DURALIE COAL MINE

ANNUAL REVIEW 2022

Reporting Period: 1st July 2021 to 30th June 2022

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Annual Review Title Block

Name of operation	Duralie Coal Mine
Name of operator	Yancoal Australia Ltd
Development consent/ project approval #	PA (08_0203) (Duralie Extension Project) (as modified)
Name of holder of Development consent/ project approval #	Duralie Coal Pty Limited
Mining Lease #	ML1427, ML1646
Name of holding of mining lease	CIM Duralie Pty Ltd
Water licence #	WAL 41518, 20WA202053, various monitoring bore licences.
Name of holder of water licence	CIM Duralie Pty Ltd & Duralie Coal Pty Ltd
MOP/ RMP start date	MOP - 1st January 2020 RMP – 1 July 2022
MOP end date	MOP - 31st December 2021
Annual Review start date	1st July 2021
Annual Review end date	30th June 2022

I, John Cullen, certify this audit report is true and accurate record of the compliance status of Duralie Coal Mine for the period of 1st July 2021 to 30th June 2022 and that I am authorised to make this statement on behalf of Yancoal.

Note.

The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.

The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).

Name of authorised reporting officer	*Mr John Cullen*
Title of authorised reporting officer	*Operations Manager – Duralie Coal*
Signature of authorised reporting officer	
Date	29 September 2022

1.0 STATEMENT OF COMPLIANCE

This Duralie Coal Mine (DCM) Annual Review has been prepared in accordance with NSW Project Approval 08_0203 Schedule 5, Condition 3 for the Duralie Extension Project (DEP) for the period 1 July 2021 to 30 June 2022. This Annual Review is also prepared in accordance with the annual reporting requirements for ML 1427 Condition 3 and ML 1646 Condition 4.

Table 1.1 provides a statement of compliance against DCPL's relevant approvals. A summary of the non-compliances with Project Approval 08_0203, ML 1427 and ML 1646 during the reporting period are included in **Table 1.3.**

Table 1.1- Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
Project Approval No. 08_0203	No – Refer to **Table 1.3**
EPL11701	No – Refer to **Table 1.3**
ML1427, ML1646	Yes

Table 1.2 – Compliance Status Categories

Risk Level	**Colour Code**	**Description**
High	Non-Compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-Compliant	Non-compliance with potential for serious environmental consequences, but is unlikely to occur; or potential for moderate environmental consequences, but is likely to occur
Low	Non-Compliant	Non-compliance with potential for moderate environmental consequences, but is unlikely to occur; or potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-Compliant	Non-compliance which does not result in any risk of environmental harm

Table 1.3- Summary of Non-Compliances

Relevant Approval	**Condition**	**Condition Description /Non-Compliance**	**Compliance Status**	**Comment**	**Section addressed**
EPL 11701 PA08_0203	O7.3(a) Schedule 2 Condition 8(a)	A shuttle train was dispatched outside of defined hours	Administrative Non-compliance	A shuttle train was dispatched from the DCM at 5:55am on Wednesday 27 October 2021. Conditions only allow dispatch between 6am and 10pm. Reported to EPA and DPIE on 29 October 2021.	Section 4.4.4

Relevant Approval	Condition	Condition Description /Non-Compliance	Compliance Status	Comment	Section addressed
EPL 11701 PA08_0203	L1.1 Schedule 3 Condition 25	Uncontrolled discharge	Low Non-compliant	Uncontrolled discharged of mine related water (rehabilitated area runoff) from sediment dam RS1 (EPL Point 15) on Friday 4 March 2022. Reported to EPA and DPIE on 4 March 2022.	Section 7.3
EPL 11701 PA08_0203	M2.2 Schedule 3 Condition 19	Less than required depositional dust monitoring	Low Non-compliant	Cracked sample bottle at EPL Point 32 causing failure to monitor (Depositional Dust Gauge 8).	Section 6.3

2.0 INTRODUCTION

The Duralie Coal Mine (DCM) is located in the Gloucester Basin approximately 80km north of Newcastle in New South Wales, between the villages of Stroud Road and Wards River. Refer **Figure 1** (**Appendix 1**).

Duralie Coal Pty Ltd (DCPL), a wholly owned subsidiary of Yancoal Australia Limited (YAL), is the owner and operator of the DCM.

The NSW Minister for Urban Affairs and Planning granted Development Consent for the DCM in August 1997 and coal production commenced in 2003.

Development of the DCM is approved under Mining Leases (MLs) 1427 and 1646 and NSW Project Approval (08_0203). Condition 5, Schedule 2 of Project Approval (08_0203) authorises mining operations to be carried at the DCM until 31 December 2021.

Accordingly, DCPL has commenced the mine closure phase (i.e. following the cessation of mining operations on 31 December 2021). Prior to closure the DCM consisted of an open cut, truck and excavator mine producing run of mine (ROM) coal, which was railed to the Stratford Mining Complex (SMC) and processed at the SMC Coal Handling and Processing Plan (CHPP).

This Annual Review (AR) has been prepared in accordance with Schedule 5, Condition 3 of the Project Approval 08_0203 and Mining Leases 1427 and 1646, and in accordance with the former Department of Planning and Environment (DP&E) Annual Review Guidelines (October 2015).

The AR describes the environmental protection, pollution control and rehabilitation activities at the DCM for the period 1 July 2021 to 30 June 2022. As required by the Project Approval, comparisons of environmental monitoring results have been made against relevant statutory requirements, monitoring results of previous years and relevant predictions of Environmental Assessments. This AR also reports on any non-compliances, trends in monitoring data and any discrepancies between the predicted and actual impacts of the development. Environmental management activities planned for the next 12 months are also discussed.

2.1 Mine Contacts

The DCM is an owner operated mine site by DCPL Site personnel responsible for mining, rehabilitation and environmental issues at the end of the reporting period were;

Position	Name	Contact	Email
Operations Manager, Stratford & Duralie Operations	Mr John Cullen	02 6538 4210	John.cullen@yancoal.com.au
Senior Environment & Community Advisor	Mr Thomas Kirkwood	02 6538 4208	Thomas.kirkwood@yancoal.com.au

3.0 APPROVALS

3.1 Status of Leases, Licences and Approvals

The DCM operates in accordance with the approvals provided in **Table 3.1**.

Table 3.1 – Duralie Coal Mine - Leases, Licences and Approvals

Description	Date of Grant	Duration of Approval	Comment
NSW Project Approvals			
Duralie Extension Project – Project Approval (08_0203)	26/11/2010 (As Modified)	The Applicant may carry out mining operations on site until the end of 2021	Granted 26/11/2010. MOD 1 (Rail Hours) 1/11/2012. MOD 2 (Open Cut variations) 5/12/2014
Mining Leases and Exploration Licences			
ML1427	06/04/1998	21 years (06/04/2019)	Renewal lodged in April 2018 (pending)
ML1646	04/01/2011	21 years (04/01/2032)	Variation of Conditions dated 20/06/2018
AUTH 315	14/10/2013	28 November 2017	Renewal lodged 27/11/2017 (pending)
Environment Protection Licences			
Environment Protection Licence (EPL) 11701	04/09/2002	Until the licence is surrendered, or revoked	As modified by subsequent variations (refer to EPA website)
Commonwealth Approvals			
Commonwealth Approval (EPBC 2010/5396)	22/12/2010	31/12/2025	Commencement of Action 14/01/2011
Water Licences			
Water Supply Works Approval 20WA202053	01/07/2004	1 October 2028	Coal Shaft Creek diversion and various on-site water management structures. Renewed 17/10/2018
WAL 41518 (previously 20BL168404)	22/09/2002	Perpetuity	Groundwater Licence for the Duralie Open Cut extraction. Converted to WAL41518 under WM Act 2000 on 14/12/2017
Groundwater licences – various monitoring bores	Various	Perpetuity	Monitoring purposes only

Environmental Management Plans

Environmental Management Plans (EMPs) have been prepared and approved for the DCM in accordance with the conditions of PA 08-0203. The current versions approved by DPIE are available on the Duralie Coal website (www.duraliecoal.com.au).

- Environmental Management Strategy (revised). Approved 23 December 2021.
- Air Quality and Greenhouse Gas Management Plan (revised). Approved 23 December 2021.
- Biodiversity Management Plan (revised). Approved by DP&E 25 January 2019, former Department of Environment & Energy (DoEE) 27 November 2018.
- Blast Management Plan (revised). Approved 16 December 2021.
- Giant Barred Frog Management Plan (revised). Approved 5 September 2017.
- Heritage Management Plan (revised). Approved 23 June 2015.
- Noise Management Plan (revised). Approved 23 December 2021.
- Waste Management Plan. Approved 23 December 2021.
- Water Management Plan (revised). Approved 24 December 2021 & 11 March 2022 (DAWE).
- Pollution Incident Response Management Plan (revised), September 2021.

3.2 Amendments to Approvals/Licences during the Reporting Period

Table 3.2 lists approvals and amendments that were granted during the reporting period.

Table 3.2 – Amendments to Approvals/Licences

Licence/Approval	Amendment type	Date of amendment
Environment Protection Licence (EPL) 11701	Final variation notice no. 1608278 for EPL 11701, issued pursuant to section 58 of the *Protection of the Environment Operations Act 1997* (POEO Act),	Notice of Variation of Licence 11701 issued 28 July 2021.
Pollution Incident Response Management Plan	Revision following Annual PIRMP Audit September 2021. Review following incident triggering PIRMP in March 2022.	September 2021

4.0 OPERATIONS SUMMARY

A summary of operations (Production), during the preceding and current reporting period as well as a forward forecast for the next reporting period is provided below in **Table 4.1**.

Table 4.1 - Production Summary

Material	Approved limit (specify source)	Previous reporting period	This reporting period	Next reporting period
Waste Rock/ Overburden (BCM) (DCM only) [2]	N/A	512,469	459,164	0
ROM Coal (tonnes) (DCM only)	3 million tonnes per annum	44,953	177,099	0

Material	Approved limit (specify source)	Previous reporting period	This reporting period	Next reporting period
PAF Rehandle (LCM) [1]	N/A	601,572	4,118	1,366,253
Codisposal Reject (tonnes) (Includes Stratford Consent)	Approx. 12.3 million tonnes over life of project.	418,986	50,692	157,975
Saleable product (tonnes) (Includes Stratford Consent)	N/A (Process limit of 5.6 million tonnes per annum)	626,039	874,096	794,771

Note 1: Rehandled PAF overburden material reported separately in LCM.
Note 2: Waste rock measured in BCM.

During the reporting period 177,099 tonnes of ROM coal was mined from the Weismantel Pit at DCM. Progressive rehabilitation and Potentially Acid Forming (PAF) material rehandling works were also undertaken.

ROM coal from the DCM was transported to the SMC via shuttle train for processing together with ROM coal from SMC. Saleable coal production, incorporating both SMC and DCM, for the period July 2021 to June 2022 was 874,096 tonnes comprising 284,869 tonnes of coking coal and 589,227 tonnes of thermal coal.

Duralie ROM production by month for the reporting period is listed in **Table 4.2** below.

Table 4.2: Monthly ROM Coal Production from the DCM

MONTH	ROM PRODUCTION (tonnes)
July 2021	0
August 2021	29,211
September 2021	11,303
October 2021	67,195
November 2021	63,216
December 2021	6,174
January 2022	0
February 2022	0
March 2022	0
April 2022	0
May 2022	0
June 2022	0
Total	**177,099**

Product coal production by month for the reporting period is shown in **Table 4.3**.

Table 4.3: Product Coal Produced by Month from DCM and SMC

Month	Coking Coal	Thermal Coal	Total Product Coal
July 2021	24,030	51,609	75,639
August 2021	24,531	71,209	95,740
September 2021	24,149	47,031	71,180
October 2021	47,514	89,818	137,332
November 2021	51,219	95,738	146,957
December 2021	9,836	36,673	46,509

Month	Coking Coal	Thermal Coal	Total Product Coal
January 2022	6,678	17,199	23,877
February 2022	21,987	52,461	74,448
March 2022	23,519	45,588	69,107
April 2022	15,995	24,032	40,027
May 2022	13,905	25,828	39,733
June 2022	21,506	32,041	53,547
Total Annual	**284,869**	**589,227**	**874,096**

4.1 Exploration

No exploration activities were undertaken during the 2021-2022 reporting period. No exploration activities are proposed for Authorisation 315 (A315) during the 2022-2023 reporting period. Work within the exploration lease areas will focus predominately on lease management, data management, review and interpretation.

During the previous reporting period Assessment Lease Application (ALA74) was lodged covering areas incorporating A315. A revised renewal application for A315 will be lodged with MEG Titles Services, excluding the ALA74 area. Further detail is included in the SMC Annual Review.

4.2 Estimated Mine Life

Condition 5, Schedule 2 of PA 08_0203 authorises mining operations to be carried at the DCM until 31 December 2021. Under this approval, DCPL is required to rehabilitate the site and carry out additional undertakings to the satisfaction of both the Secretary and the Resources Regulator. Consequently, PA 08_0203 will continue to apply in all other respects, other than the right to conduct mining operations, until the rehabilitation of the site and these additional undertakings have been carried out satisfactorily.

The removal of overburden and the extraction, processing, handling, storage and transportation of coal at the DCM was finished in December 2021. Accordingly, DCPL is now undertaking the mine closure phase (i.e. after the cessation of mining operations on 31 December 2021).

DCPL revised relevant EMPs to reflect the current stage of operations and to describe anticipated mine closure activities and describe the change to environmental impacts, mitigation measures and monitoring programs at the DCM for the mine closure phase.

A new Rehabilitation Management Plan (RMP), in accordance with the requirements of the Resources Regulator's Rehabilitation Reforms has been prepared for the DCM. The RMP includes the ongoing compliance requirements in accordance with PA 08_0203, ML 1427 and ML 1646 including rehabilitation obligations. As part of the Reforms a Rehabilitation Report and Forward Program for DCM has also been prepared which provides details of the scheduled surface disturbance and rehabilitation activities at the DCM from 1 July 2022 to 30 June 2025.

4.3 Mining

The DCM was an open cut truck and shovel operation located approximately 20km south of the Stratford Mine facilities, producing ROM coal, which is railed to the SMC and processed at the SMC Coal Handling and Processing Plant (CHPP). Product coal is transported via train on the North Coast Railway to the Port of Newcastle.

The operations extract ROM coal from the Weismantel and Clareval seams at the base of the Gloucester Coal Measures. The deposit forms a synclinal structure with the open cut area located at the southernmost crop line within the main axis of the Gloucester Basin. The operation is now situated on the west limb of the syncline with seams dipping at about 50 degrees east. Mining is undertaken within ML1427 and ML1646 and includes the extension of the Weismantel pit to the north west and the inclusion of the Clareval seam parallel and to the west of the Weismantel seam.

Dips within the deposit vary from a shallow 5 degrees to an almost vertical profile. Consequently, a method of horizontal 3m to 4m benches is used as the primary extraction method. An average of 5m of free dig material is generally experienced at Duralie after which all waste material generally requires blasting.

Mining in the Clareval pit was completed in September 2017 and mining in the Weismantel pit ceased in December 2021.

During the reporting period DCPL complied with the approved operating hours in accordance with PA 08_0203. Mining operations are permitted 7 days per week and 24 hours per day. During the reporting period mining activities were undertaken on a 7 days per week, day shift only roster. Mining ceased on 31 December 2021.

Surface facilities at the mine and current mine development and rehabilitation as at 30 June 2022 are indicated within **Figure 4**, provided in **Appendix 1**.

4.3.1 Mining Equipment and Method

The mining and rehabilitation equipment used at the DCM, during the reporting period, up until 31 December 2021 is listed in **Table 4.4**.

Table 4.4: Mining and Rehabilitation Fleet*

Plant Item	Number
Excavators	3 – 1 x Cat 360, 1 x Cat 6015 and 1x Komatsu 1250
Haul Trucks	6 x Cat 775's and 3 x Volvo 45's
Drills	1 x Atlas D65
Dozers	2 - D11 and D10
Water Carts	1 x Cat 773 and 1 x 740
Graders	1 x Cat 14M
Loader	1x Cat 938

*Total fleet not all used concurrently.

Table 4.4, includes the mobile plant fleet for undertaking mining operations, PAF rehandle works and the rehabilitation fleet up until 31 December 2021. All equipment was removed from site after mining ceased. Rehabilitation fleet will be transported to site in Q4 2022.

Coal Handling and Beneficiation

4.3.2 Duralie CHP Throughput and Rejects Management

ROM coal is initially handled at the Duralie Coal Handling Plant (CHP). Rock greater than 140 mm is removed from ROM coal using a rotary breaker at the CHP. The separated rock is conveyed to a rejects bin from which it is loaded out and trucked to be buried on site as PAF waste. The ROM coal is then transferred via conveyor to a train loadout bin and railed to the SMC via a shuttle train.

Reject fractions from the ROM coal are generated at the SMC and deposited along with processing waste fractions produced from the washing of SMC coals in accordance with Development Consent SSD-4966. The SMC utilises a co-disposal method that combines the coarse rejects with the intermediate sized materials and tailings. The co-disposal area is managed in accordance with the SMC Life of Mine Reject Disposal Plan. Refer to the SMC Annual Reviews for further details.

4.3.3 ROM Coal Processing on Site

ROM coal is processed through a rotary breaker at the Duralie CHP to produce a coal fraction less than 140 mm. The essential elements of the coal processing plant on site and their design capacities are as follows:

ROM conveyor handling rate	1400 tph
Train load out rate	2400 tph

4.3.4 Coal Stockpile Capacity (ROM)

The ROM pad stockpile with a capacity of 50,000t is utilised for temporary ROM coal storage which is transported by loader directly to the ROM hopper.

4.3.5 Product Transport

All ROM coal is transported from site to the SMC by rail. The approved hours of operation of the Duralie shuttle train are between 6 am and midnight. During the reporting period DCM did not comply with this condition. On 17 October 2021 a shuttle train was dispatched at 5:55am.

In exceptional circumstances, the Duralie shuttle train may operate on the North Coast Railway between midnight and 1am in accordance with Condition 8, Schedule 2 of the Project Approval. This condition was not utilised during the reporting period.

During the reporting period 222,052 tonnes of ROM coal was transported from the DCM to the SMC. A total of 94 train movements (Duralie-Stratford-Duralie circuit) occurred during the July 2021 to June 2022 period. There was a maximum daily movement of 4 trains. The last coal transported from the DCM to the SMC occurred on 9 December 2021. A summary of the ROM coal transported from site and the shuttle train movements is available on the Duralie Coal website in accordance with Condition 48, Schedule 3 of PA 08_0202.

A summary of Product Coal transported during the reporting period is included in the SMC Annual Review as no product is transported directly from Duralie.

4.4 Waste Management and Recycling

All waste streams generated at the DCM have historically been managed in accordance with the DCM Waste Management Plan. Key waste streams (apart from waste rock) generated at the DCM comprise:

- Recyclable and non-recyclable general wastes;
- Sewage and effluent; and
- Other wastes from mining and workshop activities (e.g. waste oils, scrap metal and used tyres).

All general domestic waste (e.g. general solid [putrescibles] waste and general solid [non-putrescible] waste as defined in *Waste Classification Guidelines Part 1: Classifying Waste* [EPA, 2014]) and general recyclable products will continue to be collected by an appropriately licensed contractor. DCPL will maintain a register of regulated waste collected by the licensed waste contractor.

Scrap metal is collected by a licensed waste contractor for recycling.

Sewage and wastewater from ablution facilities on-site is collected and transferred via a sewerage system to the existing on-site sewage treatment plant. Sewage is treated in the on-site sewage treatment plant (that consists of an aerobic treatment system) and is disposed of in a manner to the satisfaction of the EPA (i.e. EPL 11701) and the MidCoast Council.

4.4.1 Waste Minimisation and Performance

The waste management contractor provides monthly reporting on all waste streams disposed from the DCM. The monthly reports also provide details of recycling achieved and hazardous substances.

During the reporting period the volume of waste generated at the DCM increased. This was due to the recommencement of mining operations in February 2021, contributing to increased activity and number of personnel on-site and does not reflect any change in management practices. The main waste stream increases where non-hazardous recycled waste and mixed-solid waste.

During the reporting period the DCM recycled 85% of the total waste generated. This is consistent with previous reporting periods.

4.5 Hazardous and Explosive Materials Management

Hazardous materials are stored and used in accordance with relevant safety data sheets (SDS). SDS's are kept in a file inside the First Aid Room and are available from an online database on the company intranet.

Bulk explosives are approved for storage within an explosives compound at DCM, however no explosives have been stored onsite since October 2018. Only infrequent blasting was required at the DCM during the reporting period and blasting products were transported to site for each individual blast. The last blast, during the reporting period, occurred on 9 September 2021.

All hazardous waste is appropriately disposed of by a fully accredited waste contractor and waste tracking certificates are supplied to DCPL.

4.6 Other Infrastructure Management

4.6.1 Prescribed Dams – NSW Dams Safety

The Main Water Dam, Auxiliary Dam 1 and Auxiliary Dam 2 are all declared under the *Dams Safety Act 2015*. Main Water Dam and Auxiliary Dam 2 are proposed as retained non-declared water structures in the final landform. Auxiliary Dam 1 was dewatered in February 2018 and fully decommissioned in 2020. During the next reporting period, DCPL proposes to update the Prescribed Dams Safety Emergency Plan (DSEP) and to complete the 2022 Dam Surveillance Report. Routine visual inspections and monthly monitoring of piezometers will be continued.

5.0 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

DPIE provided notification on 18 October 2021 that the DCM Annual Review 2020-2021 was generally in accordance with the Project Approval requirements and the Department's Annual Review Guidelines. No further amendments or actions were requested.

No response was received from the Resources Regulator.

The follow up actions to the commitments made in the 2020/2021 Annual Review are summarised below.

Action Required from Previous Annual Review	Due Date	Action taken by DCPL	Where Discussed
DCPL to undertake an assessment of the risks to rehabilitation with regard to *AS NZS ISO 31000:2009 Risk Management - Principles and Guidelines* (or equivalent) to identify and evaluate all potential risks to achieving the final land use	11 April 2022	The DCM *Closure & Rehabilitation Risk Assessment: Summary of Key Risks and Controls* was completed by IEMA in July 2021 and submitted to Resources Regulator in August 2021	N/A
Prepare a DCM Closure Progress Report	11 April 2022	The Closure Planning Progress Report was sent and acknowledged by Resources Regulator on 16 May 2022	Section 8.8 and RMP
DCPL to prepare a Rehabilitation Management Plan and Final DCM Closure Plan	1 August 2022	The DCM RMP was prepared during the reporting period and submitted to Resources Regulator	Section 8.5 and RMP
Update the Rehabilitation Cost Estimate	1 August 2022	The Rehabilitation Cost Estimate was updated and submitted to the Resources Regulator on 1 July 2022	N/A

6.0 ENVIRONMENTAL PERFORMANCE

6.1 Review of Environmental Performance

A brief review of environmental performance in relation to EPL 11701, together with Project Approval 08_0203 conditions, is provided below. This performance is further discussed in the sections on environmental management activities and environmental monitoring.

6.1.1 Project Approval Conditions PA 08-0203

DCPL continues to operate in accordance with the existing PA 08_0203.

Project Approval conditions which were met during this reporting period are described in the following sections. These include administrative and reporting conditions, environmental management and monitoring conditions, community engagement and progressive rehabilitation. Environmental monitoring data was regularly reported as required by the Project Approval and associated EMPs.

An Independent Environmental Audit (IEA) of the DCM was conducted in December 2020 by Ken Holmes of Barnett & May, in accordance with PA 08_0203 Schedule 5, Conditions 8, 9, 9A and 9B. This includes both the Independent Environmental Audit and the Rail Haulage Audit.

A status update of DCPL's responses to the recommendations contained in the IEA 2020 Report are included in **Appendix 9**.

A summary of compliance during the reporting period is included in **Section 1** and **Table 1.2**.

6.1.2 EPA Environment Protection Licence 11701

DCPL continues to operate in accordance with the conditions of EPL 11701. During the reporting period there were three identified non-compliances at the DCM. Refer to **Table 1.3** and EPL 11701 Annual Return 2022 for further details.

- All monitoring has been carried out in accordance with licence conditions.
- Records of environmental monitoring activities have been kept.
- A record of environmental and pollution complaints has been maintained.
- Dust suppression measures are in place. Dust monitoring to date (dust deposition gauges, high volume (PM10) air samplers and a TEOM monitor) shows that current dust suppression systems have been effective and dust levels were below limits set by EPA (upon exclusion of non-dust contamination of dust deposition gauges).
- Noise compliance monitoring was undertaken in August 2021 and October 2021. The surveys determined that mine noise emissions at the time of the surveys complied with EPA noise level criteria at all monitored locations.
- A Pollution Incident Response Management Plan (PIRMP) was maintained and is available on the Duralie Coal website.
- An Annual Return for EPL 11701 was prepared.

6.2 Meteorological Monitoring

A meteorological station (i.e. weather station) is operated at the mine site as required by the Project Approval conditions. The location of the meteorological station and the two inversion monitoring towers is shown on **Figure 3** (**Appendix 1**).

6.2.1 Rainfall

Table 6.1 summarises the rainfall record obtained from the site Weather Station rain gauge. Graphical representation of the historical average and monthly recorded rainfall during the reporting period is provided in **Appendix 2**.

Table 6.1: Duralie Mine - Monthly Rainfall Records

MONTH	YEAR				STROUD DISTRICT
	2022 (to end reporting period)		2021		AVERAGE[2]
	Monthly Total (mm)	No. of Rain Days/Month[1]	Monthly Total (mm)	No. of Rain Days/Month[1]	1889-2010
January	69.8	10	157.6	16	115.3
February	184.4	18	211.6	17	125.0
March	379.6	16	450.2	14	147.3
April	55.8	9	43.2	3	100.9
May	31.6	6	49	12	91.5
June	16.4	6	75.8	10	101.1
July			25.2	4	75.1
August			20.2	5	65.3
September			46	3	63.1
October			41.4	6	78.3
November			241.4	17	83.3
December			117.4	14	100.8
TOTAL	**737.6**	**65**	**1479**	**121**	**1147.0**

Notes:

1. No. of Rain Days/Month - the number of days in the month on which rain fell. (When tipping bucket rain gauge data used, a "rain day" by definition requires a minimum recording of >0.25mm comprising dew, heavy fog or light rain (or a combination thereof).
2. Average based on Stroud Post Office records until mine site weather station commissioned in 2002.

The 2021 calendar year rainfall total was higher than both the long-term district average and the 2020 calendar year rainfall total. Five of the twelve months in 2021 exceeded their respective long-term average.

The rainfall total for the reporting period (July 2021 to June 2022) was 1229.2mm which is slightly higher than the historical average.

6.2.2 Evaporation

Table 6.2 shows minimum, average and maximum evaporation rates for the reporting period. The graphical representation of the daily minimum, average and maximum evaporation rates recorded for each month during this review period is provided in **Appendix 2**.

Table 6.2: Monthly Minimum, Average and Maximum Evaporation Rates

MONTH	MINIMUM EVAPORATION RATE (mm/day)	AVERAGE EVAPORATION RATE (mm/day)	MAXIMUM EVAPORATION RATE (mm/day)
July 2021	0.3	3.6	1.6
August 2021	0.8	3.6	2.0
September 2021	0.8	5.3	2.6
October 2021	0.4	5.6	3.5

MONTH	MINIMUM EVAPORATION RATE (mm/day)	AVERAGE EVAPORATION RATE (mm/day)	MAXIMUM EVAPORATION RATE (mm/day)
November 2021	0.6	7.0	3.5
December 2021	1.8	6.7	4.4
January 2022	1.0	6.3	4.2
February 2022	0.9	6.3	3.5
March 2022	0.4	4.1	2.2
April 2022	0.6	3.7	2.1
May 2022	0.2	3.3	1.5
June 2022	0.5	3.4	1.6

6.2.3 Wind Speed and Direction

Table 6.3 below indicates the monthly average and maximum wind speeds and dominant wind directions for the reporting period. The graphical representation of the daily average and maximum wind speeds recorded and monthly wind roses for each month during this period are provided in **Appendix 2**.

Table 6.3: Monthly Average and Maximum Wind Speeds and Dominant Wind Directions by Month

MONTH	AVERAGE WIND SPEED (km/hr)	MAXIMUM WIND SPEED RECORDED (km/hr)	DOMINANT WIND DIRECTIONS
July 2021	8.7	50.2	W-WSW
August 2021	8.1	45.6	W
September 2021	8.9	43.1	SSW
October 2021	8.5	46.3	W-WSW
November 2021	8.9	43.7	WNW
December 2021	7.5	35.2	WNW
January 2022	7.8	33.3	WNW
February 2022	7.1	41.4	WNW
March 2022	6.0	35.5	SSE
April 2022	5.5	39.0	WNW
May 2022	5.1	76.3	WNW
June 2022	6.6	56.3	SSW-SW

6.2.4 Temperature

Table 6.4 summarises monthly air temperatures. The graphical representation of the daily minimum, average and maximum atmospheric temperatures recorded for each month is provided in **Appendix 2**.

Table 6.4: Monthly Minimum, Average and Maximum Air Temperatures

MONTH	MINIMUM AIR TEMP RECORDED (deg C)	AVERAGE AIR TEMP (deg C)	MAXIMUM AIR TEMP RECORDED (deg C)
July 2021	1.0	11.6	25.5
August 2021	2.2	13.6	27.3
September 2021	3.9	15.3	29.3

MONTH	MINIMUM AIR TEMP RECORDED (deg C)	AVERAGE AIR TEMP (deg C)	MAXIMUM AIR TEMP RECORDED (deg C)
October 2021	8.3	18.4	32.4
November 2021	9.8	19.0	29.3
December 2021	11.8	21.2	36.5
January 2022	14.5	22.8	32.7
February 2022	13.7	21.3	34.2
March 2022	12.0	20.0	29.7
April 2022	9.1	18.0	28.1
May 2022	5.4	14.9	25.2
June 2022	1.9	10.8	20.2

6.3 Air Quality

6.3.1 Air Quality Control Procedures

DCM has an approved Air Quality and Greenhouse Gas Management Plan (AQMP) that establishes a dust management strategy which:

- Identifies air quality criteria;
- Outlines proactive and responsive dust management and control measures;
- Establishes dust management protocols;
- Formulates an air quality monitoring programme;
- Establishes stakeholder consultation protocols; and
- Details reporting and review requirements.

The following dust control procedures are used during mining operations to control dust emissions from wind erosion on exposed areas and dust generated from mining, handling and processing activities:

- Minimising topsoil stripping operations ahead of the pre-strip to minimise the area of exposed ground (topsoil stripping has been completed);
- Progressive rehabilitation including prompt reshaping, topsoiling and revegetation;
- Watering of haul roads and other trafficked areas;
- Watering dig faces prior to and during digging;
- Fitting drills with dust suppression equipment including aprons and sprays;
- Water sprays on the ROM dump hopper and transfer point between the ROM and train loading bins (no coal processed during the reporting period);
- Water sprays during train coal loading (no trains railed during reporting period);
- Real-time monitoring with alarm triggers set to enable implementation of reactive dust control management measures; and
- Modifying operations during adverse weather conditions.

6.3.2 Air Quality Monitoring and Criteria

DCPL monitors air quality (dust) surrounding the mine site by means of a network of nine (9) static dust fallout gauges, four (4) high volume PM10 air samplers, one real-time dust monitor (TEOM) and

a meteorological monitoring station (i.e. weather station). The locations of these monitoring sites are shown on **Figure 3** (**Appendix 1**).

Monthly dust fallout levels are measured so that dust deposition rates in g/m2/month can be determined at each monitoring site. The nine (9) gauges are located around the DCM, except for gauge D7 which is located within the Village of Wards River.

The high volume air samplers (HVAS) (PM10) are located at locations representative of surrounding sensitive receivers, along Johnsons Creek Road ("Hattam" – located to the northeast of the mine, "Twin Houses" – located to the east of the mine and "High Noon" – located to the south of the mine). A HVAS unit is also located on private land along the Bucketts Way ("Edwards" – located west of the mine).

HVAS sampling occurs for a 24 hour period every 6 days in accordance with AS 2724.3. The EPA goal for air quality is an annual average limit of 30ug/m3/day and a National Environmental Protection Measure (NEPM) 24-hour average limit of 50ug/m3/day.

A Tapered Element Oscillating Microbalance (TEOM) analyser measuring PM10 and PM2.5 is used to continuously measure particulate matter. Real-time air quality monitoring data is used to identify when ambient PM10 levels in the surrounding environment are elevated and require contingency action. Real-time response triggers have been established and are designed to provide a system to warn operation personnel (via SMS) when particulate emissions are approaching a relevant criterion and to implement a hierarchy of management/control actions to mitigate potential impacts.

6.3.3 Review of Air Quality Monitoring Results & Performance

6.3.3.1 Dust Deposition Gauges

Table 6.5 shows the dust deposition results for nine (9) dust deposition gauges. Gauge D7 is located within the Village of Wards River.

Table 6.5: Dust Deposition Gauge Results

	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22
D3	1.4	7.8[I,B,V]	0.4	0.8	1.0	0.3	1.9	0.5	2.3	0.4	3.4	2.8
D4	0.2	0.1	0.1	0.7	0.2	0.2	0.4	0.4	0.1	0.3	0.4	0.2
D5	0.5	0.3	0.6	1.0	0.9	0.7	1.0	1.8	2.2	6.4[I,B,V]	2.6	4.1
D7	0.3	0.1	0.2	0.7	0.5	1.1	1.8	2.0	1.0	0.9	0.4	1.7
D8	0.2	0.2	1.9	0.5	0.7	0.2	0.2	0.5	0.2	NR	0.5	0.1
D9	0.2	0.2	0.1	0.3	0.3	0.3	0.4	0.3	0.2	0.3	0.6	0.3
D10	0.2	0.3	0.4	0.7	0.4	0.5	0.7	0.4	0.3	0.4	0.5	0.3
D12	0.1	0.1	0.1	0.5	0.3	0.2	0.4	0.3	0.3	0.4	0.6	0.2
D13	2.4	1.5	1.5	3.9[I,B,V]	0.2	0.4	0.5	1.4	0.4	0.5	2.2	1.7

Notes/excluded results, Visual Description Guide:

NR = No result – cracked sampling jar resulting in sample leak. Unable to analyse.

I=Insects: Whole insects e.g. spiders, ants, moths or outer parts of insects including wings, legs and exoskeletons.

V=Vegetation: Plant debris and algae including trichomes, decomposed organic matter and particulates showing characteristic cellular structures.
B=Bird droppings: The most common contamination.

Dust levels recorded had an average value of 0.7 g/m2/month (contaminated results not counted). Elevated values were at times affected by various degrees of contamination from insects, bird droppings and vegetation (seeds/grasses). Excluding the contaminated samples, all results complied with the total dust deposition criterion of 4.0 g/m2/month and the incremental increase criterion of 2.0 g/m2/month.

6.3.3.2 High Volume (PM10) Air Samplers

HVAS PM_{10} monitoring results show that all monitoring locations (in terms of monitored days) did not exceed the National Environmental Protection Measure (NEPM) of 50ug/m^3/day, listed under Condition 19, Schedule 3 of the Project Approval, except for one result at Twin Houses HVAS on 4 May 2022. It was found that the one high result was not mine related but due to a road diversion from Bucketts Way to Johnsons Creek Road. **Figure 3-3 (Appendix 3)** shows the recorded PM10 24hr results across the four HVAS monitoring sites during the reporting period.

The HVAS annual rolling averages remained low and fluctuations generally reflect changes in meteorological conditions throughout the year, i.e. rainfall and wind. Annual rolling averages are presented in **Table 6.7**.

6.3.3.3 High Volume (TSP) Air Calculation

Concentrations of TSP are calculated, based on the results of the PM10 HVAS and the assumption that 40% of TSP is PM10, as per the relationship obtained from co-located TSP and PM10 monitors operated in the Hunter Valley (NSW Minerals Council, 2000) as per the approved AQMP.

The derived TSP annual rolling averages for the four HVAS are shown in **Appendix 3**. The TSP rolling average at the end of the reporting period for “High Noon” was 13.8, “Twin Houses” was 17.9, “Hattam” was 16.1 and Edwards was 13.9 ug/m3/day. Thus, annual averages for all sampling locations were well below the 90 ug/m3/day criterion.

6.3.3.4 TEOM (PM10 and PM2.5) Monitoring

A TEOM which measures PM10 and PM2.5 on a real-time continuous basis is utilised as a management tool for operations to guide proactive and reactive mitigation measures. Real-time air quality monitoring data is used to identify when ambient PM10 levels in the surrounding environment are elevated and require contingency action. Real-time response triggers have been established and are designed to provide a system to warn operation personnel (via SMS) when dust levels are approaching a relevant criterion and to require management/control actions to mitigate potential impacts.

24-hour average results for the reporting period and graphical representation of the running/cumulative average of PM10 results are provided in **Appendix 3**. The annual average from 1 July 2021 to 30 June 2022 is 6.2 ug/m3 for PM10. The TEOM results are generally consistent with those measured by the HVAS units.

A register was maintained recording any trigger alarms from the TEOM system and the response implemented by DCPL. All alarms during the reporting period resulted from either external events such as strong winds and regional dust storms or system calibration and maintenance. A real-time dust monitoring response register for the reporting period is provided in **Appendix 3**.

6.3.4 Analysis of Data Trends and comparison with EA Predictions

Table 6.6 presents the annual average dust deposition levels at the end of the reporting period (June 2022) along with the previous five years. The 2022 reporting period annual average dust deposition levels are within the range of results recorded in the previous five years at all sites. All 2022 annual averages are well below the performance criteria. Graphical representation of dust gauge results and annual rolling averages are provided in **Appendix 3**.

Table 6.6: Annual Average Dust Deposition Gauge Results

Reporting Period	Total Insoluble Solids (g/m^2/month)								
	D3	D4	D5	D7	D8	D9	D10	D12	D13
Criteria	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**
2017	1.9	0.5	5.8	0.7	1.0	1.2	0.7	1.1	1.6
2018	2.6	1.1	2.8	1.2	0.8	1.2	1.0	0.7	1.0
2019	1.7	1.0	2.2	1.0	0.8	1.5	1.1	1.0	1.5
2020	1.4	1.2	1.5	1.2	1.1	1.2	1.3	1.1	1.3
2021	1.6	0.6	0.9	0.7	0.5	0.6	0.6	0.4	1.5
2022	1.9	0.3	1.8	0.9	0.5	0.3	0.4	0.3	1.4

Results of depositional dust monitoring are in concurrence with the DCM Environmental Assessment (EA) (2010) which predicts the annual average criteria of 4 g/m2/month will not be exceeded at any receiver and that project only incremental increases in annual average dust deposition will not exceed the applicable 2 g/m2/month EPA criterion at any receiver.

Table 6.7 presents the reporting period (June 2022) HVAS PM_{10} annual averages along with the previous five years.

Table 6.7: Annual Rolling Average HVAS (PM_{10}) Results

Reporting Period	PM_{10} (µg/m3)			
	High Noon	Twin Houses	Hattam	Edwards
Criteria	**30**	**30**	**30**	**30**
2017	6.8	8.0	13.1	8.8
2018	8.0	10.9	10.6	8.9
2019	9.2	13.8	11.3	11.5
2020	15.6	21.0	19.6	16.6
2021	6.2	7.2	7.1	7.0
2022	5.5	7.2	6.5	5.6

Annual averages for all sampling locations were below the 30 µg/m3/day criterion set under the Project Approval. Graphical representation of the annual rolling average for the four HVAS including PM10 and TSP during the reporting period is provided in **Appendix 3**. The HVAS rolling averages over the 12-month period remained consistent with levels of 2021 and the years prior to the 2020 reporting period. The elevated averages in 2020 were primarily due to the poor air quality during late 2019 resulting from the widespread bushfires.

Results of HVAS monitoring are in concurrence with the DCM EA (2010) which predicts the annual average PM10 criterion of 30 µg/m3 will not be exceeded at any receiver and that project only 24 hour PM10 concentrations will not be above the 50 µg/m3 criterion at any privately owned receiver with the exception of "Hattam" which is now mine owned and in close proximity to the mining operations.

6.3.5 Air Quality Complaints

No complaints relating to air quality were received during the reporting period.

6.4 Biodiversity Management

In accordance with Condition 33, Schedule 3 of the Project Approval, DCM is required to implement the Offset Strategy and achieve the broad completion criteria to the satisfaction of the Secretary of the DPIE. The management of biodiversity at the DCM in both the Mining Lease areas and the Biodiversity Offset Area is undertaken in accordance with the approved Biodiversity Management Plan (BMP).

The *DCM Annual Biodiversity Report 2022* (**Appendix 8**) provides a review of the effectiveness of measures in the Biodiversity Management Plan (BMP) for the annual period ending 30 June 2022 in accordance with Section 7.2 of the BMP. The scope of this report covers biodiversity management activities across both the Mining Lease areas and the Biodiversity Offset Areas.

In accordance with the BMP, the *DCM Annual Biodiversity Report 2022* is included in **Appendix 8**.

6.4.1 Vegetation Clearance Report

Vegetation clearance is undertaken in accordance with the BMP Section 5.4 Vegetation Clearance Plan. Prior to any clearance operations a Clearing Plan is prepared, and vegetation pre-clearance surveys are undertaken.

Vegetation clearance for the Duralie Extension Project was finalised in 2017. During the 2021/2022 reporting period, no vegetation clearance was undertaken.

The area of disturbance at the end of June 2022 is shown in **Figure 4 (Appendix 1).**

Information obtained during vegetation clearance activities (i.e. habitat features, hollows cleared and fauna observed) has been used to determine the requirements for nest box replacement in the Biodiversity Offset Areas.

6.4.2 Nest Box Program

Nest box management is undertaken in accordance with the BMP Section 6.4. Nest boxes have been installed to provide habitat opportunities in the short to medium-term for a number of arboreal fauna species including the Squirrel Glider.

AMBS Ecology & Heritage (AMBS) was commissioned to implement the Nest Box Program as described in the BMP Section 5.4.2 and Section 6.4. An annual nest box monitoring report was completed by AMBS in February 2022. Results of the *2021 - 2022 Nest Box Programme for the Duralie Offset Area Report (AMBS, August 2021)* are included in the *DCM Annual Biodiversity Report 2022* is included in **Appendix 8.**

6.4.3 Weed Control and Monitoring

The weed control program aims to manage weeds to minimise their impact on native flora and fauna.

Weed spraying activities are generally undertaken between the months of September and April each year. Physical management measures such as mechanical removal, slashing and/or back-burning can be undertaken at other times of the year as required.

A contractor is engaged at the DCM to undertake weed management activities on an ongoing basis. Follow-up weed treatment of all remnant enhancement and regrowth management VMUs recommenced in October 2021 and continued through to April 2022 and will recommence in spring 2022. The key species targeted included blackberry, lantana, privet, wild tobacco and Giant Parramatta grass.

Weeds monitoring to evaluate the effectiveness of control measures is undertaken in conjunction with the annual vegetation monitoring and is documented in the *DCM Annual Biodiversity Report 2022* is included in **Appendix 8.**

6.4.4 Feral Animal Control and Monitoring

The objective of feral animal control program is to manage feral animals to minimise their impact on native flora and fauna in the Biodiversity Offset Areas or the impact on agricultural production in other surrounding areas.

MDP Vertebrate Pest Management has been engaged by DCPL since 2016 to implement feral animal control programs across property owned by DCPL including both the Stratford & Duralie Mining Leases and the Stratford & Duralie Biodiversity Offset Areas. During the reporting period wild dog and fox control was undertaken between October 2021 to November 2021. The program involved a combination of trapping and shooting. The programs were productive with a total of 6 wild dogs, 1 feral cat and 3 foxes trapped and shot over the control programs.

In accordance with the BMP Section 5.10 a follow-up feral animal monitoring survey was undertaken by AMBS Ecology & Heritage during March 2022 to monitor the success of control programs and determine priorities for ongoing control measures. The feral animal survey covered the Duralie Mining Lease and Duralie Biodiversity Offset Area.

The next feral animal survey of the Duralie Mining Lease and Duralie Biodiversity Offset Area is scheduled to be undertaken in September 2025. Feral animal monitoring will guide the ongoing management efforts for controlling feral animals.

6.4.5 Controlling Access and Managing Grazing

The BMP requires works to be undertaken to exclude livestock and control access to the Biodiversity Offset Areas.

During the reporting period contractors were engaged to undertake maintenance activities on access tracks, culverts, gates and fences. The works included slashing of tracks, firebreaks and repairs to damaged gates and culverts. Additional signage was also installed on the key access points to the Biodiversity Offset Areas. Fencing repairs were completed following March 2022 flood events.

The Duralie Coal Mine Biodiversity Offsets Monitoring Report 2022 found fencing on external boundaries was in good condition. There were no signs of livestock at the time of the survey, however there was some evidence of previous access by cattle in several areas.

Livestock continue to be excluded from the Biodiversity Offset areas with the exception of 'crash grazing' programs in preparation for revegetation activities following a field assessment by a qualified consultant.

6.4.6 Bushfire Management

The objective of bushfire management in the Biodiversity Areas is to prevent impacts from unplanned bushfire and to use fire to promote biodiversity.

To assist with bushfire management, access tracks and firebreaks have been constructed and maintained as shown in the BMP Figure 9.

Monitoring of fuel loads to evaluate bushfire risk and guide bushfire hazard reduction activities is undertaken in conjunction with the annual vegetation monitoring. Further detail is included in **appendix 10**. Bushfire risk will continue to be mitigated through the maintenance of access tracks and fire breaks.

The 2021 monitoring survey noted that VMUs that have been subject to multiple disturbances such as ground preparation associated with revegetation and/or bushfire (i.e. 2019) have generally recorded lower LFA indices and are still in the process of recovery and should be provided sufficient time to establish.

6.4.7 Seed Collection and Propagation

Revegetation in the BMP Revegetation Areas has occurred via seed and tubestock. Local endemic species are preferentially used where a seed supply is available, however consideration will be given to the use of a high quality seed sourced further from the site as required.

Where possible, seed required for revegetation activities has been collected from within the Biodiversity Offset area and surrounds. Specific tree and shrub species which have not been available for collection have been sourced through external third-party suppliers. Further seed collection may be undertaken if found necessary to meet the completion criteria of the BMP offset revegetation and mine site rehabilitation.

Wedgetail Project Consulting, along with several nurseries, have been engaged to assist in the propagation of native plant species with tube-stock grown under controlled nursery conditions and delivered to site as required for revegetation works.

6.4.8 Revegetation and Regeneration Management

The aim of revegetation is to establish a range of habitat niches including native canopy, and understorey, with the goal of achieving self-sustaining vegetation communities as well as increasing the resilience to identified risks such as fire, herbivory and future weed invasion.

Revegetation works in the Duralie biodiversity offset have been undertaken progressively since the implementation of the BMP. Revegetation trials initially commenced in 2016.

During Spring 2020 tubestock was propagated in preparation for further revegetation works in Autumn 2021 to reach the required woodland density and species diversity in VMUs AB, AC, AE, AF, Z, U and S. The results of the 2021 re-vegetation activities are reported in the *DCM Biodiversity Offsets Planting Program Report Autumn 2021* (Kleinfelder, 2021). Plans showing the area for revegetation in

the Biodiversity Areas in 2021 are included in *DCM Biodiversity Offsets Planting Program Report Autumn 2021*.

The 2021 Duralie Offsets Planting Program revegetated, or in-fill planted into seven VMUs. The 2021 planting campaign successfully installed 24, 718 plants over 112 ha of the Offsets areas. This included the large sections of Grey Box – Forest Red Gum – Grey Ironbark Open Forest in VMUs AB, AE, AF and Z, 89 ha of the total. These areas had been unsuccessfully seeded previously, potentially due to drought conditions. The installation of the tubestock and hikos ensures that revegetation of the three strata has begun.

A revegetation program for 2022 has been prepared to continue to progress towards the biodiversity offset completion criteria.

6.4.9 Biodiversity Offset Monitoring and Reporting

The BMP monitoring program aims to monitor and report on the effectiveness of the BMP management measures and progress against the detailed performance and completion criteria. As described in the Section 7 of the BMP an annual report reviewing DCPL's environmental performance and progress against the requirements of the BMP including monitoring and reporting is prepared annually and appended to this *Duralie Coal Mine Annual Review*.

The *DCM Annual Biodiversity Report 2022* for the annual period ending 30 June 2022 is included in **Appendix 8** and reports on monitoring for:

- Effectiveness of revegetation in the offset area;
- Usage of the offset by fauna;
- Effectiveness of weed control;
- Effectiveness of feral animal control;
- Nest box monitoring program.

Habitat and vegetation condition monitoring is undertaken to quantitatively measure the change in habitat and vegetation condition over time. The visual monitoring and photo monitoring programs are undertaken concurrently with the vegetation monitoring to provide additional information on the change of the Biodiversity Offset Areas over time and inform maintenance requirements.

Initial vegetation surveys were undertaken in 2013 and 2014. The annual vegetation and landscape function monitoring continues to be undertaken and was repeated in April 2022. The results are provided in the *DCM Biodiversity Offset Monitoring Report 2021* prepared by Kleinfelder (**Appendix 8**). The next round of monitoring is scheduled for 2023.

Monitoring of fauna usage within the Biodiversity Areas is conducted every three years to document the fauna species response to improvement in vegetation and habitat in the Biodiversity Areas and assess the performance in providing habitat for a range of vertebrate fauna. The surveys include an assessment of habitat complexity, species richness and abundance.

AMBS was engaged to undertake fauna monitoring within the Biodiversity Offset areas and native mine rehabilitation areas during Summer 2021/2022. The results are provided in the *DCM Fauna Surveys of the Offset and Mine Rehabilitation Areas, January 2022*. A summary of the survey results is included in the *Annual Biodiversity Report 2022* (**Appendix 8**).

6.4.10 Long Term Security and Conservation Bond

Long-term Security

In accordance with Condition 42, Schedule 3 of the Project Approval, DCPL is required to make suitable arrangements for the long-term security of the Duralie Extension Project Biodiversity Offset Area. DCPL used the mechanisms available under section 88E(3) of the NSW *Conveyancing Act 1919*, namely:

> Registration of a Positive Covenant under section 88E(3) of the NSW *Conveyancing Act 1919*; and
> Registration of a Restriction on the Use of Land by a Prescribed Authority under section 88E(3) of the NSW *Conveyancing Act* 1919.

Public Positive Covenants and Restrictions on the Use of Land for the Biodiversity Offsets have been registered on title with NSW Land and Property Information (LPI) in May 2015.

Conservation Bond

In accordance with Condition 44, Schedule 3 of Project Approval 08_0203, DCPL is required to lodge a Conservation Bond with the DP&E which covers the cost of implementing the Biodiversity Offset Strategy detailed in the BMP.

A conservation bond is in place for the Biodiversity Offset areas. The amount was calculated by Greening Australia, verified by Rider Levett Bucknell in December 2013 and approved by NSW DP&E on 12 December 2013.

In accordance with PA 08_0203 Schedule 3 Condition 45, DCPL will review the conservation bond during the next reporting period.

6.4.11 Biodiversity Complaints

No complaints related to the management of biodiversity were received during the reporting period. A full detailed complaints list is provided in **Appendix 7**.

6.5 Giant Barred Frog Management

Management and monitoring of the Giant Barred Frog population is conducted in accordance with the approved DCM Giant Barred Frog Management Plan (GBFMP). The GBF monitoring program has been undertaken to establish baseline data of the local frog population and monitor whether a greater than negligible impact on the Giant Barred Frog population has occurred as a result of rainfall runoff from the mine's irrigation areas. Monitoring results are used to assess the DCM against performance measures detailed in the GBFMP.

Annual monitoring and reporting on the implementation of the Giant Barred Frog Management Plan was undertaken between 2011 and 2016.

As stated in Section 7 of the GBFMP the timing and frequency of GBF monitoring will be triggered upon commencement of irrigation within the Duralie Extension Project Additional Irrigation Areas. DCM does not propose to undertake the irrigation activities associated with the DEP and as such, the Project has not presented a potential impact on the Giant Barred Frog population. All irrigation activities at the DCM ceased in 2018 and all irrigation equipment has been removed.

No further monitoring of the Giant Barred Frog has been required since 2016 in accordance with the GBFMP.

DCPL is currently updating the GBFMP to reflect current stage of operations and incorporate revisions to describe the cessation of irrigation activities at the DCM. DCPL never commenced irrigation of the "Additional Irrigation Areas" approved under the DEP, and as such the potential impact pathway to the GBF did not commence. DCPL proposes to seek the DPIE's and DAWE's acknowledgment/approval of redundancy of the GBFMP, following completion of rehabilitation earthworks, and this would be supported by an appropriate specialist report prepared by Dr Arthur White and relevant monitoring program results. Dr White will also review the revised GBFMP.

In accordance with Condition 31A, Schedule 3 of the Project Approval and the GBFMP, DCPL is required to prepare a long-term study on the life-cycle and population of the GBF.

DCPL did not commence irrigation of the Additional Irrigation Areas approved under the DEP, therefore the requirement for preparation of the Long-term GBF Study was not triggered. Notwithstanding, Dr Arthur White has prepared a GBF Review Report capturing all the monitoring and baseline data collected between 2011 and 2016 by DCPL; the results of which will be submitted to the DPIE and DAWE in support of DCPL's proposal seeking redundancy of the GBFMP.

6.6 Blasting

6.6.1 Blast Criteria and Control Procedures

Blasting at the DCM is conducted in accordance with Conditions 8-15, Schedule 3 of the Project Approval and respective EPL conditions and the approved Blast Management Plan (BLMP). Blasting criteria, blasting hours, blasting frequency, property inspection requirements and operating conditions are provided in Conditions 8 to 12, Schedule 3 of the Project Approval.

6.6.2 Review of Blast Monitoring Results & Performance

Blasting activities during the reporting period were undertaken in the Weismantel Pit. The locations of blast monitoring units are shown on **Figure 3 (Appendix 1)**. Blast monitors are located on the following residences:

- Schultz Property (Bucketts Way, south west of mine);
- Moylan Property (West);
- Fisher-Webster Property (North); and
- Former Weismantels Inn (West).

Airblast overpressure and ground vibration results for all blasts undertaken during the reporting period are provided in **Appendix 5** and summarised below.

Overpressure Results

Of the three blasts during the reporting period (period ending 30 June 2022) there were no blasts events which exceeded the overpressure criteria limit of 115 dBL.

Vibration Results

During the reporting period (period ending 30 June 2022) there were no blasts where ground vibration exceeded 5 mm/s.

Fume Results

During the reporting period, no fume was recorded from any blasts.

The 2010 EA provides predictions on blast emissions for various residential receivers. The blasting predictions indicate that blasting emissions would generally comply with airblast criterion of 115 dBL and ground vibration of 5 mm/s at nearby private receivers. During the reporting period, predicted blast emissions were generally consistent with measured values.

6.6.3 Property Inspections and Investigations

Building condition surveys of several privately owned dwellings located in the vicinity (within 2kms) of the mine have previously been undertaken by an independent structural engineer. In addition, surveys may be commissioned following a request by a landowner concerned about dwelling damage which they consider may be related to blasting activity at the DCM (Condition 11, Schedule 3).

During the reporting period, no building inspections of private residences were undertaken. No requests were received from any landowners to undertake a building inspection or to update a previous inspection report.

Former Weismantel's Inn is a heritage listed building owned by DCPL. An inspection of the Former Weismantels Inn was undertaken in May 2022 and reported there is no evidence that the former Weismantel Inn building has been affected by blast-induced ground vibrations.

6.6.4 Blasting Complaints

No blast related complaints were received during the reporting period.

6.7 Noise

6.7.1 Noise Criteria and Control Procedures

DCM has an approved Noise Management Plan (NMP) that establishes a noise management strategy which:

- Identifies noise criteria;
- Outlines proactive and responsive noise management and control measures;
- Formulates a noise monitoring program;
- Establishes data assessment protocols; and
- Details reporting and review requirements.

Noise emissions from the DCM are managed in accordance with the criteria and procedures described in the NMP. The noise criteria are specified in PA 08_0203 and EPL 11701.

DCPL implements measures to ensure noise from the DCM is managed to approved levels, through a combination of the following:

- Ensuring best management practices are implemented and reviewed;
- Implementing noise controls to reduce noise from the source and attenuate noise transmission; and
- If necessary, implementing measures to control noise at receivers following a review of monitoring data.

The noise monitoring program has included both attended noise surveys and real-time noise monitoring. The results of compliance attended monitoring are used to assess compliance with relevant noise impact assessment criteria in the NMP. Real-time noise monitoring results are used for ongoing performance assessment and will assist in the implementation of pre-emptive management actions to avoid potential non-compliances. In addition, rail noise monitoring, meteorological monitoring and sound power testing is also required under the NMP.

The NMP was revised and updated during the 2021-22 reporting period to reflect the reduction in noise-generating activities as the DCM transitions to mine closure. The noise monitoring program components will continue to cease in a staged manner, as follows:

- real-time noise monitoring ceased following the completion of mining activities in December 2021;
- rail noise monitoring ceased following the completion of ROM coal rail movements in December 2021; and
- attended noise monitoring and Sound Power Level monitoring would only be undertaken during periods when bulk rehabilitation earthworks are undertaken.

The locations of noise monitoring sites are shown on **Figure 3 (Appendix 1)**.

6.7.2 Review of Attended Noise Monitoring Results & Performance

DCPL undertakes quarterly attended noise monitoring surveys in accordance with the NMP in order to determine the status of compliance with noise limits. Attended noise monitoring is only undertaken during periods when mining activities or bulk rehabilitation earthworks are occurring in accordance with the NMP. Attended noise surveys were conducted during the first two quarters of the reporting period. No mining activities or bulk rehabilitation earthworks were undertaken during Q3 and Q4 therefore attended noise monitoring was not required to be undertaken. The surveys were conducted on Thursday 19 August 2021 and Thursday 28 October 2021

All noise performance assessments of daytime and night-time operational noise emissions found DCM to be compliant with the relevant criteria, contained within the DCM PA 08_0203 and EPL 11701, at all attended monitoring locations.

The summary results of the attended noise surveys undertaken during the reporting period are provided in **Appendix 6**. Noise monitoring locations are shown on **Figure 3 (Appendix 1).** The full Noise Survey Reports are available at the Duralie Coal website (www.duraliecoal.com.au).

6.7.3 Analysis of Data Trends and Comparison with EA Predictions

The 2010 EA and 2014 EA provide predictions on mine contributed noise emissions for various operational years. Year 5 (2015) was predicted as the maximum operational noise levels for the Modification Project with reduced operational noise from 2016 to 2019. In terms of the four monitoring locations (“Woodley”, “Fisher-Webster”, “Moylan” and “Oleksiuk & Carmody”) predicted mine contributed noise emissions were consistent with measured values for all locations, factoring in the current reduced fleet and reduced operating hours at the DCM.

Results of quarterly noise monitoring during 2016 to 2022 has shown mine contribution to be generally inaudible. During the reporting period the mobile plant fleet and the DCM has significantly reduced leading to a reduction in the total site sound power level and noise emissions. This is reflected in the attended noise monitoring results.

