Receiving Environment Monitoring Program for New Acland Mine

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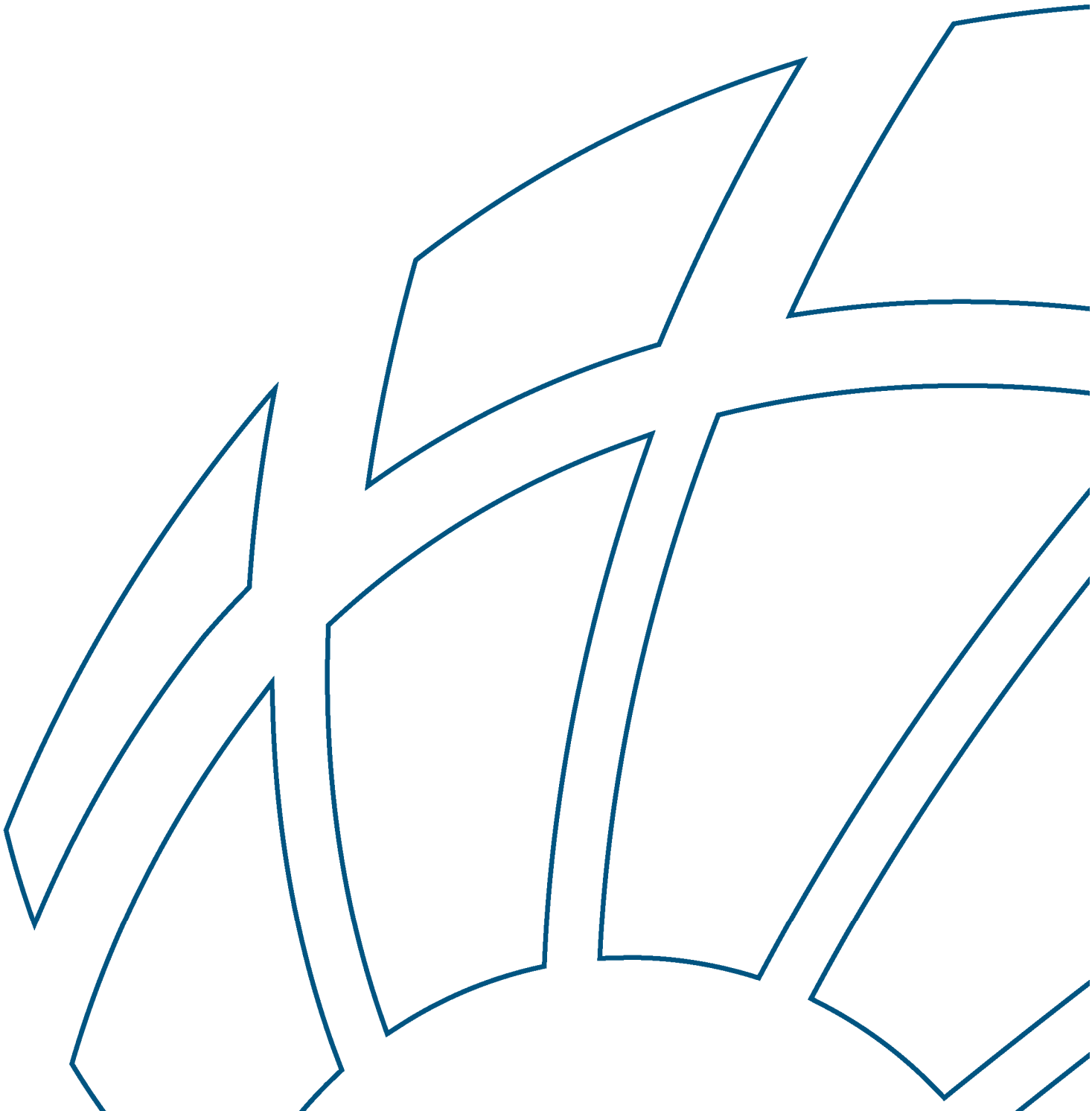

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Synopsis: This document outlines the Receiving Environment Monitoring Program (REMP) for the New Acland Mine operated by New Acland Coal Pty Ltd.

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Executive Summary

New Acland Coal Pty Ltd (NAC), a subsidiary of New Hope Group (NHG), is an open cut thermal coal mine. It is located on the Darling Downs, adjacent to the township of Acland and approximately 14 km north-west of Oakey, Queensland. The existing NAC operations are located on mining lease (ML) 50170 and ML 50216, adjacent to Mineral Development Licence (MDL) 244. NAC is proposing the New Acland Coal Mine Stage 3 Expansion Project, with the development of three new resource areas, Manning Vale East, Manning Vale West and Willeroo, within mining lease application (MLA) 50232.

A revised Environmental Authority (EA; EPML00335713) was granted for New Acland Coal Stage 3 Expansion Project to release mine affected water to the receiving waters from specified release points. The release of mine affected water to these receiving waters has strict release limits and monitoring obligations which, under the EA, must be adhered to. Lagoon Creek and Spring Creek have been identified as the receiving environment for the proposed discharge. The creeks are in the upper reaches and headwaters of the Condamine River and eventually flow into the Murray Darling Basin.

In January 2017, the Stage 3 expansion of the mine (EPBC 2007/3423) was also granted approval under the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act).

BMT was commissioned by NHG to prepare a Receiving Environment Monitoring Program (REMP) Design Document for the proposed Stage 3 Expansion Project and associated proposed discharges into the receiving environments of Lagoon Creek and Spring Creek.

This REMP Design Document is in accordance with commitments made as part of the New Acland Stage 3 EIS 2014, the Additional Information to the Environmental Impact Statement (AEIS), the revised Environmental Authority (EA), and the conditions of the EPBC approval. This REMP design document will provide a basis for evaluating whether the discharge limits or other conditions imposed upon NAC's activity have been successful in maintaining or protecting receiving environment values over time.

The REMP consists of pre-release and post-wet season surveys to determine the impact on the receiving waters from the mine-affected water discharges. Sampling will be conducted during each sampling event, of which four will be upstream control and/or reference sites and seven will be downstream test sites. Nine of the sites will be located within Lagoon Creek and two will be located within Spring Creek. The sites will be monitored for water quality, sediment quality, stream flow, aquatic macro-invertebrates, macro-crustaceans and fish.

In addition to the bi-annual REMP monitoring, a monthly water quality monitoring program will be implemented at sites within Lagoon Creek and Spring Creek.

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1 Introduction

1.1 Background

New Acland Coal Pty Ltd (NAC), a subsidiary of New Hope Group (NHG), is an open cut thermal coal mine. It is located on the Darling Downs, adjacent to the township of Acland and approximately 14 km north-west of Oakey, Queensland. The existing NAC operations are located on mining lease (ML) 50170 and ML 50216, adjacent to Mineral Development Licence (MDL) 244, under the approval of Environmental Authority (EA) EPML00335713. NAC is proposing the New Acland Coal Mine Stage 3 Expansion Project, with the development of three new resource areas, Manning Vale East, Manning Vale West and Willeroo, within mining lease application (MLA) 50232.

The current mining activity has the required licences to discharge in to two catchments; Spring Creek, a tributary of Myall Creek and Lagoon Creek, a tributary of Oakey Creek, where the majority of mine-affected water is discharged. Both creeks ultimately form part of the Condamine River Catchment, which is at the headwaters of the Murray-Darling Basin in Southern Queensland.

In accordance with commitments made as part of the New Acland Stage 3 EIS 2014 and the Additional Information to the Environmental Impact Statement (AEIS), NHG commissioned BMT to design a Receiving Environment Monitoring Program (REMP) for the proposed Stage 3 Expansion Project. This REMP design document will provide a basis for evaluating whether the discharge limits or other conditions imposed upon NAC's activity have been successful in maintaining or protecting receiving environment values over time.

1.2 Aims and Objectives

The overall aim of this REMP is to quantify the potential impact of controlled releases of mine-affected discharge water and associated contaminants from the Environmental Dams (EDs) on the mine site on the receiving environments of Lagoon Creek and Spring Creek.

The specific objectives and aims are to:

- Characterise the baseline aquatic environmental values, including water quality conditions at Lagoon and Spring Creek prior to any influence of the revised Project's activities.
- Develop the objectives of water quality monitoring in accordance with the ANZECC/ARMCANZ (2000) water quality guidelines.
- Identify the locations of the upstream control (reference) and downstream test monitoring sites, in addition to the licenced discharge points.
- Describe the sampling methods that will be implemented during the REMP.
- Develop a monitoring program that allows for the detection of any changes in the receiving environment and is able to determine (as far as practicable) whether these are natural variation or potential impacts from mining activities.

1.3 Linkages to the AEIS

The REMP has been designed to address each commitment made by NHG regarding the New Acland Coal Mine Stage 3 project (Table 1-1).

Table 1-1 New Acland Coal Mine Stage 3 project Commitments Register

No.	Chapter	Title	Commitment
130	5.2.4.58	Advisory Agency Responses	The NHG will commit to monthly monitoring of basic water quality parameters (EC, pH, Suspended Solids and Sulphate) within the proposed sedimentation and environment dams. In addition to this, annual pre wet season monitoring will be undertaken for storages with proposed release conditions, unless they are dry, to test for a broader range of water quality parameters, including metals and metalloids, nutrients and hydrocarbons. The objective of monitoring, location of sampling sites and monitoring parameters will be described in a REMP, which will be developed in consultation with DEHP.
131	5.2.4.63	Advisory Agency Responses	NHG will develop a detailed REMP for approval by DEHP after the EIS process. The REMP will include upstream control sites, sites within the mine site and sites located downstream of mining activities. It is recognised that Sites LCD1 and LCD2 would not be appropriate control sites for the purposes of assessing the environmental impacts of mining activities, as described in an REMP.
238	5.2.4.23	Advisory Agency Responses	NHG commits to develop and implement a Receiving Environment Monitoring Program (REMP) in consultation with the Department of Environment and Heritage Protection (DEHP), to achieve a more detailed characterisation of baseline water quality conditions. The REMP will describe the objectives of water quality monitoring, show the location of all monitoring sites, and describe the methods that will be implemented to determine water quality in upstream reference sites, within mine storages and downstream of mining activities. The REMP will be developed in accordance with the ANZECC/ARMCANZ (2000) water quality guidelines.
239	5.2.4.33	Advisory Agency Responses	NHG commits to conducting more detailed sampling of aquatic environmental values, including water quality prior to construction works commencing. The purpose of the monitoring will be to establish baseline environmental conditions, prior to any influence of the revised Project's activities. A Receiving Environment Monitoring Program (REMP) will be developed in consultation with DEHP, and will describe the objectives and methods of monitoring. NHG will give consideration to including seasonal macro-invertebrate assessments at relevant sites as part of the process of developing the REMP.
240	5.2.4.39	Advisory Agency Responses	Further manganese data will be collected following development of a REMP.

No.	Chapter	Title	Commitment
241	5.2.4.40	Advisory Agency Responses	The need for inclusion of pesticides in future monitoring activities will be further considered during development of the REMP.

1.4 Commonwealth Conditions

Environmental approval under the *Environment and Biodiversity Conservation Act 1999* has been granted for the Stage 3 expansion of the New Acland Coal Mine (ref no: EPBC 2007/3423). The relevant conditions are outlined in Table 1-2 which includes a summary of how the conditions are met and the location in this document.

Table 1-3 includes the recommendations provided in the Independent Expert Scientific Committee (IESC) Advice (IESC 2016), along with a summary of how the recommendations are met and the location in this document.

Table 1-2 Commonwealth Conditions

Condition	Condition fulfilment	Section
9) The approval holder must undertake management and monitoring of water resources in accordance with: i. the Environmental Authority issued for the project under the Environmental Protection Act 1994 (Qld); and ii. the requirements of any conditions regarding groundwater to be imposed by the authority responsible for administering the Water Act 2000 (Qld).	Requirements under the EA are provided in Table 1-4	1.4
10) The approval holder must submit the Receiving Environment Monitoring Plan (REMP) to the Minister for written approval. Mining activities must not commence until the REMP has been approved by the Minister in writing. The approval holder must implement the approved REMP.	The Receiving Environmental Management Plan for New Acland Mine (this document) is to be submitted to the Minister for written approval, prior to the commencement of mine activities.	All
11) In addition to the requirements for an REMP as identified in an Environmental Authority issued for the project under the Environmental Protection Act 1994 (Qld), the approval holder must:		
a) identify the location of all discharge points and include monitoring locations downstream of each discharge point and environmental dams;	Discharge locations are discussed in Section 2.1, Figure 4-1. Monitoring locations are discussed in Section 4.1.	2.1, 4.1
b) identify the locations of all sampling points and review these for adequacy to ensure these are representative of upstream, downstream, control and reference sites;	Discharge locations are discussed in Section 2.1, Figure 4-1. Monitoring locations are discussed in Section 4.1.	2.1, 4.1
c) include field observations such as weather and flow conditions during each sampling event;	Field observations are outlined in Section 4.2.4 and Section 4.2.6.	4.2.4, 4.2.6
d) increase the frequency of sampling and expand the range of analytes (e.g. metals, nutrients, ionic composition and polycyclic aromatic hydrocarbons) to be sampled at each sampling event;	In addition to the bi-annual REMP monitoring, a monthly water quality monitoring program is included.	4.2.1
e) use Australian and New Zealand Environment and Conservation Council (ANZECC) water quality guidelines for 95 per cent species protection in slightly to moderately disturbed systems until such time as site-specific water quality objectives can be derived based on data gathered during at least the first two years of the project;	ANZECC water quality guidelines used where appropriate.	3.4
f) include measures to report and verify any exceedance of triggers to the Department;		

Condition	Condition fulfilment	Section
g) include mitigation and management measures to be implemented in the event a threshold is exceeded;	Reporting and management measures included.	7
h) include additional flow gauges on Spring Creek, including automatic samplers to collect water samples during first flush and high flow events; and	Autosampler and flow gauge to be installed on Spring Creek.	4.2.4 4.2.5
i) address all the surface water management measures outlined in the IESC advice.		

Table 1-3 IESC Advice

Condition	Condition fulfilment	Section
Lagoon Creek and Spring Creek are noted to be in a highly altered state as a result of historical land use. Surface water flow in Lagoon Creek for the majority of the time is restricted to a series of disconnected pools in the form of artificially constructed farm dams. Historical and current sampling locations appear to occur mainly within these pools. Given the ephemeral and disconnected nature of Lagoon Creek, water quality has the potential to change temporally and spatially within pools, and along the length of Lagoon Creek in general. As such water quality monitoring should be increased to better reflect current conditions and provide a baseline against which potential impacts associated with the proposed project can be assessed.	Frequency of water quality monitoring increased from bi-annual to monthly.	4.2
A range of environmental values (EVs) has been identified for Lagoon Creek, which include aquatic ecosystems, irrigation, stock watering, farm water supply/ use etc. Appropriate aquatic ecosystem protection water quality guidelines should be adopted that protect the range of environmental values identified for Lagoon Creek and to minimise impacts to downstream water quality.	ANZECC/ARMCANZ (2000) guidelines have been adopted for protection of aquatic ecosystems.	3.4
To determine current conditions within these systems, the IESC considers the frequency of sampling for an expanded range of analytes (e.g. metals, nutrients, ionic composition and polycyclic aromatic hydrocarbons) be increased for at least the first two years of the project, and where possible, event-based monitoring immediately after the first flushing flow to detect any pulsed concentrations of analytes that may have accumulated during the previous flow. This will establish a statistically robust data set from which site-specific water quality objectives (or guidelines) can be derived.	Monthly sampling for an expanded range of analytes has been added to the REMP, along with event-based sampling.	4.2
During the initial period where monitoring to determine site-specific water quality thresholds is still ongoing, ANZECC water quality guidelines for 95 per cent species protection in slightly to moderately disturbed systems could be used.	ANZECC/ARMCANZ (2000) guidelines have been adopted for protection of aquatic ecosystems until such time as site-specific water quality objectives are developed.	3.4
Fix inconsistencies in water quality guideline tables.	Inconsistencies in tables has been fixed.	3.4
The location and flow data associated with the two installed surface water flow gauges are not provided. While GPS coordinates are provided for the two gauges (BMT WBM, 2016a,	Historical and proposed flow gauges, along with discharge points, are included in Figure 4-1. Historical flow data is included in Section 3.2.2.	Figure 4-1 3.2.2

Condition	Condition fulfilment	Section
p. 28), the gauges should be plotted on a map in relation to current and proposed discharge points and sampling points. Available flow data since installation should also be provided. The REMP states this as a requirement (BMT WBM, 2016a, p. 37). Flow gauges are important in identifying conditions when discharges can occur.		
Given the proponent proposes to locate environment dams, with associated overflow release points within the catchment of Spring Creek, installation of additional flow gauges on Spring Creek should be considered. This may include consideration of the installation of automatic samplers to collect water quality samples during first flush and high flow events.	Autosampler and flow gauge to be installed on Spring Creek.	4.2.4 4.2.5
The proponent should clarify the difference between release points from the proposed and existing environmental dams and the licenced discharge points.	Release points have been removed from the REMP. Licenced discharge points are the outflow locations of the Environmental Dams (ED1 – ED7)	2.1
Water quality sampling points should be established downstream of proposed discharge points and at each of the current and proposed environment dam release points located in the catchments of Spring Creek (ED1) and the tributary of Lagoon Creek (ED2, ED4 and ED5).	Sampling points have been nominated downstream of ED1, ED2, ED4 and ED5.	4.1
Figures within the proponent's REMP should show the locations of all proposed sampling locations, including historic sites which will continue to be monitored for the length of the proposed project.	Sampling locations are discussed in Section 4.1 and shown in Figure 4-1.	4.1
The proponent should review the adequacy of surface water sampling locations to ensure locations are representative of upstream, downstream, control and reference sites. For example, there are currently no monitoring locations identified on the northern tributary of Lagoon Creek.	Sampling locations included upstream, downstream, control and reference sites, including two locations in the northern tributary of Lagoon Creek.	4.1
In addition to the identified physico-chemical variables measured during each sampling event, field observations such as nature of flow (i.e. low, medium, high) and weather conditions should also be recorded.	Field observations are outlined in Section 4.2.4 and Section 4.2.6.	4.2.4 4.2.6
Details should be provided on what action will be taken if guideline values are exceeded (e.g. follow-up sampling and implementation of subsequent mitigation measures).	Management actions to be taken if guideline values are exceeded are outlined in Section 7.	7

1.5 Environmental Authority Conditions

Environmental authority under the *Environment Protection Act 1994* has been granted for the Stage 3 expansion of the New Acland Coal Mine including site ML50232 (ref no: EPML00335713). The conditions relevant to this REMP document are outlined in Table 1-4, which includes a summary of how the conditions are met and the location within this document.

Table 1-4 EA Conditions

Condition	Condition fulfilment	Section
C1 – C3	N/A to this REMP document – these conditions are addressed in New Hope Group's Water Management Plan.	N/A
C4 The release of mine affected water to waters from the release points must be monitored at the locations specified in Table C1: Mine-affected water release points, sources and receiving waters for each quality characteristic and at the frequency specified in Table C2: Mine-affected water release limits.	All EDs will be monitored in accordance with Section 4.2 of this REMP.	4.2
C5 The holder must ensure a stream flow gauging station(s) is installed, operated and maintained to determine and record stream flows in Lagoon and Spring Creek upstream of the discharge sites.	Stream flow gauges are included in Lagoon and Spring Creek upstream of the discharge sites.	4.2.4
C6 – C13	N/A to this REMP document – these conditions are addressed in New Hope Group's Water Management Plan.	N/A
C14 Receiving Environment Monitoring and Contaminant Trigger Levels The quality of the receiving waters must be monitored at the locations specified in Table C5: Receiving water upstream background sites and downstream monitoring points for each quality characteristic and at the monitoring frequency stated in Table C4: Receiving waters contaminant trigger levels.	Receiving waters are monitored at sites listed in Table C5. Trigger levels are included in Table 3-8 of this REMP.	3.4, 4.1
C15 If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in Table C4: Receiving waters contaminant trigger levels during a release event the environmental authority holder must compare the downstream results to the upstream results in the receiving waters and: a) where the downstream result is the same or a lower value than the upstream value for the quality characteristic then no additional monitoring and reporting action is required; or b) where the downstream results exceed the upstream results complete an investigation into the potential for environmental harm and provide a written report to the administering authority within 90 days of receiving the results and in the next annual return, outlining: (1) details of the investigations carried out; and (2) actions taken to prevent environmental harm.	Management measures are included in Section 7 of this REMP.	7

Condition	Condition fulfilment	Section
NOTE: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with (b) of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.		
C16 All determinations of water quality and biological monitoring must be performed by an appropriately qualified person.	Noted	N/A
C17 The following information must be recorded in relation to all water monitoring required under the conditions of this environmental authority and submitted to the administering authority in the specified format: a) the date on which the sample was taken; b) the time at which the sample was taken; c) the monitoring point at which the sample was taken; d) the measured or estimated daily quantity of mine affected water released from all release points; e) the release flow rate at the time of sampling for each release point; f) the results of all monitoring and details of any exceedances of the conditions of this environmental authority; g) water quality monitoring data must be provided to the administering authority in the specified electronic format upon request; and **h)** water level monitoring data must be provided in the specified electronic format upon request.	Reporting is included in Section7 of this REMP.	7
C18 – C22	N/A to this REMP document – these conditions are addressed in New Hope Group's Water Management Plan.	N/A

2 Description of Activity

2.1 Location of Activity

New Acland Coal mine is an open cut thermal coal mine owned by the New Hope Group (NHG). It is located on the Darling Downs, adjacent to the township of Acland and approximately 18 km north-west of Oakey, Queensland.

2.2 Contaminants of Potential Concern

The main mine-derived contaminants of potential concern are (NHG 2014):

- Total suspended sediments – associated with mobilisation of soil particles in runoff from the mine site.
- Salinity – waste rock (especially weathered mine waste), soils and coal are a source of salts (particularly sulphate, sodium and chloride). Most waste rock samples were considered sodic.
- Acid-forming substances – most mine waste is non-acid forming, although a small proportion of waste (principally inter-burden) have slightly acidic pH. There have been no incidences of acid drainage to date, with mine affected waters having circum-neutral to base pH.
- Trace metals and metalloids - contained within waste rock and soils. Multi-element scans of solids found slight enrichment (relative to median crustal values) of antimony, arsenic, bismuth, cadmium, caesium, gallium, lithium, lead, selenium, mercury, silver, tungsten and zinc, although differences were not statistically significant. Manganese was the only metal to exceed Queensland EPA (1998) soil guideline value (in weathered and fresh overburden).
- Nutrients - nitrate is the main nutrient in waste rock, whereas other forms of nitrogen and phosphorus occur at low concentrations.
- Hydrocarbons – from machinery used in the mining process (spills, leaks etc.).

2.3 Mine Water Management, Discharge Location and Release Criteria

NHG (2018) assessed sources of various contaminant sources and mitigation measures to avoid or minimize impacts to water quality and aquatic ecosystems. In summary, this involves the following:

- Measures to minimise soil disturbance (exposed areas) on site. All areas of disturbance on site are kept to an operational minimum and are controlled by strict clearance protocols, involving detailed mine planning within pit areas and a ‘permit to disturb’ system for the rest of the site. Progressive rehabilitation is conducted to help keep exposed areas to an operational minimum. A 50 m conservation zone (no mining zone) is also maintained around natural waterways.
- As required, water management structures are appropriately protected to prevent scouring, particularly in areas of potential high or concentrated flow (e.g. drains, spillways, etc.). Sediment and erosion control strategies from the Best Practice Erosion and Sediment Control Guideline (BPESC Guideline) (IECA 2008) may be applied as required to specific issues as they arise (e.g. during construction near water courses).

- Stormwater runoff from undisturbed areas is diverted away from disturbed areas to waterways. Flow paths are maintained in a grassed state, reducing the potential for sediment transport off site. A flood levees also redirects mine-affected runoff from discharging directly to Lagoon Creek.
- Assessments of the integrity and effectiveness of erosion control measures are undertaken at regular periods and following significant rainfall event.
- Mine affected waters are diverted to sediment or environment dams, where sediments (and bound contaminants) are allowed to settle and waters are treated if required. Sediment from sediment dams is periodically removed to maintain design capacity. Waters captured in sediment and environmental dams are used preferentially for dust suppression or as process water in the CHPP. Excess water is released (controlled discharges) to receiving environments only occur during certain (high) flow events and where it meets water quality criteria set out in license conditions.
- Runoff from industrial areas is managed through a number of water management measures including bunding in accordance with the applicable provisions of AS1940-2004, the use of oil and water separators and appropriate emergency controls. Spill capture and retention devices are installed in applicable areas as required (e.g. fuelling stations, etc.). All machinery is stored, refuelled and maintained outside the high banks of watercourses. Surface water runoff from these areas is be directed to a sediment dam / trap for treatment and then follow a grassed waterway to an environmental dam before release off site under discharge criteria outlined in the Mine's EA.
- Pit waters is used for make-up water and dust suppression, and runoff is captured as above.

Currently, mine waters are stored in three environmental dams (ED1, ED2 and ED3A) prior to release. Discharge of mine-affected water into Spring Creek occurs from ED1. Discharge into Lagoon Creek occurs from ED2 and ED3A with ED3A being the main discharge location from the mine site. The discharge locations of mine-affected water into the Lagoon Creek and Spring Creek are presented in Table 2-1, and shown in in Section 4.1. Monitoring locations are discussed in Section 4.1.

Three additional environmental dams (EDS) have been proposed with NAC's Stage 3 Project development of new mining areas Manning Vale East, Manning Vale West and Willeroo (). These new EDs will be located on the downstream edge of the pits. The EDs provide additional storage and treatment for water in significant rainfall events and mitigate against uncontrolled releases to the downstream environment. The additional environmental dams (ED5, ED6 and ED7) will discharge into Lagoon Creek.

The EDs will receive pit water and thus may contain contaminant concentrations, most notably high levels of salinity. A controlled release system proposed for the new EDs will be based on specific water quality targets to allow water from a significant rainfall event to be removed from the site. As indicated in the EA conditions (Appendix A), the release of mine-affected water from the listed discharge location must comply with strict physio-chemical characteristics (Table 2-2).

Table 2-1 Location of discharge release points at New Acland Mine

Release Point	Latitude (GDA94)	Longitude (GDA94)	Size (ML)	Location	Monitoring Location	Monitoring Frequency	Receiving Waters
Existing Water Management Infrastructure							
ED1	27°15'45.6836762"S	151°41'43.7783374"E	126	Northwest mining lease boundary area (ML50170)	Overflow point from ED1	As soon as practical prior to, at least daily during and immediately after any release to waters from this point.	Spring Creek
ED2	27°17'00.6429312"S	151°41'32.2135266"E	232	Downstream of the tailings dam, southwest mining lease boundary area (ML50170)	Overflow point from ED2	As soon as practical prior to, at least daily during and immediately after any release to waters from this point.	Lagoon Creek
ED3A	-27° 18' 25.7754" S	151° 43' 20.856" E	45	Southern mining lease boundary (ML50216)	Overflow point from ED3A	As soon as practical prior to, at least daily during and immediately after any release to waters from this point.	Lagoon Creek
Proposed Project Water Management Infrastructure							
ED5	TBA	TBA	250	Southwest of Manning Vale West final pit extent	TBA	TBA	Lagoon Creek
ED6	TBA	TBA	250	South of Manning Vale East final pit extent	TBA	TBA	Lagoon Creek
ED7	TBA	TBA	350	Southeast of Willeroo final pit extent	TBA	TBA	Lagoon Creek

Table 2-2 Mine-affected water quality release limits

Parameter	Release Limits	Monitoring frequency
EC (µs/cm)	Release limits specific in Table 2-3 for variable flow criteria	Real time telemetry. Daily grab samples, within 2 hours of release if telemetry unavailable.
pH	6.0- 9.0	
TSS (mg/L)	<100	Daily during release, within 2 hours.

The EA also states that release of waters must only occur where there is an existing minimum flow in receiving waters upstream of the discharge point to provide adequate dilution such that 1500 µs/cm is not exceeded outsider of the 50 m mixing zone. Due to the ephemeral nature of Spring Creek and Lagoon Creek, the opportunity for release of large volumes of mine-affected water is heavily restricted. The electrical conductivity (EC) release limits for mine-affected water release during flow events are presented in Table 2-3 over-page.

Table 2-3 Mine-affected water release during flow events

Receiving waters	Release Point (RP)	Gauging station Latitude (GDA94)	Gauging station Longitude (GDA94)	Receiving Water Flow Criteria for discharge (m^3/s)	Maximum release rate (for all combined RP flows)	Electrical Conductivity Release Limits
Lagoon Creek	ED2	27^0 16' 54.96167" S	151^0 41' 36.83113" E	Low flow <46.3 L/sec for a period of 28 days after natural flow events that exceed 4 ML/d	<17.4 L/sec	700
	ED3A	-27° 18' 25.7754"	151° 43' 20.856"			
	ED5	TBA	TBA	Medium Flow (low) >46.3 L/sec	<17.4 L/sec	1,500
	ED6	TBA	TBA		<8 L/sec	2,500
	ED7	TBA	TBA		5.8 L/sec	3,500
				Medium flow (high) >133 L/sec	< 48.6 L/sec	1,500
					< 23 L/sec	2,500
					< 15 L/sec	3,500
				High Flow >405 L/sec	< 144.7 L/sec	1,500
					< 92.6 L/sec	2,500
					<69.4 L/sec	3,500
Spring Creek	ED1	27^0 15' 40.56603" S	151^0 41' 48.32658" E	Low flow < 46.3 L/sec for a period of 28 days after natural flow events that exceed 46.3 L/sec	<17.4 L/sec	700

3 Description of the Receiving Waters

3.1 Background

For this REMP, the receiving waters are defined as the waters of Spring Creek and Lagoon Creek, downstream of some, or all, of the current and proposed New Acland mine EDs and mine infrastructure ().

Spring Creek and Lagoon Creek are ephemeral creeks with shallow, narrow poorly defined channels and wide floodplains. Lagoon Creek has a relatively small upstream catchment area of approximately 200 km^2, and for the majority of the year it is restricted to a series of disconnected pools in the form of artificially constructed farm dams. Spring Creek is a tributary of Myall Creek, which merges in to the Condamine River. Lagoon Creek merges with Oakey Creek south of the site and ultimately forms part of the Condamine River.

The receiving environment is part of the Condamine-Balonne River Catchment, which is located in southern Queensland and northern New South Wales, covering about 14% of the Murray−Darling Basin. The catchment is bordered by the Great Dividing Range to the east, the Warrego region to the west, and by the Border Rivers, Moonie and Barwon-Darling regions to the south and is one of the largest catchments in the Murray–Darling Basin.

The climate in the Condamine River catchment is variable, ranging from sub-tropical in the east to semi-arid in the west. Rainfall varies between years and seasons, with the majority occurring between October and March (CBWC 2002). Stream flow is almost restricted to rainfall run-off during storm events, thus the flow regime is unpredictable and intermittent.

The region is one of the most intensively farmed landscapes in eastern Australia, supporting grazing and dryland crops. As a consequence of increasing population, changing land use, construction of weirs and dams and extraction of water, the catchment's ecology and hydrology has been greatly altered (MDBA 2015).

The specific land use within the area of the receiving waters include a combination of grazing and cropping on small farms, in addition to limited areas of urban settlement. Most of the remnant vegetation has been cleared for agriculture production. Limited vegetation remains along Lagoon Creek, with contour banks across much of the arable land surrounding the receiving waters, to manage runoff and reduce erosion across the cleared landscape (EIS, 2014). There are several in-stream dams within both Lagoon and Spring Creek.

Spring Creek and Lagoon Creek have been moderately disturbed through past and current agricultural practices. For the purposes of this assessment, waterways are considered to represent 'slightly to moderately' disturbed (SMD) aquatic ecosystems, based on ANZECC/ARMCANZ (2000) definition due to the following:

- Riparian zone is in poor condition and has been moderately disturbed by surrounding land-use, predominately cattle damage.
- The vegetation within the riparian zone of the receiving environment has been mostly cleared with only small sections of native riparian vegetation remaining.

- Cleared catchment.
- The receiving environment supporting a poor community of non-threatened aquatic macroinvertebrates and fish indicated by previous surveys.

3.2 Previous Surveys

The most recent and relevant surveys of the receiving waters have been compiled for NAC Stage 3 Project EIS and include the following:

Desktop Review

Database searches were conducted within a 25 km radius of the aquatic ecology study area, which included larger watercourses with permanent surface water. Reviews of literature were conducted to determine the distribution of aquatic fauna and flora, Endangered, Vulnerable and Near Threatened (EVNT) species, special least-concern species, and protected areas including wetlands and sensitive environments. A range of resources were used included EPBC Act Online Protected Matters database, EHP Wildlife Online database and Queensland Museum database.

January 2008 Aquatic Ecology Survey

An aquatic ecology survey was performed during a period of no-flow between the 23rd and 24th January 2008. Four sites along Lagoon Creek (Table 3-1) were selected based on available water and were surveyed for water quality, aquatic habitat, flora and fauna.

