new growth and flowering. 	As required, during rehabilitation	Quarry Manager	Summary of species planted and location reported in AEMR.
5.18.3.14 Species Composition and Structure				
A.	<ul style="list-style-type: none"> Rehabilitation will aim to achieve the species composition and structure of the following communities: 	When undertaking rehabilitation	Quarry Manager	Nil – rehabilitation monitoring will

Item	Action	Trigger/Timing	Responsibility	Reporting
	<ul style="list-style-type: none"> Smooth-barked Apple – Blackbutt Forest and Coastal Sand Wallum Woodland-Heath. Canopy species of the adjoining Swamp Mahogany – Paperbark Swamp Forest will supplement rehabilitation in areas where this community adjoins the rehabilitation area. The composition of the rehabilitation will aim to meet the performance (Section 5.18.6) and ultimately the completion criteria (Section 5.18.7). 			record composition.
B.	<ul style="list-style-type: none"> Landscaping Areas – will include species composition and structure that will aim to establish native ground cover and shrub species that are consistent with requirements for fuel loads within Asset Protection Zones (e.g. maintained, minimal wood debris, discontinuous patches of the shrub layer, no canopy species within 10 m of building and where present do not have connected canopy with adjoining vegetation). 	For landscaped areas	Quarry Manager	Nil
5.18.3.15 Rehabilitation Monitoring				
A.	<ul style="list-style-type: none"> Six monthly (bi-annual) monitoring of rehabilitation for the first three years consistent with methodology in Section 5.18.5.1 and assessed against the performance criteria in Section 5.18.6. 	Bi-annually for first three years post-rehabilitation of each sector.	Quarry Manager	AEMR
B.	<ul style="list-style-type: none"> Post three years rehabilitation sectors will have three monitoring events; at years four, five and eight post-rehabilitation, consistent with methodology in Section 5.18.5.2 and assessed against the performance criteria in Section 5.18.6. Eight year monitoring event will also be compared against the completion criteria outlined in Section 5.18.7. 	Annually, at years 4, 5 and 8 post-rehabilitation.	Quarry Manager	AEMR

5.18.4 Rehabilitation Methodology

To aid in the re-establishment of native vegetation over the extraction area a combination of methods will be utilised. Initially topsoil will be distributed over the exhausted areas; a significant number of species will naturally regenerate from the topsoil seedbank. Where certain species are lacking (i.e. major structural species), or are known to not readily regenerate from the topsoil a number of methods will be utilised to re-introduce these species. The revegetation strategy will consist of a schedule that defines species and target plant densities for respective vegetation types in accordance with baseline survey data and recommendations from monitoring events.

Given that vegetation rehabilitation is vulnerable to climatic and other ecological factors (including human intervention), and regeneration of native species follows a pattern of succession over time, rehabilitation areas will be monitored (refer to **Section 5.18.5**) and supplemented where necessary for up to 8-years after initial planting.

5.18.4.1 Next Box Installation

Based on current surveys the project will result in the removal of approximately 77 hollow bearing trees (99 hollows) across the project area, these hollows will be offset at a ratio of 1 nest box for each hollow lost, in addition to lands proposed within the Offset Strategy. However, surveys during clearing will provide the final number of hollows to be replaced as it is likely to change from this initial assessment, as; initial surveys were conducted from the ground, and have an inherent level of inaccuracy; and, a number of hollow-bearing trees have the potential to be avoided as they occur near the edge of the resource (over 30% of the hollows are within 10 m of the resource boundary).

Hollows will be replaced with nest boxes at a ratio of 1:1 within the rehabilitation area. Nest box design will be selected to replace the natural size of removed hollows. Nest boxes will be installed on wooden poles at an approximate height of 3 m within the rehabilitation area. Installation will occur post topsoil spreading and prior to any additional seeding/ planting. Where feasible, hollows harvested from the clearing area will be utilised in place of constructed nest boxes.

5.18.4.2 Redistribution of Vegetation and Timber

Cleared vegetation is proposed to be placed back onto the rehabilitated landform, this provides both a seed source through any retained seed, and habitat. The placement of timber will need to be cognisant of avoiding saturation of the soil surface with timber. In this regard the timber can be positioned partially below ground, and where branching permits protrude above the ground. This variation in placement will provide additional structural diversity and habitat while providing increased soil moisture retention and erosion control. Where timber is considered to be at a density that is likely to prohibit the achievement of required native cover, the timber should be stockpiled for use in later rehabilitation. Any hollows salvaged from the disturbance area, that cannot feasibly be installed to replace hollows removed, will be distributed to provide ground level habitat (these hollows will not contribute to the 1:1 replacement ratio, outlined above).