6.7.4 Real Time Noise Monitoring System

A real-time noise monitoring response protocol is described in the NMP Section 7.3.5. Real-time monitoring was used as a management tool to assist DCPL to take proactive management actions and implement additional noise mitigation measures to avoid potential non-compliances. Noise investigation triggers were in place which would send alarms when noise emissions were approaching levels which may exceed the noise criteria at privately-owned receivers. The real-time noise monitor recorded noise levels during the evening and night-time periods, on days when operations are occurring at the DCM. Noise investigation trigger thresholds were set at 42 dBA between the hours of 7.00 pm and 7.00 am.

During the reporting period, up until 31 December 2021, mining operations occurred between the hours of 6:30am and 5:00pm. Hence, the first half hour of operations occurred within the applicable real-time noise monitoring period.

Details of any RTN alarms and the operational responses implemented by DCPL are recorded in the RTN Response Register. No Alarms were attributed to mining or rehabilitation activities during the reporting period

In accordance with the NMP, the real time noise monitoring system was decommissioned following the completion of mining activities in December 2021. The real time noise monitoring system will be reinstalled prior to recommencement of rehabilitation activities.

6.7.5 Rail Noise Monitoring

The NMP requires that rail noise monitoring is undertaken on a quarterly basis at the existing Wards River and Craven locations during shuttle train operations. The transport of ROM coal from the DCM via shuttle train ceased in December 2021, with the last train railed on 9 December 2021. Therefore, rail noise monitoring was not conducted during Q3 and Q4 of the reporting period.

The Q1 and Q2 surveys were conducted during August 2021 and October 2021. Rail noise survey results are included in the Noise Survey reports which are available at the Duralie Coal website.

Rail noise monitoring is reported against rail noise criteria described in Section 4 of the NMP and is undertaken for general information purposes only (i.e. they are not DCM compliance requirements).

Rail operations aim to progressively reduce noise levels to the goals of 65dB(A)Leq, (daytime from 7am – 10pm), 60dB(A)Leq (night-time from 10pm –7am) and 85dB(A) (24hr) max pass-by noise, at one metre from the façade of affected residential properties. Additionally, Condition 4(e), Schedule 3 of the Project Approval includes a notification requirement for affected residents were the maximum rail pass-by noise exceeds 85dB(A).

6.7.6 Mobile Plant Noise Assessments

The DCM fleet of mobile plant including haul trucks, excavators, dozers, graders and other items are required to be assessed annually for sound power levels (SWL) in accordance with the NMP. SWL's are compared to the target SWL's referred to in the 2010 EA and 2014 EA and are also compared to historical results to track performance over time. Availability of mobile plant for noise testing is subject to production requirements and servicing/maintenance/breakdowns.

The mining fleet is shown in **Section 4.3.1** of this report.

The current mobile plant fleet operating at the DCM is significantly less than fleet described in the Noise and Blasting Impact Assessment in the DCM 2014 EA. The current operational hours (6:30am to 5:00pm) are also significantly less than the proposed operational hours. These changes have significantly reduced the overall sound power level from the mobile plant operations.

Mobile plant sound power monitoring was undertaken in September 2021 by SLR. The monitoring concluded that most of the plant and equipment tested conform to the target sound power levels. Given that the equipment fleet in use in September 2021 at DCM are considering less than the fleet predicted in the EIS, the overall sound power level from DCM is likely to be less than the predicted 136 dBA. Since mining ceased at DCM on 31 December 2021, all equipment was removed from site.

6.7.7 Noise Complaints

No noise related complaints were received during the reporting period. The complaints list is provided in **Appendix 7**.

6.8 Landscape and Visual Screening

The overall visual impacts of the DCM are described in the EA 2014 are generally considered low. However, some local impacts will occur and undertakings such as the following have been, and will continue to be, adopted to lessen these impacts:

- Minimising (where possible) disturbance to native vegetation, especially where such vegetation is providing visual screening;
- Retention specifically of ridge Open Forest and regrowth forest (where possible);
- Retention of all riparian vegetation along Mammy Johnsons River and those out of pit sections of Coal Shaft Creek;
- Ensuring out of pit emplacement design produces a landform which integrates with the adjoining natural landform;
- Painting of substantial fabricated infrastructure with a colour ("Rivergum") that assists it to blend in with the adjoining landscape;
- Maintenance of infrastructure to retain the ability of such infrastructure to blend into the surrounding landscape over the life of the project; and
- Placement, configuration and direction of lighting to reduce offsite nuisance effects of stray light;
- Prioritising rehabilitation of exposed and outer batters of waste emplacements;
- Vegetation would be established around the perimeter of the open pit voids to provide visual screening.

In accordance with Condition 51, Schedule 3 of the Project Approval, a visual screen has been constructed and maintained along a section of the Bucketts Way to the north-west of the mine in consultation with DPIE, RMS, Great Lakes Council (now MidCoast Council) and DCM CCC. As predicted some additional vantage points of the mine have been exposed through the clearing of the northern extent of the Weismantel pit and landscaping works and progressive rehabilitation will continue to reduce the visual impact.

During the previous reporting period, a tree screen was planted, extending from the existing visual screen on The Bucketts Way to Martins Crossing Road.

During the next reporting period, DCM proposes to plant two new tree screens along the Bucketts Way extending down Durallie Road and at the northern end of the Weismantel Pit. The addition of

the new tree screens would help reduce impacts to visual amenity for road users of The Bucketts Way, Durallie Road and Martins Crossing Road. Once the tree screen is matured and established, DCM would remove the existing visual screen originally installed as part of the Project Approval.

The rehabilitation principles and objectives at the DCM are included in the Project Approval and described in the DCM RMP. This includes requirements for landscaping and visual screening to ensure the final landforms are visually consistent with the surrounding environment and meet community and regulatory expectations. The rehabilitation will be generally consistent with the proposed rehabilitation strategy described in the EA 2014.

No visual amenity related complaints were received during the reporting period. The complaints list is included in **Appendix 7** (when applicable).

6.9 Cultural and Natural Heritage Conservation

Cultural and natural heritage at the DCM are managed in accordance with the approved Heritage Management Plan (HMP). The purpose of the HMP is to address the requirements of Condition 46, Schedule 3 of the Project Approval. The aim of the HMP is to ensure that the development does not cause any direct or indirect impact on identified Aboriginal or Non-Aboriginal heritage sites located outside the approved disturbance area of the development on the site. The HMP has also been prepared to manage potential impacts on items of heritage significance at the DCM in the vicinity of the surface development.

Archaeological surveys conducted at the Duralie Mine site in the 1980's and 1990's did not identify any Aboriginal sites or items with the exception of one site. A tree, to be subsequently referred to as the "honey tree" was the subject of a site inspection involving various parties including representatives of NPWS in November 1998. The consensus at the time of inspection was that the "honey tree", an old ironbark, had had timber pieces inserted into the trunk in a spiral pattern to allow someone to scale the tree and access the crown – possibly to collect honey. It was not clear whether such timber insertion would have been performed by an Aboriginal person or early European settler. The "honey tree" was subsequently listed on the NPWS Aboriginal Heritage Information Management System (AHIMS) database.

The EA 2010 identified 9 additional sites of Aboriginal heritage significance (DM2, DM3, DM4, DM5, DM6, DM9, DM10, DM11 and the "Honey Tree") on the Mining Lease. The heritage sites outside the approved disturbance area have been protected by way of signpost and fencing where required. In addition, 4 sites (DM1, DM7, DM8 and Mammy Johnson's Grave) were identified outside of the Mining Lease.

In accordance with the HMP, topsoil disturbance during earthworks, construction and operation of the mine has been monitored utilising officers of the Karuah Local Aboriginal Land Council (KLALC). During the reporting period no topsoil disturbance was undertaken. No further topsoil stripping is proposed at the DCM.

In accordance with the HMP, monitoring of the Aboriginal heritage sites at the DCM has been undertaken. There was no change to the status of the known heritage sites during the reporting period.

Table 6.8: Aboriginal Heritage Sites within EA Study Area

Site Code (refer EA documentation)	Site Type	Status
DM2	Isolated Artefact	Salvaged by KLALC
DM3	Scarred Tree	Existing, no disturbance.
DM4	Scarred Tree	Existing, no disturbance
DM5	Scarred Tree	Salvaged by KLALC
DM6	Isolated Artefact	Existing, not located by KLALC
DM9	Open Artefact Scatter	Existing, no disturbance
DM10	Scarred Tree	Existing, no disturbance
DM11	Isolated Artefact	Disturbed, not located by KLALC.
38-1-0033	Scarred Tree – Honey Tree	Existing. No disturbance

Former Weismantels Inn is a heritage listed building owned by DCPL. A building inspection of the Weismantels Inn is conducted every two years.

An inspection of the Former Weismantels Inn was undertaken in May 2022 and reported there is no evidence that the former Weismantel Inn building has been affected by blast-induced ground vibrations.

6.10 PAF Material Management and Spontaneous Combustion

An assessment of the geochemical characteristics of the waste rock material associated with the development of the DEP is provided in the Geochemistry Assessment (EA 2010) prepared by EGi (2009). A further Geochemistry Assessment (EGi, 2012) concluded that the waste rock materials generated from Weismantel and Clareval open cut mining areas would be expected to be include PAF material, with some potentially acid forming – low capacity (PAF-LC) and NAF materials also expected to be present.

PAF material is managed in accordance with Section 7.2 of the DCM Surface Water Management Plan. PAF waste rock material is segregated and selectively handled and then placed in either in-pit (below the predicted final water table recovery level) or out-of-pit engineered PAF waste cells. PAF waste rock material would be encapsulated within constructed containment cells and capped with a low permeability layer when placed in out-of-pit waste rock emplacements.

During operations, limestone is placed on the open pit floor and interim waste rock in-pit and out-of-pit waste rock emplacement lifts/faces where PAF material is present, to minimise the generation of acid rock drainage.

DCPL monitors the water quality of contained water storages (i.e. pH and solute concentrations) as part of the existing surface water monitoring program. If in the event acid rock drainage is identified through the surface water monitoring program, specific acid rock drainage controls will be implemented. Refer to the surface water monitoring results in **Section 7.2.2** of this report.

During the reporting period PAF materials have been appropriately management to minimise the potential for any short-term or long-term effects of acid rock drainage.

Any incidences of spontaneous combustion at the DCM are managed in accordance with an internal Spontaneous Combustion Principal Mining Hazard Management Plan. This plan provides a

comprehensive overview of processes implemented at the DCM to manage identified hazards associated with spontaneous combustion. Management and mitigation practices generally involve reducing the interaction of potentially reactive materials with water and oxygen by appropriate dumping practices, profiling and capping any materials likely to heat and reducing the time coal faces are exposed prior to mining.

During the reporting period no events of spontaneous combustion were identified at the DCM.

DCPL had previously identified areas of self-heating on the PAF waste emplacements and continue to undertake remedial works to these areas. PAF rehandle activities are ongoing to place all identified PAF material in pit below the predicted post-mining groundwater table level.

One air quality complaint related to dust was received during the reporting period. A detailed complaints list is provided in **Appendix 7**.

7.0 WATER MANAGEMENT

Water management is undertaken in accordance with the approved Water Management Plan (WMP) and sub-components of the plan including surface water, ground water and site water balance required under Condition 29, Schedule 3 the Project Approval. The local and regional hydrological setting along with the baseline data is provided in the WMP.

The main objectives of the water management system on-site are:

- Protect the integrity of local and regional water resources;
- Operate such that there is no uncontrolled overflow of contained water storages;
- Maintain separation between runoff from areas undisturbed by mining and water generated within active mining areas; and
- Provide a reliable source of water to meet the requirements of the DCM.

The main principles of the water management system on-site are to:

- Minimise the generation of mine related water and divert clean water around disturbed areas;
- Minimise storage requirements by maximising re-use of mine related water;
- Remove potential impacts on downstream water resources by provision of secure containment on site and disposal by irrigation re-use;
- Implement a fail-safe system, whereby under extreme events in excess of design capacity, mine related waters would spill to the mine pit and not to the clean water catchments; and
- Not allow sediment laden water having an elevated suspended solids concentration to be discharged off site.

Mining operations ceased at DCPL in December 2021. The Duralie Coal Water Management Plan has been revised to reflect the current stage of operations and to describe anticipated mine closure activities and associated changes to water management at the DCM for the mine closure phase.

Mining of the Clareval Open Pit has now been completed and dewatering of the pit has ceased. Mining of the Weismantel Open Pit ceased on 31 December 2021. Following the cessation of mining of the Clareval Open Pit (now final void) and the Clareval void becoming available as a water storage, Weismantel Open Pit dewatering is now preferentially transferred to the Clareval void and not stored within the Main Water Dam. As a result, all irrigation activities for the purpose of reducing the total site water inventory at the DCM have ceased. All irrigation activities at the DCM have now ceased and the DCM's irrigation system has been decommissioned and removed.

Decommissioning of other redundant water management structures has also commenced. Consistent with the approved DCM final landform design, Auxiliary Dam 1 has been dewatered, decommissioned and rehabilitated.

7.1 Water Supply and Demand

The DCM water management system has operated under a surplus water balance, with a trend for increasing water storage on-site over time. The main water supply storage on-site for use in irrigation and dust suppression is the Main Water Dam (MWD) (monitoring point SW3) located to the northwest of the Industrial Area. The MWD, Auxiliary Dam 1 (AD1) (decommissioned) and Auxiliary Dam 2 (AD2) are the principal permanent mine water storages on-site. Water from these dams comprises pit produced water (runoff to/rainfall/seepage to), water from specific sediment dams and surface water runoff from the Industrial area.

The principal water losses in the water system are:

- Water used for dust suppression
- Evaporation from the Main Water Dam, Auxiliary Dam 1 and Auxiliary Dam 2
- Water retained in ROM coal and railed to Stratford.

The Main Water Dam's current storage capacity is approximately 1405 ML whilst Auxiliary Dam 2 has an estimated storage capacity of approximately 2720 ML.

At the completion of the reporting period the Mine Water Dam contained 996 ML (77.0%), and Auxiliary Dam 2 contained 1738 ML (67.0%). No mine water was disposed of to watercourses during the reporting period.

Clareval void is now available as a water storage and pit water is no longer transferred to the mine water storage dams. Auxiliary Dam 1 was dewatered to the Main Water Dam followed by decommissioning in 2020.

Surface Water Licencing

The DCM is located within the mapped extent of the Karuah River Water Source under the Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009. DCM is a water surplus site and no extraction of surface water from any unregulated stream is proposed for the DCM.

Groundwater Licencing

The groundwater systems within which the DCM lies, specifically relate to:

- Gloucester Basin Water Source (i.e. porous rock aquifer) under the Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016.
- Karuah River Water Source (i.e. alluvial aquifers) under the Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009.

DCPL currently hold WAL41518 in the Gloucester Basin Groundwater Source, for a total of 300 share components under the Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016, to account for direct and indirect take of groundwater from the porous rock aquifer.

Groundwater Licencing

DCPL holds Water Access Licence WAL41518 granted under the North Coast Fractured and Porous Rock Water Sharing Plan, that allows for up to 300 ML of groundwater to be extracted from "works"

in any 12 month period. WAL41518 was formerly 20BL168404 before being renewed in 2017 and converted under the *Water Management Act 2000*.

Table 7.2: Water Take

Water Licence #	Water sharing plan, source and management zone (as applicable)	Entitlement	Estimated Take Previous Period – 2020 (ML)Total	Estimated Take Current Period - 2021 (ML)Total
WAL41518 - Duralie Pit (Weismantel and Clareval)	Gloucester Basin Groundwater Source - North Coast Fractured and Porous Rock Groundwater Source 2016	300ML extraction	115ML	183ML

7.2 Site Water Balance Review

A water balance model of the Duralie Extension Project (EA 2010 and EA 2014) mine operations was developed by HEC based on an operational model of the DCM water management system. The site water balance model of the DCM water management system has been developed to simulate the behaviour of the water management system to the end of the approved mine life.

A site water balance review is undertaken annually and captures all inflows and outflows from the water management system. The water which accumulates in the open pits through rainfall or groundwater seepage is measured at the point of dewatering. An independent Annual Water Balance Review (Hydro Engineering & Consulting, 2021) for the DCM was conducted for the 2021 calendar year and a summary is provided below.

Open Cut Pits

A mine pit water balance analysis was undertaken for the open cut pits using data recorded during 2021. The volume of 'groundwater' (inflow other than rainfall runoff) estimated reporting to the pits (Clareval pit only) in 2021 is estimated to be 183 ML. This compared with a volume of 126 ML volume estimated/extrapolated from the groundwater model developed as part of the Duralie Extension Project (GCL, 2010), noting that no data was available from this work post 2019 and that this estimate was derived by doubling the half year forecast value to mid-2019.

Table 7.1: Summary Water Balance – Open Cut Pits - 2021

Component	Weismantel Pit (ML)	Clareval Pit (ML)
Start of Year Stored Water Volume*	2,029	1,975
End of Year Stored Water Volume*	203	6,045
Change in Stored Water Volume	-1,826	4,069
Inflows		
Rainfall Runoff	326	530
Groundwater (Estimated)	0	183
Pumped Inflow (Estimated)	0	352
Pumped Inflow	0	3,028

Component	Weismantel Pit (ML)	Clareval Pit (ML)
TOTAL†	326	4,092
Outflows		
Evaporation	26	126
Pumped Outflow	2,259	0
TOTAL	2,285	126
Inflows minus Outflows	-1,958	3,966

* Interpolated volume from recorded levels before and after 1 January and level-volume relationship derived from supplied elevation data.

† Calculated using estimated groundwater inflow

Contained Water Storages

A water balance analysis review of the Main Water Dam and AD2 water balance 2020 (HEC, 2021) is as follows: Figures are based on DCM Balance Review for the 2021 calendar year.

Table 7.3: Summary Water Balance – Contained Water Storages 2021

Component	ML
Start of Year Total Storage Volume	2,893
End of Year Total Storage Volume	2,967
Change in Storage	73
Inflows	
Rainfall Runoff	778
Pumped from Open Cut Pits	0
Pumped from RS6 (incl VC1 and LPCD)	200
MWD Diversion Seepage and Overtopping	137
First Flush Capture	108
TOTAL	**1,265**
Outflows	
Evaporation	446
Haul Road Dust Suppression	12
Irrigation Loss	0
Pumped to Open Cut Pits	769
TOTAL	**1,228**
INFLOW - OUTFLOW	**37**

The above indicates a small increase in stored water volume in these storages during 2021.

7.3 Surface Water

7.3.1 Surface Water Management

Surface water management is managed in accordance with WMP: Appendix 2 Surface Water Management Plan (SWMP) under Condition 29, Schedule 3 of the DEP Approval and is divided into the

management of clean water and mine related water as outlined below. Mine related water comprises both mine water and sediment laden/turbid water.

7.3.1.1 Erosion and Sediment Control

The primary objectives of the erosion and sediment control at the DCM are to:

- Minimise and control soil erosion and sediment generation in areas disturbed by ongoing mining and associated activities at the DCM; and
- Minimise the potential for sediment generated from site activities to adversely affect the water quality of the Mammy Johnsons River or the Karuah River.

Sediment generation and erosion is primarily controlled by:

- Maximum separation of runoff from disturbed and undisturbed areas;
- Timely progressive rehabilitation and vegetation establishment on disturbed areas (e.g. completed sections of the overburden dump) to minimise the area exposed to erosion;
- Construction of surface drains to facilitate the efficient transport of surface runoff;
- The direction of runoff from disturbed areas into sediment dams for settlement of suspended solids; and
- The placement of silt fences down slope of other disturbed areas (e.g. down slope of topsoil stockpiles before a grass cover has been established).

DCM had the following dedicated erosion and sediment control structures in use during the reporting period:

- Two (2) rail siding sediment dams – designated as RS1 and RS6
- One (1) waste emplacement (rehabilitation) sediment dam – designated as VC1
- Temporary Sediment Dams in advance of mining operations (none active at the end of the reporting period).

Sediment dam sizing is described in the SWMP Section 7.1 *Erosion and Sediment Control Plan*. Erosion and sediment control structures are designed and constructed in consideration of the recommendations for site drainage works presented in "Managing urban storm water – Soils and Construction Volume 1" (Landcom, 2004) and "Managing urban storm water – Soils and Construction Volume 2e" (DECC, 2008).

Runoff in excess of the design capacity will result in a dam spilling in accordance with the design criteria. It should be noted that pumping (where possible) of sediment dams in order to prevent or limit the amount of spilling water was undertaken. Prioritisation of pumping operations also took into account the likely quality of spilling water when a dam was considered vulnerable to spilling. The quality of water collecting within sediment dam is managed (where practicable) to minimise suspended sediment load.

Sediment dams are inspected following receipt of sufficient rain whereby such dams have the potential to spill. Diversion structures and drains are also maintained, including vegetation management, to ensure integrity of the structures and capacity for flow.

During the reporting period there was one spill from a sediment dam at the DCM. An uncontrolled discharge of mine related water (rehabilitated area runoff) from sediment dam RS1 (EPL 11701 Monitoring Point 15) occurred on 4 March 2022 reporting to Coal Shaft Creek at DCM as a result of a significant rainfall event exceeding design capacity.

The PIRMP was triggered and implemented including regulatory notifications. Pumping of sediment dam was undertaken and water samples were collected from monitoring sites upstream, downstream and at point of discharge and sent for analysis.

The volume discharged from RS1 was negligible compared to the flow in Coal Shaft Creek and Mammy Johnsons River which were both in major flood at the time of the discharge. DCPL concluded no material harm to the environment resulted from the uncontrolled discharge. Inspections of RS1 continued following the initial spill to confirm no further discharges occurred.

In addition to dedicated sediment dams, clean water is directed around disturbed areas (where practicable) using diversion drains/bunds or in the case of Coal Shaft Creek, a creek diversion (refer discussion under Water Management) in order to minimise sediment laden water.

All elements of sediment control are regularly monitored and maintained. Sediment dams are cleaned out when the storage volume is substantially reduced by sediment deposition (i.e. when 30% of storage volume is lost to sediment build up) and inspected after major rainfall events.

Inspection of diversion structures and sediment control dams occurred during and following heavy rainfall events. The site contained all mine water on site within its water management system and control structures remained effective.

A photographic surveillance record of key structures along the existing Coal Shaft Creek diversion is undertaken annually or following large rainfall events and was conducted in March and April 2022. Regular inspections of the CSC diversion are also undertaken and in general the diversion is stable and no signs of erosion or sedimentation have been identified. Maintenance activities including weed spraying and vegetation control was undertaken on the clean water diversion drains and around the prescribed dams during the reporting period.

7.3.1.2 Clean Water Management

The main objective of clean water management is the segregation of clean water from mine related water by the construction of diversion drains around disturbed areas, thereby minimising the quantity of water that is impacted by the operation.

Surface water controls aim to prevent clean runoff water from entering the open mining pit and overburden dumping areas where practical. The main structures are:

- Diversion of Coal Shaft Creek. The diversion channel (built in stages) is required until the creek can be re-established at the conclusion of mining;
- Main Water Dam (MWD) diversion drain. This drain intercepts runoff from the catchment above the MWD and delivers that water to Coal Shaft Creek;
- Auxiliary Dam 1 (AD1) and Auxiliary Dam 2 (AD2) diversion drains;
- Clareval western diversion drain;
- Flood control embankments to prevent inundation of mining areas;
- A culvert under the Main Coal Haul Road which allows Coal Shaft Creek to flow through the site; and
- Various runoff control drains/bunds about disturbed areas, designed to divert clean water runoff around those areas.

The main elements of the clean water diversion system are shown in **Figure 3** (**Appendix 1**).

Inspections of diversion structures were undertaken during and after rainfall. Remedial and maintenance works were completed as required within the diversion drains and dams during the reporting period.

7.3.1.3 Mine Related Water Management

Mine related water management refers to the control, collection and re-use of water which may have become contaminated by mining operations and associated activities. This water comprises mine water and sediment laden/turbid water. Mine water is water that has come into contact with mining activities. Sediment laden/turbid water has come into contact with disturbed areas but predominantly not core mining areas. Mine waters are typically characterised by higher salinity and on occasion lower pH. Sediment laden waters are characterised by elevated suspended solids and elevated turbidity.

During the reporting period there was one spill from Sediment Dam RS1. All other mine water was contained on site and no other spill events occurred from mine water storage dams.

The mine related water storages on site are:

- Main Water Dam (MWD)
- Auxiliary Dam 2 (AD2)
- Sediment Dam VC1 (rehabilitated waste dump)
- Sediment Dams RS1 and RS6 (rail siding dams)

The locations of mine and sediment laden water storage areas are shown in **Figure 3** (**Appendix 1**).

7.3.2 Surface Water Monitoring & Performance

DCPL monitors surface water quality on and surrounding the mine site by sampling from a series of selected locations. These locations comprise both streams and water storage structures. A meteorological monitoring station (i.e. weather station) provides site rainfall data. The locations of these monitoring sites are shown on **Figure 3** (**Appendix 1**).

Surface water monitoring is conducted in accordance with the approved SWMP and EPL 11701.

Surface water is sampled and analysed on a monthly and event basis or following a sediment dam spill.

Water sampling is not undertaken in no-flow conditions. Collected waters are analysed for a suite of physical and chemical parameters. Results are compared with water quality triggers for the DCM developed in accordance with the methodology in ANZECC/ARMCANZ (2000). "*Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project*" and EPA requirements (DCM SWMP Appendix B).

7.3.2.1 Review of Local Streams Monitoring Results

Reference should be made to accompanying data tables provided in **Appendix 4**. The routine surface water monitoring sites at the DCM are:

- *SW2 – Coal Shaft Creek (CSC)*
- *SW2 Rail Culvert – Coal Shaft Creek Downstream*
- *SW6 – Former RS3/4 Culvert*
- *SW9 – Un-named Tributary (UNT)*
- *SW10 – Coal Shaft Creek Upstream*

- *GB1 – Mammy Johnsons River (MJR)*
- *Highnoon – Mammy Johnsons River (MJR)*
- *Site 9 – Karuah River (KR)*
- *Site 11 – Mammy Johnsons River (MJR)*
- *Site 12 – Mammy Johnsons River (MJR)*
- *Site 15 - Mammy Johnsons River (MJR)*
- *Site 19 – Karuah River (KR)*
- *North Drain*
- *South Drain*

Assessment of Performance Indicators

The surface water monitoring results are used to assess the DCM against the performance indicators and performance measures as detailed in Table 7 of the SWMP. If data analysis indicates a performance indicator has been exceeded or is likely to be exceeded, an assessment will be made against the performance measure. If a performance measure is considered to have been exceeded, the Contingency Plan will be implemented (WMP Section 10). If data analysis indicates that the performance measure has not been exceeded, DCPL will continue to undertake monitoring.

Table 7.4 and **7.5** provide a summary of the surface water analysis of the monitoring data during the reporting period. The summarised data is used to assess against the surface water performance indicators and measures outlined in Table 7 of the SWMP.

Table 7.4: Summary of Surface Water Monitoring Results and Trigger Levels – pH, EC and TSS

Site	**pH**			**EC**		**TSS**	
MJR	20th%ile	80th%ile	Trigger	80th%ile	Trigger	80th%ile	Trigger
Site 11	7.2	7.5	**7.1-7.6**	353	**370**	35	**15**
GB1	7.1	7.5		303		69	
Site 12	7.2	7.5		312		43	
CSC							
SW2 (RC)	7.7	7.9	**7.1-7.9**	357	**544**	35	**80**
SW10	6.8	7.1		127		31	
UT							
SW9	6.7	6.9	**6.4-7.1**	125	**461**	73	**57**
SW10	6.8	7.1		127		31	

Table 7.5: Summary of Surface Water Monitoring Results and Trigger Levels – Copper, Turbidity, Zinc and Aluminium

Site	Copper		Turbidity		Zinc		Aluminium	
MJR	80th%ile	Trigger	80th%ile	Trigger	80th%ile	Trigger	80th%ile	Trigger
Site 11	0.002	**0.002**	40	**24**	0.008	**0.011**	2.01	**1.24**
GB1	0.002		52		0.006		1.45	
Site 12	0.001		44		0.005		1.95	
CSC								
SW2 (RC)	0.002	**0.003**	52	**119**	0.034	**0.064**	1.84	**3.02**
SW10	0.006		127		0.01		5.4	
UT								
SW9	0.002	**0.004**	73	**94**	0.013	**0.024**	1.68	**2.96**
SW10	0.002		125		0.012		2.43	

Assessment of the Performance Indicators and Performance outcomes are presented in **Table 7.6.**

Table 7.6: Surface Water Monitoring Performance Outcomes – 2021-22 Reporting Period

Performance Measure	Monitoring of Environmental Consequences			Data Analysis to Assess against Performance Indicators	Performance Indicators	Assessment of Performance Indicators	Assessment of Performance Measure	Relevant Management and Contingency Measures
	Sites	Parameters	Frequency					
No more than a negligible impact on water quality in Mammy Johnsons River as a result of the Duralie Extension Project	Site 11 GB1 Site 12	EC, pH, turbidity, Copper (total), Zinc (total), Aluminium (total). Hardness, TSS, BOD and DO.	Monthly/ Event	The 80th percentile concentration calculations for EC, pH, total copper, turbidity, total zinc, total aluminium, and TSS in addition to The 20th percentile value of pH at Site 11, GB1 and Site 12 are presented in **Tables 7.2** & **7.3**	Water quality at Site 11 is not worse than the pre-irrigation water quality at Site 11 whilst water quality is better at GB1 and Site 12 compared to the pre-irrigation water quality at these sites.	Data analysis indicates Site 11 exceeded the performance indicator for TSS, Turbidity and Aluminium. Analysis of the monitoring data shows similar trends observed upstream and downstream for TSS, Turbidity and Aluminium. Whilst TSS & Turbidity at Site 11 was outside the 80th%ile triggers it was found not to be significantly different to the average TSS & Turbidity at the upstream sites GB1 and Site 12. The lower performance indicator for DO was exceeded on five occasions at Site 11. DO was also below the low trigger upstream at Site 12 and GB1 on these occasions.	No further requirement for assessment of Performance Measure.	Continue monitoring.

Table 7.6 (Continued): Surface Water Monitoring Performance Outcomes – 2021-22 Reporting Period

Performance Measure	Monitoring of Environmental Consequences			Data Analysis to Assess against Performance Indicators	Performance Indicators	Assessment of Performance Indicators	Assessment of Performance Measure	Relevant Management and Contingency Measures
	Sites	Parameters	Frequency					
No more than a negligible impact on water quality in Coal Shaft Creek as a result of the Duralie Extension Project	SW2 (RC) SW10	EC, pH, turbidity, Copper (total), Zinc (total), Aluminium (total). Hardness, TSS, BOD and DO.	Monthly/ Event	The 80th percentile concentration calculations for EC, pH, total copper, turbidity, total zinc, total aluminium, and TSS in addition to the 20th percentile value of pH at SW2 (RC) and SW10 are presented in Tables 7.2 & 7.3	Water quality at Site SW2 (RC) is not worse than the pre-irrigation water quality at Site SW2 (RC) whilst water quality is better at SW10 compared to the pre-irrigation water quality at that site.	Data analysis indicates Site SW2 (RC) did not exceed any of the performance indicators. Upstream site SW10 exceeded the 80th%ile trigger for Copper, Turbidity & Aluminium. pH was below the 20th%ile lower trigger at SW10 also. The performance indicator for DO was exceeded on two occasions. The upstream site SW10 was dry on these sampling events.	No further requirement for assessment of Performance Measure.	Continue monitoring.

Table 7.6 (Continued): Surface Water Monitoring Performance Outcomes – 2021-22 Reporting Period

Performance Measure	Monitoring of Environmental Consequences			Data Analysis to Assess against Performance Indicators	Performance Indicators	Assessment of Performance Indicators	Assessment of Performance Measure	Relevant Management and Contingency Measures
	Sites	Parameters	Frequency					
No more than a negligible impact on water quality in Unnamed Tributary as a result of the Duralie Extension Project	SW9 SW10	EC, pH, turbidity, Copper (total), Zinc (total), Aluminium (total). Hardness, TSS, BOD and DO.	Monthly/ Event	The 80th percentile concentration calculations for EC, pH, total copper, turbidity, total zinc, total aluminium, and TSS in addition to the 20th percentile value of pH at SW9 and SW10 are presented in Tables 7.2 & 7.3	Water quality at Site SW9 is not worse than the pre-irrigation water quality at SW9 whilst water quality is better at SW10 compared to the pre-irrigation water quality at that site.	Data analysis indicates SW9 exceeded the 80th%ile performance indicator for TSS. Analysis of the monitoring data shows similar trends observed upstream and downstream for TSS. Whilst TSS at SW9 was outside the 80th%ile trigger it was found not to be significantly different to the average TSS at the upstream site SW10.Upstream site SW10 also exceeded the 80th%ile trigger for Turbidity. The performance indicator for DO was exceeded on multiple occasions. The performance indicator for DO was similar upstream at SW10 on these sampling events.	No further requirement for assessment of Performance Measure.	Continue monitoring.

7.3.2.2 Review of Mine Water Monitoring Results

The management of mine related water is described in **Section 7.3.1.3** of this report. Mine water comprises water that is generated within the mine workings, waste rock emplacements (prior to reshaping and topsoiling), storage areas for such water and runoff from areas where coal is/was handled. Mine water is generally characterised by elevated EC, elevated sulphate concentrations and low turbidity/TSS.

The two principal mine water storage areas are the Main Water Dam (sampling location SW3 major), and Auxiliary Dam 2 (AD2). Monitoring of mine water quality is also conducted within the Weismantel pit (sampling location SW4).

No overflows or discharges of mine water occurred during the 2021/22 reporting period.

Monitoring for SW3 (major) during the reporting period indicated, on average, a moderate EC (2401 uS/cm), slightly alkaline pH (8.3) and low miscellaneous metals concentration. Reference should be made to **Table 7.7** and the water monitoring results in **Appendix 4**.

Table 7.7: Summary of Mine Water Monitoring Results – pH, EC and TSS

	pH		EC (µS/cm)		TSS (mg/L)	
Site	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
MWD (SW3)	7.9-8.7	8.3	1334-2972	2401	<5-26	11
AD2	7.3-8.8	8.2	1646-3240	2746	*	*
Weismantel (SW4)	5.0-7.8	6.9	4190-6750	5695	<5-280	59

Notes * = TSS monitoring is not required for AD2, refer to Section 8.2 of SWMP

7.3.3 Analysis Data Trends & Comparison with EA Predictions

7.3.3.1 Local Streams Monitoring

Surface water results (**Table 7.4, Table 7.5 and Table 7.7**) were consistent with previous year's monitoring and the predictions made in the EA 2010. The EA 2010 indicated that water quality in Mammy Johnsons River was variable, but was generally good. It was also found that the salinity of the stream was higher during periods of low flow and generally showed a relative reduction in EC during higher flow periods (Gilbert, 2010). The current monitoring results are consistent with these observations. During the reporting period the Gloucester region experienced a significant increase in rainfall resulting in a general decrease in salinity across most monitoring sites.

Table 7.4, Table 7.5 and Table 7.7 indicates some occurrences of exceedances of the performance indicators. If data analysis indicates a performance indicator has been exceeded or is likely to be exceeded, an assessment will be made against the performance measure. The data analysis shows monitoring data also shows similar trends observed upstream and downstream, i.e. exceedances were not due to DCM. Accordingly, no further assessment of the performance measure is required.

Historical monitoring data presented in the DCM EA, Surface Water Assessment (Gilbert, 2010) show that Coal Shaft Creek is generally more saline than Mammy Johnsons River and the Karuah River. Results during the reporting period generally concur with these observations. It is considered that Coal Shaft Creek is generally more saline due to its ephemeral nature and the outcropping/sub-cropping of coal seams within the catchment.

7.3.3.2 Mine Water Monitoring

The simulated water quality for the Main Water Dam was prepared for the EA 2010 including a salinity balance and an assessment of the suitability for irrigation water (Gilberts, 2010). Mine water pH has remained generally near neutral or slightly alkaline for the life of the project. The Mine Water Dam EC trend has been generally consistent with the simulated EC showing a slightly increasing trend up to 2015 and then staying relatively stable through to 2022, however the average EC (2401 uS/cm) in 2022 has remained higher than the predicted EC of 2140 uS/cm. This is predominantly due to the higher EC water from the Clareval pit. Clareval Pit was not monitored during the reporting period due to no safe access into the pit during backfilling since operations were completed in September 2017.

7.3.4 Biological Monitoring

As part of Duralie Coal's environmental monitoring program, Invertebrate Identification Australasia was commissioned to conduct biological (aquatic ecology – macroinvertebrates) monitoring of the streams near the DCM. Biological monitoring has been conducted each year since the start of mining operations.

Monitoring during this reporting period was conducted in September 2021 and involved sampling from seven sites. For the September survey a total of 50 families of aquatic macroinvertebrates were recorded. This represents a significant increase in total numbers of families across all sites except for Site M6 compared with the previous 2021 autumn and previous 2019 spring survey. However, the results are comparable with those recorded for the two 2016 and 2017 surveys across most sites. The report concluded that *"there are no apparent adverse effects on the aquatic macroinvertebrate fauna in the Mammy Johnsons River as a result of any activities arising from the operations of the Duralie Mine."* (Invertebrate Identification Australasia 2021).

Biodiversity values have been generally similar to those noted from prior reporting periods. Biological monitoring reports to date have not indicated any significant adverse effects on the aquatic ecosystem as a result of the mine's operations as per predictions made in the environmental assessments.

7.3.5 Riparian Vegetation Monitoring

The Riparian Vegetation "Health" Monitoring program is conducted in accordance with the SWMP. Visual monitoring and photography is conducted in order to detect any potential change in the quality and quantity of riparian vegetation. The unnamed Tributary, Coal Shaft Creek and Mammy Johnsons River are monitored on an annual basis in conjunction with the biological monitoring for signs of leaf scorching, desiccation and dieback. Riparian health monitoring includes capturing photographic records and the development of a photographic database of riparian vegetation at fixed photo points. Biological monitoring reports to date have not indicated any significant adverse effects on the aquatic ecosystem or riparian vegetation.

Irrigation activities at the DCM ceased in 2018, hence the potential impact pathways identified in the EA 2014 have ceased. Riparian vegetation health monitoring is no longer required as potential impact pathways have ceased. Assessed monitoring results as part of the irrigation monitoring report showed no identified impact.

7.4 Groundwater

7.4.1 Groundwater Management

A Groundwater Management Plan (GWMP) (WMP Appendix 3) has been prepared to control potential impacts on local and regional groundwater resources and includes a monitoring program to validate and review the groundwater model predictions.

The groundwater systems within which the DCM lies, specifically relate to:

- Gloucester Basin Water Source (i.e. porous rock aquifer) under the Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016.
- Karuah River Water Source (i.e. alluvial aquifers) under the Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009.

Groundwater characteristics of the DCM have been studied prior to and over the life of the DCM and most recently for the EA 2014. A hydrogeological characterisation of the Gloucester Basin is included in the GWMP.

7.4.2 Groundwater Monitoring Results & Performance

Groundwater monitoring is conducted in accordance with the DCM Water Management Plan (WMP) Appendix 3 Groundwater Management Plan (GWMP).

DCM monitors groundwater quality on and surrounding the mine site by sampling from a series of selected monitoring bore locations. The location of these bores is shown in **Figure 3** (**Appendix 1**).

Collected waters are analysed for a suite of physical and chemical parameters. Results are evaluated for observable trending and compared to the predicted results from the EA 2010.

A summary of groundwater monitoring results for the reporting period can be found in **Table 7.8** and **Appendix 4**.

Comments on analysed parameters for monitoring conducted during the reporting period are as follows:

- Depth to groundwater was comparable with recent historical data for most monitored wells and consistent with predicted levels.
- pH is comparable with historical data with minor fluctuations apparent. pH in the reporting period varied from a slightly acidic 5.0 (DB10W in Feb 2022) to a neutral 7.5 (WR2 in Feb 2022);
- Electrical conductivity generally showed a high degree of variability across many of the wells as has historically been the case. This would appear to reflect the cycle of dry and wet conditions. Shallow wells intercept generally low conductivity alluvial aquifers, whilst deep wells associated with coal measures generally have higher conductivity;
- Calcium and magnesium concentrations across all wells tended to fluctuate within reasonably tight ranges which has historically been the case;
- Small fluctuations were also observed for Sulphate concentrations across all wells;
- Aluminium concentrations are quite low (often being close to the limit of analytical detection) in all the deeper wells but comparatively higher in the shallower wells. The highest concentration recorded was 38.4 mg/l (DB10W in May 2022);
- Iron concentrations showed no common trend with rises and falls across wells generally.

Concentrations showed a wide range from a low of 0.07 mg/l (SI1W & SI2W) to a high of 55.5 mg/l (BH4BW in November 2021);
- Manganese concentrations across all wells were not high with the highest being 2.14 mg/l within SI3W in May 2022; and
- Zinc concentrations were essentially low and consistent with available historical data.

Table 7.8: Summary of Groundwater Monitoring Results – Average depth, pH and EC.

Site	Depth (m)	pH	EC (µS/cm)
DB1W	15.6	5.7	3685
DB2W	13.6	6.2	1530
DB3W	2.6	6.4	140
DB4W	6.0	6.7	3673
DB5W	11.5	5.8	2199
DB6W	20.8	6.6	5948
DB7W	9.7	7.0	2811
DB8W	16.2	*	*
DB9W	19.1	7.1	3553
DB10W	11.4	5.1	4545
DB11W	10.4	7.1	2933
BH4BW	4.2	6.3	431
SI1W	9.6	7.0	2903
SI2W	19.1	6.9	3015
SI3W	27.8	6.7	6810
WR1	12.6	6.3	2745
WR2	28.2	7.1	6613

Note * = Depth only monitored at DB8W

Results for the reporting period are provided in **Appendix 4**. In summary, hydrographic plots (Graph 1, Graph 2 and Graph 3), indicate that groundwater monitoring results for the period are generally consistent with predicted outcomes as assessed in the EA (2010). Further review occurred in line with the GWMP where inflows to pits and water levels within bores were consistent with modelled predictions and indicators as per the GWMP. No trigger levels or exceedance of performance measures were identified during the reporting period. No complaints related to groundwater were received during the reporting period.

Assessment of Performance Indicators

Groundwater monitoring results are assessed against Performance Indicators and Measures as described Section 7.1 and Table 6 of the GWMP. Monitoring data for the reporting period was in accordance with the performance measures which indicate:

- No more than a negligible impact on stream baseflow as a result of the Duralie Project;
- No more than a negligible impact on water levels in groundwater production bores on private land.

Refer **Table 7.9** below.

7.4.3 Analysis Data Trends and Comparison with EA Predictions

Depth to water information from piezometer monitoring indicates that bore water levels are generally consistent between bores and are generally consistent with EA (2010) predictions.

The four bores to the west of the open cut pit (SI1W, SI2W, SI3W & DB6W) are all above or close to maximum predicted levels.

No depressurisation has been observed to date at Bore DB11W, located north of operations.

Groundwater quality results for the reporting period indicate results consistent with EA predictions and historical groundwater data trends. For this reporting period, the groundwater pH range for bores likely to be influenced by the coal measures was between 5.0 and 7.5. This is a generally similar range to that noted in the EA. Similarly, the electrical conductivity range for the bores was 131 to 8920 uS/cm. These results are generally similar to and within the range noted in the EA (pH – 6.0 to 8.0 EC – 100 to 7600 uS/cm).

Irrigation bores (SI Series) indicate no obvious signs of deep drainage generated from irrigation activities. Irrigation activities ceased during 2018 and no impacts from deep drainage would be expected.

No indication of an increase in connectivity between alluvial bores (DB3W and BH4BW) and the deeper groundwater system has been observed based on monitoring results for water quality and groundwater table level.

The waste emplacements bores (WR Series) indicate signs of recharging of the backfilled void, particularly at WR1. This is consistent with the numerical modelling of the post-mining groundwater levels (EA 2010) which shows slow but complete recovery of the groundwater system over many decades and that the Clareval void, once filled with water, would act as a sink, while the Weismantel void lake would act as a flow-through lake system. Additional detail is available within the EA for the DEP Modification 2 approved in December 2014.

Monitoring results show a drop in the depth to standing water level at WR2. Depth reading on 20 May 2021 was 63.45m and depth on 24 August 2021 was 38.41m. The shallow depth has been somewhat consistent since 24 August with the latest reading on 3 May 2022 showing a depth of 21.4m. Over the next reporting period DCPL will investigate the cause further.

Table 7.9: Groundwater Monitoring Performance Outcomes – 2021-22 Reporting Period

Performance Measure	Performance Indicators	Assessment of Performance Indicators	Assessment of Performance Measure
No more than negligible impact on stream baseflow and/or natural river leakage of Mammy Johnsons River to the deeper groundwater system as a result of the Duralie Extension Project (incorporating the Open Pit Modification).	Groundwater inflows to open pits are consistent with Duralie Open Pit Modification Environmental Assessment (EA) predictions.	Data analysis indicates groundwater inflows to open pits have been less than the Duralie Open Pit Modification Environmental Assessment (EA) predictions. Refer to the site water balance review for 2021 (HEC, 2021). .	No further requirement for assessment of Performance Measure.
	Groundwater levels in alluvium bores are consistent with Duralie Open Pit Modification EA predictions (accounting for temporal changes in rainfall recharge).	Data analysis of daily alluvium bore pressure sensors indicates groundwater levels in alluvium bores are consistent with Duralie Open Pit Modification EA predictions (accounting for temporal changes in rainfall recharge). Refer to groundwater monitoring data.	No further requirement for assessment of Performance Measure.
No more than negligible impact on water levels in groundwater production bores on privately-owned land as a result of the Duralie Extension Project (incorporating the Open Pit Modification).	No groundwater related complaints received	No groundwater related complaints were received during the reporting period.	No further requirement for assessment of Performance Measure.

7.4.4 Groundwater Inflows to Open Cut Mining Operations

Groundwater seepage inflows to mining voids is directed and collected in pit sumps along with rainfall and surface water runoff and seepage through backfilled pit areas. Water level and water quality analysis of the pit sumps is undertaken on a monthly basis. The volumes of water extracted from the pit sumps is recorded where practicable.

The water quality monitoring results for the open cut pits during the reporting period is included in **Section 7.3.2.2** of this report.

A site water balance review is undertaken on an annual basis to monitor the status of inflows (including groundwater inflows to open pits), storage and consumption. A summary of the 2021 site water balance review (HEC, 2021) is included in **Section 7.2** of this report.

No dewatering from the open cut pits was undertaken during the reporting period. Mining activities have currently ceased in both Weismantel and Clareval pits. Data analysis indicates groundwater inflows to open pits have been less than the EA 2014 predictions.

7.5 Irrigation

The Duralie Coal Mine has historically operated under a continual stored water surplus. The Project Approval conditions precludes the disposal of mine water from the approved project approval boundary and Duralie is managed as a zero discharge site.

Irrigation at the DCM has been managed in accordance with the WMP, specifically Appendix 2 SWMP Attachment 1 Irrigation Management Plan (IMP). During 2018 all irrigation activities at the DCM were ceased. ROM coal mining in the Clareval Pit was finalised in September 2017 and the void space has now become available for water storage and waste rock backfill. Since this time open cut dewatering to the Main Water Dam has also ceased with water preferentially transferred to the Clareval void. As such, the demand for irrigation to reduce the total site water storage has reduced and all irrigation activities on site have now ceased. Mine water will be progressively transferred from the mine water dams to the voids as discussed in the RMP. All irrigation activities at the DCM have now ceased and the DCM's irrigation system has been decommissioned and removed.

7.5.1 Irrigation Area Soil and Vegetation Monitoring

Irrigation area monitoring has been conducted in accordance with the WMP which incorporates the Irrigation Management Plan (IMP) as an attachment of the Surface Water Management Plan (SWMP). The annual irrigation area monitoring includes an assessment of soil characteristics and vegetation condition with consideration to the irrigation water quality applied.

No irrigation of mine water occurred during the reporting period and no irrigation area soil and vegetation monitoring was required.

An assessment of the irrigation performance including irrigation water quality was undertaken in the 2019 Irrigation Area Monitoring Report (Horizon Environmental, 2019) and is included in the DCM AR 2020. The 2019 monitoring included an assessment of any impacts from irrigation over the life of the DCM and recommendations for ongoing monitoring following the cessation of irrigation. Irrigation and soil monitoring in 2019 concluded that there has been no significant detrimental effect on soil properties, or suitability of soil in irrigated areas for current or future agricultural use. Additionally, the monitoring found no detectable adverse impact from irrigation management on pasture cover or

composition. The 2019 monitoring report recommended the former irrigation areas can be decommissioned without detriment to pastureland use.

The WMP including Irrigation Management Plan was revised during 2021 to reflect the current status of the DCM and the status of the Irrigation activities. As a result of the operational changes at the DCM, the requirement for, and the requirements of, the DCM Irrigation Management Plan are no longer relevant to the DCM and the plan is now redundant.

8.0 REHABILITATION

Rehabilitation of disturbed land at DCM has previously been undertaken in accordance with the approved Mining Operations Plan and Rehabilitation Management Plan (MOP, 2019) required under the Mining Lease conditions and PA 08_0203. The MOP term covers mining operations and rehabilitation activities up to the end of 2021.

A Rehabilitation Management Plan (RMP) was prepared for DCM to satisfy the requirements of Condition 2 of ML 1427 and Condition 3 of ML 1646 (relevant to preparation of an RMP) and addresses the requirements for the DCM RMP provided within Condition 57, Schedule 3 of the Project Approval (08_0203).

An amendment to the *Mining Regulation 2016* under the *Mining Act 1992*, commenced on 1 July 2021. The amendment provides new standard rehabilitation conditions for mining leases which replaces existing mining lease conditions. This RMP replaces the DCM Mining Operations Plan (MOP)/RMP (1 January 2020 to 31 December 2021).

An Annual Rehabilitation Report and Forward Program (ARRFP) has also been prepared and submitted for DCM which provides details of the scheduled surface disturbance and rehabilitation activities at the DCM from 1 July 2022 to 30 June 2025.

Condition 5, Schedule 2 of PA 08_0203 authorises mining operations to be carried at the DCM until 31 December 2021. Accordingly, DCPL has planned for the commencement of the mine closure phase (i.e. after the cessation of mining operations on 31 December 2021). DCPL has revised relevant EMPs to reflect the current stage of operations and to describe anticipated mine closure activities and describe the change to environmental impacts, mitigation measures and monitoring programs at the DCM for the mine closure phase. A summary of the rehabilitation objectives, performance indicators and completion criteria relevant to the DCM rehabilitation domains is provided in the RMP. Plan 1 in the RMP shows the conceptual final landform, relevant primary domains and secondary rehabilitation domains.

8.1 Rehabilitation of Disturbed Land

Rehabilitation of disturbed areas is undertaken progressively and concurrently with ongoing mining operations. Rehabilitation planning, management and implementation is described in the RMP. The overburden emplacement is rehabilitated in progressive increments to the final landform so the area of disturbed land is minimised and disturbed water catchment areas are reduced. Stage plans for the Duralie disturbance and rehabilitation areas are provided in the RMP.

The DCM rehabilitation progress is generally in accordance with the planned activities described in the RMP 2022 Plan 3A – Life of Mine Rehabilitation Schedule 2022. The RMP makes provision for 404 hectares of total disturbance area and 180 hectares of rehabilitated area up to June 2022.

The current (June 2022) total mine footprint area (disturbance) is 404 hectares. The completed rehabilitation area is 180.3 hectares (including 9 hectares of landform establishment).

Table 8.2 presents a summary of the rehabilitation undertaken at the Duralie mine site up to the current reporting period. The current mining areas and rehabilitation as of 30 June 2022 are shown in **Figure 4**, provided in **Appendix 1**.

Table 8.2 – Rehabilitation status

Mine Area Type	Previous RP (actual hectares) 2020/2021	Current RP (actual hectares) 2021/2022	Next RP (forecast hectares) 2022/2023
Total Mining Lease	942.8	942.8	942.8
Total mine footprint	404	404	404
Total active disturbance	227	223.7	219.2
Land being prepared for rehab (Landform Establishment)	14	9	13.5
Land under active rehabilitation (Growth Medium Development)	0	0	0
Completed rehabilitation (Ecosystem Establishment & Sustainability)	159	171.3	171.3

8.1.1 Rehabilitation Resources

Topsoil resources are managed in accordance with the RMP Section 6.2.4. No vegetation clearance or topsoil stripping was undertaken during the reporting period. No further disturbance is proposed for mining activities at the DCM. There are currently sufficient topsoil resources available to complete rehabilitation of the DCM.

The DCM's topsoil balance will be augmented to incorporate estimates of other materials required to complete rehabilitation of the DCM, including inert capping material (i.e. NAF material) and clay for the Coal Shaft Creek Reconstruction. Estimates of clay volumes required for Coal Shaft Creek Reconstruction will be determined once the detailed design works for the revised Coal Shaft Creek Reconstruction Plan have been completed.

The requirement for a LOM rehabilitation materials register, including topsoil stocktake, is included in the RMP.

8.1.2 Rehabilitation Maintenance

Recommendations for maintenance activities on rehabilitated land have been included in the rehabilitation monitoring reports, refer to **Section 8.3**.

During the reporting period maintenance activities focussed on the improvement of pasture rehabilitation at the DCM. Maintenance works included slashing, aerating and fertiliser application. Maintenance activities also included slashing and clearing of access tracks and weeds spraying. Weed

control has been undertaken across the rehabilitation areas targeting lantana, blackberry, wild tobacco and giant parramatta grass.

During the next reporting period maintenance work will focus on weeds control and improving biodiversity and stem density in the native vegetation rehabilitation areas.

8.2 Rehabilitation Monitoring

Monitoring of the DCM rehabilitation areas is described in Section 8 of the Rehabilitation Management Plan (RMP). Rehabilitation is monitored on a regular basis to ensure vegetation is establishing in the rehabilitation areas and to determine the need for any maintenance and/or contingency measures (e.g. supplementary plantings, weed or erosion control). The monitoring also aims to demonstrate the effectiveness of the rehabilitation techniques and track the progression towards achieving the performance and completion criteria.

The annual rehabilitation monitoring program includes the areas designated for agricultural (grazing) and native ecosystem final land uses.

Visual Monitoring

Rehabilitation monitoring includes a visual assessment:

- Monitoring of soil erosion status and the effectiveness of erosion control methods;
- Observing drains to determine whether substantial silting of inverts and/or any localised failure of the drain embankment has occurred;
- Assessing germination success and vegetation establishment (diversity and abundance);
- Usage of habitat enhancement features;
- Evaluating the behaviour of placed topsoil;
- Evaluating threats posed to rehabilitated areas posed by weed infestation and feral animals; and
- Opportunistic fauna observations.

The visual monitoring provides an early identification of areas requiring remedial planting or other maintenance works to maintain rehabilitation progress. The rehabilitation reports provide a list of maintenance recommendations predominantly relating to erosion control, weeds control and vegetation management and enhancement.

Ecosystem Function Analysis

The assessment of rehabilitation quality and ecosystem value is conducted via the use of Ecosystem Function analysis (EFA). EFA aims to measure the progression of rehabilitation towards self-sustaining ecosystems. EFA has been incorporated into the overall DCM rehabilitation monitoring program to provide an assessment of landscape functionality.

EFA Analogue Transects have been established in proximal areas to represent the varying landscapes (i.e. slopes and aspects) and target communities planned for each rehabilitation area. Monitoring of agricultural rehabilitation areas, including areas proposed as pasture for agricultural grazing, will also involve monitoring of LFA indices, including stability, infiltration and nutrient cycling.

The rehabilitation transects were assessed in April 2022 as part of the seventh annual round of monitoring in accordance with Section 8.12 of the RMP. A summary of the findings from the *2022 Duralie Coal Mine Rehabilitation Monitoring Report* (Wedgetail Project Consulting, 2022) can be found

in the *Duralie Annual Biodiversity Report* (**Appendix 8**). DCPL will continue to undertake annual EFA monitoring at the DCM.

Fauna Monitoring

Fauna usage of the native ecosystem rehabilitation areas is monitored and documented over time. Fauna monitoring is conducted every three years to assess the success of the rehabilitation and revegetation activities in providing habitat for a range of vertebrate fauna. The surveys include an assessment of habitat complexity, species richness and abundance.

The most recent fauna survey was conducted by AMBS Ecology during November 2021 to January 2022. A summary of the findings from the *Duralie Coal Mine: Fauna Surveys of the Offset and Mine Rehabilitation Areas* (January, 2022) can be found in the *Duralie Annual Biodiversity Report* (**Appendix 8**). The previous fauna monitoring within the Biodiversity Offset Areas and native Mine Rehabilitation Areas was undertaken in February 2018.

Surveys conducted over DCM rehabilitation areas and Biodiversity Offset Areas indicate that these areas provide habitat for a range of native vertebrate fauna, including birds, mammals, reptiles and frogs.

Habitat Enhancement and Nest Box Program

A nest box program for the Duralie Extension Project, is being implemented by AMBS Ecology & Heritage for the DCM, in accordance with the Biodiversity Management Plan (BMP). The nest boxes provide nesting habitat for birds, arboreal mammals and bats.

Installation of nest boxes has occurred over six periods with the most recent installation in March 2021. No further nest box installations were required resulting from vegetation clearance activities and the recent installations in the rehabilitation areas is to provide additional habitat enhancement. The next round of monitoring is scheduled for Spring 2022.

The nest boxes are monitored annually by AMBS Ecology to observe fauna usage. The most recent annual monitoring report was completed by AMBS with works commencing in September 2021 and completed in February 2022 due to weather impacts. Overall a total of 227 out of 269 nest boxes, approximately 84%, have been occupied of have shown signs of occupancy since their installation. A summary of the findings from the *Nest Box Programme for the Duralie Offset Area* can be found in the *Duralie Annual Biodiversity Report* (**Appendix 8**).

8.2.1 Threats to Rehabilitation Completion

During the reporting period the 2021 rehabilitation monitoring program identified a list of recommendations regarding the existing rehabilitation and future rehabilitation works (**Section 8.3**) (**Appendix 10**). The recommendations mostly related to increasing native tree and shrub structure and biodiversity in the native rehabilitation areas, and secondly continuing to manage weeds in both the native and pasture rehabilitation areas. The recommendations included a combination of weed control measures, assisted biomass reduction to stimulate regeneration and additional seeding with mid-story and shrub species in targeted areas.

Any emerging threats to rehabilitation success will be identified through the ongoing monitoring programs described in Section 9 of the RMP. The recommendations in the rehabilitation monitoring report (**Section 8.3)** provide recommended maintenance and management measures to address these specific issues.

8.2.2 Status of Rehabilitation Recommendations

A status of the implementation of the recommendations on rehabilitation and maintenance activities made in the *Duralie Coal Mine Rehabilitation Monitoring Report* (Wedgetail Project Consulting, 2022) is provided below.