March 2013 Aquatic Ecology Survey

A wet season aquatic habitat surveys was conducted on 7th March 2013 at four sites along Lagoon Creek area to assess aquatic habitat (Table 3-1).

Long-term Water Quality Monitoring (NAC)

NAC, as a requirement of their EA, has routinely conducted water quality measurements for the basic suite of parameters at three sites along Lagoon Creek (Table 3-1).

Table 3-1 Survey site locations

Survey	Site Code	Site Location on Lagoon Creek
January 2008 Aquatic Ecology Survey	AE1	Upstream of the Manning Vale East Pit and Willeroo Mine Pit
	AE2	Downstream of the Willeroo Mine Pit
	AE3	Upstream of the Manning Vale East Pit and Willeroo Mine Pit
	AE4	Upstream of the Manning Vale East Pit and Willeroo Mine Pit
March 2013 Aquatic Ecology Survey	AH4	Adjacent to Manning Vale East Pit and Willeroo Mine Pit
	AH6	Downstream of Willeroo Mine Pit
	LCU1	Upstream of the mine discharge points
	LCD1	Downstream of the mine discharge points. This site is in the approximate location of the proposed Manning Vale East pit
Long-term Water Quality Monitoring (NAC)	LCU1	Upstream of the mine discharge points
	LCD1	Downstream of the mine discharge points. This site is in the approximate location of the proposed Manning Vale East pit
	LCD2	Downstream of the mine discharge points. This site is downstream of the proposed Manning Vale East pit

3.2.1 Water Level

Water level loggers were installed by NHG in September 2010 at two sites on Lagoon Creek – one upstream of the mine and one downstream of the mine (refer to for locations).

The water level data from both sites is presented in Figure 3-1 and Figure 3-2.

3.2.2 Water Quality

Relevant historical water quality monitoring for Lagoon Creek is limited. The Department of Natural Resources, Mines and Energy (DNRME) operates a water quality gauge on Oakey Creek at Fairview downstream of the confluence with Lagoon Creek. However, it is unlikely to be representative of that in Lagoon Creek as it is influenced by other factors including releases from the Toowoomba Water Treatment Facility.

There have been several water quality monitoring events conducted within the receiving waters at various times and sites, as listed in Table 3-1. The most consistent water quality monitoring has been performed by NAC for the basic suite of parameters, which has been conducted under NAC's EA.

The following summarises trends in water quality data compared to default ANZECC/ARMCANZ (2000) guideline values (DGV) for the protection of aquatic ecosystems (see Section 3.4 for the rationale in the adoption of these guideline values).

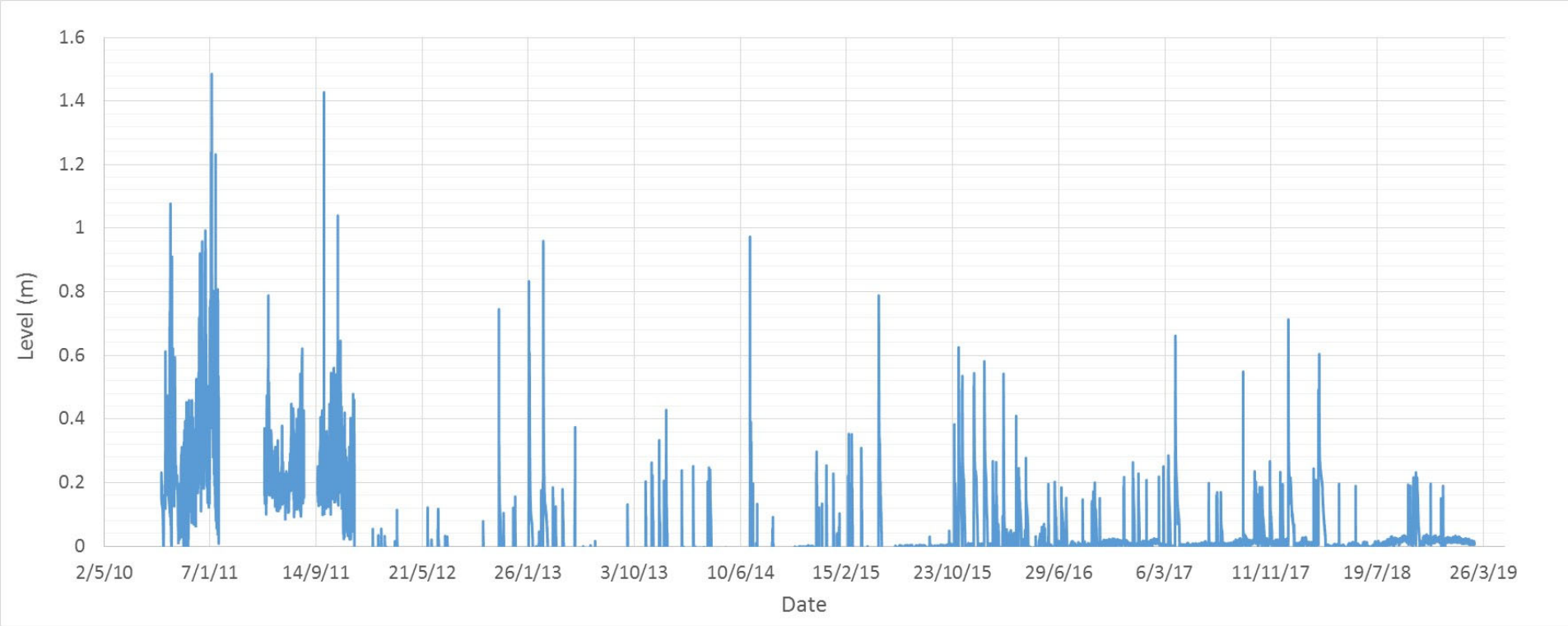


Figure 3-1 Upstream Water Level Logger

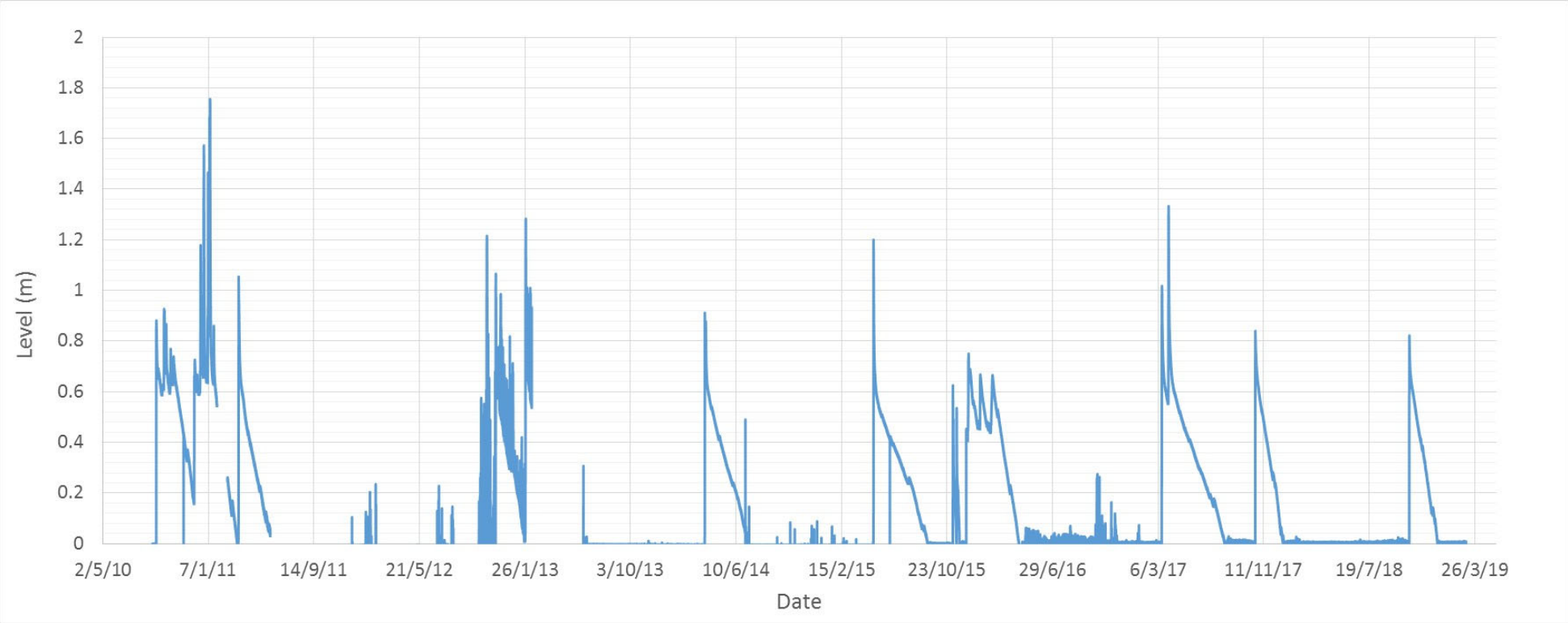


Figure 3-2 Downstream Water Level Logger

3.2.2.1 Physio-chemical Stressors

Long-term monitoring conducted by NAC found that median pH and EC values were higher at downstream test sites than those upstream. pH and EC values exceeded the DGV at both test sites (Table 3-2). During the 2013 flow event (Table 3-3), EC at all sites was below DGV, however the EC recorded during the 2008 no-flow event exceeded the DGV at all but one site. pH recorded in the 2008 survey was higher than DGVs recorded in 2013, although all measurements were within the range recorded in NAC's long-term monitoring program (Table 3-2, Table 3-3).

Dissolved oxygen did not meet DGVs at two of the sites during the 2008 no-flow event. DO levels were lower during the 2013 flow period, with all sites below DGVs. The low concentrations of DO during streamflow were suggested to be due to the decomposition of suspended and dissolved organic matter in the rainfall run-off (EIS, 2014) (Table 3-2, Table 3-3).

Turbidity was variable among sites during periods of both flow and no-flow and exceeded DGVs at three sites (Table 3-2, Table 3-3).

3.2.2.2 Nutrients and Major Ions

Total and filterable fractions of nitrogen and phosphorus exceeded DGVs at all sites monitored during the 2013 flow event. Total nitrogen was similar between sites and ammonia concentrations were high at the upstream site (Table 3-3). High total phosphorus levels are common within the waters of the Condamine Catchment have been attributed to the impacts of agriculture (CBWC 1999). Furthermore, the high concentrations of nutrients in Lagoon Creek during streamflow indicate mobilisation nitrogen and phosphorus from agricultural catchment run-off.

Concentrations of major ions were similar among sites with no spatial trend evident (Table 3-3).

3.2.2.3 Dissolved Metals and Toxicants

Dissolved concentrations of most metals and metalloids were below DGVs, the exception being copper, which exceeded the DGV at all sites.

Pesticides and hydrocarbons were below detection laboratory limits at all sites (Table 3-3).

Table 3-2 Long-term water quality data (Source NAC unpublished)

Site	Date	Temp (˚C)	Suspended Solids (mg/L)	Turbidity (NTU)	pH	DO (% sat.)	Sulphate (mg/L)	EC (µS/cm)
ANZECC Default Guideline Value (SE Australia)*		**N/A**	**N/A**	**<25**	**6.5-7.5**	**90-110%**	**<250***	**<350**
Environmental Authority Monitoring								
LCU1	2008-2013	22.4(15.5-30.5)	18 (2-179)	N/A	7.46 (6.6-**8.4**)	N/A	2 (1-190)	210.0 (97-**590**)
LCD1	2008-2013	23.8 (17.9-29.6)	11 (1-335)	N/A	**7.80 (7.3-8.9)**	N/A	25 (3-220)	**418.5** (176-**3900**)
LCD2	2008-2013	23.4 (19.3-29.6)	10 (2-353)	N/A	**7.80 (7.4-8.9)**	N/A	30 (1-200)	**596.0 (136-1700)**
In-situ sampling No Flow Event (January 2008)								
Lagoon Creek (Site 1)	23/1/2008	31.4	N/A	**94.9**	**8.90**	**111.7**	N/A	**596.4**
Lagoon Creek (Site 2)	23/1/2008	26.3	N/A	**33.3**	**8.91**	95.2	N/A	**463.1**
Lagoon Creek (Site 3)	23/1/2008	26.0	N/A	3.1	**8.03**	94.7	N/A	**8089.6**
Lagoon Creek (Site 4)	24/1/2008	26.9	N/A	20.4	**8.52**	**65.6**	N/A	**642.1**
Lagoon Creek (Site 5)	24/1/2008	30.9	N/A	16.9	**8.69**	92.1	N/A	**636.9**

Note: Bold indicates exceedance of guideline values, shaded cells indicate median exceeds guideline values. * sulfate guideline value from EA adopted as no default ANZECC/ARMCANZ (2000) guideline value

Table 3-3 Water quality monitoring during a period of flow (March 2013)

Water quality variable	Unit	Guideline Value	LCU1	LCD1	AE4	DS1
Flow*	N/A	None	Yes	Yes	Yes	Yes
Temperature*	°C	N/A	23.9	25.9	21.9	21.6
Dissolved oxygen	%	90-110%	**15**	**51.8**	**44.3**	**46**
pH	pH Units	6.5-7.5	7	7.5	7.6	7.4
Electrical conductivity	µS/cm	<350	240	310	240	280
Turbidity	NTU	<25	8.6	55	19	10
Total nitrogen	mg/L	<0.25	**1.4**	**0.84**	**1.2**	**0.97**
Ammonia	mg/L	<0.010	**0.35**	**0.037**	**0.061**	**0.04**
Total phosphorus	mg/L	<0.030	**0.15**	**0.12**	**0.31**	**0.26**
Filterable reactive phosphorus	mg/L	<0.015	**0.052**	**0.059**	**0.18**	**0.17**
DIN	mg/L	None	**0.02**	**0.29**	**0.02**	<0.02
Sodium#	mg/L	None	12	32	15	15
Sulphate#	mg/L	None	1	20	4	5
Total hardness# mg/L		Level 1 >150 Level2 > 200	95	84	98	110
Calcium*	mg/L	None	20	15	23	22
Magnesium*	mg/L	None	5.9	8.4	7.7	8
Potassium*	mg/L	None	10	6	12	11
Fluoride*	mg/L	None	<0.1	0.6	0.2	0.1
Chloride*	mg/L	None	9	26	10	13
Dissolved metals						
Arsenic (As)	mg/L	<0.013	0.002	0.001	0.002	0.002
Chromium (Cr)	mg/L	<0.0027	BDL	BDL	BDL	BDL
Copper (Cu)	mg/L	<0.0014	0.002	0.003	0.004	0.003
Manganese (Mn)	mg/L	1.9	0.001	BDL	0.022	0.001
Mercury (Hg)	mg/L	<0.00006	BDL	BDL	BDL	BDL
Nickel (Ni)	mg/L	<0.011	0.005	0.002	0.004	0.004
Zinc (Zn)	mg/L	<0.008	BDL	BDL	0.006	BDL
Barium (Ba)*	mg/L	None	0.039	0.028	0.069	0.061
Beryllium (Be)*	mg/L	None	<0.001	<0.001	<0.001	<0.001
Cobalt (Co)*	mg/L	None	<0.001	<0.001	<0.001	<0.001
Vanadium (V)*	mg/L	None	0.002	0.004	0.008	0.005

* indicates no guidelines currently available
# shows water quality indicator values used for protection of drinking water supply, all other guideline values are DGVs for the protection of aquatic ecosystems
Below detection limits (BDL) indicates the variable was below detection limits of the laboratory analysis.
Shaded and bold values indicate exceedance of the relevant guideline

3.2.3 Aquatic Flora

Previous field and desktop surveys have indicated that 24 aquatic flora species have been identified to be distributed within the receiving waters and broader Condamine Catchment area. Of these, five are introduced species, 21 are emergent form species and three are submerged forms. There were no identified species listed as Endangered, Vulnerable and Near Threatened (EVNT) species or special concern species (Table 3-4).

The Condamine Catchment generally supports low macrophyte richness and abundance (Hydrobiology 2010). Ephemeral creeks are typically dominated by emergent species, as submerged macrophytes are sensitive to desiccation when creeks run dry, and generally support a lower diversity and coverage of macrophytes compared to perennial creeks (Hydrobiology 2010). Furthermore, ephemeral creeks within the Condamine Catchment are typically highly turbid (CBWC 2002) which further reduces submerged macrophyte growth due to insufficient light penetration.

Despite the small catchment area and ephemeral nature of Lagoon Creek, the in-stream dams have provided surface water environments that support emergent macrophyte communities.

Table 3-4 Aquatic Flora recorded from previous field and desktop surveys (EIS, 2014)

Species	Common Name	Status, form	Recorded from the Study Area	Source
Bolboschoenus fluviatilis	Marsh clubrush	Native, emergent	No	WO, GC
Cyperus eragrostis	Umbrella sedge	Introduced, emergent	No	WO
Cyperus exaltus	Giant sedge	Native, emergent	No	GC
Damasonium minus	Starfruit	Native, emergent	No	GC
Eleocharis acuta	Common spike-rush	Native, emergent	Yes	WO, LC
Eleocharis cylindrostachys	Unknown	Native, emergent	No	WO
Eleocharis sphacelata	Tail spike-rush	Native, emergent	Yes	LC
Fimbristylis dichotoma	Common fringe-rush	Native, emergent	No	WO
Juncus bufonius	Toad rush	Introduced, emergent	No	WO
Juncus flavidus	Rush	Native, emergent	No	WO
Juncus polyanthemus	Unknown	Native, emergent	No	WO
Juncus subglaucus	Unknown	Native, emergent	No	WO
Juncus subsecundus	Finger rush	Native, emergent	No	WO
Juncus usitatus	Common rush	Native, emergent	Yes	WO, LC
Leptochloa digitata	Umbrella canegrass	Native, emergent	No	GC
Ludwigia spp.	Water primrose	Native, emergent	Yes	WO, LC, CC
Persicaria attenuata	Unknown	Native, emergent	No	GC

Species	Common Name	Status, form	Recorded from the Study Area	Source
Phragmites australis	Common reed	Native, emergent	No	
Pontederia cordata	Pickerel weed	Introduced, emergent	Yes	LC
Potamogeton crispus	Curly pondweed	Native, submerged	No	WO
Potamogeton perfoliatus	Perfoliate pondweed	Native, submerged	No	WO
Ruellia simplex, R. tweediana	Ruellia, Mexican bluebell	Introduced, emergent	No	WO
Rumex crispus	Curled dock	Introduced, emergent	No	GC
Vallisneria nana	Ribbon weed	Native, submerged	No	WO

WO indicates record sourced from Wildlife online database search. LC refers to Lagoon Creek field survey, CC refers to Charleys Creek (Hydrobiology 2010), GC refers to Gowrie Creek (Aquateco 2011).

3.2.4 Aquatic Macroinvertebrates

Aquatic macroinvertebrates are commonly used as indicators of the health of a water body. There is large diversity of aquatic macroinvertebrates, with different taxa reacting differentially to environmental stressors. These responses allow for a range of indices to be calculated (e.g. Stream Invertebrate Grade Number Average Level (SIGNAL) from each sample of macroinvertebrates collected and then applied for assessments of different stressors (Negus *et al*. 2014).

The macroinvertebrate community within the receiving environment is not well known. A dry season study in 2008 recorded a total of 31 families/higher level taxa, of which none had local or regional significance. The average signal scores at all four sites were less than 3.5 (Table 3-5), which is indicative of environmental degradation. The low SIGNAL scores of the Condamine basin have been attributed to a range of stressors including river regulation, agriculture, clearing of vegetation and urban development (Hydrobiology 2010).

3.2.5 Macro-crustaceans

The dry season survey in 2008 recorded the freshwater crayfish (*Cherax* spp.) at sites AE1 and AE3, and the Australian freshwater prawn (*Macrobrachium australiense*) at site AE4. Both groups are common and widely distributed in the Condamine catchment, including disturbed aquatic habitats (Hydrobiology 2010).

Table 3-5 Macroinvertebrate presence/ absence and SIGNAL-2 Scores at surveyed sites

Family Name	Site AE1	Site AE2	Site AE3	Site AE4
Hydridae (2)			2	30+
Bithyniidae (3)		2		
Thiaridae (4)	30+			30+
Physidae (1)	1			4
Planorbidae (2)		25		
Lymnaeidae (1)			1	2
Ancylidae (4)				4
Sphaeriidae (5)	3			16
Corbiculidae (5)				1
Atyidae (3)				30+
Parastacidae (4)			4	1
Acarina (6)	1	14		
Baetidae (5)	1	1	15	30+
Caenidae (4)		2		1
Aeschnidae (4)			13	2
Libellulidae (4)		4	2	5
Coenagrionidae (2)		2	30+	30+
Nepidae (3)		2		
Notonectidae (1)	15		30+	30+
Corixidae (2)	30+	7	30+	30+
Pleidae (2)		1		
Psephenidae (6)	1			
Curculionidae (2)		1		
Dytiscidae (2)	3	22	3	1
Haliplidae (2)		2		
Hydrophilidae (2)	1		2	6
Tipulidae (5)		1		
Culicidae (1)			7	1
Chironomidae (3)	13	13	30+	30+
Ceratopogonidae (4)	1		3	
Leptoceridae (6)		30+	30+	30+
No. of Taxa	12	15	16	21
Total Signal Score	41	50	46	65
Av. Signal Score	3.42	3.33	2.88	3.1

3.2.6 Fish

A total of 18 fish species are known or likely to occur within the study area and/or the catchment (Table 3-6). Two of these species, common carp (*Cyprinus carpio*) and eastern gambusia (*Gambusia holbrooki*) were introduced species and are declared pest species under the Fisheries Act 1994. The remaining 16 species are native to the Condamine catchment. One species, the Murray cod (*Maccullochella peelii*), is listed as vulnerable and may occur or may have habitat that occurs within the aquatic ecology study area.

A field survey undertaken during January 2008 recorded two native fish species (spangled perch *Leiopotherapon unicolor* and gudgeon *Hypseleotris* spp.) and one exotic fish species (*Gambusia holbrooki*) in Lagoon Creek. Lagoon Creek fish assemblages would need to tolerant of degraded physical habitat (instream barriers, degraded bed and banks) and water quality conditions, and/or have the capacity to recolonise following creek drying.

Table 3-6 Fish recorded from desktop and field surveys within the study area and the broader catchment

Species	Common Name	Status	Recorded from Study area	Likelihood of occurrence	Sources
Ambassis agassizii	Agassiz's glassfish	Native	No	Unlikely	WO
Carassius auratus	Goldfish	Introduced	No	Likely	CC, WC
Craterocephalus stercusmuscarum	Flyspecked hardyhead	Native	No	Possible	WO, QM, GC
Cyprinus carpio	Common Carp	Introduced	No	Observed	WO, CC, WC, GC
Gambusia holbrooki	Mosquitofish	Introduced	Yes	Observed	WO, LC, CC, GC
Gadopsis marmoratus	River blackfish	Native	No	Unlikely	WO, GC
Hypseleotris spp.	Gudgeon species	Native	Yes	Observed	LC, CC
Hypseleotris sp. 1	Midgley's carp gudgeon	Native	No	Unlikely	WO
Hypseleotris klunzingeri	Western carp gudgeon	Native	No	Unlikely	WO, QM, WC
Leiopotherapon unicolor	Spangled perch	Native	Yes	Observed	WO, LC, GC
Maccullochella peelii	Murray cod	Native, Vulnerable	No	Unlikely	WO
Macquaria ambigua	Golden perch	Native	No	Unlikely	WO
Melanotaenia duboulayi	Crimson spotted rainbowfish	Native	No	Unlikely	WO
Melanotaenia fluviatilis	Murray River rainbowfish	Native	No	Possible	WO, QM
Mogurnda adspersa	Purple-spotted gudgeon	Native	No	Unlikely	

Species	Common Name	Status	Recorded from Study area	Likelihood of occurrence	Sources
Nematalosa erebi	Bony beam	Native	No	Unlikely	
Retropinna semoni	Australian smelt	Native	No	Possible	
Tandanus tandanus	Eel-tailed catfish	Native	No	Unlikely	

Note: WO indicates record sourced from Wildlife online database search, LC refers to the 2008 Lagoon Creek field survey, CC refers to Charleys Creek (Hydrobiology 2010), GC refers to Gowrie Creek (Aquateco 2011)

3.3 Environmental Values

An Environmental Value (EV) is the value placed on the waterbody by the community, as outlined in the Environmental Protection (Water) Policy 2009 (EPP Water). EVs are essentially the goals that the community wants to achieve for their waterways. In 2017, draft EVs for surface waters of the Condamine river basin were released (Newham *et al*. 2017). The receiving environment covered two sub-regions: Central Condamine River (Lagoon Creek) and Upper Myall Creek (Spring Creek). The EVs for the receiving environment are shown in Table 3-7.

Table 3-7 Condamine River Basin Surface Water Environmental Values

Condamine River Basin Sub-Region	Aquatic ecosystems	Irrigation	Farm supply/use	Stock water	Aquaculture	Human consumer	Primary recreation	Secondary recreation	Visual recreation	Drinking water	Industrial use	Cultural, spiritual and ceremonial values
Lagoon Creek												
Central Condamine River	✓	✓	✓	✓		✓				✓	✓	✓
Spring Creek												
Upper Myall Creek	✓	✓	✓	✓		✓						✓

✓ means the Environmental Value is selected for protection. Blank indicates that the Environmental Value is not selected for protection.

3.4 Water Quality Guidelines

Surface water quality guidelines are derived to protect a specific EV of a waterway. They are based on the condition of aquatic ecosystems and the levels of protection provided to those ecosystems.

For the aquatic ecosystem EV, the EPP Water identifies four levels of protection per the current condition of waters: high ecological value, slightly disturbed, moderately disturbed and highly disturbed. In the context of the receiving environments relevant to the REMP, all are classified as moderately disturbed ecosystems. Moderately disturbed ecosystems are defined as waters in which

the biological integrity of the water is adversely affected by human activity to a relatively small but measurable degree. Guidelines have been derived for annual application for base (low) and event (high) flow conditions.

Monthly monitoring will be undertaken until a minimum of two years of data has been collected to establish a statistically robust data set from which site-specific water quality guideline values can be derived. In the interim, water quality guideline values from ANZECC/ARMCANZ (2000) will be used, along with trigger levels prescribed in the EA.

The receiving waters contaminant trigger levels as outlined in the EA and ANZECC/ARMCANZ (2000) are provided in Table 3-8. Consistent with DoEE requirements, default ANZECC/ARMCANZ (2000) guideline values have been adopted, except where no guideline value exists, in which case the EA trigger value has been adopted. The ANZECC/ARMCANZ (2000) guideline value is the same or more conservative than the EA trigger value. Note: At the time of REMP preparation, no default guideline values for stressors in ANZG (2018) were available for the region.

Table 3-8 Water quality guideline values for the receiving environment

Parameter	Units	Water Quality Guidelines			Adopted Guideline Value
		EA[1]	ANZECC/ ARMCANZ (2000)		
		Trigger Levels	95% species protection (toxicity)	Default Trigger Values – SE Australia[2]	
Ammonium N	µg/L	-	-	13	13
Ammonia	µg/L	900	900	-	900
Nitrate	µg/L	1100	700	-	700
Oxidised N	µg/L	-	-	15	15
Total N	µg/L	-	-	250	250
Filterable Reactive P	µg/L	-	-	15	15
Total P	µg/L	-	-	20	20
Chlorophyll-a	µg/L	-	-	NA	NA
Dissolved Oxygen	% saturation	-	-	90-110%	90-110%
	mg/L	-	-	-	-
Turbidity	NTU	-	-	25	25
Suspended Solids	mg/L	To be determined	-	-	-
pH		6.5- 9.0	-	6.5-7.5	6.5-7.5
Electrical Conductivity	µS/cm	700	-	350	350
Sulfate	mg/L	250	-	-	250
Alkalinity	mg/L $CaCO_3$	-	-	-	-
Fluoride	µg/L	2000	-	-	2000
Sodium	µg/L	To be determined	-	-	To be determined

Parameter	Units	Water Quality Guidelines			Adopted Guideline Value
		EA[1]	ANZECC/ ARMCANZ (2000)		
		Trigger Levels	95% species protection (toxicity)	Default Trigger Values – SE Australia[2]	
Petroleum hydrocarbons (C6-C9)	µg/L	20	-	-	20
Petroleum hydrocarbons (C10-C36)	µg/L	100	-	-	100
Aluminium	µg/L	55	55 (if pH>6.5)	-	55 (if pH>6.5)
Arsenic	µg/L	13	13	-	13
Boron	µg/L	370	370	-	370
Cadmium	µg/L	0.2	0.2	-	0.2
Chromium	µg/L	1	1	-	1
Cobalt	µg/L	90	-	-	90
Copper	µg/L	2	1.4	-	1.4
Iron	µg/L	300	-	-	300
Lead	µg/L	4	3.4	-	3.4
Manganese	µg/L	1900	1900	-	1900
Mercury	µg/L	0.2	0.06^	-	0.06^
Molybdenum	µg/L	34	-	-	34
Nickel	µg/L	11	11	-	11
Zinc	µg/L	8	8	-	8
Selenium	µg/L	10	5^	-	5^
Silver	µg/L	1	0.05	-	0.05
Uranium	µg/L	1	-	-	1
Vanadium	µg/L	10	-	-	10

[1] Limits as per Table C5 of the Environmental Authority

[2] Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystem (Upland river), as per Table 3.3.2 and 3.3.3 of the ANZECC/ARMCANZ (2000) guidelines

^ ANZECC/ARMCANZ (2000) guideline values are for 95% species protection, except for mercury and selenium which are 99% species protection as recommended in ANZECC/ARMCANZ (2000)

3.5 In-stream Sediment Quality Guideline Values

Sediment monitoring will be undertaken as part of the REMP, with sampling locations corresponding with the water quality monitoring locations. Table 3-9 summaries the metal and metalloids to be measured at each sampling site together with the Sediment Quality Guideline Values (SQGV) outlined in the Simpson *et al.* (2013).

In accordance with the Simpson *et al.* (2013), concentrations below the corresponding SQGV are considered low risk with no further action required. Concentrations between the SQGV and SQG-High value require background concentrations to be examined. Concentrations above the SQG- High require further investigation into the factors affecting bioavailability.

In addition, distribution of sediment grain size (PSD analyses) will be investigated. Fine sediments (<64 µm in size, such as silts) typically display higher concentrations of metals and metalloids than sediment with larger sized grains (such as sand). This reflects the tendency of most metals and metalloids to blind more readily with finer sediment fractions.

Table 3-9 Sediment monitoring parameters and guideline values

Parameter	Unit	SQGV	SQG- High
Basic characteristics			
Particle Size Distribution (sieve and hydrometer)	µm	-	-
Moisture Content (%)	%	-	-
Metals and Metalloids			
Aluminium	mg/kg	-	-
Arsenic	mg/kg	20	70
Cadmium	mg/kg	1.5	10
Chromium	mg/kg	80	370
Copper	mg/kg	65	270
Lead	mg/kg	50	220
Mercury	mg/kg	0.15	1
Nickel	mg/kg	21	52
Silver	mg/kg	1	4
Zinc	mg/kg	200	410
Boron	mg/kg	-	-
Iron	mg/kg	-	-
Cobalt	mg/kg	-	-
Manganese	mg/kg	-	-
Molybdenum	mg/kg	-	-
Selenium	mg/kg	-	-
Uranium	mg/kg	-	-
Vanadium	mg/kg	-	-
Organics			
Total PAHs	µg/kg	10,000	50,000
TPHs	mg/kg	280	550
BTEX			
Benzene	mg/kg	-	-
Toluene	mg/kg	-	-
Ethylbenzene	mg/kg	-	-
Xylene	mg/kg	-	-

4 Monitoring Program Design

4.1 Sampling Locations

Monitoring will be undertaken at nine locations within Lagoon Creek and two sites within Spring Creek. These sites will include seven sites downstream of discharge points and four sites upstream of discharge points (Figure 4-1).

The downstream sites represent 'test' sites due to mine water discharge activities, while the upstream sites represent 'control' sites as they are located upstream of the New Acland Mine ED discharge sites and have not been previously affected by mine water discharges. Within Lagoon Creek there are three control sites and four test sites. Within Spring Creek there is one control site and one test site.

Lagoon Creek and Spring Creek are intermittent headwater streams that have a 'flashy' flow regime, experiencing short duration flow events lasting for hours to days (Section 3.2.1). Temporary pools form in the channel during non-flow periods, many of which are artificial habitats created by the construction of low earthen 'bunds' within the waterway (i.e. in-channel farm dams).

Note that the two sites in Lagoon Creek Tributary (LT-1 and LT-2) have been included to satisfy conditions of approval but will be difficult to reliably sample as it is dry most of the time. The inclusion of these sites will be subject to future review of this REMP document as described in Section 8. Details of the monitoring locations and parameters to be collected at each monitoring point are provided in 8.

