YANCOAL
兖煤澳大利亚有限公司

Duralie Coal Mine
Annual Review

2021

DURALIECOAL
Part of the Yancoal Australia Group

DURALIE COAL MINE

ANNUAL REVIEW 2021

Reporting Period: 1st July 2020 to 30th June 2021

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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	1st January 2020
MOP/ RMP end date	31st December 2021
Annual Review start date	1st July 2020
Annual Review end date	30th June 2021

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 2020 to 30th June 2021 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	22 September 2021

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 2020 to 30 June 2021. 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 1.2.**

Table 1.1- Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
Project Approval No. 08_0203	No
ML1427, ML1646	No

Table 1.2- Summary of Non-Compliances

Condition #	**Condition Description/Non-Compliance**	**Compliance Status/Risk**	**Comment**	**Section addressed**
Project Approval 08_0203				
Schedule 3 Condition 25, Water Management Plan and EPL 11701 Condition L1.1	21/03/2021 Uncontrolled discharge of mine related water (rehabilitated area runoff) from sediment dam VC1 (EPL 11701 Monitoring Point 27) reporting to Coal Shaft Creek at DCM as a result of a significant rainfall event exceeding design capacity	Low	The PIRMP was triggered and implemented including regulatory notifications and reports. Sediment Dam VC1 operated in accordance with design and management procedures. Rainfall exceeded design capacity. The volume discharged from VC1 would be 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 concludes no material harm to the environment resulted from the uncontrolled discharge.	Section 7.3.1
Schedule 3 Condition 7 - Noise Management Plan Section 7.5 Sound Power Level Monitoring	30/06/2021 Annual mobile plant sound power monitoring not undertaken at Duralie.	Administrative	No adverse effects would be anticipated resulting from the non-compliance and no noise complaints have been received. Sound power monitoring is scheduled to be conducted in September 2021. The NMP has been revised to reflect monitoring requirements during periods of reduced operations. The NMP is expected to be submitted in September 2021.	Section 6.8.6

Condition #	Condition Description/Non-Compliance	Compliance Status/Risk	Comment	Section addressed
Schedule 3 Condition 29(b) - Surface Water Management Plan Section 8.7 Ecotoxicity Testing Program	30/06/2021 Ecotoxicity monitoring not completed in reporting period at Duralie.	Administrative	A review of the WMP has been prepared to update the ecotoxicity monitoring requirements as per the recommendations in CMLR, 2019. The revised WMP was submitted to DPIE on 08 September 2021. The application of mine water via irrigation ceased in 2018. A review of ecotoxicity monitoring results between 2013 and 2019 was undertaken in April 2019 (CMLR, 2019). There was no evidence of any significant toxicity and no connection with any effects from mining. The review recommended that the Ecotoxicity Testing Program is no longer required in the absence of irrigation.	Section 7.3.6
Schedule 3 Condition 29(b) - Surface Water Management Plan Section 8.6 Riparian Vegetation Monitoring	30/06/2021 Riparian vegetation monitoring not completed in 2020/21reporting period at Duralie.	Administrative	The WMP has been revised and is pending DPIE approval. The application of mine water via irrigation ceased in 2018 and the potential impact pathway on the health of Mammy Johnsons River including riparian vegetation no longer exists. Biological monitoring found 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. The riparian vegetation monitoring program is no longer required in the absence of irrigation.	Section 7.35
Mining Leases ML 1427 & ML 1646				
ML 1646 Condition 3 and ML 1427 Condition 2, relating to the Duralie Coal Mine Mining Operations Plan (MOP). Specifically, the commitments set out in Table 13 in Section 8 of the MOP.	30/06/2021 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.	Administrative	*Official Caution Notice issued by Resources Regulator on 20 August 2021. *Section 240 issued by Resources Regulator on 31 August 2021. The Mining Act Section 240 Notice gives directives for mine closure planning and relates to the recent Landform Establishment TAP and NCG0004016 Investigation Outcome.	Section 8.6
EPL 11701				
Condition L1.1 (*Also reported under PA08_0203*)	21/03/2021 Uncontrolled discharge of mine related water (rehabilitated area runoff) from sediment dam VC1	Low	The PIRMP was triggered and implemented including regulatory notifications and reports. Sediment Dam VC1 operated in accordance with design and management procedures.	Section 7.3.1

Condition #	Condition Description/Non-Compliance	Compliance Status/Risk	Comment	Section addressed
	(EPL 11701 Monitoring Point 27) reporting to Coal Shaft Creek at DCM as a result of a significant rainfall event exceeding design capacity		Rainfall exceeded design capacity. The volume discharged from VC1 would be 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 concludes no material harm to the environment resulted from the uncontrolled discharge.	

Table 1.3 – 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

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.

Development Consent for the mine was granted by the NSW Minister for Urban Affairs and Planning on 21 August 1997 and Mining Lease Number 1427 was issued by the NSW Minister for Mineral Resources on 6 April 1998.

In October 1998, a Statement of Environmental Effects (SEE) was produced to consider proposed alterations to the Duralie Coal Mine. These proposed alterations were approved by the NSW Minister for Urban Affairs and Planning on 5 February 1999.

Construction of the DCM commenced in June 2002 with mining production commencing in March 2003 and the first coal railed to the Stratford Mining Complex (SMC) for processing in the same month.

DCPL received Project Approval for the Duralie Extension Project (PA 08_0203) in November 2010 for mining activities to extend until 31 December 2021 and Mining Lease 1646 was issued on 4 January 2011. The Project Approval has since been modified on two occasions on 1 November 2012 and 5 December 2014.

DCM consists of an open-cut, truck and excavator mine producing run of mine (ROM) coal, which is railed to the Stratford Mining Complex (SMC) and processed at the SMC Coal Handling and Processing Plant (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 2020 to 30 June 2021. 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
Operations Manager, Stratford & Duralie Operations	Mr John Cullen	02 6538 4210
Environment & Community Superintendent	Mr Michael Plain	02 6538 4203

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	22/12/2020	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 WAL 41518 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 24 October 2017.
- Air Quality and Greenhouse Gas Management Plan (revised). Approved 23 June 2015.
- 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 24 October 2017.
- Giant Barred Frog Study. Approved 6 March 2012.
- Giant Barred Frog Management Plan (revised). Approved 5 September 2017.
- Heritage Management Plan (revised). Approved 23 June 2015.
- Noise Management Plan (revised). Approved 9 May 2018.
- Waste Management Plan. Approved 23 June 2015.
- Water Management Plan (revised). Approved 5 September 2017.
- Mining Operations Plan & Rehabilitation Management Plan (MOP) (revised). Resources Regulator approved 27 February 2020.
- Duralie Extension Project Study of Dust Emissions from Rail Transport under condition 21A of the Project Approval, approved 2012.
- Consultation Plan – Additional Rail Noise Mitigation Measures, approved December 2012.
- Pollution Incident Response Management Plan (revised), April 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
Commonwealth Approval (EPBC 2010/5396)	Extension of the period of effect of EPBC approval 2010/5396 under section 145D(4) of the EPBC Act granted until 31 December 2025.	8 October 2021
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.

Licence/Approval	Amendment type	Date of amendment
Pollution Incident Response Management Plan	Revision following Annual PIRMP Audit 2021. Revision following incident triggering PIRMP in March 2021.	April 2021

Environmental Management Plans

Condition 5, Schedule 2 of PA 08_0203 authorises mining operations to be carried at the DCM until 31 December 2021. Accordingly, DCPL is planning for the commencement of the mine closure phase (i.e. after the cessation of mining operations on 31 December 2021). DCPL is currently preparing revisions of the 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.

DCPL will revise the DCM's environmental management plans, strategies and programs in consultation with relevant regulatory authorities to reflect the current status of operations, and to describe the anticipated changes to activities undertaken at the DCM consistent with the future DCM Mine Closure Plan.

EMP revision are expected to be submitted throughout the second half of 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	0	512,469	350,000
ROM Coal (tonnes) (DCM only)	3 million tonnes per annum	0	44,953	210,000
PAF Rehandle (LCM) [1]	N/A	264,463	601,572	0
Codisposal Reject (tonnes) (Includes Stratford Consent)	Approx. 12.3 million tonnes over life of project.	535,056	418,986	873,000
Saleable product (tonnes) (Includes Stratford Consent)	N/A (Process limit of 5.6 million tonnes per annum)	763,749	626,039	1,057,000

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

Mining at the DCM was postponed in October 2018. Since this time periodic rehabilitation and Potentially Acid Forming (PAF) material rehandling works have been undertaken. Mining at the DCM recommenced in February 2021 with ROM coal being extracted from the Weismantel Pit. 44,953 tonnes of ROM coal was mined at the DCM during the reporting period.

ROM coal from the DCM is transported to the SMC via shuttle train and product coal utilising DCM ROM coal is produced at the SMC. No Duralie ROM coal was transported to the SMC nor processed at the CHPP to produce a saleable product coal during the reporting period. Saleable coal production, incorporating both SMC and DCM (nil contribution), for the period July 2020 to June 2021 was 626,039 tonnes comprising 196,946 tonnes of coking coal and 429,093 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 2020	0
August 2020	0
September 2020	0
October 2020	0
November 2020	0
December 2020	0
January 2021	0
February 2021	0
March 2021	0
April 2021	10,833

MONTH	ROM PRODUCTION (tonnes)
May 2021	6,525
June 2021	27,595
Total	**44,953**

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

Table 4.3: Product Coal Produced by Month from SMC

	Coking Coal	Thermal Coal	Total Product Coal
July 2020	18,855	23,890	42,745
August 2020	14,957	29,971	44,928
September 2020	18,140	36,275	54,415
October 2020	24,711	46,676	71,387
November 2020	21,067	43,456	64,523
December 2020	34,725	51,544	86,269
January 2021	11,091	21,131	32,222
February 2021	5,605	7,015	12,620
March 2021	13,900	22,338	36,238
April 2021	13,859	17,877	31,736
May 2021	11,600	33,865	45,465
June 2021	8,436	95,055	103,491
Total Annual	**196,946**	**429,093**	**626,039**

4.1 Exploration

No exploration activities were undertaken during the 2020-2021 reporting period. No exploration activities are proposed for Authorisation 315 (A315) during the 2021-2022 reporting period. Work within the exploration lease areas will focus predominately on lease management, data management, review and interpretation.

During the reporting period Assessment Lease Application (ALA74) was lodged covering areas incorporating A315. A revised renewal application for A315 will be lodged with DRG 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 is proposed to be finalised prior to 31 December 2021. Accordingly, DCPL is planning for the commencement of the mine closure phase (i.e. after the cessation of mining operations on 31 December 2021).

DCPL is currently preparing revisions of the 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.

Approximately 250kt of ROM coal is remaining in the Weismantel pit and extraction of this remaining coal will be completed in 2021. The MOP includes the production schedule for the next two years.

A new Rehabilitation Management Plan in accordance with the requirements of the Resources Regulator's Operational Rehabilitation Reform will be prepared for the next term following 31 December 2021. This Rehabilitation Management Plan will include the ongoing compliance requirements in accordance with PA 08_0203, ML 1427 and ML 1646 including rehabilitation obligations. This Rehabilitation Management Plan will also include a Closure Plan for the DCM.

4.3 Mining

The DCM is 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 at the DCM was postponed in October 2018. Since this time periodic rehabilitation and PAF rehandling works have been undertaken. Mining at the DCM recommenced in February 2021 with ROM coal being extracted from the Weismantel Pit.

Mining in the Clareval pit was completed during September 2017. Clearing in advance of mining up to the approved disturbance limit in both Weismantel and Clareval was completed in 2018. No further clearing is proposed for the DEP.

44,953 tonnes of ROM coal was mined at the DCM during the reporting period. Approximately 250kt of ROM coal is remaining in the Weismantel pit and is intended to be extracted prior to the end of 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 PAF rehandle activities was undertaken during day shift Monday to Friday ceasing in September 2020. Mining activities recommenced in February 2021 on a 7 days per week, day shift only roster.

Surface facilities at the mine and current mine development and rehabilitation as at 30 June 2021 are indicated within **Figure 4**, provided in **Appendix 1**.

4.3.1 Mining Equipment and Method

The mining and rehabilitation equipment currently in use at the DCM up until 30 June 2021 is listed in **Table 4.4** provided below.

Table 4.4: Current 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 undertaking mining operations, PAF rehandle works and the rehabilitation fleet.

The rehabilitation fleet are generally mobilised for individual campaigns of a few months at a time. 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 Environmental Assessment. The current operational hours (6:30am to 5:00pm) are also significantly less than the proposed operational hours.

The mining sequence is summarised below and is conducted in accordance with the approved MOP and supporting approvals including relevant EMPs (refer Section 1.1) as required. The mining sequence generally occurs in the following manner:

- A vegetation clearance and ground disturbance plan is prepared. This included fauna/flora assessments and cultural heritage surveys.
- A sedimentation control plan is prepared for the area to be disturbed.
- Delineation of the proposed disturbance area is undertaken.
- Water infrastructure and sedimentation controls are implemented.
- Tree clearing is limited to the minimum required for ongoing operations and undertaken ahead of the advancing workings.
- Topsoil is removed in accordance with a topsoil stripping plan.
- Overburden removal is undertaken by a hydraulic excavator. Generally, the first one to five metres of subsoil/overburden is ripped and/or free-dug. Deeper overburden requires blasting prior to excavation.
- Overburden waste material is deposited either in out-of-pit waste emplacements or backfilled into mining voids.
- Following waste emplacement, shaping to the approved final landform is undertaken in preparation for rehabilitation works.

4.4 Coal Handling and Benefication

4.4.1 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 potentially acid forming (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 Stratford Mine 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.

4.4.2 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

4.4.3 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.

4.4.4 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. 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. No ROM coal was railed during the reporting period. DCPL complied with the operating hours and this condition was not utilised during the reporting period.

The last coal transported from the DCM to the SMC occurred in October 2018. Shuttle train operations are scheduled to recommence in August 2021 until the completion of mining.

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.

4.5 Waste Management and Recycling

A fully accredited waste contractor was engaged during the reporting period to manage all waste streams from the DCM. This contract includes general waste and recycling, scrap metal, hydrocarbons including waste grease and oil and hazardous waste.

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. The waste management contractor undertakes routine inspections of waste disposal facilities to identify any management actions required.

4.5.1 Sewerage Treatment and Disposal

Sewage treatment at the mine site involves multiple septic systems at the offices and crib rooms that manage all generated sewage. Sewage is processed using Garden Master 7100 Elite Aerated Waste Water Treatment Systems. The systems work on the combined principles of primary settlement and aerobic treatment. Treated effluent is discharged via a spray system into a grassed area located to the southwest of the Main Office.

The sewage treatment facility is registered with MidCoast Council and serviced on a quarterly basis by an approved contractor.

4.5.2 Fuel, Oil and Grease Management and Disposal

Fuel (diesel) storage at the mine site consists of a single 70,000 litre capacity above ground double-skinned storage tank (Transtanks). An "Acknowledgement of Notification of Hazardous Chemicals on Premises" (Acknowledgement Number NDG 036328) was held for this facility during the reporting period. Potential hydrocarbon contaminated runoff from fuel fill points is captured on concrete pads and directed through an oil water separator. Dirty water runoff from the fuel pad is captured and directed to the main water dam.

Bulk oil is stored onsite within a bunded area and double-skinned tanks near the workshop. Used engine oils (lubricating oils), hydraulic oils and grease are recovered during plant and vehicle servicing in the workshop and in the field. Waste oil is stored in designated Transtanks and waste grease is stored in drums on bunded pallets.

Within the workshop area, separate bunded areas hold a 28,000 litre waste oil tank and bulk storage of oils, greases and lubricants (tanks and drums). A washpad is utilised to clean vehicles and plant either prior to leaving site or for general servicing/repair. Off the washpad is a concrete sump which serves to trap silt and from which oil is removed using an oil water separator. Waste oil collected is removed from site by a commercial contractor for subsequent recycling off-site.

4.5.3 Rubbish Disposal

All domestic rubbish (e.g. food scraps, paper etc.) are deposited in industrial rubbish bins which are periodically emptied by a waste contractor for subsequent disposal.

Scrap metal produced by the workshop is collected and transferred off site by a scrap metal merchant. The merchant collects the scrap metal following inspections by the waste contractor.

Paper, cardboard, aluminium drink cans and other recyclables are collected for recycling as part of site waste segregation. Waste is transported to licenced facilities and waste tracking sheets recorded.

4.5.4 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.

A review of the effectiveness of waste minimisation and management measures is provided below, including a comparison against results of previous years and assessment of any trends over time. 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 89% of the total waste generated. This is consistent with previous reporting periods.

4.6 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. During the reporting period blasting activities recommenced in February 2021 at the DCM. Only infrequently blasting is currently required at the DCM and blasting products are transported to site for each individual blast. Hence, no blasting products are currently stored onsite.

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

4.6.1 Status of Hazardous Chemical Notification

An "Acknowledgement of Notification of Hazardous Chemicals on Premises" (Acknowledgement Number NDG 036328) issued by SafeWork NSW is held by Duralie Coal Pty Ltd. This Acknowledgement addresses:

- Above-ground tanks (diesel)
- External magazine (detonators and boosters)
- Above-ground tank (oxidising liquid)
- Roofless bulk storage (ammonium nitrate)

4.7 Other Infrastructure Management

4.7.1 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. The Dams Safety Act 2015 requirements came into force during the reporting period following a transition period between 2019-2021. The Dam Safety Act 2015 imposes new requirements for declared dam owners.

Management plans for the declared dams are combined into single documents. The DCM Prescribed Dams Operation and Maintenance Manual was updated and approved by the DSC during 2018. The Prescribed Dams Safety Emergency Plan (DSEP) was updated in consultation with the SES and approved by the DSC during 2017.

Routine visual inspections of the declared dams are undertaken three (3) times per week. Monthly monitoring of piezometers terminating beneath the dam's clay core and within the clay core is also undertaken and water levels interpreted. Monuments located along the crests of the dams were surveyed for any indication of movement during the reporting period. No significant movement has been identified in any of the dam walls during the reporting period. Routine maintenance of vegetation on the dam walls has been undertaken.

The 5-yearly declared dam surveillance reports were completed during November 2017. The surveillance reports didn't identify any significant issues with the management and maintenance of the structures. The surveillance reports have been endorsed by the Dam Safety Committee in their letter dated 14 December 2017.

During the reporting period, no water was transferred from the open cuts to the declared dams. Mining in the Clareval Pit has been finalised and the Clareval Pit is now available for long-term water storage. Accordingly, DCPL has engaged ATC Williams and prepared plans for the decommissioning of the declared dams. The conceptual plans were submitted to NSW Dam Safety in 2019 who have requested an independent peer review of the proposed strategy. During the reporting period Norm Himsley was endorsed by Dam Safety NSW to peer review the decommissioning strategy. Following the independent review a detailed Duralie Dams Decommissioning Strategy was prepared by ATW Williams and the plans were resubmitted to NSW Dam Safety for approval.

AD1 was dewatered during February 2018 and decommissioned during 2020 with the structure completely removed. AD2 is planned to be dewatered during the next reporting period and decommissioning works will commence following approval of the proposed strategy by NSW Dams Safety. Further detail regarding the decommissioning of the declared dams is included in the mine closure planning program in Section 8.5.

5.0 Actions Required from Previous Annual Review

DPIE provided notification on 9 December 2020 that the DCM Annual Review 2019-2020 was generally in accordance with the Project Approval requirements and the Department's Annual Review Guidelines. No further amendments or actions were requested.

The Resources Regulator provided confirmation of receipt of the DCM Annual Review 2019-2020 on 30 September 2020. No further correspondence has been received from the Resources Regulator.

DPIE conducted a site inspection of the Duralie Coal Mine on 20 April 2021. A general inspection of the mining operations was undertaken. No further follow up or actions were requested.

The NSW Resources Regulator completed a Targeted Assessment Program (TAP) inspection regarding rehabilitation soils and materials management at the DCM on 10 September 2020. The assessment focused on progressive rehabilitation obligations as outlined in the Mining Operations Plan (MOP) and how materials and soils on site were being managed to achieve sustainable rehabilitation outcomes.

The site inspections identified no significant rehabilitation risks or compliance issues at the DCM.

The Resources Regulator provided a summary of observations and recommendations on 24 September 2020:

- Update the risk assessments for rehabilitation and mine closure.
- Develop an assurance process to validate monitoring and inspection results to ensure rehabilitation control measures are effective throughout the mining/rehabilitation lifecycle.
- Reporting of any delays to rehabilitation progress in the Annual Reviews.
- Conduct agricultural rehabilitation trials to demonstrate completion criteria.
- Assess and report on the requirement for clay resources at Duralie as part of the annual material balance survey.
- Review of the Rehabilitation Trigger Action Response Plan included in the MOP.

The NSW Resources Regulator completed a second TAP inspection regarding landform establishment at the DCM on 16 June 2021. The assessment focused on how the final approved landform is being established to achieve sustainable rehabilitation outcomes

The Resources Regulator provided a summary of observations and recommendations on 8 July 2021:

- Consider implementing contemporary landform design methodologies including geomorphic design principles and landform erosion modelling including water management structures.
- Develop a QA/QC process for the design and implementation of rehabilitated landforms. Including a signoff process.
- Validation and verification of long-term stability of all constructed landforms including erosion modelling.
- Confirmation of materials characterisation. Verification of waste material placement for long-term ARD control.
- Implement landform erosion monitoring linked to completion criteria.

The recommendations will be addressed in the mine closure risk assessment during the next reporting period and included in the preparation of the new Rehabilitation Management Plan and DCM Closure Plan.

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.

EMPs required in accordance with the conditions of PA 08_0203 have been prepared and continued to be implemented during the reporting period. DCPL is currently preparing revisions of the 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.

EMP revision are expected to be submitted throughout the second half of 2021.

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 summary is included in Section 10 of this report and DCPL's responses to the recommendations contained in the IEA 2020 Report are included in **Appendix 8**.

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

During the reporting period DCPL lodged an application for a variation to EPL 11701. The variation was proposed to amend surface water monitoring conditions in accordance with the approved Duralie Coal Mine Surface Water Management Plan. Final variation notice no. 1608278 for EPL 11701, issued pursuant to section 58 of the Protection of the Environment Operations Act 1997 (POEO Act), was issued on 28 July 2021.

DCPL continues to operate in accordance with the conditions of EPL 11701. During the reporting period there was one identified non-compliance at the DCM relating to Condition L1.1 Pollution of waters. Refer to **Table 1.2** and EPL 11701 Annual Return 2021 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 2020, February 2021 and June 2021. The surveys determined that mine noise emissions at the time of the surveys complied with EPA noise level criteria at all monitored locations.
- One sediment dam spill occurred during the reporting period on 21 March 2021, as a result of a significant rainfall event exceeding design capacity.
- 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.
- One reportable environmental incident occurred at the DCM during the reporting period, relating to the sediment dam spill above.

During the reporting period nil complaints were received via the EPA hotline. Responses to complaints are provided to the EPA and details are included in the Complaints Register in **Appendix 5** (if applicable).

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 provided below 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
	2021 (to end reporting period)		2020		AVERAGE[2]
	Monthly Total (mm)	No. of Rain Days/Month[1]	Monthly Total (mm)	No. of Rain Days/Month[1]	1889-2010
January	157.6	16	135.6	20	115.3
February	211.6	17	262.6	18	125.0
March	450.2	14	91	18	147.3
April	43.2	3	17.8	9	100.9
May	49	12	63.4	8	91.5
June	75.8	10	49.4	8	101.1
July			93	10	75.1
August			31.2	8	65.3
September			37.4	8	63.1
October			95.2	10	78.3
November			26.8	8	83.3
December			209.2	24	100.8
TOTAL	987.4	72	1102	149	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 2020 calendar year rainfall total was comparable to the long-term district average and significantly higher than the 2019 calendar year rainfall total. Five of the twelve months in 2020 exceeded their respective long-term average.

The rainfall total for the reporting period (July 2020 to June 2021) was 1469.6mm which is considerably higher than the historical average. This was largely due to significant rain and flooding in March 2021.

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 2020	0.3	1.2	2.2
August 2020	0.3	2.1	2.2
September 2020	0.4	2.5	4.8
October 2020	0.5	2.8	5.5
November 2020	1.1	3.7	6.9
December 2020	0.6	2.9	5.4
January 2021	0.7	3.1	6.0
February 2021	0.7	2.3	4.3
March 2021	0.4	1.9	3.4
April 2021	0.2	1.9	3.8
May 2021	0.4	1.3	3.3
June 2021	0.4	1.1	2.4

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 period July 2020 to June 2021, inclusive. 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 (k/hr)	MAXIMUM WIND SPEED RECORDED	DOMINANT WIND DIRECTIONS
July 2020	7.9	44.1	W*
August 2020	9.0	54.3	W
September 2020	8.7	61.1	W & NW
October 2020	8.4	37.3	SW-S
November 2020	9.5	69.5	SSW-SSE
December 2020	9.0	68.8	SSW-SSE
January 2021	8.3	36.1	SSW-SSE
February 2021	7.6	35.0	SSW-S
March 2021	7.1	64.2	N & SSE

MONTH	AVERAGE WIND SPEED (k/hr)	MAXIMUM WIND SPEED RECORDED	DOMINANT WIND DIRECTIONS
April 2021	5.2	40.7	W-SSW
May 2021	6.4	49.2	WSW-SSW
June 2021	6.6	41.4	WSW

*Limited data set. Faulty wind direction sensor 1-20 July 2020

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 2020	1.3	12.0	22.8
August 2020	-0.2	12.2	24.8
September 2020	5.0	16.2	28.8
October 2020	8.4	18.9	32.4
November 2020	9.1	21.0	39.7
December 2020	11.4	21.5	34.7
January 2021	12.0	22.0	36.0
February 2021	14.4	21.3	30.8
March 2021	12.6	20.1	31.6
April 2021	5.3	16.5	28.5
May 2021	1.4	14.4	24.6
June 2021	1.7	11.4	19.7

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 EPA annual average limit for dust deposition is 4.0g/m2/month.

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-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21
D3	2.8	13.2[I,B,V S]	7.9 [I,B,V S]	3.2	1.8	2.7	0.5	0.5	0.8	4.0[I,B,V,S]	1.4	0.4
D4	0.1	0.2	0.6	0.5	0.4	2.9	0.4	0.7	0.8	0.1	0.2	5.8[I,V,S]
D5	0.4	0.2	1.7	0.5	0.4	2.1	1.5	0.7	5.5[I,V,S,D]	0.2	1.1	0.6
D7	0.2	0.2	0.7	0.3	0.8	1.4	0.3	2.4	1.1	0.2	0.3	0.4
D8	0.2	0.2	0.5	0.4	0.6	1.4	0.5	0.7	1.2	0.1	0.3	0.1
D9	0.7	0.3	1.0	0.4	0.4	1.3	0.4	0.5	0.6	0.7	0.3	8.2[I,V,S]
D10	0.2	0.4	0.3	0.4	0.3	1.7	0.5	0.6	1.1	0.2	0.5	0.5
D12	0.3	0.2	0.4	0.2	0.4	1.1	0.6	0.4	0.6	0.3	0.2	0.2
D13	0.9	0.5	0.3	0.8	2.1	1.9	6.1[I,V,S]	1.5	4.6	0.4	1.5	2.1

Notes/excluded results, Visual Description Guide:
D=Dirt: Subhedral to euhedral crystalline grains including fine sand, clay and other fine mineral particulates.
C=Coal: Black sharp angled grains with glossy conchoidal fractures or dull with cellular feature.
I=Insects: Whole insects e.g. spiders, ants, moths or outer parts of insects including wings, legs and exoskeletons.
S=Polysaccharide Slime: Slimy gelatinous material including decomposed soft body parts of insects and vegetation.
V=Vegetation: Plant debris and algae including trichomes, decomposed organic matter and particulates showing characteristic cellular structures.
B=Bird droppings: The most common contamination.
O=Other contaminants not included above.

Dust levels recorded had an average value of 0.8 g/m2/month (contaminated results not counted). Elevated values were at times affected by various degrees of contamination from insects, bird droppings, vegetation (seeds/grasses) and algae.

6.3.3.2 High Volume (PM10) Air Samplers

Table 6.6 shows the PM_{10} HVAS monitoring results for the four HVAS in ug/m^3/day (24 hours) for the monitoring sites during the reporting period.

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.

Table 6.6: High Volume Air Sampler (PM10) Results

Date	High Noon	Twin Houses	Hattam	Edwards
1-Jul-20	3	6	3	2
7-Jul-20	5	6	5	6
13-Jul-20	1	2	1	2
19-Jul-20	3	1	1	1
25-Jul-20	3	3	3	4
31-Jul-20	6	8	7	13
6-Aug-20	2	5	3	6

Date	High Noon	Twin Houses	Hattam	Edwards
12-Aug-20	1	1	1	1
18-Aug-20	3	3	3	1
24-Aug-20	1	3	3	1
30-Aug-20	11	14	12	18
5-Sep-20	11	10	13	13
11-Sep-20	1	1	1	1
17-Sep-20	10	10	11	10
23-Sep-20	3	5	6	2
29-Sep-20	5	7	6	5
5-Oct-20	11	13	11	12
11-Oct-20	8	13	12	12
17-Oct-20	14	14	15	15
23-Oct-20	7	7	9	7
29-Oct-20	6	6	5	5
4-Nov-20	4	5	5	6
10-Nov-20	7	3	4	4
16-Nov-20	11	9	14	12
22-Nov-20	20	20	24	22
28-Nov-20	12	17	22	14
4-Dec-20	9	8	9	9
10-Dec-20	13	15	14	13
16-Dec-20	6	7	6	6
22-Dec-20	7	11	7	9
28-Dec-20	14	13	14	6
3-Jan-21	9	7	7	8
9-Jan-21	7	7	6	9
15-Jan-21	19	18	15	20
21-Jan-21	8	9	9	8
27-Jan-21	9	12	15	11
2-Feb-21	7	7	7	7
8-Feb-21	7.7	10	10.6	10
14-Feb-21	12.8	11.7	12.4	13.6
20-Feb-21	3.4	2.5	2.9	2.3
26-Feb-21	9.3	15.1	11.4	11.2
4-Mar-21	5.2	5.4	5	5.6
10-Mar-21	10.7	11.1	10.8	11
16-Mar-21	2.8	2.8	3.3	2.7
22-Mar-21	3	2.3	3.4	2.3
28-Mar-21	4.2	6.7	6.7	7.1
3-Apr-21	1.7	1.9	1.8	2.8
9-Apr-21	5.3	5.2	6.3	6.8
15-Apr-21	7.9	14.1	11.7	10.2
21-Apr-21	6.8	10.6	10.4	10.9
27-Apr-21	3.7	5.2	4.5	4.5
3-May-21	2.9	7.5	2.5	3.1
9-May-21	4.7	4.2	4.2	6.3
15-May-21	4.6	5.4	5.6	5.4

Date	High Noon	Twin Houses	Hattam	Edwards
21-May-21	1.1	2.1	1.7	1.8
27-May-21	0.5	2.1	2.1	4.4
2-Jun-21	1.8	3	2.9	1.4
8-Jun-21	1.6	2	1.4	2.2
14-Jun-21	1	1	0.2	1
20-Jun-21	0.5	0.4	0.5	0.9
26-Jun-21	1	1	1	1
Annual Rolling Average	**6.2**	**7.2**	**7.1**	**7.0**

All results at all sites were below the 50 µg/m3 24 hour criterion 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.

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 AGMP.

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 15.6, "Twin Houses" was 18.0, "Hattam" was 17.7 and Edwards was 17.6 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) 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 2020 to 30 June 2021 is 7.7 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 6.7 presents the annual average dust deposition levels at the end of the reporting period (June 2021) along with the previous five years. The 2021 reporting period annual average dust deposition

levels are within the range of results recorded in the previous five years at all sites. All 2021 annual averages are well below the performance criteria. Graphical representation of dust gauge results and annual rolling averages are provided in **Appendix 3**.

Table 6.7: Annual Average Dust Deposition Gauge Results

Reporting Period	Total Insoluble Solids (g/m²/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**
2016	1.0	0.5	1.7	0.9	0.9	1.3	1.2	1.3	1.5
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

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 6.8 presents the reporting period (June 2021) HVAS PM_{10} annual averages along with the previous five years.

Table 6.8: Annual Rolling Average HVAS (PM_{10}) Results

Reporting Period	PM_{10} (µg/m3)			
	High Noon	Twin Houses	Hattam	Edwards
Criteria	**30**	**30**	**30**	**30**
2016	8.6	9.7	10.0	9.2
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

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 decreased over the 12-month period back to levels consistent with 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 related to air quality were received during the reporting period. A full detailed complaints list is provided in **Appendix 5**.

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 2021* (**Appendix 7**) provides a review of the effectiveness of measures in the Biodiversity Management Plan (BMP) for the annual period ending 30 June 2021 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.

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.

An Independent Environmental Audit was again undertaken in December 2020. The BMP will be revised during the next reporting period.

In accordance with the BMP, the *DCM Annual Biodiversity Report 2021* is included in **Appendix 7**. A brief summary of main findings and conclusions are provided in the subsections below.

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 2020/2021 reporting period, no vegetation clearance was undertaken.

The area of disturbance at the end of June 2021 is shown in the DCM Annual Review 2021 **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.

The nest box program currently 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 in October 2020. Results of the *2019 - 2020 Nest Box Programme for the Duralie Offset Area Report (AMBS, August 2021)* are included in the *DCM Annual Biodiversity Report 2021* is included in **Appendix 7.**

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 2020** and continued through to **April 2020**. 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.

6.4.4 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 2020 to November 2020. The program involved a combination of trapping and shooting. The programs were productive with a total of 4 wild dogs and 2 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 April 2017 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 **(Appendix 7)**.

A feral animal survey of the Duralie Mining Lease and Duralie Biodiversity Offset Area is scheduled to be undertaken in September 2021. 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 the bushfires in November 2019.

The Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021 (Appendix F) found fencing on external boundaries was in good condition. At OB28 in VMU AE, a tree has fallen, blocking the track and damaging the fence. 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.

Hazard reduction burning has been undertaken in consultation with the 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 5 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 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.

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.

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 2021* for the annual period ending 30 June 2021 is included in **Appendix 7** 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 February 2021. The results are provided in the *DCM Biodiversity Offset Monitoring Report 2021* prepared by Kleinfelder (**Appendix 7**). The next round of monitoring is scheduled for early 2022.

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 February 2018. The results are provided in the *DCM Fauna Surveys of the Offset and Mine Rehabilitation Areas, February 2018*. A summary of the survey results is included in the *Annual Biodiversity Report 2021* (**Appendix 7**).

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.

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 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.

No complaints related to the management of biodiversity were received during the reporting period. A full detailed complaints list is provided in **Appendix 5**.

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 Bioremediation

Operations at the DCM are conducted with the aim of minimising the potential for land contamination. The management of hydrocarbon contaminated soils is detailed in the Duralie Coal PIRMP. DCM has previously operated an onsite bioremediation area for hydrocarbon contaminated soil where biological degradation of hydrocarbons is used to reduce the hydrocarbon concentration in the soil to an acceptable level.

The bioremediation area at the DCM was decommissioned during the 2017/18 reporting period, following the cessation of operations and maintenance activities at the DCM. Any hydrocarbon contaminated material is now recovered and stored for disposal offsite by the licenced waste contractor engaged at DCPL.

6.7 Blasting

6.7.1 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).

The BLMP establishes a blast management strategy which:

- Identifies blasting criteria;
- Outlines blast management and control measures;

- Establishes blast management protocols;
- Formulates a blast monitoring programme;
- Details reporting and review requirements.

EPL condition L5 and Condition 8 of the Project Approval state that overpressure caused by blasting at monitored locations may exceed 115 dB(L) for no more than 5% of blasts during the reporting period and must not exceed 120 dB(L) at any time. Similarly, ground vibration at monitored locations caused by blasting may exceed a peak particle velocity of 5 mm/s for no more than 5% of blasts during the reporting period and not exceed 10 mm/s. Additionally, blasting must not exceed 5mm/s at Mammy Johnson's grave or 10mm/s at Former Weismantel's Inn.

In accordance with Condition 13(b) of the Project Approval, a dedicated blasting hotline is available to provide current scheduled blasting times for the DCM. Persons living within two (2) kilometres of an active or approved operational area may also request advice of scheduled blasting activities.

The permitted blasting hours and frequency are prescribed in the Project Approval. Blasting is permitted between 9am and 5pm on Monday to Saturday only. Additionally, a maximum of 1 blast per day is permitted on site and an annual average of 3 blasts per week.

Blasting activities at the DCM recommenced in February 2021 after ceasing in August 2018.

Blasting activities are designed and managed in accordance with the BLMP.

6.7.2 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

During the reporting period (period ending 30 June 2021) there were no blasts events which exceeded the overpressure criteria limit of 120 dBL. There were also no blasts where overpressure exceeded 115 dBL during the reporting period.

Vibration Results

During the reporting period (period ending 30 June 20121) 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.

6.7.3 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 Weismantel's Inn was undertaken in July 2020 and reported there is no evidence that the former Weismantel Inn building has been affected by blast-induced ground vibrations.

6.7.4 Blasting Complaints

No blast related complaints were received during the reporting period. A full detailed complaints list is provided in **Appendix 5** (when required).

6.8 Noise

6.8.1 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. The NMP was revised and updated during the 2018 reporting period to reflect the ongoing monitoring requirements at times when no operations are occurring at the DCM.

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.

Mining at the DCM was postponed in October 2018. Since this time periodic rehabilitation and PAF rehandling works have been undertaken. Mining at the DCM recommenced in February 2021 with ROM coal being extracted from the Weismantel Pit.

Mining operations are permitted 24 hours per day and 7 days per week in accordance with the EA 2014. During the reporting period DCPL complied with the approved operating hours in accordance with PA 08_0203. During the reporting period PAF rehandle activities were undertaken during day shift Monday to Friday ceasing in September 2020. Mining activities recommenced in February 2021 on a 7 days per week, day shift only roster (6:30am to 5:00pm).

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.

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 surveys were conducted during the reporting period. These surveys were conducted during August 2020, February 2021 and June 2021. Attended noise monitoring is only undertaken during periods when mining or rehabilitation activities are occurring in accordance with the NMP.

A Sentinex real-time noise (RTN) monitor provides a management tool for operations to measure mine contribution noise emissions and implement management controls as outlined under the approved NMP. The real-time noise monitor records noise levels during the evening and night-time periods, on days when operations are occurring at the DCM. Noise investigation trigger thresholds are set at 42 dBA between the hours of 7.00 pm and 7.00 am. During the reporting period mining operations occurred between the hours of 6:30am and 5:00pm. Hence, the first half hour of operations occurs within the applicable real-time noise monitoring period.

The noise monitoring program also includes rail noise monitoring and mobile plant monitoring. The locations of noise monitoring sites are shown on **Figure 3 (Appendix 1)**.

6.8.2 Review of Attended Noise Monitoring Results & Performance

The summary results of the attended noise surveys undertaken during the reporting period are provided in **Tables 6.9**, **6.10** and **6.11**. 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).

Operator-attended operational noise monitoring was conducted at four locations on Thursday 13 August 2020, Friday 26 February 2021 and Friday 25 June 2021.

August 2020 Survey

Table 6.9: Noise Performance Assessment – Operations – 13 August 2020 Survey

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

I/A = Inaudible

The August 2020 assessment of daytime operational noise emissions found DCM to be compliant with the relevant criteria, contained within the DCM PA 08_0203 and EPL, at all attended monitoring locations.

February 2021 Survey

Table 6.10: Performance Assessment – Operations – 26 February 2021 Survey

Location	Estimated DCM LAeq(15minute) Contribution dBA	Noise Criteria LAeq(15minute) dBA	Compliance
NM1 Woodley	I/A	35	Yes
NM4 Fisher-Webster (day time)	I/A	35	Yes
NM4 Fisher-Webster (night time)	<25	37	Yes
NM5 Moylan	I/A	35	Yes
NM6 Oleksiuk and Carmody	<25	35	Yes

I/A = Inaudible

The February 2021 assessment 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, at all attended monitoring locations.

June 2021 Survey

Table 6.11: Performance Assessment – Operations – 25 June 2021 Survey

Location	Estimated DCM LAeq(15minute) Contribution dBA	Noise Criteria LAeq(15minute) dBA	Compliance
NM1 Woodley	I/A	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	27	35	Yes

I/A = Inaudible

The June 2021 assessment 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, at all attended monitoring locations.

6.8.3 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 2021 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.

6.8.4 Real Time Noise Monitoring System

A real-time noise monitoring response protocol is described in the NMP Section 7.3.5. Real-time monitoring is 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 have been established which send alarms when noise emissions are approaching levels which may exceed the noise criteria at privately-owned receivers. The real-time noise monitor records noise levels during the evening and night-time periods, on days when operations are occurring at the DCM. Noise investigation trigger thresholds are set at 42 dBA between the hours of 7.00 pm and 7.00 am.

The RTN monitor located to the north of the DCM was recommissioned during February 2021. During the reporting period mining operations occurred between the hours of 6:30am and 5:00pm. Hence, the first half hour of operations occurs 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.

6.8.5 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. 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).

The transport of ROM coal from the DCM via shuttle train ceased during October 2018 with the last train railed on 4 October 2018. Therefore, rail noise monitoring was not conducted during the current reporting period.

Shuttle train operations are scheduled to recommenced in August 2021 and monitoring will be reported in the next AR.

6.8.6 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 current mining fleet is shown in Section 4.3.1 of this report.

Mining at the DCM was postponed in October 2018. Since this time periodic rehabilitation and PAF rehandling works have been undertaken. Mining at the DCM recommenced in February 2021 with ROM coal being extracted from the Weismantel Pit. Mining activities have been undertaken on a 7 days per week, day shift only roster between 6:30am to 5:00pm.

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.

No mobile plant sound power monitoring has been undertaken during the 2020/21 reporting period due to the reduced fleet, reduced operating periods and no evening or night-time operations. Notwithstanding, an administrative non-compliance has been recorded in accordance with the NMP monitoring requirements. No adverse effects would be anticipated resulting from the non-compliance and no noise complaints have been received.

The same non-compliance was reported in the previous reporting period and was subject to a Show Cause Notice received on 13 August 2021, followed by a Warning Letter issued by DPIE on 09 September 2021. Under the provisions of Schedule 2 condition 4 of the PA 08_0203, the Department requested that Duralie Coal submits a revised Noise Management Plan for the Secretary's approval.

Sound power monitoring is scheduled to be conducted in September 2021. The NMP has been revised to reflect monitoring requirements during periods of reduced operations. The NMP is expected to be submitted in September 2021.

6.8.7 Noise Complaints

No noise related complaints were received during the reporting period. The complaints list is provided in **Appendix 5** (when required).

6.9 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 reporting period, a tree screen was planted, extending from the existing visual screen on the Buckets Way to Martins Crossing Rd.

The rehabilitation principles and objectives at the DCM are included in the Project Approval and described in the DCM MOP. 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 5** (when applicable).

6.10 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 6.12: 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 July 2020 and reported there is no evidence that the former Weismantel Inn building has been affected by blast-induced ground vibrations.

6.11 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). The 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 potentially acid forming (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 a Spontaneous Combustion PMHMP. 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 previous reporting period no events of spontaneous combustion were identified at the DCM.

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

No air quality complaints related to odour were received during the reporting period. A detailed complaints list is provided in **Appendix 5**.

6.12 Agricultural Report

An assessment of the Agricultural and Rural Suitability of the land surrounding the DCM was undertaken in the EA 2010. The Project is located in a rural area characterised by cattle grazing on native and improved pastures. Areas managed for forestry, conservation, poultry farming and other types of agricultural production also occur in the wider area.

The Agricultural Land Use Rehabilitation Objective for the DCM is to establish the land capability classification for the relevant nominated agricultural pursuit.

Rural Land Capability

The Rural Land Capability classification system is used to determine the various classes of rural land on the basis of the capability of the land to remain stable under particular uses. Land is allocated to one of eight classes, with emphasis on the erosion hazards in the use of the land. The majority of land within the existing DCM and Project area is classified as Class IV using the rural land capability classification with the major factors in determining the classes being slope and soil stability in water.

Agricultural Suitability

The Agricultural Suitability system is used to classify land in terms of its suitability for general agricultural use. Agricultural land is classified by evaluating biophysical, social and economic factors that may constrain the use of land for agriculture. The agricultural land classification mapping classifies the majority of lower slopes of the DCM area as Class 3 land, and the upper slopes as Class 4. The land in the far south of ML is classified as Class 5 agricultural suitability.

The rehabilitated areas on the Duralie Waste Emplacement are proposed for Class 4 agricultural suitability. Class 4 Agricultural Suitability is defined as (NSW Agriculture, 2002):

Land suitable for grazing but not for cultivation. Agriculture is based on native pastures and improved pastures established using minimum tillage techniques. Production may be seasonally high but the overall production level is low as a result of major environmental constraints.

Agricultural lands on and surrounding the DCM including DCPL owned land continues to be managed for agricultural production. DCPL implements a property management strategy which includes grazing & pasture management and weed and pest control measures. The majority of agricultural lands are grazed under agistment/lease contracts.

There have been no changes to the agricultural land suitability during the reporting period. Further information on agricultural rehabilitation areas is included in Section 8.

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.

DCPL is planning for the commencement of the mine closure phase (i.e. after the cessation of mining operations on 31 December 2021) and is currently revising this Water Management Plan 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. Partial backfilling with waste rock mined from the Weismantel Open Pit has commenced, along with shaping of the pit area to its final landform design. Mining of the Weismantel Open Pit will continue until 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 No. 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 applied to land by means of irrigation.
- 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 1102 ML (85.1%), and Auxiliary Dam 2 contained 2455 ML (94.7%). 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 SMC 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 WAL 41518 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.

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, 2020) for the DCM was conducted for the 2020 calendar year and a summary is provided below.

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 2020 calendar year.

Table 7.1: Summary Water Balance – Contained Water Storages 2020

Inflows (mL/pa)

Rainfall runoff	501
Pumped from open cut pits	0
Pumped from other storages	0
MWD diversion seepage	37
First flush capture	111
Total Inflow	**649**

Outflows (mL/pa)

Evaporation	438
Haul Road dust suppression	9
Irrigation loss	0
Total Outflow	**447**
INFLOW - OUTFLOW	**202**

Start of 2020 year total storage volume	2,714
End of 2020 year total storage volume	2,885
Change in Storage	**171**

The above indicates an increase in stored water volume in these storages during 2020. Note that this does not include any increase in stored water volume in the Clareval pit, the Weismantel pit and the adjacent waste rock emplacements. The estimated volume of water contained in the pits increased during 2020.

Open Cut Pits

No dewatering from the open cut pits to the mine water dams was undertaken during the reporting period. A mine pit water balance analysis was undertaken for the open cut pits using data recorded during 2020. The volume of 'groundwater' (inflow other than rainfall runoff) estimated reporting to the pits (Clareval pit only) in 2020 is estimated to be 115 ML. This contrasts with a volume of 126 ML

volume estimated from the groundwater model developed as part of the Duralie Extension Project (GCL, 2010).

Table 7.2: Summary Water Balance – Open Cuts 2020

Component	Weismantel Pit (ML)	Clareval Pit (ML)
Start of Year Stored Water Volume*	410	1,030
End of Year Stored Water Volume*	306	1,975
Change in Stored Water Volume	-104	945
Inflows		
Rainfall Runoff	241	339
Groundwater (Predicted)	0	126^
Groundwater (Estimated)	0	115
Pumped Inflow	0	607
TOTAL†	241	1,061
Outflows		
Evaporation	36	63
Pumped Outflow	607	0
TOTAL	643	63
Inflows minus Outflows	-402	998

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

† Calculated using estimated groundwater inflow

^ From GCL (2010). No data available post 2019 – half year value to mid-2019 doubled.

Groundwater Licencing

DCPL holds an existing Water Access Licence (WAL 41518) 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.

Table 7.3: Water Take

Water Licence #	Water sharing plan, source and management zone (as applicable)	Entitlement	Estimated Take Previous Period – 2019 (ML)Total	Estimated Take Current Period - 2020 (ML)Total
WAL 41518 (NOW ref: 20AL213502) - Duralie Pit (Weismantel and Clareval)	Gloucester Basin Groundwater Source - North Coast Fractured and Porous Rock Groundwater Source 2016	300ML extraction.	66ML	115ML

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 VC1 (EPL 11701 Monitoring Point 27) occurred on 21 March 2021 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. Inspections of VC1 continued following the initial spill to confirm no further discharges occurred.

Sediment Dam VC1 operated in accordance with design and management procedures. Rainfall exceeded design capacity. The volume discharged from VC1 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.

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 and was conducted during March 2021. 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 all mine water was contained on site and no spills occurred from mine water storage dams.

The main objectives of the mine related water control facilities are:

- Segregation of clean water from mine related water, to minimise the quantities of mine related water to be managed;
- On site storage to prevent escape to Coal Shaft Creek and Mammy Johnsons River; and
- Management of the stored quantity of dirty water by irrigation.