5.18.4.3 Species Selection and Revegetation Methodology

A large portion of the Project Area has been subject to past disturbance and has been rehabilitated with a broad range of species characteristic of vegetation in the adjoining Subject Land and the broader Tomago Sand Beds. Past rehabilitation in addition to resspreading of 300 mm of the topsoil included a combination of methods from direct seeding (with a composite seed mix from the local area), to more targeted planting of tube stock species that were likely to exist pre-mining. This methodology is in part the likely reason for the presence of *Eucalyptus signata*, *Eucalyptus parramattensis subsp. decadens* and *Eucalyptus camfieldii*, within communities that would be more commonly dominated by *Angophora Costata*.

A list of indicative species that regularly occur across these Coastal Sand Apple – Blackbutt Forest and Coastal Sand Wallum Woodland-Heath vegetation communities is provided in **Table 35**. This listed is based on quadrat data collected by Kleinfelder (full species list in the Ecological Summary Report (Kleinfelder 2016)). This list is not exhaustive and is not intended to be a prescriptive list (i.e. where all species must be present). Overstorey species of the Swamp-Mahogany-Broad-leaved Paperbark community are also included as an opportunity exists to broaden the existing ecotone from the interface with these communities. This ecotone is typically well defined where topography increases rapidly, however with the removal of the dunes an opportunity exists to broaden the ecotone of this important community, that is considered preferred koala habitat.

A number of key species for rehabilitation have been highlighted in **Table 35**. These 'key species' are indicative species of the targeted vegetation communities for the rehabilitation, and their presence will be specifically monitored (**Section 5.18.5**) to ensure the rehabilitation is achieving its performance indicators (**Section 5.18.6**) and completion criteria (**Section 5.18.7**).

The recommended choice of rehabilitation methods for particular plant species is summarised in **Table 35** (re-establishment mode provided in order or preference). This Table will be used as a guide to vegetation rehabilitation. Actual methods of rehabilitation may be modified or varied in response to the results of monitoring surveys as detailed in **Section 5.18.5**.

The rehabilitation method proposed through direct resspreading of topsoil and transfer of cleared vegetation over the topsoil should improve the success of both the species that store seed in woody fruits/capsules on the branches or canopy of the parent plant (bradysporous species) and for the species that build up a seed bank within the topsoil (geosporous).

Methods of re-establishment are listed below and are abbreviated as follows:

- R** Regenerates from topsoil
- B** Brush matting
- D** Direct Seeding
- M** Mature Specimens retained in mine path
- P** Propagation
- O** Organic Screenings (from processing)
- T** Transplanted specimens

Table 35: Typical species present within target vegetation communities, noting this is not exhaustive or prescriptive (i.e. all species shown should not be present within all areas).

Stratum	Scientific Name	Common Name	Re-establishment Mode
Ground	<i>#Actinotus helianthi</i>	Flannel Flower	R
Ground	<i>Dianella caerulea</i>	Blue Flax-lily	T, R
Ground	<i>Entolasia stricta</i>	Wiry Panic	R
Ground	<i>Gonocarpus teucroides</i>	Raspwort	R
Ground	<i>Hardenbergia violacea</i>	Purple Coral Pea	R, O, P
Ground	<i>Imperata cylindrica</i>	Blady Grass	R
Ground	<i>Leptocarpus tenax</i>	Slender Twine rush	R, T
Ground	<i>#Lomandra glauca</i>	Pale Mat-rush	T, R
Ground	<i>#Lomandra longifolia</i>	Spiny-headed Mat-rush	T, R
Ground	<i>Pandorea pandorana</i> subsp. <i>pandorana</i>	Wonga Wonga Vine	R, D, P
Ground	<i>Pomax umbellata</i>	-	R
Shrub	<i>Pteridium esculentum</i>	Common Bracken	R
Ground	<i>Ptilothrix deusta</i>	-	R
Ground	<i>Schoenus ericetorum</i>	Heath Bog-rush	R
Shrub	<i>#Acacia longifolia</i> subsp. <i>longifolia</i>	Sydney Golden Wattle	R, O
Shrub	<i>Acacia suaveolens</i>	Sweet Wattle	R, O
Shrub	<i>Acacia terminalis</i>	Sunshine Wattle	R, O
Shrub	<i>#Acacia ulicifolia</i>	Prickly Moses	R, O
Shrub	<i>Actinotus helianthi</i>	Flannel Flower	R
Shrub	<i>Amperea xiphoclada</i> var. <i>xiphoclada</i>	Broom Spurge	R
Shrub	<i>Aotus ericoides</i>	Golden Pea	R, B
Shrub	<i>Astroloma pinifolium</i>	Pine Heath	R, P