4.1.1 Reference Sites

Reference sites are typically defined as sites that are considered to relatively undisturbed conditions and are used to develop site-specific water quality objectives. It should be noted that the nominated reference sites are not in 'pristine' condition and are influenced by surrounding and upstream catchment users. As outlined in the Queensland Water Quality Guidelines (DERM 2009), good control (reference) sites are difficult to locate and a least disturbed site can be used as an alternative.

4.1.1.1 Adopted Reference Sites

For the purpose of this document, sites L-US1 and S-US1 will serve as 'reference' sites. These reference sites:

- Are representative of aquatic habitat (i.e. high order ephemeral streams with a sandy substrate) and flow conditions found with Lagoon Creek and Spring Creek
- Are located outside the influences of mine waters
- Are lotic features rather than impounded (lentic) waters (i.e. outside farm dams)
- Are relatively undisturbed compared to other sites on these waterways.

The selected reference sites will enable spatial and temporal trends to be separated from those that may have been caused of the release of mine-affected water. A description of these reference sites is provided below.

L-US1

Site L-US1 is located on Lagoon Creek and is an intermittent, first order stream. The aquatic ecosystem is representative of control and test sites further downstream. The surrounding land use is dry land grazing. This site occurs upstream (but outside the impoundment) of a small in-stream farm dam. The site has semi-continuous riparian vegetation with some shading of the waterbody. Emergent macrophytes are present along the banks of the waterway, and macrophyte cover is typically limited to the littoral margins. The bed substrate is comprised of clays and silts.

Where possible, sampling will be undertaken in the main channel of the site when sufficient water is present. Figure 4-2 provides a view of upstream and downstream habitat from November 2015 to October 2018.

S-US1

Site S-US1 is an intermittent (first order) stream on the main channel of Spring Creek. The aquatic ecosystem is representative of the test site on Spring Creek but is unaffected by mine waters. This site occurs upstream (but outside the impoundment) of a small in-stream farm dam. The surrounding land use is predominantly low intensity dry land grazing. The site has limited riparian vegetation and patches of emergent macrophytes are present. Bed sediments are comprised of sandy silts and clays.

In addition, Ecosystem Health Monitoring Program (EHMP) monitoring sites (which includes reference and test sites) will also be used where relevant as a comparative data-set.

4.1.1.2 Alternative Reference Sites Not Adopted

There are no available reference sites upstream of L-US1 and S-US1 on Lagoon and Spring creeks due to lack of pool habitat and/or access constraints.

There is a lack of suitable reference sites in surrounding catchments due to the intensive nature of agricultural activities and associated with this, lack of undisturbed waterways. The Queensland Water Quality Guidelines (DERM 2009) identifies two reference sites exist within a 100km radius of the mine, the closest occurring some 50 from the mine site (Figure 4-1; Table 4-1). Both reference sites have different aquatic ecosystem types to those occurring in Lagoon and Spring Creek (e.g. rocky substrates), and being remote from the mine site, experience different flow conditions. These sites were therefore inappropriate for use as reference sites for the REMP.

4.1.2 Control Sites

As noted, most pools on the subject waterways are artificial habitats created by the construction of earthen bunds by farmers. As these are artificial waterbodies, they do not represent reference sites. For the purposes of this REMP, sites upstream of mine water discharges within impounded waters are considered control sites.

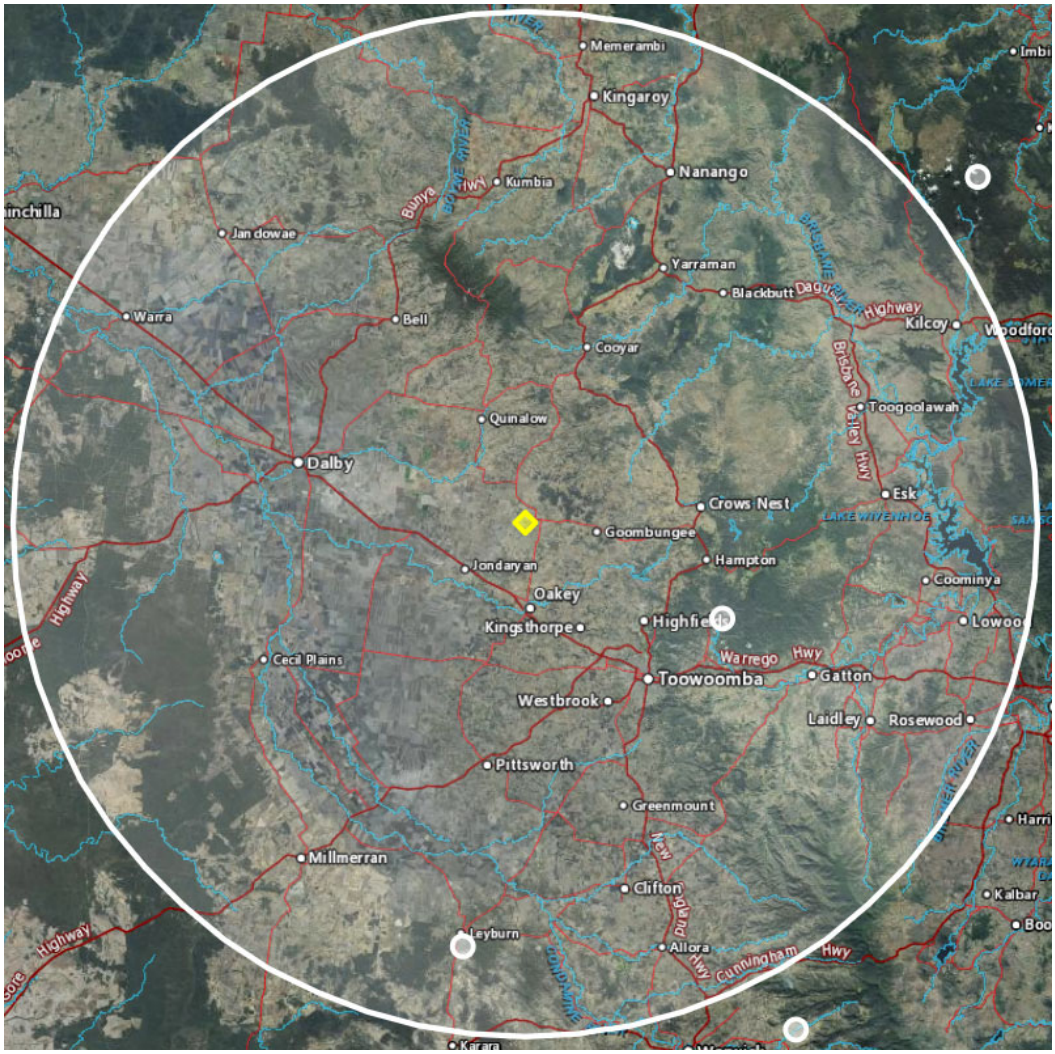


Figure 4-1 QWGC Reference Sites (mine in yellow)

Table 4-1 QWGC Reference Site Details

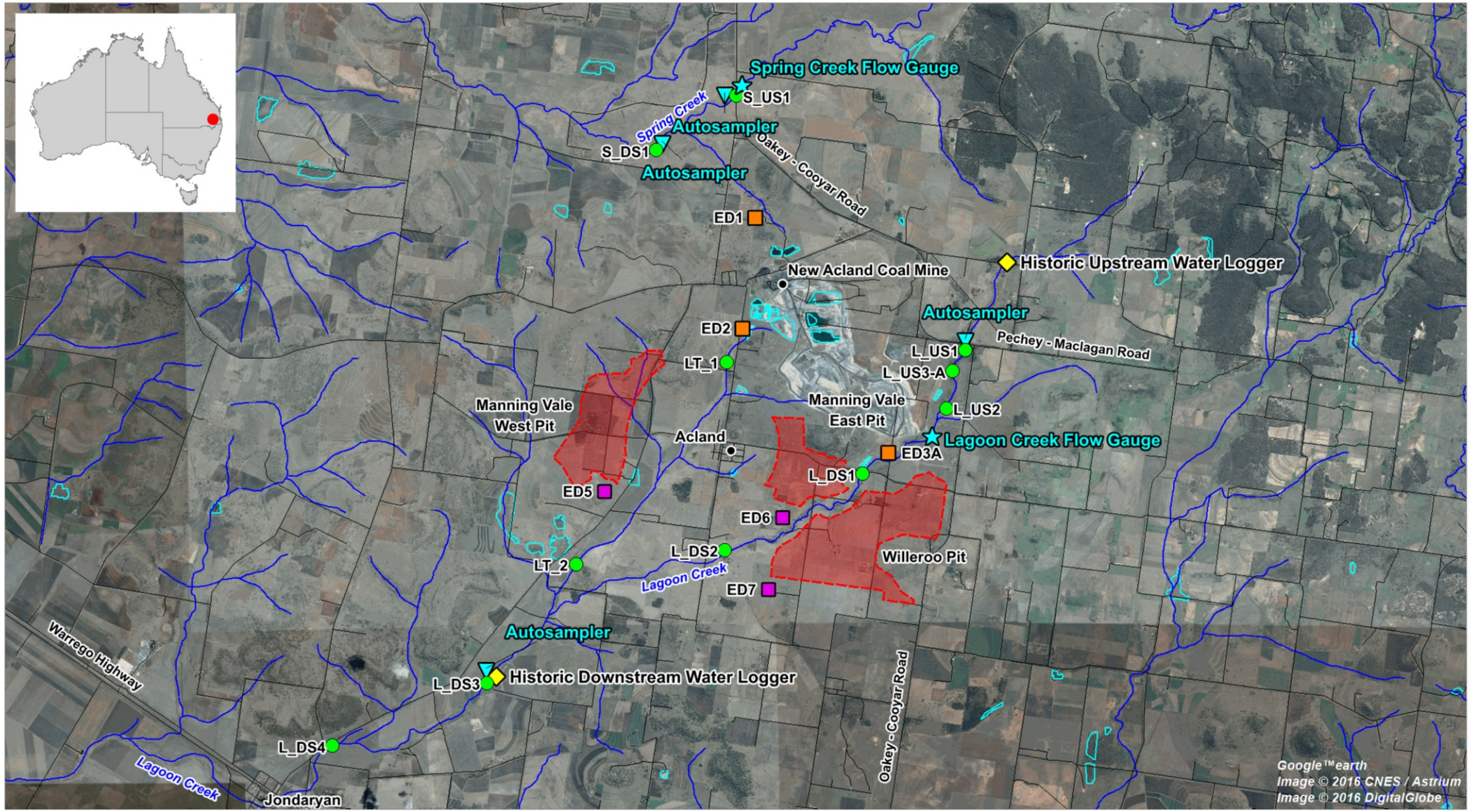
Site Name	Region	Distance From Mine (km)	LAT	LONG
Acland Mine	Murray Darling	-	-27.2906	151.7103
Fifteen Mile Creek at Murphys Creek	Southeast	43	-27.4586	152.0994
Canal Creek at Leyburn	Murray Darling	80	-28.0321	151.5856

Figure 4-2 Site L-US1: Upstream (L column) and downstream (R column) between 2015 - 2018

Table 4-2 Location of sites to be monitored during the REMP (WGS84). Parameter group sampled at the site shown as blue shading (✓)

Site No.	Easting	Northing	Treatment	Parameter group:				Descriptors:				
				Water quality (grab, in-situ) and sediment quality	Water quality (auto-sampler)	Invertebrates incl. crustaceans	Fish	Mine affected	Stream order	Hydraulic habitat/ Aquatic ecosystem type	Land use	Other human disturbance
Lagoon Creek												
L-US1	375285	6981190	Reference	✓	✓	✓	✓	>2km u/s of mine discharges and runoff	1st order (headwater)	Main channel Lotic: ephemeral stream	Agriculture (grazing) – predominantly cleared	No upstream extractive industries, urban areas, point source discharges, water infrastructure
L-US2	374889	6979973	Control	✓		✓	✓	>500 m u/s of mine discharges and runoff	1st order (headwater)	Main channel Lotic/lentic: ephemeral stream/ permanent waterbody created by earthen bund	Agriculture (grazing) – predominantly cleared	No upstream extractive industries, urban areas, point source discharges, water infrastructure
L-US3-A[1]	375017	6980749	Control	✓		✓	✓	>2km u/s of mine discharges and runoff	1st order (headwater)	Main channel Lotic/lentic: ephemeral stream/ permanent waterbody created by earthen bund	Agriculture (grazing) – predominantly cleared	No upstream extractive industries, urban areas, point source discharges, water infrastructure
L-DS1	373136	6978581	Test	✓		✓	✓	Receiving environment of ED3A	2nd order (headwater)	Main channel Lotic: ephemeral stream	Agriculture (grazing), mining – predominantly cleared	No other upstream extractive industries, urban areas, point source discharges, water infrastructure
L-DS2	370330	6976955	Test	✓		✓	✓	Receiving environment of ED3A	1st order (headwater)	Main channel Lotic/lentic: ephemeral stream/ permanent waterbody created by earthen bund	Agriculture (grazing) – predominantly cleared	No other upstream extractive industries, urban areas, point source discharges, water infrastructure
L-DS3	365319	6974268	Test	✓	✓	✓	✓	Receiving environment of ED2 and ED3A	3rd order	Main channel Lotic: ephemeral stream	Agriculture (grazing) – predominantly cleared	No other upstream extractive industries, urban areas, point source discharges, water infrastructure
L-DS4	362117	6972946	Test	✓		✓	✓	Receiving environment of ED2 and ED3A	3rd order	Main channel Lotic: ephemeral stream	Agriculture (grazing) – predominantly cleared	No other upstream extractive industries, urban areas, point source discharges, water infrastructure
Lagoon Creek Tributary [2]												
LT-1	370289	6980833	Test	✓		✓	✓	Receiving environment of ED2	1st order (headwater)	Main channel Ephemeral stream	Agriculture (grazing) – predominantly cleared	No other upstream extractive industries, urban areas, point source discharges, water infrastructure
LT-2	367305	6976742	Test	✓		✓	✓	Receiving environment of ED2	1st order (headwater)	Main channel Ephemeral stream	Agriculture (grazing) – predominantly cleared	No other upstream extractive industries, urban areas, point source discharges, water infrastructure
Spring Creek												
S-US1	370485	6986418	Reference	✓	✓	✓	✓	>4km u/s of mine discharges and runoff	2nd order (headwater)	Main channel Lotic: ephemeral stream	Agriculture (grazing) – predominantly cleared	No upstream extractive industries, urban areas, point source discharges, water infrastructure
S-DS1	368858	6985345	Test	✓	✓	✓	✓	Receiving environment of ED1	2nd order (headwater)	Main channel Lotic: ephemeral stream	Agriculture (grazing) – predominantly cleared	No other upstream extractive industries, urban areas, point source discharges, water infrastructure

1 Previous REMP surveys have shown that site L_US3 has not been a reliable monitoring location due to a lack of water at time of sampling. During the most recent survey undertaken in October 2018, site L_US3-A was used instead. Site L_US3-A is upstream of sites L_US2 and however it was chosen as it has similar site features representative of L_US3. 2 Sites LT-1 and LT-2 have been included to satisfy conditions of approval but may be difficult to sample as the tributary is dry most of the time. The inclusion of these sites will be subject to future review of this REMP document.



LEGEND

- Existing Environmental Dam
- Proposed Environmental Dam
- Monitoring Sites
- Stage 3 Pit Area
- Watercourse
- Waterbody
- Historic Water Level Logger
- Flow Gauging Station
- Event-based (Autosampler)

Title:

Discharge Points and Monitoring Sites

Figure: 4-3

Rev: A

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0km 2 4

Approx. Scale

BMT

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4.2 Monitoring Programs

4.2.1 Monthly Water Quality Monitoring

In addition to the bi-annual monitoring outlined below, monthly water quality monitoring is also to be undertaken. Given the ephemeral and disconnected nature of the receiving environment, water quality has the potential to change temporally and spatially within pools. As outlined in the Queensland Water Quality Guidelines (QWQGs), ephemeral streams exhibit a high level of natural variability in water quality, due to the irregularity and intensity of flow/rainfall events (DERM 2009). As the stream flow decreases, streams become a series of disconnected water bodies, as typified in Lagoon and Spring Creek. Thus, the water quality at each monitoring site may become less dependent on the upstream water quality and more dependent on local effects. The smaller the water body, the more significant these effects may be. Different water quality parameters are affected more than others, with dissolved oxygen and pH much more variable during stagnant conditions (DERM 2009).

Therefore, monthly water quality monitoring will be undertaken at each of the nine sites within Lagoon Creek and at the two sites within Spring Creek. Monthly water quality monitoring will allow these variable conditions to be captured and will provide a baseline against which potential impacts associated with the mine-affected water releases can be assessed. The monthly monitoring will be undertaken until a minimum of two years of data has been collected to establish a statistically robust data set from which site-specific water quality objectives (or guidelines) can be derived.

4.2.2 Bi-annual Biological Monitoring

Biological sampling (fish and macroinvertebrates) will occur on a bi-annual basis: pre-release and post-wet season. The exact timing of the sampling is dependent on the timing of the wet and dry seasons which can vary annually. The pre-release sampling will take place at the start of the wet-season prior to any discharges from the mine, typically around October/November. The post-wet season sampling will take place once all mine-affected water releases have ceased at the end of the wet season, typically around May.

Monitoring will take place at control (reference) sites (L-US1, L-US2, L-US3 and S-US1) and test sites (L-DS1, L-DS2, L-DS3, L-DS4, LT-1, LT-2 and S-DS1).

4.2.3 Bi-annual Water Quality and Sediment Quality Monitoring

Water quality and sediment quality monitoring will be performed bi-annually at the same 11 sites as the pre-release and post-release biological monitoring. In addition, field observations such as nature of flow (i.e. low, medium, high), weather conditions and other notable observations will be recorded.

In addition to the biological monitoring sites, water quality monitoring will also take place at the existing environmental dams (ED1, ED2 and ED3A) during pre-release and post-wet season REMP surveys. The EDs will also be monitored monthly by NAC staff for basic water quality parameters. The proposed EDs (ED5, ED6 and ED7) will be monitored similarly once constructed.

4.2.4 Stream Flow Monitoring

The Queensland Government does not operate stream gauges near the New Acland Mine site. There are four gauges in current operation in the vicinity of the catchment on Oakey and Gowrie Creek (Table 4-4). All four flow gauges either have significantly larger catchment areas or have upstream catchments significantly different to that of Lagoon Creek and Spring Creek.

Since 2007, NAC has operated two surface water level loggers on Lagoon Creek, enabling flows to be estimated (, Table 4-4). Due to the ephemeral nature of the creek with long periods of zero depth records, Lagoon Creek has only recorded stream flow approximately once per year.

In addition to the historic water level data measured and recorded from the NAC water loggers, flow gauging stations will be installed in Spring Creek and Lagoon Creek at sites upstream of the mine water discharges. These locations are included in Table 4-5 and shown in .

Stream flow data will be used in the interpretation of the water quality, sediment quality and biological indicators results.

Table 4-3 Qld Government stream flow gauge details

Gauge Number	River Name	Catchment Area (km^2)	Open- Closed	Location (degrees S)	Location (degrees W)
422326A	Gowrie Creek at Cranley	47	1969- present	27.52	151.94
422332B	Gowrie Creek at Oakey	142	1992- present	27.47	151.74
422350A	Oakey Creek at Fairview	1970	1980- present	27.30	151.28
422333A	Condamine at Loudoun Bridge	12380	1969- present	27.22	151.18

Table 4-4 Historic water level logger locations at Lagoon Creek

Water Logger	Location	
	Latitude	Longitude
Upstream Lagoon Creek	$27^0$16’12.78” S	$151^0$44’45.46” E
Downstream Lagoon Creek	$27^0$20’53.85” S	$151^0$38’18.91” E

Table 4-5 NHG flow gauge stations at Lagoon Creek and Spring Creek

Flow Gauge	Location	
	Latitude	Longitude
Upstream Lagoon Creek	$27^0$16’12.78” S	$151^0$44’45.46” E
Upstream Spring Creek	$27^0$14’18.22” S	$151^0$41’32.76” E

4.2.5 Event-Based Water Quality Sampling

Event-based water quality monitoring stations (automatic samplers) will be located at two upstream sites and two test sites (refer to):

- Reference site S_US1 on Spring Creek.
- Reference site L_US1 on Lagoon Creek.
- The downstream reaches of Lagoon Creek near site L-DS3. This location is downstream of all mine water discharge locations in the Lagoon Creek catchment.
- The downstream reaches of Spring Creek near site S-DS1. This location is downstream of all mine water discharge locations in the Spring Creek catchment.

Note that the event-based water quality monitoring station in Spring Creek may be difficult to install due to landowner access issues. The inclusion of this station will be subject to future review of this REMP document as described in Section 8.

The stations will consist of an automatic sampler interfaced with a flow meter. The automatic samplers will be set to begin sample collection once flow is detected following a rainfall event and will continue to collect samples at regular intervals throughout the flow event hydrograph.

To ensure sample integrity (i.e. holding times met), samples will be collected by from the auto-sampler device environment personnel within two days of the commencement of the flow event, where safe to do so. If the flow event extends for greater than two days, samples will be collected at two-day intervals. Samples collected will be homogenised in a single composite sample (for each two-day period) and transferred to relevant laboratory sample bottles. Samples will be sent to a NATA accredited laboratory for analysis of the following parameters:

- Total suspended solids
- Total dissolved solids
- Electrical conductivity
- Total nitrogen
- Total phosphorus
- NOx
- Total metals/metalloids (general suite)
- Oil and grease.

This suite represents the contaminants of potential concern (see Section 2.2). The monitoring stations will be checked and serviced following each sampling event and on a monthly basis.

4.2.6 Weather Monitoring

The Oakey Aero (041359) monitoring station is located approximately 14 km south of the mine. Daily minimum and maximum temperature can be sourced from this station, along with wind data. In the event of an unexplained anomaly in water quality (after comparison with stream flow, rainfall,

discharges etc.), temperature and wind data will be sourced and analysed to aid in the interpretation of the anomaly in water quality data.

4.2.7 Summary of REMP Monitoring Program

A summary of the REMP monitoring program is outlined in Table 4-6.

Table 4-6 Summary of the proposed REMP monitoring

Parameter		Sampling site	Sampling Frequency
Basic suite	pH, EC, TSS sulphate (SO4)	Existing EDs (ED1, ED2, ED3A) Proposed EDs once constructed (ED5, ED6, ED7)	Monthly
	pH, EC, TSS sulphate (SO_4), temperature, flow rate		As soon as practical prior to, at least daily during and immediately after any release to waters from this point
Water Quality			
Physio-chemical	Temperature, pH, EC, DO, Turbidity, pH	Existing EDs (ED1, ED2, ED3A) Proposed EDs once constructed (ED5, ED6, ED7) Control (reference) sites: L-US1, L-US2, L-US3, S-US1 Receiving Environment/ Impact sites: L-DS1, L-DS2, L-DS3, L-DS4, LT-1, LT-2, S-DS1.	• Pre-release and post-wet season at all sites • Monthly at receiving water sites only (L-US1, L-US2, L-US3, S-US1, L-DS1, L-DS2, L-DS3, L-DS4, LT-1, LT-2, S-DS1)
Nutrients	Total nitrogen, NOx (oxides of N), Ammonium (NH4+), Ammonia (NH3), Dissolved inorganic nitrogen (DIN), Organic N, Total phosphorus, Filterable reactive phosphorus		
Major Cations and Anions	Cations: calcium, potassium, magnesium, sodium Anions: chlorine, sulphate, carbonate, bicarbonate		
Contaminants	Total and dissolved (filtered) metals (Al, Cd, Cr, Cu, Fe, Hg, Pb, Ni, Zn, B, Co, Mn, Mo, Se, Ag, U, V) and metalloids (As), fluoride, petroleum hydrocarbons (C6-C9) (C10-C36), recoverable hydrocarbons, BTEX, polycyclic aromatic hydrocarbons (PAH)		
Biological	Chlorophyll-*a*		
Other	TSS, Total fluoride, water hardness		
Event-Based Water Quality (Autosamplers)			
TSS, TDS, EC, total nitrogen, total phosphorus, NOx, total metals (Al, Cd, Cr, Cu, Fe, Hg, Pb, Ni, Zn, B, Co, Mn, Mo, Se, Ag, U, V) and metalloids (As), oil and grease		L-US1, L-DS3, S-US1 and S-DS1	During flow events in Lagoon Creek and Spring Creek
Sediment Quality			
Contaminants	Total metals (Al, Cd, Cr, Cu, Fe, Hg, Pb, Ni, Zn, B, Co, Mn, Mo, Se, Ag, U, V) and metalloids (As), petroleum hydrocarbons (C6-C9) (C10-C36), recoverable	Receiving Environment/ Impact sites: L-DS1, L-DS2, L-DS3,	Pre-release and post-wet season

Parameter		Sampling site	Sampling Frequency
	hydrocarbons, BTEX, polycyclic aromatic hydrocarbons (PAH)	L-DS4, S-DS1. Control (reference) sites: L-US1, L-US2, L-US3, LT-1, LT-2, S-US1	
Physical	Particle Size Distribution (PSD)		
Biological Indicators			
Fish, macro-crustaceans	Richness and abundance of fish and macro-crustaceans	Receiving Environment/ Impact sites: L-DS1, L-DS2, L-DS3, L-DS4, LT-1, LT-2, S-DS1. Control (reference) sites: L-US1, L-US2, L-US3, S-US1	Pre-release and post-wet season
Macro-invertebrates	Aquatic macroinvertebrates identified to the lowest practical taxonomic level (family or order)	Receiving Environment/ Impact sites: L-DS1, L-DS2, L-DS3, L-DS4, LT-1, LT-2, S-DS1. Control (reference) sites: L-US1, L-US2, L-US3, S-US1	Pre-release and post-wet season

5 Sampling Methodology

5.1 Water Quality Sampling Methods

All in-situ water quality measurements will be performed in accordance with DERM (2009) and/or relevant Australian standards (AS/NZS 5667.1:1998 Water Quality Sampling). At each site for each sampling event, in-situ measurements of physio-chemical characteristics of the water column will be collected using a calibrated water quality instrument. Samples will also be collected for laboratory analysis for a range of parameters. The parameters that will be recorded at each sampling site are shown in Table 5-1.

Water samples will be collected at an approximate depth of 30 cm in a representative area of each site by hand or by a sampling pole with clamp if required for safety reasons. Samples requiring field filtration (e.g. dissolved metals) will be filtered through a 0.45 µm filter on-site, and the supernatant will be retained for analysis.

Table 5-1 Summary of the surface water quality sampling parameters

Water Quality Type	Parameter	Units
In-situ parameters		
Physio-chemical	Temperature	(°C)
	Electrical conductivity	µS/cm and mS/cm
	Salinity	ppt
	Dissolved oxygen	(% saturation
	Dissolved oxygen	mg/L
	Turbidity	NTU
	pH	
Analytical parameters		
Major Ions	Cations: calcium, potassium, magnesium, sodium	mg/L
	Anions: chlorine, sulphate, carbonate, bicarbonate	mg/L
Nutrients	Total nitrogen	mg/L
	Ammonia	mg/L
	Nitrate	mg/L
	Nitrite	mg/L
	Total phosphorus	mg/L
	Filterable reactive phosphorus	mg/L
Metals (total and dissolved)	Aluminium	µg/L
	Arsenic	µg/L
	Boron	µg/L
	Cadmium	µg/L
	Chromium	µg/L

Water Quality Type	Parameter	Units
	Cobalt	µg/L
	Copper	µg/L
	Iron	µg/L
	Lead	µg/L
	Manganese	µg/L
	Mercury	µg/L
	Molybdenum	µg/L
	Nickel	µg/L
	Selenium	µg/L
	Silver	µg/L
	Uranium	µg/L
	Vanadium	µg/L
	Zinc	µg/L
Others (analytical)	Total suspended solids (TSS)	mg/L
	Total fluoride	mg/L
	Water hardness	mg/L
	Total Petroleum Hydrocarbons	µg/L
	Total Recoverable Hydrocarbons	µg/L
	BTEX	µg/L
	Polycyclic aromatic hydrocarbons (PAH)	µg/L

5.1.1 Sample Handling and Storage

Samples will be collected and transported in appropriately pre-treated samples bottles supplied by the analytical laboratory. Correct sample volumes for each parameter with be collected using the appropriate sampling bottle. Sample containers will be labelled with a waterproof xylene-free marker pen on the containers label and lid. The site number, name of the collector, time and date will be included on the label.

Furthermore, field replicate and laboratory split samples will be labelled with numbers/ names that do not relate to the sampling location names.

Clean, power free gloves will be used for samples collection and discarded after collection of each sample. All storage containers will be chilled on ice (4°C) immediately following collection and during transport to the chosen laboratory (same day, otherwise transferred to refrigerator). The samples requiring freezing will be placed in the freezer at the completion of the day's sampling. Storage requirements and holding times are specified in the Queensland Monitoring and Sampling Manual 2009 (DERM 2009).

Accurate chain of custody forms will be maintained for samples. The form will identify the all samples numbers, the respective analyses and limits or reporting (LORs) required for analysis. All samples

will be submitted to the analytical laboratory as a single batch to minimise the chance for misplaced or misdirected freight.

5.1.2 Quality Assurance and Quality Control

Sampling will be undertaken in accordance with AS5667 Water Quality Sampling and in accordance with the Queensland Monitoring and Sampling Guidelines 2009 (DERM 2009). In summary, quality control during the sampling will be ensured by:

- Using suitably qualified and competent staff experienced in water quality sampling.
- Calibrating water quality probes prior to the commencement of sampling with calibration records kept.
- Cleaning water quality probes between sites, with the instrument stored within appropriate case and probe kept moist.
- Collecting water samples straight into the sample jar whenever possible and not rinsing bottle prior to sample collection.
- Ensuring staff wear nitrile gloves while processing samples with gloves changed between samples to avoid cross-contamination.
- Using a container thoroughly rinsed with ambient site water to reduce contamination risk if the sample cannot be collected straight into the sample jar.
- Following specific sampling procedures, including the provision of field trip blanks, field replicates and field duplicates.
- Storing samples in appropriately cleaned, pre-treated and labelled sample containers.
- Chilling samples (4°C) after sampling and during transport, storing in eskies with pre-frozen ice bricks and ice. Samples to be delivered to the laboratory within the appropriate holding times in accordance with the security and transport protocols outlined in the Queensland Monitoring and Sampling Manual (DERM 2009).
- Maintaining an accurate chain of custody form for sediment samples collected from the project area. The form would identify all sample numbers and the respective analysis and practical quantitation limits required for analysis.
- Analysing samples at a NATA accredited laboratory. The laboratory practical quantitation limits (PQLs) should be sufficient to enable any exceedances of the Queensland Water Quality Guidelines (2009) and ANZECC/ARMCANZ (2000) guideline limits to be detected (where available).

The Australian standard for Water Quality Sampling AS5667 and ANZECC/ARMCANZ (2000) guidelines provide details on the number of recommended field and laboratory blanks and replicate samples for monitoring programs. Table 5-2 provides a summary of the quality assurance samples that have been adopted for the REMP.

Table 5-2 Water quality QA/QC and replication requirements

QA/QC Sample type	Quantifies contamination from	Action in the laboratory	Action in the field	Number of samples recommended by guidelines
Trip blanks	Contamination during transport of samples when analysing for volatile substances (such as hydrocarbons)	Section of three identical sample containers, which are filled with distilled water. One remains at the laboratory as a control sample whilst two are taken into the field	Transport blank to be carried in the cooler with other samples. No actions required in the field, return to laboratory for analysis	Once per monitoring event
Field blanks	Sample contamination from sampling personnel, equipment, or the atmosphere	None	samples taken in the field using laboratory supplied solution which is placed into sample containers the same way as normal samples (i.e. using sampling equipment such as the sample pole, syringes and filters)	Once per monitoring event
Rinsate blanks	Equipment decontamination and sample handling procedures	None	Wash sampling equipment as required. Collect final rinse water as the blank	No specific recommendation
Intra-laboratory duplicates	Variability of analysis within laboratory	None	Samples split into two sub-subsamples and tested as separate (blind) samples by the primary laboratory	10% of monitoring sites
Inter-laboratory duplicates	Variability of analysis between laboratories	None	Samples split into two duplicate sub-samples and tested as separate (blind) samples by the primary and second independent laboratory	5% of monitoring sites

5.2 Sediment Quality Sampling Methods

Sediment monitoring will be undertaken in conjunction with water quality monitoring, with stream sediments analysed for the parameters provided in Table 3-9 and particle size distribution.

Samples will be provided to a NATA registered laboratory and the laboratory practical quantitation limits (PQLs) set out in Table 1 of DEWHA (2009) should be at least lower than sediment quality (SQG-Low) guideline values (Simpson *et al.* 2013).

Surface sediment samples (upper 30 cm of the sediment column) will be collected using a plastic trowel from several representative locations at each sampling site. Each sample will initially be emptied into a plastic tray to allow photography of the sample. Details of the field texture (sandy, silty, gravel etc.), sediment colour and sediment odours will be recorded.

