Delta coal	Doc Owner: **Environmental Compliance Coordinator** Doc No:

CHAIN VALLEY COLLIERY

Annual Review 2023

1 January 2023 – 31 December 2023

Author:	Lachlan McWha Delta Coal Environmental Compliance & Approvals Coordinator
Authorised by:	
Date:	31 March 2024

Chain Valley Colliery – Annual Review (AEMR) 2023

Table 1 - Annual Review title block

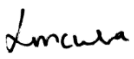
Name of operation	Chain Valley Colliery
Name of operator	Great Southern Energy Pty Ltd trading as Delta Coal
Project Approval #	SSD 5465
Name of Project Approval holder	Delta Coal
Titles/Mining Leases #	Consolidated Coal Lease 706, Consolidated Coal Lease 707, Mining Lease 1051, Mining Lease 1052, Mining Lease 1308, Mining Lease 1781, Mining Lease 1782, Mining Lease 1783, Mining Lease 1784, Mining Lease 1785, Mining Purposes Lease 1349, Mining Purposes Lease 1389, Mining Purposes Lease 1400, Mining Purposes Lease 337.
Name of holder of mining leases	Great Southern Energy Pty Ltd
Water License #	WAL41508 / Work Approval 20MW065025
Annual Review start date	1 January 2023
Annual Review end date	31 December 2023

I, Lachlan McWha, certify that this audit report is a true and accurate record of the compliance status of Chain Valley Colliery for the period 1 January 2023 to 31 December 2023 and that I am authorised to make this statement on behalf of Great Southern Energy Pty Ltd (trading as Delta Coal Pty Ltd).

Note.

a) 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.

b) 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).

Reporting Officer	Name:	**Lachlan McWha**
	Title:	**Environmental Compliance & Approvals Coordinator**
	Date:	**31st March 2024**
	Signature:	

Executive Summary

Below details a summary of the key performance indicators for Chain Valley Colliery.

Indicator	Value
Total full-time employees (at 31 December 2023)	207
ROM coal produced on site (tonnes)	931,016
Product coal transported from site via Mannering Colliery (tonnes)	931,016
Total ROM coal to export market (million tonnes)	0
Total ROM coal to domestic market (tonnes)	931,016
Total Coal Haulage on public roads (tonnes)	0
Total waste disposed (tonnes)	209.8
Total waste recycled (tonnes)	93.3
Waste recycling % achieved (%)	30.8
Potable water consumed (ML)	59.3
Total water discharged from the operation (ML)	2,447
Total number of community complaints received	0
Total number of reportable environmental incidents (including approvals non-compliances) for the period	7
Total funding accrued for the Voluntary Planning Agreement with Council in reporting period	$43,404
Number of Community Consultative Committee (CCC) meetings undertaken	4
Total Scope 1 greenhouse gas emissions (CO_2 equivalent tonnes) 1st July 2022 – 30th June 2023	597,385

1 Statement of Compliance

Summary of Non-compliances (2023 Reporting Period):

The **seven** reportable environmental incidents during the reporting period were air quality or water related exceedances. These are summarised in **Table 2** and **Table 3**.

Table 2 - Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
SSD 5465	No
EPL 1770	No
Consolidated Coal Lease 706, Consolidated Coal Lease 707, Mining Lease 1051, Mining Lease 1052, Mining Lease 1308, Mining Lease 1781, Mining Lease 1782, Mining Lease 1783, Mining Lease 1784, Mining Lease 1785, Mining Purposes Lease 1349, Mining Purposes Lease 1389, Mining Purposes Lease 1400, Mining Purposes Lease 337.	Yes
Water Access Licence 41508 / Work Approval 20MW065025	Yes

Table 3 - Non-compliances

Relevant Approval	Condition No.	Condition Description (summary)	Compliance Status	Comment	Where addressed in Annual Review
EPL 1770	L2.4	Faecal Coliform Exceedance at EPA 1 discharge point.	Non-compliant	14 February 2023	Section 7.4 and Section 11
Development Consent SSD-5465	Schedule 3, Condition 11	Depositional Dust Exceedance at DDG004.	Non-compliant	16 March 2023	Section 6.1.3 and Section 11
EPL 1770	L2.4	Faecal Coliform Exceedance at EPA 1 discharge point.	Non-compliant	20 March 2023	Section 7.4 and Section 11
Development Consent SSD-5465	Schedule 3, Condition 11	Depositional Dust Exceedance at DDG004.	Non-compliant	03 April 2023	Section 6.1.3 and Section 11

Relevant Approval	Condition No.	Condition Description (summary)	Compliance Status	Comment	Where addressed in Annual Review
Development Consent SSD-5465	Schedule 3, Condition 11	Depositional Dust Exceedance at DDG001.	Non-compliant	18 September 2023	Section 6.1.3 and Section 11
EPL 1770	L2.4	Faecal Coliform Exceedance at EPA 1 discharge point.	Non-compliant	06 November 2023	Section 7.4 and Section 11
Development Consent SSD-5465	Schedule 3, Condition 11	Depositional Dust Exceedance at DDG004.	Non-compliant	14 December 2023	Section 6.1.3 and Section 11

Compliance status key for Table 3

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

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2 Introduction

2.1 Background

Chain Valley Colliery (CVC) is an underground coal mine located on the southern end of Lake Macquarie approximately 60 km south of Newcastle, 80 km north of Sydney and adjacent to Vales Point Power Station (VPPS). The pit-top is located 1 km south-east of the township of Mannering Park. The sites locality and approved boundary are shown on **Figure 1**.

CVC operates under Development Consent SSD-5465 which was most recently modified (Modification 4) in August 2021.

Underground mining at CVC commenced in 1962 and since that time has extracted coal from three seams; namely, the Wallarah Seam, the Great Northern Seam and the Fassifern Seam, using a combination of bord and pillar and miniwall mining methods. Current mining activities are within the Fassifern Seam. CVC completed its final planned miniwall in 2021. All mining undertaken in the reporting period was first-workings bord and pillar methods.

Delta Coal is currently undertaking the mine closure/rehabilitation process for the Moonee Colliery stockpile area, within intentions to relinquish this holding area to National Parks and Wildlife Services upon completion of rehabilitation.

CVC peaked with a workforce of approximately 380 personnel in the mid 1980's. At the end of the reporting period, CVC had a workforce of 207 personnel.

2.2 Mine Contacts

The Colliery contacts as at the end of the reporting period were:

Mine Manager:	Joshua Cornford
Telephone:	02 4358 0800
Email:	info@deltacoal.com.au
Environmental Compliance & Approvals Coordinator:	Lachlan McWha
Telephone:	02 4358 0800
Email:	Lmcwha@deltacoal.com.au

Postal Address: Delta Coal
P.O Box 7115
Mannering Park NSW 2259

Figure 1 - Chain Valley Colliery Site Boundary and Regional Locality

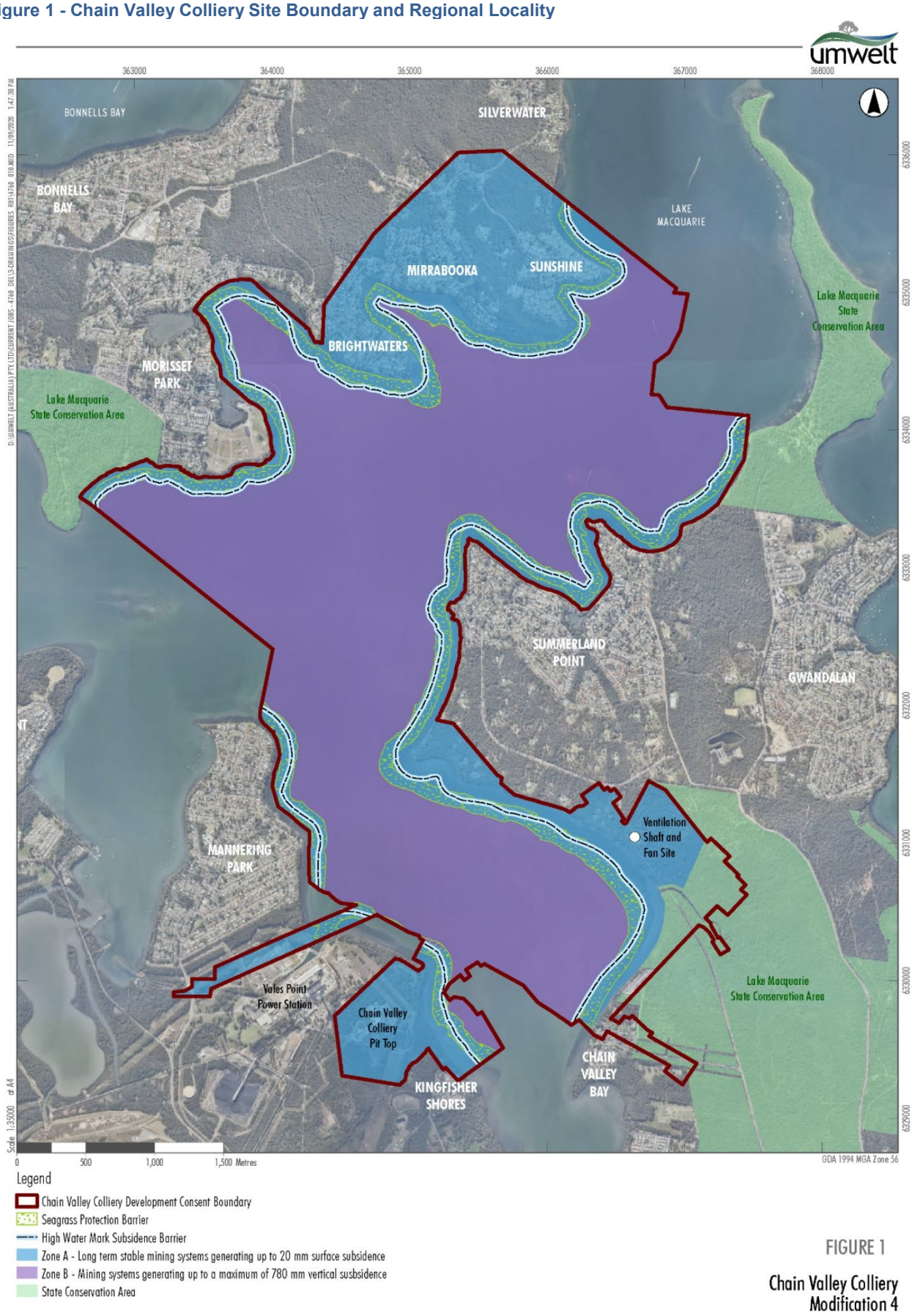


FIGURE 1

Chain Valley Colliery Modification 4

3 Approvals

This Annual Review has been completed in compliance with Condition 8 of Schedule 6 within SSD-5465. A copy of the modified Development Consent is attached as **Appendix 1**.

3.1 Development Consent SSD-5465

CVC commenced mining operations in 1962 and the mine had been operating under existing use rights until 23 January 2012 at which time major project approval (MP 10_0161) was issued under Section 75J of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The project approval permitted secondary extraction within domains referred to as Domain 1 and Domain 2, along with first workings within an area identified as Parcel A. The approval also permitted the continuation of mining within the Fassifern Seam until 31 December 2016.

The approval was subsequently modified on 30 August 2012, following approval of a Section 75W modification, to permit a revised mine layout associated with the introduction of wider miniwalls within the Domain 1 and 2 areas.

In 2013 the mine lodged an application for the Chain Valley Colliery Mining Extension 1 Project (SSD-5465) under Part 4 of the EP&A Act. The Mining Extension 1 Project sought approval for:

- an extension of the approved extraction area to allow underground mining to continue within the Fassifern Seam;
- the increase of the approved maximum rate of production from 1.2 million tonnes per annum (Mtpa) to 1.5 Mtpa of run-of-mine (ROM) coal;
- an increase in the approved hours for haulage of coal from the Colliery on private roads to Delta Electricity's VPPS;
- minor upgrades and modifications to existing approved infrastructure;
- an extension of the approved mining by a period of approximately 14 years, to 2027; and
- the consolidation of the above with all the operations and environmental activities currently approved under MP10_0161, as modified, within a single development consent.

Development Consent for the Mining Extension 1 Project was subsequently issued under Section 89E of the EP&A Act on 23 December 2013.

On 24 April 2014 a modification (Mod 1) was sought for SSD-5465, which related to the development of an underground linkage between Chain Valley Colliery and Mannering Colliery. Concurrently, a modification (Mod 2) to Mannering Colliery's Project Approval (MP 06_0311) was sought to permit coal to be received from Chain Valley Colliery and transported via existing facilities to VPPS. The modification application was approved on the 27 November 2014.

On the 15 July 2015 an additional modification (Mod 2) was sought for SSD-5465. The Department of Planning and Environment (DP&E) approved the modification on 16 December 2015. The modification approved the following changes to the CVC operations:

- an increase in the maximum rate of ROM coal extraction at the mine from 1.5 Mtpa to 2.1 Mtpa;
- mine design changes, primarily the re-orientation of miniwall panels in the mine's northern area;
- an increase in full-time personnel from approximately 160 to approximately 220; and
- construction of asset protection zones (APZs) around critical infrastructure to protect from bushfires.

In May 2019 a Statement of Environmental Effects was submitted to support an additional modification (Mod 3) being sought for SSD-5465. The Department of Planning, Industry and Environment (DPIE) approved the modification on the 26th June 2020, the modification approved the following changes to the CVC operations:

- the use of alternate bord and pillar mine designs; and
- an extension of allowed operations until 31 December 2027.

On the 25th August 2021 a further modification to SSD-5465 (Mod 4) was approved by the DPIE. The modification approved the following changes to the CVC operations:

- extend the boundary of the Northern Mining Area approved for extraction under the Chain Valley Colliery consent into a mining lease area partially transferred from Centennial Myuna Colliery (Part ML1632 transferred to ML1785); and
- increase the maximum employee numbers permitted at Chain Valley Colliery to approximately 330 full-time equivalent employees.

Delta Coal submitted an Environmental Impact Statement (EIS) in the review period. The purpose of the EIS was to facilitate the consolidation of the Chain Valley Colliery and Mannering Colliery consents, as well as the extension of the life of both mines to 31 December 2029, which reflects the current forecasted VPPS operational timeframe.

3.2 Extraction Plans

Delta Coal holds an approved extraction plan to facilitate the mining of Miniwall S5 and pillar extraction in the Northern Mining Area (Miniwall S5 and Northern Pillar Area Extraction Plan), which was approved by the Planning Secretary on 6th April 2021.

No extraction plans were submitted in the 2023 review period. During the 2023 reporting period, no secondary extraction was undertaken by Delta Coal. All coal mined during the reporting period was obtained via bord and pillar first workings designed to be long-term stable. CVC is approved to undertake pillar extraction within Subsidence Zone B (beneath Lake Macquarie excluding sea-grass and subsidence protection barriers) in the Northern mining area (up to 780mm of subsidence approved).

3.3 Rehabilitation Management Plan

Throughout the 2023 period the site operated in accordance with the Rehabilitation Management Plan for Delta Coal (incorporating Chain Valley Colliery, Mannering Colliery and the former Moonee Colliery). In addition to the Rehabilitation Management Plan, Delta Coal operated in accordance with the Rehabilitation Forward Program and approved Rehabilitation Objectives required under Schedule 8A of the Mining Regulations 2021.

3.4 Leases

The surface areas occupied by CVC lie within the Central Coast local government area (LGA). The facilities include the pit top area at Mannering Park and ventilation shaft site at Summerland Point.

All extraction during the reporting period was undertaken within the Lake Macquarie LGA.

The Colliery holdings are shown on **Figure 2** and the applicable mining tenements are listed in **Table 4**.

Table 4 - Mining Tenements

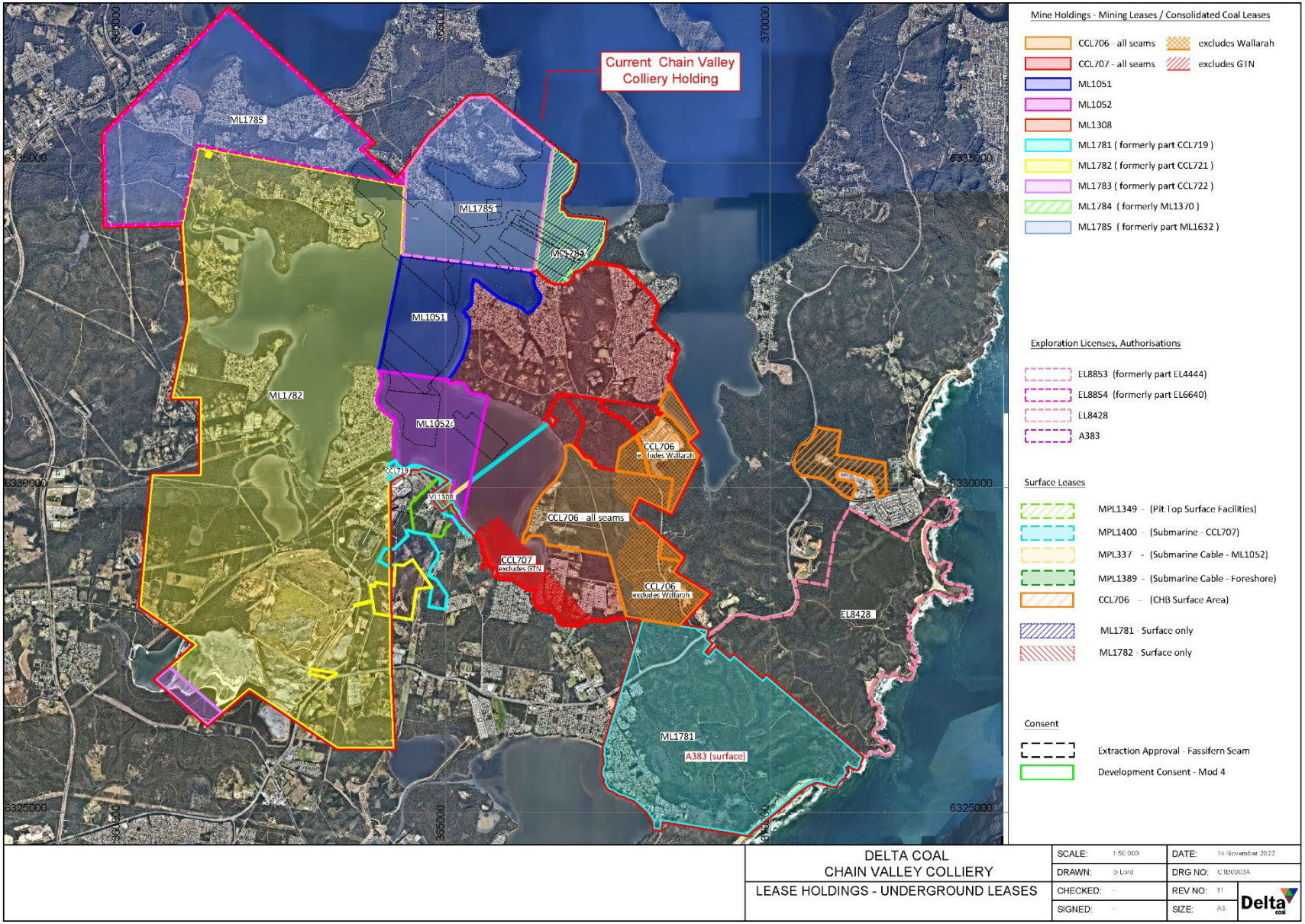
Current Mining tenement	Holder	Grant Date	Renewal date	Lease expiry date	Applicability
A 383	Great Southern Energy	21 March 1988	24 June 2021	21 September 2025	Authorisation for area covered by ML1781.
EL 8428	Great Southern Energy	7 December 2015	8 November 2021	7 December 2025	Potential future mine extension area.
EL 8853	Great Southern Energy	31 October 2022		23 October 2026	Exploration lease for ML 1785 area. Current mine area approved under Development Consent SSD-5465.
EL 8854	Great Southern Energy	12 October 2022		23 April 2026	Exploration Lease for ML 1785 area. Potential future mine extension area.
CCL 706	Great Southern Energy	24 January 1990	10 February 2023	29 December 2029	Incorporates historical workings within the Fassifern, Wallarah and Great Northern Seams which are, and would continue to be utilised for passive operational activities.
CCL 707	Great Southern Energy	3 July 1989	1 June 2023	30 December 2029	Incorporates historical workings within the Fassifern, Wallarah and Great Northern seams which are, and would continue to be, utilised for passive operational activities and the Summerland Point ventilation shaft site.
ML 1051	Great Southern Energy	7 July 1941	30 January 2023	7 July 2042	Part of the area approved under Development Consent SSD-5465.

Current Mining tenement	Holder	Grant Date	Renewal date	Lease expiry date	Applicability
ML 1052	Great Southern Energy	7 July 1941	30 January 2023	7 July 2042	Part of the area approved under SSD-5465.
ML 1308	Great Southern Energy	4 May 1965	30 January 2023	4 January 2031	Mining lease for the mine drift entries.
ML1781	Great Southern Energy	22 April 2022		3 July 2031	Partial Transfer from subleased area of CCL719 from Centennial Coal to GSE. Incorporates historic workings within the Wallarah and Great Northern Seams utilised for passive operational activities.
ML 1782	Great Southern Energy	24 January 2022		29 July 2026	Partial Transfer of previous sublease area of CCL721 from Centennial coal to GSE.
ML 1783	Great Southern Energy	22 April 2022		28 June 2028	Partial transfer of previous subleased area of CCL722 from Centennial Coal to GSE.
ML 1784	Great Southern Energy	14 May 2021		7 Mar 2033	Partial Transfer of previous sublease area of ML1370 from Centennial coal to GSE.
ML 1785	Great Southern Energy	14 October 2022		13 October 2043	Partial transfer of previous subleased area of ML1632 from Centennial Coal to GSE.
MPL 337	Great Southern Energy	30 January 1995	30 January 2016	30 January 2037	Mining purposes lease for a portion of the electricity cable on the bed of Chain Valley Bay connecting the pit top switchyard to the ventilation shaft site at Summerland Point.
MPL 1349	Great Southern Energy	5 October 1967	5 October 2008	5 Oct 2028	Mining purposes lease for the Chain Valley pit top area.
MPL 1389	Great Southern Energy	14 May 1970	14 May 2011	14 May 2031	Mining purposes lease for a portion of the electricity cable on the bed of Chain Valley Bay connecting the pit top switchyard to the ventilation shaft site at Summerland Point.
MPL 1400	Great Southern Energy	6 November 1970	6 November 2011	6 Nov 2031	Mining purposes lease for a portion of the electricity cable on the bed of Chain Valley Bay connecting the pit top switchyard to the ventilation fan at Summerland Point.