Stratum	Scientific Name	Common Name	Re-establishment Mode
Shrub	<i>Banksia oblongifolia</i>	-	B, D, P
Shrub	# <i>Bossiaea heterophylla</i>	Variable Bossiaea	R
Shrub	<i>Comesperma ericinum</i>	Pyramid Flower	R
Shrub	<i>Conospermum taxifolium</i>	Variable Smoke-bush	R
Shrub	# <i>Dillwynia retorta</i>	Small leaf Parrot pea	R, O
Shrub	# <i>Eriostemon australasius</i>	Pink Wax Flower	R, T
Shrub	<i>Gompholobium latifolium</i>	Golden Glory Pea	R, O
Shrub	<i>Haemodorum planifolium</i>	-	R
Shrub	<i>Hibbertia fasciculata</i>	-	R
Shrub	# <i>Hibbertia linearis</i>	Guinea Flower	R
Shrub	<i>Isopogon anemonifolius</i>	Broad- leaf Drumsticks	R
Shrub	<i>Lambertia formosa</i>	Mountain Devils	R, P
Shrub	# <i>Leucopogon ericoides</i>	Pink Beard-heath	R
Shrub	<i>Leucopogon esquamatus</i>		R
Shrub	<i>Leucopogon juniperinus</i>	Prickly Beard-heath	R
Shrub	<i>Leucopogon lanceolatus</i> var. <i>lanceolatus</i>	-	R
Shrub	<i>Macrozamia communis</i>	Burrawang	T, P, D
Shrub	<i>Marsdenia suaveolens</i>	Scented Marsdenia	R
Shrub	<i>Micromyrtus ciliata</i>	Heath- myrtle	R, P
Shrub	<i>Monotoca scoparia</i>	Prickly Broom heath	R
Shrub	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>	Slender Rice-flower	R
Shrub	<i>Platysace ericoides</i>	-	R
Shrub	# <i>Ricinocarpus pinifolius</i>	Wedding Bush	R

Stratum	Scientific Name	Common Name	Re-establishment Mode
Shrub	<i>Tetradlea thymifolia</i>	Thyme Pink-bells	R
Shrub	<i>Woolisia pungens</i>	Woolisia	R
Shrub	<i>Xanthorrhoea glauca</i>	Austral Grass Tree	T, P, D
Mid-Storey	# <i>Banksia aemula</i>	Wallum Banksia	P, D
Mid-Storey	# <i>Banksia serrata</i>	Old Man Banksia	P, D
Mid-Storey	<i>Leptospermum polygalifolium</i> subsp. <i>cismontanum</i>	Tantoon	B, P
Mid-Storey	# <i>Leptospermum trinervium</i>	Flaky-barked Tea-tree	B, P
Mid-Storey	<i>Melaleuca nodosa</i>	Prickly- leaved Paperbark	R, B, D, P
Mid-Storey	<i>Monotoca elliptica</i>	Tree Broom-heath	B, R, P
Mid-Storey	<i>Persoonia lanceolata</i>	Lance Leaf Geebung	R
Mid-Storey	<i>Persoonia levis</i>	Broad-leaved Geebung	R
Over-storey	# <i>Angophora costata</i>	Smooth-barked Apple	B, D, P
Over-storey	# <i>Corymbia gummifera</i>	Red Bloodwood	B, D, P
Over-storey	# <i>Eucalyptus piperita</i>	Sydney Peppermint	B, D, P
Over-storey	# <i>Eucalyptus signata</i>	Scribbly Gum	B, D, P
Over-storey	<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	B, D, P
Over-storey	<i>Eucalyptus robusta</i>	Swamp Mahogany	B, D, P
Over-storey	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	B, D, P,

= Key target species for rehabilitation

Direct Seeding

Locally sourced seed will be used, and will be sown in the soil rather than broadcast. Harvesting of mature seed and direct sowing into re-topsoiled areas at the most appropriate time of year (usually autumn or spring) will be undertaken for species that typically do not readily regenerate from the soil seedbank, such as *Eucalyptus*, *Angophora*, *Banksia* and *Xanthorrhoea*.

Common pioneer (i.e. *Acacia* species and *Actinotus helianthi*) will usually regenerate in abundance and direct seeding is not required. If for any reason they don't germinate within areas of the rehabilitation; they can be introduced in this way.

Brush Matting

Rehabilitation will be facilitated by spreading brush matting composed of plant material cut ahead of the mining face and spread in a thick layer over the rehabilitation areas. Large branches and whole plants are preferred for matting because they will not move in the wind. Brush matting facilitates direct seeding, provides a protected microclimate for developing seedlings, and adds nutrients to the soil.

Where possible individual plant species (especially *Leptospermum*, *Melaleuca* and *Eucalyptus* species) will be harvested when they are bearing mature seed rather than immediately prior to clearing. Bradysporous (seed retaining) species are best harvested and spread in autumn whereas geosporous (seed shedding) species are best harvested immediately prior to annual seed release in late spring.