The principal sources of mine related water are:

a) Mine Water

- Incident rainfall
- Groundwater seeping into mining pits;
- Rainfall induced runoff and seepage from active sections of the overburden dump; and
- Rainfall induced runoff from the Industrial Area.

b) Sediment Laden Water

- Rainfall induced runoff from roads;
- Rainfall induced runoff from areas stripped of topsoil (typically exposing clays); and
- Rainfall induced runoff from areas yet to adequately vegetate within sediment dam catchments.

Mine related water uses and losses are:

- Evaporation and seepage losses from water storages;
- Haul road dust suppression;
- Railed coal dust suppression;

- Water retained in ROM coal railed to the Stratford Mine; and
- Stored water applied to land via irrigation (evapotranspiration) including evaporative sprays.

The mine related water storages on site are:

- Main Water Dam (MWD)
- Auxiliary Dam 1 (AD1) (decommissioned)
- 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 weekly, monthly, 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 Surface Water Management Plan 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	7.1	7.4	**7.1-7.6**	402	**370**	42	**15**
GB1	6.9	7.3		246		31	
Site 12	7.0	7.3		367		31	
CSC							
SW2 (RC)	7.5	7.7	**7.1-7.9**	500	**544**	18	**80**
SW10	6.6	7.2		100		29	
UT							
SW9	6.5	6.7	**6.4-7.1**	195	**461**	70	**57**
SW10	6.6	7.2		100		29	

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	0.001	**0.002**	45	**24**	0.005	**0.011**	0.97	**1.24**
GB1	0.001		48		0.005		0.95	
Site 12	0.001		35		0.005		1.06	
CSC								
SW2 (RC)	0.012	**0.003**	44	**119**	0.026	**0.064**	1.68	**3.02**
SW10	0.007		126		0.012		7.32	
UT								
SW9	0.002	**0.004**	73	**94**	0.013	**0.024**	1.68	**2.96**
SW10	0.007		126		0.007		7.32	

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

Table 7.6: Surface Water Monitoring Performance Outcomes – 2020-21 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 EC, TSS and Turbidity. Analysis of the monitoring data shows EC to be elevated on four occasions during the reporting period. EC was also elevated at upstream sites GB1 and Site 12 on these occasions. Whilst EC at Site 11 slightly exceeded the 80th%ile trigger it was found to not be significantly higher than EC concentrations at GB1 and Site 12. Hence similar trends observed upstream and downstream. Analysis of the monitoring data also shows similar trends observed upstream and downstream for TSS and Turbidity. 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 performance indicator for DO was exceeded on four occasions at Site 11. DO was also elevated 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 – 2020-21 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 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.

Table 7.6 (Continued): Surface Water Monitoring Performance Outcomes – 2020-21 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 did not exceed any of the performance indicators. Upstream site SW10 exceeded the 80th%ile trigger for Copper, Turbidity & Aluminium. 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 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) and the Clareval pit (sampling location Clareval).

No overflows or discharges of mine water occurred during the 2020/21 reporting period.

Monitoring for SW3 (major) during the reporting period indicated, on average, a moderate EC (2840 uS/cm), slightly alkaline pH (8.4) and low miscellaneous metals concentration. Reference should be made to **Table 7.7** and the water monitoring results in **Appendix 4**. AD1 was dewatered prior to the previous reporting period and no samples were required. Access to the Clareval Pit was not available during the reporting period. Mining and dewatering of the Clareval pit has ceased.

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)	7.3-8.9	8.4	1417-3640	2840	<5-10	7
AD2	7.1-9.8	8.7	2213-6440	3262	*	*
Weismantel (SW4)	3.1-7.9	6.6	3640-6840	5907	9-94	37

Notes * = TSS not monitored at AD2

The performance measure and performance indicator for the mine water storages (SWMP Table 7) states “Minimal operational disruption while maintaining negligible risk of spill from the MWD and Auxiliary Dams to Mammy Johnsons River and Coal Shaft Creek”. No overflows or discharges of mine water occurred during the 2020/21 reporting period.

Irrigation of water from the MWD at the DCM has ceased, hence the irrigation water quality performance indicator in Table 7 of the Surface Water Management Plan (SWMP) is no longer applicable. However average EC showed a decrease compared to the previous reporting period.

An assessment of the irrigation water quality was undertaken in the 2019 Irrigation Area Monitoring Report (Horizon Environmental, 2019) and is included in **Section 7.5.1**. 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.

No irrigation of mine water occurred during the reporting period and no additional assessment were required.

7.3.3 Analysis Data Trends & Comparison with EA Predictions

7.3.3.1 Local Streams Monitoring

The above results were consistent with previous year's monitoring results 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 7.7 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 Environmental Assessment, 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 2021, however the average EC (2840 uS/cm) in 2021 has remained higher than the predicted EC of 2140 uS/cm. This is predominantly due to the higher EC water from the Clareval pit. No pumping from the open cut pits occurred during the reporting period. 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 2020 and involved sampling from seven sites. For the September survey a total of 38 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 2020 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 summaries are provided below.

The September 2020 report concluded that;

> *"the results of the current survey confirm what has previously been demonstrated, i.e. that the aquatic biodiversity is continuing to show similar trends to that recorded in previous years and under similar environmental conditions. The higher numbers of EPT taxa recorded at all river sites above and below the mining operations indicates that while both river systems have been impacted by the previous low to no flow conditions the resumption of significant flows has increased the biodiversity, particularly in the Karuah and the lower sections of the Mammy Johnsons Rivers. The other off-river sites recorded lower values than the river sites. However, as they are much smaller systems, they do not have the same scale of resources, permanence of water levels and variety of niches to support more complex biodiversity. They are also more impacted by decreases in flow or changes in environmental conditions and therefore require a longer period to recover. In conclusion, the results from the current survey suggest that the overall biodiversity and river environmental conditions has increased, 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 2020).*

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.

The revised WMP reflecting the changes to environmental impacts, mitigation measures and monitoring programs at the DCM was submitted to DPIE on 8 September 2021. Notwithstanding, an administrative non-compliance was recorded against the current requirements of the current WMP as no riparian vegetation monitoring was undertaken during the period July 2020 to June 2021.

7.3.6 Ecotoxicity Testing Program

In accordance with the SWMP and Condition 29(b) of Project Approval (08_0203), DCM have undertaken ecotoxicity testing of samples taken from selected water monitoring sites in Mammy Johnsons River, Coal Shaft Creek and DCM Main Water Dam since 2013. The ecotoxicity testing

programme was initially required to be undertaken quarterly and then revised following analysis of the monitoring results. The ecotoxicity tests were undertaken by Ecotox Services Australasia during 2013 to 2019. A review of the ecotoxicity monitoring data was undertaken by the University of Queensland Centre for Mined Land Rehabilitation in May 2014 and again in October 2015. The ecotoxicity program was refined based on recommendations contained in the reviews of the monitoring data.

The application of mine water via irrigation ceased in 2018. This irrigation of mine water was identified in the EA 2010 to potentially have an impact on the water quality and ecology of Mammy Johnsons River and was the basis for the requirement for undertaking ecotoxicity monitoring.

In April 2019, a further review and summary interpretation of the DCM ecotoxicity monitoring program results was undertaken by University of Queensland Centre for Mined Land Rehabilitation (CMLR). The review was undertaken to assess any identified impacts over the life of the project and provide recommendations on the ongoing monitoring efforts.

The *Summary Interpretation of Duralie Coal Mine Ecotoxicity Testing Results, Apr 2019* (CMLR, 2019) concluded the following;

> *The results for ecotoxicity testing with five aquatic species of Coal Shaft Creek, Mammy Johnsons River at two additional sampling times during 2016 – 2018 show that there was no evidence for any significant toxicity and no connection with any effects from mining. The Main Water Dam at Duralie Coal Mine showed that sporadic effects to some test species occurred, but not all. This is considered to indicate the potential for minor effects to occur on an on-going basis but does not show affects from the offsite natural waters.*
>
> *Based on the consistent evidence from 2013-2018 for aquatic testing in the Main Water Dam it is recommended that the Ecotoxicity Testing Program is no longer required. If any irrigation activity were to be undertaken from the Main Water Dam at Duralie Mine site, the mine site and downstream waters would require ecotoxicity testing before and after application.*

In accordance with the recommendation above ecotoxicity monitoring is no longer recommended as potential impact pathways have ceased. Assessed monitoring results as part of the irrigation monitoring report and ecotoxicity monitoring reports showed no identified impact. A review of the WMP is currently being prepared to update the ecotoxicity monitoring requirements as per the recommendations in CMLR, 2019.

On 13 August 2021, DPIE issued a Show Cause Notice which refers to a non-compliance self-reported in the Duralie Coal Mine Annual Review 2019/20, as acknowledged by the Department in the letter dated 09 December 2020. An administrative non-compliance was recorded against the current requirements of the WMP as no ecotoxicity monitoring was undertaken during the period July 2019 to June 2020.

A response to Show Cause Notice was submitted by DCPL on 31 August 2021 and in consideration of this, a warning letter was issued by DPIE on 06 September 2021. Under the provisions of Schedule 2 condition 4 of the PA 08_0203, the Department requested that Duralie Coal submits a revised Water Management Plan to the by Friday 29 October 2021 for the Secretary's approval.

The revised WMP reflecting the changes to environmental impacts, mitigation measures and monitoring programs at the DCM was submitted to DPIE on 8 September 2021. Notwithstanding, an

administrative non-compliance was recorded against the current requirements of the current WMP as no ecotoxicity monitoring was undertaken during the period July 2020 to June 2021.

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 5.1 (DB10W in May 2021) to a neutral 7.4 (DB9W in August 2020);
- 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 17.7 mg/l (DB3W in May 2021);
- Iron concentrations showed no common trend with rises and falls across wells generally. Concentrations showed a wide range from a low of <0.05 mg/l (SI2W) to a high of 41.5 mg/l (DB5W in August 2020);
- Manganese concentrations across all wells were not high with the highest being 2.6 mg/l within WR2 in February 2021; 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	15.7	6.1	4393
DB2W	13.8	6.2	1628
DB3W	3.9	6.3	127
DB4W	6.7	6.6	3036
DB5W	11.7	5.7	2121
DB6W	21.3	6.6	6083
DB7W	10.2	6.9	2916
DB8W	16.2	*	*
DB9W	20.4	7.3	3915
DB10W	12.8	5.4	4630
DB11W	9.8	7.0	2858
BH4BW	28.1	6.9	8435
SI1W	10.2	6.4	3064
SI2W	68.9	6.9	6375
SI3W	15.7	6.1	4393
WR1	13.8	6.2	1628
WR2	3.9	6.3	127

Note * = Depth only monitored at DB8W

It should be noted that the EA (2010) described groundwater in the Project area as being characterised by the following parameters/ranges:

pH – 6.0 to 8.0
Electrical conductivity – 100 to 7600 uS/cm

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 5.4 and 7.3. This is a generally similar range to that noted in the EA. Similarly, the electrical conductivity range for the bores was 127 to 8435 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.

Table 7.9: Groundwater Monitoring Performance Outcomes – 2020-21 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 2020 (HEC, 2020). .	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 2020 site water balance review (HEC, 2020) 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). Irrigation has previously consisted of a network of fixed sprays in the Type I, II and IV irrigation areas supported by evaporative fans in the Type I and Type V irrigation areas (waste rock emplacement) only.

During the 2017 reporting period the fixed spray system was removed from the Type IV area (rehabilitated waste emplacement). The evaporative sprays were also removed from the Type I and Type V (waste rock emplacement area) during the 2017 reporting. The remainder of the irrigation network was removed in 2018. No irrigation has occurred within Type III irrigation areas located in the catchment of Coal Shaft Creek above Dam 3. Furthermore, the additional irrigation areas proposed in the EA 2014 have not be commissioned during the life of the project.

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 mine closure planning section. All irrigation activities at the DCM have now ceased and the DCM's irrigation system has been decommissioned and removed.

The irrigation system management controls were maintained until the cessation of irrigation activities in 2018. An overview of the site irrigation system is outlined in the WMP.

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.

The irrigation area performance measures and indicators are included in Table 6 of SWMP Section 9. The irrigation performance measure states that irrigation activities would have no significant impact on soil properties or suitability of soil in irrigated areas for future agricultural use (i.e. grazing on native pasture). The irrigation performance indicators relate to pH in the MWD being maintained between 6.0 and 8.5; SAR less than 6 and EC less than 2500µS/cm (2.5dS/m). If a performance indicator is exceeded an assessment of the performance measure is also included in the irrigation monitoring report.

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 is currently being revised 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 is 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. The MOP is available on the Duralie Coal website.

A new MOP was prepared for the DCM during 2019 and was approved by the Resources Regulator on 27 February 2020. The new MOP reflects the proposed mining and rehabilitation activities for the 2-year period until the end of 2021 and also includes a detailed Mine Closure Planning Program.

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

Condition 55, Schedule 3 of the Project Approval specifies the DCM post mining land use and rehabilitation objectives which are reproduced in **Table 8.1** below.

Table 8.1: Rehabilitation Objectives

Feature	Objective
Mine site (as a whole of the disturbed land and water)	Safe, stable and non-polluting, fit for the purpose of the intended post-mining land use(s).
Surface infrastructure	To be decommissioned and removed, unless the Secretary agrees otherwise.
Coal Shaft Creek Diversion	Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than prior to mining.
Landforms	Final landforms sustain the intended land use for the post-mining domain(s). Final landforms are consistent with and compliment the topography of the surrounding region to minimise the visual prominence of the final landforms in the post-mining landscape. Final landforms incorporate design relief patterns and principles consistent with natural drainage.
Other land affected by the project	Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising: local native plant species; and a landform consistent with the surrounding environment
Water Quality	Water retained on site is fit for the intended land use(s) for the post-mining domain(s). Water discharged from site is consistent with the baseline ecological, hydrological and geomorphic conditions of the creeks prior to mining disturbance. Water management is consistent with the regional catchment management strategy.
Native flora and fauna habitat and corridors	Size, locations and species of native tree lots and corridors are established to sustain biodiversity habitats. Species are selected that re-establishes and complements regional and local biodiversity.
Final void	Safe, stable and non-polluting.
Post-mining agricultural pursuits	The land capability classification for the relevant nominated agricultural pursuit for each domain is established and self-sustaining within 5 years of land use establishment (first planting of vegetation).
Community	Minimise the adverse socio-economic effects associated with mine closure.

A summary of the rehabilitation objectives, performance indicators and completion criteria relevant to the DCM rehabilitation domains is provided in the MOP. Plan 4 in the MOP shows the conceptual final landform, relevant primary domains and secondary rehabilitation domains.

8.1 Buildings and Infrastructure

Buildings and infrastructure at the DCM have been utilised during the life of the operations. Following the cessation of mining activities in October 2018, some infrastructure has been decommissioned and an assessment has been undertaken for the infrastructure which will still be required. During the 2018 reporting period the following infrastructure was decommissioned and relocated to the SMC:

- Muster area and bathhouse
- Field crib hut
- Fuel storage tanks
- Oil and grease storage tanks

The remaining infrastructure will be required at the DCM for future activities including completion of mining, PAF rehandle and progressive rehabilitation work. No other buildings or infrastructure were constructed, demolished or renovated during the reporting period. No decommissioning of infrastructure is scheduled during the next reporting period. Building and infrastructure decommissioning is further addressed in the Section 8.6 Mine Closure and will be included in the Mine Closure Plan.

8.2 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 MOP. 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 MOP.

Mining and rehabilitation activities follow the general progression below:

- Vegetation is cleared ahead of mine progression. Details are included in the Annual Biodiversity Report included in **Appendix 6** (vegetation clearance has been completed);
- Topsoil is removed ahead of the advancing pit or overburden dump and recovered for rehabilitation (topsoil stripping has been completed;
- Overburden and ROM coal extraction is undertaken:
- Bulk shaping of waste emplacements to the final landform, drainage works, ground preparation and topsoil placement; and
- Planting of rehabilitation areas following all preparation works. The areas to be rehabilitated will comprise a combination of native forest/woodland and pasture with scattered trees as described in the MOP.

The DCM rehabilitation progress is generally in accordance with the planned activities described in the MOP 2019 Plan 3B - Mining and Rehabilitation 2021. The MOP makes provision for 406 hectares of total disturbance area and 206 hectares of rehabilitated area by the end of 2021.

The current (June 2021) total mine footprint area (disturbance) is 400 hectares and the completed rehabilitation area is 173 hectares (including 14 hectares of landform establishment). The difference between proposed and completed rehabilitation is due to 22 hectares of waste emplacement due for rehabilitation prior to the end of 2021 and 14 hectares of waste emplacement not yet completed due to ongoing mining operations and waste emplacement activities.

During the reporting period, approximately 3 hectares of the Weismantel waste emplacement area was bulk shaped to the final landform.

Prior to the end of 2021, a further 22 hectares of bulk shaping (landform establishment) is scheduled to be finalised on the Clareval waste emplacement.

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 2021 are shown in **Figure 4**, provided in **Appendix 1.**

Table 8.2 – Rehabilitation status

Mine area type	Previous RP (actual hectares)	Current RP (actual hectares)	Next RP (forecast hectares)
Total Mining Lease	942.8	942.8	942.8
Total mine footprint	400	400	400
Total active disturbance	230	227	208
Land being prepared for rehab (Landform Establishment)	11	14	31
Land under active rehabilitation (Growth Medium Development)	0	0	0
Completed rehabilitation (Ecosystem Establishment & Sustainability)	159	159	195

Note: Areas recalculated in the new MOP 2019 based on updated survey data.

8.2.1 Rehabilitation Resources

Topsoil resources are managed in accordance with the MOP Section 3.3.4. No vegetation clearance or topsoil stripping was undertaken during the reporting period. No further disturbance is proposed for mining activities at the DCM.

The site topsoil balance is updated annually to track the recovery and usage of topsoil and ensure adequate resources are available for rehabilitation of disturbed areas at the DCM. The latest topsoil balance was updated in June 2021. At the end of the reporting period an estimated 112,000 cubic metres of topsoil was held in various stockpiles. This would provide for rehabilitation of 112 hectares to the nominal topsoil depth of 100mm. The current area of disturbance which will require topsoil (i.e. not including final void of 53ha or water management area of 63ha) is 115 hectares, therefore sufficient topsoil resources are available to complete rehabilitation of the operation.

Topsoil stripping has now been completed up to the northern extent of both the Clareval pit and the Weismantel pit. The DCM topsoil balance will be updated again during the next reporting period.

8.2.2 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.

8.3 Rehabilitation Monitoring

Monitoring of the DCM rehabilitation areas is described in Section 8 of the MOP. 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 the post-mining land uses (Secondary Domains) of Native Vegetation (Woodland/Open Forest) and Agricultural Pursuits (Pasture/Scattered Trees).

Visual Monitoring

Rehabilitation monitoring includes a visual assessment:

- monitoring of soil erosion status and the effectiveness of erosion control methods;
- assessing germination success and vegetation establishment (diversity and abundance);
- usage of habitat enhancement features;
- the presence of weeds or feral animals; and
- mine landform runoff water quality.

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.

In December 2013, a fixed transect-based Landscape Function Analysis (LFA), Vegetation Dynamics and Habitat Complexity monitoring program was established across the DCM Rehabilitation areas. As rehabilitation progresses, additional EFA Revegetation Transects will be established at the DCM in each of the rehabilitation domain areas.

The rehabilitation transects were assessed again in June 2021 as part of the seventh annual round of monitoring in accordance with Section 8.1 of the MOP. A summary of the findings from the *2021 Duralie Coal Mine Rehabilitation Monitoring Report* (Kleinfelder, 2021) (**Appendix 9**) follows;

The revegetated waste emplacement has been designated 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). 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. The LFA indices continue to trend in the direction of the of analogue values, a feature that has been noted in previous reports. The Stability Index scores for the older (2008 to 2013) rehabilitation areas have achieved or exceeded Analogue values The younger rehabilitation areas (2016 to 2020) are still in the process of increasing soil surface stability, and currently have recorded lower index scores. There was no significant erosion observed during the surveys on the southern spoil emplacement (rehabilitation ages 2008 to 2012) or on the central spoil emplacement in the more recent rehabilitation areas. The pasture areas – as monitored by Transects 3504 and 3505 - have been established on flat areas of the spoil emplacement. Although the revegetation is relatively young, the seeding of pasture species has been successful, and no areas of seeding failure or erosion were observed.

The vegetation structure data for the woodland rehabilitation assessed as Ecosystem Sustainability i.e., 2008 to 2013 rehabilitation shows that these areas are currently heavily dominated by canopy species with all ages of rehabilitation recording higher than analogue canopy species densities, but with total stem densities lower than the analogue sites. The shrub stratum in particular is well below analogue densities. All sites in this older rehabilitation have relatively low numbers of true shrub and midstory species – where the vegetation structure data indicates high numbers of stems in the shrub stratum, the data shows that these were Eucalypt seedlings and saplings under two meters in height, recently germinated, rather than shrubs. The lower number of stems in the midstory and shrub strata reflect a combination of limited species initially seeded and the natural lifecycles of those Acacia species now resulting in die-back. The younger rehabilitation, 2016 and 2018, assessed as being in the Ecosystem Establishment phase have benefitted from more diverse initial seedings with shrub and midstory species.

When measured against the completion criteria, the younger rehabilitation areas – Ecosystem Establishment - have achieved the criteria or on trajectory to achieve the completion criteria. The older rehabilitated areas – Ecosystem Sustainability - have partially achieving the criteria. The establishment of self-sustaining ecosystems, as observed by self-recruitment is occurring in those areas where seedings have conditions allowing germination.

Recommendations include changes to monitoring methods to more accurately collect data that demonstrates progress towards the completion criteria including cessation of LFA monitoring in areas of older rehabilitation where LFA indices demonstrate achievement of analogue values or good trajectory toward those values. Biodiversity is not quantitatively measured with the current methodology, and it is suggested that instigating quadrat-based methodology such as used in the Biodiversity Assessment Methodology would provide data aimed at biodiversity and cover of vegetation.

Further management actions designed to improve biodiversity and structure are recommended based on different timelines for surrender of the revegetation. With minimal intervention management is restricted to weed control of listed and environmental weeds and the vegetation is allowed to mature and diversify at natural rates – this is considered a long-term strategy. Reducing biomass of the grassy understory and stimulation of the seed bank that has resulted from revegetation could be achieved by controlled burns. This would be considered a medium level of intervention. The most intense level intervention aimed at a shorter time frame for surrender would biomass reduction – burns and/or slashing – combined with a seeding program of midstory and shrub species.

The rehabilitation of the Duralie spoil emplacement continues to be on track for successful re-establishment of native woodland and pasture. The Landscape Functional Analysis indices have either achieved analogue or on track to achieve analogue values. In the older rehabilitation areas, LFA monitoring could be replaced by a more targeted monitoring program to provide quantitative data to support trajectories towards completion criteria. Vegetation will take much longer to achieve "natural" woodland vegetation structure and composition, but indications from the older rehabilitation areas show that this is occurring in areas where the right combination of species were seeded. Species diversity and structure is improving through natural recruitment, although seeding with further shrub and midstory species in particular but also canopy in selected areas, would increase the rate of diversification and provide greater fauna habitat.

Fauna Monitoring

Fauna usage of the native woodland/forest rehabilitation areas is monitored and documented over time. Fauna surveys are conducted 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. Fauna monitoring is undertaken every three years and was last undertaken during February 2018.

During 2018 AMBS Ecology & Heritage (AMBS) was engaged to undertake a fauna survey within the DCM native rehabilitation areas to assess the success of the rehabilitation areas in providing habitat for a range of vertebrate fauna. The fauna survey undertaken in February 2018 also extended to the Duralie Biodiversity Offset Areas.

The results are provided in the *DCM Fauna Surveys of the Offset and Mine Rehabilitation Areas, February 2018* (AMBS, 2018). An extracted summary 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 during February 2018. 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 124 species of vertebrate were recorded, comprising 8 frogs, 10 reptiles, 56 birds and 30 mammals…, most of which were native. With the exception of reptiles, a similar number of frog, mammal and bird species were recorded at Mine Rehabilitation Area sites compared with Offset Area sites. Five introduced species were recorded during the surveys, including Cattle (Bos taurus), House Mouse (Mus musculus), European Rabbit (Oryctolagus cuniculus), Black Rat (Rattus rattus) and Red Fox (Vulpes vulpes). Fifteen 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)."

Four of these species have been recorded for the first time during dedicated fauna surveys for the DCM, including the Little Lorikeet, Masked Owl, Long-nosed Potoroo and New Holland Mouse.

The fauna surveys suggest the DCM offset and rehabilitation areas provide habitat for a range of native vertebrate fauna, including birds, mammals, reptiles and frogs. The number of species recorded utilising the rehabilitation area is encouraging, particularly given the relatively young age of the vegetation."

Fauna monitoring is scheduled to be undertaken again October 2021.

Habitat Enhancement

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). During 2019 the nest box program was extended to the native vegetation rehabilitation areas to provide for habitat enhancement in the relatively young native vegetation where natural hollow development will take several decades.

The nest box program for the native rehabilitation areas involves:

- First round - 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.
- Second round - 25 nest boxes targeting a variety of hollow-dependent species that were installed in the Rehabilitation Area between 22 March 2021 and 26 March 2021.

Quarterly monitoring of the rehabilitation area nest boxes has been undertaken during the first year after installation for the boxes installed in 2019. Monitoring has only recently commenced for the boxes installed in 2021. The nest box program progress reports present the monitoring results:

85% of the nest boxes installed in the Rehabilitation Area in September-October 2019 where occupied after 12 months. Species records included the:

- Sugar Glider (Petaurus breviceps)
- Brush-tailed Phascogale (Phascogale tapoatafa)
- Brown Antechinus (Antechinus stuartii)
- Bush Rat (Rattus fuscipes)
- Mountain Brushtail Possum (Trichosurus cunninghami)
- Common Ringtail Possum (Pseudocheirus peregrinus)
- Gould's Long-eared Bat (Nyctophilus gouldi)
- Lesser Long-eared Bat (Nyctophilus geophroyii)
- Grey Shrike Thrush (Collurincincia harmonica)
- Diamond Python (Morelia spilota spilota)

For some of the above species, signs of previous occupation were recorded including leaf and bark nests, scats, fur, indentation in the substrate, prey remains, insect material, possum drey and sticks. Evidence of breeding individuals included the Brush-tailed Phascogale, which were observed with juveniles inside the nest box. An assortment of nesting material was also present in one nest box, possibly collected by a Grey Shrike-thrush.

Occupancy of nest boxes in the Duralie Rehabilitation Area is high 12 months after their installation. Compared to other nest box installation years, fauna occupancy in the Rehabilitation Areas was the most rapid. Additional nest box installations in the Rehabilitation Area may be beneficial, as the habitat is clearly deficient in tree cavities and roosting resources.

Further details are included in the DCM Annual Biodiversity Report.

8.3.1 Threats to Rehabilitation Completion

The DCM MOP Section 6 establishes the performance indicators and completion criteria for the rehabilitation of the DCM. The MOP Section 10 includes a description of intervention and adaptive management for threats to achieving the rehabilitation completion criteria. DCPL has successfully undertaken rehabilitation activities at the DCM since 2008 with the results of rehabilitation monitoring continuing to inform the effectiveness of rehabilitation methods and requirements for contingency measures. The Environmental Risk Assessments (SP Solutions, 2009) (HMS, 2017) identified potential issues and risks associated with rehabilitation at the DCM. These potential risks are identified and risk assessed which leads to improvement of rehabilitation practices and remediation as required.

A trigger, action, response plan (TARP) (MOP Table 15) has been developed based on identified threats to rehabilitation at the DCM.

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 9**). 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.

A review of the threats identified in the rehabilitation TARP (MOP Table 15) indicates the following issues may present a risk to the success of the DCM rehabilitation achieving the relevant rehabilitation completion criteria:

- Species diversity and/or density in rehabilitation areas does not correspond with reference site(s).
- Inadequate weed and pest animal control results in failure of rehabilitation area.

The recommendations in the rehabilitation monitoring report (**Section 8.3)** provide recommended maintenance and management measures to address these specific issues.

8.3.2 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* (Kleinfelder, 2021) 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.

8.4 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 to **Section 6.4** of this report and the Duralie Coal Mine Annual Biodiversity Report (DCPL, 2021) for a summary of works undertaken during the reporting period.

8.5 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 173 hectares of rehabilitation has been completed comprising Landform Establishment, Ecosystem Establishment and Ecosystem Sustainability.

Prior to the end of 2021, a further 22 hectares of bulk shaping (landform establishment) is scheduled to be finalised on the Clareval waste emplacement.

The rehabilitation target for end of 2022 calendar year will be established in the new Rehabilitation Management Plan.

During 2022, DCPL proposes to undertake rehabilitation of approximately 22 hectares of waste emplacement to Landform Establishment phase and an additional 5 hectares to Ecosystem Establishment phase. Furthermore, approximately 26 hectares of water infrastructure domain will be rehabilitated to Landform Establishment phase.

8.6 Development of the Final Rehabilitation Plan

8.6.1 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 is planning for the commencement of the mine closure phase (i.e. after the cessation of mining operations on 31 December 2021). A new MOP was prepared for the DCM during 2019 and was approved by the Resources Regulator on 27 February 2020. The new MOP reflects the proposed mining and rehabilitation activities for the 2-year period until the end of 2021 and also includes a detailed Mine Closure Planning Program.

DCPL is currently preparing revisions of the 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 next reporting period, DCPL will prepare a new Rehabilitation Management Plan (RMP) consistent with the requirements of the Resources Regulator Operational Rehabilitation Reform. The new RMP will incorporate 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 will be required to undertake final rehabilitation following the cessation of open-cut mining at the DCM. 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, identified in the 2017 ERA (MOP Section 3.1).

The majority of the assessments/studies required by the Mine Closure Planning Program have been completed progressively during the MOP term. The remaining components of the program will continue to be developed over the this MOP term.

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 have been established for the next reporting period and will be complied with by DCPL.

The Mine Closure Planning Program components and completion status/schedule for each component is provided in the MOP Table 13. The subsections below provide progressive updates on the key mine closure planning requirements for the DCM and the actions completed during the reporting period. A workshop to review and update the Mine Closure and Rehabilitation Risk Assessment is scheduled for the next reporting period.

8.6.2 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 status of the DCM upon completion of mining operations. As mining of the Clareval and Weismantel open pits will 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, with Auxiliary Dam No. 2 and the MWD being retained, however reduced in size.

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.

The NSW Resources Regulator completed a second TAP inspection regarding landform establishment at the DCM on 16 June 2021. The assessment focused on how the final approved landform is being established to achieve sustainable rehabilitation outcomes

The Resources Regulator provided a summary of observations and recommendations on 8 July 2021:

- Consider implementing contemporary landform design methodologies including geomorphic design principles and landform erosion modelling including water management structures.
- Develop a QA/QC process for the design and implementation of rehabilitated landforms. Including a signoff process.
- Validation and verification of long-term stability of all constructed landforms including erosion modelling.
- Confirmation of materials characterisation. Verification of waste material placement for long-term ARD control.
- Implement landform erosion monitoring linked to completion criteria.

The recommendations will be addressed in the mine closure risk assessment during the next reporting period and included in the preparation of the new Rehabilitation Management Plan and DCM Closure Plan.

8.6.3 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 previous 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 current reporting period the 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 MOP.

During the next reporting period DCPL will commence engagement with the Resources Regulator to seek verification of the final void design and confirmation of the proposed detailed completion criteria.

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 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 engage during the previous reporting to revise the site water balance and provide advice on the predicted post-mining final void equilibrium level.

The HEC final void water balance 2020 indicates a further review of the water balance will be required to be undertaken after further revision to the final landform design is completed to ensure satisfactory long-term objectives are met. This work will be undertaken in 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 2020 to determine the requirement for additional/alternate management measures other than that currently proposed. As indicate above, further revision of these studies will be required following the completion of the detailed final landform design. 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.

8.6.4 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 balance will be included in a revision of the DCM Water Management Plan.

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 final landforms 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 will be included in the Final Closure Plan.

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

8.6.5 Coal Shaft Creek Reconstruction Plan

Re-construction of the lower reaches of Coal Shaft Creek is required following the completion of mining activities. The Coal Shaft Creek Reconstruction Plan was prepared in December 2012 and provides a conceptual design for the creek reconstruction. The plan is included as an attachment to the DCM Water Management Plan. The final Coal Shaft Creek design will be included in the mine closure planning process as described in the MOP Section 8.4.2

The MOP requires an analysis to be conducted into the geotechnical, hydrological and hydraulic design of the final alignment focusing on long-term stability, seepage management and the creation of habitat. The outcomes of these analyses will inform the final detailed design of the post-mining alignment and reconstruction of Coal Shaft Creek.

During the 2019/20 reporting period HEC was commissioned to prepare a detailed final design of the Coal Shaft Creek re-alignment and reconstruction. The Coal Shaft Creek Reconstruction Plan will be prepared in consultation with the relevant authorities and stakeholders. The Coal Shaft Creek Reconstruction Plan will be described in the MOP and included as an attached to the Water Management Plan. The detailed CSC Reconstruction Plan will be finalised during the next reporting period.

8.6.6 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 MOP Section 3.3.4. 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.

The NSW Resources Regulator completed a TAP inspection regarding rehabilitation soils and materials management at the DCM on 10 September 2020. The assessment focused on progressive rehabilitation obligations as outlined in the Mining Operations Plan (MOP) and how materials and soils on site were being managed to achieve sustainable rehabilitation outcomes.

The site inspections identified no significant rehabilitation risks or compliance issues at the DCM.

The Resources Regulator provided a summary of observations and recommendations on 24 September 2020:

- Update the risk assessments for rehabilitation and mine closure.
- Develop an assurance process to validate monitoring and inspection results to ensure rehabilitation control measures are effective throughout the mining/rehabilitation lifecycle.
- Reporting of any delays to rehabilitation progress in the Annual Reviews.
- Conduct agricultural rehabilitation trials to demonstrate completion criteria.
- Assess and report on the requirement for clay resources at Duralie as part of the annual material balance survey.
- Review of the Rehabilitation Trigger Action Response Plan included in the MOP.

The above actions will be progressed during the next reporting period and incorporate in the Final Closure Plan.

8.6.7 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 MOP. Additionally, a removal strategy and decommissioning schedule is included in the MOP.

Further details regarding decommissioning activities during the reporting period is included in Section 8.1 of his report. During the 2018 reporting period the following infrastructure was decommissioned and relocated to the SMC:

- Muster area and bathhouse
- Field crib hut
- Fuel storage tanks
- Oil and grease storage tanks

The further development of the detailed decommissioning and demolition plan will be prepared during the next reporting period and included in the Final Closure Plan.

Decommissioning activities are expected to commence following the completion of mining operation on 31 December 2021.

8.6.8 Contaminated Lands Assessment

A contaminated land assessment will be undertaken once mining operations have ceased, during the mine closure phase. The assessment will focus on decommissioned infrastructure areas, including ROM coal handling and stockpiling facilities, workshops, fuel storage areas and chemical storage facilities.

The contaminated land assessment will be undertaken in accordance with the requirements of the NSW Contaminated Land Management Act, 1997 and in consideration of relevant guidelines, including the Managing Land Contamination Planning Guidelines SEPP 55–Remediation of Land (Department of Urban Affairs and Planning and EPA, 1998), Guidelines for Consultants Reporting on Contaminated Sites (OEH, 2011) and the National Environment Protection (Assessment of Site Contamination) Measure (National Environment Protection Council, 2013).

Any potential contamination areas will be remediated as recommended in the assessment, which is expected to involve excavation of the contaminated materials and disposal at an off-site licensed facility or on-site subject to relevant approvals being obtained. The remediation of any identified contaminated land would be undertaken in conjunction with the infrastructure decommissioning plan.

8.6.9 Mine Water Dams Decommissioning

The Main Water Dam, Auxiliary Dam 1 and Auxiliary Dam 2 are all declared under the Dams Safety Act 2015. The Dams Safety Act 2015 requirements came into force during the reporting period following

a transition period between 2019-2021. The Dam Safety Act 2015 imposes new requirements for declared dam owners.

Management plans for the declared dams are combined into single documents. The DCM Prescribed Dams Operation and Maintenance Manual was updated and approved by the DSC during 2018. The Prescribed Dams Safety Emergency Plan (DSEP) was updated in consultation with the SES and approved by the DSC during 2017.

DCPL is required to prepare a strategy for decommissioning of the mine water dams or for integration with the final land use. Additionally, DCPL is required to prepare a strategy for transferring mine water from the prescribed dams back to the final voids following the completion of mining activities.

During the reporting period, no water was transferred from the open cuts to the declared dams. Mining in the Clareval Pit has been finalised and the Clareval Pit is now available for long-term water storage. Accordingly, DCPL has engaged ATC Williams and prepared plans for the decommissioning of the declared dams. The conceptual decommissioning plans were submitted to NSW Dam Safety in 2019 who have requested an independent peer review of the proposed strategy. During the reporting period Norm Himsley was endorsed by Dam Safety NSW to peer review the decommissioning strategy. Following the independent review a detailed Duralie Dams Decommissioning Strategy (ATC Williams, 2021) was prepared by ATW Williams and the plans were resubmitted to NSW Dam Safety for approval.

The decommissioning strategy proposes that Auxiliary Dam 1 will be decommissioned and will not form part of the DCM final landform, while Auxiliary Dam 2 and the MWD will be reduced in size and retained for beneficial use by a future landholder. The approach for Auxiliary Dam 2 and the MWD is to reduce the capacity of the dams such that under a dam break scenario, the consequence category would be considered Low, thereby having no ongoing regulated status (ATC Williams, 2021).

AD1 was dewatered during February 2018 and decommissioned during 2020 with the structure completely removed. AD2 is planned to be dewatered during the next reporting period and decommissioning works will commence following approval of the proposed strategy by NSW Dams Safety. Further detail regarding the decommissioning of the declared dams is included in the mine closure planning program in Section 8.5.

8.6.10 EMPs, Post-Closure Monitoring and Maintenance Program

The development of the post-closure monitoring and maintenance program is described in Section 8.11 of the MOP.

DCPL is currently preparing revisions of the 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 next reporting period, DCPL will also prepare a new Rehabilitation Management Plan (RMP) consistent with the requirements of the Resources Regulator Operational Rehabilitation Reform. The new RMP will incorporate 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.

8.6.11 Stakeholder Consultation, Community & Human Resources Strategies

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

- Stakeholder Consultation Strategy
- Community Engagement Strategy, including Socio-economic impact assessment
- Human Resources Strategy

The above strategies are described conceptually in Section 8 of the MOP. The strategies will be further developed and incorporated into the Final Closure Plan. 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 $767,000 since commencing in 2010 and during 2021 a total of $84,200 in grants was approved. The community groups to receive grants in 2021 were:

Community Support Program 2021 Recipients	Project Description
Stroud Neighbourhood Children's Cooperative	Installation of Safety Fencing, Essential Drainage and Landscaping
Gloucester Pre-School Incorporated	Community Supported Playgroup
Gloucester Country Club	Stratford Coal Super Sevens Golf Competition 2021
Stratford Public School	Stratford Public School iPads for Students
Stratford Public School P & C	School Uniforms and Student Activities
Barrington Public School	Barrington Public School Multilit Program
Booral Rural Fire Brigade	Booral RFS Media Wall - Interactive Training and Engagement
Stroud Cricket Club	Cricket Pitch Upgrade and Transition for Sports
MidCoast Science & Engineering Challenge Committee	MidCoast Science & Engineering Challenge and Discovery Days 2021
Gloucester Agricultural, Horticultural & Pastoral Assoc.	Gloucester Show 2021 - Educational & Interactive Activities for the Younger Show Audience
Stroud Community Lodge Inc	High Care Beds for residents at Stroud Community Lodge
St Joseph's Primary School	Safe School Access - Fencing and gate improvements. Playground seating.
Worimi First People Aboriginal Corporation	Cultural Weaving Workshops
Stroud Road Community Hall & Progress Assoc	Stroud Road Spring "Bash 'n Bang" 2021
Stroud Public School P&C Association	Stroud Public School Laptops for Students
Gloucester Public School P & C Assoc	New Seating in Peace Park
Individual Ability Support Inc	Construction of Nest Boxes for Stratford Coal Biodiversity Areas
Stroud Rodeo Association	2021 Stroud Rodeo and Campdraft - Major Sponsor
Stroud & District Country Club	Stroud Country Club Family Fun Day and Mini Golf Day
Gloucester Mountain Man Tri-Challenge Inc.	2021 Gloucester Mountain Man Tri Challenge - 30th Year
Stroud Show Association	2021 Stroud Show - Major Sponsor

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 2021, $22,500 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 $795,700 to locally based community and training initiatives via the Education Support Program. During that time, the funding has support over 200 tertiary students, 135 apprentices and 55 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 2021 CCC meetings have reverted to being held quarterly in line with the recommencement of mining operations. Three CCC meetings were held during the reporting period in August 2020, February 2021 and May 2021.

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
- Yancoal community support program

- Agricultural rehabilitation possibilities
- Stratford Extension Project updates and transition from Duralie Mine
- Triennial Independent Environmental Audit.

The Committee continued to hold biannual meetings throughout 2020 as mining operations ceased at Duralie in late 2018, however this has reverted to quarterly in 2021. The February and May 2021 meetings were carried out with normal face to face attendance. However, the August 2020 meeting was held via video/teleconferencing with only one community member able to participate remotely. The meeting proceeded via video conferencing with the Council representatives, Duralie Coal personnel, one community member and the Chairperson.

Regular site inspections have been undertaken during the CCC meeting including viewing of the rehabilitation area and biodiversity offset area. 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 5 March 2021 (**Appendix 5**).

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 9.1**:

Table 9.1 – Community Complaints Summary

Complaint Category	2016/17	2017/18	2018/19	2019/20	2020/21
Noise	3	0	0	0	0
Blasting	0	0	0	0	0
Air Quality	14	1	4	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	0
Total Complaints	**17**	**1**	**4**	**0**	**0**

No complaints were received during the 2020/21 reporting period relating to the DCM operations.

9.3.1 Liaison and Complaint Resolution

DCPL aims to inform the community of its activities and consult with the community in an open and honest manner and address complaints/conflicts and consult to achieve mutually acceptable outcomes.

In accordance with the Project Approval Conditions, DCPL is required to establish and maintain a complaint handling and response procedure. DCPL operates a system to receive, handle, respond to and record complaints or information requests relating to operation of the DCM which is described in the EMS.

DCPL operates a dedicated community information 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 and Dungog Chronicle) on a six-monthly basis.

Designated DCPL staff, when notified of a complaint, determine an appropriate response on the basis of the nature of the complaint during business hours. This may involve a site visit/inspection, liaison with personnel on site or other appropriate action. After business hours, all complaints and operations are reviewed as soon as practicable by the open cut examiner and responded to by DCPL staff during business hours.

All complaints received and responses taken in relation to each complaint are recorded in a Complaints Register. The Complaints Register is tabled at each Community Consultative Committee meeting for the period covered since the last Committee meeting and is included in **Appendix 5.** The complaints register is also made available on the Duralie Coal website.

9.4 Employment Status and Demography

At the end of the reporting period (i.e. June 2021), the total number of FTE's (staff/employees/contractors) employed at the DCM was 38, including 10 DCPL employees (shared with SMC) and 28 contractors. During the reporting period 2 environment & community representatives were employed and shared with the nearby Stratford Mining Complex.

During 2021, mining operations at the DCM recommenced in the Weismantel Pit. Mining operations are currently undertaken by a contractor fleet which was mobilised to the DCM in February 2021. . Ongoing rehabilitation works at the DCM have been undertaken by Ditchfield contractors.

In addition to direct permanent employment at the mine, on the basis of a conservative employment multiplier of one mine site job generating one job within the general community, up to 38 (full time equivalent) jobs are expected to have been provided in supporting services. On the basis of a review of employees' living location, 52% of mine employees resided within the greater local area (defined as being bounded by Stroud, Gloucester and Dungog).

9.5 Employee Environmental Awareness Training

DCPL recognises the importance of establishing, developing and maintaining a risk-aware, trained, and competent workforce at its operations to ensure a high standard of environment and community management.

DCPL environmental & community management objectives include:

- ensuring 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;
- providing all employees/contractors with the knowledge, skills and equipment necessary to meet their environmental obligations; and
- promoting an awareness and concern for good environmental management amongst all employees/contractors.

New employees and contractors working at site are provided with information on environmental and community issues as part of Stratford Coal induction training which is updated periodically. This includes elements such as the Pollution Incident Response Management Plan and reporting obligations of personnel and the management of environmental incidents. Ongoing environmental awareness training is also undertaken with staff and employees periodically.

During the reporting period employee and contractor training included presentations on:

- 2021 Internal Environmental Assurance Audit - A presentation was provided to the site managers and supervisors on the findings presented as opportunities for improvement.
- Duralie recommencement 2021: Relevant information regarding environmental management requires was provided to contractors prior to recommencing mining operations. Information was also provided regarding blast management for the recommencement of blasting activities.
- Aboriginal heritage sites: A presentation was provided to all managers and supervisors regarding the management of aboriginal heritage at the DCM.

10.0 Independent Environmental Audit

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. The purpose of the audit was to review compliance over the audit period 2018-2020 with the conditions and obligations of the DCM environmental licences, approvals and management plans.

The scope of this IEA complied with the requirements of the NSW DPIE Independent Audit Post Approval Guidelines, May 2020. DCPL sought the Secretary's endorsement for the audit team to undertake the IEA. The Secretary approved the audit team on 23 October 2020.

The DCM 2020 Independent Environmental Audit (Barnett & May, 2020) was submitted to DPIE on 2 March 2021 and is available on the Duralie Coal website.

The IEA 2020 presents a summary of compliance with the DCM statutory requirements. Non-compliances identified during the site inspection, interviews and document reviews are recorded in detail in the Compliance Registers in the IEA 2020 Appendix A and are summarised in Table 6. Recommendations have been made by the lead auditor to address all identified Non-Compliances. The IEA 2020 identified a total of 20 non-compliances and associated recommendations (9 Administrative, 11 Low).

The key findings/recommendations in the IEA related to the following matters:

- Shuttle train operations;
- Management of odours;
- Incident reporting; and
- Management Plan revisions.

DCPL received correspondence from DPIE dated 25 June 2021 confirming DPIE considers that the IEA report generally satisfies the reporting requirements of PA 08_0203. DPIE also requested DCPL to include a status update for all actions provided in the RAR in the next Annual Review.

DCPL's responses to the recommendations contained in the IEA 2020 Report are included in **Appendix 8** of this report. A status update on DCPL's progress against these recommendations will be included in the next AR.

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 was one identified reportable incident at the DCM in accordance with the Project Approval 08_0203 and EPL 11701. An uncontrolled discharge of mine related water (rehabilitated area runoff) from sediment dam VC1 (EPL 11701 Monitoring Point 27) reporting to Coal Shaft Creek occurred on Sunday 21 March 2021 at DCM as a result of a significant rainfall event exceeding design capacity. This incident was reported in accordance with the PIRMP and the PA 08_0203 and no further action has been requested.

A non-compliance was recorded as annual mobile plant sound power monitoring was not undertaken at the DCM during the reporting period. The same non-compliance was reported in the previous reporting period and was subject to a Show Cause Notice received on 13 August 2021, followed by a Warning Letter issued by DPIE on 09 September 2021. Under the provisions of Schedule 2 condition 4 of the PA 08_0203, the Department requested that Duralie Coal submits a revised Noise Management Plan for the Secretary's approval. The revised NMP will be submitted prior to 3 November 2021.

On 13 August 2021, DPIE issued a Show Cause Notice which refers to a non-compliance self-reported in the Duralie Coal Mine Annual Review 2019/20, An administrative non-compliance was recorded against the current requirements of the WMP as no ecotoxicity monitoring was undertaken during the period July 2019 to June 2020. A warning letter was issued by DPIE on 06 September 2021. Under the provisions of Schedule 2 condition 4 of the PA 08_0203, the Department requested that Duralie Coal submits a revised Water Management Plan for the Secretary's approval. The revised WMP will be submitted prior to 29 October 2021. The revised WMP reflecting the changes to environmental impacts, mitigation measures and monitoring programs at the DCM was submitted to DPIE on 8 September 2021. Notwithstanding, an administrative non-compliance was also recorded as no ecotoxicity monitoring was undertaken during the period July 2020 to June 2021.

A non-compliance was recorded as riparian vegetation monitoring was not undertaken at the DCM during the reporting period. The application of mine water via irrigation ceased in 2018 and the potential impact pathway on the health of Mammy Johnsons River including riparian vegetation no longer exists. The riparian vegetation monitoring program is no longer required in the absence of irrigation. Notwithstanding, an administrative non-compliance has been recorded against the current requirements of the WMP.

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 and. Mine closure planning directives have been established for the next reporting period and will be 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 8** of this report.

12.0 Activities Proposed in the Next AR Period

DCPL will continue mining operations 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. Accordingly, DCPL is planning for the commencement of the mine closure phase (i.e. after the cessation of mining operations on 31 December 2021).

DCPL is currently preparing revisions of the 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 next reporting period, DCPL will prepare a new Rehabilitation Management Plan (RMP) consistent with the requirements of the Resources Regulator Operational Rehabilitation Reform. The new RMP will incorporate a Mine Closure Plan for the DCM consistent with the Mine Closure Planning Program described in Section 8 of the MOP.

