Permit

Environmental Protection Act 1994

Environmental authority EPML01470513

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

Environmental authority number: EPML01470513

Environmental authority takes effect on 14 February 2023

Environmental authority holder(s)

Name(s)	Registered address
ADANI MINING PTY LTD	Level 9 120 Edward St BRISBANE CITY QLD 4000 Australia

Environmentally relevant activity and location details

Environmentally relevant activity/activities	Location(s)*
Schedule 3 Resource Activity - ERA 13 (c): Mining black coal	ML70441, ML70505, ML70506
Ancillary 08 - Chemical Storage 3: Storing more than 500 cubic metres of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c)	ML70441, ML70505, ML70506
Ancillary 08 - Chemical Storage 4: storing 200t or more of chemicals that are solids or gases, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)	ML70441, ML70505, ML70506
Ancillary 08 - Chemical Storage 5: storing 200 cubic metres or more of chemicals that are liquids, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)	ML70441, ML70505, ML70506
Ancillary 16 - Extraction and Screening 2: Extracting, other than by dredging, in a year, the following quantity of material (c) more than 1,000,000t	ML70441, ML70505, ML70506

Environmentally relevant activity/activities	Location(s)*
Ancillary 31 - Mineral processing 2: Processing, in a year, the following quantities of mineral products, other than coke (b) more than 100,000t	ML70441, ML70505, ML70506
Ancillary 60(1)(a) – Waste Disposal 2: Operating a facility for disposing of, in a year, 2(h) more than 200,000t	ML70441, ML70505, ML70506
Ancillary 63 - Sewage Treatment 1: Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of (d) more than 4000 but not more than 10,000EP	ML70441, ML70505, ML70506
* Note: The ERAs must only be carried out within the authorised footprint approved under this Environmental Authority	

Additional information for applicants

Environmentally relevant activities

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

An EA authorises the carrying out of an ERA and does not authorise any environmental harm unless a condition stated by the EA 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 an owner or occupier of contaminated land give written notice to the administering authority if they become aware of the following:

- the happening of an event involving a hazardous contaminant on the contaminated land (notice must be given within 24 hours); or
- a change in the condition of the contaminated land (notice must be given within 24 hours); or
- a notifiable activity (as defined in Schedule 3) having been carried out, or is being carried out, on the contaminated land (notice must be given within 20 business days);

that is causing, or is reasonably likely to cause, serious or material environmental harm.

For further information, including the form for giving written notice, refer to the Queensland Government website www.qld.gov.au, using the search term ‘duty to notify’.

Take effect

Please note that, in accordance with section 200 of the EP Act, an EA has effect:

a) if the authority is for a prescribed ERA and it states that it takes effect on the day nominated by the holder of the authority in a written notice given to the administering authority-on the nominated day; or

b) if the authority states a day or an event for it to take effect-on the stated day or when the stated event happens; or

c) otherwise-on the day the authority is issued.

However, if the EA is authorising an activity that requires an additional authorisation (a relevant tenure for a resource activity, a development permit under the *Sustainable Planning Act 2009* or an SDA Approval under the *State Development and Public Works Organisation Act 1971*), this EA will not take effect until the additional authorisation has taken effect.

If this EA takes effect when the additional authorisation takes effect, you must provide the administering authority written notice within 5 business days of receiving notification of the related additional authorisation taking effect.

If you have incorrectly claimed that an additional authorisation is not required, carrying out the ERA without the additional authorisation is not legal and could result in your prosecution for providing false or misleading information or operating without a valid environmental authority.

Juliana McCosker
Department of Environment and Science
Delegate of the administering authority
Environmental Protection Act 1994

Date issued: 14 February 2023

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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 *(QLD)*. For example, the holder must comply with the following provisions of the 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)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443)

Conditions of environmental authority

The environmentally relevant activity(ies) conducted at the location as described above must be conducted in accordance with the following site-specific conditions of approval.

This environmental authority consists of the following Schedules and Appendices:

Schedule A	General
Schedule B	Air
Schedule C	Waste
Schedule D	Noise
Schedule E	Groundwater
Schedule F	Water
Schedule G	Sewage treatment
Schedule H	Land and rehabilitation
Schedule I	Offsets and biodiversity
Schedule J	Subsidence
Schedule K	Structures
Appendix 1	Definitions
Appendix 2	Rehabilitation requirements
Appendix 3	Subsidence guidance material
Appendix 4	Figures
Appendix 5	Tables

Schedule A: General	
Condition number	**Condition**
A1	This environmental authority authorises the 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.
Scope of activity	
A2	The environmental authority holder is approved to extract coal at a rate of up to 74.5 million tonnes per year (Mtpa) of run-of-mine (ROM) coal in accordance with this environmental authority.
A3	In carrying out mining activity(ies) authorised by this environmental authority, the environmental authority holder must comply with Table A1 - Mining Domains, and Figures A1 to A2.

Table A1 - Mining domains

Mine Domain	Location	Domain Area (ha)	Maximum Disturbance Areas (ha)			Total Maximum Disturbance Area (ha)
			Year 1–10	Year 11–20	Year 21–60	
Open-cut voids and slopes	Illustrated in Figure A1	8192.68	3590.69	2011.95	2590.04	8192.68
Underground mining and subsidence boundary	Illustrated in Figure A1	7786.78	1931.95	3030.16	2824.67	7786.78
Mine infrastructure	Illustrated in Figure A1	2216.26	2094.62	110.42	11.22	2216.26
Out-of-pit spoil dumps	Illustrated in Figure A1	8102.91	6397.32	1670.8	34.79	8102.91
Water storage areas, including MAW dams, raw water dams	Illustrated in Figure A1	1206.73	927.66	230.69	48.38	1206.73
Stream diversions	Illustrated in Figure A1	460.80	400.46	60.34	0	460.80
Tailings drying cell	Illustrated in Figure A1	0.0	0.0	0	0	0.0
Carmichael River corridor and levees	Illustrated in Figure A1	1799.02	50.78	0	0	50.78
Carmichael River	Illustrated in Figure A1	1748.24	0	0	0	0
Exploration*	Illustrated in Figure A2	NA*	40.51	0	0	40.51
Total						**28,057.45**

*The exploration domain is outside of domains illustrated in Figure A1.

A4	The environmental authority holder must: a) install 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 manner; and d) ensure all instruments and devices used for measurement or monitoring under any condition of this environmental authority are properly calibrated.
Plans, Programs and Reports	
A5	All plans, programs, and reports required by this environmental authority must be prepared by an appropriately qualified person, including any subsequent review. A copy must be submitted to the administering authority upon request. All plans, programs and reports must be kept until surrender of this environmental authority.
Monitoring, Monitoring Records and Determinations	
A6	All monitoring and determinations required by this environmental authority must be performed by a suitably qualified person and copies of monitoring records must be submitted to the administering authority upon request. Monitoring records must be kept for a period of not less than 5 years.
Risk Management	
A7	The environmental authority holder must develop and implement a risk management system for mining activities which mirrors the content requirement of the Standard for Risk Management (ISO31000:2009), or the latest edition of an Australian standard for risk management, to the extent relevant to environmental management.
Notification of Emergencies, Incidents and Exceptions	
A8	The environmental authority holder must notify the administering authority in writing within 24 hours after becoming aware of any emergency or incident that causes or threatens serious or material environmental harm or the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this environmental authority.
A9	Within 10 business days following the initial notification of an emergency or incident made under condition A8, or receipt of monitoring results, whichever is the latter, further written advice must be provided to the administering authority, including the following: a) results and interpretation of all samples taken and analysed; b) outcomes of actions taken to prevent or minimise unlawful environmental harm; and c) proposed actions to prevent a recurrence of the emergency or incident.

Complaints	
A10	The environmental authority holder must record all environmental complaints received about the mining activities including: a) name, address and contact number 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(s) responsible for resolving the complaint.
A11	The environmental authority holder 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.
Third Party Reporting	
A12	The environmental authority holder must: a) obtain a report on compliance with the conditions of this environmental authority at intervals not exceeding 3 yearly intervals from 30 October 2018; and b) provide each report to the administering authority within 90 days of its completion.
A13	Where environmental authority conditions require compliance with a document published externally to this environmental authority, and the document is amended or changed subsequent to the issue of this environmental authority, the environmental authority holder must: a) comply with the amended or changed standard, policy or guideline within two years of the amendment or change being made, unless a different period is specified in the amended document; and b) until compliance with the amended or changed document is achieved, continue to remain in compliance with the corresponding provision that was current immediately prior to the relevant amendment or change.

Schedule B: Air	
Condition number	**Condition**
B1	The release of dust, particulate matter, or both, resulting from activities authorised by this environmental authority must not cause an environmental nuisance at any sensitive place or commercial place.
B2	The environmental authority holder must ensure that all reasonable avoidance and mitigation measures are employed so that the dust and particulate matter emissions generated by mining activities do not cause exceedances of the following limits 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 *Australian Standard 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, when monitored in accordance with the most recent version of either: i) *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 ii) *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 iii) *AS/NZS 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 (TEOM) analyser*; or iv) *AS/NZS 3580.9.11Methods for sampling and analysis of ambient air Method 9.11: Determination of suspended particulate matter – PM_{10} beta attenuation monitors*. *Note: The exceedances of PM_{10} above 50 micrograms per cubic metre over a 24-hour averaging time as a result of bushfires, dust storms and fuel reduction burning for fire management purposes are not considered a breach of condition B2(b).*

Schedule C: Waste	
Condition number	**Condition**
C1	Unless otherwise permitted by this environmental authority or with prior written approval from the administering authority; and in accordance with relevant standard operating procedure(s), waste must not be burnt.
C2	The environmental authority holder 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.
Tailings disposal	
C3	A tailings management plan must be prepared prior to the production of tailings. The tailings management plan must include provisions for: a) containment of tailings; b) the management of seepage and leachates during operation or independently certified that tailings are safe stable and non-polluting; c) the control of fugitive emissions to air; d) a program of progressive sampling and characterisation to identify acid producing potential and metal concentrations of tailings; e) maintaining records of the relative locations of any other waste stored within the tailings; f) rehabilitation strategy; and g) monitoring of rehabilitation 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. The tailings management plan must be implemented.
Other Prescribed Waste Stream/s	
C4	Acid sulfate soils must be treated and managed in accordance with the latest edition of the *Queensland Acid Sulfate Soil Technical Manual*.
C5	Scrap tyres are authorised to be stored awaiting disposal or disposed of on the mining lease in a manner that minimises environmental harm. A survey record must be kept of the number and location (using coordinates) of tyres disposed.

Schedule D: Noise	
Condition number	**Condition**
D1	The environmental authority holder must ensure that noise generated by the mining activities approved under this administering authority does not cause the limits in Table D1 - Noise limits to be exceeded at a sensitive place or commercial place.

Table D1 - Noise limits

Sensitive place or commercial place			
Noise level dB(A) measured as:	**Monday to Sunday**		
	7am to 6pm	**6pm to 10pm**	**10pm to 7am**
LAeq, adj, 15 mins	41	41	33
LA1, adj, 15 mins	46	46	35

Airblast overpressure nuisance	
D2	The environmental authority holder must ensure that blasting does not cause the limits for peak particle velocity and air blast overpressure in Table D2 - Blasting noise limits to be exceeded at a sensitive place or commercial place.

Table D2 - Blasting noise limits

Blasting noise limits	**Sensitive place or commercial place blasting noise limits**	
	7am to 6pm (daylight hours)	**6pm to 7am (non-daylight hours)**
Airblast overpressure	115dB (Linear) Peak for 9 out of 10 consecutive blasts initiated; and not greater than 120dB (Linear) Peak for any single blast	No blasting to occur
Ground vibration peak particle velocity	10mm/s for ground vibration of no more than 35Hz; and 25mm/s for ground vibration of more than 35Hz	No blasting to occur

Monitoring and reporting	
D3	Noise monitoring and recording must include the following descriptor characteristics and matters: a) LAN,T (where N equals the statistical levels of 1, 10 and 90 and T = 15 mins); b) background noise LA90; 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; f) location, date and time of monitoring; and g) If monitoring is conducted because of a complaint as a result of low frequency noise, Max LpLIN,T and one third octave band measurements in dB(LIN) for centre frequencies in the 10–200Hz range.
Schedule E: Groundwater	
Condition number	**Condition**
E1	The environmental authority holder must not release contaminants to groundwater.
Monitoring and reporting	
E2	All determinations of groundwater quality, groundwater monitoring and biological monitoring must be performed by an appropriately qualified person/s.

Baseline Monitoring Program	
E3	A baseline groundwater monitoring program must be developed by a suitably qualified person, implemented and be provided to the administering authority. The baseline groundwater monitoring program must result in the environmental authority holder finalising a groundwater dataset that must be provided to the administering authority at least 90 days prior to commencement of box cut excavation. The groundwater dataset must: a) contain representative groundwater quality samples from the geological units identified as potentially affected by mining activities including Quaternary alluvium, Tertiary sediments, Bandanna Formation, Colinlea Sandstone, Clematis Sandstone, Rewan Formation, Dunda Beds, and Early Permian sediments; b) include at least 12 sampling events that are no more than 2 months apart over a 2 year period, so as to determine background groundwater quality; c) include background groundwater quality in hydraulically isolated background bore(s); and d) allow for the identification of natural groundwater level trends and groundwater contaminant trigger levels.

Groundwater Management and Monitoring Program (GMMP)	
E4	The Groundwater Management and Monitoring Program (GMMP) must be developed and implemented and include: a) validation of the groundwater numerical model (including review of boundary and recharge conditions) to refine and confirm accuracy of groundwater impacts predicted; b) the groundwater monitoring bore locations and purpose for each bore; c) groundwater level monitoring in all identified geological units present across and adjacent to the mine site to confirm existing groundwater flow patterns and monitor drawdown impacts; d) identification of groundwater drawdown level thresholds for monitoring the impacts to Groundwater Dependant Ecosystems (including spring complexes and Carmichael River alluvium); e) monitoring of aquifers in the area to the south of the mining lease that may affect the Mellaluka springs; f) identifying and refining potential impacts on groundwater levels in the Great Artesian Basin Clematis Sandstone and Dunda Beds geological units; g) estimating groundwater inflow to mine workings and surface water ingress to groundwater from flooding events using the groundwater model; h) monitoring in any identified source aquifers for alternative water supplies, relevant to any approval issued under the Water Act 2000 for the project; i) identify groundwater quality triggers for monitoring potential impacts to groundwater quality from mining activities; j) monitoring water level and water quality of geological units throughout all phases of mining operations including for the period post-closure and until surrender of this environmental authority; k) identifying monitoring bores that will be replaced due to mining activities; and l) identify, monitor and mitigate potential groundwater impacts, including groundwater level and quality, from mine dewatering and mine water and waste storage facilities (artificial recharge).

Monitoring Program Review	
E5	The GMMP must be reviewed and a draft GMMP Review Report finalised and provided to the administering authority for comment by 10 October 2022, and every 5 years thereafter, or after every Groundwater model review undertaken as required by condition E9.
E6	A final GMMP Review Report must address any comments made by the administering authority and submitted to the administering authority within three months of the draft GMMP Review Report submitted under condition E5.
E7	The draft and final GMMP Review Reports required by Condition E5 and E6, must include: a) an assessment of the groundwater management and monitoring program against the objectives in Condition E4; b) an assessment of the GMMP against the commitments in section 7 of the GMMP; c) a review of the adequacy of the monitoring locations, frequencies and groundwater quality triggers specified in Table E1—Groundwater monitoring locations and frequency, Table E3—Groundwater quality trigger levels and Table E4—Groundwater level thresholds; and d) a review of the validity of the groundwater monitoring program against the revised model predictions required under Condition E9. *Note: Tables E1, E3, and E4 are in Appendix 5 Tables*
E8	Within 3 months of the Groundwater Model Review Report being approved under condition E10 (or by a later date agreed to by the administering authority in writing), the GMMP must be updated and submitted for approval. The updated GMMP must incorporate: a) The updated drawdown predictions and recommendations from Groundwater Model Review Report submitted under Condition E10; and b) Any relevant recommendations and certifications from the Final GMMP Review Report submitted under condition E6.

Groundwater Model Review	
E9	The numerical groundwater model in the reports titled “Carmichael Coal Mine and Rail Project SEIS: Report for Mine Hydrogeology Report (13 November 2013)” and “Carmichael Coal Mine and Rail Project SEIS: Mine Hydrogeology Report Addendum (24 October 2013)” must be reviewed to incorporate groundwater monitoring data and measured mine dewatering volumes from the GMMP in conditions E4 and E5. The review must be completed by 10 October 2022 and at least every 5 years thereafter, or at other intervals specified by the administering authority in writing, if the observed groundwater levels and groundwater flow rates to surface water are not consistent with those predicted by the groundwater model. The review must provide a revised numerical groundwater model which is based on a transient calibration and includes additional model layers for aquifers below the D seam of the Colinlea Sandstone, and in accordance with the GMMP. The revised model must include: a) a review of the hydrogeological conceptualisation used in the previous model; b) an update of the predicted impacts; c) a revised water balance model; d) a review of assumptions used in the previous model; e) predictions of changes in groundwater levels for a range of scenarios; f) any changes made since the previous model review, including data changes; g) a justification for the refined model and the outputs of the refined model; h) an evaluation of the accuracy of the predicted changes in groundwater levels, groundwater flow rates to surface water and recommended actions to improve the accuracy of the model predictions; i) an independent peer review and certification that the environmental authority holder has undertaken the review in accordance with all commitments in the GMMP.
E10	A Groundwater Model Review Report outlining the findings and any recommendations from the review required under Condition E9 must be submitted to the administering authority for approval no later than 3 months from the completion of Groundwater model review required under condition E9 and include independent reviews and recommendations as required by condition E9.

Groundwater quality monitoring	
E11	Groundwater quality and levels must be monitored: a) at the locations and frequencies defined in Table E1 - Groundwater monitoring locations and frequency, as illustrated in Figure E1 – Groundwater Monitoring Bore Locations, and b) for quality characteristics identified in Table E2 - Groundwater monitoring parameters. Monitoring must commence within 2 months after approval by the administering authority in condition E8.
Trigger level investigation	
E12	If groundwater quality characteristics from groundwater monitoring bores identified in Table E1 - Groundwater quality monitoring locations and frequency** reach or exceed any of the trigger levels stated in Table E3 - Groundwater quality trigger levels** for two consecutive monitoring events, an investigation must be commenced by the environmental authority holder within 14 days of becoming aware of the exceedance to determine if the exceedance is a result of: a) mining activities authorised under this environmental authority; or b) seasonal / natural variation; or c) neighbouring land use, or d) any other potential cause of exceedance. The environmental authority holder must: i) notify the administering authority of the analysis results via WaTERS within 10 days of receiving the analysis results; ii) complete an investigation required by this condition within 3 months of the investigation commencing, and iii) provide a report of the investigation to the administering authority via WaTERS within 28 days of completion of the investigation. *Note*: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with this condition, no further reporting is required for subsequent trigger events for that quality characteristic.* *Note** Tables E1 and E2 are in Appendix 5.*
E13	If the investigation under condition E12 determines that the exceedance was the result of the mining activities, then a further investigation must be undertaken by the environmental authority holder to establish whether environmental harm has occurred or may occur, and the extent thereof.

E14	If the investigation required by condition E13 determines environmental harm has or may occur, the environmental authority holder must: a) implement immediate measures to mitigate the potential for environmental harm; and b) develop long-term mitigation measures to address any existing groundwater contamination and prevent recurrence of groundwater contamination, and; c) provide a written report to the administering authority via WaTERS within 28 days after completing the investigation under condition E13.
Groundwater (water levels), monitoring, draw down and investigation	
E15	In the event that monitored groundwater levels at groundwater monitoring bores identified in Table E1 - Groundwater quality monitoring locations and frequency** exceed the corresponding groundwater level drawdown threshold stated in Table E4 - Groundwater level drawdown thresholds**, the environmental authority holder must: a) notify the administering authority of the analysis results via WaTERS within 10 days of receiving the analysis results; and b) commence an investigation within 14 days of becoming aware of the exceedance to determine if the drawdown is the result of; i) mining activities authorised under this environmental authority; ii) pumping from licensed bores; iii) seasonal / natural variation; iv) neighbouring land use resulting in groundwater impacts, or v) any other potential cause of exceedance. c) complete an investigation required by this condition within 3 months of the investigation commencing; and d) submit a report of the findings of the investigation to the administering authority via WaTERS within 28 days of completing the investigation. Note** Tables E1 and E4 are in Appendix 5.

E16	If the investigation under condition E15(b) concludes exceedance/s of groundwater level thresholds are result of mining activities, the environmental authority holder must: a) determine whether unlawful environmental harm has occurred or likely to occur; b) determine the actions to reduce the potential for unlawful environmental harm; c) undertake an assessment of the associated impact to Matters of State Environmental Significance in accordance with condition I3; d) determine the mitigation measures required to address the affected groundwater resource; and e) prepare a final report of the findings of the investigation which must be submitted to the administering authority via WaTERS within 3 months after submission of the preliminary report in accordance with condition E15(c).
E17	Any and all groundwater monitoring data collected under this schedule must be submitted annually by 1 July to the administering authority via WaTERS.
E18	An Annual Groundwater Monitoring Report must be submitted by 1 July each year to the administering authority. The Annual Groundwater Monitoring Report must include: a) summary of groundwater monitoring activity undertaken during the year; b) an assessment of water quality data and water level data for long-term trends with time series graphs of all data for all groundwater bores; c) a summary of investigation of exceedances of groundwater quality triggers and groundwater level thresholds carried out under this schedule; d) month wise dewatering volumes during the year; e) an assessment of any differences between the impacted groundwater level predicted and the actual impacts for the corresponding period; and f) a summary of all recommended changes to the GMMP.
E19	Within 3 months of submitting the Annual Groundwater Monitoring Report required by condition E18, the environmental authority holder must amend the GMMP to include any recommendations, as well as any comments made by the administering authority, and resubmit the GMMP to the administering authority for approval.
Bore construction and maintenance and decommissioning	
E20	The construction, maintenance, and decommissioning of groundwater bores (including groundwater monitoring bores) must be undertaken in a manner that prevents and minimises impacts to the environment and ensures the integrity of the bores to obtain accurate monitoring data.