Blue = Change within the reporting period

It is noted that while the CVC holding boundary incorporates the entirety of the former Mannering Colliery holding, Annual Reviews for the two Collieries remain separate pending consolidation of the consents and this Annual Review relates specifically to the activities occurring within the Development Consent SSD-5465 boundary under the EP&A Act 1979.

Figure 2 - Delta Coal Tenement Holdings



3.5 Licences

Environment Protection Licence (EPL) No. 1770 issued by the Environment Protection Authority (EPA) under the Protection of the Environment Operations Act 1997 covers the activities and premises for CVC.

EPL 1770 also includes the licenced daily discharge volume for mine water from the pit top settling ponds into Lake Macquarie at a maximum rate of 12,161 kL per day. EPL 1770 was last varied on 24 October 2023.

A copy of EPL 1770 is posted on the Delta Coal website, www.deltacoal.com.au or via the EPA website, http://www.environment.nsw.gov.au/licensing/ and is also provided in **Appendix 2**.

Monitoring results obtained in accordance with the license conditions are made available on the Delta Coal website (updated monthly), under the environmental reporting page: https://www.deltacoal.com.au/environment/chain-valley-colliery/chain-valley-colliery-environmental-reporting

Delta Coal also holds WAL41508 issued under the *Water Act 1912* and permits the extraction of 4443 ML per annum.

4 Operations

4.1 Exploration

There was no surface exploration drilling undertaken during the reporting period.

4.2 Land Preparation

There was no land preparation undertaken during the reporting period, as a result the surface disturbance footprint remains unchanged.

4.3 Construction/Demolition

During the reporting period Delta Coal completed the construction of a sewage pump station, pumping wastewater generated by the sites bath-houses to the Central Coast Council sewer system. The pump station was commissioned in July 2023, satisfying two existing Pollution Reduction Programs within EPL 1770 to connect the sites bath-houses and administration building to the Council sewer system. The works included the installation of a sewage pump station, diversion of on-site wastewater to the pump station and development of a below ground connection to the Council operated sewer line on Tall Timbers Road, Kingfisher Shores.

No additional construction or demolition projects were undertaken during the reporting period.

4.4 Mining

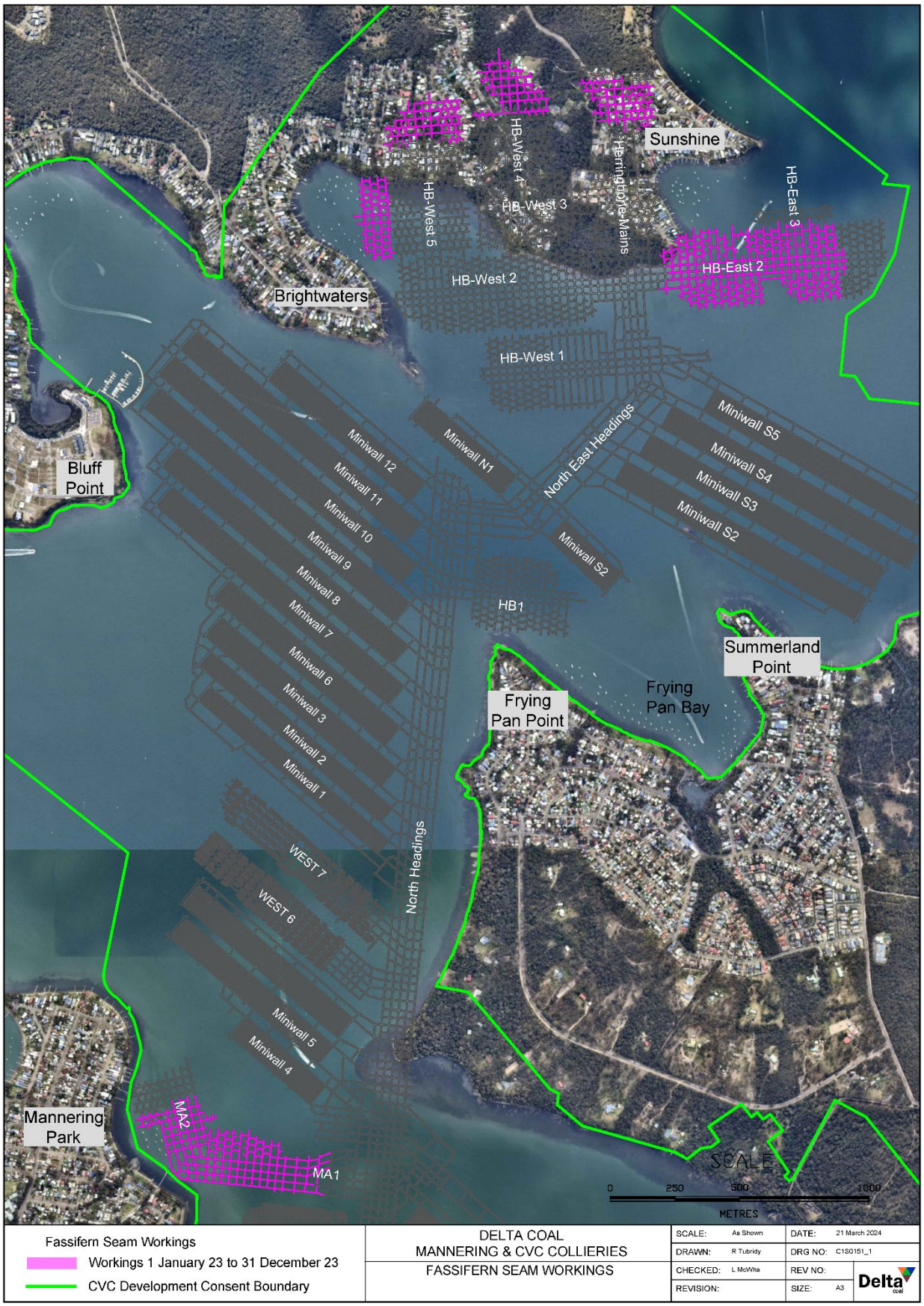
In the 2023 reporting period, CVC undertook first workings through bord and pillar mining methods in a herringbone style, while pillar extraction is permitted in the northern mining area within subsidence zone B (**Figure 1**) pillar extraction was not undertaken in the 2023 reporting period.

Total production for 2023 was:

- 931,016 tonnes of ROM coal from herringbone first workings.

CVC's existing underground workings and mining undertaken in the reporting period is shown on **Figure 3**.

Figure 3 - CVC Underground Workings (2023 workings in pink)

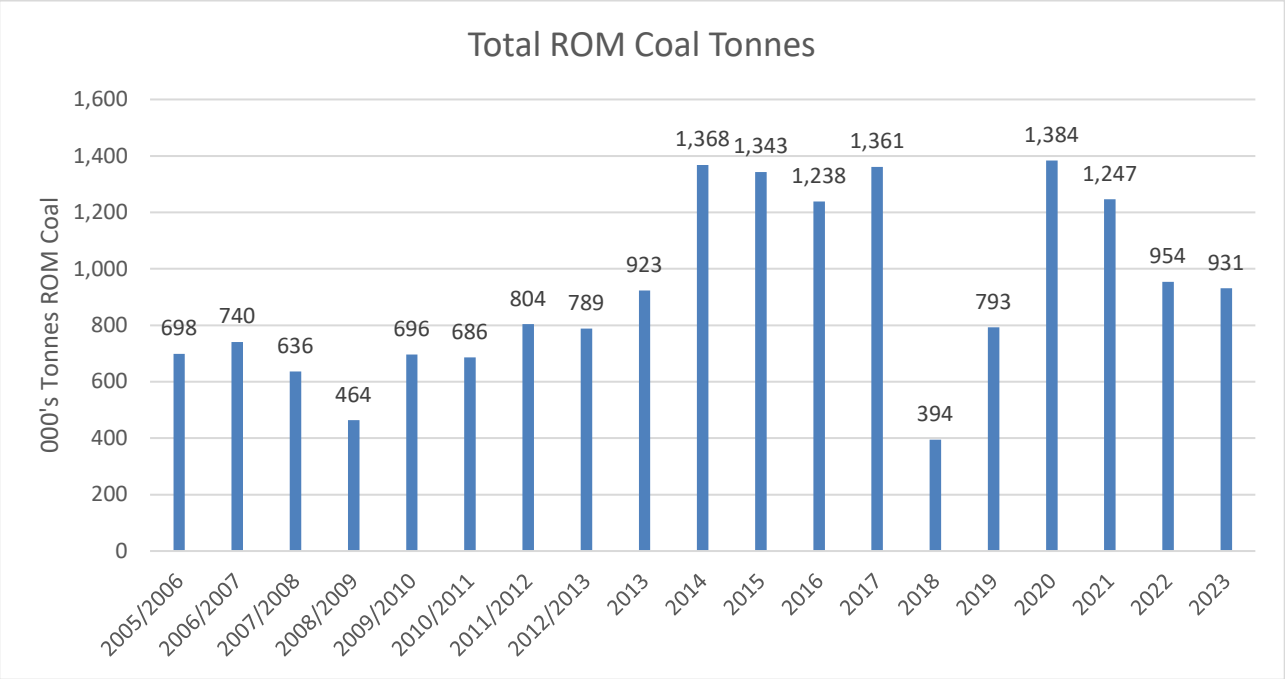


A production summary for the reporting period is provided in **Table 5. Figure 4** shows the past 18 years of annual ROM production, including that for the current reporting period. All coal produced was dispatched to VPPS via conveyor from Mannering Colliery. During the reporting period a total of 931,016 tonnes was dispatched to VPPS (domestic market). No coal was sold for export in the reporting period.

Table 5 - Production Summary

Material	Approved Limit (Mt)	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
Waste Rock / Overburden	n/a	n/a	n/a	n/a
ROM Coal	2.1 Mt	0.95 Mt	0.93 Mt	1.36 Mt
Coarse Reject	n/a	n/a	n/a	n/a
Fine Reject	n/a	n/a	n/a	n/a
Saleable Product (Same as ROM)	2.1 Mt	0.95 Mt	0.93 Mt	1.36 Mt

Figure 4 - Annual ROM Production Levels



4.4.1 Mine Geology

The Fassifern seams have been mined at CVC to produce a raw, crushed thermal coal with low sulphur, which is suitable for both export and domestic markets.

The Fassifern Seam is mined at a depth of approximately 160 to 200 m, approximately 30 m deeper than the Great Northern Seam, which underlies the Wallarah Seam by approximately 30 m also. **Figure 5** shows the typical stratigraphy at CVC including the Wallarah, Great Northern and Fassifern seams.

The Fassifern Seam is overlain by a tuffaceous claystone material which varies in thickness between 20 and 30 metres. The Fassifern Seam measures up to 5 metres in thickness with roadway development carrying a coal roof and floor.

Mining in the Wallarah Seam is complete in the Colliery holding area and mining was discontinued in the late 1990's. There is still some remaining resource within the Great Northern and Fassifern seams. Current operations and development consent only permits mining within the Fassifern Seam.

Figure 5 - Typical Stratigraphy at Chain Valley Colliery



Source: Modified by AECOM (2011) from Seedsman Geotechnics Pty Ltd (2010).

Typical stratigraphy at the Site

EMM

Chain Valley Colliery Mining Extension | Project - Environmental Impact Statement

4.5 Coal Processing

CVC produces a raw, crushed thermal coal which is suitable for both export and domestic markets. In 2020 Mannering Colliery's above ground rotary breaker was decommissioned. Since the rotary breaker was decommissioned initial crushing and sizing occurs underground before being conveyed to Mannering Colliery pit-top for further sizing and screening in the coal handling and preparation plant (CHPP). Coal is transferred from the CHPP to the Mannering Surface ROM Coal Bin which feeds the YE1 conveyor for transport directly to VPPS. In scenarios where the coal transport to VPPS is limited or offline, coal material can be directed to Mannering Collieries coal stockpile, for later transport to VPPS (still via the YE1 conveyor).

4.6 Waste Management

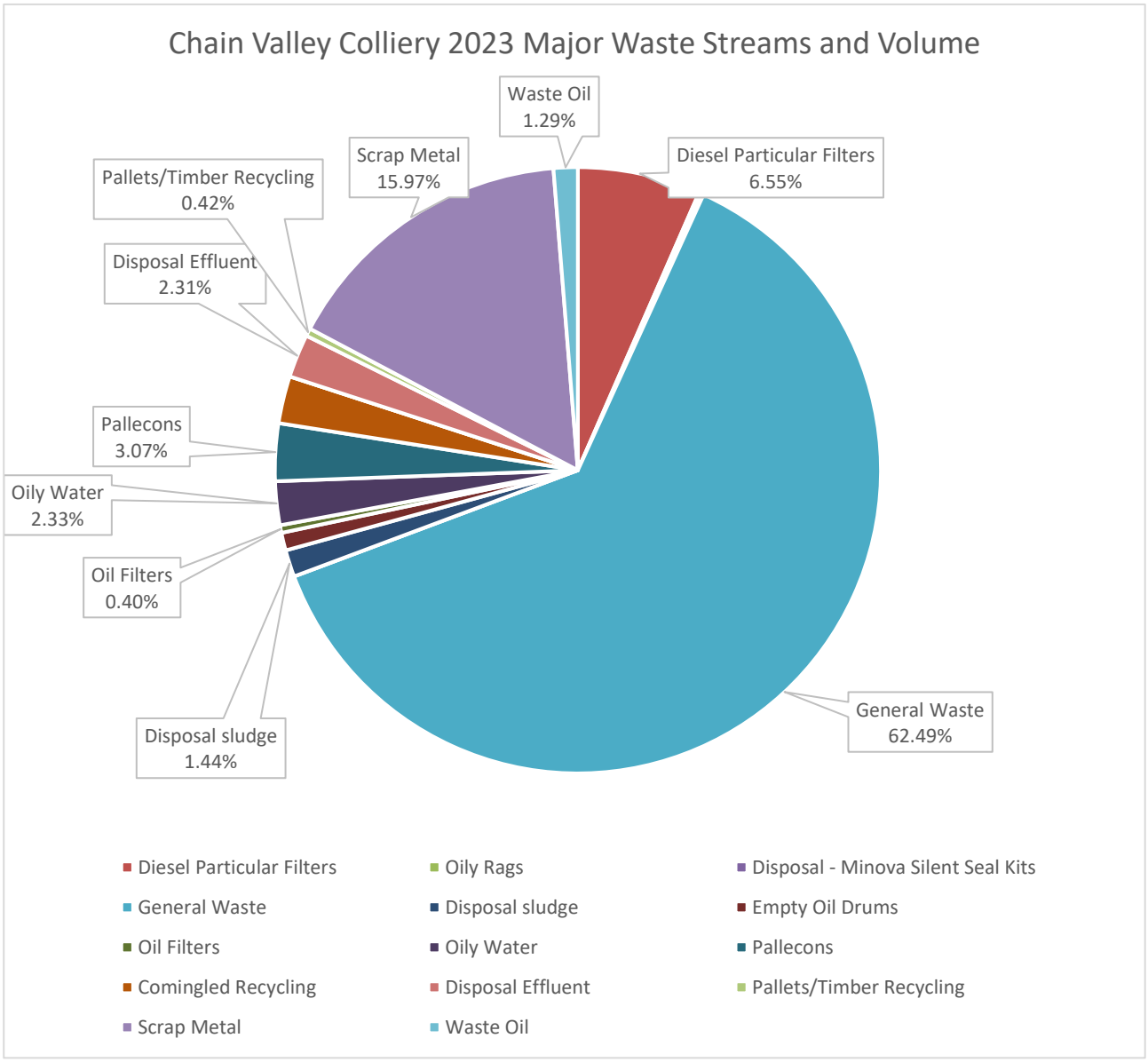
Delta Coal continued to implement a total waste management system for the site during the reporting period. The waste streams currently provided for include:

- general waste (disposal), 189.2 tonne (t) (62.5 %);
- scrap metal (recycle), 48 t (16 %);
- diesel particulate filters (disposal), 19.8 t (6.55 %);
- pallecons (recycle), 9.3 t (3.1 %);
- comingled recycling (recycle), 7.6 t (2.5 %);
- effluent (recycle), 7 t (2.31 %);
- oily water (recycle), 7.1 t (2.3 %);
- sludge (recycle), 4.4 t (1.4%);
- waste oil (recycle),3.9 t (1.3 %);
- empty oil drums (recycle), 2.9 t (1 %);
- timber / pallets (recycle), 1.3 t (0.4%);
- oil filters (recycle), 1.2 t (0.4 %);
- silent seal kit waste (disposal), 0.3 t (0.1 %);
- oily rags (disposal),0.5 t (0.2 %);

The total waste management system also involves weekly site inspections by the waste management contractor to facilitate effective waste management and continual improvement along with monthly reporting, with data from key waste streams presented in **Figure 6.**

During the reporting period there was a continued focus on recycling. The total waste management system will continue during the next reporting period. A total of 30.7% of waste collected from the site was recycled.

Figure 6 – Chain Valley Colliery Waste Streams



4.7 Stockpiles

The CVC stockpile does not receive product coal following the linkage of CVC and MC underground. Active control of sediment and erosion is undertaken on the stockpile area footprint.

4.8 Hazardous Materials Management

Bulk storage of hazardous materials and dangerous goods occurs in the stores area adjacent to the workshop. The primary hazardous chemicals storage locations are:

- a 15,900 L above ground diesel tank (not in operation during the reporting period);
- a covered, bunded area for storage of pallets of oils, and bulk fluid containers;
- 31.4 kL self-bunded diesel tank (compliant with both AS1692 and AS1940); and
- three 210kg LPG bottles.

There have been no significant changes made to the management of hazardous materials during the 2023 reporting period.

4.9 Other Infrastructure Management

As noted in Section 4.3, A sewage pump station transferring wastewater generated at CVC to the Council operated sewer system was completed in 2023. In the previous reporting period (2022), the aerated water treatment system utilised for wastewater generated at the administration building was connected to the CVC septic tanks, now draining to the CVC sewage pump station.

During the 2023 reporting period, works were undertaken to complete sealing of the sites entry road, these works complimented works completed in the 2022 reporting period to seal the sites carpark.

There are no further planned surface infrastructure works to be undertaken in the upcoming 2024 review period.

4.10 Proposed Changes

Forecast changes for CVC that are likely to occur in the next reporting period include:

- Delta Coal is consolidating the CVC and MC approvals under the EP&A Act 1979, an EIS for the project was submitted in 2022, the project has progressed through consultation phases with it being assessed by the Planning Secretary at the end of the reporting period. In the upcoming 2024 reporting period, it is anticipated that the project will be assessed by the Independent Planning Commission.
- If the CVC and MC Consent Consolidation Project is approved, request to consolidate EPL 1770 and EPL 191 to one license.

5 Actions Required from Previous Annual Review

5.1 Actions required from 2022 Annual Review

As detailed in **Table 6**, correspondence was received from DPIE on 3 October 2023, noting that the CVC Annual Return 2022 generally satisfied reporting requirements.

Table 6 - Actions requiring updating in 2022 Annual Review

Item	Section	Action	Status
-	-	Nil – the CVC AR 2022 was reviewed by the Department and was considered to generally satisfy the reporting requirements of the consent and the Departments *Annual Review Guideline* (October 2015).	N/A

5.2 Delta Coal Environmental Management System

Environmental management at CVC is structured through the environmental management system based on the company's Environmental Policy. The site risk assessment of environmental aspects at CVC forms the basis of environmental impact mitigation and control and will be reviewed throughout the life of the Colliery.

The Environmental Management Strategy provides the overview of the environmental management system which has been visually presented in **Figure 7**. Modification 3 of SSD-5465 (June 2020) allowed for the combination of some Mannering Colliery and Chain Valley Colliery management plans, at the end of the reporting period the following combined plans were approved:

- Delta Coal Environmental Management Strategy (incorporating Environmental Monitoring Program);
- Delta Coal Noise Management Plan (combining the Mannering Colliery Noise Management Plan and Noise Monitoring Program and CVC Noise Management Plan);
- Delta Coal Air Quality and Greenhouse Gas Management Plan (combining CVC Air Quality Management Plan and Mannering Colliery Air Quality and Greenhouse Gas Management Plan); and
- Delta Coal Heritage Management Plan (combining CVC Heritage Management Plan, Mannering Colliery Aboriginal Cultural Heritage Management Plan and Mannering Colliery Non-indigenous Management Plan).
- Delta Coal Land Management Plan (capturing the requirement of the Mannering Colliery Land Management Plan and includes CVC land management requirements)

Table 7 provides the status of CVC's Environmental Management Plans.