The following environmental targets have been set for the next 12 months:

- The removal of overburden and the extraction, processing, handling, storage and transportation of coal at the DCM is proposed to be finalised prior to 31 December 2021.
- Mining and rehabilitation activities will be implemented in accordance with the timing in stage plans in the DCM MOP. Progressive rehabilitation works to satisfy DEP EA and MOP nominated rehabilitation targets;
- DCPL will prepare a new Rehabilitation Management Plan (RMP) consistent with the requirements of the Resources Regulator Operational Rehabilitation Reform. The new RMP will incorporate a Mine Closure Plan for the DCM consistent with the Mine Closure Planning Program described in Section 8 of the MOP.
- DCPL will prepare revisions of the EMPs to reflect the current stage of operations and to describe anticipated mine closure activities.
- Continue to meet the environmental management, monitoring and reporting requirements in accordance with the Project Approval conditions.
- Progress biodiversity offset works in accordance with the BMP including full implementation of the revegetation works.
- Maintain low level of complaints and non-compliances.

13.0 References

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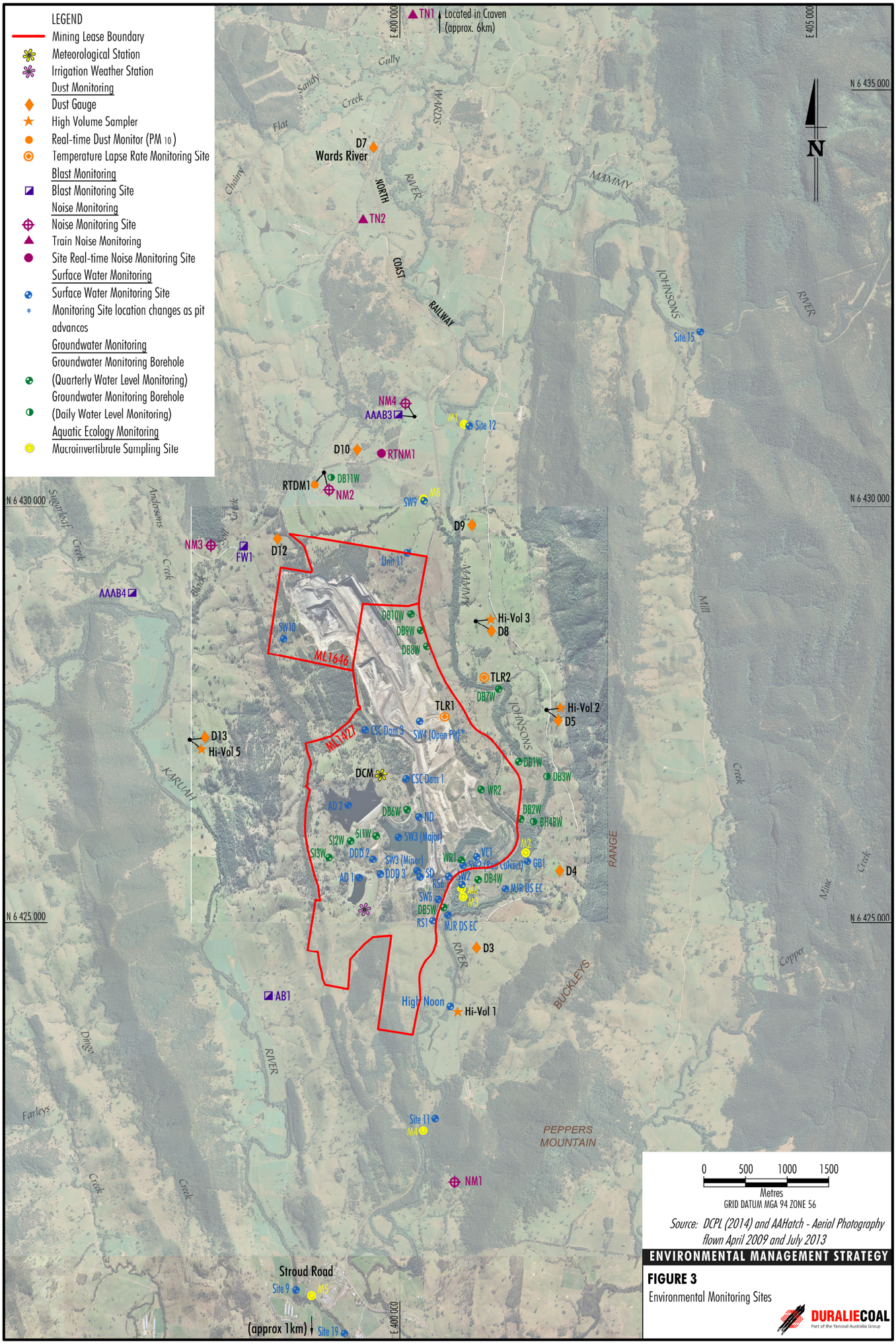
Appendix 1:

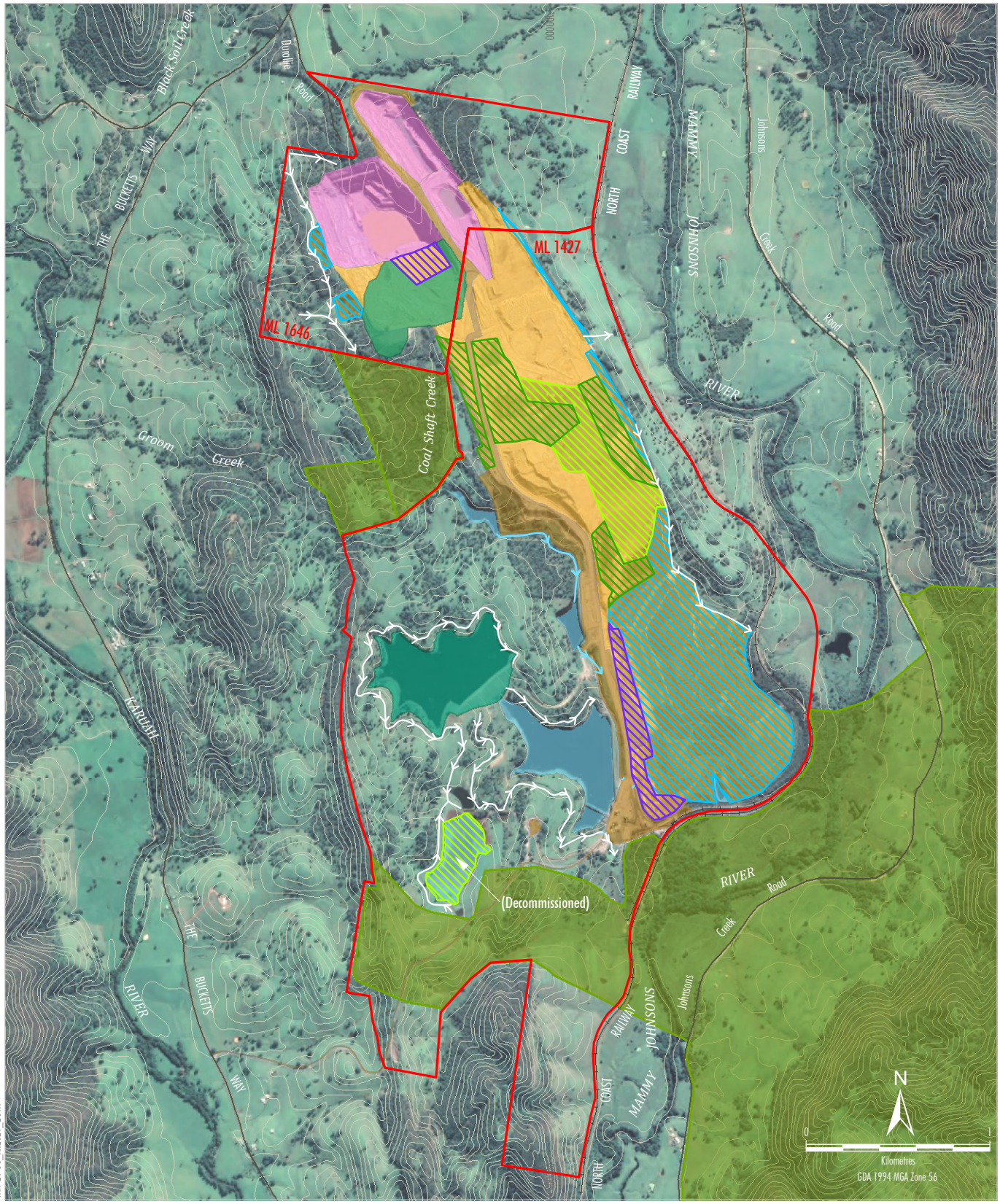
- **Site Locality Plan**
- **Project General Arrangement**
- **Monitoring Locations**
- **Disturbed and Rehabilitated Land Plan.**

GCL-10-13 EMS 2017_101A

GCL-10-13 EMS 2017_102A



GCL-10-13 EMS 2017_103A



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LEGEND

- Mining Lease Boundary
- Up-catachment Diversion
- Culvert
- Indicative Coal Shaft Creek Diversion
- Proposed Rehabilitation for 2022

Primary Domains

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

Rehabilitation Phase - Secondary Domain

- Landform Establishment - Woodland/Open Forest
- Ecosystem and Land Use Establishment – Pasture/Scattered Trees
- Ecosystem and Land Use Establishment – Woodland/Open Forest
- Ecosystem and Land Use Sustainability - Woodland/Open Forest

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

DURALIECOAL
Part of the Yancoal Australia Group

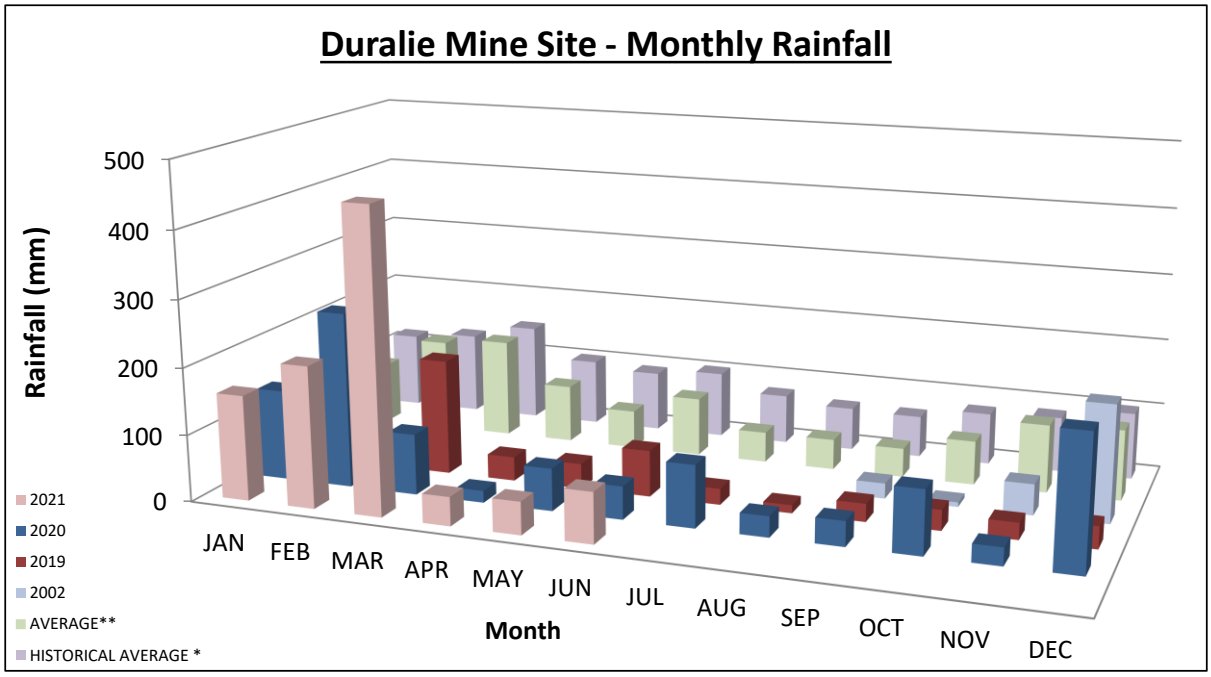
DURALIE COAL MINE 2021 ANNUAL REVIEW

Mining and Rehabilitation Areas

Figure 4

Appendix 2:

Meteorological Monitoring



*Stroud + Duralie 1889 to 2010 (inclusive)

**Duralie Mine 2002 – 2021 (inclusive)

Figure 2-1: Monthly Rainfall for 2019 to 2021 and Historical Averages

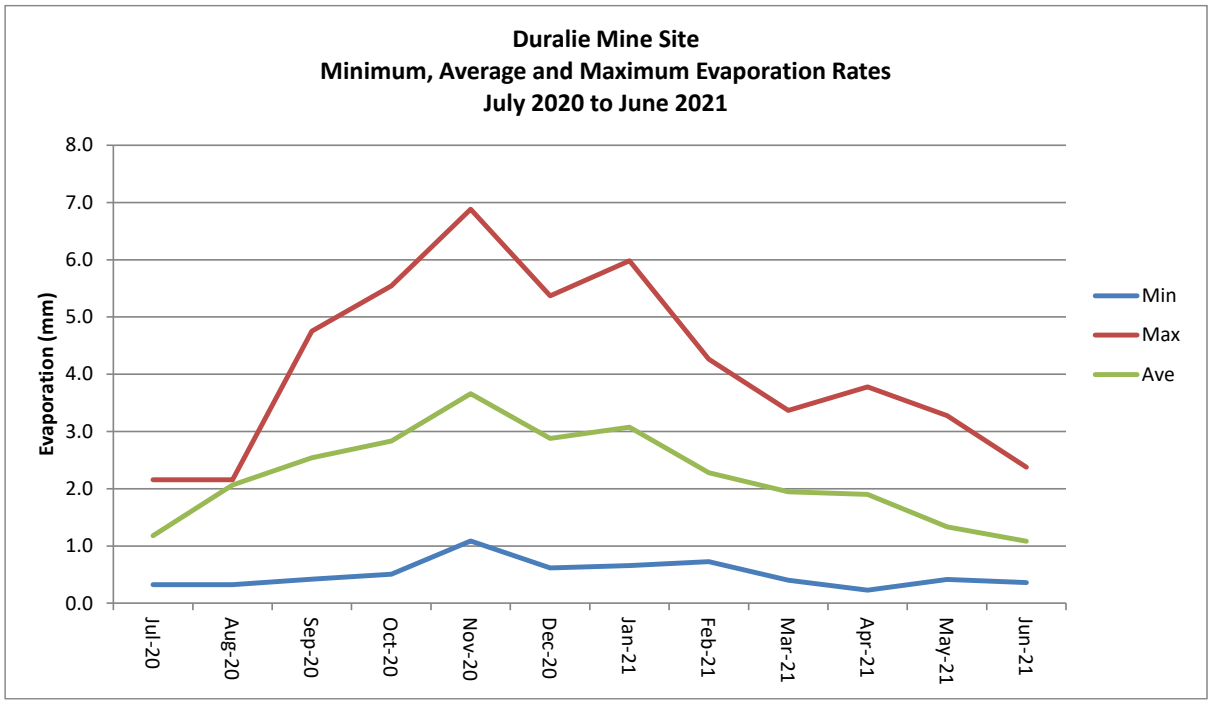


Figure 2-2: Minimum, Maximum and Average Evaporation Rates During the Reporting Period

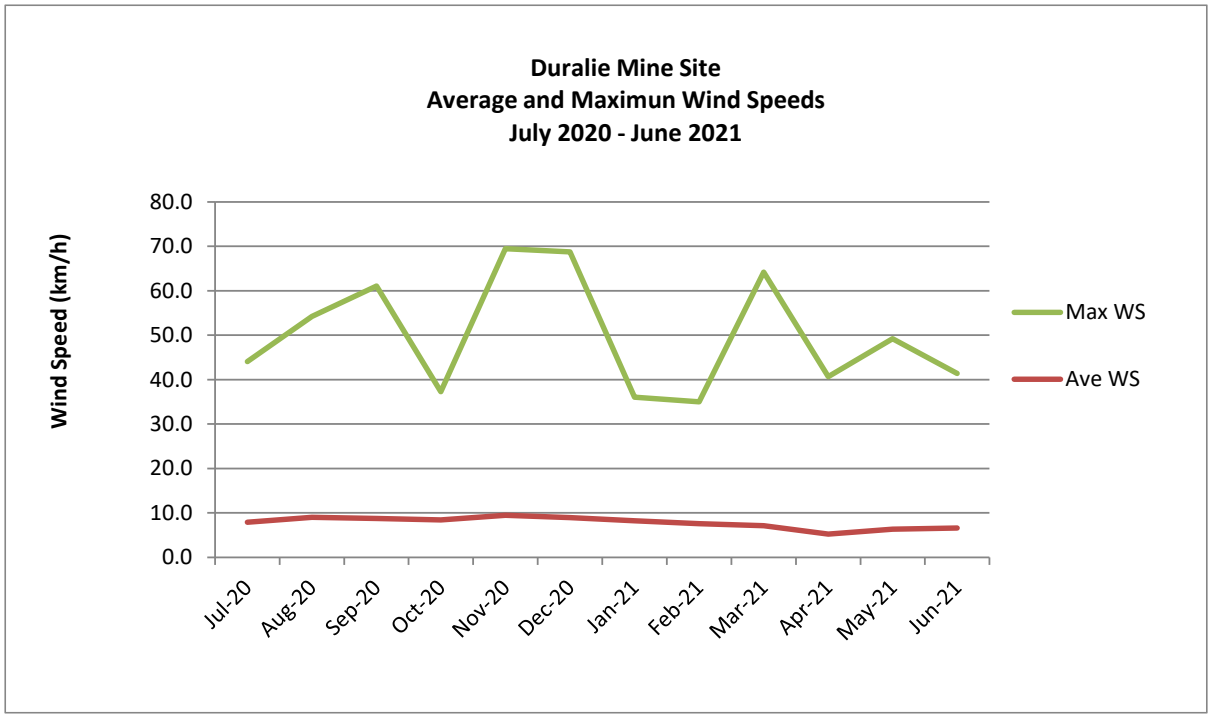


Figure 2-3: Maximum and Average Wind Speeds During the Reporting Period

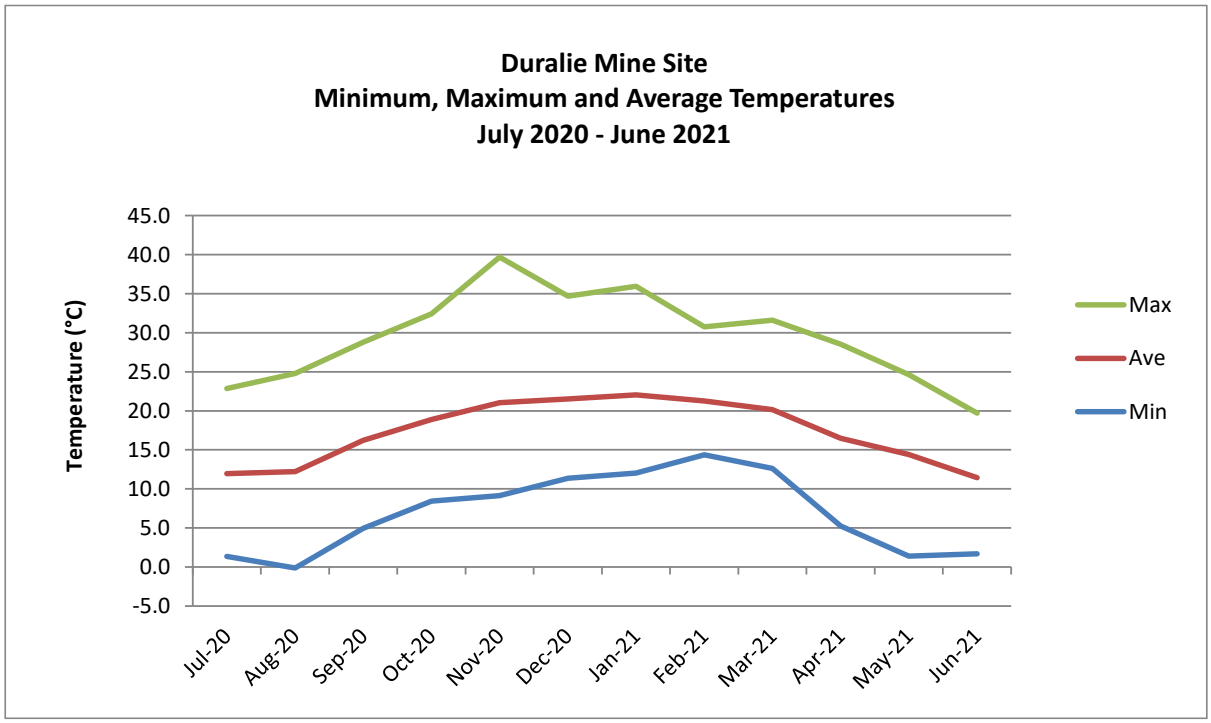


Figure 2-4: Minimum, Maximum and Average Temperatures During the Reporting Period

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 Results

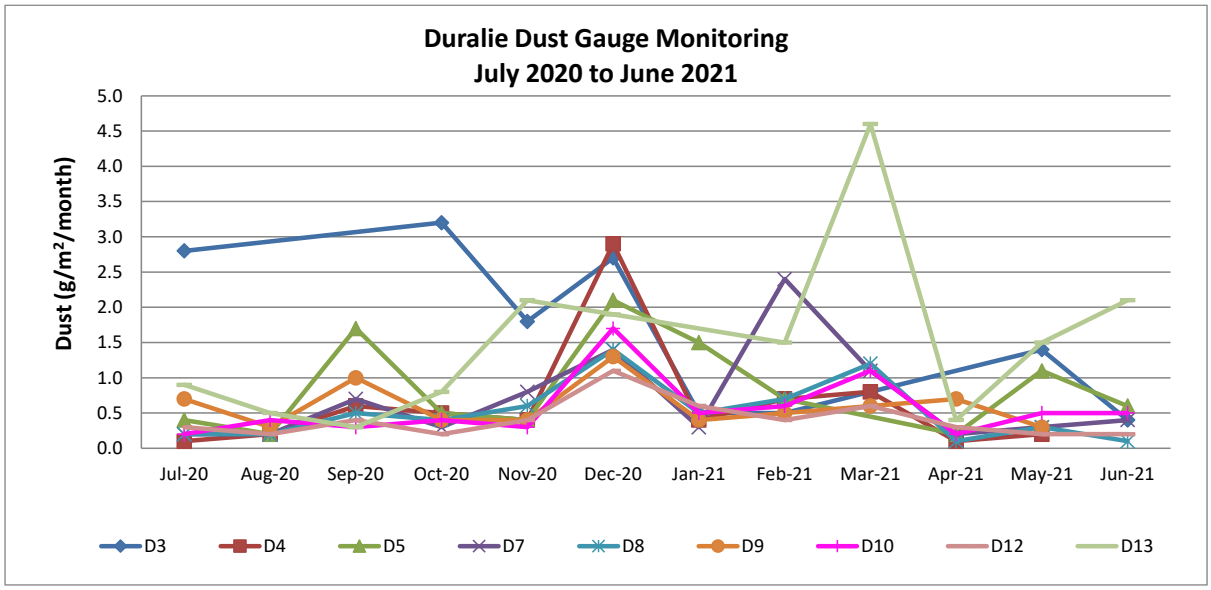


Figure 3-1: Monthly Depositional Dust Monitoring Results (minus contaminated results) during the Reporting Period

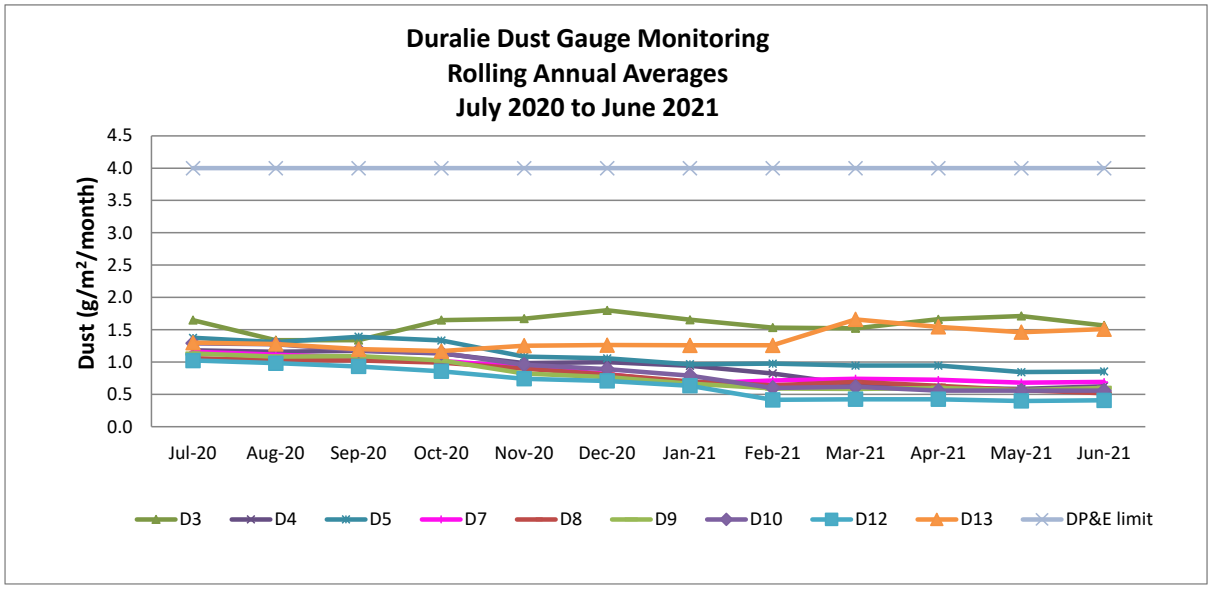


Figure 3-2: Rolling Annual Average Depositional Dust Monitoring Results (minus contaminated results) during the Reporting Period

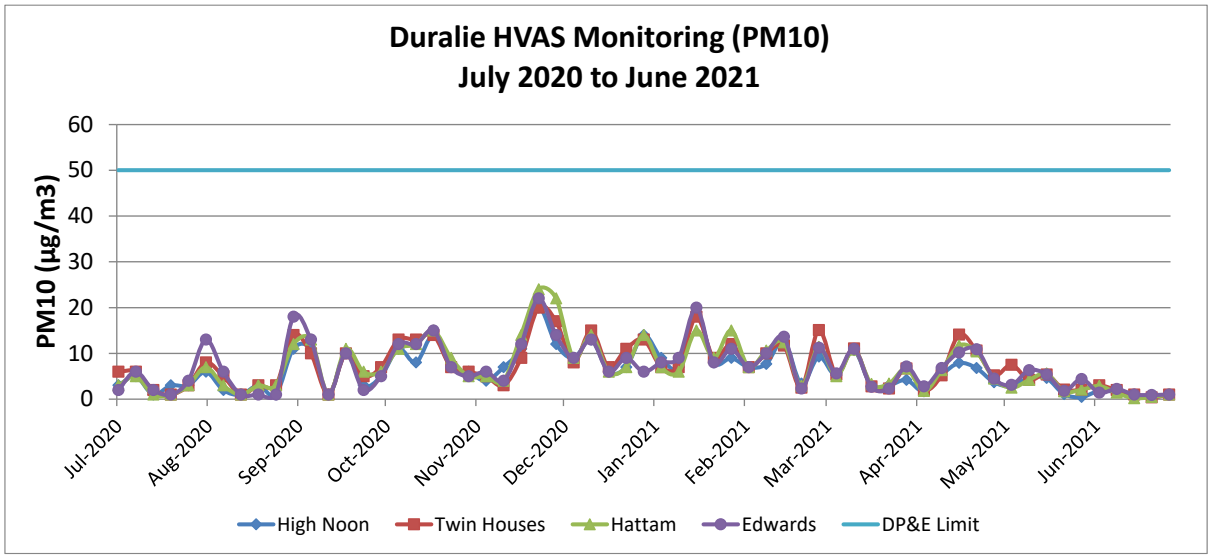


Figure 3-3: High Volume Air Sampling (PM_{10}) Results during the Reporting Period

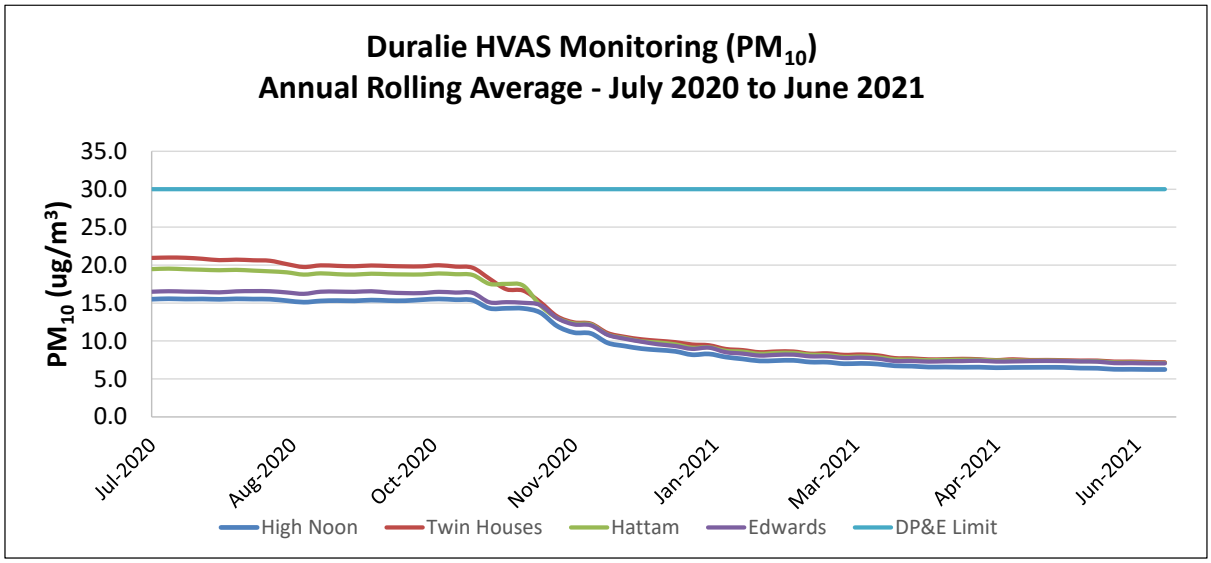


Figure 3-4: Rolling Annual Average HVAS (PM_{10}) Results during the Reporting Period

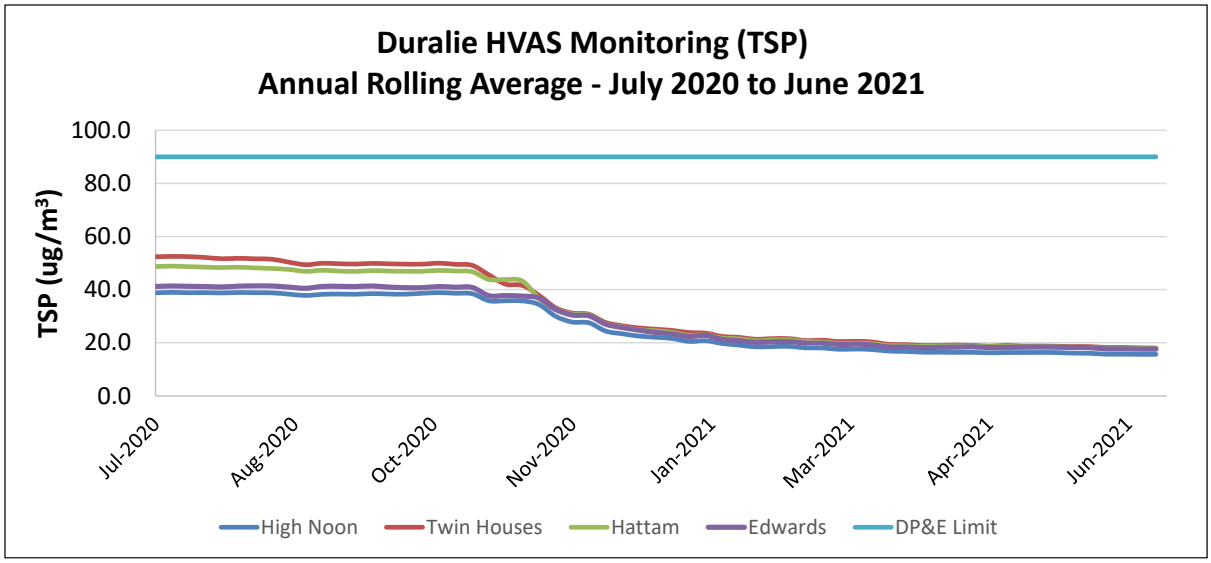


Figure 3-5: Rolling Annual Average HVAS (TSP) Results during the Reporting Period

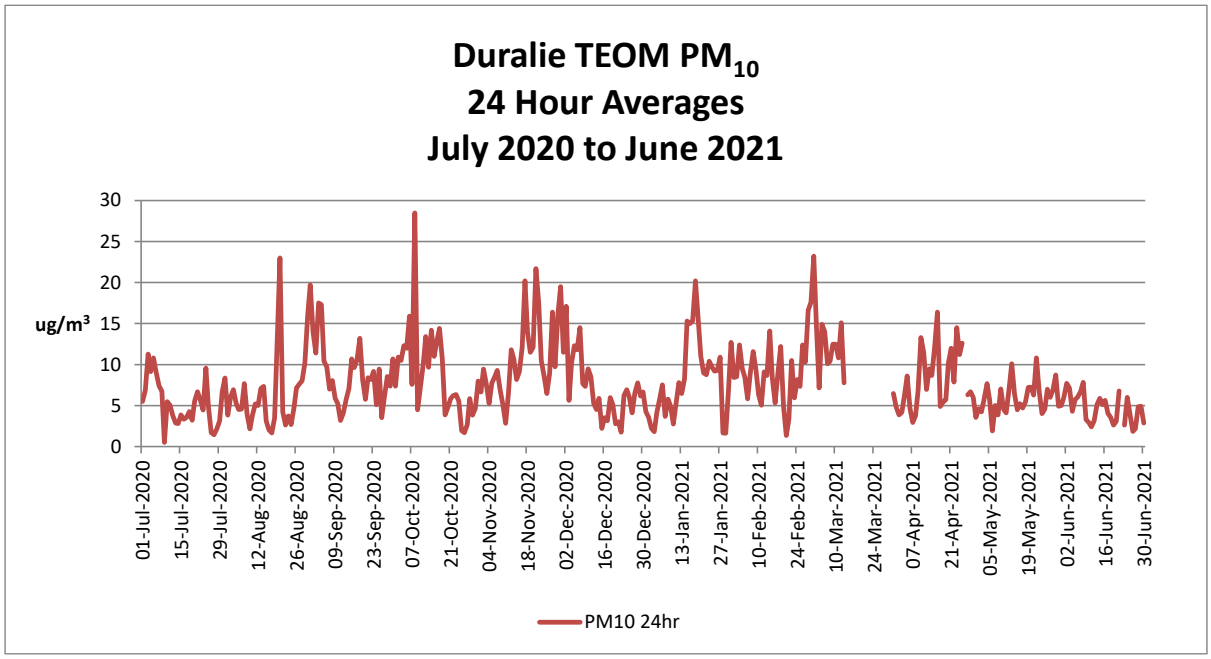


Figure 3-6: Real Time Dust Monitoring (PM_{10}) Results during the Reporting Period

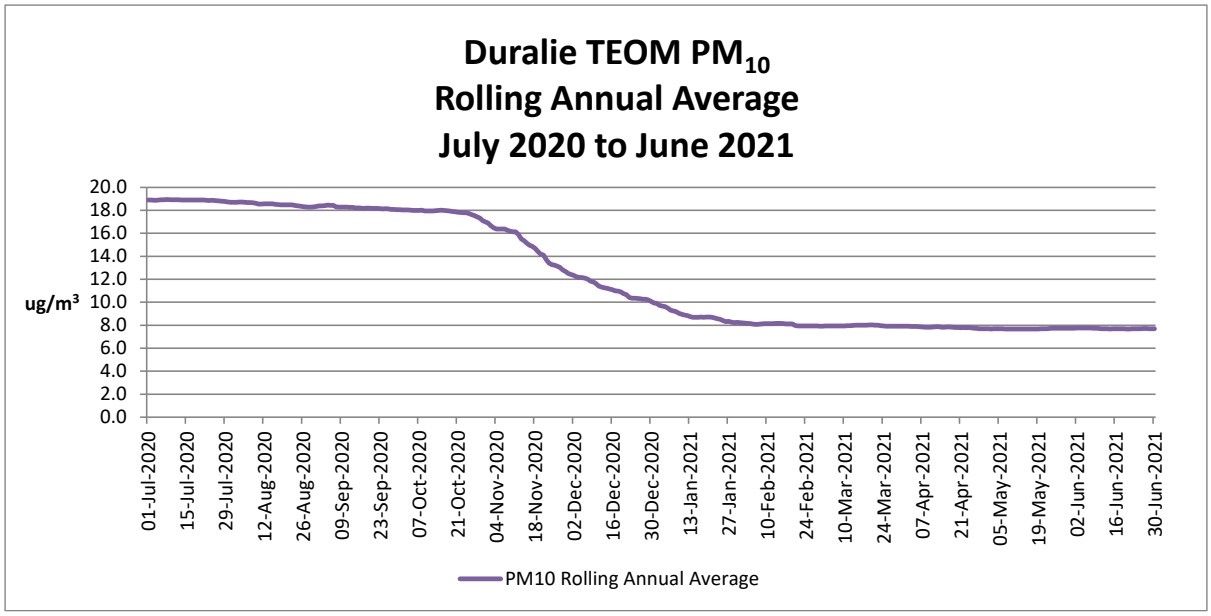


Figure 3-7: Rolling Annual Average TEOM (PM_{10}) Results during the Reporting Period

DCPL Real-time Dust Monitoring Response Register

**Note: Alarming operational as of January 2014.*

**Note: For the baseline data from the 12 month period April 2012 to April 2013, no exceedances of the 24-hour average criterion of 50 µg/m³ were recorded.*

Alarm		Validate Data	Source Identification	Management Strategy	Review
Alarm Date/Time	**What Performance Indicator has been exceeded?**	**Assess potential for influence of extreme activities or irregular events non-mine related.**	**Visually assess if excessive dust being generated and identify source?**	**Management measure taken, i.e. Additional mitigation measures applied or ceasing of activities.**	**Review of real-time data to determine whether the management strategy has resulted in a discernible dust reduction.**
2020-08-20,01:44:50	PM10>100=116.1 Hi	Wind speed gusting upwards of 50km/h at time of alarms. Westerly wind direction consistent. Alerts and very similar results seen at Craven Stratford and Duralie indicating a widespread regional air quality issue. No mining operations.	N/A	N/A	N/A
2020-08-20,02:10:07	MED24H=25.39M/ug Hi	Wind speed gusting upwards of 50km/h at time of alarms. Westerly wind direction consistent. Alerts and very similar results seen at Craven Stratford and Duralie indicating a widespread regional air quality issue. No mining operations.	N/A	N/A	N/A
2020-08-20,02:51:29	PM10>25=25.3 Hi	Wind speed gusting upwards of 50km/h at time of alarms. Westerly wind direction consistent. Alerts and very similar results seen at Craven Stratford and Duralie indicating a widespread regional air quality issue. No mining operations.	N/A	N/A	N/A
2020-10-08,12:47:53	DMC=342.56M/ug	Calibration and filter changes.	N/A	N/A	N/A
2020-10-08,15:59:55	MED24H=25.44M/ug	Poor air quality observed throughout valley. Mining not a contributing factor Prevailing wind coming from North of DCM.	N/A	N/A	N/A
2020-10-08,20:11:41	PM10>25=25.0	Poor air quality observed throughout valley. Mining not a contributing factor Prevailing wind coming from North of DCM.	N/A	N/A	N/A

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
15-Jul-20	Discharge	Walked in - river too high	**6.9**	443	30	56	17	34	9	83	45	16	13	0.49	0.186	0.008	1.54	<0.001
26-Jul-20	Discharge	Steady flow, turbid, brown	7.3	227	58		42											
27-Jul-20	Discharge	Fast flow, light brown	7.9	165	50		49											
28-Jul-20	Discharge	Slow flow, clear, light brown	7.4	445	13		<5											
29-Jul-20	Discharge	Slow flow, clear	7.7	458	12		8											
30-Jul-20	Discharge	Fast flow, clear, light brown	7.4	457	10		<5											
31-Jul-20	Discharge	Steady flow, clear, light brown	7.5	464	9		<5											
11-Aug-20	Discharge	Trickle, slightly turbid, Light brown	7.3	339	22	NR	7	59	9	45	36	14	12	0.81	0.072	0.011	1.32	<0.001
30-Sep-20	Monthly	Trickle, clear, light brown	7.1	**576**	22	51	13	136	4	56	116	21	18	0.04	0.917	<0.005	3.56	<0.001
28-Oct-20	Monthly	No flow																
30-Oct-20	Discharge	Slow flow, turbid, grey	**6.8**	413	73	65	34	32	16	103	36	14	11	1.73	0.152	0.019	1.9	0.002
27-Nov-20	Monthly	No flow																
16-Dec-20	Discharge Event	Slow flow, slightly turbid, light brown	**6.7**	343	34	32	28	48	8	8	53	12	7	0.14	0.659	<0.005	2.23	<0.001
22-Dec-20	Discharge	Slow flow, slightly turbid, light brown	**7.0**	247	37		6											
23-Dec-20	Discharge	Slow flow, clear, light brown	7.3	456	4		<5											
24-Dec-20	Discharge	Fast flow, clear, light brown	7.1	155	14		9											
1-Jan-21	Discharge	brown	**7.1**	371	20		9											
4-Jan-21	Discharge	Fast flow, slightly turbid and brown	**6.6**	101	75		58											
5-Jan-21	Discharge	Fast flow, slightly turbid and brown	7.2	82	79		60											
6-Jan-21	Discharge	Slow flow, slightly turbid and brown	7.5	278	49		27											
7-Jan-21	Discharge	Steady flow, slightly turbid and brown	7.5	205	47	92	16	55	6	14	21	8	7	1.55	0.051	0.014	1.64	0.002
8-Jan-21	Discharge	Slow flow, slightly turbid and brown	7.6	212	49		11											
9-Jan-21	Discharge	Slow flow, slightly turbid and brown	7.4	217	40		<5											
10-Jan-21	Discharge	brown	7.4	232	33		<5											
11-Jan-21	Discharge	Slow flow, slightly turbid and brown	7.3	237	30		<5											
12-Jan-21	Discharge	Slow flow, clear and light brown	7.2	179	30		21											
13-Jan-21	Discharge	Slow flow, slightly turbid and brown	7.3	293	23		<5											
14-Jan-21	Discharge	brown	7.2	273	20		<5											
27-Jan-21	Monthly	brown	**6.9**	402	12	24	50	130	13	7	29	18	14	0.27	1.570	0.021	8.15	<0.001
14-Feb-21	Discharge Event	brown	**7.1**	297	23	39	22	45	7	19	38	11	8	0.25	0.091	0.005	1.5	<0.001
16-Feb-21	Discharge	Steady flow, clear, brown	**6.9**	138	45		32											
17-Feb-21	Discharge	Slow flow, clear, light brown	7.5	360	57		14											
18-Feb-21	Discharge	Steady flow, slightly turbid and brown	7.2	155	26		5											
19-Feb-21	Discharge	Slow flow, turbid, light brown	7.5	212	30		22											
20-Feb-21	Discharge	brown	7.3	254	21		19											
21-Feb-21	Discharge	Steady flow, slightly turbid, brown	7.4	197	91		48											
22-Feb-21	Discharge	Steady flow, clear, light brown	**6.9**	139	25		15											
23-Feb-21	Discharge	Slow flow, slightly turbid, brown	7.3	190	55		18											
24-Feb-21	Discharge	Slow flow, slightly turbid, brown	7.4	191	58		33											
25-Feb-21	Discharge	Steady flow, clear, light brown	7.7	182	50		7											
26-Feb-21	Discharge	Slow flow, slightly turbid, light brown	7.4	219	42		<5											
27-Feb-21	Discharge	Slow flow, slightly turbid, brown	7.6	220	40		15											
28-Feb-21	Discharge	Slow flow, slightly turbid, brown	7.4	217	42		8											
1-Mar-21	Discharge	Slow flow, slightly turbid, light brown	7.5	215	30		11											
2-Mar-21	Discharge	Steady flow, slightly turbid, brown	7.6	236	24		<5											
3-Mar-21	Discharge	Steady flow, slightly turbid, brown	7.6	250	20		<5											
15-Mar-21	Discharge Event	Slow flow, slightly turbid, brown	**6.9**	254	33	67	18	42	4	39	20	12	10	0.52	0.107	0.014	1.48	<0.001
16-Mar-21	Discharge	brown	7.3	249	26		<5											
17-Mar-21	Discharge	Steady flow, clear, light brown	7.6	266	15		8											
18-Mar-21	Discharge	Steady flow, clear, light brown	7.5	275	14		<5											
19-Mar-21	Discharge	Fast flow, turbid, brown	7.1	136	**229**		**156**											
20-Mar-21	Discharge	flooded	**7.0**	78	**204**		**129**											
21-Mar-21	Discharge	Fast flow, turbid, brown	**7.0**	54	**300**		**138**											
22-Mar-21	Discharge	Turbid, light brown	**6.9**	94	**187**		**119**											
23-Mar-21	Discharge	Fast flow, turbid, light brown	**7.0**	106	**177.0**		**103**											
24-Mar-21	Discharge	Fast flow, turbid, brown	**7.0**	92	**154.0**		**82**											
25-Mar-21	Discharge	brown	**6.9**	98	**133.0**		60											
26-Mar-21	Discharge	Steady flow, slightly turbid, brown	**7.0**	115	101.0		38											
27-Mar-21	Discharge	Steady flow, slightly turbid, brown	7.3	120	100.0		36											
28-Mar-21	Discharge	brown	**6.2**	172	73.1		16											
29-Mar-21	Discharge	brown	7.3	139	60.6		8											
30-Mar-21	Discharge	Slow flow, slightly turbid, light brown	**6.7**	175	52.4		7											
31-Mar-21	Discharge	brown	7.5	160	64.5		13											
1-Apr-21	Discharge	brown	**4.5**	200	36.2		6											
28-Apr-21	Monthly	Slow flow, clear, light brown	**7.1**	247	14.9	54	6	6	58	6	35	23	12	**9**	0.270	**0.252**	<0.005	2.25
7-May-21	Discharge	Steady flow, turbid, light brown	**6.8**	207	53.3	66	21	34	8	35	19	9	6	1.79	0.108	0.011	2.16	<0.001
20-Jun-21	Discharge	Slow flow, slightly turbid, light brown	7.6	191	25.2	96	21	50	4	27	15	9	7	1.06	0.083	0.027	1.4	<0.001
21-Jun-21	Discharge	Slow flow, slightly turbid, light brown	7.4	166	23.3		10											
22-Jun-21	Discharge	brown	**7.9**	231	36.0		12											
23-Jun-21	Discharge	Steady flow, clear, light brown	7.9	197	17.9		<5											
24-Jun-21	Discharge	Trickle flow, clear, light brown	7.5	213	9.8		16											
25-Jun-21	Discharge	Trickle flow, clear, yellow/brown tinge	7.5	218	16.4		<5											
26-Jun-21	Discharge	Slow/steady flow, clear, light brown	7.4	261	17.5		<5											
Min			4.5	54	4.2	24	5	6	4	6	15	8	6	0.04	0.051	0.005	0.01	0.001
Avg			7.2	235	52.7	58	26	56	12	37	39	14	10	1.47	0.356	0.033	2.24	0.189
Max			7.9	576	300.0	96	156	136	58	103	116	23	18	9.00	1.570	0.252	8.15	2.250
Var			0.2	11883	3055.9	503	1110	1486	221	960	723	23	13	6.01	0.218	0.005	4.12	0.421
SD			0.5	109	55.3	22	33	39	15	31	27	5	4	2.45	0.467	0.069	2.03	0.649
*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
15-Jul-20	Discharge Event	w flow, slightly turbid, light brow	7.6	494	42.7	99.5	316	14	96	39	5	108	41	17	13	1.52	0.014	0.023	1.39	<1	39	2	48
11-Aug-20	Discharge Event	Nil flow																					
30-Sep-20	Monthly	Nil flow																					
28-Oct-20	Monthly	ady flow, Slightly turbid, light bro	**7.1**	**887**	15.75	**50.8**	568	12	218	47	7	229	68	38	30	0.42	0.092	0.045	0.63	<1	47	2	70
30-Oct-20	Discharge	Slow flow, slightly turbid, grey	7.4	516	25	88.5	330	13	112	34	7	139	32	20	15	0.74	0.01	0.023	0.6	<1	34	2	55
27-Nov-20	Monthly	No flow																					
16-Dec-20	Discharge Event	Trickle flow, slightly turbid, clear	7.7	411	44.3	94.4	263	9	132	36	6	154	50	23	18	0.32	0.01	0.035	0.33	<1	36	<2	61
7-Jan-21	Discharge Event	Fast flow, slightly turbid, brown	7.8	200.2	43.3	98.8	128	18	51	52	6	13	20	9	7	2.41	0.065	0.015	2.47	<1	52	<2	19
27-Jan-21	Monthly	No flow																					
14-Feb-21	Discharge Event	Slow flow, clear, light brown	7.6	496.3	11	87.6	318	7	125	64	8	92	30	22	17	0.54	0.039	0.013	0.55	<1	64	<2	40
15-Mar-21	Discharge Event	teady flow, Slightly turbid, brow	7.5	234.1	49	95.3	150	20	54	30	10	51	15	10	7	2.34	0.03	0.024	2.81	<1	30	<2	21
28-Apr-21	Monthly	Trickle flow, clear, light brown	7.5	221.2	42.4	98.5	142	22	54	45	4	34	16	10	7	0.45	0.064	0.015	1.03	<1	45	2	23
7-May-21	Discharge Event	ady flow, slightly turbid, light bro	7.5	271.1	19.7	93.9	174	12	72	36	6	65	19	14	9	0.71	0.032	0.018	1.15	<1	36	<2	23
20-Jun-21	Discharge Event	st flow, slightly turbid, light brow	7.7	193.3	21.5	99.8	124	18	54	58	4	26	16	10	7	1.13	0.064	0.022	1.55	<1	58	3	19
Min			7.1	193	11.0	50.8	124	7	51	30	4	13	15	9	7	0.32	0.010	0.013	0.33	1	30	2	19
Avg			7.5	392	31.5	90.7	251	15	97	44	6	91	31	17	13	1.06	0.042	0.023	1.25	1	44	2	38
Max			7.8	887	49.0	99.8	568	22	218	64	10	229	68	38	30	2.41	0.092	0.045	2.81	1	64	3	70
Var			0.0	47448	200.4	215.4	19435	24	2796	124	3	4605	311	81	55	0.61	0.001	0.000	0.69	0	124	0	379
SD			0.2	218	14.2	14.7	139	5	53	11	2	68	18	9	7	0.78	0.028	0.010	0.83	0	11	0	19
*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
15-Jul-20	<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	<0.01	<0.01	0.12	0.7	0.03
28-Oct-20	<0.001	0.045	<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	0.19	0.6	0.02
30-Oct-20	<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	0.01	<0.01	0.1	0.5	<0.01
16-Dec-20	<0.001	0.025	<0.0001	0.003	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.16	0.5	0.01
7-Jan-21	<0.001	0.014	<0.0001	0.002	0.002	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	0.04	<0.01	0.02	1.1	0.02
14-Feb-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	0.05	0.4	<0.01
15-Mar-21	<0.001	0.014	<0.0001	0.002	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	0.05
28-Apr-21	<0.001	0.011	<0.0001	0.002	<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	0.4	0.01
7-May-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	0.07	<0.01	0.1	0.6	0.05
20-Jun-21	<0.001	0.005	<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	0.03
Min	0.001	0.005	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	0.01
Avg	0.001	0.019	0.0001	0.002	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	0.6	0.02
Max	0.001	0.045	0.0001	0.003	0.002	0.001	0.001	0.002	0.01	0.001	0.001	0.05	0.0001	0.1	0.07	0.01	0.19	1.1	0.05
Var	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.00	0.0000	0.0	0.00	0.00	0.00	0.0	0.00
SD	0.000	0.011	0.0000	0.001	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.00	0.0000	0.0	0.02	0.00	0.06	0.2	0.02
*Water Quality Trigger					0.003										0.05			1.2	0.08