Propagation and Replanting

The focus of propagation is twofold:

- Dominant structural species that have difficulty establishing naturally or recalcitrant species, and
- Species that are desired for establishment in strategic locations or densities to achieve the revegetation objective.

Seed will be collected locally and supplied to a wholesale nursery for propagation, or alternatively, will be propagated at a local nursery. Planting programs will occur in autumn for optimum seedling establishment success.

Transplanting

Transplanting of will be a valuable method of revegetation for certain species (outlined in **Table 35**). The transplanting efforts will focus on mature *Xanthorrhoea* and *Macrozamia* species as they do not readily germinate from the topsoil seedbank. The methodology for transplanting the species is outlined in **Section 5.18.3.13**.

5.18.4.4 Koala Feed Trees

All canopy species identified within the extension area are potentially important to Koalas in the Port Stephens LGA; these have been identified from multiple sources (**Table 36**). A focus on the revegetation of species that are preferred Koala feed trees will occur where appropriate habitat for these species occurs in the final landform, with the whole rehabilitation area being returned to supplementary or preferred Koala habitat. This will aim to encourage Koalas into the post extraction landscape.

Table 36: Tree species important for Koalas proposed for rehabilitation

Scientific Name	Common Name	Source
<i>Angophora costata</i>	Smooth-barked Apple	Potentially important in LGA (CKPoM)
<i>Corymbia gummifera</i>	Red Bloodwood	Potentially important in LGA (CKPoM)
<i>Eucalyptus piperita</i>	Sydney Peppermint	Potentially important in LGA (CKPoM)
<i>Eucalyptus robusta</i>	Swamp Mahogany	Preferred feed tree in LGA (CKPoM) Primary feed tree on North Coast (Recovery Plan) Feed tree (SEPP 44)
<i>Eucalyptus signata</i>	Scribbly Gum	Feed tree (SEPP 44)
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	Potentially important in LGA (CKPoM)

5.18.5 Monitoring Methodology

5.18.5.1 Bi-annual Monitoring

The following monitoring methodology will be conducted every six months (bi-annually) across each sector post rehabilitation for a period of three years.

Plot monitoring

Each sector will have points overlaid in a grid fashion at approximately 15 m intervals using a GIS program; these points represent a single sample plot, each 2 x 2 m (4 m²). The plot points will be confirmed in the field during the first monitoring event, to ensure each point occurs within the extraction area. These confirmed points will be retained and used for following monitoring events until completion after 3 years.

The pre-confirmed 2 x 2 m quadrat locations will be uploaded on to hand held GPS unit and a qualified ecologist will visits each of these quadrat locations using the GPS. Once the point is located, four 2 m poles will be laid on the ground around the point to define the sample area and the data outlined in **Table 37** will be collected at each point.

Table 37: Details of data collected at each survey

Parameter	Details	Description
Species	The total number of different species of plant present.	A measure of biodiversity/ species composition
Plants	The total number of each species present.	A measure of plant/ species density.
Height	The average height of all plants in the plot.	An indicator of overall growth.
Cover	An estimate of the total plot area having plant cover-percentage of area.	A measure of the total green cover for the rehabilitation area.

Inspection

During all monitoring events an inspection of each sector for weeds, signs of feral pests, erosion, die-off, and site access issues will occur. Any significant problems will be mapped.

Photo Monitoring

A minimum of four phot monitoring points will be established within each sector. Photographs will be taken at the same location and bearing at each monitoring event. A panoramic photograph will be taken at each survey to allow a visual assessment of the rehabilitation progression in future monitoring events.

Reporting

Data will be collected bi-annually and reported on annually. These data will be compared to any previous surveys events to assess the progression of the rehabilitation. Additionally, the rehabilitation will be assessed against the performance indicators outlined in **Table 38**. If the rehabilitation sectors are not meeting these performance indicators, specific management measures (i.e. revegetation measures, weed and pest control and/ or measures for erosion control) will be outlined in the AEMR.

5.18.5.2 Post 3-year Monitoring

The following monitoring methodology will be conducted annually at years four, five and eight post-rehabilitation

Quadrat Monitoring

One permanent 20 m x 20 m quadrat will be established per hectare of rehabilitation. This quadrat will be used to give a broad scale indication of the rehabilitation structure and diversity. The quadrat location will be in an area that is representative of rehabilitation within the sector. The data collected from each quadrat will include:

- Total species richness.
- Average height.
- Percent foliage cover of each species: recorded from 1 – 5% and then to the nearest 5%.
- Abundance rating of each species, using the following intervals (numbers above 20 are estimates only): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, 1,000 or specify a number greater than 1,000 if required.
- Reproductive status and any evidence of second generation plants (succession) will be recorded for each species; and

- General comments; including notes on litter deposition and structural formation.