During the reporting period maintenance activities focussed on the improvement of pasture rehabilitation at the DCM. Maintenance works included slashing, aerating and fertiliser application. Maintenance activities also included slashing and clearing of access tracks and weeds spraying. Weed control has been undertaken across the rehabilitation areas targeting lantana, blackberry, wild tobacco and giant parramatta grass in the areas identified in the rehabilitation monitoring report.

During the next reporting period maintenance work will focus on addressing the recommendations to improving biodiversity and stem density in the native vegetation rehabilitation areas. This will include consideration of techniques for biomass reduction to stimulate regeneration of the seed bank.

8.3 Rehabilitation Trials and Research

DCPL has extensive experience in both native woodland/forest revegetation and agricultural pasture rehabilitation, with successful rehabilitation areas completed over the past 20 years at both the Duralie and Stratford mine sites. Learnings from the rehabilitation works undertaken onsite to date along with industry best practice guidelines are employed in the methodology for new rehabilitation areas.

Revegetation trials continue to be implemented in the biodiversity offset area in accordance with the Biodiversity Management Plan. The program has trialled several methods for ground preparation, seeding and planting to determine the most suitable and cost-effective methods for completing the remaining offset revegetation and mine site rehabilitation. Refer the *Duralie Coal Mine Annual Biodiversity Report* (DCPL, 2022) for a summary of works undertaken during the reporting period.

8.4 Rehabilitation Targets

The DCM MOP Plan 3B - Mining and Rehabilitation 2021 rehabilitation target for end of 2021 calendar year is a cumulative total of 206 hectares of rehabilitation. To date 171.3 hectares of rehabilitation has been completed comprising Landform Establishment, Ecosystem Establishment and Ecosystem Sustainability.

The rehabilitation targets reported in the previous AR, have been replaced and outlined in the new Rehabilitation Management Plan.

During the 2022/2023 reporting period, DCPL proposes to undertake rehabilitation of approximately 4.5 hectares of waste emplacement to Landform Establishment phase.

8.5 Mine Closure Planning

Condition 5, Schedule 2 of PA 08_0203 authorises mining operations to be carried at the DCM until 31 December 2021. Accordingly, DCPL planned for the commencement of the mine closure phase (i.e. after the cessation of mining operations on 31 December 2021). During the reporting period a new Rehabilitation Management Plan (RMP) was prepared consistent with the requirements of the Resources Regulator Operational Rehabilitation Reform. The new RMP incorporates a Mine Closure Plan for the DCM consistent with the Mine Closure Planning Program described in Section 8 of the MOP.

The mine closure planning program developed for the DCM includes a schedule of all technical and/or environmental assessments that are required to undertake final rehabilitation now that open-cut mining at the DCM has ceased. The technical assessments identified in the Mine Closure Planning Program have been informed by the key risks and risk reduction strategies associated with rehabilitation and mine closure of the DCM.

The majority of the assessments/studies required by the Mine Closure Planning Program have been completed progressively. The remaining components of the program will continue to be developed in accordance with the RMP.

DCPL has revised relevant EMPs to reflect the current stage of operations and to describe anticipated mine closure activities and describe the change to environmental impacts, mitigation measures and monitoring programs at the DCM for the mine closure phase.

The Mine Closure Planning Program components and completion status/schedule for each component is provided in Appendix 1 of the RMP. The subsections below provide progressive updates on the key mine closure planning requirements for the DCM and the actions completed during the reporting period. Further information can be found within the Duralie RMP.

8.5.1 Final Landform Designs

The rehabilitation objectives for the final landforms requires final landform designs which sustain the intended land use for the post-mining domain(s). Final landforms are to be consistent with and complement the topography of the surrounding region to minimize the visual prominence of the final landforms in the postmining landscape. Final landforms are to incorporate design relief patterns and principles consistent with natural drainage.

The conceptual DCM final landform design (prepared as part of the 2014 Modification EA) has been refined to reflect the actual progress of the DCM at the completion of mining operations. As mining of the Clareval and Weismantel open pits has not be undertaken to the depths modelled in the conceptual final landform design, the changes to the conceptual final landform design are therefore primarily limited to the final voids and immediate surrounds. The only other change to the conceptual final landform is the removal of Auxiliary Dam No. 1, and the reduced size of Auxiliary Dam No. 2 and the MWD.

As required by the Mine Closure Planning Program, numerous technical assessments have commenced based on the refined final landform design, including a Geotechnical Assessment of the final voids, final void water balance and final void water quality review, and a revised site water balance. A stability assessment and erosion modelling will also be required to be undertaken for the final landform design.

8.5.2 Final Void Management

Under the Project Approval, at the cessation of mining, the northern extents of the currently approved DEP include final voids in the Clareval pit and Weismantel pit. A final void water balance and groundwater model was prepared for the DEP EA 2010 and was revised for the Open Pit Modification EA 2014.

The mine closure planning schedule includes several components relating to water management and final voids.

Final Void Design

DCPL is required to rehabilitate the final void to ensure the landform is safe, stable and non-polluting. During the 2019/20 reporting period DCPL engaged an independent consultant to provide advice on the development of a detailed final void design including geotechnical stability and provide recommendations for the reshaping of final highwalls and endwalls. The report provides advice on rehabilitated wall stability and slope design.

The final void design was revised during the previous reporting period to reflect the current mining activities occurring in the Weismantel Pit and incorporate a detailed waste mass balance to guide the requirements for any rehandle and bulk shaping. The final void design aims to minimise the overall extent of the final void as much as is reasonably feasible and within the Project Approval constraints. The final void design will continue to be included in the Annual Rehabilitation Report and Forward Program (ARRFP).

Final Void Water Balance

The final void water balance conducted by Gilbert & Associates (2014) for the DCM indicates the final voids would slowly fill over time and the final water levels in the Clareval open pit and Weismantel open pit would stabilise below the spill levels.

A review of the final void water balance was completed in October 2020 to ensure the water balance incorporates the final landform design and surface water inflows and outflows to/from the final void and provide advice on the predicted post-mining final void equilibrium. HEC were engaged during the 2019/20 reporting period to revise the site water balance and provide advice on the predicted post-mining final void equilibrium level. A further review Final Void Water Balance will be undertaken during the next reporting period conjunction with the review of the post-mining groundwater model.

Final Void Water Quality

A review of the medium to long term water quality predictions of the final void against available monitoring data as prepared by HEC during 2021 to determine the requirement for additional/alternate management measures other than that currently proposed. As indicated above, further revision of these studies has continued during the reporting period. The outcomes of these reviews will be reported in the next AR.

Groundwater model

The groundwater model for the post-mining groundwater system is intrinsically related to the final void water balance. In conjunction with the final void water balance review, SLR has also been engaged to undertake a verification of the site groundwater model in relation to the final landform designs and inform the groundwater seepage rates to the final void. The groundwater model revision was completed in 2020, however the outcomes of this study indicate further revision would be required to achieve satisfactory outcomes for the proposed final landform and final void design.

SLR will undertake a further review a verification of the site groundwater model in relation to the final landform designs and inform the groundwater seepage rates to the final void during the next reporting period.

8.5.3 Water Management

The rehabilitation and post-mining water management strategy is described in the DEP EA 2014.

Site Water Balance

A review of the post-mining site water balance has been prepared by HEC to ensure the water balance incorporates the final landform design. The site water is included in the revised DCM Water Management Plan (2021).

Site water balance reviews are undertaken annually to track performance of the DCM water management system including inflows, outflows and current storage (refer **Section 7.2**). The current site water balance provides the baseline for the development of the post-mining site water balance.

Further review and verification of the post-mining site water balance will be undertaken following completion of the detailed Mine Closure studies.

Water Infrastructure

Consistent with the approved DCM, rehabilitation of water management infrastructure would occur in consultation with regulatory authorities and the community, and considering future local and regional water infrastructure needs. Site water dams (e.g. MWD, Auxiliary Dams) and accompanying upstream diversion structures may be retained for future use. Sediment dams would remain pending long-term acceptable water quality and may be kept for stockwater if suitable. Irrigation infrastructure owned by DCPL would be decommissioned, unless used for post-mining agricultural use.

A detailed plan for the retained water management infrastructure and the decommissioned water infrastructure is included in the DCM RMP.

Further detail regarding the management of the Coal Shaft Creek reconstruction and the Mine Water Dams are included in the sub-sections below.

8.5.4 Coal Shaft Creek Reconstruction

Coal Shaft Creek is required to be reconstructed following the completion of mining activities. The Coal Shaft Creek Reconstruction Plan is described in the DCM Mine Closure Plan and Schedule (Appendix 1 of the Duralie RMP). In accordance with 29(b), Schedule 3 of Project Approval (08_0203), the current proposed design for the post-mining alignment of Coal Shaft Creek has been prepared and is described in the DCM Mine Closure Plan (Appendix 1 of the RMP).

8.5.5 Rehabilitation Resources

Rehabilitation resources refers to all physical resources required to carry out rehabilitation of the DCM, including topsoil, clay, rock and habitat material.

Topsoil resources are managed in accordance with the RMP Section 6.2.4. To ensure suitable and adequate topsoil resources are available for final rehabilitation, a site topsoil balance is undertaken annually and the volume compared to the total remaining disturbed area requiring rehabilitation. Annual reporting of the site soil balance and rehabilitation performance is provided in **Section 8.2** of this report.

Topsoil stripping has now been completed up to the northern extent of both the Clareval pit and the Weismantel pit. DCM currently holds sufficient topsoil resources to completion rehabilitation of the site.

Clay resources will be required for the construction of clay cut-off walls along the southern end of the toe of the waste rock emplacement to reduce direct seepage out of the waste rock emplacement to

negligible levels. Clay resources would also be required for lining of the reconstructed Coal Shaft Creek and potentially for the construction of other water management features. Details are included in the CSC Reconstruction Plan. A clay balance will be developed to identify to current clay resources available and the estimate clay volumes required for rehabilitation.

8.5.6 Infrastructure Decommissioning & Demolition

The mine closure planning program includes consideration for infrastructure decommissioning including:

- Identify and remove/demolish all non-active infrastructure which is not required for the remainder of processing activities.
- Undertake consultation to confirm any alternative use for retained infrastructure (i.e. rail loop, haul roads, access tracks and dams) post-mining.

A list of the site assets/infrastructure designated for decommissioning and rehabilitation is included in the RMP. Additionally, a removal strategy and decommissioning schedule is included in the RMP.

8.5.7 Contaminated Lands Assessment

A contaminated land assessment will be completed during the next reporting period as operations at DCM have now ceased. The assessment would include, but not be limited to, decontamination of areas such as those impacted by carbonaceous material (e.g. coal spillage, coal storage), by hydrocarbon spillage (e.g. workshops, fuel storage areas) or by sedimentation (e.g. dams which have directly received pit water).

The Contaminated Lands Assessment will provide recommendations for the development of a Remediation Action Plan, that will inform future contamination clean-ups.

All contamination areas will be remediated as recommended in the Remediation Plans, which are expected to involve excavation of the contaminated materials and disposal at an off-site licensed facility or treated on-site subject to relevant approvals being obtained. The remediation of any identified contaminated land would be undertaken in conjunction with the Infrastructure Decommissioning Strategy. Rehabilitation of the area would be undertaken in accordance with the rehabilitation objectives for the Infrastructure Area Domain (i.e. revegetated to native ecosystem), or domain applicable to the area.

8.5.8 EMPs, Post-Closure Monitoring and Maintenance Program

The development of the post-closure monitoring and maintenance program is described in Section 11 of the DCM Mine Closure Plan and Schedule (RMP, Appendix 1).

DCPL have revised EMPs to reflect the current stage of operations and to describe anticipated mine closure activities and describe the change to environmental impacts, mitigation measures and monitoring programs at the DCM for the mine closure phase.

During the reporting period, DCPL also prepared a new Rehabilitation Management Plan (RMP) consistent with the requirements of the Resources Regulator Operational Rehabilitation Reform. The new RMP incorporates a Mine Closure Plan for the DCM consistent with the Mine Closure Planning Program described in Section 8 of the MOP.

DCPL will refine its monitoring and maintenance programs in consultation with the relevant government agencies during the mine closure planning phase. Amendments to the monitoring programs during the post- closure phase will be reflected in further environmental management plan revisions. It is expected that the residual monitoring programs will be undertaken for approximately ten years following mine closure.

Post-closure maintenance activities will continue until the specific completion criteria has been met and confirmation has been received from the relevant authority.

8.5.9 Stakeholder Consultation, Community & Human Resources Strategies

The Mine Closure Planning Program includes requirements for the development of the following strategies:

- Stakeholder Consultation Strategy
- Human Resources Strategy

The above strategies are described conceptually in Section 4.2 of the RMP. The strategies have been further developed and incorporated into the Mine Closure Plan and Schedule. DCPL will continue to consult with relevant government agencies and the community throughout the mine life and during mine closure.

9.0 COMMUNITY RELATIONS

DCPL is committed to a policy of regular liaison with the local community and strives to maintain positive relationships with stakeholders. DCPL's community objectives aim to:

- Ensure employees and contractors are informed about DCPL's policies and are made aware of their environmental and community responsibilities in relation to DCPL's activities;
- Inform the community of DCPL's activities and consult with the community in an open and honest fashion in relation to DCPL's projects; and
- Address complaints/conflicts and consult to achieve mutually acceptable outcomes.

Dissemination of information to the local community and relevant agencies regarding DCPL, its progress and environmental management performance will be achieved via the following communication and reporting mechanisms.

- Community Consultative Committee
- Duralie Coal Website
- Duralie Coal Mine Annual Review
- Community Information and Complaints Line

9.1 Community Engagement Activities

Yancoal Australia Ltd is committed to making a positive contribution in the areas in which it operates. To help facilitate this commitment Stratford Coal Pty Ltd have established the Community Support Program to provide assistance to local initiatives within the local area in which they operate. The aim of the Community Support Program is to help benefit a diverse range of community needs such as education, environment, health, infrastructure projects, arts, leisure and cultural heritage.

The Stratford Coal Community Support Program has granted over $848,000 since commencing in 2010 and during 2022 a total of $81,387 in grants was approved. The community groups to receive grants in 2022 are listed in **Table 9.1**.

Table 9.1 – Community Grants

Community Support Program 2022 Recipients	Project Description
Barrington Public School P&C	Canteen kitchen upgrade - new freezer
Stroud & District Men's Shed Inc	Men's Shed Machine upgrade/replacement - table saw
Stroud Show Association	2022 Stroud Show - Major Sponsor
Hunter New England Local Health District - Gloucester Community Health	Leisure Resources & Outdoor Furnishings
Booral Rural Fire Brigade	Cat 1 Fire Truck Safety Curtains
Stroud Community Lodge Inc	Replacement of 2 x Air Chairs (for pressure relief)
Stroud Show Association 2	Purchase/install of a multipurpose building data projector
Stroud Show Association 3	Purchase of a multipurpose building floor scrubber
Gloucester Worimi First People Aboriginal Corporation	Weaving resources to establish school program
Stroud Neighbourhood Children's Cooperative	Improved visual presence in community by the purchase of signage, uniforms and information to the community
Gloucester High School P&C Association	Park bench seating for students
Gloucester Public School P & C Assoc	Local heritage murals in playgrounds
St Joseph's Primary School	Greening our school environment - by construction of green space with native planting
Rystem Engagement MidCoast Inc	MidCoast Science & Engineering Challenge and Discovery Days 2022
Gloucester Agricultural, Horticultural & Pastoral Association	2022 Gloucester Show - Major Sponsor - Activities for the younger audience
Stroud Public School P&C Association	Secure technology Laptop charging trolley x 1
Stroud Public School	Secure technology Laptop charging trolley x 2
Stroud Rodeo Association	2022 Stroud Rodeo and Campdraft - Major Sponsor
Gloucester Junior Rugby League	Start-up fees for Gloucester Junior Rugby League Club

Stratford Coal Pty Ltd have also continued their commitment to education and training in the Gloucester region through Stratford Coal's Education Support Program, providing much needed funding for the next generation of young students. The Education Support Program is managed by an independent committee and the funds distributed by MidCoast Council. In 2022, $41,000 has been

allocated in funding to help support local students and businesses in university degrees, TAFE courses and apprenticeships.

Since the commencement of mining in 1995, Stratford Coal has contributed more than $830,000 to locally based community and training initiatives via the Education Support Program. During that time, the funding has support over 220 tertiary students, 140 apprentices and 60 businesses.

Yancoal and Stratford Coal have continued their partnerships with:

- The Clontarf Foundation -Chatham Academy
- QLD University of Technology
- Westpac Rescue Helicopter.

9.2 Community Consultative Committee

The Duralie Community Consultative Committee (CCC) was established in 2003 and operates under the guidance of the NSW DPIE. Meetings are held 6-monthly and provide a forum for open discussion between the community, Council, the Company and other stakeholders on issues relating to the mine's operations, environmental performance and community engagement.

The Community Consultative Committee (CCC) for the DCM is currently comprised of:

- An independent Chairperson;
- Three (3) local community representatives;
- Two (2) local government representatives (MidCoast Council); and
- Two (2) DCPL representatives.

The CCC was formed in accordance with Schedule 5, Condition 5 of the Project Approval for the Duralie Extension Project. The Committee operates in such a manner as to generally satisfy the Community Consultative Committees Guidelines for State Significant Projects (Department of Planning, 2016) and to the satisfaction of the Secretary of the DPIE.

In 2022 CCC meetings have reverted to being held biannually in line with the completion of mining operations. Three CCC meetings were held during the reporting period in August 2021, November 2021 and May 2022. No site tours were scheduled for the August and November 2021 meetings due to covid restrictions. A reduced site tour was undertaken following the May 2022 meeting.

Items raised and/or discussed during the CCC meetings held during the reporting period include but are not limited to:

- General environmental management & monitoring, including air quality, noise, surface water and groundwater
- Water management
- Community complaints
- Biodiversity management & Duralie Nest Box program
- Broader community engagement and the CCC's print media articles
- Yancoal land management, maintenance and leasing
- Yancoal community support program

The CCC meeting agendas, presentations and minutes are available on the Duralie Coal website (www.duraliecoal.com.au).

An Annual Report for the Duralie Coal CCC was prepared by the Chair and submitted to DPIE on 15 March 2022 (**Appendix 7**).

9.3 Environmental Complaints

DCPL manages complaints received at the DCM in accordance with the protocol established in the Environmental Management Strategy (EMS). DCPL aims to address all complaints/conflicts and consult to achieve mutually acceptable outcomes.

Complaints may be received in any form. DCPL operates a dedicated community information and complaints hotline (1300 658 239) 24 hours per day. The number is advertised within the Sensis White Pages Directory (Newcastle), a local telephone directory (Pink Pages) and in the local newspapers (Gloucester Advocate) on a six-monthly basis.

Complaints (by category) received by DCPL over the last 5 reporting years are shown in **Table 9.2**.

Table 9.2 – Community Complaints Summary

Complaint Category	2017/18	2018/19	2019/20	2020/21	2021/22
Noise	0	0	0	0	0
Blasting	0	0	0	0	0
Air Quality	1	4	0	0	0
Water	0	0	0	0	0
Lighting	0	0	0	0	0
Visual	0	0	0	0	0
Train	0	0	0	0	0
Other	0	0	0	0	1
Total Complaints	**1**	**4**	**0**	**0**	**1**

One complaint was received during the 2021/22 reporting period relating to the DCM operations. The one complainant listed multiple concerns including dust, lighting, noise and blasting.

9.4 Employment Status and Demography

At the end of the reporting period (i.e. June 2022), the total number of FTE's employed at the DCM was 10. During the reporting period two Environment and Community representatives were employed and shared with the nearby Stratford Mining Complex.

On the basis of a review of employees' living location, 40% of mine employees resided within the greater local area (defined as being bounded by Stroud, Gloucester and Dungog).

10.0 INDEPENDENT ENVIRONMENTAL AUDIT

An Independent Environmental Audit (IEA) of the DCM was not required during the reporting period. The next IEA is scheduled to be undertaken prior to 31 December 2023.

The previous IEA reports for the DCM along with the responses to the recommendations are available on the Duralie Coal website at http://www.duraliecoal.com.au.

A status update on DCPL's progress against the 2020 IEA recommendations are included in **Appendix 9**.

11.0 INCIDENTS AND NON-COMPLIANCE

Activities at the DCM continue to be carried out in accordance with the conditions of Project Approval 08_0203, ML 1427, ML 1646 and EPL 11701.

A protocol for managing incidents and non-compliances is included in the DCM Environmental Management Strategy (EMS). A statement of compliance is included in **Section 1** of this report.

During the reporting period, there were three non-compliances with the Project Approval 08_0203 and EPL 11701 during the reporting period (see **Section 1, Table 1.3)**.

As reported in previous AR, an Official Caution Notice was issued by Resources Regulator on 20 August 2021 regarding alleged failures to conduct mining operations at the Duralie Coal Mine (DCM) in compliance with the DCM Mining Operations Plan (MOP). Specifically, the commitments set out in Table 13 in Section 8 of the MOP were not completed in the required timeframe. Following on from this a Section 240 Notice was issued by the Resources Regulator on 31 August 2021. The Mining Act Section 240 Notice gives directives for mine closure planning and also relates to the recent Landform Establishment TAP. Mine closure planning directives were established for the current reporting period and were complied with by DCPL.

All incidents/non-compliances at the DCM are reported and recorded in Intelex compliance management system. The severity of the incident will determine the level of investigation required. The reporting of incidents to regulators is conducted in accordance with the EMS, Condition 6, Schedule 5 of PA 08_0203 and the POEO Act and PIRMP where applicable.

Compliance recommendations identified in the IEA 2020 are referred to separately in **Section 10** and **Appendix 9** of this report.

12.0 ACTIVITIES PROPOSED IN THE NEXT AR PERIOD

DCPL will continue rehabilitation and mine closure activities in accordance with Project Approval 08_0203 and the relevant Environmental Management Plans for DCM.

Condition 5, Schedule 2 of PA 08_0203 authorises mining operations to be carried at the DCM until 31 December 2021. Under this approval, DCPL is required to rehabilitate the site and carry out additional undertakings to the satisfaction of both the Secretary and the Resources Regulator. Consequently, PA 08_0203 will continue to apply in all other respects, other than the right to conduct mining operations, until the rehabilitation of the site and these additional undertakings have been carried out satisfactorily.

The following key activities at the DCM are proposed within in the next 12 months:

- Infrastructure decommissioning and demolition
- Bulk rehandle, shaping and rehabilitation earthworks (which may include final blasting to achieve final landform design), including PAF rehandling
- Growth medium establishment activities including topsoil spreading
- Revegetation of the final landform in accordance with the DCM RMP
- Removal of all mining fleet, major earthworks fleet and drilling fleet from the DCM
- Review and refinement of monitoring programs and environmental management plans.

Additionally, during the next reporting period, DCM proposes to plant two new tree screens along the Bucketts Way extending down Durallie Road and at the northern end of the Weismantel Pit. The addition of the new tree screens would help reduce impacts to visual amenity for road users of The Bucketts Way, Durallie Road and Martins Crossing Road. Once the tree screen is matured and established, DCM would remove the existing visual screen originally installed as part of the Project Approval.

13.0 REFERENCES

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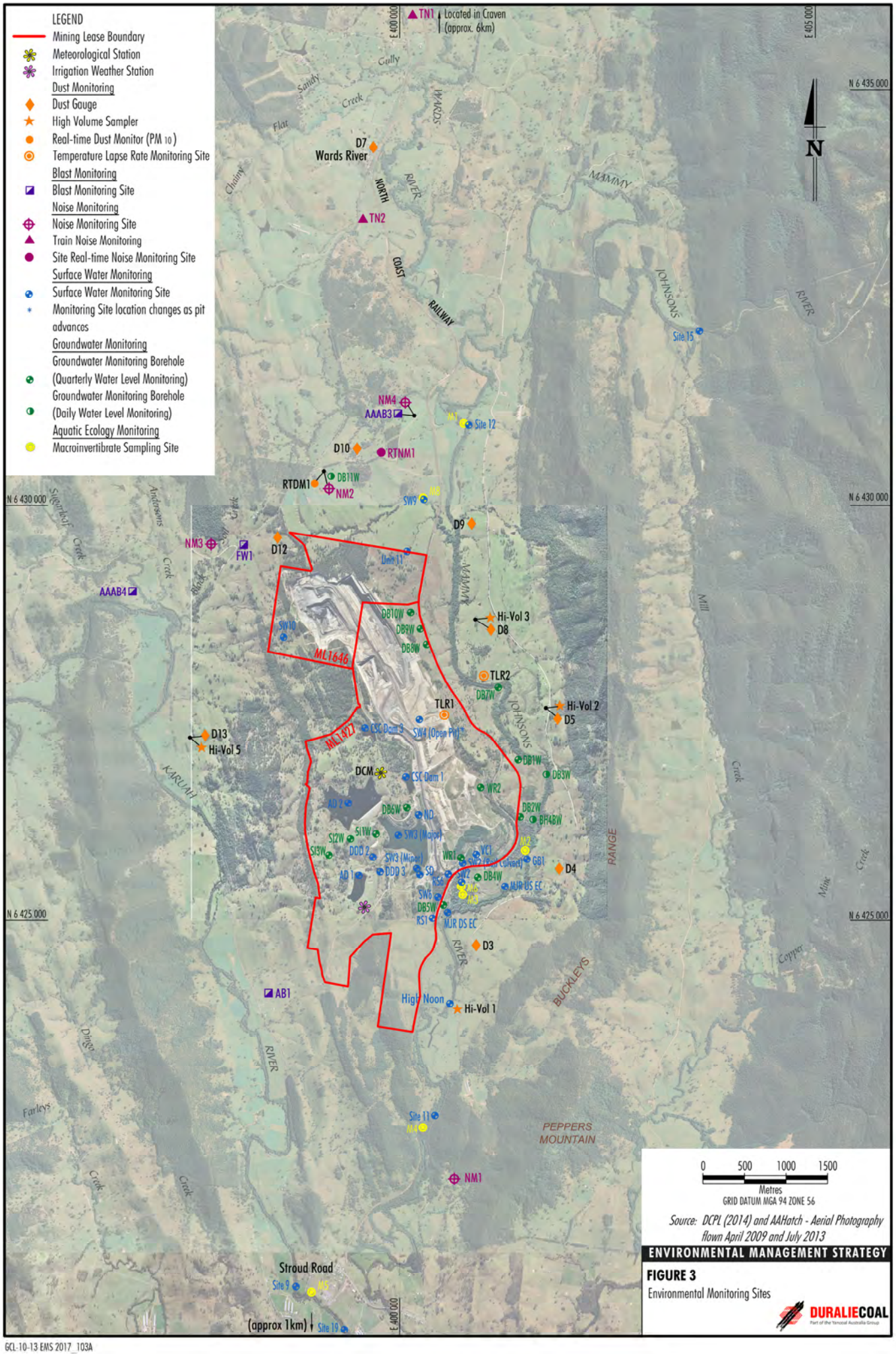
APPENDIX 1

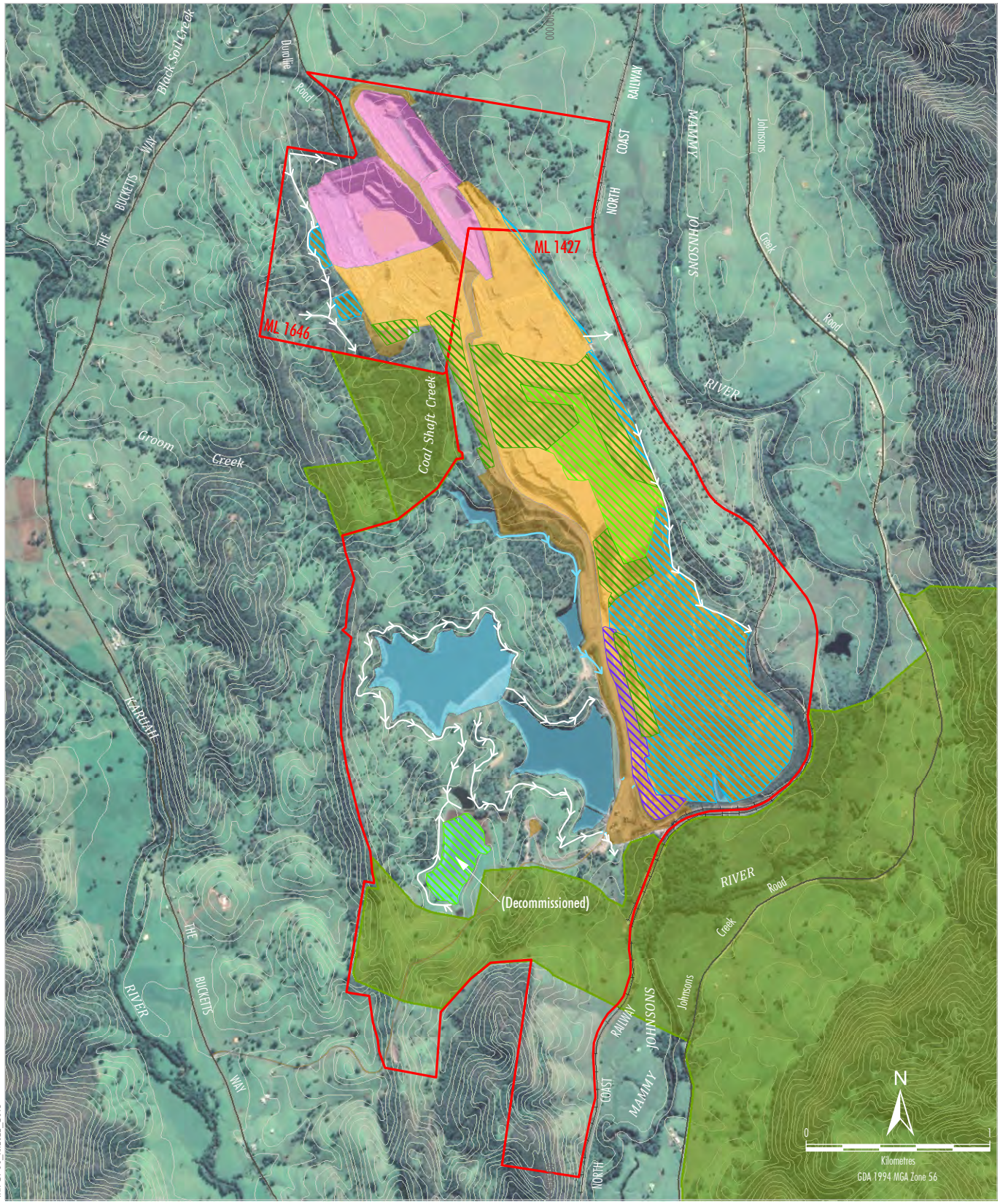
Regional Location
Site General Arrangement
Environmental Monitoring Locations
Mining and Rehabilitated Areas

GCL-10-13 EMS 2017_101A

GCL-10-13 EMS 2017_102A



GCL-10-13 EMS 2017_103A



YAN-21-36_AR2022_201B

LEGEND

- Mining Lease Boundary
- Up-catchment Diversion
- Culvert
- Indicative Coal Shaft Creek Diversion

Mining Domains

- Infrastructure (1)
- Water Management Area (2)
- Waste Emplacement Area (3)
- Final Void/Open Pit (4)
- Offset Area (5)

Rehabilitation Phase - Final Land Use Domain

- Landform Establishment - Native Ecosystem
- Ecosystem and Land Use Establishment - Agricultural Grazing
- Ecosystem and Land Use Establishment - Native Ecosystem
- Ecosystem and Land Use Development - Native Ecosystem

Source: © NSW Spatial Services (2019)
Orthophoto: Google Imagery (April 2020)

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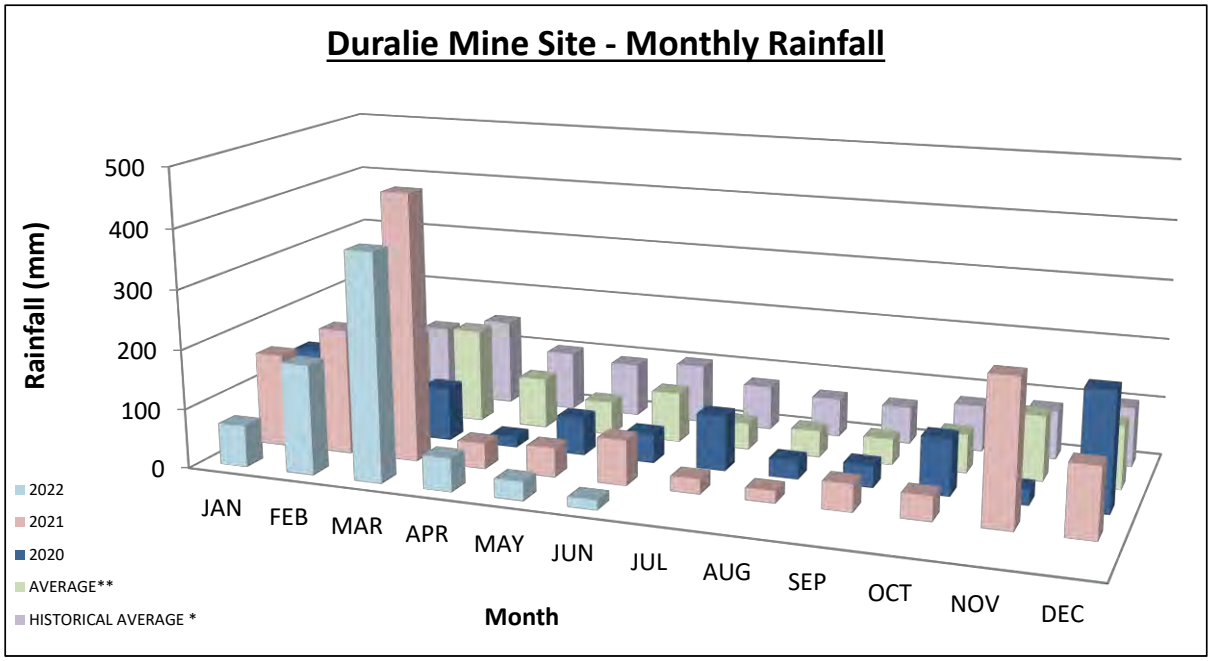
DURALIE COAL MINE 2022 ANNUAL REVIEW

Mining and Rehabilitation Areas

Figure 4

APPENDIX 2

Meteorological Monitoring



*Stroud + Duralie 1889 to 2010 (inclusive)
**Duralie Mine 2002 – 2022 (inclusive)

Figure 2-1: Monthly Rainfall for 2020 to 2022 and Historical Averages

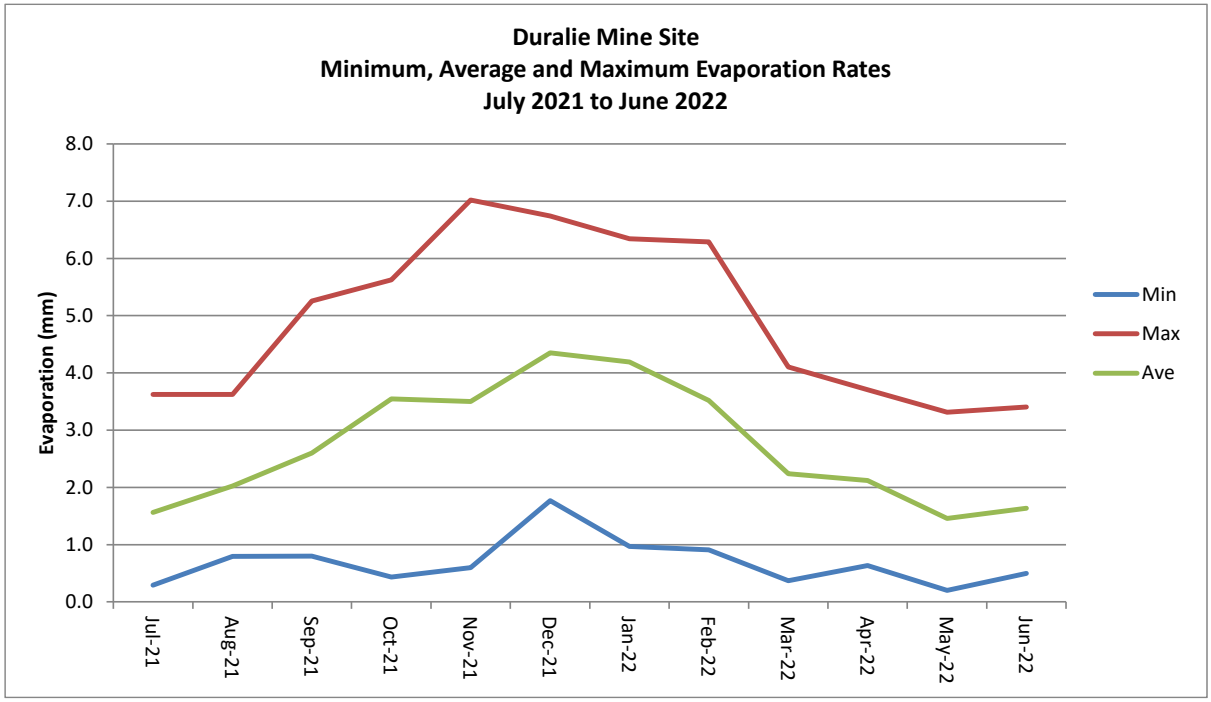


Figure 2-2: Minimum, Maximum and Average Evaporation Rates During the Reporting Period

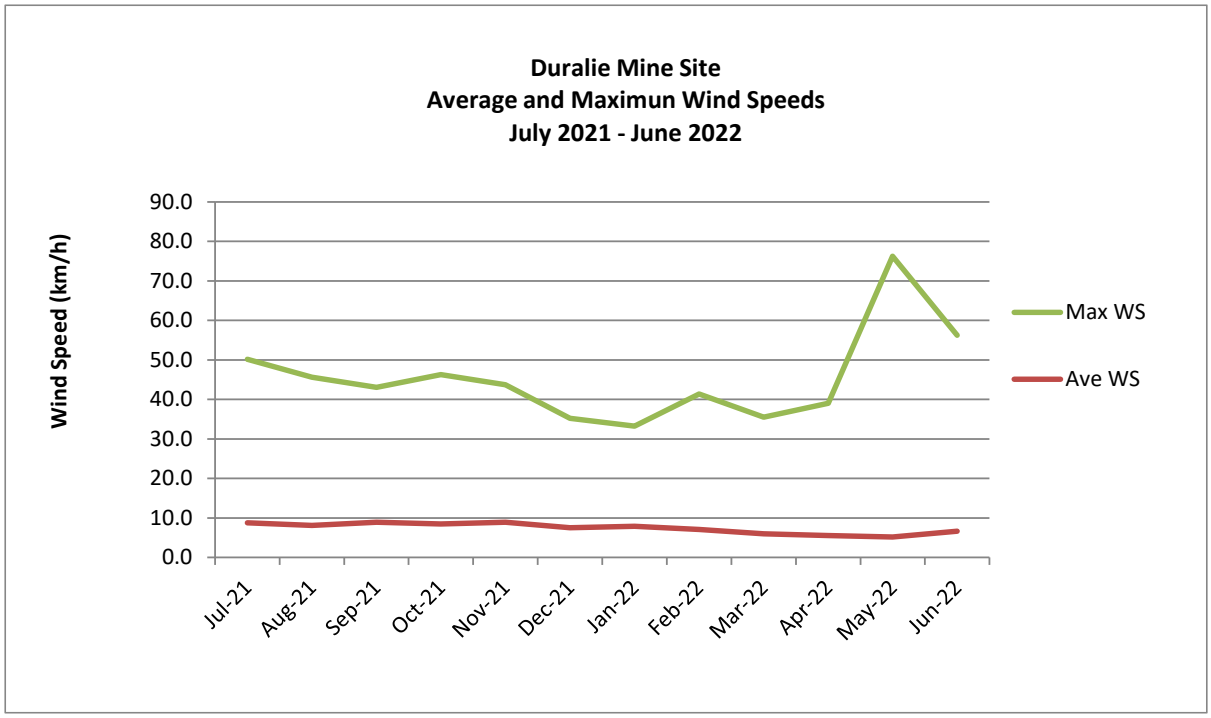


Figure 2-3: Maximum and Average Wind Speeds During the Reporting Period

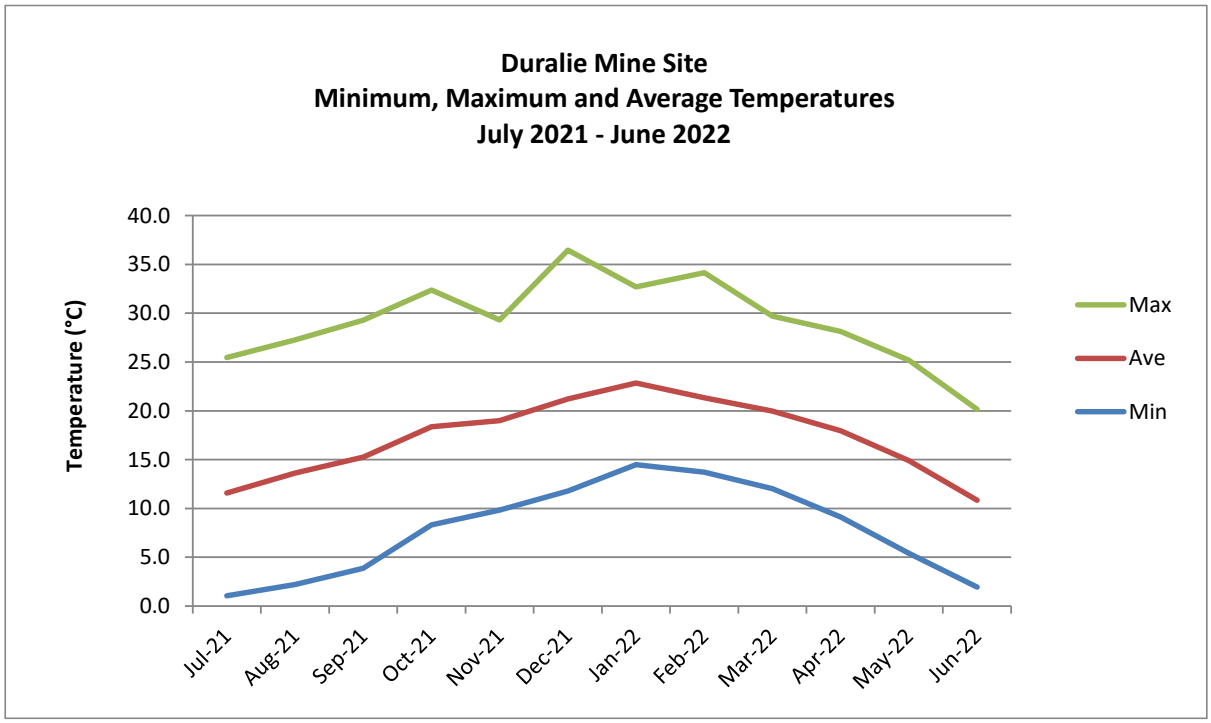


Figure 2-4: Minimum, Maximum and Average Temperatures During the Reporting Period

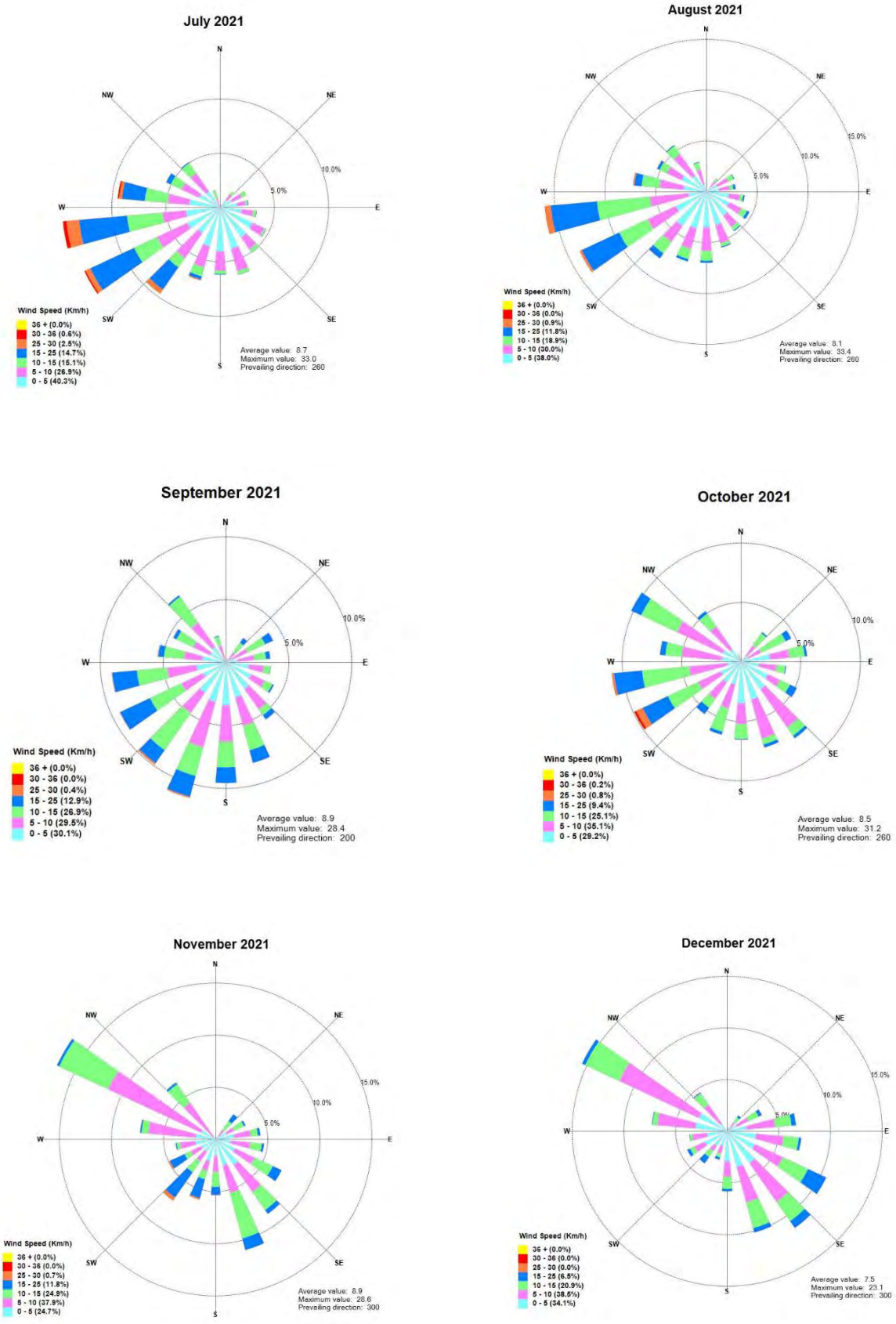


Figure 2-5: Monthly Windroses showing wind direction, speed and frequencies

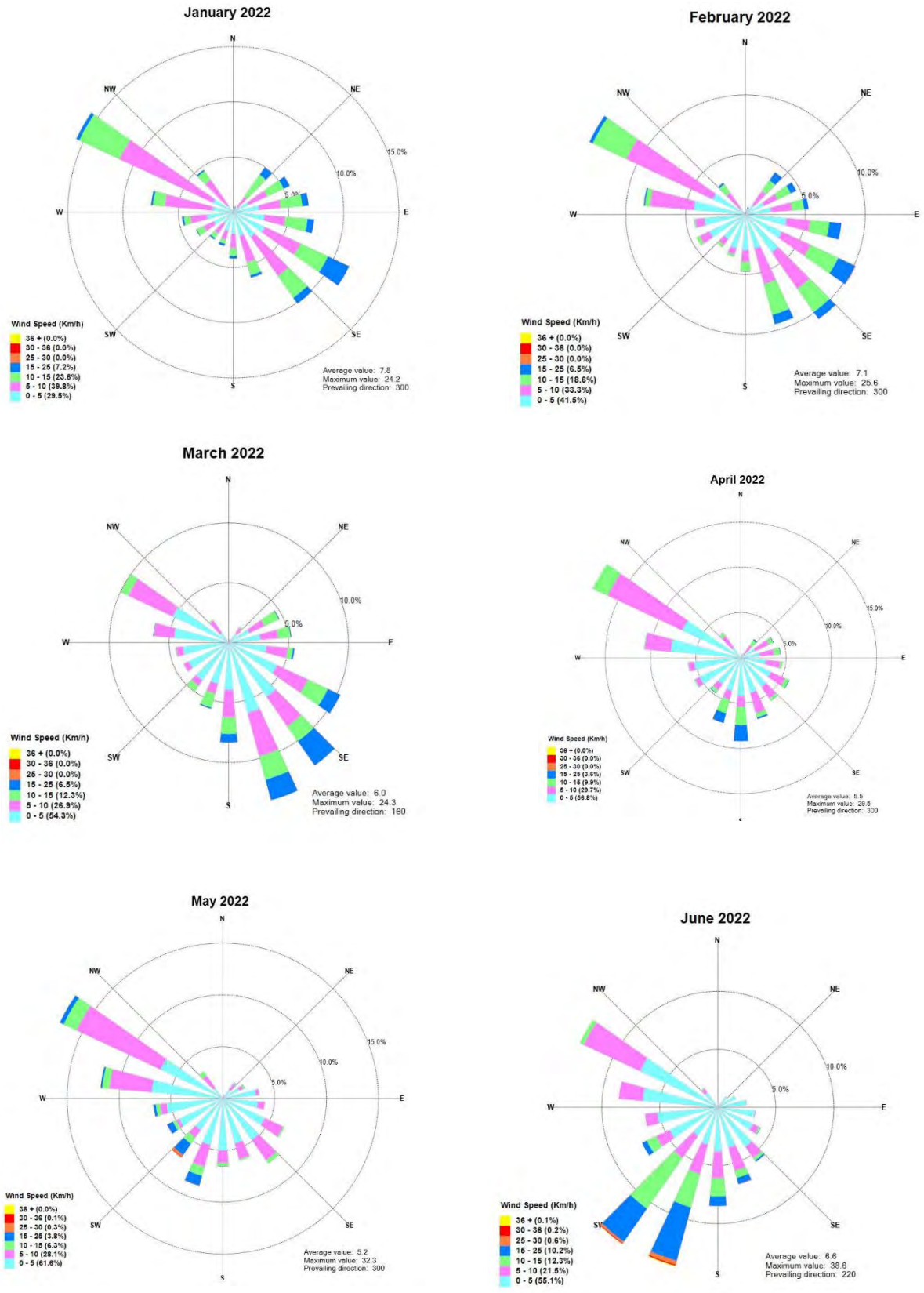


Figure 2-5 (continued): Monthly Windroses showing wind direction, speed and frequencies

APPENDIX 3

Air Quality Monitoring

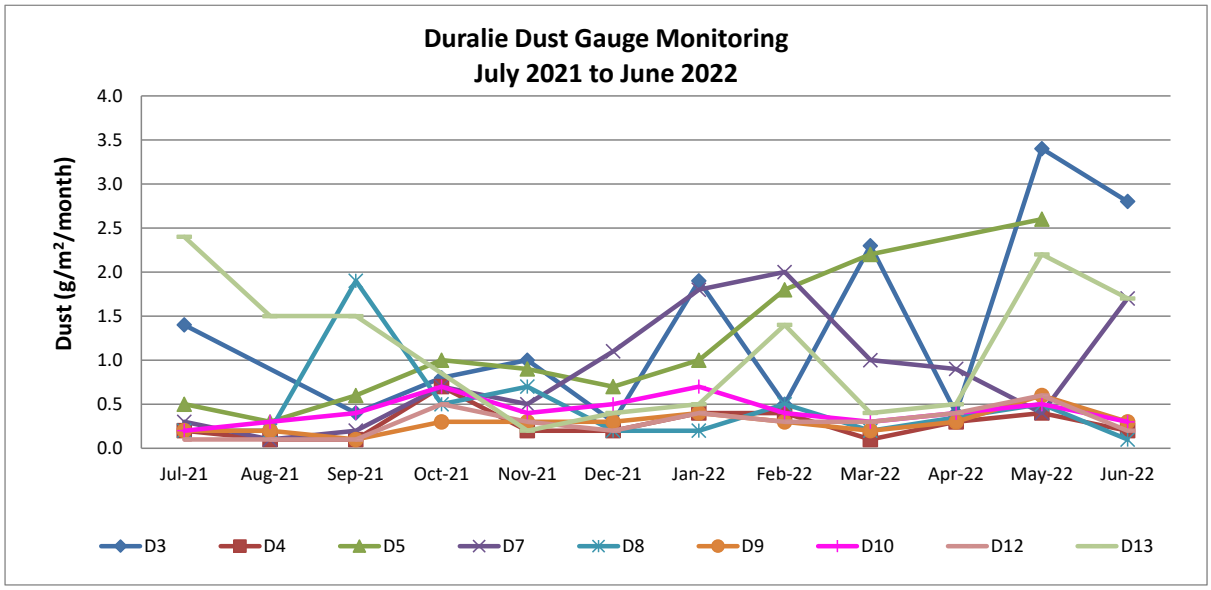


Figure 3-1: Monthly Depositional Dust Monitoring Results (minus contaminated results) during the Reporting Period

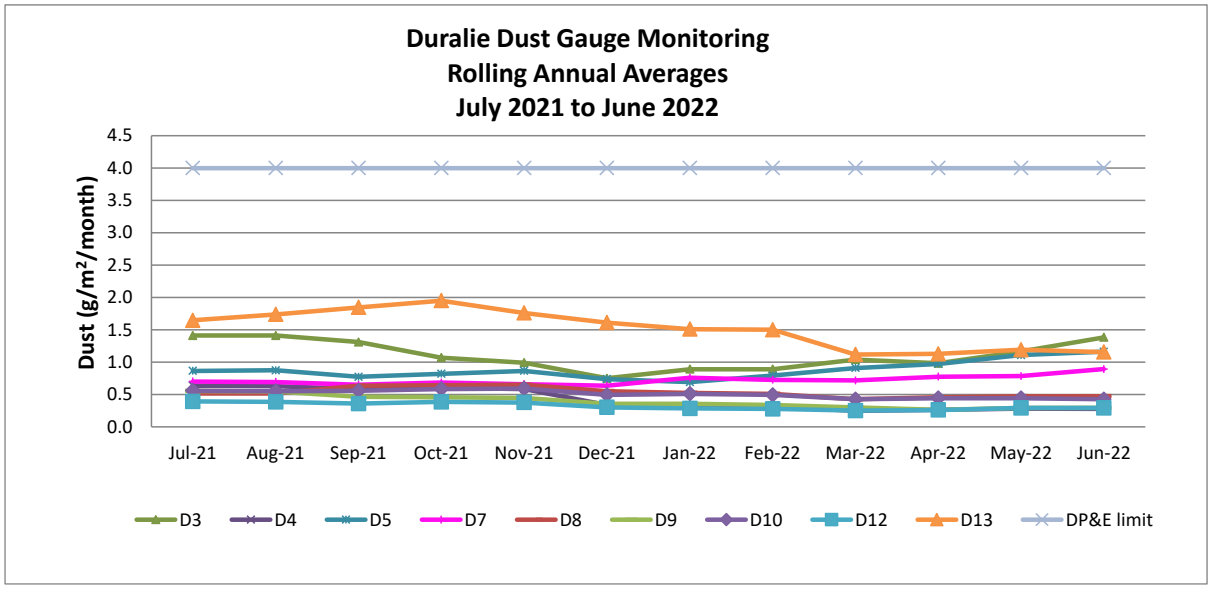


Figure 3-2: Rolling Annual Average Depositional Dust Monitoring Results (minus contaminated results) during the Reporting Period

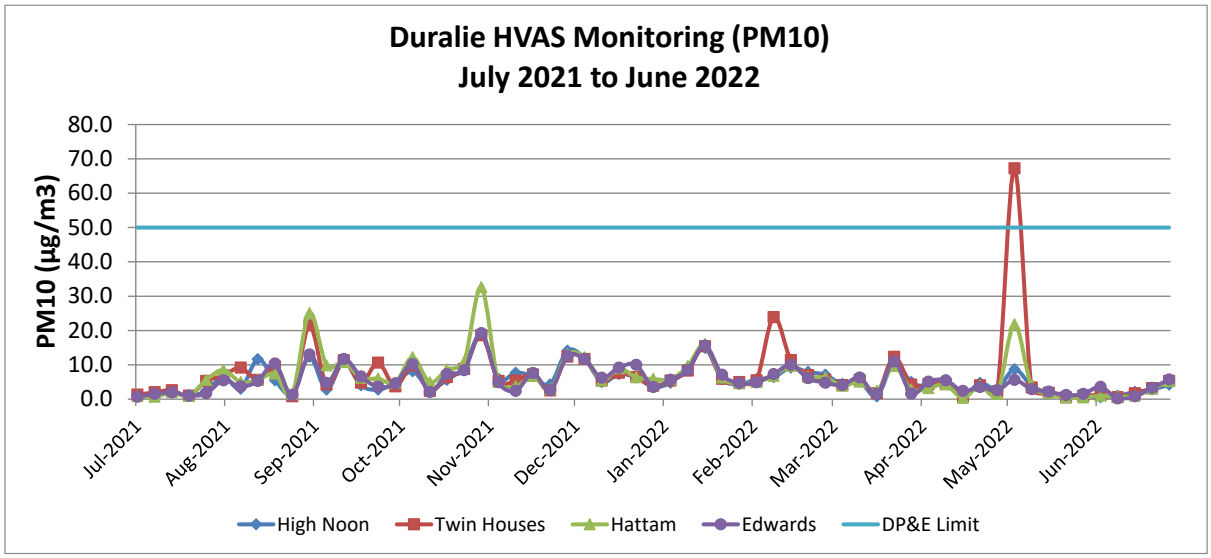


Figure 3-3: High Volume Air Sampling (PM_{10}) Results during the Reporting Period

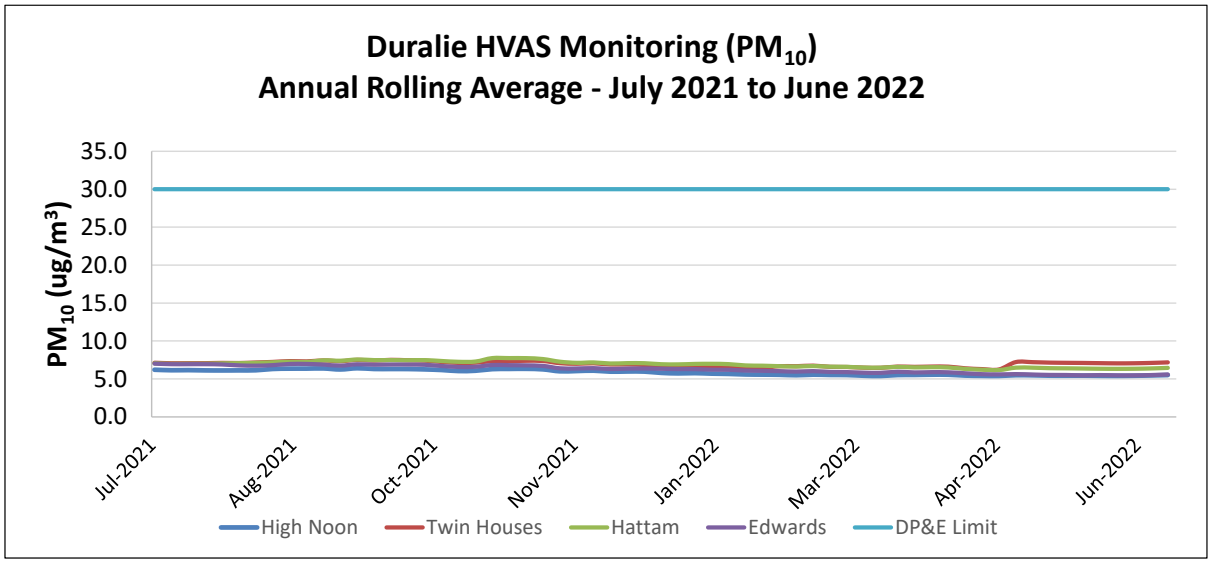


Figure 3-4: Rolling Annual Average HVAS (PM_{10}) Results during the Reporting Period

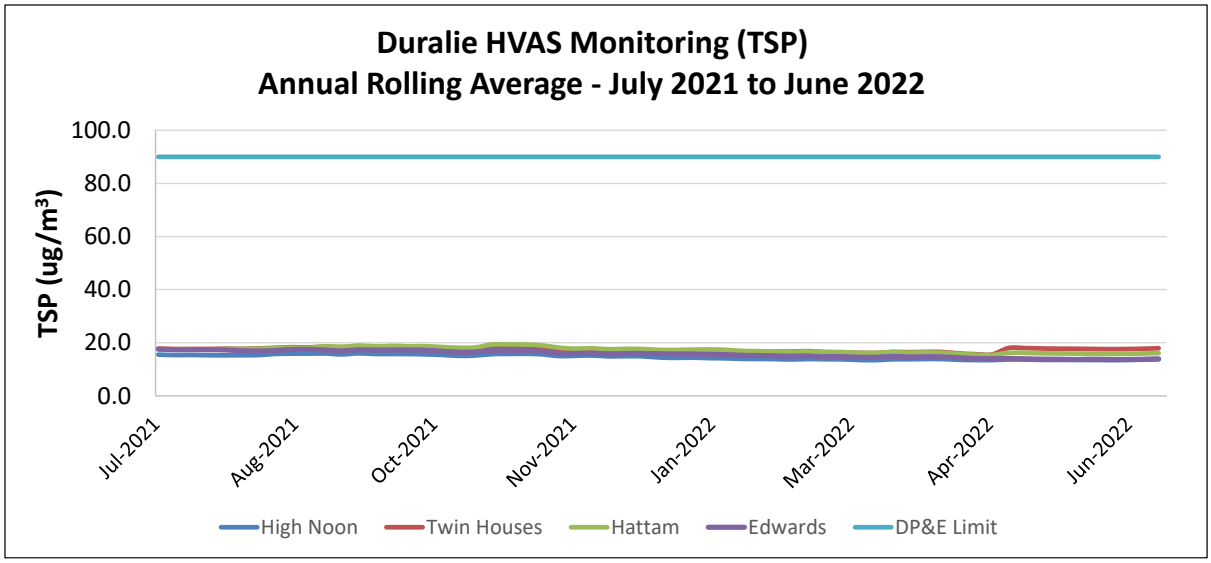


Figure 3-5: Rolling Annual Average HVAS (TSP) Results during the Reporting Period

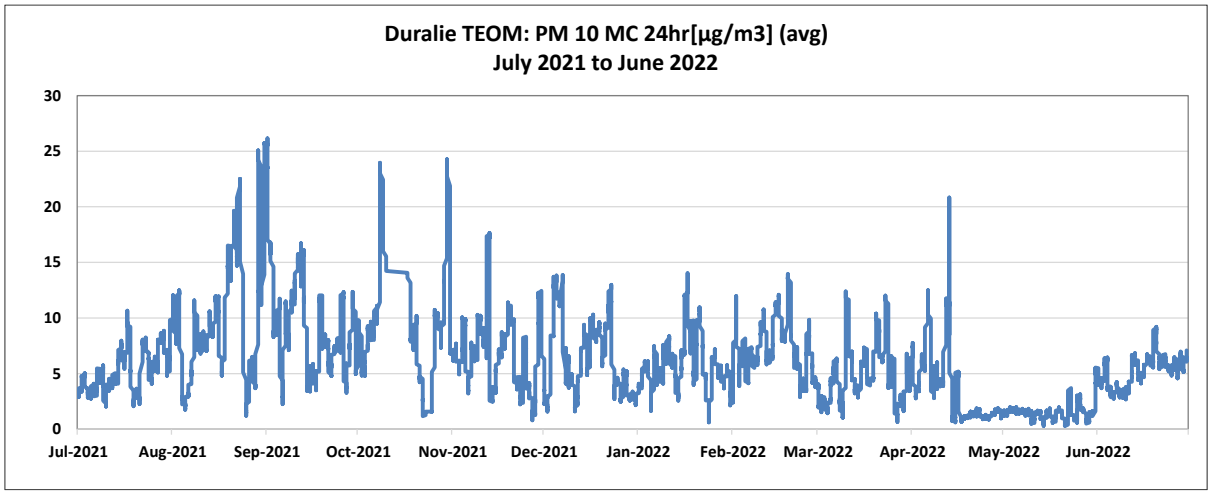


Figure 3-6: Real Time Dust Monitoring (TEOM PM_{10}) Results during the Reporting Period

APPENDIX 4

Surface Water & Groundwater Monitoring Results

Surface Water

SW2 - Coal Shaft Creek **EPL 11701 Point 30**

Date	Category	Comment	ph	EC	Turbidity	DO	TSS	Alkalinity (as $CaCO_3$)	Acidity (as $CaCO_3$)	SO4	Cl	Ca	Mg	Al	Mn	Zn	Fe	Cu
				uS/cm	NTU	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
10-Jul-21	Discharge	brown	7.6	346	45	**81**	35	52	4	58	28	16	11	1.25	0.064	0.014	1.59	<0.001
11-Jul-21	Discharge	Steady flow, slightly turbid, orange	7.8	264	29		6											
12-Jul-21	Discharge	Slow flow, slightly turbid, light brown	7.6	344	19		<5											
13-Jul-21	Discharge	Slow flow, clear, light brown	7.6	348	17		<5											
30-Aug-21	Monthly	brown/green	7.2	485	6	**55**	<5	90	17	66	65	20	16	0.05	0.169	<0.005	1.22	<0.001
15-Sep-21	Discharge	Slow flow, turbid, brown	7.6	360	90	**81**	34	55	7	67	30	16	11	2.15	0.078	0.019	1.84	0.002
13-Oct-21	Discharge	Slow flow, slightly turbid, light brown	7.5	326	51	95	10	56	8	58	26	14	10	2.62	0.069	0.02	2.35	0.002
12-Nov-21	Discharge	Slow flow, slightly turbid, light brown	7.3	400	45	**85**	16	60	9	56	98	15	13	1.85	0.084	0.015	1.68	0.002
22-Nov-21	Discharge	brown	**8.4**	**672**	9		<5											
3-Dec-21	Discharge	Slow flow, slightly turbid, light brown	7.3	289	22	85	<5	62	8	34	27	14	11	1.53	0.087	0.018	1.85	0.001
10-Dec-21	Discharge	Slow flow, turbid, light brown	7.6	175	97		39											
20-Jan-22	Discharge	brown	7.1	349	16	**63**	12	113	6	29	33	16	12	0.14	0.346	0.008	1.54	**0.004**
24-Feb-22	Discharge	brown	7.9	285	53	97	22	68	2	65	23	18	14	1.06	0.069	0.028	1.19	<0.001
24-Mar-22	Discharge	brown	7.1	172	47	92	36	36	6	36	13	9	7	1.44	0.151	0.044	2.01	**0.017**
8-Apr-22	Discharge	Slow flow, slightly turbid, brown	7.2	191	46		15											
24-Apr-22	Discharge	Slow flow, slightly turbid, light brown	**7.0**	196	25	**50**	<5	41	10	25	21	11	9	1.07	0.124	0.011	2.11	<0.001
30-May-22	Monthly	Steady flow, clear, light brown	**8.0**	236	19	109	5	12	3	8	39	8	5	0.22	0.012	<0.005	0.62	<0.001
29-Jun-22	Monthly	Trickle flow, clear, clear	7.4	312	8	**76**	<5	72	2	37	41	14	11	0.05	0.303	<0.005	1.64	<0.001
*Water Quality Trigger			7.1 - 7.9	544	119	85 - 110%	80							3.02		0.064		0.003

Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).** ***"Gilberts & Asscocistes 2011 -
Development of Water Quality Trigger Levels for the Duralie Extension Project".