Schedule F: Water	
Condition number	**Condition**
Release of contaminants	
F1	Contaminants must not be released to any surface waters except as permitted under the conditions of Schedule F in this environmental authority.
Discharge of Mine Affected Water	
F2	The release of mine affected water to waters must only occur from the release points specified in Table F1 - Mine affected water release points, sources and receiving waters, as depicted in Figure F1: Water release and monitoring locations attached to this environmental authority.

Table F1 - Mine affected water release points, sources and receiving waters

Release Point (RP)	Easting (GDA94—Zone 55K)	Northing (GDA94—Zone 55K)	Contaminant Source and Location	Monitoring Point	Receiving Waters Description
RP1—Central MAW North	443373.41	7558805.00	Mine Affected Water Dam Central - North	Outlet works to Carmichael River	Carmichael River
RP2—Central MAW South	435539.56	7553979.62	Mine Affected Water Dam Central—South	Outlet works to Carmichael River	Carmichael River

F3	The release of mine affected water to internal water management infrastructure installed and operated in accordance with a water management plan that complies with condition F25 is permitted
F4	The release of mine affected water to waters in accordance with condition F2 must not exceed the release limits stated in Table F2 - Mine affected water release limits when measured at the monitoring points specified in Table F1 - Mine affected water release points, sources and receiving waters for each quality characteristic.

Table F2 - Mine affected water release limits

Quality characteristic	Release limits	Monitoring frequency
Electrical conductivity (µS/cm)	Release limits specified in Table F4 for variable flow criteria.	Continuous
pH (pH Unit)	6.5 (minimum) 9.0 (maximum)	Continuous
Turbidity (NTU)	500	Continuous

F5	The release of mine affected water to waters from the release points must be monitored at the locations specified in Table F1 - Mine affected water release points, sources and receiving waters for each quality characteristic and at the frequency specified in Table F2 - Mine affected water release limits and Table F3 - Release trigger levels.

Table F3 - Release trigger levels

Quality Characteristic	Trigger Levels (µg/L)	Monitoring frequency
Aluminium[1]	120	Commencement of release and thereafter weekly during release (first sample to be taken within 2 hours of commencement of release)
Arsenic[1]	13	
Cadmium[1]	0.2	
Chromium[1]	2	
Copper[1]	4	
Iron[1]	115	
Lead[1]	4	
Mercury[1]	0.2	
Nickel[1]	11	
Zinc[1]	30	
Boron[1]	370	
Cobalt[1]	1.4	
Manganese[1]	1900	
Molybdenum[1]	34	
Selenium[1]	10	
Silver[1]	1	
Uranium[1]	1	
Vanadium[1]	10	
Ammonia as N	900	
Nitrate as NO_3	1100	
Total Nitrogen	2020	
Total Phosphorus	360	
Petroleum hydrocarbons (C6-C9)	20	
Petroleum hydrocarbons (C10-C36)	50	
Fluoride	1000	
Sodium[1]	180,000	
Suspended Solids	150	
Sulphate (SO_4^{2-})	125,000	

[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.

F6	If quality characteristics of the release exceed any of the trigger levels specified in Table F3 - Release trigger levels during a release event, the environmental authority holder must compare the downstream results in the receiving waters, as monitored at BEL01 as specified in Table F6 – Receiving water upstream and downstream monitoring points, to the trigger values specified in Table F3 - Release trigger levels, and: a) where the trigger values are not exceeded then no action is to be taken; or b) where the downstream results at BEL01 exceed the trigger values specified in Table F3 – Release trigger levels for any quality characteristic, compare the results of the downstream site to the data from all upsteam monitoring sites as specified in Table F6 - Receiving water upstream and downstream monitoring points and: i) if the result is less than the upstream monitoring sites data, then no action is to be taken; or ii) if the result is greater than the upstream monitoring sites data, complete an investigation into the potential for environmental harm and provide a written report to the administering authority via WaTERS within 90 days of receiving the result, 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 condition F6(b)(ii) of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.*
F7	If an exceedance in accordance with condition F6(b)(ii) is identified, the environmental authority holder must notify the administering authority via WaTERS within 24 hours of receiving the result.
Mine Affected Water Release Events	
F8	The environmental authority holder must ensure a stream flow gauging station/s is installed, operated, and maintained to determine and record stream flows at the locations and flow recording frequency specified in Table F4 - Mine affected water release during flow events.
F9	The release of mine affected water to waters in accordance with condition F2 must only take place during periods of natural flow in accordance with the receiving water flow criteria for discharge specified in Table F4 - Mine affected water release during flow events for the release point(s) specified in Table F1 - Mine affected water release points, sources and receiving waters.
F10	The release of mine affected water to waters in accordance with condition F2 must not exceed the Maximum Release Rate (for all combined release point flows) for each receiving water flow criterion for discharge specified in Table F4 - Mine affected water release during flow events when measured at the monitoring points specified in Table F1 - Mine affected water release points, sources and receiving waters.

Table F4 - Mine affected water release during flow events

Receiving waters/ stream	Release Point (RP) and Gauging station (GS) Name	GS Easting (GDA94— Zone 55K)	GS Northing (GDA94— Zone 55K)	Receiving Water Flow Recording Frequency	Receiving Water Flow Criteria for discharge (m^3/s)	Maximum release rate (for all combined RP flows)	Electrical Conductivity Release Limits
Carmichael River	RP1 (Central MAW North) & RP2 Central MAW South (Table F1), to each be monitored via Carmichael River CAR04 upstream gauging station.	433237.06	7554988.83	Continuous (minimum daily)	Low Flow <0.2 m^3/s for a period of 28 days after natural flow events that exceed 0.2 m^3/s	0.05 m^3/s	Electrical conductivity: 168 µS/cm (maximum)
					Medium Flow 1 - 5 m^3/s	0.25 m^3/s	Electrical conductivity: 840 µS/cm (maximum)
					Medium Flow 5 - 10 m^3/s	0.5 m^3/s	Electrical conductivity: 1850 µS/cm (maximum)
					High Flow > 10 m^3/s	0.5 m^3/s	Electrical conductivity: 3,500 µS/cm (maximum)

F11	Releases to waters must be undertaken so as not to cause erosion of the bed and banks of the receiving waters, or cause a material build-up of sediment in the receiving waters.

Notification of Release Event	
F12	The environmental authority holder must notify the administering authority via WaTERS 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/time; b) details regarding compliance of the release with conditions of Schedule F: 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.
F13	The environmental authority holder must notify the administering authority via WaTERS as soon as practicable within 24 hours after cessation of a release notified under condition F12. The cessation notification must include the following information: a) release cessation date and time; b) details regarding the compliance of the release with the conditions of this environmental authority (that is, contaminant limits, natural flow, discharge volume); c) release point/s; d) release rate; e) release salinity; f) receiving water/s including natural flow rate; g) the continuous monitoring data for flow rate, electrical conductivity (EC) and turbidity from downstream monitoring locations; and h) all in situ and any water quality monitoring results (including all laboratory analyses). *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 F12 and F13, provided the relevant details of the release are included within the notification provided in accordance with Conditions F12 and F13.*

F14	The environmental authority holder must provide a report to the administering authority via WaTERS within 28 days after cessation of a release event notified under condition F12. The report must include: a) release commencement and cessation dates and times; b) natural flow rate in receiving water; c) the total, and daily (24 hour) volumes of water released; d) details regarding the compliance of the release with the conditions of this environmental authority (i.e. contamination limits, natural flow, discharge volume); e) all continuous and in situ water quality monitoring results (including laboratory analyses); and f) any other matters pertinent to the water release event.
Notification of Release Event Exceedance	
F15	If the release limits defined in Table F2 - Mine affected water release limits are exceeded, the environmental authority holder must notify the administering authority via WaTERS within 24 hours of receiving the results.
F16	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 via WaTERS 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) extent 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.
Receiving Environment Monitoring and Contaminant Trigger Levels	
F17	The quality of the receiving waters must be monitored at the locations specified in Table F6 - Receiving water upstream and downstream monitoring points for each quality characteristic and at the monitoring frequency stated in Table F5 - Receiving waters trigger levels.

Table F5—Receiving waters trigger levels

Quality Characteristic	Trigger Levels (µg/L)	Monitoring frequency
Electrical Conductivity (µS/cm)	CAR01 - 1160 BEL01 - 895	Continuous during release
Turbidity (NTU)	CAR01 - 380 BEL01 - 542	
pH	<6.5 >9.0	Daily during the release
Sulphate (SO_4^{2-})	15,000	
Aluminium[1]	CAR01 - 110	
	BEL01 - 120	
Arsenic[1]	13	
Cadmium[1]	0.2	
Chromium[1]	2	
Copper[1]	4	
Iron[1]	CAR01 - 760	
	BEL01 - 115	
Lead[1]	4	
Mercury[1]	0.2	
Nickel[1]	11	
Zinc[1]	30	
Boron[1]	370	
Cobalt[1]	1.4	
Manganese[1]	1900	
Molybdenum[1]	34	
Selenium[1]	10	
Silver[1]	1	
Uranium[1]	1	
Vanadium[1]	10	
Ammonia as N	900	
Nitrate as NO_3	1100	
Total Nitrogen	CAR01 - 1400	
	BEL01 - 2020	
Total Phosphorus	CAR01 - 270	
	BEL01 - 360	
Petroleum hydrocarbons (C6-C9)	20	
Petroleum hydrocarbons (C10-C36)	50	
Fluoride	1000	
Sodium[1]	CAR01 - 165,000	
	BEL01 - 180,000	
Suspended Solids	CAR01 - 76	
	BEL01 - 150	

[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

Table F6 - Receiving water upstream and downstream monitoring points

Monitoring Points	Receiving Waters Location Description	Easting (GDA94—Zone 55K)	Northing (GDA94—Zone 55K)
Upstream Background Monitoring sites			
CAR04	Carmichael River at Upstream Gauging station	433237.06	7554988.83
BEL02	Belyando River at Bygana Waterhole	451391.30	7549162.75
Downstream Monitoring sites			
CAR01	Carmichael River far downstream mining lease	445073.13	7558878.15
BEL01	Belyando River at Carmichael/Moray Rd	464569	7571642

Table F6 - **Receiving water upstream and downstream monitoring points** notes:

a) The data from background monitoring points must not be used where they are affected by releases from other mines.

F18	If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in Table F5 - Receiving waters 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 action is to be taken; or b) where the downstream result exceeds the upstream results, complete an investigation into the potential for environmental harm and provide a written report to the administering authority via WaTERS within 90 days, outlining: i) details of the investigations carried out; and ii) actions taken to prevent environmental harm.
F19	All continuous environmental monitoring systems required by this environmental authority must have an instrument availability for at least eighty percent (80%) of a calendar year except for the continuous monitoring of release points specified in Table F1 - Mine affected water release points, sources and receiving waters which must have an instrument availability of at least ninety percent (90%) of a calendar year.

Receiving Environment Monitoring Program (REMP)	
F20	The environmental authority holder must develop and implement a Receiving Environment Monitoring Program (REMP) to: a) monitor, identify and describe any adverse impacts to surface water environmental values, quality and flows due to the authorised mining activity. b) this must include monitoring the effects of the mine on the receiving environment periodically (under natural flow conditions) and while mine affected water is being discharged from the site. c) for the purposes of the REMP, the receiving environment is the waters of the Carmichael River and connected or surrounding waterways within 12km downstream of the release (this includes the Belyando River, immediately downstream of the confluence with the Carmichael River and monitoring points Bel 02 and Bel 01 listed in Table F6 - Receiving water upstream and downstream monitoring points). d) the REMP should encompass any sensitive receiving waters or environmental values downstream of the authorised mining activity that will potentially be directly affected by an authorised release of mine affected water.
F21	A REMP Design Document that addresses the requirements of the REMP must be prepared and made available to the administrating authority upon request.
F22	A report outlining the findings of the REMP, including all monitoring results and interpretations must be prepared annually and provided to the administering authority by 1 July each year. The annual REMP report must include an assessment of background water quality, the condition of downstream water quality compared against water quality objectives, and the suitability of current discharge limits to protect downstream environmental values.
Water reuse	
F23	Mine affected water may be piped or trucked or transferred by some other means that does not contravene the conditions of this environmental authority and deposited into artificial water storage structures, such as farm dams or tanks, or used directly at properties owned by the environmental authority holder or a third party (with the written consent of the third party).

Annual Water Monitoring Reporting	
F24	The following information must be recorded in relation to all REMP and water release monitoring required under Schedule F of this environmental authority and submitted to the administering authority via WaTERS by 1 July each year: a) the date on which the sample was taken; b) the time at which the sample was taken; c) the location (including coordinates); 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) and water quality monitoring data.
Water Management Plan	
F25	A Water Management Plan must be developed.
F26	The Water Management Plan required by condition F25 must: a) provide for effective management of actual and potential environmental impacts resulting from water management associated with the mining activity and release of Mine Affected Water carried out under this environmental authority; and b) include i) a study of the source of contaminants; ii) a water balance model for the site; iii) a water management system for the site; iv) measures to manage and prevent saline drainage; v) measures to manage and prevent acid rock drainage; vi) procedures for release of mine affected water vii) contingency procedures for emergencies; and viii) a program for monitoring and review of the effectiveness of the Water Management Plan.
F27	The Water Management Plan required by condition F25 must be implemented
Stormwater and Water Sediment Controls	
F28	An Erosion and Sediment Control Plan must be developed by an appropriately qualified person and implemented for all stages of the authorised activities on the site to minimise erosion and the release of sediment to receiving waters and contamination of stormwater.

F29	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 F28; and b) water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with condition F25, for the purpose of ensuring water does not become mine affected water.

Schedule G: Sewage Treatment	
Condition number	**Condition**
G1	Treated sewage effluent is permitted to be released to land or to mine affected water storages in compliance with the release limits stated in Table G1 - Contaminant release limits to land or mine affected water storages.

Table G1 - Contaminant release limits to land or mine affected water storages

Contaminant	Unit	Release limit	Limit type	Monitoring Frequency
5-day Biochemical oxygen demand (BOD)1	mg/L	20	Maximum	Monthly
Total suspended solids	mg/L	30	Maximum	Monthly
Nitrogen	mg/L	30	Maximum	Monthly
Phosphorus	mg/L	15	Maximum	Monthly
E-coli	Organisms/100ml	10	Maximum	Monthly

G2	All treated sewage effluent released from the treatment plant must be monitored at the frequency and for the parameters specified in Table G1 - Contaminant release limits to land or mine affected water storages.
G3	The daily volume of treated sewage effluent released to land or mine affected water storages must be measured and records kept of the volumes released.

Schedule H: Land and Rehabilitation	
Condition number	**Condition**
Rehabilitation	
H1	Land disturbed by mining activities authorised under this Environmental Authority must be rehabilitated in accordance with Table H1 – Rehabilitation acceptance criteria (in Appendix 2) and Figure H1: Cross Sections of Residual Voids, Figure H2: Final Landform (Northern Section), Figure H3: Final Landform (Central Section) and Figure H4: Final Landform (Southern Section) in Appendix 4.
H2	The rehabilitation completion criteria specified in Table H1 – Rehabilitation Acceptance Criteria (Appendix 2) must be reviewed by an appropriately qualified person by the 2 February 2021 and from then on, every 5 years with any proposed amendments or changes submitted to the administering authority for approval.
Rehabilitation Monitoring Program	
H3	A Rehabilitation Monitoring Program must be developed and certified by an appropriately qualified person and implemented. The Rehabilitation Monitoring Program must contain a schedule for gathering baseline data noting agreed reference sites and conducting rehabilitation trials to support the rehabilitation outcomes detailed in Table H1 – Rehabilitation Acceptance Criteria. Baseline monitoring and rehabilitation trials under this program must be undertaken at a suitable frequency to ensure that the environmental authority holder has a representative dataset to enable: a) progressive certification of rehabilitation under Chapter 5A of the *Environmental Protection Act 1994*. b) surrender of the Environmental Authority under Chapter 5 of the *Environmental Protection Act 1994.*
H4	Rehabilitation must be undertaken progressively in accordance with the Rehabilitation Management Plan and Progressive Rehabilitation Closure Plan (when approved).
H5	Self-sustaining vegetation and native ecosystem, as per Table H1 – Rehabilitation Acceptance Criteria (Appendix 2), must be consistent with the reference sites identified in Table H2 – Reference Sites and Figure H6: Reference Sites.

Table H2: Reference Sites

Reference Site ID	Final Land Use Objective	Easting (GDA94—Zone 55)	Northing (GDA94—Zone 55)	Regional Ecosystem Reference
1	Pasture	435015.03	7555606.11	Not Applicable
2	Pasture	443025.57	7556465.56	Not Applicable
3	Pasture	440270.90	7555837.51	Not Applicable
4	Woodland and Pasture	444416.00	7554892.00	11.3.7/11.3.10/11.5.3
5	Woodland	420464.05	7462197.97	10.5.5a, 10.5.5a/10.3.6ax1
6	Woodland	426136.73	7577685.88	10.5.5a/10.3.6ax1
7	Woodland	424019.29	7578271.57	10.5.5a/10.3.6ax1
8	Woodland and Pasture	437811.00	7548031.00	10.3.28a/10.3.6a
9	Woodland	444040.04	7541770.08	10.5.5a
10	Pasture	445500.99	7544738.92	Not Applicable
11	Woodland and Pasture	434750.95	7554579.43	10.3.6a

Residual Void Outcome

H6	Residual voids must not cause any serious environmental harm to land, surface waters or any recognised groundwater aquifer, other than the environmental harm constituted by the existence of the residual void itself and subject to condition H7 within this environmental authority.
H7	Residual voids, as detailed and presented in Figure H1: Cross Sections of Residual Voids Open Cut Pits B, C, D, E, F and G are authorised in accordance with Table H3 – Residual Voids.

Table H3 – Residual Voids

Open Cut Pit	Residual Void Treatment
B	Residual void authorised to the depth of the top of the D1 Seam at the highwall face
C	Residual void authorised to the depth of the top of the AB1 Seam at the highwall face
D	Residual void authorised to the depth of the top of the D1 Seam at the highwall face
E	Residual void authorised to the depth of the top of the AB1 Seam at the highwall face
F	Residual void authorised to the depth of the top of the AB1 Seam at the highwall face
G	Residual void authorised to the depth of the top of the D1 Seam at the highwall face

Topsoil Management Plan

H8	A Topsoil Management Plan must be developed and implemented.

Mining Waste and Rejects Management	
H9	A Mine Waste and Rejects Management Plan must be developed, implemented and include: a) characterisation of the waste rock, spoil and rejects to predict the quality of runoff and seepage generated, including salinity, acidity, alkalinity and dissolved metals, metalloids and non-metallic inorganic substances; b) a program of progressive sampling and characterisation to identify dispersive and nondispersive spoil and the salinity, acid and alkali producing potential and metal concentrations of waste rock, spoil and rejects; c) a materials balance d) management of potentially acid forming and acid forming waste rock, spoil and rejects will be selectively placed and/or encapsulated to minimise the potential generation of acid mine drainage; e) a sampling program to verify encapsulation and/or placement of potentially acid-forming and acid-forming waste rock, spoil and rejects; f) a schedule of periodic review of the plan's effectiveness in addressing the requirements of this condition; g) the indicators or other criteria on which the performance of the plan will be assessed; h) a rehabilitation strategy; i) rehabilitation monitoring, and/or trials to verify the requirements and methods for decommissioning and final rehabilitation of the placed materials.
H10	Reject disposal areas must be designed and constructed to ensure that any runoff or seepage from the reject disposal area is contained within the mine water management system.
Contaminated Land	
H11	Before applying for surrender of a mining lease, the environmental authority holder must (if applicable) provide to the administering authority a site investigation report under the EP Act, in relation to any part of the mining lease which has been used for notifiable activities or which the environmental authority 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.
H12	Before applying for progressive rehabilitation certification for an area, the environmental authority holder must (if applicable) provide to the administering authority a site investigation report under the EP Act, in relation to any part of the area the subject of the application which has been used for notifiable activities or which the environmental authority 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 under condition H1.