Figure 7 - Environmental Management Strategy Summary

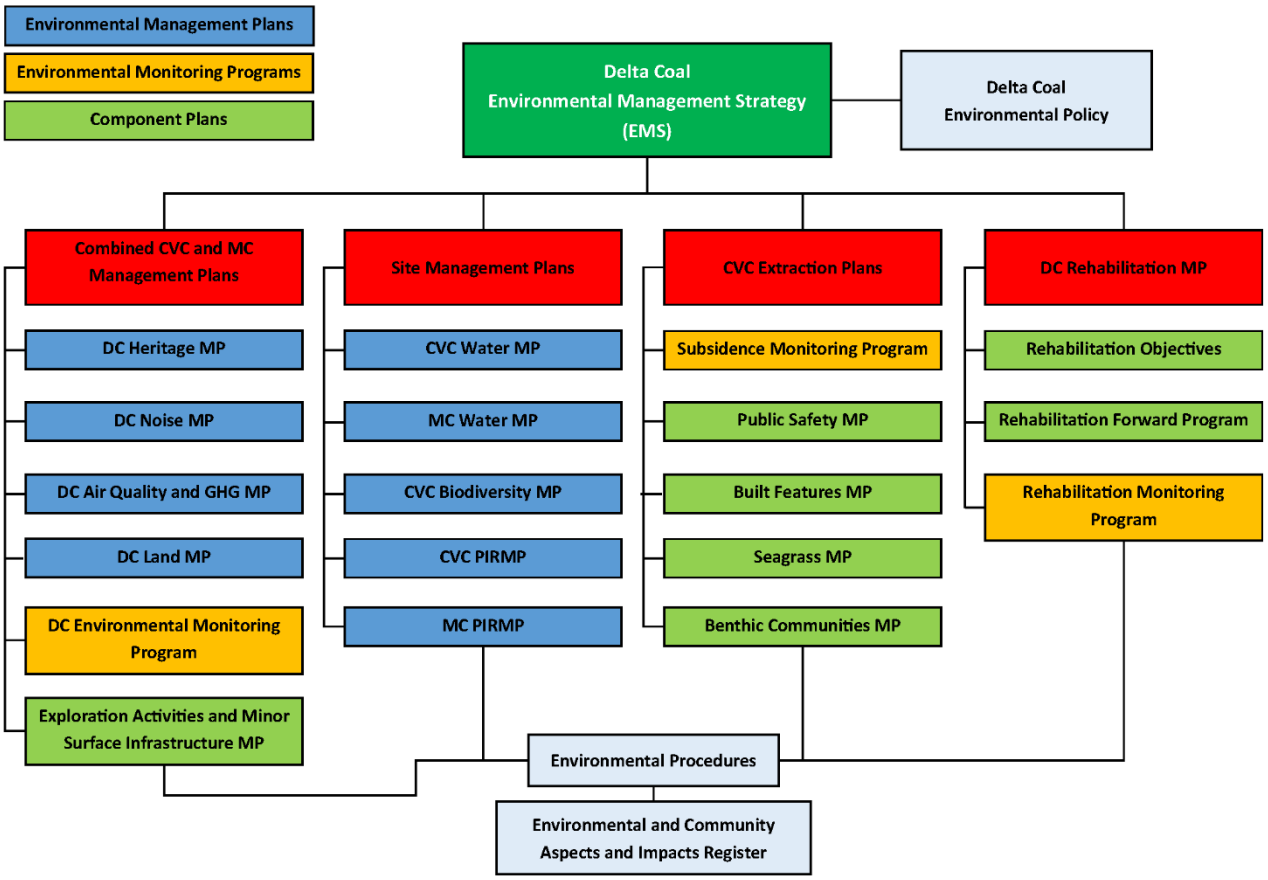


Table 7 - Primary Elements of the Environmental Management System

Document Title	Last Approved / Reviewed	Status
Delta Coal Environment Policy	October 2022	Current
Delta Coal Environmental Management Strategy	March 2021	Revised version submitted for consultation and approval with DPE in 2023, to be implemented in 2024
Delta Coal Environmental Monitoring Program	March 2021	Incorporated into combined Delta Coal Environmental Management Strategy
Environmental Risk Assessment	June 2023	Final
CVC Water Management Plan	December 2022	Under revision after completion of sewer connection for waste water at CVC, consultation with DCCEEW-Water provided on 7 February 2024
Delta Coal Air Quality and Greenhouse Gas Management Plan	January 2024	Current
Delta Coal Noise Management Plan	April 2022	Current

Document Title	Last Approved / Reviewed	Status
Delta Coal Heritage Management Plan	September 2023	Current
Delta Coal Land Management Plan	Not yet approved	Submitted for consultation with Council in 2023, consultation advice pending, approval and implementation anticipated in 2024
Biodiversity Management Plan	April 2023	Current
Road Transport Protocol (Traffic Management Plan) and Coal Haulage Drivers Code of Conduct	Reviewed in 2022, unchanged as CVC does not undertake road coal haulage.	Reviewed in 2022, unchanged as CVC does not undertake road coal haulage.
Seagrass Management Plan	April 2021	Revised in submitted for Planning Secretary review on 6 June 2023 pending review.
Benthic Communities Management Plan	September 2023	Current
Groundwater Management Plan	December 2022	Water Management Plan incl. Groundwater Management Plan approved December 2022.
Built Features Management Plan	April 2021	Approved with Miniwall S5 and NMA Extraction Plan.
Public Safety Management Plan	April 2021	Approved with Miniwall S5 and NMA Extraction Plan.
Rehabilitation Management Plan	January 2024	Current
Rehabilitation Objectives	November 2023	Current
Rehabilitation Forward Program	September 2023	Current
Subsidence Monitoring Program – Northern Mining Area First Workings and Lake Macquarie Extraction	August 2021	Approved with Delta Coal Mining Operations Plan Amendment 2.
Subsidence Monitoring Program – Miniwall S5 and Northern Mining Area Pillar Extraction	November 2020	Approved with Miniwall S5 and NMA Extraction Plan.
Pollution Incident Response Management Plan (PIRMP)	December 2023	Current
Environmental Inspection Forms	May 2023	Current
Complaints Register	December 2023	Updated monthly on www.deltacoal.com.au

6 Environmental Performance

6.1 Air Pollution

6.1.1 Depositional Dust

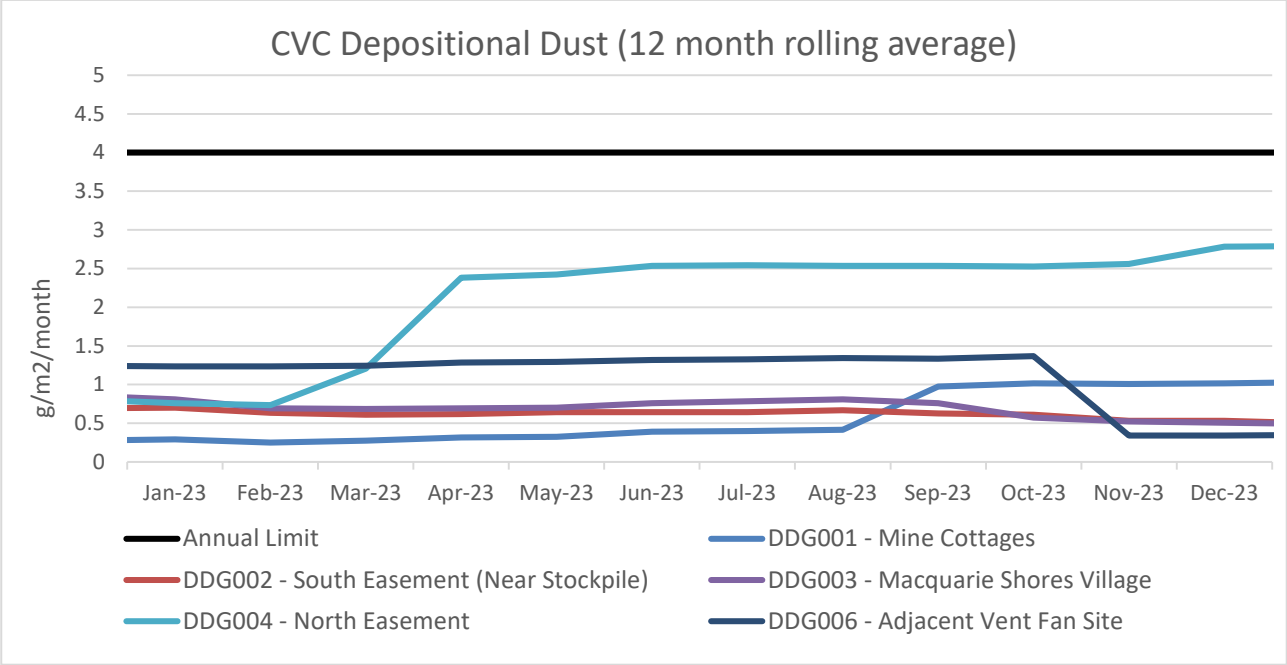
During the reporting period monitoring was undertaken in accordance with the approved Air Quality Management Plan. Depositional dust monitoring results are shown in **Table 8** and the 12 month rolling averages are presented in **Figure 8.** Delta Coal ceased monitoring at DDG005 during the 2022 Reporting period due to frequent issues with dust gauge contamination following approval of the Delta Coal Air Quality Management Plan with proposed the removal of DDG005 and substitution with DDG006.

Table 8 - 2023 CVC Depositional Dust Monitoring

Dep Dust	Limit	DDG001 - Mine Cottages	DDG002 - South Easement	DDG003 - Macquarie Shores	DDG004 - North Easement	DDG006 - Adjacent Vent Site
Month		Insoluble Solids	Insoluble Solids	Insoluble Solids	Insoluble Solids	Insoluble Solids
Jan-23	4	0.30	0.50	0.60	0.90	0.10
Feb-23	4	0.20	0.80	0.50	0.90	0.40
Mar-23	4	0.40	0.40	0.30	6.20	0.40
Apr-23	4	0.70	0.80	0.90	15.00	0.80
May-23	4	0.20	0.40	0.20	0.90	0.20
Jun-23	4	1.10	0.60	1.00	2.10	0.40
Jul-23	4	0.20	0.50	0.40	0.70	0.30
Aug-23	4	0.30	0.40	0.40	0.40	0.30
Sep-23	4	7.30	0.60	0.40	0.90	0.30
Oct-23	4	0.80	0.50	0.20	0.70	0.50
Nov-23	4	0.20	0.40	0.50	1.20	0.20
Dec-23	4	0.50	0.50	0.70	3.50	0.20
2023 AVG	4	1.02	0.53	0.51	2.78	0.34

Notes: 1) For site locations refer **Figure 10.** 2) purple – increase >2g/m^2/month

Figure 8 - CVC 2022 Rolling Annual Average Depositional Dust



During the reporting period, there were four instances where results exceeded the monthly increase limit of 2g/m2/month. The results are shown on **Table 9.** The 12-month rolling average results remained below the annual limit of 4g/m2/month. Investigation into exceedances determined there was no change in site operations that would contribute to the four elevated monthly samples. CVC will continue monitoring and will undertake further action should the results remain elevated.

Table 9 Depositional Dust Exceedances

Sample period	Dust Gauge	Comment
3/02/2023 – 3/03/2023	DDG004	The monthly depositional dust level increased from 0.9 g/m2/month to 6.2 g/m2/month.
3/03/203 – 3/04/2023	DDG004	The monthly depositional dust level increased from 6.2 g/m2/month to 15g/m2/month.
4/08/2023 – 4/09/2023	DDG001	The monthly depositional dust level increased from 0.3 g/m2/month to 7.3 g/m2/month.
1/11/2023 – 1/12/2023	DDG004	The monthly depositional dust level increased from 1.2 g/m2/month to 3.5 g/m2/month.

Annual averages were similar to the maximum predicted cumulative air quality impacts identified in the EIS (May 2013) as presented in Table 3 of the Air Quality Management Plan. Long term (2012-2023) depositional dust annual average values are shown on **Figure 9**.

Figure 9 - Annual Average Depositional Dust Trend

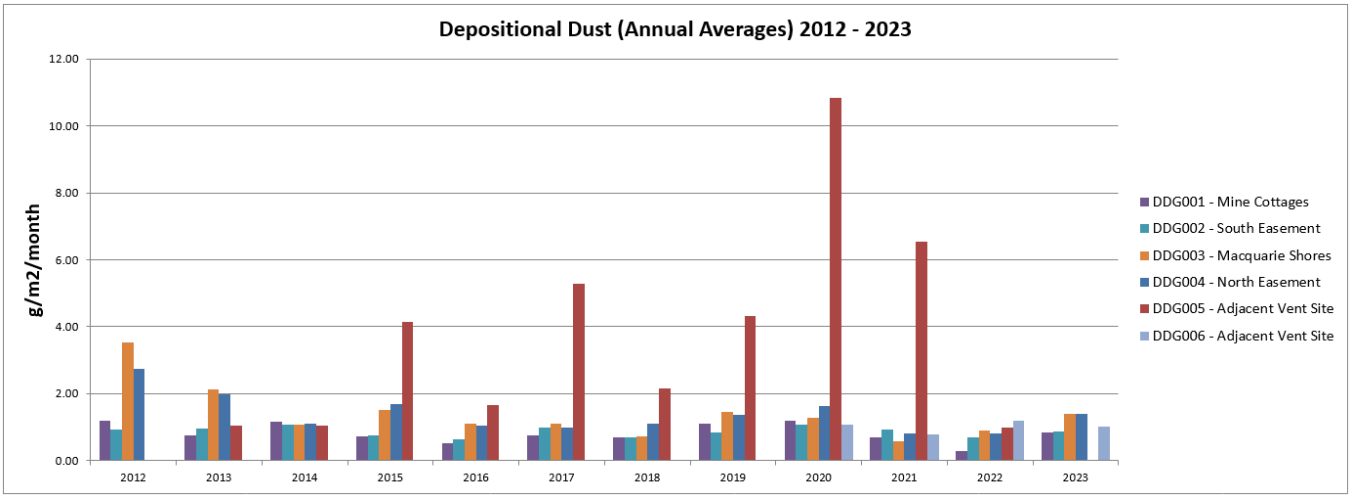


Figure 9 Note: Monitoring of DDG005 ceased in 2022 due to frequent contamination of the dust gauge (due to location) and was replaced by monitoring at DDG006 commencing in 2021 which was considered a more representative location of potential dust emissions from the ventilation fan site.

6.1.2 PM_{10} Monitoring

The real-time air quality monitor was installed in late 2013 within the Mannering Park Wastewater Treatment Plant site. The site is identified as RTD001 with the location shown on **Figure 10**. The real-time monitor measures particulate matter less than 10 microns (µm) in size (PM10).

Data capture from the real time monitor for the 2023 period was 97.5% with 356 days monitored of 365 available days. There were no exceedances of the EPA short-term 24hr average criteria (50 µg/m^3) during the reporting period.

The annual average criterion (25 µg/m^3) was not exceeded during the 2023 period. Daily results, the rolling average and relevant limits are shown on **Figure 11.**

Daily (24-hour) results ranged from a minimum of 4.3 µg/m^3 to a maximum of 38.9 µg/m^3 during 2023. The 2023 annual average of 24hr PM_{10} results was 13.9 µg/m^3. The most comparative locations from the EIS where PM_{10} air quality modelling was completed relate to receptors R12 and R15, with cumulative PM_{10} annual average predictions of 22 µg/m^3 and 20 µg/m^3 respectively. The actual location of real time PM_{10} monitoring is in between these two receivers, a result of 13.9 µg/m^3 is below modelled values.

Monitoring of PM_{10} airborne particulates via the TEOM unit commenced in late December 2013. When comparing the 2023 annual results to the previous year, the data capture rate was slightly reduced to 2022, generally this was due to minor power outages during electrical storms. Data from the commencement of monitoring through to the end of the reporting period is shown on **Figure 12**.