Photo Monitoring

The photo monitoring points established during bi-annual monitoring will be continued during the post-3 year monitoring. Additionally, a permanent photographic monitoring point will be established in one corner of each quadrat. A panoramic photograph will be taken at each survey to allow a visual assessment of the rehabilitation progression in future monitoring events.

Inspection

During all monitoring events an inspection of each sector for weeds, signs of feral pests, erosion, die-off, and site access issues will occur. Any significant problems will be mapped.

Reporting

The survey data from the post 3-year monitoring will be compared against previous survey events and the performance indicators to assess the progression of the rehabilitation. Any recommendations for revegetation, weed and pest control and any mitigation measures for erosion issues will be outlined in the AEMR. In addition, the eight year survey data will be assessed against the completion criteria (outlined in **Table 39**) to determine whether the rehabilitation sector can be released from further rehabilitation and monitoring.

5.18.6 Performance Criteria

At each stage of monitoring the rehabilitation will be compared to the performance indicators outlined in **Table 38**Table 38. If the rehabilitation areas are not meeting these performance indicators specific management measures will be developed to remedy the deficiencies.

Table 38: Performance criteria for rehabilitation

Year	Aims for Each Strategic Ecosystem Development Stage	Performance Indicators
1	<p>Monitoring will be on a bi-annual basis until achieving the early pioneer stage, with the following features:</p> <ul style="list-style-type: none"> • Topsoil stabilized by primary colonizers (eg. acacias & pea species). • Key species present. • No significant erosion problems. • Weed control program in place. 	<ul style="list-style-type: none"> • Early pioneer stage appearing: Small seedlings (< 5 cm) regenerating from topsoil, < 5% surface cover. • Brush-matting evident. • Woody debris (>10 cm diameter) does not exceed 20% of the ground surface cover. • Local seed has been collected and is stored appropriately for direct seeding or propagation.
2		<ul style="list-style-type: none"> • Natural regeneration of pioneer species occurring. • Seedlings developing under brush-matting. • Cover of 10 - 20% of ground surface. • Plant height and density in each strata increasing • Trees and shrubs not present, but expected are planted (based on deficiencies identified in Year 1 monitoring). • No significant erosion problems. • Weed control program in place.
3		<ul style="list-style-type: none"> • Mid and over-storey species are present. • Shrub layer and ground cover strata evident. • Natural regeneration covering 30 - 50% of surface. • Key species present across sector. • No significant erosion problems. • Weed control programme in place and weeds successfully controlled.
4		<ul style="list-style-type: none"> • Key species present across each sector • Mature pioneer stage evident; cover 50 – 70% • No significant erosion problems. • Weed control programme in place and weeds successfully controlled.
5	<p>Single annual monitoring event to determine development of mature pioneer stage characterised by:</p> <ul style="list-style-type: none"> • Gradual dieback of some primary colonizers. • Appearance of mature vegetation. • Key species present. • Beginning of differentiation of structural layers (canopy, sub-canopy, shrub layer). • No significant erosion problems. • Weed control program in place. 	<ul style="list-style-type: none"> • Decline in pioneer community, coinciding with emergence in canopy species. • Canopy layer emerging above shrub layer. • No significant erosion problems. • Weed control programme in place and weeds successfully controlled.

Year	Aims for Each Strategic Ecosystem Development Stage	Performance Indicators
8	Single monitoring event to determine development of early stages of mature vegetation assemblage characterised by: <ul style="list-style-type: none"> • Key species present. • Species composition similar to pre-mining. 	<ul style="list-style-type: none"> • Overstorey and midstorey species increasing in height and percentage cover. • Overstorey and midstorey species density stable. • Key species present across each sector. • Overstorey layer evident above shrub layer.

5.18.7 Completion Criteria

At the end of the project life the rehabilitation will be assessed against the completion criteria set out in **Table 39**. Each rehabilitation sector will be assessed against these completion criteria to determine eligibility of operational areas for release from further rehabilitation or monitoring, and if the rehabilitation bond can be released.

The Completion Criteria will be independently audited to assess whether the adopted criteria are reasonable performance indicators for the rehabilitation, relative to its age. Monitoring of the rehabilitation post mining should be conducted until such time that these completion criteria are met or there is a high degree of confidence that based on monitoring undertaken the rehabilitation is on the correct trajectory to meeting those levels.

Table 39: Completion criteria for rehabilitation

Completion Indicator	Completion Criteria
Topsoil coverage across the rehabilitation area.	100% topsoil cover.
Similar species composition to pre-extraction at similar topographic levels.	Species composition of the rehabilitation similar to Coastal Sand Apple – Blackbutt Forest and/ or Coastal Sand Wallum Woodland-Heath (determined through comparison of quadrat data in Table 35 and Error! Reference source not found.).
Canopy average height.	Canopy >1.5 m tall (average at 8 years).
Midstorey average height.	Midstorey >1 m tall (average at 8 years).