SW2 RC - Coal Shaft Creek at Rail Siding Culvert (Entrance)

Date	Category	Comment	ph	EC	Turbidity	DO	TDS	TSS	Hardness	Alkalinity $CaCO_3$)	Acidity $CaCO_3$)	SO4	Cl	Ca	Mg	Al	Mn	Zn	Fe	CO3 $CaCO_3$)	Bicarb (as $CaCO_3$)	BOD	Na
				uS/cm	NTU	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
10-Jul-21	Discharge Event	teady flow, slightly turbid, brow	7.9	279	49	98.5	179	12	70	48	3	43	23	13	9	1.83	0.019	0.025	2.13	<1	48	2	25
30-Aug-21	Monthly	Trickle flow, clear, clear	7.8	419	2.23	**113.6**	268	<5	109	87	4	62	40	19	15	0.06	0.026	0.011	0.23	<1	87	<2	42
15-Sep-21	Discharge	Steady flow, turbid, light brown	7.7	281.5	56.4	99.1	180	17	70	42	7	66	21	13	9	1.78	0.021	0.028	1.65	<1	42	<2	28
13-Oct-21	Discharge	ady flow, slightly turbid, light brd	**8.0**	336	31.4	101.8	215	6	76	59	6	55	27	14	10	1.66	0.02	0.028	1.48	<1	59	<2	31
12-Nov-21	Discharge	Steady flow, turbid, brown	**8.0**	361.7	82.9	100.8	231	38	84	54	5	61	21	14	12	2.35	0.042	0.043	1.9	<1	54	3	29
3-Dec-21	Discharge	ady flow, slightly turbid, light brd	7.7	271	19.7	106.4	173	5	74	53	2	34	26	13	10	1.41	0.029	0.025	1.79	<1	53	<2	26
20-Jan-22	Discharge	Trickle flow, clear, light brown	7.6	427.4	18.52	94.7	274	10	116	94	9	80	34	20	16	0.8	0.172	0.018	1.05	<1	94	<2	44
24-Feb-22	Discharge	ady flow, Slightly turbid, light brd	7.9	289	52.4	94.8	185	23	98	67	6	67	24	18	13	1.13	0.063	0.026	1.19	<1	67	<2	35
24-Mar-22	Discharge	st flow, slightly turbid, light brov	7.4	183.3	51.7	96.5	117	40	54	36	2	37	13	10	7	1.84	0.159	0.036	2.34	<1	36	<2	17
24-Apr-22	Discharge	Slow flow, slightly turbid, brown	7.8	226.5	48.9	105.9	145	**164**	76	51	4	46	18	14	10	**3.13**	1.29	**0.136**	5.49	<1	51	<2	18
30-May-22	Monthly	Trickle flow, clear, clear	**8.3**	256.5	3.88	**113.2**	164	<5	60	38	9	26	20	11	8	0.22	0.03	0.011	0.74	<1	38	<2	21
29-Jun-22	Monthly	Trickle flow, clear, clear	7.8	299.3	9.49	104.2	192	<5	74	57	1	44	32	13	10	0.13	0.066	0.009	0.77	<1	57	<2	30
*Water Quality Trigger			7.1 - 7.9	544	119	85 - 110%		80								3.02		0.064					

Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).** ***"Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

SW2 RC - Coal Shaft Creek at Rail Siding Culvert (Entrance)

Date	As	Ba	Cd	Cr	Cu	Pb	Mo	Ni	Se	Ag	U	B	Hg	F	NH3 (as N)	NO2 (as N)	NO3 (as N)	N	P
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
10-Jul-21	<0.001	0.014	<0.0001	0.001	<0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.03	0.7	0.04
30-Aug-21	<0.001	0.014	<0.0001	<0.001	<0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	<0.01	0.4	<0.01
15-Sep-21	<0.001	0.018	<0.0001	<0.001	0.001	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.04	0.6	0.03
13-Oct-21	<0.001	0.015	<0.0001	<0.001	0.002	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	<0.01	0.8	0.03
12-Nov-21	<0.001	0.02	<0.0001	<0.001	0.002	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.02	1	0.05
3-Dec-21	<0.001	0.016	<0.0001	0.001	0.001	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	<0.01	0.8	0.03
20-Jan-22	0.002	0.02	0.0002	<0.001	0.002	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.07	0.7	0.03
24-Feb-22	<0.001	0.018	<0.0001	<0.001	<0.001	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.22	0.5	0.01
24-Mar-22	<0.001	0.02	<0.0001	0.002	0.001	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	<0.01	<0.01	0.38	1.2	0.07
24-Apr-22	0.001	0.046	<0.0001	0.002	0.003	0.002	<0.001	0.004	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.04	1.1	**0.14**
30-May-22	<0.001	0.009	<0.0001	<0.001	0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	0.03	<0.01	0.02	0.5	<0.01
29-Jun-22	<0.001	0.012	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.04	<0.01	0.01	0.4	0.02
*Water Quality Trigger					0.003										0.05			1.2	0.08

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000). "Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".**

SW6

Date	Category	Comment	ph	EC	Turbidity	DO	TSS	Alkalinity (as $CaCO_3$)	Acidity (as $CaCO_3$)	SO4	Cl	Ca	Mg	Al	Mn	Zn	Fe	Cu
				uS/cm	NTU	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
10-Jul-21	Discharge Event	Trickle flow, clear, light brown	**6.6**	**672**	15	**67**	11	57	5	151	53	30	24	0.58	0.037	<0.005	1.49	<0.001
30-Aug-21	Monthly	Dry																
15-Sep-21	Discharge	Trickle flow, turbid, grey	**6.7**	438	73	**81**	14	59	13	100	30	19	15	2.02	0.027	0.006	1.6	0.001
13-Oct-21	Discharge	Steady flow, turbid, light brown	**8.0**	**1177**	57	102	37	125	7	320	119	59	49	1.99	0.028	0.006	1.67	0.002
12-Nov-21	Discharge	eady flow, slightly turbid, light brow	7.7	**1147**	35	96	16	97	7	260	86	50	45	1.36	0.043	<0.005	1.3	0.002
3-Dec-21	Discharge	eady flow, slightly turbid, light brow	7.9	451	39	105	11	77	2	72	37	20	16	2.36	0.023	<0.005	1.88	0.001
20-Jan-22	Discharge	Trickle flow, clear, light brown	**6.8**	**583**	21	93	12	89	4	141	42	32	25	0.22	0.047	0.01	0.74	**0.007**
24-Feb-22	Discharge	eady flow, slightly turbid, light brow	7.5	389	74	94	28	67	5	91	29	24	17	2.02	0.027	0.005	1.57	0.003
24-Mar-22	Discharge	Fast flow, slightly turbid, brown	7.8	371	93	98	**122**	52	2	95	29	18	16	2.18	0.088	0.008	2.04	0.003
24-Apr-22	Discharge	rickle flow, slightly turbid, light brow	**7.0**	445	22	94	<5	68	8	115	45	27	20	0.75	0.037	<0.005	2.07	<0.001
30-May-22	Monthly	No flow																
29-Jun-22	Monthly	Dry																
*Water Quality Trigger			7.1 - 7.9	544	119	85 - 110%	80							3.02		0.064		0.003

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000). "Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".**

SW9 - Un-named Tributary (Fisher-Webster)

Date	Category	Comment	ph	EC	Turbidity	DO	TDS	TSS	Hardness	Alkalinity (as $CaCO_3$)	Acidity (as $CaCO_3$)	SO4	Cl	Ca	Mg	Al	Mn	Zn	Fe	CO3 (as $CaCO_3$)	Bicarb (as $CaCO_3$)	BOD	Na
				uS/cm	NTU	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
10-Jul-21	Discharge Event	/steady flow, turbid, light br	6.8	136	66.5	90.7	42.56	28	25	13	4	12	21	5	3	2.12	0.05	0.008	3.48	<1	13	3	15
30-Aug-21	Monthly	Dry																					
15-Sep-21	Discharge	Trickle flow, turbid, brown	**5.9**	238	48.2	**75.8**	30.848	34	40	13	12	35	34	8	5	1.08	0.201	0.018	2.5	<1	13	<2	24
13-Oct-21	Discharge	ow flow, slightly turbid, brov	6.8	136	58.4	**78.1**	37.376	28	25	27	9	8	21	5	3	2.01	0.132	0.011	3.78	<1	27	3	13
12-Nov-21	Discharge	Slow flow, turbid, brown	6.6	150	**157**	**67.4**	100.48	**86**	22	24	8	21	19	4	3	**3.13**	0.131	0.011	4.64	<1	24	7	12
3-Dec-21	Discharge	/ flow, slightly turbid, light br	6.7	245	38	**65.8**	24.32	13	40	29	7	23	34	8	5	2.23	0.143	0.012	4.91	<1	29	<2	24
20-Jan-22	Discharge	ckle flow, slightly turbid, bro	6.9	373	**108**	99.6	69.12	56	70	39	7	39	71	15	8	0.53	0.468	0.006	6.46	<1	39	5	40
24-Feb-22	Discharge	Steady flow, turbid, brown	7.0	65	**136**	89.3	87.04	**84**	16	14	5	<10	13	3	2	2.57	0.057	0.012	2.73	<1	14	5	10
24-Mar-22	Discharge	No access																					
24-Apr-22	Discharge	oggy/boggy from very start of track																					
30-May-22	Monthly	rickle flow, clear, light brow	7.0	309	30.2	**69.3**	19.328	7	56	32	3	30	42	11	7	1.05	0.093	0.006	6.23	<1	32	<2	31
29-Jun-22	Monthly	No flow																					
*Water Quality Trigger			6.4 - 7.1	461	94	85 - 110%		57								2.96		0.024					

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**
"Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

SW9 - Un-named Tributary (Fisher-Webster)

Date	As	Ba	Cd	Cr	Cu	Pb	Mo	Ni	Se	Ag	U	B	Hg	F	NH3 (as N)	NO2 (as N)	NO3	N	P
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	(as N) mg/l	mg/l	mg/l
10-Jul-21	0.001	0.035	<0.0001	0.001	0.001	0.002	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	**0.17**	<0.01	0.28	2.5	0.51
15-Sep-21	<0.001	0.035	<0.0001	<0.001	0.001	<0.001	<0.001	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.11	1.7	0.22
13-Oct-21	0.002	0.038	<0.0001	0.001	0.002	0.001	<0.001	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	**0.14**	<0.01	0.07	2.6	0.5
12-Nov-21	0.002	0.042	<0.0001	0.002	0.002	0.002	<0.001	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	**0.19**	<0.01	0.08	**3.5**	0.66
3-Dec-21	0.003	0.053	<0.0001	0.002	0.002	0.001	<0.001	0.005	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	**0.14**	<0.01	0.04	2.3	0.46
20-Jan-22	0.003	0.056	<0.0001	<0.001	0.002	0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	**0.82**	<0.01	0.03	**3.2**	0.47
24-Feb-22	0.002	0.04	<0.0001	0.001	**0.006**	0.002	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.05	<0.01	0.18	0.7	0.16
30-May-22	0.002	0.042	<0.0001	<0.001	0.001	<0.001	<0.001	0.004	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.2	1.8	0.4
*Water quality trigger				0.002	0.0040										0.13			2.6	0.68

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**
"Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

SW10 - Coal Shaft Creek (Holmes Upstream)

Date	Category	Comment	ph	EC	Turbidity	DO	TDS	TSS	Hardness	Alkalinity (as $CaCO_3$)	Acidity (as $CaCO_3$)	SO4	Cl	Ca	Mg	Al	Mn	Zn	Fe	CO3 (as $CaCO_3$)	Bicarb (as $CaCO_3$)	Na	BOD
				uS/cm	NTU	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l			mg/l	mg/l
10-Jul-21	Discharge Event	Trickle flow, turbid and brown	**7.0**	71.8	78.4	**67**	50	17	21	13	4	<1	11	5	2	**3.22**	0.027	0.008	3.13	<1	13	3	7
30-Aug-21	Monthly	Dry																					
15-Sep-21	Discharge	Trickle flow, turbid, brown	**6.8**	63.1	55	88	35	17	18	17	8	21	9	4	2	2.84	0.046	<0.005	2.48	<1	17	<2	7
13-Oct-21	Discharge	Steady flow, turbid, brown	7.1	81	108	93	69	18	18	15	10	<1	9	4	2	**5.44**	0.045	0.01	4.58	<1	15	3	6
12-Nov-21	Discharge	Steady flow, turbid, light brown	**6.9**	51.2	92	95	59	19	18	12	8	22	5	4	2	**3.98**	0.027	0.008	3.53	<1	12	3	5
3-Dec-21	Discharge	No flow																					
20-Jan-22	Discharge	Dry																					
24-Feb-22	Discharge	Fast flow, slightly turbid, brown	**6.8**	34.4	**132**	87	84	34	18	10	5	<10	7	4	2	**5.26**	0.036	0.01	4.96	<1	10	<2	7
24-Mar-22	Discharge	Steady flow, slightly turbid, brown	7.6	139	62	100	39	30	9	10	3	<1	4	2	1	**3.26**	0.031	0.007	3.11	<1	10	<2	4
24-Apr-22	Discharge	Trickle flow, turbid, brown	**6.6**	57	**183**	**18**	117	31	25	25	6	<10	9	5	3	**7.73**	0.074	0.016	6.31	<1	25	3	9
30-May-22	Monthly	Dry																					
29-Jun-22	Monthly	No flow																					
*Water Quality Trigger			7.1 - 7.9	544	119	85 - 110%		80								3.02		0.064					

Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).** ***"Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension

SW10 - Coal Shaft Creek (Holmes Upstream)

Date	As	Ba	Cd	Cr	Cu	Pb	Mo	Ni	Se	Ag	U	B	Hg	F	NH3 (as N)	NO2 (as N)	NO3 (as N)	N	P
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
10-Jul-21	<0.001	0.01	<0.0001	0.002	0.003	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.03	**1.7**	**0.1**
15-Sep-21	<0.001	0.009	<0.0001	0.002	0.003	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.12	**1.4**	0.08
13-Oct-21	<0.001	0.013	<0.0001	0.004	**0.006**	<0.001	<0.001	0.004	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.01	**1.6**	**0.12**
12-Nov-21	<0.001	0.01	<0.0001	0.002	**0.005**	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.02	**1.4**	**0.09**
24-Feb-22	<0.001	0.013	<0.0001	0.006	**0.006**	<0.001	<0.001	0.005	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	<0.01	**1.4**	**0.12**
24-Mar-22	<0.001	0.01	<0.0001	0.002	0.003	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.02	1.2	**0.12**
24-Apr-22	<0.001	0.021	<0.0001	0.005	**0.006**	<0.001	<0.001	0.004	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	<0.01	**1.7**	**0.18**
*Water Quality Trigger					0.003										0.05			1.2	0.08

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**
"Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

GB1 - Mammy Johnsons River EPL 11701 Point 31

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as $CaCO_3$) mg/l	Acidity (as $CaCO_3$) mg/l	SO4 mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO3 (as $CaCO_3$) mg/l	Bicarb (as $CaCO_3$) mg/l	BOD mg/l	Na mg/l
10-Jul-21	Discharge	teady flow, slightly turbid, light brow	7.4	293	**28**	93	188	**22**	59	40	2	15	47	12	7	0.84	0.037	<0.005	1.69	<1	40	2	31
11-Jul-21	Discharge	Steady flow, slightly turbid, orange	**7.68**	177	**40**		113	**22**															
12-Jul-21	Discharge	ady/fast flow, slightly turbid, light bro	**6.92**	191	**41**		122	12															
13-Jul-21	Discharge	teady flow, slightly turbid, light brow	**7.64**	174	**36**		112	8															
30-Aug-21	Monthly	Slow flow, clear, clear	7.44	**396**	5	86	254	<5	77	69	6	15	65	16	9	0.14	0.027	<0.005	0.97	<1	69	<2	42
15-Sep-21	Discharge	teady flow, slightly turbid, light brow	7.16	356	18	**77**	228	**22**	68	60	7	14	65	14	8	0.69	0.076	<0.005	1.41	<1	60	<2	37
13-Oct-21	Discharge	Fast flow, clear, light brown	7.5	310	**25**	91	198	**24**	59	53	7	14	61	12	7	1.10	0.084	0.006	1.88	<1	53	<2	36
12-Nov-21	Discharge	Fast flow, slightly turbid, light brown	7.13	184	**55**	86	118	**67**	38	35	7	5	30	7	5	**1.55**	0.102	0.006	2.45	<1	35	3	21
22-Nov-21	Discharge	Steady flow, turbid, light brown	7.46	64	**125**		41	**77**															
3-Dec-21	Discharge	Steady flow, clear, brown	**7.04**	159	**36**	98	102	13	31	31	3	7	30	6	4	0.64	0.033	<0.005	1.00	<1	31	<2	21
10-Dec-21	Discharge	Fast flow, turbid, brown	**6.85**	82	**116**		52	**72**															
20-Jan-22	Discharge	Slow flow, clear, light brown	**7.09**	258	10	**69**	165	9	50	57	6	6	52	10	6	0.12	0.097	<0.005	1.42	<1	57	2	30
24-Feb-22	Discharge	Steady flow, turbid, brown	7.29	155	**61**	88	99	**72**	34	14	4	8	27	7	4	**1.58**	0.104	0.007	2.13	<1	14	2	20
24-Mar-22	Discharge	Fast flow, slightly turbid, light brown	7.1	235	**25**	89	150	**70**	40	40	2	8	35	8	5	**1.53**	0.089	<0.005	2.11	<1	40	8	26
8-Apr-22	Discharge	Fast flow, slightly turbid, light brown	7.33	133	**48**		85	**21**															
24-Apr-22	Discharge	ady flow, slightly turbid, very light bro	7.41	231	23	90	148	8	58	49	3	10	38	10	8	1.14	0.028	<0.005	1.71	<1	49	<2	26
30-May-22	Monthly	Steady flow, clear, light brown	7.57	246	**40**	98	158	**26**	50	42	2	10	38	10	6	0.46	0.024	<0.005	1.07	<1	42	2	25
29-Jun-22	Monthly	Steady flow, clear, light brown	7.35	314	10	93	201	<5	65	54	2	12	64	13	8	0.19	0.036	0.005	1.45	<1	54	<2	38
26-Jun-21	Discharge	teady flow, slightly turbid, very light	7.44	211	**29**			<5															
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%		15								1.24		0.011					

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**
"Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

GB1 - Mammy Johnsons River

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH3 (as N) mg/l	NO2 (as N) mg/l	NO3 (as N) mg/l	N mg/l	P mg/l
10-Jul-21	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.08	0.8	0.09
30-Aug-21	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.04	0.2	<0.01
15-Sep-21	<0.001	0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.07	0.6	0.04
13-Oct-21	<0.001	0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.02	**0.9**	0.07
12-Nov-21	<0.001	0.04	<0.0001	<0.001	0.002	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.05	**1.2**	0.11
3-Dec-21	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.04	0.6	0.06
20-Jan-22	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.07	**0.9**	0.09
24-Feb-22	0.001	0.04	<0.0001	<0.001	0.002	0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.06	0.8	0.12
24-Mar-22	0.001	0.05	<0.0001	<0.001	**0.003**	0.002	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.07	0.8	0.08
24-Apr-22	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.06	0.5	0.05
30-May-22	<0.001	0.04	<0.0001	<0.001	**0.004**	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.07	0.7	0.05
29-Jun-22	<0.001	0.04	<0.0001	0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.05	0.01	0.03	0.2	0.02
*Water Quality Trigger				0.001	0.0020										0.06			0.8	0.15

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**
"Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Highnoon - Mammy Johnsons River EPL 11701 Point 35

Date	Category	Comment	ph	EC	Turbidity	DO	TDS	TSS	Hardness	Alkalinity (as $CaCO_3$)	Acidity (as $CaCO_3$)	SO4	Cl	Ca	Mg	Al	Mn	Zn	Fe	CO3 (as $CaCO_3$)	Bicarb (as $CaCO_3$)	BOD	Na
				uS/cm	NTU	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
10-Jul-21	Discharge	Slow flow, slightly turbid, light brown	7.38	259	**35**	91	166	**28**	50	35	2	13	42	10	6	0.94	0.038	<0.005	1.64	<1	35	<2	29
11-Jul-21	Discharge	Steady flow, slightly turbid, orange	**7.84**	191	**52**		122	**30**															
12-Jul-21	Discharge	ow/steady flow, slightly turbid, light bro	**7.06**	197	**41**		126	12															
13-Jul-21	Discharge	Slow flow, slightly turbid, light brown	7.43	182	**37**		117	7															
30-Aug-21	Monthly	Slow flow, clear, clear	7.36	**390**	5	**79**	249	<5	74	69	6	15	63	15	9	0.09	0.040	<0.005	0.94	<1	69	<2	38
15-Sep-21	Discharge	Steady flow, turbid, light brown	7.25	368	**53**	**72**	236	**34**	76	76	10	19	60	14	10	**1.61**	0.124	<0.005	2.01	<1	76	<2	39
13-Oct-21	Discharge	Fast flow, clear, light brown	7.56	277	**31**	**81**	177	**24**	52	52	8	11	51	11	6	**1.29**	0.076	<0.005	1.75	<1	52	<2	31
12-Nov-21	Discharge	Fast flow, slightly turbid, light brown	**7.68**	224	**60**	**83**	143	**83**	38	38	7	2	29	7	5	**1.93**	0.091	0.005	2.60	<1	38	2	21
22-Nov-21	Discharge	Steady flow, turbid, brown	7.55	71	**150**		46	**116**															
3-Dec-21	Discharge	Steady flow, clear, brown	7.11	159	**40**	89	102	10	31	31	3	8	29	6	4	**2.62**	0.042	<0.005	1.90	<1	31	3	21
10-Dec-21	Discharge	Steady flow, turbid, light brown	**7.02**	95	**146**		61	**94**															
20-Jan-22	Discharge	Slow flow, clear, light brown	**7.04**	278	10	**56**	178	12	63	69	6	8	55	12	8	0.29	0.187	<0.005	1.72	<1	69	2	34
24-Feb-22	Discharge	Steady flow, slightly turbid, brown	7.38	199	**35**	**81**	128	**36**	47	45	5	9	32	9	6	**1.27**	0.082	<0.005	1.75	<1	45	<2	27
24-Mar-22	Discharge	Steady flow, slightly turbid, light brown	7.17	233	23	88	149	**35**	45	45	2	9	34	8	6	**1.39**	0.083	0.005	1.94	<1	45	7	26
8-Apr-22	Discharge	Steady flow, slightly turbid, light brown	7.23	149	**46**		95	**24**															
24-Apr-22	Discharge	Slow flow, slightly turbid, light brown	7.25	192	**33**	87	123	**19**	45	41	3	9	34	8	6	1.20	0.036	<0.005	1.97	<1	41	2	22
30-May-22	Monthly	Fast flow, clear, light brown	7.52	285	**29**	96	183	**16**	50	42	2	11	42	10	6	0.89	0.028	<0.005	1.59	<1	42	<2	28
29-Jun-22	Monthly	Slow flow, clear, clear	**7.69**	355	12	92	227	<5	65	52	3	12	64	13	8	0.21	0.046	<0.005	1.26	<1	52	<2	38
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%		15								1.24		0.011					

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**
"Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Highnoon - Mammy Johnsons River

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH3 (as N) mg/l	NO2 (as N) mg/l	NO3 (as N) mg/l	N mg/l	P mg/l
10-Jul-21	<0.001	0.04	<0.0001	<0.001	0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.09	0.9	0.08
30-Aug-21	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.05	0.2	<0.01
15-Sep-21	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.08	0.8	0.05
13-Oct-21	<0.001	0.04	<0.0001	0.001	0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.03	0.8	0.07
12-Nov-21	<0.001	0.04	<0.0001	<0.001	0.002	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.03	**1.3**	0.12
3-Dec-21	<0.001	0.04	<0.0001	0.001	<0.001	0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.04	0.6	0.07
20-Jan-22	0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.04	0.3	0.04
24-Feb-22	<0.001	0.03	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.04	0.4	0.05
24-Mar-22	0.001	0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.08	0.8	0.08
24-Apr-22	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.07	0.7	0.09
30-May-22	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.06	0.6	0.04
29-Jun-22	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.04	0.01	0.05	0.3	0.02
*Water Quality Trigger				0.001	0.0020										0.06			0.8	0.15

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000). "Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".**

Site 9 - Karuah River (Near Stroud Road Village)

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as $CaCO_3$) mg/l	Acidity (as $CaCO_3$)	SO4 mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO3 (as $CaCO_3$)	Bicarb (as $CaCO_3$)	BOD mg/l	Na mg/l
10-Jul-21	Discharge Event	Steady flow, slightly turbid, light brown	7.6	266	36	97	170	23	65	68	2	8	33	13	8	1.16	0.028	<0.005	1.31	<1	68	2	27
30-Aug-21	Monthly	Steady flow, clear, clear	7.8	210	3	94	134	<5	50	54	4	5	29	10	6	0.10	0.006	<0.005	0.38	<1	54	<2	20
15-Sep-21	Discharge	Steady flow, slightly turbid, light brown	7.3	240	14	92	154	14	56	73	7	6	32	11	7	0.61	0.021	<0.005	0.86	<1	73	<2	25
13-Oct-21	Discharge	Fast flow, turbid, light brown	7.5	225	36	90	144	19	52	68	7	1	29	11	6	1.68	0.043	<0.005	1.65	<1	68	<2	24
12-Nov-21	Discharge	Fast flow, slightly turbid, light brown	7.4	214	31	82	137	30	50	57	6	<1	25	10	6	1.25	0.052	<0.005	1.56	<1	57	<2	20
3-Dec-21	Discharge	Fast flow, slightly turbid, light brown	7.3	113	25	106	72.4	9	25	40	2	3	20	5	3	1.44	0.017	<0.005	1.15	<1	40	<2	20
20-Jan-22	Discharge	Fast flow, slightly turbid, light brown	7.4	67	40	98	42.6	35	14	25	<1	<1	13	4	1	1.82	0.037	<0.005	1.45	<1	25	2	8
24-Feb-22	Discharge	Fast flow, slightly turbid, brown	7.6	132	30	91	84.5	34	40	49	3	<1	18	8	5	1.17	0.046	<0.005	1.37	<1	49	<2	18
24-Mar-22	Discharge	Fast flow, slightly turbid, brown	7.5	164	52	97	105	92	36	45	2	4	23	8	4	2.05	0.136	<0.005	2.42	<1	45	6	19
24-Apr-22	Discharge	ast flow, slightly turbid, very light brow	7.5	131	19	99	84.1	10	38	36	2	4	24	7	5	0.87	0.013	<0.005	1.08	<1	36	<2	14
30-May-22	Monthly	Steady flow, clear, clear	7.4	161	8	105	103	<5	34	34	1	5	26	7	4	0.31	0.007	<0.005	0.47	<1	34	<2	17
29-Jun-22	Monthly	Fast flow, clear, clear	7.6	187	3	109	120	<5	40	39	2	5	32	8	5	0.09	0.006	<0.005	0.29	<1	39	<2	19
*Water Quality Trigger			N/A	N/A	N/A											N/A		N/A					

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000). "Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".**

Site 9 - Karuah River (Near Stroud Road Village)

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH3 (as N) mg/l	NO2 (as N) mg/l	NO3 (as N) mg/l	N mg/l	P mg/l
10-Jul-21	<0.001	0.023	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.06	0.7	0.06
30-Aug-21	<0.001	0.016	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.04	0.1	<0.01
15-Sep-21	<0.001	0.02	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.09	0.5	0.04
13-Oct-21	<0.001	0.023	<0.0001	0.001	0.002	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.03	0.8	0.09
12-Nov-21	<0.001	0.022	<0.0001	<0.001	0.002	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.05	<0.01	0.02	0.8	0.1
3-Dec-21	<0.001	0.018	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.04	0.4	0.04
20-Jan-22	<0.001	0.02	<0.0001	<0.001	0.002	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.04	<0.01	0.13	1.0	0.06
24-Feb-22	<0.001	0.02	<0.0001	<0.001	0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.03	0.4	0.04
24-Mar-22	<0.001	0.031	<0.0001	0.002	0.002	0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.09	1.0	0.13
24-Apr-22	<0.001	0.018	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.04	<0.01	0.06	0.4	0.04
30-May-22	<0.001	0.015	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.07	0.3	0.02
29-Jun-22	<0.001	0.015	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	0.07	<0.01	0.03	0.1	0.01

Site 11 - Mammy Johnsons - Downstream of High Noon

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity $CaCO_3$ mg/l	Acidity $CaCO_3$ mg/l	SO4 mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO3 $CaCO_3$ mg/l	Bicarb (as $CaCO_3$) mg/l	BOD mg/l	Na mg/l
10-Jul-21	Discharge Event	ady flow, slightly turbid, light bro	7.46	275	**33**	92	176	**22**	56	38	2	14	45	11	7	0.95	0.035	<0.005	1.68	<1	38	<2	29
30-Aug-21	Monthly	Slow flow, clear, clear	7.42	**409**	4	86	261	<5	81	69	6	15	64	16	10	0.11	0.034	<0.005	0.96	<1	69	<2	42
15-Sep-21	Discharge	ady flow, slightly turbid, light bro	7.26	368	**28**	**77**	235	**21**	79	78	8	18	59	15	10	1.18	0.089	<0.005	1.65	<1	78	<2	38
13-Oct-21	Discharge	ist flow, slightly turbid, light brov	**8.3**	278	**39**	**82**	178	**31**	52	54	7	11	48	11	6	**2.03**	0.095	0.006	2.37	<1	54	<2	31
12-Nov-21	Discharge	ist flow, slightly turbid, light brov	7.33	190	**59**	**82**	121	**64**	38	38	7	6	29	7	5	**2.22**	0.109	0.006	2.70	<1	38	2	21
03-Dec-21	Discharge	Steady flow, clear, brown	7.12	160	**40**	89	102	14	31	29	3	8	29	6	4	**1.95**	0.040	0.008	1.80	<1	29	2	21
20-Jan-22	Discharge	Steady flow, clear, light brown	7.15	**258**	8	**69**	1656	10	54	63	8	6	52	10	7	0.31	0.119	<0.005	1.56	<1	63	<2	32
24-Feb-22	Discharge	Fast flow, slightly turbid, brown	7.34	**196**	**31**	**78**	1254	**36**	47	46	4	8	33	9	6	1.16	0.102	**0.012**	1.78	<1	46	2	27
24-Mar-22	Discharge	ady flow, slightly turbid, light bro	7.23	232	**56**	91	149	**80**	47	44	3	8	36	9	6	**2.95**	0.100	0.007	3.25	<1	44	8	26
24-Apr-22	Discharge	ist flow, slightly turbid, light brov	7.39	199	**36**	88	127	**18**	47	42	3	9	34	9	6	**1.27**	0.037	0.006	2.08	<1	42	<2	22
30-May-22	Monthly	Fast flow, clear, light brown	**8.03**	283	**24**	99	181	12	54	42	2	11	42	10	7	0.7	0.026	**0.014**	1.49	<1	42	2	28
29-Jun-22	Monthly	Steady flow, clear, clear	7.36	344	11	102	220	**17**	65	54	2	13	65	13	8	0.44	0.056	<0.005	1.53	<1	54	2	38
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%		15								1.24		0.011					

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**
"Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Site 11 - Mammy Johnsons - Downstream of High Noon

Date	As	Ba	Cd	Cr	Cu	Pb	Mo	Ni	Se	Ag	U	B	Hg	F	NH3 (as N)	NO2 (as N)	NO3 (as N)	N	P
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
10-Jul-21	<0.001	0.036	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.09	0.7	0.05
30-Aug-21	<0.001	0.041	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.05	0.2	<0.01
15-Sep-21	<0.001	0.042	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.1	0.7	0.06
13-Oct-21	<0.001	0.042	<0.0001	0.001	0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.04	<0.01	0.03	0.8	0.07
12-Nov-21	<0.001	0.042	<0.0001	<0.001	0.002	0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.06	**1.1**	0.1
3-Dec-21	<0.001	0.038	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.04	0.6	0.07
20-Jan-22	0.001	0.039	<0.0001	<0.001	0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.05	0.6	0.07
24-Feb-22	<0.001	0.036	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.04	<0.01	0.05	0.4	0.06
24-Mar-22	0.001	0.053	<0.0001	**0.002**	0.002	0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.11	0.7	0.14
24-Apr-22	<0.001	0.039	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.06	<0.01	0.07	0.6	0.08
30-May-22	<0.001	0.037	<0.0001	<0.001	**0.003**	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.06	0.6	0.04
29-Jun-22	<0.001	0.043	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	0.01	<0.01	0.05	0.4	0.03
*Water Quality Trigger				0.001	0.0020										0.06			0.8	0.15

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000). "Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".**

Site 12 - Mammy Johnsons - Relton Property

Date	Category	Comment	ph	EC	Turbidity	DO	TDS	TSS	Hardness	Alkalinity (as $CaCO_3$)	Acidity (as $CaCO_3$)	SO4	Cl	Ca	Mg	Al	Mn	Zn	Fe	CO3 (as $CaCO_3$)	Bicarb (as $CaCO_3$)	BOD	Na
				uS/cm	NTU	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l		mg/l	mg/l	mg/l
10-Jul-21	Discharge Event	ady flow, sightly turbid, light bro	7.42	296.2	**40.0**	93	190	**33**	61	45	2	16	45	13	7	1.09	0.064	<0.005	1.99	<1	45	<2	32
30-Aug-21	Monthly	Steady flow, clear, clear	7.47	349.8	4.2	93	224	<5	70	71	5	12	58	15	8	0.12	0.025	<0.005	0.90	<1	71	<2	36
15-Sep-21	Discharge	ow flow, slightly turbid, light bro	**7.2**	**433.9**	13.7	**82**	278	**21**	81	73	9	17	78	16	10	0.45	0.182	<0.005	1.87	<1	73	<2	46
13-Oct-21	Discharge	Fast flow, clear, light brown	7.49	294	**41.8**	87	188	**37**	59	56	7	16	51	12	7	**1.79**	0.1	0.006	2.32	<1	56	2	33
12-Nov-21	Discharge	st flow, slightly turbid, light brov	7.17	167.9	**58.8**	89	107	**70**	34	33	7	4	30	7	4	**1.99**	0.127	0.008	2.72	<1	33	<2	19
3-Dec-21	Discharge	Steady flow, clear, brown	7.06	158.4	**35.3**	95	101	9	25	29	3	7	30	5	3	**2.32**	0.04	<0.005	1.68	<1	29	2	21
20-Jan-22	Discharge	Steady flow, clear, light brown	7.26	306.4	11.2	**81**	196	13	63	75	6	8	58	12	8	0.33	0.116	<0.005	2.19	<1	75	<2	36
24-Feb-22	Discharge	Fast flow, slightly turbid, brown	7.46	163.1	**44.7**	89	104	**45**	40	37	4	9	29	8	5	**1.53**	0.081	0.006	1.85	<1	37	<2	24
24-Mar-22	Discharge	st flow, slightly turbid, light brov	6.99	229.5	**48.5**	89	147	**337**	50	48	3	10	35	10	6	**4.38**	0.3	**0.012**	6.91	<1	48	2	28
24-Apr-22	Discharge	Steady flow, slightly turbid, gree	7.39	201.8	18.2	93	129	<5	54	45	3	10	37	10	7	1.13	0.026	<0.005	1.70	<1	45	<2	24
30-May-22	Monthly	Fast flow, clear, light brown	7.61	238.6	**26.1**	100	153	12	47	38	3	10	38	9	6	0.92	0.022	<0.005	1.29	<1	38	2	25
29-Jun-22	Monthly	Steady flow, clear, clear	7.36	313.3	7.9	98	201	<5	65	57	2	12	64	13	8	0.16	0.03	<0.005	1.11	<1	57	<2	36
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%		15								1.24		0.011					

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000). "Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".**

Site 12 - Mammy Johnsons - Relton Property

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH3 (as N) mg/l	NO2 (as N) mg/l	NO3 (as N) mg/l	N mg/l	P mg/l
10-Jul-21	<0.001	0.043	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.04	<0.01	0.09	**1**	0.08
30-Aug-21	<0.001	0.039	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.04	0.2	<0.01
15-Sep-21	<0.001	0.057	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.07	0.6	0.08
13-Oct-21	<0.001	0.050	<0.0001	<0.001	0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.05	**1.2**	0.11
12-Nov-21	0.001	0.049	<0.0001	<0.001	0.002	0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.05	**1.6**	0.13
3-Dec-21	<0.001	0.039	<0.0001	<0.001	<0.001	0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.04	0.6	0.05
20-Jan-22	0.001	0.049	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.04	0.7	0.11
24-Feb-22	<0.001	0.037	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.03	0.5	0.07
24-Mar-22	0.002	0.096	<0.0001	0.002	0.002	0.004	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.04	<0.01	0.06	**1.2**	**0.16**
24-Apr-22	<0.001	0.036	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.06	0.4	0.04
30-May-22	<0.001	0.036	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.07	0.6	0.04
29-Jun-22	<0.001	0.040	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.04	0.01	0.03	0.2	0.03
*Water Quality Trigger				0.001	0.0020										0.06			0.8	0.15

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**
"Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Site 15 - Mammy Johnsons - Tereel

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as $CaCO_3$) mg/l	Acidity (as $CaCO_3$)	SO4 mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO3 (as $CaCO_3$) mg/l	Bicarb (as $CaCO_3$)	BOD mg/l	Na mg/l
10-Jul-21	Discharge Event	Steady flow, clear,clear	7.5	225	11	98	144	6	43	24	2	10	42	9	5	0.48	0.013	<0.005	0.90	<1	24	<2	25
30-Aug-21	Monthly	Steady flow, clear, clear	7.6	234	5	95	150	<5	47	29	5	10	52	9	6	0.16	0.013	<0.005	0.96	<1	29	<2	26
15-Sep-21	Discharge	ow flow, slightly turbid, light brow	7.3	261	8	90	167	12	50	36	<1	10	57	10	6	0.3	0.024	<0.005	0.79	<1	36	<2	28
13-Oct-21	Discharge	Fast flow, clear, clear	**8.5**	234	21	96	150	**17**	46	31	6	8	50	10	5	0.78	0.057	<0.005	1.50	<1	31	<2	25
12-Nov-21	Discharge	Fast flow, clear, light brown	7.2	192	**26**	95	123	**34**	40	25	6	6	36	8	5	1	0.043	<0.005	1.49	<1	25	2	20
3-Dec-21	Discharge	Slow flow, clear, brown	7.1	145	21	99	92.7	<5	22	18	2	17	30	4	3	**1.46**	0.020	<0.005	1.08	<1	18	<2	19
20-Jan-22	Discharge	Steady flow, clear, light brown	7.2	185	8	92	119	10	34	34	6	5	36	7	4	0.41	0.050	<0.005	1.14	<1	34	2	21
24-Feb-22	Discharge	Fast flow, turbid, brown	7.3	105	**64**	95	67.2	**74**	25	17	3	<1	22	5	3	**2.02**	0.072	0.005	1.79	<1	17	<2	15
24-Mar-22	Discharge	ast flow, slightly turbid, light brow	**6.5**	259	18	98	166	**22**	31	25	2	6	35	6	4	0.95	0.021	<0.005	1.16	<1	25	5	24
24-Apr-22	Discharge	Fast flow, clear, very light brown	7.4	188	11	100	120	<5	38	26	2	7	41	7	5	0.6	0.011	<0.005	0.81	<1	26	<2	21
30-May-22	Monthly	Fast flow, clear, light brown	7.6	213	9	106	136	<5	40	26	1	8	40	8	5	1.1	0.012	<0.005	1.08	<1	26	3	23
29-Jun-22	Monthly	Fast flow, clear, clear	7.3	262	6	108	168	<5	47	26	2	8	62	9	6	0.11	0.014	<0.005	0.82	<1	26	2	30
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%		15								1.24		0.011					

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**
Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project.

Site 15 - Mammy Johnsons - Tereel

Date	As	Ba	Cd	Cr	Cu	Pb	Mo	Ni	Se	Ag	U	B	Hg	F	NH3 (as N)	NO2 (as N)	NO3 (as N)	N	P
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
10-Jul-21	<0.001	0.029	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.05	0.4	0.03
30-Aug-21	<0.001	0.035	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.02	0.2	<0.01
15-Sep-21	<0.001	0.037	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.03	0.2	0.04
13-Oct-21	<0.001	0.042	<0.0001	0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.02	0.4	0.02
12-Nov-21	<0.001	0.037	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.03	0.7	0.04
3-Dec-21	<0.001	0.029	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.03	0.3	0.03
20-Jan-22	<0.001	0.033	<0.0001	<0.001	<0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.04	0.4	0.03
24-Feb-22	<0.001	0.038	<0.0001	<0.001	0.001	0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.08	0.8	0.07
24-Mar-22	<0.001	0.037	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.31	0.5	0.02
24-Apr-22	<0.001	0.030	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.04	0.2	0.01
30-May-22	<0.001	0.035	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.1	0.4	0.02
29-Jun-22	<0.001	0.036	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	<0.01	0.1	0.01
*Water Quality Trigger				0.001	0.0020										0.06			0.8	0.15

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**
Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project.

Site 19 - Karuah River (Washpool Turnoff)

Date	Category	Comment	ph	EC	Turbidity	DO	TDS	TSS	Hardness	Alkalinity (as $CaCO_3$)	Acidity (as $CaCO_3$)	SO4	Cl	Ca	Mg	Al	Mn	Zn	Fe	CO3 (as $CaCO_3$)	Bicarb (as $CaCO_3$)	BOD	Na
				uS/cm	NTU	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
10-Jul-21	Discharge Event	Fast flow, slightly turbid, light brown	7.31	272	**39**	96	174	**25**	61	51	2	11	40	13	7	1.05	0.029	<0.005	1.50	<1	51	2	27
30-Aug-21	Monthly	Fast flow, clear, clear	**7.93**	316	4	96	202	<5	68	71	4	9	46	14	8	0.11	0.014	<0.005	0.59	<1	71	<2	32
15-Sep-21	Discharge	Steady flow, slightly turbid, light brow	7.26	**438**	**47**	93	280	**36**	97	83	10	14	79	19	12	**1.25**	0.085	<0.005	1.90	<1	83	<2	40
13-Oct-21	Discharge	Fast flow, turbid, light brown	**7.07**	213	**78**	90	136	**51**	43	45	8	2	36	9	5	**3.01**	0.061	0.007	2.82	<1	45	2	23
12-Nov-21	Discharge	Fast flow, turbid, light brown	7.25	259	**63**	87	166	**37**	54	50	7	11	34	10	7	**3.98**	0.072	0.010	3.96	<1	50	3	24
3-Dec-21	Discharge	Steady flow, clear, brown	7.11	138	**36**	94	88	13	27	28	3	6	26	6	3	**2.50**	0.029	<0.005	1.71	<1	28	<2	18
20-Jan-22	Discharge	Fast flow, slightly turbid, light brown	**7.64**	109	**39**	100	69	**33**	21	34	<1	<1	19	5	2	0.74	0.040	<0.005	0.93	<1	34	<2	12
24-Feb-22	Discharge	Fast flow, turbid, brown	7.5	213	**36**	87	136	**33**	56	54	4	4	34	11	7	**1.29**	0.063	<0.005	1.73	<1	54	2	27
24-Mar-22	Discharge	Fast flow, slightly turbid, brown	7.37	176	**140**	96	113	**234**	40	37	3	<1	27	8	5	**5.14**	0.213	**0.014**	6.62	<1	37	5	19
24-Apr-22	Discharge	ast flow, slightly turbid, very light brow	7.47	181	22	97	116	10	47	43	2	6	30	9	6	1.05	0.020	<0.005	1.44	<1	43	<2	19
30-May-22	Monthly	Fast flow, clear, clear	**7.75**	222	**1468**	104	142	6	47	37	2	7	34	9	6	0.68	0.016	<0.005	0.95	<1	37	2	22
29-Jun-22	Monthly	Fast flow. Clear, clear	**7.72**	249	4	108	159	<5	50	49	2	8	43	10	6	0.10	0.014	<0.005	0.53	<1	49	<2	26
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%		15								1.24		0.011					

"Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Site 19 - Karuah River (Washpool Turnoff)

Date	As	Ba	Cd	Cr	Cu	Pb	Mo	Ni	Se	Ag	U	B	Hg	F	NH3 (as N)	NO2 (as N)	NO3 (as N)	N	P
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
10-Jul-21	<0.001	0.028	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.10	0.7	0.08
30-Aug-21	<0.001	0.026	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	0.04	<0.01	0.03	0.2	<0.01
15-Sep-21	<0.001	0.037	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	<0.01	<0.01	0.15	**1**	0.13
13-Oct-21	<0.001	0.031	<0.0001	**0.002**	0.002	0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.06	**1.4**	**0.17**
12-Nov-21	0.001	0.036	<0.0001	**0.002**	**0.003**	0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.02	**1.3**	**0.16**
03-Dec-21	<0.001	0.028	<0.0001	0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	<0.01	<0.01	0.05	0.6	0.07
20-Jan-22	<0.001	0.019	<0.0001	<0.001	0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.12	0.7	0.06
24-Feb-22	<0.001	0.029	<0.0001	<0.001	0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.04	<0.01	0.06	0.6	0.10
24-Mar-22	0.002	0.058	<0.0001	**0.003**	**0.003**	0.003	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.05	**2.6**	**0.38**
24-Apr-22	<0.001	0.025	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.07	0.4	0.04
30-May-22	<0.001	0.024	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.08	0.4	0.03
29-Jun-22	<0.001	0.022	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.06	0.01	0.05	0.3	0.02
*Water Quality Trigger				0.001	0.0020										0.06			0.8	0.15

"Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

SW3 - Main Water Dam (Major) EPL11701 Point 3

Date	Category	Storage RL	pH	EC uS/cm	Turbidity NTU	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as $CaCO_3$)	Acidity (as $CaCO_3$)	SO4 mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO3 (as $CaCO_3$) mg/l	Bicarb (as $CaCO_3$) mg/l	BOD mg/l	Na mg/l
7-Jul-21	Weekly	RL71.484	7.9	2565	2.5	1641.6																
10-Jul-21	Discharge	RL71.515	7.9	2519	2.2	1612.2	6	784	148	3	765	216	136	108	0.02	0.16	<0.005	0.05	<1	148	<2	230
14-Jul-21	Weekly	RL71.490	7.9	2559	2.5	1637.8																
21-Jul-21	Weekly	RL71.502	8.2	2098	7.8	1342.7																
28-Jul-21	Weekly	RL71.507	8.1	2501	4.8	1600.6																
4-Aug-21	Weekly	RL71.507	8.4	2491	1.7	1594.2																
11-Aug-21	Weekly	RL71.500	8.5	2555	4.3	1635.2																
18-Aug-21	Weekly	NR	8.3	2475	2.3	1584																
25-Aug-21	Weekly	NR	8.5	2503	1.9	1601.9																
30-Aug-21	Monthly	RL71.426	8.0	2480	3.2	1587.2	14	778	179	6	725	209	130	110	0.05	0.14	<0.005	0.08	<1	179	<2	230
8-Sep-21	Weekly	RL71.46	8.4	2450	3.2	1568																
15-Sep-21	Discharge	RL71.505	8.3	2497	2.0	1598.1	12	768	188	6	718	225	128	109	0.02	0.08	<0.005	<0.05	<1	188	<2	224
22-Sep-21	Weekly	RL71.606	8.3	2489	1.3	1593																
29-Sep-21	Weekly	RL71.418	8.3	2110	1.9	1350.4																
6-Oct-21	Weekly	RL71.341	8.5	2363	3.3	1512.3																
12-Oct-21	Weekly	RL71.343	8.4	2406	2.0	1539.8																
13-Oct-21	Discharge	RL71.354	8.3	2388	2.0	1528.3	<5	795	158	4	739	233	137	110	0.05	0.11	<0.005	0.07	<1	158	<2	230
20-Oct-21	Weekly	NR	8.4	2506	1.9	1603.8																
28-Oct-21	Weekly	RL71.200	8.3	2533	1.8	1621.1																
5-Nov-21	Weekly	RL71.295	8.3	2651	1.3	1696.6																
10-Nov-21	Weekly	RL71.231	8.4	2575	2.2	1648																
12-Nov-21	Discharge	RL71.283	8.4	2624	2	1679.4	5	825	156	4	761	224	144	113	0.02	0.21	<0.005	<0.05	<1	156	<2	251
16-Nov-21	Weekly	RL71.203	8.7	2588	1	1656.3																
24-Nov-21	Weekly	RL71.194	8.4	2972	6	1902.1																
30-Nov-21	Weekly	RL71.222	8.3	2858	1	1829.1																
3-Dec-21	Discharge	RL71.182	8.2	2040	3	1305.6	8	651	121	1	640	200	114	89	0.12	0.11	<0.005	0.11	<1	121	<2	197
8-Dec-21	Weekly	RL71.224	8.6	2176	2	1392.6																
16-Dec-21	Weekly	RL71.243	8.3	2605	0	1667.2																
22-Dec-21	Weekly	RL71.102	8.2	2441	3	1562.2																
30-Dec-21	Weekly	RL71.128	8.6	2240	2	1433.6																
5-Jan-22	Weekly	RL71.178	8.4	2609	1	1669.8																
11-Jan-22	Weekly	RL71.259	8.6	2560	4	1638.4																
19-Jan-22	Weekly	RL71.187	8.3	2199	0	1407.4																
20-Jan-22	Discharge	RL71.131	8.3	2152	3	1377.3	6	739	123	5	705	216	131	100	<0.01	0.09	<0.005	<0.05	<1	123	<2	207
24-Feb-22	Discharge	RL71.244	8.5	2162	3	1383.7	8	850	121	4	816	241	149	116	0.08	0.10	<0.005	0.09	<1	121	<2	270
24-Mar-22	Discharge	RL71.4	8.6	1334	17	853.76	17	450	91	3	493	119	83	59	1.05	0.11	0.01	0.67	<1	91	<2	145
24-Apr-22	Discharge		8.3	1976	5	1264.6	16	658	117	5	681	173	125	84	0.04	0.10	<0.005	0.09	<1	117	<2	188
30-May-22	Monthly	RL70.97	7.9	2368	8	1515.5	26	682	118	8	724	191	128	88	0.09	0.35	<0.005	0.22	<1	118	<2	201
29-Jun-22	Monthly	RL70.951	8.2	2037	1	1303.7	<5	677	134	2	734	204	116	94	<0.01	0.05	<0.005	<0.05	<1	134	2	216
*Water Quality Trigger			N/A	N/A	N/A	N/A	N/A								N/A		N/A					

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**

Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project.