Figure 10 - Delta Coal Air Quality Monitoring Locations

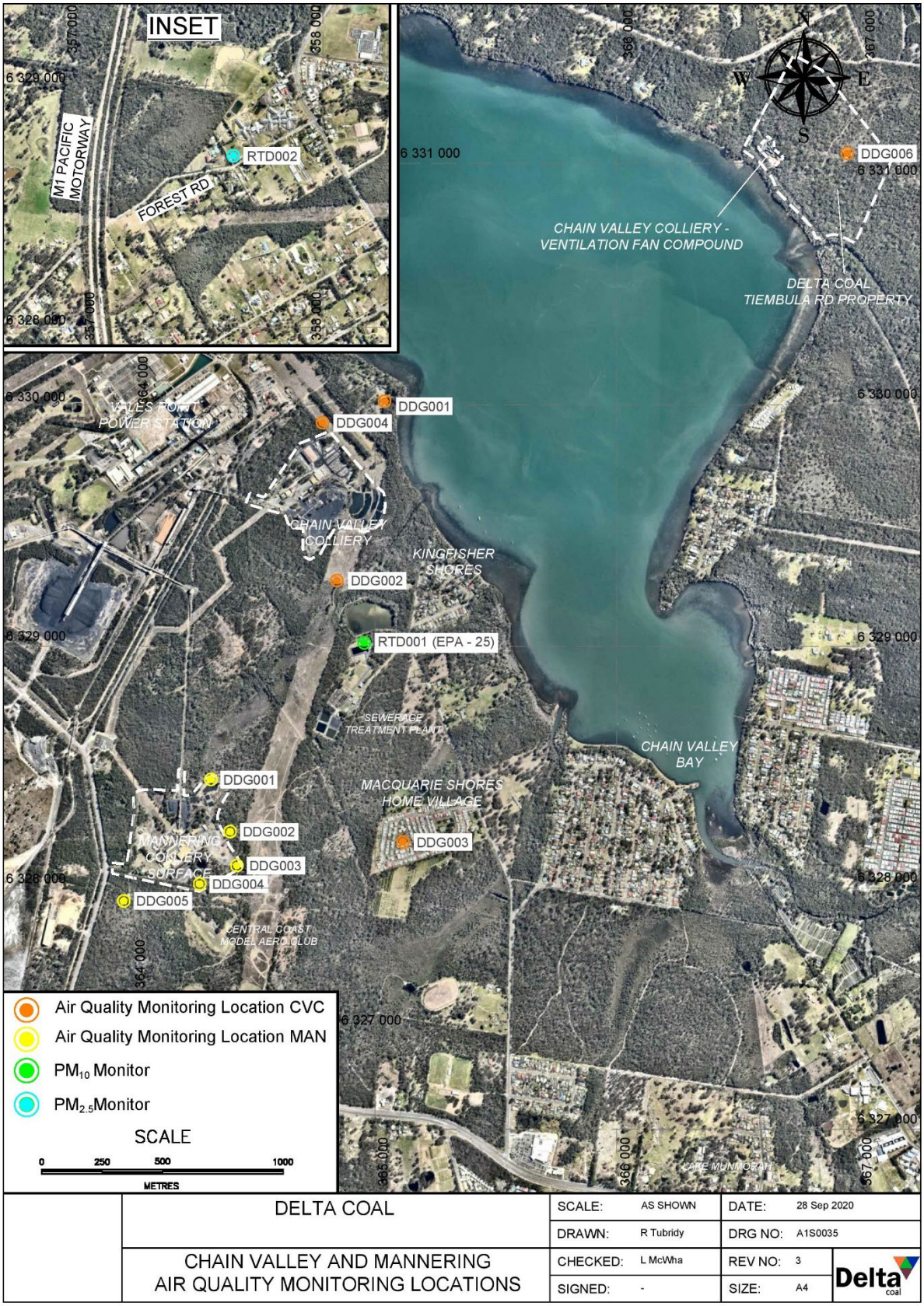


Figure 11 - CVC 2023 PM_{10} Particulate Monitoring

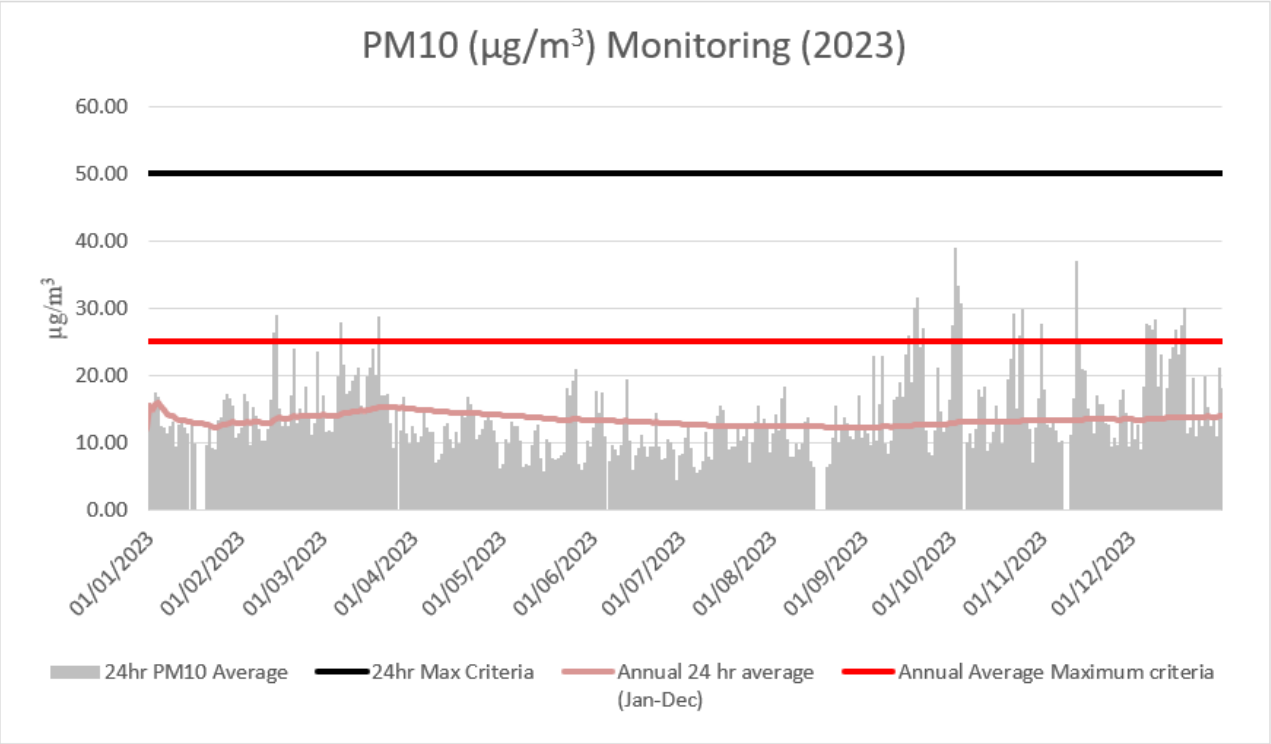
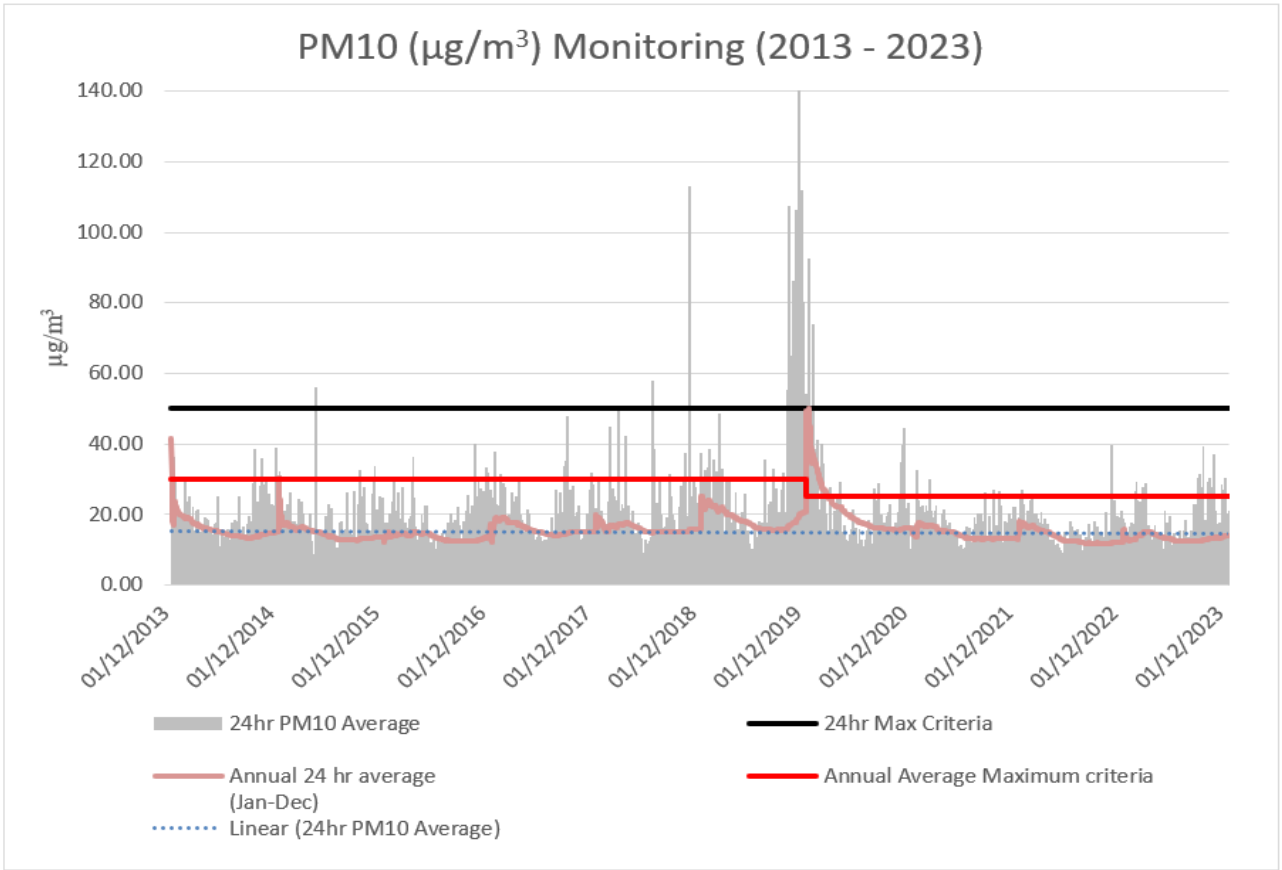


Figure 12 - Long term PM10 data compared against criteria and EIS predictions



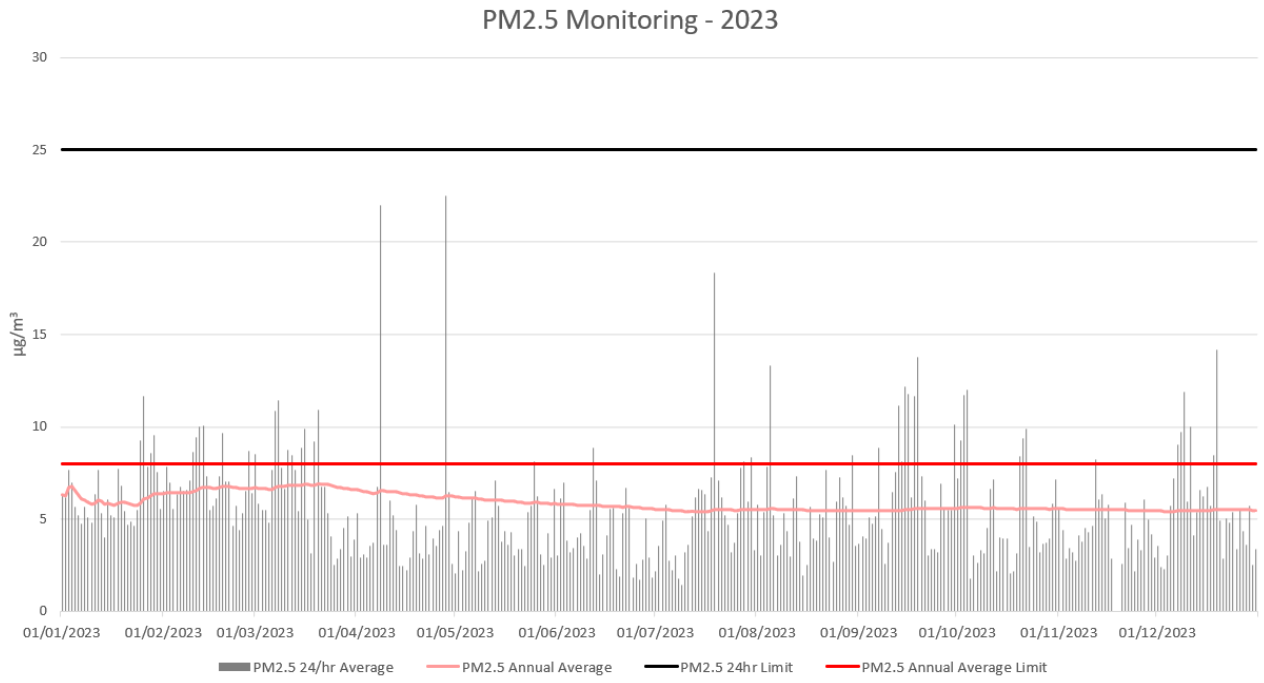
In relation to **Figure 12,** note that the apparent yearly spikes in the rolling annual averages are associated with the commencement of a new calendar year when the annual average "resets", and is not reflective of significant air quality changes. Additionally, seasonal variations in concentrations, particularly increases in PM_{10} load during summer, impacts the long-term data as evident in **Figure 12**. As noted in the linear trend line for the dataset there has been no observable increase or decrease in PM_{10} concentration trends since commencement of monitoring in December 2013.

The operation of a water cart continued throughout the current reporting period. The water cart operates around the unsealed surface areas, including hardstands, roads, coal stockpile and handling area. It is noted that in the reporting period, CVC completed sealing of the sites entrance driveway and access to the sites 'stores' with a bitumen seal. There were no complaints received during the reporting period relating to dust.

6.1.3 $PM_{2.5}$

In accordance with Table 3, Condition 11 of Schedule 3 SSD-5465 (as modified), Delta Coal commenced monitoring of $PM_{2.5}$ concentrations following the approval of Modification 3 to SSD-5465 in June 2020. $PM_{2.5}$ monitoring for the 2023 period utilised Delta Electricity's $PM_{2.5}$ TEOM unit at Tingley Road, Wyee as shown on the inset on **Figure 10**. Delta Coal's current arrangement to monitor $PM_{2.5}$ was approved within Delta Coal Air Quality and Greenhouse Gas Management Plan last approved on 21 March 2022. $PM_{2.5}$ concentrations for the 2022 reporting period have been displayed on **Figure 13**.

Figure 13 - CVC PM2.5 Monitoring 2023



No exceedances of $PM_{2.5}$ criteria were observed in the 2023 reporting period. The average $PM_{2.5}$ concentration for the period of 1 January 2023 to 31 December 2023 was 5.5 µg/m^3 with 24/hour averages between 1.45 and 22.5 µg/m^3.

The air quality monitoring program, including depositional dust, PM_{10} and $PM_{2.5}$ monitoring will continue into the 2023 reporting period.

6.2 Contaminated Land

There were no significant spills during the reporting period or reports of polluted land.

There is no known contaminated land at CVC, however it is expected that a detailed contamination study, such as an environmental site assessment would be completed at a time closer to mine closure as part of the operational rehabilitation requirements.

6.3 Threatened Flora

6.3.1 Aquatic Flora

Seagrass communities are a major feature of Lake Macquarie, which have the potential to be affected by subsidence as a result of mining activities under the Lake. To ensure protection of the seagrass communities from mining related impacts a Seagrass Protection Barrier was placed around the mapped seagrass communities, with the barrier extending out to the 26.5° angle of draw to the Colliery workings. Only first workings are permitted in the Seagrass Protection Barrier, which will result in negligible subsidence (<20 mm).

Seagrass monitoring occurred during the reporting period in accordance with the 2023 seagrass monitoring report reproduced in **Appendix 3**. Seagrass transect locations are shown in the report.

The discussion from the report (Laxton, June 2023) related to the results obtained during the reporting period highlighted the following:

- In June 2023 seagrass cover ranged from 50 to 100 percent. The seagrasses were in good condition, with most seagrasses not fouled or only lightly fouled with epiphytic algae. These results were consistent with the previous monitoring year.
- Since 2008 seagrass coverage has been increasing throughout the study area, and percentage cover has been consistent since 2012. This is reflected in the percentage of bare ground observed in the study transects, with bare ground decreasing from 38.13% in 2011 to 9.59% in 2023 in the Summerland Point, Frying Pan Bay and Sugar Bay region. In the Chain Valley Bay region bare ground has decreased from 13.32% in 2011 to 6.41% in 2023. In Crangan Bay, bare ground has decreased from 26.98% in 2011 to 5.36% in 2023;
- Seagrass cover was relatively consistent with 2022 monitoring, with minor natural variations as expected when monitoring an ecosystem; and
- The study concluded that the June 2023 seagrass monitoring programme shows compliance to the SSD-5465 (MOD 4) Schedule 4, Condition 2 being that seagrass display nil to minor environmental consequences due to underground mining.

Figures 9.1 to 9.6 in the June 2023 Seagrass Annual report (**Appendix 3**) details percentage changes in of seagrass coverage in the study area.

6.3.2 Terrestrial Flora

Potential impacts to threatened flora would arise from either impact or clearing of vegetation communities surrounding the pit top and ventilation shaft site which have been classified as the following communities:

Surrounding the pit top area:

- Coastal Open Woodland;
- Swamp Oak Forest; and
- Swamp Sclerophyll Forest.

Surrounding the ventilation shaft site:

- Coastal Open Woodland;
- Grassy Open Woodland and
- Swamp Sclerophyll forest.

Figure 14 and **Figure 15** identify the approximate boundaries of the communities surrounding the surface infrastructure.

A Biodiversity Management Plan was previously completed and approved in 2014. A review and update of management plans, including the CVC Biodiversity Management Plan, was completed in 2023. The latest approved version of this document is available from the Delta Coal website.

Annual biodiversity monitoring was undertaken by Atlantech Pty Ltd in accordance with the Biodiversity Management Plan was continued during the reporting period. Fieldwork was carried out on October 2023. The 2023 annual biodiversity monitoring report is provided as **Appendix 4**.

The annual biodiversity monitoring specifically monitors:

- the Swamp Oak Floodplain Forest condition below the sediment dams;
- Vegetation community condition at the ventilation shaft site;
- weeds (both at the pit top area and ventilation shaft site); and
- feral animal activity.

The monitoring results were assessed against the criteria and triggers within the Biodiversity Management Plan with no trigger levels being reached. Specifically, monitoring of the two established plots within the Swamp Oak Floodplain Forest, recorded a total weighted score of 77.8% in 2023, which is higher than the established trigger value of 60% as well as, the score in the 2022 annual monitoring of 67.8%. Refer to the Biodiversity Management Plan for details on site attributes and methodology for determining the weighted score.

In 2023 two feral animal species (european fox and dog) were recorded using the presence of scat indicators however these observed scats were limited in numbers, notably the CVC pit-top is located within a predominately residential setting. Feral animal control was not recommended to be undertaken given the limited number of scats and location. Weed monitoring and management is discussed in **Section 6.5**.

Figure 14 - Vegetation Communities around the CVC Pit Top Area

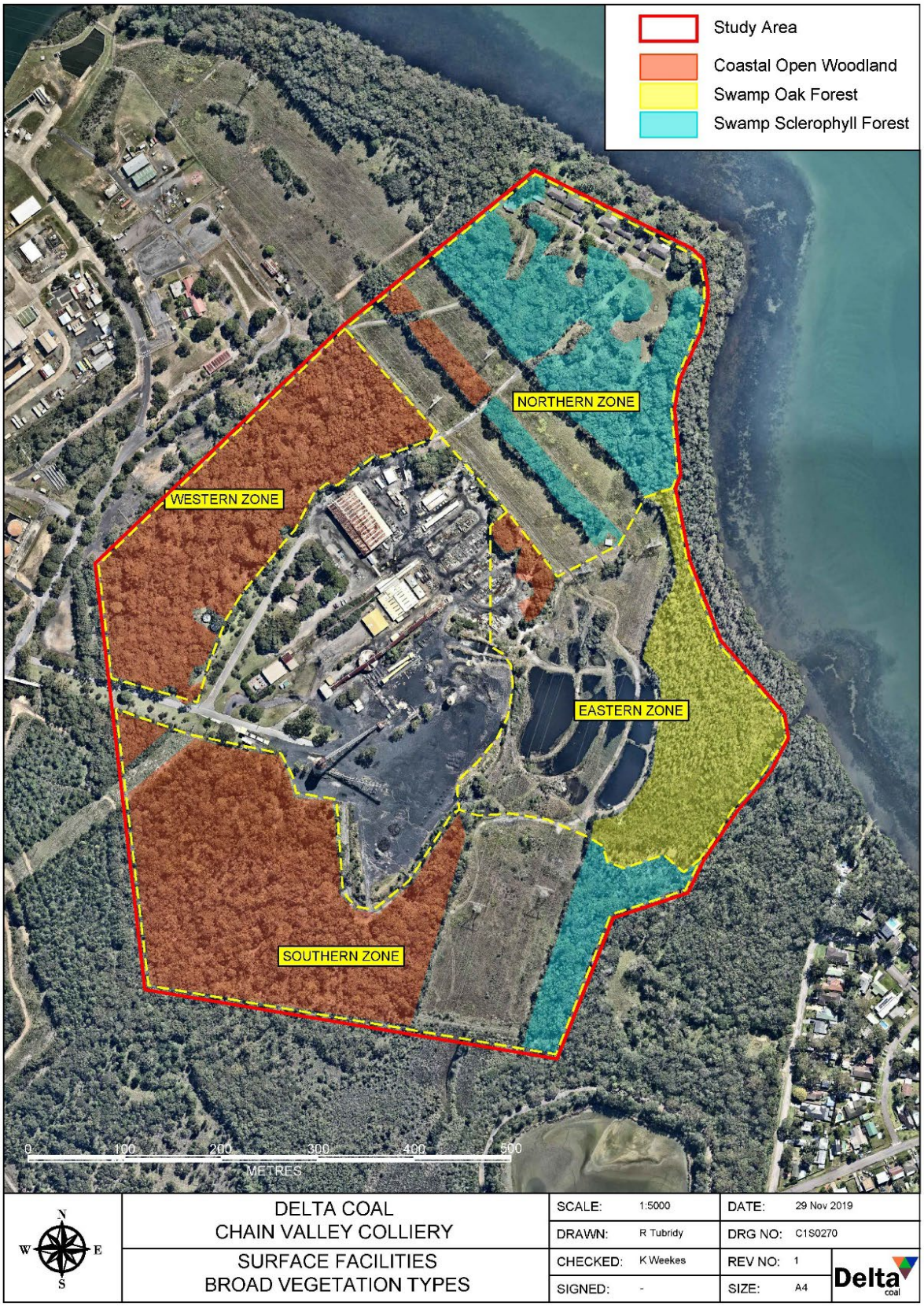
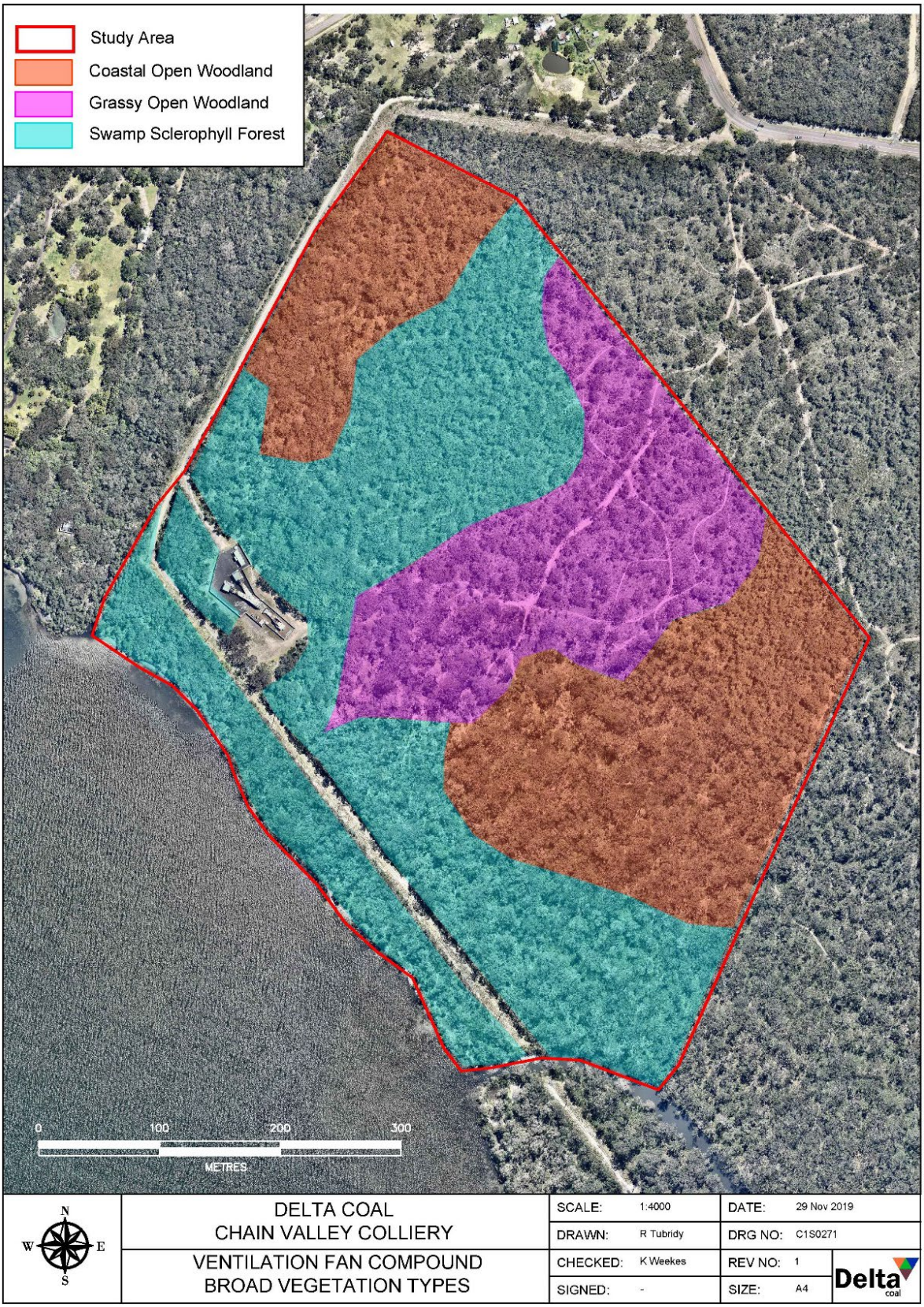


Figure 15 - Vegetation Communities around the Ventilation Shaft Site



6.4 Threatened Fauna

6.4.1 Terrestrial Fauna

No clearing works were undertaken during the reporting period and as a result potential to impact threatened fauna or other native fauna was minimised. The annual biodiversity report for the 2023 reporting period is provided as **Appendix 4**.

6.4.2 Aquatic Fauna

In 2023 Delta Coal undertook seasonal benthic communities monitoring within the sediment of Lake Macquarie, the survey were completed in March 2023 (autumn) in accordance with the approved Benthic Communities Management Plan. The monitoring undertaken in 2023 sampled 22 benthic stations, benthic sampling locations are shown on **Figure 16**. The March 2023 benthic communities monitoring report are provided in **Appendix 5**.

In 2023 Delta Coal undertook biennial statistical evaluation of benthic communities monitoring data. The benthic communities biennial statistical analysis has been provided as **Appendix 6.** The benthic statistical analysis reviewed monitoring data from 2012-2022 and observed the following:

- Statistical analysis of CVC's benthic monitoring data, primarily undertaken for the period September 2016 to September 2022, did not identify statistical differences between the benthic assemblages evident at sites designated as Impact, Reference and Control;
- From an ecological perspective, the benthic assemblages across the monitoring area fall into several groups (statistically) that do not appear to be a response to CVC operations but are most likely grouping because of environmental factors;
- Concluded that the results of statistical analysis of CVC's benthic monitoring data indicate that no exceedance of the Benthic Communities Management Plan subsidence impact performance measure of "minor environmental consequences, including minor changes to species composition and/or distribution" has occurred. Consequently, CVC is not required to implement any additional investigations of benthic communities within the project study area at this time and should continue the monitoring of benthic assemblages; and
- Given the absence of statistically relevant differences between benthic assemblages at CVC's impact monitoring sites when compared to the reference and control sites, it was recommended that the frequency of CVC's benthic monitoring could be reduced to once per year.

The Benthic Communities Management Plan was revised and approved in 2023, this management plan included the proposition to reduce the frequency of monitoring from twice annual to just once per year in-line with recommendations made in the 2020 and 2022 statistical analysis.