Chemicals and Flammable and Combustible Liquids	
H13	All flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm and maintained in accordance with *AS 1940—Storage and Handling of Flammable and Combustible Liquids*.
H14	The storing of chemicals and pollutants on site that have the potential to cause environmental harm must be carried out in an effective containment system, impervious to the materials stored and managed to prevent release of harmful liquids to waters or land.
H15	The environmental authority holder must minimise the potential for contamination of land and waters by diverting stormwater around contaminated areas and facilities used for the storage of chemicals and flammable or combustible liquids.
Schedule I: Offsets and Biodiversity	
Condition number	**Condition**
I1	The environmental authority holder must provide an offset for impacts on applicable Matters of State Environmental Significance, in accordance with the *Carmichael Coal Project Biodiversity Offset Strategy*, as approved. The biodiversity offset must be provided: a) prior to impacting on Matters of State Environmental Significance; or b) where a land-based offset is to be provided, within 36 months of the later of either of the following: i) the date of issue of this environmental authority; or ii) the relevant stage identified in the Biodiversity Offset Strategy; or c) where an offset payment is to be provided, within 4 months of the later of either of the following: i) the date of issue of this environmental authority; or ii) the relevant stage identified in the Biodiversity Offset Strategy.
Review of Biodiversity Offset Delivery	
I2	The Biodiversity Offset Strategy must be reviewed by the 2 February 2021, and thereafter every 5 years with a report prepared by an appropriately qualified person. The report must: a) assess the area of Matters of State Environmental Significance proposed to be impacted by the mining activities in the Biodiversity Offset Strategy; and b) identify the actual on ground areas of Matters of State Environmental Significance impacted by the mining activities.

I3	If an investigation conducted under conditions E15 or E16 of this environmental authority indicates that there is a risk of impacting a Matter of State Environmental Significance, or condition J11 is triggered, the Biodiversity Offset Strategy must be reviewed and a report must be prepared within 3 months by an appropriately qualified person. The report must: a) assess the area of Matter of State Environmental Significance proposed to be impacted by the mining activities in the Biodiversity Offset Strategy; and b) identify the actual on ground areas of Matter of State Environmental Significance impacted by the mining activities.
I4	If the review under condition I2 or I3 finds that the actual areas of disturbance to Matters of State Environmental Significance are greater than the areas of disturbance as detailed in the Biodiversity Offset Strategy, or that additional Matters of State Environmental Significance will be impacted, the environmental authority holder must amend the Biodiversity Offset Strategy as per condition I5 and deliver the amended offset requirement within 12 months.
I5	In response to condition I4 the environmental authority holder may apply to the administering authority to amend the Biodiversity Offset Strategy within either 30 days, or a lesser period agreed to by the administering authority, prior to impacting on the applicable Matter of State Environmental Significance.

Black-throated finch (BTF) Management Plan at Carmichael project (BTFMP)	
I6	The environmental authority holder must submit a BTFMP, prepared and certified by a suitably qualified and experienced person to the administering authority for approval prior to commencement of Project Stage 2. The environmental authority holder must publish the BTFMP on its website within 10 business days of receiving the administering authority's approval in writing. The approved BTFMP must be implemented. The holder must align the BTFMP with any Bioregional BTF Management Plan and relevant documentation requirements under the *Environmental Protection and Biodiversity Conservation Act 1999* including the BTF Recovery Plan, conservation advice and the threat abatement plan. The submitted BTFMP must include: a) a baseline research program on the specific nesting and feeding requirements of the species that will be undertaken prior to and during Project Stage 1; b) a baseline research program to establish whether the BTF at the project site are sedentary, locally migratory or regionally migratory; c) a description of how the results of baseline research program are to be used to determine any changes of classification of and/or impact on BTF habitat; d) details of proposed impacts to BTF habitat from each Project Stage including impacts from clearing, subsidence, ecological function changes, hydrological changes and weed and pest infestation changes; e) mitigation measures to be undertaken to avoid, mitigate and manage impact resulting from each stage of the project, including rehabilitation of habitat; f) monitoring of watering points that must be conducted for a minimum 3 hour period commencing from 9am, to accurately capture BTF utilisation of watering points; g) detailed botanical assessment that must occur at all BTF sighting locations in the project area to record habitat values at those locations; h) detailed surveys that must occur across the mining lease area and approved offset areas and must include information on BTF movements. The survey method and effort must be sufficient to accurately describe the BTF home range and detail BTF resource usage patterns between seasons and years (for up to 10 years) and allow robust management actions to be developed for the maintenance of a viable local BTF population; i) survey work that records all birds present when BTF are encountered; j) specific surveys that must be undertaken during the BTF breeding season and include nest location and assessment of the habitat attributes associated with the breeding locations. The survey method and effort must be sufficient to accurately describe the BTF breeding requirements with consideration to spatial and temporal variation of resources of up to 10 years; and k) survey and monitoring that must be undertaken by experienced ecologists.

I7	The BTFMP required under condition I6 must be reviewed by a suitably qualified and experienced person annually. The review must: a) assess the plan against the requirements under condition I6; b) include recommended actions to ensure actual and potential environmental impacts are effectively managed for the coming year; c) identify any amendments made to the BTFMP following the review; d) all revisions of the survey and monitoring program must be carried out in consultation with the BTF recovery team; e) any revisions must be independently peer reviewed, and f) a report of the review that addressed the outcomes of the review must be provided to the administering authority no later than 1 September each year.
I8	The baseline research program must fund a research project to determine the relationship between water sources, woody habitat and the BTF food sources within the mining lease area and approved offset areas to determine the inter-relationships among these factors.
I9	The baseline research program under condition I6 must: a) establish whether the Ten Mile Bore and surrounds are high value habitat for the species; and b) establish management actions to maintain the current BTF population of Ten Mile Bore and surrounds.
I10	The environmental authority holder must maintain water troughs for BTF within undisturbed areas and surface areas of underground mining footprint, and where necessary repair troughs, pipes and tanks to a standard that maintains a constant source of water.
Groundwater Dependent Ecosystems Management Plan	
I11	The environmental authority holder must develop and implement a Groundwater Dependent Ecosystems Management Plan (GDEMP) to detail the management of threats to defined environmental values and to report results and corrective actions for each GDE over the full period of mining activities and for a period of five years post mining rehabilitation.
I12	The GDEMP must be approved by the administering authority in writing and the GDEMP published on the environmental authority holder's website before the commencement of Project Stage 2.
I13	For the purposes of conditions I11 and I12, the GDEs include the affected Carmichael River riparian zone (ecosystems associated with the Carmichael River between Doongmabulla Springs and the Belyando River, including populations of Waxy Cabbage Palm), the Lignum, Stories and Mellaluka springs and the Doongmabulla, Spring complex.

I14	A report of the findings of the GDEMP, including all monitoring results and interpretations, must be prepared annually and provided to the administering authority no later than 1 August each year.
I15	The report submitted under condition I14 must include: a) an assessment of groundwater levels against pre-mining groundwater levels, b) a comparison of surface water quality monitoring results to determine any interaction or impact from groundwater on surface water quality results; c) the condition of each GDE compared with previous monitoring results; d) the suitability of current groundwater level thresholds Table E4 - Groundwater level drawdown thresholds in Schedule E; e) detail on the effectiveness of avoidance, mitigation and management actions in curtailing adverse impacts on GDEs; f) a description of any adaptive management initiatives implemented; g) any offsets required for significant residual impacts.
Schedule J: Subsidence	
Condition number	**Condition**
J1	Subsidence is authorised within the subsidence impact area identified in Figure A1.
J2	A Subsidence Management Plan must be developed and implemented by the environmental authority holder prior to the commencement of activities that result in subsidence.

J3	The Subsidence Management Plan must: a) provide for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity authorised by this environmental authority and to ensure compliance with the conditions of this environmental authority; b) include baseline data; prior to underground mining; c) describe the proposed impacts of subsidence on any land, BTF habitat, watercourse and floodplain including but not limited to: i) physical condition of surface drainage: 1) erosion; 2) areas susceptible to higher levels of erosion such as watercourse confluences; 3) incision processes; 4) stream widening; 5) tension cracking; 6) lowering of bed and banks; 7) creation of instream waterholes; 8) changes to local drainage patterns; and 9) BTF habitat. ii) overland flow: 1) capture of overland flow by subsided long-wall panels; 2) increased overbank flows due to lowering of high bank of watercourses; 3) the portion of local and large-scale catchment likely to be captured by subsided long-wall panels and the associated impacts on downstream users iii) water quality: 1) surface water; 2) groundwater. iv) land condition: current land condition to be impacted by subsidence; v) infrastructure: detail of existing infrastructure (pipelines, railway, powerlines and haul roads) should be identified where there is a potential impact from effects of land subsidence; d) propose options for mitigating any impacts associated with subsidence, how these mitigation methods will be implemented, and the extent to which these measures will impact a Matter of State Environmental Significance(s); e) describe cumulative impacts on watercourses, diversions or catchments; f) describe impacts on groundwater;

	g) quantify the area of on ground impacts to Matters of State Environmental Significance; and h) include a program for monitoring and review of the effectiveness of the Subsidence Management Plan. Guidance material has been provided in Appendix 3 to assist with the development of the Subsidence Management Plan.
J4	The Subsidence Management Plan must be reviewed each calendar year and a report prepared on 1 July each year. The report must: a) assess the plan against the requirements under condition J3 and the certified reports required under condition J10; b) include recommended actions to ensure actual and potential environmental impacts are effectively managed for the coming year; and c) identify any amendments made to the Subsidence Management Plan following the review.
J5	The environmental authority holder must attach a written response and recommended actions to the review report required by condition J4. The response must detail the actions taken and/or proposed to be taken in order to ensure continuing compliance with this environmental authority.
J6	The review report required by condition J4 and the written response to the review report required by condition J5 must be submitted to the administering authority upon request.
Annual Inspection of Subsidence	
J7	The environmental authority holder must arrange for each subsided longwall panel to be inspected annually by an appropriately qualified person, in accordance with conditions J8 to J10 inclusive. If the appropriately qualified person deems and records under condition J9 that a subsided longwall no longer has an associated environmental risk, the longwall panel does not need to be reinspected in the future annual inspections under conditions J7 to J9 inclusive.
J8	The annual inspection must be conducted between 1 April and 1 November each year.
J9	At each annual inspection, the condition of each subsided longwall panel must be assessed by an appropriately qualified person. The inspection must include assessments of the structural, geotechnical and hydraulic adequacy of the subsided longwall panel and the adequacy of the works with respect to the Subsidence Management Plan.
J10	For each inspection required under condition J9, copies of a report, including any recommendations to ensure the integrity of each subsided longwall panel, must be provided to the administering authority upon request.

J11	If the review under conditions J4 or J7 indicates that the impact to Matters of State Environmental Significance caused by mining activities authorised under this environmental authority differs from the area of disturbance detailed in the Biodiversity Offset Strategy, the environmental authority holder must undertake a review in accordance with conditions I4 and I5.
Schedule K: Structures	
Condition number	**Condition**
Consequence Category	
K1	The consequence category of any structure must be assessed by a suitably qualified and experienced person in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933)* at the following times: a) prior to the design and construction of the structure; or b) prior to any change in its purpose or the nature of its stored contents.
K2	A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence assessment for more than one structure.
K3	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 (ESR/2016/1933)*.
Design and Construction of a Regulated Structure	
K4	All regulated structures must be designed by, and constructed under the supervision of, a suitably qualified and experienced person in accordance with the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933)*.
K5	Construction of a regulated structure is prohibited unless: a) the environmental authority holder has submitted a consequence category assessment report and certification to the administering authority; and b) certification for the design, design plan and the associated operating procedures has been certified by a suitably qualified and experienced person in compliance with the relevant condition of this authority.
K6	Certification must be provided by the suitably qualified and experienced person who oversees the preparation of the design plan in the form set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933)* and must be recorded in the Register of Regulated Structures.

K7	Regulated Structures must: a) be designed and constructed in compliance with and conform to the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933*); b) be designed and constructed with due consideration given to ensuring that the design integrity would not be compromised on account of: i) floodwaters from entering a regulated dam from any watercourse or drainage line; and ii) wall failure due to erosion by floodwaters arising from any watercourse or drainage line. c) 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.
K8	Certification by the suitably 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.
K9	All affected persons must be provided with a copy of the emergency action plan in place for each regulated structure a) for existing structures that are regulated structures, within 10 business days of this condition taking effect; b) prior to the operation of the new regulated structure; and c) if the emergency action plan is amended, within 5 business days of it being amended.

Operation of a regulated structure	
K10	Operation of a regulated structure**,** except for an existing structure, is prohibited unless the environmental authority holder has submitted to the administering authority in respect of regulated structure, all of the following: a) one electronic copy of the design plan and certification of the 'design plan' in accordance with condition K6; b) a set of 'as constructed' drawings and specifications; c) certification of those 'as constructed drawings and specifications' in accordance with condition K8; 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; e) the requirements of this environmental authority relating to the construction of the regulated structure have been met; f) the environmental authority holder has entered the details required under this environmental authority into a Register of Regulated Structures; and g) there is a current operational plan for the regulated structure.
K11	Each regulated structure must 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.
Mandatory Reporting Level	
K12	Conditions K12 to K16 inclusive only apply to Regulated Dams which have not been certified as low consequence category for 'failure to contain—overtopping'.
K13	The Mandatory Reporting Level (the MRL) must be marked on a regulated dam in such a way that during routine inspections of that dam, it is clearly observable.
K14	The environmental authority holder must, as soon as practical but within 48 hours of becoming aware, notify the administering authority when the level of the contents of a regulated dam reaches the MRL.
K15	The environmental authority holder must, immediately on becoming aware that the MRL has been reached, act to prevent the occurrence of any unauthorised discharge from the regulated dam.
K16	The environmental authority holder must record any changes to the MRL in the Register of Regulated Structures.

Design Storage Allowance	
K17	The environmental authority 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.
K18	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 for the dam (or network of linked containment system).
K19	The environmental authority holder must, as soon as possible but within 48 hours of becoming aware that a 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.
K20	The environmental authority 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 system.
Annual Inspection	
K21	Each regulated structure must be inspected each calendar year by a suitably qualified and experienced person.
K22	At each annual inspection, the condition and adequacy of all components of the regulated structure must be assessed and a suitably qualified and experienced person must prepare an annual inspection report containing details of the assessment and include a recommendations section with any recommended actions to ensure the integrity of the regulated structure, or a positive statement that no recommendations are required.
K23	The suitably 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 (ESR/2016/1933)*.
K24	Within 20 business days of receipt of the annual inspection report, the environmental authority holder must provide to the administering authority: a) the recommendations section of the annual inspection report; and b) if applicable, any actions being taken in response to those recommendations; and c) if, following receipt of the recommendations and (if applicable) recommended actions, the administering authority requests a full copy of the annual inspection report from the environmental authority holder, provide this to the administering authority within 10 business days of receipt of the request.

Transfer Arrangements	
K25	The environmental authority holder must provide a copy of any reports, documentation and certifications prepared under this environmental authority, including but not limited to any Register of Regulated Structures, consequence assessment, design plan and other supporting documentation, to a new environmental authority holder on transfer of this environmental authority.
Decommissioning and Rehabilitation	
K26	Dams must not be abandoned but must be either: a) decommissioned and rehabilitated to achieve compliance with condition K27; or b) be left in situ for a beneficial use(s) provided that: i) it no longer contains contaminants that will migrate into the environment; and ii) it contains water of a quality that is demonstrated to be suitable for its intended beneficial use(s); and iii) the administering authority, the environmental authority holder and the landholder agree in writing that the dam will be used by the landholder following the cessation of the environmentally relevant activity(ies).

K27	After decommissioning, all significantly disturbed land caused by the carrying out of the environmentally relevant activity(ies) must be rehabilitated to meet the following final acceptance criteria: a) the landform is safe for humans and fauna; b) the landform is stable with no subsidence or erosion gullies for at least 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) rehabilitation is undertaken in a manner such that any actual or potential acid sulfate soils on the area of significant disturbance are treated to prevent or minimise environmental harm in accordance with the *Queensland Acid Sulfate Soil Technical Manual and Soil Management Guideline V 4.0 (2014)*; g) all significantly disturbed land is reinstated to the pre-disturbed soil suitability class; h) for land that is not being cultivated by the landholder: i) groundcover, that is not a declared pest species is established and self-sustaining ii) vegetation of similar species richness and species diversity to pre-selected analogue sites is established and self-sustaining; and iii) the maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance caused by carrying out the resource activity(ies); and i) for land that is to be cultivated by the landholder, cover crop is revegetated, unless the landholder will be preparing the site for cropping within 3 months of resource activities being completed.
Register of Regulated Structures	
K28	A Register of Regulated Structures must be established and maintained by the environmental authority holder for each regulated structure.
K29	The environmental authority holder must provisionally enter the required information in the Register of Regulated Structures when a design plan for a regulated structure is submitted to the administering authority.
K30	The environmental authority holder must make a final entry of the required information in the Register of Regulated Structures once compliance with condition K10 has been achieved.
K31	The environmental authority holder must ensure that the information contained in the Register of Regulated Structures is current and complete on any given day.
K32	All entries in the Register of Regulated Structures must be endorsed by the chief executive officer for the environmental authority holder, or their delegate, as being accurate and correct.

K33	The environmental authority 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 Structures, in the electronic format required by the administering authority.

END OF CONDITIONS

APPENDIX 1: DEFINITIONS

Words and phrases used throughout this environmental authority are defined below. Where a definition for a term used in this environmental authority is not provided within this environmental authority and is provided in the EP Act or subordinate legislation, the definition in the EP Act or subordinate legislation must be used.

'activity(ies)' means mining activities and / or resource activities as noted within this Appendix.

'acid rock drainage' means any contaminated discharge emanating from a mining activity formed through a series of chemical and biological reactions when geological strata are disturbed and exposed to oxygen and moisture.

'airblast overpressure' means 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).

'annual exceedance probability' or **'AEP'** the probability that at least one event in excess of a particular magnitude will occur in any given year.

'annual inspection report' means 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):

a) against recommendations contained in previous annual inspections reports;

b) against recognised dam safety deficiency indicators;

c) for changes in circumstances potentially leading to a change in consequence category;

d) for conformance with the conditions of this authority;

e) for conformance with the 'as constructed' drawings;

f) 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); and

g) for evidence of conformance with the current operational plan.

'appropriately qualified person(s)' means a person or persons who has professional qualifications, training, skills and experience relevant to nominated subject matter and can give authoritative assessment, advice and analysis in relation to the subject matter using the relevant protocols, standards, methods or literature.

'assessed' or '**assessment'** by a 'suitably qualified and experienced person' in relation to a consequence assessment of a dam, means that 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:

a) exactly what has been assessed and the precise nature of that determination;

b) the relevant legislative, regulatory and technical criteria on which the assessment has been based;

c) 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

d) 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, means:

a) operations of any kind and all things constructed, erected or installed for that dam; and

b) any land used for those operations.

'authority' means an environmental authority.

'background' with reference to the water schedule means the average of samples taken prior to the commencement of mining from the same waterway that the current sample has been taken.

'blasting' means the use of explosive materials to fracture:

a) rock, coal and other minerals for later recovery; or

b) structural components or other items to facilitate removal from a site or for reuse.

'box-cut excavation' means bulk earthworks excavation required for open cut mining, which for the avoidance of doubt does not include clearing or topsoil stripping.

'BTF Management Plan' refers to the Black-throated finch **(BTF)** plan prepared in accordance with the conditions of the environmental authority for the project's mining activities issued under the *Environmental Protection Act 1994* (Qld)

'Carmichael Coal Project Biodiversity Offset Strategy' means the Biodiversity Offset Strategy approved by the Coordinator-General in accordance with the imposed conditions under Section 54B of the *State Development and Public Works Organisation Act 1971* for the Carmichael Coal Mine and Rail project.

'certifying, certify, certification or certified relating to regulated structures' means assessment and approval must be undertaken by a suitably qualified and experienced person in relation to any assessment or documentation required by this Manual, 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)).

In all other cases **'certifying, certify, certification or certified'** means by an suitably qualified person holding industry certification such as CEnvP or other recognised independent body, who, in relation to any program, plan or report, means that 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 at any time:

a) exactly what is being certified and the precise nature of that certification;

b) the relevant legislative, regulatory and technical criteria on which the certification has been based;

c) the relevant data and facts on which the certification has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and

d) the reasoning on which the certification has been based using the relevant data and facts, and the relevant criteria.

'chemical' means:

a) an agricultural chemical product or veterinary chemical product within the meaning of the Agricultural and *Veterinary Chemicals Code Act 1994* (Commonwealth); or
b) a dangerous good under the Australian Code for the Transport of Dangerous Goods by Road and Rail approved by the Australian Transport Council; or
c) a hazardous substance within the meaning of the Workplace Health and Safety Regulation 2011;
d) 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
e) any substance used as, or intended for use as:
    i) a pesticide, insecticide, fungicide, herbicide, rodenticide, nematicide, miticide, fumigant or related product; or
    ii) a surface-active agent, including, for example, soap or related detergent; or
    iii) a paint solvent, pigment, dye, printing ink, industrial polish, adhesive, sealant, food additive, bleach, sanitiser, disinfectant, or biocide; or
    iv) a fertiliser for agricultural, horticultural or garden use; or
    v) a substance used for, or intended for use for mineral processing or treatment of metal, pulp and paper, textile, timber, water or wastewater; or
    vi) manufacture of plastic or synthetic rubber.

'commercial place' means a workplace used as an office or for business or commercial purposes, which is not part of the mining activity and does not include employees' accommodation or public roads. A 'commercial place' is based on Schedule 1 of EPP Noise. That is a commercial place is inside or outside a commercial or retail activity.

'consequence' in relation to a structure as defined, means 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' means 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 (ESR/2016/1933)*.

'construction' or **'constructed'** in relation to a regulated structure includes building a new regulated structure and lifting or otherwise modifying an existing regulated structure, but does not include investigations and testing necessary for the purpose of preparing a design plan.

'dam' means 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' means 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).

'design document' for the purposes of a REMP is a document that demonstrates compliance with condition F24. The document should also address each criterion on what a REMP should be as outlined in the guide.