SW3 - Main Water Dam (Major)

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH3 (as N) mg/l	NO2 (as N) mg/l	NO3 (as N) mg/l	N mg/l	P mg/l
10-Jul-21	<0.001	0.028	<0.0001	<0.001	<0.001	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	0.14	<0.01	0.05	0.6	0.01
30-Aug-21	<0.001	0.027	<0.0001	<0.001	<0.001	<0.001	0.001	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	<0.01	<0.01	<0.01	0.3	<0.01
15-Sep-21	<0.001	0.028	<0.0001	<0.001	<0.001	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	<0.01	<0.01	0.02	0.3	<0.01
13-Oct-21	<0.001	0.028	<0.0001	<0.001	<0.001	<0.001	0.025	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	<0.01	<0.01	<0.01	0.4	<0.01
12-Nov-21	<0.001	0.026	<0.0001	<0.001	<0.001	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	<0.01	<0.01	0.01	0.4	<0.01
3-Dec-21	<0.001	0.027	<0.0001	<0.001	<0.001	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	<0.01	<0.01	<0.01	0.4	0.01
20-Jan-22	<0.001	0.03	<0.0001	<0.001	<0.001	<0.001	<0.001	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	0.3	<0.01	<0.01	<0.01	0.3	<0.01
24-Feb-22	<0.001	0.031	<0.0001	<0.001	0.003	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	0.03	<0.01	0.05	0.4	0.01
24-Mar-22	<0.001	0.029	<0.0001	<0.001	0.001	<0.001	<0.001	0.005	<0.01	<0.001	<0.001	<0.05	<0.0001	0.3	0.05	<0.01	0.19	1.4	0.06
24-Mar-22	<0.001	0.027	0.0002	<0.001	<0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	<0.01	<0.01	<0.01	0.3	0.01
30-May-22	<0.001	0.03	<0.0001	<0.001	<0.001	<0.001	<0.001	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	0.04	<0.01	<0.01	0.5	<0.01
29-Jun-22	<0.001	0.028	<0.0001	<0.001	<0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	0.1	0.01	0.03	0.3	0.02

SW3 - Mine Water Dam (Minor)

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU
7-Jul-21	Weekly	80%	8.1	2250	3.7
10-Jul-21	Discharge	85%	8.2	2171	7.46
14-Jul-21	Weekly	65%	8.0	2094	11.1
21-Jul-21	Weekly	70%	8.0	2579	3.27
28-Jul-21	Weekly	70%	8.3	2115	5.39
4-Aug-21	Weekly	85%	8.4	2227	5.64
11-Aug-21	Weekly	80%	8.6	2300	4.33
18-Aug-21	Weekly	75%	8.2	2282	3.44
25-Aug-21	Weekly	75%	8.5	2368	2.93
30-Aug-21	Monthly	70%	8.2	2361	4.22
8-Sep-21	Weekly	80%	8.3	2434	4.64
15-Sep-21	Discharge	95%	8.2	2308	19.2
22-Sep-21	Weekly	75%	8.1	2218	6.25
29-Sep-21	Weekly	70%	8.1	2060	2.7
6-Oct-21	Weekly	85%	8.3	2304	4.17
12-Oct-21	Weekly	85%	8.1	2257	7.07
13-Oct-21	Discharge	95%	8.0	2153	10.71
20-Oct-21	Weekly	70%	8.4	2034	3.05
28-Oct-21	Weekly	65%	8.2	2110	2.21
5-Nov-21	Weekly	80%	8.3	2320	2.22
10-Nov-21	Weekly	65%	8.3	2131	2.57
12-Nov-21	Discharge	95%	8.2	2195	9.53
16-Nov-21	Weekly	60%	8.5	2040	3.07
24-Nov-21	Weekly	60%	8.4	2139	4.43
30-Nov-21	Weekly	70%	9.1	1839	6.05
3-Dec-21	Discharge	80%	7.9	1412	6.48
8-Dec-21	Weekly	70%	9.0	1307	4.5
16-Dec-21	Weekly	90%	8.3	1336	4.96
22-Dec-21	Weekly	NR	8.1	1308	5.13
30-Dec-21	Weekly	70%	8.6	1229	2.85
5-Jan-22	Weekly	85%	8.2	1503	2.02
11-Jan-22	Weekly	70%	8.5	1574	1.11
19-Jan-22	Weekly	70%	8.1	1385	1.48
20-Jan-22	Discharge	70%	8.0	1437	3.6
24-Feb-22	Discharge	70%	8.2	1626	5.7
24-Mar-22	Discharge	70%	7.4	805.2	5.12
24-Apr-22	Discharge	95%	7.5	1032	3.59
30-May-22	Monthly	70%	8.3	1731	5.03
29-Jun-22	Monthly	70%	8.3	1668	2.64
*Water Quality Trigger			N/A	N/A	N/A

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000). "Gilberts & Asscocistes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".**

SW4 - Strips 8-12 EPL 11701 Point 4

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	TSS mg/l	Alkalinity (as $CaCO_3$)	Acidity (as $CaCO_3$) mg/l	SO4 mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	Cu mg/l
7-Jul-21	Weekly	Sampled from Strip 15	6.9	**6220**	**107**												
10-Jul-21	Discharge	Sampled from Strip 16	7.6	**6380**	**117**	23	504	4	2870	377	594	231	0.03	7.08	0.009	6.53	<0.001
14-Jul-21	Weekly	Sampled from Strip 16	5.0	**4390**	**18**												
21-Jul-21	Weekly	Sampled from Strip 16	7.2	**5250**	**33**												
28-Jul-21	Weekly	Sampled from Strip 16	7.3	**4890**	**8**												
4-Aug-21	Weekly	Sampled from Strip 16	7.4	**6040**	**40**												
11-Aug-21	Weekly	Sampled from Strip 16	7.8	**6120**	**39**												
18-Aug-21	Weekly	Sampled from Strip 16	7.2	**6040**	**190**												
25-Aug-21	Weekly	Sampled from Strip 16	7.5	**6350**	**41**												
30-Aug-21	Monthly	Sampled from Strip 16	6.0	**6410**	**22**	18	564	148	2530	352	616	217	0.01	7.19	0.023	1.51	<0.001
8-Sep-21	Weekly	Sampled from Strip 16	7.1	**5710**	**86**												
15-Sep-21	Discharge	Sampled from Strip 16	6.5	**5630**	**21**	17	591	43	2400	362	643	168	0.13	5.31	0.015	2.03	<0.001
22-Sep-21	Weekly	NR	6.2	**6060**	**11**												
29-Sep-21	Weekly	NR	6.5	**4690**	**23**												
6-Oct-21	Weekly	Sampled from Strip 15	6.6	**5680**	**19**												
12-Oct-21	Weekly	Sampled from Strip 15	6.4	**5570**	**4**												
13-Oct-21	Discharge	Sampled from Strip 15	6.8	**4190**	**357**	280	213	18	2050	182	594	102	2.58	3.52	0.048	6.64	0.004
20-Oct-21	Weekly	NR	7.7	**5970**	**259**												
28-Oct-21	Weekly	NR	5.8	**5950**	**3**												
5-Nov-21	Weekly	Sampled from Strip 15	6.4	**6250**	**139**												
10-Nov-21	Weekly	Sampled from Strip 16	6.8	**5830**	**118**												
12-Nov-21	Discharge	Sampled from Strip 15	6.9	5540	56	46	468	33	2580	297	595	200	0.92	6.4	0.094	4.63	0.006
16-Nov-21	Weekly	Sampled from Strip 15	6.92	5920	120												
24-Nov-21	Weekly	Sampled from Strip 16	6.97	6750	63												
30-Nov-21	Weekly	Sampled from Strip 16	7.27	6680	38												
3-Dec-21	Discharge	Sampled from Strip 16	7.19	5820	110	32	450	26	2470	388	596	211	0.54	6.7	0.027	8.71	<0.001
8-Dec-21	Weekly	Sampled from Strip 16	7.33	5120	7												
16-Dec-21	Weekly	No access															
22-Dec-21	Weekly	Too low to sample															
30-Dec-21	Weekly	No access															
5-Jan-22	Weekly	No access															
11-Jan-22	Weekly	No access															
19-Jan-22	Weekly	No access															
20-Jan-22	Discharge	No access															
24-Feb-22	Discharge	Sampled from Strip 16	6.82	4750	75	52	413	139	2390	351	618	222	0.39	6.34	0.074	13.7	0.005
24-Mar-22	Discharge	No access															
24-Apr-22	Discharge	No access															
30-May-22	Monthly	No safe access															
29-Jun-22	Monthly	Sampled from Strip 16	6.74	4950	5	<5	372	18	2750	328	563	214	0.08	5.22	0.025	0.61	<0.001

Site - Southern Arm of MWD Diversion Drain

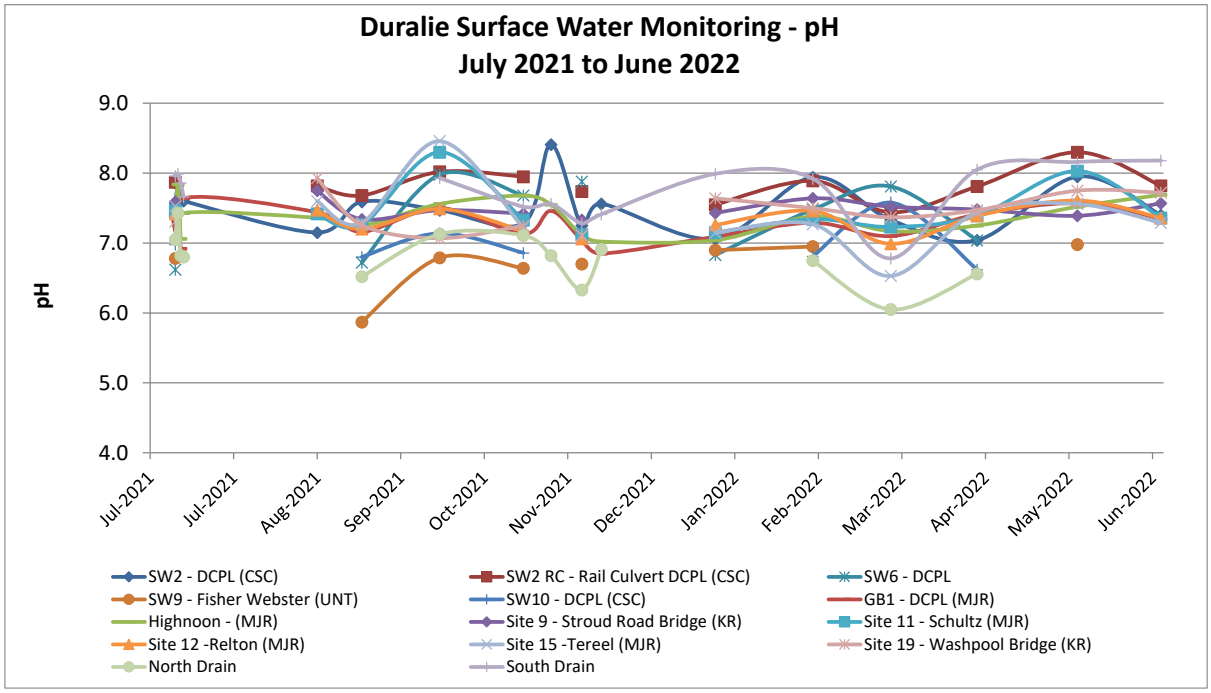
Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	TSS mg/l
10-Jul-21	Discharge	Steady flow, clear, clear	**8.0**	**2131**	10.57	7
11-Jul-21	Discharge	No flow - was running down a pit	**8.0**	**1234**	33.6	9
12-Jul-21	Discharge	Steady flow, slightly turbid, light brown - flow to drain	7.9	**1192**	37.6	9
13-Jul-21	Discharge	Steady flow, slightly turbid, light brown - flow to drain	7.7	**1275**	28.1	<5
30-Aug-21	Monthly	Dry				
15-Sep-21	Discharge	No flow				
13-Oct-21	Discharge	No flow	**7.9**	**1430**	32.5	14
12-Nov-21	Discharge	Fast flow, slightly turbid, light brown - flow to drain	7.5	**1115**	43	9
22-Nov-21	Discharge	Steady flow, clear, light brown - flow to drain	7.6	**1330**	27.9	6
3-Dec-21	Discharge	Steady flow, slightly turbid, light brown - flow to drain	7.3	397	37	6
10-Dec-21	Discharge	Fast flow, slightly turbid, light brown - flow to drain	7.4	**678**	45.1	18
20-Jan-22	Discharge	Slow flow, clear, clear - flow to dam	**8.0**	**2081**	13.74	16
24-Feb-22	Discharge	Steady flow, clear, light brown - flow to drain	**7.9**	**1357**	21.4	20
24-Mar-22	Discharge	Steady flow, clear, light brown	**6.8**	201.9	65.4	36
8-Apr-22	Discharge	Fast flow, slightly turbid, brown	7.3	356.4	34.5	7
24-Apr-22	Discharge	Steady flow, clear, very light brown - flow to dam	**8.1**	**1674**	9.1	<5
30-May-22	Monthly	Slow flow, clear, clear - Flow to dam	**8.2**	**2382**	4.08	<5
29-Jun-22	Monthly	Steady flow, clear, clear - Flow to dam	**8.2**	**2309**	5.41	<5
*Water Quality Trigger			7.1 - 7.9	544	119	80

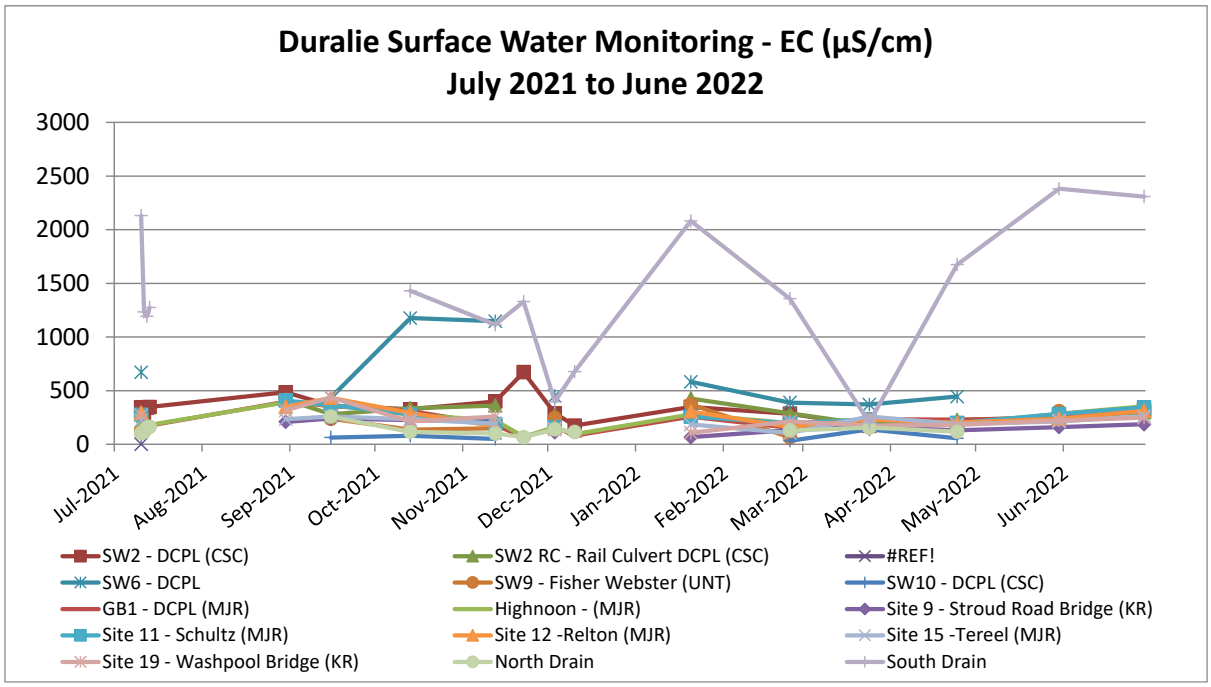
***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**

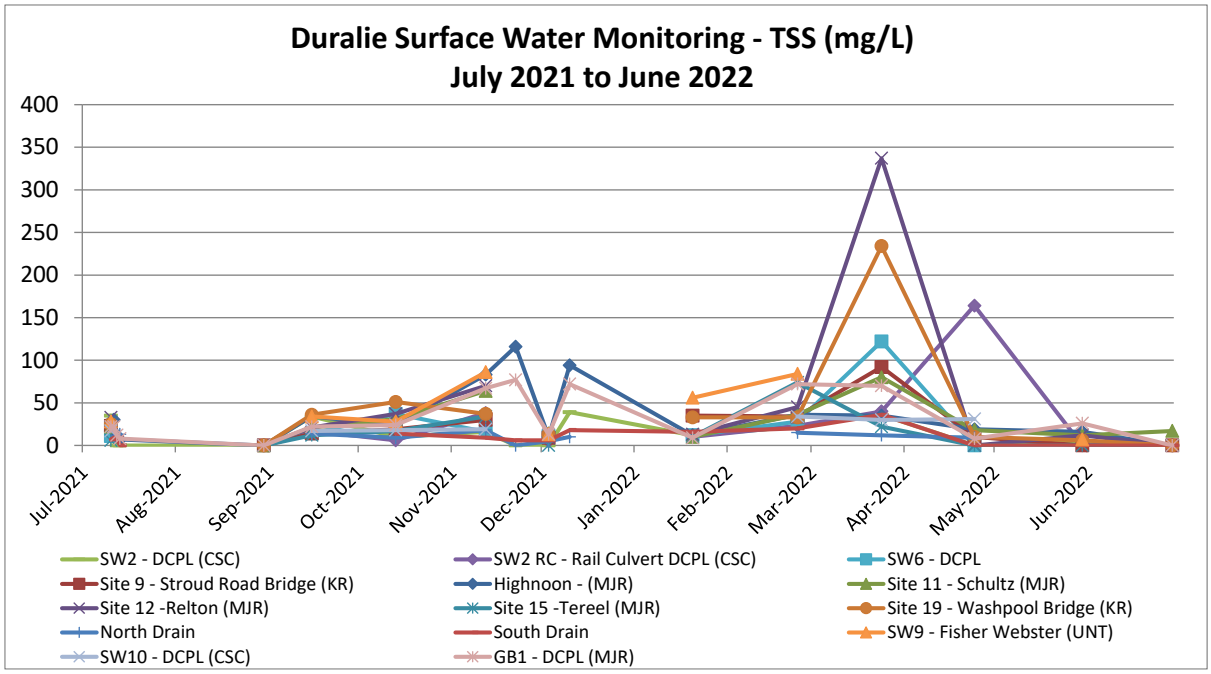
Site - Northern Arm of MWD Diversion Drain

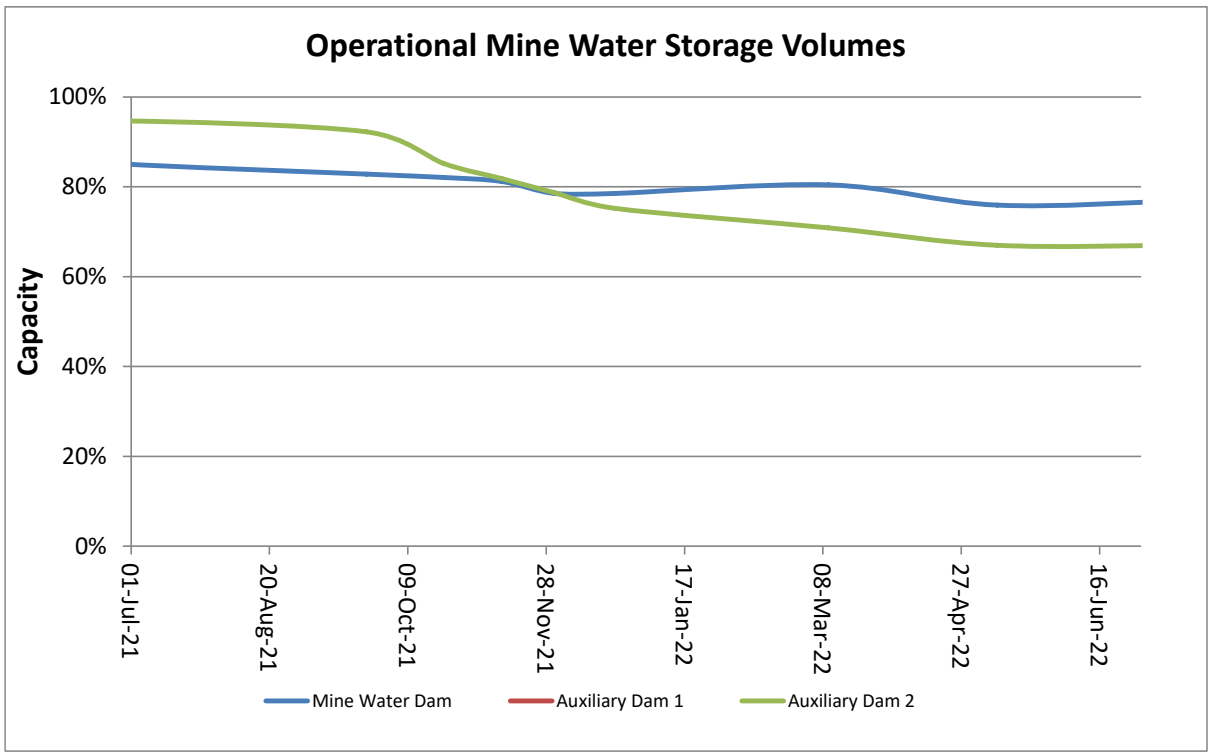
Date	Category	Comment	ph	EC	Turbidity	TSS
				uS/cm	NTU	mg/l
15-Jul-20	Discharge	Steady flow, turbid, light brown	6.4	97.3	115	30
26-Jul-20	Discharge	Fast flow, turid, brown	7.1	59.3	133	45
27-Jul-20	Discharge	Steady flow, slightly turbid, light brown	7.1	183.2	67.5	13
28-Jul-20	Discharge	Slow flow, clear, light brown	6.9	210.5	53.9	10
29-Jul-20	Discharge	No flow				
30-Jul-20	Discharge	No flow				
31-Jul-20	Discharge	No flow				
11-Aug-20	Discharge	Steady flow, light brown	7.2	126.8	182	47
30-Sep-20	Monthly	No flow				
28-Oct-20	Monthly	No flow				
30-Oct-20	Discharge	No flow	6.4	180.8	73.3	25
27-Nov-20	Monthly	No flow				
16-Dec-20	Discharge Event	No flow	7.2	42.7	28.1	19
22-Dec-20	Discharge	Steady flow, slightly turbid, light brown	6.8	168.8	23.4	6
23-Dec-20	Discharge	Slow flow, clear, light brown	6.8	234.8	14.13	8
24-Dec-20	Discharge	Trickle flow, slightly turbid, brown	6.6	206.8	10.64	9
1-Jan-21	Discharge	Steady flow, slightly turbid, light brown	6.6	186.3	23	11
4-Jan-21	Discharge	Steady flow, clear, light brown	7.3	246.4	19.8	<5
5-Jan-21	Discharge	Fast flow, clear, light brown	6.9	184.6	22.9	<5
6-Jan-21	Discharge	Slow flow, slightly turbid, light brown	6.8	287.9	11.85	<5
7-Jan-21	Discharge Event	Steady flow, slightly turbid, brown	6.9	171.8	36.9	<5
8-Jan-21	Discharge	Steady flow, clear, light brown	6.8	309.4	12.26	<5
9-Jan-21	Discharge	Steady flow, slightly turbid, light brown	6.8	312.2	8.68	<5
10-Jan-21	Discharge	Trickle flow, clear, light brown	6.7	323.6	4.98	<5
11-Jan-21	Discharge	Trickle flow, clear, brown	6.6	378.5	3.36	<5
12-Jan-21	Discharge	No flow, clear, clear	6.6	344.8	2.81	6
13-Jan-21	Discharge	No flow - Drain not flowing				
14-Jan-21	Discharge	No flow				
27-Jan-21	Monthly	No flow				
14-Feb-21	Discharge Event	Steady flow, slightly turbid, light brown	6.5	106.1	59.8	18
16-Feb-21	Discharge	Steady flow, clear, light brown	6.8	163.9	28	10
17-Feb-21	Discharge	Slow flow, clear, light brown	7.3	222.9	28.5	15
18-Feb-21	Discharge	Trickle flow, clear, brown	6.8	177.4	26.9	13
19-Feb-21	Discharge	Steady flow, turbid, light brown	7.1	119	68.9	21
20-Feb-21	Discharge	Steady flow, slightly turbid, light brown	6.9	203.3	32.3	12
21-Feb-21	Discharge	Steady flow, slightly turbid, brown	6.9	279.4	18.22	<5
22-Feb-21	Discharge	Steady flow, clear, light brown	6.9	226	17.46	7
23-Feb-21	Discharge	Steady flow, slightly turbid, brown	6.9	237.6	42.7	16
24-Feb-21	Discharge	Steady flow, clear, brown	6.7	244.6	18.78	12
25-Feb-21	Discharge	Slow flow, clear, light brown	6.6	253.2	12.26	5
26-Feb-21	Discharge	Trickle flow, clear, light brown	6.8	290.1	10.13	10
27-Feb-21	Discharge	Trickle flow, clear, light brown	6.7	280.3	8.05	7
28-Feb-21	Discharge	Slow flow, clear, light brown	6.3	249.8	6.65	9
1-Mar-21	Discharge	Trickle flow, slightly turbid, brown	6.6	230	5.24	<5
2-Mar-21	Discharge	No flow, clear, brown	6.7	269.5	4.15	5
3-Mar-21	Discharge	No flow				
15-Mar-21	Discharge Event	Slow/steady flow, turbid, brown	6.6	163.7	70	13
16-Mar-21	Discharge	Slow flow, turbid, brown	6.6	177.2	58.5	7
17-Mar-21	Discharge	Steady flow, slightly turbid, brown	6.4	154	52.1	12
18-Mar-21	Discharge	Fast flow, slightly turbid, brown	**6.2**	142	46.3	15
19-Mar-21	Discharge	Fast flow, slightly turbid, light brown	7.1	104.2	45.8	12
20-Mar-21	Discharge	Fast flow, slightly turbid, light brown	7.2	214.9	38	5
21-Mar-21	Discharge	Fast flow, slightly turbid, light brown	**7.1**	57.3	30.9	<5
22-Mar-21	Discharge	Slightly turbid, light brown	**6.7**	162.9	23.3	6
23-Mar-21	Discharge	Fast flow, slightly turbid, light brown	**6.7**	167.8	32.5	<5
10-Jul-21	Discharge	Slow flow, turbid, brown	**7.1**	106.4	160	23
11-Jul-21	Discharge	Slow flow, slightly turbid, orange	7.4	113	156	16
12-Jul-21	Discharge	Slow flow, turbid, light brown	**6.8**	155.8	123	11
13-Jul-21	Discharge	No flow	**6.8**	163.5	114	13
30-Aug-21	Monthly	Dry				
15-Sep-21	Discharge	No flow	**6.5**	258.1	33.3	14
13-Oct-21	Discharge	Steady flow, turbid, brown	7.1	116.4	69.1	9
12-Nov-21	Discharge	Steady flow, turbid, light brown	7.1	100.8	77.4	18
22-Nov-21	Discharge	Steady flow, slightly turbid,light brown	**6.8**	67.3	46.1	<5
3-Dec-21	Discharge	Trickle flow, slightly turbid, light brown	**6.3**	140.1	15.92	5
10-Dec-21	Discharge	Steady flow, slightly turbid, light brown	**6.9**	114.4	62	10
20-Jan-22	Discharge	No flow				
24-Feb-22	Discharge	Steady flow, slightly turbid, light brown	**6.8**	129.3	32.6	15
24-Mar-22	Discharge	Flow to the dam, clear, light brown	**6.1**	155.4	34.8	12
8-Apr-22	Discharge	Steady flow, slightly turbid, brown	**6.6**	87.7	88.7	14
24-Apr-22	Discharge	Slow flow, slightly turbid, light brown	**6.6**	117.8	22.8	9
30-May-22	Monthly	No flow				
29-Jun-22	Monthly	No flow				
*Water Quality Trigger			7.1 - 7.9	544	119	80

***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**


Duralie Surface Water Monitoring - pH
July 2021 to June 2022
pH
9.0
8.0
7.0
6.0
5.0
4.0
Jul-2021
Jul-2021
Aug-2021
Sep-2021
Oct-2021
Nov-2021
Dec-2021
Jan-2022
Feb-2022
Mar-2022
Apr-2022
May-2022
Jun-2022
SW2 - DCPL (CSC)
SW2 RC - Rail Culvert DCPL (CSC)
SW6 - DCPL
SW9 - Fisher Webster (UNT)
SW10 - DCPL (CSC)
GB1 - DCPL (MJR)
Highnoon - (MJR)
Site 9 - Stroud Road Bridge (KR)
Site 11 - Schultz (MJR)
Site 12 -Relton (MJR)
Site 15 -Tereel (MJR)
Site 19 - Washpool Bridge (KR)
North Drain
South Drain


Duralie Surface Water Monitoring - EC (µS/cm)
July 2021 to June 2022
3000
2500
2000
1500
1000
500
0
Jul-2021
Aug-2021
Sep-2021
Oct-2021
Nov-2021
Dec-2021
Jan-2022
Feb-2022
Mar-2022
Apr-2022
May-2022
Jun-2022
SW2 - DCPL (CSC)
SW2 RC - Rail Culvert DCPL (CSC)
#REF!
SW6 - DCPL
SW9 - Fisher Webster (UNT)
SW10 - DCPL (CSC)
GB1 - DCPL (MJR)
Highnoon - (MJR)
Site 9 - Stroud Road Bridge (KR)
Site 11 - Schultz (MJR)
Site 12 -Relton (MJR)
Site 15 -Tereel (MJR)
Site 19 - Washpool Bridge (KR)
North Drain
South Drain


Duralie Surface Water Monitoring - TSS (mg/L)
July 2021 to June 2022
400
350
300
250
200
150
100
50
0
Jul-2021
Aug-2021
Sep-2021
Oct-2021
Nov-2021
Dec-2021
Jan-2022
Feb-2022
Mar-2022
Apr-2022
May-2022
Jun-2022
SW2 - DCPL (CSC)
SW2 RC - Rail Culvert DCPL (CSC)
SW6 - DCPL
Site 9 - Stroud Road Bridge (KR)
Highnoon - (MJR)
Site 11 - Schultz (MJR)
Site 12 -Relton (MJR)
Site 15 -Tereel (MJR)
Site 19 - Washpool Bridge (KR)
North Drain
South Drain
SW9 - Fisher Webster (UNT)
SW10 - DCPL (CSC)
GB1 - DCPL (MJR)


Operational Mine Water Storage Volumes
Capacity
100%
80%
60%
40%
20%
0%
01-Jul-21
20-Aug-21
09-Oct-21
28-Nov-21
17-Jan-22
08-Mar-22
27-Apr-22
16-Jun-22
Mine Water Dam
Auxiliary Dam 1
Auxiliary Dam 2

Groundwater

DB1W

Parameter	Units	19-Aug-21	18-Nov-21	28-Apr-22	10-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	15.74	15.73	15.32	15.48	15.3	15.57	15.74	0.04	0.20
pH		5.71	5.53	5.88	5.74	5.53	5.72	5.88	0.02	0.14
Conductivity @ 25^{0}C	(µS/cm)	4350	4050	3160	3180	3160	3685	4350	368700	607
ORP	(mV)	26	35	-6	25	-6	20	35	321	18
Dissolved Oxygen	(%)	27.1	11.9	29.7	25.4	11.90	23.53	29.70	63.19	7.95
TDS	(mg/L)	2860	3150	2230	2470	2230	2678	3150	166625	408
Alkalinity as CaCO3	(mg/L)	133	136	80	88	80	109	136	862	29
Acidity as CaCO3	(mg/L)	109	139	111	140	109	125	140	291	17
Sulphate	(mg/L)	356	356	343	309	309	341	356	493	22
Chloride	(mg/L)	969	1020	863	845	845	924	1020	7068	84
Calcium	(mg/L)	240	228	188	168	168	206	240	1136	34
Magnesium	(mg/L)	58	54	48	53	48	53	58	17	4
Sodium	(mg/L)	483	452	402	432	402	442	483	1160	34
Aluminium	(mg/L)	0.24	0.37	0.65	0.61	0.24	0.47	0.65	0.04	0.20
Manganese	(mg/L)	0.979	0.871	0.694	0.71	0.69	0.81	0.98	0.02	0.14
Zinc	(mg/L)	0.053	0.068	0.037	0.046	0.04	0.05	0.07	0.00	0.01
Iron	(mg/L)	31.6	24.6	26.2	26.1	24.60	27.13	31.60	9.44	3.07

DB2W

Parameter	Units	19-Aug-21	17-Nov-21	28-Apr-22	10-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	13.85	13.76	13.37	13.40	13.4	13.60	13.85	0.06	0.25
pH		5.97	6.57	6.24	6.18	5.97	6.24	6.57	0.06	0.25
Conductivity @ 25^{0}C	(µS/cm)	1699	1593	1395	1433	1395	1530	1699	20055	142
ORP	(mV)	-3	12	16	45	-3	18	45	403	20
Dissolved Oxygen	(%)	17.6	23.5	25.6	25.4	17.60	23.03	25.60	13.98	3.74
TDS	(mg/L)	1170	1040	1160	1090	1040	1115	1170	3767	61
Alkalinity as CaCO3	(mg/L)	185	186	159	163	159	173	186	203	14
Acidity as CaCO3	(mg/L)	80	98	70	85	70	83	98	136	12
Sulphate	(mg/L)	186	188	198	195	186	192	198	32	6
Chloride	(mg/L)	281	295	292	284	281	288	295	43	7
Calcium	(mg/L)	106	116	112	106	106	110	116	24	5
Magnesium	(mg/L)	27	26	25	29	25	27	29	3	2
Sodium	(mg/L)	162	157	150	164	150	158	164	39	6
Aluminium	(mg/L)	<0.01	0.02	<0.01	<0.01	0.02	0.02	0.02		
Manganese	(mg/L)	0.864	0.83	0.844	0.86	0.83	0.85	0.86	0.00	0.02
Zinc	(mg/L)	0.017	0.019	0.012	0.021	0.01	0.02	0.02	0.00	0.00
Iron	(mg/L)	13.8	11.8	12.7	12.7	11.80	12.75	13.80	0.67	0.82

DB3W

Parameter	Units	19-Aug-21	18-Nov-21	28-Apr-22	10-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	2.78	2.98	2.20	2.31	2.2	2.57	2.98	0.14	0.37
pH		6.36	6.58	6.41	6.34	6.34	6.42	6.58	0.01	0.11
Conductivity @ 25^{0}C	(µS/cm)	144	131	141	144	131	140	144	39	6
ORP	(mV)	124	158	83	130	83	124	158	958	31
Dissolved Oxygen	(%)	74.8	56.2	64.0	63.7	56.20	64.68	74.80	58.58	7.65
TDS	(mg/L)	185	134	173	202	134	174	202	835	29
Alkalinity as CaCO3	(mg/L)	43	42	36	41	36	41	43	10	3
Acidity as CaCO3	(mg/L)	12	24	14	21	12	18	24	32	6
Sulphate	(mg/L)	5	4	4	<1	4	4	5	0	1
Chloride	(mg/L)	15	15	13	13	13	14	15	1	1
Calcium	(mg/L)	3	2	3	2	2	3	3	0	1
Magnesium	(mg/L)	2	2	2	2	2	2	2	0	0
Sodium	(mg/L)	22	19	18	20	18	20	22	3	2
Aluminium	(mg/L)	4.06	3.11	4.28	6.42	3.11	4.47	6.42	1.95	1.40
Manganese	(mg/L)	0.048	0.035	0.072	0.068	0.04	0.06	0.07	0.00	0.02
Zinc	(mg/L)	0.032	0.017	0.029	0.037	0.02	0.03	0.04	0.00	0.01
Iron	(mg/L)	7.28	6.32	6.84	11	6.32	7.86	11.00	4.54	2.13

DB4W

Parameter	Units	19-Aug-21	17-Nov-21	28-Apr-22	10-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	6.15	6.49	5.32	5.92	5.3	5.97	6.49	0.24	0.49
pH		6.62	6.80	6.67	6.69	6.62	6.70	6.80	0.01	0.08
Conductivity @ 25^{0}C	(µS/cm)	4000	3760	3360	3570	3360	3673	4000	74358	273
ORP	(mV)	-243	-280	215	-175	-280	-121	215	51992	228
Dissolved Oxygen	(%)	17.8	7.6	12.0	6.5	6.50	10.98	17.80	26.35	5.13
TDS	(mg/L)	2310	2400	2270	2070	2070	2263	2400	19425	139
Alkalinity as CaCO3	(mg/L)	364	354	294	290	290	326	364	1516	39
Acidity as CaCO3	(mg/L)	14	30	29	14	14	22	30	80	9
Sulphate	(mg/L)	56	52	107	117	52	83	117	1141	34
Chloride	(mg/L)	882	923	975	917	882	924	975	1472	38
Calcium	(mg/L)	143	156	168	151	143	155	168	110	10
Magnesium	(mg/L)	54	53	62	65	53	59	65	35	6
Sodium	(mg/L)	502	508	489	519	489	505	519	156	13
Aluminium	(mg/L)	0.01	0.04	<0.01	<0.01	0.01	0.03	0.04	0.00	0.02
Manganese	(mg/L)	1.07	1.01	1.36	1.29	1.01	1.18	1.36	0.03	0.17
Zinc	(mg/L)	<0.005	<0.005	<0.005	<0.005	0.00				
Iron	(mg/L)	0.08	0.11	0.26	0.25	0.08	0.18	0.26	0.01	0.09

DB5W

Parameter	Units	19-Aug-21	17-Nov-21	28-Apr-22	11-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	11.35	11.56		10.85	11.4	11.46	11.56	0.02	0.15
pH		5.47	6.09		5.55	5.47	5.78	6.09	0.19	0.44
Conductivity @ 25^{0}C	(µS/cm)	2204	2193		1800	2193	2199	2204	61	8
ORP	(mV)	-205	6		13	-205	-100	6	22261	149
Dissolved Oxygen	(%)	26.2	20.0	N	24.9	20.00	23.10	26.20	19.22	4.38
TDS	(mg/L)	1330	1390	o	1190	1190	1303	1390	10533	103
Alkalinity as CaCO3	(mg/L)	56	55		53	53	55	56	2	2
Acidity as CaCO3	(mg/L)	115	143	a	114	114	124	143	271	16
Sulphate	(mg/L)	169	197	c	172	169	179	197	236	15
Chloride	(mg/L)	483	536	c	477	477	499	536	1054	32
Calcium	(mg/L)	28	31	e	25	25	28	31	9	3
Magnesium	(mg/L)	30	33	s	30	30	31	33	3	2
Sodium	(mg/L)	289	301	s	284	284	291	301	76	9
Aluminium	(mg/L)	0.01	0.02		0.01	0.01	0.01	0.02	0.00	0.01
Manganese	(mg/L)	1.02	1.06		0.998	1.00	1.03	1.06	0.00	0.03
Zinc	(mg/L)	0.032	0.034		0.045	0.03	0.04	0.05	0.00	0.01
Iron	(mg/L)	39.9	37.3		36.8	36.80	38.00	39.90	2.77	1.66

DB6W

Parameter	Units	20-Aug-21	19-Nov-21	28-Apr-22	3-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	21.02	20.86	20.60	20.61	20.6	20.77	21.02	0.04	0.20
pH		6.48	6.67	6.65	6.63	6.48	6.61	6.67	0.01	0.09
Conductivity @ 25^{0}C	(µS/cm)	6310	6480	5540	5460	5460	5948	6480	272892	522
ORP	(mV)	-30	-8	-33	-21	-33	-23	-8	126	11
Dissolved Oxygen	(%)	26.3	20.3	26.6	25.4	20.30	24.65	26.60	8.67	2.94
TDS	(mg/L)	3740	4690	3720	3950	3720	4025	4690	207367	455
Alkalinity as CaCO3	(mg/L)	669	656	610	618	610	638	669	823	29
Acidity as CaCO3	(mg/L)	76	108	75	96	75	89	108	258	16
Sulphate	(mg/L)	93	100	90	91	90	94	100	20	5
Chloride	(mg/L)	1420	1530	1530	1630	1420	1528	1630	7358	86
Calcium	(mg/L)	275	300	322	324	275	305	324	525	23
Magnesium	(mg/L)	190	186	192	201	186	192	201	40	6
Sodium	(mg/L)	635	604	592	606	592	609	635	333	18
Aluminium	(mg/L)	0.02	0.24	0.26	0.21	0.02	0.18	0.26	0.01	0.11
Manganese	(mg/L)	0.318	0.33	0.33	0.285	0.29	0.32	0.33	0.00	0.02
Zinc	(mg/L)	0.015	0.019	0.018	0.014	0.01	0.02	0.02	0.00	0.00
Iron	(mg/L)	3.81	4	4.86	3.95	3.81	4.16	4.86	0.23	0.48

DB7W

Parameter	Units	19-Aug-21	18-Nov-21	28-Apr-22	10-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	9.95	10.29	9.06	9.38	9.1	9.67	10.29	0.31	0.55
pH		7.35	6.62	6.93	6.92	6.62	6.96	7.35	0.09	0.30
Conductivity @ 25^{0}C	(µS/cm)	3030	3091	2630	2491	2491	2811	3091	87174	295
ORP	(mV)	188	-192	-150	-105	-192	-65	188	29654	172
Dissolved Oxygen	(%)	47.5	26.4	31.6	30.0	26.40	33.88	47.50	87.24	9.34
TDS	(mg/L)	1730	1720	1640	1650	1640	1685	1730	2167	47
Alkalinity as CaCO3	(mg/L)	434	435	394	399	394	416	435	486	22
Acidity as CaCO3	(mg/L)	20	40	24	26	20	28	40	76	9
Sulphate	(mg/L)	62	66	76	77	62	70	77	55	7
Chloride	(mg/L)	619	638	652	621	619	633	652	242	16
Calcium	(mg/L)	140	139	136	133	133	137	140	10	3
Magnesium	(mg/L)	53	51	51	56	51	53	56	6	2
Sodium	(mg/L)	373	344	345	373	344	359	373	271	16
Aluminium	(mg/L)	0.5	0.92	0.17	0.11	0.11	0.43	0.92	0.14	0.37
Manganese	(mg/L)	0.683	0.651	0.652	0.696	0.65	0.67	0.70	0.00	0.02
Zinc	(mg/L)	0.036	0.006	<0.005	<0.005	0.01	0.02	0.04	0.00	0.02
Iron	(mg/L)	0.73	1.64	0.3	0.16	0.16	0.71	1.64	0.45	0.67

DB8W

Parameter	Units	20-Aug-21	19-Nov-21	22-Feb-22	3-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	16.36	16.29	16.22	16.08	16.1	16.24	16.36	0.01	0.12

DB9W

Parameter	Units	20-Aug-21	19-Nov-21	22-Feb-22	3-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	19.62	19.34	18.87	18.41	18.4	19.06	19.62	0.28	0.53
pH		7.02	7.10	7.20	7.07	7.02	7.10	7.20	0.01	0.08
Conductivity @ 25^{0}C	(µS/cm)	3770	3800	3230	3410	3230	3553	3800	77625	279
ORP	(mV)	-6	45	213	92	-6	86	213	8770	94
Dissolved Oxygen	(%)	24.7	24.0	35.3	22.8	22.80	26.70	35.30	33.49	5.79
TDS	(mg/L)	2280	2180	2270	2150	2150	2220	2280	4200	65
Alkalinity as CaCO3	(mg/L)	170	155	139	141	139	151	170	207	14
Acidity as CaCO3	(mg/L)	7	11	7	5	5	8	11	6	3
Sulphate	(mg/L)	258	258	248	259	248	256	259	27	5
Chloride	(mg/L)	851	852	888	938	851	882	938	1678	41
Calcium	(mg/L)	164	161	183	219	161	182	219	712	27
Magnesium	(mg/L)	15	15	16	18	15	16	18	2	1
Sodium	(mg/L)	498	496	528	506	496	507	528	215	15
Aluminium	(mg/L)	0.48	0.05	0.3	0.07	0.05	0.23	0.48	0.04	0.20
Manganese	(mg/L)	0.219	0.173	0.168	0.168	0.17	0.18	0.22	0.00	0.02
Zinc	(mg/L)	0.01	0.01	0.01	0.014	0.01	0.01	0.01	0.00	0.00
Iron	(mg/L)	1.06	0.41	0.84	0.35	0.35	0.67	1.06	0.12	0.34

DB10W

Parameter	Units	20-Aug-21	19-Nov-21	22-Feb-22	3-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	11.70	11.48	11.48	11.00	11.0	11.42	11.70	0.09	0.30
pH		5.15	5.20	5.02	5.20	5.02	5.14	5.20	0.01	0.09
Conductivity @ 25^{0}C	(µS/cm)	4730	5010	4030	4410	4030	4545	5010	177967	422
ORP	(mV)	110	149	109	289	109	164	289	7264	85
Dissolved Oxygen	(%)	40.7	20.3	25.5	19.2	19.20	26.43	40.70	98.12	9.91
TDS	(mg/L)	2840	2990	2830	2840	2830	2875	2990	5900	77
Alkalinity as CaCO3	(mg/L)	32	43	20	38	20	33	43	98	10
Acidity as CaCO3	(mg/L)	86	133	100	95	86	104	133	420	21
Sulphate	(mg/L)	440	452	459	456	440	452	459	70	8
Chloride	(mg/L)	1050	1140	1170	1200	1050	1140	1200	4200	65
Calcium	(mg/L)	77	81	84	106	77	87	106	169	13
Magnesium	(mg/L)	87	87	92	93	87	90	93	10	3
Sodium	(mg/L)	674	668	698	662	662	676	698	249	16
Aluminium	(mg/L)	0.14	0.54	0.09	38.4	0.09	9.79	38.40	363.77	19.07
Manganese	(mg/L)	0.929	0.876	0.797	1.27	0.80	0.97	1.27	0.04	0.21
Zinc	(mg/L)	0.172	0.192	0.217	0.319	0.17	0.23	0.32	0.00	0.07
Iron	(mg/L)	13.5	10.1	11.3	45.2	10.10	20.03	45.20	283.66	16.84

DB11W

Parameter	Units	24-Aug-21	17-Nov-21	23-Feb-22	11-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	10.39	10.55	10.45	10.22	10.2	10.40	10.55	0.02	0.14
pH		6.91	7.06	7.41	6.90	6.90	7.07	7.41	0.06	0.24
Conductivity @ 25^{0}C	(µS/cm)	3000	3140	2680	2910	2680	2933	3140	37292	193
ORP	(mV)	-10	-66	52	-26	-66	-13	52	2404	49
Dissolved Oxygen	(%)	32.2	27.7	16.0	31.5	16.00	26.85	32.20	56.23	7.50
TDS	(mg/L)	2110	2100	2230	2000	2000	2110	2230	8867	94
Alkalinity as CaCO3	(mg/L)	296	293	294	273	273	289	296	115	11
Acidity as CaCO3	(mg/L)	22	27	26	14	14	22	27	35	6
Sulphate	(mg/L)	184	183	171	181	171	180	184	36	6
Chloride	(mg/L)	770	702	709	712	702	723	770	989	31
Calcium	(mg/L)	203	206	207	190	190	202	207	62	8
Magnesium	(mg/L)	37	32	39	37	32	36	39	9	3
Sodium	(mg/L)	388	366	371	385	366	378	388	114	11
Aluminium	(mg/L)	0.03	0.04	0.02	0.03	0.02	0.03	0.04	0.00	0.01
Manganese	(mg/L)	0.882	0.785	0.725	0.841	0.73	0.81	0.88	0.00	0.07
Zinc	(mg/L)	0.008	0.012	0.011	0.014	0.01	0.01	0.01	0.00	0.00
Iron	(mg/L)	3.96	3.02	2.94	3.7	2.94	3.41	3.96	0.25	0.50

BH4BW

Parameter	Units	19-Aug-21	17-Nov-21	28-Apr-22	10-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	4.60	4.63	3.74	3.97	3.7	4.24	4.63	0.20	0.45
pH		6.45	6.47	6.05	6.01	6.01	6.25	6.47	0.06	0.25
Conductivity @ 25^{0}C	(µS/cm)	489	505	326	402	326	431	505	6872	83
ORP	(mV)	122	51	86	38	38	74	122	1424	38
Dissolved Oxygen	(%)	37.0	31.2	50.4	39.0	31.20	39.40	50.40	64.72	8.04
TDS	(mg/L)	5710	352	304	258	258	1656	5710	7305880	2703
Alkalinity as CaCO3	(mg/L)	81	89	65	70	65	76	89	117	11
Acidity as CaCO3	(mg/L)	71	73	25	49	25	55	73	505	22
Sulphate	(mg/L)	7	9	14	<1	7	10	14	13	4
Chloride	(mg/L)	97	102	60	67	60	82	102	444	21
Calcium	(mg/L)	21	24	16	17	16	20	24	14	4
Magnesium	(mg/L)	14	14	7	9	7	11	14	13	4
Sodium	(mg/L)	44	46	32	39	32	40	46	39	6
Aluminium	(mg/L)	4.23	28.8	11.1	5.92	4.23	12.51	28.80	126.45	11.24
Manganese	(mg/L)	1.14	1.88	0.514	0.677	0.51	1.05	1.88	0.37	0.61
Zinc	(mg/L)	0.047	0.172	0.071	0.047	0.05	0.08	0.17	0.00	0.06
Iron	(mg/L)	14.6	55.5	21.5	13.3	13.30	26.23	55.50	393.85	19.85

SI1W

Parameter	Units	20-Aug-21	18-Nov-21	22-Feb-22	10-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	9.45	9.57	9.72	9.65	9.5	9.60	9.72	0.01	0.12
pH		6.93	7.02	6.90	7.14	6.90	7.00	7.14	0.01	0.11
Conductivity @ 25^{0}C	(µS/cm)	3051	3079	2660	2820	2660	2903	3079	39606	199
ORP	(mV)	107	158	207	10	10	121	207	7094	84
Dissolved Oxygen	(%)	47.9	34.3	25.0	47.6	25.00	38.70	47.90	123.63	11.12
TDS	(mg/L)	2120	2410	2390	2020	2020	2235	2410	38033	195
Alkalinity as CaCO3	(mg/L)	491	481	480	457	457	477	491	207	14
Acidity as CaCO3	(mg/L)	20	36	34	20	20	28	36	76	9
Sulphate	(mg/L)	777	805	818	<1	777	800	818	439	21
Chloride	(mg/L)	280	296	317	315	280	302	317	305	17
Calcium	(mg/L)	136	181	199	165	136	170	199	714	27
Magnesium	(mg/L)	257	147	154	156	147	179	257	2754	52
Sodium	(mg/L)	1450	260	272	271	260	563	1450	349508	591
Aluminium	(mg/L)	0.04	0.16	0.01	0.04	0.01	0.06	0.16	0.00	0.07
Manganese	(mg/L)	0.004	0.006	0.003	0.002	0.00	0.00	0.01	0.00	0.00
Zinc	(mg/L)	0.007	0.017	<0.005	<0.005	0.01	0.01	0.02	0.00	0.01
Iron	(mg/L)	<0.05	0.42	<0.05	0.07	0.07	0.25	0.42	0.06	0.25

SI2W

Parameter	Units	20-Aug-21	18-Nov-21	22-Feb-22	10-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	17.33	18.72	20.16	20.15	17.3	19.09	20.16	1.83	1.35
pH		6.84	6.85	6.68	7.38	6.68	6.94	7.38	0.09	0.31
Conductivity @ 25^{0}C	(µS/cm)	3240	3340	2670	2810	2670	3015	3340	105767	325
ORP	(mV)	86	109	209	4	4	102	209	7119	84
Dissolved Oxygen	(%)	34.3	17.7	11.3	35.6	11.30	24.73	35.60	146.51	12.10
TDS	(mg/L)	2410	2530	2540	2040	2040	2380	2540	54867	234
Alkalinity as CaCO3	(mg/L)	319	309	302	292	292	306	319	130	11
Acidity as CaCO3	(mg/L)	10	16	14	6	6	12	16	20	4
Sulphate	(mg/L)	1050	1070	983	<1	983	1034	1070	2076	46
Chloride	(mg/L)	262	262	259	250	250	258	262	32	6
Calcium	(mg/L)	137	140	149	125	125	138	149	98	10
Magnesium	(mg/L)	237	145	145	150	145	169	237	2046	45
Sodium	(mg/L)	878	333	337	340	333	472	878	73269	271
Aluminium	(mg/L)	0.02	<0.01	0.01	0.44	0.01	0.16	0.44	0.06	0.25
Manganese	(mg/L)	0.011	0.013	0.013	0.058	0.01	0.02	0.06	0.00	0.02
Zinc	(mg/L)	0.012	<0.005	0.01	0.034	0.01	0.02	0.03	0.00	0.01
Iron	(mg/L)	<0.05	0.07	0.08	1.05	0.07	0.40	1.05	0.32	0.56

SI3W

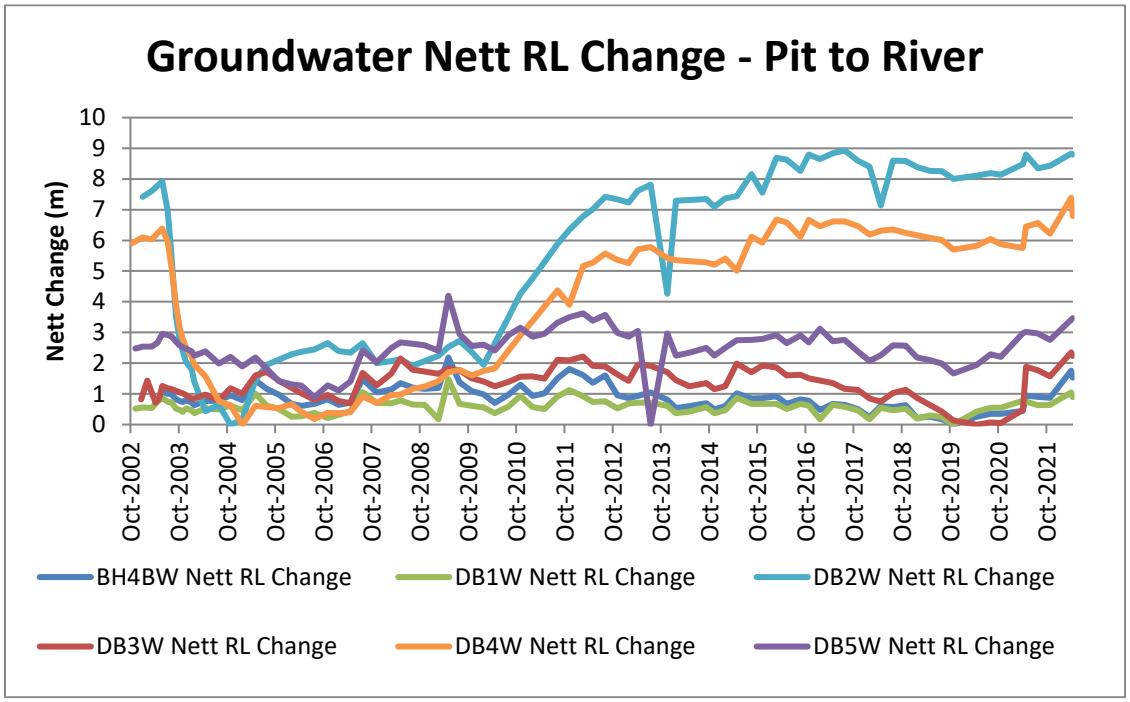
Parameter	Units	20-Aug-21	18-Nov-21	22-Feb-22	10-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	28.40	27.86	27.58	27.47	27.5	27.83	28.40	0.17	0.42
pH		6.75	6.48	6.81	6.90	6.48	6.74	6.90	0.03	0.18
Conductivity @ 25^{0}C	(µS/cm)	8920	7760	6400	4160	4160	6810	8920	4181733	2045
ORP	(mV)	92	152	217	12	12	118	217	7623	87
Dissolved Oxygen	(%)	63.7	67.5	32.4	46.4	32.40	52.50	67.50	263.89	16.24
TDS	(mg/L)	6180	5970	4440	2890	2890	4870	6180	2343800	1531
Alkalinity as CaCO3	(mg/L)	406	334	302	270	270	328	406	3387	58
Acidity as CaCO3	(mg/L)	31	41	30	8	8	28	41	194	14
Sulphate	(mg/L)	846	745	638	<1	638	743	846	10819	104
Chloride	(mg/L)	1910	1840	1440	975	975	1541	1910	185373	431
Calcium	(mg/L)	138	530	453	280	138	350	530	30951	176
Magnesium	(mg/L)	285	153	123	86	86	162	285	7502	87
Sodium	(mg/L)	1090	738	666	525	525	755	1090	57778	240
Aluminium	(mg/L)	0.18	1.17	0.05	4.98	0.05	1.60	4.98	5.34	2.31
Manganese	(mg/L)	0.027	0.326	0.063	2.14	0.03	0.64	2.14	1.02	1.01
Zinc	(mg/L)	0.041	0.066	0.033	0.151	0.03	0.07	0.15	0.00	0.05
Iron	(mg/L)	0.28	1.64	0.16	5.85	0.16	1.98	5.85	7.10	2.66