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"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
15-Jul-20	Discharge Event	Nil flow																
11-Aug-20	Discharge Event	Slow flow, light brown	**7.0**	**732**	16	**79**	<5	53	8	219	56	33	28	0.55	0.008	<0.005	0.44	<0.001
30-Sep-20	Monthly	Nil flow																
28-Oct-20	Monthly	Steady flow, brown	7.7	227	**721**	95	**452**	39	4	54	11	10	7	**10.1**	0.259	0.042	10.5	0.008
30-Oct-20	Discharge Event	Trickle, light brown	**6.8**	473	36	**56**	12	47	8	120	36	18	14	1.25	0.018	<0.005	1.01	0.001
27-Nov-20	Monthly	No flow																
16-Dec-20	Discharge Event	No flow																
7-Jan-21	Discharge Event	Fast flow, slightly turbid, brown	7.8	475	35	99	12	66	6	93	32	19	15	1.19	0.015	<0.005	1.21	0.001
27-Jan-21	Monthly	No flow																
14-Feb-21	Discharge Event	w, slightly turbid and lig	**6.6**	525	23	**56**	11	49	20	133	35	20	18	0.36	0.018	<0.005	0.44	0.002
15-Mar-21	Discharge Event	e flow, clear and light b	**7.0**	**817**	14	**84**	11	64	5	214	59	32	28	0.49	0.026	<0.005	1.04	<0.001
28-Apr-21	Monthly	No flow																
7-May-21	Discharge Event	teady flow, turbid, brow	7.2	400	83	90	28	54	6	94	25	21	14	2.04	0.024	0.006	1.84	<0.001
20-Jun-21	Discharge Event	ady flow, turbid, light br	7.9	**1002**	46	99	24	118	5	247	79	45	42	1.46	0.047	<0.005	1.57	<0.001
Min			6.6	227	13.9	56	5	39	4	54	11	10	7	0.36	0.008	0.005	0.44	0.001
Avg			7.3	581	121.8	82	69	61	8	147	42	25	21	2.18	0.052	0.010	2.26	0.002
Max			7.9	1002	721.0	99	452	118	20	247	79	45	42	10.10	0.259	0.042	10.50	0.008
Var			0.2	62815	59095.6	306	23959	603	27	4996	470	123	125	10.56	0.007	0.000	11.33	0
SD			0.5	251	243.1	18	155	25	5	71	22	11	11	3.25	0.084	0.013	3.37	0.002
*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
15-Jul-20	Discharge Event	w, light brown, sligh	6.6	211	27.7	**65**	17.728	14	29	22	7	<10	41	5	4	0.72	0.037	0.011	1.86	<1	22	4	24
11-Aug-20	Discharge Event	low flow, light brow	6.8	157	31.9	91.5	20.416	20	29	16	7	15	30	5	4	1.11	0.037	0.014	2	<1	16	<2	18
30-Sep-20	Monthly	Nil flow																					
28-Oct-20	Monthly	Nil flow																					
30-Oct-20	Discharge Event	Trickle, light brown	**6.2**	96	77.1	**45.9**	49.344	**79**	16	13	11	12	11	3	2	1.81	0.056	0.012	1.44	<1	13	6	13
27-Nov-20	Monthly	No flow																					
16-Dec-20	Discharge Event	No flow																					
7-Jan-21	Discharge Event	flow, slightly turbid,	6.6	136	33.6	93.8	21.504	21	22	16	10	<1	20	4	3	1.49	0.044	0.01	1.56	<1	16	2	13
27-Jan-21	Monthly	No flow																					
14-Feb-21	Discharge Event	le flow, turbid and b	6.5	250	**98**	**24.4**	62.72	**75**	47	32	9	25	30	9	6	1.32	0.158	0.012	7.07	<1	32	5	20
15-Mar-21	Discharge Event	flow, slightly turbid,	6.6	140	48.9	91.1	31.296	28	22	12	6	6	21	4	3	1.93	0.059	0.014	3.03	<1	12	2	15
28-Apr-21	Monthly	No flow																					
7-May-21	Discharge Event	ady flow, turbid, bro	6.5	170	51.3	**75.2**	32.832	52	27	18	8	21	24	6	3	1.2	0.132	0.007	3.75	<1	18	<2	17
20-Jun-21	Discharge Event	y flow, turbid, light b	**7.6**	123	66.5	98.8	42.56	**62**	13	16	5	<1	12	2	2	1.39	0.03	0.007	1.8	<1	16	4	10
Min			6.2	96	27.7	24.4	18	14	13	12	5	1	11	2	2	0.72	0.030	0.007	1.44	1	12	2	10
Avg			6.6	160	54.4	73.2	35	44	26	18	8	11	24	5	3	1.37	0.069	0.011	2.81	1	18	3	16
Max			7.6	250	98.0	98.8	63	79	47	32	11	25	41	9	6	1.93	0.158	0.014	7.07	1	32	6	24
Var			0.2	2483	607.8	704.7	249	691	109	41	4	77	100	5	2	0.15	0.002	0.000	3.59	0	41	3	20
SD			0.4	50	24.7	26.5	16	26	10	6	2	9	10	2	1	0.39	0.048	0.003	1.89	0	6	2	4
*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
15-Jul-20	0.001	0.035	<0.0001	<0.001	0.002	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.04	<0.01	0.2	2.5	0.56
11-Aug-20	0.001	0.039	<0.0001	<0.001	**0.003**	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.11	2.2	**0.62**
30-Oct-20	0.001	0.024	<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	0.35	2.4	0.82
7-Jan-21	0.002	0.032	<0.0001	0.001	0.002	<0.001	<0.001	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.06	2.2	0.61
14-Feb-21	0.002	0.033	<0.0001	0.005	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	**0.46**	0.01	0.06	**2.7**	0.5
15-Mar-21	0.002	0.041	<0.0001	0.001	0.002	0.001	<0.001	0.004	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.04	<0.01	0.08	2.1	0.41
7-May-21	0.002	0.033	<0.0001	<0.001	<0.001	<0.001	<0.001	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.15	0.01	0.11	1.9	0.38
20-Jun-21	0.001	0.027	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.18	<0.01	0.25	2.2	0.66
Min	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	0.06	1.9	0.38
Avg	0.002	0.033	0.0001	0.002	0.002	0.001	0.001	0.002	0.01	0.001	0.001	0.05	0.0001	0.1	0.12	0.01	0.15	2.3	0.57
Max	0.002	0.041	0.0001	0.005	0.003	0.001	0.001	0.004	0.01	0.001	0.001	0.05	0.0001	0.1	0.46	0.01	0.35	2.7	0.82
Var	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.00	0.0000	0.0	0.02	0.00	0.01	0.1	0.02
SD	0.001	0.006	0.0000	0.001	0.001	0.000	0.000	0.001	0.00	0.000	0.000	0.00	0.0000	0.0	0.15	0.00	0.10	0.2	0.14
*Water Quality Trigger				0.002	0.0040										0.13			2.6	0.68

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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	mg/l	mg/l
15-Jul-20	Discharge Event	Trickle, turbid, brown	**6.6**	515	105	86	67	24	18	14	8	<10	<10	4	2	**4.37**	0.028	0.009	3.63	<1	14	2	9
11-Aug-20	Discharge Event	Slow flow, brown and slightly turbi	7.5	72.4	115	104	74	34	18	20	7	<10	11	4	2	**6.72**	0.038	0.011	5.91	<1	20	2	11
30-Sep-20	Monthly	Nil flow																					
28-Oct-20	Monthly	Nil flow																					
30-Oct-20	Discharge Event	Trickle, light brown	**6.4**	60.2	66	**56**	42	24	18	13	9	<1	8	4	2	**3.21**	0.035	0.007	2.79	<1	13	3	10
27-Nov-20	Monthly	No flow																					
16-Dec-20	Discharge Event	No flow																					
7-Jan-21	Discharge Event	Steady flow, turbid, brown	**6.8**	87.4	77	**83**	50	12	21	26	7	<1	12	5	2	2.97	0.02	0.005	2.46	<1	26	<2	8
27-Jan-21	Monthly	No flow																					
14-Feb-21	Discharge Event	Trickle flow, turbid and light brown	**6.5**	74	118	**40**	76	26	18	16	10	<1	9	4	2	**4.94**	0.044	0.01	4.9	<1	16	3	10
15-Mar-21	Discharge Event	Slow flow, turbid and brown	**6.8**	83	**131**	**84**	84	31	27	15	16	<1	9	6	3	**7.72**	0.046	0.013	7	<1	15	4	8
28-Apr-21	Monthly	No flow																					
7-May-21	Discharge Event	Steady flow, turbid, brown	7.2	108	**142**	**82**	91	25	25	20	8	<1	10	5	3	**7.99**	0.078	0.012	7.77	<1	20	<2	8
20-Jun-21	Discharge Event	Steady flow, turbid, light brown	7.2	48	55	95	35	25	16	18	5	<1	8	3	2	**3.26**	0.023	0.005	3.06	<1	18	3	6
Min			6.4	48	54.9	40.0	35	12	16	13	5	1	8	3	2	2.97	0.020	0.005	2.46	1	13	2	6
Avg			6.9	131	101.1	78.7	65	25	20	18	9	3	10	4	2	5.15	0.039	0.009	4.69	1	18	3	9
Max			7.5	515	142.0	103.6	91	34	27	26	16	10	12	6	3	7.99	0.078	0.013	7.77	1	26	4	11
Var			0.1	24412	1001.4	429.4	410	41	15	18	11	17	2	1	0	4.27	0.000	0.000	4.10	0	18	1	3
SD			0.4	156	31.6	20.7	20	6	4	4	3	4	1	1	0	2.07	0.018	0.003	2.03	0	4	1	2
*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
15-Jul-20	<0.001	0.015	<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	0.02	1.9	0.17
11-Aug-20	<0.001	0.025	<0.0001	**0.005**	**0.006**	<0.001	<0.001	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	<0.01	1.4	0.11
30-Oct-20	<0.001	0.01	<0.0001	0.003	0.005	<0.001	<0.001	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.4	1.9	0.1
7-Jan-21	<0.001	0.01	<0.0001	0.002	0.005	<0.001	<0.001	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	<0.01	1.4	0.06
14-Feb-21	<0.001	0.015	<0.0001	0.004	0.007	<0.001	<0.001	0.004	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.03	1.4	0.11
15-Mar-21	<0.001	0.02	<0.0001	0.006	0.007	<0.001	<0.001	0.005	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	<0.01	1.8	0.15
7-May-21	<0.001	0.017	<0.0001	0.006	0.006	<0.001	<0.001	0.005	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.08	<0.01	0.03	2.1	0.17
20-Jun-21	<0.001	<0.001	<0.0001	0.003	<0.001	<0.001	<0.001	0.004	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.01	1.1	0.1
	0.001	0.001	0.0001	0.002	0.001	0.001	0.001	0.003	0.01	0.001	0.001	0.05	0.0001	0.1	0.01	0.01	0.01	1.1	0.06
	0.001	0.014	0.0001	0.004	0.005	0.001	0.001	0.004	0.01	0.001	0.001	0.05	0.0001	0.1	0.02	0.01	0.07	1.6	0.12
	0.001	0.025	0.0001	0.006	0.007	0.001	0.001	0.005	0.01	0.001	0.001	0.05	0.0001	0.1	0.08	0.01	0.40	2.1	0.17
	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.00	0.0000	0.0	0.00	0.00	0.02	0.1	0.00
	0.000	0.007	0.0000	0.001	0.002	0.000	0.000	0.001	0.00	0.000	0.000	0.00	0.0000	0.0	0.02	0.00	0.14	0.3	0.04
*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	Turbidity	DO	TDS	TSS	Hardness	Alkalinity	Acidity	SO4	Cl	Ca	Mg	Al	Mn	Zn	Fe	CO3	Bicarb	BOD	Na
				uS/cm	NTU	%	mg/l	mg/l	mg/l	(as $CaCO_3$) mg/l	(as $CaCO_3$) mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	(as $CaCO_3$) mg/l	(as $CaCO_3$) mg/l	mg/l	mg/l
15-Jul-20	Discharge	Fast flow, slightly turbid, light brown	7.2	264	19	88	169	**22**	59	32	4	22	51	12	7	0.55	0.060	**<0.005**	1.11	<1	32	<2	32
26-Jul-20	Discharge	Fast flow, slightly turbid, light brown	**7.01**	137	**114**			**133**															
27-Jul-20	Discharge	Fast flow, clear, light brown	**7.64**	116	**54**			**53**															
28-Jul-20	Discharge	Fast flow, clear, light brown	**6.95**	162	20			11															
29-Jul-20	Discharge	Fast flow, clear	**7.03**	185	14			6															
30-Jul-20	Discharge	Fast flow, clear	**6.97**	197	11			**<5**															
31-Jul-20	Discharge	Steady flow, clear, light brown	**7.09**	206	9			**<5**															
11-Aug-20	Discharge	Fast flow, light brown	7.25	256	**29**	99	164	**25**	52	30	6	25	46	11	6	0.91	0.060	0.005	1.51	<1	30	<2	29
30-Sep-20	Monthly	Slow flow, clear, clear	7.24	**402**	2	**64**	257	**<5**	77	60	3	20	61	16	9	0.03	0.108	**<0.005**	0.94	<1	60	2	38
28-Oct-20	Monthly	Trickle, light brown	**7.04**	**440**	2	**47**	282	5	86	66	6	17	60	18	10	0.03	0.181	**<0.005**	0.87	<1	66	2	38
30-Oct-20	Discharge	Steady flow, light brown	**7.05**	369	20	**52**	236	14	70	57	6	17	51	15	8	0.55	0.118	**<0.005**	1.25	<1	57	2	36
27-Nov-20	Monthly	Trickle, clear	**7.02**	279	4	**55**	178	**<5**	55	45	4	10	52	12	6	0.05	0.226	**<0.005**	1.03	<1	45	<2	29
16-Dec-20	Discharge Event	Fast flow, slightly turbid, light brown	7.27	126	**58**	**79**	81	**70**	34	21	6	10	36	7	4	0.70	0.189	**<0.005**	1.98	<1	21	<2	20
22-Dec-20	Discharge	Fast flow, slightly turbid, light brown	**6.77**	177	**50**		113	**36**															
23-Dec-20	Discharge	Fast flow, clear, light brown	7.32	176	19		113	15															
24-Dec-20	Discharge	Fast flow, clear, light brown	7.25	163	14		104	**<5**															
1-Jan-21	Discharge	Fast flow, slightly turbid, light brown	**6.95**	155	**28**		99	9															
4-Jan-21	Discharge	Fast flow, slightly turbid, brown	**6.74**	109	**44**		70	**31**															
5-Jan-21	Discharge	Fast flow, slightly turbid, brown	**6.75**	84	**62**		54	**44**															
6-Jan-21	Discharge	Fast flow, slightly turbid, light brown	**6.91**	188	21		120	11															
7-Jan-21	Discharge Event	Fast flow, slightly turbid, light brown	7.11	208	**30**	89	133	**24**	34	28	7	7	35	7	4	**1.37**	0.053	**<0.005**	1.42	<1	28	<2	20
8-Jan-21	Discharge	Fast flow, slightly turbid, light brown	7.11	180	23		115	8															
9-Jan-21	Discharge	Steady flow, clear, light brown	**7.07**	189	19		121	10															
10-Jan-21	Discharge	Steady flow, clear, light brown	**7.02**	215	13		137	**<5**															
11-Jan-21	Discharge	teady flow, slightly turbid, light brow	7.11	225	11		144	**<5**															
12-Jan-21	Discharge	Steady flow, clear, clear	7.49	244	10		156	7															
13-Jan-21	Discharge	Slow flow, clear, light brown	7.2	246	9		157	**<5**															
14-Jan-21	Discharge	Steadyslow flow, clear, light brown	**7.08**	275	8		176	**<5**															
27-Jan-21	Monthly	Steady flow, clear, light brown	**7.03**	342	5	**62**	219	**<5**	61	51	7	13	50	13	7	0.06	0.072	**<0.005**	1.29	<1	51	<2	32
14-Feb-21	Discharge Event	st flow, slightly turbid and light brow	7.27	246	**26**	**81**	157	**34**	50	34	6	9	38	10	6	0.68	0.093	**<0.005**	1.91	<1	34	<2	27
16-Feb-21	Discharge	Steady flow, slightly turbid, brown	**6.92**	114	**55**		73	**45**															
17-Feb-21	Discharge	Fast flow, clear, colourless	7.6	178	**27**		114	14															
18-Feb-21	Discharge	Steady flow, slightly turbid, brown	7.14	156	**25**		100	7															
19-Feb-21	Discharge	Fast flow, turbid, light brown	**6.93**	113	**102**		72	5															
20-Feb-21	Discharge	Fast flow, slightly turbid, light brown	7.38	170	**39**		109	12															
21-Feb-21	Discharge	Steady flow, slightly turbid, brown	**6.99**	157	**39**		100	8															
22-Feb-21	Discharge	teady flow, slightly turbid, light brow	**7.03**	143	**30**		92	**24**															
23-Feb-21	Discharge	Fast flow, turbid, light brown	**6.79**	105	**93**		67	**42**															
24-Feb-21	Discharge	Fast flow, clear, light brown	7.14	167	**27**		107	**18**															
25-Feb-21	Discharge	teady flow, slightly turbid, light brow	**5.65**	192	22		123	5															
26-Feb-21	Discharge	Fast flow, slightly turbid, light brown	7.11	204	18		130	5															
27-Feb-21	Discharge	Slow flow, slightly turbid, light brown	**6.92**	185	15		118	6															
28-Feb-21	Discharge	Steady flow, clear, light brown	**6.85**	210	15		135	**<5**															
1-Mar-21	Discharge	teady flow, slightly turbid,light brow	**7.03**	205	13		131	**<5**															
2-Mar-21	Discharge	Steady flow, clear, light brown	7.36	241	11		154	5															
3-Mar-21	Discharge	Steady flow, clear, very light brown	7.29	250	11		160	9															
15-Mar-21	Discharge Event	teady flow, slightly turbid, light brow	7.31	282	**30**	90	181	**50**	52	38	4	13	45	11	6	0.80	0.065	0.005	2.18	<1	38	2	29
16-Mar-21	Discharge	teady flow, slightly turbid, light brow	7.11	235	15		150	6															
17-Mar-21	Discharge	Steady flow, clear, light brown	**7.07**	253	17		162	9															
18-Mar-21	Discharge	Steady flow, clear, light brown	7.53	230	21		147	9															
19-Mar-21	Discharge	Fast flow, turbid, brown	**6.37**	76	**292**		48	**206**															
20-Mar-21	Discharge	No access - Road flooded																					
21-Mar-21	Discharge	Fast flow, slightly turbid, light brown	**6.78**	29	**28**		19	**19**															
22-Mar-21	Discharge	No sample collected																					
23-Mar-21	Discharge	Fast flow, slightly turbid, light brown	**6.87**	119	**62**		76	**42**															
24-Mar-21	Discharge	Fast flow, slightly turbid, light brown	**6.38**	100	**48**		64	**31**															
25-Mar-21	Discharge	Fast flow, clear, light brown	**6.55**	119	**48**		76	**19**															
26-Mar-21	Discharge	Steady flow, clear, light brown	**6.6**	144	**42**		92	**24**															
27-Mar-21	Discharge	Steady flow, clear, clear	**6.92**	196	**28**		126	11															
28-Mar-21	Discharge	Steady flow, clear, clear	**6.26**	206	23		132	10															
29-Mar-21	Discharge	Steady flow, clear, light brown	**6.95**	182	23		116	11															
30-Mar-21	Discharge	Steady flow, clear, clear	**6.3**	223	18		143	6															
31-Mar-21	Discharge	Steady flow, clear, light brown	**6.86**	212	19		136	**<5**															
1-Apr-21	Discharge	Steady flow. Clear, very light brown	7.13	228	15		146	9															
28-Apr-21	Monthly	Steady flow, clear, clear	7.34	291	10	87	186	**<5**	59	47	4	11	54	12	7	0.31	0.032	**<0.005**	1.47	<1	47	<2	35
7-May-21	Discharge	Steady flow, turbid, light brown	7.22	272	**41**	**83**	174	**42**	50	48	6	13	53	10	6	1.01	0.071	**<0.005**	2.08	<1	48	<2	30
20-Jun-21	Discharge	Fast flow, turbid, light brown	7.36	188	**101**	94	121	**122**	34	33	5	10	29	7	4	**2.17**	0.177	0.007	2.94	<1	33	3	20
21-Jun-21	Discharge	Steady flow, turbid, brown	7.13	80	**80**			**44**															
22-Jun-21	Discharge	Fast flow, clear, light brown	7.53	137	**60**			**17**															
23-Jun-21	Discharge	teady flow, slightly turbid, light brow	**6.91**	167	**50**			7															
24-Jun-21	Discharge	Slow flow, slightly turbid, light brown	7.47	179	**28**			8															
25-Jun-21	Discharge	Slow flow, clear, light brown	**6.85**	159	23			8															
26-Jun-21	Discharge	teady flow, slightly turbid, very light	7.44	211	**29**			**<5**															
Min			5.7	29	1.6	46.7	19	5	34	21	3	7	29	7	4	0.03	0.032	0.005	0.87	1	21	2	20
Avg			7.0	195	34.3	76.4	129	22	55	42	5	14	47	12	6	0.66	0.108	0.005	1.57	1	42	2	30
Max			7.6	440	292.0	99.1	282	206	86	66	7	25	61	18	10	2.17	0.226	0.007	2.94	1	66	3	38
Var			0.1	5348	1546.3	290.0	2410	1052	241	178	2	29	92	11	3	0.36	0.004	0.000	0.34	0	178	0	39
SD			0.3	73	39.3	17.0	49	32	16	13	1	5	10	3	2	0.60	0.061	0.001	0.58	0	13	0	6
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%		15								1.24		0.011					

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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
15-Jul-20	<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	0.4	0.05
11-Aug-20	0.002	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	0.02	0.10	0.6	0.06
30-Sep-20	<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	0.04	0.3	0.04
28-Oct-20	<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	0.01	0.4	0.05
30-Oct-20	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	0.04	0.8	0.08
27-Nov-20	<0.001	0.03	<0.0001	0.002	0.004	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.04	0.5	0.04
16-Dec-20	<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	0.10	0.7	0.04
7-Jan-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	0.14	0.8	0.12
27-Jan-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	0.06	<0.01	0.10	0.5	0.04
14-Feb-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	0.06
15-Mar-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	0.02	<0.01	0.09	1	0.14
28-Apr-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	0.07	0.3	0.02
7-May-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	0.06	<0.01	0.09	0.8	0.08
20-Jun-21	<0.001	0.04	<0.0001	0.002	<0.001	0.001	<0.001	0.004	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.09	1.1	0.14
Min	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	0.01	0.01	0.01	0.3	0.02
Avg	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	0.02	0.01	0.07	0.6	0.07
Max	0.002	0.049	0.0001	0.002	0.004	0.001	0.001	0.004	0.01	0.001	0.001	0.05	0.0001	0.1	0.06	0.02	0.14	1.1	0.14
Var	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.00	0.0000	0.0	0.00	0.00	0.00	0.1	0.00
SD	0.000	0.004	0.0000	0.000	0.001	0.000	0.000	0.001	0.00	0.000	0.000	0.00	0.0000	0.0	0.02	0.00	0.03	0.2	0.04
*Water Quality Trigger				0.001	0.0020										0.06			0.8	0.15

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Highnoon - Mammy Johnsons River EPL 11701 Point 35

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
15-Jul-20	Discharge	Steady flow, slightly turbid, light brown	**7.08**	248	**26**	**82**	159	**16**	50	28	5	21	49	10	6	0.77	0.050	**<0.005**	1.34	<1	28	<2	30
26-Jul-20	Discharge	Fast flow, slightly turbid, light brown	7.1	154	**98**			**50**															
27-Jul-20	Discharge	Fast flow, clear, light brown	**8.76**	191	**59**			**39**															
28-Jul-20	Discharge	Fast flow, clear, light brown	**6.87**	176	20			11															
29-Jul-20	Discharge	Steady flow, clear	**7.01**	197	14			**<5**															
30-Jul-20	Discharge	Steady flow, clear	**6.73**	210	11			**<5**															
31-Jul-20	Discharge	Steady flow, clear	**7.03**	208	10			**<5**															
11-Aug-20	Discharge	Fast flow, light brown	7.1	234	**28**	94	150	**24**	50	26	6	22	43	10	6	0.76	0.048	**<0.005**	1.47	<1	26	<2	27
30-Sep-20	Monthly	Slow flow, clear	7.21	**415**	2	**63**	266	**<5**	74	58	4	22	62	15	9	0.03	0.098	**<0.005**	0.76	<1	58	3	37
28-Oct-20	Monthly	Slow flow, Light brown	**7.02**	**433**	2	**37**	277	**<5**	84	67	6	18	62	17	10	0.03	0.146	**<0.005**	0.72	<1	67	2	40
30-Oct-20	Discharge Event	Slow flow, Light brown	**7.01**	**389**	**60**	**36**	249	**58**	79	65	7	22	49	15	10	**1.52**	0.260	**<0.005**	2.40	<1	65	<2	41
27-Nov-20	Monthly	Slow flow, clear	**7.05**	268	2	**60**	172	**<5**	52	41	4	11	52	11	6	0.03	0.111	**<0.005**	0.77	<1	41	<2	28
16-Dec-20	Discharge Event	Fast flow, slightly turbid, light brown	**6.91**	99	**49**	**81**	63	**52**	27	16	9	5	32	6	3	**1.51**	0.139	**<0.005**	2.13	<1	16	<2	18
22-Dec-20	Discharge	Fast flow, slightly turbid, light brown	**6.58**	189	**61**		121	**46**															
23-Dec-20	Discharge	Fast flow, clear, light brown	**7.66**	188	22		120	12															
24-Dec-20	Discharge	Fast flow, clear, light brown	**7.05**	156	15		100	8															
1-Jan-21	Discharge	Fast flow, slightly turbid, light brown	**7.02**	148	**32**		95	**19**															
4-Jan-21	Discharge	Fast flow, slightly turbid, brown	**6.67**	112	**50**		72	**63**															
5-Jan-21	Discharge	Fast flow, slightly turbid, brown	**6.62**	81	**80**		52	**50**															
6-Jan-21	Discharge	Fast flow, slightly turbid, light brown	**6.92**	189	**25**		121	**18**															
7-Jan-21	Discharge Event	Fast flow, slightly turbid, light brown	**7.07**	189	**32**	87	121	**35**	31	27	7	2	32	6	4	**1.36**	0.045	**<0.005**	1.40	<1	27	<2	19
8-Jan-21	Discharge	Fast flow, slightly turbid, light brown	**7**	182	**26**		117	**20**															
9-Jan-21	Discharge	Steady flow, clear, light brown	7.11	192	23		123	**<5**															
10-Jan-21	Discharge	Steady flow, clear, light brown	**7**	214	14		137	**<5**															
11-Jan-21	Discharge	Steady flow, slightly turbid, light brown	**7.05**	232	12		149	**<5**															
12-Jan-21	Discharge	Steady flow, clear, clear	7.29	245	10		157	10															
13-Jan-21	Discharge	Slow flow, clear, light brown	7.18	282	4		181	**<5**															
14-Jan-21	Discharge	Slow flow, clear, light brown	**7.06**	278	9		178	**<5**															
27-Jan-21	Monthly	Slow flow, clear, clear	7.2	349	5	**64**	223	**<5**	59	48	7	13	50	12	7	0.10	0.090	**<0.005**	1.38	<1	48	<2	31
14-Feb-21	Discharge Event	Steady flow, slightly turbid, light brown	7.14	255	21	**74**	163	**33**	47	36	6	10	40	9	6	0.58	0.071	**<0.005**	1.76	<1	36	<2	28
16-Feb-21	Discharge	Steady flow, slightly turbid, brown	**6.81**	125	**58**		80	**51**															
17-Feb-21	Discharge	Fast flow, clear, colourless	**7.69**	194	**29**		124	**35**															
18-Feb-21	Discharge	Steady flow, slightly turbid, brown	7.26	159	**27**		102	15															
19-Feb-21	Discharge	Fast flow, turbid, light brown	**6.77**	114	**111**		73	**65**															
20-Feb-21	Discharge	Fast flow, slightly turbid, light brown	7.46	172	**41**		110	10															
21-Feb-21	Discharge	Steady flow, slightly turbid, brown	**7**	161	**48**		103	13															
22-Feb-21	Discharge	Steady flow, clear, light brown	**6.97**	141	**27**		90	**23**															
23-Feb-21	Discharge	Fast flow, turbid, light brown	**6.56**	117	**92**		75	**17**															
24-Feb-21	Discharge	Fast flow, slightly turbid, light brown	**7.04**	173	**32**		111	**18**															
25-Feb-21	Discharge	Steady flow, slightly turbid, light brown	**5.63**	201	24		129	7															
26-Feb-21	Discharge	Steady flow, slightly turbid, light brown	**6.91**	207	20		132	**<5**															
27-Feb-21	Discharge	Slow flow, slightly turbid, light brown	**6.63**	191	14		122	6															
28-Feb-21	Discharge	Steady flow, clear, light brown	**6.95**	215	16		137	10															
1-Mar-21	Discharge	Steady flow, slightly turbid, light brown	**7.01**	208	14		133	**<5**															
2-Mar-21	Discharge	Slow flow, clear, light brown	7.16	245	12		157	6															
3-Mar-21	Discharge	Slow flow, clear, light brown	**7.07**	252	11		161	**<5**															
15-Mar-21	Discharge Event	Steady flow, slightly turbid, light brown	**6.94**	260	**48**	86	166	**49**	45	32	5	11	42	8	6	**1.27**	0.101	0.007	2.51	<1	32	2	26
16-Mar-21	Discharge	Steady flow, slightly turbid, light brown	**6.96**	242	19		155	13															
17-Mar-21	Discharge	Steady flow, clear, light brown	7.12	266	17		170	8															
18-Mar-21	Discharge	Steady flow, clear, light brown	**6.95**	247	21		158	7															
19-Mar-21	Discharge	Fast flow, turbid, brown	**6.42**	74	**195**		47	**246**															
20-Mar-21	Discharge	No access - Road flooded																					
21-Mar-21	Discharge	Fast flow, turbid, brown	**6.63**	74	**131**		47	**118**															
22-Mar-21	Discharge	Fast flow, turbid, light brown	**6.61**	88	**101**		56	**70**															
23-Mar-21	Discharge	Fast flow, slightly turbid, light brown	7.1	131	**62**		84	**42**															
24-Mar-21	Discharge	Fast flow, slightly turbid, light brown	**6.56**	124	**52**		79	**30**															
25-Mar-21	Discharge	Fast flow, clear, light brown	**6.43**	115	**47**		74	15															
26-Mar-21	Discharge	Steady flow, clear, light brown	**6.81**	151	**39**		97	11															
27-Mar-21	Discharge	Steady flow, clear, clear	**6.67**	217	**32**		139	13															
28-Mar-21	Discharge	Steady flow, clear, clear	**6.34**	222	**25**		142	12															
29-Mar-21	Discharge	Steady flow, clear, light brown	**6.73**	178	24		114	**<5**															
30-Mar-21	Discharge	Slow flow, slightly turbid, light brown	**6.83**	236	20		151	**<5**															
31-Mar-21	Discharge	Steady flow, clear, light brown	7.12	218	20		140	7															
1-Apr-21	Discharge	Steady flow, clear, very light brown	7.13	228	18		146	**<5**															
28-Apr-21	Monthly	Steady flow, clear, clear	7.33	290	10	88	186	**<5**	59	45	4	11	54	12	7	0.34	0.042	**<0.005**	1.56	<1	45	<2	36
7-May-21	Discharge	Slow flow, turbid, light brown	7.25	367	**43**	**75**	235	**42**	72	65	6	16	62	14	9	1.15	0.078	**<0.005**	2.27	<1	65	<2	37
20-Jun-21	Discharge	Steady flow, turbid, light brown	7.2	176	**111**	93	112	**143**	31	32	6	11	28	6	4	**1.89**	0.177	**<0.005**	2.91	<1	32	3	19
21-Jun-21	Discharge	Steady flow, turbid, brown	7.24	87	**92**			**66**															
22-Jun-21	Discharge	Fast flow, clear, light brown	**7.69**	136	**58**			**16**															
23-Jun-21	Discharge	Steady flow, slightly turbid, light brown	**7.01**	156	**48**			11															
24-Jun-21	Discharge	Slow flow, slightly turbid, light brown	**7.69**	159	**28**			8															
25-Jun-21	Discharge	Slow flow, clear, yellow/brown tinge	**6.82**	191	23			6															
26-Jun-21	Discharge	Steady flow, slightly turbid, very light b	7.24	203	**30**			**<5**															
Min			5.6	74	1.7	35.6	47	5	27	16	4	2	28	6	3	0.03	0.042	0.005	0.72	1	16	2	18
Avg			7.0	200	37.6	72.8	132	26	54	42	6	14	47	11	7	0.81	0.104	0.005	1.67	1	42	2	30
Max			8.8	433	195.0	94.2	277	246	84	67	9	22	62	17	10	1.89	0.260	0.007	2.91	1	67	3	41
Var			0.1	5589	1182.5	358.6	2577	1373	327	275	2	41	128	13	5	0.42	0.004	0.000	0.48	0	275	0	60
SD			0.4	75	34.4	18.9	51	37	18	17	1	6	11	4	2	0.64	0.061	0.001	0.69	0	17	0	8
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%		15								1.24		0.011					

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Highnoon - Mammy Johnsons River

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
15-Jul-20	<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	0.09	0.8	0.10
11-Aug-20	<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	0.12	0.7	0.08
30-Sep-20	<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	<0.01	0.4	0.04
28-Oct-20	<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	<0.01	0.4	0.05
30-Oct-20	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	0.04	0.7	0.10
27-Nov-20	<0.001	0.03	<0.0001	0.002	0.003	<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	0.03
16-Dec-20	<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	0.14	0.9	0.04
7-Jan-21	<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	<0.01	<0.01	0.13	0.9	0.12
27-Jan-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	0.10	<0.01	0.12	0.9	0.05
14-Feb-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	0.08	0.6	0.05
15-Mar-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	0.08	1.1	0.14
28-Apr-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	0.07	0.3	0.02
7-May-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	0.06	<0.01	0.12	0.7	0.06
20-Jun-21	<0.001	0.04	<0.0001	0.002	<0.001	0.002	<0.001	0.002	<0.01	<0.001	<0.001	0.08	<0.0001	<0.1	0.02	<0.01	0.16	1.2	0.14
Min	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	0.01	0.01	0.04	0.3	0.02
Avg	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	0.02	0.01	0.10	0.7	0.07
Max	0.001	0.050	0.0001	0.002	0.003	0.002	0.001	0.002	0.01	0.001	0.001	0.08	0.0001	0.1	0.10	0.01	0.16	1.2	0.14
Var	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.00	0.0000	0.0	0.00	0.00	0.00	0.1	0.00
SD	0.000	0.005	0.0000	0.000	0.001	0.000	0.000	0.000	0.00	0.000	0.000	0.01	0.0000	0.0	0.03	0.00	0.04	0.3	0.04
*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	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
15-Jul-20	Discharge Event	Fast flow, slightly turbid, grey in colou	7.5	228	24	95	146	13	56	46	4	15	38	11	7	0.72	0.015	<0.005	0.93	<1	46	<2	26
11-Aug-20	Discharge Event	Fast flow, light brown	7.6	192	35	98	123	21	47	44	5	27	33	9	6	1.15	0.023	<0.005	1.32	<1	44	<2	22
30-Sep-20	Monthly	Steady flow, light brown in colour	7.7	183	1	101	117	<5	40	45	1	7	28	8	5	0.04	0.005	<0.005	0.26	<1	45	<2	18
28-Oct-20	Monthly	Fast flow, light brown in colour	7.4	160	4	89	102	6	40	38	4	6	24	8	5	0.09	0.017	<0.005	0.62	<1	38	<2	16
30-Oct-20	Discharge Event	Fast flow, light brown in colour	7.3	107	25	91	68.3	26	25	26	8	4	16	5	3	0.73	0.033	<0.005	0.94	<1	26	<2	15
27-Nov-20	Monthly	Steady flow, light brown in colour	7.2	170	3	72	109	<5	39	48	4	4	24	9	4	0.10	0.030	<0.005	0.59	<1	48	<2	16
16-Dec-20	Discharge Event	Fast flow, light brown in colour	7.4	84	47	89	53.7	76	27	30	5	3	18	6	3	0.96	0.100	<0.005	1.84	<1	30	<2	12
7-Jan-21	Discharge Event	Fast flow, turbid, brown	7.1	113	85	94	72.1	96	21	27	7	<1	18	5	2	3.29	0.079	0.008	2.72	<1	27	<2	11
27-Jan-21	Monthly	Steady flow, clear, clear	7.4	179	3	93	114	<5	36	38	5	4	24	8	4	0.06	0.017	<0.005	0.48	<1	38	<2	15
14-Feb-21	Discharge Event	Fast flow, clear, light brown	7.5	191	19	92	122	<5	40	43	8	4	24	8	5	0.58	0.045	<0.005	0.98	<1	43	<2	19
15-Mar-21	Discharge Event	Fast flow, slightly turbid, light brown	7.7	128	48	97	82.2	43	18	15	4	<1	21	4	2	1.46	0.037	0.006	1.46	<1	15	2	13
28-Apr-21	Monthly	Fast flow, clear, clear	7.5	155	5	101	99	6	36	36	4	4	27	8	4	0.14	0.011	<0.005	0.49	<1	36	<2	21
7-May-21	Discharge Event	Steady flow, clear, very light brown	7.6	208	9	96	133	12	46	49	5	6	29	10	5	0.36	0.015	<0.005	0.74	<1	49	<2	20
20-Jun-21	Discharge Event	Fast flow, turbid, light brown	7.5	273	70	96	175	44	63	91	5	5	31	12	8	2.41	0.106	<0.005	2.66	<1	91	3	30
Min			7.1	84	1.3	72.3	54	5	18	15	1	3	16	4	2	0.04	0.005	0.005	0.15	1	14	2	11
Avg			7.5	169	26.9	93.1	108	26	38	41	5	7	25	8	5	0.86	0.038	0.005	0.95	1	39	2	18
Max			7.7	273	84.5	101.0	175	165	63	91	8	27	38	12	8	3.29	0.106	0.011	3.14	1	91	7	30
Var			0.0	2575	711.9	49.8	1055	1451	161	302	3	82	38	5	3	0.93	0.001	0.000	0.72	0	276	1	29
SD			0.2	51	26.7	7.1	32	38	13	17	2	7	6	2	2	0.97	0.033	0.001	0.85	0	17	1	5
*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).**
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Site 9 - Karuah River (Near Stroud Road Village)

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
15-Jul-20	<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	0.04	0.4	0.08
11-Aug-20	<0.001	0.027	<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	0.7	0.15
30-Sep-20	<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	0.02	0.2	0.04
28-Oct-20	<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	0.01	0.3	0.04
30-Oct-20	<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	0.03	<0.01	0.04	0.5	0.05
27-Nov-20	<0.001	0.015	<0.0001	0.003	0.004	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.67	2.0	0.26
16-Dec-20	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	0.1	<0.01	0.12	1.1	0.09
7-Jan-21	<0.001	0.032	<0.0001	0.003	0.002	0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.08	1.2	0.15
27-Jan-21	<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	0.02	<0.01	0.06	0.3	0.03
14-Feb-21	<0.001	0.021	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.12	<0.01	0.03	0.4	0.03
15-Mar-21	<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	0.03	<0.01	0.15	1.0	0.08
28-Apr-21	<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	<0.01
7-May-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	0.18	<0.01	0.06	0.6	0.04
20-Jun-21	<0.001	0.028	<0.0001	0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.10	1.1	0.19
Min	0.001	0.011	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	0.1	0.01
Avg	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	0.21	0.8	0.09
Max	0.002	0.044	0.0001	0.003	0.008	0.003	0.001	0.002	0.01	0.001	0.001	0.05	0.0001	0.1	0.39	0.04	2.80	5.5	0.27
Var	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.00	0.0000	0.0	0.01	0.00	0.32	1.2	0.01
SD	0.000	0.008	0.0000	0.001	0.002	0.000	0.000	0.000	0.00	0.000	0.000	0.00	0.0000	0.0	0.08	0.01	0.57	1.1	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".