In monitoring undertaken between 2012 and 2023 the mud basins off Summerland Point, in Chain Valley Bay and Bardens Bay, were found to be inhabited by 26 different taxonomic groups. Polychaete worms and bivalve

molluscs were the most frequently encountered fauna. No new taxonomic groups were identified in 2023 monitoring.

Benthic Community monitoring undertaken in the 2023 reporting period identified the following:

- the same suite of organisms dominated each of the 22 sample stations as in previous years. These were polychaete worms and bivalves;
- In March 2023 a total of 1287 organisms greater than 1mm in size were found, comprising 13 species. This compares with the results from March 2017, March 2018, March 2019, March 2020 and March 2021, March 2022 where 1031, 1160, 832, 103, 797 and 1196 organisms respectively were recorded representing approximately 12 species;
- The bivalve *Soletellina alba* was the most commonly encountered organism. A total of 808 *Soletellina* were recorded during the survey, representing 63 percent of the organisms collected. The number of *S. alba* at each station ranged from 1 to 177. The bivalve was present at every station. Polychaete worms were also common in the benthos. A total of 284 were recorded, representing 22 percent of the organisms collected. Other species recorded, in small numbers only, included the bivalves *Paphia undulata*, *Corbula truncata* and *Dosinia sculpta*; the gastropod *Nassarius jonassii*; and juvenile crabs;
- water depth was not in any way important in determining the species composition at a station; and
- The results from the March 2023 benthic communities monitoring results show compliance to the Schedule 4 Environmental Conditions - underground mining of SSD5465 - Modification 4 in the Performance Measures table with respect to the Subsidence Impact Performance Measure for Benthic communities which display nil to minor environmental consequences due to underground mining.
- Physical variables such as salinity, conductivity and turbidity of the bottom water had little influence on the species composition of the benthos. Dissolved oxygen concentration, however, can have a major effect on abundance. Major extinction events have occurred in the mud basin of Lake Macquarie. The evidence for this lies in the presence of large numbers of intact but dead bivalve shells entombed in the mud. The cause of extinction events appears to be prolonged dissolved oxygen depletion of bottom water. Prolonged dissolved oxygen depletion of the bottom water was measured during the water quality study conducted by Laxton and Laxton (1983 to 1997) and low dissolved oxygen levels were measured during the March 2020 benthic survey. In March 2023, dissolved oxygen levels of Lake Macquarie ranged from 4.50 mg/L to 6.49 mg/L or 69.6% to 101.1% saturation. Surface waters generally had higher concentrations of dissolved oxygen than the bottom waters.

Figure 16 - Benthic Sampling Locations



6.5 Weed Management

Identification, treatment and ongoing monitoring are the key steps in managing weeds that surround the surface infrastructure areas (pit top area and ventilation shaft site).

During the reporting period Delta Coal engaged a land-care contractor to undertake a weed control campaign across its operational areas. The main weeds targeted included Lantana, Bitou Bush, Crofton Weed and Pampas Grass. See **Appendix 7** for the Weed Action Plan. Delta Coal will be continuing the weed control program in the 2024 reporting period. The 2023 annual biodiversity monitoring report made recommendations for weed control work locations in which will be targeted in the 2024 weed management works.

6.6 Blasting

No surface blasting activities were undertaken during the reporting period at CVC. From time to time, small amounts of explosives are used underground to remove geological intrusions into the coal seam to create overcasts or inter-seam shafts. This blasting is not relevant to environmental impact.

6.7 Operational Noise

Relevant noise criteria from SSD-5465 (Mod 4) and EPL 1770 are provided in **Table 10**. Attended noise monitoring locations are shown on **Figure 17**.

Table 10 - CVC Noise Criteria dB(A)

Location	NMP ID	Day	Evening	Night	
		$LA_{eq(15\ min)}$	$LA_{eq(15\ min)}$	$LA_{eq(15\ min)}$	$LA_{1(1\ min)}$
Location	**NMP ID**	**Day**	**Evening**	**Night**	**Location**
R11 (EPL Point 12)	ATN002	$LA_{eq(15\ min)}$	$LA_{eq(15\ min)}$	$LA_{eq(15\ min)}$	54
R8 (EPL Point 9)	ATN001	38	38	38	R8 (EPL Point 9)
R11 (EPL Point 12)	ATN002	49	49	49	R11 (EPL Point 12)
R12 (EPL Point 13)	R12	49	49	49	R12 (EPL Point 13)
R13 (EPL Point 14)	R13	43	43	43	R13 (EPL Point 14)
R15 (EPL Point 16)	ATN003	36	36	36	R15 (EPL Point 16)
R19 (EPL Point 20)	ATN006	37	37	37	R19 (EPL Point 20)

The long-term noise goals are reproduced in **Table 11**. Mechanisms that will be used to achieve these goals are detailed in Section 2.6 of the Delta Coal Noise Management Plan. It is noted that during the reporting period Delta Coal continued a Noise Mitigation Options Assessment for reasonably and feasibly achieving long-term noise goals. Long term noise goals are considered to have been satisfied at R11-13, with the Noise Mitigation Options Assessment focussing on Receiver 22 adjacent the CVC ventilation fan site. At the time of reporting the Noise Mitigation Options Assessment is ongoing and forecasted for completion in the 2024 reporting period.

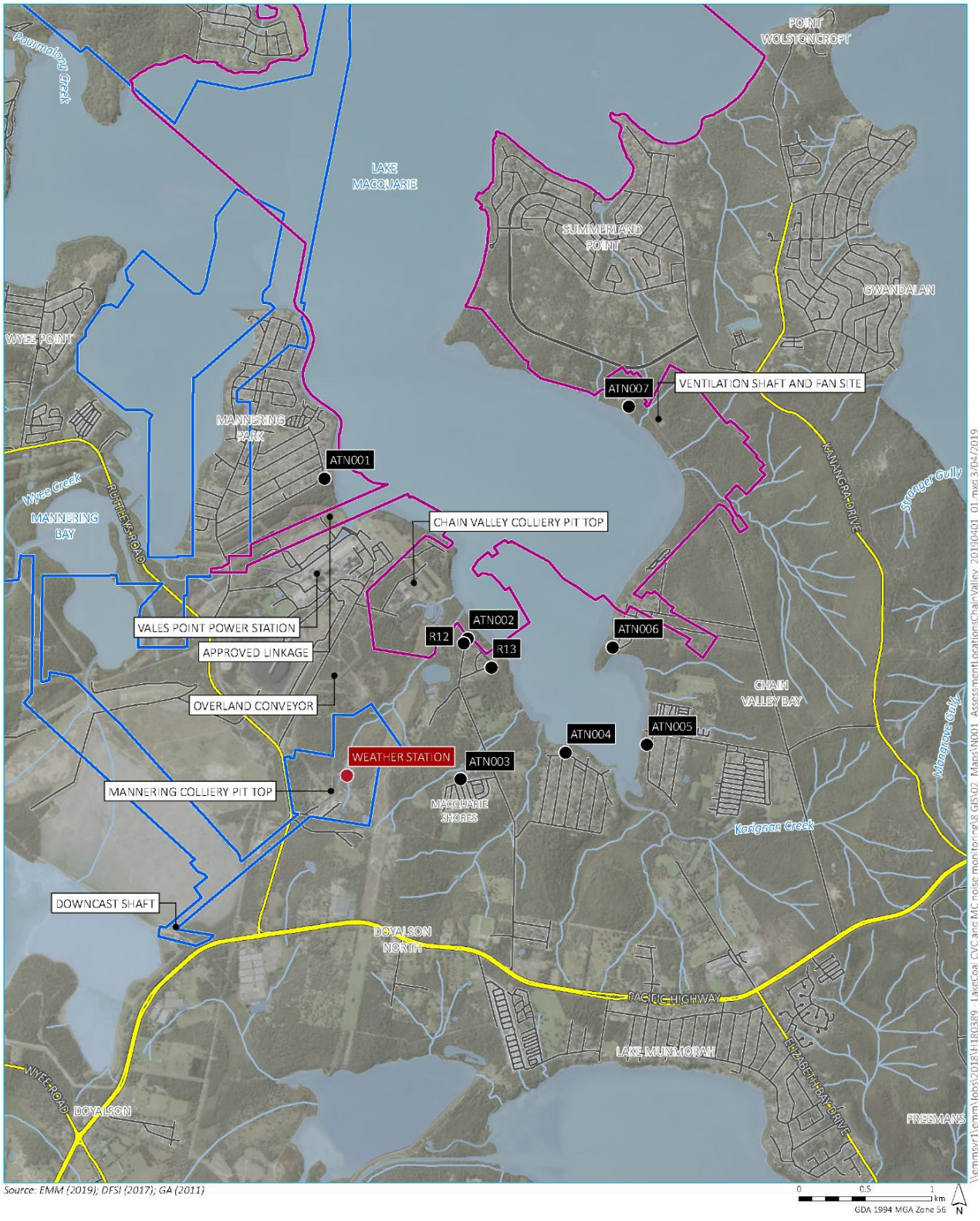
Table 11: CVC Long-term Noise Goals dB(A)

Location	Day	Evening	Night
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$
R11-13	41	41	41
R22	40	40	40

During the reporting period, quarterly environmental noise monitoring was undertaken on 21 and 22 March (Quarter 1), 15, 19 and 21 June (Quarter 2), 13, 14 and 15 September (Quarter 3) and 5, 6 and 7 December (Quarter 4) 2023.

Attended noise monitoring during the 2023 reporting period was undertaken in accordance with the methodologies described in the approved Delta Coal Noise Management Plan. Attended noise monitoring results for the reporting period are provided in **Appendix 8**. CVC was compliant with the relevant limits during 2023 noise monitoring.

Figure 17 - CVC Noise Monitoring Locations



6.8 Visual, Stray Light

The pit top area and ventilation shaft site are not dominant features of the landscape. The pit top area is somewhat overshadowed by the adjacent power station. The ventilation fans were also designed to maintain a relatively low profile, below the surrounding vegetation to ensure amenity and lighting impacts were minimised.

There have been no significant changes to surface lighting during the reporting period and no visual amenity or lighting complaints were received in 2023.

A lighting and visual review was completed in 2019 as per the project approval conditions. A letter was received from DPIE on 17th February 2020 noting that "no lighting complaints have been received by the site in 2018 or 2019. As such, future lighting survey reports are not considered necessary, unless otherwise directed by the Secretary".

In accordance with the relevant Australian standard, no lights are directed offsite or installed to shine above the horizontal. Additionally, the nearest residents to CVC sites are approximately 300 m away.

6.9 Aboriginal Heritage

Chain Valley Colliery has a total of 3 heritage sites registered with AHIMS within the surface footprint. Two midden sites were identified in 2020 during demolition of the former mine cottages, and a known flake site adjacent the CVC pollution control dams. During 2023 no aboriginal heritage sites were identified nor were known sites disturbed, all sites within the surface foot print are fenced off-with high visibility fencing to prevent access or accidental disturbance.

The Heritage Management Plan was updated and submitted to for consultation and approval during the 2022 reporting period following an Independent Environmental Audit in 2022. The revised Delta Coal Heritage Management Plan is was approved in 2023.

6.10 Natural Heritage

There are no sites or items of historic heritage within the pit top area and ventilation shaft site as determined by both the Environmental Assessment completed in 2011 and the Environmental Impact Statement that was prepared to support the Mining Extension 1 Project.

Accordingly, no ongoing monitoring or management actions were required and none have been undertaken within the reporting period.

6.11 Spontaneous Combustion

The R_{70} self-heating rate value recorded for a sample from the middle of the Fassifern Seam is 3.03 ^{o}C/h. This rates the coal as having medium intrinsic spontaneous combustion reactivity for New South Wales conditions.

This value is consistent with the rank and type of coal and agrees with previous test results obtained for the Fassifern Seam at CVC. The self-heating rates of the samples from the CVC are significantly lower than coals from the Hunter Valley, and are also lower than Spring Creek Mine in New Zealand and San Juan Mine in New Mexico.

Moist adiabatic benchmark tests of the samples from CVC indicate that self-heating is controlled by the moisture in the coal and the initial start temperature. Heating development to thermal runaway would take in the order of 48 to 72 days for the middle of the Fassifern Seam, but the top and bottom of the seam show self-heating over a protracted period, before any possible thermal runaway could take place. Similarly, the higher ash content Chain Valley Rider Seam also shows a protracted delay in self-heating due to its lower intrinsic reactivity.

While the laboratory R_{70} analysis of the Fassifern Seam coal at CVC indicates a medium propensity for spontaneous combustion, propensity to spontaneously combust is only one factor in a complex chain of conditions that can create spontaneous combustion in underground coalmines. There have been no known underground spontaneous combustion incidences in the Fassifern Seam at CVC. Accordingly, the risk of spontaneous combustion is considered to be low. Coal stockpiling is kept to a minimum and is managed in such a way as to limit risk of combustion.

Controls in place to mitigate the risk from spontaneous combustion include:

- sealing of extracted panels;
- consideration of spontaneous combustion issues within the mine design and utilisation of an Authority to Mine Permit;
- the development of Trigger Action Response Plans (TARP) for Spontaneous Combustion;
- segregation of extraction panels by an inter panel pillar; and
- monitoring of mine gases using a multipoint tube bundle gas analysis system and a real time gas monitoring system.

There were no incidents of spontaneous combustion at CVC during the reporting period.

6.12 Bushfire

The pit top area contains vegetation which is considered to be bushfire prone land (Category 1) as shown on **Figure 18**. The ventilation shaft area has also been identified as containing Category 1 vegetation as shown on **Figure 29**.

As the project site is not a residential development, there are no strict requirements for fire management, with the exception of preventing fires within the project area and their spread to surrounding land.

To manage bushfire risk Delta Coal have the following management measures in place:

- a high capability for firefighting purposes through the 100 mm diameter mine water reticulation line and the mine Emergency Management System;
- breaks and trails in the vicinity of the pit top area and ventilation shaft site;
- fire hydrants and depots placed in strategic positions around the pit top area; and
- regular training of mine firefighting crews and liaison with local rural firefighting brigades.

Figure 20 shows the approved Asset Protection Zone (APZ) area. The establishment of the APZ's was undertaken during the 2017 reporting period to improve its bushfire protection zones. As detailed in the Biodiversity Management Plan, fire trails and APZ areas are inspected annually prior to the start of the Bushfire Danger Period. This inspection is scheduled via the mines Work Order system.

Figure 18 - Bushfire Prone Land Map for CVC Pit Top Area (Source: Central Coast Council, 2022)



Figure 19 - Bushfire Prone Land Map for Ventilation Shaft Area (Source: Central Coast Council, 2022)

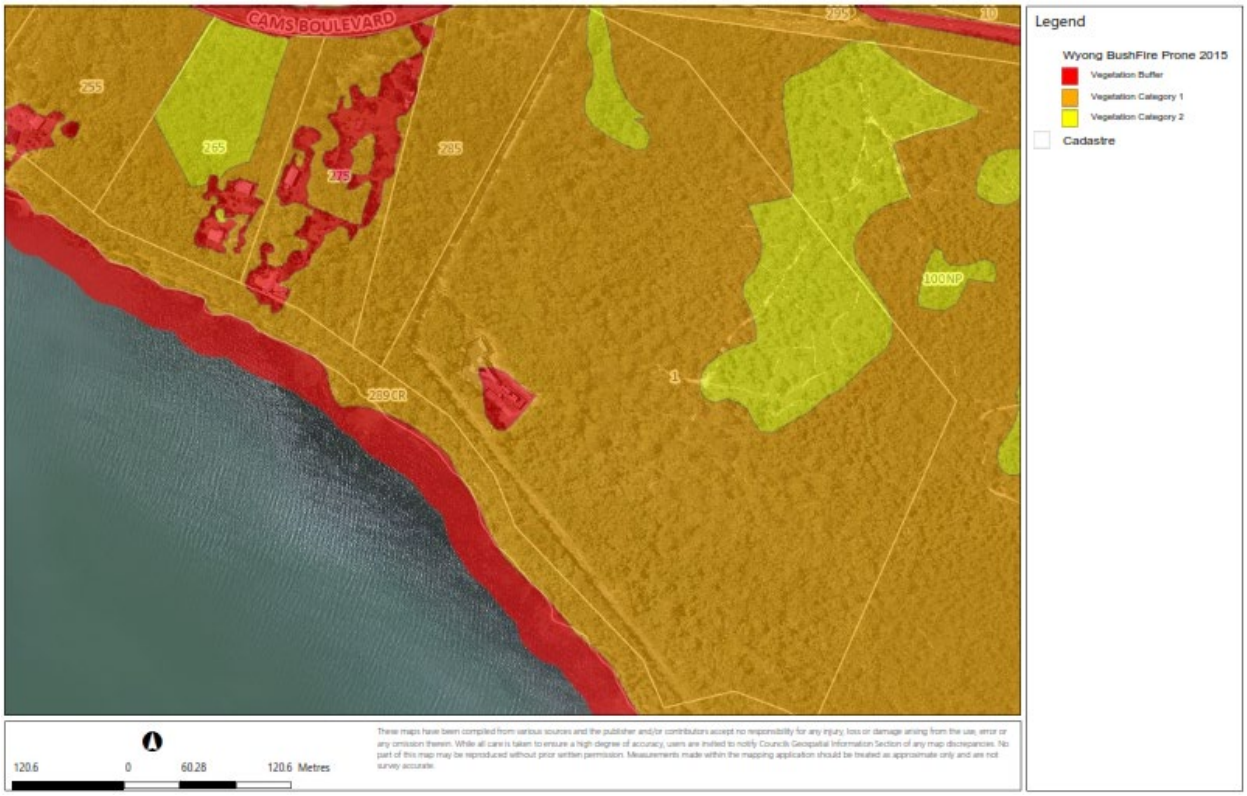


Figure 20 - Chain Valley Colliery Approved APZ's and Fire Trails



EMM
EMGA Mitchell McLennan

Land management zones
Chain Valley Colliery
Bushfire Management Plan

6.13 Mine Subsidence

The Annual Subsidence Report as required by SSD-5465 (Statement of Commitments) is provided in **Appendix 9** of this report, this section provides a summary of subsidence monitoring at Chain Valley Colliery.

6.13.1 Overview of Mining Progress

Please refer to **Section 4.4** for details of the mining activities undertaken during the 2023 reporting period.

6.13.2 Approvals

During the reporting period Delta Coal undertook its mining activities in accordance with its extraction plan approvals for Miniwall S5 and Northern Mining Area.

6.13.3 Subsidence Surveys

Subsidence surveys are required to be undertaken annually as a minimum, with reference monitoring points located on shorelines nearby any mining activities. Shoreline surveys are also undertaken at intervals corresponding with key Miniwall retreat milestones.

Bathymetric surveys were also undertaken 6-monthly to gauge subsidence levels over the area of secondary extraction undertaken beneath Lake Macquarie and where land-based surveys are not possible.

Delta Coals subsidence monitoring commitments are presented in **Table 12**.

Table 12 - Delta Coal Subsidence Monitoring Commitments

Type of monitoring	Pre-extraction requirements	During extraction requirements	Post extraction requirements
Secondary Extraction			
Bathymetric surveys	Single baseline survey prior to extraction	End of panel (of relevance to S2, S3, S4 and S5) Annual surveys over areas of pillar extraction (not commenced)	Annual for three years unless TARP triggered (as committed in Subsidence Monitoring Program) Six monthly bathymetric scans committed in SSD-5465 Statement of Commitments
Foreshore monitoring	Baseline survey prior to commencement of extraction	Monthly intervals	Annual for three years unless TARP triggered
Pelican Rock Navigation Marker	Baseline RL and tilt measurements	End of panel (of relevance to S2 and S3)	Visual inspection and confirmation from RMS of nil impacts
First Workings			
Terrestrial based subsidence monitoring (foreshore)	Baseline prior to extraction	Annual surveys during extraction unless TARP triggered	Annual surveys ongoing unless TARP triggered

Type of monitoring	Pre-extraction requirements	During extraction requirements	Post extraction requirements
Terrestrial based subsidence monitoring (along main roads in suburbs of Brightwaters, Mirrabooka and Sunshine)	Baseline prior to extraction	Annual surveys during extraction unless TARP triggered	Annual surveys ongoing unless TARP triggered

6.13.4 Performance Measures

Performance measures summarised from SSD-5465 are detailed in **Table 13**.

Table 13 - SSD-5465 Summary of Subsidence Performance Measures

Condition No.	Condition
Schedule 4, Condition 1	The Applicant must ensure that vertical subsidence within the High Water Mark Subsidence Barrier and within seagrass beds is limited to a maximum of 20 millimetres (mm). If at any stage predicted subsidence levels are exceeded within these areas, an ecological monitoring program shall be initiated to assess the impacts to ecological communities and threatened species and if appropriate, offsets are to be provided for any impacts detected.
Schedule 4, Condition 2	The Applicant must ensure that the development does not cause any exceedance of the performance measures in Table 6 to the satisfaction of the Planning Secretary.
Schedule 4, Table 6: Subsidence Impact Performance Measures - Natural and Heritage Features	First Workings under an approved Extraction Plan beneath any feature where performance measures in this table require negligible environmental consequences. They are to remain long term stable and non-subsiding
Schedule 4, Condition 4	The Applicant must ensure that the development does not cause any exceedances of the performance measures in Table 7, to the satisfaction of the Planning Secretary.
Table 7, Schedule 4: Subsidence Impact Performance Measures - Built Features	Trinity Point Marina Development and other built features. They are to remain: • Always safe; • Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated; • Damage must be fully compensated.