'design plan' is 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'** means an available volume, estimated in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933)* 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, means the certifier of the design plan for the regulated dam.

'disturbance' of land includes:

a) compacting, removing, covering, exposing or stockpiling of earth;
b) removal or destruction of vegetation or topsoil or both to an extent where the land has been made susceptible to erosion;
c) carrying out mining within a watercourse, waterway, wetland or lake;
d) the submersion of areas by tailings or hazardous contaminant storage and dam/structure walls;
e) 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
f) releasing of contaminants into the soil or underlying geological strata.

However, the following areas are not included when calculating areas of 'disturbance':

a) areas off lease (e.g. roads or tracks which provide access to the mining lease);
b) areas previously disturbed which have achieved the rehabilitation outcomes;
c) 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);
d) 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; or
e) disturbance that pre-existed the grant of the tenure.

'EC' means electrical conductivity.

'effluent' treated wastewater released from sewage treatment plants.

'emergency action plan' means documentation forming part of the operational plan held by the environmental authority holder, that identifies emergency conditions that sets out procedures and actions that will be followed and taken by the 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 offset' has the meaning in Section 7 of the *Environmental Offsets Act 2014*.

'ERC' means estimated rehabilitation cost.

'existing structure' means a structure that was in existence prior to the adoption of this schedule of conditions under the authority.

'extreme storm storage'—means a storm storage allowance determined in accordance with the criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933)* published by the administering authority.

'Financial Provisioning Act' means the *Mineral and Energy Resources (Financial Provisioning) Act 2018*.

'GDE' means groundwater dependent ecosystem.

'Groundwater Dependent Ecosystem Management Plan (GDEMP)' - A GDEMP is a plan developed by a suitably qualified and experienced person that is consistent with any Bioregional Management Plan for the bioregion, the Water Resource (Great Artesian Basin) Plan and relevant threat abatement plans, conservation advice and project species management plans.

'groundwater level drawdown threshold' means the authorised maximum drawdown of groundwater at the nominated location at any time during the life of mining activities.

'**GMMP**' is the most recently approved version of the Groundwater Management and Monitoring Program.

'hazard category' means 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 Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933)*.

'incident' means a set of circumstances arising as a result of activities carried out under an environmental authority which cause or threaten to cause environmental harm.

'infrastructure' means water storage dams, levees, roads and tracks, buildings and other structures built for the purpose of the mining activity.

'LA1,adj,15mins' means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 1% of a 15-minute period when measured using a fast standardised response time.

'LAeq,adj,15mins' means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a 15-minute period has the same mean square sound pressure of a sound that varies with time.

'land' in the 'land schedule' of this EA means 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 use' –means the selected post mining use of the land, which is planned to occur after the cessation of mining activities.

'leachate' means 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 mining lease or operational land which contains soluble, suspended or miscible contaminants likely to have been derived from the said material.

'levee' means 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.

'**LOR**' means limit of reporting.

'low consequence dam' means 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 (ESR/2016/1933)*.

'm' means metres.

'mandatory reporting level' or **'MRL'** means a warning and reporting level determined in accordance with the criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933)* published by the administering authority.

'manual' means the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933)* published by the administering authority.

'maximum extent of impact' means the total, cumulative, residual extent and duration of impact to a prescribed environmental matter that will occur over a project's life after all reasonable avoidance and reasonable on-site mitigation measures have been, or will be, undertaken.

'measures' includes any measures or actions to prevent or minimise environmental impacts of the mining activity such as bunds, silt fences, diversion drains, capping, and containment systems.

'mg/L' means milligrams per litre.

'**mine affected water'**

a) means 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 mine's dewatering activities; or
   vi) a mix of mine affected water (under any of paragraphs i) - v)) and other water.
b) 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:
   i) 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

ii) 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:

1) areas that are been capped and have monitoring data demonstrating hazardous material adequately contained with the site; or

2) 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 both.

'mine site' means the area of land on which the project is located.

'mining activities' means the activities:

a) authorised as per the definition in section 110 of the *Environmental Protection Act 1994*; and

b) all environmentally relevant activities authorised under this environmental authority.

'modification' or **'modifying'** (see definition of 'construction').

'natural flow' means the flow of water through waters caused by nature.

'non-polluting' means having no adverse impacts upon the receiving environment.

'notice of election' has the meaning in section 18(2) *Environmental Offsets Act 2014*.

'operational plan' includes:

a) normal operating procedures and rules (including clear documentation and definition of process inputs in the DSA allowance); and
b) 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)' means 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).

'project' means the Carmichael Coal Mine located within Mining Lease (applications) 70441, 70505 and 70506

'project stage 1' means project activities carried out prior to commencement of significant ground disturbance including:

a) pre-construction surveying and technical assessment including geotechnical, establishment of site security arrangements (including signs, fences, safety barriers, and temporary security personnel facilities) and maintenance of existing roads and tracks;

b) installation of facilities for the purpose of environmental monitoring compliance; and

c) other works limited to the existing site facilities and access roads.

'project stage 2' means project activities, other than activities carried out under project stage 1, leading to the production of coal including:

a) removal of existing structures, site clearance;

b) construction of access roads, potable water treatment and sewage treatment plants, new power plants, mine administrative buildings, water storage infrastructure and hard standing;

c) removal and stockpiling of overburden and excavation of box cuts for open pit or underground mining; and

d) commencement of dewatering operations.

'protected area' means—a protected area under the *Nature Conservation Act 1992*; or

a) a marine park under the Marine Parks Act 1992; or

b) a World Heritage Area.

'receiving environment' in relation to an activity that causes or may cause environmental harm, means the part of the environment to which the harm is, or may be, caused. The receiving environment includes (but is not limited to):

a) a watercourse;
b) groundwater; and
c) an area of land that is not specified in a Schedule or Table (Authorised Activities) of this environmental authority.

The term does not include land that is specified in Table A1 of this environmental authority.

'receiving waters' means the waters into which this environmental authority authorises releases of mine affected water.

'Register of Regulated Dams' includes**:**

a) date of entry in the register;

b) name of the dam, its purpose and intended/actual contents;

c) the consequence category of the dam as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933)*;

d) 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;

e) name and qualifications of the suitably qualified and experienced person who certified the design plan and 'as constructed' drawings;

f) for the regulated dam, other than in relation to any levees—

  i) the dimensions (metres) and surface area (hectares) of the dam measured at the footprint of the dam;

  ii) coordinates (latitude and longitude in GDA94) within five metres at any point from the outside of the dam including its storage area;

  iii) dam crest volume (megalitres);

  iv) spillway crest level (metres AHD);

  v) maximum operating level (metres AHD);

  vi) storage rating table of stored volume versus level (metres AHD);

  vii) design storage allowance (megalitres) and associated level of the dam (metres AHD); and

viii) mandatory reporting level (metres AHD);

g) the design plan title and reference relevant to the dam;

h) the date construction was certified as compliant with the design plan;

i) the name and details of the suitably qualified and experienced person who certified that the constructed dam was compliant with the design plan;

j) details of the composition and construction of any liner;

k) the system for the detection of any leakage through the floor and sides of the dam;

l) 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;

m) dates when recommendations and actions arising from the annual inspection were provided to the administering authority; and

n) dam water quality as obtained from any monitoring required under this authority as at 1 November of each year.

'regulated dam' means any dam in the significant or high consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933)* 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.

'rehabilitation' the process of reshaping and revegetating land to restore it to a stable landform that is enduring and unlikely to collapse, erode or subside (*EP Regulations Sch 8 Part 1 (1) Definitions*).

'rejects' means all coal waste material generated from the washing of coal at the Coal Preparation Plant.

'release event' means a surface water discharge from mine affected water storages or contaminated areas on the mine site.

'representative' means a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.

'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.

'RL' means reduced level, relative to mean sea level as distinct from depths to water.

'saline drainage' The movement of waters, contaminated with salts, as a result of the mining activity.

'scheme fund' means the scheme fund established under the *Mineral and Energy Resources (Financial Provisioning) Act 2018*, section 24.

'Scheme Manager' means the scheme manager (from time to time) under the Financial Provisioning Act and any delegate of that person under the Financial Provisioning Act.

sensitive place' or 'sensitive receptor'

a) a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or

b) a motel, hotel or hostel; or

c) an educational institution; or

d) a medical centre or hospital; or

e) Commercial and retail activity (indoors),

f) a protected area under the Nature Conservation Act 1992, the Marine Parks Act 1992 or a World Heritage Area; or

g) a public park or gardens,

h) or other 'sensitive receptor', or place based on Schedule 1 of EPP Noise.

'spillway' means 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.

'structure' means dam or levee.

'suitably qualified person' means a person who;

a) is a member of an organisation listed in Schedule 14 of the *EP Regulations 2019;* and

b) holds certification as an environmental practitioner (i.e. Certified Environmental Practitioner, (CEnvP) under the CEnvP Scheme) or,

c) has professional qualifications, training, skills and 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.

'suitably qualified and experienced person' in relation to the BTF species management plan means a person who has professional qualifications, certification as an environmental Practitioner (CEnvP), training, or skills, and experience relevant to bird ecology, and can give authoritative assessment, advice and analysis about performance relevant to the subject matters using relevant protocols, standards, methods or literature.

'suitably qualified and experienced person' in relation to regulated structures means 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.

'Surety' has the same meaning as used in the *Financial Provisioning Act.*

'system design plan' means a plan that manages an integrated containment system that shares the required DSA and/or ESS volume across the integrated containment system.

'the Act' means the *Environmental Protection Act 1994*.

'µS/cm' means micro siemens per centimetre.

'void' means any constructed, open excavation in the ground.

'water quality' means the chemical, physical and biological condition of water.

'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—

a) in a natural channel, whether artificially improved or not; or

b) 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.

'wet season' means 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.

END OF DEFINITIONS

Appendix 2: Rehabilitation requirements

Table H1 – Rehabilitation acceptance criteria

Post Mining Land Use	Domain	Rehabilitation Objectives	Indicators	Completion Criteria
Ironbark Woodland	Open pit voids and slopes Out of Pit Spoil dumps	**Safe** – Safe to humans and stock with safety hazards similar to surrounding unmined landscape	Structurally safe Risk assessment completed with risk mitigation measures implemented.	0 (zero) significant difference to surrounding landscape as defined in AS/NZS ISO 31000:2009. For underground area – no access to underground workings.
		Stable – Landforms are both geotechnically and erosionally stable	Factor of safety Slope gradient Ground cover	Factor of Safety of greater than 1.5 Slope gradient <20% for outer slopes and <40% for inner facing slopes Minimum of 70% native vegetative ground cover. No bare surfaces >20m^2 in area or >10m in length down slope. Absence of active gully and rill lines. <u>For Underground mined areas</u> • Long-term stability of underground mine area achieves 1.5 Factor of Safety • All surface cracks remediated • No remaining depressions that cause ponding of incident rainfall and water runoff
		Non-polluting – Surface runoff from rehabilitated land is non-polluting to receiving waters	Water Quality Objectives for Carmichael River are met downstream of the mine	pH 6.5 – 8.5 EC <1,000µS/cm TSS <106mg/l Arsenic 13µg/L Molybdenum 34µg/L

Post Mining Land Use	Domain	Rehabilitation Objectives	Indicators	Completion Criteria
				Selenium 10µg/L Sulfate (SO_4^{2+}) 129µg/L No PAF or dispersive waste exposed on high wall slopes. Exposed strata do not have elevated concentrations of heavy metals Groundwater quality in all aquifers maintain baseline values
		Sustainable – rehabilitation of Pits B and C residual voids and slopes to attain elements of silver-leaved ironbark woodland (regional ecosystem 10.5.5)	Native species composition and density Weed abundance	Two tree species Three shrub species Five groundcover species At relevant benchmark density as per regional ecosystem biocondition benchmarks for 10.5.5* and 10.3.6 4 native perennial pasture species with 80% ground cover <5% declared weed cover
Ironbark Woodland and Pasture	Open pit voids and slopes Stream diversions Out of pit spoil dumps	**Safe –** Safe to humans and stock with safety hazards similar to surrounding unmined landscape	Structurally safe Risk assessment completed with risk mitigation measures implemented.	0 (zero) significant difference to surrounding landscape as defined in AS/NZS ISO 31000:2009
		Stable – Stable Landforms are both geotechnically and erosionally stable	Geotechnical assessment	Factor of Safety of greater than 1.5 Slope <12% for outer facing slopes and <40% for inner facing slopes

Post Mining Land Use	Domain	Rehabilitation Objectives	Indicators	Completion Criteria
			Slope angle and length Visual assessment of channel morphology, presence/absence of head cuts, presence of deposited sediment and vegetation in channel	Minimum of 80% native perennial vegetative ground cover. No bare surfaces >20m^2 in area or >10m in length down slope Absence of active gully and rill lines No PAF or dispersive waste exposed on slopes Exposed strata do not have elevated concentrations of heavy metals
		Non-polluting – Surface runoff from rehabilitated land is non-polluting to receiving waters	Water Quality Objectives for Carmichael River are met downstream of the mine	pH 6.5 – 8.5 EC <1,000µS/cm TSS <106mg/l Arsenic 13µg/L Molybdenum 34µg/L Selenium 10µg/L Sulfate (SO_4^{2+}) 129µg/L Groundwater quality in all aquifers maintain baseline measurements
		Sustainable – Rehabilitation of Pits F and G residual voids and slopes to attain elements of silver-leaved ironbark woodland (regional ecosystem 10.5.5) and pasture	Vegetation assessment	Two tree species Three shrub species Five groundcover species At relevant benchmark density as per regional ecosystem biocondition benchmarks for 10.5.5* and 10.3.6 4 native perennial pasture species with 80% ground cover

Post Mining Land Use	Domain	Rehabilitation Objectives	Indicators	Completion Criteria
				<5% declared weed cover Evidence of baseline fauna species using rehabilitated areas
Pasture	Mining infrastructure areas Out of pit spoil dumps	**Safe –** Safe to humans and stock with safety hazards similar to surrounding unmined landscape	Structurally safe Risk assessment completed with risk mitigation measures implemented.	0 (zero) significant difference to surrounding landscape as defined in AS/NZS ISO 31000:2009
		Stable – Stable Landforms are both geotechnically and erosionally stable	Geotechnical assessment Slope gradient Ground cover	Factor of Safety of greater than 1.5 Slope <12% Minimum of 60% vegetative ground cover. No bare surfaces >20m^2 in area or >10m in length down slope Absence of active gully and rill lines No PAF or dispersive waste exposed on slopes Exposed strata do not have elevated concentrations of heavy metals
		Non-polluting – Surface runoff from rehabilitated land is non-polluting to receiving waters	Water Quality Objectives for Carmichael River are met downstream of the mine	pH 6.5 – 8.5 EC <1,000µS/cm TSS <106mg/l Arsenic 13µg/L Molybdenum 34µg/L Selenium 10µg/L Sulfate (SO_4^{2+}) 129µg/L

Post Mining Land Use	Domain	Rehabilitation Objectives	Indicators	Completion Criteria
				Groundwater quality in all aquifers no different to baseline measurements
		Sustainable – Rehabilitation of Pits F and G spoil dumps to attain pasture	Vegetation assessment Land suitability assessment Evidence that rehabilitated area is able to support a range of fauna species identified in the pre-mining baseline studies. Evidence of habitat elements within rehabilitated area supporting BTF population	4 native perennial pasture species with 70% ground cover Agricultural land class B condition Land Suitability for grazing Class 3 (as per DSITI/DNRM 2015) <5% declared weed cover Evidence of baseline fauna species using rehabilitated areas
Ironbark woodland /pasture	Exploration disturbance as per Figure 2	**Safe –** Safe to humans and stock with safety hazards similar to surrounding unmined landscape	Bore integrity	Certification by suitably qualified person that all non-artesian exploration drill holes not converted to either a water bore or groundwater monitoring bore have been rehabilitated in accordance with the '*Code of Environmental Compliance for Exploration and Mineral Development projects*.'
		Stable – Stable Landforms are both geotechnically and erosionally stable	Vegetation assessment	Minimum of 70% vegetative groundcover is present No bare surfaces >20m^2 in area or >10m in length down slope
		Non-polluting – Surface runoff from	Groundwater quality	Groundwater quality in all aquifers no different to baseline measurements

Post Mining Land Use	Domain	Rehabilitation Objectives	Indicators	Completion Criteria
		rehabilitated land is non-polluting to receiving waters		
		Self-sustaining – Supporting target land use (e.g. pasture and/or Iron bark woodlands).	Achieves a sustainable grazing or woodland outcome Vegetation assessment of plant establishment Land suitability assessment via soil sample	<u>Woodland</u> • Two tree species >8m tall with canopy cover exceeding 15% • Three shrub species • Five groundcover species • Species at relevant benchmark density as per regional ecosystem biocondition benchmarks for 10.5.5* and/or 10.3.6 • 4 native endemic perennial pasture species (including *Bothriochloa ewartiana, Chrysopogon fallax, Paspalidium sp.,* and *Panicum sp.*) with 60% ground cover Density of dominant species in rehabilitated areas consistent with density of species at reference sites. <u>Pasture</u> • 4 native palatable perennial pasture species endemic to the local area (including *Bothriochloa ewartiana, Chrysopogon fallax, Paspalidium sp., and Panicum sp.*) with 60% ground cover • Agricultural land class B condition • Land Suitability for grazing Class 3 • < than 5% declared weed cover
	Water Storages	**Non-polluting** – Surface runoff from rehabilitated land is non-polluting to receiving waters	Water quality	<u>Absence of contaminants in surface water and runoff does not exceed</u> pH 6.5 – 8.5 EC <1,000µS/cm TSS <106mg/l Arsenic 13µg/L Molybdenum 34µg/L Selenium 10µg/L Sulfate (SO_4^{2+}) 129µg/L

Post Mining Land Use	Domain	Rehabilitation Objectives	Indicators	Completion Criteria
	Water drainage, diversions and landform levees	**Non-polluting** – Surface runoff from rehabilitated land is non-polluting to receiving waters	Water quality Geotechnical assessment Erosion assessment	<u>Absence of contaminants in surface water and runoff does not exceed</u> pH 6.5 – 8.5 EC <1,000µS/cm TSS <106mg/l Arsenic 13µg/L Molybdenum 34µg/L Selenium 10µg/L Sulfate (SO_4^{2+}) 129µg/L All retained water diversion structures are geotechnically and erosionally stable and are assessed as functional.
	Contaminated sites	**Non-polluting** – Surface runoff from rehabilitated land is non-polluting to receiving waters	Surface water qualify run off	<u>Absence of contaminants in surface water and runoff does not exceed</u> pH 6.5 – 8.5 EC <1,000µS/cm TSS <106mg/l Arsenic 13µg/L Molybdenum 34µg/L Selenium 10µg/L Sulfate (SO_4^{2+}) 12µg/L Certification by suitably qualified person that site can be removed from Contaminated Land Register, Environmental Management Register or both. Hydrocarbons and heavy metals met trigger values in Table F3 of EA.
*Silver-leaved ironbark woodland (regional ecosystem - 10.5.5 is the target regional ecosystem)				

END OF APPENDIX 2.

Appendix 3: Subsidence guidance material

When to use

This appendix is to be used by the Environmental Authority (EA) holders in the preparation of a Subsidence Management Plan (SMP) where a watercourse, as defined under the *Water Act 2000*, is to be impacted as a result of underground longwall mining. For a feature to be defined as a watercourse under Chapter 1, Part 2 of the *Water Act 2000,* the feature must possess particular characteristics. Watercourse determinations are regularly undertaken across Central Queensland by authorised departmental officers as it is the determining factor in the requirement for approvals under the *Water Act 2000*.

In addition, this appendix is to be used by the Department when providing advice and assessing Subsidence Management Plans submitted by EA holders or proposed EA holders.

Purpose

The purpose of this appendix is to detail the information to be provided in a SMP and the legislative basis of the requirement for approval. The SMP forms the major reference document regarding subsidence impacts on watercourses as a result of underground longwall mining and is required to accompany proposals for watercourse subsidence.

The objective of the SMP is to ensure that the impacts of subsidence are properly managed. Where surface subsidence intersects a watercourse, it is important for the situation to be managed effectively to ensure no long-term maintenance is required within the watercourse, and to ensure that naturally occurring processes are not impaired.

A SMP should include the following information:

- Location of proposed longwall panels and modelled subsidence effects on the watercourse;
- Pre-subsidence management of watercourses proposed to be subsided;
- Monitoring methods pre and post-subsidence to detect and document any impacts on watercourses;
- Post-subsidence management of impacted watercourses through remediation and rehabilitation;
- Agreed outcome for proposed future landscape between the Department and the EA holder.

Background

Throughout the Bowen Basin, economically viable coal deposits frequently extend beneath watercourses. Consequently, underground mining operations targeting the associated coal seams often also extend beneath watercourses. Underground mining is not a new concept in the extraction of coal throughout the Bowen Basin. This form of mining is preferred when economic constraints reduce the feasibility of mining using open cut methods. Whilst coal deposits located beneath watercourses contribute to total extractable coal, more importantly, extraction of this coal facilitates underground mining activities to continue along a coal seam uninterrupted across both sides of a watercourse. This provides for a more cost effective extraction of coal that might otherwise be uneconomic to mine.