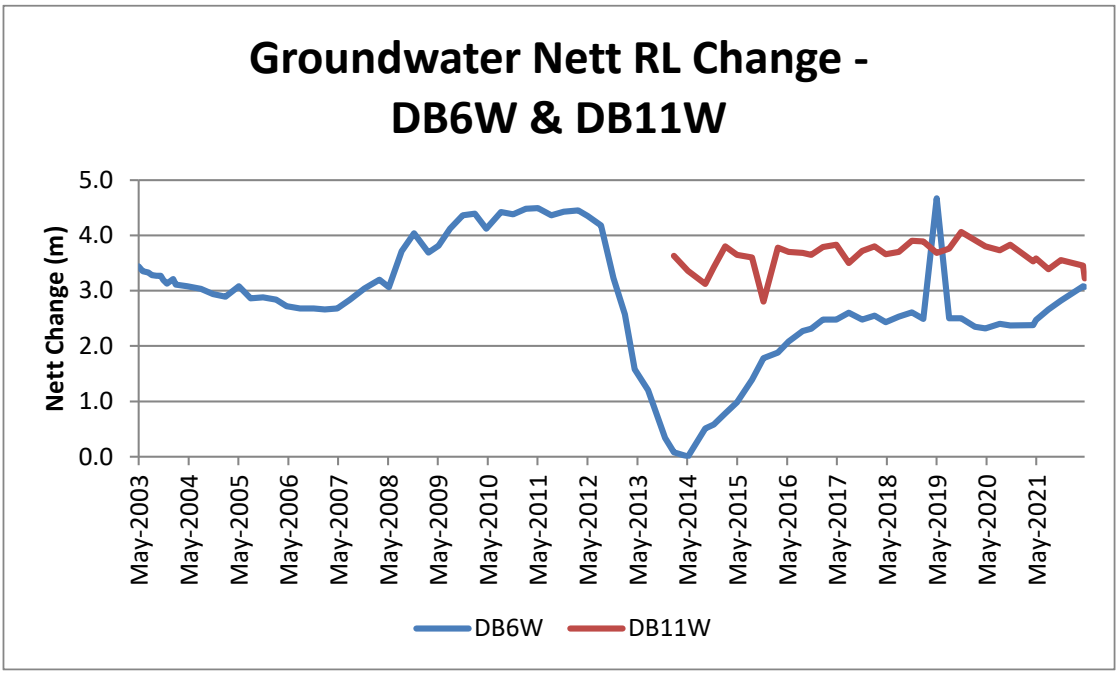
WR1

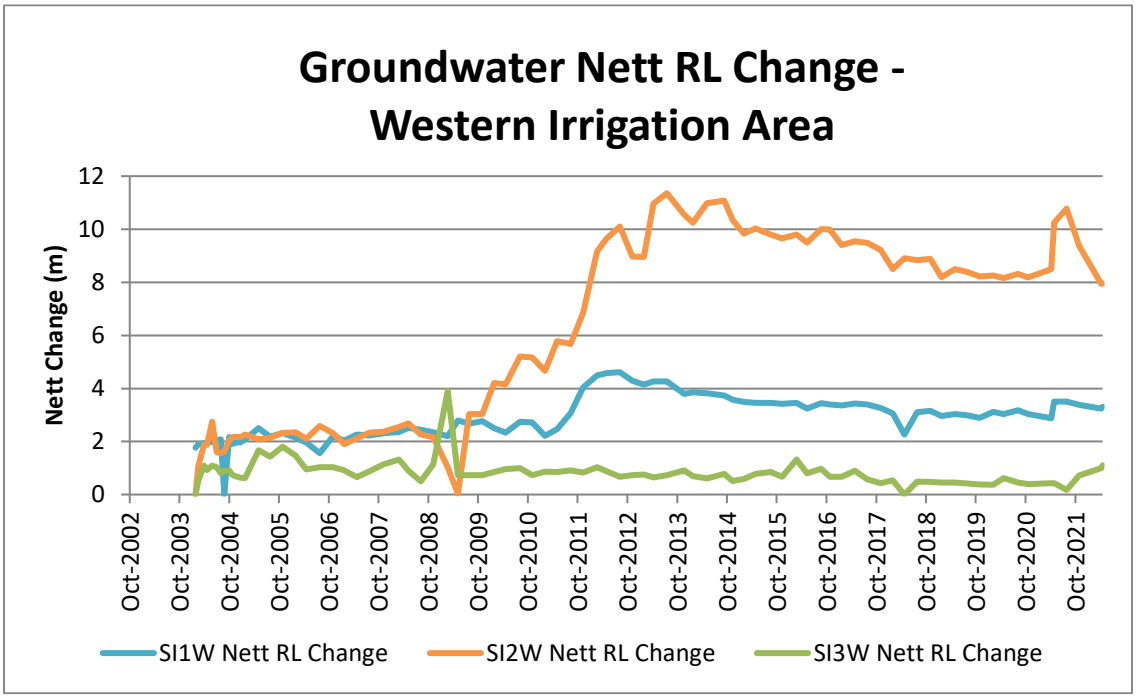
Parameter	Units	24-Aug-21	19-Nov-21	28-Apr-22	3-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	11.74	13.48	12.58	12.39	11.7	12.55	13.48	0.52	0.72
pH		6.31	6.24	6.29	6.37	6.24	6.30	6.37	0.00	0.05
Conductivity @ 25^{0}C	(µS/cm)	2840	2990	2586	2563	2563	2745	2990	42485	206
ORP	(mV)	-68	84	34	175	-68	56	175	10268	101
Dissolved Oxygen	(%)	62.1	27.0	36.2	46.8	27.00	43.03	62.10	227.16	15.07
TDS	(mg/L)	2070	1970	1940	1800	1800	1945	2070	12433	112
Alkalinity as CaCO3	(mg/L)	252	267	251	248	248	255	267	72	9
Acidity as CaCO3	(mg/L)	101	85	48	72	48	77	101	502	22
Sulphate	(mg/L)	663	629	651	630	629	643	663	276	17
Chloride	(mg/L)	453	399	384	394	384	408	453	959	31
Calcium	(mg/L)	232	208	217	260	208	229	260	518	23
Magnesium	(mg/L)	48	43	41	44	41	44	48	9	3
Sodium	(mg/L)	372	324	307	302	302	326	372	1019	32
Aluminium	(mg/L)	2.14	2.59	3.88	5.12	2.14	3.43	5.12	1.81	1.35
Manganese	(mg/L)	1.02	0.904	0.932	0.775	0.78	0.91	1.02	0.01	0.10
Zinc	(mg/L)	0.029	0.015	0.021	0.025	0.02	0.02	0.03	0.00	0.01
Iron	(mg/L)	3.5	2.6	3.78	4.17	2.60	3.51	4.17	0.45	0.67

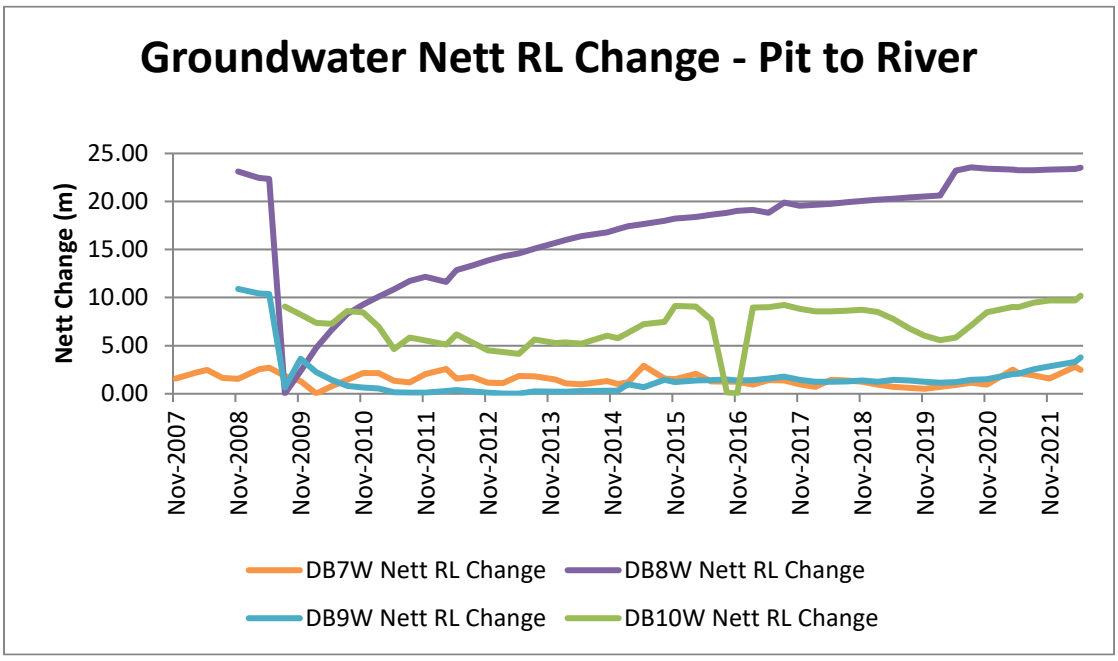
WR2

Parameter	Units	24-Aug-21	18-Nov-21	22-Feb-22	3-May-22	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	38.41	27.21	25.71	21.40	21.4	28.18	38.41	52.55	7.25
pH		6.84	7.10	7.54	7.01	6.84	7.12	7.54	0.09	0.30
Conductivity @ 25^{0}C	(µS/cm)	5650	7800	6400	6600	5650	6613	7800	793958	891
ORP	(mV)	42	130	218	-25	-25	91	218	11169	106
Dissolved Oxygen	(%)	32.6	72.1	57.5	28.9	28.90	47.78	72.10	424.28	20.60
TDS	(mg/L)	4770	6450	6100	5860	4770	5795	6450	525633	725
Alkalinity as CaCO3	(mg/L)	53	105	107	155	53	105	155	1736	42
Acidity as CaCO3	(mg/L)	12	12	13	15	12	13	15	2	1
Sulphate	(mg/L)	808	438	521	644	438	603	808	25885	161
Chloride	(mg/L)	1620	2190	2210	2170	1620	2048	2210	81492	285
Calcium	(mg/L)	957	856	1010	1000	856	956	1010	4951	70
Magnesium	(mg/L)	12	98	82	74	12	67	98	1420	38
Sodium	(mg/L)	414	430	441	385	385	418	441	592	24
Aluminium	(mg/L)	0.96	0.51	0.05	0.04	0.04	0.39	0.96	0.19	0.44
Manganese	(mg/L)	0.288	1.15	0.514	2	0.29	0.99	2.00	0.59	0.77
Zinc	(mg/L)	0.054	0.037	0.048	0.022	0.02	0.04	0.05	0.00	0.01
Iron	(mg/L)	4.02	2.06	0.85	2.9	0.85	2.46	4.02	1.79	1.34


Groundwater Nett RL Change - Pit to River
Nett Change (m)
10
9
8
7
6
5
4
3
2
1
0
Oct-2002
Oct-2003
Oct-2004
Oct-2005
Oct-2006
Oct-2007
Oct-2008
Oct-2009
Oct-2010
Oct-2011
Oct-2012
Oct-2013
Oct-2014
Oct-2015
Oct-2016
Oct-2017
Oct-2018
Oct-2019
Oct-2020
Oct-2021
BH4BW Nett RL Change
DB1W Nett RL Change
DB2W Nett RL Change
DB3W Nett RL Change
DB4W Nett RL Change
DB5W Nett RL Change


Groundwater Nett RL Change -
DB6W & DB11W
Nett Change (m)
5.0
4.0
3.0
2.0
1.0
0.0
May-2003
May-2004
May-2005
May-2006
May-2007
May-2008
May-2009
May-2010
May-2011
May-2012
May-2013
May-2014
May-2015
May-2016
May-2017
May-2018
May-2019
May-2020
May-2021
DB6W
DB11W


Groundwater Nett RL Change - Western Irrigation Area
Nett Change (m)
12
10
8
6
4
2
0
Oct-2002
Oct-2003
Oct-2004
Oct-2005
Oct-2006
Oct-2007
Oct-2008
Oct-2009
Oct-2010
Oct-2011
Oct-2012
Oct-2013
Oct-2014
Oct-2015
Oct-2016
Oct-2017
Oct-2018
Oct-2019
Oct-2020
Oct-2021
SI1W Nett RL Change
SI2W Nett RL Change
SI3W Nett RL Change


Groundwater Nett RL Change - Pit to River
Nett Change (m)
25.00
20.00
15.00
10.00
5.00
0.00
Nov-2007
Nov-2008
Nov-2009
Nov-2010
Nov-2011
Nov-2012
Nov-2013
Nov-2014
Nov-2015
Nov-2016
Nov-2017
Nov-2018
Nov-2019
Nov-2020
Nov-2021
DB7W Nett RL Change
DB8W Nett RL Change
DB9W Nett RL Change
DB10W Nett RL Change

APPENDIX 5

Blast Monitoring Results

Duralie Coal Mine Blast Monitoring Results

Shot #	Location	Date	Time	Schultz (AB1)		Fisher-Webster Extrapolated (AAAB3)		Moylan (AAAB4)		Weismantel Inn		Overpressure Site Exceedance [1]	Overpressure "Cumulative Exceedance" [1]	Ground Vibration Site Exceedance [1]	Ground Vibration "Cumulative Exceedance" [1]	Monitored Blasts[1]	Fume Rating	Observations
			24hr	mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL	%		%				
B1087	Weismante	13-Jul-21	11:56:00	<0.22	<110.0	0.37	110	0.25	109.1	1.14		0.0%	0	0.0%	0	5	Nil	
B1088	Weismante	25-Aug-21	13:01:00	<0.22	<110.0	0.31	105.7	0.06	101	1.21		0.0%	0	0.0%	0	6	Nil	
B1089	Weismante	09-Sep-21	12:59:00	<0.22	<110.0	0.04	112.4	0.12	111.2	<0.22		0.0%	0	0.0%	0	7	Nil	

Note 1 Site exceedance, monitored blasts & cumulative exceedances reference blasts between 4/9/17 and most recent blast.

Note 2 Blast exceedance of 115dBL or 5mm/s.

Note 3 Blast exceedance of 120dBL or 10mm/s

**Note: Blast compliance,*

- *No more than 5% of total blasts for annual monitoring period to exceed an overpressure of 115dB(L) or ground vibration of 5mm/s.*
- *No blast is to exceed an overpressure of 120dB(L) or ground vibration of 10mm/s.*
- *Weismantel's Inn – No blast is to exceed 10 mm/s ground vibration. No limit on overpressure.*
- *Mammy Johnson's Grave - No blast is to exceed 5 mm/s ground vibration. No limit on overpressure.*

APPENDIX 6

Noise Monitoring Results

August 2021 Survey

Noise Performance Assessment – Operations – 19 August 2021 Survey

Location	**Estimated DCM LAeq(15minute) Contribution dBA**	**Noise Criteria LAeq(15minute) dBA**	**Compliance**
NM1 Woodley	33	35	Yes
NM4 Fisher-Webster (daytime)	I/A	35	Yes
NM4 Fisher-Webster (night-time)	I/A	37	Yes
NM5 Moylan	I/A	35	Yes
NM6 Oleksiuk and Carmody	I/A	35	Yes

I/A = Inaudible

October 2021 Survey

Performance Assessment – Operations – 28 October 2021 Survey

Location	**Estimated DCM LAeq(15minute) Contribution dBA**	**Noise Criteria LAeq(15minute) dBA**	**Compliance**
NM1 Woodley	29	35	Yes
NM4 Fisher-Webster (day time)	I/A	35	Yes
NM4 Fisher-Webster (night-time)	I/A	37	Yes
NM5 Moylan	I/A	35	Yes
NM6 Oleksiuk and Carmody	I/A	35	Yes

I/A = Inaudible

APPENDIX 7

Complaints Register and CCC Annual Report

Duralie Complaint Summary

Period: 12 Months to June 2022

Total No. of Complaints: 1 (0 noise, 0 blasting, 0 air quality (inc. odour), 1 other)

Total No. of Complainants: 0

Date/Time of Complaint	Complainant Location	Method of Complaint	Nature of Complaint	Investigation/Outcome
24/03/2022 16:37hrs	5.9km NNE of Duralie	Community Hotline	Various	• Senior Environment & Community Advisor (SECA) returned complainants call at 4:25PM. No answer. • The Complainant returned SECAs call at 4:37PM. • The Complainant listed his concerns to be dust, lighting, noise, blasting and damage to his property from blasting from both Stratford and Duralie Coal mines. • The Complainant stated that he had contacted the complaints line multiple times and had not received a call back. SECA informed The Complainant that the complaints line has been functioning and all complaints received by the complaints line are forwarded directly to the SECA and no complaints from The Complainant had been received by Stratford Coal or Duralie Coal. SECA advised that he would investigate the call logs of the complaints line and investigate any potential failure of the complaints line process. • SECA requested specific dates for the listed noise, dust and blasting concerns, the complainant said that they he had a record and would be able to provide the specific details at a later date. • The Complainant stated that there was a constant glow of lights from Stratford CHPP and the constant glow was penetrating his bedroom window. SECA advised that investigation of the light source and severity would need to be undertaken but would be difficult to identify due to distance. SECA agreed to investigate further. • The complainant stated that cracking had appeared in his home and believed it was due to blasting at Stratford and Duralie Coal. SECA offered to arrange a property investigation to investigate the cracking. Complainant thanked SECA and said he would confer with his wife and respond to the offer of the property investigation. • The complainant further stated that the transport of heavy machinery on the buckets way under police escort, departing Duralie Coal Mine at 11:00am on multiple days is unreasonable and cannot possibly be legal. SECA stated that he is unaware of the legalities of the transport of heavy machinery and would investigate further with the contracting company undertaking the machinery moves. • SECA thanked The complainant for their call.

Duralie Coal Community Consultative Committee Annual Report for Year 2021

Community Consultative Committee Details

CCC / Project Name:	Duralie Coal Mine	**Reporting Period:**	January - December 2021
Independent Chairperson:	**Margaret MacDonald-Hill**	**Proponent Contact:**	**Thomas Kirkwood**

1. Executive Summary

The Duralie Community Consultative Committee was established in 2003 as part of the Duralie Coal Mine Development Consent approval and operates in accordance with the Department of Planning and Environment's 2019 Community Consultative Committee Guidelines for State Significant Projects. The Committee is currently comprised of:

- three local community representatives;
- two Mid Coast Council representatives (elected and staff);
- two Duralie Coal representatives, with attendance from other personnel as required;
- one independent Chairperson.

In February 2019, the Committee resolved to move to biannual meetings as mining operations had ceased at Duralie in late 2018. However, Duralie Mine personnel advised the February 2021 meeting that operations would resume for remnant coal throughout 2021 and subsequently recommended a return to quarterly meetings for the year. Accordingly, meetings were held in February, May, August and November for the reporting year. The February and May meetings were carried out as a combination of attendance on site and video conferencing, with a site tour following the May meeting. The August and November meetings were held via video/teleconferencing only. Despite interruptions to normal meeting procedures with the ongoing escalation of Covid-19, the May and November meetings were fortunate to include invited guest speakers and good attendance numbers.

At the May meeting, the MidCoast Council Catchment Officer presented an update on the Karuah River Catchment Management Plan and the progress of the Karuah-Borland Landcare Project, which is partially funded by the Duralie catchment contributions paid to Council. With Council and the Catchment Officer's proactive approach and the benefit of careful planning and seed funding, this has led to the Branch/Karuah Catchment Grants, Beyond the Shed and a major demonstration project. The community are interested and actively involved in these projects.

The November meeting had three invited guest speakers from MidCoast Council. The Senior Ecologist spoke on Council's newly developed Biodiversity Framework, the goals, responsibility and shared vision to 2030. As with the Catchment Officer's presentation, the committee was suitably impressed with Council's stewardship and protection of the environment.

In response to a request for an update on the management of Giant Parramatta Grass, Council's Weeds Management Officer was able to join the meeting and provide the information to the committee.

The final speaker to the November meeting was Council's Community Development Coordinator, who presented the annual financial reports on Duralie Coal Community Enhancement and Environmental contributions, in a comprehensive format, which has taken a few years to finesse but certainly meets the committee's expectations. Her efforts have received accolades from both the Stratford and Duralie CCCs.

Mine closure, rehabilitation and future land use remain stable agenda items to each meeting. A discussion was held during the May meeting on a Sydney Morning Herald article claiming the NSW Government did not hold sufficient funds within mining security deposits to meet the cost of rehabilitation for all mines across the State. Future use of mining voids was also discussed with the video example of Yancoal's involvement in Lake Kepwari in Western Australia given as a good example of what can be achieved.

Other topics of discussion for the reporting period also included:

- general environmental management and monitoring, including air quality, noise, surface water and groundwater
- water management
- March 2021 flood event
- community complaints
- biodiversity management and Duralie Nest Box program
- broader community engagement and the CCC's print media articles
- Yancoal land management, maintenance and leasing
- Yancoal Community Support Program

2. CCC activities over the last 12 months

- Committee meetings were held during February, May, August and November 2021. The committee reviews its meeting schedule for the ensuing year in November each year.
- A site visit of the Weismantel mining operations and the rehabilitation was undertaken following the May meeting.
- No joint Committee meetings were held, although the Duralie Committee maintains an interest in Yancoal's sister operation at Stratford. Stratford updates are included on the agenda for each meeting.
- Through aligned networks, the committee is kept informed by Duralie Coal and Mid Coast Council of other events occurring in the region throughout the year such as Karuah Catchment Landcare group, MidCoast Council and Land Service field days and next round of funding grants.
- Two representatives of the Duralie CCC are members on the Duralie Community Fund Panel under the auspice of Mid Coast Council,

3. Key issues

Issue	Actions Taken	Next Steps

Stratford Coal Education Program	Actively support ongoing success of Stratford Coal Education Program through CCC networks and media	Ongoing
Yancoal Community Support Programs	Disseminate information through CCC networks and media.	Ongoing
Post mining requirements	Planning for post mining landforms	Ongoing interaction through CCC and workshops as required
Giant Parramatta Grass Trial	Committee request for outcome of trials and update on management control	Current advice provided to November meeting.

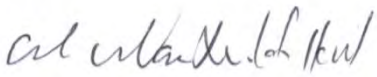
4. Focus for next 12 months

The planned activities for 2022 will remain consistent with those of previous years and will be guided by the contributions of the CCC members. These activities are likely to include:

- to investigate potential opportunities to increase agricultural land capability whilst meeting rehabilitation requirements.
- Engage with Yancoal and the broader community on post mining options, including landscape and potential uses.

To the best of my knowledge, there are no outstanding or emerging issues that have not been addressed or are in the process of being so, to the committee's satisfaction.

Committee Meeting minutes and presentations are available on the website within two weeks of each meeting.

Signature of Chair:	
Date:	March 15 2022

APPENDIX 8

Annual Biodiversity Report 2022

Duralie Coal Mine Annual Biodiversity Report 2022

FOR THE YEAR ENDING 30 JUNE 2022

CONTENTS

List of Appendices

1 INTRODUCTION

The Duralie Coal Mine (**DCM**), located in the Southern part of the Gloucester Basin NSW, is approximately 30 kilometres south of Gloucester and is owned and operated by Duralie Coal Pty Ltd (**DCPL**), a fully owned subsidiary of Yancoal Australia Limited (**YAL**). This Annual Biodiversity Report has been prepared in accordance with the DCM Biodiversity Management Plan (BMP).

1.1 Scope

In accordance with the Duralie Extension Project, Project Approval 08_0203 (as modified December 2014), the proponent (DCPL) is required in accordance with *Schedule 3, condition 43* to prepare and implement a Biodiversity Management Plan (BMP). This Plan must include a:

> *"a program to monitor and report on the effectiveness of the measures in the Biodiversity Management Plan and conditions 33-43 of this approval, and the performance of the Offset Strategy, with summary reporting to be carried out annually and comprehensive reporting every three years following the independent environmental audit".*

This DCM Annual Biodiversity Report provides a review of the effectiveness of measures in the BMP for the annual year ending 30 June 2022 in accordance with Section 7.2 of the BMP. The scope of the review includes the Mining Lease area ML1427 and ML1646 and Biodiversity Offset areas as indicated on Plan A.

This report (and associated Appendices) is included as an Appendix of the DCM Annual Review which is available on the Duralie Coal website www.duraliecoal.com.au.

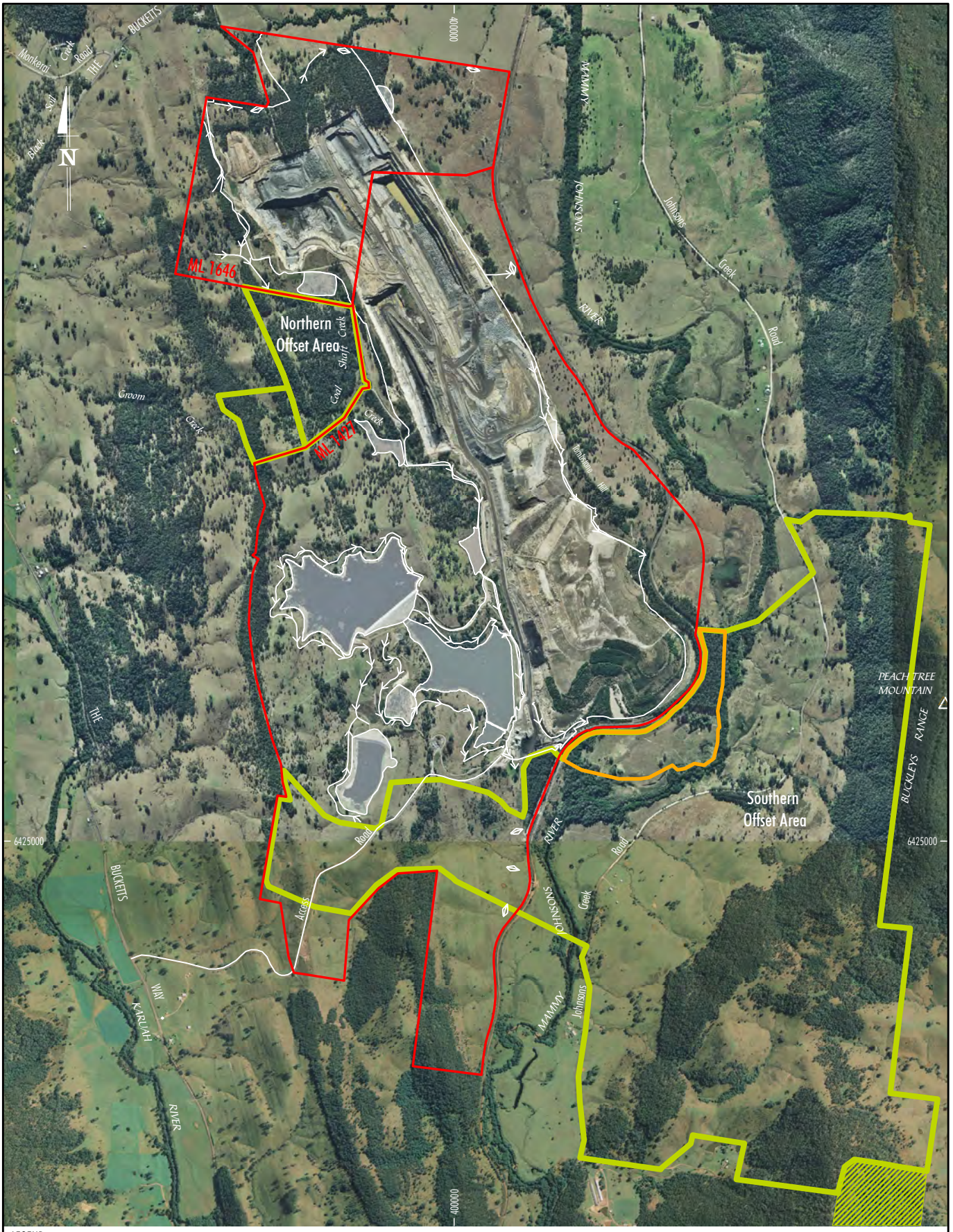
A revised BMP was submitted to the NSW Department of Planning and Environment (DP&E) and approved on **25 January 2019 (Appendix A).** Following the DCM Independent Environmental Audit undertaken in **December 2017** a revision of the BMP was prepared for the three-year period between August 2018 and July 2021 and includes broader concepts for the longer term (6+ years) management since commencement of the BMP in 2012. The key changes to the BMP include relevant updates to the performance and completion criteria tables with consideration to the works which have been completed to date.

The BMP is currently being revised to:

- Reflect the current status and/or completion of the 2018 to 2022 BMP performance criteria;
- Further development of longer-term (year 9+) performance criteria for the biodiversity offset strategy components; and
- Reflect the current stage of operations and to describe anticipated mine closure activities at the DCM for the mine closure phase.

2 STATUS OF BMP PERFORMANCE CRITERIA

Performance criteria as prescribed in the BMP is presented in **Tables 1 to 10**. The performance criteria have been developed to meet the specific objectives for the areas described in Section 2 of the BMP. All performance criteria are linked to the management specifications listed in the BMP Section 5 and Section 6, and monitoring/reporting specifications in the BMP Section 7. The status of BMP performance criteria is provided in the subsequent sections of this report.



LEGEND

- Mining Lease Boundary
- Approximate Extent of Project Major Surface
- Private Land Under Conservation Agreement
- Offset Area
- Bowens Road North Offset Area

0 1000

Metres

GRID DATUM MGA 94 ZONE 56

Source: DCPL (2014); AAHatch - Aerial Photography flown April 2009 and July 2013

BIODIVERSITY MANAGEMENT PLAN

FIGURE 3

Location of the Offset Areas

DURALIECOAL

3 VEGETATION CLEARANCE PROTOCOL

3.1 Vegetation Clearance Report

Vegetation clearance is undertaken in accordance with the BMP Section 5.4 Vegetation Clearance Plan. Prior to any clearance operations a Clearing Plan is prepared, and vegetation pre-clearance surveys are undertaken.

Vegetation clearance for the Duralie Extension Project was finalised in 2017. During the 2021/2022 reporting period, no vegetation clearance was undertaken.

The area of disturbance at the end of June 2022 is shown in the DCM Annual Review 2022 Figure 4 (Appendix B).

Information obtained during vegetation clearance activities (i.e. habitat features, hollows cleared and fauna observed) has been used to determine the requirements for nest box replacement in the biodiversity offset areas (refer Section 4).

3.2 Salvaged and Reused Material for Habitat Enhancement

Section 5.8 of the BMP requires salvaged material from vegetation clearance activities to be used for habitat enhancement within the revegetation or rehabilitation areas. Habitat features such as trunks, logs, large rocks, branches, stumps and roots are salvaged and relocated where practicable.

As there was no vegetation clearance undertaken during the reporting period, no further habitat materials were salvaged.

During previous reporting periods cleared vegetation was managed as follows:

- Suitable trees and stumps salvaged and stockpiled for reuse; and
- Mulched vegetation stored in stockpiles and used on the rehabilitation and incorporated into topsoil.

4 NEST BOX PROGRAM

Nest box management is undertaken in accordance with the BMP Section 6.4. Nest boxes will be installed to provide habitat opportunities in the short to medium-term for a number of arboreal fauna species including the Squirrel Glider (*Petaurus norfolcensis*).

Table 1: Nest Box Program Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Nest box strategy including target species, habitat trees/feature, nest box designs maintenance and monitoring	Nest box plan developed following habitat assessment and pre-clearance surveys (Section 5.4).		
Nest box installation Includes installation of 18 Squirrel Glider boxes, however may be expanded as required.	Hollow bearing habitat features (nest boxes) installed (Section 6.4).		Nest boxes installed.

Maintenance and monitoring of installed nest boxes. Including monitoring for European bee invasion and repair/replacement	Monitoring in autumn and spring completed. Maintenance undertaken where required (Sections 6.4 and 7.1).	Annual nest box monitoring and maintenance (Sections 6.4 and 7.1).	Nest boxes monitored and maintained, being replaced where required.

Legend	Not commenced	In progress	Completed

AMBS Ecology & Heritage (AMBS) was commissioned to implement the Nest Box Program. The Nest Box Program consists of two main components:

- Replacing 18 boxes specifically targeting the Squirrel Glider; and
- Replacing boxes on a like for like basis for any hollow bearing trees cleared during vegetation clearance operations (refer to Section 3).

The installation of nest boxes has occurred over six periods with the most recent installation in **March 2021**. No further nest box installations were required resulting from vegetation clearance activities and the recent installations in the rehabilitation areas is to provide additional habitat enhancement. The next round of monitoring is scheduled for spring 2022.

The current program involves:

- 18 nest boxes targeting the Squirrel Glider (*Petaurus norfolcensis*), installed during February 2013;
- 106 nest boxes targeting a variety of hollow-dependent species, installed during August 2013;
- 45 nest boxes targeting a variety of hollow-dependent species, installed during September 2014;
- 42 nest boxes targeting a variety of hollow-dependent species, installed during September 2016.
- 26 nest boxes targeting a variety of hollow-dependent species that were installed in the Rehabilitation Area between 16 October 2019 and 18 October 2019;
- 9 nest boxes targeting the Feathertail Glider (*Acrobates pygmaeus*) that were installed during September and October 2019; and
- 25 nest boxes targeting a variety of hollow-dependent species that were installed in the Rehabilitation Area between 22 March 2021 and 26 March.

An annual nest box monitoring report was completed by AMBS with works commencing in **September 2021** and completed in **February 2022** due to weather impacts (Appendix C). A summary of the results from the 2021 – 2022 report is provided below.

> *The 2021 – 2022 Nest Box Programme for the Duralie Offset Area Report (AMBS, July 2022) summarises the work undertaken in relation to the Nest Box Programme for the Duralie Offset and Rehabilitation Area between September 2021 and February 2022, in accordance with the Duralie Coal Mine BMP. Works undertaken in relation to the Duralie Offset and Rehabilitation Areas included yearly monitoring of the following;*
>
> - *18 Squirrel Glider nest boxes;*
> - *106 additional nest boxes (Variation 1);*
> - *45 additional nest boxes (Variation 2);*
> - *41 additional nest boxes (Variation 3);*
> - *9 Feathertail Glider (hardwood) nest boxes; and*
> - *Quarterly monitoring was also conducted of the 25 nest boxes installed in the Duralie Rehabilitation area in March 2021.*

Fifteen species were recorded or shown signs of previous occupation during the current reporting report, including the Squirrel Glider, Sugar Glider (probable), Feathertail Glider, Brush-tailed Phascogale, Brown Antechhinus, Bush Rat (probable), Black Rat (possible), Common Brushtail Possum, Mountain Brushtail Possum, Common Ringtail Possum (probable), Gould's Wattled Bat, Lesser Long-eared Bat, White-throated Teecrepper (probable), Australian Owlet-nightar and Lace Monitor.

One new Feathertail Glider (hardwood) nest box showed signs of previous occupancy by the target species. Occupancy of nest boxes installed in the Duralie Rehabilitation Area in 2019 have remained stable, with 73% of nest boxes recorded new signs of occupancy during the annual monitoring. After approximately 9 months, the new nest boxes installed in 2021 in the Duralie Rehabilitation Area recorded a 37% occupancy rate.

Two of the species recorded utilising the nest boxes are listed as vulnerable under the NSW Biodiversity Conservation Act 2016 (BC Act), the Squirrel Glider and Brush-tailed Phascogale. Majority of the nest boxes were in good condition with minor degradation noted on several nest boxes.
Overall a total of 227 out of 269 nest boxes, approximately 84%, have been occupied of have shown signs of occupancy since their installation.

Plate 1 - Squirrel Gliders (Petaurus norfolcensis*)*

Plate 2 – Brush-tailed Phascogales (Phascogale tapoatafa)

5 WEED CONTROL AND MONITORING

Weed control is undertaken in accordance with the BMP Section 5.9 and Section 6.5. The weed control program aims to manage weeds to minimise their impact on native flora and fauna.

Table 2: Weed Control Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Weed Control/treatment program in remnant enhancement and regrowth management VMUs (vegetation management units)	Primary woody weed control (Sections 5.9 and 6.5). Primary control of priority target weeds described in Sections 5.9 and 6.5 commenced. Follow-up woody and priority weed control undertaken as per Sections 5.9 and 6.5.	Follow-up woody and priority weed control undertaken as per Sections 5.9 and 6.5.	Target/priority weed coverage within offset VMUs reduced by 90%.
Weed control/ management in Installation (revegetation) VMUs	Pre-cultivation spraying in all installation VMUs undertaken including control of exotic Sporobolus and fireweed (Figure 7 and Section 6.11). Second cultivation spray in all installation VMUs undertaken including control of exotic Sporobolus and fireweed where necessary (Section 6.11). Additional pre-planting weed treatment in all installation VMUs undertaken if required (Section 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11.	Additional pre-planting weed treatment in all installation VMUs undertaken if required (Section 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11.	Control of competitive plants within revegetation areas until maintenance phase (detailed in Section 6.11) is complete i.e. 90% of canopy and shrub species have survived 12 months after planting including replanting of lost species.
Monitoring and reporting	Monitoring and documentation of weed species, occurrence and densities a per Section 7.1.	Monitoring and documentation of weed species, occurrence and densities as per Section 7.1.	Monitoring and reporting undertaken.

The general procedure for controlling weed involves:

- Monitoring to identify locations and densities of priority weed;
- Identification of suitable control measures;
- Implementation of the selected control measure by a suitable qualified person; and
- Follow-up inspections to evaluate effective of weed control.

Weed spraying activities are generally undertaken between the months of September and April each year. Physical management measures such as mechanical removal, slashing and/or back-burning can be undertaken at other times of the year as required.

Greening Australia were contracted to undertake an initial weed assessment of the offset area in August 2013. The aim of the weed assessment was to assist in setting priorities and developing on-ground actions for weed control and is presented in the form of a mapping survey. The mapping survey provides reference to individual weed infestations within each Vegetation Management Unit (**VMU**) for the biodiversity offset area. Each weed occurrence was allocated a priority ranking based on the species status i.e. noxious or agricultural, and the size and density of the infestation. The survey information contributed to the development of a strategic approach to the control of priority weeds and allow contractors to locate infestations using the mapping files. Additionally, it will continue to assist in tracking weeds to gauge the effectiveness of control measures and the potential spread and future distribution.

A contractor is engaged at the DCM to undertake weed management activities on an ongoing basis. Follow-up weed treatment of all remnant enhancement and regrowth management VMUs recommenced in **October 2021**, continued

through to **April 2022** and will recommence in spring 2022. The key species targeted included blackberry, lantana, privet, wild tobacco and Giant Parramatta grass.

Weeds monitoring to evaluate the effectiveness of control measures is undertaken in conjunction with the annual vegetation monitoring and is documented in the *Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021* (Appendix F).

The 2020 monitoring report indicates that:

> *Weeds were recorded in all VMUs with Blackberry the most widespread despite obvious control efforts. Privet was very common in the VMUs adjoining Mammy Johnson's River, as was Wild Tobacco. Lantana was occasionally recorded in the grassy areas but was more common in the remnant vegetation areas.*
>
> *Recommendation:*
> *Weed control efforts to be expanded, recognising that weed control will always be a requirement until the Offsets are surrendered. Targeted weed control on VMU U along the ridgeline. It is further suggested that the use of drones to survey the Offsets areas for location of weed infestations be undertaken.*

6 FERAL ANIMAL CONTROL AND MONITORING

Feral animal control is undertaken in accordance with the BMP Section 5.10 and Section 6.5. The objective of feral animal control program is to manage feral animals to minimise their impact on native flora and fauna in the Biodiversity Offset Areas or the impact on agricultural production in other surrounding areas.

Table 3: Feral Animal Management Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Feral animal control program	Initial study undertaken.	Feral animal control as required.	Feral animal numbers within offset areas minimised as evidenced through monitoring data.
Monitoring and reporting	Monitoring and documentation of feral animal species undertaken.	Monitoring undertaken.	-

AMBS was commissioned to undertake the initial invasive animal survey, in accordance with Section 5.10 of the BMP in 2013. The objective of the study was to determine the range of invasive animals that occur or are likely to occur within the DCM and offset areas and provide recommendations for invasive animal control.

MDP Vertebrate Pest Management has been engaged by DCPL since 2016 to implement feral animal control programs across property owned by DCPL including both the Stratford and Duralie Mining Leases and the Stratford and Duralie Biodiversity Offset Areas. During the reporting period wild dog and fox control was undertaken between **October 2021** to **November 2021**. The program involved a combination of trapping and shooting. The programs were productive with a total of 6 wild dogs, 1 feral cat and 3 foxes trapped and shot over the control programs.

During the control programs no non-target species were trapped. Soft jaw wild dog traps were used to trap targeted pest animals. MDP Trap dog and trail camera monitoring was used to find and locate wild dog and fox signs in the program area for trap placement. The wild dog and fox numbers were moderate in the previous controlled areas of the Stratford/Duralie Mining Lease and Biodiversity Areas which demonstrates the control programs are being successful in having an impact and lowering the numbers and presence of wild dogs and foxes within that area. The program is showing positive results of reducing the impacts of wild dogs and foxes within the area to the native animals and reducing the impact of livestock attacks to the surrounding agricultural properties.

Plate 3 – Wild Dog

Plate 4 – Wild Dog

In accordance with the BMP the abundance of feral animal species should be monitored every three years to determine if future controls are necessary. A feral animal monitoring survey was undertaken by AMBS Ecology & Heritage in **March 2022** to monitor the success of control programs and determine priorities for ongoing control measures. The feral animal survey covered the Duralie Mining Lease and Duralie Biodiversity Offset Area.

An extracted summary of the survey results from the *Feral animal study of the Duralie Coal Mining Lease and offset areas, Gloucester Valley* (May 2022) is provided below (**Appendix D**).

Invasive animal study of the Duralie Coal Mining Lease and Offset areas, Gloucester Valley (September 2017) is provided below (**Appendix D**).

> *A total of 16 feral species have been recorded in the study area in the past or during recent surveys or are considered to have the potential to occur. Twelve of these species were either not recorder or were recorded in very low numbers during the current surveys and are of little concern at the current time.*
>
> *In summary:*
>
> - *Foxes and Feral Cats may represent a threat to biodiversity within the study area, and both the Fox and Feral Cat are considered Priority Pest Animals under the Hunter Regional Strategic Pest Animal Management Plan 2018- 2022 (HRSPAMP);*
> - *Wild Dogs are present in the study area, and while they may or may not be a threat to biodiversity, are currently considered a Priority Pest animal in the HRSPAMP. Wild dog control in the study area should only focus on reducing negative impacts to stock and landholders, to ensure a balance is struck between the control of Wild Dogs and conservation of Dingoes;*
> - *The European Rabbit is present at low densities, but its abundance can increase rapidly, particularly if Dog, Fox and Cat numbers decrease, and it is also considered a Priority Pest Animal in the HRSPAMP; and*
> - *The abundances of Foxes, Feral Cats, Wild Dog and the European Rabbit within the study area are likely to be inter-related.*

A feral animal survey of the Duralie Mining Lease and Duralie Biodiversity Offset Area is scheduled to be undertaken in September 2025. Feral animal monitoring will guide the ongoing management efforts for controlling feral animals.

7 CONTROLLING ACCESS AND MANAGING GRAZING

Controlling access and managing grazing is undertaken in accordance with the BMP Section 5.11, 6.6 and 6.7.

Table 4: Managing Grazing and Agriculture Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Managing grazing and agriculture	Livestock excluded from the Offset through installation of gates and fencing illustrated in Figure 9 (Section 6.7).		Livestock excluded from the offset.
Monitoring and maintenance of fencing and gate infrastructure	Monitoring of gates and fencing to exclude livestock. Where required, maintenance undertaken and documented (Section 7.1).	Monitoring of gates and fencing to exclude livestock. Where required, maintenance undertaken and documented (Section 7.1).	Gates and fencing monitored and maintained.

Table 5: Controlling Access Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Operational Review to facilitate site access for offset management activities including installation, inspection and bushfire management	Operational Review developed. Review includes road, fire trail and culvert construction and requirements for fencing and revegetation cultivation/site preparation[2]. Maintenance activities, particularly track maintenance and slashing have been considered (Section 6.7, plus related Sections 6.9 and 6.5).		Operational Review undertaken and outcomes implemented.
Community and stakeholder engagement	Assessment of surrounding landholders and the local community to evaluate opportunities for participation in implementation of this Biodiversity Management Plan undertaken. Local council consultation has commenced regarding placement of signage on the Johnson's Creek Road bisect area of the Offset (see Figure 9 for location) (Section 6.7). Signage has been installed on the Johnson's Creek Road bisect area of the Offset to alert drivers of potential fauna on the roads.		Opportunities for landholder and community participation in the BMP identified. Local council consulting regarding signage. Signage installed on Johnsons Creek Road.
Infrastructure including access tracks, fencing, fire trails and culverts	Access tracks, fire trails, firebreaks, fencing and culverts have been completed as per Figure 9 and the Operational Review[2] (Section 6.7).		Access related infrastructure identified in the Operational Review and completed.
Monitoring and maintenance of infrastructure including tracks, fire trails, signs, culverts and fences.	Monitoring and maintenance of all access tracks and fire trails has been undertaken[2] (Sections 6.7, 6.9 and 7.1).	Monitoring and maintenance of all access tracks, fire trails and warning signs has been undertaken[2] (Sections 6.7, 6.9 and 7.1).	Regular monitoring and maintenance program for roads, tracks, fire trails, signs, fences and culverts.

The implementation of the BMP management measures commenced in 2013. The BMP requires works to be undertaken to exclude livestock and control access to the Biodiversity Offset Areas.

Installation works to control access and manage grazing in the offset areas was completed in 2014. During the reporting period contractors were engaged to undertake maintenance activities on access tracks, culverts, gates and fences. The works included slashing of tracks, firebreaks and repairs to damaged gates and culverts. Additional signage was also

installed on the key access points to the Biodiversity Offset Areas. Fencing repairs were completed following March 2022 flood events

The *Duralie Coal Mine Biodiversity Offsets Monitoring Report 2022* (Appendix F) found fencing on external boundaries was in good condition. There were no signs of livestock at the time of the survey, however there was some evidence of previous access by cattle in several areas.

Livestock continue to be excluded from the Biodiversity Offset areas with the exception of 'crash grazing' programs in preparation for revegetation activities following a field assessment by a qualified consultant.

Roadside Flora and Fauna signage has been installed in accordance with advice from Great Lakes Council (GLC) and with regard to Australian Standard AS1742.2. Further correspondence was held with GLC Ecologist in 2015 regarding future requirements for traffic controls within the offset areas.

Plate 5 – Biodiversity Offset fencing and signage

8 BUSHFIRE MANAGEMENT

Bushfire management is undertaken in accordance with the BMP Section 5.12 and Section 6.9. The objective of bushfire management in the Biodiversity Areas is to prevent impacts from unplanned bushfire and to use fire to promote biodiversity.

Table 6: Bushfire Management Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Operational Review to facilitate site access for offset management activities including installation, inspection and bushfire management.	Operational Review completed[2]. Areas addressed within the review include road, fire trail and culvert construction along with maintenance activities, particularly track slashing (Sections 5.12 and 6.7).		

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Fire excluded from the offset for initial 3 years.	Fire excluded from offset prior to 2015 (Section 6.9).		Fire excluded from offset prior to 2015.
Bushfire management activities through hazard reduction actions installation and maintenance of relevant access infrastructure.	Access tracks, fire trails, firebreaks, fencing and culverts have been completed as per Figure 9 and the Operational Review 2 (Sections 6.7 and 6.9Fire management activities have been undertaken as required, including yearly access trail inspection, maintenance and repair of inaccessible tracks within one month of identification2, hazard reduction burning (Sections 5.12, 6.7 and 6.9).	Fire management activities have been undertaken as required, including yearly access trail inspection, maintenance and repair of inaccessible tracks within one month of identification2, hazard reduction burning (Sections 5.12, 6.7 and 6.9).	Regular bushfire management measures in place.
Monitoring and maintenance	Fuel loads monitored and documented (Sections 6.9 and 7.1). Identified issues incorporated into future management planning	Fuel loads monitored and documented (Sections 6.9 and 7.1). Identified issues incorporated into future management planning.	Fuel loads monitored and maintained. Risks identified and managed as part of part of hazard reduction actions.

Where possible, fire was excluded from the Biodiversity Offset area during the first three years (up to 2015) to assist with native regeneration. To assist with bushfire management, access tracks and firebreaks have been constructed and maintained as shown in the BMP Figure 9.

Hazard reduction burning has been undertaken in consultation with the NSW Rural Fire Service (RFS). Continued discussions have been held with the RFS to conduct fire management activities and any such activities will be assessed and implemented to ensure the most appropriate period for ecological burn activities whilst also giving due consideration to personnel and asset safety. Following the revegetation works, the aim is to exclude fire from the offsets areas for at least five years to allow for tubestock and seedlings to establish.

Monitoring of fuel loads to evaluate bushfire risk and guide bushfire hazard reduction activities is undertaken in conjunction with the annual vegetation monitoring. Further detail is included in Section 10 and Appendix F. Bushfire risk will continue to be mitigated through the maintenance of access tracks and fire breaks.

The 2021 monitoring survey noted that VMUs that have been subject to multiple disturbances such as ground preparation associated with revegetation and/or bushfire (i.e. 2019) have generally recorded lower landscape functional analysis (LFA) indices and are still in the process of recovery and should be provided sufficient time to establish.

9 REVEGETATION MANAGEMENT

9.1 Seed Collection and Propagation

Seed collection and propagation is undertaken in accordance with the BMP Section 5.7 and 6.10.

Table 7: Seed Collection and Tubestock Supply Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Collecting and propagating seed	Seed collection (of required species as specified in Section 6.10 and Appendix D) has commenced during vegetation clearance or an alternate seed source has been obtained. (Sections 5.7 and 6.10). Seed collection from cleared vegetation finalised (Section 5.7). Seed collection to obtain required quantities and species for future revegetation continued (Section 6.10, Appendix D).		Seed collection necessary to obtain required quantities and species for future revegetation completed.
Plant propagation/ tubestock supply	Propagation of species required for revegetation work in Offsets commenced. Species and quantity as per guidelines in Section 5.7, 6.10 and Appendix D or adjusted based on additional literature/field trial results.	Propagation of species required for revegetation/supplementary infill planting work in Offsets undertaken as per guidelines in Sections 5.7 and 6.10 and Appendix D.	Plant propagation necessary to obtain quantities and species required for revegetation completed.

Revegetation in the BMP Revegetation Areas has occurred via seed and tubestock. Local endemic species are preferentially used where a seed supply is available, however consideration will be given to the use of a high quality seed sourced further from the site as required.

Where possible, seed required for revegetation activities has been collected from within the Biodiversity Offset Area and surrounds. Specific tree and shrub species which have not been available for collection have been sourced through external third-party suppliers. Further seed collection may be undertaken if found necessary to meet the completion criteria of the BMP offset revegetation and mine site rehabilitation.

Kleinfelder along with several nurseries have been engaged to assist in the propagation of native plant species with tube-stock grown under controlled nursery conditions and delivered to site as required for revegetation works.

9.2 Revegetation and Regeneration

Revegetation management is undertaken in accordance with the BMP Section 6.11 and 6.12. The aim of revegetation is to establish a range of habitat niches including native canopy, and understorey, with the goal of achieving self-sustaining vegetation communities as well as increasing the resilience to identified risks such as fire, herbivory and future weed invasion. The Revegetation VMUs in the Biodiversity Areas will be revegetated to substantially increase the area of native vegetation and maximise habitat diversity and a range of successional stages.

Table 8: Revegetation Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Operational Review	Operational review including access, tracks and cultivation requirements for implementing revegetation completed (Section 6.7).		Operational Review completed and implemented.
Implementing Revegetation - Weed management and maintenance	Pre-cultivation spraying in all installation VMUs including control of exotic Sporobolus and fireweed undertaken (Sections 6.5 and 6.11). Pre-plant weed treatment in all installation VMUs as per Figure 7 undertaken as required (Sections 6.5 and 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11. Maintenance including watering and herbivory controls, undertaken as required (Section 6.11).	Pre-plant weed treatment in all installation VMUs as per Figure 7 undertaken as required (Sections 6.5 and 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11. Maintenance including watering and herbivory controls, undertaken as required (Section 6.11).	Pre-planting weed control undertaken, including control of threatening weeds Sporobolus and Fireweed. Competitive plants controlled during revegetation establishment.
Implementing revegetation	Initial cultivation of all proposed trial installation VMUs commenced (Vegetation Management Units I, S, U and AB.) according to guidelines in Section 6.11. Trial revegetation for VMUs I, S, U and AB completed. Plant palettes adjusted where field trails or research demonstrate alternative species/density (Section 6.10). Propagation of species required for revegetation work in Offsets commenced. Species and quantity as per guidelines in Sections 5.7 and 6.10 and Appendix D.	Revegetation planting finalised. All plants prescribed in Appendix D have been installed. (Section 6.11). Based on learnings from the revegetation trials, planting of tubestock/direct seeding in installation VMUs according to species palette and quantity guidelines in Appendix D and Section 6.1 has been completed	Species type and quantities planted according to threshold guidelines in the species palette or as guided by on site trials. 90% survival of canopy and shrub-layer plants 12 months after installation, including replacement of lost plants to above threshold levels. Revegetation areas have met Assessment Criteria and Completion criteria described in Table 24, Section 8 (e.g. 90% of all initial canopy species rates are present within VMUs).
Monitoring and reporting	Monitoring and reporting of trial revegetation results, changes to plant palette, plant health, establishment success and maintenance activities. (Section 7.1).	Monitoring and reporting of trial revegetation results, changes to plant palette, plant health, establishment success and maintenance activities. (Section 7.1).	Annual Monitoring and reporting completed.

Revegetation Planning, Trials and Schedule

Pre-cultivation weed spraying was undertaken in Summer to Autumn 2016 in preparation for the trial revegetation works. Initial revegetation works for VMUs I, S and U commenced in Autumn of 2016. Preparation works were completed including seed collection, inoculation, growing of tube-stock and ground preparations including weed spraying. The trial revegetation program included methods involving both tube-stocking, and direct seeding. Ground preparation was site specific and included weed spraying, crash grazing and back burning as required.

Revegetation works in VMUs AF, AE, AA and Z were undertaken during **December 2016** and included ground preparation and direct seeding of approximately 80 hectares. Due to the inability to undertake controlled burning, slashing was undertaken as an alternative option prior to direct and broadcast seeding.

Plate 6 - Loading seed for revegetation works.

Plate 7 - Spreading native tree and shrub seed.

Revegetation Implementation

Tubestock was propagated during Summer 2016/2017 in preparation for Autumn planting in 2017. VMUs Y, AD and S, (approximately 40 hectares), located on alluvial flats near Mammy Johnsons River were prepared for planting by slashing, spraying for weeds and ripping. This was followed by the planting of approximately 7,200 tube-stock in **April 2017**. The results of the 2017 re-vegetation activities are reported in the *DCM Biodiversity Offsets Revegetation Program Report Spring 2016 - Autumn 2017*.

Following the hazard reduction burning in **August 2017**, revegetation works in VMUs Z, AB and AC were undertaken. In **September 2017**, direct seeding of approximately 52 hectares was completed, followed by harrowing.

Plate 8: Tube-stock being prepared for the biodiversity offset.

Plate 9: Planted tube-stock.

Tube-stock planting of VMUs F, V, W and X was proposed for Autumn 2018 including approximately 16,000 plants over 61 hectares. The native tree seed was propagated over the Summer of 2017/2018 by Cumberland Plain Seeds. However, due to the slower than expected establishment of the tubestock, planting was postponed during winter and completed in **September 2018**. The results of the 2018 re-vegetation activities are reported in the *DCM Biodiversity Offsets Results of Spring 2018 Planting Report*.

Plate 10: *Tubestock planted in September 2018.*

Plate 11: *Tubestock planted in September 2018.*

During Spring 2019 tubestock was propagated in preparation for further revegetation works in Autumn 2020 to reach the required woodland density and species diversity in VMUs F, V, W, X, AA and AH. The results of the 2020 re-vegetation activities are reported in the *DCM Biodiversity Offsets Planting Program Report Autumn 2020*.

During Spring 2020 tubestock was propagated in preparation for further revegetation works in Autumn 2021 to reach the required woodland density and species diversity in VMUs AB, AC, AE, AF, Z, U and S. The results of the 2021 re-vegetation activities are reported in the *DCM Biodiversity Offsets Planting Program Report Autumn 2021* (Kleinfelder, 2021) in **Appendix E**. Plans showing the area for revegetation in the Biodiversity Areas in 2021 are included in **Appendix E**.

The 2021 Duralie Offsets Planting Program revegetated, or in-fill planted into seven VMUs. The 2021 planting campaign successfully installed 24, 718 plants over 112 ha of the Offsets areas. This included the large sections of Grey Box – Forest Red Gum – Grey Ironbark Open Forest in VMUs AB, AE, AF and Z, 89 ha of the total. These areas had been unsuccessfully seeded previously, potentially due to drought conditions. The installation of the tubestock and hikos ensures that revegetation of the three strata has begun.

Plate 12: *Tubestock planting in VMU V in Mar 2020.*

Plate 13: *Tubestock preparation in 2020.*

A revegetation program for 2022 has been prepared to continue to progress towards the biodiversity offset completion criteria. The program will involve planting a minimum of 2,200 plants over 113 days in nine offset areas over both Stratford and Duralie. Two offset areas at Duralie will be targeted as part of this program.

Monitoring

Following the initial re-vegetation works in 2015, annual vegetation monitoring (including LFA and vegetation dynamics) was undertaken in **January 2017** and continues to be undertaken annually. Vegetation monitoring was undertaken again in **June 2022**. The results from the biodiversity offset monitoring are shown in Section 10. Results from the annual monitoring will be used to measure revegetation against the performance criteria and completion criteria and to determine future works requirements and maintenance activities.

10 BIODIVERSITY OFFSET MONITORING AND REPORTING

The Biodiversity Offset monitoring and reporting program is prescribed in the BMP Section 7. The program aims to monitor and report on the effectiveness of the BMP management measures and progress against the detailed performance and completion criteria.

Table 9: Monitoring and Reporting Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Monitoring and reporting	Monitoring and reporting has been undertaken[3] as per requirements in Sections 7.1 and 7.2. Independent Environmental Audit has been supplied to the NSW Secretary of the DP&E for review.	Monitoring and reporting has been undertaken[3] as per requirements in Sections 7.1 and 7.2.	Monitoring requirements completed when all completion criteria are achieved in accordance with Section 8 (e.g. 357.5 ha of revegetated woodland/open woodland habitat areas and 36 ha of revegetated forest habitat areas are a self-sustaining ecosystem).

As described in the Section 7 of the BMP an annual report reviewing DCPL's environmental performance and progress against the requirements of the BMP including monitoring and reporting is prepared annually and appended to the *Duralie Coal Mine Annual Review*. The Annual Biodiversity Report, reports on monitoring for:

- Effectiveness of revegetation in the offset area;
- Usage of the offset areas by fauna;
- Effectiveness of weed control;
- Effectiveness of feral animal control; and
- Nest box monitoring program.

10.1 Habitat and Vegetation Condition Monitoring

Habitat and vegetation condition monitoring is undertaken to quantitatively measure the change in habitat and vegetation condition over time. The visual monitoring and photo monitoring programs are undertaken concurrently with the vegetation monitoring to provide additional information on the change of the Biodiversity Offset Areas over time and inform maintenance requirements.

To monitor the effectiveness of revegetation in the Biodiversity Offset Areas, Greening Australia was commissioned to undertake the baseline monitoring of LFA and vegetation structure within the Biodiversity Offset areas in **February 2013**. The baseline monitoring provides information to track the progression towards meeting the completion criteria of the BMP.

The annual vegetation and landscape function monitoring continues to be undertaken and was repeated in **April 2022.** The results are provided in the *DCM Biodiversity Offset Monitoring Report 2022* prepared by Wedgetail Project Consulting (Appendix F). An extracted summary is reproduced below. The next round of monitoring is scheduled for 2023.