Site 11 - Mammy Johnsons - Downstream of High Noon

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
15-Jul-20	Discharge Event	st flow, slightly turbid, light brow	7.33	304	**28**	**82**	195	**21**	56	32	4	21	53	11	7	0.91	0.066	<0.005	1.43	<1	32	<2	33
11-Aug-20	Discharge Event	Fast flow, light brown	**6.89**	227	**35**	98	145	**22**	43	26	9	24	46	9	5	0.84	0.046	<0.005	1.47	<1	26	<2	26
30-Sep-20	Monthly	Steady flow, clear	7.43	**424**	2	**76**	271	**<5**	74	60	2	22	63	15	9	0.03	0.034	<0.005	0.57	<1	60	2	37
28-Oct-20	Monthly	Steady flow, light brown	7.1	**469**	2	**44**	300	**<5**	93	78	6	18	66	19	11	0.05	0.176	<0.005	0.90	<1	78	2	42
30-Oct-20	Discharge Event	Steady/Fast flow, light brown	**7.08**	**408**	**46**	**52**	261	**32**	81	67	8	24	52	16	10	**1.32**	0.200	<0.005	2.32	<1	67	2	41
27-Nov-20	Monthly	Slow flow, clear	7.33	318	3	**60**	203	**19**	64	49	4	12	56	14	7	0.07	0.427	<0.005	1.21	<1	49	<2	32
16-Dec-20	Discharge Event	st flow, slightly turbid, light brow	**7.02**	122	**55**	**80**	78	**66**	34	23	6	10	36	7	4	1.01	0.190	<0.005	2.23	<1	23	2	20
07-Jan-21	Discharge Event	Fast flow, slightly turbid, brown	7.37	190	**42**	87	121	**38**	31	28	7	<1	29	6	4	**1.76**	0.051	0.006	1.54	<1	28	<2	18
27-Jan-21	Monthly	Steady flow, clear, clear	**7.64**	353	5	**69**	226	**<5**	61	50	8	13	50	13	7	0.07	0.070	<0.005	1.37	<1	50	<2	32
14-Feb-21	Discharge Event	flow, slightly turbid and light br	**7.03**	295	**31**	**72**	189	**44**	50	40	7	9	40	10	6	0.88	0.092	<0.005	2.07	<1	40	<2	29
15-Mar-21	Discharge Event	No access - Overgrown lantana																					
28-Apr-21	Monthly	Steady flow, clear, clear	7.25	289	10	88	185	6	63	46	4	11	55	12	8	0.33	0.041	<0.005	1.59	<1	46	2	38
07-May-21	Discharge Event	st flow, slightly turbid, light brow	7.31	**392**	**27**	**80**	251	**30**	81	64	6	18	65	16	10	0.85	0.074	<0.005	2.06	<1	64	<2	38
20-Jun-21	Discharge Event	Fast flow, turbid, light brown	7.3	160	**128**	**92**	102	**155**	29	38	7	10	27	5	4	**<0.01**	0.279	**0.046**	2.25	<1	38	3	18
Min			6.9	122	1.6	44.1	78	5	29	23	2	9	27	5	4	0.03	0.034	0.005	0.57	1	23	2	18
Avg			7.2	304	31.8	75.4	195	34	58	46	6	16	49	12	7	0.68	0.134	0.008	1.62	1	46	2	31
Max			7.6	469	128.0	97.9	300	155	93	78	9	24	66	19	11	1.76	0.427	0.046	2.32	1	78	3	42
Var			0.0	11316	1158.2	251.9	4635	1637	420	297	4	33	166	18	6	0.32	0.014	0.000	0.30	0	297	0	71
SD			0.2	106	34.0	15.9	68	40	21	17	2	6	13	4	2	0.57	0.117	0.011	0.55	0	17	0	8
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%		15								1.24		0.011					

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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
15-Jul-20	<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	0.09	0.7	0.1
11-Aug-20	<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	0.13	**0.8**	0.12
30-Sep-20	<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	0.04	0.3	0.02
28-Oct-20	<0.001	0.047	<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	0.04
30-Oct-20	<0.001	0.046	<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	0.6	0.08
27-Nov-20	<0.001	0.036	<0.0001	0.002	0.003	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.02	0.6	0.03
16-Dec-20	<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	0.1	0.7	0.04
7-Jan-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	**<0.01**	<0.01	0.12	**1.1**	0.12
27-Jan-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	0.09	<0.01	0.1	0.5	0.06
14-Feb-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	0.14	<0.01	0.08	0.6	0.06
28-Apr-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	0.08	0.4	0.02
7-May-21	<0.001	0.048	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.1	<0.01	0.13	0.6	0.05
20-Jun-21	<0.001	0.009	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	3.07	<0.0001	<0.1	**0.02**	<0.01	0.14	1.1	0.14
Min	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	0.1	0.01	0.01	0.01	0.3	0.02
Avg	0.001	0.039	0.0001	0.001	0.001	0.001	0.001	0.001	0.01	0.001	0.001	0.28	0.0001	0.1	0.04	0.01	0.08	0.6	0.07
Max	0.001	0.048	0.0001	0.002	0.003	0.001	0.001	0.001	0.01	0.001	0.001	3.07	0.0001	0.1	0.14	0.01	0.14	1.1	0.14
Var	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.70	0.0000	0.0	0.00	0.00	0.00	0.1	0.00
SD	0.000	0.010	0.0000	0.000	0.001	0.000	0.000	0.000	0.00	0.000	0.000	0.84	0.0000	0.0	0.04	0.00	0.05	0.2	0.04
*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	mg/l
15-Jul-20	Discharge Event	, slightly turbid, lig	7.19	224.1	32.3	**93**	143	29	47	17	4	21	44	9	6	0.78	0.049	<0.005	1.27	<1	17	<2	26
11-Aug-20	Discharge Event	ast flow, light brow	7.38	**226.9**	20.2	**98**	145	**18**	46	24	5	20	45	10	5	0.77	0.04	<0.005	1.20	<1	24	<2	26
30-Sep-20	Monthly	flow, light brown,	**7.18**	365	2.4	**63**	234	<5	70	54	4	21	58	15	8	0.04	0.061	<0.005	0.76	<1	54	2	34
28-Oct-20	Monthly	ckle flow, light bro	7.14	**386**	1.2	**42**	247	**<5**	82	62	6	16	56	18	9	0.03	0.187	<0.005	0.64	<1	62	2	34
30-Oct-20	Discharge Event	y/fast flow, light b	7.26	**406**	12.3	**70**	260	**19**	80	68	6	21	51	17	9	0.28	0.099	<0.005	1.24	<1	68	<2	37
27-Nov-20	Monthly	Trickle flow, clear	6.93	**267.2**	4.8	**54**	171	**<5**	55	43	4	10	50	12	6	0.09	0.269	<0.005	0.88	<1	43	<2	28
16-Dec-20	Discharge Event	ast flow, light brow	6.97	76	**37.5**	**92**	48.6	**34**	18	11	9	<1	25	4	2	**1.13**	0.07	<0.005	1.12	<1	11	<2	15
7-Jan-21	Discharge Event	, slightly turbid, lig	7	183	**33.4**	**90**	117	**25**	27	27	7	2	33	6	3	**1.38**	0.042	<0.005	1.38	<1	27	<2	19
27-Jan-21	Monthly	ady flow, clear, cl	7.03	351.2	**4.8**	**74**	225	**<5**	61	51	7	13	50	13	7	**0.09**	0.066	<0.005	1.36	<1	51	<2	31
14-Feb-21	Discharge Event	, slightly turbid, lig	7.36	238.7	**18.2**	**87**	153	**21**	43	33	6	11	37	9	5	**0.54**	0.045	<0.005	1.36	<1	33	<2	25
15-Mar-21	Discharge Event	, slightly turbid, lig	7.25	266.2	42.0	**88**	170	43	50	40	4	14	38	10	6	1.02	0.087	<0.005	2.06	<1	40	2	26
28-Apr-21	Monthly	ast flow, clear, cle	7.27	278.4	9.2	91	178	<5	59	47	4	11	54	12	7	0.24	0.04	<0.005	1.48	<1	47	<2	36
7-May-21	Discharge Event	, slightly turbid, lig	7.21	369.9	18.8	**86**	237	24	65	59	6	19	63	13	8	0.48	0.067	<0.005	1.83	<1	59	<2	36
20-Jun-21	Discharge Event	flow, turbid, light b	7.43	164.3	96.2	**95**	105	114	31	34	5	8	26	6	4	2.36	0.159	<0.005	3.03	<1	34	3	18
Min			6.9	76	1.2	41.5	49	5	18	11	4	2	25	4	2	0.03	0.040	0.005	0.64	1	11	2	15
Avg			7.2	272	23.8	80.2	174	25	52	41	6	14	45	11	6	0.66	0.092	0.005	1.40	1	41	2	28
Max			7.4	406	96.2	97.8	260	114	82	68	9	21	63	18	9	2.36	0.269	0.005	3.03	1	68	3	37
Var			0.0	9148	617.8	295.9	3747	803	360	298	2	35	138	17	5	0.43	0.005	0.000	0.36	0	298	0	51
SD			0.2	96	24.9	17.2	61	28	19	17	2	6	12	4	2	0.66	0.068	0.000	0.60	0	17	0	7
*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	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
15-Jul-20	<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	**<0.01**	<0.01	0.10	0.6	0.11
11-Aug-20	<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	0.01	0.03	0.09	0.5	0.05
30-Sep-20	<0.001	0.047	<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	0.3	0.03
28-Oct-20	<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	0.03	<0.01	0.01	**0.4**	**0.04**
30-Oct-20	<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	0.03	<0.01	0.04	**0.4**	**0.06**
27-Nov-20	<0.001	0.036	<0.0001	0.002	0.004	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	0.01	0.36	**0.8**	**0.09**
16-Dec-20	<0.001	0.034	<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	0.50	**1.3**	**0.03**
7-Jan-21	<0.001	0.034	<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	**1**	**0.08**
27-Jan-21	<0.001	0.047	<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	0.10	**0.5**	**0.03**
14-Feb-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	<0.01	<0.01	0.06	0.5	0.04
15-Mar-21	0.001	0.046	<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	0.24	1.1	0.12
28-Apr-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	0.01	<0.01	0.06	0.3	0.02
7-May-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	0.1	<0.01	0.10	0.6	0.05
20-Jun-21	<0.001	0.044	<0.0001	0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.26	1.3	0.15
Min	0.001	0.034	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	0.3	0.02
Avg	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	0.03	0.01	0.15	0.7	0.06
Max	0.001	0.050	0.0001	0.002	0.004	0.001	0.001	0.001	0.01	0.001	0.001	0.05	0.0001	0.1	0.10	0.03	0.50	1.3	0.15
Var	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.00	0.0000	0.0	0.00	0.00	0.02	0.1	0.00
SD	0.000	0.006	0.0000	0.000	0.001	0.000	0.000	0.000	0.00	0.000	0.000	0.00	0.0000	0.0	0.03	0.01	0.14	0.4	0.04
*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	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
15-Jul-20	Discharge Event	low, slightly turbid, light b	**7.1**	174	15	**99**	112	10	34	14	4	12	39	7	4	0.57	0.034	<0.005	0.94	<1	14	2	22
11-Aug-20	Discharge Event	Fast flow, light brown	7.2	147	19	**101**	94	14	31	17	5	10	31	6	4	0.64	0.020	<0.005	0.74	<1	17	4	18
30-Sep-20	Monthly	Steady flow, light brown	**7.3**	297	1	**87**	190	**<5**	52	27	3	22	52	11	6	0.03	0.025	<0.005	0.42	<1	27	3	28
28-Oct-20	Monthly	Steady flow, light brown	**7.0**	315	2	**60**	202	**<5**	65	35	10	17	50	13	8	0.04	0.100	<0.005	0.38	<1	35	2	29
30-Oct-20	Discharge Event	eady/fast flow, light brow	**7.2**	289	9	**94**	185	**12**	59	25	5	21	48	12	7	0.24	0.062	<0.005	1.30	<1	25	2	29
27-Nov-20	Monthly	Slow flow, clear	7.0	248	2	**70**	159	<5	50	35	4	13	50	10	6	0.05	0.091	<0.005	0.68	<1	35	2	26
16-Dec-20	Discharge Event	low, slightly turbid, light b	6.8	155	26	**100**	99.2	**14**	18	9	7	<1	24	4	2	**1.21**	0.039	<0.005	0.89	<1	9	2	15
7-Jan-21	Discharge Event	low, slightly turbid, light b	7.0	163	14	**98**	104	<5	22	17	7	1	31	4	3	0.75	0.016	<0.005	0.58	<1	17	<2	17
27-Jan-21	Monthly	Steady flow	7.4	256	3	**90**	164	<5	43	32	6	10	42	9	5	**0.08**	0.038	<0.005	0.80	<1	32	<2	25
14-Feb-21	Discharge Event	low, slightly turbid, light b	**7.3**	193	14	97	123	17	31	16	5	2	34	6	4	0.58	0.026	0.005	0.74	<1	16	<2	22
15-Mar-21	Discharge Event	low, slightly turbid, light b	7.4	244	13	**98**	156	14	38	20	4	8	45	7	5	0.41	0.036	<0.005	1.11	<1	20	2	25
28-Apr-21	Monthly	Fast flow, clear, clear	7.6	239	6	**98**	153	<5	40	22	4	8	49	8	5	0.17	0.013	<0.005	0.75	<1	22	<2	30
7-May-21	Discharge Event	dy flow, clear, very light b	7.3	246	9	**95**	158	11	43	24	6	9	56	9	5	0.31	0.016	0.025	1.08	<1	24	<2	26
20-Jun-21	Discharge Event	st flow, turbid, light brow	**7.2**	133	**64**	**100**	84.8	**57**	25	18	6	2	24	5	3	**1.16**	0.065	<0.005	1.24	<1	18	<2	16
Min			6.8	133	1.4	59.5	85	5	18	9	3	1	24	4	2	0.03	0.013	0.005	0.38	1	9	2	15
Avg			7.2	221	14.1	91.8	142	13	39	22	5	10	41	8	5	0.45	0.042	0.006	0.83	1	22	2	23
Max			7.6	315	63.6	100.5	202	57	65	35	10	22	56	13	8	1.21	0.100	0.025	1.30	1	35	4	30
Var			0.0	3587	256.9	151.5	1469	181	191	63	3	48	113	8	3	0.16	0.001	0.000	0.08	0	63	0	27
SD			0.2	60	16.0	12.3	38	13	14	8	2	7	11	3	2	0.39	0.028	0.005	0.28	0	8	1	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.

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
15-Jul-20	<0.001	0.032	<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	0.21	0.7	0.09
11-Aug-20	<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	<0.01	0.02	0.12	0.6	0.04
30-Sep-20	<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	<0.01	<0.01	0.02	0.3	<0.01
28-Oct-20	<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	0.02	<0.01	<0.01	0.3	0.03
30-Oct-20	<0.001	0.046	<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	0.4	0.02
27-Nov-20	<0.001	0.035	<0.0001	0.002	0.004	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.44	0.7	0.06
16-Dec-20	<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	0.05	<0.01	0.47	1.2	0.02
7-Jan-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	<0.01	<0.01	0.13	0.6	<0.01
27-Jan-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	0.03	<0.01	0.04	0.3	0.02
14-Feb-21	<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	<0.01	<0.01	0.11	0.5	0.01
15-Mar-21	<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	<0.01	<0.01	0.09	0.4	0.06
28-Apr-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	0.01	0.1	<0.01
7-May-21	<0.001	0.038	<0.0001	<0.001	<0.001	<0.001	<0.001	0.019	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.23	<0.01	0.06	0.6	0.04
20-Jun-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	0.02	<0.01	0.48	1.2	0.06
Min	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	0.01	0.01	0.01	0.1	0.01
Avg	0.001	0.035	0.0001	0.001	0.001	0.001	0.001	0.002	0.01	0.001	0.001	0.05	0.0001	0.1	0.03	0.01	0.16	0.6	0.03
Max	0.001	0.046	0.0001	0.002	0.004	0.001	0.001	0.019	0.01	0.001	0.001	0.05	0.0001	0.1	0.23	0.02	0.48	1.2	0.09
Var	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.00	0.0000	0.0	0.00	0.00	0.03	0.1	0.00
SD	0.000	0.006	0.0000	0.000	0.001	0.000	0.000	0.005	0.00	0.000	0.000	0.00	0.0000	0.0	0.06	0.00	0.17	0.3	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 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
15-Jul-20	Discharge Event	Fast flow, slightly turbid, light brown	7.44	232	26	**95**	149	14	50	37	4	15	42	10	6	0.91	0.028	0.005	1.17	<1	37	<2	28
11-Aug-20	Discharge Event	Fast flow, light brown	**7.44**	202	**33**	**99**	129	**19**	40	30	6	17	38	8	5	**0.88**	0.022	<0.005	1.10	<1	30	<2	24
30-Sep-20	Monthly	Steady/fast flow, light brown	**7.69**	**213**	**2**	**103**	137	<5	52	46	1	9	34	11	6	**0.03**	0.016	<0.005	0.31	<1	46	2	24
28-Oct-20	Monthly	Fast flow, light brown	**7.08**	264	10	**87**	169	11	65	53	4	10	41	13	8	0.26	0.029	<0.005	0.76	<1	53	2	24
30-Oct-20	Discharge Event	Fast flow, light brown	**7.13**	245	50	**88**	157	48	50	44	5	12	35	10	6	1.46	0.060	<0.005	1.49	<1	44	2	28
27-Nov-20	Monthly	Steady flow, light brown	**7.08**	208	4	**83**	133	<5	46	50	4	5	28	10	5	0.08	0.043	<0.005	0.52	<1	50	<2	20
16-Dec-20	Discharge Event	Fast flow, slightly turbid, light brown	**7.5**	98	**45**	**86**	63	**81**	34	36	5	3	20	7	4	**0.88**	0.129	0.006	1.81	<1	36	<2	14
7-Jan-21	Discharge Event	Fast flow, turbid, brown	**6.94**	155	**75**	**92**	99	**92**	27	29	6	<1	24	6	3	**2.60**	0.072	0.006	2.15	<1	29	<2	15
27-Jan-21	Monthly	Fast flow, clear, clear	**7.27**	218	**5**	**87**	139	**9**	43	43	5	6	30	9	5	**0.10**	0.035	<0.005	0.75	<1	43	<2	19
14-Feb-21	Discharge Event	Fast flow, slightly turbid, light brown	**7.14**	181	50	**91**	116	26	34	35	8	<1	24	7	4	1.72	0.035	<0.005	1.86	<1	35	<2	19
15-Mar-21	Discharge Event	Fast flow, slightly turbid, light brown	**7.36**	173	58	96	111	44	29	24	5	<1	28	5	4	2.13	0.038	0.008	2.13	<1	24	<2	19
28-Apr-21	Monthly	Fast flow, clear, clear	7.51	208	6	96	133	7	50	42	4	6	38	10	6	0.21	0.018	<0.005	0.83	<1	42	<2	27
7-May-21	Discharge Event	Fast flow, clear, light brown	**7.19**	344	15	93	220	20	73	63	6	11	56	16	8	0.44	0.043	<0.005	1.30	<1	63	<2	32
20-Jun-21	Discharge Event	Fast flow, turbid, light brown	**7.15**	157	**114**	**97**	101	**91**	31	37	6	<1	24	6	4	**3.65**	0.090	<0.005	3.68	<1	37	3	17
Min			6.9	98	1.5	82.6	63	5	27	24	1	1	20	5	3	0.03	0.016	0.005	0.31	1	24	2	14
Avg			7.3	207	35.1	92.3	132	34	45	41	5	7	33	9	5	1.10	0.047	0.005	1.42	1	41	2	22
Max			7.7	344	114.0	103.2	220	92	73	63	8	17	56	16	8	3.65	0.129	0.008	3.68	1	63	3	32
Var			0.0	3321	1067.9	32.9	1360	1044	181	107	3	30	92	9	2	1.20	0.001	0.000	0.77	0	107	0	29
SD			0.2	58	32.7	5.7	37	32	13	10	2	5	10	3	1	1.09	0.031	0.001	0.87	0	10	0	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).**
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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
15-Jul-20	<0.001	0.027	<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	0.7	0.09
11-Aug-20	<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	0.03	0.07	**0.7**	**0.09**
30-Sep-20	<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	<0.01	<0.01	0.01	**0.5**	**0.05**
28-Oct-20	<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	0.02	<0.01	0.02	0.4	0.04
30-Oct-20	<0.001	0.029	<0.0001	0.002	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	0.07
27-Nov-20	<0.001	0.016	<0.0001	0.003	0.005	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	<0.01	<0.01	0.65	4	0.02
16-Dec-20	<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	0.03	<0.01	0.04	0.8	0.11
07-Jan-21	<0.001	0.032	<0.0001	0.002	0.002	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.12	**1.1**	0.11
27-Jan-21	0.002	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	0.06	<0.01	0.14	0.4	0.05
14-Feb-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	<0.01	<0.01	0.07	0.8	0.07
15-Mar-21	0.001	0.031	<0.0001	0.002	0.002	0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.08	<0.01	0.07	1	0.10
28-Apr-21	<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	0.10	0.3	0.01
07-May-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	0.05	<0.01	0.16	0.6	0.08
20-Jun-21	<0.001	0.028	<0.0001	0.003	<0.001	<0.001	<0.001	0.004	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.19	**1.6**	**0.28**
Min	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	0.01	0.3	0.01
Avg	0.001	0.026	0.0001	0.002	0.001	0.001	0.001	0.001	0.01	0.001	0.001	0.05	0.0001	0.1	0.03	0.01	0.13	1.0	0.08
Max	0.002	0.032	0.0001	0.003	0.005	0.001	0.001	0.004	0.01	0.001	0.001	0.05	0.0001	0.1	0.08	0.03	0.65	4.0	0.28
Var	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.00	0.0000	0.0	0.00	0.00	0.03	0.9	0.00
SD	0.000	0.005	0.0000	0.001	0.001	0.000	0.000	0.001	0.00	0.000	0.000	0.00	0.0000	0.0	0.02	0.01	0.16	0.9	0.06
*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).**
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SW3 - Main Water Dam (Major) EPL11701 Point 3

Date	Category	Storage RL	pH	EC	Turbidity	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
15-Jul-20	Discharge Event	RL 71.020	8.2	3640	1.6	2329.6	<5	943	151	5	1050	319	145	141	<0.01	0.08	<0.005	0.07	<1	151	<2	312
23-Jul-20	Weekly	RL 70.970	8.2	2873	2.2																	
29-Jul-20	Weekly	RL 71.009	8.4	3190	1.2																	
5-Aug-20	Weekly	RL not recorded	8.5	3150	1.8																	
11-Aug-20	Discharge Event	RL 71.079	8.6	2679	5.8	1714.6	8	830	146	8	873	226	133	121	0.07	0.09	<0.005	0.10	<1	146	<2	256
20-Aug-20	Weekly	RL 70.998	8.5	2872	3.7																	
28-Aug-20	Weekly	RL 70.989	8.6	3174	2.3																	
3-Sep-20	Weekly	RL no recorded	8.5	3150	20.1	2016																
11-Sep-20	Weekly	RL 71.053	8.5	3148	3.0	2014.7																
16-Sep-20	Weekly	RL 71.170	8.6	2989	3.3	1913																
23-Sep-20	Weekly	RL 71.076	8.6	3041	1.7	1946.2																
30-Sep-20	Monthly	RL 71.120	8.6	3380	6.1	2163.2	9	901	167	1	882	301	140	134	0.03	0.13	<0.005	<0.05	<1	167	<2	279
7-Oct-20	Weekly	RL no recorded	8.9	3004	1.8	1922.6																
14-Oct-20	Weekly	RL 71.102	8.7	3193	2.6	2043.5																
21-Oct-20	Weekly	RL 94.60	8.7	3390	1.4	2169.6																
28-Oct-20	Monthly	RL 71.043	8.7	3510	2.1	2246.4	<5	953	137	2	976	299	154	138	<0.01	0.09	<0.005	<0.05	<1	137	<2	307
30-Oct-20	Discharge Event	RL 70.996	8.5	2597	7.8	1662.1	10	782	138	8	761	220	122	116	0.17	0.11	<0.005	0.17	<1	138	2	256
4-Nov-20	Weekly	RL 71.017	8.8	3067	2.2	1962.9																
11-Nov-20	Weekly	RL 71.005	8.5	3220	2.3	2060.8																
18-Nov-20	Weekly	RL 71.044	8.9	2976	1.6	1904.6																
27-Nov-20	Monthly	RL 71.045	8.6	3154	1.6	2018.6	7	931	128	3	963	285	147	137	0.04	0.12	<0.005	0.13	<1	128	<2	300
3-Dec-20	Weekly	RL71.117	8.5	3360	3	2150.4																
9-Dec-20	Weekly	RL no recorded	8.7	3188	2	2040.3																
16-Dec-20	Discharge	RL71.05	8.3	2720	6	1740.8	6	742	142	8	718	218	114	111	0.08	0.04	<0.005	0.09	<1	142	2	239
23-Dec-20	Weekly	RL no recorded	8.6	3050	2	1952																
30-Dec-20	Weekly	RL no recorded	8.5	2591	1	1658.2																
6-Jan-21	Discharge	RL71.223	8.2	3010	4	1926.4																
7-Jan-21	Discharge	RL71.152	8.6	2990	3	1913.6	<5	862	123	4	800	252	129	131	0.07	0.03	<0.005	0.10	<1	123	2	278
13-Jan-21	Discharge Event	RL71.092	8.8	3010	1	1926.4																
20-Jan-21	Discharge Event	RL70.965	8.4	3060	1	1958.4																
27-Jan-21	Monthly	RL70.95	8.5	3200	1	2048	7	868	126	7	832	265	138	127	<0.01	0.03	<0.005	<0.05	<1	126	<2	278
3-Feb-21	Weekly	RL70.994	8.9	3070	3	1964.8																
10-Feb-21	Weekly	RL71.029	8.7	3060	6	1958.4																
14-Feb-21	Discharge Event	RL71.084	8.5	3030	2	1939.2	<5	904	122	10	840	262	141	134	0.03	0.04	<0.005	0.05	<1	122	<2	290
16-Feb-21	Weekly	RL71.104	8.4	2911	1	1863																
23-Feb-21	Weekly	RL71.229	8.4	2890	3	1849.6																
3-Mar-21	Weekly	RL71.134	8.6	2940	2	1881.6																
10-Mar-21	Weekly	RL not recorded	8.4	3000	1	1920																
15-Mar-21	Discharge Event	RL71.100	8.1	2910	2	1862.4	8	828	126	5	863	266	122	127	0.01	0.03	<0.005	<0.05	<1	126	2	270
24-Mar-21	Weekly	RL72.145	7.3	1417	7	906.88																
7-Apr-21	Weekly	RL71.518	8.2	2118	1	1355.5																
14-Apr-21	Weekly	RL71.507	8.0	1798	3	1150.7																
21-Apr-21	Weekly	RL71.568	7.9	2421	2	1549.4																
28-Apr-21	Monthly	RL71.530	8.1	2370	2	1516.8	7	766	147	4	665	209	119	114	<0.01	0.10	<0.005	<0.05	<1	147	<2	234
5-May-21	Weekly	RL71.561	8.2	2458	1	1573.1																
7-May-21	Discharge Event	RL not recorded	8.1	2366	1	1514.2	8	719	114	5	742	199	118	103	0.01	0.09	<0.005	<0.05	<1	114	<2	217
12-May-21	Weekly	RL71.572	8.0	2424	3	1551.4																
19-May-21	Weekly	RL71.447	8.0	2500	3	1600																
26-May-21	Weekly	RL71.501	8.1	2466	2	1578.2																
2-Jun-21	Weekly	RL71.506	8.3	2395	1	1532.8																
9-Jun-21	Weekly	RL71.515	8.0	2580	2	1651.2																
16-Jun-21	Weekly	RL71.484	8.0	2332	1	1492.5																
20-Jun-21	Discharge Event	RL71.617	8.0	2447	2	1566.1	6	757	172	6	612	206	120	111	0.02	0.35	<0.005	0.10	<1	172	<2	242
23-Jun-21	Weekly	RL71.668	8.2	2237	4	1431.7																
30-Jun-21	Weekly	RL71.478	8.0	2459	10	1573.8																
Min			7.3	1417	1	907	5	719	114	1	612	199	114	103	0.01	0.03	0.005	0.05	1	114	2	217
Avg			8.4	2840	3	1804	7	842	139	5	827	252	132	125	0.04	0.10	0.005	0.08	1	139	2	268
Max			8.9	3640	20	2330	10	953	172	10	1050	319	154	141	0.17	0.35	0.005	0.17	1	172	2	312
Var			0.1	181269	9	78850	3	6224	290	7	14901	1560	161	144	0.00	0.01	0.000	0.00	0	290	0	835
SD			0.3	426	3	281	2	79	17	3	122	39	13	12	0.04	0.08	0.000	0.04	0	17	0	29
*Water Quality Trigger			N/A	N/A	N/A	N/A	N/A								N/A		N/A					

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SW3 - Main Water Dam (Major)

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
15-Jul-20	<0.001	0.03	<0.0001	<0.001	<0.001	<0.001	0.002	0.004	<0.01	<0.001	<0.001	<0.05	<0.0001	0.3	0.02	<0.01	<0.01	0.4	<0.01
11-Aug-20	<0.001	0.029	<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	0.5	0.03
30-Sep-20	<0.001	0.029	<0.0001	<0.001	<0.001	<0.001	0.002	0.004	<0.01	<0.001	<0.001	<0.05	<0.0001	0.3	<0.01	<0.01	0.01	0.5	<0.01
28-Oct-20	<0.001	0.028	<0.0001	<0.001	<0.001	<0.001	0.002	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	0.3	<0.01	<0.01	<0.01	0.4	0.01
30-Oct-20	<0.001	0.026	<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	0.02	0.5	0.02
27-Nov-20	<0.001	0.028	<0.0001	0.004	0.003	<0.001	0.002	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	0.3	<0.01	<0.01	0.02	0.7	<0.01
16-Dec-20	<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	0.3	<0.01	<0.01	<0.01	0.5	0.01
7-Jan-21	<0.001	0.027	0.0002	0.002	<0.001	<0.001	0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	0.3	<0.01	<0.01	<0.01	0.4	<0.01
27-Jan-21	<0.001	0.029	<0.0001	<0.001	<0.001	<0.001	0.002	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	0.18	<0.01	<0.01	0.5	0.02
14-Feb-21	<0.001	0.032	0.0002	<0.001	<0.001	<0.001	0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	0.16	<0.01	0.02	0.4	<0.01
15-Mar-21	<0.001	0.03	<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	0.3	0.01
28-Apr-21	<0.001	0.027	<0.0001	<0.001	<0.001	<0.001	0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	0.04	<0.01	0.03	0.3	<0.01
7-May-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	0.03	<0.01	0.03	0.4	0.03
20-Jun-21	<0.001	0.023	<0.0001	<0.001	<0.001	<0.001	0.001	0.006	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	0.14	<0.01	0.07	0.6	0.01
Min	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	0.2	0.01	0.01	0.01	0.3	0.01
Avg	0.001	0.028	0.0001	0.001	0.001	0.001	0.001	0.003	0.01	0.001	0.001	0.05	0.0001	0.3	0.05	0.01	0.02	0.5	0.01
Max	0.001	0.032	0.0002	0.004	0.003	0.001	0.002	0.006	0.01	0.001	0.001	0.05	0.0001	0.3	0.18	0.01	0.07	0.7	0.03
Var	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.00	0.0000	0.0	0.00	0.00	0.00	0.0	0.00
SD	0.000	0.002	0.0000	0.001	0.001	0.000	0.000	0.001	0.00	0.000	0.000	0.00	0.0000	0.1	0.06	0.00	0.02	0.1	0.01

***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 - Southern Arm of MWD Diversion Drain

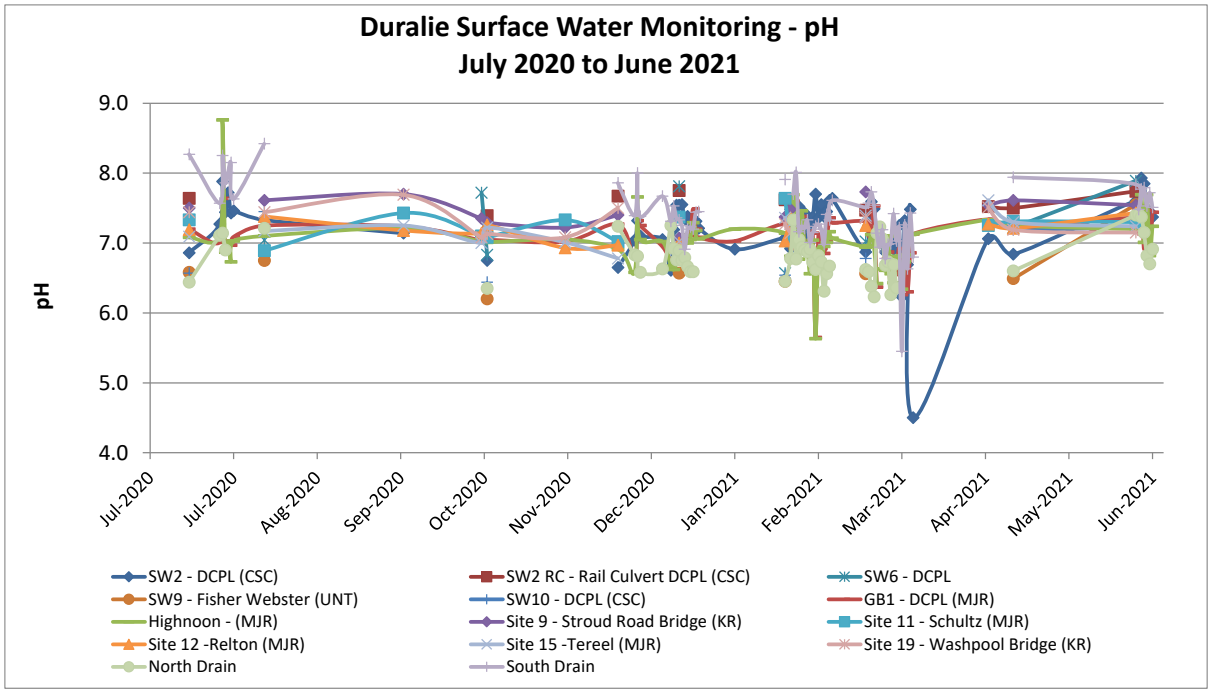
Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	TSS mg/l
15-Jul-20	Discharge	Flow to dam. no flow, clear, light brown	8.3	**2250**	7.45	7
26-Jul-20	Discharge	Fast flow, slightly turbid, light brown, flow to drain	7.6	**598**	56.6	26
27-Jul-20	Discharge	Fast flow, light brown.Flow to drain	8.3	**617**	42.6	12
28-Jul-20	Discharge	Fast flow, light brown.Flow to drain	7.9	**742**	34.5	14
29-Jul-20	Discharge	Fast flow, slightly turbid, light brown, flow to drain	8.0	**744**	30.4	6
30-Jul-20	Discharge	Fast flow, slightly turbid, light brown. Flowing to drain	8.2	**825**	30.1	8
31-Jul-20	Discharge	Steady flow, light brown, flow to drain	7.6	**1095**	12.51	6
11-Aug-20	Discharge	Fast flow, light brown, flow to dam	8.4	**1884**	15.2	8
30-Sep-20	Monthly	Nil flow				
28-Oct-20	Monthly	Nil flow				
30-Oct-20	Discharge Event	Nil flow				
27-Nov-20	Monthly	Nil flow				
16-Dec-20	Discharge Event	Steady flow, clear, light brown - sample taken at dam	7.9	**2589**	3.54	7
22-Dec-20	Discharge	Fast flow, slightly turbid, light brown	7.4	**1024**	20.4	6
23-Dec-20	Discharge	Fast flow, clear, light brown	8.0	**811.6**	24.6	19
24-Dec-20	Discharge	Fast flow, clear, light brown	7.4	**923**	12.91	8
1-Jan-21	Discharge	Steady flow, clear, light brown - flow to dam	7.7	**1704**	9.64	<5
4-Jan-21	Discharge	Fast flow, slighlty turbid, brown	7.3	**429**	31.1	10
5-Jan-21	Discharge	Fast flow, clear, light brown - flow to drain	7.5	**401**	31.7	11
6-Jan-21	Discharge	Fast flow, slightly turbid, light brown - flow to drain	7.4	**550.5**	20.1	5
7-Jan-21	Discharge Event	Fast flow, slightly turbid, brown- flow to drain	7.3	**460.2**	34.6	<5
8-Jan-21	Discharge	Fast flow, slightly turbid, light brown - flow to drain	7.3	**470**	16.29	<5
9-Jan-21	Discharge	Fast flow, slightly turbid, light brown	6.9	**447.5**	14.95	<5
10-Jan-21	Discharge	Fast flow, clear, light brown - flow to drain	7.2	**449.2**	11.74	<5
11-Jan-21	Discharge	Steady flow, slightly turbid, light brown - flow to drain	7.2	**461.4**	11.77	<5
12-Jan-21	Discharge	Fast flow, clear, light brown	7.2	**488.4**	11.04	<5
13-Jan-21	Discharge	Steady flow, clear, light brown - flow to drain	7.4	**634.8**	7.51	<5
14-Jan-21	Discharge	Steady/slow flow, clear, light brown - flow to drain	7.5	**588.5**	12.75	<5
27-Jan-21	Monthly	No flow				
14-Feb-21	Discharge Event	No flow	7.9	**2427**	3.8	<5
16-Feb-21	Discharge	No flow				
17-Feb-21	Discharge	Fast flow, clear, colourless - flow to dam	7.7	**1744**	9.44	<5
18-Feb-21	Discharge	Steady flow, clear, brown - flow to dam	8.0	**1629**	6.22	6
19-Feb-21	Discharge	Fast flow, turbid, light brown - flow to drain	7.2	**552.4**	65.6	13
20-Feb-21	Discharge	Fast flow, slightly turbid, light brown - flow to drain	7.2	**583.5**	41.1	18
21-Feb-21	Discharge	Steady flow, slightly turbid, light brown - flow to drain	7.2	**569.1**	26	<5
22-Feb-21	Discharge	Fast flow, clear, light brown - flow to drain	7.3	**441.1**	20.6	5
23-Feb-21	Discharge	Fast flow, slightly turbid, brown- flow to drain	7.0	**438.5**	33.7	9
24-Feb-21	Discharge	Fast flow, clear, brown - flow to drain	7.2	**468.3**	24.7	8
25-Feb-21	Discharge	Fast flow, clear, light brown	7.2	**406**	24.5	<5
26-Feb-21	Discharge	Steady flow, slightly turbid, brown - flow to drain	7.3	**458.2**	19	5
27-Feb-21	Discharge	Fast flow, clear, light brown - flow to drain	7.2	**488.4**	15.96	<5
28-Feb-21	Discharge	Fast flow, clear, light brown - flow to drain	7.0	**470**	14.99	5
1-Mar-21	Discharge	Steady flow, slightly turbid, light brown - flow to drain	7.4	**535**	10.55	<5
2-Mar-21	Discharge	Steady flow, clear, brown - flow to drain	7.3	**677**	6.89	<5
3-Mar-21	Discharge	Slow flow, clear, very light brown - flow to drain	7.6	**932.4**	5.55	<5
15-Mar-21	Discharge Event	No flow, clear, light brown - flow to dam	7.5	**1635**	10.51	12
16-Mar-21	Discharge	Steady flow, slightly turbid, light brown - flow to drain	7.6	**1269**	15.21	<5
17-Mar-21	Discharge	Fast flow, clear, light brown - flow to drain	7.7	**1365**	8.28	8
18-Mar-21	Discharge	Fast flow, clear, light brown - flow to drain	7.5	**821**	29.6	6
19-Mar-21	Discharge	Fast flow, slightly turbid, light brown - flow to drain	7.1	**309.9**	62	30
20-Mar-21	Discharge	Fast flow, slightly turbid, light brown - flow to drain, flooding over weir	6.9	**200.5**	50	19
21-Mar-21	Discharge	Fast flow, slightly turbid, brown- flow to not recorded	7.2	**181.8**	40.1	22
22-Mar-21	Discharge	Slightly turbid, light brown	6.8	**226.3**	56.5	16
23-Mar-21	Discharge	Fast flow, slightly turbid, light brown	7.0	**274.8**	48.7	14
24-Mar-21	Discharge	Fast flow, clear, light brown - flow to drain	7.0	**317**	26.3	9
25-Mar-21	Discharge	Fast flow, clear, light brown - flow to drain	7.4	**284.1**	28.9	<5
26-Mar-21	Discharge	Fast flow, clear, light brown - flow to drain	7.0	**291.5**	24.9	<5
27-Mar-21	Discharge	Fast flow, clear, light brown - flow to drain	7.2	**345**	18.6	<5
28-Mar-21	Discharge	Fast flow, clear, clear	5.5	**403.4**	16.9	<5
29-Mar-21	Discharge	Fast flow, clear, light brown - flow to drain	7.3	**320**	14.91	7
30-Mar-21	Discharge	Fast flow, clear, light brown - flow to drain	6.6	**412**	13.23	6
31-Mar-21	Discharge	Fast flow, clear, light brown - flow to drain	7.4	**572**	7.47	5
1-Apr-21	Discharge	Slow flow, clear, very light brown - flow to dam	6.8	**476.5**	13.07	8
28-Apr-21	Monthly	No flow				
7-May-21	Discharge	Steady flow, clear, light brown - flow to dam	7.9	**2055**	17.28	13
20-Jun-21	Discharge	Fast flow, turbid, light brown - flow NR	7.8	**858.4**	105	34
21-Jun-21	Discharge	Steady flow, slightly turbid, brown - flow to drain	7.5	**728**	44.4	10
22-Jun-21	Discharge	Fast flow, clear, light brown - flow to drain	7.8	**619.2**	50.6	18
23-Jun-21	Discharge	Fast flow, clear, light brown - flow to drain	7.8	**610.4**	46.6	7
24-Jun-21	Discharge	Slow flow, slightly turbid, light brown - flow to drain	7.5	**683.9**	24.9	6
25-Jun-21	Discharge	Slow flow, clear, yellow/brown tinge -flow to drain	7.7	**802.2**	22.3	<5
26-Jun-21	Discharge	Slow/steady flow, clear, light brown - flow to drain	7.5	**1093**	7.56	<5
Min			5.5	182	3.54	5
Avg			7.4	775	24.79	9
Max			8.4	2589	105.00	34
Var			0.2	310394	336.90	40
SD			0.5	557	18.35	6
*Water Quality Trigger			7.1 - 7.9	544	119	80

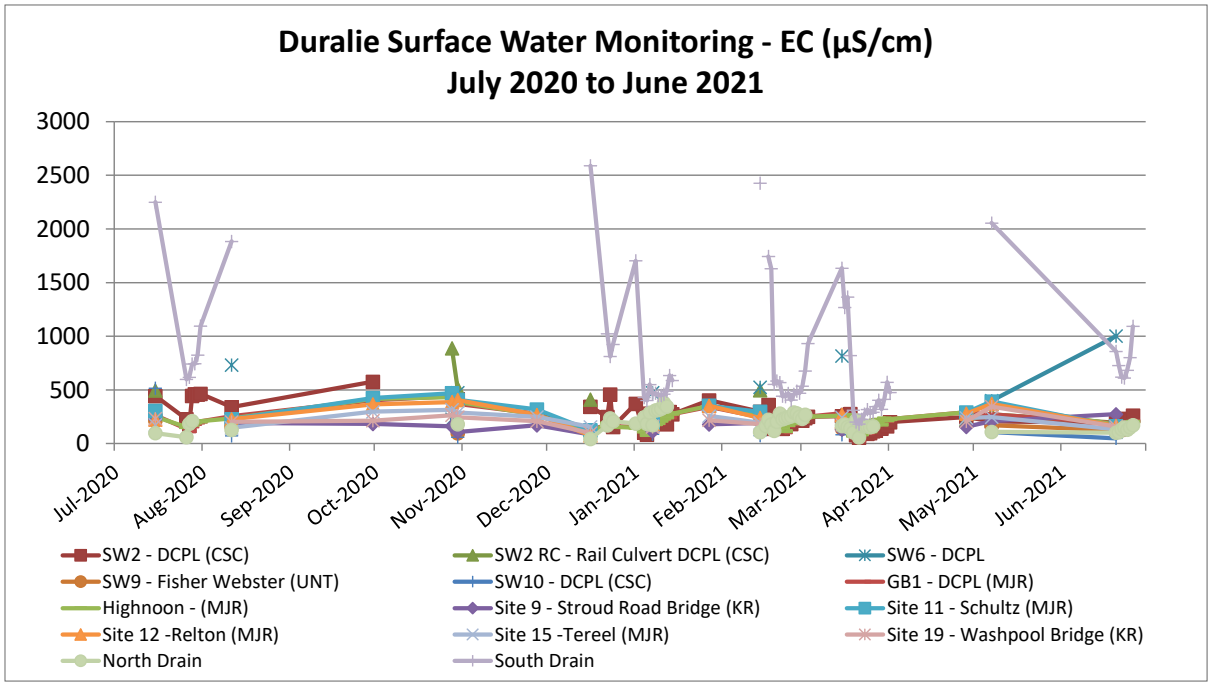
***Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).**

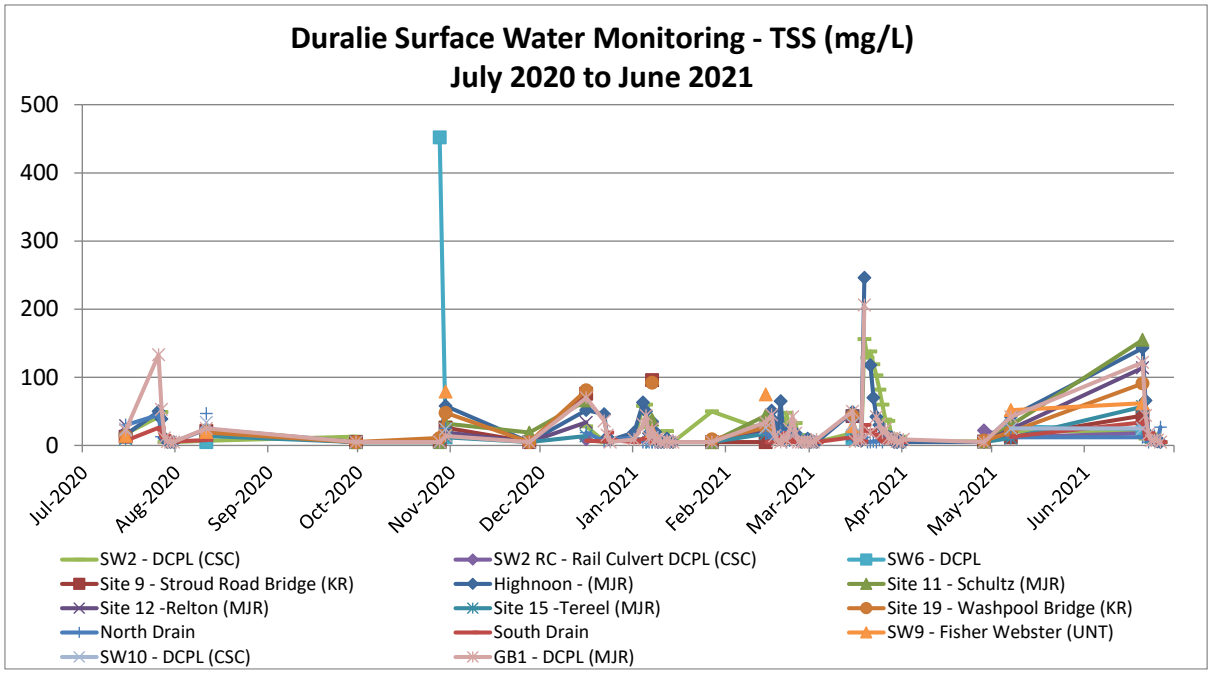
Site - Northern Arm of MWD Diversion Drain

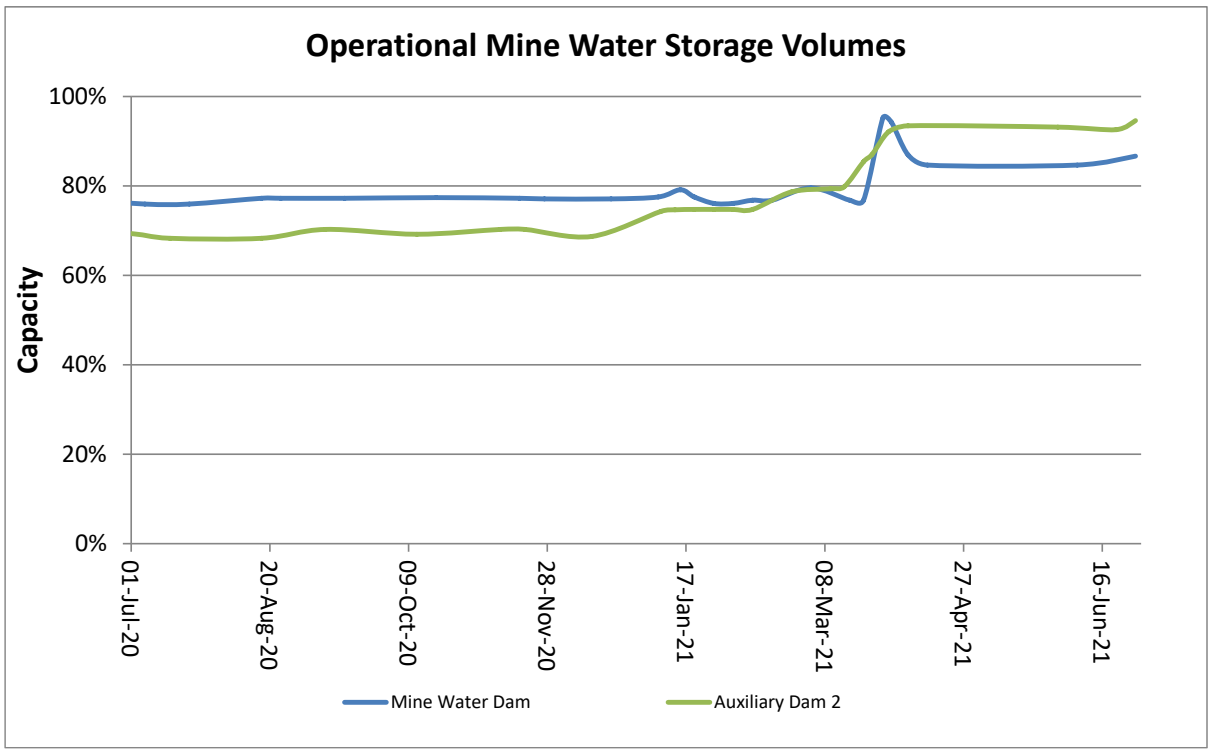
Date	Category	Comment	ph	EC	Turbidity	TSS
				uS/cm	NTU	mg/l
15-Jul-20	Discharge	Steady flow, turbid, light brown	6.4	97.3	115	30
26-Jul-20	Discharge	Fast flow, turid, brown	7.1	59.3	133	45
27-Jul-20	Discharge	Steady flow, slightly turbid, light brown	7.1	183.2	67.5	13
28-Jul-20	Discharge	Slow flow, 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
24-Mar-21	Discharge	Steady flow, clear, light brown	6.3	157.8	22.2	8
25-Mar-21	Discharge	Steady flow, clear, light brown	6.7	152.7	19.8	<5
26-Mar-21	Discharge	Trickle flow, clear, light brown	6.4	161.3	16.67	9
27-Mar-21	Discharge	No flow				
28-Mar-21	Discharge	No flow				
29-Mar-21	Discharge	No flow				
30-Mar-21	Discharge	No flow				
31-Mar-21	Discharge	No flow				
1-Apr-21	Discharge	No flow				
28-Apr-21	Monthly	No flow				
7-May-21	Discharge	Slow/steady flow, turbid, brown	6.6	108.2	42.2	12
20-Jun-21	Discharge	Steady flow, turbid, light brown	7.4	101.4	61.4	12
21-Jun-21	Discharge	Steady flow, turbid, brown	7.4	106.1	81.4	12
22-Jun-21	Discharge	Steady flow, slightly turbid, light brown	7.4	133.7	78	<5
23-Jun-21	Discharge	Slow flow, slightly turbid, brown	7.2	150.8	73.8	8
24-Jun-21	Discharge	Trickle flow, slightly turbid, light brown	6.8	129.9	40.8	14
25-Jun-21	Discharge	Trickle flow, slightly turbid, light brown	6.7	151.3	44.8	8
26-Jun-21	Discharge	Trickle flow, slightly turbid, light brown	6.9	170.9	58.4	27
Min			6.2	43	3	5
Avg			6.8	191	39	11
Max			7.4	379	182	47
Var			0.1	5509	1156	79
SD			0.3	74	34	9
*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 2020 to June 2021
pH
9.0
8.0
7.0
6.0
5.0
4.0
Jul-2020
Jul-2020
Aug-2020
Sep-2020
Oct-2020
Nov-2020
Dec-2020
Jan-2021
Feb-2021
Mar-2021
Apr-2021
May-2021
Jun-2021
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 2020 to June 2021
3000
2500
2000
1500
1000
500
0
Jul-2020
Aug-2020
Sep-2020
Oct-2020
Nov-2020
Dec-2020
Jan-2021
Feb-2021
Mar-2021
Apr-2021
May-2021
Jun-2021
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 - TSS (mg/L)
July 2020 to June 2021
500
400
300
200
100
0
Jul-2020
Aug-2020
Sep-2020
Oct-2020
Nov-2020
Dec-2020
Jan-2021
Feb-2021
Mar-2021
Apr-2021
May-2021
Jun-2021
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-20
20-Aug-20
09-Oct-20
28-Nov-20
17-Jan-21
08-Mar-21
27-Apr-21
16-Jun-21
Mine Water Dam
Auxiliary Dam 2