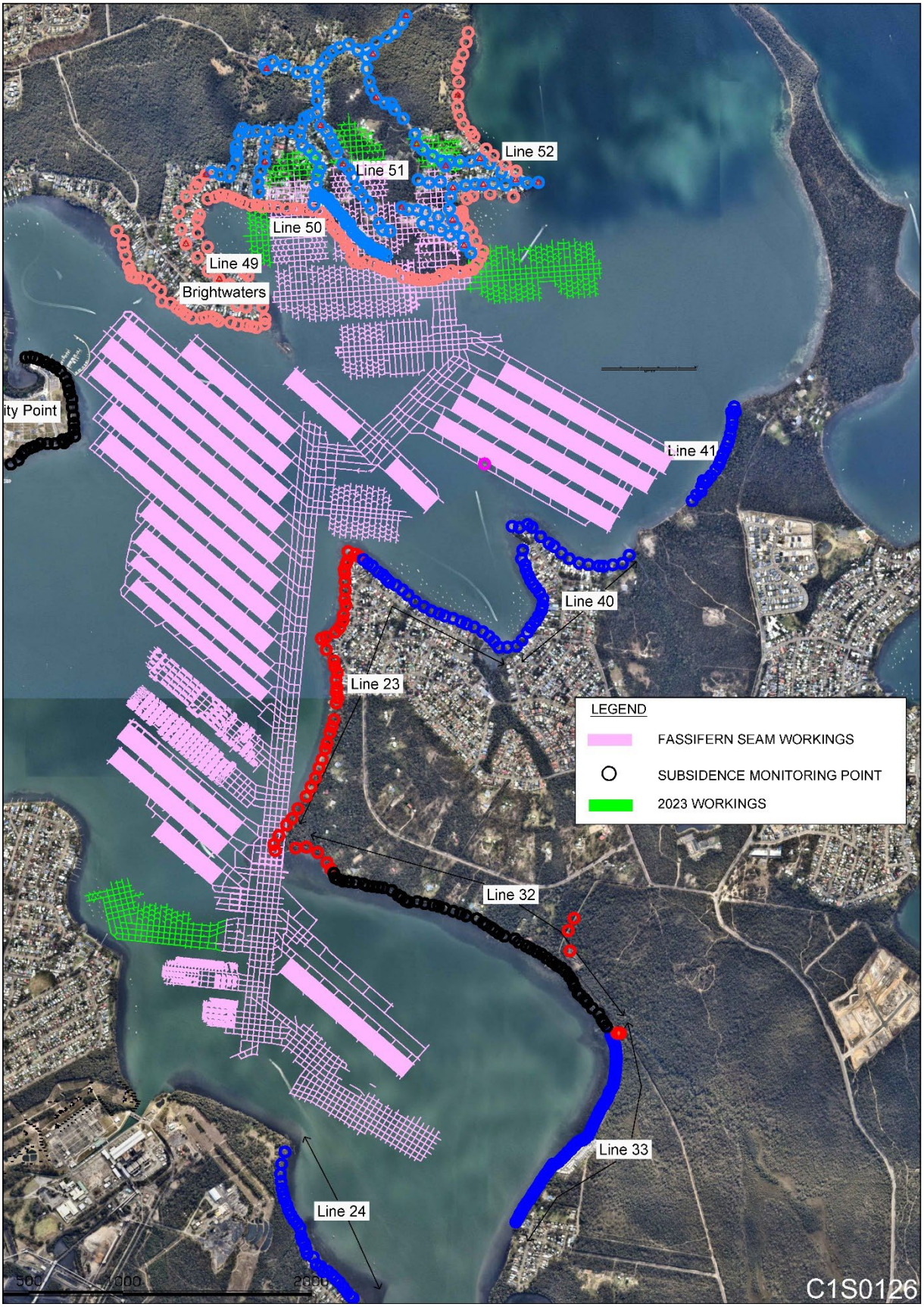
6.13.5 Foreshore Monitoring

Delta Coal completes subsidence monitoring around Trinity Point, Brightwaters, Mirrabooka, Sunshine Frying Pan Bay, Summerland Point, Chain Valley Bay (**Figure 21**). Monitoring points occur along the foreshore at approximately 20 m – 30 m intervals where practicable / achievable with a slightly wider distribution of monitoring points in the Northern Mining Area (50 – 80 m in some areas). The results are issued to the Resources Regulator within 10 days of survey. In addition, observations are made where required to report on visual impacts or changes to public safety risk. A Subsidence Inspection Proforma is completed with each survey. The proforma includes visual inspection of steep slopes, boulder or tree instability, ponding and other potential effects of mine subsidence.

No subsidence attributable to mining operations undertaken in the 2023 reporting period were detected.

subsidence monitoring results are graphically presented in the 2023 Annual Subsidence Report (**Appendix 9**).

Figure 21 - Foreshore Subsidence Monitoring Points



Line 49, 50, 51 and 52

Foreshore monitoring lines 49, 50 and 51 were installed in 2021, for the purpose of monitoring potential subsidence associated with future northern mining area workings. Line 52 was installed in 2022 to cover the foreshore as mining extends to the north. Surveys are carried out over the current mining areas quarterly, with annual surveys over the full grid. Survey results show less than 20mm movement attributable to mining induced subsidence.

Brightwaters Monitoring Line

Monitoring points were installed along the Brightwaters peninsula in June 2016 to monitor the effects of Miniwall 11 and 12 extraction. Survey results show less than 20mm movement attributable to mining induced subsidence. Surveys are carried out over the Brightwaters foreshore annually.

Trinity Point

Monitoring points were installed in the Trinity Point area in 2014 for shoreline monitoring during extraction of Miniwalls 7-12 panels. A number of marks have been disturbed or destroyed due to development along the foreshore in the area, this was particularly obvious in the February 2022 survey where only 3 marks where able to be identified, 6 marks were identified in the October 2023 survey. No movement attributable to subsidence has been detected. This monitoring line is surveyed annually.

Summerland Point, Lines 23, 32, 40 and 41

The foreshore along Summerland Point has been monitored since 1994, after secondary extraction was undertaken in the Wallarah seam beneath the south-western point (corresponding to mark S63 – 74). Approximately 130-150mm of subsidence was measured (Point S71 – Line 23) since 1994.

Monitoring points along Line 40 were established in 2018 to monitor the shoreline adjacent to Miniwall S1. This line was extended in 2019 as part of the subsidence monitoring program for Miniwall S2 and S3. Minor ground movement along the line is limited to ±5mm and appears seasonal, subsidence appears to be limited to negligible subsidence (<20mm). Monitoring of Line 40 was undertaken monthly during MWS2 – MWS4 extraction.

Line 41 was established in July 2020 to monitor the shoreline adjacent Miniwall S4. Monitoring was undertaken monthly during extraction and as part of annual monitoring, surveying has indicated to date nil to negligible subsidence (<20mm).

Chain Valley Bay, Lines 24 and 33A

Surveys of the existing monitoring points along the foreshore of Chain Valley Bay (many of which had experienced 40-60mm of subsidence) were ongoing during the reporting period, and where required additional monitoring locations were installed. Similarly to the Summerland Point monitoring, many of the historically monitored subsidence marks have experienced greater than negligible subsidence (20mm), however no additional subsidence movement was detected during the miniwall extraction in CVB.

Monitoring results for Line 24 shows potential minor changes in level in the reporting period from points L24A-03 to L24A-17, however any identified vertical movement was negligible (< 20mm). No additional subsidence was observed at Line 33A within the reporting period.

As the area where Line 33A monitoring marks are located is along a public reserve where regular slashing / brush-cutting activities are carried out, a number of monitoring points have been disturbed / moved over time. Where this type of movement occurs, the new RL point is adopted and monitoring continues (i.e. Point 62A).

Pelican Rock Navigational Marker

As described in CVC's Subsidence Monitoring Program, the Pelican Rock Navigation Marker is expected to be impacted by approximately 90 mm of subsidence from mining within Miniwall panels S2 and S3.

NSW Roads and Maritime Services (RMS) has indicated a functional impact on the marker is likely to occur at 500 mm of subsidence and 5° or 87 mm/m of tilt.

A survey for RL and tilt was conducted on 10 July 2019 by Daly Smith Surveyors prior to mining and measured Pelican Rock Navigation Marker was 1.14 mm Australian Height Datum (AHD) and the navigational pole was vertical.

A final survey was undertaken on 16 June 2023, recording the level at 1.09 mAHD, indicating an impact of 50 mm. Miniwall mining methods were ceased at Chain Valley Colliery in August 2021, with MWS3 completed in July 2020.

Following completion of the June 2023 survey of Pelican Rock navigational marker, Delta Coal contacted Transport for NSW (formerly RMS) in August 2023, seeking confirmation that the navigational marker was deemed still suitable for operation and to confirm monitoring of the marker could cease, provided no further subsidence impacts where anticipated. No response has been received from Transport for NSW.

6.13.6 Lake Floor Bathymetric Survey / Scanning

Chain Valley Colliery's Secondary Extraction subsidence monitoring requirements are presented in **Table 14**. It is noted that subsidence predictions were not updated for subsequent extraction approved and proposed after initial subsidence predictions, hence there have been exceedances of subsidence predications triggering geotechnical review, however all subsidence recorded has remained within the site's subsidence limit.

A software error was identified in the hydrographic survey results in the 2023 reporting period, and altered the survey height results by approximately -0.15m. This was a developer error for that particular version (2012) of the software and was corrected by a hotfix sent to all users sometime after. upon discovering this error, Astute surveying upgraded their other projects to correct this error. The surveyor decided to continue using the original project to keep consistency between surveys. Equipment for monitoring was later replaced which adopted the corrected version an ultimately, survey results were 0.15m deeper than actually recorded,

impacting subsidence results received by 150mm. This was corrected for in the 2023 bathymetric data, but was present in previous surveys (excluding the baseline survey).

Table 14 - Chain Valley Colliery Secondary Extraction Subsidence Monitoring Commitments

Secondary Extraction Panel	Approved S_{max}(mm)	Predicted S_{max} (mm)	Measured S_{max} (mm)	Extraction Completion date	Post Extraction Monitoring Commitment
Miniwall S1	780	420	<200	September 2018	Annual for 3 years unless TARP triggered
Miniwall S2	780	300	200-250	March 2020	Annual for 3 years unless TARP triggered
Miniwall S3	780	300	350-400	July 2020	Annual for 3 years unless TARP triggered
Miniwall S4	780	300	500-550	February 2021	Annual for 3 years unless TARP triggered
Miniwall S5	780	500	350-400	August 2021	Annual for 3 years unless TARP triggered
NMA Pillar Extraction	780	500	n/a	Not commenced in 2023.	Annual for 3 years unless TARP triggered

Bathymetric scans undertaken in the 2023 reporting period have been provided in the 2023 Annual Subsidence Monitoring Report (**Appendix 9**):

- MWS1, MWS2, MWS3, MWS4, MWS5 bathymetric scanning was undertaken in March and September 2023.
- Subsidence remained below the 0.78m limit imposed in Development Consent SSD-5465, with a maximum subsidence of 500-550mm observed over Miniwall S4.
- The maximum subsidence of Miniwall S4 triggered level 1 of the Chain Valley Colliery subsidence TARP in 2022, and as such prompted a geotechnical review of the results and underlying workings to ensure on-going stability and compliance to the 0.78m subsidence limit.
- Independent geotechnical review of Miniwall S2-S5 subsidence did not predict a potential exceedance of the 0.78m subsidence limit.

6.14 Hydrocarbon Contamination

Hydrocarbons are managed in accordance with the site Storage of Fuel and Chemical Standard.

Suitable bunding has been installed around all liquid storage areas with an oil separator installed on the wash down sump which treats water prior to transfer of the treated water to the site sediment dams. Spill kits are also located at hydrocarbon storage areas. All waste oil is taken off site by an external licensed waste collection company. A weekly inspection regime is in place to check waste oil levels and arrange disposal on an as required basis.

During the reporting period any contaminated material encountered on site was disposed of at a licensed waste facility by the site's approved waste management contractor.

6.15 Methane Drainage and Greenhouse Gases

Methane levels in the Fassifern seam of approximately 2 – 5 m^3/t is considered a low level for pre or post gas drainage, and as such all methane from the mining operations are ventilated from the via the main fans at Summerland Point.

The methane levels in the return are low enough to ensure operations are not adversely affected by the gas levels.

Methane levels are manageable with the existing ventilation system there are no plans to install pre or post gas drainage infrastructure at this time.

Methane emissions from CVC are reported annually to the Clean Energy Regulator in accordance with the *National Greenhouse and Energy Reporting Act 2007* (NGER Act).

For the Financial Year 2022-2023 period (NGER reporting period) CVC emitted approximately 597,385 tonnes of CO_2-e as Scope 1 emissions.

6.16 Public Safety

Public safety is primarily a concern around the surface facilities at CVC being both the pit top area and the ventilation shaft site.

The public safety around the ventilation shaft site is afforded by:

- restricting access to the site by utilising a locked access gate across the access road;
- provision of a security fence around the entire perimeter of the compound, with locked access gates; and
- security monitoring.

In relation to the pit top area, there is one sealed access road into the site which has a set of lockable gates present, which can be closed should the need arise to stop access to the site. These gates may be closed and locked at times of no expected traffic, such as during the night time period but would otherwise remain open for deliveries, employee and authorised visitor access. A security firm is also engaged to undertake scheduled site security checks and remote alarm monitoring and reporting. The security checks are random, but typically undertaken at times of higher unauthorised access risk such as nights, public holidays and weekends.

Public access is monitored and managed during operation of the mine through the standard incident reporting process which includes reporting of unauthorised access.

A visitor login system onsite ensures that authorised visiting members of the public are assigned a site contact and that upon login the site contact is notified immediately by email of the visitors' presence onsite.

A Built Features Management Plan was developed for the Extraction Plan associated with Miniwall S4 as well as the Extraction Plan for Miniwall S5 and Northern Pillar Extraction. This included subsidence monitoring for foreshore infrastructure.

Public safety is also a consideration in the road coal haulage operations; this is discussed in **Section 6.17**.

During the reporting period there were no incidents of injury to the public as a result of Delta Coal's operations.

6.17 Other Issues and Risks

During the reporting period CVC did not undertake any coal haulage and as such was not required to undertake an independent traffic audit as completed in previous years.

Delta Coal was not required to complete an independent traffic audit for the 2023 period as no coal haulage was undertaken during the reporting period, Delta Coal submitted a notification to the NSW DPE regarding this and received acknowledgement from the NSW DPE with no comment (23 January 2023).

6.18 Summary of Environmental Performance

In summary, environmental performance during the reporting period for CVC is detailed in **Table 15**.

Table 15 - Environmental Performance

Aspect	Approved criteria/ EIS prediction	Performance during the reporting period	Trend/ key management implications	Implemented/ proposed management actions
Noise	Chapter 9 Noise *(EIS, EMGA Mitchell McLennan 2013)*	Generally in accordance with approved criteria.	Main trend (attended noise monitoring during 2023): Quarterly noise monitoring results from the AR reporting period indicate that CVC is operating within relevant limits and is not the dominant source of environmental noise within the vicinity. VPPS is audible to receivers to the north and the Pacific Highway is also audible from the south. The CVC ventilation fan site is an exception to the above were it is typically audible at ATN007 monitoring location. The EIS predicted that that CVC will operate within acceptable noise limits.	There were no exceedances during 2023 quarterly attended noise monitoring (see **Appendix 8** for results). Mitigation actions of cleaning the ventilation fan silencers was undertaken in the reporting period. Noise management will continue to be monitored in an effective manner.
Blasting	n/a	n/a	n/a	n/a

Aspect	Approved criteria/ EIS prediction	Performance during the reporting period	Trend/ key management implications	Implemented/ proposed management actions
Air Quality	Chapter 10 Quality and Greenhouse Gases *(EIS, EMGA Mitchell McLennan 2013)*	In accordance with approved criteria and EIS predictions	Main trend (depositional dust results 2023): Based on modelling in the EIS, total dust emissions from CVC are expected to be minor, at less than 2 grams/m^2/month. No exceedances of depositional dust limits were attributed to mining operations during the reporting period. The PM10 and PM2.5 results for 2023 reflect CVC's compliance to air quality criteria, remaining minor at most locations for the reporting period.	The air quality monitoring program, in accordance with the approved management plan, was ongoing at the end of the reporting period. Results are detailed in **Section 6.1**. Management of air quality will continue to be monitored in an effective manner.
Biodiversity	Chapter 14 Terrestrial Ecology *(EIS, EMGA Mitchell McLennan 2013)*	In accordance with approved criteria and EIS predictions/surveys.	Main trend: Vegetation and habitat values broadly similar to previous years.	The biodiversity monitoring program, in accordance with the approved management plan, was ongoing at the end of the reporting period. See **Appendix 4** for results. Biodiversity will continue to be monitored, with noxious weed control to be continued on-site.
Heritage	Chapter 15 Heritage *(EIS, EMGA Mitchell McLennan 2013)*	No predicted impact on aboriginal or non-aboriginal heritage items was identified in the EIS.	Main Trend: No aboriginal heritage incidents within the reporting period, with 3 identified Aboriginal Heritage sites within CVC pit-top boundaries. All locations are fenced off with restricted public access to prevent disturbance.	Ongoing diligence and monitoring of ground disturbance activities. Heritage Management Plan revised and approved in the reporting period. Ongoing consultation with RAPs, as required.

7 Water Management

7.1 Water Management

7.1.1 Licenced Mine Dewatering

Delta Coal holds a groundwater bore license WAL41508 under the *Water Act, 1912*, which permits the industrial dewatering of groundwater up to volume of 4443 megalitres (ML) per year. The following details groundwater extraction volumes during the reporting period.

During the 2023 reporting period, an average of 6,703.4 kL of mine water was extracted per day from within the mine workings, before being pumped to the CVC surface facilities, where it is discharged into sediment dams, prior to being discharged into Lake Macquarie under NSW Environment Protection Authority (EPA) EPL No.1770 granted under the POEO Act 1997. The daily average has slightly increased since the previous reporting period when compared with the 2022 daily average of 6,429 kL (refer to **Section 7.1.4** Water Balance for long term water data).

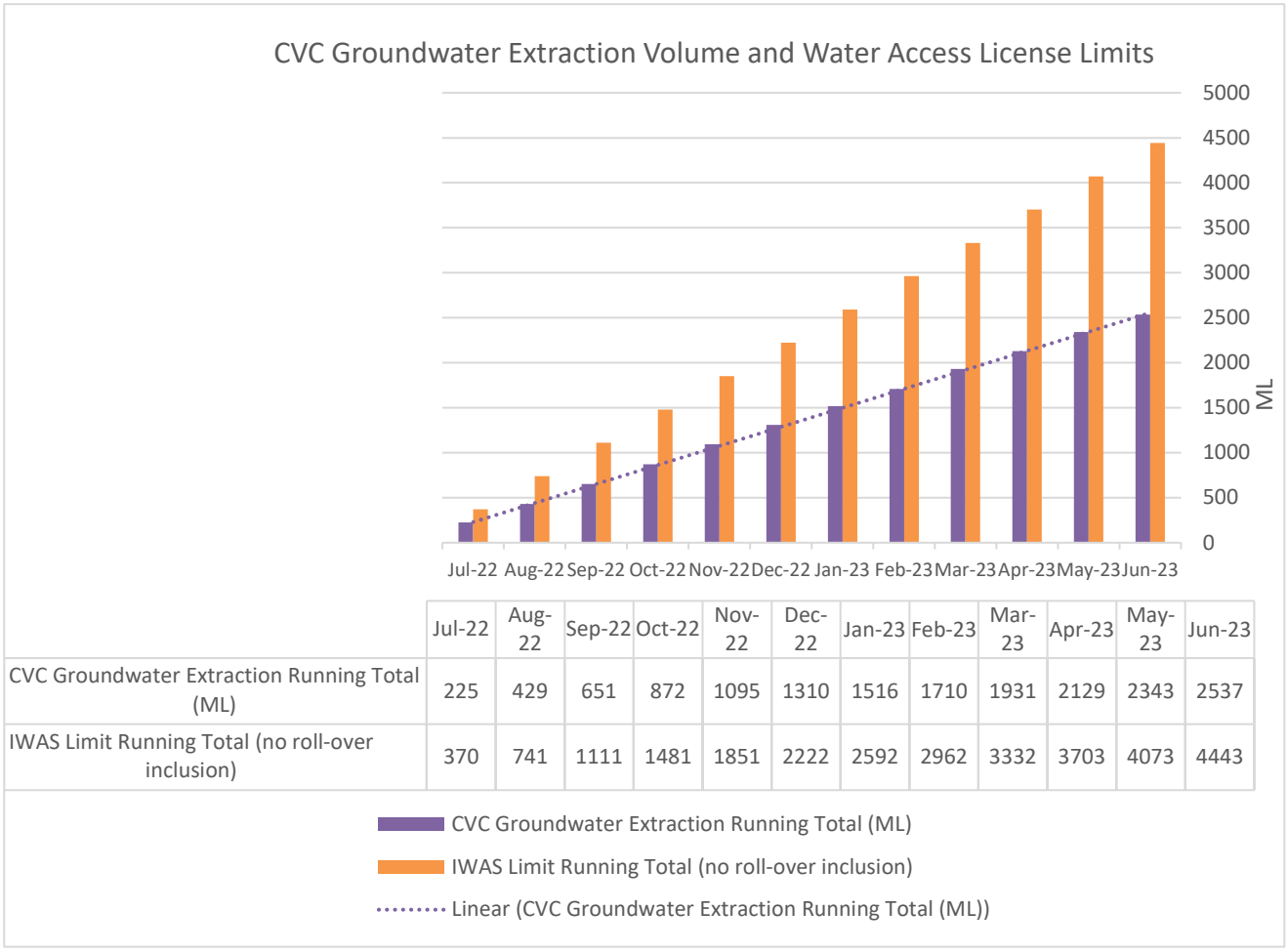
The maximum groundwater extraction on any day during 2023 peaked at 10,500 kL, which reflects the automated control of pumping limits (10.5 ML) implemented on site as committed to by Delta Coal within the Environmental Impact Statement (EIS) for the current mining operations.

Delta Coal operated well within the groundwater extraction limits prescribed by license WAL41508 as shown in **Figure 22**. Groundwater extraction data is summarised in **Table 16**.