All sampling equipment will be thoroughly cleaned using decontaminating solution and rinsed in freshwater prior to use. The trowel and tray will be thoroughly cleaned and rinsed with site water between samples to prevent sample cross contamination.

Samples will be thoroughly homogenised and transferred to appropriately cleaned, pre-treated and labelled sample containers provided by an accredited laboratory. The quantity of sediment material removed at each location will be sufficient to ensure that sediment is available for further testing or analysis (i.e. above SQG-Low which triggers further investigations). The analytical laboratory is required to provide sample storage (in appropriate containers) for at least three months following the receipt of samples. The sample labels will include location, site and sample number as well as the time of sample collection.

All samples will be chilled on ice (4°C) immediately following sample collection and during transport. Samples will then be couriered to the analytical laboratories within holding times. Interim refrigerated storage will be provided for all samples whilst waiting to be transported to the laboratory.

5.2.1 Quality Control and Assurance

Field sampling will be undertaken by a qualified and competent person in accordance with the most recent version of AS5667.1 Guidance on Sampling of Bottom Sediments and Simpson *et al*. (2005). In summary:

- Using sampling equipment that is thoroughly inspected and washed down, prior to the beginning each survey.
- Following specific sampling procedures, including the provision of field trip blanks, field replicates and field duplicates.
- Ensuring staff wear nitrile gloves while processing samples with gloves changed between samples to avoid cross-contamination.
- Storing samples in appropriately cleaned, pre-treated and labelled sample containers.
- Chilling samples (4°C) after sampling and during transport, storing in eskies with pre-frozen ice bricks and ice. Samples to be delivered to the laboratory within the appropriate holding times in accordance with the security and transport protocols outlined in DERM (2009).
- Maintaining an accurate chain of custody form for sediment samples collected from the project area. The form would identify all sample numbers and the respective analysis and practical quantitation limits required for analysis.
- Analysing samples by a NATA accredited laboratory.
- Collecting QA/QC samples at each sampling event as follows:

- Laboratory blank - for each sampling event one laboratory blank will be collected. The purpose of this assessment is to monitor a potential laboratory contamination of samples due to potential cross-contamination of samples during laboratory preparation, extraction or analysis.
- Split duplicate sample – one split sample will be taken each sampling event, were a sample is separated in the field and both samples sent to the laboratory for analysis.
- Field replicates – triplicate samples will be collected from one site during each sampling event.

5.3 Biological Indicator Sampling Methods

5.3.1 Aquatic Macroinvertebrates

5.3.1.1 Sampling Methods

Aquatic macroinvertebrate sampling procedures will be undertaken in accordance with the Queensland AusRivAS (Australian Rivers Assessment) sampling protocol (DNRM 2001). Three replicate macroinvertebrate samples will be collected from the edge habitat type at each site. This level of replication has been found to provide a robust means for assessing intra-site spatial variability in aquatic macroinvertebrate communities in intermittent streams (WBM 2005).

Macroinvertebrate samples should only be compared between sites if they are collected from the same aquatic habitat type, as each habitat supports unique macroinvertebrate assemblages (Humphries *et al*. 1996). Comparing assemblages from different habitat types may be confounded by the differences between habitats (Parsons and Norris 1996). Due to insufficient pool/riffle habitat within the study area, only edge habitat will be sampled. Edge habitat is defined as an area along the bank with minimal or no current, with trailing terrestrial vegetation and/or exposed tree roots.

Samples will be collected using a triangular sweep-net (250 x 250 x 250 mm; 25 µm mesh). The sweep net will be thoroughly cleaned and rinsed between samples. Macroinvertebrates communities will be surveyed during the pre-release and post-wet season, in conjunction with water and sediment quality and fish sampling. For safety and data integrity, surveys will not be undertaken during or within two weeks following flood events.

5.3.1.2 Field Sampling Handling and Storage

The material collected will be retained and placed into a 600 ml plastic screw-top container. All remaining material on the sieve will be carefully washed using ambient creek water into the container. In cases when retained sample cannot fit in to a single container, two (or more) containers may be used.

Containers will be labelled on the lid and the side of the container using a waterproof permanent maker. A water-proof label will also be placed inside each sample container. The sample labels will contain the following details:

- Location, site and replicate sample number.
- Job name and number.
- Date and time of sample collection.

The sample will be preserved in 70% ethanol solution and transferred to an appropriate storage container.

5.3.1.3 Laboratory Sorting and Identifications

Samples will be passed through a 25 µm sieve. The retained material will be spread over a shallow tray and animals will be picked from detrital and inorganic material for a standard 60-minute period. An illuminated Magilamp or similar will be used to assist with sample picking.

All picked animals (including parts of animals) will be placed in a sample vial containing 70% ethanol solution. In cases where all organisms cannot fit into a single vial, two (or more) vials may be used. A label will be placed inside each sample vial and will contain the following details (as taken from the label containing the unsorted sample):

- Location, site and replicate sample number.
- Job name and number.
- Date and time of sample collection.
- Number of vials used for each sample, using a sequential numbering system (i.e. 1 of 1, 1 of 3 etc.).

The field sample and field collections logs will be consulted to ensure that all collected samples listed in the log are accounted for.

Binocular and/or dissecting microscope techniques will be used to identify fauna to the lowest practical taxonomic level outlined by DNRM (2001) and Chessman (2003). In most cases, this should be to sub-family (chironomid larvae) or family level, although higher taxonomic levels may be used for taxa that are difficult to identify (e.g. Oligochaeta worms).

All taxa will be counted in each sample. In some cases, particularly fragile organisms like worms may break. Only the head of broken animals will be counted.

5.3.1.4 Quality Control and Quality Assurance

Quality control during sampling will be ensured by:

- Using suitably qualified (AusRivAS trained) and competent staff experienced in macroinvertebrate sampling.
- Following specific sampling procedures outlined in the Qld AusRivAS guidelines.
- Using appropriately cleaned, pre-treated and labelled containers to store samples.
- Completing a check list to ensure all samples are collected.
- Retaining 10% of the sorted sample residue to assess sorting efficiency.
- Compiling and storing a reference collection of each taxon identified.
- Comparing and cross-referencing voucher specimens with specimen with confirmed identifications.

- Retaining and storing all samples in ethanol solution for at least five years.
- Entering all data into a database. The database will have a set of standard operating procedures, and should contain, as a minimum, the following fields:
  - Sample data (site and location details, data type, etc.).
  - Ambient environment data (water depth, sediment characteristics, other data).
  - Fauna data (number of individuals in each sample).
  - Taxonomic data (standard taxa codes for each taxa, family, class, order and phylum of each taxon).

5.3.2 Fish Monitoring

5.3.2.1 Sampling Methods

Fish community structure will be sampled using the following sampling apparatus:

- Backpack electro-fisher - Output power will be standardised to electrical conductivity of waters to ensure that only enough power will be used to temporarily stun fish. Pulsed DC current will be fixed at a pulse rate of 60 Hz and a duty cycle of 25%. Samples will be collected in pools and other suitable habitat types for 600 seconds of pulse time. Backpack electro-fishing will be undertaken in shallow areas (<1m deep) due to safety issues of operating equipment in deeper waters. Fish will be collected using a dip net and will be retained in temporary storage buckets until all electro-fishing is completed to avoid potential recapture.
- Baited box traps (0.5 mm mesh) - baited box traps will be used at all sampling sites and represent a key technique for capturing small bodied species. Ten collapsible, baited fish traps will be deployed across a range of microhabitats types present, with traps deployed for approximately two hours.
- Push seine (3m long, 2m high, 5mm stretched mesh) - a push seine net will be used to sample small bodied fish. Numerous hauls will be undertaken within each microhabitat types present, depending on channel dimensions and the number of snags present.
- Scissor seine net (2m long, 2 m drop, 0.5 mm mesh) - a scissor seine net will be used to sample small fish. Three 10 m hauls will be conducted in each microhabitat at each site where waterway dimensions permit.
- Beach seine net (70 m long, 2 m high and 18mm mesh) – techniques will be used to sample large open areas of water, targeting larger bodies species. Numerous hauls will be undertaken, which would be dependent on the waterbody dimensions.

Note, backpack electrofishing and baited traps are the preferred methods for targeting fish and macro crustaceans and should be attempted at all sites. Nets should be used at sites where electrofishing returns on fish are low or is not considered possible or appropriate. At sites where nets are required three replicated hauls should be undertaken in representative habitats using a variety of net types.

5.3.2.2 Sample Handling and Storage

The catch from each sampling method will be placed into plastic tubs, identified to species and counted, and later released. The following will be recorded in each sample:

- Number of species caught.
- Abundance of each species in the catch.
- Size distribution, as lengths.
- % of external lesions, abnormalities and parasites.

All data (counts of each species for each method) will be transcribed onto pre-printed pro-forma sheets. Identifications and nomenclature will follow Allen *et al*. (2002). Species that cannot be identified in the field will be euthanized and returned to the laboratory for identification. Any exotic species captured will be euthanized in accordance with appropriate animal ethics procedures.

5.3.2.3 Quality Control and Quality Assurance

All fish monitoring will be undertaken in accordance with regulator permits (i.e. General Fisheries Permit, Animal Ethics Approval and Scientific Purpose Permit) and under the requirement of the Australian Code of Electrofishing Practice. Quality Control during sampling will be ensured by:

- Using suitably qualified and competent staff experienced in fish sampling.
- Following specific sampling procedures outlined in the Queensland Monitoring and Sampling Manual 2009 (DERM 2009) and any condition under the operators fisheries and ethnics permits.
- Using appropriately cleaned, pre-treated and labelled sample containers to collect and store samples.
- Compiling a list of collected reference specimens.

6 Data Analysis

6.1 Stream Flow Monitoring

Due to the absence of gauging stations within the proximity of the New Acland Mine site, data regarding the stream flow will be gathered from NAC's flow gauging stations on Lagoon Creek and Spring Creek. The annual and seasonal patterns in the flow in the receiving environment will be identified and discussed. Rainfall data from the closest BoM station will also be incorporated and discussed.

6.2 Monthly Water Quality Data

Water quality data collected during monthly water quality sampling will be compared between sites (i.e. test sites compared to control sites) and to the water quality trigger values presented in Section 3. In the event of an exceedance of a trigger value, the management actions and reporting outlines in Section 7.1 will be undertaken.

6.3 Bi-annual Water Quality

Water quality data collected from each monitoring site will be compared between sites (i.e. test sites compared to control sites) and to the water quality guidelines presented in Section 3. Water quality data will also be compared to data collected during previous REMP surveys.

Standard descriptive statistics for water quality monitoring points will be summarised in tables. Piper diagrams should be used, where appropriate, to infer potential impacts of discharge mine-affected water. A discussion on the water quality data relating to the sediment quality and biological data will also be presented.

6.4 Bi-annual Sediment Quality

Sediment quality data collected from each monitoring site will be compared between sites and to the sediment quality guideline values presented in Section 3. Sediment quality data will also be compared to data from previous REMP surveys.

Standard descriptive statistics for sediment quality monitoring points will be summarised in tables. A discussion on the sediment quality data relating to the water quality and biological data will also be presented.

6.5 Bi-annual Biological Parameters and Indicators

6.5.1 Aquatic Macroinvertebrates

The following stream condition parameters will be generated for each sample:

Taxa Richness

Taxa richness is a measure of the number of types of organisms within a sample. Generally, the more favourable the ecological conditions the more taxa will be present (Hannaford and Resh 1995; Sorvell and Vondracek 1999). Samples with high taxa richness are typically indicative of a healthier aquatic ecosystem than samples with few taxa.

SIGNAL Index

The taxonomic composition of macro-invertebrate communities is often used to determine the 'health' of waterbodies. The SIGNAL (Stream Invertebrate Grade Number Average Level) index was developed by Chessman (1995) as a rapid bio-assessment method for water pollution. Most macro-invertebrate families have been assigned a SIGNAL grade number (Chessman 1995, Chessman 2001, Chessman *et al*. 1997), based on the known tolerance of the taxa to water pollution. The SIGNAL grade numbers range from 1 (most tolerant of pollution) to 10 (most sensitive to pollution). Waterways with a high proportion of taxa with high SIGNAL grade numbers are generally indicative of a 'healthy' waterbody, whereas the dominance of a site by taxa with low SIGNAL grade numbers is typically indicative of a stressed waterbody.

PET Richness

The PET Richness is another measure based on the pollution sensitivity of macroinvertebrates, which can be used to assess changes in environmental conditions. Three particular groups (orders) of insect are known to be highly sensitive to disturbance (particularly pollutants): Plecoptera (Stoneflies), Ephemeroptera (Mayflies) and Trichoptera (Caddisflies), these three groups being the PET. It has been demonstrated that sites with good habitat and water quality typically often contain higher number of PET families than degraded sites (Plafkin *et al*. 1989).

Multivariate Analysis

Patterns of similarity in macroinvertebrate communities among sites will be quantified using multivariate statistical techniques. The following analyses will be undertaken:

- Non-metric multidimensional scaling (n-MDS) ordinations (graphs) of community structure, which provide a two-dimensional visual representation of the similarity among samples (i.e. the closer together two samples are, the more similar the community is structured). Similarity groupings produced by hierarchical cluster analysis will be superimposed to determine the group membership of samples/sites.
- One-way analysis of similarity (ANOSIM) will be performed to for differences in assemblages among treatments.
- SIMPER analysis will be undertaken to determine the taxa contributing most to the differences between sites and times.

6.5.2 Macro-crustaceans

Species richness and total abundance of macro-crustacean species will be compared between sites and sampling events. Macro-crustacean data will also be compared with the previous desktop and field studies conducted within the study area.

The multivariate statistical measures described above can also be used to assess spatial and temporal changes in macro-crustacean communities.

6.5.3 Fish

Species richness and total abundance of fish species will be compared between sites and sampling events. Fish health (including wounds, lesions or deformities) and length data will also be compared

between sites and sampling events. Fish data will also be compared with the previous desktop and field studies conducted within the study area.

The multivariate statistical measures described above can also be used to assess spatial and temporal changes in fish communities.

7 Reporting and Management Actions

This section outlines the reporting and management actions to be implemented should there be an exceedance of monitoring criteria. A flowchart of management actions is provided in Figure 7-1.

7.1 Monthly Water Quality Monitoring

As per the EA, in the event of exceedance of the water quality trigger levels specified in Table 3-8 at the downstream monitoring points, the following management measures must be followed:

- The downstream results are to be compared to the upstream results in the receiving waters and:
  a) where the downstream result is the same or a lower value than the upstream value for the quality characteristic, then no additional monitoring and reporting action is required; or
  b) where the downstream results exceed the upstream results, complete an investigation into the potential for environmental harm and provide a written report to the administering authority in the next annual return, outlining:
     1. Details of the investigations carried out, and
     2. Actions taken to prevent environmental harm.

Where an exceedance of a trigger level has occurred and is being investigated as per the above, no further reporting is required for subsequent trigger events for that quality characteristic.

Further to the above, any exceedances detected during monthly sampling will be immediately reported to the Department of Environment. The exceedance notification will include raw data from the sampling event, a comparison against the relevant criteria and likely cause of the exceedance.

A summary of monthly reporting and any exceedances will be provided in an annual report.

7.2 Bi-annual Water, Sediment and Biological Monitoring

The biannual monitoring data will be used to assess whether there are any discernible impacts from the mine discharges during the wet season. This will be undertaken by comparing the water quality, sediment quality and biological data between upstream and downstream sites to determine whether there is a difference at the downstream sites that may be attributable to mine water releases.

If an impact is identified through this assessment, the findings will be included in the biannual report (see below) for submission to the relevant authorities. Appropriate management actions will then be discussed and negotiated with the administering authorities to ensure further impacts are minimised.

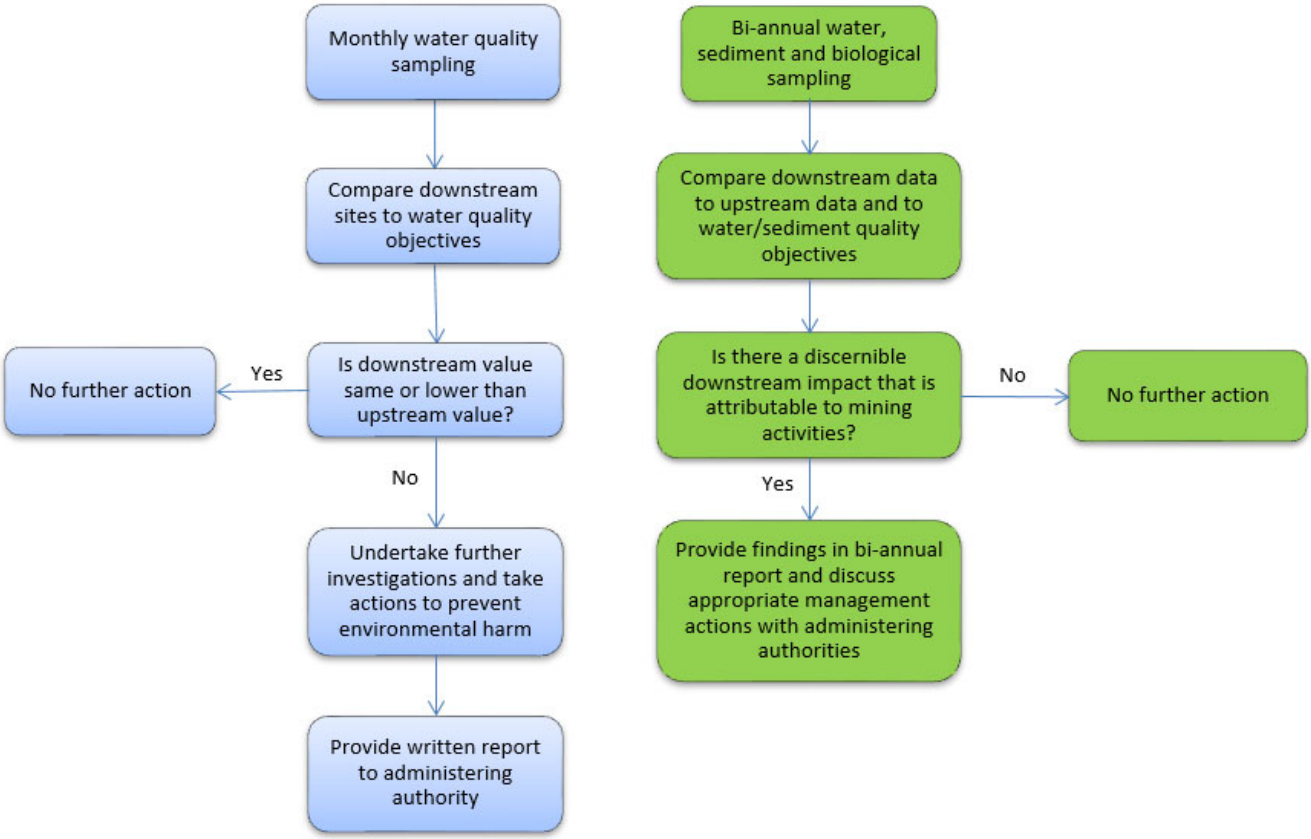

Figure 7-1 Management Action Flowchart

7.3 Further Investigations and Potential Management Actions

7.3.1 Investigation Steps

Further investigations will be carried out by NHG should water quality parameters at test sites exceed the guideline values stipulated in Table 3-8, and the upstream control sites. The specific scope of investigations will depend on the parameter/s exceeding guideline values and spatial patterns in exceedances (e.g. number of sites, location of sites). The investigation steps are as follows:

- Review incident reports to determine potential mine-related causes (e.g. spills, inappropriate water diversions etc.)
- Review dam water quality monitoring data to identify potential contaminant sources
- Review spatial and temporal receiving environment water quality and sediment quality monitoring to determine potential causes of guideline value exceedances, including mine water discharges or due to physical disturbance or physio-chemical stressors operating at a highly localised scale (e.g. cattle disturbance of bed sediments, inputs of nutrients etc. occurring at a local waterbody scale).

- Review biological indicator data from the REMP to determine whether there is any evidence that water quality parameters exceeding guideline values caused ecological impairment.

7.3.2 Management Responses

Section 2.3 outlines pro-active water management strategies implemented by NHG to minimise the potential for mine-associated contaminants entering and impacting on environmental (including human use) values[1] of adjacent receiving environments.

Where it is demonstrated or suspected that mine-related activities were the cause of guideline value exceedances, a strategy and/or standard procedures will be developed and implemented to minimise the likelihood of a recurrence. Actions may include the following (where applicable – see Table 7-1):

- Spills/uncontrolled release:
  - contaminant spills occurring on site will be cleaned up in accordance with standard measures
  - repair of damaged areas and re-establishing the banks or scoured areas, if excessive erosion has occurred
  - removal of chemical contaminants, where practicable.
- Dam waters of unacceptable quality. Management measures will be developed and implemented to improve the quality of water in dams. This could include:
  - modifications to water management practices (e.g. flow paths) to minimise contaminant exposure
  - operational controls to improve sediment settlement in dams (e.g. flocculation), maximise salinity dilution prior to discharge (e.g. pumping of clean water into dams), measures to maintain appropriate pH (e.g. liming)
- Optimise the water release management strategy to ensure adequate dilution and dispersion in receiving environments.
- Removing excessive sediment built up from sensitive areas or where it may be causing problems.

7.3.3 Water and Sediment Quality Guideline Review

The guideline values adopted in the present study are based on default guideline values (see Tables 3.4 and 3.5) that may not be applicable in the local context. A review of the water/sediment quality guideline values will be undertaken where there has been a guideline value exceedance. In accordance with step 7 of the ANZG (2018) water quality framework (Figure 7-2), it may be appropriate to refine guideline values where it can be demonstrated that environmental and human use values are still protected. This could include for example the adoption of default regional guideline values for physio-chemical stressors, or the development of local guideline values in accordance with the process outlined in ANZG 2018).

[1] Referred to as community values in ANZG (2018)

Table 7-1 Potential water quality impact scenarios and management actions

Issue	How detected	Management actions
Hydrocarbon or toxicant spill to environment dam or sediment dam released to receiving environments	• Incident observation at mine site	• No water release to receiving environments until cleaned-up to appropriate standards
	• Hydrocarbons in receiving environments > GV and upstream sites	• Assess extent of contamination and potential causes • Inform downstream land owners • Carry out risk assessment to inform management response • Undertake clean-up and rehabilitate waterway, if required
Salinity, pH and total suspended solids (TSS) in site runoff entering environment dam or sediment dam released to receiving environments	• In situ monitoring in dams • Salinity, pH or TSS[2] in receiving environments > GV and upstream sites • Biological monitoring in REMP	• Release of mine affected waters in accordance with EA release limits • Should salinity, pH or TSS in receiving environments exceed GV and upstream sites, and REMP results indicate no impairment of biological communities as a result of these exceedances: – Consider modification of water quality guideline values, either in accordance with process in ANZG (2018), or adoption of default regional guideline values – Develop and implement measures to improve the quality of water in dams. This could include (i) source identification; (ii) modifications to water management practices (e.g. flow paths) to minimise contaminant exposure; (iii) operational controls to improve sediment settlement in dams, maximise salinity dilution prior to discharge, maintain appropriate pH); or – Refine the water release management strategy to ensure adequate dilution and dispersion in receiving environments. • Should salinity, pH or TSS in receiving environments exceed GV and upstream sites, and REMP results indicate impairment of biological communities as a result of mine activities: – Undertake measures to improve the quality of water in dams as above; or – Refine water release management strategy to ensure adequate dilution and dispersion in receiving environments.
Nutrients and metals/metalloids in site runoff entering environment dam or sediment dam released to receiving environments	• In situ monitoring in dams • Nutrient/metals/metalloid concentrations > GV and upstream sites • Biological monitoring in REMP	• Release of mine affected waters in accordance with EA release limits • Should nutrient/metals/metalloids concentrations in receiving environments exceed GV and upstream sites, and REMP results indicate no impairment of biological communities as a result of these exceedances: – Consider modification of water quality guideline values, either in accordance with process in ANZG (2018) for metals/metalloids and nutrients, or adoption of default regional guideline values (applicable to nutrients only)

[2] And associated parameters such as major ions and alkalinity (salinity) and turbidity (TSS)

Issue	How detected	Management actions
		– Develop and implement measures to improve the quality of water in dams (e.g. source identification, changes to water flows to minimise contaminant exposure, operational controls to improve sediment (and bound nutrient/metal) settlement; or – Refine water release management strategy to ensure adequate dilution and dispersion in receiving environments. • Should concentrations in receiving environments exceed GV and upstream sites, and REMP results indicate impairment of biological communities as a result of mine activities: – For metals/metalloids, undertake studies to assess their bioavailability and potential to cause impacts to biotic receptors – Undertake measures to improve the quality of water in dams as above; or – Refine water release management strategy to ensure adequate dilution and dispersion in receiving environments.

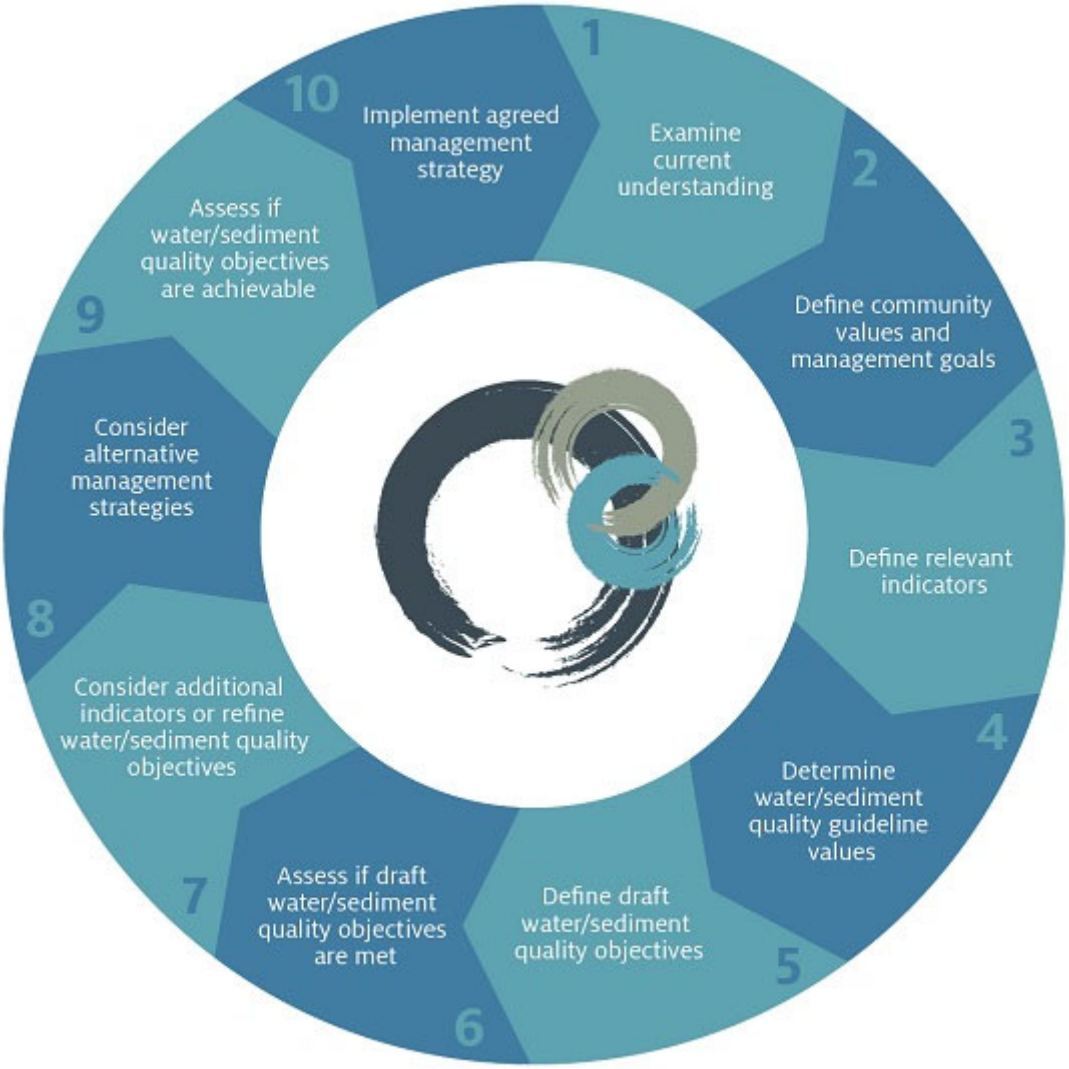

Figure 7-2 Steps to implement the Water Quality Management Framework (Source: ANZG 2018)

7.4 Bi-Annual Reporting

A report will be prepared following the pre-release and post-wet season sampling events which will outline key findings of the respective REMP sampling event. The report will compare results against relevant guidelines and previous surveys to determine whether a potential mine impact has been detected within the receiving environments.

The report will identify all methods employed and assumptions made, the location and survey effort undertaken, the distribution of aquatic biota within the study area, the relative abundance of each species/taxa within each surveyed habitat type, a description of significant and notable findings, and survey constraints (if any). Field observations such as nature of flow and weather conditions will also be reported. The report will:

- Describe the water quality and sediment quality within the study area.

- Provide full details of exceedances of water quality and sediment quality triggers.
- Summarise the existing information on the aquatic biota of the study area.
- Provide a list of taxa encountered and the location of these species.
- Describe any potential ecological impacts on the receiving environment associated with the release of mine affected water.
- Provide recommendations for the need or otherwise for additional work or future monitoring programs.
- Provide full referencing and a bibliography of relevant information sources. Where appropriate, tables and figures will be used to present and summarise data.

8 Review of REMP

A regular review of this REMP document should be undertaken once every two years as follows:

- At the first review (i.e. after two years), site-specific water quality objectives (WQOs) should be developed using the two-year monthly data set (as described in Section 3.4). These site-specific WQOs will replace the ANZECC/ARMCANZ (2000) guideline values.
- At each review, the monitoring design should be assessed to determine its suitability and whether the REMP objectives are being met.

Based upon the reviews, and in consultation with the relevant authorities, revisions are to be made to this REMP document where necessary.

9 References

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Appendix A Environmental Authority- New Acland Coal Mine

Department of Environment and Science

Permit[1]

Environmental Protection Act 1994

Environmental authority EPML00335713 New Acland Coal Mine

This environmental authority is issued by the administering authority under Chapter 5 of the Environmental Protection Act 1994.

Permit[1] number: EPML00335713

Environmental authority takes effect upon grant of ML50232 and ML700002

Anniversary Day: **27 May**

Environmental authority holder(s)

Name	Registered address
New Acland Coal Pty Ltd	3/22 Magnolia Drive BROOKWATER QLD 4300

Environmentally relevant activity and location details

Environmentally relevant activity(ies)	Location(s)
Environmental Protection Regulation 2008 — Schedule 2 ERA 31(2)(b) Mineral processing - processing, in a year, the following quantities of mineral products, other than coke - more than 100,000t ERA 8(3) Chemical Storage — storing more than 500m^3 of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c) ERA 60(1)(a) operating a facility for disposing of, in a year, the following quantity of waste mentioned in subsection (1)(a)(i) - less than 50,000t ERA 63(1)(b) Sewage treatment — operating sewage treatment works, other than no-release works, with a total daily peak design capacity of - more than 100 but not more than 1500EP ***Environmental Protection Regulation 2008 — Schedule 2A*** ERA 13 Mining black coal	ML50170 ML50216 ML700002 ML50232

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation

Additional information for applicants

Environmentally relevant activities

The description of any environmentally relevant activity (ERA) for which an environmental authority is issued is a restatement of the ERA as defined by legislation at the time the approval is issued. Where there is any inconsistency between that description of an ERA and the conditions stated by an environmental authority as to the scale, intensity or manner of carrying out an ERA, then the conditions prevail to the extent of the inconsistency.

An environmental authority authorises the carrying out of an ERA and does not authorise any environmental harm unless a condition stated by the authority specifically authorises environmental harm.

A person carrying out an ERA must also be a registered suitable operator under the *Environmental Protection Act 1994 (*EP Act).

Contaminated land

It is a requirement of the EP Act that if an owner or occupier of land becomes aware a notifiable activity (as defined in Schedule 3 and Schedule 4) is being carried out on the land, or that the land has been, or is being, contaminated by a hazardous contaminant, the owner or occupier must, within 22 business days after becoming so aware, give written notice to the chief executive.

	12 March 2019
Signature	Date

Wayne Boyd
Department of Environment and Science
Delegate of the administering authority
Environmental Protection Act 1994

Enquiries:
Business Centre (Coal)
Department of Environment and Science
PO Box 3028
EMERALD QLD 4720
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Email: CRMining@des.qld.gov.au

Obligations under the *Environmental Protection Act 1994*

In addition to the requirements found in the conditions of this environmental authority, the holder must also meet their obligations under the EP Act, and the regulations made under the EP Act. For example, the holder must comply with the following provisions of the EP Act:

- general environmental duty (section 319);
- duty to notify environmental harm (section 320-320G);
- offence of causing serious or material environmental harm (sections 437-439);
- offence of causing environmental nuisance (section 440);
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG); and
- offence to place contaminant where environmental harm or nuisance may be caused (section 443).