Technological improvements in underground mining methods have provided the ability to extract coal in areas previously inaccessible for mining. Modern day underground coal mining operations commonly utilise longwall mining techniques which allow extraction of more of the coal seam. Longwall mining allows access to the coal seam via a shaft, a decline or a highwall portal and system of underground workings, without the need to remove overburden. This technique is used to extract the coal seam via a series of “panels”, which can be hundreds of metres wide and kilometres in length. As the coal shearer removes the coal in the seam along the length of a panel, the overlying strata is collapsed behind, filling the void (goaf) left by the extracted coal. The collapse and settlement of the overlying strata can extend to the land surface above, resulting in localised lowering of the surface profile, and depressions in the landscape (commonly referred to as subsidence troughs).

Where a watercourse is located above a longwall panel, extraction of the coal seam causes subsidence of the panel can have a number of impacts on the watercourse. Some of these impacts include:

- Lowering of bed and banks

- Creation of in-stream waterholes
- Changes to local drainage patterns
- Incision processes
- Stream widening
- Erosion
- Increased overbank flows due to lowering of the high banks
- Tension cracking through both shallow and deeper underlying strata (including aquifers)
- Root shear and loss of riparian vegetation
- Changes to water quality (surface water and groundwater).

The degree of subsidence is generally a function of thickness of coal extracted, depth of overburden, strata type and panel width. The point of maximum subsidence generally occurs along the centreline of an extracted panel, whilst the pillar zones located between panels remain at natural surface level. Experience gained through widespread adoption of longwall mining processes in the Bowen Basin has seen advancement in the modelling and ability to predict the likely impacts of a subsidence event. This technology has also facilitated improved design and implementation of mitigation measures (engineered structures and associated earthworks) and highlighted potential short and long term maintenance issues which may require specific management intervention.

Subsidence Management Plan

The objective of the SMP is to ensure that the impacts of subsidence are properly managed. Where surface subsidence intersects a watercourse, effective management is required to ensure no long-term maintenance is required within the watercourse, and to ensure that naturally occurring processes are not unduly impaired. Consideration must be given for potential impacts on erosion, groundwater and surface water as a result of a proposed subsidence event.

A Subsidence Management Plan must address the following issues:

(1) Description of Pre Subsidence Situation & Survey

  (a) A general description of the area pre subsidence including photographic record should be provided.

  (b) Survey of cross-section and longitudinal profiles should be undertaken on all watercourses with potential to be impacted through subsidence. Permanent transects should be detailed within the proposed Subsidence Management Plan. Surveys should include the confluence with any other watercourses in the impacted area as well as any infrastructure spanning the watercourse. Surface drainage patterns should be investigated to determine current paths of water movement through the landscape. This path of water movement should be maintained where possible post-subsidence.

(2) Predicted Subsidence

  The degree of anticipated subsidence should be provided, including the length of watercourse to be impacted and the average depth of subsidence across individual panels. The predicted subsidence should be modelled to indicate the change in surface elevations expected. The volumes of water expected to be captured within the bed of the watercourse due to creation of waterholes should be provided. Consequences of any lowering of the high banks of the watercourse should be discussed, including impacts associated with greater floodplain interaction and potential for creation of new channels.

(3) Infrastructure

  Prior to mining, the anticipated impacts from subsidence should be determined on all infrastructure located within or above the watercourse to be subsided along with measures to be implemented to mitigate any impacts. Priority should be given to infrastructure which provides services to external parties (other mines, towns, industry). Measures for dealing with any interruption to such services should be outlined. Relocation of infrastructure may be necessary should the proposed subsidence pose sufficient risk.

(4) Preventative Works

Where preventative measures are required to ensure the stability of the bed and banks of the watercourse (establishment of pile fields, exclusion of cattle, bentonite treatment) these should be discussed in the Subsidence Management Plan, including supporting evidence outlining the legitimacy of such works. These works may be required where self-repair by natural processes will not provide adequate remediation of impacted areas. Where there is potential for root shear to result in significant loss of riparian vegetation, mitigation measures may be required.

(5) Engineered Structures

Engineered works may be required to maintain the stability and function of a watercourse impacted by subsidence. These works are often constructed prior to subsidence occurring within the watercourse. Such works can include timber pile fields, rock revetment, reshaping of existing stream banks, and river bed treatment to prevent increased ingress of surface water into underground aquifers. Where subsidence mitigation measures require engineered structures be installed, the design, monitoring and maintenance of these structures should be detailed in the Subsidence Management Plan. The plan should detail the purpose of each structure and any consequences should the structure fail to be installed. Appropriate design plans including the location of each structure will be required. As a minimum, fourth and fifth order watercourse will require the installation of engineered structures. Works undertaken within the bed and banks of a watercourse aimed at mitigating or remediating an y physical impacts pre or post-subsidence are authorised under the conditions of the Environmental Authority. Where a separate report has been produced for engineered structures, this should be included as an appendix to the Subsidence Management Plan.

(6) Erosion

The Subsidence Management Plan should detail the current watercourse condition to be impacted by subsidence. Identification of erosion zones which are likely to be exacerbated through tension cracking should be stabilised using appropriate methods. Such areas may include reaches with elevated rates of bed and bank erosion, access tracks and areas with poor quality, sparsely populated riparian vegetation. Sufficient riparian vegetation should be established prior to subsidence to assist with initial stabilisation of the bed and banks. Removal of grazing animals to allow establishment or recovery of riparian vegetation may be required for an extended period prior to subsidence.

(7) Groundwater

Where groundwater aquifers exist beneath the mine plan area, investigations should be undertaken regarding the potential for impacts on these aquifers as a result of subsidence. The Subsidence Management Plan should discuss these aquifers, any anticipated impacts on each aquifer and proposed measures for mitigating these impacts. Any anticipated movement of surface water into underlying aquifers should be discussed, as this can result in loss of surface water from the system and impacts on water quality in these aquifers. Geotechnical assessment across the bed and banks of the watercourse should be undertaken to provide an indication of potential permeability issues related to sub-surface cracking and interaction with local groundwater tables. Monitoring bores should be established in each aquifer prior to subsidence and monitored for a period of time sufficient for obtaining background water levels and trends. Monitoring of these bores should continue post-subsidence to aid the detection of impacted aquifers.

(8) Surface Water

(a) Baseline Monitoring

The Subsidence Management Plan should detail baseline condition monitoring of all watercourses likely to be impacted through subsidence. The preferred monitoring assessment technique for stream condition in the Bowen Basin is the Index of Diversion Condition. This methodology was established as a result of the Australian Coal Association Research Program (ACARP) Project C9068. Monitoring of watercourses should extend a minimum of 1km upstream and downstream of the proposed area to be impacted and should include a geomorphic assessment of the entire reach. Where a baseline monitoring assessment has been undertaken as part of an Environmental Impact Statement (EIS) process, this may be considered sufficient provided there has been no subsequent

modification or interference to the watercourse. The condition of riparian vegetation should also be detailed.

(9) Cumulative Impacts on Watercourses

(a) With an increasing number of mines being established in close proximity to watercourses, an EA holder utilising longwall mining methods may be requested to investigate the cumulative impact of these activities on the watercourse.

Monitoring and Reporting Requirements

The following criteria have been developed to provide detailed direction regarding monitoring and reporting requirements associated with subsidence of watercourses.

These criteria are outlined in a four step approach:

- Monitoring
- Assessment
- Reporting
- Mitigation

Monitoring

- Representative sites need to be identified that allow the impacts of subsidence to be assessed in a particular watercourse with particular attention to the following:
  - Sites must be located at all pillar zones intersecting a watercourse or tributary.
  - Sites must include representative locations at the interface of natural ground level and observed changes in surface elevation from subsidence within a watercourse.
- Control sites beyond proposed mining extents should be established to verify pre-mining conditions. In watercourses, the sites should extend a minimum of 1km both upstream and downstream of the subsidence reach.
- Assessment of watercourse condition: Specific monitoring assessment techniques for watercourse condition should include but not be limited to the Index of Diversion Condition, as outlined in the ACARP Project C9068.
- Vegetation and ecological condition assessments should form part of the baseline dataset.
- Rainfall monitoring should be undertaken within areas proposed to be impacted by subsidence. In addition, flow event monitoring should occur in watercourses proposed to be impacted by subsidence. The type of monitoring devices and locations to be installed should be detailed in the Subsidence Management Plan.
- Where preventative works are undertaken pre-subsidence, subsequent monitoring assessments should include the integrity and effectiveness of these works in reducing the impact of subsidence within the watercourse.
- Surveys must include cross-sectional area and bed slope throughout all monitored reaches of impacted watercourses.
- Annual aerial photography and Digital Terrain Mapping is required to verify predicted subsidence surface profiles, and to identify potential short and long term erosion issues resulting from subsidence of watercourses.
- Surveys pre-subsidence should quantify the following features within watercourses:
  - pool/riffle sequences
  - bed controls
  - entry points of other watercourses and localised tributaries
  - existing bed and bank scour points
  - infrastructure located within the watercourse.
- Surveys post-subsidence should quantify any changes to the pre-mining conditions including:
  - erosion or deposition processes that have occurred as a result of subsidence,
  - migration of head cut erosion within watercourses and tributaries,
  - localised changes to stream bed slope,

  - localised widening of channels,
  - destabilisation of stream bed and banks including fracturing and incision,
  - localised changes to bank heights
  - size of subsidence void created within the watercourse.
- The subsidence monitoring program for groundwater must include the following information:
  - Sites must include representative locations at the interface of natural ground surface and observed changes in surface elevation from subsidence.
  - Monitoring bores should be established in each aquifer at each monitoring site.
  - Monitoring must include both water level measurements and water quality sampling in accordance with the following:
    - water level measurement to be taken quarterly
    - water quality field conductivity measurement to be taken 6 monthly
    - full chemical analysis of water samples to be taken annually.

Frequency of Monitoring

A proposed timeframe should be provided by the EA holder in relation to the monitoring outlined in the Subsidence Management Plan. The Department, upon review of the proposed Subsidence Management Plan will determine a suitable monitoring timeframe based on the information provided. Monitoring requirements will depend on a number of factors, including the stream order of the watercourse proposed to be impacted. As a guide:

Stream Order 1, 2 and 3
Monitoring must be undertaken at the following intervals:

- immediately prior to subsidence,
- within two (2) months of the initial subsidence,
- following a rainfall event of **1 in 2-year** ARI for the duration equal to the time of concentration for the catchment at the location of the subsidence.
- following a peak flow event of greater than a **1 in 2 year** ARI and
- annually.

Stream Order 4 and higher
Monitoring (including surveys) must be undertaken at the following intervals:

- immediately prior to subsidence,
- within two (2) months of the initial subsidence,
- following a rainfall event of **1 in 5-year** ARI for the duration equal to the time of concentration for the catchment at the location of the subsidence.
- following a peak flow event of greater than a **1 in 5 year** ARI, and
- annually.

Cumulative Impacts

Where subsidence is proposed in a Subsidence Management Plan, and the watercourse has already been subsided upstream or downstream, the monitoring assessment must determine not only the localised impacts on the watercourse resulting from the proposed subsidence, but also any cumulative impacts on the watercourse as a result of all other subsidence events.

Assessment

The design and assessment of engineered structures should be performed by a Registered Professional Engineer of Queensland (RPEQ). All other assessments should be performed by suitably qualified and experienced persons in the fields that they are assessing.

- The results of all monitoring activities should be reviewed by a suitably qualified person and detailed in the associated monitoring report.
- Recommendations should be made after assessment of the results regarding any specific treatment, remediation works, or engineered structures required post-subsidence to achieve stability in the watercourse.

Reporting

An annual report will be requested by the administering authority post-subsidence. The report should detail mining activities and all monitoring and rehabilitation activities as outlined within the Subsidence Management Plan. The reporting date will be determined in consultation with the administering authority.

- A monitoring report should contain the results of all monitoring activities, the assessment of these results, and recommendations for any remedial works required. The report should comment on the following:
  - Watercourse condition and geomorphic processes;
  - The condition of vegetation in riparian zones;
  - Examination of pillar zones in watercourses with particular attention to potential for tension cracking;
  - The creation of in-stream waterholes;
  - Any impacts on groundwater.
- Where preventative works were undertaken pre-subsidence, subsequent monitoring assessments should include assessment of the integrity and effectiveness of these works in mitigating the impacts of subsidence.
- An annual report in the form of two (2) hard copies and one electronic copy shall be furnished to the administering authority. The report should in addition to addressing specific monitoring requirements provide comment on:
  - The current state of the groundwater and surface water resources;
  - Any impacts on these features;
  - Any remedial works required to be undertaken including a timetable for implementation.
  - Commitment from the EA holder to addressing the recommendations in the report.

Mitigation

Where recommendations are made regarding specific treatment, remediation works, or engineered structures required post-subsidence to achieve stability in the watercourse, the EA holder must ensure this work is undertaken.

Rehabilitation

The holder of the EA, if directed by the administering authority, will carry out additional remedial works deemed necessary to minimise the impacts of subsidence on the physical integrity of the watercourse.

Relinquishment

Relinquishment of monitoring and rehabilitation responsibilities conditional under an EA holder's EA can only occur after the subsidence and approved mitigation and rehabilitation measures have been subjected to a suitable range of rainfall and flow events, and are deemed by the administering authority to be in a stable and functional condition. Any request for relinquishment will be negotiated with the administering authority and will require a submission containing monitoring data demonstrating stability and functionally in the watercourse over a suitable range of rainfall and flow events.

Acknowledgement

In 2007, BMA and Anglo Coal instigated discussions with the Department into a proposed assessment on the cumulative impacts of longwall mining beneath the Isaac River in Central Queensland. A final report was produced by Alluvium Consulting in July 2009 documenting the outcomes of the study. The Department greatly acknowledges the findings from this report and the assistance provided in the development of this guideline.

R Lucas, J Crerar, R Hardie, J Merritt and B Kirsch, 2009. Isaac River Cumulative Impact Assessment of Mining Developments. Report by Alluvium Consulting. ACARP for Diversion assessment guideline ex C9068.

END OF APPENDIX 3.