Completion Indicator	Completion Criteria
Shrub layer average height.	Shrubs 90 cm tall (average at 8 years).
Vegetation cover	Vegetation cover present across 90% of each sector (assessed via inspection), with no bare areas >25 m ² (i.e. 5 m x 5 m). Bare area defined as no foliage cover.
Key species	Key species present across the rehabilitation sector.
Litter development.	Early litter development evident.
Woody debris	Woody debris (>10 cm diameter) does not exceed 20% of the ground surface cover.

5.19 DECOMMISSIONING AND CLOSURE

Decommissioning of the site will take place once marketable sand resources have been extracted and at the completion of quarrying and rehabilitation. Rehabilitation works must be consistent with plans for future land use in the area.

5.19.1 Management Controls

Management controls for decommissioning of the site from the compliance obligations are detailed within **Table 40**.

Table 40: Management controls for Decommission of the Site

Item	Action	Trigger/Timing	Responsibility	Reporting
A	Prepare quarry closure plan to establish a safe, stable and non-polluting final landform.	3 years prior to closure of quarry	Quarry Manager	Updated Quarry Closure and Decommissioning Plan
B	Satisfy land owner lease conditions for relinquishment of bond.	During decommission and rehabilitation.	Quarry Manager	Updated Quarry Closure and Decommissioning Plan
C	Decommissioning will include: <ul style="list-style-type: none"> Removal of all plant and equipment (e.g. all fuel infrastructure, weigh bridges, site office and the workshop structure). Consultation with land owner to agree on residual infrastructure to be left onsite. Expected residual infrastructure / works includes: <ul style="list-style-type: none"> Intersection and bitumen access road. Building pads. Electrical line work from Cabbage Tree Road to Office and Workshop area. Water mains pipe work though to Office and Workshop area. 	During decommissioning	Quarry Manager	Updated Quarry Closure and Decommissioning Plan

Item	Action	Trigger/Timing	Responsibility	Reporting
	<ul style="list-style-type: none"> Building pads. A 40 m wide asset protection zone (with inner and outer protection areas) around office and workshop compound. 			
D	Meet rehabilitation completion criteria, or at a minimum establish that the rehabilitated lands are on trajectory to meet the completion criteria without additional input.	During decommissioning	Quarry Manager	Quarry Completion Report

6. PERFORMANCE EVALUATION

6.1 INTERNAL ANNUAL REVIEW

On an annual basis the performance evaluation is to be undertaken on the following matters:

- Completion of individual area of the project controls and performance measures as defined by Section 5.
- This success of the EMP to provide management controls to meet relevant compliance obligations.
- How the Company's has adhered to the Environmental Policy.

6.2 INDEPENDENT ENVIRONMENTAL AUDIT

Within two years of the commencement of the project, and every three years thereafter, WSS will commission an independent, suitably qualified auditor to complete an environmental audit of the project. The audit will include consideration of:

- The environmental performance of the project, and its effects on the surrounding environment.
- Whether the project is complying with the relevant standards, performance measures and statutory requirements.
- The adequacy of this EMP and any other applicable strategy/plan/program required under the project approval.
- Measures or actions to improve the environmental performance of the project, and/or this EMP or any other strategy/plan/program required under this approval.

Based on the results of the audit provide a response to findings and develop a schedule to address measures raised by the audit, including proposed action, responsibility and completion date. Provide a copy of the response and schedule to relevant agencies and provide a copy on the website.

7. REPORTING

Table 41 provides a summary of the reporting requirements, distribution and timing.

Table 41: Summary of reporting requirements, distribution and timing

Report	Requirements	Distribution	Trigger/Timing
AEMR	<ul style="list-style-type: none"> Summary of environmental performance of the quarry, including consideration of trends for key performance measures. Area disturbed, rehabilitated and tonnes of sand removed. Community Consultation: <ul style="list-style-type: none"> Major details of Community consultative committee (CCC). CCC Meeting agendas and minutes. Information contact phone number. Feedback, enquiries and complaints summary. Details of Community Open Day. Community information newsletters. Evidence of installation of signage published in first AEMR. Truck and production details: <ul style="list-style-type: none"> Haulage truck numbers. Tonnage transported by product. Weed management summary: <ul style="list-style-type: none"> Weed infested topsoil management. Inspections. Weed control activities. Vertebrate pest management summary: <ul style="list-style-type: none"> Pest monitoring summary. Observations. Pest control activities. Surveyed plans of final rehabilitation level for each completed section with depth to highest predicted groundwater shown. Water: <ul style="list-style-type: none"> Water usage. Summary of monitoring results. Groundwater model update every two years with summary of change. Revised plans of extraction limit / quarry floor level. Waste and contamination: <ul style="list-style-type: none"> Summary of waste volumes, disposal pathways and contractors used. Detail of any foreign material encountered during excavations and its management. Detail of any obvious signs of contamination in the sands. Summary of excavation below water table level. 	<p>Website NSW Planning PSC HWC</p>	Annually