Groundwater

DB1W

Parameter	Units	26-Aug-20	10-Nov-20	Apr-21	20-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	15.82	15.82	15.59	15.62	15.6	15.71	15.82	0.02	0.12
pH		6.0	6.0	6.1	6.3	6.0	6.1	6.3	0.02	0.13
Conductivity @ 25^{0}C	(µS/cm)	4890	3840	4610	4230	3840	4393	4890	208825	457
ORP	(mV)	107	199	74	66	66	112	199	3718	61
Dissolved Oxygen	(%)	26	36	22	18	18	25	36	58	8
TDS	(mg/L)	2900	3250	3150	2620	2620	2980	3250	79267	282
Alkalinity as CaCO3	(mg/L)	141	150	127	106	106	131	150	367	19
Acidity as CaCO3	(mg/L)	107	103	128	88	88	107	128	272	17
Sulphate	(mg/L)	404	395	378	387	378	391	404	123	11
Chloride	(mg/L)	1050	1100	978	1060	978	1047	1100	2583	51
Calcium	(mg/L)	262	292	239	246	239	260	292	555	24
Magnesium	(mg/L)	61	64	60	55	55	60	64	14	4
Sodium	(mg/L)	484	516	492	465	465	489	516	446	21
Aluminium	(mg/L)	1.54	0.88	4.45	1.17	0.88	2.01	4.45	2.72	1.65
Manganese	(mg/L)	1.0	1.0	0.9	0.9	0.9	0.9	1.0	0.00	0.06
Zinc	(mg/L)	0.11	0.08	0.17	0.07	0.07	0.11	0.17	0.00	0.04
Iron	(mg/L)	27.0	30.4	25.3	25.0	25.0	26.9	30.4	6.14	2.48

DB2W

Parameter	Units	21-Aug-20	10-Nov-20	Apr-21	20-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	14.00	14.05	13.71	13.40	13.40	13.79	14.05	0.09	0.30
pH		6.13	6.19	6.28	6.25	6.1	6.2	6.3	0.00	0.07
Conductivity @ 25^{0}C	(µS/cm)	1704	1448	1685	1676	1448	1628	1704	14576	121
ORP	(mV)	130	132	49	26	26	84	132	3003	55
Dissolved Oxygen	(%)	20	24	21	28	20	23	28	13.54	3.68
TDS	(mg/L)	989	1110	1030	865	865	999	1110	10446	102
Alkalinity as CaCO3	(mg/L)	200	197	180	170	170	187	200	202	14
Acidity as CaCO3	(mg/L)	48	81	77	79	48	71	81	243	16
Sulphate	(mg/L)	186	187	199	192	186	191	199	35	6
Chloride	(mg/L)	311	294	272	296	272	293	311	258	16
Calcium	(mg/L)	109	108	108	110	108	109	110	1	1
Magnesium	(mg/L)	26	25	27	26	25	26	27	0.67	0.82
Sodium	(mg/L)	169	162	154	153	153	160	169	56	8
Aluminium	(mg/L)	0.04	<0.01	0.03	0.01	0.01	0.03	0.04		
Manganese	(mg/L)	0.73	0.72	0.83	0.82	0.72	0.77	0.83	0.00	0.06
Zinc	(mg/L)	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.00	0.00
Iron	(mg/L)	11.9	11.5	11.7	12.2	11.5	11.8	12.2	0.09	0.30

DB3W

Parameter	Units	26-Aug-20	10-Nov-20	Feb-21	20-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	4.48	4.50	4.07	2.67	2.67	3.93	4.50	0.74	0.86
pH		6.2	6.4	6.3	6.4	6.2	6.3	6.4	0.01	0.12
Conductivity @ 25^{0}C	(µS/cm)	125	144	105	134	105	127	144	275	17
ORP	(mV)	112	142	49	72	49	94	142	1712	41
Dissolved Oxygen	(%)	62	58	45	59	45	56	62	54	7
TDS	(mg/L)	178	133	126	168	126	151	178	656	26
Alkalinity as CaCO3	(mg/L)	44	51	54	49	44	50	54	18	4
Acidity as CaCO3	(mg/L)	10	22	18	19	10	17	22	26	5
Sulphate	(mg/L)	4	3	3	6	3	4	6	2	1
Chloride	(mg/L)	13	12	15	16	12	14	16	3	2
Calcium	(mg/L)	2	2	3	4	2	2	2	0	0
Magnesium	(mg/L)	2	2	2	2	2	2	2	0	0
Sodium	(mg/L)	20	21	21	22	20	21	22	1	1
Aluminium	(mg/L)	5	2	2	17.7	2	6	17.7	58	8
Manganese	(mg/L)	0.05	0.04	0.04	0.13	0.04	0.07	0.13	0.00	0.05
Zinc	(mg/L)	0.07	0.06	0.02	0.07	0.02	0.05	0.07	0.00	0.02
Iron	(mg/L)	7.4	3.0	4.0	22.4	3.0	9.2	22.4	80.91	9.00

DB4W

Parameter	Units	21-Aug-20	10-Nov-20	Feb-21	20-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	6.67	6.84	6.96	6.26	6.26	6.68	6.96	0.09	0.31
pH		6.2	6.9	6.6	6.7	6.2	6.6	6.9	0.09	0.30
Conductivity @ 25^{0}C	(µS/cm)	4350	332	3510	3950	332	3036	4350	3366094	1835
ORP	(mV)	-170	-172	-62	-86	-172	-123	-62	3233	57
Dissolved Oxygen	(%)	6	6	47	15	6	18	47	377	19
TDS	(mg/L)	2160	2340	2580	2160	2160	2310	2580	39600	199
Alkalinity as CaCO3	(mg/L)	351	358	300	324	300	333	358	706	27
Acidity as CaCO3	(mg/L)	9	33	64	22	9	32	64	551	23
Sulphate	(mg/L)	72	54	191	79	54	99	191	3873	62
Chloride	(mg/L)	911	869	1040	994	869	954	1040	6023	78
Calcium	(mg/L)	151	151	172	150	150	156	172	114	11
Magnesium	(mg/L)	58	52	83	56	52	62	83	198	14
Sodium	(mg/L)	506	491	513	486	486	499	513	159	13
Aluminium	(mg/L)	0.02	0.02	<0.01	0.06	0.02	0.03	0.06	0.00	0.02
Manganese	(mg/L)	1.1	0.9	1.5	1.1	0.9	1.2	1.5	0.07	0.26
Zinc	(mg/L)	<0.005	0.05	0.01	<0.005	0.01	0.03	0.05		
Iron	(mg/L)	0.1	0.1	2.9	0.5	0.1	0.9	2.9	1.77	1.33

DB5W

Parameter	Units	21-Aug-20	10-Nov-20	Apr-21	20-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	12.03	12.11	11.34	11.30	11.30	11.70	12.11	0.19	0.43
pH		5.6	5.7	5.9	5.7	5.6	5.7	5.9	0.01	0.11
Conductivity @ 25^{0}C	(µS/cm)	2350	1980	2120	2032	1980	2121	2350	26748	164
ORP	(mV)	53	22	26	47	22	37	53	234	15
Dissolved Oxygen	(%)	20	28	25	16	16	22	28	27	5
TDS	(mg/L)	1270	1310	1260	1120	1120	1240	1310	6867	83
Alkalinity as CaCO3	(mg/L)	64	63	44	46	44	54	64	115	11
Acidity as CaCO3	(mg/L)	99	147	103	114	99	116	147	474	22
Sulphate	(mg/L)	202	184	182	173	173	185	202	148	12
Chloride	(mg/L)	549	502	458	509	458	505	549	1390	37
Calcium	(mg/L)	31	29	27	26	26	28	31	5	2
Magnesium	(mg/L)	34	30	29	28	28	30	34	7	3
Sodium	(mg/L)	302	282	282	268	268	284	302	196	14
Aluminium	(mg/L)	0.12	0.03	0.12	0.11	0.03	0.09	0.12	0.00	0.04
Manganese	(mg/L)	1.1	1.0	0.9	0.9	0.91	0.97	1.05	0.00	0.06
Zinc	(mg/L)	0.034	0.046	0.055	0.048	0.03	0.05	0.06	0.00	0.01
Iron	(mg/L)	41.5	38.4	31.6	34.2	31.6	36.4	41.5	19.30	4.39

DB6W

Parameter	Units	20-Aug-20	25-Nov-20	12-Feb-21	19-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	21.28	21.31	21.30	21.21	21.21	21.28	21.31	0.00	0.05
pH		6.6	6.6	6.6	6.4	6.4	6.6	6.6	0.01	0.10
Conductivity @ 25^{0}C	(µS/cm)	6830	5980	5080	6440	5080	6083	6830	567358	753
ORP	(mV)	136	-40	112	73	-40	70	136	6076	78
Dissolved Oxygen	(%)	20	36	21	25	20	25	36	53	7
TDS	(mg/L)	3620	3460	4010	3740	3460	3708	4010	53825	232
Alkalinity as CaCO3	(mg/L)	673	669	682	670	669	674	682	35	6
Acidity as CaCO3	(mg/L)	49	38	90	63	38	60	90	505	22
Sulphate	(mg/L)	110	103	92	97	92	101	110	60	8
Chloride	(mg/L)	1480	1470	1540	1610	1470	1525	1610	4167	65
Calcium	(mg/L)	301	302	300	297	297	300	302	5	2
Magnesium	(mg/L)	196	186	202	187	186	193	202	58	8
Sodium	(mg/L)	619	607	648	600	600	619	648	448	21
Aluminium	(mg/L)	0.69	0.17	0.71	0.11	0.11	0.42	0.71	0.11	0.32
Manganese	(mg/L)	0.295	0.297	0.310	0.333	0.295	0.309	0.333	0.000	0.017
Zinc	(mg/L)	0.017	0.035	0.023	0.021	0.017	0.024	0.035	0.000	0.008
Iron	(mg/L)	3.9	3.3	4.2	4.9	3.3	4.1	4.9	0.46	0.68

DB7W

Parameter	Units	26-Aug-20	25-Nov-20	Apr-21	20-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	10.71	10.92	9.37	9.71	9.37	10.18	10.92	0.57	0.75
pH		6.9	6.7	7.0	7.1	6.7	6.9	7.1	0.04	0.19
Conductivity @ 25^{0}C	(µS/cm)	2949	2623	3090	3003	2623	2916	3090	41594	204
ORP	(mV)	-67	-34	-107	-19	-107	-57	-19	1524	39
Dissolved Oxygen	(%)	16	26	24	27	16	23	27	25	5
TDS	(mg/L)	1550	1550	1770	1600	1550	1618	1770	10892	104
Alkalinity as CaCO3	(mg/L)	437	425	423	433	423	430	437	44	7
Acidity as CaCO3	(mg/L)	17	13	22	22	13	19	22	19	4
Sulphate	(mg/L)	44	60	66	66	44	59	66	108	10
Chloride	(mg/L)	659	615	631	694	615	650	694	1201	35
Calcium	(mg/L)	139	144	133	144	133	140	144	27	5
Magnesium	(mg/L)	50	53	55	53	50	53	55	4	2
Sodium	(mg/L)	330	349	364	354	330	349	364	204	14
Aluminium	(mg/L)	0.1	0.3	0.3	0.2	0.1	0.2	0.3	0.01	0.08
Manganese	(mg/L)	0.625	0.602	0.632	0.604	0.602	0.616	0.632	0.000	0.02
Zinc	(mg/L)	0.006	0.006	0.010	<0.005	0.006	0.007	0.010	0.000	0.00
Iron	(mg/L)	0.19	0.13	0.3	0.15	0.13	0.19	0.30	0.01	0.08

DB8W

Parameter	Units	20-Aug-20	10-Nov-20	12-Feb-21	19-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	16.07	16.2	16.3	16.36	16.07	16.23	16.36	0.02	0.13

DB9W

Parameter	Units	20-Aug-20	10-Nov-20	27-Apr-21	19-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	20.74	20.67	20.11	20.09	20.09	20.40	20.74	0.12	0.35
pH		7.41	7.23	7.38	7.32	7.2	7.3	7.4	0.01	0.08
Conductivity @ 25^{0}C	(µS/cm)	4700	3560	3690	3710	3560	3915	4700	278300	528
ORP	(mV)	197	162	52	-4	-4	102	197	8787	94
Dissolved Oxygen	(%)	40	59	25	62	25	47	62	294	17
TDS	(mg/L)	2380	2060	2160	2050	2050	2163	2380	23492	153
Alkalinity as CaCO3	(mg/L)	181	132	131	127	127	143	181	655	26
Acidity as CaCO3	(mg/L)	6	15	8	9	6	10	15	15	4
Sulphate	(mg/L)	224	242	257	259	224	246	259	263	16
Chloride	(mg/L)	985	786	808	900	786	870	985	8342	91
Calcium	(mg/L)	200	158	159	152	152	167	200	486	22
Magnesium	(mg/L)	14	13	12	11	11	13	14	2	1
Sodium	(mg/L)	597	483	520	486	483	522	597	2815	53
Aluminium	(mg/L)	6.14	0.04	3.38	0.06	0.0	2.4	6.1	8.66	2.94
Manganese	(mg/L)	0.299	0.14	0.196	0.142	0.140	0.194	0.299	0.01	0.07
Zinc	(mg/L)	0.058	0.01	0.045	0.024	0.010	0.034	0.058	0.00	0.02
Iron	(mg/L)	8.69	0.37	4.77	0.35	0.35	3.55	8.69	16.09	4.01

DB10W

Parameter	Units	20-Aug-20	10-Nov-20	27-Apr-21	19-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	14.07	12.7	12.15	12.17	12.15	12.77	14.07	0.81	0.90
pH		5.39	5.41	5.76	5.12	5.1	5.4	5.8	0.07	0.26
Conductivity @ 25^{0}C	(µS/cm)	4560	4310	5060	4590	4310	4630	5060	97933	313
ORP	(mV)	173	217	106	68	68	141	217	4451	67
Dissolved Oxygen	(%)	31	46	26	47	26	38	47	115	11
TDS	(mg/L)	2450	2590	2910	2560	2450	2628	2910	39092	198
Alkalinity as CaCO3	(mg/L)	37	37	73	14	14	40	73	594	24
Acidity as CaCO3	(mg/L)	39	117	87	76	39	80	117	1038	32
Sulphate	(mg/L)	444	446	468	459	444	454	468	128	11
Chloride	(mg/L)	942	926	1070	1120	926	1015	1120	9100	95
Calcium	(mg/L)	78	78	116	73	73	86	116	399	20
Magnesium	(mg/L)	80	76	94	78	76	82	94	67	8
Sodium	(mg/L)	602	586	674	618	586	620	674	1467	38
Aluminium	(mg/L)	0.29	0.9	6.06	0.14	0.1	1.8	6.1	8	3
Manganese	(mg/L)	0.896	0.885	1.07	0.779	0.779	0.908	1.070	0.01	0.12
Zinc	(mg/L)	0.214	0.163	0.157	0.329	0.157	0.216	0.329	0.01	0.08
Iron	(mg/L)	11.2	14.6	15.4	11.6	11.20	13.20	15.40	4.45	2.11

DB11W

Parameter	Units	26-Aug-20	25-Nov-20	Apr-21	21-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	10.73	10.83	10.53	10.58	10.5	10.67	10.83	0.02	0.14
pH		6.77	6.4	6.92	6.85	6.4	6.74	6.92	0.05	0.23
Conductivity @ 25^{0}C	(µS/cm)	3790	3099	3430	3600	3099	3480	3790	86054	293
ORP	(mV)	103	56	-28	186	-28	79	186	8001	89
Dissolved Oxygen	(%)	23	17	19	19	17	19	23	7	3
TDS	(mg/L)	1990	1990	2240	2020	1990	2060	2240	14600	121
Alkalinity as CaCO3	(mg/L)	286	296	290	280	280	288	296	45	7
Acidity as CaCO3	(mg/L)	17	12	21	22	12	18	22	21	5
Sulphate	(mg/L)	201	208	194	199	194	201	208	34	6
Chloride	(mg/L)	790	795	716	835	716	784	835	2461	50
Calcium	(mg/L)	213	240	196	215	196	216	240	329	18
Magnesium	(mg/L)	37	44	35	39	35	39	44	15	4
Sodium	(mg/L)	362	391	365	377	362	374	391	174	13
Aluminium	(mg/L)	0.51	0.29	0.18	0.20	0.2	0.30	0.51	0.02	0.15
Manganese	(mg/L)	0.976	1.020	0.855	0.937	0.9	0.95	1.02	0.00	0.07
Zinc	(mg/L)	0.007	0.010	0.005	0.010	0.0	0.01	0.01	0.00	0.00
Iron	(mg/L)	3.86	3.71	2.83	3.87	2.8	3.57	3.87	0.25	0.50

BH4BW

Parameter	Units	26-Aug-20	10-Nov-20	Feb-21	20-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	5.15	5.15	5.05	4.55	4.6	4.98	5.15	0.08	0.29
pH		6.0	6.2	6.4	6.3	6.0	6.23	6.36	0.02	0.13
Conductivity @ 25^{0}C	(µS/cm)	219	216	199	518	199	288	518	23632	154
ORP	(mV)	161	172	2	79	2	104	172	6300	79
Dissolved Oxygen	(%)	34	32	37	36	32	35	37	6	2
TDS	(mg/L)	168	154	151	291	151	191	291	4499	67
Alkalinity as CaCO3	(mg/L)	97	94	104	82	82	94	104	84	9
Acidity as CaCO3	(mg/L)	24	70	52	31	24	44	70	436	21
Sulphate	(mg/L)	2	1	1	8	1	3	8	11	3
Chloride	(mg/L)	12	12	15	88	12	32	88	1408	38
Calcium	(mg/L)	11	11	11	22	11	14	22	30	6
Magnesium	(mg/L)	7	7	8	13	7	9	13	8	3
Sodium	(mg/L)	20	19	21	43	19	26	43	133	12
Aluminium	(mg/L)	5	3	9	7	3	6	9	6.39	2.53
Manganese	(mg/L)	0.6	0.5	0.7	0.7	0.5	0.64	0.70	0.01	0.09
Zinc	(mg/L)	0.1	0.07	0.05	0.1	0.1	0.07	0.09	0.00	0.02
Iron	(mg/L)	21.5	23.3	19.4	15.8	15.8	20.00	23.30	10.38	3.22

SI1W

Parameter	Units	20-Aug-20	25-Nov-20	12-Feb-21	19-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	9.78	9.92	10.08	9.45	9.45	9.81	10.08	0.07	0.27
pH		7.1	6.9	7.1	6.9	6.9	7.0	7.1	0.01	0.11
Conductivity @ 25^{0}C	(µS/cm)	3116	2760	2494	3060	2494	2858	3116	83156	288
ORP	(mV)	246	90	123	110	90	142	246	4968	70
Dissolved Oxygen	(%)	34	31	34	38	31	34	38	9	3
TDS	(mg/L)	2040	2000	2080	2010	2000	2033	2080	1292	36
Alkalinity as CaCO3	(mg/L)	494	506	502	476	476	495	506	177	13
Acidity as CaCO3	(mg/L)	18	15	23	25	15	20	25	21	5
Sulphate	(mg/L)	766	766	760	797	760	772	797	280	17
Chloride	(mg/L)	296	267	293	285	267	285	296	170	13
Calcium	(mg/L)	183	186	177	169	169	179	186	56	8
Magnesium	(mg/L)	154	148	153	140	140	149	154	41	6
Sodium	(mg/L)	265	263	272	252	252	263	272	69	8
Aluminium	(mg/L)	0.13	0.05	0.57	0.04	0.04	0.20	0.57	0.06	0.25
Manganese	(mg/L)	0.003	0.004	0.021	0.002	0.0	0.01	0.02	0.00	0.01
Zinc	(mg/L)	<0.005	<0.005	0.048	<0.005	0.0	0.05	0.05		
Iron	(mg/L)	0.08	0.07	0.75	0.06	0.06	0.24	0.75	0.12	0.34

SI2W

Parameter	Units	20-Aug-20	25-Nov-20	12-Feb-21	19-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	19.79	19.92	19.60	17.86	17.9	19.29	19.92	0.93	0.96
pH		7.4	7.0	7.2	7.0	7.0	7.15	7.36	0.03	0.17
Conductivity @ 25^{0}C	(µS/cm)	3930	3184	2820	3420	2820	3339	3930	216409	465
ORP	(mV)	206	68	64	100	64	110	206	4398	66
Dissolved Oxygen	(%)	41	51	22	19	19	33	51	233	15
TDS	(mg/L)	2370	2400	2500	2380	2370	2413	2500	3558	60
Alkalinity as CaCO3	(mg/L)	316	314	298	310	298	310	316	65	8
Acidity as CaCO3	(mg/L)	8	8	8	13	8	9	13	6	3
Sulphate	(mg/L)	1220	1220	1150	1170	1150	1190	1220	1267	36
Chloride	(mg/L)	282	277	304	288	277	288	304	138	12
Calcium	(mg/L)	163	166	163	150	150	161	166	51	7
Magnesium	(mg/L)	172	168	174	159	159	168	174	44	7
Sodium	(mg/L)	364	351	365	341	341	355	365	131	11
Aluminium	(mg/L)	0.03	0.01	0.01	0.02	0.01	0.02	0.03	0.00	0.01
Manganese	(mg/L)	0.014	0.012	0.016	0.015	0.012	0.014	0.016	0.000	0.002
Zinc	(mg/L)	0.010	0.012	0.014	<0.005	0.010	0.012	0.014	0.000	0.002
Iron	(mg/L)	0.07	0.06	0.07	<0.05	0.06	0.07	0.07	0.00	0.01

SI3W

Parameter	Units	20-Aug-20	25-Nov-20	12-Feb-21	19-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	27.96	28.12	28.18	28.15	27.96	28.10	28.18	0.01	0.10
pH		7.0	6.9	6.9	6.6	6.6	6.9	7.0	0.02	0.15
Conductivity @ 25^{0}C	(µS/cm)	8840	8250	7760	8890	7760	8435	8890	286967	536
ORP	(mV)	276	69	195	112	69	163	276	8410	92
Dissolved Oxygen	(%)	66	52	62	46	46	56	66	86	9
TDS	(mg/L)	5250	5200	6420	6060	5200	5733	6420	365425	605
Alkalinity as CaCO3	(mg/L)	361	398	402	390	361	388	402	343	19
Acidity as CaCO3	(mg/L)	20	24	38	31	20	28	38	63	8
Sulphate	(mg/L)	721	754	858	922	721	814	922	8616	93
Chloride	(mg/L)	1740	2030	2470	2390	1740	2158	2470	114092	338
Calcium	(mg/L)	610	583	673	642	583	627	673	1522	39
Magnesium	(mg/L)	177	176	195	189	176	184	195	86	9
Sodium	(mg/L)	838	818	899	852	818	852	899	1187	34
Aluminium	(mg/L)	4.32	0.82	2.85	1.21	0.82	2.30	4.32	2.59	1.61
Manganese	(mg/L)	0.748	0.704	0.618	0.132	0.132	0.551	0.748	0.08	0.28
Zinc	(mg/L)	0.071	0.134	0.112	0.123	0.071	0.110	0.134	0.00	0.03
Iron	(mg/L)	2.62	1.78	3.37	1.73	1.73	2.38	3.37	0.61	0.78

WR1

Note: Installed 3-Sep-13. E - 400776, N - 6425804

Waste Emplacement - South

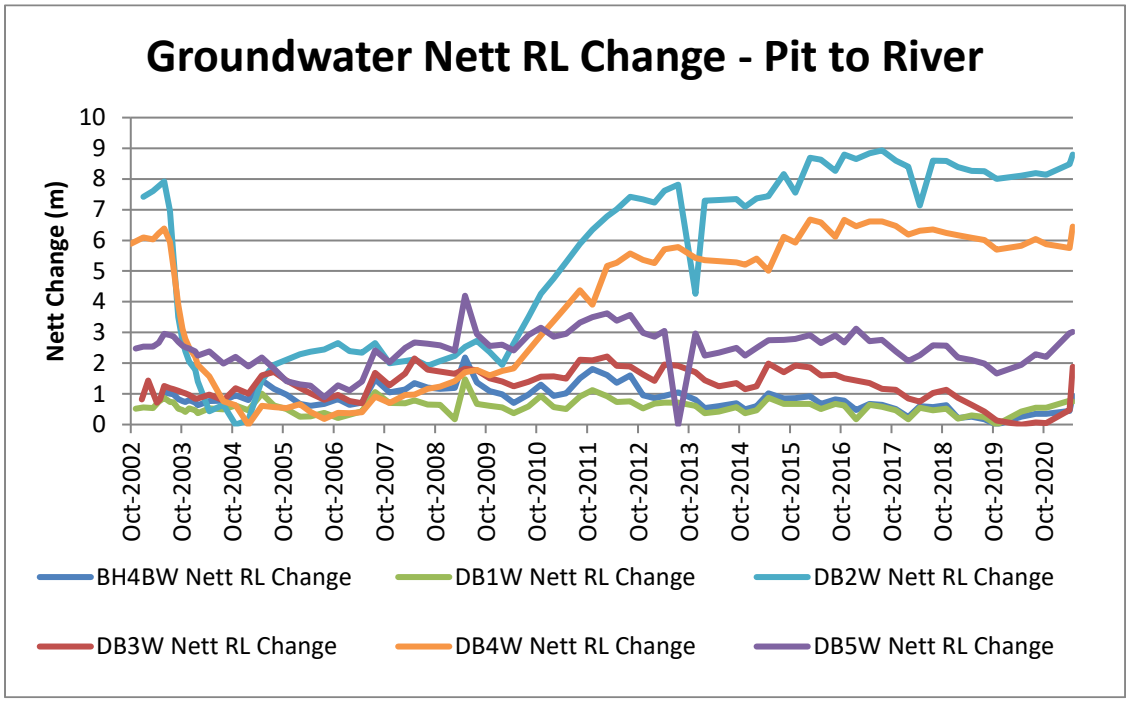
Parameter	Units	21-Aug-20	10-Nov-20	12-Feb-21	20-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	10.04	10.17	10.6	9.98	9.98	10.20	10.60	0.08	0.28
pH		6.26	6.62	6.39	6.33	6.3	6.4	6.6	0.02	0.16
Conductivity @ 25^{0}C	(µS/cm)	3055	3070	2710	3420	2710	3064	3420	84056	290
ORP	(mV)	258	161	182	116	116	179	258	3514	59
Dissolved Oxygen	(%)	38	76	46	43	38	50	76	293	17
TDS	(mg/L)	1810	1890	1970	2200	1810	1968	2200	28292	168
Alkalinity as CaCO3	(mg/L)	307	294	299	265	265	291	307	335	18
Acidity as CaCO3	(mg/L)	22	64	70	41	22	49	70	486	22
Sulphate	(mg/L)	563	546	622	745	546	619	745	8117	90
Chloride	(mg/L)	435	417	456	508	417	454	508	1550	39
Calcium	(mg/L)	224	224	233	248	224	232	248	128	11
Magnesium	(mg/L)	43	40	44	48	40	44	48	11	3
Sodium	(mg/L)	340	331	358	356	331	346	358	168	13
Aluminium	(mg/L)	3.74	0.96	3.35	1.38	1.0	2.4	3.7	1.93	1.39
Manganese	(mg/L)	0.952	0.874	1.12	1.07	0.874	1.004	1.120	0.01	0.11
Zinc	(mg/L)	0.028	0.014	0.182	<0.005	0.014	0.075	0.182	0.01	0.09
Iron	(mg/L)	4.41	2.50	5.38	2.83	2.50	3.78	5.38	1.83	1.35

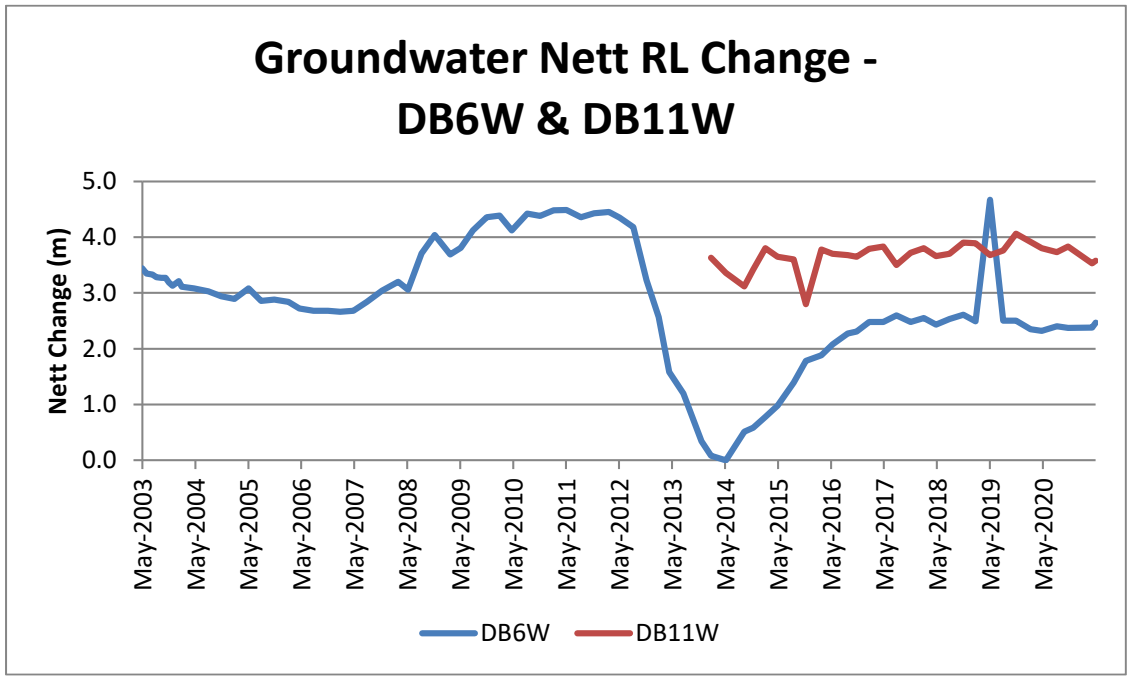
WR2

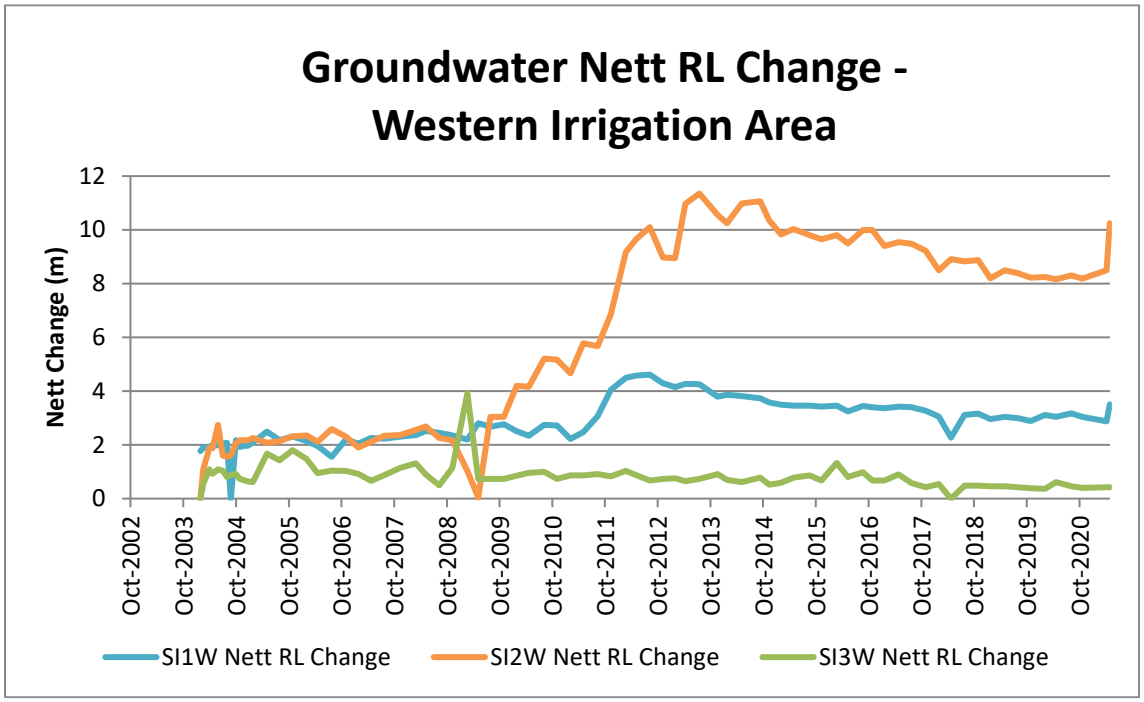
Note: Installed 3-Sep-13. E - 400990, N - 6426582

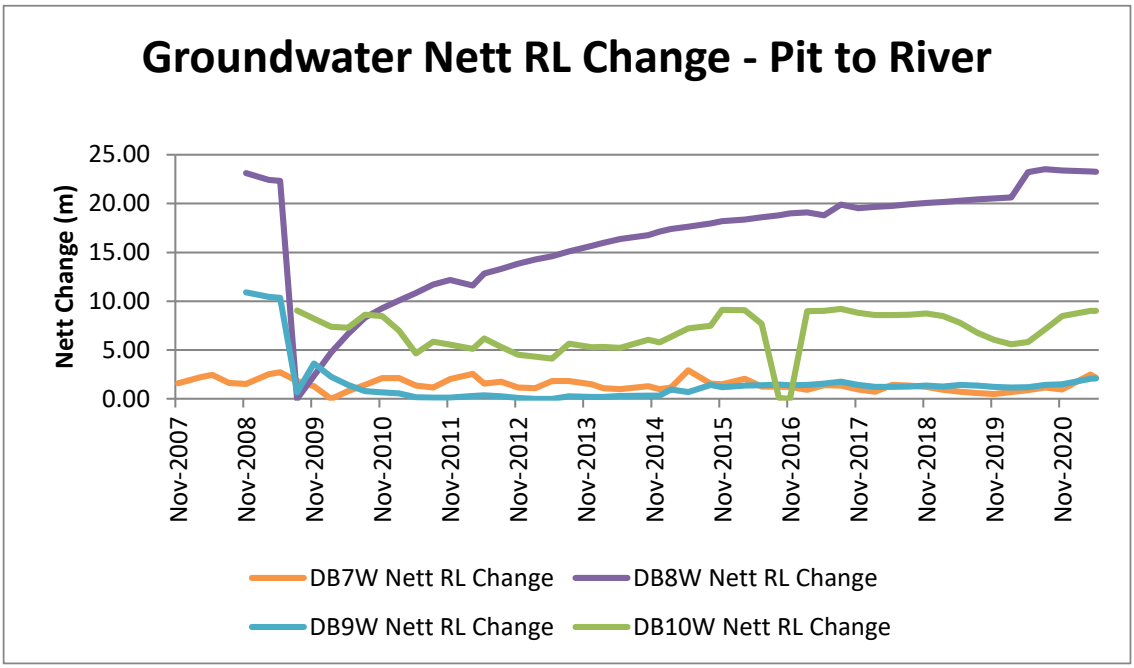
Waste Emplacement - East

Parameter	Units	20-Aug-20	10-Nov-20	12-Feb-21	20-May-21	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	70	69.01	72.99	63.45	63.45	68.86	72.99	15.88	3.99
pH		6.95	6.97	6.83	6.75	6.8	6.88	6.97	0.01	0.10
Conductivity @ 25^{0}C	(µS/cm)	7190	6140	5020	7150	5020	6375	7190	1052033	1026
ORP	(mV)	230	205	170	104	104	177	230	2990	55
Dissolved Oxygen	(%)	27	26	31	42	26	31	42	54	7
TDS	(mg/L)	5040	5240	5130	5140	5040	5138	5240	6692	82
Alkalinity as CaCO3	(mg/L)	205	227	244	108	108	196	244	3697	61
Acidity as CaCO3	(mg/L)	21	30	165	18	18	59	165	5067	71
Sulphate	(mg/L)	1150	899	1080	910	899	1010	1150	15607	125
Chloride	(mg/L)	1270	1280	1480	1600	1270	1408	1600	25825	161
Calcium	(mg/L)	1020	887	1040	925	887	968	1040	5433	74
Magnesium	(mg/L)	32	30	32	18	18	28	32	45	7
Sodium	(mg/L)	357	331	380	371	331	360	380	457	21
Aluminium	(mg/L)	5.17	3.85	8.88	1.95	1.95	4.96	8.88	8.57	2.93
Manganese	(mg/L)	2.28	2.39	2.64	0.802	0.80	2.03	2.64	0.69	0.83
Zinc	(mg/L)	0.072	0.206	0.217	0.158	0.072	0.163	0.217	0.00	0.07
Iron	(mg/L)	4.18	7.95	17.5	3.8	3.80	8.36	17.50	40.66	6.38


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
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
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
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
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 (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	%		%				
	Weismantel Strip 16	17-Mar-21	13:22:00	<0.22	<110.0	<0.22	<110.0	0.52	101.7	<0.22	<110.0	0.0%	0	0.0%	0	1	Nil	
	Weismantel Strip 16	31-Mar-21	16:15:00	<0.22	<110.0	<0.22	<110.0	0.44	100.4	<0.22	<110.0	0.0%	0	0.0%	0	2	Nil	
	Weismantel Strip 16	30-Apr-21	13:04:00	<0.22	<110.0	<0.22	<110.0	0.06	104.6	<0.22	<110.0	0.0%	0	0.0%	0	3	Nil	
	Weismantel Strip 17	19-May-21	13:13:00	<0.22	<110.0	0.4	107.0	<0.22	<110.0	<0.22	<110.0	0.0%	0	0.0%	0	4	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:

Complaints & CCC Annual Report

Duralie Complaint Summary

Period: 12 Months to July 2021

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

Total No. of Complainants: 0

Date/Time of Complaint	Complainant Location	Method of Complaint	Nature of Complaint	Investigation/Outcome

Duralie Coal Community Consultative Committee Annual Report for Year 2020

Community Consultative Committee Details

CCC / Project Name:	Duralie Coal Mine	**Reporting Period:**	January - December 2020
Independent Chairperson:	**Margaret MacDonald-Hill**	**Proponent Contact:**	**Michael Plain**

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.

The Committee continued to hold biannual meetings throughout the reporting year as mining operations ceased at Duralie in late 2018. The February meeting was carried out with normal face to face attendance. However, the August meeting was held via video/teleconferencing with only one community member able to participate remotely. The meeting proceeded via video conferencing with the Council representatives, Duralie Coal personnel, one community member and myself.

Early in the year the committee accepted with a degree of sadness the resignation of one of the inaugural members because of ill health. Owing to Covid-19 and the cessation of mining, recruitment and refreshment of the group was postponed. Even though the committee is only small, meetings are usually well attended, however, the combination of Covid-19 and technology problems reduced attendance numbers throughout the year.

Mine closure has been a regular agenda item at each meeting for the past few years, as has rehabilitation and future land use. A community member asked about the Duralie Biodiversity Offset Area, which is protected by a Public Positive Covenant. He expressed concern that the restriction on the land titles for this area may not be in perpetuity and could be changed by a future Government Minister. He suggested that the area would be better served by the relatively new Biodiversity Conservation Trust Voluntary Conservation Agreement Program. The discussion was ongoing throughout the year. Duralie Coal provided the committee with the Land Titles searches and instruments and an explanation of how the biodiversity security mechanisms for the Duralie Biodiversity Offset had been finalised in accordance with the Development Consent and the fact that the Biodiversity Conservation Trust post dates the Consent requirements. As Chair, this matter was discussed at length with the Department's Team Leader for Resource Assessments, who confirmed the information already provided to the committee was correct, the land was held in perpetuity and additional agreements were not required. This information was shared with the committee.

During late 2019 as NSW was greatly affected by bushfires, the biodiversity offset was also impacted by a nearby bushfire. Many RFS and volunteer fire fighters, who are also committee members, were able to control the fire. With the enduring drought, the committee had voiced its dismay in preceding years that the proposed controlled burns were delayed. The committee was pleased to hear Yancoal's response to the emergency situation throughout the state, the contribution of $500,000 to the RFS and SES and policy support for employees to assist communities during these circumstances. The RFS also had access to water storages at Stratford and Duralie throughout the bushfire season.

In the wake of the previous years' drought and extreme bushfire events experienced across the State and prior discussions on controlled release of water in times of drought, the committee welcomed the news of the approval of the Stratford Water Access Modification to allow offsite water transfer by a public authority, the Mid Coast Council, and access to water by the RFS for fire fighting purposes. A water reuse order from the EPA is still required to be finalised before water can be transferred onsite.

Mid Coast Council is a major contributor at the committee meetings. The Catchment Officer is a regular invited speaker as the members have a strong interest in his work. The Duralie community enhancement contributions paid to Council are part of an environmental fund which has greatly assisted catchment management and garnered additional funding opportunities. The Council has been successful in establishing the Karuah Catchment Management Project and Grants Program in partnership with Landcare Australia and targeted landholders. The $900,000 grant supports many projects such as Beyond the Shed Pilot Project, connectivity mapping of the Karuah and Myall Catchments, a business case for private conservation, wetland mapping and development of an MOU between Council and Hunter Local Land Services.

The achievements and proposed works form part of Council's annual financial report presented to the committee by Council's Coordinator, Community Strengthening and the Director of Community Spaces and Services. The Duralie CCC maintains its interest in the process and allocation of the community enhancement contributions paid to Council each year and acknowledges the benefit to the community these contributions bring. With mining operations coming to a close at Duralie, the committee is aware that this component of the contribution ceases in 2021, although contributions under Stratford's consent are still payable to Mid Coast Council

Other topics of discussion for the reporting period also included:

- 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
- Yancoal Community Support Program
- Agricultural rehabilitation possibilities
- Stratford Extension Project updates and transition from Duralie Mine.

- Triennial Independent Environment Audit

All the committee members are an integral part of the local community, excepting the Chair. As long term residents, they are well known to their neighbours and in the area.

Duralie Coal Personnel continue to provide a high standard of information in advance of each meeting and in response to committee requests.

2. CCC activities over the last 12 months

- Committee meetings were held during February and August 2020. The August meeting was held via video/teleconference. The committee reviews its meeting schedule for the ensuing year in November each year. The number of meetings is likely to increase during 2021 in anticipation of further activity towards mine closure.
- A site visit of the newly completed rehabilitation area was undertaken prior to the February 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 and Land Service field days.
- 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

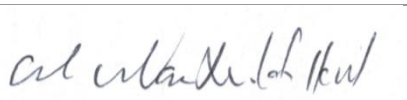
4. Focus for next 12 months

The planned activities for 2021 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 5 2020

Appendix 7:

Duralie Coal Mine Annual Biodiversity Report 2021

Duralie Coal Mine Annual Biodiversity Report 2021

FOR THE YEAR ENDING 30 JUNE 2021

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 2021 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.

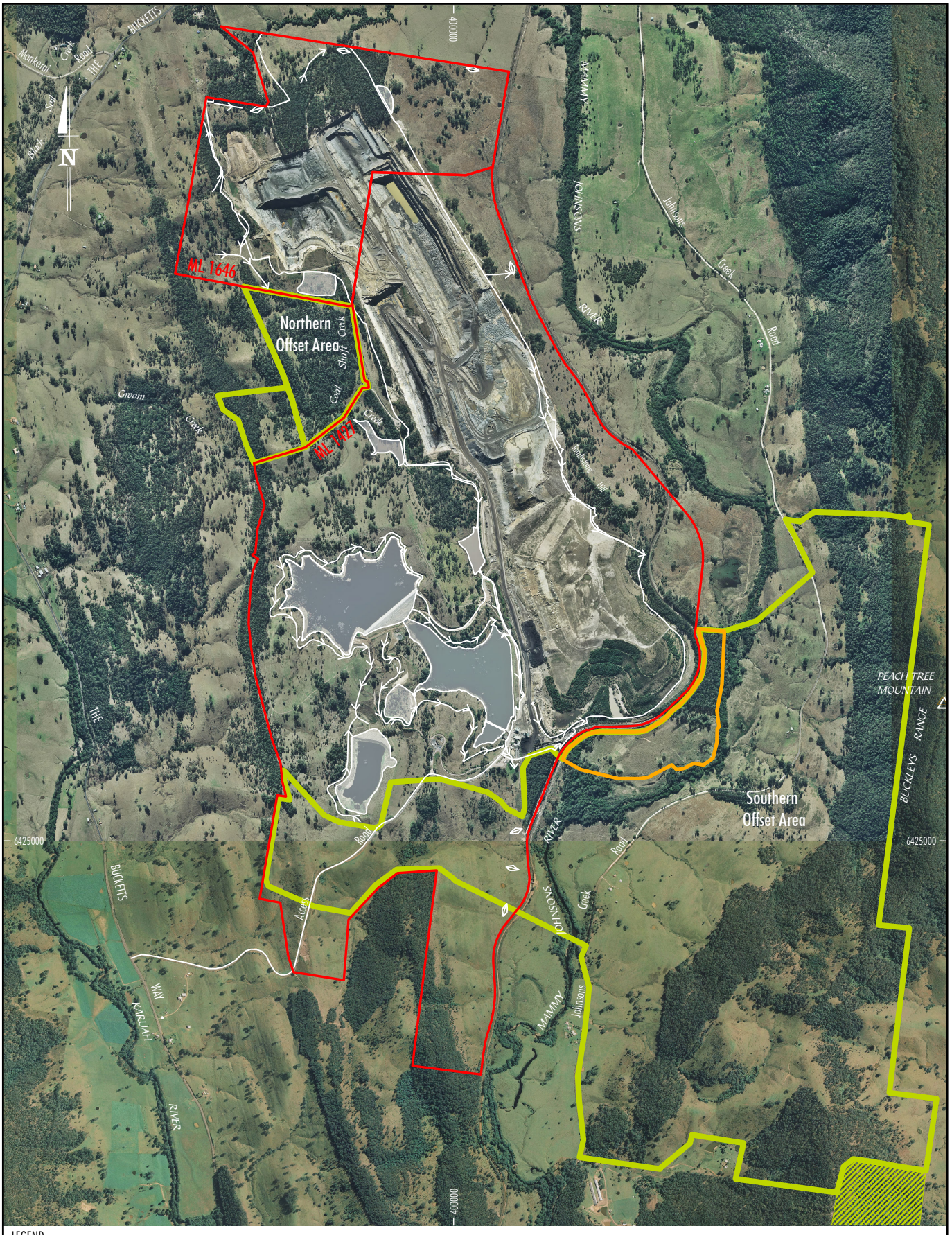
A revised BMP was submitted to the NSW Department of Planning and Environment (DP&E) and approved on **25 January 2019 (Appendix A).** Following the DCM Independent Environmental Audit undertaken in **December 2017** a revision of the BMP was prepared for the three-year period between August 2018 and 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.

An Independent Environmental Audit was again undertaken in December 2020. The BMP will be revised during the next reporting period to:

- reflect the current status and/or completion of the 2018 to 2021 BMP performance criteria.
- further development of longer-term (year 9+) performance criteria for the biodiversity offset strategy components.
- 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.



GCL-10-13 Bio MP 2018_204A

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 2020/2021 reporting period, no vegetation clearance was undertaken.

The area of disturbance at the end of June 2021 is shown in the DCM Annual Review 2021 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.
- 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.

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 as described in the BMP Section 5.4.2 and Section 6.4. 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. During the reporting period 25 nest boxes were installed in the rehabilitation areas for additional habitat enhancement and to supplement the initial 26 boxes installed in 2019. The next round of monitoring is scheduled for September 2021.

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 in **October 2020** (Appendix C).

The 2019 - 2020 Nest Box Programme for the Duralie Offset Area Report (AMBS, August 2021) summarises the work undertaken in relation to the Nest Box Programme for the Duralie Offset and Rehabilitation Area between October 2019 and November 2020, in accordance with the Duralie Coal Mine Biodiversity Management Plan (BMP). Works undertaken and other milestones that took place during this period included yearly monitoring of 210 nest boxes that have been installed between February 2013 and September 2016, the installation of eight new Feathertail Glider (hardwood) nest boxes in the Offset Areas, the installation of 26 nest boxes in the Rehabilitation Area, and quarterly monitoring of the new nest boxes .

A summary of results from the 2019-2020 report is provided below.

> *"Seventeen species were recorded or shown signs of previous occupation during the current reporting period, including the Squirrel Glider, Sugar Glider, Feathertail Glider (probable), Brush-tailed Phascogale, Brown Antechinus, Bush Rat, Common Brushtail Possum, Mountain Brushtail Possum, Common Ringtail Possum, Gould's Long-eared Bat, Lesser Long-eared Bat, Masked Owl, White-throated Treecreeper (probable), Eastern Rosella, Grey Shrike Thrush*

(possible), Australian Owlet-nightjar (probable) and Diamond Python. The nesting signs of the Grey Shrike Thrush is the first for the Nest Box Programme.

Three of the species recorded utilising the nest boxes are listed as vulnerable under the NSW Biodiversity Conservation Act 2016 (BC Act), the Squirrel Glider, Brush-tailed Phascogale and Masked Owl (previous signs of occupation). The Brush-tailed Phascogale was recorded nesting/breeding in a nest box on the Duralie Rehabilitation Area.

The majority of nest boxes were in good condition. Multiple nest boxes were destroyed due to a bushfire which occurred in the Southern Offset Area, as well as falling branches due to the ongoing drought. Nine nest boxes that were destroyed will require replacement. Two nest boxes that were impacted by fire and/or drought were replaced during the monitoring period.