Table 16 - CVC Groundwater Extraction, 2023

Water Access Licence	Water sharing plan, source and management zone (as applicable)	Entitlement	Passive Take / inflows	Active pumping	TOTAL
WAL41508	Sydney Basin North Coast Groundwater Source	4443 ML	N/A	2447 ML	2447 ML

Figure 22 – CVC Groundwater Extraction Volume and Water Access License Limits (WAL reporting period FY22-23)



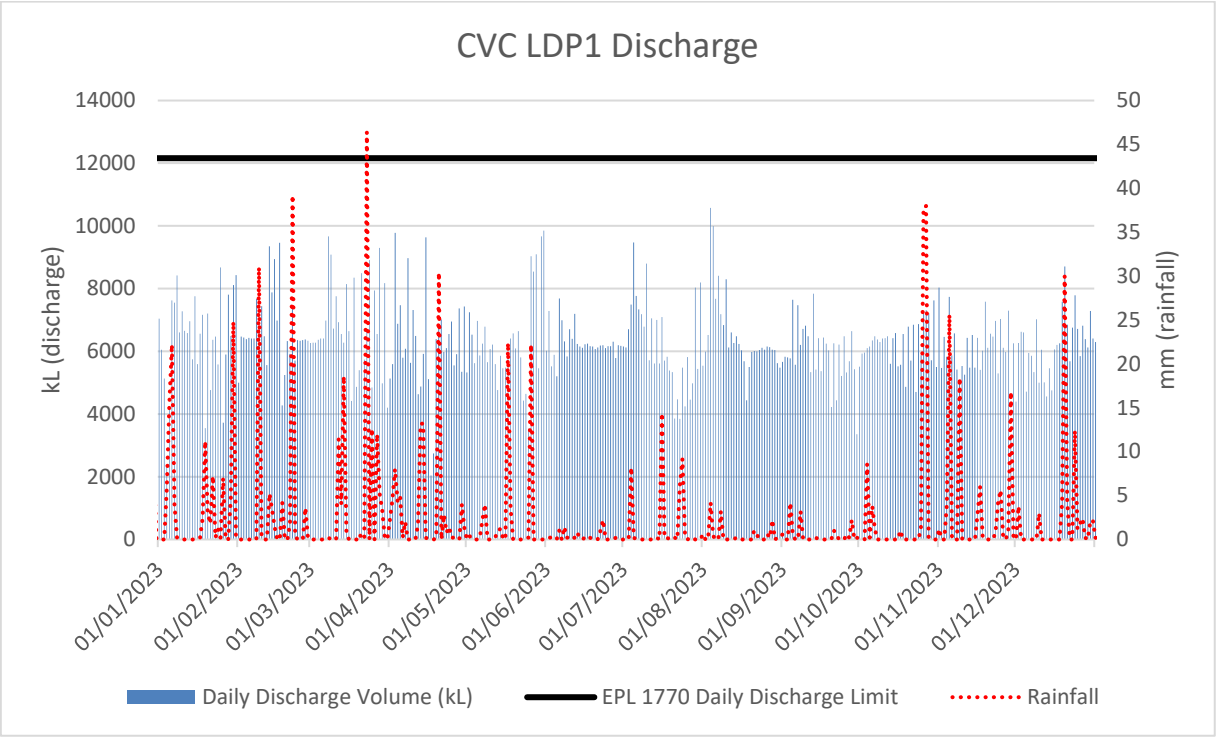
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
CVC Groundwater Extraction Running Total (ML)	225	429	651	872	1095	1310	1516	1710	1931	2129	2343	2537
IWAS Limit Running Total (no roll-over inclusion)	370	741	1111	1481	1851	2222	2592	2962	3332	3703	4073	4443

7.1.2 Licenced Discharge under EPL 1770

Delta Coal holds EPL 1770, which licences the discharge of up to 12,161 kL per day from the site. During the 2023 reporting period the daily average discharges were 6,331.8 kL with a maximum of 10579.2 kL and a minimum of 2036 kL.

Figure 23 shows the daily discharge volumes over the reporting period. Note that discharge limits applied under EPL 1770 relate to both licenced discharge points 1 and 27 which reflect the low and high (emergency) flow discharge points at the final sediment dam. As shown in **Figure 23**, there were no exceedances of the daily volumetric limit (12,161 kL) during the reporting period and there were no discharges via Point 27 (CVC High Flow Spillway) in the reporting period.

Figure 23 - Chain Valley Colliery, EPA Point 1 Discharge Volume (2022 Period)



Water quality monitoring is required, and undertaken, at the licensed discharge point (EPA Point 1) with sampling undertaken on a monthly basis, Delta Coal also collects water quality samples from additional locations to obtain data from receiving environments, water quality monitoring locations are detailed in **Figure 24**. Results for pH, EC, TSS and faecal coliforms are compared against the compliance limits specified in EPL 1770 are presented in **Figure 25**, **Figure 26**, **Figure 27** and **Figure 28**, respectively.

Figure 24 - Chain Valley Colliery Water Management Structures

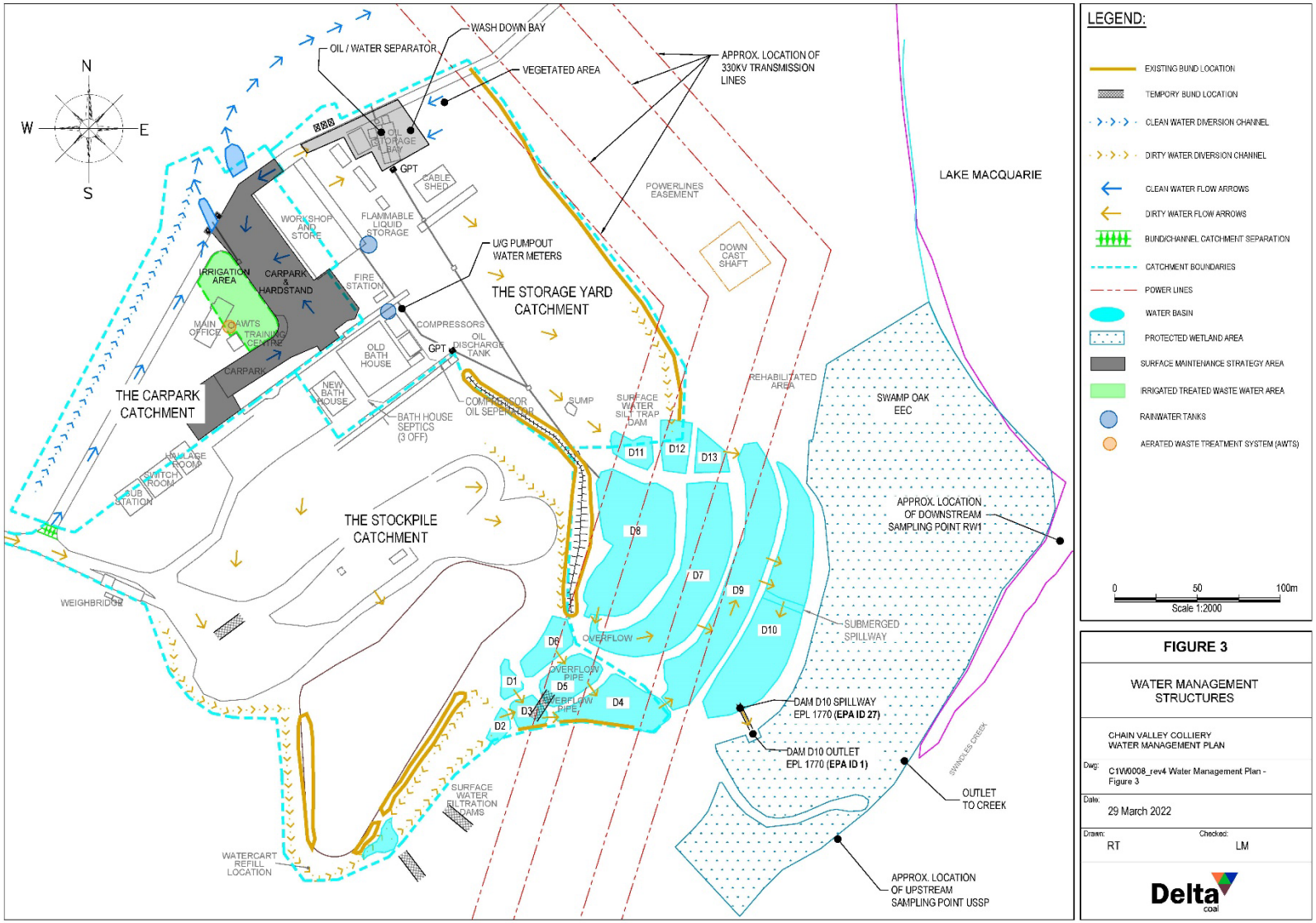


Figure 25 - pH Monitoring Results at EPA Point 1

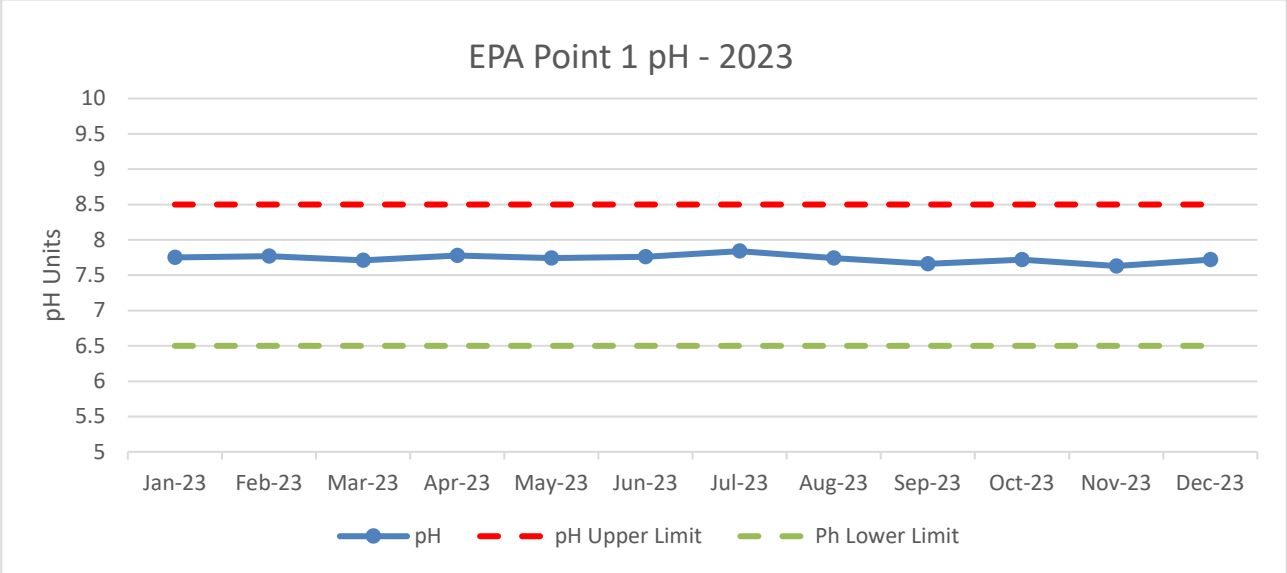


Figure 26 - Electrical Conductivity Monitoring Results at EPA Point 1

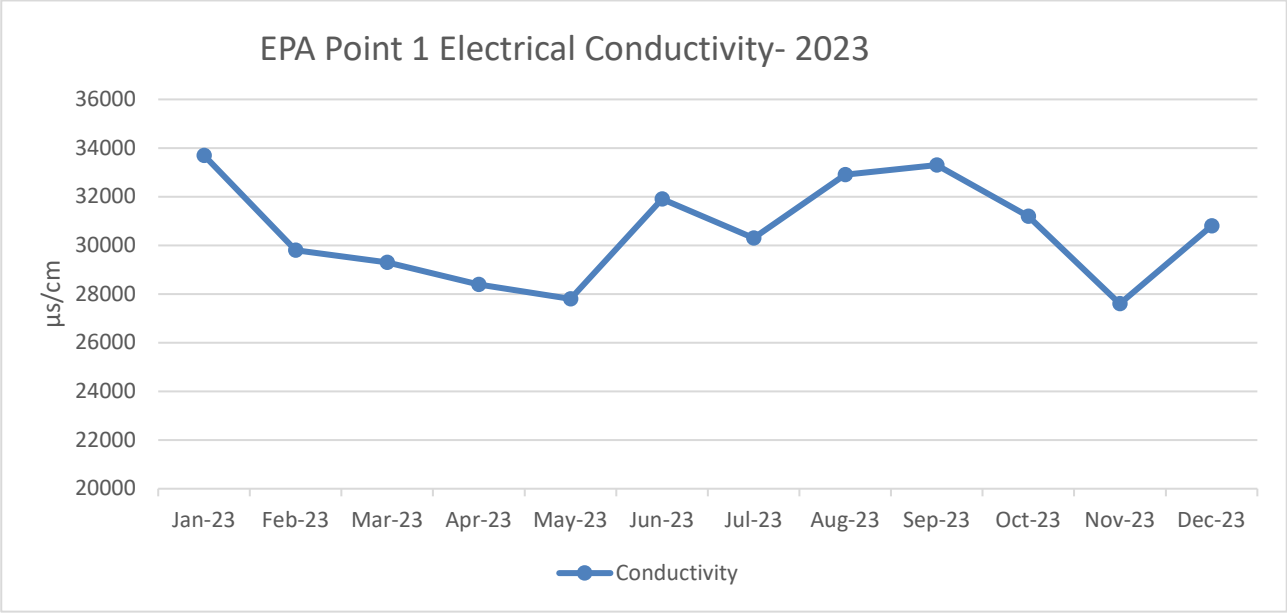
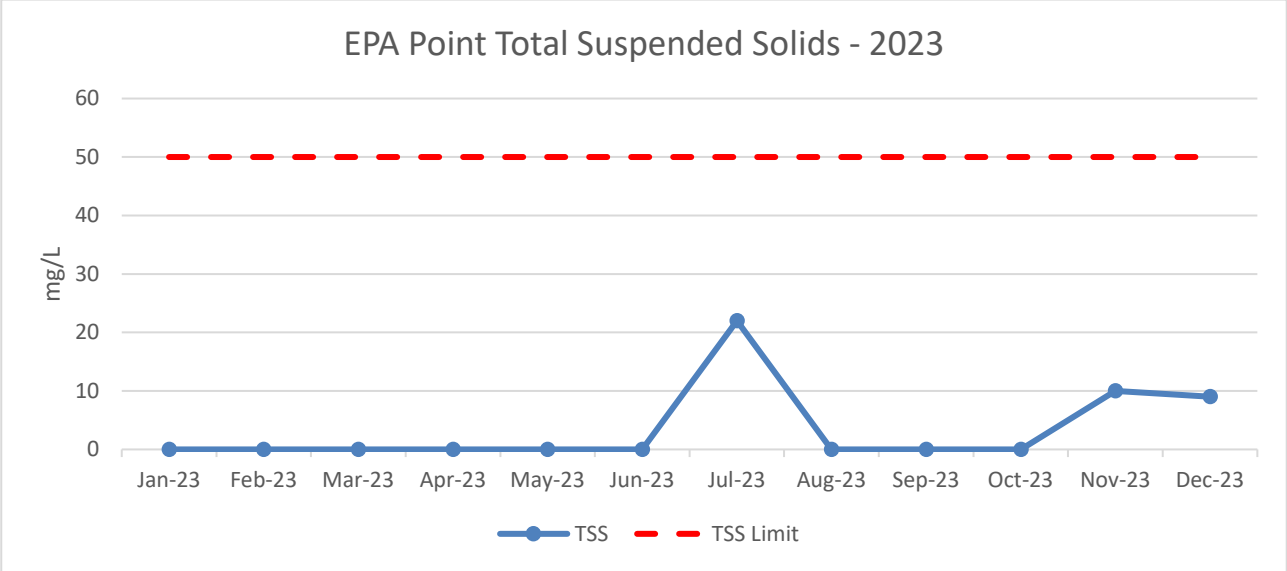
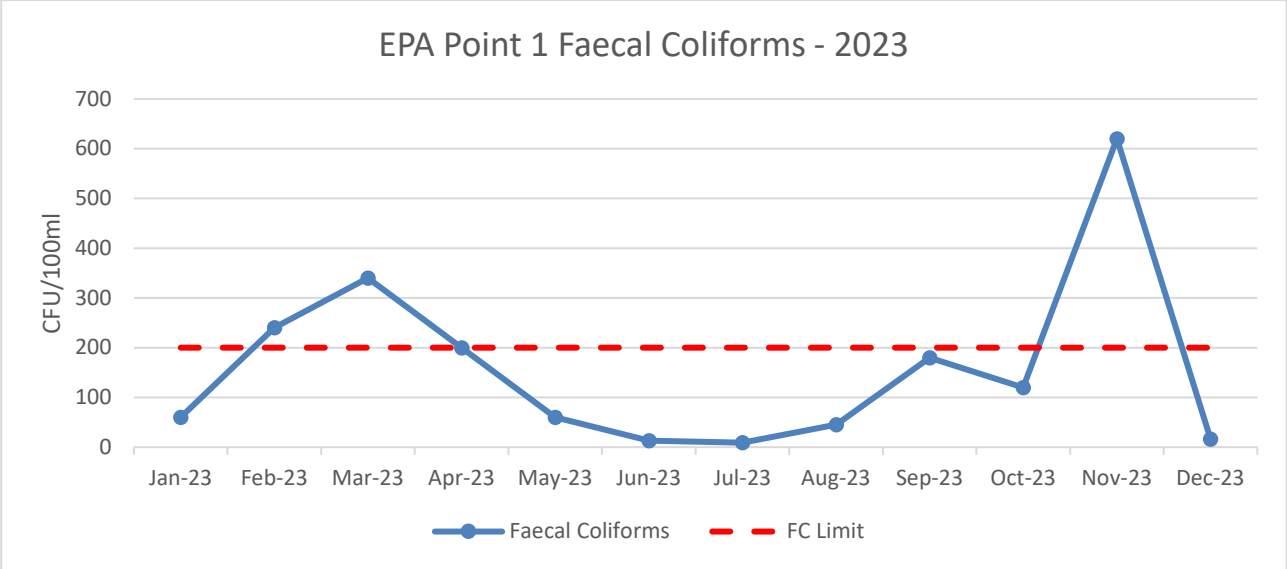


Figure 27 - Total Suspended Solids Monitoring Results at EPA Point 1



Notes: ***1. TSS results that were below the limit of reporting (<5 mg/L) have been reported as 0 mg/L.***

Figure 28 - Faecal Coliform Monitoring Results at EPA Point 1



7.1.3 Long Term Water Management

To assess any long-term trends in both water quality and quantity, ten years of monthly sampling data (2012 to 2023 inclusive) is presented for pH (**Figure 29**), electrical conductivity (**Figure 30**), total suspended solids (**Figure 31**) and faecal coliforms from EPA Point 11 (**Figure 32**).

The annual average of mine dewatering volumes from 2009 to 2023 is also presented in **Figure 33**. Note that prior to 2013, average mine dewatering volumes were calculated using the EPL 1770 reporting period (April – March), but since this time have reflected the calendar year period consistent with Annual Review requirements.

From the below figures, there are no significant trends in the water quality parameters, with infrequent spikes in faecal coliforms and total suspended solids concentrations and dips in electrical conductivity. Minor trends observed are a reduction in faecal coliform concentrations, pH, electrical conductivity over the period of 2012-2023.

There is no obvious increase in mine dewatering volumes over the last six or seven years, however, it is expected that this will occur over time consistent with the groundwater modelling within the Chain Valley Colliery EIS that predicts an increase in groundwater make will occur to an annual average of 10.5 ML/day (at the end of mine life). The current mine dewatering levels (approximately 6.7 ML/day during 2023) are still significantly below this level.