> *In accordance with Section 7 of the Duralie Coal Mine – Biodiversity Management Plan (2018), monitoring and assessment of the effectiveness of the Offset Area revegetation is required. This assessment was conducted using the stipulated methodologies which both components of Ecosystem Functional Analysis (EFA) which includes Landscape Functional Analysis (LFA) and Vegetation Dynamics to measure the progression of the rehabilitation towards a self-sustaining ecosystem, floristic surveys and walkover surveys to assess the effectiveness of the revegetation efforts and weed control.*
> *The LFA used data from the 2013 baseline monitoring event conducted by Greening Australia for comparison and tracking changes over time. The 2022 monitoring was undertaken over seven days (7th, 8th, 11th, 12th, 21st, 22nd and 28th) of April 2022 and represents the first Offset Areas survey undertaken by Wedgetail Project Consulting, but the fourth undertaken by Dr Nigel Fisher (formerly employed by Kleinfelder Australia).*
>
> *LFA Indices recorded for the 2022 survey generally show variation between VMUs in the same vegetation communities and some variation when compared to previous years' surveys. Partly this can be attributed to the level of disturbance or intervention experienced by the Offsets Areas. As noted in the 2021 Offset Monitoring report (Kleinfelder, 2021), the installation VMUs have now had some combination of slashing, ripping, and/or burning, and in some cases multiple rounds of intervention. The indices most susceptible to disturbance or variation in environmental conditions, the Infiltration Index and the Nutrient Cycling Index, display more variation over the period of the monitoring and from year to year than the Stability Index which is largely influenced by the underlying soil make up.*

Biophysical processes measured by the LFA indices show that the multiple disturbances that have occurred during the revegetation works have had an effect with decreases in Infiltration and Nutrient Cycling. This suggests that the Duralie Coal Mine Offsets require a period to mature and recover.

The older revegetated VMUs are continuing to grow (as expected) with midstorey and shrub species showing reproductive features such as flowers and seeds. Canopy species have not yet reached reproductive age. Natural recruitment is contributing to the revegetation at the edges and in remnant patches, a welcome bonus to revegetation efforts. Planting in two VMUs (VMU Y, AD) scheduled and with plants in the nursery should proceed, while planning could begin for the area of VMU I that has had minimal intervention.

Weed control should be the major activity undertaken this next year to slow the spread of woody weeds that threaten the revegetation process

10.2 Fauna Monitoring

Monitoring of fauna usage within the Biodiversity Areas is conducted every three years to document the fauna species response to improvement in vegetation and habitat in the Biodiversity Areas and assess the performance in providing habitat for a range of vertebrate fauna. The surveys include an assessment of habitat complexity, species richness and abundance.

AMBS was engaged to undertake fauna monitoring within the Biodiversity Offset Areas and native mine rehabilitation areas during summer 2022. The results are provided in the *DCM Fauna Surveys of the Offset and Mine Rehabilitation Areas, January 2022* (Appendix G). The previous fauna monitoring within the Biodiversity Offset Areas and native mine rehabilitation areas was undertaken in February 2018. An extracted summary of the 2022 report is provided below.

"Targeted fauna surveys were undertaken at five sites within the Duralie Offset Area and two sites in the Duralie Mine Rehabilitation Area between November 2021 and January 2022. At most sites survey techniques included pitfall traps, funnel traps, Elliott A traps, harp traps, ultrasonic call recording, spotlighting, diurnal bird surveys and reptile searches. Opportunistic observations of signs of fauna were noted throughout the field survey period, including during transit between surveys sites".

"A total of 151 species of vertebrate were recorded, comprising 11 frogs, 8 reptiles, 95 birds and 37 mammals…, most of which were native. A similar number of frog, reptile, mammal and bird species were recorded at Mine Rehabilitation Area sites compared with Offset Area sites. Four introduced species were recorded during the surveys, including the House Mouse (Mus musculus), Brown Hare (Lepus capensis), Black Rat (Rattus rattus) and Red Fox (Vulpes vulpes)".

"Eighteen of the species detected are listed as threatened or migratory on the schedules of the Biodiversity Conservation Act 2016 (NSW) and/or the Environment Protection Biodiversity Conservation Act 1999 (Cth). Two of the eighteen species have been recorded for the first time during dedicated fauna surveys for the DCM, the Eastern Chestnut Mouse (Pseudomys gracilicaudatus) and Red-backed Button-Quail (Turnix maculosus).

Plate 16: Koala (*Phascolarctos cinereus*)

Plate 17: Eastern Chestnut Mouse (*Pseudomys gracilicaudatus)*

11 MAMMY JOHNSONS RIVER STABILISATION

In accordance with Section 6.8 of the BMP a detailed design for the in-stream rehabilitation of a severely eroded section of Mammy Johnsons River (MJR) has been prepared by Alluvium (2013) (Appendix H). No works on the MJR bank stabilisation have commenced during the reporting period. Further planning is required.

Table 10: MJR Bank Stabilisation Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
River bank stabilisation design	Design for the in-stream rehabilitation of a severely eroded section of Mammy Johnsons River has been prepared. Office of Water engaged regarding plan approval[1] (Section 6.8).		Design of stabilisation plan completed and approved by the Office of Water
River bank in-stream rehabilitation		In-stream rehabilitation works undertaken[1] (Section 6.8).	Rehabilitation of severely eroded section of Mammy Johnsons River completed.

12 LONG TERM SECURITY AND CONSERVATION BOND

12.1 Long Term Security

In accordance with Condition 42, Schedule 3 of Project Approval 08_0203, DCPL is required to make suitable arrangements for the long-term security of the Duralie Extension Project Biodiversity Offset Area. DCPL used the mechanisms available under section 88E(3) of the NSW *Conveyancing Act 1919*, namely:

- Registration of a Positive Covenant under section 88E(3) of the NSW *Conveyancing Act 1919*; and
- Registration of a Restriction on the Use of Land by a Prescribed Authority under section 88E(3) of the NSW *Conveyancing Act 1919*.

Public Positive Covenants and Restrictions on the Use of Land for the Biodiversity Offsets have been registered on title with NSW Land and Property Information (LPI) in **May 2015**.

12.2 Conservation Bond

In accordance with Condition 44, Schedule 3 of Project Approval 08_0203, DCPL is required to lodge a Conservation Bond with the DP&E which covers the cost of implementing the Biodiversity Offset Strategy detailed in the BMP.

The conservation bond for the Biodiversity Offset areas was calculated by Greening Australia and verified by Rider Levett Bucknell in December 2013. The terms of the conservation bond in the form of a Bank Guarantee were approved by NSW Department of Planning & Environment (DP&E) on **12 December 2013**. The Bank Guarantee has been subsequently provided to DP&E.

In December 2020, an Independent Environmental Audit of the DCM was undertaken in accordance with PA 08_0203. A revision of the BMP was approved in January 2019 in accordance with PA 08_0203 Schedule 5 Condition 4. Following this, a revision of the conservation bond will be prepared and lodged with DP&E in accordance with Schedule 3 Condition 45.

The revised conservation bond will be prepared and lodged with DPIE in the next reporting period.

13 COMMONWEALTH EPBC APPROVAL COMPLIANCE REPORTS

In accordance with Condition 20 of the Commonwealth Approval [**EPBC 2010/5396**], during the reporting period DCPL submitted to the Department of Agriculture, Water and Environment (DAWE) the following compliance report:

- *Duralie Coal Extension Project Annual Compliance Report 2022,* submitted on **14 April 2022** (Condition 20) (**Appendix I**).

Additionally, the following reports were submitted annually for the first five years following the commencement of the operation:

- *DCM Implementation of the Giant Barred Frog Management Plan Annual Reports (Condition 10);*
- *DCM Implementation of the Biodiversity Management Plan Annual Reports (Condition 14(i)).*

These reports are now required to be submitted every **fifth** (5) year before the anniversary of the commencement of the operations.

14 APPENDICES

Appendix A: DP&E approval of the BMP

Appendix B: DCM Annual Review 2021 – Figure 4 Mining & Rehabilitation Areas

Appendix C: AMBS Ecology & Heritage - Nest Box Programme for the Duralie Offset Area, Annual Report for 2020

Appendix D: AMBS Ecology & Heritage - Feral Animal Study, Duralie Coal Mining Lease and Offset areas 2022

Appendix E: Kleinfelder – DCM Biodiversity Offsets Planting Program Report Autumn 2021

Appendix F: Kleinfelder - Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021

Appendix G: AMBS Ecology & Heritage - DCM Fauna Surveys of the Offset and Mine Rehabilitation Areas 2022

Appendix H: Alluvium - Mammy Johnson's River – Bank Stabilisation Detailed Design 2013

Appendix I: Duralie Coal Extension Project Annual Compliance Report 2022

(Appendices available on request)

APPENDIX 9

DCM Independent Environmental Audit 2020
Responses to Recommendations
Status Update 2022

Duralie Coal Mine - Independent Environmental Audit 2020
Response to Recommendations

IEA 2020 Recommendations								
Condition Reference No #	**Condition Detail**	**Management Area**	**Risk Level of Non-compliance**	**Auditor Recommendation**	**Duralie Coal Response**	**Target Due Date**	**Completion Status**	**2022 Status Update**
Project Approval 08_0203 Non-compliance Recommendations								
Schedule 2 Condition 8(b)	**The proponent shall: (b) only receive shuttle trains on site between 6am and midnight; and**	**Trains**	**Low**	Prior to recommencement of Shuttle Train Operations, ensure that train operators are made aware of their obligations under this Condition.	Shuttle train records reviewed indicated that one train was received (22 March 2018) at the site after midnight. SCPL accepts the recommendation. Only 1 train was received between midnight and 1am during the entire 3 year audit period. This train was not identified in the report due to an error in the spreadsheet calculation. Hence, no explanation for the late arrival was provided. DCPL has demonstrated all intentions to comply with this condition throughout the audit period. The shuttle train spreadsheet and website have already been corrected.	30-Jun-21	Completed	Licence conditions relating to shuttle train operations have been updated on the Duralie Shuttle Train Load Point Capability Statement with Pacific National. Operators will be familiarised before commencing shuttle train operations.
Schedule 2 Condition 8(c)	**The proponent shall: (c) only operate shuttle trains on the North Coast railway between midnight and 1am in exceptional circumstances.**	**Trains**	**Low**	Prior to recommencement of shuttle Train Operations ensure that train operators are made aware of their obligations under this Condition	SCPL accepts the recommendation. The 2018 Duralie Coal Train Performance spreadsheet indicated that one train (left Duralie at 20:30 on 22 March 2018, arrived back at Duralie at 1am (23 March). No reason for the late arrival of the train was provided on the website. Only 1 train was received between midnight and 1am during the entire 3 year audit period. This train was not identified in the report due to an error in the spreadsheet calculation. Hence, no explanation for the late arrival was provided. DCPL has demonstrated all intentions to comply with this condition throughout the audit period. The shuttle train spreadsheet and website have already been corrected.	30-Jun-21	Completed	Licence conditions relating to shuttle train operations have been updated on the Duralie Shuttle Train Load Point Capability Statement with Pacific National. Operators will be familiarised before commencing shuttle train operations.
Schedule 2 Condition 8A	**Within 12 hours of operating shuttle trains on the North Coast railway between midnight and 1am in exceptional circumstances, the Proponent shall provide a detailed explanation of the exceptional circumstances on its website.**	**Trains**	**Administrative**	Ensure that the reasons for operating trains on the North Coast Railway between midnight and 1am are published on the Duralie Website.	SCPL accepts the recommendation. The 2018 Duralie Coal Train Performance spreadsheet indicated that one train (left Duralie at 20:30 on 22 March 2018, arrived back at Duralie at 1am (23 March). No reason for the late arrival of the train was provided on the website. Only 1 train was received between midnight and 1am during the entire 3 year audit period. This train was not identified in the report due to an error in the spreadsheet calculation. Hence, no explanation for the late arrival was provided. DCPL has demonstrated all intentions to comply with this condition throughout the audit period. The shuttle train spreadsheet and website have already been corrected.	12-May-21	Completed	No further action required.
Schedule 3 Condition 17	**The Proponent shall ensure that no offensive odours are emitted from the site, as defined under the POEO Act.**	**Air Quality**	**Low**	DCPL has responded to the odour incidents and no further actions have been identified during this IEA.	This recommendation relates to four odour complaints received during 2018. There have been no ongoing instances of odour from the Duralie Mine since November 2018. There have been no further complaints relating to odours since November 2018. Duralie have implemented specific response measures since the first odour complaints to ensure potential odours from the Duralie Mine are controlled. During the IEA Inspection no offensive odours were detected. DCPL have provide responses to the EPA as requested. No further action currently required.	12-May-21	Completed	No further action.

Schedule 3 Condition 22	**The Proponent shall: (a) implement best practice air quality management on site, including all reasonable and feasible measures to minimize the off-site odour, fume and dust emissions generated by the project, including any emissions from spontaneous combustion;**	**Air Quality**	**Low**	DCPL has responded to the odour incidents and no further actions have been identified during this IEA	This observation relates to four odour complaints received during 2018. DCPL has demonstrated compliance with this condition through the implementation of reasonable and feasible mitigation measures to minimise the ongoing generation and release of odour. There have been no ongoing instances of odour from the Duralie Mine since November 2018. There have been no further complaints relating to odours since November 2018. Duralie have demonstrated the intent to comply with this condition through the implementation of all reasonable and feasible mitigation measures to control the generation and release of any odours from the Duralie Mine. This is evidenced by ongoing correspondence with the EPA and follow-up inspections. Duralie have identified and implemented the control measures necessary to minimise odours. Odours from Duralie have been appropriately controlled at the time of the audit.	12-May-21	Completed	No further action.
Schedule 3 Condition 23b	**The Air Quality & Greenhouse Gas Management Plan for the project shall: (b) describe the measures that would be implemented to ensure compliance with conditions 17-22 of Schedule 3 of this approval, including the proposed real-time**	**Air Quality**	**Administrative**	Revise the AQGGMP to include odour risks and management	SCPL accepts the recommendation. The AQGGMP will be revised to include details regarding the management of potential odours at the Duralie Coal Mine.	13-Aug-21	Completed	The Duralie AQGGMP has been revised to include sources of odour and odour management measures. The revised AQGGMP has been submitted to DPIE for approval in September 2021.
Schedule 3 Condition 23 (note)	**Note: The effectiveness of the Air Quality & Greenhouse Gas Management Plan is to be reviewed and audited in accordance with the requirements in Schedule 5. Following this review and audit the plan is to be revised to ensure it remains up to date (see Condition 4 of Schedule 5).**	**Air Quality**	**Administrative**	Revise the AQGGMP to include odour risks and management	SCPL accepts the recommendation. The AQGGMP will be revised to include details regarding the management of potential odours at the Duralie Coal Mine.	13-Aug-21	Completed	The Duralie AQGGMP has been revised to include sources of odour and odour management measures. The revised AQGGMP was submitted to DPIE for approval in September 2021 and approved in October 2021.
Schedule 3 Condition 25	**The Proponent shall ensure that: (b) all surface water discharges from the site comply with section 120 of the POEO Act or, if an EPL has been issued regulating water discharges from the site, the discharge limits (both volume and quality) set for the project in the EPL.**	**Water**	**Low**	The exceedances in water quality discharges from the site were a result of environmental factors and not considered to be related to operational impacts of the mine. No actions relating to this noncompliance have been identified.	This observation relates to only two pH results (Point 36 - North Drain) during the entire audit period which were marginal outside the pH criteria. This is negligible in the context of the monitoring undertaken and was not determined to be related to operational impacts. Duralie has constantly demonstrated intentions to comply with these conditions and has operated to a high standard of environmental performance.	12-May-21	Completed	No further action required.
Schedule 3 Condition 45	**After each Independent Environment Audit (see Condition 8 of Schedule 5), the Proponent shall review and adjust the sum of the (conservation) bond to the satisfaction of the Secretary.**	**Conservation Bond**	**Administrative**	Expediate the finalization of the review of the conservation bond.	SCPL accepts the recommendation.	17-Sep-21	Open	Conservation Bond will be reviewed and updated before next IEA.
Schedule 3 Condition 57d	**This Rehabilitation Management Plan must: (d) provide for scientific knowledge gained during the rehabilitation, to be made publicly available;**	**Rehabilitation**	**Administrative**	Update the plan to provide for scientific knowledge gained during the rehabilitation, to be made publicly available. For example, include a process for publication (in appropriate journals) of lessons learned / discoveries related to the rehabilitation works.	SCPL accepts the recommendation. The MOP/RMP will be updated. Information is available on the Duralie website including: * EIS rehabilitation assessment * MOP and rehabilitation management plan * Annual Reviews including rehabilitation progress and reports on rehabilitation methodologies and rehabilitation monitoring results. Information is distributed to the CCC as required. A community information line is operated to provide information when requested.	12-Nov-21	Open	A Rehabilitation Management Plan (RMP) has been prepared by DCPL in accordance with the new standard rehabilitation conditions on mining leases imposed through an amendment to the Regulation under the *Mining Act 1992* . The RMP is available on Duralie Coal website.
Schedule 5 Condition 4a	**Within 3 months of: (a) the submission of an annual review under Condition 3 above; the Proponent shall review, and if necessary, revise, the strategies, plans, and programs required under this approval to the satisfaction of the Secretary.**	**Management Plans**	**Administrative**	Establish a register that records the reviews of all management plans (as evidence for future audits).	DCPL accepts the recommendation. The intention of this condition is to ensure that the EMPs remain current and relevant. The Duralie EMPs provide the basis for a highly structure and detailed Environmental Management System. The EMPs will be revised as required.	12-May-21	Open	The EMPs will be revised as required.

Schedule 5 Condition 4b	**b) the submission of an incident report under Condition67 below; the Proponent shall review, and if necessary, revise, the strategies, plans, and programs required under this approval to the satisfaction of the Secretary.**	**Management Plans**	**Administrative**	Ensure that following any reportable incident that the relevant plan is reviewed and if required revised.	DCPL accepts the recommendation. The intention of this condition is to ensure that the EMPs remain current and relevant. The Duralie EMPs provide the basis for a highly structure and detailed Environmental Management System. The EMPs will be revised as required.	12-May-21	Open	The EMPs will be revised as required.
Environment Protection Licence EPL 11701 Recommendations								
L2.2	**For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.**	**Water**	**Low**	The exceedances in water quality discharges from the site were a result of environmental factors and not considered to be related to operational impacts of the mine. No actions relating to this noncompliance have been identified.	This observation relates to only two pH results (Point 36 - North Drain) during the entire audit period which were marginal outside the pH criteria. This is negligible in the context of the monitoring undertaken and was not determined to be related to operational impacts. Duralie has constantly demonstrated intentions to comply with these conditions and has operate to a high standard of environmental performance. Point 27 (VC1) – This dam doesn't currently discharge offsite. The EPL limits are only applicable to water discharged. Refer to notes in the EPL 11701 monitoring spreadsheet. Monthly monitoring is still undertaken in accordance with EPL11701. Point 36 (North Drain) - Two pH results during the entire 3 year audit period where only marginally below the pH Criteria. I.e. 6.1 and 6.3. This is insignificant in the context of the total monitoring undertaken and not related to operational impacts. Point 37 (South Drain) – On the occasions when the sampled EC has been above 1326uS/cm the flow has been directed to the Main Water Dam and not discharged offsite. Refer to notes in the EPL 11701 monitoring spreadsheet. The EPL limits are only applicable to water discharged. TSS is not applicable to Points 36 and 37.	12-May-21	Completed	No further action required.
L6.1	**The licensee must not cause or permit the emission of offensive odour beyond the boundary of the premises.** **Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising**	**Air Quality**	**Low**	DCPL has responded to the odour incidents and no further actions have been identified during this IEA.	This recommendation relates to four odour complaints received during 2018. There have been no ongoing instances of odour from the Duralie Mine since November 2018. There have been no further complaints relating to odours since November 2018. Duralie have implemented specific response measures since the first odour complaints to ensure potential odours from the Duralie Mine are controlled. During the IEA Inspection no offensive odours were detected. DCPL have provide responses to the EPA as requested. Duralie have identified and implemented the control measures necessary to minimise odours. Odours from Duralie have been appropriately controlled. No further action currently required.	12-May-21	Completed	No further action.
O7.3b	**The licensee shall only:** **b) receive shuttle trains on site between 6am and midnight; and**	**Trains**	**Low**	Prior to recommencement of shuttle Train Operations ensure that train operators are made aware of their obligations under this Condition.	Shuttle train records reviewed indicated that one train was received (22 March 2018) at the site after midnight. SCPL accepts the recommendation. Only 1 train was received between midnight and 1am during the entire 3 year audit period. This train was not identified in the report due to an error in the spreadsheet calculation. Hence, no explanation for the late arrival was provided. DCPL has demonstrated all intentions to comply with this condition throughout the audit period. The shuttle train spreadsheet and website have already been corrected.	30-Jun-21	Completed	Licence conditions relating to shuttle train operations have been updated on the Duralie Shuttle Train Load Point Capability Statement with Pacific National. Operators will be familiarised before commencing shuttle train operations.
O7.3c	**The licensee shall only:** **c) operate shuttle trains on the North Coast railway between midnight and 1am in exceptional circumstances.**	**Trains**	**Low**	Prior to recommencement of shuttle Train Operations ensure that train operators are made aware of their obligations under this Condition.	SCPL accepts the recommendation. The 2018 Duralie Coal Train Performance spreadsheet indicated that one train (left Duralie at 20:30 on 22 March 2018, arrived back at Duralie at 1am (23 March). No reason for the late arrival of the train was provided on the website. Only 1 train was received between midnight and 1am during the entire 3 year audit period. This train was not identified in the report due to an error in the spreadsheet calculation. Hence, no explanation for the late arrival was provided. DCPL has demonstrated all intentions to comply with this condition throughout the audit period. The shuttle train spreadsheet and website have already been corrected.	30-Jun-21	Completed	Licence conditions relating to shuttle train operations have been updated on the Duralie Shuttle Train Load Point Capability Statement with Pacific National. Operators will be familiarised before commencing shuttle train operations.
M2.2	**For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1**	**Air Quality**	**Low**	No recommendation required as this was an isolated incident that was immediately rectified.	This incident related to one dust gauge sample damaged out of several hundred sampling events over the three-year audit period. DCPL have endeavoured to meet all monitoring requirements throughout the audit period. This administrative monitoring non-compliance would not result in any potential environmental impact.	12-May-21	Completed	
M2.3	**For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1**	**Water**	**Low**	No recommendation required as this was an isolated incident that was immediately rectified.	This non-compliance relates to missing a single monitoring point during the entire 3-year period at Point 27 (VC1) which does not discharge offsite. This administrative monitoring non-compliance would not result in any potential environmental impact. DCPL have endeavoured to meet all monitoring requirements throughout the audit period.	12-May-21	Completed	
M7.2	**The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.**	**Complaints Line**	**Administrative**	Update the website to specify that the Community Hotline is also the complaints telephone number.	This matter has never been regarded as non-compliant previously and has never been raised as an issue by a community member. The Community (complaints) Information hotline is shown on the Duralie website on the Community page, Environment page and Contacts page. The Community hotline is also advertised in the local phone directory and periodically in the local newspaper. The Duralie website has been updated to state the Community Information line is also for lodging complaints.	22-Jun-21	Completed	No further action required.
Mining Lease 1646								

5	**(a) The lease holder must report any environmental incidents. The report must:** **(i) be prepared according to any relevant Departmental guidelines.** **(ii) be submitted within 24 hours of the environmental incident occurring:**	**Environmental Incident Reporting**	**Administrative**	Ensure that all reportable environmental incidents are included in the reporting of incidents to the Resources Regulator.	SCPL accepts the recommendation. Incident notifications and reports will be provided to the regulators as required.	22-Jun-21	Completed	No further action required. Ongoing reporting of incidents as required
General Recommendations								
Schedule 3 Condition 15	**The Proponent shall not carry out blasting within 500 metres of any privately-owned land or land not owned by the Proponent unless:** **(a) the Proponent has a written agreement with the relevant landowner to allow blasting to be carried out closer to the land, and the Proponent has advised the Department in writing of the terms of this agreement; or** **(b) the Proponent has:** **• demonstrated to the satisfaction of the Secretary that the blasting can be carried out without compromising the safety of the people or livestock on the land, or damaging the buildings and/or structures on the land; and** **• updated the Blast Management Plan to include the specific measures that would be implemented while blasting is being carried out within 500 metres of the land.**	**Blasting**	**Recommendation only**	Recommendation for Improvement – If blasting is required in 2021, then it is recommended that attempts be made to contact the relevant landowner again to seek agreement for blasting within 500 metres of that private property.	SCPL accepts the recommendation. It is noted that one unoccupied private property is located within the 500 m blast zone. DCPL has previously attempted to contact the landowner in relation to blasting although no response was received from the landowner. DCPL implemented specific measures in the Blast Management Plan to allow blasting to be undertaken safely within 500m of the noted property.	12-May-21	Ongoing	
Schedule 3 Condition 16	**The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Secretary.**	**Blasting**	**Recommendation only**	Recommendation for Improvement – If blasting is required in 2021, then it is recommended that the Blast Management Plan be reviewed and revised to ensure that any future blasting is undertaken in accordance with best practice.	SCPL accepts the recommendation.	12-May-21	Ongoing	
Schedule 3 Condition 29	**The Proponent shall prepare and implement a Water Management Plan for the project to the satisfaction of the Secretary. This plan must be prepared in consultation with EPA and NOW.**	**Water**	**Recommendation only**	Ensure that as part of any future revision pf the Water Management Plan that all relevant stakeholders are consulted.	SCPL accepts the recommendation.	12-May-21	Ongoing	
Schedule 3 Condition 29b	**(b) a Surface Water Management Plan that includes:** **• an irrigation management plan for the irrigation system under the water management system, which includes: - salinity trigger levels for controlling discharges from the irrigation areas.**	**Water**	**Recommendation only**	The Surface Water Management Plan is attached to Appendix 2 of the Water Management Plan. Table 1 (Section 2) of the Irrigation Management Plan states that details of the salinity trigger values are provided in Section 4.4. Section 4.4 does not detail the salinity trigger values. That information is contained in Section 4.6. Update Table 1 (section 2) of the Irrigation Management Plan to provide the correct reference to the location of the Salinity Trigger Values.	SCPL accepts the recommendation.	15-Aug-21	Open	

APPENDIX 10

Rehabilitation Monitoring Report 2022

WEDGETAIL
PROJECT CONSULTING

Duralie Coal Mine
2022 Rehabilitation EFA Monitoring

Stroud Road, New South Wales

Rev 3
23 August 2022

Duralie Coal Mine
2022 Rehabilitation EFA Monitoring

Stroud Road, New South Wales

REPORT PREPARED FOR:

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Rev. No.	Revision Date	Author / Position	Reviewer	Details
Rev 1	22 August 2022	Nigel Fisher Senior Ecologist	Jonathan Berry Principal Advisor	Draft for Client Review
Rev 2	23 August 2022	Nigel Fisher Senior Ecologist	L Byrne (Yancoal)	Draft for Client Review
Rev 3	23 August 2022	Nigel Fisher Senior Ecologist	L Byrne (Yancoal)	Final

EXECUTIVE SUMMARY

Duralie Coal Pty Ltd (DCPL) is a wholly owned subsidiary of Yancoal Australia Ltd and operates the Duralie Coal Mine (DCM). The DCM is located between the small towns of Stroud Road and Wards River, approximately 80km north of Newcastle in New South Wales. Approval for mining was granted in 1997 and coal production commenced in 2003. The DCM has operated under two key approvals, NSW Project Approval (08_0203) and the Commonwealth Approval (EPBC 2010/5396). In accordance with Section 8.1 of the Duralie Coal Mine – Mining Operations Plan & Rehabilitation Management Plan (MOP & RMP) (2019) monitoring and assessment of the quality and ecological value of the woodland rehabilitation is required. This assessment was conducted using EFA (Ecosystem Functional Analysis of which LFA or Landscape Functional Analysis is a component) to measure the progression of the rehabilitation towards a self-sustaining ecosystem. It should be noted here that a Rehabilitation Management Plan (RMP) has been prepared and submitted for Duralie to satisfy the requirements of Condition 2 of ML 1427 and Condition 3 of ML 1646 (relevant to preparation of an RMP) and addresses the requirements for the DCM RMP provided within Condition 57, Schedule 3 of the Project Approval (08_0203). The RMP replaces the 2019 DCM MOP & RMP, but a transition period to July 2022 has allowed for implementation of the new requirements. The monitoring and this report fall under the previous regime but notes the requirements for standardisation of rehabilitation domains which will be fully implemented in future reporting.

Wedgetail Project Consulting conducted LFA and EFA monitoring at transects situated to provide representative data of rehabilitation age, slope and aspect. This, the seventh annual survey (the first conducted by Wedgetail Project Consulting staff, but the seventh conducted by Nigel Fisher) was conducted on the 21st – 23rd of June 2022. ***Table 21*** *details the transects by age of rehabilitation surveyed in 2022.*

Table 1: Details of transects surveyed in 2022

Age of Rehabilitation	Designation	Rehabilitation Type	Aspect	Transect Bearing	Date Surveyed
2008	3042	Native Woodland	South	190	22 June
	3443	Native Woodland	North-East	060	23 June
	3450	Native Woodland	North-East	045	22 June
2010	3046	Native Woodland	North	017	22 June
2011	3048	Native Woodland	East	072	22 June
2012	3041	Native Woodland	South	190	23 June
	3054	Native Woodland	West	250	23 June
	3466	Native Woodland	South-West	224	22 June
2013	3503	Native Woodland	East	080	21 June
2016	3501	Native Woodland	West	260	22 June
	3502	Native Woodland	South	170	21 June
2018	3504	Pasture	North (flat)	350	21 June
2020	3505	Pasture	West (flat)	287	21 June
	3506	Native Woodland	West	250	21 June

Landscape Functional Analysis (LFA) is a monitoring technique that uses eleven soil surface characteristics to determine the functional status of a landscape. These soil surface characteristics correspond to a range of physical, chemical, and biological processes that control movement of water, topsoil, and organic matter in a landscape. The results of the monitoring are input into purpose-built software that reports the results as three indices, Stability, Infiltration and Runoff, and Nutrient Cycling Indices.

The second component of the monitoring consisted of assessing the vegetation structure at each transect. At 5 x 5m points along transects, the distance to the nearest stem or other important species or structural component (i.e., largest canopy) was measured and the plant height, canopy density, and dimensions (breadth and width) were recorded. Tallest trees had dimensions estimated, whereas smaller stems (<4m) were measured.

Results – Landscape Functional Analysis

The Stability Index scores for the individual Woodland Rehabilitation Areas recorded this survey showed ten of the 12 transects were at or have exceeded the Analogue average score of 76.9 ± 1.9. One individual transect, recorded a Stability Index score below the Analogue average, Transect 3041 (65.6 ± 0.0), 2012 rehabilitation. All individual transects recorded Infiltration scores below the Analogue average of 68.9 ± 5.5. Results this survey were varied, with no clear-cut trend based on age of rehabilitation. Nutrient Cycling scores for the individual Woodland Rehabilitation Areas recorded this survey showed two of the individuals transects were near the Analogue average score of 61.7 ± 5.1. The scores for this index were correlated to stem density and the consequent quantity of litter production and whether grasses or litter dominated the groundcover. Other Soil Surface Indicators that the rehabilitation areas were entirely nutrient accumulating "patches" with uniform coverage.

Pasture rehabilitation areas have achieved Analogue values for all indices.

Vegetation Structure

Ecosystem Sustainability Phase Rehabilitation - This survey of the 2008 Woodland Revegetation transects recorded average stem densities at 3, 321 stems/ha, and woody vegetation volume was 40, 6049 m^3/ha. Individual transects surveyed in this aged rehabilitation varied from heavily wooded (Transect 3042 recorded a total stem density of 5, 623 stems/hectare and a total woody volume (TWV) of 55, 356 m^3/ha) to moderately wooded with canopy (Transect 3443 recorded a total stem density of 1, 950 stems/ha and TWV of 47, 366 m^3/ha) to no canopy species and only shrubs and midstorey species recorded (Transect 3450 stem density was measured as nearest stem resulting in a total stem density of 2, 391 stems/ha and TWV of 19, 226 m^3/ha). 2010 rehabilitation recorded a total stem density of 2, 864 stems/ha and TWV of 29, 350 m^3/ha measured as three strata – canopy Eucalypts, midstorey under 11m and shrubs under 3.0m. 2011 rehabilitation recorded a total stem density of 4, 884 stems/ha with a TWV of 55, 940 m^3/ha. The 2012 rehabilitation recorded an average total stem density of 3, 275 stems/ha with a TMV of 41, 825 m^3/ha. The three transects surveyed in this area display considerable variation in regard to vegetation structure. Transect 3041 recorded a total stem density of 357 stems/ha with a TWV of 32, 864 m^3/ha. Transect 3054 recorded a total stem density of 2, 322 stems/ha and TWV of 39, 889 m^3/ha. Transect 3466 recorded a total stem density of 7, 148 stems/ha and a TWV of 52, 7234 m^3/ha. This last transect was the only area to record stem densities approaching Analogue values. 2013 rehabilitation, Transect 3503 recorded a total stem density of 738 stems/ha and TWV of 13, 454 m^3/ha.

Ecosystem Establishment Phase - This survey the 2016 rehabilitation recorded an average total stem density of 1, 542 stems/ha and average TWV of 80, 6077 m^3/ha with two transects. Transect

3501 recorded a total stem density of 1, 667 stems/ha and TWV of 84, 408 m^3/ha. Transect 3502 recorded a stem density of 1, 419 stems/ha and a TWV of 76, 948 m^3/ha. No canopy species have been recorded in the vicinity of this transect, but this survey a very small number were observed emerging from the dense Acacias. 2020 rehabilitation recorded a total stem density of 5064 stems/ha with a TWV of 100, 963.00 m^3/ha. This last area recorded a huge canopy volume of Acacias which have shown rapid growth from the previous survey.

Discussion

The revegetated waste emplacement has been designated Domain 3, with two subdomains, Domain 3A – Waste Emplacement (Pasture/Scattered Trees) (RMP Domain A – Agriculture – Grazing referred to as pasture here) and Domain 3B – Waste Emplacement (Woodland/Open Forest) (RMP Domain B - Native Ecosystem referred to as woodland here).

The 2008 to 2013 woodland rehabilitation has been assessed as being in the Ecosystem and Land Use Sustainability phase – the last phase of rehabilitation – while younger rehabilitation, 2016 to 2018, both pasture and woodland – have been assessed as being in the Ecosystem and Land Use Establishment phase of rehabilitation.

Soil surface indicators for this round of monitoring for the various ages of rehabilitation are generally positive and are trending towards Analogue values, with one or two exceptions. The Stability Index scores are consistent across the ages of Woodland rehabilitation, with the younger rehabilitation areas (Ecosystem Establishment) having improved from the previous survey with scores above or near the Analogue score. The notable exception to this trend is Transect 3041 in the 2012 rehabilitation – Ecosystem Sustainability. This transect was last surveyed in 2019 and examination of that data shows that all indices for this transect have regressed, largely as a result of a reduction in litter build up and quality. Monitoring of this transect next year is recommended to determine if this result was anomalous. There were no areas of significant erosion noted throughout either the southern spoil emplacement (2008 to 2012, and 2016 rehabilitation) and the northern spoil emplacement (2013 to 2020 rehabilitation). Pasture areas have exceeded all LFA indices when compared to the Stratford Mine Complex Analogue transect T33. The seeding of these areas has been successful with dense growth of grasses evident.

The vegetation structure data for the woodland rehabilitation assessed as Ecosystem Sustainability i.e., 2008 to 2013 rehabilitation monitored this survey shows a range of canopy and woody vegetation density from heavily wooded areas with dense canopy to areas without true canopy and relatively sparse shrub and midstorey cover. These areas are developing good diversity with natural recruitment of additional species observed. Where the areas are more open, and exotic grasses dominate the groundcover (e.g., Transect 3041), there are no naturally recruited species and few saplings and seedlings of the required canopy species such as C. maculata and E punctata, even though these areas have been observed to be in seed. The younger rehabilitation areas 2016 and 2018, assessed as being in the Ecosystem Establishment phase, have greater diversity due to the initial seeding mix, but also have dense grassy groundcover. The growth of the Acacias in these younger areas was notable between surveys. The areas around Transect 3501 and 3506 in particular recording a large increase in height and canopy volume.

The difference between the grassy and litter dominated groundcover has been remarked upon above. The relationship between the density of the woody vegetation, the resulting groundcover and its effect on the Nutrient Cycling. While the age of the rehabilitation also has an impact on litter accumulation, it can be seen that there is a correlation between stem density and nutrient cycling with high density areas producing more litter. While this may not appear revelatory, it does provide

some empirical evidence that the rehabilitation of these different areas will progress at different rates and may illustrate the need for some form of management for these areas. For instance, with the ongoing natural recruitment observed in the denser areas, a reduction in grassy groundcover may be beneficial. Ongoing monitoring will demonstrate if this correlation continues.

Recommendations

Management recommendations can be divided into practical physical actions and improvements to monitoring methods to extract more relevant data. The pasture rehabilitation areas require weed control to maintain these areas as pasture. Woody weeds such as Lantana, Privet and Wild Tobacco are and will be an ongoing issue for the woodland rehabilitation areas and further control works are required. A controlled burn has been advocated in the past and the suggestion is again proposed for the following reasons – hazard reduction, weed control and improvement to biodiversity and natural recruitment by reduction of grassy groundcover. The current monitoring methodology focusses on the biophysical processes and vegetation structure as measured by LFA and Vegetation Structure. A more formal quadrat-based method would provide better data tracking the progress – or otherwise – of the diversity of the revegetation. The formal identification of flora species in the quads would then be used to infer the vegetation structure, for instance, true shrub and midstorey species. Regardless of changes to the methodology, the rotation of transects monitored in the 2008 and 2012 rehabilitation areas should become more targeted. Currently transects are rotated on a random basis resulting in open and wooded areas being combined into the same data sets, making comparisons of historical data difficult. It is suggested that transects be grouped according to stem density allowing for like-to-like comparison to be made.

Conclusions

The majority of the Duralie spoil emplacement revegetation is on track to establish woodland and pasture areas. Denser wooded areas of the 2008, 2010, 2011 and 2012 rehabilitation areas are progressing well with LFA indices stable or tracking to achieve Analogue values, increasing biodiversity and improving structure. The younger woodland rehabilitation areas are developing as expected. More open areas of the revegetation have plateaued and while further maturation of the existing canopy will occur with time, some form of active management such as controlled burn can be implemented to improve diversity and structure.

Proposed changes to the monitoring method will better inform the progress of the revegetation to the stated goals of biodiversity and structure similar to Analogue vegetation.

Contents

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1. INTRODUCTION

Duralie Coal Pty Ltd (DCPL) is a wholly owned subsidiary of Yancoal Australia Ltd and operates the Duralie Coal Mine (DCM). The DCM is located between the small towns of Stroud Road and Wards River, approximately 80km north of Newcastle in New South Wales. Approval for mining was granted in 1997 and coal production commenced in 2003 (Figure 1).

The DCM operates under two key approvals, NSW Project Approval (08_0203) and the Commonwealth Approval (EPBC 2010/5396) which authorise mining operations to be carried out at DCM until 31 December 2021. Both may be viewed at http://www.duraliecoal.com.au. Accordingly, DCPL has commenced the mine closure phase (i.e., following the cessation of mining operations on 31 December 2021).

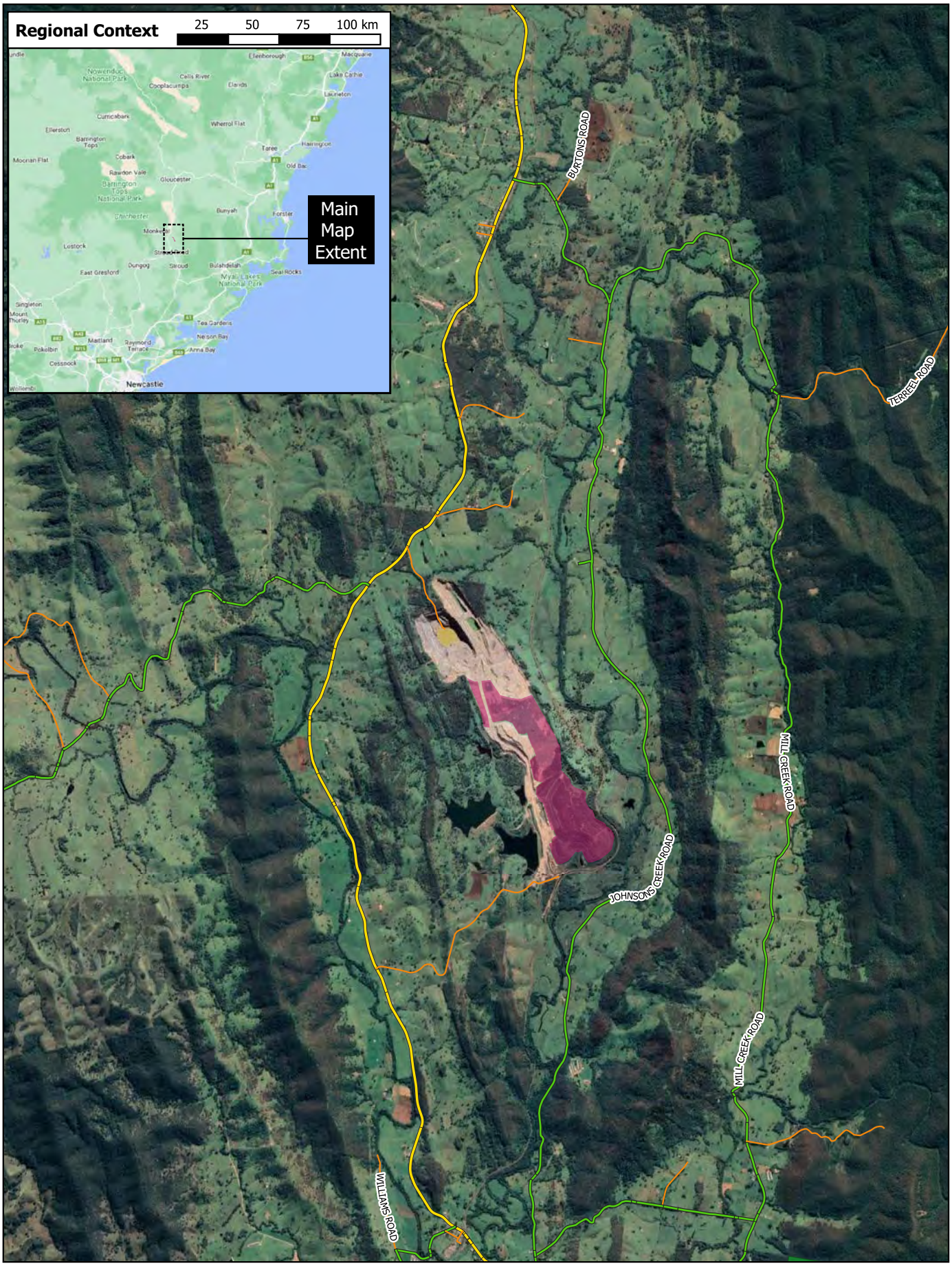
A Rehabilitation Management Plan (RMP) has been prepared and submitted for the Duralie Coal Mine to satisfy the requirements of Condition 2 of ML 1427 and Condition 3 of ML 1646 (relevant to preparation of an RMP) and addresses the requirements for the DCM RMP provided within Condition 57, Schedule 3 of the Project Approval (08_0203).

An amendment to the *Mining Regulation 2016* under the *Mining Act 1992*, commenced on 2 July 2021. The amendment provides new standard rehabilitation conditions for mining leases which replaces existing mining lease conditions. A transitional period of 12 months (to 2 July 2022) has been established to allow mining operations sufficient time to prepare for the implementation of the new conditions for any existing Mining Lease (ML). This RMP replaces the Duralie Coal Mine - Mining Operations Plan (MOP)/RMP (1 January 2020 to 31 December 2021).

The monitoring conducted for this report occurs during the transition period noted above, and therefore this report has been completed under the previous conditions, i.e., in accordance with Section 8.1 of the Duralie Coal Mine – Mining Operations Plan & Rehabilitation Management Plan (2019) monitoring and assessment of the quality and ecological value of the woodland rehabilitation will be required. This assessment will be conducted using EFA (Ecosystem Functional Analysis of which LFA or Landscape Functional Analysis is a component) to measure the progression of the rehabilitation towards a self-sustaining ecosystem. This report is submitted to fulfil this requirement while noting the changes in terminology required under the amendments.

1.1 SCOPE AND RATIONALE

Wedgetail Project Consulting (WPC) was commissioned by DCPL to conduct LFA and EFA monitoring to ensure compliance with the above stated objectives. As part of the monitoring program, Kleinfelder undertook to conduct LFA and EFA monitoring at transects situated to provide representative data of rehabilitation age, slope and aspect. This, the eighth annual survey (the sixth conducted by Kleinfelder Australia staff, and the first by WPC) was conducted on the 21st – 23rd of June 2022. It should be noted that the WPC staff involved in this survey, Dr. Nigel Fisher has conducted the previous six surveys when employed by Kleinfelder Australia, while Ash Owen has previously conducted two surveys when employed by Kleinfelder Australia.



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Date: 21.08.2022

WEDGETAIL PROJECT CONSULTING PTY LTD
www.wedgetail.com.au

Legend

- Rehab Areas
- Arterial Road
- Sub-arterial Road
- Local Road

1 2 3 4
kilometers

N

Locality

Figure: 1

Duralie Coal Pty Ltd
Duralie Rehabilitation LFA
Duralie Coal Mine

2. METHODS

2.1 TRANSECTS SURVEYED

The 2022 survey utilised a combination of a subset of the original 20 Greening Australia transects on the DCM spoil emplacement which were surveyed in 2013 and 2014, and new transects established to monitor more recent rehabilitation. **Table 2** details the transects by age of rehabilitation surveyed in 2022. **Figure 2** shows the location of the transects on the Duralie Spoil Emplacement and the age of rehabilitation monitored.

Table 2: Year of rehabilitation and designation of the transects selected for monitoring in 2022

Age of Rehabilitation	Designation	Rehabilitation Type	Aspect	Transect Bearing	Date Surveyed
2008	3042	Native Woodland	South	190	22 June
	3443	Native Woodland	North-East	060	23 June
	3450	Native Woodland	North-East	045	22 June
2010	3046	Native Woodland	North	017	22 June
2011	3048	Native Woodland	East	072	22 June
2012	3041	Native Woodland	South	190	23 June
	3054	Native Woodland	West	250	23 June
	3466	Native Woodland	South-West	224	22 June
2013	3503	Native Woodland	East	080	21 June
2016	3501	Native Woodland	West	260	22 June
	3502	Native Woodland	South	170	21 June
2018	3504	Pasture	North (flat)	350	21 June
2020	3505	Pasture	West (flat)	287	21 June
	3506	Native Woodland	West	250	21 June

The 2016 survey (the first undertaken by Kleinfelder) utilised 10 of these previously established transects, having ascertained in conjunction with Yancoal staff that this number satisfied reporting requirements (**Table 3**). The 2017 survey utilised a different set of six established transects with an additional four new transects – two transects in areas of the spoil emplacement rehabilitated in 2016, one transect in 2013 rehabilitation and one transect in an area of 2008 rehabilitation that had not been previously surveyed. While data collected from this survey was not from the same transects as surveyed in 2020, all ages of rehabilitation are represented in all surveys. **Table 3** compares the transects used for the 2016 – 2020 surveys to the 2021 survey and includes the two transects that were established on newly rehabilitated areas in 2020 but not surveyed that year (Transects 3505 and 3506).

Monitoring photographs were taken looking along transects from the starting peg with the tape measure visible, if possible, as well as representative photographs of the query zones of each transect. Representative photographs can be viewed in **Appendix A**.

Table 3: Comparison of transects surveyed from 2016 – 2022.

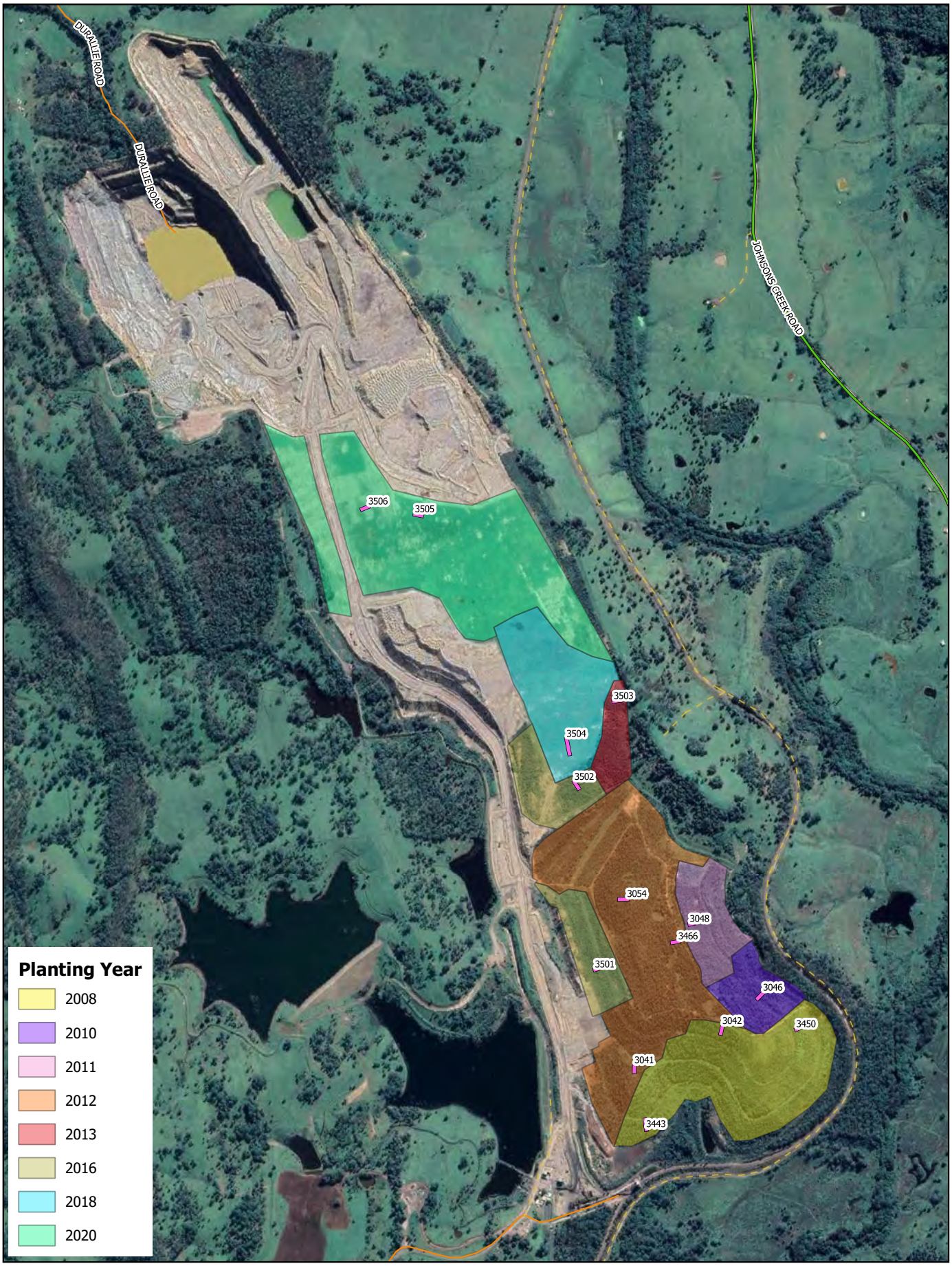
Year Rehabilitated	2016 Survey	2017 Survey	2018 Survey	2019 Survey	2020 Survey	2021 Survey	2022 Survey
2008	3045			3045		3045	
	3443	3444 (new)	3443	3444	3443	3444	3443
	3474	3042			3042		3042
	3450		3450		3450		3450
2010	3046	3454	3046	3454	3046	3454	3046
2011	3043	3048	3043	3048	3043	3048	3048
2012	3041	3044	3047	3041	3044	3047	3041
	3049	3052	3055	3054	3049	3052	3054
	3055	3466	3056	3466	3055	3056	3446
2013		3503	3503	3503	3503	3503	3503
2016		3501	3501	3501	3501	3501	3501
		3502	3502	3502	3502	3502	3502
2018				3504	3504	3504	3504
2020					3505	3505	3505
					3506	3506	3506

2.2 LANDSCAPE FUNCTIONAL ANALYSIS

Landscape Functional Analysis (LFA) is a monitoring technique that uses eleven soil surface characteristics to determine the functional status of a landscape and is fully described in Tongway and Hindley (2011). These soil surface characteristics correspond to a range of physical, chemical, and biological processes that control movement of water, topsoil, and organic matter in a landscape. The landscape is divided into a patch and interpatch system along transects where water and nutrients are accumulated or shed, respectively. Full data for each transect is provided in **Appendix B**.

2.3 VEGETATION STRUCTURE

The second component of the monitoring consisted of assessing the vegetation structure at each transect. The “point-centre-quadrat” method as outlined in Tongway and Hindley (2011) was employed to collect density and canopy size of vegetation present at each transect. At 5 x 5m points along transects, the distance to the nearest stem or other important species or structural component (i.e., largest canopy) was measured and the plant height, canopy density, and dimensions (breadth and width) were recorded. Tallest trees had dimensions estimated, whereas smaller stems (<4m) were measured.



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Legend
Rehab LFA Transect
Local Road
Sub-arterial Road
Track-Vehicular

250 500 750 1,000
metres

N

LFA Transects
Duralie Mining Complex
June 2022

Figure: 2

Duralie Coal Pty Ltd
Duralie Rehabilitation LFA
Duralie Coal Mine

2.4 DATA ANALYSIS

The collected data is input into a software system purpose designed for LFA where a series of tables are generated providing data on both a hillside and a patch basis. This data can then be used to provide insight into the functional status of the landscape.

Vegetation Structure data is also input into purpose-designed software where woody plant density and vegetative volume on a per hectare basis is calculated. These surveys were conducted in conjunction with the LFA monitoring using the same transects for data collection from the six ages of rehabilitation (**Table 2**). Raw data for each transect is presented in **Appendix B**.

Analogue data for comparison of monitoring on the spoil emplacement was undertaken in 2017 (Kleinfelder, 2017). Surveys were undertaken in six vegetation management units (VMUs) representing the most common woodland vegetation communities in the Biodiversity Offset areas. This data is included for comparison to the monitoring results from the 2013 and 2014 surveys for LFA in the Duralie Biodiversity Offset area (**Table 4**). The average vegetation data from the Analogue survey is presented in **Table 5**.

LFA results for Pasture sites were compared to the Stratford Pasture Analogue transect surveyed each year.

Table 4: LFA Index results from the six analogue sites (Woodland Remnant Offsets) surveyed in the 2017 Biodiversity Offsets Monitoring Report

Index	Stability Index			Infiltration Index			Nutrient Cycling Index		
Survey Year	2013	2014	2017	2013	2014	2017	2013	2014	2017
Index Score	71.5	69.6	76.9	47.3	51.0	68.9	44.6	44.1	61.7
Standard Error	4.2	7.7	1.9	3.9	5.5	5.5	4.8	5.0	5.1

Table 5: Average Vegetation data results from the six analogue sites (Woodland Remnant Offsets) surveyed in the 2017 Biodiversity Offsets Monitoring Report

Canopy Density (stems/ha)	Dist between stems (m)	Midstory Density (stems/ha)	Dist between stems (m)	Shrub Density (stems/ha)	Dist between stems (m)	Total Stem Density (stems/ha)	Total Woody Veg Volume (m3/ha)
188.2	7.60	1320.7	3.80	5528.3	2.20	7037.2	45121.2

3. RESULTS

3.1 LANDSCAPE FUNCTIONAL ANALYSIS

3.1.1 Domain 3A Pasture/Scattered Trees

Two transects were surveyed as Pasture rehabilitation – Transect 3504 2018 rehabilitation and Transect 3505 2020 rehabilitation. Transect T33, located at the Stratford Mine Complex was used as the Pasture Analogue. Both Pasture rehabilitation areas exceeded the Analogue values across all indices (**Table 7**). Transect T33 recorded scores of 72.5 ± 2.6 for the Stability Index, 39.8 ± 2.9 for the Infiltration Index and 34.3 ± 4.3 for the Nutrient Cycling Index. The2018 rehabilitation area, Transect 3504 recorded scores (in the same order of indices) 79.0 ± 3.0, 48.0 ± 6.0 and 46.3 ± 6.2. The 2020 rehabilitation area, Transect 3505 recorded scores of 78.8 ± 1.4, 52.4 ± 4.3 and 47.6 ± 2.3 for the three indices.

3.1.2 Domain 3B – Woodland/Open Forest - Stability Index

The Stability Index scores for the individual Woodland Rehabilitation Areas recorded this survey showed ten of the 12 transects were at or have exceeded the Analogue average score of 76.9 ± 1.9 (**Table 6** and **Chart 1**). One individual transect, recorded a Stability Index score below the Analogue average, Transect 3041 (65.6 ± 0.0), 2012 rehabilitation. Where the results can be averaged for the rehabilitation areas, all ages of rehabilitation were equivalent to the Analogue score. The average 2008 rehabilitation Stability Index score was 75.9 ± 2.9, while the 2012 aged rehabilitation score 72.9 ± 4.3 and the 2016 aged rehabilitation score was 76.6 ± 2.2.

3.1.3 Infiltration Index

All individual transects recorded Infiltration scores below the Analogue average of 68.9 ± 5.5. Results this survey were varied, with no clear-cut trend based on age of rehabilitation. 2008 rehabilitation transects recorded the highest individual and the highest average Infiltration Index scores – Transect 3042 recorded 57.7 ± 4.5 while the average score was 49.9 ± 4.8. The 2010 and 2011 rehabilitation transects recorded very similar scores of 48.4 ± 10.5 and 48.4 ± 7.5 respectively. The 2012 rehabilitation transects recorded a low of 39.8 ± 4.6 for Transect 3054, and a high of 55.3 ± 3.5 for Transect 3466 with an average of three transects measured in this aged rehabilitation of 45.5 ± 4.9. The 2016 rehabilitation transects recorded a high of 53.9 ± 7.8 for Transect 3502 and a lower score of 41.9 ± 6.3 for Transect 3501. The most recently rehabilitated transect, 3506 – 2020 rehabilitation – recorded a score of 41.5 ± 4.7.

3.1.4 Nutrient Cycling Index

Nutrient Cycling scores for the individual Woodland Rehabilitation Areas recorded this survey showed two of the individual transects were near the Analogue average score of 61.7 ± 5.1. Transect 3042 in the 2008 rehabilitation recorded a score of 58.8 ± 3.5. The remaining two transects in this aged rehabilitation were fairly close with Transect 3443 recording 41.8 ± 1.8 and Transect 3450 recording 39.4 ± 8.4. The 2010 and 2011 rehabilitation transects recorded scores of 45.8 ± 8.2 and 50.4 ± 9.9 for Transects 3046 and 3048 respectively. The 2012 rehabilitation was varied with Transect 3466 recording a high score of 58.8 ± 3.5 while transects 3054 and 3041 had lower index scores of 34.3 ± 6.7 and 28.2 ± 0.0 respectively. The 2013 rehabilitation, Transect 3503, returned a score of 37.4 ± 6.7. The 2016 rehabilitation varied considerably with scores of 37.4 ± 9.2 for

Transects 3501 and 52.7 ± 9.5 for Transect 3502. The 2020 rehabilitation Transect 3506 recorded an index score of 41.5 ± 5.8.