Appendix 4: Figures

Figure A1: Overall Site Layout Domain Plan

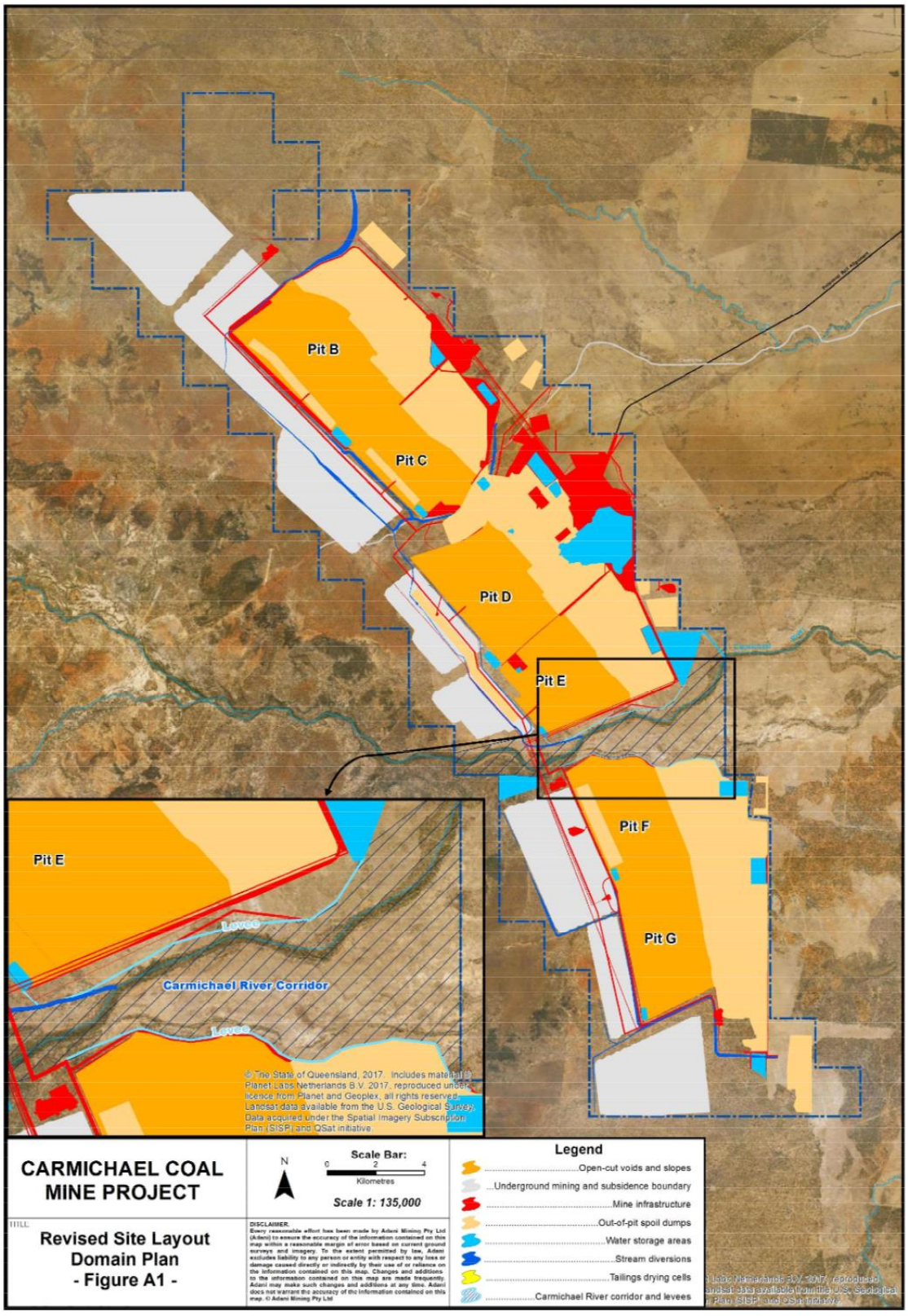


Figure A2: Exploration Disturbance

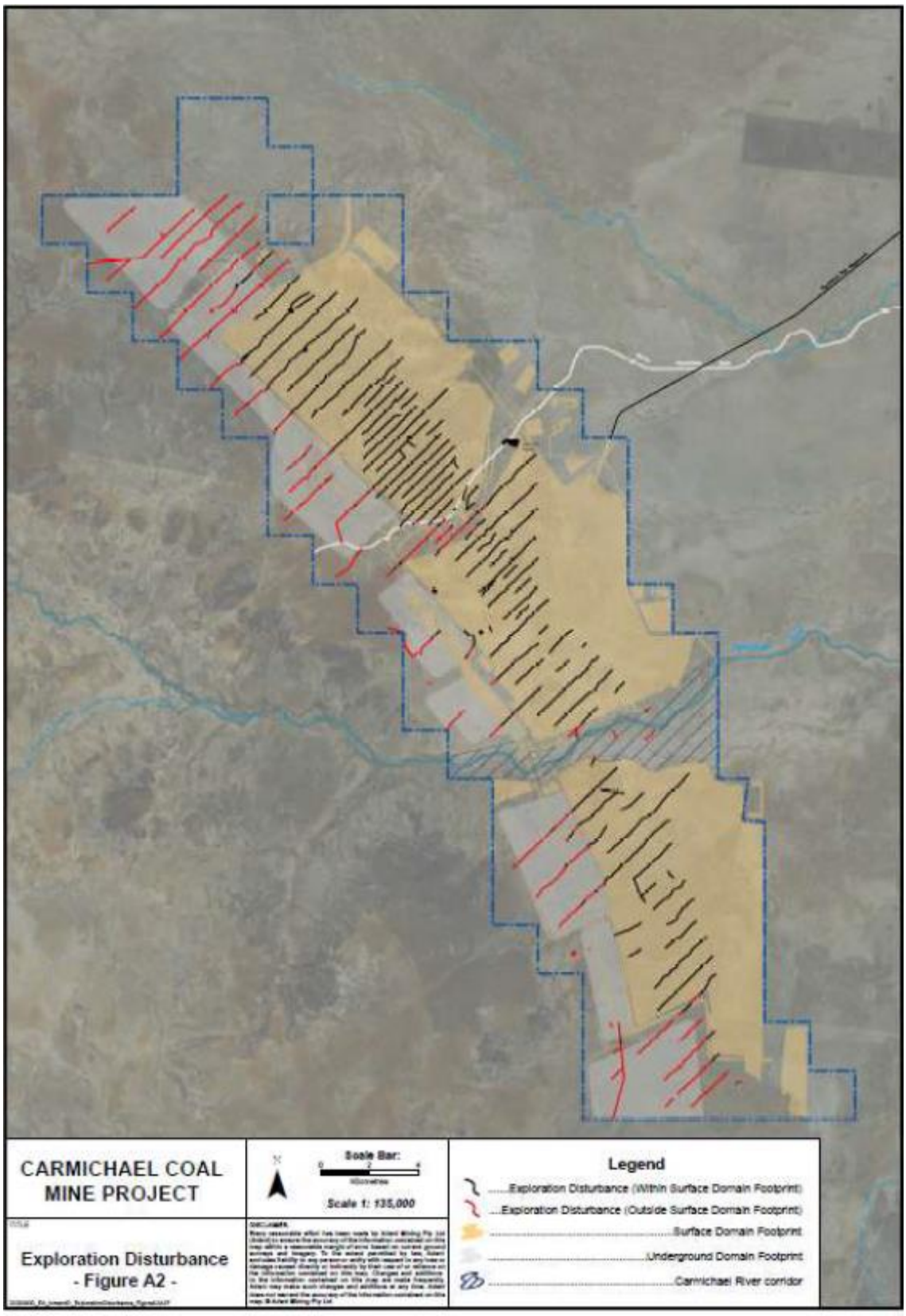


Figure E1: Groundwater Monitoring Locations

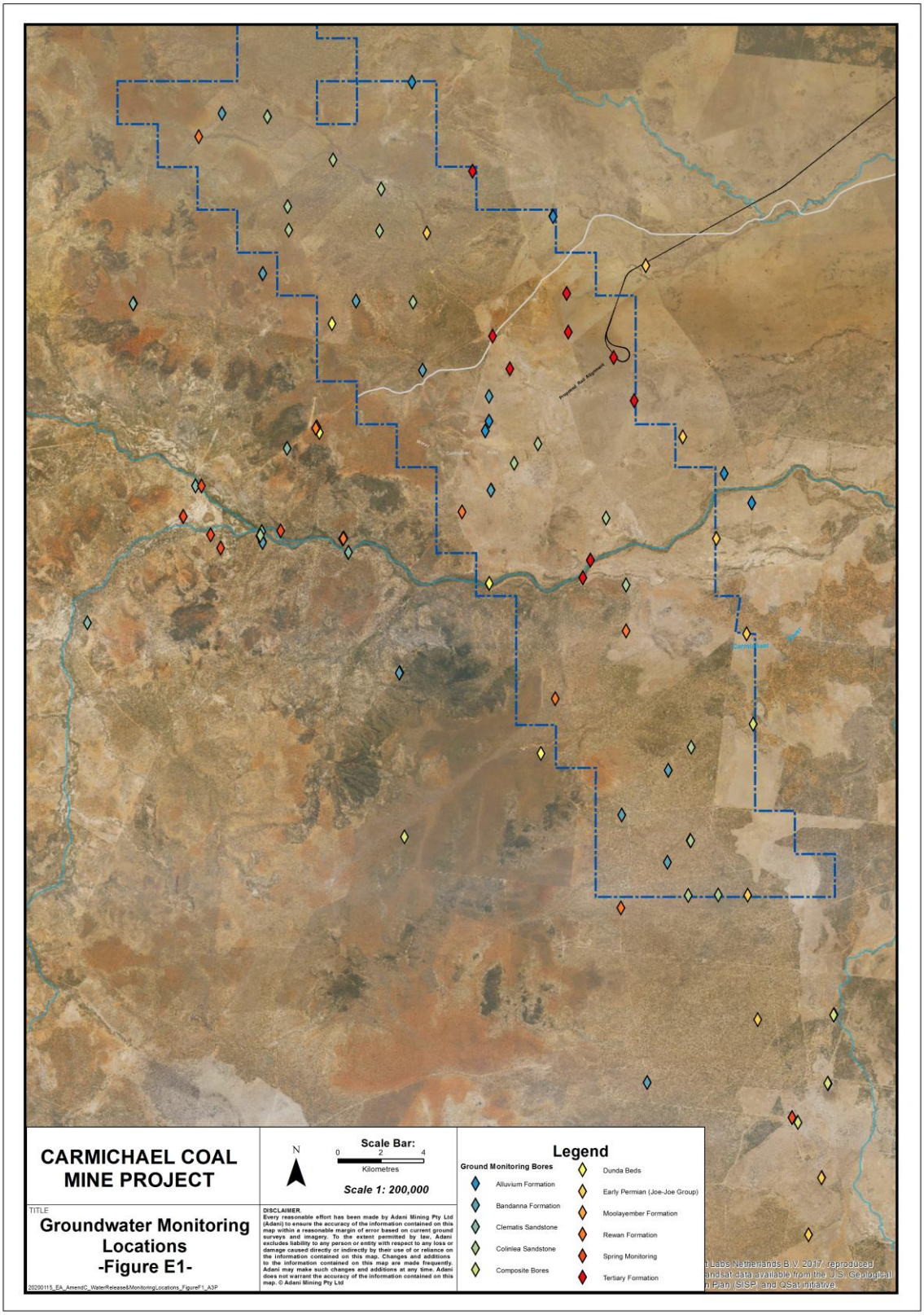
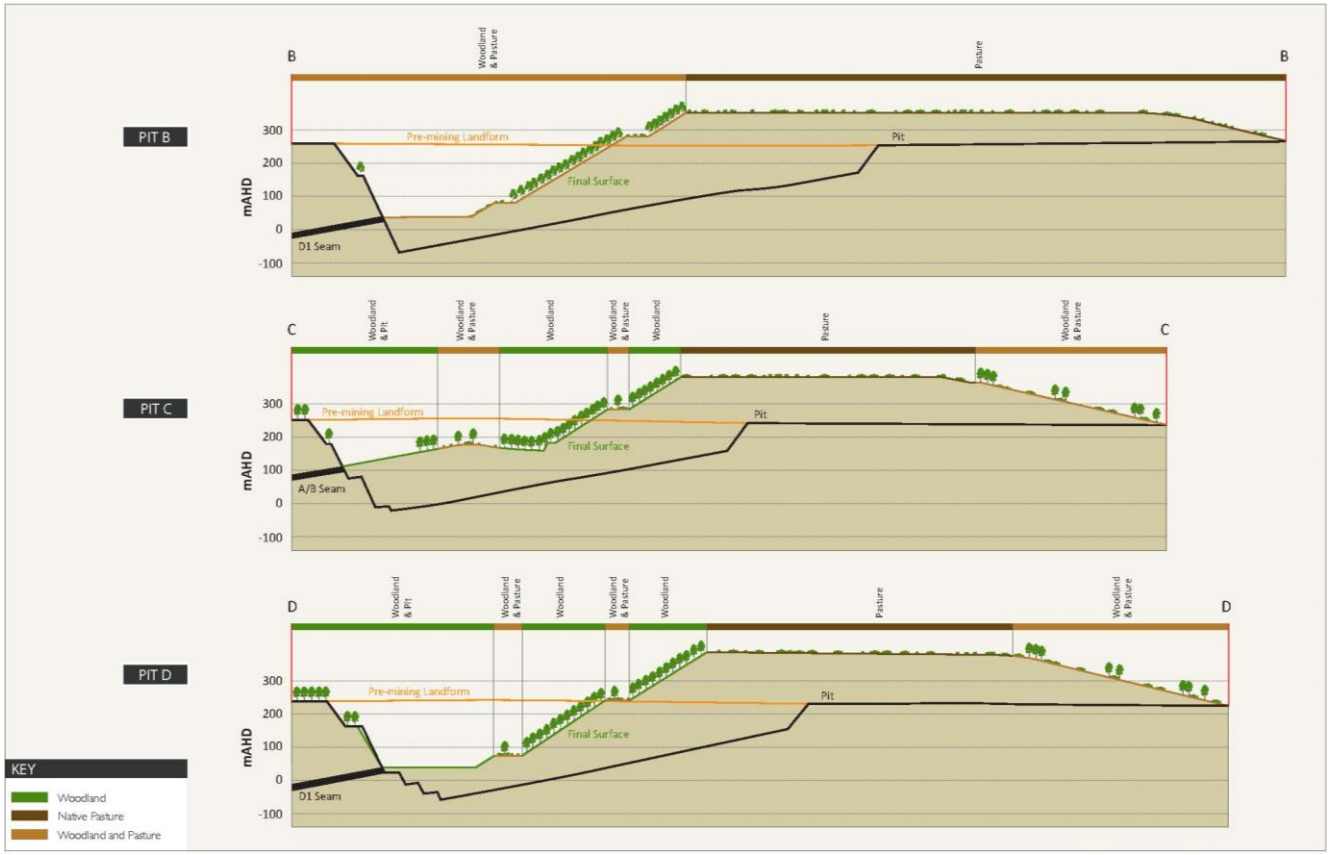


Figure F1: Water Release and Monitoring Locations

Figure H1: Cross Sections of Residual Voids



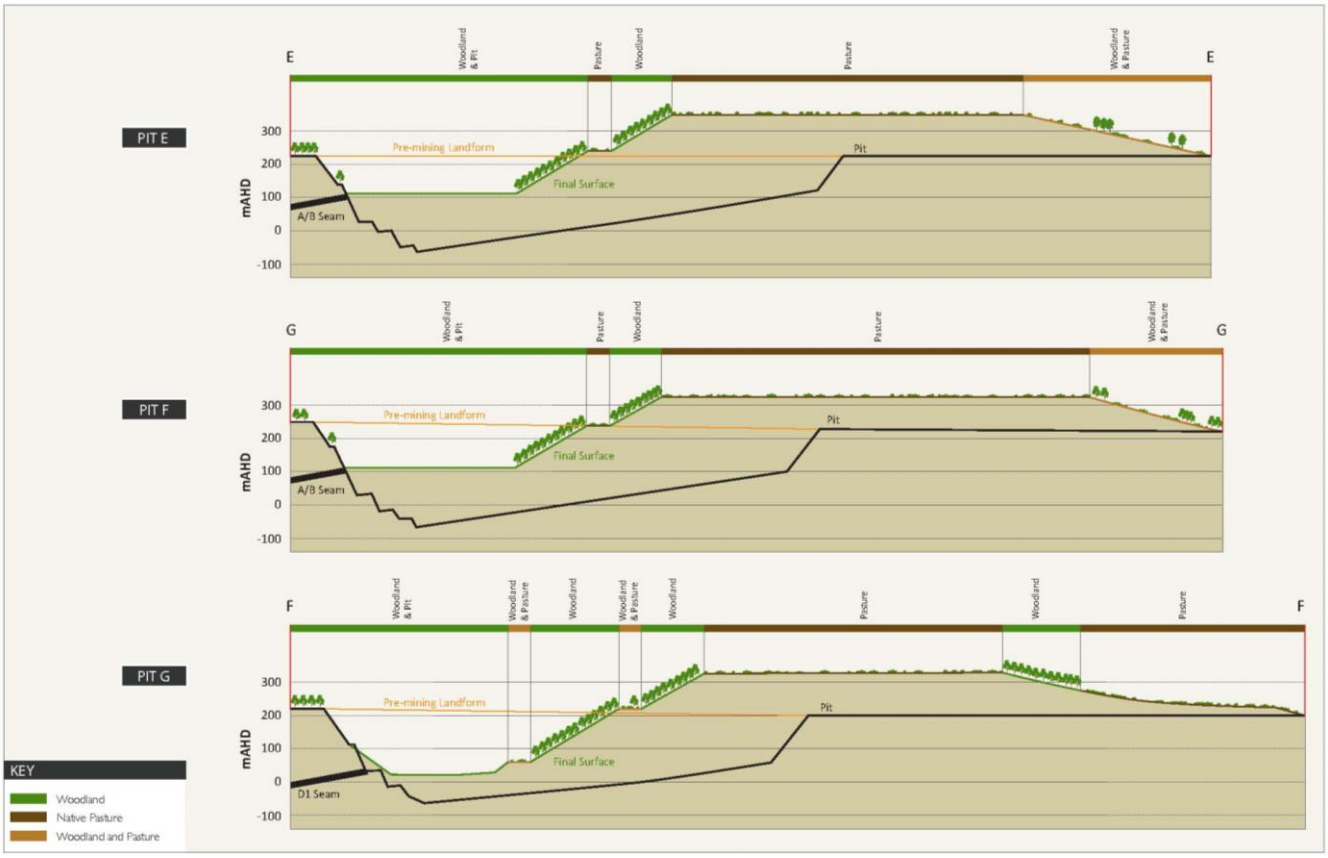


Figure H2: Final Landform (Northern Section)
Note – this figure, as well as figures H3 and H4, are solely to conceptually support the cross-sections illustrated in Figure H1. They are not an authorisation of disturbance, or final land use. That authorisation is contained within other conditions of this environmental authority.

Figure H3: Final Landform (Central Section)

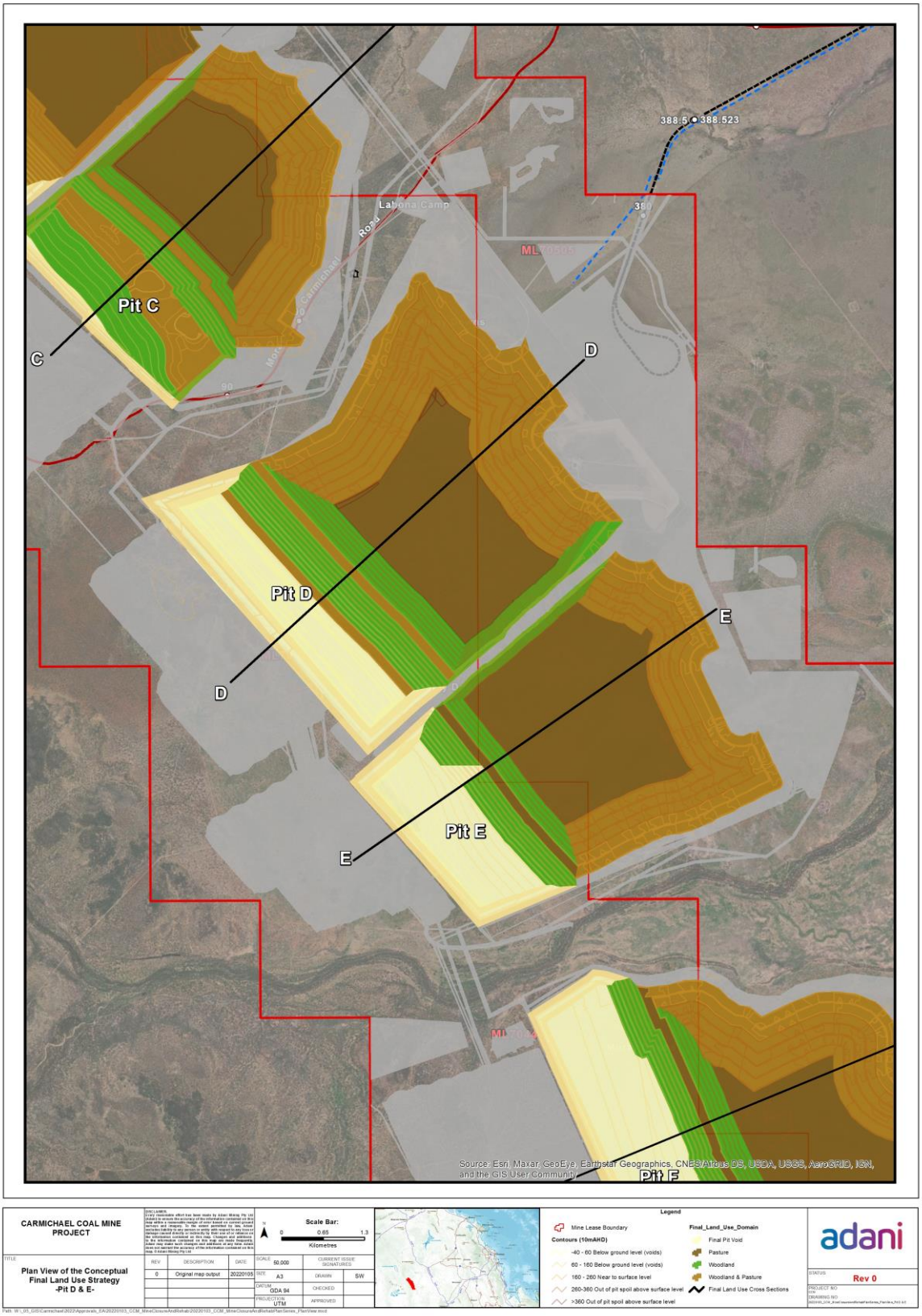


Figure H4: Final Landform (Southern Section)

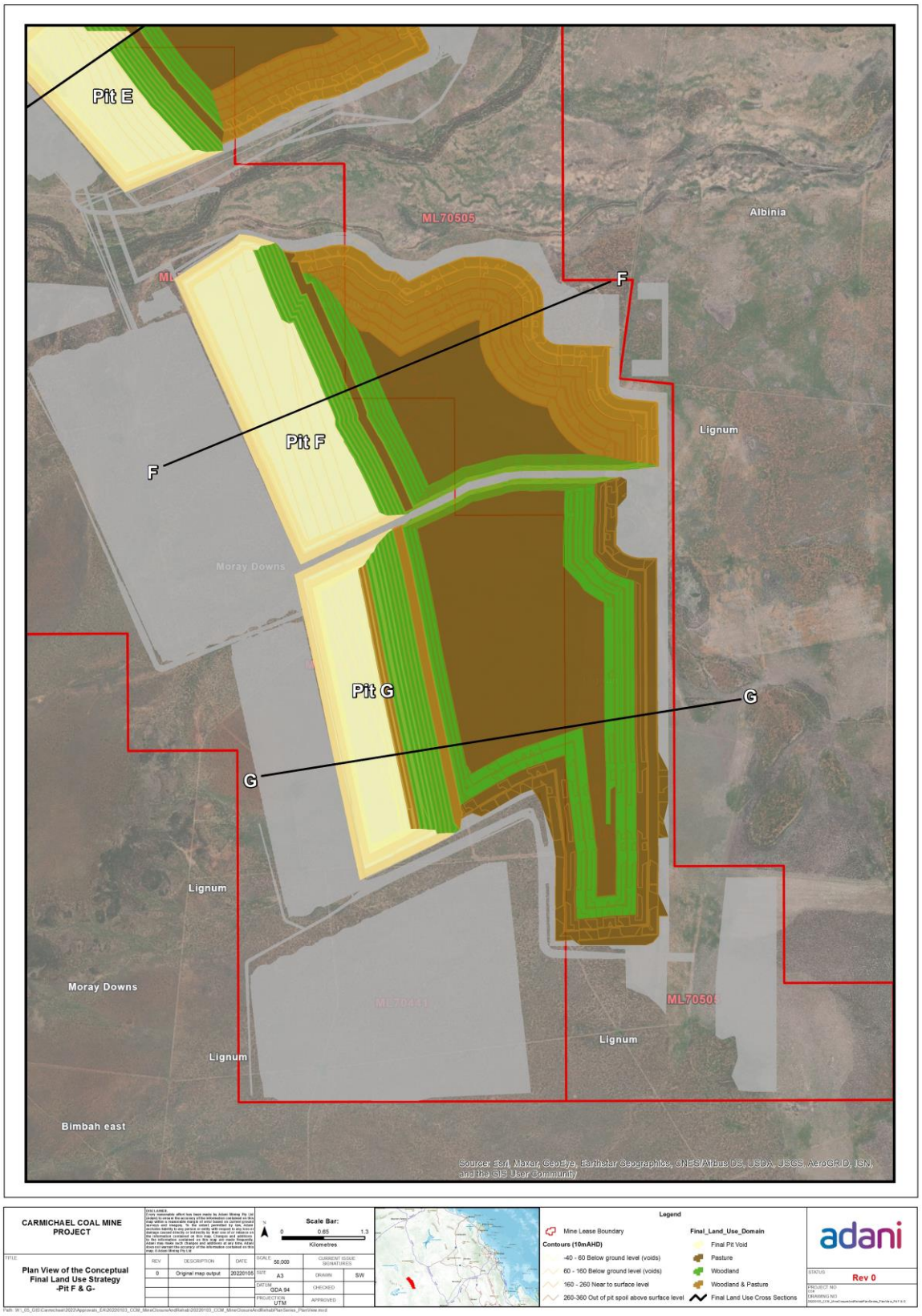


Figure H5: Final Post Mining Land Form

Note – Figure H5 is intended to support the Rehabilitation acceptance criteria detailed in Table H1 within Appendix 2. Where there is an inconsistency between Figure H5, and Table H1, Table H1 prevails.