Location: New Acland Coal Mine

Muldu Road, ACLAND QLD 4401

Schedules: Agency interest A General

Agency interest B Air

Agency interest C Water

Agency interest D Groundwater

Agency interest E Waste

Agency interest F Noise

Agency interest G Sewage Treatment

Agency interest H Land and Rehabilitation

Agency interest I Biodiversity

Agency interest J Regulated Structures

Agency interest K Rail Infrastructure

Agency interest L Light

Agency interest M Community

Agency interest Figures

Conditions of environmental authority

Agency interest: General	
Condition number	**Condition**
A1	This environmental authority authorises environmental harm referred to in the conditions. Where there is no condition or this environmental authority is silent on a matter, the lack of a condition or silence does not authorise environmental harm.
A2	In carrying out the mining activity authorised by this environmental authority, the holder of this environmental authority must comply with **Figure 1 (Revised Project Overview — Mine Area)**.
A3	The holder of the environmental authority must implement the Environmental Management Plan New Acland Coal Mine Stage 3 project dated June 2015. This document should be made available to the administering authority upon request.
A4	**Maintenance of measures, plant and equipment** The holder of this environmental authority must: a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority; b) maintain such measures, plant and equipment in a proper and efficient condition; c) operate such measures, plant and equipment in a proper and efficient manner; and d) ensure all instruments and devices used for the measurement or monitoring of any parameter under any condition of this environmental authority are properly calibrated.
A5	**Monitoring** Except where specified otherwise in another condition of this environmental authority, all monitoring records or reports required by this environmental authority must be kept for a period of **not less than 5 years.**
A6	Upon request from the administering authority, copies of monitoring records and reports will be made available and provided to the administering authority's nominated office within 10 business days or an alternative timeframe agreed between the administering authority and the holder.
A7	Any management or monitoring plans, systems or programs required to be developed and implemented by a condition of this environmental authority should be reviewed for effectiveness in minimising the likelihood of environmental harm on an annual basis, and amended promptly if required, unless a particular review date and amendment program is specified in the plan, system or program.
A8	**Financial assurance** The activity must not be carried out until the environmental authority holder has given financial assurance to the administering authority as security for compliance with this environmental authority and any costs or expenses, or likely costs or expenses, mentioned in section 298 of the *Environmental Protection Act 1994.*
A9	The amount of financial assurance must be reviewed by the holder of this environmental authority when a plan of operations is amended or replaced or the environmental authority is amended.

A10	**Risk management** The holder of this environmental authority must develop and implement a risk management system for mining activities which mirrors the content requirement of the Standards Australia Risk management — Principles and guidelines (AS/NZS ISO 31000:2009), or the latest edition of a Standards Australia for risk management, to the extent relevant to environmental management, prior to the commencement of mining activities.
A11	**Third-party reporting** The holder of this environmental authority must: a) **within 1 year** of the commencement of this environmental authority, obtain from an appropriately qualified person a report on compliance with the conditions of this environmental authority; b) obtain further such reports at regular intervals, **not exceeding 3 yearly** intervals, from the completion of the report referred to above; and c) provide each report to the administering authority **within 90 days** of its completion.
A12	Where a condition of this environmental authority requires compliance with a standard, policy or guideline and the standard is amended or changed subsequent to the issue of this environmental authority, the holder of this environmental authority must: a) comply with the amended or changed standard, policy or guideline **within 2 years** of the amendment or change being made, unless a different period is specified in the amended standard or relevant legislation, or where the amendment or change relates specifically to regulated structures referred to in conditions **J1 to J33**, the time specified in that condition; and b) until compliance with the amended or changed standard, policy or guideline is achieved, continue to remain in compliance with the corresponding provision that was current immediately prior to the relevant amendment or change.
A13	**Project milestone commencement dates** The environmental authority holder must notify the administering authority as a nominated entity in accordance with Imposed Condition 2, contained within Appendix 1 of the 'New Acland Coal Mine Stage 3 project Coordinator-General's evaluation report on the environmental impact statement dated December 2014' (the CG's report).
A14	**Environmental monitoring reports** The environmental authority holder must provide the environmental monitoring reports required by Imposed Condition 3 in Appendix 1 of the CG's report to the administering authority each month.

A15	**Storage and handling of flammable and combustible liquids** Spillage of all chemicals and fuels must be contained within an on-site containment system and controlled in a manner that prevents environmental harm (other than trivial harm) and maintained in accordance with Section 5.9 of AS1940 - Storage and Handling of Flammable and Combustible Liquids of 2004 (or more recent editions).

Agency interest: Air	
Condition number	**Condition**
B1	The environmental authority holder must ensure that dust and particulate matter emissions generated by the mining activities do not cause exceedances of the following levels when measured at any sensitive place or commercial place: a) Dust deposition of 120 milligrams per square metre per day, averaged over 1 month, when monitored in accordance with the most recent version of Standards Australia AS/NZS 3580.10.1 Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method; b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM_{10}) suspended in the atmosphere of 50 micrograms per cubic metre over a 24-hour averaging time[1] and 25 micrograms per cubic metre over a 1 year averaging time, for no more than 5 exceedances recorded per year[2], when monitored in accordance with the most recent version of either: (1) Standards Australia AS/NZS 3580.9.6 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM_{10} high volume sampler with size-selective inlet - Gravimetric method; or (2) Standards Australia AS/NZS 3580.9.9 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM_{10} low volume sampler - Gravimetric method; or (3) Standards Australia AS 3580.9.8 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser; c) A concentration of particulate matter suspended in the atmosphere of 80 micrograms per cubic metre over a 24-hour averaging time and 90 micrograms per cubic metre over a 1 year averaging time, when monitored in accordance with the most recent version of AS/NZS3580.9.3:2003 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - Total suspended particulate matter (TSP) - High volume sampler gravimetric method. d) A concentration of particulate matter with an aerodynamic diameter of less than 2.5 micrometres ($PM_{2.5}$) suspended in the atmosphere of 25 micrograms per cubic metre over a 24-hour averaging time[1] and 8 micrograms per cubic metre over a 1 year averaging time[1], when monitored in accordance with: (1) the most recent version of Standards Australia AS/NZS 3580.9.12 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter – $PM_{2.5}$ beta attenuation monitors; or (2) the most recent version of Standards Australia AS/NZS 3580.9.13:2013 Determination of suspended particulate matter – $PM_{2.5}$ continuous direct mass method using a tapered element oscillating microbalance monitor, or

	(3) another method as agreed to in writing by the administering authority. *[1] These limits are based upon relevant air quality objectives contained in the Environmental Protection (Air) Policy 2008 and may be automatically amended to reflect any amendment or replacement of the relevant air quality objective in the Environmental Protection (Air) Policy 2008.* *[2] The five exceedance allowed each year within **Condition B1(b)** are only permitted to allow for events that are known to occur, but which cannot be managed by the environmental authority holder. Such events could include emissions from bushfires, fuel reduction burning for fire management purposes, or dust storms. All exceedance due to such events would not be considered to be in breach of **Condition B1(b)** if the environmental authority holder can demonstrate that the exceedance was not generated by mining activities.*
B2	If monitoring indicates the potential for exceedance of the relevant limits in **Condition B1** then the environmental authority holder must immediately implement dust abatement measures to avoid exceeding the relevant limits.
B3	**Air emissions management** An Air Emissions Management Plan must be developed by a suitably qualified and experienced person in relation to air emmissions and implemented for all stages of mining. The Air Emissions Management Plan must be submitted to the administering authority for review and comment **within 3 months upon the grant of ML50232 and ML700002**, and at intervals **not exceeding two (2) years thereafter.**
B4	**Air emissions management** The Air Emissions Management Plan must incorporate a program for continuous improvements for the management of dust resulting from mining operations with respect to, but not limited to: a) The collection of air quality and meteorological data in accordance with **Table B1: Air quality monitoring requirements**; b) PM_{10} trend monitoring[1], including 3 locations located to the north-west, north and east of the site, for a minimum period of **3 years**; c) A trigger action response plan that requires the environmental authority holder to investigate, mitigate and manage TSP caused by mining activities at any sensitive place or commercial place when monitoring indicates exceedance of 80 micrograms per cubic metre over a 24-hour averaging time; d) A forecasting system that provides daily predictions of upcoming meteorological conditions in order to identify adverse meteorological conditions likely to produce elevated levels of dust including PM_{10} at a sensitive place or commercial place due to the mining activities; e) A dust control strategy which activates a timely implementation of dust control management actions aimed to avoid or minimise elevated levels of dust including PM_{10} at a sensitive place or commercial place due to mining activities; f) Annual review of the Air Emissions Management Plan including its adequacy and effectiveness in avoiding and minimising air emissions and dust at a sensitive place or commercial place; and g) A protocol and register for the recording of requests and installation of first flush diverter systems as required by **Condition B8**.

	[1] *Trend monitoring as required by **Condition B4(b)** can be undertaken using different instruments and methods from those specified in **Table B1: Air quality monitoring requirements**.*
B5	Within **twenty (20) business days** of receiving comments from the administering authority as required by **Condition B3**, the Air Emissions Management Plan must be updated by a suitably qualified and experienced person in relation to air emmissions having regard to the comments, and submitted to the administering authority.
B6	The monitoring locations listed in **Table B1: Air quality monitoring requirements** must be reviewed by a suitably qualified and experienced person(s) in relation to air emmissions and a report must be provided to the administering authority within **two (2) years within 3 months upon grant of ML50232 and ML700002**, and at intervals not exceeding **two (2) years** thereafter. The review must include: a) The effectiveness of the monitoring network; b) The frequency and cause of any exceedances of air quality objectives measured by the monitoring program over a period of at least **two (2) years**; c) Dust complaints; d) Future progression of the mining activities; e) Locations of sensitive receptors relative to the mining activities; and f) Mining operating modes.
B7	All continuously monitored parameters required by **Table B1: Air quality monitoring requirements** and the forecasting system required by **Condition B4** must be made publically available online and in real-time.

Table B1: Air quality monitoring requirements

Monitoring location*	Air quality indicator	Instrument	Frequency	Air quality limit	Nuisance limit	Monitoring method
1,2 (Acland)	$PM_{2.5}$	BAM or TEOM	Continuous	25µg/m^3 (24 hr avg) 8µg/m^3 (annual)		AS3580.9.12-2013 AS3580.9.13-2013
	PM_{10}	TEOM	Continuous	50µg/m³ (24 hr avg) 25µg/m³ (annual)		AS 3580.9.8-2008
	TSP	Hi-Vol Sampler^	24hr, 1 day in 6	90µg/m³ (annual)	80µg/m³ (24 hr avg)	AS/NZS 3580.9.3:2003
	TSP#^	Modified TEOM#,^	Continuous	90µg/m³ (annual)	80µg/m³ (24 hr avg)	Modified TEOM
	Insoluble solids	Dust gauge	Monthly		120mg/m² /day	AS/NZS 3850.10.1:2003
	Wind speed and direction		Hourly			AS 3580:14-2011
7, 8 (or an alternative location to the north of the Stage 3 New Acland mine identified in the Air Emissions Management Plan developed pursuant to condition B3).	PM_{10}	TEOM	Continuous	50µg/m^3 (24 hr avg) 25µg/m^3 (annual)		AS 3580.9.8-2008
	TSP	Hi-Vol Sampler^	24hr, 1 day in 6	90µg/m^3 (annual)	80µg/m^3 (24 hr avg)	AS/NZS 3580.9.3:2003
	Insoluble solids	Dust gauge	Monthly	120mg/m^2/day	120mg/m^2/day	AS/NZS 3850.10.1:2003
38, 39 (or an alternative location to the north-west of the Stage 3 New Acland mine identified in the Air Emissions Management Plan developed	PM_{10}	TEOM	Continuous	50µg/m^3 (24 hr avg) 25µg/m^3 (annual)		AS 3580.9.8-2008
	TSP	Hi-Vol Sampler^	24hr, 1 day in 6	90µg/m^3 (annual)	80µg/m^3 (24 hr avg)	AS/NZS 3580.9.3:2003
	Insoluble solids	Dust gauge	Monthly	120mg/m^2 /day	120mg/m^2 /day	AS/NZS 3850.10.1:2003

Monitoring location*	Air quality indicator	Instrument	Frequency	Air quality limit	Nuisance limit	Monitoring method
pursuant to condition B3).						
A location within 1 kilometre of the southern boundary of ML50232	PM_{10}	TEOM	Continuous	50µg/m^3 (24 hr avg) 25µg/m^3 (annual)		AS 3580.9.8-2008
	TSP	Hi-Vol Sampler^	24hr, 1 day in 6	90µg/m^3 (annual)	80µg/m^3 (24 hr avg)	AS/NZS 3580.9.3:2003
	Insoluble solids	Dust gauge	Monthly	120mg/m^2 /day	120mg/m^2 /day	AS/NZS 3850.10.1:2003
35,36 (west of mine site)	PM_{10}	TEOM	Continuous	50µg/m^3 (24 hr avg) 25µg/m^3 (annual)		AS/NZS 3580.9.8-2008
	TSP	Hi-Vol Sampler^	24hr, 1 day in 6	90µg/m^3 (annual)	80µg/m^3 (24 hr avg)	AS/NZS 3580.9.3:2003
	Insoluble solids	Dust gauge	Monthly	120mg/m^2/ day	120mg/m^2/ day	AS/NZS 3850.10.1:2003
Acland-Silverleigh Road (East,at site on Fig 6 where real time PM_{10} and dust deposition is monitored)	PM_{10}	TEOM	Continuous	50µg/m^3 (24 hr avg) 25µg/m^3 (annual)		AS/NZS 3580.9.8-2008
	TSP	Hi-Vol Sampler^	24hr, 1 day in 6	90µg/m^3 (annual)	80µg/m^3 (24 hr avg)	AS/NZS 3580.9.3:2003
	Insoluble solids	Dust gauge	Monthly	120mg/m^2/ day	120mg/m^2/day	AS/NZS 3850.10.1:2003
As per figure 6	Insoluble solids	Dust gauge	Monthly	120mg/m^2/ day	120mg/m^2/day	AS/NZS 3850.10.1:2003
Siting of monitoring equipment						AS/NZS 3580.1.1:2007

**See Figures 5 and 6*
 # Data from the modified TEOM and Hi-Vol samplers to be used to calibrate the modified TEOM for monitoring TSP. Calibration needs to be undertaken over at least a 6 month period from June to December. Once the modified TEOM has been calibrated it can be used to measure TSP instead of the Hi-Vol sampler.
^ The modified TEOM can be used to measure TSP at other sites.

B8	The environmental authority holder must provide and install "first flush" **systems within three (3) months** of request at those residences, within 5 km of the mine boundary, asking for the systems.
B9	**Odour Nuisance** Subject to **Conditions M2 and B10**, the release of noxious or offensive odour(s) or any other noxious or offensive airborne contaminant(s) resulting from the mining activity must not cause an environmental nuisance at any sensitive place or commercial place.
B10	When requested by the administering authority, odour monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive place or commercial place, and the results must be notified within **fourteen (14) days** to the administering authority following completion of monitoring.
B11	If monitoring indicates **Condition B9** is not being met then the environmental authority holder must: a) address the complaint including the use of appropriate dispute resolution if required; or b) immediately implement odour abatement measures so that emissions of odour from the activity do not result in further environmental nuisance.

Agency interest: Water	
Condition number	**Condition**
C1	Contaminants that will, or have the potential to, cause environmental harm must not be released directly or indirectly to any waters as a result of the authorised mining activities, except as permitted under the conditions of this environmental authority.
C2	Unless otherwise permitted under the conditions of this environmental authority, the release of mine affected water to waters must only occur from the release points specified in **Table C1: Mine affected water release points, sources and receiving waters** and depicted **in Figure 2: Mine affected water release points, sources and receiving waters monitoring locations** attached to this environmental authority.

Table C1: Mine-affected water release points, sources and receiving waters

Release Point (RP)	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)	Mine-affected water source and location	Monitoring Point	Receiving waters description
ED1	27° 15' 40.5603" S	151° 41' 48.32659" E	ED1	Overflow from ED1	Spring Creek
ED2	27° 16' 54.96167" S	151° 41' 36.83113" E	ED2	Overflow from ED2	Lagoon Creek
ED3	27° 18' 29.40913" S	151° 42' 50.52694" E	ED3	Overflow from ED3	Lagoon Creek
ED4	27° 17' 41.49436" S	151° 41' 33.60156" E	ED4	Overflow from ED4	Lagoon Creek
ED5	TBA	TBA	ED5	Overflow from ED5	Lagoon Creek
ED6	TBA	TBA	ED6	Overflow from ED6	Lagoon Creek
ED7	TBA	TBA	ED7	Overflow from ED7	Lagoon Creek

C3	The release of mine affected water to waters in accordance with **Condition C2** must not exceed the release limits stated in **Table C2: Mine-affected water release limits** when measured at the monitoring points specified in **Table C1: Mine-affected water release points, sources and receiving waters** for each quality characteristic.

Table C2: Mine-affected water release limits

Quality characteristic	Release limits	Monitoring frequency
Electrical conductivity (µS/cm)	Release limits specified in **Table C3** for variable flow criteria	Real time telemetry for EC and pH. Daily grab samples if telemetry not available If telemetry is unavailable, the first sample must be taken within 2 hours of commencement of release
pH (pH Unit)	6.0 (minimum) 9.0 (maximum)	
Total suspended solids (mg/L)	100	Daily during release (the first sample must be taken within 2 hours of commencement of release)

C4	The release of mine affected water to waters from the release points must be monitored at the locations specified in **Table C1: Mine-affected water release points, sources and receiving waters** for each quality characteristic and at the frequency specified in **Table C2: Mine-affected water release limits**.

C5	**Mine-affected water release events** The holder must ensure a stream flow gauging station(s) is installed, operated and maintained to determine and record stream flows in Lagoon and Spring Creek upstream of the discharge sites.
C6	Notwithstanding any other condition of this environmental authority, the release of mine affected water to waters in accordance with **Condition C2** must only take place during periods of natural flow in accordance with the receiving water flow criteria for discharge specified in **Table C2: Mine-affected water release limits** for the release point(s) specified in **Table C1: Mine-affected water release points, sources and receiving waters**.
C7	The release of mine affected water to waters in accordance with **Condition C6** must not exceed the Maximum Release Rate (for all combined release point flows) for each receiving water flow criterion for discharge specified in **Table C3: Mine-affected water release during flow events** when measured at the monitoring points specified in **Table C1: Mine-affected water release points, sources and receiving waters**.
C8	The daily quantity of mine affected water released from each release point must be measured and recorded.
C9	Release to waters must be undertaken so not as to cause erosion of the bed and banks of the receiving waters or cause material build-up of sediment in such waters.
C10	**Notification of release event** The environmental authority holder must notify the administering authority as soon as practicable and **no later than 24 hours after commencing** to release mine affected water to the receiving environment. Notification must include the submission of written advice to the administering authority of the following information: a) release commencement date and time; b) details regarding the compliance of the release with the conditions of Agency Interest: Water of this environmental authority (that is, contaminant limits, natural flow, discharge volume); c) release point(s); d) release rate; e) release salinity; and f) receiving water(s) including the natural flow rate. NOTE: Notification to the administering authority must be made via the Pollution Hotline, (or WaTERS where applicable) or its successor.

Table C3: Mine-affected water release during flow events

Receiving waters/ stream	Release Point (RP)	Gauging Station Latitude (GDA94)	Gauging Station Longitude (GDA94)	Receiving Water Flow Criteria for discharge (m3/s)	Maximum release rate (for all combined RP flows)	Electrical Conductivity Release Limits
Lagoon Creek	ED2 ED3	27° 16' 54.96167" S 27° 18' 29.40913" S	151° 41' 36.83113" E 151' 42' 50.52694" E	Low Flow <46.3 L/sec for a period of 28 days after natural flow events that exceed 4 ML/d	<17.4 L/sec	700
	ED4	27° 17' 41.49436" S	151° 41' 33.60156" E	Medium Flow (low) > 46.3 L/sec	<17.4 L/sec	1500
	ED5	TBA	TBA		< 8 L/sec	2,500
	ED6	TBA	TBA		< 5.8 L/sec	3,500
	ED7	TBA	TBA	Medium Flow (high) > 133 L/sec	< 48.6 L/sec	1500
					< 23 L/sec	2,500
					< 15 L/sec	3,500
				High Flow >405 L/sec	< 144.7 L/sec	1500
					< 92.6 L/sec	2,500
					< 69.4 L/sec	3,500
Spring Creek	ED1	27° 15' 40.5603" S	151° 41' 48.32659" E	Low Flow < 46.3 L/sec for a period of 28 days after natural flow events that exceed 46.3 L/sec	< 17.4 L/sec	700

C11	The environmental authority holder must notify the administering authority as soon as practicable and nominally **no later than 24 hours after cessation** of a release event of the cessation of a release notified under **Condition C10** and **within 28 days** provide the following information in writing: a) release cessation date and time; b) natural flow rate in receiving water; c) volume of water released; d) details regarding the compliance of the release with the conditions of Agency Interest: Water of this environmental authority (i.e. contaminant limits, natural flow, discharge volume); e) all in-situ water quality monitoring results; and f) any other matters pertinent to the water release event. NOTE: Successive or intermittent releases occurring within **24 hours of the cessation** of any individual release can be considered part of a single release event and do not require individual notification for the purpose of compliance with **Conditions C10 and C11**, provided the relevant details of the release are included within the notification provided in accordance with **Conditions C10 and C11**.
C12	If the release limits defined in **Table C2: Mine-affected water release limits** are exceeded, the holder of the environmental authority must notify the administering authority within 24 hours of receiving the results.
C13	The environmental authority holder must, **within 28 days of a release** that is not compliant with the conditions of this environmental authority, provide a report to the administering authority detailing: a) the reason for the release; b) the location of the release; c) the total volume of the release and which (if any) part of this volume was non-compliant; d) the total duration of the release and which (if any) part of this period was non-compliant; e) all water quality monitoring results (including all laboratory analyses); f) identification of any environmental harm as a result of the non-compliance; g) all calculations; and h) any other matters pertinent to the water release event.
C14	**Receiving Environment Monitoring and Contaminant Trigger Levels** The quality of the receiving waters must be monitored at the locations specified in **Table C5: Receiving water upstream background sites and downstream monitoring points** for each quality characteristic and at the monitoring frequency stated in **Table C4: Receiving waters contaminant trigger levels**.

Table C4: Receiving waters contaminant trigger levels

Quality Characteristic	Trigger Levels (µg/L)	Comment on Trigger Level	Monitoring Frequency
pH	6.5 — 9.0		Daily during the release
Electrical Conductivity (µS/cm)	700		
Total Suspended solids (mg/L)	To be determined	Turbidity may be required to assess ecosystems impacts and can provide instantaneous results.	
Aluminium	55	*For aquatic ecosystem protection, based on SMD guideline*	Commencement of release and thereafter weekly during release N
Arsenic	13	*For aquatic ecosystem protection, based on SMD guideline*	
Cadmium	0.2	*For aquatic ecosystem protection, based on SMD guideline*	
Chromium	1	*For aquatic ecosystem protection, based on SMD guideline*	
Copper	2	*For aquatic ecosystem protection, based on LOR for ICPMS*	
Iron	300	*For aquatic ecosystem protection, based on low reliability guideline*	
Lead	4	*For aquatic ecosystem protection, based on SMD guideline*	
Mercury	0.2	*For aquatic ecosystem protection, based on LOR for CV FIMS*	
Nickel	11	*For aquatic ecosystem protection, based on SMD guideline*	
Zinc	8	For aquatic ecosystem protection, based on SMD guideline	Commencement of release and thereafter weekly during release
Boron	370	For aquatic ecosystem protection, based on SMD guideline	
Cobalt	90	For aquatic ecosystem protection, based on low reliability guideline	
Manganese	1900	For aquatic ecosystem protection, based on SMD guideline	
Molybdenum	34	For aquatic ecosystem protection, based on low reliability guideline	
Selenium	10	For aquatic ecosystem protection, based on LOR for ICPMS	
Silver	1	For aquatic ecosystem protection, based on LOR for ICPMS	
Uranium	1	For aquatic ecosystem protection, based on LOR for ICPMS	
Vanadium	10	For aquatic ecosystem protection, based on LOR for ICPMS	

Quality Characteristic	Trigger Levels (µg/L)	Comment on Trigger Level	Monitoring Frequency
Ammonia	900	For aquatic ecosystem protection, based on SMD guideline	
Nitrate	1100	For aquatic ecosystem protection, based on ambient Queensland Water Quality Guidelines (2006) for TN	
Petroleum hydrocarbons (C6-C9)	20		
Petroleum hydrocarbons (C10-C36)	100		
Fluoride (total)	2000	Protection of livestock and short term irrigation guideline	
Sodium	TBA		
Sulphate (SO42-) (mg/L)	250 (Protection of drinking water Environmental Value)	Drinking water environmental values from NHMRC 2006 guidelines OR ANZECC	Daily during release

Table C4: Receiving waters contaminant trigger levels *notes:*

1. *All metals and metalloids must be measured as total (unfiltered) and dissolved (filtered). Trigger levels for metal/metalloids apply if dissolved results exceed trigger.*
2. *The quality characteristics required to be monitored as per* ***Table C4: Receiving waters contaminant trigger levels*** *can be reviewed once the results of 2 years monitoring data is available, or if sufficient data is available to adequately demonstrate negligible environmental risk, and it may be determined that a reduced monitoring frequency is appropriate or that certain quality characteristics can be removed from* ***Table C4: Receiving waters contaminant trigger levels*** *by amendment.*
3. *SMD - slightly moderately disturbed level of protection, guideline refers ANZECC & ARMCANZ (2000).*
4. *LOR - typical reporting for method stated. ICPMS/CV FIMS - analytical method required to achieve LOR.*

Table C5: Receiving water upstream background sites and downstream monitoring points

Monitoring Points	Receiving Waters Location Description	Latitude (GDA94)	Longitude (GDA94)
Upstream Background Monitoring Points			
LCU1	Lagoon Creek at a point upstream of mine	27° 18' 9.7728" S	151° 44' 23.136" E
LCU2	Spring Creek at a point upstream of mine	27° 14' 18.7728" S	151° 41' 31.2864" E
Downstream Monitoring Points			
LCD1	Lagoon Creek downstream of mine	27° 18' 35.64" S	151° 43' 4.3536" E
LCD2	Lagoon Creek downstream of mine	27° 18' 37.36" S	151° 43' 1.8768" E
SCD1	Spring Creek at a point downstream of mine	27° 14' 47.364" S	151° 40' 36.2028" E
DS1	Located at the downstream boundary of ML50232* (*or any subsequent identifier for the ML required for the New Acland Coal Mine Stage 3 project)	27° 19' 26.68" S	151° 41' 7.02 E

C15	If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in **Table C4: Receiving waters contaminant trigger levels** during a release event the environmental authority holder must compare the downstream results to the upstream results in the receiving waters and: a) where the downstream result is the same or a lower value than the upstream value for the quality characteristic then no additional monitoring and reporting action is required; or b) where the downstream results exceed the upstream results complete an investigation into the potential for environmental harm and provide a written report to the administering authority within 90 days of receiving the results and in the next annual return, outlining: (1) details of the investigations carried out; and (2) actions taken to prevent environmental harm. NOTE: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with **(b) of this condition**, no further reporting is required for subsequent trigger events for that quality characteristic.
C16	All determinations of water quality and biological monitoring must be performed by an appropriately qualified person.

C17	**Annual water monitoring reporting** The following information must be recorded in relation to all water monitoring required under the conditions of this environmental authority and submitted to the administering authority in the specified format: a) the date on which the sample was taken; b) the time at which the sample was taken; c) the monitoring point at which the sample was taken; d) the measured or estimated daily quantity of mine affected water released from all release points; e) the release flow rate at the time of sampling for each release point; f) the results of all monitoring and details of any exceedances of the conditions of this environmental authority; g) water quality monitoring data must be provided to the administering authority in the specified electronic format upon request; and h) water level monitoring data must be provided in the specified electronic format upon request.
C18	**Stormwater and water sediment controls** An Erosion and Sediment Control Plan must be developed by an appropriately qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to receiving waters and contamination of stormwater.
C19	Stormwater, other than mine affected water, is permitted to be released to waters from: a) Erosion and sediment control structures that are installed and operated in accordance with the Erosion and Sediment Control Plan required by **Condition C18**; and b) Water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with **Condition C20** for the purpose of ensuring water does not become mine affected water.
C20	**Water Management Plan** A Water Management Plan must be developed by an appropriately qualified person and implemented for all stages of mining. The Water Management Plan must be submitted to the administered authority for review and comment within **3 months upon the grant of ML50232 and ML700002.**
C21	The Water Management Plan must identify methods to: a) identify the environmental values of the receiving waters including Lagoon and Spring Creek and water quality objectives and how they will be protected; b) incorporate a risk management approach to how changing levels of flood, drought and water quality risks should be addressed; c) manage stormwater discharge; d) develop and implement a system for emergency spills or discharges including procedures to minimise extent and duration of release, staff training, investigation and reporting procedures; e) manage the environmental impacts of any release of wastewater to the environment so that any impacts are minimised including restricting any discharge to waters to occasions where there is flow in receiving waters to provide considerable dilution;

	f) separate clean water from undisturbed areas and water from disturbed areas; g) manage site water quality and quantity during the three (3) phases of mining: development, operation and decommissioning and include a site water balance including groundwater generated through mine dewatering; h) safeguard against the potential for soil erosion and acid drainage; and i) provide details of operational monitoring and monitoring of hydrological processes including associated performance indicators.
C22	Within twenty (20) business days of receiving comments from the administering authority as required by **Condition C20**, the Water Management Plan must be updated by a suitably qualified and experienced person having regard to the comments, and submitted to the administering authority.
C23	A copy of the Water Management Plan and any subsequent amendment of the Water Management Plan must be kept at the place to which this environmentally relevant activity relates and be available for examination by Emergency Services Personnel or an authorised person on request.
C24	If an exceedance in accordance with **Condition C15(b)** is identified, the holder of the environmental authority must notify the administering authority in writing within **24 hours of receiving the resul**t.

Agency interest: Groundwater	
Condition number	**Condition**
D1	**Contaminant release** The holder of this environmental authority must not release contaminants to groundwater.
D2	All determinations of groundwater quality and biological monitoring must be performed by an appropriately qualified person.
D3	Groundwater quality and levels must be monitored at the locations and frequencies defined in **Table D1 - Groundwater monitoring locations and** frequency for quality characteristics identified in **Table D2 - Groundwater quality triggers and limits**.
D4	Groundwater levels when measured at the monitoring locations specified in **Table D1 - Groundwater monitoring locations and frequenc**y must not exceed the groundwater level trigger change thresholds specified in **Table D3 - Groundwater level monitoring** below.