Report	Requirements	Distribution	Trigger/Timing
	<ul style="list-style-type: none"> • Energy efficiency <ul style="list-style-type: none"> ◦ Diesel and electricity use. ◦ Review of opportunities to improve energy efficiency. • Air Quality <ul style="list-style-type: none"> ◦ Summary of air quality monitoring data. ◦ Summary of recorded weather data. ◦ Summary of effectiveness of trigger mechanisms. ◦ Summary of any non-compliance evaluations. • Noise: <ul style="list-style-type: none"> ◦ Summary of attended monitoring results. ◦ Summary of corrective actions and improvements to reduce noise levels. • Summary of heritage related findings and management. • Ecology and Rehabilitation <ul style="list-style-type: none"> ◦ Area cleared. ◦ Details of Koala management. ◦ Summary of species relocated, including records of death or injury due to clearing. ◦ Topsoil weed management summary. ◦ Areas of topsoil application and depth. ◦ Survey details of final landform against extraction level. ◦ Summary of nest box installation. ◦ Area, timing, location and species seeded, propagated or planted. ◦ Six-monthly and three-yearly rehabilitation monitoring. 		
Air and Noise Incident Notification	Provide details of the time, type, location, expected cause, compliance evaluation considerations and proposed controls to address non-compliance.	DPE EPA	Within 24 hours of incident
Training and Induction Register	The training and induction register will record the person, date and content of training and inductions provided to visitors, contractors and employees.	Nil – Internal	Updated as necessary
Consultation Register	The consultation register will include details and responses to all complaints, enquires and feedback provided during operations from general public and neighbours received during construction and operations.	Nil – Internal	Updated as necessary
Equipment Maintenance Register	Details of maintenance undertaken for all plant and equipment used onsite.	Nil – Internal	Updated as necessary

Report	Requirements	Distribution	Trigger/Timing
Independent Environmental Audit	Commission an Independent Environmental Audit of the Project, consistent with Section 6 and the Project Approval.	DPE Other Agencies Website	Two years from commencement and every three years thereafter.
Driver Code of Conduct	<p>The Driver Code of Conduct will include but is no limited to the following:</p> <ul style="list-style-type: none"> • Quarry operating times. • Proposed digital signs prior to deceleration lane stating status of quarry being open or close subject to RMS approval. This will mitigate early arrivals to the quarry. • No stopping signage for extent of site for deceleration lane to deter early arrivals. • Pre booking of high demand slots between 0500 and 0700 which are anticipated to be limited, these slots are likely to be pre-booked. Any unexpected truck turning up on site will have to wait on-site prior to exiting the site in the allocated slots. • Quarry approach and need to limit air breaking. • Respect our neighbours internal signage on exit of quarry. • Sign-on gate: in the event of arriving prior to gate being open turn off vehicle immediately. • UHF radio contact to quarry manager for enquiries prior approach to the quarry. 	Website Customers Contractors Provided at time of booking and during site induction.	Updated as necessary
Pollution Incident Response Management Plan (PIRMP)	Prepared as per NSW EPA guidelines.	As per PRIMP	As per PRIMP
EPL Annual Report	Completion of annual return for EPL	NSW EPA	Annually
Website	<p>Website to include:</p> <ul style="list-style-type: none"> • Contact numbers. • Copies of community newsletters. • Copies of minutes from Community Liaison Group. • Copies of approvals. • Copies of licences. • Copies of independent audits. • Monthly air quality data. • Copies of attended monitoring reports. 	Public	Reviewed every 3 months and updated as required.