Minor degradation was noted on several other nest boxes, such as peeling or splitting of the plywood, slight warping of the lid, disintegration of the brace plate, chewing of entrance holes, small cracks on the outside of the nest box, and moisture appearing inside the nest box. Eight nest boxes are likely to require replacing during the next monitoring survey due to more significant issues such as degradation of the lid, or heavy degradation. Five nest boxes were replaced during the current monitoring period due to ongoing degradation. Signs of the European Honey Bee were recorded at two nest boxes, but no bees were present at the time of the survey.

Overall, a total of 215 out of 245 nest boxes, or approximately 88%, have been occupied or shown signs of occupancy since their installation. This includes 100% of the Squirrel Glider nest boxes installed in February 2013, 86% of the additional nest boxes installed in August 2013, 93% of the additional nest boxes installed in September 2014, 95% of the additional nest boxes installed in September 2016, 85% of the nest boxes installed in the Rehabilitation Area in September-October 2019, and 33% of the Feathertail Glider (hardwood) nest boxes installed in September-October

Occupancy of nest boxes has generally increased over time until the previous few years when occupation rates have remained relatively constant. However, for some nest boxes there has been a noticeably decrease in occupation during 2019-2020, which is likely due to record low rainfall and extreme drought conditions. The record low rainfall experienced in the study area would negatively affect local animal populations, in particular reducing abundance and reproductive success.

Occupancy of nest boxes in the Duralie Rehabilitation Area is high 12 months after their installation. Additional nest box installations in the Rehabilitation Area may be beneficial, as the habitat is clearly deficient in tree cavities and roosting resources.

A total of twenty-five vertebrate species have now been recorded within nest boxes during the Nest Box Programme. This includes fourteen species of mammal, seven species of bird, one species of frog, and three species of reptile."

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	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 2020** and continued through to **April 2020**. 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 & Duralie Mining Leases and the Stratford & Duralie Biodiversity Offset Areas. During the reporting period wild dog and fox control was undertaken between **October 2020** to **November 2020**. The program involved a combination of trapping and shooting. The programs were productive with a total of 4 wild dogs and 2 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 & trail camera monitoring was used to find and locate wild dog & 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 Section 5.10 a follow-up feral animal monitoring survey was undertaken by AMBS Ecology & Heritage during **April 2017** 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 *Invasive animal study of the Duralie Coal Mining Lease and Offset areas, Gloucester Valley* (September 2017) is provided below (Appendix D).

> *The results of the current invasive animal survey were similar to those from the initial invasive animal survey in 2013. A total of 14 invasive species have been recorded in the study area in the past or during recent surveys or are considered to have potential to occur. Eleven of these species were either not recorded or were recorded in very low numbers during the current surveys and are of little concern at the current time. These include the Common Starling, House Sparrow, Mallard, Rock Dove, Spotted Turtle-Dove, House Mouse, Black Rat, Brown Hare and Deer. In accordance with the BMP the abundance of these species should be monitored every two years to determine if future controls are necessary.*
>
> *Four species of invasive animal were repeatedly recorded in the study area and are a potential threat to native biodiversity. These are the Fox, Feral Cat, Rabbit and the Common Myna. Wild Dogs were also recorded in the study area. Wild Dogs are mostly seen as an agricultural threat, preying on sheep, calves and other livestock (Fleming et al. 2001). They are not generally considered to have severe negative impacts on biodiversity, although this topic has not been well studied.*
>
> *In summary:*
> *• Foxes and Feral Cats may represent a threat to biodiversity within the study area;*
> *• Wild Dogs are present in the study area, and while they may or may not be a threat to biodiversity, are currently a declared pest species;*
> *• 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 a declared pest species;*
> *• The abundances of all of the above species within the study area are likely to be inter-related.*
>
> *It is therefore recommended that if control measures for Wild Dogs and/or European Rabbits are implemented in order to comply with the Pest Control Order, that any such control measures should be implemented together with control measures for Foxes and Feral Cats, in a co-ordinated manner, and the impacts monitored. Pest control in the study area should be considered in the context that the study area represents a small part of a much broader region. Pest control in the study area alone is likely to be of only temporary and limited benefit, unless carried out in a broader area in conjunction with other landholders, and carried out over the medium to long term.*

A feral animal survey of the Duralie Mining Lease and Duralie Biodiversity Offset Area is scheduled to be undertaken in September 2021. 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 the bushfires in November 2019

The *Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021* (Appendix F) found fencing on external boundaries was in good condition. At OB28 in VMU AE, a tree has fallen, blocking the track and damaging the fence. 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 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 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 5 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 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 & 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 8 - Loading seed for revegetation works.

Plate 9 - 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 10: Tube-stock being prepared for the biodiversity offset.

Plate 11: 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 12: *Tubestock planted in September 2018.*

Plate 13: *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 14: *Tubestock planting in VMU V in Mar 2020.*

Plate 15: *Tubestock preparation in 2020.*

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

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 February 2021. 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;
- 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 **February 2021.** The results are provided in the *DCM Biodiversity Offset Monitoring Report 2021* prepared by Kleinfelder (Appendix F). An extracted summary is reproduced below. The next round of monitoring is scheduled for 2022.

> *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 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 BMP refers to VMUs as either "installation/revegetation" or "remnant enhancement". Installation VMUs being representative of the VMUs that require extensive revegetation with woodland species, while Enhancement were VMUs requiring minimum work, usually only weed control. This report presents the results of the monitoring undertaken over four days (4th, 5th, 9thand 10th) in March 2021 and represents the third Offset areas survey undertaken by Kleinfelder. As an additional note, in November 2019, a section of the Duralie Offset areas was affected by the Buckley's Range Fire with all VMUs located to the east of Johnson's Creek Rd affected.*
>
> *A total of 18 transects were surveyed in March 2021, an increase of three transects (VMU X, V, and AH) that were surveyed in 2019 and 2020 (Table 2). These included 17 "installation" transects and one forested transect designated "regrowth management".*
>
> *The LFA used data from the 2013 baseline monitoring event conducted by Greening Australia for comparison and tracking changes over time. This data is presented as averages for the three indices.*
>
> *The 2021 survey show that VMUs that have been subject to multiple disturbances such as ground preparation associated with revegetation and/or the 2019 Buckley's Range Bushfire have generally recorded lower LFA indices and are still in the process of recovery. VMUs associated with the Grey Box - Forest Red - Gum Grey Ironbark community (VMUs AA, AB, AE and AF) and VMU AC are noticeably affected. Earlier planted VMUs and VMUs that have been recently planted, but only slashed or burned the once recorded higher LFA indices. These included the Rough-barked Apple – Red Gum Woodland and Spotted Gum – Grey Ironbark Forest VMUs, and as a point of contrast, VMU AH in the Grey Box - Forest Red - Gum Grey Ironbark community which has only been planted in May 2020.*

Vegetation Dynamics were conducted eight installation and the regrowth management VMU. The survey recorded improved stem densities in VMUs AA, F and W (33 stems/ha, 361 stems/ha and 110.6 stems/ha respectively) as a result of replanting undertaken in May 2020. VMU Y also recorded an increase in stem density, but as a result of the relocation of the transect to better capture replanting efforts. The VMU U transect was also relocated to better represent the planting effort, resulting in a slight reduction in calculated stem density. The regrowth management VMU P, also recorded a slight decrease from the previous survey, whereas VMU I, also affected by the Buckley's Range Fire recorded a dramatic increase in shrub numbers (no canopy recorded on this VMU), up from nil in 2019 to 660 stems/ha this survey.

Walkover surveys recorded good natural regeneration, especially along the edges of the installation VMUs where remnant vegetation is starting to colonise the grassy areas. 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.

Recommendations from this survey include –

- *Allowing VMUs AA, AB, AC, AE, AF and Z have been planted in 2021, and require time for "rest" from further disturbance to allow for the accumulation of litter and soil nutrients.*
- *Additional infill planting on VMUs AD, Y (shrubs only) and VMU I (targeted at the crown of the transect hill)*
- *Consideration to expanding the planting of VMU U*
- *Consideration of planting of VMUs L, M and T.*

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.

Overall, the revegetation of the Offsets areas is progressing well with successful establishment of native species of the targeted vegetation communities achieved. Further work is required to achieve target densities in some VMUs, and work to be instigated on the few remaining installation VMUs where revegetation has not yet been undertaken.

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 February 2018. The results are provided in the *DCM Fauna Surveys of the Offset and Mine Rehabilitation Areas, February 2018* (Appendix G). An extracted summary 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 during February 2018. 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 124 species of vertebrate were recorded, comprising 8 frogs, 10 reptiles, 56 birds and 30 mammals…, most of which were native. With the exception of reptiles, a similar number of frog, mammal and bird species were recorded at Mine Rehabilitation Area sites compared with Offset Area sites. Five introduced species were recorded during the surveys, including Cattle (Bos taurus), House Mouse (Mus musculus), European Rabbit (Oryctolagus cuniculus), Black Rat (Rattus rattus) and Red Fox (Vulpes vulpes). Fifteen 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).

Plate 16: Koala (*Phascolarctos cinereus*)

Plate 17: Long-nosed Potoroo (*Potorous tridactylus*)

The next round of fauna monitoring is scheduled to be undertaken in November 2021 and the results will be included in the next Annual Biodiversity Report.

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 2021,* submitted on **29 March 2021** (Condition 20).

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 - Invasive Animal Study, Duralie Coal Mining Lease and Offset areas, 2017.

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, 2018.

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

(Appendices available on request)

Appendix 8:

Duralie Coal Mine Independent Environmental Audit 2020 – Response to Recommendations

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**	**Statues 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	Open	
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	Open	
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	
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. DCPL has made provisions for rehabilitation knowledge to be made publicly available.	12-Nov-21	Open	
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 odour.**	**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 9:

Rehabilitation Monitoring Report 2021

Duralie Coal Mine Rehabilitation EFA Monitoring 2021

1164 Buckets Way South, via Stroud Road, NSW 2415

20220445

09 September 2021

KLEINFELDER
Bright People. Right Solutions.

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Duralie Coal Mine Rehabilitation EFA Monitoring 2021

1164 Buckets Way South, via Stroud Road NSW 2415

Kleinfelder Project: 20220445

Kleinfelder Document: NCA21R127849

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Prepared	Reviewed	Endorsed
Nigel Fisher	M. Plain (client)	

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 operates 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 (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. Kleinfelder conducted LFA and EFA monitoring at transects situated to provide representative data of rehabilitation age, slope and aspect. This, the seventh annual survey (the sixth conducted by Kleinfelder Australia staff) was conducted on the 8th – 10th of June 2021. ***Table 2*** *details the transects by age of rehabilitation surveyed in 2021.*

Table 1: Year of rehabilitation and designation of the transects selected for monitoring in 2021

Age of Rehabilitation	Designation	Rehabilitation Type	Aspect	Transect Bearing	Date Surveyed
2008	3045	Native Woodland	South	196	9 June
	3444	Native Woodland	South	160	10 June
2010	3454	Native Woodland	North-East	051	9 June
2011	3048	Native Woodland	North-East	063	4 June
2012	3047	Native Woodland	South-West	229	9 June
	3052	Native Woodland	West	250	9 June
	3056	Native Woodland	North-West	310	8 June
2013	3503	Native Woodland	East	080	8 June
2016	3501	Native Woodland	West	260	10 June
	3502	Native Woodland	South	170	8 June
2018	3504	Pasture	North (flat)	350	8 June
2020	3505	Pasture	West (flat)	287	10 June
	3506	Native Woodland	West	250	10 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

Results from the 2021 survey show that the stability index is at or near analogue average values (76.9 ± 1.9) for all rehabilitation older than four years (i.e., 2008 to 2013 rehabilitation). There were no major surface erosion issues observed during the 2021 survey. Younger rehabilitation areas – 2016 to 2020 - were below the analogue average. A benchmark value of 68.9 ± 5.5 was recorded for the infiltration index from the analogue sites in 2017. Results from this year's survey shows that several of the older transects located in older rehabilitation areas have

achieved, or nearly achieved the analogue benchmark score. The 2010 and 2011 rehabilitation areas surveyed this year are substantially below the analogue benchmark score while the 2012 rehabilitation average index score of 63.7 ± 0.5 is near the analogue benchmark score. Younger rehabilitation areas – 2013 to 2020 – recorded much lower index scores. The average analogue nutrient cycling index score recorded in 2017 was 61.7 ± 5.1. As with the previous index, the general trend for this index follows the age of the rehabilitation. The average 2008 rehabilitation index score has achieved the analogue index score again this survey (62.8 ± 0.8), with both of the transects surveyed recording scores over 62.0. This trend continues to the 2020 rehabilitation with the lowest Nutrient Cycling Index score of 31.8 ± 4.1.

Vegetation Structure

This survey of the 2008 transects recorded average stem densities at 3, 714 stems/ha, and woody vegetation volume was 31, 580 m^3/ha. Individual transects surveyed in this area of rehabilitation are variable in terms of native species density and diversity. The 2010 rehabilitation area recorded an overall stem density of 22, 831 stems/ha and woody vegetation volume of 26, 831 m^3/ha. This area is densely vegetated, mostly by canopy species of various sizes with true midstory and shrub species less common. The 2012 rehabilitation area is the largest area on the Duralie Spoil Emplacement and three transects were surveyed this year. The average total stem density was 1874 stems/ha and an average total woody vegetation volume of 19, 414 m^3/ha, but as with the 2008 rehabilitation, this rehabilitation area is variable in plant density and diversity. The three transects in this area were measured as two strata consisting of the nearest Eucalyptus stem regardless of size and then the nearest other stem of any species. The survey of the 2016 rehabilitation recorded an average stem density of 3762 stems/ha and an average total woody vegetation volume of 35, 999 m^3/ha. Previous surveys have measured the vegetation structure as "nearest stem" with no division by species or height. This year the vegetation structure of these transects had progressed so that the structure could be subdivided into two strata. The 2020 rehabilitation was surveyed for the first time this year, with data recorded in two strata, nearest Eucalypt and nearest other stem. This produced a total stem density of 4324 stems/ha and a canopy volume of 5, 063 m^3/ha.

Discussion

The revegetated waste emplacement has been designated 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). 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. The LFA indices continue to trend in the direction of the of analogue values, a feature that has been noted in previous reports. The Stability Index scores for the older (2008 to 2013) rehabilitation areas have achieved or exceeded Analogue values The younger rehabilitation areas (2016 to 2020) are still in the process of increasing soil surface stability, and currently have recorded lower index scores. There was no significant erosion observed during the surveys on the southern spoil emplacement (rehabilitation ages 2008 to 2012) or on the central spoil emplacement in the more recent rehabilitation areas. The pasture areas – as monitored by Transects 3504 and 3505 - have been established on flat areas of the spoil emplacement. Although the revegetation is relatively young, the seeding of pasture species has been successful, and no areas of seeding failure or erosion were observed.

The vegetation structure data for the woodland rehabilitation assessed as Ecosystem Sustainability i.e., 2008 to 2013 rehabilitation shows that these areas are currently heavily dominated by canopy species with all ages of rehabilitation recording higher than analogue canopy species densities, but with total stem densities lower than the analogue sites. The shrub stratum in particular is well below analogue densities. All sites in this older rehabilitation have relatively low numbers of true shrub and midstory species – where the vegetation structure data indicates high numbers of stems in the shrub stratum, the data shows that these were Eucalypt seedlings and saplings under two meters in height, recently germinated, rather than shrubs. The lower number of stems in the midstory and shrub strata reflect a combination of limited species initially seeded and the natural lifecycles of those Acacia species now resulting in die-back. The younger rehabilitation, 2016 and 2018, assessed as being in the Ecosystem Establishment phase have benefitted from more diverse initial seedings with shrub and midstory species.

When measured against the completion criteria, the younger rehabilitation areas – Ecosystem Establishment - have achieved the or on trajectory to achieve the completion criteria. The older rehabilitated areas – Ecosystem

Sustainability - have partially achieving the criteria. The establishment of self-sustaining ecosystems, as observed by self-recruitment is occurring in those areas where seedings have conditions allowing germination.

Recommendations

Recommendations include changes to monitoring methods to more accurately collect data that demonstrates progress towards the completion criteria including cessation of LFA monitoring in areas of older rehabilitation where LFA indices demonstrate achievement of analogue values or good trajectory toward those values. Biodiversity is not quantitatively measured with the current methodology, and it is suggested that instigating quadrat-based methodology such as used in the Biodiversity Assessment Methodology would provide data aimed at biodiversity and cover of vegetation.

Further management actions designed to improve biodiversity and structure are recommended based on different timelines for surrender of the revegetation. With minimal intervention management is restricted to weed control of listed and environmental weeds and the vegetation is allowed to mature and diversify at natural rates – this is considered a long-term strategy. Reducing biomass of the grassy understory and stimulation of the seed bank that has resulted from revegetation could be achieved by controlled burns. This would be considered a medium level of intervention. The most intense level intervention aimed at a shorter time frame for surrender would biomass reduction – burns and/or slashing – combined with a seeding program of midstory and shrub species.

Conclusions

The rehabilitation of the Duralie spoil emplacement continues to be on track for successful re-establishment of native woodland and pasture. The Landscape Functional Analysis indices have either achieved analogue or on track to achieve analogue values. In the older rehabilitation areas, LFA monitoring could be replaced by a more targeted monitoring program to provide quantitative data to support trajectories towards completion criteria. Vegetation will take much longer to achieve "natural" woodland vegetation structure and composition, but indications from the older rehabilitation areas show that this is occurring in areas where the right combination of species were seeded. Species diversity and structure is improving through natural recruitment, although seeding with further shrub and midstory species in particular but also canopy in selected areas, would increase the rate of diversification and provide greater fauna habitat.

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1. INTRODUCTION

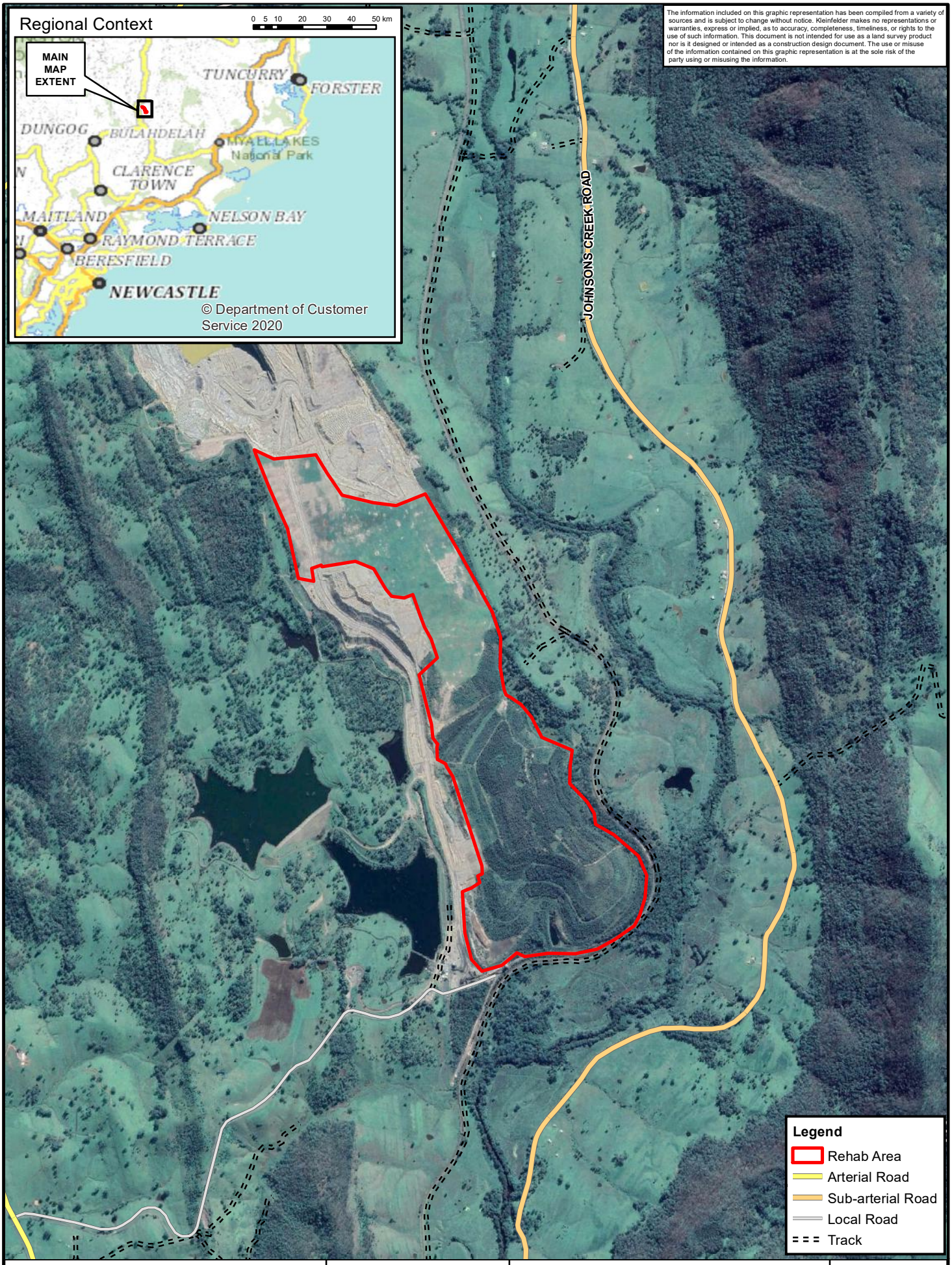
Duralie Coal Pty Ltd (DCPL) is a wholly owned subsidiary of Yancoal Australia Ltd and operates the Duralie Coal Mine (DCM). The DCM is located between the small towns of Stroud Road and Wards River, approximately 80km north of Newcastle in New South Wales (**Figure 1**). Approval for mining was granted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

The DCM operates under two key approvals, NSW Project Approval (08_0203) and the Commonwealth Approval (EPBC 2010/5396). Both may be viewed at http://www.duraliecoal.com.au.

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.

1.1 SCOPE AND RATIONALE

Kleinfelder Australia 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 seventh annual survey (the sixth conducted by Kleinfelder Australia staff) was conducted on the 8th – 10th of June 2021.



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DATA SOURCE:
NSW DFSI - 2018
Google Earth - 2020

Locality

Duralie Coal Pty Ltd
2021 Duralie Coal Mine Rehabilitation Monitoring Report
1164 Buckett's Way via Stroud Road NSW

FIGURE:

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2. METHODS

2.1 TRANSECTS SURVEYED

The 2021 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 2021. **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 2021

Age of Rehabilitation	Designation	Rehabilitation Type	Aspect	Transect Bearing	Date Surveyed
2008	3045	Native Woodland	South	196	9 June
	3444	Native Woodland	South	160	10 June
2010	3454	Native Woodland	North-East	051	9 June
2011	3048	Native Woodland	North-East	063	4 June
2012	3047	Native Woodland	South-West	229	9 June
	3052	Native Woodland	West	250	9 June
	3056	Native Woodland	North-West	310	8 June
2013	3503	Native Woodland	East	080	8 June
2016	3501	Native Woodland	West	260	10 June
	3502	Native Woodland	South	170	8 June
2018	3504	Pasture	North (flat)	350	8 June
2020	3505	Pasture	West (flat)	287	10 June
	3506	Native Woodland	West	250	10 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 1**.

Table 3: Comparison of transects surveyed from 2016 – 2021.

Year Rehabilitated	2016 Survey	2017 Survey	2018 Survey	2019 Survey	2020 Survey	2021 Survey
2008	3045			3045		3045
	3443	3444 (new)	3443	3444	3443	3444
	3474	3042			3042	
	3450		3450		3450	
2010	3046	3454	3046	3454	3046	3454
2011	3043	3048	3043	3048	3043	3048
2012	3041	3044	3047	3041	3044	3047
	3049	3052	3055	3054	3049	3052
	3055	3466	3056	3466	3055	3056
2013		3503	3503	3503	3503	3503
2016		3501	3501	3501	3501	3501
		3502	3502	3502	3502	3502
2018	Pasture			3504	3504	3504
2020	Pasture – First Survey				3505	3505
	Woodland – First Survey				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 2**.

1.1 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.

2.3 DATA ANALYSIS

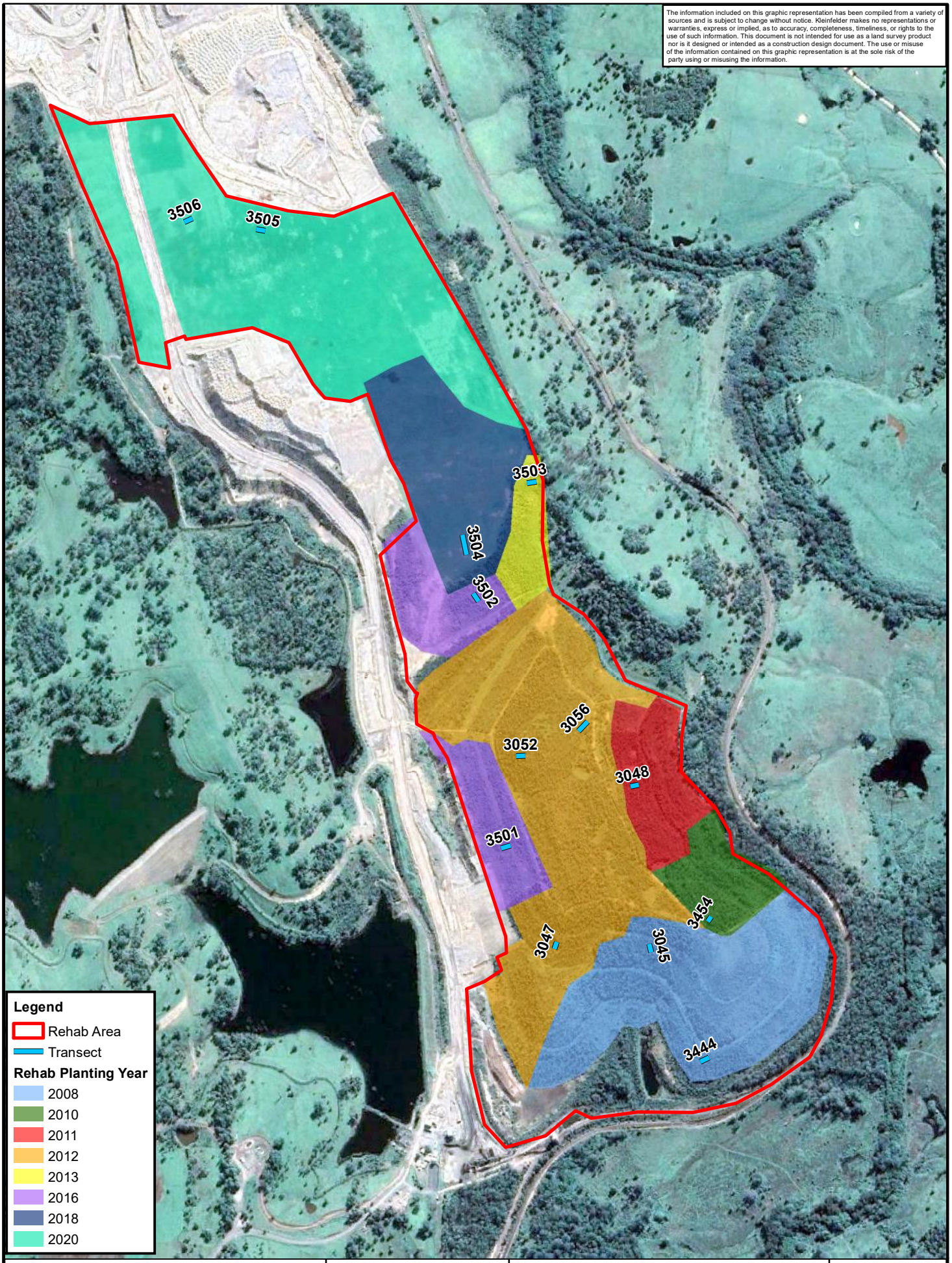
The collected data is input into a software system purpose designed for LFA where a series of tables are generated providing data on both a hillside and a patch basis. This data can then be used to provide insight into the functional status of the landscape.

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 2**.

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 and 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**).

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



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NSW DFSI - 2018
Google Earth - 2020

2021 Transects

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2021 Duralie Coal Mine Rehabilitation Monitoring Report
1164 Buckett's Way via Stroud Road NSW

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3. 2021 SURVEY RESULTS

3.1 SOIL SURFACE INDICATORS

3.1.1 Stability Index

Results from the 2021 survey show that the stability index is at or near analogue average values (76.9 ± 1.9) for all rehabilitation older than eight years (i.e., 2008 to 2013 rehabilitation) (**Table 5** and **Chart 1**). There were no major surface erosion issues observed during the 2021 survey.

The oldest rehabilitation areas – 2008 to 2011 – all recorded average stability index scores at or above the analogue average, with individual transects also recording index scores at or above analogue average score. The 2012 rehabilitation average stability index score was lower than the analogue at 72.0 ± 0.8 but reflects the variability in inherent with surveying different transects each year. Younger rehabilitation areas – 2016 to 2020 - were below the analogue average.

3.1.2 Infiltration Index

A benchmark value of 68.9 ± 5.5 was recorded for this index from the analogue sites in 2017. Results from this year's survey shows that several of the transects located in older rehabilitation areas have achieved, or nearly achieved the analogue benchmark score (**Table 5** and **Chart 1**). Overall, the trend is for the oldest rehabilitation to have recorded the highest Infiltration Index scores, decreasing to the most recent rehabilitation (**Chart 1**). The average 2008 rehabilitation index score is exactly the analogue average with an index score of 68.9 ± 3.3. Transect 3045 with an Infiltration index score of 72.2 ± 2.3 has exceeded the analogue average (**Table 5**). The 2010 and 2011 rehabilitation areas surveyed this year are substantially below the analogue benchmark score while the 2012 rehabilitation average index score of 63.7 ± 0.5 is near the analogue benchmark score. Younger rehabilitation areas – 2013 to 2020 – recorded much lower index scores.

3.1.3 Nutrient Cycling Index

The average analogue nutrient cycling index score recorded in 2017 was 61.7 ± 5.1. As with the previous index, the general trend for this index follows the age of the rehabilitation (**Table 5** and **Chart 1**). The average 2008 rehabilitation index score has achieved the analogue index score again this survey (62.8 ± 0.8), with both of the transects surveyed recording scores over 62.0. This trend continues to the 2020 rehabilitation with the lowest Nutrient Cycling Index score of 31.8 ± 4.1.

3.1.4 Other Soil Surface Indicators

Landscape Organisational Index (LOI) (**Table 5**) 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., 04

patches per 10m, with 25m transects). The exception being transect 3501 (2016 rehabilitation) where 1.6 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 3501 recorded an average patch width of under 10 m.

Table 5: Results of the 2021 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 Analogue Average		76.9	1.9	68.9	5.5	61.7	5.1	1	1.9	6.63
2008	3045	75.6	0.6	72.2	2.3	62.0	3.4	1	0.4	10
	3444	78.1	1.4	65.6	2.6	63.5	3.8	1	0.4	10
2010	3454	75.1	4.1	55.3	3.5	49.9	6.1	1	0.4	10
2011	3048	79.4	0.8	61.2	1.9	58.8	1.6	1	0.4	10
2012	3047	70.4	1.7	64.4	4.9	51.5	6.3	1	0.4	10
	3052	73.1	2.1	62.6	3.7	53.0	5.4	1	0.4	10
	3056	72.6	5.0	64.0	8.3	53.7	11.4	1	0.4	10
2013	3503	73.8	4.2	56.1	7.5	49.7	10.9	1	0.4	10
2016	3501	68.2	1.5	49.9	2.8	36.6	3.3	1	1.6	9
	3502	70.8	12.3	50.3	5.8	41.3	10.2	1	0.4	10
2018	3504	65.1	7.3	43.8	7.9	32.1	11.1	1	0.4	10
2020	3505	66.3	5.1	41.0	6.7	27.7	9.8	1	0.4	10
	3506	71.9	1.0	40.9	1.1	35.9	1.6	1	0.4	10

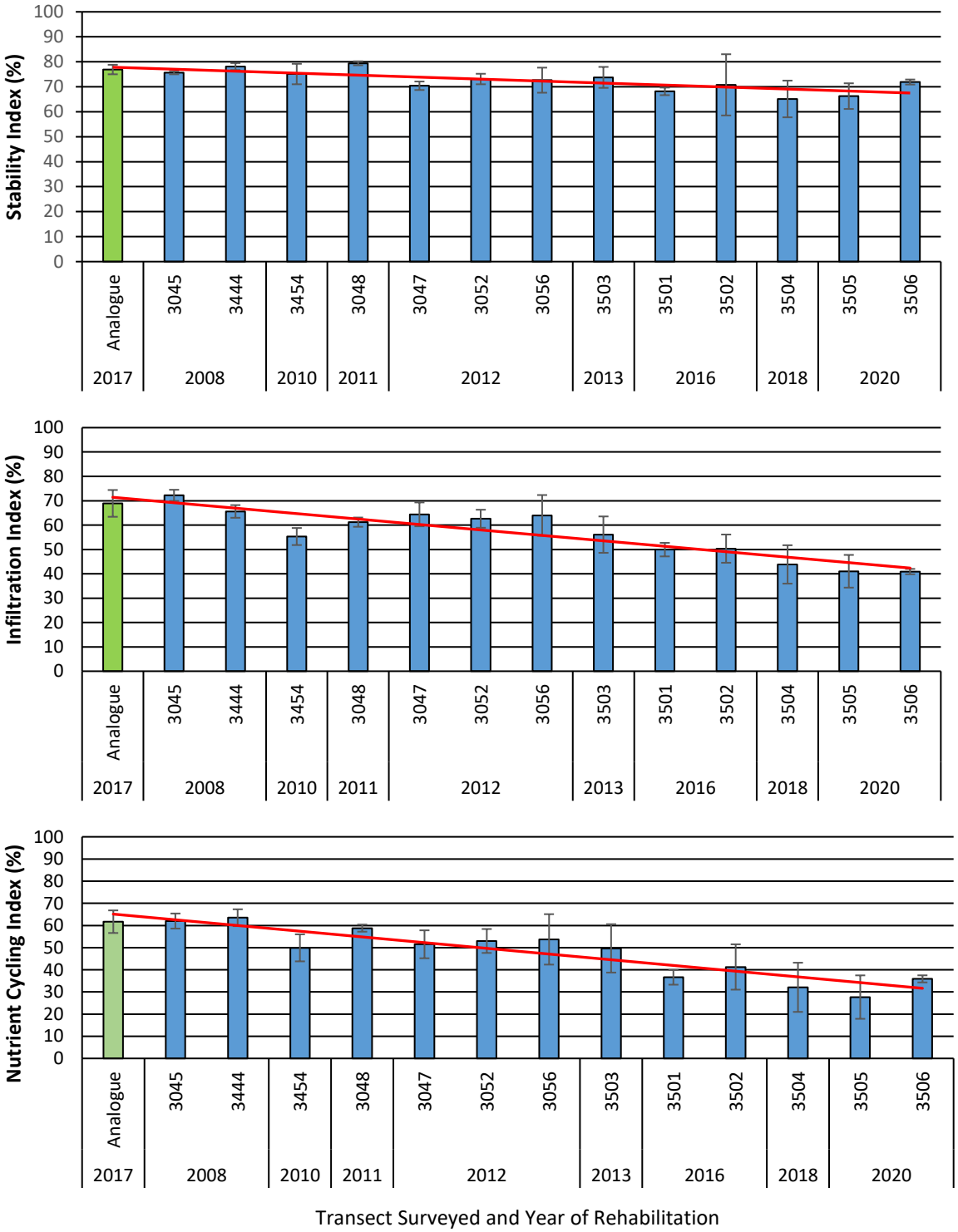


Chart 1: **Landscape Functional Analysis results by Index for the 2021 survey of the Duralie Rehabilitation. Transects are grouped by year of rehabilitation. Error bars are Standard Errors of Mean. Red line is linear trendline.**

3.1.5 Soil Surface Indicators - Historical

A comparison of the 2021 survey results is made to the previous surveys conducted and are shown in **Chart 2** and **Chart 3**.

3.1.5.1 Stability Index

The older rehabilitation areas (2008 to 2011) have generally achieved average analogue values (76.9 ± 1.9) for this index and have done so since 2017 (**Chart 2**). The exception was the 2008 rehabilitation in the 2018 survey where the index score was 68.9, but as was noted in the 2018 Rehabilitation Report (Kleinfelder, 2018) the average index score for this survey was dragged down by a single transect, Transect 3443 (63.5 ± 1.7). The following three surveys show that this aged rehabilitation has achieved consistent scores indicating that the soil surface is stabile across the remaining area of the spoil emplacement.

The 2010 and 2011 rehabilitation areas have been more consistent since achieving the index analogue value. Partly this can be attributed to a smaller area with only two transects with similar aspect, but even with the surveys alternating between transects, the consistent results indicate soil surface stability across the rehabilitated spoil emplacement.

The 2012 rehabilitation has achieved analogue index scores in previous surveys but recorded slightly decreased scores (72 ± 0.8) this survey (**Chart 3**). While any decrease in this index is not desirable, the score this survey does fall within the range recorded since 2016 (>70) and represents a relatively small decrease. Some variation can be expected given the relatively large area of this aged rehabilitation.

More recently rehabilitated areas of the spoil emplacement show more variable results but generally there is a trend for this index score to increase over the survey period, to currently be at or near analogue values.

3.1.5.2 Infiltration and Nutrient Cycling Indices

While the absolute values differ between these two indices, they largely follow the same trajectory and can be discussed as one in broad terms. With these indices influenced by plant cover and litter production, time is a key factor in their progression towards analogue values and both indices show a general trend of increase with age of rehabilitation. The 2008 rehabilitation illustrates this point with both transects for this survey located in more heavily wooded areas, and hence the soil surface was covered in leaf litter, as opposed to more open, grass covered transects. 2010 and 2011 rehabilitation areas also show improvements in these indices over time, and again are in more wooded areas. The younger rehabilitation areas, 2013 to 2020 recorded much lower indices sores, but generally are increasing with time.

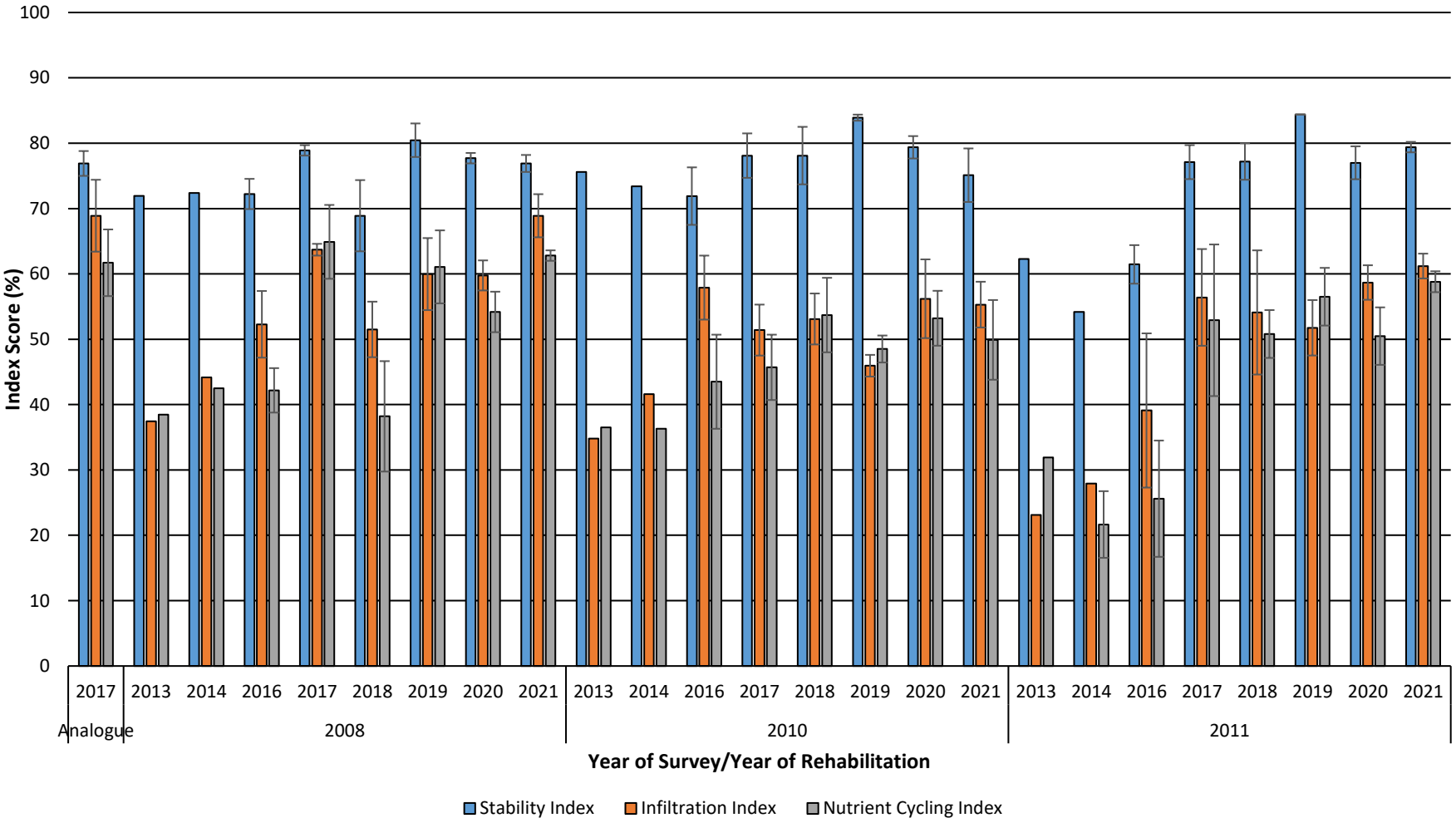


Chart 2: **Landscape Functional Analysis results for the surveys of the 2008 to 2011 rehabilitation areas on the Duralie Coal Mine spoil emplacement and comparison to the 2017 average analogue sites derived from the Biodiversity Offsets Areas. Standard Error bars are shown where statistically valid, i.e., three or more transects in that age cohort for the 2021 survey**

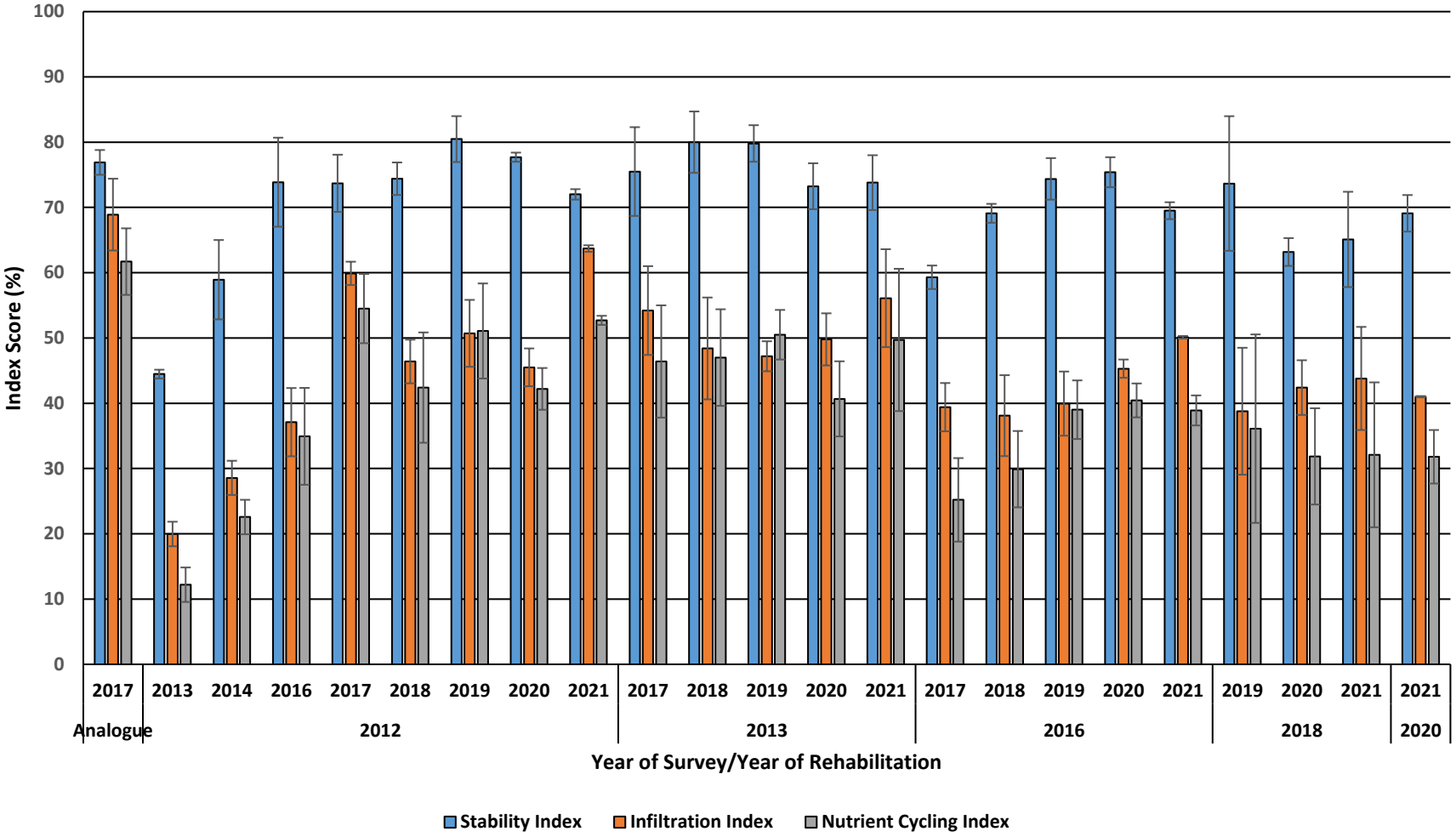


Chart 3: **Landscape Functional Analysis results for the surveys of the 2012 to 2020 rehabilitation areas on the Duralie Coal Mine spoil emplacement and comparison to the 2017 average analogue sites derived from the Biodiversity Offsets Areas. Standard Error bars are shown where statistically valid, i.e., three or more transects in that age cohort for the 2021 survey**

3.2 VEGETATION DENSITY AND STRUCTURE

Vegetation density and structure numerical data from the 2021 survey are presented in **Table 6** with graphical representation of this data in **Chart 4** and **Chart 5.**

3.2.1 2008 Rehabilitation

This survey of the 2008 transects recorded average stem densities at 3, 714 stems/ha, and woody vegetation volume was 31, 580 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.

Transect 3045 recorded stem densities of 1, 845 stems/ha, and a total canopy volume of 29, 119 m^3/ha. This survey the vegetation was divided into stems >5cm DBH (Diameter Breast Height) and stems <5cm in DBH. The area is more open than when previously surveyed in 2019 due to continued dieback of old, large *Acacias* (**Plate 3**). There were very few seedlings or low shrub species recorded. The first stratum recorded a density of 759 stems/ha with a canopy volume of 27, 414 m^3/ha and consisted of Eucalypts that were predominantly *Corymbia maculata* (Spotted Gum) and *Eucalyptus punctata* (Grey Gum). There appears to have been at least one recruitment of these canopy species with many saplings recorded in the second stratum. This stratum recorded 1, 086 stems/ha with a canopy volume of 1, 705 m^3/ha. Tall shrub species in this stratum included *Breynia oblongifolia* (Coffee Bush), *Trema tomentosa* (Native Peach) and a new species *Polyscias sambucifolia* (Elderberry Panax) – another species readily spread by birds. The groundcover was mainly exotic grasses and litter with native vine species including *Stephania japonica* (Snake Vine), *Clematis glycinoides* (Headache Vine) and *Cissus antarctica* (Kangaroo Vine). This area was heavily infested with woody weed species including *Lantana camara* (Lantana), *Ligustrum sinense*, (Small-leaved Privet) and *Solanum mauritianum* (Wild Tobacco).

Transect 3444 recorded a total of 5, 582 stems/ha and a total woody vegetation volume of 34, 561 m^3/ha. The canopy stratum was composed of dense *C. maculata, E. punctata* and *Eucalyptus crebra* (986 stems/ha at 3.19m spacing) between 9m and 17m in height (**Plate 5**). The midstory stratum was consisted of numerous smaller *C. maculata, E. punctata,* and *E. crebra* between 2m and 8.5m, with a few taller shrub species including *Logania albiflora* and *Acacia decurrens* (Black Wattle). This stratum was very dense with 3, 764 stems/ha at a spacing of 1.63m and a canopy volume of 6, 564 m^3/ha. The shrub stratum (<2m tall) was more diverse with *Acacia falcata, A. irrorata, Acacia longissima, A. mearnsii, A. ulicifolia, Exocarpos cupressiformis* (Ballarat Cherry), *Leucopogon juniperinus* (Prickly Beard-heath), *P. sambucifolia*, *Ozothamnus diosmifolius* (Rice Flower) and *T. tomentosa* between 0.3m and 2.0m in height with 833 stems/ha at 3.47m spacing. The ground cover in this area of the rehabilitation included forbs (*Cheilanthes sieberi, Dichondra repens* and *Lobelia purpurascens*), a twiner *Glycine clandestina,* other vines *S. japonica*, *C. glycinoides* and a perennial herb *Lepidosperma laterale*, observed for the first time. This area has good self-recruitment, and the observation of new species indicates that the revegetation is progressing well. Woody weed species such as *L. camara* and *S. mauritianum* were observed but were not in densities sufficient to pose a major threat.