3.1.5 Other Soil Surface Indicators

Landscape Organisational Index (LOI) (Error! Reference source not found.) scores for the transects in the different rehabilitation areas are uniform, with all rehabilitation areas being assessed entirely as “patch”, i.e., areas of nutrient accumulation, thus they have LOI’s of 1.00.

The number of patches per 10m of transect is an indicator of the heterogeneity of the ground surface and given that the ground surface of all the transects was judged to be all patch, this indicates the that patch types may also vary. For instance, transects with numbers less than one are a single patch type, whether that is grassy sward or litter, whereas transects with higher numbers will have numerous smaller patch types. Thus, the analogue areas have an average of 1.9 patch types per 10m, whereas the majority of the rehabilitation areas have been assessed as having a single patch type per 10m (i.e., 0.4 patches per 10m, with 25m transects). These patches were generally assessed as either grass swards i.e., dense grass, or litter, largely dependent upon the vegetation density. The exception being transect 3443 (2008 rehabilitation) where 0.8 patches were identified per 10m.

Average Patch Width measures the cross slope spread of the patches. The Analogue sites recorded an average patch width of 6.63m, with most of the rehabilitation areas recording a width of 10m – the maximum that the LFA system can record. This indicates that the patch system identified in the surveys is very uniform with a minimum of variation as expected for areas seeded with grasses. This survey only Transect 3443 recorded an average patch width of under 10 m.

Table 6: Results of the 2022 Landscape Functional Analysis survey at Duralie Coal Mine spoil emplacement by transect and age of rehabilitation compared to average results from the Analogue sites in the Biodiversity Offsets areas (surveyed 2017).

Year of Rehab	Transect	Stability Index	SE	Infiltration Index	SE	Nutrients Cycling Index	SE	LOI	No Patches /10m	Ave Patch Width (m)
2017 Woodland Analogue Average		76.9	1.9	68.9	5.5	61.7	5.1	1	1.9	6.63
2008	3042	80.6	1.4	57.7	4.5	58.8	3.5	1	0.4	10.0
	3443	74.1	0.3	41.0	2.3	41.8	1.8	1	0.8	7.0
	3450	72.5	5.1	50.8	5.8	39.4	8.4	1	0.4	10
2010	3046	75.6	4.1	48.4	10.5	45.8	8.2	1	0.4	10
2011	3048	80.6	4.1	48.4	7.7	50.4	9.9	1	0.4	10
2012	3041	65.6	0.0	41.4	0.0	28.2	0.0	1	0.4	10
	3054	72.5	4.1	39.8	4.6	34.3	6.7	1	0.4	10
	3466	80.6	3.4	55.3	3.5	58.8	3.5	1	0.4	10
2013	3503	71.9	3.1	46.5	6.8	37.4	6.7	1	0.4	10
2016	3501	74.4	5.6	41.9	6.3	37.4	9.2	1	0.4	10
	3502	78.8	4.1	53.5	7.8	52.7	9.5	1	0.4	10
2020	3056	79.4	3.6	41.5	4.7	41.5	5.8	1	0.4	10

Table 7: Results of the 2022 Landscape Functional Analysis survey at Duralie Coal Mine spoil emplacement for the Pasture transects compared to results from the Analogue Pasture transect at the Stratford Mining Complex surveyed in 2022.

Year of Rehab	Transect	Stability Index	SE	Infiltration Index	SE	Nutrients Cycling Index	SE	LOI	No Patches /10m	Ave Patch Width (m)
2022 Pasture Analogue – T33		72.5	2.6	39.8	2.9	34.3	4.3	1	0.2	10
2018	3504	79.0	3.0	48.0	6.0	46.3	6.2	1	0.4	10
2020	3505	78.8	1.4	52.4	4.3	47.6	2.3	1	0.4	10

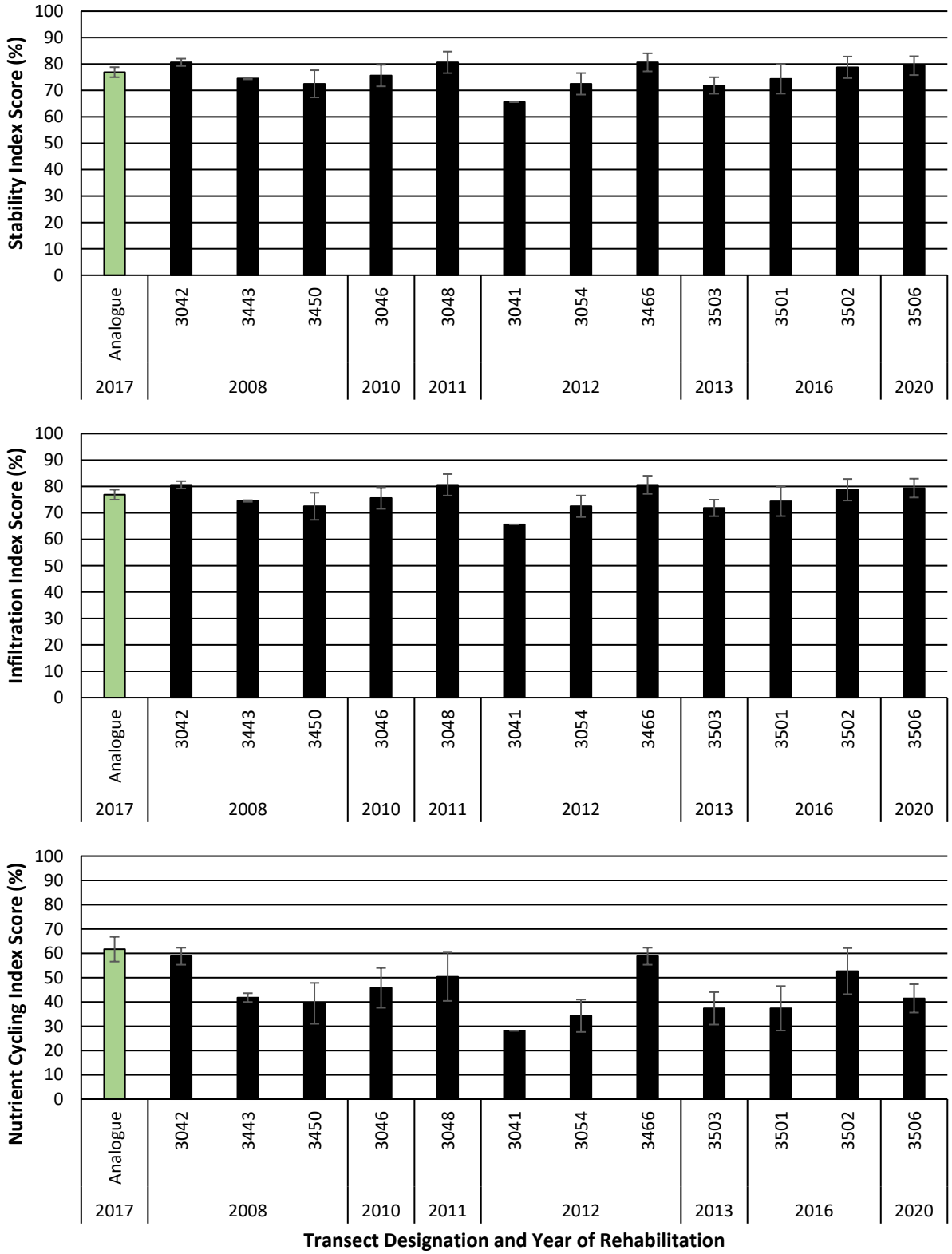

Chart 1: Landscape Functional Analysis results by Index for the 2022 survey of the Duralie Spoil Emplacement Woodland Rehabilitation. Transects are grouped by year of rehabilitation. Error bars are Standard Errors of the Mean.

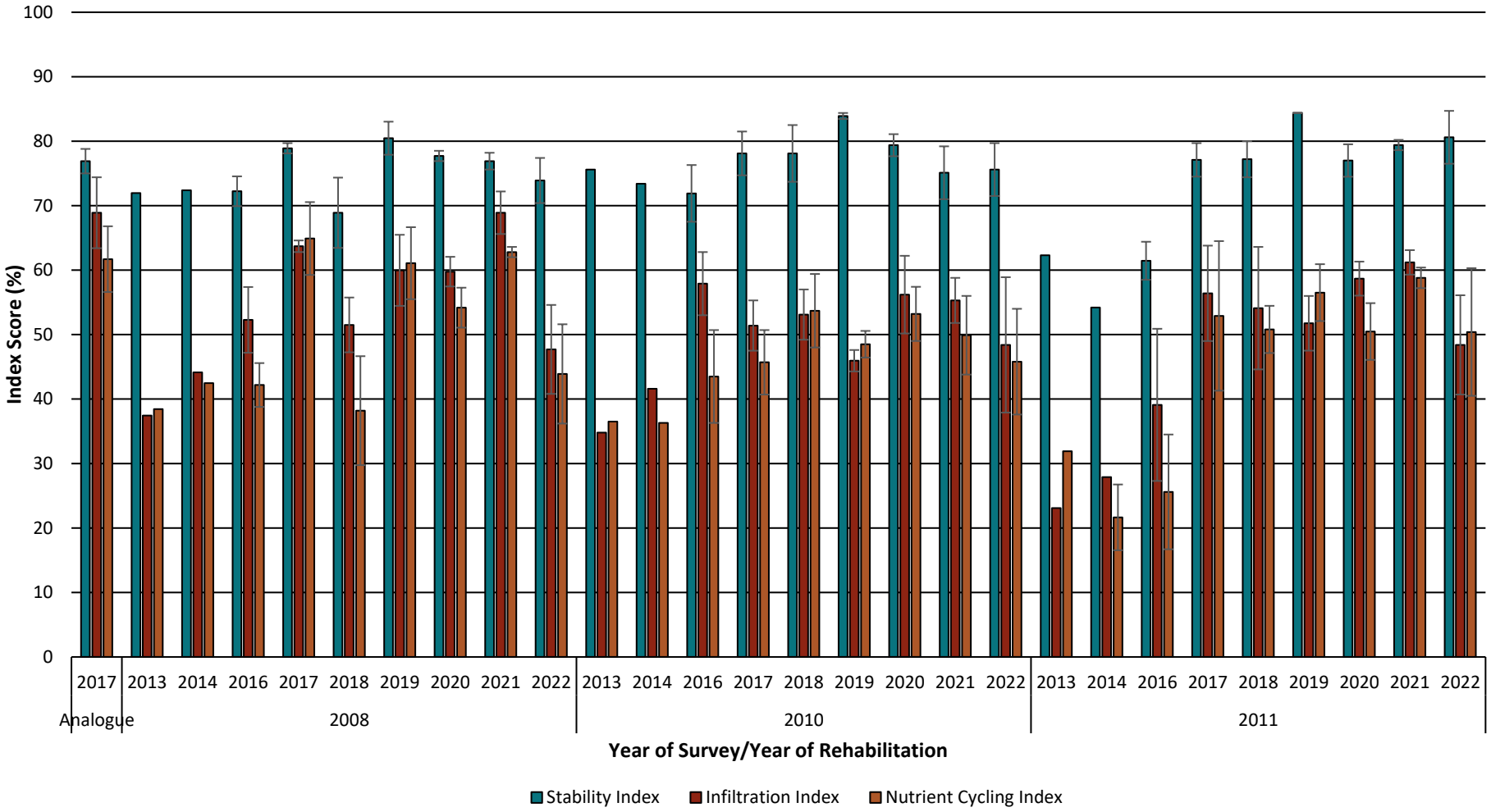

Chart 2: Landscape Functional Analysis results for the surveys of the 2008 to 2011 rehabilitation areas on the Duralie Coal Mine spoil emplacement and comparison to the 2017 average analogue sites derived from the Biodiversity Offsets Areas.

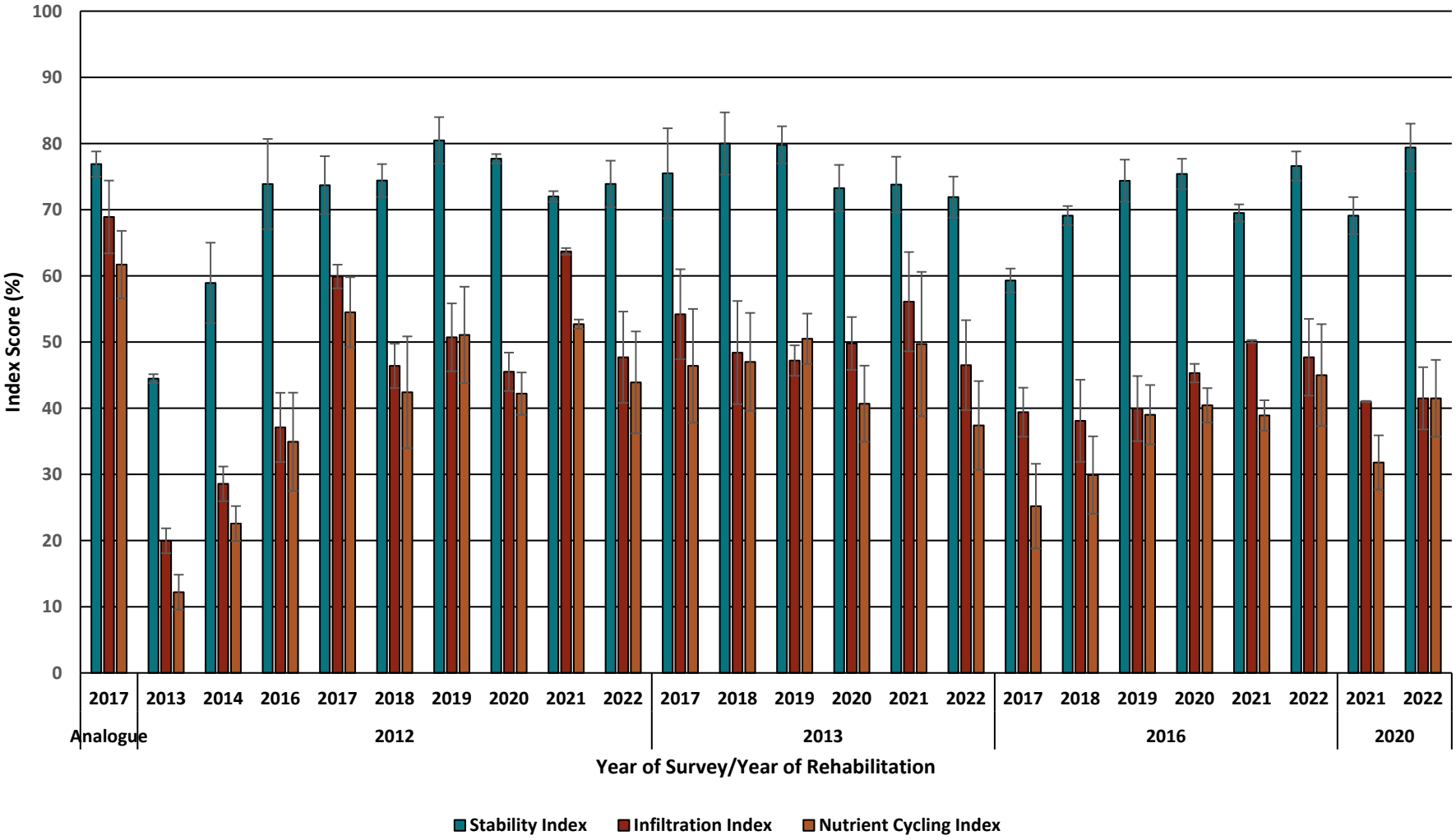

Chart 3: Landscape Functional Analysis results for the surveys of the 2012 to 2020 rehabilitation areas on the Duralie Coal Mine spoil emplacement and comparison to the 2017 average analogue sites derived from the Biodiversity Offsets Areas.

3.2 VEGETATION – DOMAIN 3A – PASTURE/SCATTERED TREES

Transects 3504 2018 rehabilitation and Transect 3505 2020 rehabilitation have been rehabilitated to pasture. These areas have not been seeded or planted with woody vegetation and no woody vegetation was recorded during the survey. Nonetheless, it was noted that Transect 3504 has some minor *Acacia* colonisation (**Plate 1**). Transect 3505 does not yet have *Acacias* encroaching – but will given the proximity of native rehabilitation - but *Tagetes minuta* (Stinking Roger) was becoming established.

Plate 1: Transect 3504 2018 Pasture rehabilitation showing *Acacia* colonisation

Plate 2: Transect 3505 2020 Pasture rehabilitation showing *Tagetes minuta* (Stinking Roger) colonising

3.3 VEGETATION DENSITY AND STRUCTURE – DOMAIN 3B – WOODLAND/OPEN FOREST

3.3.1 2008 Rehabilitation

This survey of the 2008 transects recorded average stem densities at 3, 321 stems/ha, and woody vegetation volume was 40, 6049 m^3/ha. Examination of the individual transects (see below) shows that this area of rehabilitation is variable in terms of native species density and diversity. Individual transect data is presented in **Chart 4** and **Chart 5**.

Transect 3042 recorded a total stem density of 5, 623 stems/hectare and a total woody volume (TWV) of 55, 356 m^3/ha. The woody vegetation was measured as canopy, midstorey (under 10m) and shrubs (under 2.5m). The canopy consisted of dense *Corymbia maculata* (Spotted Gum) with occasional *Eucalyptus punctata* (Grey Gum) and *E. crebra* (Narrow-leaved Ironbark). The canopy stratum of larger trees were estimated to be over 12m in height recorded 396 stems/ha with a TWV of 38, 422 m^3/ha. The midstorey stratum consisted of younger Eucalypts recorded a very dense 2, 938 stems/ha and TWV of 15, 882 m^3/ha. The shrub stratum recorded a density of 2, 289 stems/ha and TWV of 1, 053 m^3/ha. This area is one of the denser areas of the 2008 rehabilitation (**Plate 3**). Based on the size range of the Eucalypts there have been four seeding events with many saplings and seedlings observed. The diversity of this area is also very good with several native midstorey and shrub species observed including *Acacia irrorata* (Green Wattle), *A. longifolia* (Sydney Golden Wattle), *A ulicifolia* (Prickly Moses), *Breynia oblongifolia* (Coffee Bush), *Leucopogon juniperinus, Melia azedarach* (White Cedar), *Notelaea microcarpa* (Native Olive) and *Pultenaea villosa* (Hairy Bush Pea). Other native species observed included the vines *Clematis glycinoides* (Headache Vine), *Glycine clandestina* and *Parsonsia straminea* (Common Silkpod). Scattered woody weeds included *Lantana camara* (Lantana), *Ligustrum sinense* (Small-leaved Privet) and *Solanum mauritianum* (Wild Tobacco).

Transect 3443 recorded a total stem density of 1, 950 stems/ha and TWV of 47, 366 m^3/ha. The woody vegetation was measured in two strata – a canopy stratum consisting of tall Eucalypts and a second stratum composed of all other stems. The canopy stratum recorded a density of 84 stems/ha and a TWV of 14, 253 m^3/ha. This stratum consisted of *E. punctata* and *C. maculata* up to an estimated 16m in height. Based on the size range of the Eucalypts there have been three seeding events with saplings and seedlings observed. The second stratum recorded a density of 1, 866 stems/ha with a TWV of 33, 113 m^3/ha. This stratum recorded a good diversity of native species with *A. irrorata, Acacia falcata* (Sickle Wattle), *A. longifolia, A ulicifolia, B. oblongifolia, Leucopogon juniperinus* and *Trema tomentosa* (Native Peach). Other native species observed included the vines *Calystegia marginata, C. glycinoides*, *Grona varians* (Slender Tick-foil) and *G. clandestina.* The area surrounding the transect had a density of Privet which was observed to be in flower.

Transect 3450 (**Plate 5**) was not planted with canopy species and stem density was measured as nearest stem resulting in a total stem density of 2, 391 stems/ha and TWV of 19, 226 m^3/ha. The area was characterised by dense exotic grass ground cover, predominantly *Setaria sphacelata* (South African Pigeon Grass) and much fallen timber from the original seeding of *Acacias* which have now died back. The current native vegetation can be considered recruitment from the original seeding and consists of *A. falcata, A. irrorata, A. longifolia, B. oblongifolia, L. juniperinus* and *T. tomentosa. Polyscias sambucifolia* (Elderberry Panax) was observed for the first time this survey. Exotic species were also quite dense with Lantana, Small-leaved Privet and Wild Tobacco observed.

3.3.2 2010 Rehabilitation

Transect 3046 (**Plate 7**) recorded a total stem density of 2, 864 stems/ha and TWV of 29, 350 m^3/ha measured as three strata – canopy Eucalypts, midstorey under 11m and shrubs under 3.0m. The canopy stratum recorded 248 stems/ha and TWV of 23, 288 m^3/ha. The canopy was dominated by *C. maculata* with occasional *E. punctata*. It is estimated that there have been three seeding events with the *C. maculata* bearing fruit at the time of survey. The midstorey recorded a total stem density of 260 stems/ha with TWV of 4, 908 m^3/ha. This stratum consisted of tall *A. irrorata, Acacia implexa* (Hickory Wattle) and *C. maculata, E. punctata* and *E. crebra.* The shrub layer was diverse with *A. irrorata, A. longifolia, B. oblongifolia, Denhamia sylvestris* (Narrow-leaved Orangebark) for the first time, *L. juniperinus, P. sambucifolia* and *P. villosa.* This stratum recorded a total stem density of 2, 356 stems/ha with a TWV of 1334 m^3/ha. Ground cover and other native species included *Gonocarpus teucrioides* (Raspwort) and *Lepidosperma laterale,* Although the ground cover was dominated by exotic species. Woody weeds observed included the usual Lantana, Small-leaved Privet and Wild Tobacco.

3.3.3 2011 Rehabilitation

Transect 3048 (**Plate 9**) recorded a total stem density of 4, 884 stems/ha with a TWV of 55, 940 m^3/ha. The vegetation was measured in three strata consisting of canopy Eucalypts, midstorey under 10m and shrubs under 2.5m. The canopy stratum recorded 652 stems/ha and TWV of 44, 101 m^3/ha. The canopy was dominated by *C. maculata* with occasional *E. punctata.* There was an estimated four seeding events with seedlings, saplings, midstorey and larger canopy stems. The midstorey stratum recorded 1, 575 stems/ha with TWV of 11, 278 m^3/ha. This stratum was dominated by *C. maculata,* but also recorded *E. punctata, E. crebra* and tall *A. implexa.* The shrub stratum recorded 2, 657 stems/ha with a TWV of 4, 884 m^3/ha. Overall diversity was good with numerous native species observed in addition to those already listed including *A. falcata*, *A. longifolia, B. oblongifolia, G. teucrioides, L. juniperinus, Pimelea linifolia* (Slender Rice Flower), *Hibbertia obtusifolia* (Hoary Guinea Flower) and *P. villosa.* Vines included *Billardiera scandens* (Hairy Apple Berry), *C. glycinoides, Geitonoplesium cymosum* (Scrambling Lily), *G. clandestina* and *Kennedia rubicunda* (Dusky Pea Coral). Woody weeds were in low abundance with only Wild Tobacco observed in the vicinity of the transect.

3.3.4 2012 Rehabilitation

This survey the 2012 rehabilitation recorded an average total stem density of 3, 275 stems/ha with a TMV of 41, 825 m^3/ha. The three transects surveyed in this area display considerable variation in regards to vegetation structure.

Transect 3041 (**Plate 11**) recorded a total stem density of 357 stems/ha with a TWV of 32, 864 m^3/ha. The vegetation structure was measured in two strata – canopy Eucalypts and all other stems. This canopy recorded 121 stems/ha and a TWV of 27, 992 m^3/ha. This stratum was dominated by *C. maculata* with occasional *E. punctata*. The second stratum recorded a total stem density of 236 stems/ha and TWV of 4, 876 m^3/ha. This stratum consisted of *A. falcata, A. implexa, A. irrorata* with a few younger Eucalypts. Diversity in the vicinity of the transect was low with few saplings or seedlings observed despite many of the canopy trees bearing fruit. The ground cover consisted of a very dense layer of *S. sphacelata,* which be preventing germination of native species.

Transect 3054 (**Plate 13**) recorded a total stem density of 2, 322 stems/ha and TWV of 39, 889 m^3/ha. The vegetation structure was measured in two strata – canopy Eucalypts and all other stems. The canopy recorded a total stem density of 293 stems/ha with a TWV of 24, 300 m^3/ha. The canopy

was dominated by *C. maculata* with several *E. punctata* and the occasional Ironbark, identified as *E. fibrosa* (Red Ironbark). Based on stem size, it was estimated that three seeding events have occurred with two heights of saplings, but very few seedlings observed. The second stratum recorded 2029 stems/ha with a TWV of 15, 889 m^3/ha. This stratum was dominated by *Acacias, A. falcata*, *A. implexa, A. irrorata, A. longifolia* and *T. tomentosa,* forming a midstorey. The dense *S. sphacelata* may be preventing germination of natives and no subshrubs and few forb species were observed. Lantana and Wild Tobacco were dense in this area and requires control works.

Transect 3466 (**Plate 15**) recorded a total stem density of 7, 148 stems/ha and a TWV of 52, 7234 m^3/ha. The vegetation structure was measured as three strata – Canopy stratum Eucalypts up to an estimated 15m, a midstorey stratum under 11m and a shrub stratum under 3.0m. The canopy stratum recorded a total stem density of 418 stem/ha and TWV of 17, 231 m^3/ha. This stratum was composed a dense canopy dominated *C. maculata*, with occasional *E. punctata* and *E. crebra.* It was estimated there had been four seeding events with saplings and seedlings observed. The midstorey stratum was dominated by young Eucalypts with occasional other species, recorded a density of 2, 133 stems/ha and TWV of 8, 738 m^3/ha. These other species included *A. falcata, A. implexa, A. irrorata, A. longifolia* and *T. tomentosa*. The shrub stratum recorded a total stem density of 3, 496 stems/ha and TWV of 26, 755 m^3/ha. This stratum was moderately diverse with *A. ulicifolia, B. oblongifolia, L. juniperinus* and *Ozothamnus diosmifolius* (Rice Flower). Other species recorded included the vines *C. glycinoides, C. marginata, Pandorea pandorana* (Wonga wonga Vine) and *Stephania japonica* (Snake Vine). The woody weeds Lantana and Wild Tobacco were only observed in low abundance.

3.3.5 2013 Rehabilitation

Transect 3503 (**Plate 17**) recorded a total stem density of 738 stems/ha and TWV of 13, 454 m^3/ha. This was measured in three strata this survey as canopy Eucalypts up to 13m in height, young Eucalypts up to 6m in height and all other stems. The canopy recorded 107 stems/ha with a TWV of 4, 440 m^3/ha. It consisted of a mixture of *C. maculata* and *E. punctata* up to 13m in height. The second stratum of young Eucalypts recorded a total stem density of 237 stems/ha with TWV 642 m^3/ha. This stratum represented two seeding events with heights ranging from 1.4m to 6m and consisted of numerous *C. maculata* and *E. punctata.* The third stratum recorded a total stem density of 394 stems/ha and a TWV of 8373 m^3/ha. This stratum was dominated by *A. falcata* and *A. irrorata* with scattered *Exocarpos cupressiformis* (Ballart Cherry). This area was characterised by relatively sparse natives, dense *S. sphacelata* ground cover, dieback of the *Acacia* layer and a moderate density of woody weeds Lantana and Wild Tobacco.

3.3.6 2016 Rehabilitation

This survey the 2016 rehabilitation recorded an average total stem density of 1, 542 stems/ha and average TWV of 80, 6077 m^3/ha.

Transect 3501 (**Plate 19**) recorded a total stem density of 1, 667 stems/ha and TWV of 84, 408 m^3/ha. This was measured as two strata, nearest Eucalypt and nearest other stem. The Eucalypts recorded a density of 129 stems/ha and a TWV of 537 m^3/ha – indicating they were still very small. *C. maculata* and a few scattered *E. punctata* were the species identified. The second stratum recorded a density of 537 stems/ha and TWV of 83, 870 m^3/ha. This stratum was dominated by *A. irrorata* and *Acacia decurrens* (Black Wattle). Other species recorded included *A. falcata, A. implexa, A. ulicifolia, Leptospermum polygalifolium* (Tantoon) and *P. villosa.* The groundcover was dominated by very dense *S. sphacelata,* with very few weed species observed, and no woody weeds.

Transect 3502 (**Plate 21**) recorded a stem density of 1, 419 stems/ha and a TWV of 76, 948 m^3/ha. No canopy species have been recorded in the vicinity of this transect, but this survey a very small number were observed emerging from the dense *Acacias* but were not measured. Vegetation structure was measured in two strata – tall *Acacias* and all other stems. The first stratum recorded stem density of 533 stems/ha with a YWV of 63, 885 m^3/ha. This stratum was dominated by *A. decurrens* and *A. irrorata* with a few taller *A. falcata.* The second stratum recorded a stem density of 886 stems/ha and a TWV of 13, 063 m^3/ha. This stratum was more diverse, with the three *Acacias* mentioned above and *A. implexa, A. ulicifolia, D. ulicifolia, L. polygalifolium* and *P. villosa.* The vine *K. rubicunda* was also very common. The groundcover was dense *S. sphacelata*. Only Lanata was observed and in low abundance.

3.3.7 2020 Rehabilitation

Transect 3506 (**Plate 23**) recorded a total stem density of 5064 stems/ha with a TWV of 100, 963.00 m^3/ha. The vegetation structure was measured in two strata – nearest Eucalypt, nearest stem. The Eucalypt stratum recorded 1, 332 stems/ha with TWV of 613 m^3/ha. All Eucalypts were very young – maximum estimated height was 3.5m, with the majority between 1.0m and 2.0m tall. All were recorded as generic Eucalypts (*Eucalyptus spp*.) at this stage. The second stratum recorded a stem density of 3, 732 stems/ha with a TWV of 100, 350 m^3/ha. This stratum was dominated by *A. irrorata,* which have achieved a large size in a reasonably short period of time. The largest had an estimated height of 8m, with many in the 4.0 to 6.0m range, which has contributed to the very large canopy volume. Other species included *A. falcata*, *A. longifolia, Acacia longissima* (Long-leaf Wattle), *A. ulicifolia*. Vines included *G. clandestina, G. varians* and *K. rubicunda.* Despite the very dense groundcover of exotic grasses including *S. sphacelata* and *Cenchrus clandestinus* (Kikuyu), some off the seeded native grass species were still present with *Themeda triandra* (Kangaroo Grass), *Entolasia stricta* (Wiry Panic) and *Chloris truncata* (Windmill Grass) all recorded. Wild Tobacco was the only woody weed observed, but evidence of feral pigs (trotter prints) was observed.

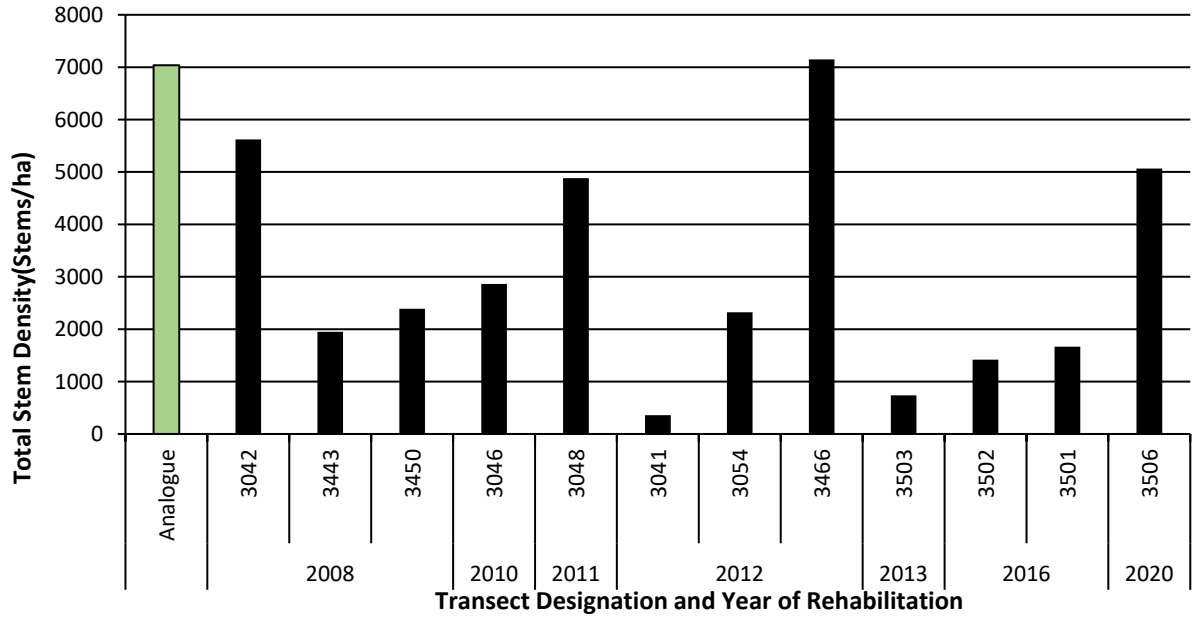

Chart 4: Total stem density by transect and year of rehabilitation for the 2022 DCM Spoil Emplacement

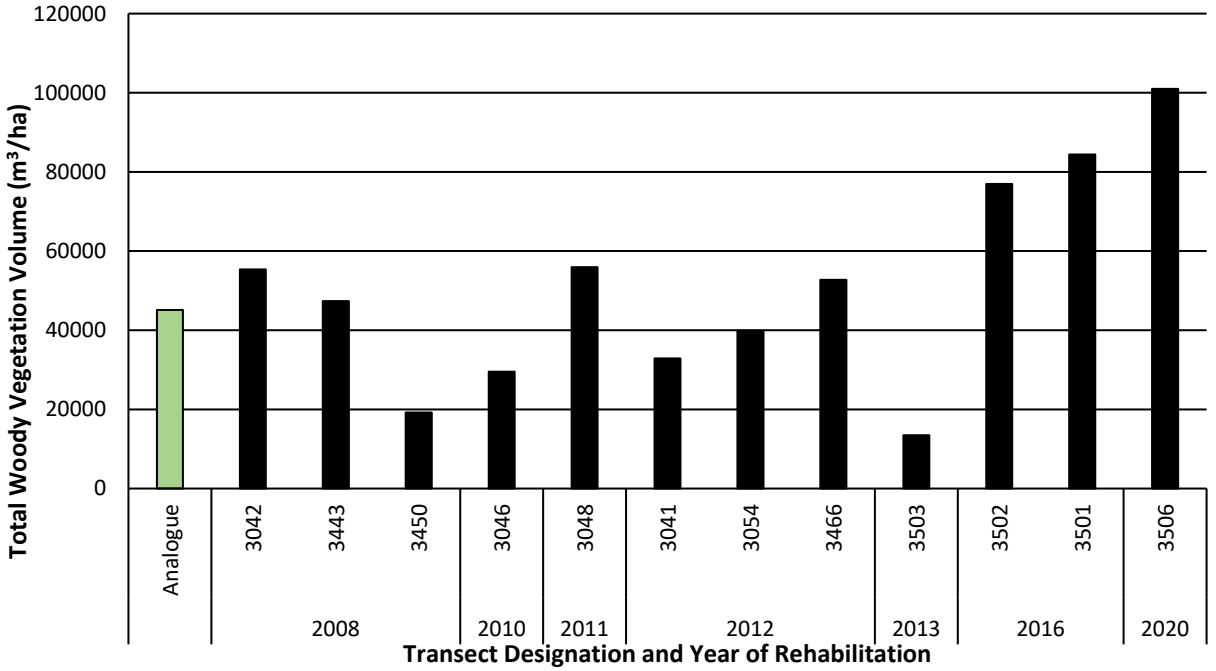

Chart 5: Total woody vegetation volume by transect of year of rehabilitation for the 2022 survey of the DCM spoil emplacement

4. DISCUSSION AND RECOMMENDATIONS

4.1 DISCUSSION

The Duralie Coal Mine – Mining Operations Plan and Rehabilitation Management Plan (1 January 2020 – 31 December 2021) (the MOP), has designated the revegetated waste emplacement as Domain 3, with two subdomains, Domain 3A – Waste Emplacement (Pasture/Scattered Trees) (referred to as pasture) and Domain 3B – Waste Emplacement (Woodland/Open Forest) (referred to as woodland). Based upon the Duralie Annual Review 2020 Mining & Rehabilitation Areas (2020), the 2008 to 2013 woodland rehabilitation has been assessed as being in the Ecosystem and Land Use Sustainability phase – the last phase of rehabilitation – while younger rehabilitation, 2016 to 2018, both pasture and woodland – have been assessed as being in the Ecosystem and Land Use Establishment phase of rehabilitation (**Table 8**).

Table 8: The 2021 Rehabilitation areas, domains, vegetation type and completion criteria for the phases of rehabilitation

Age of Rehabilitation	Designation	Secondary Domain	Rehabilitation Phase	Completion Criteria
2008	3042	3B - Woodland/Open Forest	Ecosystem and Land Use Sustainability	EFA results indicate areas on trajectory towards self-sustaining ecosystem and/or measures of ecosystem function such as vegetation cover, landform stability and species diversity equivalent to unmined control sites of remnant vegetation
	3443			
	3450			
2010	3046			
2011	3048			
2012	3041			
	3054			
	3466			
2013	3503			
2016	3501	3B - Woodland/Open Forest	Ecosystem and Land Use Establishment	Suitable EFA reference site selected. EFA results indicate that vegetation is developing similar to that found in the relevant reference site based on measurement of stability, infiltration and nutrient cycle by a suitably qualified expert.
	3502			
2020	3506			
2018	3504	3A - Pasture/Scattered Trees	Ecosystem and Land Use Establishment	Suitable LFA reference site selected. LFA results indicate that the pasture is developing similar to that found in the relevant reference site based on measurement of stability, infiltration and nutrient cycle by a suitably qualified expert.
2020	3505			

As has been alluded to in the Introduction, the 2019 MOP &RMP has been replaced by a new Rehabilitation Management Plan (2022). Section 4.1 of the RMP details the new requirements and terminology for future operations and reporting, including to Domain designations. The new designations replace the Domain names used in **Table 8** above are shown in **Table 9** below.

Completion criteria and monitoring methodologies and outcomes remain unchanged for this report.

Table 9: Comparison of Domain designations between 2020-21 MOP & RMP and 2022 RMP

2022 RMP Designations		2020-21 MOP & RMP Equivalent	
Final Land Use Domain	Mining Domain	Primary Domain	Secondary Domain
Domain A – Agriculture - Grazing	Domain 3 – Waste Emplacement	Waste Emplacement	3A - Pasture/Scattered Trees
Domain B – Native Ecosystem	Domain 3 – Waste Emplacement	Waste Emplacement	3B - Woodland/Open Forest

4.1.1 Landscape Functional Analysis

Soil surface indicators for this round of monitoring for the various ages of rehabilitation are generally positive and are trending towards Analogue values, with one or two exceptions.

The Stability Index scores are consistent across the ages of Woodland rehabilitation, with the younger rehabilitation areas (Ecosystem Establishment) having improved from the previous survey (**Chart 3**) with scores above or near the Analogue score. The notable exception to this trend is Transect 3041 in the 2012 rehabilitation – Ecosystem Sustainability (**Chart 1**). This transect was last surveyed in 2019 and examination of that data shows that all indices for this transect have regressed, largely as a result of a reduction in litter build up and quality.

The Infiltration and Nutrient Cycling scores follow a similar pattern as the Stability Index scores. As discussed in the 2021 report (Kleinfelder, 2021) the organisation of the soil surface as measured by the Landscape Organisation Index score into nutrient accumulating “patches” and nutrient shedding “interpatches” shows that all areas of the rehabilitation have become uniformly even across the rehabilitation areas. All LOI’s were recorded as 1.00, indicating that the soil surfaces of the transect areas were not shedding resources, but accumulating nutrients and able to limit rain run-off. Within the Woodland revegetation areas there are broadly two types of “patch” or groundcover – either grass dominated, and usually *Setaria sphacelata* in the more open areas where canopy density is lower such as Transect 3041, or where canopy has not been established such as Transect 3450, or litter dominated where canopy is dense e.g. Transect 3442. This will be discussed further below.

There were no areas of significant erosion noted throughout either the southern spoil emplacement (2008 to 2012, and 2016 rehabilitation) and the northern spoil emplacement (2013 to 2020 rehabilitation).

Pasture areas have exceeded all LFA indices when compared to the Stratford Mine Complex Analogue transect T33. The seeding of these areas has been successful with dense growth of grasses evident.

4.1.2 Vegetation Density and Structure

The vegetation structure data for the woodland rehabilitation assessed as Ecosystem Sustainability i.e., 2008 to 2013 rehabilitation monitored this survey shows a range of canopy and woody vegetation density from heavily wooded areas with dense canopy to areas without true canopy and relatively sparse shrub and midstorey cover. The denser wooded areas have been developing the required structure, with vegetation in multiple strata, but with a low diversity of true shrub species when compared to the Analogue areas. However, as has been observed for several surveys, natural recruitment has led to increasing diversity. These species appear to have been able to establish under the canopy due to the soil surface being litter dominated, allowing seed to germinate and establish. Where the areas are more open, and exotic grasses dominate the groundcover (e.g., Transect 3041), there are no naturally recruited species and few saplings and seedlings of the required canopy species such as *C. maculata* and *E punctata*, even though these areas have been observed to be in seed.

The younger rehabilitation areas 2016 and 2018, assessed as being in the Ecosystem Establishment phase, have greater diversity due to the initial seeding mix, but also have dense grassy groundcover. With the exception of the area surrounding Transect 3502, these areas have a good density of Eucalypts, but the individual stems are still quite young and have not yet emerged from under the faster growing *Acacias*. The growth of the *Acacias* in these younger areas was notable between surveys. The areas around Transect 3501 and 3506 in particular recording a large increase in height and canopy volume.

4.1.3 Interaction between LFA and Vegetation Structure

The difference between the grassy and litter dominated groundcover has been remarked upon above. The relationship between the density of the woody vegetation, the resulting groundcover and its affect on the Nutrient Cycling Index is shown in **Chart 6.** While the age of the rehabilitation also has an impact on litter accumulation, it can be seen that there is a correlation between stem density and nutrient cycling with high density areas producing more litter.

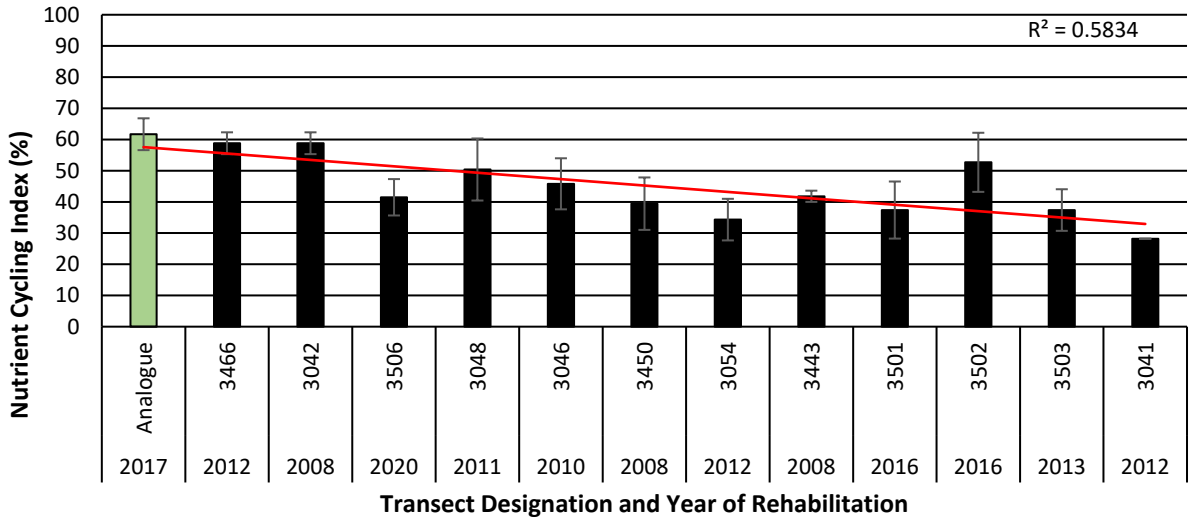

Chart 6: Nutrient Cycling Index arranged by total stem density from highest (left) to lowest (right). Trend line in red, with the trend line correlation (R^2 number) in top right

While this may not appear revelatory, it does provide some empirical evidence that the rehabilitation of these different areas will progress at different rates and may illustrate the need for some form of management for these areas. For instance, with the ongoing natural recruitment observed in the denser areas, a reduction in grassy groundcover may be beneficial. Ongoing monitoring will demonstrate if this correlation continues.

4.2 MANAGEMENT RECOMMENDATIONS

Management recommendations can be divided into practical physical actions and improvements to monitoring methods to extract more relevant data.

The pasture rehabilitation areas require weed control to maintain these areas as pasture. Recognising that the above average rainfall has hindered access and prevented slashing and weed control from occurring and has allowed some minor establishment of *Acacias* and other undesirable species.

Woody weeds such as Lantana, Privet and Wild Tobacco are and will be an ongoing issue for the woodland rehabilitation areas and further control works are required – indeed have been scheduled and some works completed at the time of writing – and it is recommended that such works are regularly conducted.

A controlled burn has been advocated in the past and the suggestion is again proposed. The rationale for the implementation of a controlled burn include:

- Hazard reduction – there is a large build-up of litter on the spoil emplacement and the increased rainfall experienced over the last few seasons will only increase the grass growth.
- Contribute to woody weed control by reducing the Lantana and Wild Tobacco, while allowing easier access to the Privet thickets that are appearing on the emplacement.
- Reducing the grassy ground cover will stimulate the native seed bank improving native vegetation.
- If a burn can be conducted, additional seeding could be undertaken to increase diversity of species that have not been recorded within the rehabilitation.

It is recognised that the combination of location adjacent to the Northern Rail line, ongoing operations at the DCM and safety concerns ensures that this type of operation would not be a trivial undertaking. Preliminary investigations suggests that upwards of 30 ha per day could be burned, but certainly smaller burn areas could be trialled.

The current monitoring methodology focusses on the biophysical processes and vegetation structure as measured by LFA and Vegetation Structure. The completion criteria as outlined in **Table 8** place a strong emphasis on biodiversity and structure. Currently biodiversity is not formally recorded as part of the monitoring but is conducted as observations around the transects. A more formal quadrat-based method would provide better data tracking the progress – or otherwise – of the diversity of the revegetation. The formal identification of flora species in the quads would then be used to infer the vegetation structure, for instance, true shrub and midstorey species. Quadrats could be established at the same locations as the current transects, allowing for the current monitoring to be reinstated if deemed necessary. This is suggested for areas deemed to be in the Ecosystem Sustainability phase only.

The exception to the above being Transect 3041 – this transect requires monitoring again next year to determine if this year's result was anomalous.

Regardless of changes to the methodology, the rotation of transects monitored in the 2008 and 2012 rehabilitation areas should become more targeted. Currently transects are rotated on a random basis resulting in open and wooded areas being combined into the same data sets, making comparisons of historical data difficult. It is suggested that transects be grouped according to stem density allowing for like-to-like comparison to be made.

4.2.1 Conclusions

The majority of the Duralie spoil emplacement revegetation is on track to establish woodland and pasture areas. Denser wooded areas of the 2008, 2010, 2011 and 2012 rehabilitation areas are progressing well with LFA indices stable or tracking to achieve Analogue values, increasing biodiversity and improving structure. The younger woodland rehabilitation areas are developing as expected. More open areas of the revegetation have plateaued and while further maturation of the existing canopy will occur with time, some form of active management such as a controlled burn can be implemented to improve diversity and structure.

Proposed changes to the monitoring method will better inform the progress of the revegetation to the stated goals of biodiversity and structure similar to Analogue vegetation.

5. REFERENCES

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Tongway, D. and Hindley, N. (2004b) *Landscape Function Analysis: Procedures for Monitoring and Assessing Landscapes with special reference to Mine sites and Rangelands.* CSIRO Publishing, Canberra.

Tongway, D.J. and Ludwig, J.A. (2011). *Restoring Disturbed Landscapes: Putting Principles into Practice*. Island Press, Washington

APPENDIX A: MONITORING PHOTOGRAPHS

Plate 3: Transect 3042 2008 Woodland Rehabilitation looking down LFA transect

Plate 4: Transect 3042 at the 3m point showing typical sparse grass and dense leaf litter

Plate 5: Transect 3450 2008 Rehabilitation. Note the open nature of the rehab, no Eucalypts were seeded into this area.

Plate 6: Transect 3450 2008 Rehabilitation at the 3m point of the LFA transect showing typical dense exotic grassy understorey

Plate 7: Transect 3046 2010 Rehabilitation looking down LFA transect. Note the density of Eucalyptus stems and the exotic groundcover

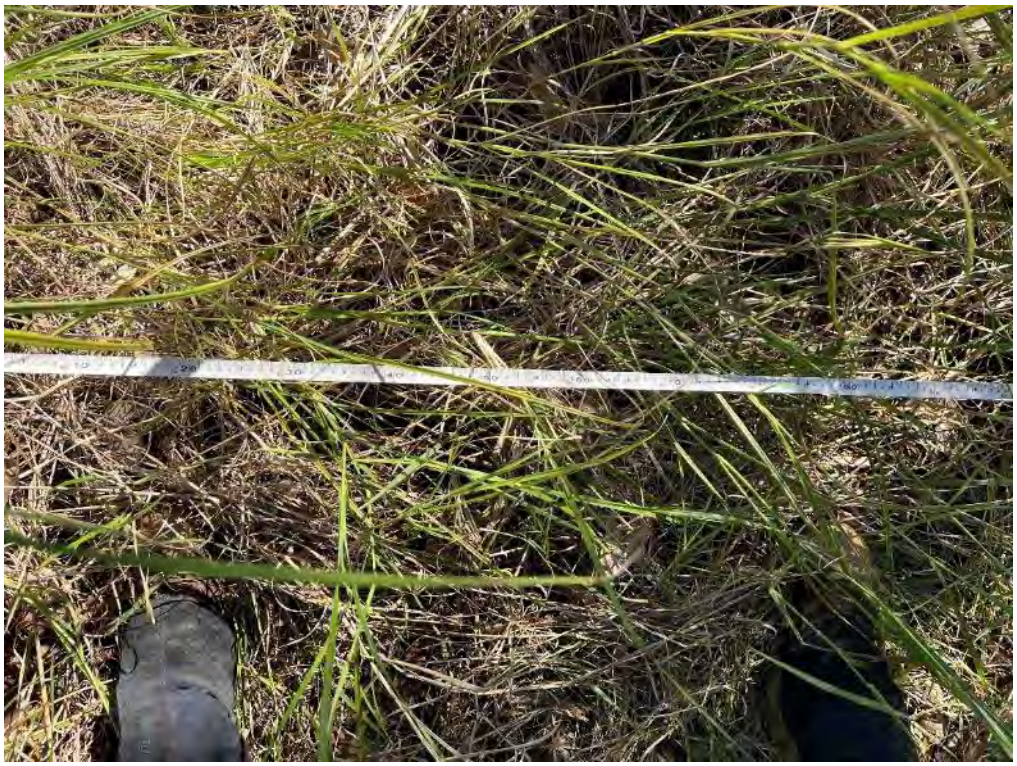

Plate 8: Transect 3046 2010 Rehabilitation - exotic ground cover at the 5m point on the LFA transect

Plate 9: Transect 3048 2011 Rehabilitation looking down the LFA transect showing dense canopy

Plate 10: Transect 3048 2011 Rehabilitation. Dense exotic groundcover at the 4m on the LFA transect

Plate 11: Transect 3041 2012 Rehabilitation looking down the LFA transect showing sparser woody vegetation, but very dense exotic ground cover – *Setaria sphacelata.*

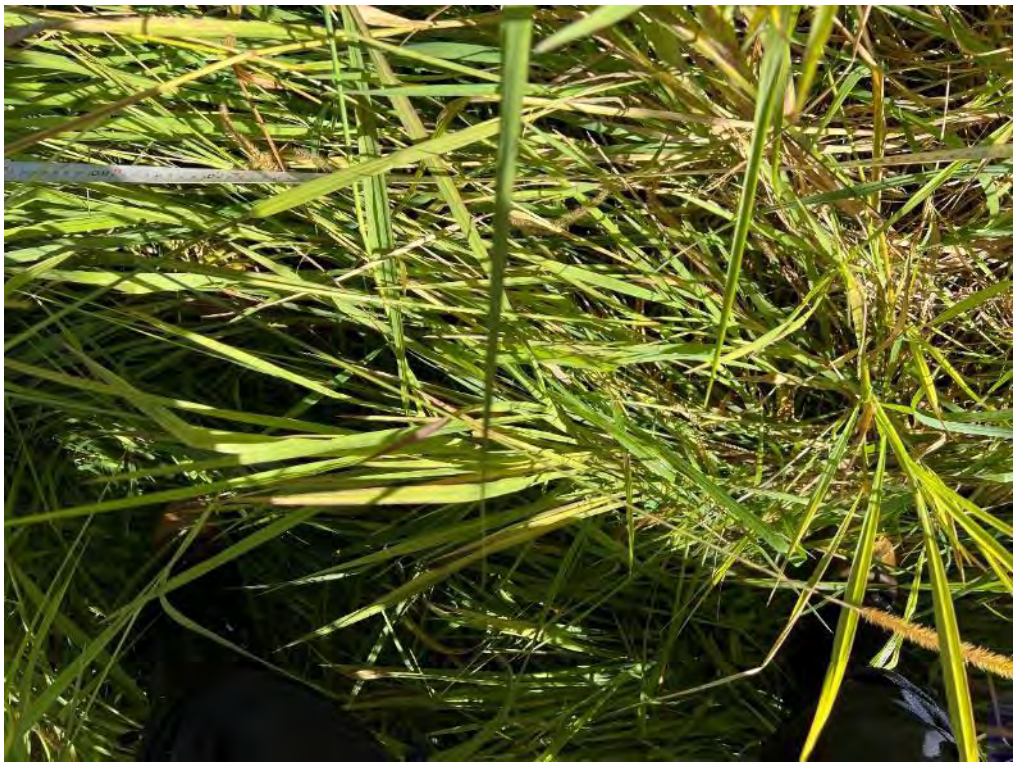

Plate 12: Transect 3041 2012 Rehabilitation. Dense ground cover at the 5m point in the LFA transect is approximately 1.5 m in height

Plate 13: Transect 3054 2012 Rehabilitation looking down the LFA transect showing dense midstory

Plate 14: Transect 3054 2012 Rehabilitation showing exotic ground cover at the 7m point on the LFA transect

Plate 15: Transect 3466 looking down LFA transect - note the very dense canopy of multiple generations of Eucalypts.

Plate 16: Transect 3466 2012 Rehabilitation at the 7m point on the LFA transect showing dense leaf litter with sparse grassy understorey

Plate 17: Transect 3503 2013 Rehabilitation looking down the LFA transect. Note the dense exotic groundcover – *Setaria sphacelata*

Plate 18: Transect 3503 2013 Rehabilitation at the 2m point on the LFA transect showing typical exotic groundcover

Plate 19: Transect 3501 2016 Rehabilitation looking down the LFA transect. Note the dense Acacias and the height of the exotic groundcover

Plate 20: Transect 3501 2016 Rehabilitation at the 5m point om the LFA transect showing typical dense groundcover

Plate 21: Transect 3502 2016 Rehabilitation looking down LFA transect showing dense Acacias and shrubs and exotic groundcover

Plate 22: Transect 3502 2016 Rehabilitation at the 5m point on the LFA transect showing dense exotic groundcover

Plate 23: Transect 3506 2020 Rehabilitation looking down the LFA transect showing dense Acacias and shrubs and exotic and native grass groundcover

Plate 24: Transect 3506 2020 Rehabilitation at the 5m point on the LFA transect showing typical dense exotic and native grassy groundcover

Plate 25: Transect 3504 2018 Pasture Rehabilitation looking down LFA transect

Plate 26: Transect 3504 2018 Pasture Rehabilitation at the 4m point on the LFA transect

Plate 27: Transect 3505 2020 Pasture Rehabilitation looing down the LFA transect

Plate 28: Transect 3505 2020 Pasture Rehabilitation at the 4m point on the LFA transect

APPENDIX B: TRANSECT EFA DATA

Table 10: Summary of Vegetation Density and Structure data for the 2022 Woodland Rehabilitation by transect and age of rehabilitation

Year Rehab	Transect	Canopy			Midstorey			Shrubs			Totals		Comments	Totals	
		Canopy Density (stems/ha)	Ave. Dist between stems (m)	Canopy Vol/ha (m^3/ha)	Midstory Density (stems/ha)	Ave. Dist between stems (m)	Canopy Vol/ha (m^3/ha)	Shrub Density (stems/ha)	Ave. Dist between stems (m)	Canopy Vol/ha (m^3/ha)	Stem Density (stems/ha)	Woody Veg Volume (m^3/ha)		Ave. Stem Density (stems/ha)	Ave. Woody Veg Volume (m^3/ha)
	Analogue	188.2	7.60		1320.7	3.80		5528.3	2.20		7037.2	45121.2	all layers	7037.2	45121.2
2008	3042	396	5.03	38422	2938	1.85	15882	2289	2.09	1053.00	5623	55356	Canopy Eucs, Midstorey (<10m), shrubs (<2.5m)	3321.50	40649.34
	3443	84	10.89	14253	1866	2.32	33113				1950	47366	Canopy Eucs, all other stems		
	3450				2391	2.05	19226				2391	19226	Nearest Stem, no canopy or eucs (<7.0m)		
2010	3046	248	6.35	23288	260	6.21	4908	2356	2.06	1334	2864	29530	Canopy Eucs, Midstorey (<11m), shrubs (<3.0m)		
2011	3048	652	3.92	44101	1575	2.52	11278	2657	1.94	561	4884	55940	Canopy Eucs, Midstorey (<10m), shrubs (<2.5m)		
2012	3041	121	9.08	27992	236	6.52	4873				357	32864	Canopy Eucs, all other stems	3275.61	41825.91
	3054	293	5.85	24300	2029	2.22	15589				2322	39889	Canopy Eucs, all other stems		
	3466	418	4.89	17231	2133	2.17	8738	4596	1.48	26755	7148	52724	Canopy Eucs, Midstorey (<11m), shrubs (<3.0m)		
2013	3503	107	9.67	4440	237	6.49	642	394	5.04	8373	738	13454	Canopy Eucs, Young Eucs, all other stems		
2016	3502				886	3.36	13063	533	4.33	63885	1419	76948	Tall Acacias (>7m), Smaller Acacias and shrubs (<6m) - no eucs	1542.92	80677.70
	3501	129	8.81	537	1538	2.55	83870				1667	84408	Canopy Eucs (>7m), Young Eucs (<6m), Acacias - all heights		
2020	3506	1332	2.74	613	3732	1.64	1000350				5064	100963	All eucs, all other stems (Acacias)		

APPENDIX C: STAFF CONTRIBUTIONS

Name	Qualification	Title/Experience	Contribution
Kane Blundell	B Education	GIS Specialist	GIS & Mapping
Ash Owen	BSc-	Ecologist	Field Work
Nigel Fisher	BSc (Hons) PhD	Senior Ecologist	Project Mgt, Field Work, Report Writing and Review