Table D1: Groundwater monitoring locations and frequency

Monitoring Point	Aquifer Compliance Bore (C)	Location (GDA94 – Zone 56)		Parameter[1] and Monitoring Frequency
		Easting (m)	Northing (m)	
2289P	Coal measures (C)	371265	6983532	Groundwater levels: monthly Groundwater quality: Six monthly to include: Al, As, Ca, Se, Cl, Cu, F, Fe, Total N, K, Mg, Mn, Na, SO_4, HCO_3, TDS, EC, pH
2291P	Coal measures (C)	374620	6980033	
18P	Coal measures (C)	371028	6982641	
25P	Coal measures (C)	374146	6982057	
26P	Coal measures (C)	374266	6982977	
27P	Coal measures (C)	373360	6983554	
28P	Coal measures (C)	372328	6983977	
843	Basalt (C)	370698	6981283	
848	Coal measures (C)	370705	6981723	
81P	Coal measures (C)	375003	6979638	
82P	Coal measures (C)	373697	6978814	
83P	Coal measures (C)	371854	6979679	
84P	Basalt (C)	370355	6982187	
BMH1	Basalt (C)	369658	6982204	
CSMH1	Coal measures (C)	375404	6977336	
109P	Basalt	368263	6982378	
122PGC	Coal measures	370656	6977837	
114P	Coal measures	371806	6976037	
116P	Coal measures	374220	6975132	
119PGC	Coal measures	371609	6973337	
120WB	Coal measures	367523	6976115	
121WB	Coal measures	368472	6978441	
1A	Basalt	366548	6982090	
1B	Coal measures	366548	6982090	
2A	Basalt	365884	6979300	
2B	Coal measures	365884	6979300	

3A	Basalt	369416	6973707	
3B	Coal measures	369416	6973707	
4A	Basalt	365800	6977025	
4B	Coal measures	365800	6977025	
4C	Marburg Sandstone	365800	6977025	
5A	Oakey Creek alluvium	373845	6972482	
5B	Coal measures	373845	6972482	
5C	Marburg Sandstone	373845	6972482	
6	Coal measures	375435	6975738	
7A	Basalt	367572	6982694	
7B	Coal measures	367572	6982694	
8	Mine Pit Backfill	372514	6982689	
2289_ Lower	Coal measures (C)	371266	6983554	
25P(R)	Coal measures (C)	374036	6981883	
26P(R)	Coal measures (C)	374158	6982801	
10Pb	Basalt (C)	370359	6980896	
4517WB	Coal measures (C)	369728	6980680	
4518WB	Coal measures (C)	369265	6979260	

[1] - Aluminium (Al), Arsenic (As), Calcium (Ca). Selenium (Se), Chloride (Cl), Copper (Cu), Fluorine (F), Iron (Fe), Total Nitrogen (Total N), Potassium (K), Magnesium (Mg), Manganese (Mn), Sodium (Na). Sulphate (SO4), Bicarbonate (HCO3), Total dissolves solids (TDS), Electrical conductivity (EC), Acidity/alkalinity (pH)

Table D2: Groundwater quality triggers and limits

Parameter	Units	Contaminant Limit[1]	Monitoring frequency
Al	mg/l	5.0	Half yearly
As	mg/l	.05	Half yearly
Ca	mg/l	1000	Half yearly
Se	mg/l	0.02	Half yearly
Cl	mg/l	TBA	Half yearly
Cu	mg/l	1.0 [2]	Half yearly
F	mg/l	TBA	Half yearly
Fe	mg/l	TBA	Half yearly
NO_3	mg/l	400	Half yearly
NO_2	mg/l	30	Half yearly
K	mg/l	TBA	Half yearly
Mg	mg/l	TBA	Half yearly
Mn	mg/l	TBA	Half yearly
Na	mg/l	TBA	Half yearly
SO_4	mg/l	1000	Half yearly
HCO_3	mg/l	TBA	Half yearly
TDS	mg/l	5000 [2,3]	Half yearly
EC	mg/l	7460 [2,3,4]	Half yearly
pH	unit	TBA	Half yearly

[1] Based on Stockwater limits defined in ANZECC (2000)

[2] Defined for beef cattle based on landholder bore survey results

[3]Existing bores 27P, 28P, 2289 and 118P background levels already exceed this limit prior to mine operation

[4] Based on EC to TDS conversion factor of 0.67 as per ANZECC (2000)

Table D3: Groundwater level monitoring

Monitoring Point	Level trigger threshold
2289P	TBA[1]
2291P	52.0 (±5m)
18P	130.0 (±5m)
25P	TBA[1]
26P	TBA[1]
27P	50.0 (±5m)
28P	50.0 (±5m)
843	TBA[1]
848	TBA[1]
81P	42.0 (±5m)
82P	48.0m (±5m)
83P	TBA[1]
84P	TBA[1]
BMH1	96.0 (±5m)
CSMH1	90.0 (±5m)
109P	TBA[1]
122PGC	TBA[1]
114P	TBA[1]
116P	TBA[1]
119PGC	TBA[1]
120WB	TBA[1]
121WB	TBA[1]
1A	TBA[1]
1B	TBA[1]
2A	TBA[1]
2B	TBA[1]
3A	TBA[1]

3B	TBA[1]
4A	TBA[1]
4B	TBA[1]
4C	TBA[1]
5A	TBA[1]
5B	TBA[1]
5C	TBA[1]
6	TBA[1]
7A	TBA[1]
7B	TBA[1]
8	TBA[1]
2289_ Lower	59.7m (±5m)
25P(R)	97.8m (±5m)
26P(R)	90.0m (±5m)
10Pb	25.0m (±5m)
4517WB	43.5m (±5m)
4518WB	59.0m (±5m)

[1]To be provided — Water level trigger thresholds will be proposed following 12 months of monitoring of the new bores and following the first update of the groundwater model prior to the operation of the revised project.

D5	**Exceedance investigation** If quality characteristics of groundwater from compliance bores identified in **Table D1 - Groundwater monitoring locations and frequency** exceed any of the trigger levels stated in **Table D2 - Groundwater quality triggers and limits** or exceed any of the groundwater level trigger threshold stated in **Table D3 - Groundwater level monitoring**, the holder of this environmental authority must compare the compliance monitoring bore results to the reference bore results and complete an investigation in accordance with the ANZECC and ARMCANZ 2000.
D6	Results of monitoring of groundwater from compliance bores identified in **Table D1 - Groundwater monitoring locations and frequency** must not exceed any of the limits defined in **Table D2 - Groundwater quality triggers and limits**.
D7	**Bore construction and maintenance and decommissioning** The construction, maintenance and management of groundwater bores (including groundwater monitoring bores) must be undertaken in a manner that prevents or minimises impacts to the environment and ensures the integrity of the bores to obtain accurate monitoring.

D8	**Groundwater management and monitoring program** The approved Groundwater Management and Monitoring Program required by Imposed Condition 10, in Appendix 1, of the CG's report must be provided, to the administering authority, within **20 business days** of it being approved.
D9	In addition to the requirements of Imposed Condition 10 in Appendix 1 of the CG's report, a plan must be developed and certified by an appropriately qualified person to meet the following objectives: a) identification of groundwater drawdown level thresholds for monitoring the impacts to Groundwater Dependant Ecosystems; and b) collection and analysis of data that identifies natural groundwater level trends for identification of water level impact to authorised water users from the mining operation as required by Schedule 3, recommended Condition 1 in Appendix 3 of the CG's report. The plan must be provided to the administering authority in conjunction with submission of the approved program in **Condition D8**.
D10	**Monitoring Program Review** The environmental authority holder must provide the approved report required by Imposed Condition 11, in Appendix 1, of the CG's report, to the administering authority, within **20 business days** of the report being approved.
D11	The plan required under **Condition D9** must be reviewed by an appropriately qualified person in accordance with the requirements of Imposed Condition 11 in Appendix 1 of the CG's report, and be provided to the administering authority in conjunction with the submission of the approved report in **Condition D10**.
D12	**Groundwater model review** The environmental authority holder must provide the approved report required by Imposed Condition 12, in Appendix 1, of the CG's report, to the administering authority, within **20 business days** of it being approved.
D13	**General requirements — Oakey Creek Alluvial aquifer** As a component of the second and subsequent reviews of the New Acland Coal numerical groundwater model the environmental authority holder must provide an approved (*under Water Act 2000*) report outlining the impact on the Oakey Creek Alluvial aquifer, to the administering authority. The report should: a) Establish any identified impact associated with mining activities, if any, on the Oakey Creek Alluvial aquifer; b) Include an assessment of natural and potential pumping based water level variation caused by non-mining authorised users, in the Oakey Creek Alluvial aquifer; c) Outline any requirements for additional modelling or monitoring required; d) If the investigation under **Condition D13(a)** concludes that there is an identified impact on the Oakey Creek Alluvial aquifer as a result of mining activities, the environmental authority holder must determine the volumetric impact associated with the identified impact; and e) If the impact is determined to be the result of mining activities, the environmental authority may be required to construct additional monitoring bores. Additional monitoring bores are to be incorporated in the Groundwater Monitoring and Management Plan required by **Condition D8.**

D14	**Main Range Volcanics aquifer** The environmental authority holder must determine the long term impact of the take of water from the Main Range Volcanics aquifer and incorporate this into the second review of the New Acland Coal numerical groundwater model pursuant to **Conditions D8 — D12**.
D15	A groundwater monitoring network must be maintained. The network must: a) be installed and maintained by a person possessing appropriate qualifications and experience in the fields of hydrogeology and groundwater monitoring program design to be able to competently make recommendations about these matters; b) be constructed in accordance with methods prescribed in either the latest edition of the Agriculture and Resource Management Council of Australia and New Zealand manual titled 'Minimum Construction Requirements for Water Bores in Australia' or the 'Minimum standards for the construction and reconditioning of water bores that intersect the sediments of artesian basins in Queensland', whichever applies; and c) include a sufficient number of 'bores of compliance' that are located at an appropriate distance from potential sources of impact from mining activities and provides the following: (1) representative groundwater samples from the uppermost aquifer; and (2) background water quality in hydraulically up-gradient or background bore(s) that have not been affected by any mining activities to groundwater's; and (3) the quality of groundwater downgradient of any potential source of contamination including groundwater passing the relevant bore(s) of compliance.

Agency interest: Waste Management	
Condition number	**Condition**
E1	Unless otherwise permitted by the conditions of this environmental authority or with prior approval from the administering authority and in accordance with a relevant standard operating procedure, waste must not be burnt.
E2	The holder of this environmental authority may burn vegetation cleared in the course of carrying out extraction activities provided the activity does not cause environmental harm at any sensitive place or commercial place.
E3	The holder of this environmental authority may dispose of inert waste (packing material) associated with blasting into open pits, buried in such a manner that it will not impede saturated aquifers.
E4	**Storage of tyres** Tyres stored awaiting disposal or transport for take-back and, recycling, or waste-to-energy options - should be stockpiled in volumes less than 3m in height and 200m^2 in area and at least 10m from any other tyre storage area.
E5	**Disposal of tyres** Scrap tyres resulting from the mining activities can be disposed of into open pits provided tyres are placed as deeply in the spoil as reasonably possible and this practice does not cause an unacceptable fire risk or compromise mine safety.

E6	Scrap tyres resulting from the mining activities disposed within the operational land must not impede saturated aquifers or compromise the stability of the consolidated landform.
E7	**Tailings disposal** Tailings must be managed in accordance with procedures contained within the current plan of operations. These procedures must include provisions for: a) containment of tailings; b) the management of seepage and leachates both during operation and the foreseeable future; c) the control of fugitive emissions to air; d) maintaining records of the relative locations of any other waste stored within the tailings; e) rehabilitation strategy; and f) monitoring of rehabilitation, research and/or trials to verify the requirements and methods for decommissioning and final rehabilitation of tailings, including the prevention and management of acid mine drainage, erosion minimisation and establishment of vegetation cover.

E8	**Green waste storage** The waste management hierarchy must be considered in the management of green waste.

Agency interest: Noise	
Condition number	**Condition**
F1	**Noise limits** The holder of this environmental authority must ensure that noise generated by the mining activities does not cause the criteria in **Table F1 – Noise limits** to be exceeded at a noise sensitive place or commercial place.
F2	If monitoring indicates the potential for exceedance of the relevant limits in **Table F1 – Noise Limits** then the environmental authority holder must immediately implement noise abatement measures to avoid exceeding the relevant limits.
F3	Notwithstanding any other condition of this environmental authority, noise from the activity must not cause an environmental nuisance, at any noise sensitive place.
F4	**Monitoring and reporting** A Noise Monitoring Program must be developed by a suitably qualified and experienced person in relation to noise and implemented for all stages of mining to monitor compliance with **Table F1 - Noise limits**. The Noise Monitoring Program must be submitted to the administering authority for approval **within 3 months upon grant of ML50232 and ML700002**. The Noise Monitoring Program must be implemented **within 3 months** of the administering authority approving the program.

Table F1 – Noise limits (includes construction activities)

Noise level dB(A) measured as	**All days**		
	7am – 6pm	**6pm – 10pm**	**10pm – 7am**
	Noise measured at a 'Noise sensitive place'		
$L_{Aeq,\ adj,\ 15\ min}$	42	35	35
L_{Amax}	-	-	50
L_{Amax} rail spur	-	-	56
$L_{Aeq(24hr)}$ rail spur	-	-	50

F5	Noise monitoring and recording must include the following descriptor characteristics and matters: a) $L_{A01,\ adj,\ 15\ min}$ - day, evening & night; $L_{A10,\ adj,\ 15\ min}$ - day, evening & night; $L_{Aeq,\ adj,\ 15\ min}$ - day, evening & night; and $L_{A90,\ adj,\ 15\ min}$ - day, evening & night; b) background noise L_{A90}; c) the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels; d) atmospheric conditions including temperature, relative humidity and wind speed and directions; e) effects due to any extraneous factors such as traffic noise and natural sources (e.g. insects, birds and wind); f) location, date and time of monitoring; g) if the complaint concerns low frequency noise, $L_{LINeq\ 10\ mins}$ (internal), $L_{Aeq\ 10\ mins}$ (internal) and one third octave band measurements in $L_{LINeq\ 10\ mins}$ (internal) for centre frequencies in the 10 – 200 Hz range; h) maximum (L_{Amax}) noise levels - night (for a minimum of 30 minutes); and i) ⅓ octave band spectrums.
F6	The Noise Monitoring Program must also include a system of real time performance monitoring against the criteria in **Table F1 - Noise limits** at: a) location in Acland to be identified in the Noise Monitoring Program; b) location to the east of the New Acland mine to be identified in the Noise Monitoring Program; c) location to the north of the New Acland mine to be identified in the Noise Monitoring Program; and d) location to the west of the New Acland mine to be identified in the Noise Monitoring Program. NOTE: The performance monitoring required under this condition is to be used for performance management rather than monitoring for compliance with **Table F1 - Noise limits.**
F7	All real-time performance monitoring parameters required by **Condition F6** must be made publically available, online and in real-time.
F8	**Noise management** A Noise and Vibration Management Plan must be developed by a suitably qualified and experienced person in relation to noise and be implemented for all stages of mining **within 3 months upon the grant of ML50232 and ML700002**.

F9	The Noise and Vibration Management Plan must incorporate a program for continuous improvements for the management of noise emissions caused by mining operations and must include, but is not limited to: a) a detailed description of the noise management system; b) a description of the noise mitigation measures that would be implemented to ensure best practice noise management is being employed, is regularly benchmarked against contemporary industry standards and is regularly reviewed to ensure continual improvement; c) the Noise Monitoring Program described in **Condition F4** and **Table F2 - Compliance noise monitoring locations and frequency**; d) a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations and the implementation of both proactive and reactive mitigation measures to ensure compliance with these conditions, improved understanding of noise data at the monitoring locations in **Table F2 - Compliance noise monitoring locations and frequency** and its correlation with the noise data collected from the locations specified in **Condition F6**; e) a protocol for determining exceedances of the conditions; f) a protocol for recording and responding to complaints; g) the content of the monthly compliance report required under **Condition 3** of the imposed conditions of the Coordinator-General, including for the provision of data in that report, and a peer review of that content.
F10	The environmental authority holder must, at their own cost, appoint an independent acoustic consultant to review the monthly noise report format for a **twelve (12) month period** following the commencement of reporting. A report must be produced to present information from noise monitoring in a manner that is clear, open and unambiguous.
F11	**Mitigation** Upon receiving a written request from the owner of a noise sensitive place shown in **Figure 7 - Noise Sensitive Places (Mitigation)**, the environmental authority holder must implement additional reasonable and feasible noise mitigation measures at the noise sensitive place in consultation with the owner. If within **3 months** of receiving this request, the environmental authority holder and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to a suitably qualified and experienced person in relation to noise appointed by the Chief Executive or the President for the time being of the Institute of Engineers for resolution. The suitably qualified and experienced person's decision as to the mitigation measures to be implemented must be final. The environmental authority holder is responsible for payment of costs of the suitably qualified and experienced person in relation to noise.

Table F2 - Compliance noise monitoring locations and frequency

Monitoring location*	Frequency
1 (Acland)	Monthly
34 (rail spur), 35 and 38 (or alternative noise sensitive places identified in the Noise Monitoring Program developed pursuant to condition F5)	Monthly
4, 8 and 10 (or alternative noise sensitive places identified in the Noise Monitoring Program developed pursuant to condition F5)	Monthly
11, 15 and 19 (or alternative noise sensitive places identified in the Noise Monitoring Program developed pursuant to condition F5)	Monthly

*See Figure 5

F12	**Airblast overpressure nuisance** The holder of this environmental authority must ensure that blasting does not cause the limits for peak particle velocity and air blast overpressure in **Table F3 – Blasting noise limits** to be exceeded at a sensitive place or commercial place.
F13	The holder of this environmental authority must develop and implement a blast monitoring program to monitor compliance with **Table F3 – Blasting noise limits** for: a) At least 90% of all blasts undertaken on this site in each year at the nearest sensitive place or commercial place to the centroid of the blast; and b) All blasts conducted during any time period specified by the administering authority at the nearest sensitive place or commercial place.

Table F3: Blasting noise limits

Blasting noise limits	Sensitive place or commercial place blasting noise limits	
	Monday to Friday 7am to 6pm **Saturday 9am to 1pm**	**Monday to Friday 6pm to 7am** **Saturday 1pm to 9am** **Sunday and Public Holidays^**
Airblast overpressure	115 dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time	No blasting
Ground vibration peak particle velocity	5mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time	No blasting

^ Blasting not permitted on public holidays

Agency interest: Sewage Treatment	
Condition number	**Condition**
G1	All effluent released from the treatment plant must be monitored at the frequency and for the parameters specified in **Table G1 — Sewage Effluent Quality Targets for Dust Suppression and Irrigation**.

Table G1: Sewage Effluent Quality Targets for Dust Suppression and Irrigation

Contaminant	Unit	Release limit	Limit type	Frequency
5-day Biochemical oxygen demand (uninhibited)	mg/L	20	Maximum	Quarterly
Faecal coliforms, based on the average of a minimum of five samples collected	Colonies/100m1	1000	Maximum	Quarterly
Total suspended solids	mg/L	30	Maximum	Quarterly
Nitrogen	mg/L	15	Maximum	Quarterly
Phosphorus	mg/L	1000	Maximum	Quarterly
pH	pH units	6.0 — 9.0.	Range	Quarterly

G2	Treated sewage effluent used for dust suppression or irrigation must not exceed sewage release limits defined in **Table G1 — Sewage Effluent Quality Targets for Dust Suppression and Irrigation**.
G3	Sewage effluent used for dust suppression or irrigation must not cause spray drift or overspray to any sensitive place.
G4	Subject to Condition **G5**, sewage effluent from sewage treatment facilities must be reused or evaporated and must not be directly released from the sewage treatment plant to any water way or drainage line.
G5	In periods of wet weather or following wet weather, when no irrigation of effluent is reasonable practicable and when effluent storage ponds are full, the release of effluent to waters is permitted in accordance with the release limits in **Table G1 - Sewage Effluent Quality Targets for Dust Suppression and Irrigation** and locations specified in **Table C1 - Mine-affected water release points, sources and receiving waters**.
G6	The holder of the environmental authority must ensure that irrigation of effluent is carried out in such a manner that prevents and or minimises environmental harm.
G7	The holder of this environmental authority is authorised to accept treated wastewater from the Wetalla Wastewater Reclamation Facility.

G8	Sewage effluent used for dust suppression or irrigation must not exceed sewage effluent release limits defined in **Table G1 - Sewage Effluent Quality Targets for Dust Suppression and Irrigation**.

Agency interest: Land and Rehabilitation	
Condition number	**Condition**
H1	**Buffer Zone** The holder of the environmental authority must not cause any disturbance within 50 metres of the high bank of Lagoon Creek (buffer zone) as shown on **Figure 3 - Lagoon Creek, buffer and levee** unless in accordance with **Condition H2 and H3**.
H2	The holder of the environmental authority is authorised to construct and maintain a flood protection levee and access road for inspection purposes, with the tow of the levee being no closer than 50 metres from the high bank of Lagoon Creek as shown on **Figure 3 - Lagoon Creek, buffer and levee**
H3	The holder of the environmental authority is authorised to access the 50 metre buffer zone as shown on **Figure 3 - Lagoon Creek, buffer and levee**, for the purposes of maintaining the integrity of the flood protection levee, riparian conservation and weed management purposes.
H4	The flood protection levee must be designed and inspected by a suitably qualified and experienced person. The final design level of the levee crest must be above the predicted 1,000 year ARI event flood level.
H5	Any section of the outside face of the levee must be treated with cover material and grass seeded (unless rock armoured) within **three months of completion** of the earthworks for that section of the outside face of the levee.
H6	The condition of the levee must at a minimum be assessed: a) by the environmental authority holder **within 1 week** of any storm of such intensity that greater than 25mm of rain falls in less than 3 hours; and b) by a suitably qualified and experienced person at least once per year between the months of May and October inclusive (i.e. during the 'dry' season and before the onset of the 'wet' season).
H7	Remedial works identified as necessary during assessments conducted under Condition **H6** must be commenced **within 30 days** unless delayed by inclement weather.
H8	Any actions and incidents on site that may impact upon the integrity of the levee bank must be notified to the administering authority in accordance with **Condition H4**.
H9	For Stage 3 New Acland Mine Project, land disturbed by mining must be rehabilitated in accordance with **Table H4: Rehabilitation Requirements Stage 3 New Acland Mine Project, Table H5: Rehabilitation Acceptance Criteria — Grazing Lands Stage 3 New Acland Mine Project and Table H6: Rehabilitation Acceptance Criteria — Treed Areas Stage 3 New Acland Mine Project.**

H10	**Final Land Use and Rehabilitation Plan** Within twelve (12) months **upon the grant of ML50232 and ML700002** the holder of this environmental authority must develop and implement a Final Land Use and Rehabilitation Plan to ensure that all areas disturbed by mining activities will be suitably rehabilitated in accordance with **Table H1 – Final Land Use and Rehabilitation Approval Schedule – ML50170 and ML50216, Table H2 - Landform design criteria for New Acland Coal Mine – ML50170 and ML50216, Table H3: Residual Void Design – ML50170 and ML50216, Table H4: Rehabilitation Requirements Stage 3 New Acland Mine Project, Table H5: Rehabilitation Acceptance Criteria — Grazing Lands Stage 3 New Acland Mine Project and Table H6: Rehabilitation Acceptance Criteria — Treed Areas Stage 3 New Acland Mine Project.** The Plan must include, but is not limited to the following: a) disturbance type; b) disturbance area; c) pre and post mine land descriptions; d) pre and post mine land capability; e) analogue site(s) identification; f) a description of rehabilitation management techniques incorporating works and monitoring programs and timetables; g) indicators for success; and h) keeping of appropriate records or rehabilitation measures implemented including taking of photographs demonstrative of rehabilitation achieved and the preparation of annual rehabilitation progress reports. **NOTE:** The Final Land Use and Rehabilitation Plan is to be managed through the Plan of Operations.

Table H1: Final Land Use and Rehabilitation Approval Schedule — ML 50170 and ML50216

Disturbance Type							
	Residual Voids	**Tailings Dams**	**Recontoured spoil area**	**Waste Rock Dumps**	**Infrastructure & ROM Areas**	**Roads and Tracks**	**Water Supply and Sediment Dams**
Tenure ID	ML50216	ML50170	ML50170 ML50216	ML50216	ML50170	ML50170 ML50216	ML50216
Projective Surface Area (ha)	55	70	740	100	5	5	40
Post mine land use	Possible water storage	Grazing	Grazing	Grazing	Grazing	Grazing	Possible water storage
Post mine land suitability classification	5	5	3-4	4	4	4	5

NOTE: The Final Land Use and Rehabilitation Plan will be managed through the Plan of Operations.

Table H2: Landform design criteria for New Acland Coal Mine – ML50170 and ML50216

Disturbance Type	Slope Range (%)	Projective Surface Area (ha)
Residual Voids (high wall)	0 - 214 % or 65°	55
Residual Voids (low wall)	0 - 100 % or 45°	
Tailings Dam Top	0 - 20 % or 11.5°*	60
Tailings Dam Wall	0 - 20 % or 11.5° *	10
Recontoured Spoil Area	0 - 20 % or 11.5° *	740
Waste Rock Dumps	0 - 20 % or 11.5° *	100
Infrastructure and ROM areas	0 - 18% or 10°	5
Roads and Tracks	0 - 10 % or 5.7°	5

NOTE: *= The slope depends on the vertical height and slope length. See Landform Acceptance Criteria.

Table H3: Residual Void Design – ML50170 and ML50216

Void Identification	Void wall - competent rock slope (%)	Void wall - incompetent rock slope (%)	Void maximum surface area (ha)
Central Pit/South Pit Void	65° or 214%	45° or 100%	55

Table H4: Rehabilitation Requirements Stage 3 New Acland Mine Project

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
Solid Waste Rock Disposal	Safe	Site safe for humans and animals	Structurally safe and shallow slopes (geotechnically stable). No hazardous materials (geochemically benign).	Monitoring / observation demonstrates safe site
	Non-polluting	No environmental harm attributed to adverse chemical conditions within the waste rock dumps	Minimise erosion (to at least <10t/ha/yr) through selective placement of mine waste, adequate vegetation cover. Runoff and seepage does not cause environmental harm	Suitable for low intensity grazing. Runoff and discharge water (including seepage) meets specified limits.
	Stable	Minimise erosion	Wastes selectively placed above and below original ground level to agreed slopes. Adequate ground cover established to control erosion. Runoff control measures (contour banks, etc) effective in controlling erosion.	Suitable for low intensity grazing
	Self-sustaining	To return to agreed grazing land capability	Slope and other landform design criteria achieved. Establish adequate vegetation cover.	Refer **Table H5** and **Table H6**
Tailings Dams	Safe	Site safe for humans and animals	Structurally safe (geotechnically stable). Adequate capping. Accessibility to voids is permanently removed.	Monitoring / observation demonstrates safe site
	Non-polluting	Acid mine drainage will not cause environmental harm	Adequately capped. Minimise erosion through adequate vegetation cover to less than 10t/ha/yr. Runoff and seepage controlled by water management.	Monitoring meeting release limits. Suitable for low intensity grazing

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
	Stable	Minimise erosion	Stored in both pits below natural surface level and in dams above natural surface. Establish adequate vegetation cover.	Monitoring demonstrates revegetation success. No structural erosion present. Suitable for low intensity grazing
	Self-sustaining	To return to agreed grazing land capability	Monitoring demonstrates successful revegetation.	Refer **Table H5** and **Table H6**
Mine Infrastructure Areas	Safe	Site safe for humans and animals	Hazardous materials removed.	Monitoring / observation demonstrates safe site
	Non-polluting	Undertake contaminated land assessment.	Remediate contamination so that runoff and seepage are of good quality.	Monitoring meeting release limits.
	Stable	Minimise erosion	Remove infrastructure or allow continued use of useful infrastructure. Establish adequate vegetation cover.	Slope will be a maximum of 17° (30%)
	Self-sustaining	To return to agreed grazing land capability	Return to previous use (grazing). Establish adequate groundcover.	Refer **Table H5** and **Table H6**
Linear Infrastructure areas	Safe	Site safe for humans and animals	Structurally safe (geotechnically stable).	Monitoring / observation demonstrates safe site
	Non-polluting	No environmental harm attributed to adverse chemical conditions within the rehabilitation areas.	Runoff and seepage controlled by water management (e.g. dams).	Monitoring meeting release limits.
	Stable	Minimise erosion	Remove infrastructure, rip reshape and revegetate or allow continued use of useful infrastructure.	Suitable for low intensity grazing

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
	Self-sustaining	To return to agreed grazing land capability	Remove infrastructure or allow continued use of useful infrastructure. Establish adequate vegetation cover.	Refer **Table H5** and **Table H6**

Table H5: Rehabilitation Acceptance Criteria Stage 3 New Acland Mine Project — Grazing Lands

Land Suitability Class	**Acceptance Criteria — Grazing Land**						
	Non-polluting	**Stability and Sustainability Land Use**					
	Active Rill / Gully Erosion	Vegetation Cover	Native and Exotic Grass Species Diversity (spp./ha)	Slopes	Geo-technical Stability	Active Rill / Gully Erosion	Declared Weeds
2 to 5	Absence (<10t/ha/yr)	> 50%	≥4	Maximum 17°	stable	absence	absence

Table H6: Rehabilitation Acceptance Criteria Stage 3 New Acland Mine Project — Treed Areas

Land Suitability Class	**Acceptance Criteria — Grazing Land Treed Areas**						
	Non-polluting	**Stability and Sustainable Land Use**					
	Active Rill / Gully Erosion	Vegetation Cover (including tree / shrub canopy)	Native Tree / Shrub & Native / Exotic Grass Species Diversity (spp./ha)	Slopes	Geo-technical Stability	Active Rill / Gully Erosion	Declared Weeds
2 to 5	Absence (<10t/ha/yr)	> 50%	Eucalyptus spp. ≥2 Acacia spp. ≥2 Other tree / shrub spp. ≥2 Grass ≥3	Maximum 17°	stable	absence	absence

H11	All areas significantly disturbed by mining activities must be rehabilitated in accordance with the Mine Closure Plan outlined in **Condition H13**.
H12	Rehabilitation must commence progressively in accordance with the plan of operations.

H13	**Closure and post closure** The environmental authority holder must submit a Mine Closure Plan to the administering authority at least **five years prior** to the surrender of this environmental authority.
H14	When the deposition of tailings ceases, the holder of this Environmental Authority must install a final cover system to the Tailings Storage Facility, which effectively minimises: a) infiltration of water into the Tailings Storage Facility; and b) the likelihood of any erosion occurring to either the final cover system, dumped spoil material or deposited tailings.
H15	The final cover system must include an inert layer to reduce infiltration and an upper/final layer of earthen material that is capable of sustaining plant growth.
H16	**Sustainable final land use outcomes** Areas that are to be progressively rehabilitated must comply with, but not be limited to, the following outcomes: a) All areas disturbed by mining activities must be rehabilitated to the landform design criteria defined in the Final Land Use and Rehabilitation Plan required by **Condition H10 to H13;** and b) The final landforms must be stable with erosion rates comparable to a suitable analogue site.
H17	**Grazing pasture outcome for ML50170 and ML50216** Areas which are to be progressively rehabilitated to grazing pasture must comply with the following outcomes; a) generate a self-sustaining vegetation with projective cover, species composition and species distribution comparable with that of analogue sites to be determined by the study detailed in **Condition H10** e.g. planting local native grass and shrub species where possible. These vegetation species must be listed in the Final Land Use and Rehabilitation Plan; b) all areas disturbed by mining activities must be rehabilitated to the landform design criteria defined in **Table H2 - Landform design criteria for New Acland Coal Mine – ML50170 and ML50216**; c) a measure of productivity (e.g. sustainable dry matter production, stock live weight gain) are comparable to the selected analogue sites detailed in **Condition H18**.
H18	Complete an investigation into rehabilitation of disturbed areas and submit a report to the administering authority proposing acceptance criteria to meet the outcomes in **Condition H17** and landform design criteria in **Table H2 - Landform design criteria for New Acland Coal Mine – ML50170 and ML50216** within **twelve months** of the issue of the Environmental Authority.

H19	**Residual void outcome** Residual voids must comply with the following outcomes: a) residual voids must not cause any serious environmental harm to land, surface waters or any recognised ground water aquifer, other than the environmental harm constituted by the existence of the residual void itself, and subject to any other condition within this Environmental Authority; and b) residual voids must comply with **Table H3 - Residual Void Design – ML50170 and ML50216**.
H20	Complete an investigation into residual voids and submit the findings in the Mine Closure Plan outlined by **Condition H13** to the administering authority proposing acceptance criteria to meet the outcomes in **Condition H19** and landform design criteria in **Table H3 — Residual Void Design – ML50170 and ML50216**.
H21	All areas within the mining lease will be managed to reduce the spread of declared plants including both disturbed and undisturbed areas.
H22	**Topsoil** a) The environmental authority holder must ensure that topsoil is removed and stockpiled prior to carrying out any disturbance activities such that topsoil must be strategically stripped ahead of mining activities, including the establishment of spoil dump areas; and, b) Topsoil must not be disposed of in a pit or otherwise sterilised from reuse.
H23	**Contaminated land** Before applying for surrender of a mining lease, the holder must (if applicable) provide to the administering authority a site investigation report under the Act, in relation to any part of the mining lease which has been used for notifiable activities or which the holder is aware is likely to be contaminated land, and also carry out any further work that is required as a result of that report to ensure that the land is suitable for its final land use.
H24	Before applying for progressive rehabilitation certification for an area, the holder must (if applicable) provide to the administering authority a site investigation report under the Act, in relation to any part of the area the subject of the application which has been used for notifiable activities or which the holder is aware is likely to be contaminated land, and also carry out any further work that is required as a result of that report to ensure that the land is suitable for its final land use in accordance with **Condition F10.**
H25	Minimise the potential for contamination of land by hazardous contaminants.
H26	**Impacted land** The holder of the environmental authority must provide the approved report required by Imposed Condition 9, of Appendix 1, of the CG's report, to the administering authority, within **20 business days** of it being approved.
H27	The holder of the environmental authority must provide a report demonstrating fulfilment of the requirements of Imposed Condition 9(i) — (k) in the CG's report, to the administering authority with any surrender application.

H28	**Land resource survey** The holder of the environmental authority must provide the approved report required by Imposed Condition 6, of Appendix 1, of the CG's report, to the administering authority, within **20 business days** of approval.
H29	**Rehabilitation of disturbed land** The holder of the environmental authority must provide the approved rehabilitation success criteria required by Imposed Condition 7, of Appendix 1, of the CG's report, to the administering authority within **20 business days** of approval.