3.2.2 2010 Rehabilitation

The 2010 rehabilitation area (Transect 3454) recorded an overall stem density of 22, 831 stems/ha and woody vegetation volume of 26, 831 m^3/ha. This area is densely vegetated, mostly by canopy species of various sizes with true midstory and shrub species less common (**Plate 7**). The canopy stratum was dominated by *C. maculata* with a few *E. punctata* which were between 2.5m and 11m in height, recorded 5, 963 stems/ha at an average spacing of 1.3m. This height range indicates two and possibly three

recruitment periods. The lower stratum (<2m in height) recorded 16, 649 stems/ha at a spacing of 0.78m. This stratum was dominated by *Eucalyptus* saplings and seedlings, almost exclusively under 1.0m in height indicating recent germination, with *Acacia* seedlings also observed. While this area is dominated by Eucalypt species, and mainly *C. maculata, E. punctata* and *E. crebra* were also present. Midstory species included *A. implexa* and *A. irrorata*, while true shrub species recorded included *A. falcata, A. ulicifolia, L. juniperinus, O. diosmifolius, Pimelea linifolia* (Slender Rice Flower) and *Pultenaea villosa* (Hairy Bush-pea). Ground covers was very sparse under the dense canopy, but the native grass species *Entolasia stricta* (Wiry Panic) was the most common along with the exotic grasses *Chloris gayana* (Rhodes Grass) and *Setaria sphacelata* (South African Pigeon Grass) where the canopy allowed for more light penetration. Weeds were not considered to be a major issue for this area with *L. camara* and *S. mauritianum* the only woody weed species observed.

3.2.3 2011 Rehabilitation

The 2011 rehabilitation area (Transect 3048) recorded a density of 4, 703 stems/ha and a total woody vegetation volume of 45, 876 m^3/ha consisting of three strata. The canopy stratum was dominated by *C. maculata* with only a few *E. punctata.* They ranged in height from 9.0m to 15.0m with a density of 1, 068 stems/ha at an average spacing of 3.06m. The midstory stratum consisted of a mix of younger Eucalypts and *Acacia implexa* at a very dense 1, 899 stems/ha varying between 2.0 m and 9.0m at an average spacing of 2.30m. The shrub stratum consisted of a mix of a few young Eucalypts, *A. falcata, A. implexa, A. longissima, O. diosmifolius and T. tomentosa* that were <2m height with 1, 736 stems/ha at an average spacing of 2.40m. Diversity was observed to be relatively high with additional species observed in the vicinity of the transect including *A. falcata, B. oblongifolia, L. juniperinus, P. linifolia, P. sambucifolia* and two new species *Plectranthus parviflorus* (Cockspur Flower) and *Zieria smithii* (Sandfly Zieria). Observations of the vegetation in this area suggest three generations of *Eucalyptus* and at least three generations of *Acacia* species given the die-off of the original *Acacias* and the newly germinated seedlings observed. Weeds observed in the vicinity of this transect included young plants of *Lantana camara* (Lantana) and *Solanum mauritianum* (Wild Tobacco).

3.2.4 2012 Rehabilitation

The 2012 rehabilitation area is the largest area on the Duralie Spoil Emplacement and three transects were surveyed this year. The average total stem density was 1874 stems/ha and an average total woody vegetation volume of 19, 414 m^3/ha, but as with the 2008 rehabilitation, this rehabilitation area is variable in plant density and diversity. The three transects in this area were measured as two strata consisting of the nearest Eucalyptus stem regardless of size and then the nearest other stem of any species.

Transect 3047 (**Plate 9**) recorded a total stem density 2, 141 stems/ha and a total woody vegetation volume of 17, 630 m^3/ha. This area of the rehabilitation consisted of scattered larger Eucalypts between 4.0m and 14.0m in height dominated by *C. maculata* with occasional *E. crebra* and *E. punctata* producing a stem density of 405 stems/ha at any average spacing of 4.97m. The second stratum was dominated by two species of *Acacia*, *A. implexa* and *A. irrorate* with occasional *A. falcata* and *L. juniperinus.* The groundcover was almost exclusively dense *S. sphacelate.* Dieback of older *Acacias* was evident, while regeneration was limited to a few Eucalypt and *Acacia* saplings – very few seedlings. Weeds observed were *L. camara* and *S. mauritianum* in moderate densities requiring control.

Transect 3052 (**Plate 11**) recorded an overall stem density of 2, 779 stems/ha and a total woody vegetation volume of 30, 853 m^3/ha measured in two strata, with no true shrub stratum present. This area had *Acacia* die-off and many Eucalyptus saplings. The Eucalypt stratum was predominantly *C. maculata,* but *E. crebra* and an unidentified *Eucalyptus* spp. were recorded along the transect. These stems were between 0.5m and 14m in height at 2, 268 stems/ha and an average spacing of 2.10m with a canopy volume of 30, 287 m^3/ha. The second stratum consisted of *Acacias* (*A. falcata* and *A. implexa* only) and *T. tomentosa* that were between 1.2m and 9m in height at a density of 512 stems/ha at an

average distance of 4.42m and a canopy volume of 566 m^3/ha. The heights recorded suggested that there have been at least three generations of both Eucalypts and Acacias in this area with die-back of older *Acacias* evident. Diversity was very low in the section of the rehabilitation with only the above noted species observed. The grassy groundcover was dense, dominated by *Setaria sphacelata.* Weeds observed were *L. camara* and *S. mauritianum* in moderate densities requiring control.

The final transect in this rehabilitation area, Transect 3056 (**Plate 13**) is the most open area of the rehabilitation surveyed this year with sparse total stem density of 703 stems/ha and canopy volume of 9, 760 m^3/ha. The Eucalypt stratum recorded 279 stems/ha and a canopy volume of 6, 092 m^3/ha at ab average distance of 5.99m. It was dominated by *C. maculata* with a significant proportion of *E. punctata* ranging in height from 0.5m to 10.0m suggesting three recruitment episodes. The second stratum was a mixture of *A. falcata* and *A. implexa* with a single *A. irrorata* on the transect. This stratum recorded a density of 424 stems/ha at a spacing of 4.86m and a canopy volume of 3, 668 m^3/ha. Diversity in the area was also low with only a few additional native species observed including *T. tomentosa* – but there were numerous *Acacia* seedlings present, offsetting the *Acacia dieback.* The understorey was dominated by *S. sphacelata* while the woody weeds *L. camara* and *S. mauritianum* were present.

3.2.5 2013 Rehabilitation

This transect, 3503 (**Plate 15**) recorded a total stem density of 888 stems/ha and total woody vegetation volume of 2,723 m^3/ha. The vegetation structure of the 2013 rehabilitation area was recorded as two strata again this year. The first was composed of relatively sparse Eucalypts entirely *E. punctata* this survey – varying in height from 1.6m to 10.0m at a density of 355 stems/ha at a spacing of 5.31m and a canopy volume of 1, 604 m^3/ha. The second stratum consisted of all other species and was dominated by *A. falcata, A. implexa, A. irrorata* with occasional *E. cupressiformis*. Heights ranged from 1.8m to 8.0m. Density was 533 stems/ha at a spacing of 4.33m. The groundcover consisted of dense exotic grasses dominated by *S. sphacelata* up to 2.5m tall. Weed species were the usual *L. camara* and *S. mauritianum* present in moderate densities.

3.2.6 2016 Rehabilitation

The survey of the 2016 rehabilitation recorded an average stem density of 3762 stems/ha and an average total woody vegetation volume of 35, 999 m^3/ha. Previous surveys have measured the vegetation structure as “nearest stem” with no division by species or height. This year the vegetation structure of these transects had progressed so that the structure could be subdivided into two strata as detailed below.

This transect, 3501 (**Plate 17**) recorded a total stem density of 4244 stems/ha and total woody vegetation volume of 43, 953 m^3/ha. This was assessed in two strata – nearest Eucalypt and nearest stems. The Eucalypt stratum recorded a stem density of 596 stems/ha at a spacing of 4.10m and a canopy volume of 1, 384 m^3/ha. The stratum consisted of a combination of species – *C. maculata, E. moluccana* and *E. punctata* and several young, unidentified species. This stratum ranged in height from 0.7. to a surprising 9.0m. The second stratum recorded 4823 stems/ha at a spacing of 1.44m and a canopy volume measured at 43, 953 m^3/ha. This stratum was quite diverse with a number of midstory, and shrub species observed including *A. decurrens, A. falcata*, *A. implexa*, *A. irrorata*, *A. ulicifolia, Daviesia ulicifolia* (Gorse Bitter Pea) and *Leptospermum polygalifolium* (Tantoon). These ranged in height from 0.4m to 10m with many seedlings observed in the rehabilitation area. The groundcover is dense *S. sphacelata*, with no woody weed species observed.

Transect 3502 (**Plate 19**) recorded a total stem density of 2105 stems/ha and a total woody vegetation volume of 28, 046 m^3/ha. This transect was recorded as two strata, with no Eucalyptus species recorded along the transect. The upper stratum consisted only of *Acacia* species >2m in height up to 8.0m. These species were *A. decurrens, A. falcata,* and *A. irrorata.* This stratum recorded a stem density of 843

stems/ha at mean spacing of 3.45m and a canopy volume of 27, 023 m^3/ha. The lower stratum consisted of the above *Acacia* species plus *A. ulicifolia, D. ulicifolia* and *P. villosa.* This stratum had a density of 1262 stems/ha at a mean spacing of 2.82m and a canopy volume of 1023 m^3/ha. Other native species observed in the vicinity of the transect included *A. implexa, C. maculata,* and the vines *Hardenbergia violacea* (Purple Coral Pea) *Kennedia rubicunda* (Dusky Coral Pea). The appearance of canopy species is especially important in this area as previous surveys have failed to locate any such species. There was evidence of *Acacia* die-off observed, but *Acacia* seedlings were also observed to be germinating, indicating a second generation of these species. The groundcover is again dominated by exotic grasses, with no significant woody weeds observed.

3.2.7 2020 Rehabilitation

Transect 3506 was surveyed for the first time this year, with data recorded in two strata, nearest Eucalypt and nearest other stem. This produced a total stem density of 4324 stems/ha and a canopy volume of 5, 063 m^3/ha. The Eucalypt strata recorded 983 stems/ha at a spacing of 3.19m and a canopy volume of 69 m^3/ha indicating that they were all very young ranging in height from 0.2m to 1.8m. These stems were all recorded as “Eucalyptus spp.” due tother young age, except for a single *Angophora floribunda*. The second stratum recorded 3, 341 stems/ha at a spacing of 1.73m and a canopy volume of 4, 994 m^3/ha. This stratum was composed entirely of *Acacias* including *A. falcata*, *A. longifolia*, *A. irrorata*, and *A. ulicifolia.* The groundcover was dominated by *Cenchrus clandestinus* (Kikuyu) and *C. gayana*, due to the seeding program undertaken, six native grass species were readily observed including *Bothriochloa macra* (Red Grass), *Chloris truncata* (Windmill Grass), *Chloris ventricosa* (Plump Windmill Grass), *Eragrostis leptostachya* (Paddock Lovegrass) and *Themeda triandra* (Kangaroo Grass).

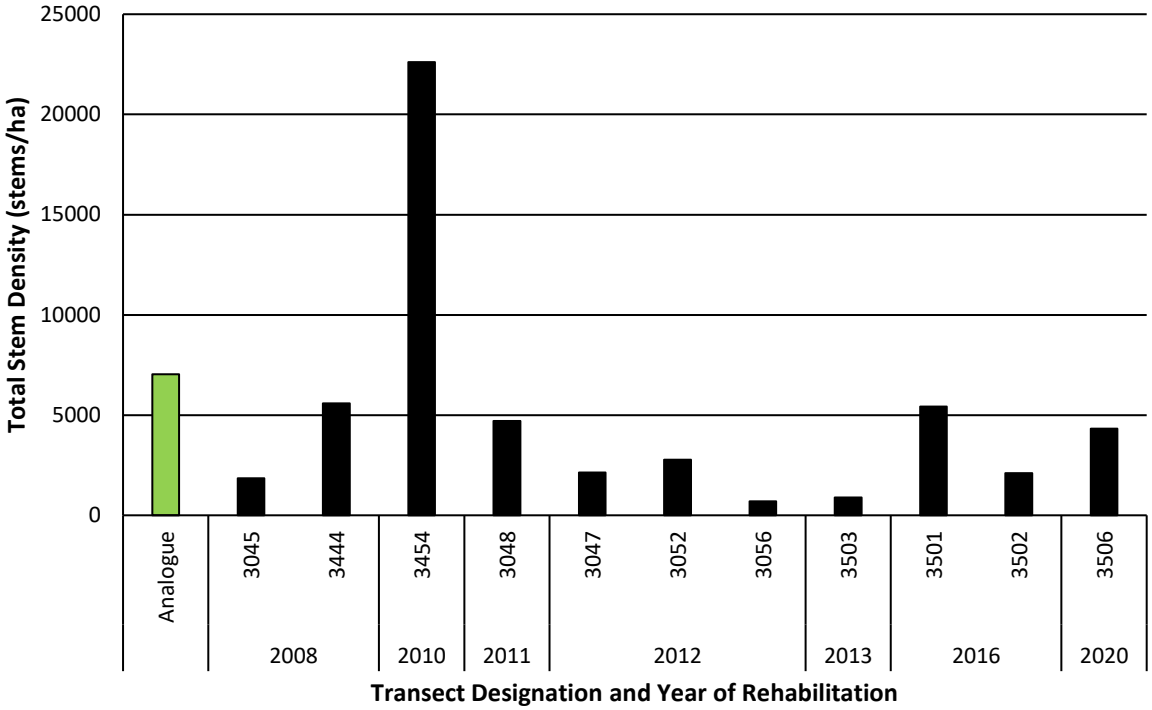


Chart 4: **2021 survey data Total Stem Densities for the individual Duralie Spoil Emplacement LFA Transects compared to average Analogue data surveyed in 2017**

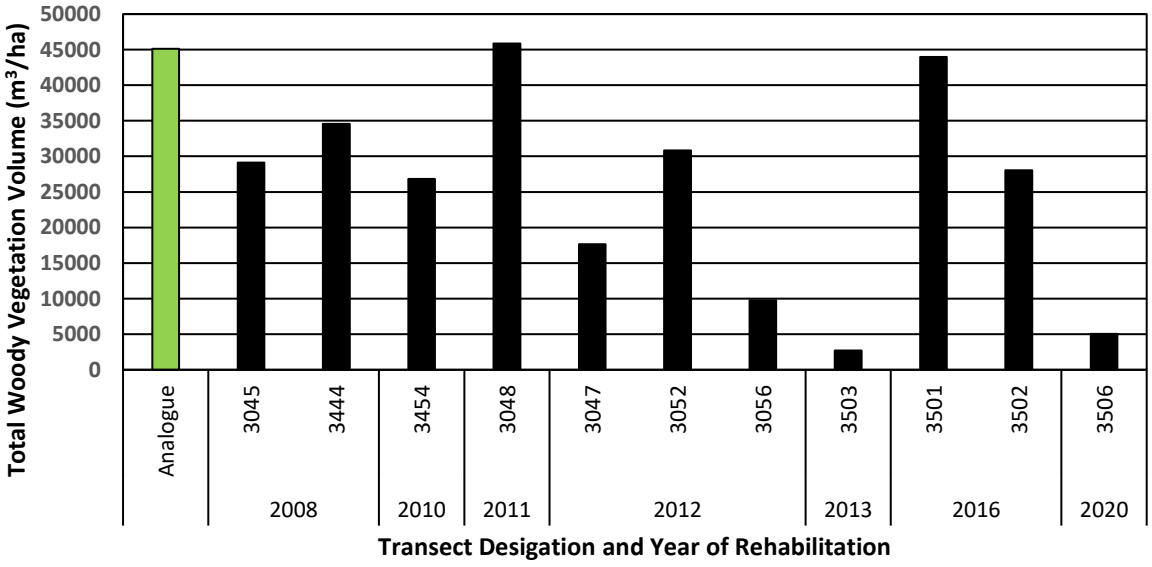


Chart 5: **2021 survey data Total Woody Vegetation Volume for the individual Duralie Spoil Emplacement LFA Transects compared to average Analogue data surveyed in 2017**

Table 6: 2020 survey stem densities and canopy volume of the woody vegetation for the Duralie Coal Mine spoil emplacement monitoring transects and the Average Analogue site values derived from the Biodiversity Offsets areas

Year Rehab	Transect	Canopy			Midstory			Shrubs			Totals		Averages		Comments
		Density (stems/ ha)	Distance between stems (m)	Canopy Vol/ha (m^3/ha)	Density (stems/ ha)	Distance between stems (m)	Canopy Vol/ha (m^3/ha)	Density (stems/ ha)	Distance between stems (m)	Canopy Vol/ha (m^3/ha)	Stem Density (stems /ha)	Woody Veg Volume (m^3/ha)	Stem Density (stems/ ha)	Woody Veg Volume (m^3/ha)	Attributes Measured
2017	Analogue	188.2	7.60		1320.7	3.80		5528.3	2.20		7037.2	45121.2	7037.2	45121.2	All strata - canopy, midstory and shrubs
2008	3045	759	3.63	27414				1086	3.04	1705.00	1845	29119	3713.5	31579.70	Eucalypt spp. > 5cm DBH, Mixed spp. <5 cm DBH
	3444	986	3.19	27336	3764	1.63	6564	833	3.47	140	5582	34040			Eucalypt spp. > 5cm DBH, Mid < 5cm DBH, Shrubs spp.< 2m tall
2010	3454	5963	1.30	26430				16649	0.78	401	22612	26831	22612.26	26830.99	Nearest Eucalypt spp. and Acacia spp. > 2m, Mixed spp. < 2m
2011	3048	1068	3.06	40590	1899	2.30	5135	1736	2.40	151	4703	45876	4702.68	45875.94	Canopy = Eucalypt spp., Mid = Acacia spp. and Eucalypt spp. < 10m, Shrubs < 2m
2012	3047	405	4.97	16287				1736	2.40	1343	2141	17630	1878.47	19414.31	Nearest Eucalypt spp., nearest Mixed spp.,
	3052	2268	2.10	30287				512	4.42	566	2779	30853			Nearest Eucalypt spp., nearest Mixed spp.,
	3056	279	5.99	6092				424	4.86	3668	703	9760			Nearest Eucalypt spp., nearest Mixed spp.,
2013	3503	355	5.31	1604				533	4.33	1119	888	2723	888.02	2723.42	Nearest Eucalypt spp., nearest Mixed spp.,
2016	3501	596	4.10	1384				4823	1.44	69936	5419	43953	3716.71	35999.23	Nearest Eucalypt spp., nearest Mixed spp.,
	3502				843	3.45	27023	1262	2.82	1023	2105	28046			No Eucalypts, Nearest Mixed spp. > 2m, Mixed species < 2m
2020	3506	983	3.19	69				3341	1.73	4994	4324	5063	4323.94	5062.72	Nearest Eucalypt spp., nearest Mixed species,

"Eucalypt spp." - refers to some or all of these species in combination - *Corymbia maculata* (Spotted Gum), *Eucalyptus crebra* (Narrow-leaved Ironbark), *Eucalyptus fibrosa* (Broad-leaved Ironbark) *Eucalyptus moluccana* (Grey Box) and *Eucalyptus punctata* (Grey Gum).

"Acacia spp." – refers to some, or all, of these species in combination – *Acacia decurrens* (Black Wattle), *Acacia falcata* (Sickle Wattle), *Acacia implexa* (Hickory Wattle), *Acacia irrorata* (Green Wattle), *Acacia mearnsii* (Black Wattle), *Acacia ulicifolia* (Prickly Moses).

"Shrub spp." - refers to some, or all, of these species in combination – *Acacia longifolia* (Coastal Wattle), *Breynia oblongifolia* (Coffee Bush), *Leucopogon juniperinus* (Prickly Beard-heath), *Ozothamnus diosmifolius* (Rice Flower), *Pultenaea villosa* (Hairy Bush-pea), *Trema tomentosa* (Native Peach).

"Mixed spp." - refers to some, or all, of the above species in combination.

DBH = diameter at breast height and roughly corresponds to trees over 3m in height.

3.2.8 Historical Comparison

The results of the 2021 survey are compared to the previous surveys in **Chart 6** for Average Stem Densities and **Chart 7** for Average Woody Vegetation Volume.

The combination of 2008 rehabilitation transects surveyed this year have recorded average stem densities that were very similar to but slightly below the previous two surveys, with an average of 3, 714 stems/ha in 2021 compared to 4, 015 stems/ha in 2020 and 4, 309 stems/ha in 2019. These are similar to the densities recorded early in the monitoring program in 2013 (4, 256 stems/ha), 2014 (4, 162 stems/ha) and 2016 (3, 617 stems/ha) (**Chart 6**). It should be noted that these numbers take in different areas and different combinations of transects across this rehabilitation area, which serves to make year to year comparison difficult. However, this year's combination of transects was surveyed in 2019, recording a substantial reduction in average stem densities. The 2017 survey recorded the highest average stem densities for any of the surveys conducted to date (12, 813 stems/ha) while the 2018 survey recorded the lowest average density at 814 stems/ha. While stem densities can be expected to be variable across parts of the rehabilitation, where surveys have included the more wooded areas, canopy volumes have remained high, despite the variability in the data (**Chart 7**).

With alternate transects being surveyed each year, the 2021 survey (22, 612 stems/ha) for the 2010 rehabilitation area requires comparison to the 2019 survey (5, 378 stems/ha), and then the 2017 survey (8, 900 stems/ha) (**Chart 6**), showing a huge increase in stem density this survey. Likewise, the 2016 and 2018 survey results are directly comparable with 5, 950 and 1, 860 stems/ha respectively. The previously observed trend for a decrease in stems density due to self-thinning was apparent across this aged rehabilitation but appears to have been reversed this survey. Canopy volume was increasing as the vegetation has matured from the 2014 to the 2020 surveys (**Chart 7**). For instance, 2016 recorded 14, 354 m^3/ha, 2018 recorded 24, 070 m^3/ha and the 2020 survey recorded 28, 621 m^3/ha. However, this survey the canopy volume decreased (26, 831 m^3/ha) when compared to the 2019 survey (30, 207 m^3/ha).

Despite having the same survey situation (alternating transects) the 2011 rehabilitation does not follow the same pattern as the 2010 rehabilitation stem densities with some variation in the numbers – i.e. the 2018 survey recorded higher stem densities than the 2016 survey (22, 531 stems/ha and 17, 155 stems/ha respectively) with a decrease to the 2020 survey (15, 632 stems/ha). This has continued this survey with 4, 703 stems/ha recorded compared to 5, 336 stems/ha for the 2019 survey. Canopy volumes had been following a similar pattern with each area surveyed increasing in volume as the vegetation matures, but this survey the canopy has decreased when compared to the 2019 survey (Error! Reference source not found.).

The 2012 rehabilitation has recorded a steady decline in average stem densities over the period of the surveys despite the mix of the transects (more wooded and less wooded areas) being surveyed. From a high in 2014 where an average of 14, 378 stems/ha were recorded to this survey where an average of 1, 874 stems/ha were recorded (**Chart 6**). Canopy volume had increased with each survey, up until 2019. This survey recorded a considerable increase over the 2019 survey (7187 m^3/ha vs 19, 414 m^3/ha) from the highest recorded volume of 46, 904 m^3/ha 2019 survey.

The 2013 rehabilitation recorded a modest increase in stem density from 657 stems/ha to 888 stems/ha, after the downward trend over the previous four monitoring events (**Chart 6**). Average woody vegetation volume has remained substantially unchanged for the previous survey in 2020 (2171 m^3/ha this survey compared to 2, 723 m^3/ha for this survey (**Chart 7)**.

The 2016 rehabilitation average stem density has remained unchanged with the 2021 survey recording 3762 stems/ha compared to the 2020 survey of 3600 stems/ha (**Chart 6**). Canopy volume has also

recorded a substantial increase this survey increasing to 35, 999 m^3/ha compared to 7799 m^3/ha for the 2020 survey (**Chart 7**).

The 2020 rehabilitation area was surveyed for the first time this year and therefore does not have historical data.

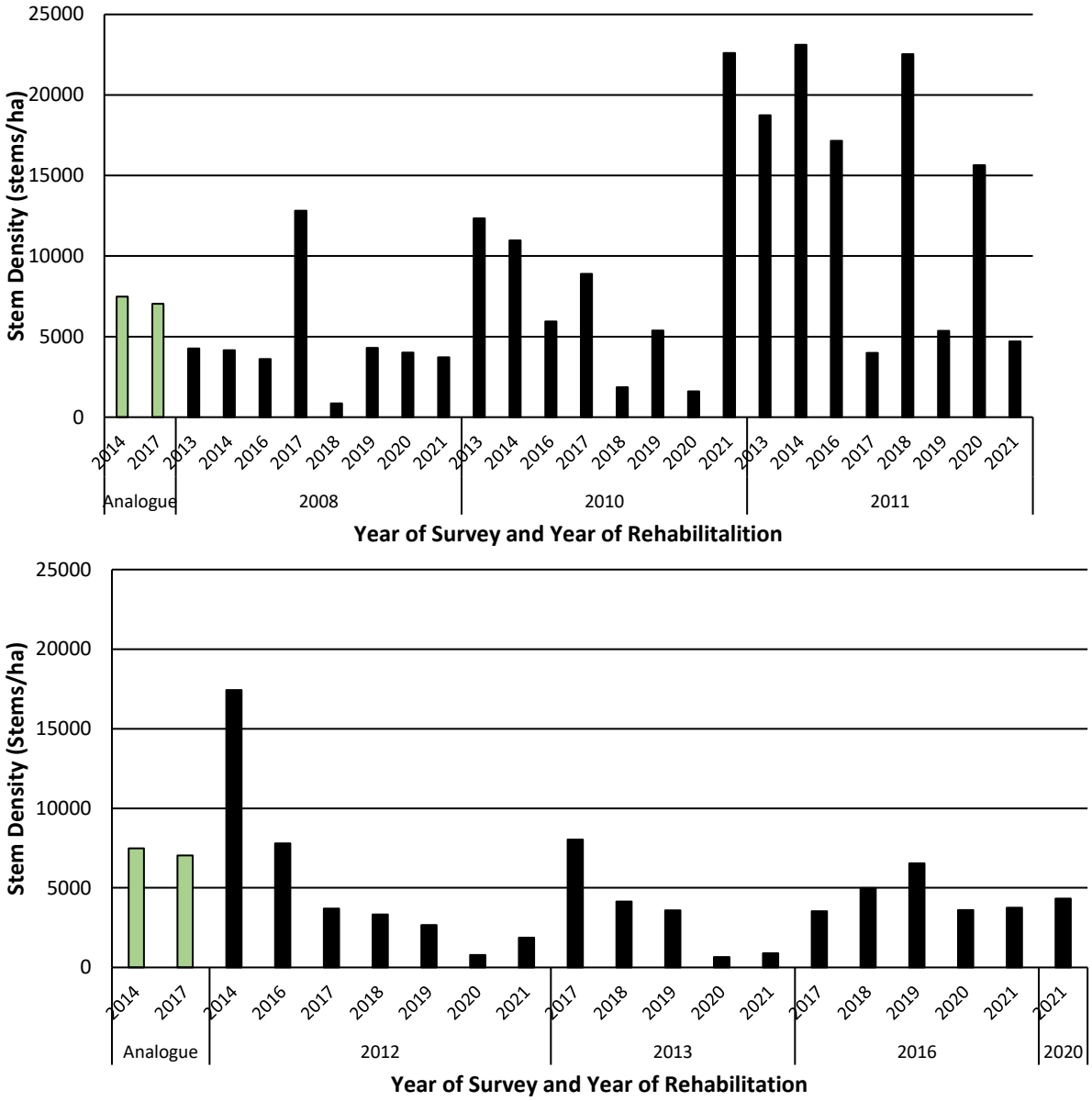


Chart 6: **Average Total Stem Density (stems/ha) values recorded from the 2021 survey, comparison to previous surveys and the 2017 Average Analogue values derived from the Biodiversity Offsets Areas**

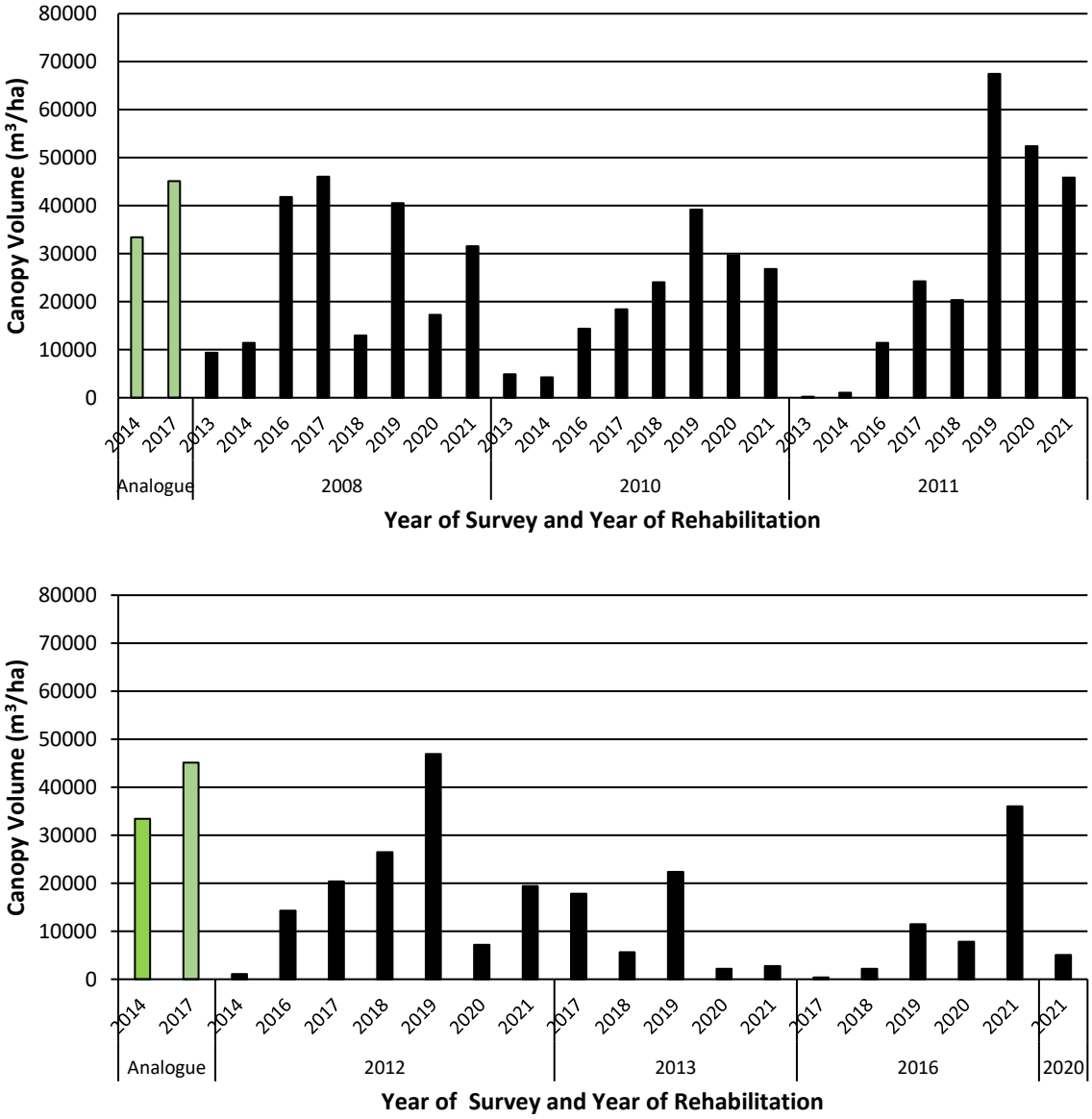


Chart 7: **Average Total Woody Vegetation Volume (m3) values recorded from the 2021 survey, comparison to previous surveys and the 2014 and 2017 Average Analogue values derived from the Biodiversity Offsets Areas**

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 7**).

Table 7: 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	3045	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
	3444			
2010	3454			
2011	3048			
2012	3047			
	3052			
	3056			
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			

4.1.1 Landscape Functional Analysis

Soil surface indicators for the various ages of rehabilitation are overall positive and indicate progression towards sustainable ecosystem functions. There are variations for the indicators for some of the ages of the rehabilitation but since the commencement of monitoring, the trend has been towards the analogue values.

The LFA indices continue to trend in the direction of the of analogue values, a feature that has been noted in previous reports. The Stability Index scores for the older (2008 to 2013) rehabilitation areas have achieved or exceeded Analogue values, a pattern that appears to be well established suggesting that even with the rotation of survey transects across the spoil emplacement soil surface stability has been established. The younger rehabilitation areas (2016 to 2020) are still in the process of increasing soil surface stability, and currently have recorded lower index scores. As stated in the 2020 Monitoring Report (Kleinfelder, 2020) further increases in the Stability Index for these areas will come from the build-up of litter and maturation of the vegetation itself. There was no significant erosion observed during the surveys on the southern spoil emplacement (rehabilitation ages 2008 to 2012) or on the central spoil emplacement in the more recent rehabilitation areas. Landscape Organisation Index scores – the arrangement of the soil surface into nutrient accumulating and shedding "patches" and "interpatches"– 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 rehabilitation areas, there tend to be two main patch types identified. Where the canopy has thinned out due to *Acacia* die-off, grassy sward dominates (**Plate 1**), whereas under the dense plantings – especially dense *Eucalyptus* – litter is the dominant ground covering (**Plate 2**). Either type of patch serves to stabilise the soil surface and traps and recycles nutrients.

The pasture areas – as monitored by Transects 3504 and 3505 - have been established on flat areas of the spoil emplacement. Although the revegetation is relatively young, the seeding of pasture species has been successful, and no areas of seeding failure or erosion were observed.

Despite some of the issues that are associated with the monitoring methodology – alternate/different transects monitored each year - the data recorded shows that the biophysical processes are on track for successful rehabilitation, and while no recommendations are made to attempt improvement or accelerate development that are directly related to the indices, it should be noted that improvements to vegetation structure and densities will act directly upon some of the inputs (such as litter quality and quantity) into the LFA indices.

Plate 1: Transect 3056 (2012 rehab) – looking down LFA transect. Note the open nature of the woody vegetation due to the relatively young age of the canopy species and some Acacia species die-off and the dense exotic groundcover

Plate 2: Photograph of Transect 3454 LFA in the 2010 rehabilitation area. Note the dense Eucalypts, litter layer and sparser groundcover

4.1.2 Vegetation Structure – Woodland Domains

The vegetation structure data for the woodland rehabilitation assessed as Ecosystem Sustainability i.e., 2008 to 2013 rehabilitation shows that these areas are currently heavily dominated by canopy species with all ages of rehabilitation recording higher than analogue canopy species densities. With the exception of Transect 3454 in the 2010 rehabilitation (and from the historical data Transect 3043 in the 2011 rehabilitation), all areas recorded total stem densities below the analogue values, with the shrub stratum in particular well below the analogue sites. All sites in this older rehabilitation have relatively low numbers of true shrub and midstory species – where the vegetation structure data indicates high numbers of stems in the shrub stratum – Transect 3454 – the data shows that these were Eucalypt seedlings and saplings under two meters in height, recently germinated, rather than shrubs. The lower number of stems in the midstory and shrub strata reflect a combination of limited species initially seeded and the natural lifecycles of those *Acacia* species now resulting in die-back as has been noted. The observation made in **Section 4.1.1** regarding the type of groundcover – litter versus grassy – also has influenced the ability of the vegetation to self-recruit, or to have new species colonise. Where exotic grasses dominate the groundcover, diversity and self-recruitment were observed to be lower, with fewer seedlings and saplings recorded as highlighted by Transects 3056 (2012 rehabilitation) and 3503 (2013 rehabilitation) where the total stem densities were 703 and 888 stems/ha – but still recorded greater numbers of Eucalypt stems than the analogue average. It should be noted here that the current openness of these areas will change with time as the canopy trees mature and increase the area shaded. This contrasts with the litter dominated areas, especially Transect 3444 (2008 rehabilitation), Transect 3454 (2010 rehabilitation) and Transect 3048 (2011 rehabilitation), where each survey records new species colonising the area, along with multiple generations of Eucalypts. Diversity in these areas is increasing slowly but is limited to species that appear to be dispersed by fauna, especially birds.

The younger rehabilitation, 2016 and 2018, assessed as being in the Ecosystem Establishment phase have benefitted from more diverse initial seedings with shrub and midstory species. These areas are still young and continued monitoring will detail the progression of the revegetation. Transect 3502 does have not any Eucalypt stems recorded in the vicinity of the transect and requires remedial seeding.

When measured against the completion criteria, the younger rehabilitation areas – Ecosystem Establishment - have achieved or on trajectory to achieve the completion criteria. The older rehabilitated areas – Ecosystem Sustainability - have partially achieving the criteria. The establishment of self-sustaining ecosystems, as observed by self-recruitment is occurring in those areas where seedings have conditions allowing germination. Multiple germination events are inferred from the quite distinct height ranges of the original seeded trees (estimated to be up to 15m in height), followed by mid-range heights, and then smaller saplings followed by recently germinated

seedlings. Total vegetation cover is improving as the vegetation matures, with the more open areas likely to result in densities that are more characteristic of woodland/open forest as opposed to the forest "poles" that are currently observed in the densely treed areas. In terms of biodiversity similar to unmined vegetation, the rehabilitation is not at the level of the analogue sites. This is to be expected given that the rehabilitation is still in the process of developing and may take many more years to approach the diversity of the unmined, analogue areas. As has been stated above it is the densely treed areas where self-recruitment and colonisation by new species has been most readily observed, while the more recent rehabilitation areas benefit from a greater diversity of midstory and shrub species.

4.2 RECOMMENDATIONS FOR MANAGEMENT

The first set of recommendations for management include changes to monitoring to more accurately collect data that demonstrates progress towards the completion criteria outlined in **Table 6**.

The LFA indices demonstrate that the oldest rehabilitation – 2008 to 2012 – have achieved a stable soil surface, equivalent to analogue sites and that infiltration and nutrient cycling are on trajectory. Therefore, it is suggested that LFA monitoring of the soil surface indicators can be discontinued in these areas.

Biodiversity and vegetation cover are two of the key components of the completion criteria, and the current monitoring methodology does not quantitatively measure these aspects of the revegetation. The vegetation structure methodology provides a measure of vegetation cover, but the more commonly used percentage foliage cover can provide more detailed data. Biodiversity is not quantified at all with the current methodology but is recorded as observations at each transect. It suggested that a quadrat-based methodology, utilising the current transect positions, aligned with the Biodiversity Assessment Methodology be employed. This will provide detailed floristics, quantities and cover at each monitoring location.

Further management actions, largely aimed at increasing biodiversity and improving vegetation structure and/or weed control measures will be outlined. The level of intervention for increasing biodiversity and structure is largely dependent upon the time frame for surrender of portions of the rehabilitation.

If surrender is not deemed necessary for a period of time, say in the order of 10 years, then natural recruitment of species (as has been demonstrated by the 2008 rehabilitation around Transect 3444) can be allowed to proceed without further intervention. This approach would also allow areas that are currently deemed more open such as Transects 3056 (2012 rehabilitation) and 3503 (2013 rehabilitation), further time to mature and the natural shading of the larger canopy trees may allow for additional natural recruitment. In this scenario, management actions are restricted to weed control of listed noxious weeds and other environmental weeds that would hinder these processes, such as *L. camara, L. sinense* and *S. mauritianum.* The DCM has now undertaken two rounds of woody weed control in addition to weed spraying operations. This has been reported on in a separate report (Kleinfelder, 2021) with the areas treated in both 2020 and 2021 shown in **Figure 3**. Weed control works could be enhanced by use of drone technology to identify areas requiring treatment.

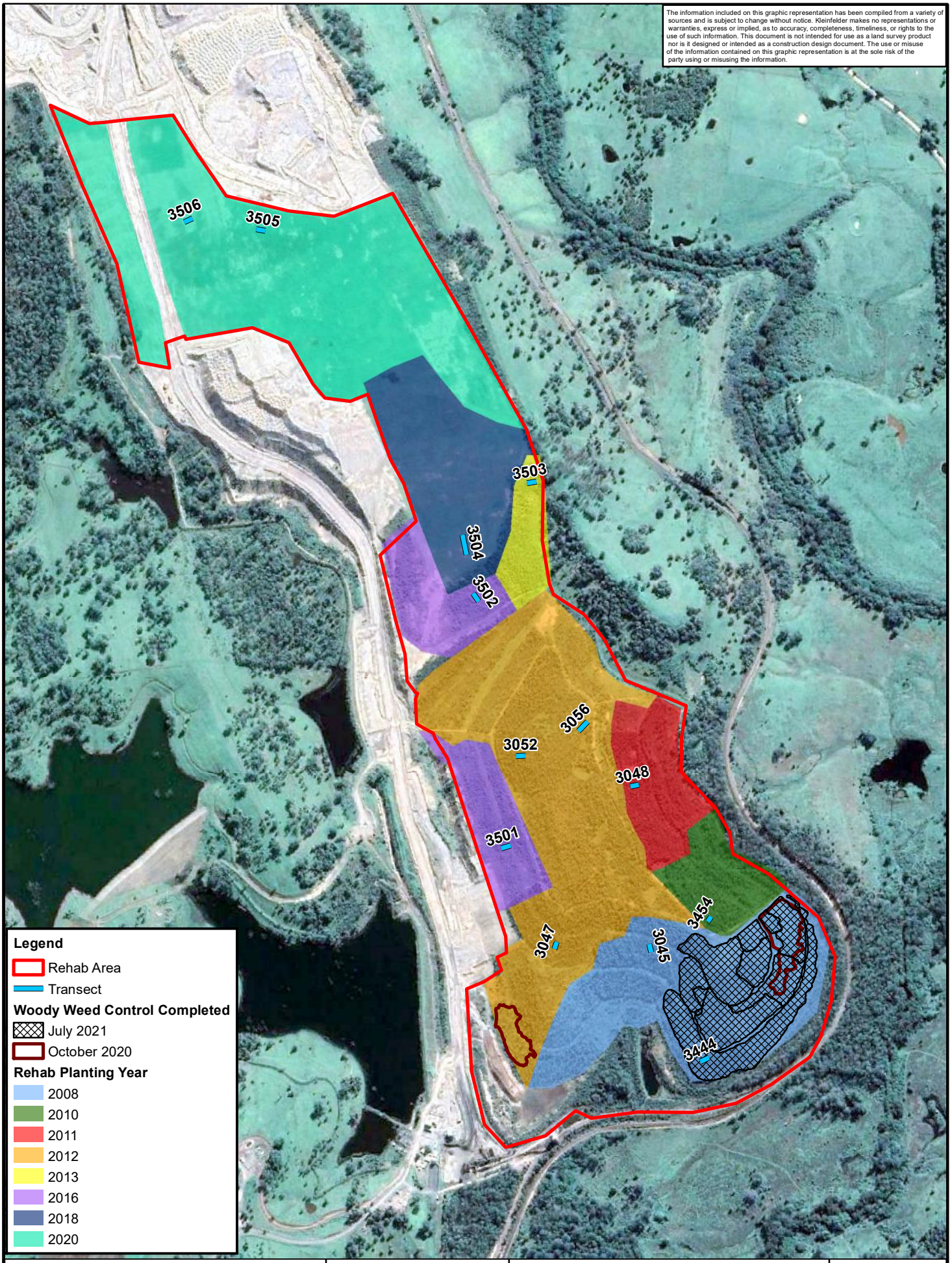
The next level of intervention would involve the use of hazard reduction burns. The continuing build-up of litter (including the die-off of *Acacias*) combined with the either dense and tall grassy groundcover or high stem density of woody vegetation poses a risk if an uncontrolled fire were to occur (e.g., lightning strike). A controlled burn would have the added advantages of reducing the biomass of the groundcovers and allowing ease of movement off tracks and drains. Presently the combination of woody litter and dense groundcovers presents a hazard for the movement of personnel on foot for weed control measures and surveys. Promotion of the germination of the seed bank from the species on the spoil emplacement would also occur – although this may lead to a large increase in the density of the *Acacias.* A controlled burn would also assist with control of some of the woody weeds – *L. camara* in particular. *L. sinense* is not controlled by fire as it acts as a firebreak and can resprout from roots (NSW WeedWise website). However, fire can be used to reduce the ground cover vegetation and then allow follow-up with herbicide application when re-sprouting.

The highest level of intervention would require additional seeding or planting programs that could be targeted to improve diversity and/or specific stratum and be undertaken after biomass reduction actions, such as burning. For instance, the areas surrounding Transect 3502 have been reported to contain very few Eucalypts and seeding

of this area after biomass reduction would serve to introduce this stratum to this area. More generally, additional midstory and shrub species would improve the ecosystem function of the spoil emplacement. With no quantitative data available, observations show that Transect 3444 has the most native flora diversity with about 15 species of native plants. The survey of the analogue transects undertaken in 2017 recorded an average of 38 native species, albeit many of these are forbs and herbs that will be extremely difficult to introduce. Nevertheless, additional species if added will improve the rehabilitation effort. For instance, *Leucopogon juniperinus* (Prickly Beard-heath) is a common species through the analogue sites but is not available commercially. It would be beneficial to attempt to collect seed from on site to use in the rehabilitation introducing it to younger rehabilitation areas or where it has not yet colonised. The PAF area and VMU AG both have dense populations of this species, and it may be possible to collect seed from these areas. PlantNET states that seed are mature from August to January. Improving the floral biodiversity need not be undertaken as an emplacement-wide task but could be restricted to pockets or areas to introduce these species and allow spread through natural means.

4.3 CONCLUSIONS

The rehabilitation of the Duralie spoil emplacement continues to be on track for successful re-establishment of native woodland and pasture. The Landscape Functional Analysis indices have either achieved analogue or on track to achieve analogue values. In the older rehabilitation areas, LFA monitoring could be replaced by a more targeted monitoring program to provide quantitative data to support trajectories towards completion criteria. Vegetation will take much longer to achieve “natural” woodland vegetation structure and composition, but indications from the older rehabilitation areas show that this is occurring in areas where the right combination of species were seeded. Species diversity and structure is improving through natural recruitment, although seeding with further shrub and midstory species in particular but also canopy in selected areas, would increase the rate of diversification and provide greater fauna habitat.



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PROJECT REFERENCE: 20220445

DATE DRAWN: 2021/08/17 10:29 Version 1

DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2018
Google Earth - 2020

2021 Transects and Weed Control Completed

Duralie Coal Pty Ltd
2021 Duralie Coal Mine Rehabilitation Monitoring Report
1164 Buckett's Way via Stroud Road NSW

FIGURE:

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APPENDIX 1: TRANSECT PHOTOGRAPHS

Plate 3: Transect 3045, 2008 rehabilitation

Plate 4: Transect 3045 showing typical groundcover with exotic grasses, litter and native vines – Headache Vine (*Clematis glycinoides*), bottom right.

Plate 5: Transect 3444, 2008 rehabilitation

Plate 6: Transect 3444 showing typical dense litter with sparse grass groundcover

Plate 7: **Transect 3454, 2010 rehabilitation showing dense canopy cover**

Plate 8: **Transect 3454 - typical groundcover of dense litter under canopy with only scattered plant**

Plate 9: **Transect 3047, 2012 rehabilitation showing more open nature and the dense exotic groundcover**

Plate 10: **Transect 3047 showing dense exotic groundcover – *Setaria sphacelata***

Plate 11: Transect 3052, 2012 rehabilitation.

Plate 12: Transect 3052 showing dense exotic groundcover

Plate 13: Transect 3056, 2012 rehabilitation

Plate 14: Transect 2012, dense exotic grass groundcover

Plate 15: Transect 3503, 2013 rehabilitation

Plate 16: Transect 3503 showing typical dense exotic grass groundcover

Plate 17: Transect 3501, 2016 rehabilitation showing large Acacia and dense grassy groundcover

Plate 18: Transect 3501 - typical dense *Setaria sphacelata* groundcover

Plate 19: **Transect 3502, 2016 rehabilitation. Dense grassy groundcover, dense Acacias, with Acacia dieback evident**

Plate 20: **Transect 3502 showing the typical dense *Setaria sphacelata* groundcover**

Plate 21: Transect 3504, 2018 pasture rehabilitation

Plate 22: Transect 3504 - mixed grass species groundcover

Plate 23: Transect 3505, 2020 pasture rehabilitation

Plate 24: Transect 3506, 2020 woodland rehabilitation

Plate 25: Transect 3506 showing typical groundcover - mixed exotic and native species

APPENDIX 2: STAFF CONTRIBUTIONS

Name	Qualification	Title/Experience	Contribution
Gayle Joyce	BSc (Forestry) (Hons)	GIS Specialist	GIS & Mapping
Katrina Hailstone	-	Field Assistant	Field Work
Nigel Fisher	BSc (Hons) PhD	Senior Restoration Ecologist	Project Mgt, Field Work, Report Writing and Review