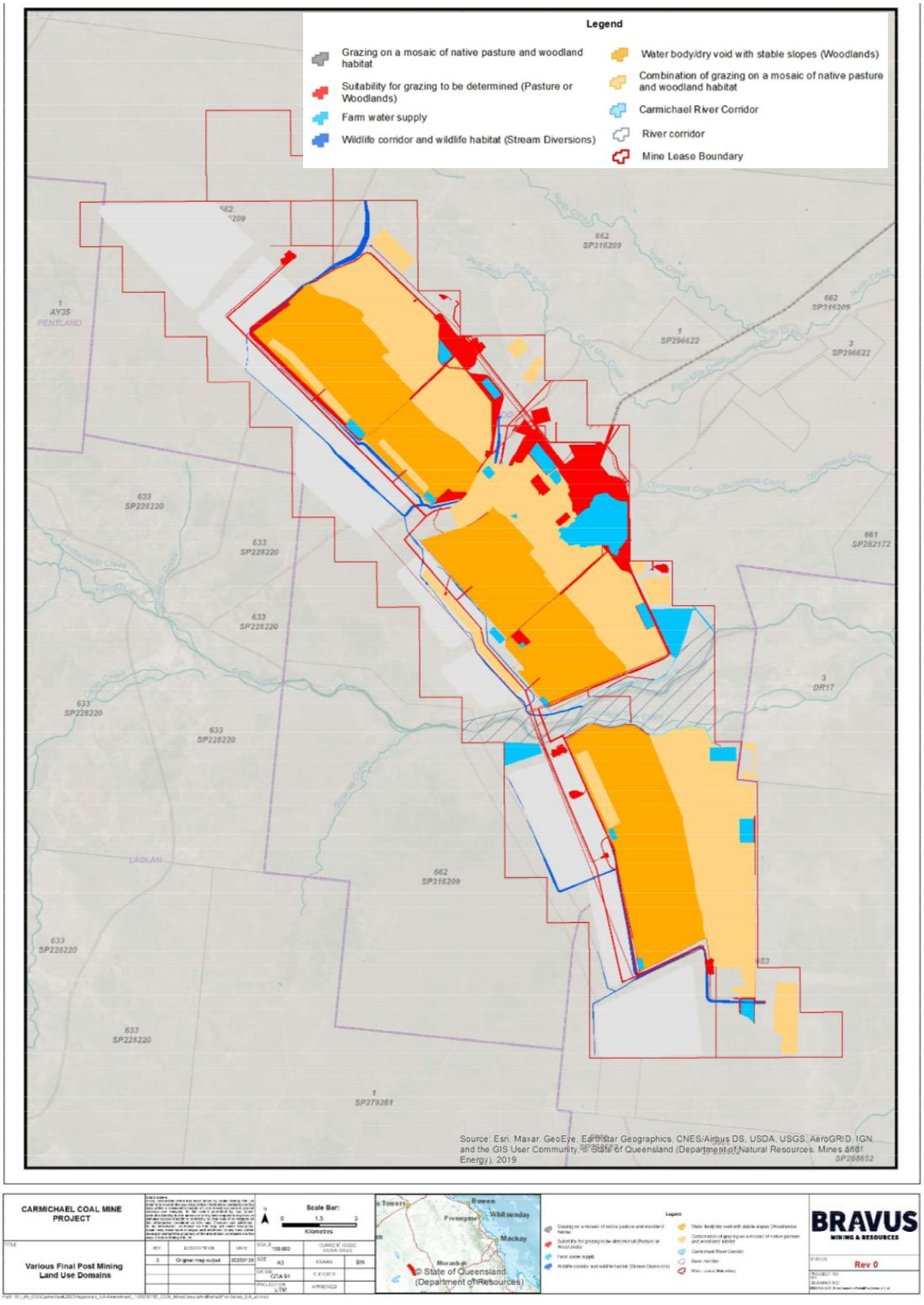
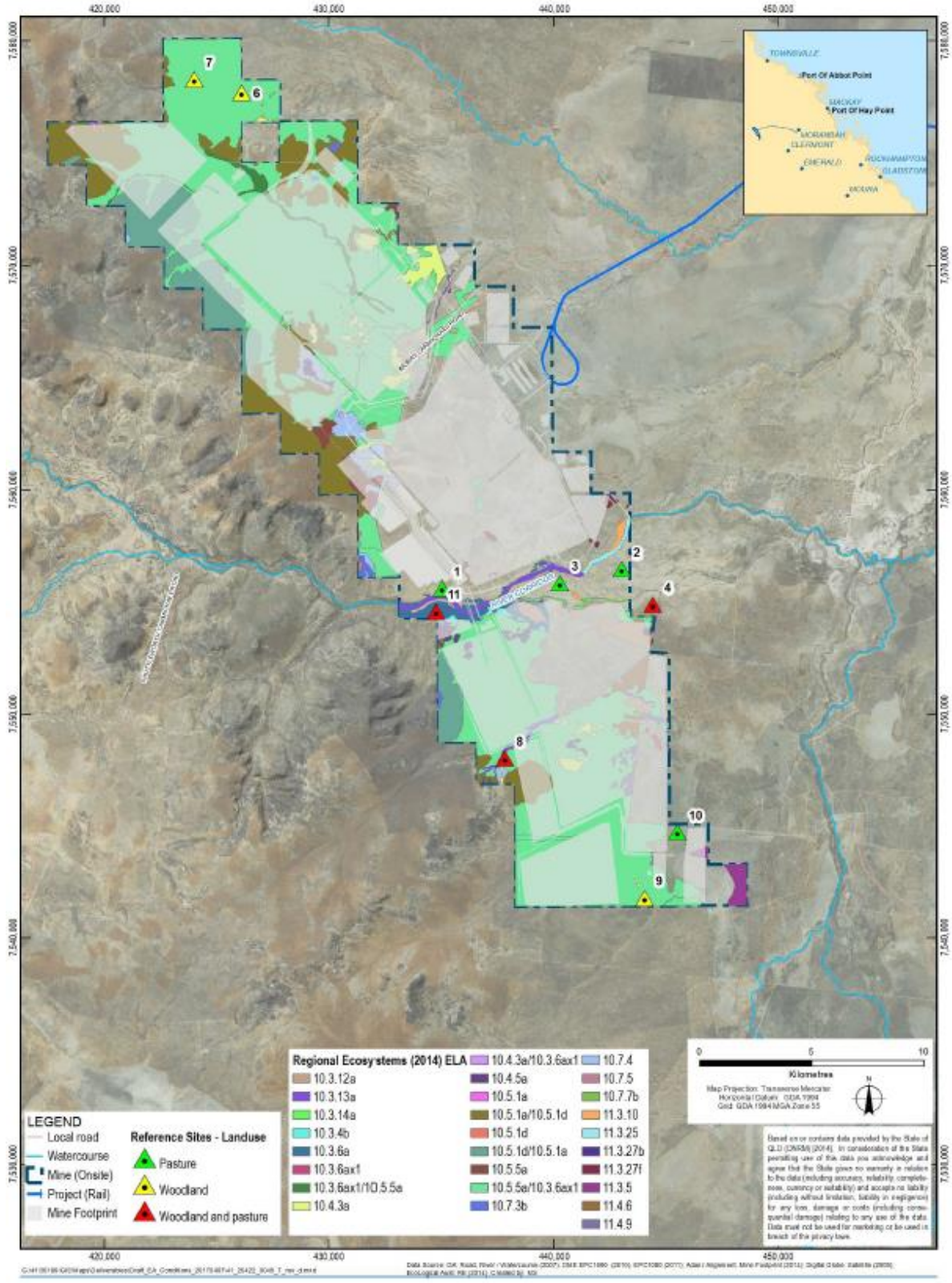


Figure H6: Reference Sites



END OF APPENDIX 4.

Appendix 5: Tables

Table E1 - Groundwater monitoring locations and frequency

Monitoring Point[1]	Monitoring	Location		Surface RL (mAHD)	Reference RL (m AHD)	Monitoring Frequency	Comments Regarding Triggers
		Easting (GDA94 – Zone 55K)	Northing (GDA94 – Zone 55K)				
Alluvium							
C027P1	Water level and quality	433643	7554818	226.95	227.62	At least 2- to 3-monthly	Bore-specific triggers
C029P1	Water level and quality	437691	7555082	225.44	226.05		Bore-specific triggers
C14027SP	Water level and quality	444965	7558330	217.56	218.13		Bore-specific triggers
C14028SP	Water level and quality	443776	7559581	218.86	219.63		Bore-specific triggers
C19001SP	Water level and quality	438025	7555853	227.06	227.95		Bore-specific triggers.
C19019SP	Boundary Bore. Water level and quality	432845	7572555	255.35	255.91		No baseline data, (Dry Bore) triggers to be developed
C19021SP	Boundary Bore. Water level and quality	430226	7576369	264.61	265.55		No baseline data, (Dry Bore) triggers to be developed
C19023SP	Boundary Bore. Water level and quality	436338	7570630	225.15	225.91		No baseline data, (Dry Bore) triggers to be developed
C19024SP	Seepage Bore. Water level and quality	433447	7561376	253.59	254.53		No baseline data, (Dry Bore) triggers to be developed
C19025SP	Seepage Bore. Water level and quality	433612	7561775	247.49	248.41		No baseline data, (Dry Bore) triggers to be developed
HD03B	Water level and quality	427559	7556119	229.41	230.16		Bore-specific triggers
Tertiary							
C025P2	Water level and quality	438010	7555845	227.48	228.24	At least 2- to 3-monthly	Bore-specific triggers
C029P2	Water level and quality	437688	7555081	225.37	226.00		Bore-specific triggers
C558P1	Water level and quality	430312	7566903	250.07	250.72		Bore-specific triggers
C9845SPR	Water level and quality	439411	7544903	255.41	256.24		Bore-specific triggers

C9180121SPR	Water level and quality	448085	7529364	226.46	227.75		Bore-specific triggers
C18004SP	Seepage Bore. Water level and quality	437013	7565647	228.79	229.47		Bore-specific triggers
C18005SP	Seepage Bore. Water level and quality	438984	7564556	221.01	221.66		Bore-specific triggers
C18006SP	Seepage Bore. Water level and quality	439880	7562706	221.49	222.27		Bore-specific triggers
C18007SP	Seepage Bore. Water level and quality	434500	7564054	231.53	232.22		No baseline data, (Dry Bore) triggers to be developed
C18008SP	Seepage Bore. Water level and quality	433744	7565456	235.89	236.47		No baseline data, (Dry Bore) triggers to be developed
C18009SP	Seepage Bore. Water level and quality	436936	7567301	226.00	226.75		Bore-specific triggers
C19020SP	Boundary Bore. Water level and quality	432847	7572550	255.86	256.54		No baseline data, (Dry Bore) triggers to be developed
C19022SP	Boundary Bore. Water level and quality	436340	7570625	225.23	225.92		No baseline data, triggers to be developed
Clematis Sandstone							
C14011SP	Water level and quality	426131	7561455	311.67	312.44	At least 2- to 3-monthly	Bore-specific triggers
C14012SP	Water level and quality	424896	7560596	286.37	287.06		Bore-specific triggers
C14013SP	Water level and quality	424895	7560591	286.47	287.26		Bore-specific triggers
C14021SP	Water level and quality	429796	7550966	277.59	278.59		Bore-specific triggers
C14033SP	Water level and quality	418211	7566776	296.47	297.35		Bore-specific triggers
C18001SP	Water level and quality	416312	7553052	246.97	247.35		Bore-specific triggers
C18002SP	Water level and quality	420948	7558952	248.30	249.28		Bore-specific triggers
C19002SP	Water level and quality	423799	7568106	305.33	306.27		Bore-specific triggers)
C19010SP	Nested bore. Water level and quality	427323.404	7556733.58	238.41	239.70		No baseline data. Triggers to be developed

C19014SP	Nested bore. Water level and quality	423766	7556814	239.27	240.13		No baseline data. Triggers to be developed
HD02	Water level and quality	423822	7557008	236.35	237.42		Bore-specific triggers
HD03A	Water level and quality	427562	7556132	229.41	230.16		Bore-specific triggers
Dunda beds							
C022P1	Water level and quality	426813	7565962	273.76	274.15	At least 2- to 3-monthly	Bore-specific triggers
C027P2	Water level and quality	433648	7554819	227.58	228.38		Bore-specific triggers
C14023SP	Water level and quality	429802	7550969	277.675	278.675		Bore-specific triggers
C180117SP	Water level and quality	435915	7547522	279.59	280.67		Bore-specific triggers
C19007SP	Nested bore. Water level and quality	426268	7561274	310.28	310.94		Bore-specific triggers
C19011SP	Nested bore. Water level and quality	427337	7556725	238.068	238.868		Bore-specific triggers
C19015SP	Nested bore. Water level and quality	423768	7556827	239.385	240.365		Bore-specific triggers
Rewan Formation							
C008P1	Water level and quality	433713	7558834	238.14	238.64	At least 2- to 3-monthly	Bore-specific triggers
C035P1	Water level and quality	441404	7546824	236.31	236.79		Bore-specific triggers
C555P1	Water level and quality	432461	7557893	241.15	241.86		Bore-specific triggers
C556P1	Water level and quality	436524	7549882	260.63	261.42		Bore-specific triggers
C9553P1R	Water level and quality	421010	7573975	294.11	294.63		Bore-specific triggers
C9838SPR	Water level and quality	439558	7552812	228.81	229.6		Bore-specific triggers
C19008SP	Nested bore. Water level and quality	426268	7561277	310.18	311.07		No baseline data; Triggers to be developed
C19009SP	Nested bore. Water level only	426286	7561268	310.15	310.47		No quality triggers assigned
C19012SP	Nested bore. Water level and quality	427331.21	7556730	238.4	239.42		No baseline data; Triggers to be developed
C19017SP	Nested bore. Water level and quality	423736	7556825	239.62	239.935		No baseline data; Triggers to be developed

C19028SP)	Water level only	439400	7540894	260.68	261.62		No quality triggers assigned
C919013SPR	Nested bore. Water level and quality	427345.98	7556721.4	238.1	238.29		No baseline data; Triggers to be developed
C919016SPR	Nested bore. Water level and quality	423767	7556821	239.4	240.23		Bore-specific triggers
C19842C (VWP)	VWP – assessment of depressurisation trends only	423736	7556821	239.77			No quality triggers assigned
Bandanna Formation[2]							
C14200VWP1	VWP – assessment of depressurisation trends only	440547	7533419	247.08		At least 2- to 3-monthly	No quality triggers assigned
C14206VWP_1		429783	7550957	227.15			No quality triggers assigned
C14207VWP1		423807	7568105	305.17			No quality triggers assigned
C851VWP1		441384	7542877	244.67			No quality triggers assigned
C851VWP2		441384	7542877	244.75			No quality triggers assigned
C968VWP_P5		424874	7570989	279.18			No quality triggers assigned
C008P2	Water level and quality	433710	7558830	238.12	238.805		Bore-specific triggers
C014P2	Water level and quality	430731	7563976	256.27	256.9		Bore-specific triggers
C016P2	Water level	422017	7574975	294.45	295.08		No quality triggers assigned
C018P2	Water level and quality	423988	7574849	281.32	282.06		Bore-specific triggers
C032P2	Water level and quality	439404	7544896	256.32	256.92		Bore-specific triggers
C035P2	Water level and quality	441402	7546828	236.24	236.67		Bore-specific triggers
C823SP	Water level	433605	7562864	246.07	247.33		No quality triggers assigned
C847SP	Water level and quality	442385	7543809	237.01	237.92		Bore-specific triggers
C19018SP	Nested bore. Water level and quality	423737	7556834	239.28	239.56		No baseline data; Triggers to be developed
C19027SP	Water level and quality	427832	7566929	262.37	263.34		Bore-specific triggers
Colinlea Sandstone							
C006P3R	Water level and quality	435727	7560835	233.86	234.36		Bore-specific triggers

C011P3	Water level and quality	428846	7569955	254.54	255.08	At least 2- to 3-monthly	Bore-specific triggers
C018P3	Water level and quality	423978	7574853	281.36	281.98		Bore-specific triggers
C024P3	Water level and quality	428909	7571761	258.62	259.16		Bore-specific triggers
C034P3	Water level and quality	442389	7547814	227.38	228.26		Bore-specific triggers
C833SP	Water level and quality	439559	7554779	223.3	224.61		Bore-specific triggers
C848SP	Water level and quality	442364	7543815	237.03	237.835		Bore-specific triggers
C975SP	Water level and quality	426824	7573002	266.81	267.81		Bore-specific triggers
C9849SPR	Water level	442384	7543808	236.69	237.69		No quality triggers assigned
C19003SP	Water level	443571	7541484	229.8	231.36		No quality triggers assigned
C19004SP	Water level	442278	7541451	238.43	239.355		No quality triggers assigned
C19026SP	Water level	434698	7559985	238.44	239.28		No quality triggers assigned
C19029SP	Water level and quality	438685	7557647	224.74	225.445		Bore-specific triggers
C056VWP1	VWP – assessment of depressurisation trends only	424924	7569972	283.86			No quality triggers assigned
C558VWP1		430312	7566903	250.05			No quality triggers assigned
C968VWP_P2		424874	7570989	279.18			No quality triggers assigned
C19031SP (VWP)	VWP – assessment of depressurisation trends only	423753	7556845	238.92			No quality triggers assigned
Joe-Joe Group							
C012P1	Water level and quality	430888	7569874	247.33	247.94	At least 2- to 3-monthly	Bore-specific triggers
C012P2	Water level and quality	430887	7569877	247.25	247.87		Bore-specific triggers
C14002SP	Water level	441978	7561158	226.23	226.925		No quality triggers assigned
C14003SP	Water level and quality	440351	7568519	217.97	218.98		Bore-specific triggers
C14004SP	Water level	440356	7568513	217.97	218.92		No quality triggers assigned
C14006SP	Water level and quality	443447	7556785	218.98	219.68		Bore-specific triggers
C14008SP	Water level and quality	444761	7552698	219.54	220.66		Bore-specific triggers
C14015SP	Water level and quality	445302	7536139	228.22	229.3		Bore-specific triggers

C14016SP	Water level	444852	7541471	221.75	222.72		No quality triggers assigned
C14017SP	Water level and quality	447525	7526907	229.23	230.43		Bore-specific triggers
C14032SP	Water level and quality	448356	7533401	221.13	222.44		Bore-specific triggers
C180119SP	Water level and quality	448588	7536355	223.13	224.33		Bore-specific triggers
C180123SP	Water level and quality	448079	7529358	226.47	227.85		Bore-specific triggers
C914001SPR	Water level and quality	441973	7561150	226.15	227.25		Bore-specific triggers
C914030SPR	Water level and quality	445072	7548821	216.96	218.06		Bore-specific triggers
C9180124SPR	Water level and quality	448600	7536358	223.19	224.29		Bore-specific triggers
C9180125SPR	Water level and quality	447040	7531739	222.5	223.8		Bore-specific triggers
Additional Monitoring Bores[3]							
Moolayember Formation							
C14020SP	Water level and quality	418233	7566780	296.55	297.37	At least 2- to 3-monthly	Triggers not required
C18003SP	Water level and quality	420944	7558964	248.22	249.08		Triggers not required
Composite Bore							
C14024SP (Clematis/Rewan)	Water level	430037	7543917	332.58	333.31	At least 2- to 3-monthly	No quality triggers for composite bores
C14029SP (Tertiary/Joe Joe)	Water level	445059	7548821	216.87	218.17		
C14031SP (Tertiary/Joe Joe)	Water level	448331	7533407	221.06	222.02		
C180120SP (Tertiary/Joe Joe)	Water level	447057	7531730	222.4	223.6		
C180122SP (Tertiary/Joe Joe)	Water level	448580	7536349	222.95	224.14		
Springs							
Joshua Spring	Water level and quality	421202	7559388	241.17 (243.26)*	NA	At least 2- to 3-monthly	Triggers not required
Mellaluka Spring	Water level and quality	446826	7531904.29	224.4	NA		
C18010SP	Water level and quality	421610	7556861	237.84	238.21		

C18011SP	Water level and quality	422045	7556286	240.11	240.618		
C18012SP	Water level and quality	420424	7557642	239.03	239.541		
C18013SP	Water level and quality	420428	7557637	238.66	239.167		
C18014SP	Water level and quality	424640	7557046	235.48	235.974		

Notes

1. Monitoring is not required where a bore has been removed as a direct result of the mining activity.
2. Bandanna Formation bore C007P2 will be decommissioned within 1-2 years (as at February 2022) and has not been included in Table E1. However, until the bore is decommissioned, water level and water quality monitoring must be undertaken.
3. Although monitoring of composite bores and Moolayember Formation are not required in the EA, these bores will add value to the monitoring network, allowing for additional assessment of potential groundwater impacts.
4. *The two surface RLs for Joshua Spring refer to: the floor of the spring and (top of turkey's nest). Measurements are taken relative to the top of turkey's nest.