Agency interest: Biodiversity	
Condition number	**Condition**
I1	The holder of the environmental authority must ensure that staff induction and environmental awareness programs include reference to *Anomalopus mackayi* (Five-clawed Worm-skink, Long-legged Worm-skink) and *Tympanocryptis pinguicolla* (Grassland Earless Dragon, South-eastern Lined Earless Dragon) to ensure that any individuals that might be present in the project area are identified and reported to the mine site environmental officer for recovery and release into suitable habitat.
I2	The holder of this Environmental Authority must develop a Conservation Management Plan for the riparian area of Lagoon Creek and existing stands of regional ecosystems RE11.8.5 and RE11.8.3 located on Bottle Tree Hill and submit the Plan to the Administering Authority and the Department of Natural Resources, Mines and Water within twelve months of the date this environmental authority takes effect. The Plan must for the two proposed conservation areas (Lagoon Creek and Bottle Tree Hill): a) ensure the combined surface area to be protected and enhanced is no less than the surface area of the regional ecosystems proposed to be cleared by mining activities on Mining Leases 50170 and 50216; b) develop appropriate conservation/rehabilitation objectives; c) outline suitable conservation/rehabilitation techniques (including those areas where local native plant species/communities are to be re-established and/or enhanced); d) develop an action plan/rehabilitation schedule for the planned conservation/rehabilitation activities; e) propose specific conservation/rehabilitation acceptance criteria (including those areas where local native plant species/communities are re-established and/or enhanced); f) detail a suitable monitoring program to quantify conservation/rehabilitation success (including those areas where local native plant species/communities are re-established and/or enhanced); and g) propose appropriate remedial actions for conservation/rehabilitation areas not achieving the required conservation/rehabilitation objectives.

I3	**Biodiversity offsets** Significant residual impacts to prescribed matters of state environmental significance must not exceed the maximum authorised residual impact area listed for that matter in **Table I1 - Maximum authorised impacts on matters of state environmental significance** and shown in **Figure 4 —Impact on vegetation and habitat**. **Note:** Deemed conditions in Sections 18, 22, 24 and 25 of *the Environmental Offsets Act 2014* are taken to be conditions of this authority.
I4	The holder of the environmental authority must provide an environmental offset for the following maximum significant residual impacts on matters of state environmental significance in accordance with the requirements of the *Environmental Offsets Act 2014* (including deemed conditions), the *Environmental Offsets Regulation 2014* and the *Queensland Environmental Offsets Policy 2014*.

Table I1 — Maximum authorised impacts on matters of state environmental significance

RE (Prescribed matter)	VM Act status	Maximum area of residual impact (ha)	Environmental offset required
11.3.1#	Endangered	12	Yes
11.3.21#	Endangered	35.9	Yes
11.9.5#	Endangered	12.6	
11.3.2	Of concern	4.8	Yes
11.3.17	Of concern	7	Yes
11.8.11#	Of concern	4.1	Yes
11.9.10	Of concern	4.1	Yes
11.9.13	Of concern	3.6	Yes
Of concern RE within a defined distance from the defining banks of a relevant watercourse 11.3.2	Of concern	2.39	Yes
Koala *Phascolarctos cinereus*	Special least concern	19.5	Yes
Belson's Panic# *Homopholis belsoni*	Endangered	70.8	Yes

 # These prescribed environmental values duplicate MNES values and, in the event of an Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) decision on the project, offsets for these matters may be conditioned for by the Commonwealth. Further, any offsets conditioned by the Commonwealth are likely to address offsetting for these matters as required by this environmental authority.

I5	Residual impacts are not authorised on any Matters of State Environmental Significance not identified in **Table I1 — Maximum authorised impacts on matters of state environmental significance**
I6	**Environmental Offset Strategy (EOS)** The environmental authority holder must provide the approved environmental offset strategy required by Imposed Condition 13 of the CG's report, to the administering authority within **20 business days** of its being approved.
I7	**Pre-clearance fauna and flora surveys** Prior to commencement of any project construction activities, the environmental authority holder must conduct pre-clearance ecological surveys of areas to be impacted, consistent with: a) Queensland state government survey guidelines; b) Requirements of the *Nature Conservation Act 1992*; and c) Australian government threatened species guidelines.
I8	The surveys must be sufficient to identify the extent to which the following will be unavoidably impacted by the project: a) Protected wildlife listed under the *Nature Conservation Act* 1992; b) Matters of state environmental significance (MSES) as defined by the State Planning Policy; and c) MNES as listed under the EPBC Act
I9	The surveys must include areas of potential foraging, roosting or nesting habitat for the painted honeyeater (*Grantiella picta*). If the painted honeyeater is found during pre-clearance surveys, then any significant impacts on its habitat may require additional offsets in accordance with the EOS for the project.
I10	If protected plants are found during pre-clearance surveys, then impacts may require a permit under the *Nature Conservation Act 1992* and offsets under the *Environmental Offsets Act 2014*.
I11	Should additional MSES species and communities be located that were not previously identified during field surveys, the development of management plans and/or additional offsets may be required to address any significant residual impacts for matters of state environmental significance in accordance with the EOS for the project.
I12	Notification of the discovery of additional protected plants or MSES species and communities will be impacted is to be provided to the administering authority within five business days of the discovery. The proponent is required to propose how the species is to be managed and to seek advice from the administering authority on the undertaking.
I13	Survey results must be included in an updated EOS for the project.
I14	Surveys must include area of potential habitat for the vulnerable pale imperial hairstreak butterfly — *Jalmenus eubulus*. If the pale imperial hairstreak is found during pre-clearance surveys, then any significant impacts on its habitat may require additional offsets in accordance with the EOS for the project.

I15	**Lagoon Creek Conservation Zone Management Plan (CZMP)** The holder of the environmental authority holder must provide the approved Lagoon Creek Conservation Zone Management Plan, which is in accordance with Imposed Condition 15 of the CG's report, to the administering authority, within **20 business days** of it being approved.
I16	**Koala Species Management Plan (KSMP)** The holder of the environmental authority holder must provide the approved Koala species management plan, which is in accordance with Imposed Condition 16 of the CG's report, to the administering authority, within **20 business days** of it being approved.

Agency interest: Regulated Structures	
Condition number	**Condition**
J1	**Regulated Dams and Levees** The consequence category of any structure must be assessed by a suitable qualified and experienced person in accordance with the *Manual for Assessing Categories and Hydraulic Performance of Structures* (EM635) at the following times: a) Prior to the design and construction of the structure, if it is not an existing structure; or b) If it is an existing structure, prior to the adoption of this schedule; or c) Prior to any change in its purpose or the nature of its stored contents.
J2	A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence for more than one structure.
J3	Certification must be provided by the suitably qualified and experienced person who undertook the assessment, in the form set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635).
J4	**Design and construction of a regulated structure** **Conditions J5** to **J9** inclusive do not apply to existing structures.
J5	All regulated structures must be designed by and constructed under the supervision of a suitable qualified and experienced person in accordance with the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635).
J6	Construction of a regulated structure is prohibited unless the holder has submitted a consequence category assessment report and certification to the administering authority that has been certified by a suitably qualified person for the design and the design plan and the associated operating procedures in compliance with the relevant condition of this authority.
J7	Certification must be provided by the suitable qualified and experienced person who oversees the preparation of the design plan set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635), and must be recorded in the Regulated Dams/Levees register.

J8	Regulated structures must: a) be designed and constructed in accordance with and conform to the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635); b) be designed and constructed with due consideration given to ensuring that the design integrity would not be compromised on account of: floodwaters from entering the regulated dam from any watercourse or drainage line; and wall failure due to erosion by floodwaters arising from any watercourse or drainage line; c) (only for regulated dams associated with a failure to contain seepage) have the floor and sides of the dam designed and constructed to prevent or minimise the passage of the wetting front and any entrained contaminants through either the floor or sides of the dam during the operational life of the dam and for any period of decommissioning and rehabilitation of the dam.
J9	Certification by the suitable qualified and experienced person who supervises the construction must be submitted to the administering authority on the completion of construction of the regulated structure and state that: a) The 'as constructed' drawings and specifications meet the original intent of the design plan for that regulated structure; and b) Construction of the regulated structure is in accordance with the design plan.
J10	**Operation of a regulated structure** Operation of a regulated structure, except for an existing structure, is prohibited unless the holder has submitted to the administering authority: a) One paper copy and one electronic copy of the design plan and certification of the 'design plan' in accordance with **Condition J6**; and b) A set of 'as constructed' drawings and specifications; and c) Certification of those 'as constructed drawings and specifications' in accordance with **Condition J6;** and d) Where the regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the DSA volume across the system, a copy of the certified system design plan; and e) The requirements of this authority relating to the construction of the regulated structure have been met; and f) The holder has entered the details required under this authority into a Register of Regulated Dams; and g) There is a current operational plan for the regulated structures.
J11	For existing structures that are regulated structures: a) Where the existing structure that is a regulated structure is to be managed as part of an integrated containment system for the purposes of sharing DSA volume across the system, the holder must submit to the administering authority within **12 months of the commencement** of this condition a copy of the certified system design plan including that structure; and b) There must be a current operational plan for the existing structures.
J12	Each regulated structure just be maintained and operated for the duration of its operational life until decommissioned and rehabilitated in a manner that is consistent

	with the current operational plan and if applicable the current design plan and associated certified 'as constructed' drawings.
J13	**Mandatory reporting level** **Conditions J14 to J17** inclusive apply to Regulated Structures which have not been certified as low consequence category for 'failure to contain — overtopping'.
J14	The Mandatory Reporting Level (the MRL) must be marked on a regulated dam in such a way that during routine inspections of the dam it is clearly observable.
J15	The holder must, as soon as practical and **within forty-eight (48) hours** of becoming aware, notify the administering authority when the level of the contents of a regulated dam reaches the MRL.
J16	The holder must, immediately on becoming aware that the MRL has been reached, act to prevent the occurrence on any unauthorised discharges from the regulated dam.
J17	The holder must record any changes to the MRL in the Register of Regulated Structures.
J18	**Design storage allowance** The holder must assess the performance of each regulated dam or linked containment system over the preceding November to May period based on actual observations of the available storage in each regulated dam or linked containment system taken **prior to 1 July of each year.**
J19	**By 1 November of each year**, storage capacity must be available in each regulated dam (or network of linked containment systems with a shared DSA volume) to meet the Design Storage Allowance (DSA) volume of the dam (or network of linked containment systems).
J20	The holder must, as soon as possible and within **forty-eight (48) hours** of becoming aware that the regulated dam (or network of linked containment system) will not have the available storage to meet the DSA volume on 1 November of any year, notify the administering authority.
J21	The holder must, immediately on becoming aware that a regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on 1 November of any year, act to prevent the occurrence of any unauthorised discharge from the regulated dam or linked containment systems.
J22	**Annual inspection report** Each regulated dam must be inspected each calendar year by a suitable qualified and experienced person.
J23	At each inspection the condition and adequacy of all components of the regulated structure must be assessed and a suitable qualified and experienced person must prepare an annual inspection report containing details of the assessment and include recommended actions to ensure the integrity of the regulated structure.
J24	The suitable qualified and experienced person who prepared the annual inspection report must certify the report in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635).

J25	The holder must: a) **Within 20 business days** of receipt of the annual inspection report provide to the administering authority: (1) the recommendations section of the anneal inspection report; and (2) if applicable, any actions being taken in response to those recommendations; and b) If, following receipt of the recommendations and (if applicable) actions, the administering authority requests a full copy of the annual inspection report from the holder, provide this information to the administering authority **within 10 business days** of receipt of the request.
J26	**Transfer arrangements** The holder must provide a copy of any reports, documentation and certifications prepared under this authority, including but not limited to and Register of Regulated Structures, consequence assessment, design plan and other supporting documentation, to a new holder on transfer of this authority.
J27	**Decommissioning and rehabilitation** Dams must not be abandoned but be either: a) Decommissioned and rehabilitated to achieve compliance with **Condition H30**; or b) Be left in-situ for a beneficial use(s) provided that: (1) it no longer contains contaminants that will migrate into the environment; and (2) it contains water of a quality that is demonstrated to be suitable for the intended beneficial use(s); and (3) the administrating authority, the holder of the environmental authority and the landholder agree in writing that the dam will be used by the landholder following cessation of the resource activity.

J28	After decommissioning, all significantly disturbed land caused by carrying out of the resource activity must be rehabilitated to meet the final acceptance criteria: a) The landform is safe for humans and fauna; b) The landform is stable with no subsidence of erosion gullies for at least **three (3) years**; c) Any contaminated land (e.g. contaminated soils) is remediated and rehabilitated; d) Not allowing for acid mine drainage; e) There is no ongoing contamination to waters (including groundwater); f) All significantly disturbed land is reinstated as defined in **Table H1 — Rehabilitation requirements**; g) For land that is not being cultivated by the landholder: (1) groundcover, that is not a declared pest species is established and self-sustaining (2) vegetation of similar species richness and species diversity to pre-selected analogue sites is established and self-sustaining, and (3) the maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance caused by carrying out the petroleum activity(ies). h) For land that is to be cultivated by the landowner, cover crop is revegetated, unless the landholder will be preparing the site for cropping **within 3 months** of resource activities being completed.
J29	**Register of Regulated Dams** A Register of Regulated Dams must be established and maintained by the holder for each regulated dam.
J30	The holder must provisionally enter the required information in the Register of Regulated Dams when a design plan for a regulated dam is submitted to the administering authority.
J31	The holder must make a final entry of the required information in the Register of Regulated Dams once compliance with **Condition J10 and J11** has been achieved.
J32	The holder must ensure that the information contained in the Register of Regulated Dams is current and complete on any given day.
J33	All entries in the Register of Regulated Dams must be approved by the chief executive officer for the holder of this authority, or the delegate, as being accurate and correct.
J34	The holder must, at the same time as providing the annual return, supply to the administering authority a copy of the records contained in the Register of Regulated Dams, in the electronic format required by the administering authority.

Agency interest: Rail Infrastructure	
Condition number	**Condition**
K1	**Train load-out facility: New Acland Coal Mine Stage 3** The new train load-out facility, rail loop and rail spur for the project is required to be the sole distribution point for all railed product from the first day of operations of the stage 3 project.
K2	The holder of the EA must notify the administering authority once the Coordinator-General has been notified that the new train-load out facility has become operational.
K3	**New Acland Coal Mine Stage 3: Rail Spur Design** A suitably qualified person must certify that the design and construction of the rail spur: a) is in accordance with the design criteria in the Department of Transport and Main Roads (March 2010) Road Drainage Manual 2nd edition; and b) meets the following criteria for a two per cent annual exceedance probability rainfall event (50-year Annual Recurrence Interval): (1) not cause, or have the potential to increase flood damage at a domestic premises or commercial premises; (2) a maximum increase in afflux of 0.1m at a domestic premises or commercial premises; (3) a maximum increase in afflux of 0.2m at the Jondayran-Muldu road, or existing electricity, water supply, sewage or telecommunications infrastructure in the town of Jondaryan; (4) a design objective of an increase in afflux of 0.3m, with a maximum increase in afflux of 0.5m at other locations; (5) a maximum culvert outlet velocity of 2.5m/s; and (6) any increase in duration of floodplain inundation is not to exceed 72 hours or 20 per cent of existing flood duration (whichever is greater).
K4	A copy of the certification required by **Condition K3** is to be provided to the Administering Authority upon request.
K5	Land owners, residents, asset owners likely to be impacted by changes to the existing flooding/drainage system, and, at a minimum, Toowoomba Regional Council and the Queensland Reconstruction Authority must be consulted prior to completion of the final rail spur design
K6	Where the rail spur cannot be designed, constructed and maintained so as not to cause or increase flood damage at residential premises or at a commercial premises, compensation is to be negotiated with affected land owners, residents, and asset owners.

Agency interest: Light	
Condition number	**Condition**
L1	Subject to **Condition L2**, the emission of light resulting from the mining activity must not cause an environmental nuisance at any sensitive place.
L2	When requested by the administering authority, an assessment of the light nuisance* must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive place, and the results must be notified within **14 days** of the administering authority following completion of the assessment. (* Assessment to be conducted according to and with reference to the limits specified in AS 4282-1997 Control of the Obtrusive Effects of Outdoor lights).
L3	If the assessment indicates **Condition L2** is not being met then the environmental authority holder must: a) address the complaint including the use of appropriate dispute resolution if required; or b) immediately implement light abatement measures so the emissions of light from the activity do not result in further environmental nuisance.

Agency interest: Community	
Condition number	**Condition**
M1	**Complaints** The holder of this environmental authority must record all environmental complaints received about the mining activities including: a) name, address and contact number for of the complainant; b) time and date of complaint; c) reasons for the complaint; d) investigations undertaken; e) conclusions formed; f) actions taken to resolve the complaint; g) any abatement measures implemented; and h) person responsible for resolving the complaint. The information as outlined in **Condition M1 (a) to (h)** with the consent of the complainant must be sent to the administering authority (and the complainant) within 28 days of the action taken to resolve the complaint.
M2	The holder of this environmental authority must, when requested by the administering authority, undertake relevant specified monitoring within a reasonable timeframe nominated or agreed to by the administering authority to investigate any complaint of

	environmental harm. The results of the investigation (including an analysis and interpretation of the monitoring results) and abatement measures, where implemented, must be provided to the administering authority **within 10 business days** of completion of the investigation, or no later than 10 business days after the end of the timeframe nominated by the administering authority to undertake the investigation.
M3	**Notification of emergencies, incidents and exceptions** The holder of this environmental authority must notify the administering authority by written notification **within 24 hours** after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with, the conditions of this environmental authority.
M4	**Within 10 business days** following the initial notification of an emergency or incident, or receipt of monitoring results, whichever is the later, further written advice must be provided to the administering authority, including the following: a) results and interpretation of any samples taken and analysed; b) outcomes of actions taken at the time to prevent or minimise unlawful environmental harm; and c) proposed actions to prevent a recurrence of the emergency or incident.
M5	At the completion of mining, the environmental authority holder must apply to the relevant authority to restore or provide alternative road access to Acland Township, in particular the war memorial.
M6	Basalt from stockpiles must only be transported within the approved mining area as indicated in **Figure 1 (Revised Project Overview - Mine Area)**, wherever possible.
M7	The environmental authority holder must provide an independent counselling service accessible to all local landowners located within 5km of the mining lease boundary to deal with concerns, stress and emotional distress associated with mining activities.

Definitions

acid rock drainage	any contaminated discharge emanating from a mining activity formed through a series of chemical and biological reactions, when geological strata is disturbed and exposed to oxygen and moisture.
acceptance criteria	means the measures by which actions implemented are deemed to be complete. The acceptance criteria indicate the success of the decommissioning and rehabilitation outcomes or remediation of areas which have been significantly been disturbed by the mining activities. Acceptance criteria may include information regarding: - stability of final land forms in terms of settlement, erosion, weathering, pondage and drainage; - control of geochemical and contaminant transport processes; - quality of runoff waters and potential impact on receiving environment; - vegetation establishment, survival and succession; - vegetation productivity, sustained growth and structure development; - fauna colonisation and habitat development; - ecosystem processes such as soil development and nutrient cycling, and the recolonisation of specific fauna groups such as collembola, mites and termites which are involved in these processes; - microbiological studies including recolonisation by mycorrhizal fungi, microbial biomass and respiration; - effects of various establishment treatments such as deep ripping, topsoil handling, seeding and fertiliser application on vegetation growth and development; - resilience of vegetation to disease, insect attack, drought and fire; - vegetation water use and effects on ground water levels and catchment yields.
administering authority	means the Environmental Protection Agency or its successor.
affected person	someone whose drinking water can potentially be impacted as a result of discharges from a dam or their life can be put at risk due to dwellings or workplaces being in the path of a dam break flood.
airblast overpressure	energy transmitted from the blast site within the atmosphere in the form of pressure waves. The maximum excess pressure in this wave, above ambient pressure is the peak airblast overpressure measured in decibels linear (dBL).
ambient (or total) noise	at a place, means the level of noise at the place from all sources (near and far), measured as the Leq for an appropriate time interval.
appropriately qualified person	a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating

	to the subject matter using the relevant protocols, standards, methods or literature.
annual inspection report	an assessment prepared by a suitably qualified and experienced person containing details of the assessment against the most recent consequence assessment report and design plan (or system design plan): • against recommendations contained in previous annual inspections reports; • against recognised dam safety deficiency indicators; • for changes in circumstances potentially leading to a change in consequence category; • for conformance with the conditions of this authority; • for conformance with the 'as constructed' drawings; • for the adequacy of the available storage in each regulated dam, based on an actual observation or observations taken after 31 May each year but prior to 1 November of that year, of accumulated sediment, state of the containment barrier and the level of liquids in the dam (or network of linked containment systems); • for evidence of conformance with the current operational plan.
Annual Exceedance Probability or AEP	the probability that at least one event in excess of a particular magnitude will occur in any given year.
appropriately qualified person	means a person or body possessing appropriate experience and qualifications to perform these tasks.
assessed or assessment by a suitably qualified and experienced person in relation to a consequence assessment of a dam	a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit of the assessment: • exactly what has been assessed and the precise nature of that determination; • the relevant legislative, regulatory and technical criteria on which the assessment has been based; • the relevant data and facts on which the assessment has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and • the reasoning on which the assessment has been based using the relevant data and facts, and the relevant criteria.
associated works in relation to a dam	operations of any kind and all things constructed, erected or installed for that dam; and any land used for those operations.
authority	an environmental authority or a development approval.
background, with reference to the water schedule	the average of samples taken prior to the commencement of mining from the same waterway that the current sample has been taken.

background noise level	means noise, measured in the absence of the noise under investigation, as either: • L A90,T being the A-weighted sound pressure level exceeded for 90 percent of the time period of not less than 15 minutes, using Fast response, or • L LAbg,T being the arithmetic average of the minimum readings during a representative time period of not less than 15 minutes, using Fast response.
blasting	the use of explosive materials to fracture: • rock, coal and other minerals for later recovery; or • structural components or other items to facilitate removal from a site or for reuse.
Certification	assessment and approval must be undertaken by a suitably qualified and experienced person in relation to any assessment or documentation required by the Manual (*Manual for Assessing Categories and Hydraulic Performance of Structures* (EM635)), including design plans, 'as constructed' drawings and specifications, construction, operation or an annual report regarding regulated structures, undertaken in accordance with the Board of Professional Engineers of Queensland Policy Certification by RPEQs (ID: 1.4 (2A)).
Certifying, certify or certified	a corresponding meaning as certification
chemical	• an agricultural chemical product or veterinary chemical product within the meaning of the *Agricultural and Veterinary Chemicals Code Act 1994* (Commonwealth); or • a dangerous good under the Australian Code for the Transport of Dangerous Goods by Road and Rail approved by the Australian Transport Council; or • a lead hazardous substance within the meaning of the Workplace Health and Safety Regulation 1997; • a drug or poison in the Standard for the Uniform Scheduling of Drugs and Poisons prepared by the Australian Health Ministers Advisory Council and published by the Commonwealth; or • any substance used as, or intended for use as: a) a pesticide, insecticide, fungicide, herbicide, rodenticide, nematocide, miticide, fumigant or related product; or b) a surface active agent, including, for example, soap or related detergent; or c) a paint solvent, pigment, dye, printing ink, industrial polish, adhesive, sealant, food additive, bleach, sanitiser, disinfectant, or biocide; or d) a fertiliser for agricultural, horticultural or garden use; or

	e) a substance used for, or intended for use for mineral processing or treatment of metal, pulp and paper, textile, timber, water or wastewater; or f) manufacture of plastic or synthetic rubber.
commercial place	a workplace used as an office or for business or commercial purposes, which is not part of the mining activity and does not include employee accommodation or public roads.
Consequence in relation to a structure as defined	the potential for environmental harm resulting from the collapse or failure of the structure to perform its primary purpose of containing, diverting or controlling flowable substances.
Consequence category	a category, either low, significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635).
construction or constructed in relation to a dam	includes building a new dam and modifying or lifting an existing dam, but does not include investigations and testing necessary for the purpose of preparing a design plan.
dam	a land-based structure or a void that contains, diverts or controls flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works.
dam crest volume	the volume of material (liquids and/or solids) that could be within the walls of a dam at any time when the upper level of that material is at the crest level of that dam. That is, the instantaneous maximum volume within the walls, without regard to flows entering or leaving (for example, via spillway).
dB (Linear) Peak	is the maximum reading in decibels (dB) obtained using the "P" time — weighting characteristic as specified in AS 1259.1 — 1990 with all frequency — weighted networks inoperative
declared plant	means a plant that has been declared under the *Rural Lands Protection Act 1985*
design plan	a document setting out how all identified consequence scenarios are addressed in the planned design and operation of a regulated structure.
design storage allowance or DSA	an available volume, estimated in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635) published by the administering authority, must be provided in a dam as at 1 November each year in order to prevent a discharge from that dam to an **annual exceedance probability** (AEP) specified in that Manual.
designer for the purposes of a regulated dam	the certifier of the design plan for the regulated dam.
development approval	a development approval under the *Integrated Planning Act 1997* or the *Sustainable Planning Act 2009* in relation to a matter that involves an environmentally relevant activity under the *Environmental Protection Act 1994.*

disturbance of land	includes: • compacting, removing, covering, exposing or stockpiling of earth; • removal or destruction of vegetation or topsoil or both to an extent where the land has been made susceptible to erosion; • carrying out mining within a watercourse, waterway, wetland or lake; • the submersion of areas by tailings or hazardous contaminant storage and dam/structure walls; • temporary infrastructure, including any infrastructure (roads, tracks, bridges, culverts, dam/structures, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc.) which is to be removed after the mining activity has ceased; or • releasing of contaminants into the soil, or underlying geological strata. However, the following areas are not included when calculating areas of disturbance: • areas off lease (e.g. roads or tracks which provide access to the mining lease); • areas previously disturbed which have achieved the rehabilitation outcomes; • by agreement with the administering authority, areas previously disturbed which have not achieved the rehabilitation objective(s) due to circumstances beyond the control of the mine operator (such as climatic conditions); • areas under permanent infrastructure. Permanent infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dam/structures, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be left by agreement with the landowner; • disturbance that pre-existed the grant of the tenure.
EC	electrical conductivity.
effluent	treated waste water released from sewage treatment plants.
emergency action plan	documentation forming part of the operational plan held by the holder or a nominated responsible officer, that identifies emergency conditions that sets out procedures and actions that will be followed and taken by the dam owner and operating personnel in the event of an emergency. The actions are to minimise the risk and consequences of failure, and ensure timely warning to downstream communities and the implementation of protection measures. The plan must require dam owners to annually update contact.
environmental authority holder	means the holder of this environmental authority

environmental nuisance	is unreasonable interference or likely interference with an environmental value caused by: a) noise, dust, odour, light; or b) an unhealthy, offensive or unsightly condition because of contamination; or c) another way prescribed by regulation.
existing structure	a structure that was in existence prior to the adoption of this schedule of conditions under the authority.
Extreme Storm Storage	a storm storage allowance determined in accordance with the criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635) published by the administering authority
flowable substance	matter or a mixture of materials which can flow under any conditions potentially affecting that substance. Constituents of a flowable substance can include water, other liquids fluids or solids, or a mixture that includes water and any other liquids fluids or solids either in solution or suspension.
foreseeable future	is the period used for assessing the total risk of an event occurring. Permanent structures and ecological sustainability should be expected to still exist at the end of a 150 year foreseeable future with an acceptable risk of failure before that time.
hazard category	a category, either low significant or high, into which a dam is assessed as a result of the application of tables and other criteria in Manual for Assessing Hazard Categories and Hydraulic Performance of Dams.
holder	• where this document is an environmental authority, any person who is the holder of, or is acting under, that environmental authority; or • where this document is a development approval, any person who is the registered operator for that development approval.
hydraulic performance	the capacity of a regulated dam to contain or safely pass flowable substances based on the design criteria specified for the relevant consequence category in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635).
infrastructure	water storage dams, levees, roads and tracks, buildings and other structures built for the purpose of the mining activity.
LAmax adj,T	means the average maximum A-weighted sound pressure level, adjusted for noise character and measured over a time period of not less than 15 minutes, using Fast response
land in the land schedule of this document	land excluding waters and the atmosphere, that is, the term has a different meaning from the term as defined in the *Environmental Protection Act 1994*. For the purposes of the *Acts Interpretation Act 1954*, it is expressly noted that the term land in this environmental authority relates to physical land and not to interests in land.

land capability	as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland
land suitability	as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.
land use	the selected post mining use of the land, which is planned to occur after the cessation of mining operations.
LAr, 1 hour	means the specific noise level measured as the A-weighted equivalent continuous noise level (LAeq) plus any adjustment for the character of the noise (tonal and/or impulsive) determined over a reference time period of one hour
leachate	a liquid that has passed through or emerged from, or is likely to have passed through or emerged from, a material stored, processed or disposed of at the operational land which contains soluble, suspended or miscible contaminants likely to have been derived from the said material.
levee	an embankment that only provides for the containment and diversion of stormwater or flood flows from a contributing catchment, or containment and diversion of flowable materials resulting from releases from other works, during the progress of those stormwater or flood flows or those releases; and does not store any significant volume of **water** or **flowable substances** at any other times.
licensed place	the mining activities carried out at the mining tenements detailed in this environmental authority.
low consequence dam	any dam that is not a high or significant consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635)
m	metres
mandatory reporting level or MRL	a warning and reporting level determined in accordance with the criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635) published by the administering authority.
manual	the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635) published by the administering authority.
maximum	means that the measured value of the quality characteristic or contaminant must not be greater than the release limit stated
Maximum Instantaneous Charge (MIC)	is the maximum amount of explosive on any one specific delay detonator in any one blast hole.
MaxLpA,T	means the maximum A-weighted sound pressure level measured over a time period of not less than 15 minutes, using Fast response

measures	includes any measures to prevent or minimise environmental impacts of the mining activity such as bunds, silt fences, diversion drains, capping, and containment systems.
median	means the middle value, where half the data are smaller, and half the data are larger. If the number of samples is even, the median is the arithmetic average of the two middle values
mg/kg	means milligrams per kilogram
mg/L	means milligrams per litre

mine-affected water	the following types of water: i. pit water, tailings dam water, processing plant water; ii. water contaminated by a mining activity which would have been an environmentally relevant activity under Schedule 2 of the Environmental Protection Regulation 2008 if it had not formed part of the mining activity; iii. rainfall runoff which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated, excluding rainfall runoff discharging through release points associated with erosion and sediment control structures that have been installed in accordance with the standards and requirements of an Erosion and Sediment Control Plan to manage such runoff, provided that this water has not been mixed with pit water, tailings dam water, processing plant water or workshop water; iv. groundwater which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated; v. groundwater from the mines dewatering activities; vi. a mix of mine affected water (under any of paragraphs i-v, above) and other water. does not include surface water runoff which, to the extent that it has been in contact with areas disturbed by mining activities that have not yet been completely rehabilitated, has only been in contact with: • land that has been rehabilitated to a stable landform and either capped or revegetated in accordance with the acceptance criteria set out in the environmental authority but only still awaiting maintenance and monitoring of the rehabilitation over a specified period of time to demonstrate rehabilitation success; or • land that has partially been rehabilitated and monitoring demonstrates the relevant part of the landform with which the water has been in contact does not cause environmental harm to waters or groundwater, for example: a) areas that are been capped and have monitoring data demonstrating hazardous material adequately contained with the site; b) evidence provided through monitoring that the relevant surface water would have met the water quality parameters for mine affected water release limits in this environmental authority, if those parameters had been applicable to the surface water runoff; or c) both.
minimum	means that the measured value of the quality characteristic or contaminant must not be less than the release limit stated
modification or modifying	see definition of construction
NATA	National Association of Testing Authorities, Australia.

natural flow	the flow of water through waters caused by nature.
ng/L	means nanograms per litre
noise sensitive place	means: • a legal dwelling, caravan park, residential marina or other residential premises; or • a motel, hotel or hostel; or • a kindergarten, school, university or other educational institution; or • a medical centre or hospital; or • a protected area; or • a public park or gardens; and • includes the curtilage of any such place. but does not include (a) places that are within the boundaries of the mining lease; or (b) places that are owned or leased by the holder of the environmental authority or its related companies; or (c) places for which an agreement has been entered into between the holder of the environmental authority and the owner of the place for the provision of alternative measures to mitigate the impact of mining activities for the Stage 3 New Acland Mine Project at the place, where those measures are reasonably expected to result in noise levels experienced at the place that are consistent with the relevant limits in Table F1 - Noise Limits.
non polluting	having no adverse impacts upon the receiving environment.
noxious	means harmful or injurious to health or physical well being, other than trivial harm
offensive	means causing unreasonable offence or displeasure; is unreasonably disagreeable to the sense; disgusting, nauseous or repulsive, other than trivial harm.
operational plan	includes: • normal operating procedures and rules (including clear documentation and definition of process inputs in the DSA allowance); • contingency and emergency action plans including operating procedures designed to avoid and/or minimise environmental impacts including threats to human life resulting from any overtopping or loss of structural integrity of the regulated structure.
peak particle velocity (ppv)	a measure of ground vibration magnitude which is the maximum rate of change of ground displacement with time, usually measured in millimetres/second (mm/s).
protected area	means:

	• a protected area under the *Nature Conservation Act 1992*; or • a marine park under the *Marine Parks Act 1992*; or • a World Heritage Area.
progressive rehabilitation	means rehabilitation (defined below) undertaken progressively OR a staged approach to rehabilitation as mining operations are ongoing
range	means that the measured value of the quality characteristic or contaminant must not be greater than the higher release limit stated nor lower than the lower release limit stated
receiving environment in relation to an activity that causes or may cause environmental harm	the part of the environment to which the harm is, or may be, caused. The receiving environment includes (but is not limited to): • a watercourse; • groundwater; and • an area of land.
receiving waters	the waters into which this environmental authority authorises releases of mine affected water.
Register of Regulated Dams	includes: • Date of entry in the register; • Name of the dam, its purpose and intended/actual contents; • The consequence category of the dam as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635); • Dates, names, and reference for the design plan plus dates, names, and reference numbers of all document(s) lodged as part of a design plan for the dam; • Name and qualifications of the suitably qualified and experienced person who certified the design plan and as constructed drawings; • For the regulated dam, other than in relation to any levees - a) The dimensions (metres) and surface area (hectares) of the dam measured at the footprint of the dam; b) Coordinates (latitude and longitude in GDA94) within five metres at any point from the outside of the dam including its storage area; c) Dam crest volume (megalitres); d) Spillway crest level (metres AHD); e) Maximum operating level (metres AHD); f) Storage rating table of stored volume versus level (metres AHD); g) Design storage allowance (megalitres) and associated level of the dam (metres AHD); h) Mandatory reporting level (metres AHD);

	• The design plan title and reference relevant to the dam; • The date construction was certified as compliant with the design plan; • The name and details of the suitably qualified and experienced person who certified that the constructed dam was compliant with the design plan; • Details of the composition and construction of any liner; • The system for the detection of any leakage through the floor and sides of the dam; • Dates when the regulated dam underwent an annual inspection for structural and operational adequacy, and to ascertain the available storage volume for 1 November of any year; • Dates when recommendations and actions arising from the annual inspection were provided to the administering authority; • Dam water quality as obtained from any monitoring required under this authority as at 1 November of each year.
rehabilitation	the process of reshaping and revegetating land to restore it to a stable landform
release event	a surface water discharge from mine affected water storages or contaminated areas on the licensed place.
RL	reduced level, relative to mean sea level as distinct from depths to water.
representative	a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.
regulated dam	any dam in the significant or high consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635) published by the administering authority.
regulated structure	includes land-based containment structures, levees, bunds and voids, but not a tank or container designed and constructed to an Australian Standard that deals with strength and structural integrity.
residual drilling material	waste drilling materials including muds and cuttings or cement returns from well holes and which have been left behind after the drilling fluids are pumped out.
residual void	means an open pit resulting from the removal of ore and/or waste rock, which will remain following the cessation of all mining activities and completion of rehabilitation processes
saline drainage	the movement of waters, contaminated with salts, as a result of the mining activity.

self sustaining	means an area of land which has been rehabilitated and has maintained the required acceptance criteria without human intervention for a period nominated by the administering authority.
sensitive place	• a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or • a motel, hotel or hostel; or • an educational institution; or • a medical centre or hospital; or • a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 1992* or a World Heritage Area; or • a public park or gardens.
Structure	dam or levee.
Spillway	a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges form the dam, normally under flood conditions or in anticipation of flood conditions.
spillway crest	means the highest point (elevation) of the spillway, above which water will flow along the spillway and discharge from the dam if the flow rate is sufficient
stable	means land form dimensions are or will be stable within tolerable limits now and in the foreseeable future. Stability includes consideration of geotechnical stability, settlement and consolidation allowances, bearing capacity (traffic ability), erosion resistance and geochemical stability with respect to seepage and contaminant generation
Stage 3 New Acland mine project	means the Stage 3 New Acland mine project that was approved in the CG's report.
suitably qualified and experienced person in relation to air emissions	A person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the Professional Engineers Act 2002, and has demonstrated competency and relevant experience in relation to air emissions.
suitably qualified and experienced person in relation to noise	A person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the Professional Engineers Act 2002, and has demonstrated competency and relevant experience as an acoustician.
suitably qualified and experienced person in relation to regulated structures	a person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Engineers Act 2002*, and has demonstrated competency and relevant experience: • for regulated dams, an RPEQ who is a civil engineer with the required qualifications in dam safety and dam design. • for regulated levees, an RPEQ who is a civil engineer with the required qualifications in the design of flood protection embankments. Note: It is permissible that a suitably qualified and experienced person obtain subsidiary certification from an RPEQ who has demonstrated

	competence and relevant experience in either geomechanics, hydraulic design or engineering hydrology.
system design plan	a plan that manages an integrated containment system that shares the required DSA and/or ESS volume across the integrated containment system.
the Act	the *Environmental Protection Act 1994.*
tolerable limits	means that a range of values could be accepted to achieve an overall environmental management objective (eg a range of settlement of a tailing capping could still meet the objective of draining the cap quickly, preventing pondage and limiting infiltration and percolation)
uS/cm	microsiemens per centimetre.
ug/L	means micrograms per litre.
void	any constructed, open excavation in the ground.
watercourse	has the meaning in Schedule 4 of the *Environmental Protection Act 1994* and means a river, creek or stream in which water flows permanently or intermittently— • in a natural channel, whether artificially improved or not; or • in an artificial channel that has changed the course of the watercourse. watercourse includes the bed and banks and any other element of a river, creek or stream confining or containing water.
Waters	includes all or any part of a river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water in natural or artificial watercourses, bed and banks of a watercourse, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater.
Water quality	the chemical, physical and biological condition of water.
Water year	the 12-month period from 1 July to 30 June.
Wet season	the time of year, covering one or more months, when most of the average annual rainfall in a region occurs. For the purposes of DSA determination this time of year is deemed to extend from 1 November in one year to 31 May in the following year inclusive.

Agency Interest — Figures

Figure 1: Revised Project Overview — Mine Area

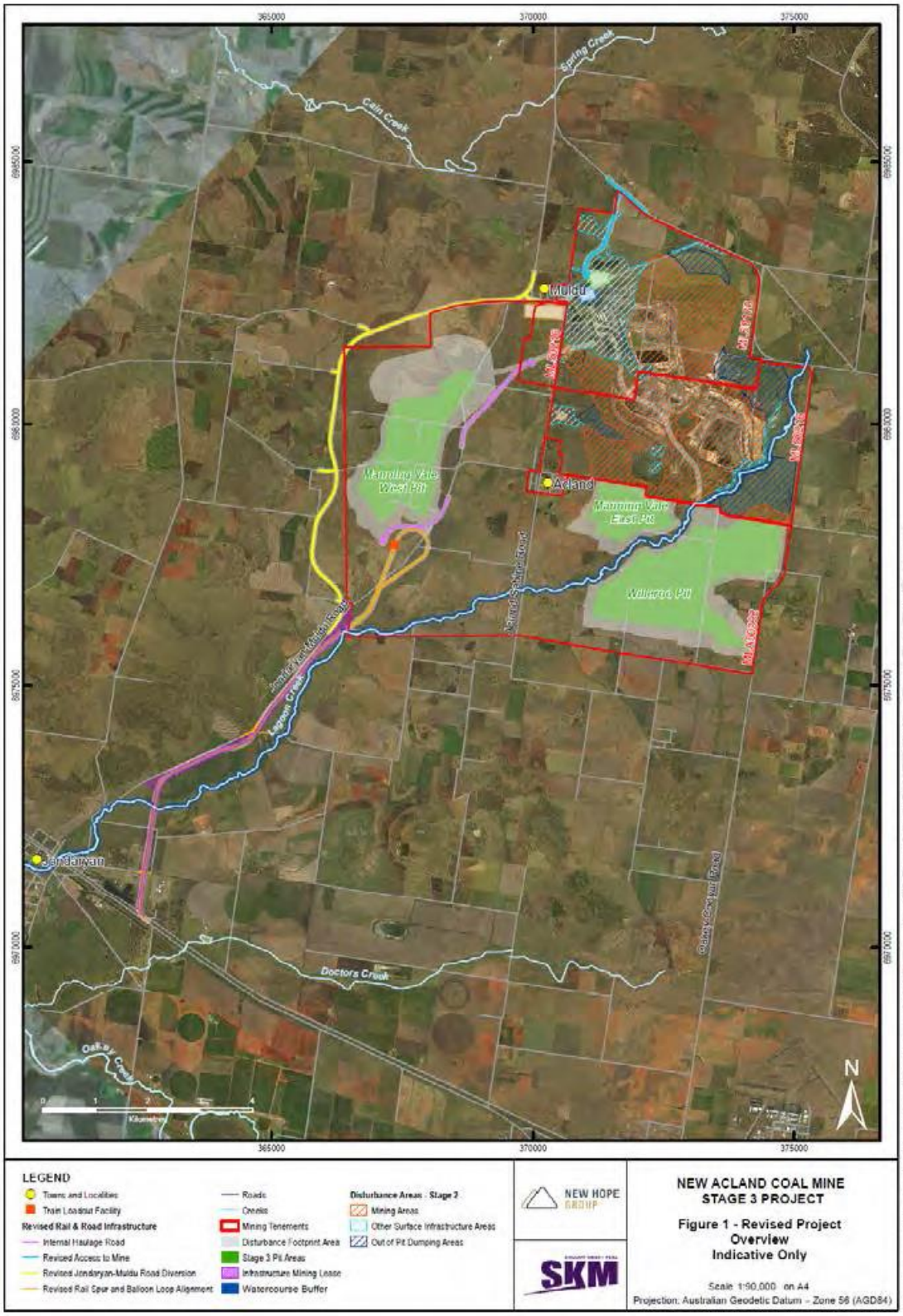


Figure 2: Mine affected water release points, sources and receiving waters monitoring locations

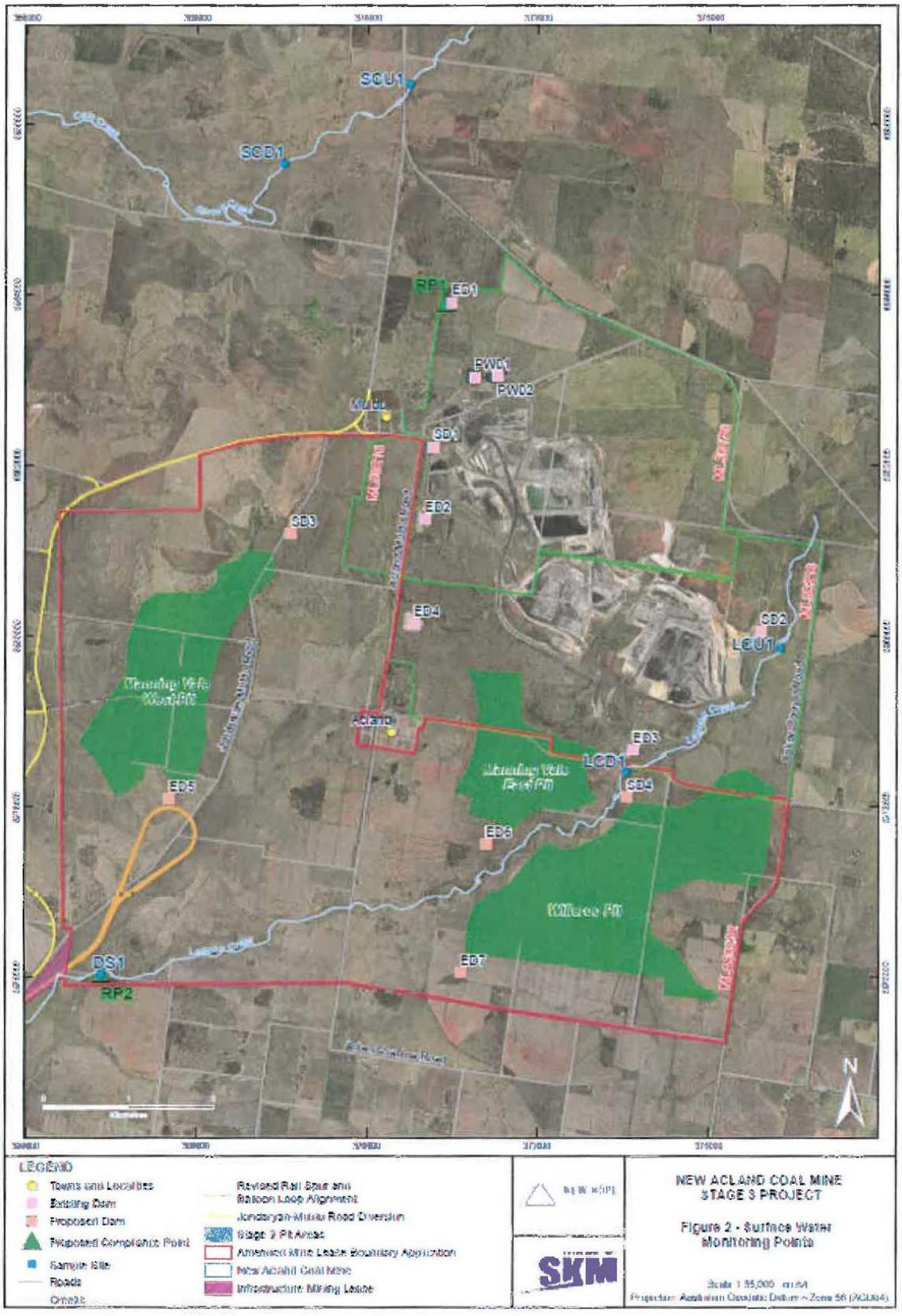


Figure 3: Lagoon Creek, buffer and levee

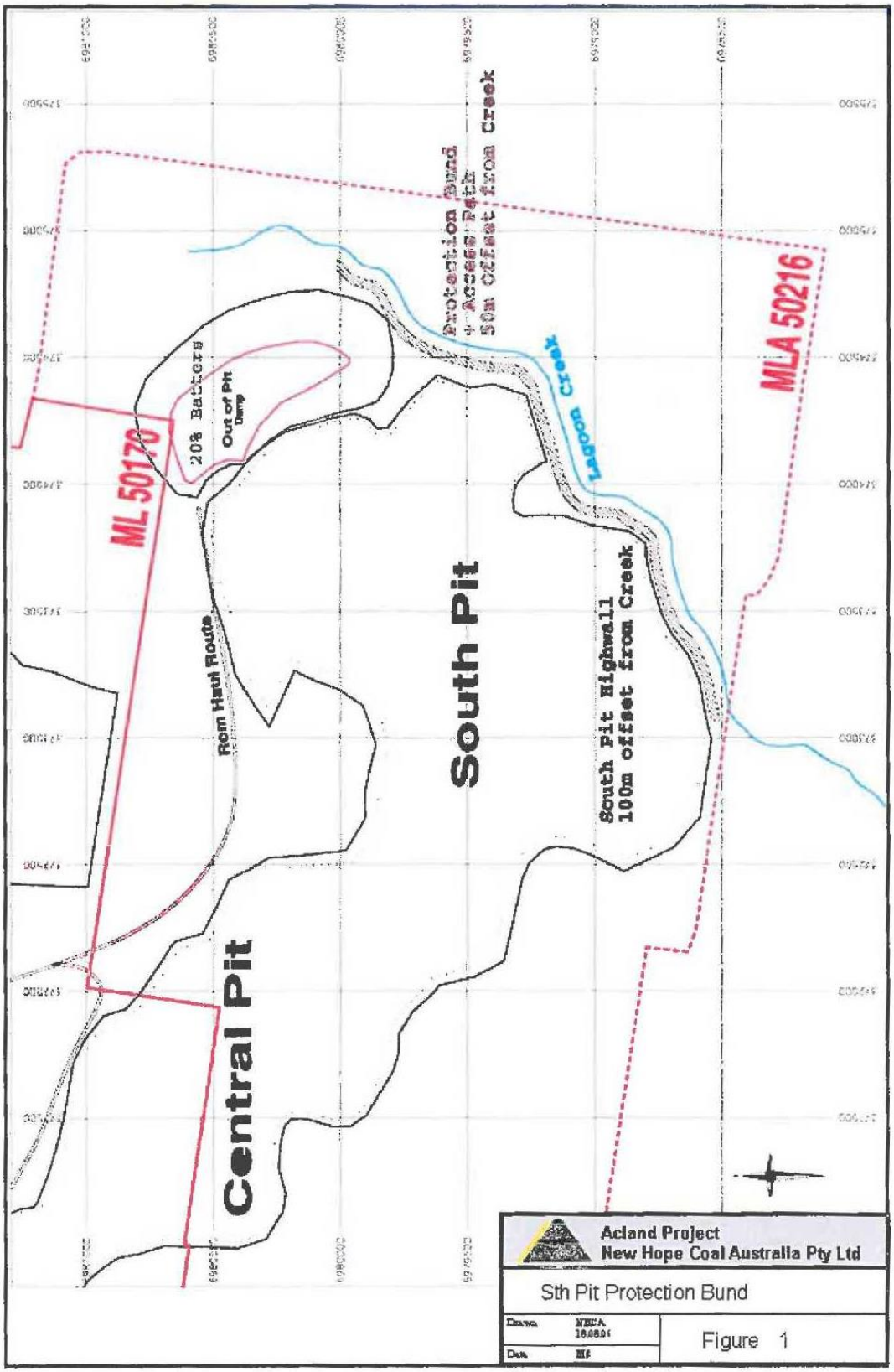


Figure 4 - Impact on vegetation and habitat

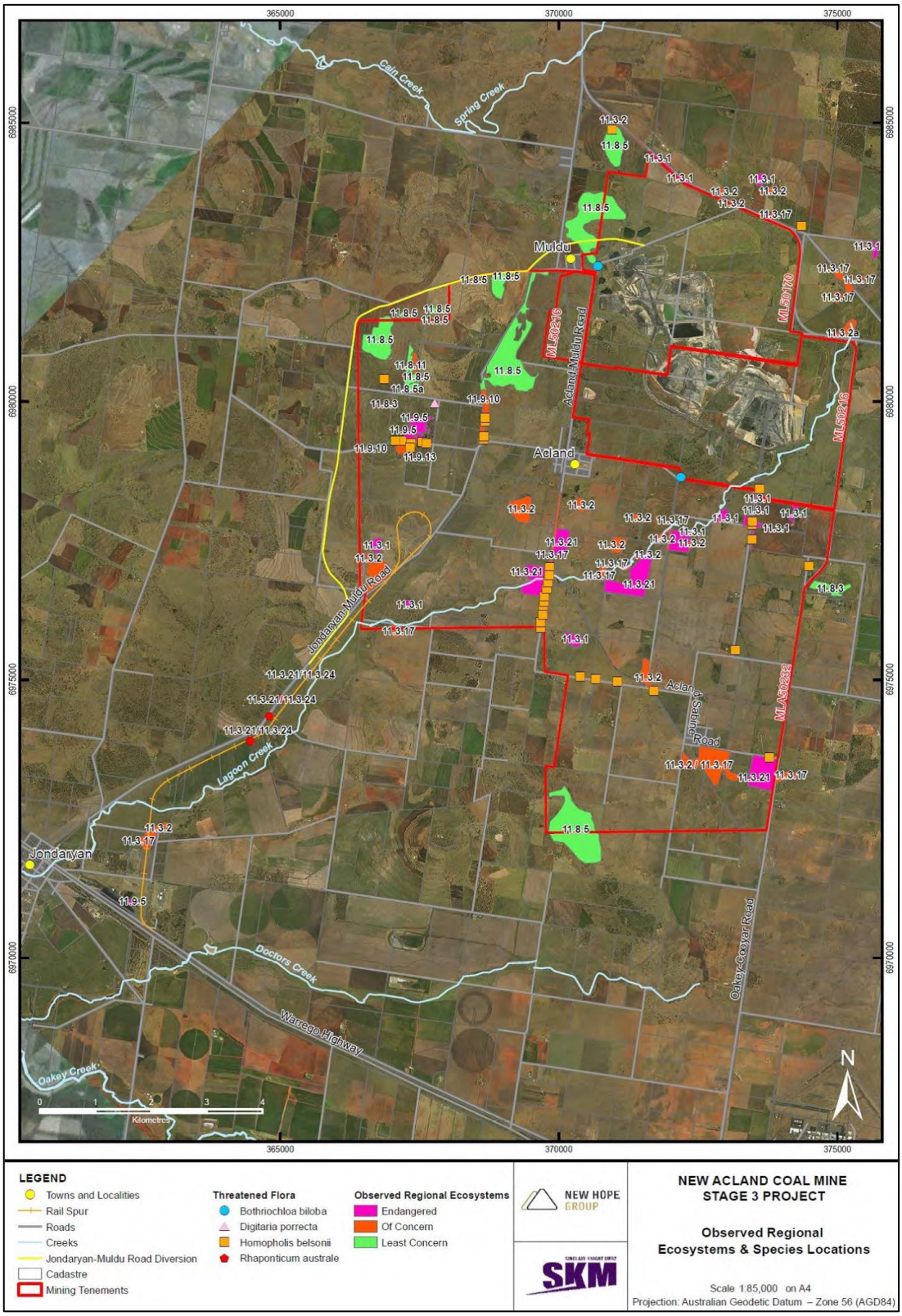


Figure 5 — Location of sensitive receptors

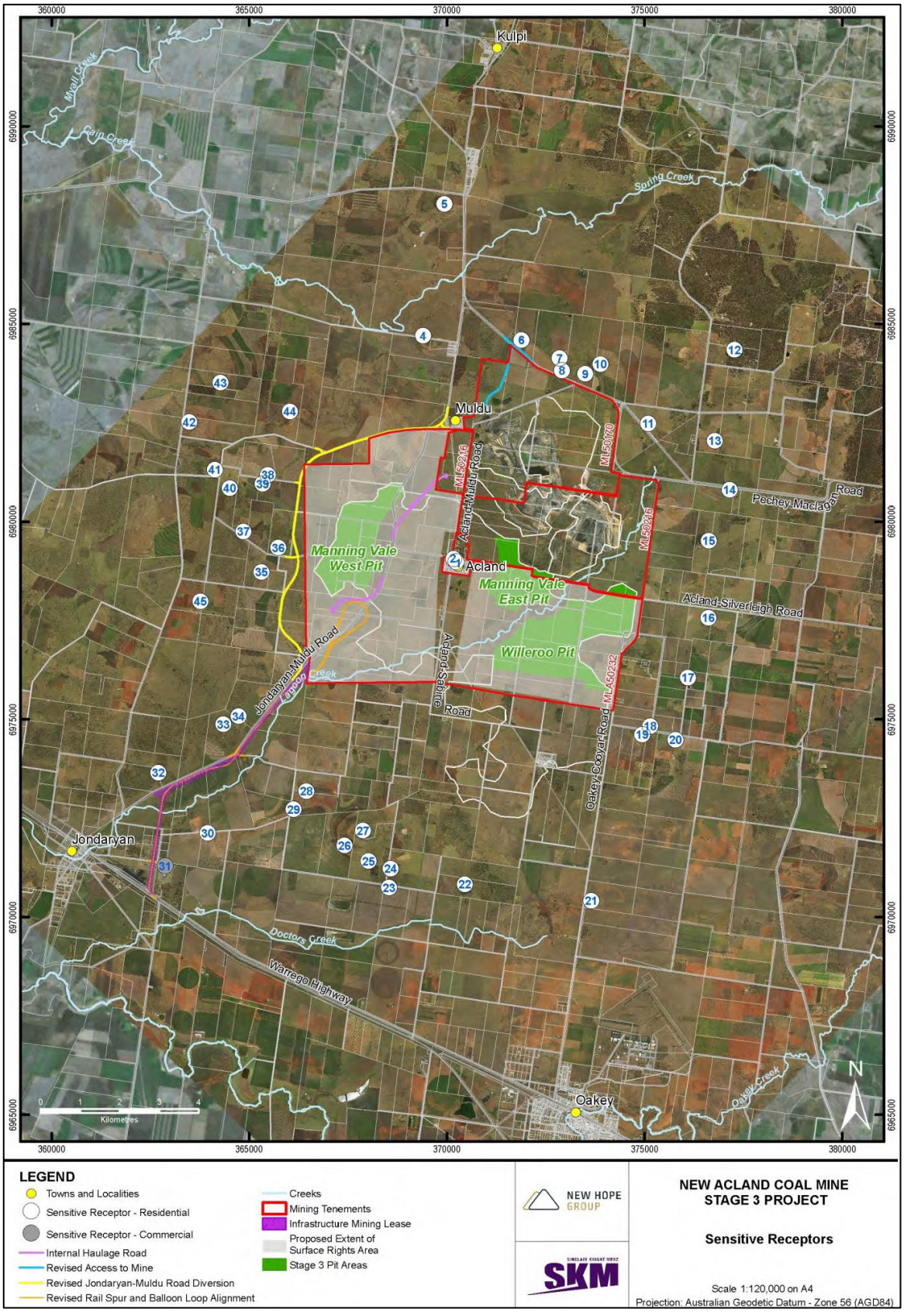


Figure 6 — Air quality monitoring locations for the revised project (Stage 3)

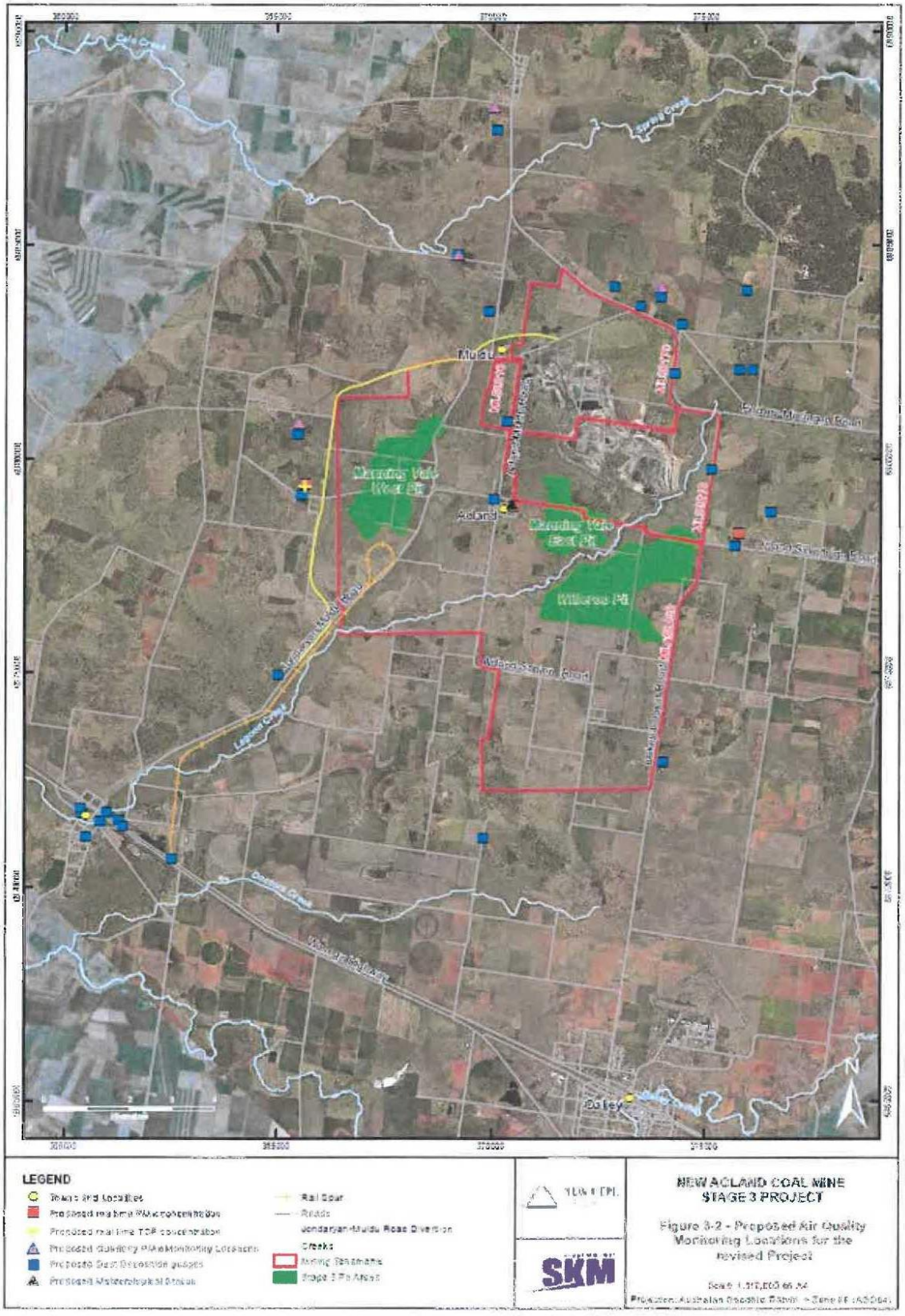
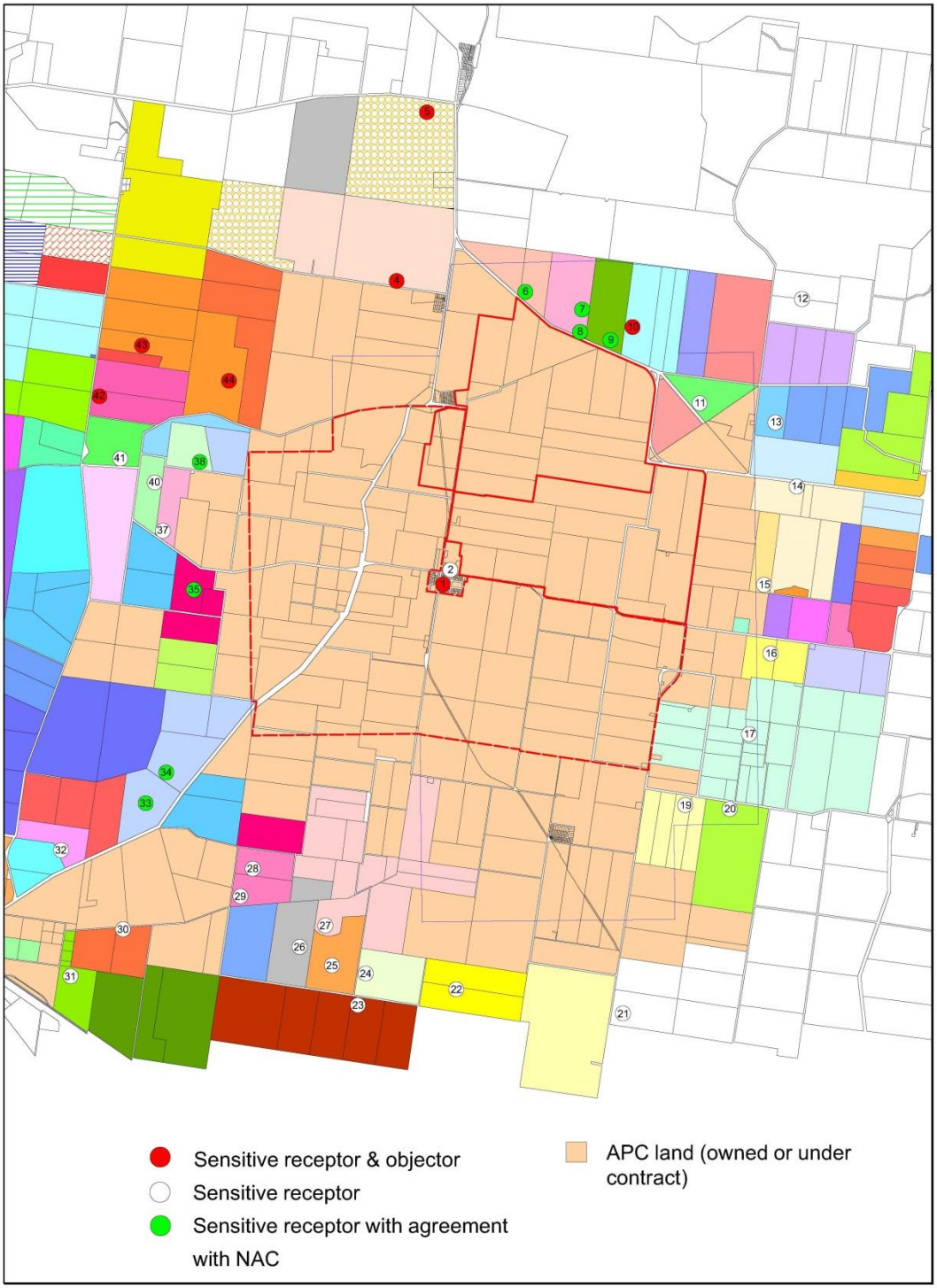


Figure 7 - Noise Sensitive Places (Mitigation)



BMT has a proven record in addressing today's engineering and environmental issues.

Our dedication to developing innovative approaches and solutions enhances our ability to meet our client's most challenging needs.

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