Report	Requirements	Distribution	Trigger/Timing
Maps	<p>The following maps will be updated following changes and updated in relevant documents, maps include:</p> <ul style="list-style-type: none"> Map of access roads locations updated where changed and distributed to all personnel. Map of delineated areas and gate locations. Map of fence lines and gate locations updated where fencing changed. 	Internal RFS Land Owner	Following changes
Construction Environmental Management Plan (CEMP)	<p>The CEMP will include the following:</p> <ul style="list-style-type: none"> Traffic control plans. Erosion and sediment control plans for intersection, access road and facility construction. 	RMS PSC DPE	Before construction
Protocol for PFAS Management	The protocol for management of potential PFAS contamination will be developed prior to construction to provide guidance on construction activities that excavate below the highest predicted groundwater level.	WWG EPA DPI Water	Before construction
Erosion and Sediment Control Plans (ESCPs)	The ESCPs comprises plans illustrating sedimentation measures to be implemented for operation construction activities.	Nil - Internal	Before operational construction activity
Register of monthly / post major rainfall inspections	<p>The weekly inspection register is a simple checklist for site inspection, that records who undertook the inspection and provides a comment if measures required for maintenance, indicatively this should include:</p> <ul style="list-style-type: none"> Key erosion and sediment controls. Presence of signage. 	Nil - Internal	Monthly / post major rainfall
Final Water Management section of this EMP	Revised Water Management Section of this EMP to be developed with additional consultation with DPI Water and HWC.	HWC DPI Water DPE	Before construction
Final Air Quality Management section of this EMP	Revised Air Quality Management section	EPA DPE	Before construction
Final Noise Management section of this EMP	Revised Noise Management section	EPA DPE	Before construction
Application to PSC for effluent management system	Application for installation of effluent management system to PSC.	PSC	Before construction
Waste Tracking Register / Documentation	Records of waste generated on the site and its disposal location to be recorded including haulage contractor details.	Nil – Internal Summary in AEMR	Updated as necessary

Report	Requirements	Distribution	Trigger/Timing
Detailed Dilapidation Report	Undertaken at all properties within a 300 m radius of extraction activities and/or intersection works where access is provided to undertake the reporting prior to the commencement of any works.	Affected property owner	When works are within 300m of a property
Noise Model Review Report	Review of noise model prior to commencement of extraction in Sector 8, around Year 5/6 of operations.	DPE	Before extraction in Sector 8
Final Aboriginal Cultural Heritage Management Plan (ACHMP)	ACHMP developed in consultation with OEH and Aboriginal stakeholders	Relevant Aboriginal stakeholders OEH	Before construction
Radar Station Archival Report	Photographic archival report	DPE RAAF PSC	Prior to disturbance of footings – expected within Sector 1A or 2
Artefact Management Form	Form for recording details of any previously unknown items of Aboriginal heritage. Prepared in accordance with the ACHMP.	Aboriginal Stakeholders OEH	Following artefact discovery
Updated Quarry Closure and Decommissioning Plan	Quarry closure plan building on the documentation contained within the EIS and this EMP with consideration to contemporary details (e.g. findings during quarrying or other environmental aspects) known or expected at time of closure.	DPE	3 years prior to cessation of quarrying activities.
Quarry Completion Report	The completion report provides documented evidence of the satisfactory decommissioning and rehabilitation of the quarry. The completion report will include: <ul style="list-style-type: none"> • Batter angles. • Rehabilitation evaluation against completion criteria. • Documented acceptance of any residual infrastructure by land owner. • Evaluation against the lease terms with PSC. • Documented evidence of landform survey and controls against highest predicted water table. • Any other aspect 	DPE PSC HWC	On closure of quarry.

8. IMPROVEMENT

WSS will implement the necessary actions to meet the performance objectives described by this EMP and review implementation performance to identify opportunities for improvement.

8.1 NON-CONFORMANCE AND CORRECTIVE ACTION

Non-conformance will be assessed through consideration of each respective action and performance criteria within of Section 5. The key steps for each non-conformance (consistent with ISO 14001) is as follows:

1. React to non-conformances and as applicable:
 - a) Implement corrective actions.
 - b) Deal with the consequences, including mitigating adverse environmental impacts.
2. Evaluate the need for action to eliminate the cause of the non-conformance, in order that it does not recur or occur elsewhere by:
 - a) Reviewing non-conformance.
 - b) Determining the causes of non-conformance.
 - c) Determining if similar non-conformances exist or could potentially occur.
3. Implement the actions required.
4. Review the effectiveness of corrective actions taken.
5. Amend this EMP if necessary.

For each non-conformance, WSS will retain records of:

- The nature of the non-conformances and subsequent actions taken.
- The results of corrective actions.

8.2 CONTINUAL IMPROVEMENT

WSS will continually improve the suitability, adequacy and effectiveness of this EMP and its actions to enhance the project's environmental performance. Continual improvement will be initiated through:

- Outcomes of corrective actions to non-conformances.
- Results of Independent three yearly audits.

9. REFERENCES

International Organization for Standardization. ISO 14001:2015. Environmental Management Systems. September 2015. Geneva, Switzerland.

Project Reference Documents

- Kleinfelder 2016 Response to Submissions
- Umwelt 2015 Environmental Impact Statement

APPENDIX 1. PROJECT APPROVAL

[completed for final following determination]

APPENDIX 2. EPL

[completed for final following determination]

APPENDIX 3. PSC LEASE

[completed for final following determination]

APPENDIX 4. STAKEHOLDER CONSULTATION

[completed for final following determination]