Notes:
1. Monitoring is not required where a bore has been removed as a direct result of the mining activity.
2. RL must be measured to the nearest 5cm from the top of the bore casing.
3. Locations, monitoring frequency and surface RL to be finalised based on information provided to the administering authority under Condition E8 (a). Contaminant trigger levels to be finalised for each aquifer type based on information provided to the administering authority under Condition E8 (a)

Table E2 Groundwater Quality Monitoring Parameters

Parameter Group	Parameter	Units	Trigger Applies
Physiochemical Parameters	Temperature (Field)	°C	No
	Dissolved oxygen (Field)	mg/L	No
	Oxidation Reduction Potential (Field)	mV	No
	pH (Laboratory)	pH Unit	No
	pH (Field)	pH Unit	Yes
	Electrical Conductivity (Laboratory)	µS/cm	No
	Electrical Conductivity (Field)	µS/cm	Yes
	Total Dissolved Solids (Laboratory)	mg/L	No
Alkalinity	Hydroxide Alkalinity as $CaCO_3$	mg/L	No
	Carbonate Alkalinity as $CaCO_3$	mg/L	No
	Bicarbonate Alkalinity as $CaCO_3$	mg/L	No
	Total Alkalinity as $CaCO_3$	mg/L	No
	Total Hardness as CaCO3	mg/L	No
Major ions	Sulfate as SO_4	mg/L	Yes
	Chloride	mg/L	No
	Calcium	mg/L	No
	Fluoride	mg/L	No
	Magnesium	mg/L	No
	Sodium	mg/L	No
	Potassium	mg/L	No
	Total Anions	meq/L	No
	Total Cations	meq/L	No
	Ionic Balance	%	No
Total and Dissolved Metals (triggers and limits apply to the dissolved fraction only)	Aluminium	mg/L	Yes
	Arsenic	mg/L	Yes
	Boron	µg/L	Yes
	Cadmium	mg/L	No
	Chromium	mg/L	No
	Cobalt	mg/L	Yes
	Copper	mg/L	Yes
	Iron	mg/L	Yes
	Lead	mg/L	No
	Manganese	mg/L	No
	Mercury	mg/L	Yes
	Molybdenum	mg/L	Yes
	Nickel	mg/L	Yes
	Selenium	mg/L	Yes
	Silver	mg/L	Yes
	Uranium	mg/L	No
	Vanadium	mg/L	No
	Zinc	mg/L	Yes
Flouride	Fluoride	mg/L	No
Nutrients	Ammonia as N	mg/L	No
	Nitrate as N	mg/L	Yes
	Total Nitrogen as N	mg/L	No
	Total Phosphorus as P	mg/L	Yes
	C6 - C10 Fraction	µg/L	Yes

Parameter Group	Parameter	Units	Trigger Applies
Total Recoverable Hydrocarbons	>C10 - C40 Fraction	µg/L	Yes
BTEXN[a]	Benzene	µg/L	No
	Toluene	µg/L	No
	Ethylbenzene	µg/L	No
	Meta- & para-Xylene	µg/L	No
	Ortho-Xylene	µg/L	No
	Total Xylenes	µg/L	No
	Sum of BTEX	µg/L	No
	Naphthalene	µg/L	No

Table E3 –Groundwater Quality Trigger Levels

Alluvium							
Parameter[a]	**Units**	**HD03B**	**C027P1**	**C029P1**	**C14027SP**	**C14028SP**	**C19001SP**
pH (field)	N/A	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0
Electrical conductivity	µS/cm	893	7240	33550	50740	45000	24880
Total dissolved solids	mg/L	540	4400	20355	38720	32500	16170
Sulphate	mg/L	13	530	1100	2200	1900	820
Aluminium	µg/L	55	55	55	55	55	55
Arsenic	µg/L	13	13	13	13	13	13
Molybdenum	µg/L	34	34	34	34	34	34
Selenium	µg/L	11	11	11	11	11	11
Silver	µg/L	0.05	0.05	0.05	0.05	0.05	0.05
Iron	µg/L	650	12510	997	4537	1217	60
Mercury	µg/L	0.06	0.06	0.06	0.06	0.06	0.06
Nitrate as N	mg/L	0.7	0.7	0.7	0.7	0.7	0.7
Total Phosphorus as P	mg/L	0.16	0.1	0.35	0.19	0.1	0.1
Boron	µg/L	180	830	5255	2890	3150	2133
Cobalt	µg/L	1.4	8	12	66	23	1.4
Copper	µg/L	4.5	9	65	180	25	3
Nickel	µg/L	11	22	20	48	11	16
Zinc	µg/L	19.5	50	26	276	72	8

TRH C6 - C10 Fraction	µg/L	20	20	20	20	20	20			
TRH >C10 - C40 Fraction (sum)	µg/L	100	100	100	100	100	100			
Tertiary Sediments										
Parameter[a]	**Units**	**C025P2**	**C029P2**	**C558P1**	**C9845SPR**	**C9180121SPR**	**C18004SP[b]**	**C18005SP[b]**	**C18006SP[b]**	**C18009SP[b]**
pH (field)	N/A	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	5.8-9.0	5.5 - 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0
Electrical conductivity	µS/cm	14685	12100	9656	2000	3800	40525	53150	61160	25700
Total dissolved solids	mg/L	8698	7485	6232	1200	2300	36400	45880	50510	21560
Sulphate	mg/L	440	310	260	64	98	803	2380	2997	946
Aluminium	µg/L	55	55	55	55	55	55	55	55	55
Arsenic	µg/L	13	13	13	13	13	13	13	13	13
Molybdenum	µg/L	34	34	34	34	34	34	34	34	34
Selenium	µg/L	11	11	11	11	11	11	11	11	11
Silver	µg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Iron	µg/L	7760	1440	410	5	344	120	170	674	80
Mercury	µg/L	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Nitrate as N	mg/L	0.7	0.7	0.7	0.1	0.7	0.7	0.7	0.7	0.7
Total Phosphorus as P	mg/L	0.24	0.1	0.1	0.1	0.1	0.1	0.37	0.1	0.1
Boron	µg/L	1658	1260	840	240	314	1423	5070	5855	1328
Cobalt	µg/L	1.4	1.4	3	1.4	1.4	1.4	17	14	1.4
Copper	µg/L	10	20	122	180	3	1.4	185	1.4	12
Nickel	µg/L	12	11	55	11	11	30	37	23	13

Zinc	µg/L	22	32	67	41	2160	8	120	8	46
TRH C6 - C10 Fraction	µg/L	20	20	20	20	20	20	20	20	20
TRH >C10 - C40 Fraction (sum)	µg/L	100	100	100	100	100	100	100	100	100
Clematis Sandstone										
Parameter[a]	**Units**	**C14011SP**	**C14012SP**	**C14013SP**	**C14021SP**	**C14033SP**	**HD02**	**HD03A**	**C18001SP**	**C18002SP**	**C19002SP[c]**
pH (field)	N/A	4.9 - 9.0	6.0 – 9.0	4.9 - 9.0	5.6 - 9.0	5.1- 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	5.4- 9.0
Electrical conductivity	µS/cm	272	490	410	620	377	633	730	667	380	343
Total dissolved solids	mg/L	173	290	248	369	233	380	430	379	225	202
Sulphate	mg/L	6	6	11	21	4	5	12	9	1	8
Aluminium	µg/L	*55*	*55*	*55*	*55*	*55*	*55*	*55*	*55*	*55*	*55*
Arsenic	µg/L	*13*	*13*	*13*	*13*	*13*	*13*	*13*	*13*	*13*	*13*
Molybdenum	µg/L	*34*	*34*	*34*	*34*	*34*	*34*	*34*	*34*	*34*	*34*
Selenium	µg/L	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
Silver	µg/L	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*
Iron	µg/L	15	45	13	14	11	1297	640	1648	5	5
Mercury	µg/L	*0.06*	*0.06*	*0.06*	*0.06*	*0.06*	*0.06*	*0.06*	*0.06*	*0.06*	*0.06*
Nitrate as N	mg/L	*0.7*	*0.7*	*0.7*	*0.7*	*0.7*	*0.7*	*0.7*	*0.7*	*0.7*	*0.7*
Total Phosphorus as P	mg/L	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	0.19	*0.1*	*0.1*	0.18	*0.1*
Boron	µg/L	110	120	120	130	90	113	140	120	65	110
Cobalt	µg/L	2	*1.4*	4	*1.4*	2	2	*1.4*	*1.4*	*1.4*	*1.4*
Copper	µg/L	13	*1.4*	16	8	13	*1.4*	*1.4*	*1.4*	*1.4*	6

Nickel	µg/L	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
Zinc	µg/L	82	22	117	56	60	25	45	96	10	72
TRH C6 - C10 Fraction	µg/L	20	20	20	20	20	20	20	20	20	20
TRH >C10 - C40 Fraction (sum)	µg/L	100	100	100	100	100	100	100	100	100	100
Dunda Beds											
Parameter[a]	**Units**	**C022P1**		**C027P2**	**C14023SP**	**C180117SP**	**C19007SP**	**C19011SP**	**C19015SP**		
pH (field)	N/A	5.2 - 9.0		5.6 - 9.0	6.0 – 9.0	5.7- 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0		
Electrical conductivity	µS/cm	288		786	748	360	1390	797	712		
Total dissolved solids	mg/L	182		489	432	220	821	468	398		
Sulphate	mg/L	7		21	3	17	27	1	1		
Aluminium	µg/L	55		55	55	55	55	55	55		
Arsenic	µg/L	13		13	13	13	13	13	13		
Molybdenum	µg/L	34		34	34	34	44	34	34		
Selenium	µg/L	11		11	11	11	11	11	11		
Silver	µg/L	0.05		0.05	0.05	0.05	0.05	0.05	0.05		
Iron	µg/L	5		2477	5	1498	5	5	5		
Mercury	µg/L	0.06		0.06	0.06	0.06	0.06	0.06	0.06		
Nitrate as N	mg/L	0.7		0.7	0.7	0.7	0.7	0.7	0.7		
Total Phosphorus as P	mg/L	0.1		0.1	0.1	0.1	0.1	0.1	0.1		
Boron	µg/L	130		210	90	76	73	25	100		

Cobalt	µg/L	51	2	1.4	1.4	1.4	1.4	1.4
Copper	µg/L	68	2	1.4	103	1.4	1.4	1.4
Nickel	µg/L	11	11	11	20	11	11	11
Zinc	µg/L	47	45	8	73	8	8	8
TRH C6 - C10 Fraction	µg/L	20	20	20	20	20	20	20
TRH >C10 - C40 Fraction (sum)	µg/L	100	100	100	100	100	100	100
Rewan Formation								
Parameter[a]	**Units**	**C008P1**	**C035P1**	**C555P1**	**C556P1**	**C9553P1R**	**C9838SPR**	**C919016SPR**
pH (field)	N/A	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	5.4 - 9.0	5.8 - 9.0	5.2 - 9.0	6.0 – 9.0
Electrical conductivity	µS/cm	22790	4000	830	260	526	414	787
Total dissolved solids	mg/L	15690	2400	490	172	316	252	460
Sulphate	mg/L	244	57	1	11	59	8	20
Aluminium	µg/L	55	55	55	55	55	55	55
Arsenic	µg/L	13	13	13	13	13	13	13
Molybdenum	µg/L	34	34	34	34	34	34	34
Selenium	µg/L	11	11	11	11	11	11	11
Silver	µg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Iron	µg/L	2155	342	1764	65	2700	23	5
Mercury	µg/L	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Nitrate as N	mg/L	0.7	0.7	0.7	0.7	0.7	0.7	0.7

Total Phosphorus as P	mg/L	0.26	0.1	0.1	0.2	0.3	0.1	0.1
Boron	µg/L	1580	710	264	110	210	133	60
Cobalt	µg/L	10	1.4	1.4	5	1.4	1.4	1.4
Copper	µg/L	16	1.4	1.4	26	34	10	1.4
Nickel	µg/L	29	11	11	11	11	11	11
Zinc	µg/L	59	50	31	44	40	48	37
TRH C6 - C10 Fraction	µg/L	20	20	20	20	20	20	20
TRH >C10 - C40 Fraction (sum)	µg/L	238	100	100	100	188	100	100
Bandanna Formation								
Parameter[a]	**Units**	**C008P2**	**C014P2**	**C032P2**	**C035P2**	**C19027SP**	**C018P2**	**C847SP**
pH (field)	N/A	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	5.3 – 9.0
Electrical conductivity	µS/cm	2916	1927	1300	1541	1789	1800	358
Total dissolved solids	mg/L	1800	1077	790	916	1000	1005	257
Sulphate	mg/L	91	40	2	20	27	7	8
Aluminium	µg/L	55	55	55	55	55	55	55
Arsenic	µg/L	13	13	13	13	13	13	13
Molybdenum	µg/L	34	34	34	34	34	34	34
Selenium	µg/L	11	11	11	11	11	11	11
Silver	µg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Iron	µg/L	58	178	235	444	5	533	22

Mercury	µg/L	0.06	0.06	0.06	0.06	0.06	0.06	0.06		
Nitrate as N	mg/L	0.7	0.7	0.7	0.7	0.7	0.7	0.7		
Total Phosphorus as P	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Boron	µg/L	266	347	370	261	537	570	110		
Cobalt	µg/L	1.4	1.4	1.4	1.4	1.4	1.4	1.4		
Copper	µg/L	1.4	1.4	1.4	1.4	1.4	1.4	8		
Nickel	µg/L	11	24	11	11	11	11	11		
Zinc	µg/L	24	8	24	24	8	15	54		
TRH C6 - C10 Fraction	µg/L	20	20	20	20	20	20	20		
TRH >C10 - C40 Fraction (sum)	µg/L	100	100	100	100	100	100	100		
Colinlea Sandstone (D Seam)										
Parameter[a]	**Units**	**C006P3R**	**C011P3**	**C018P3**	**C024P3**	**C034P3**	**C833SP**	**C848SP**	**C975SP**	**C19029SP[d]**
pH (field)	N/A	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	6.0 – 11.2	6.0 – 9.0	5.4 – 9.0	6.0 – 9.0
Electrical conductivity	µS/cm	1030	960	1020	1500	2000	1210	3000	608	1127
Total dissolved solids	mg/L	631	574	610	860	1200	800	1800	353	673
Sulphate	mg/L	6	1	15	23	30	8	20	27	1
Aluminium	µg/L	55	55	55	55	55	55	55	55	55
Arsenic	µg/L	13	13	13	13	13	13	13	13	13
Molybdenum	µg/L	34	34	34	34	34	34	34	34	34

Selenium	µg/L	11	11	11	11	11	11	11	11	11	
Silver	µg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Iron	µg/L	240	474	860	18220	2796	46	1832	91	165	
Mercury	µg/L	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	
Nitrate as N	mg/L	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	
Total Phosphorus as P	mg/L	0.1	0.1	0.1	0.18	0.1	0.1	0.1	0.1	0.1	
Boron	µg/L	160	450	360	371	250	190	190	190	380	
Cobalt	µg/L	1.4	1.4	1.4	5	1.4	1.4	1.4	1.4	1.4	
Copper	µg/L	1.4	1.4	1.4	1.4	1.4	1.4	1.4	15	1.4	
Nickel	µg/L	11	11	11	36	11	11	11	11	11	
Zinc	µg/L	19	15	18	100	307	10	24	153	53	
TRH C6 - C10 Fraction	µg/L	20	20	20	20	20	20	20	20	20	
TRH >C10 - C40 Fraction (sum)	µg/L	100	100	100	100	100	100	100	100	100	
Joe Joe Group											
Parameter[a]	**Units**	**C012P1**	**C012P2**	**C14003SP**	**C14006SP**	**C14008SP**	**C14015SP**	**C14017SP**	**C14032SP**	**C180119SP**	**C180123SP**	**C914001SPR**
pH (field)	N/A	5.7-9.0	6.0 – 9.0	5.2-9.0	6.0 – 9.0	5.7 - 9.0	6.0 – 9.0	6.0 – 9.0	5.5-9.0	6.0 – 9.0	6.0 – 9.0	5.9-9.0
Electrical conductivity	µS/cm	2067	2600	53230	8600	690	2500	6800	2160	758	840	21300
Total dissolved solids	mg/L	1301	1600	43245	5222	410	1570	4100	1230	441	516	14855
Sulphate	mg/L	56	53	2715	216	14	65	120	33	8	26	1500
Aluminium	µg/L	55	55	55	55	55	55	55	55	55	55	55

Arsenic	µg/L	13	13	13	13	13	13	13	13	13	13	13
Molybdenum	µg/L	34	34	34	34	34	34	34	34	34	34	34
Selenium	µg/L	11	11	11	11	11	11	11	11	11	11	11
Silver	µg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Iron	µg/L	95	443	17460	7988	2560	580	540	2126	1370	282	9140
Mercury	µg/L	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Nitrate as N	mg/L	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Total Phosphorus as P	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Boron	µg/L	447	500	3930	502	112	420	766	170	161	356	2000
Cobalt	µg/L	1.4	1.4	36	1.4	10	1.4	3	1.4	1.4	1.4	1.4
Copper	µg/L	1.4	40	660	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Nickel	µg/L	11	11	33	11	11	11	11	11	11	11	11
Zinc	µg/L	79	18	105	195	193	122	80	273	2000	8	170
TRH C6 - C10 Fraction	µg/L	20	20	20	20	20	20	20	20	20	20	20
TRH >C10 - C40 Fraction (sum)	µg/L	100	289	100	100	100	100	100	100	100	100	100

Joe Joe Group				
Parameter[a]	**Units**	**C914030SPR**	**C9180124SPR**	**C9180125SPR**
pH (field)	N/A	5.7-9.0	5.5 - 9.0	6.0 – 9.0
Electrical conductivity	µS/cm	602	473	1000
Total dissolved solids	mg/L	348	280	607

Sulphate	mg/L	12	7	18
Aluminium	µg/L	55	55	55
Arsenic	µg/L	13	13	13
Molybdenum	µg/L	34	34	34
Selenium	µg/L	11	11	11
Silver	µg/L	0.05	0.05	0.05
Iron	µg/L	749	110	78
Mercury	µg/L	0.06	0.06	0.06
Nitrate as N	mg/L	0.7	0.7	0.7
Total Phosphorus as P	mg/L	0.1	0.1	0.1
Boron	µg/L	119	92	286
Cobalt	µg/L	8	1.4	1.4
Copper	µg/L	1.4	3	3
Nickel	µg/L	11	11	11
Zinc	µg/L	180	656	223
TRH C6 - C10 Fraction	µg/L	20	20	20
TRH >C10 - C40 Fraction (sum)	µg/L	100	100	100

Notes:

[a] Trigger values for hydrocarbons are defined at the limit of reporting (LOR) for each parameter, unless sufficient data warranted a bore specific trigger be derived. Since the LOR may vary between analyses due to methods and matrix effects, Table E2 lists triggers for Total Recoverable Hydrocarbon (TRH) fractions C6-C10 and >C10-C40, which have been selected using the lowest historical LOR. The lowest historical LOR thus provides a conservative measure to take into account this potential variation in LORs.

[b] Bores with screened intervals in weathered tertiary.

[c] C19002SP is a replacement bore for C180118SP. The triggers to be updated after additional data obtained in 2022. Till such time triggers for bore C180118SP will be used.

[d] Triggers for C19029SP determined from combined dataset from C19029SP and C180114SP (bore C180114SP was replaced by C19029SP).

Table E4 –Groundwater level thresholds

Groundwater level drawdown thresholds Monitoring[1] Location	Unit	Easting (GDA94 – Zone 55)	Northing (GDA94 – Zone 55)	Groundwater Level Drawdown Threshold (m)
Carmichael River Location				
C027P1	Alluvium	433643.08	7554818.39	2.805
HD03B	Alluvium	427559.00	7556120.00	0.63
C027P2	Dunda Beds	433648.21	7554818.54	1.19
C029P1	Alluvium	437691.19	7555082.39	0.67
C029P2	Tertiary sediments	437687.63	7555080.91	0.55
C19001SP	Alluvium	438020.82	7555845.82	1.19
C025P2	Tertiary sediments	438010.34	7555844.69	1.50
C14028SP	Alluvium	443775.64	7559581.18	0.23
C14027SP	Alluvium	444964.65	7558330.02	0.13
C14006SP*	Joe Joe Group	443446.61	7556785.07	0.79
Great Artesian Basin to West of Mine Lease				
C19002SP	Clematis Sandstone	423804.06	7568099.87	2.07
C14033SP	Clematis Sandstone	418210.8	7566775.83	0.32
C14011SP	Clematis Sandstone	426130.96	7561454.81	0.58
C14012SP	Clematis Sandstone	424896.07	7560596.18	0.40
C14013SP	Clematis Sandstone	424895.49	7560591.10	0.43
HD02	Clematis Sandstone	423822.04	7557008.25	0. 26

HD03A	Clematis Sandstone	427562.00	7556132.00	0.69
C14021SP	Clematis Sandstone	429796.25	7550966.33	1.37
C022P1	Dunda Beds	426812.52	7565961.84	3.10
C027P2	Dunda Beds	433648.21	7554818.54	1.19
C14023SP	Dunda Beds	429801.74	7550968.73	0.39
C180117SP	Dunda Beds	435915.16	7547522.16	3.81
C9553P1R	Rewan Formation	421010.11	7573974.87	3.45
C556P1	Rewan Formation	436524.08	7549881.55	76.34
C555P1	Rewan Formation	432461.38	7557892.99	65.88
Doongmabulla to West of Mine Lease				
HD02	Clematis Sandstone	423822.04	7557008.25	0.26
HD03A	Clematis Sandstone	427562.00	7556132.00	0. 69
C14013SP	Clematis Sandstone	424895.49	7560591.10	0.43
C022P1	Dunda Beds	426812.52	7565961.84	3.10
C14012SP	Clematis Sandstone / Rewan	424896.07	7560596.18	0.40
C14021SP	Clematis Sandstone	429796.76	7550966.33	1.37
C14206VWP_1[2]	AB Seam	429783.15	7550956.80	32.4
C558VWP1[2]	D seam	430311.51	7566903.01	129
C968VWP_P2[2]	D seam	424873.59	7570989.17	186
C968VWP_P5[2]	AB seam	424873.59	7570989.17	154

C848SP	D seam	442363.39	7543815.03	115.7
Mellaluka Springs to the southeast of Mine Lease				
C851VWP2[2]	AB Seam	441384.00	7542877.33	122.4
C180120SP	Tertiary sediments/Joe Joe Group	447056.56	7531729.89	1.29
C180122SP	Tertiary sediments / Joe Joe Group	448579.21	7536348.70	0.42
C180119SP*	Joe Joe Group	448587.45	7536355.38	0.29
C180123SP*	Joe Joe Group	448077.54	7529357.50	0.34
C9180124SPR*	Joe Joe Group	448600.00	7536357.00	0.32
C9180125SPR*	Joe Joe Group	447039.74	7531738.83	0.56
Sentinel Bores				
C14016SP*	Joe Joe Group	444852.34	7541471.06	25.57
C9845SPR	Tertiary sediments	439410.87	7544903.28	19.48
C14029SP	Tertiary sediments / Joe Joe Group	445059.11	7548820.62	1.66
C14003SP	Joe Joe Group	440350.8	7568518.85	0.23
C914030SPR	Joe Joe Group	445072.27	7548821	2.07
C14015SP*	Joe Joe Group	445301.98	7536138.69	5.26
C016P2*	AB seam	422017.38	7574974.58	143.77
C14004SP	Joe Joe Group	440355.93	7568513.34	5.52
C14008SP*	Joe Joe Group	444760.74	7552697.83	1.58

C180116SP	Rewan Formation	439392.91	7540908.81	15.14
C14024SP	Clematis Sandstone / Rewan Group	430036.80	7543917.13	1.92
C14020SP	Moolayember Formation	418230.28	7566782.35	0.27

Note: [1] The period of measurement for change threshold is the life of the mine.

Note: [2] VWP triggers for assessing depressurisation impacts from mine dewatering.

Note: * The groundwater level threshold drawn for these bores will be updated in 2 years based on a review of groundwater data (logger data validation with future manual readings and datum measurements).

END OF APPENDIX 5.

END OF ENVIRONMENTAL AUTHORITY.