Figure 29 - Long term pH monitoring results at EPA Point 1

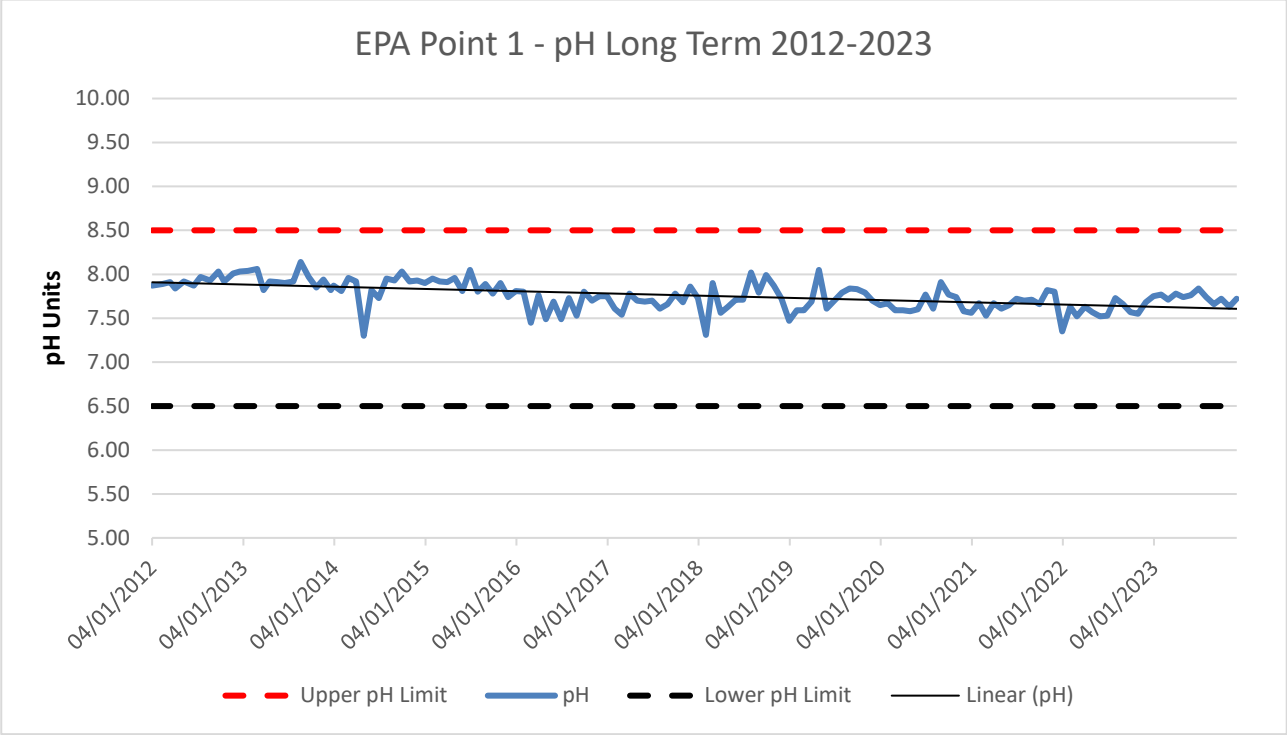


Figure 30 - Long term electrical conductivity monitoring results at EPA Point 1

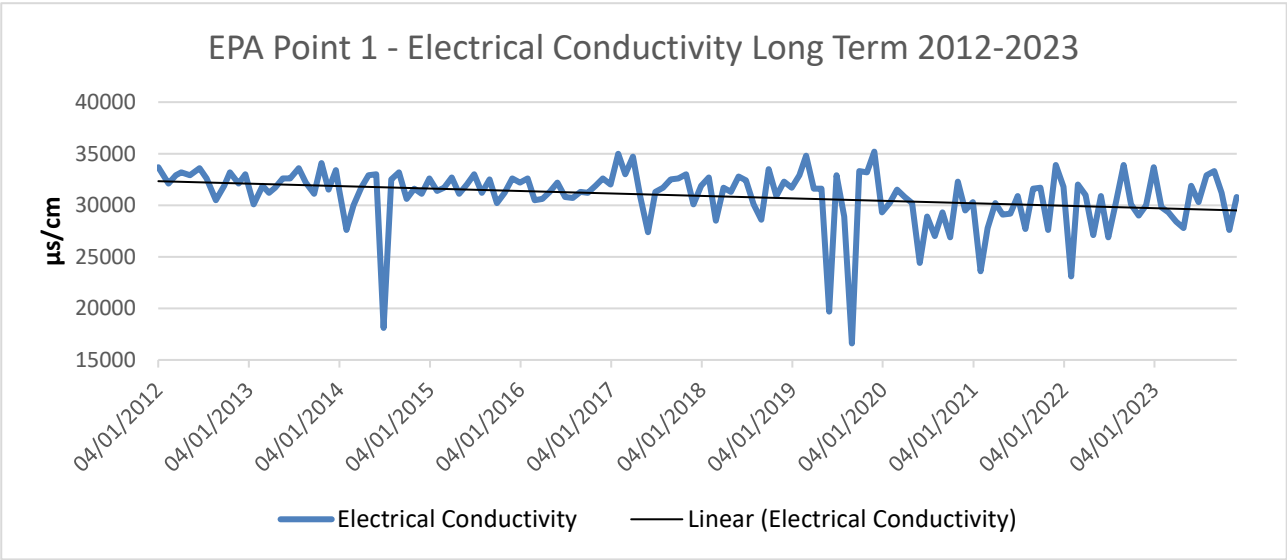


Figure 31 - Long term total suspended solids monitoring results at EPA Point 1

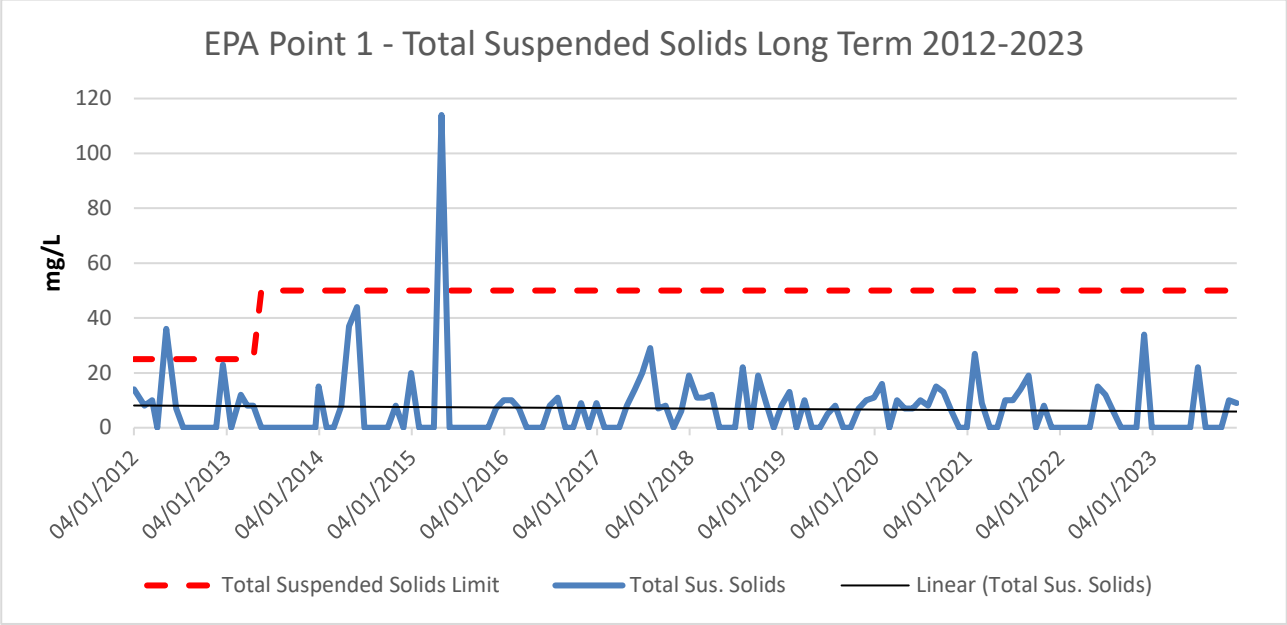


Figure 32 - Long term faecal coliform monitoring results EPA Point 1

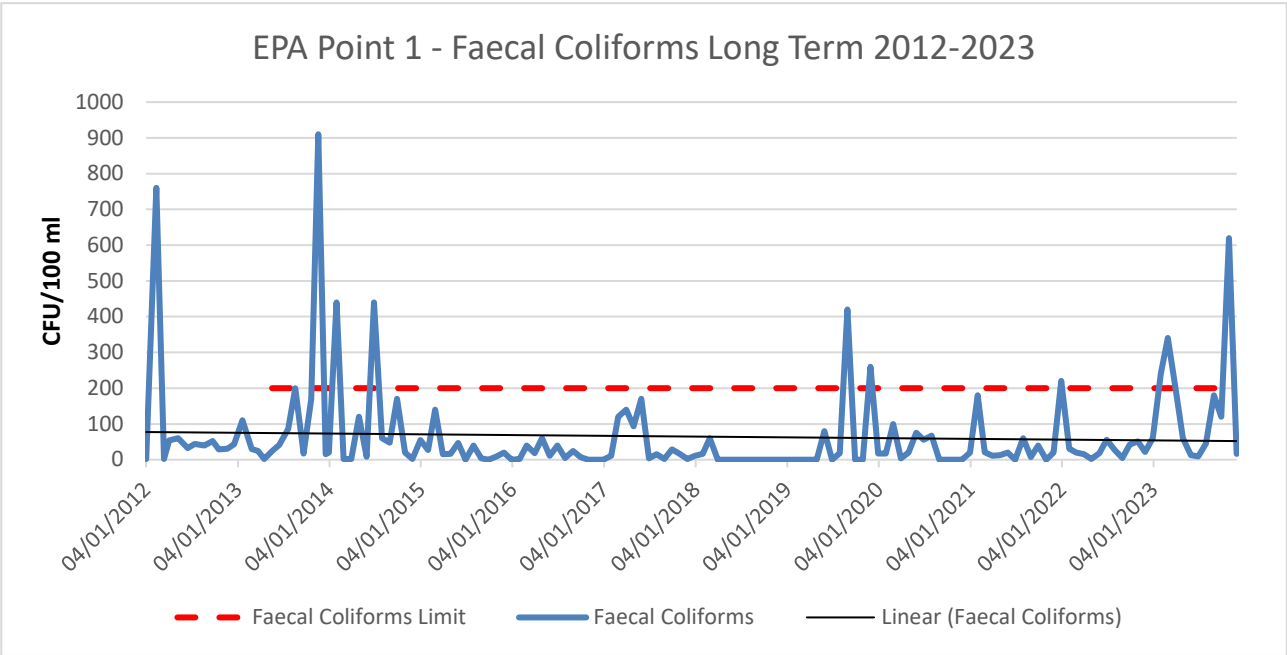
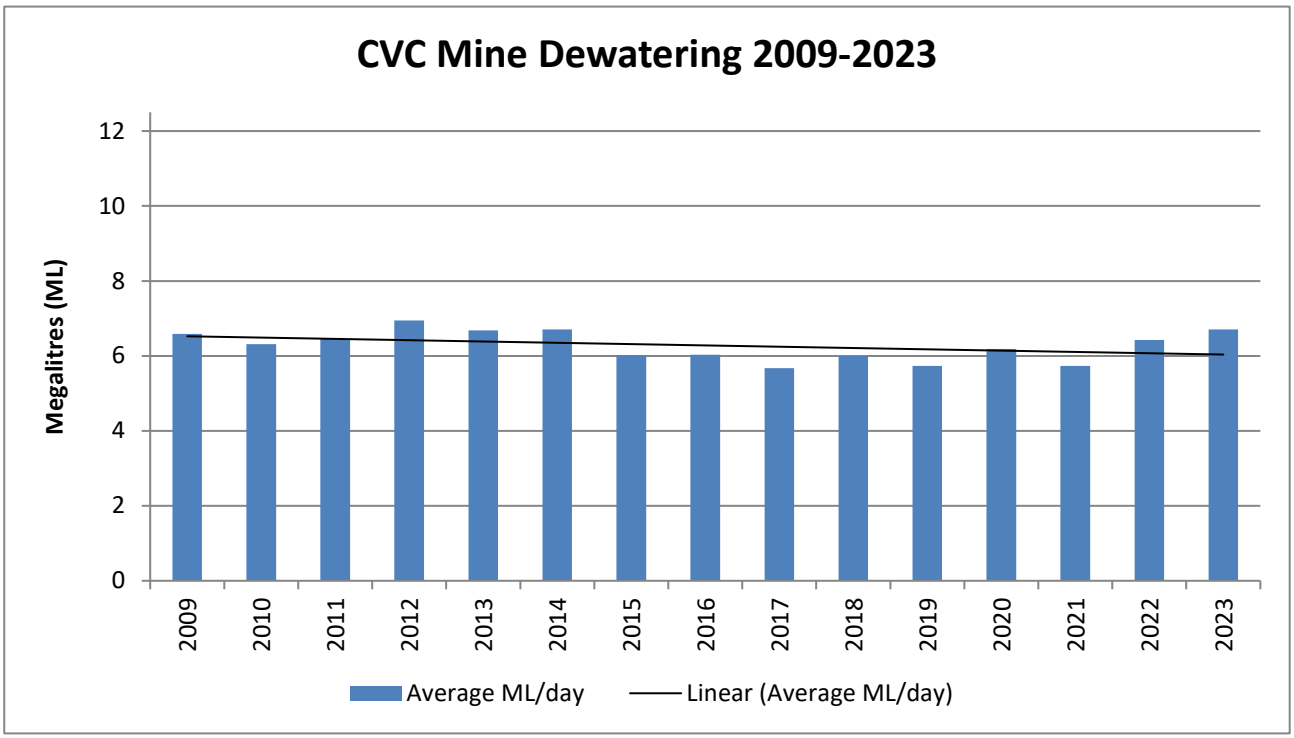


Figure 33 - Long term mine dewatering volumes



7.1.4 Water Balance

A summary of the key water balance model predictions from the EIS compared with actual results over the reporting period are provided in **Table 17**.

Table 17 - Key Water Balance Predictions and Actual Results - 2023

Water Balance Results (from EIS)	2023 Reporting Period Result	Comment
Daily average discharge through the EPA Point 1 of 10.716 ML	Daily annual average discharge of 6.7 ML/day	The water balance used the groundwater model end of mine life groundwater make to ensure model was conservative over the life of the mine. 2023 result is significantly below the water balance prediction but not unexpected due to the assumptions used in the water balance.
Maximum discharge through EPA Point 1 of 30.52 ML/day	Maximum discharge of 10.6 ML/day	The result is significantly lower than the water balance prediction as water balance was conducted using a daily time step model over a 100-year period. A maximum result would not be expected except in the event of a 1:100 ARI rainfall event.
Likelihood of EPA Point 1 volumetric limit exceedance on any given day of 4% (or approximately 15 times per year)	No exceedances of the EPL volumetric limit at EPA Point 1 and EPA Point 27 (combined volume).	Result reflects no major rainfall events in the 2023 period (i.e. maximum rainfall of 47mm in a 24-hour period), as well as, improvements made to both the surface and underground water management system subsequent to the EIS modelling.
Average annual rainfall 1206 mm	794 mm (Mannering Colliery Meteorological Station)	Approximately 54% less annual rainfall to the previous year and approximately 34% less than anticipated annual average.
Potable water use of 161.9 ML/yr	59.3 ML	Significantly less than the EIS prediction due to both the cessation of miniwall mining methods. Similar potable water use to previous year (40 ML). Slight increase due to the mines ability to switch receiving water to underground between CVC and MC.

7.2 Erosion and Sediment

Mining operations and related activities that have the potential to cause erosion and/or generate sediment and impact on the surrounding catchment areas were unchanged during the reporting period, with exception to the bitumen sealing of the previously unsealed access roads to the mines stores facility, and consist of:

- the exposed areas of the laydown and internal access tracks;
- coal stockpiling area (not utilised for coal storage in 2023 reporting period) and coal handling equipment areas;
- vehicle and equipment movements; and
- erosion of drainage structures.

Water draining from the access road on the western side of the site runs via a number of small drainage channels through dry basins, swales or silt fencing.

The water draining from the hardstand catchment area reports to the pollution control ponds D11, D12 and D13. D13 overflows in to D9 which then flows into D10 prior to being discharged from site via the gravity fed discharge point (EPA Point 1), or, if over-loaded via the concrete spill-way (EPA Point 27). The pollution control ponds (sediment dams) and the location of the monitoring points are show on **Figure 24.**

Runoff from the coal handling and stockpile area is contained by two main drainage channels that surround the stockpile and report to a number of sediment dams below the stockpile. Runoff from this area can contain a significant amount of coal fines due to the nature of the activities. In the 2020 residual coal stockpiles at CVC were removed and processed off-site by a contractor for domestic sale, reducing the potential and volume of coal fines reporting to the sediment dams. The majority of the runoff from this catchment area reports to D1, D2 and D6. These dams also function as primary settling ponds before discharging into dams further downstream. Both D1 and D2 report to D3 and then into D4 while D6 reports to D5 and then into D4. Once in D4 all the water flows into D9, water from D9 flows into D10 prior to discharge. Delta Coal has allocated funding for additional sediment and erosion control works in the 2024 reporting period.

7.3 Stream monitoring

Delta Coal undertakes monitoring of stream health, channel flow and riparian vegetation monitoring of Swindles creek (receiving creek of EPA Point 1 and Point 27 discharge). The monitoring inspections involve undertaking a visual assessment and photographs of the creek on a 3-monthly basis to identify any potential instabilities that may form as a result of operations. The results of the visual inspection of watercourse stability are recorded on a pro-forma field inspection sheet.

Monitoring has been undertaken at four locations along the unnamed creek since 2014. There has been no noticeable degradation of stream and riparian health during the reporting period, with inspections undertaken on a quarterly basis in the 2023 reporting period.

7.4 Surface Water Pollution

There were no exceedances of the volumetric limit for EPA Point 1 and EPA Point 27 combined discharge in the reporting period.

During the reporting period there three were separate exceedances of discharge water quality exceeding site water quality limits:

- 14 February 2023 – Exceedance of Faecal Coliform limits during monthly sampling of EPA Point 1. The result of 240 CFU/100ml exceeded the site limit of 200 CFU/100ml. Faecal Coliform limits exceeded the National Health Research and Medical Council, Guidelines for Managing Risk in Recreational Water, 2008 (NHRMC 2008) primary contact guidelines (i.e. swimming) of 150 CFU/100ml however did not exceed secondary contact guidelines of 1000 CFU/100ml (i.e. boating and fishing). It was noted that upstream sampling of EPA Point 1 Discharge in Swindles Creek recorded a Faecal Coliform concentration of 1,400 CFU/100ml representing the receiving environment.
- 20 March 2023 – Exceedance of Faecal Coliform limit at EPA Point 1 with a result of 340 CFU/100ml. Faecal Coliform limits exceeded the National Health Research and Medical Council, Guidelines for Managing Risk in Recreational Water, 2008 (NHRMC 2008) primary contact guidelines (i.e. swimming) of 150 CFU/100ml however did not exceed secondary contact guidelines of 1000 CFU/100ml (i.e. boating and fishing). It was noted that upstream sampling of EPA Point 1 Discharge in Swindles Creek recorded a Faecal Coliform concentration of 1,140 CFU/100ml representing the receiving environment.
- 6 November 2023 - Exceedance of Faecal Coliform limit at EPA Point 1 with a result of 620 CFU/100ml. Faecal Coliform limits exceeded the National Health Research and Medical Council, Guidelines for Managing Risk in Recreational Water, 2008 (NHRMC 2008) primary contact guidelines (i.e. swimming) of 150 CFU/100ml however did not exceed secondary contact guidelines of 1000 CFU/100ml (i.e. boating and fishing). It was noted that upstream sampling of EPA Point 1 Discharge in Swindles Creek recorded a Faecal Coliform concentration of 820 CFU/100ml representing the receiving environment. No additional waste water containing sewage had been discharged to the CVC pollution control dams since the connection of the site to the municipal sewer system in July 2023. First-order Decay rates for total coliform in water and sediment range from 0.021 to 0.047 h-1 (Kinnaman R, Surbeck C, Usner D 2012), these rates are further validated by additional studies indicating ~0.60 d-1 in in-situ sediment (Craig D, Fallowfield H, Cromar, N,2005). Given the decay rate of faecal indicator bacteria, it is considered that faecal coliform bacterial contamination would not persist within the CVC pollution control dams for greater than 3-4 days. Notably there had been 112 days between the cessation of waste water discharge to the CVC pollution control damsand the exceedance of the Faecal Coliform limit at LDP1. Water within the CVC pollution control ponds is also relatively saline, which has been observed to increase decay rates of indicator bacteria. It was considered that the exceedance in faecal coliform limits are unrelated to wastewater handling

previously being undertaken on site. The dams and surrounding catchment are often populated by bird species, as the site is located next to Lake Macquarie, which may contribute to elevated faecal coliform and enterococcus results.

Actions taken to mitigate the risk of the exceedance and/or prevent reoccurrence were:

- Completion of Pollution Reduction Programs 8 and 9 in EPL 1770, connecting the wastewater generated on site at bathhouses as well as the administration building to the Council operated sewage system on 17 July 2023. No additional sources of Faecal Coliforms are considered to be discharged to water or land by the operation.

7.5 Groundwater Pollution

There was no evidence of groundwater pollution detected during the 2023 reporting period, and there has been no groundwater pollution previously identified at CVC.

8 Rehabilitation

8.1 Buildings

There were no changes to the site infrastructure in the 2023 reporting period, with exception to the installation of a sewage pump station and rising main to Council's sewer system.

8.2 Rehabilitation of Disturbed Land

There were no significant rehabilitation works on disturbed lands during the reporting period.

Infrastructure pertaining to coal conveyors and ROM coal handling facilities were demolished on site in the previous reporting period (2020). Former mine cottages and the land they occupied adjacent Lake Macquarie were demolished in 2020 with the rehabilitation of the land ongoing within the 2023 reporting period. The area is being rehabilitated to an open grasslands land use scenario and in the reporting period satisfied the criteria for the ecosystem and land use establishment phase. As such, the rehabilitation of the mine cottages site progressed to the ecosystem and land use sustainability phase. Active noxious and priority weed management was ongoing in the 2023 reporting period. It is not anticipated that the rehabilitated area will be relinquished from the mining lease.

A summary of the rehabilitation statistics for Chain Valley Colliery is provided in **Table 18** and **Table 19**. The Final Landform Plan has been included as **Figure 34**.

Table 18 - Summary of rehabilitation at CVC

		Last period (2022)	This period (2023)	Next period (2024)
A	**Total mine footprint** (managed by Delta Coal)	Approximately 14.70 ha	Approximately 14.70 ha	Approximately 14.70 ha
B	**Total active disturbance**	14.70 ha	14.70 ha	14.70 ha
C	**Land being prepared for rehabilitation**	Nil	nil	Nil
D	**Land under active rehabilitation**	Nil	Nil	Nil
E	**Completed rehabilitation**	Nil	Nil	Approximately 0.69 h. Ongoing land management of open grasslands area (former mine cottages)

Table 19 - Maintenance activities on rehabilitated land at CVC

	Area Treated (Ha)		
NATURE OF TREATMENT	**This period (2023)**	**Next period (2024)**	**Comment/Control Strategies/Treatment Detail**
Additional erosion control works (drains re-contouring, rock protection)	0	0	No additional works required.
Re-covering (further topsoil, subsoil sealing etc.)	0	0	n/a
Soil treatment (fertiliser, lime, gypsum etc.)	0	0	n/a
Treatment/management (grazing, cropping, slashing etc.)		0	n/a
Re-seeding/replanting (species density, season etc.)		0	n/a
Adversely affected by weeds (type and treatment)	Approx 7	7	Ongoing implementation of a weed management program of noxious weeds including but not limited to lantana, bitou bush, asparagus fern and pampas grass, foliar spray, physical removal and poisoning of stems as appropriate.
Feral animal control (additional fencing, trapping, baiting etc.)	0	0	No feral animal control undertaken during the reporting period.

During the previous reporting period (2022), Delta Coal aligned its rehabilitation management plan to meet Schedule 8A requirements, as well as submitting a rehabilitation forward program and rehabilitation objectives to the resources regulator. The forward program and revised management plan has been made public on the Delta Coal website and can be accessed at the following link https://www.deltacoal.com.au/environment/chain-valley-colliery/chain-valley-management-plans.

The Forward Program details the following for the two active rehabilitation areas at CVC:

Former Mining Cottages Area Rehabilitation:

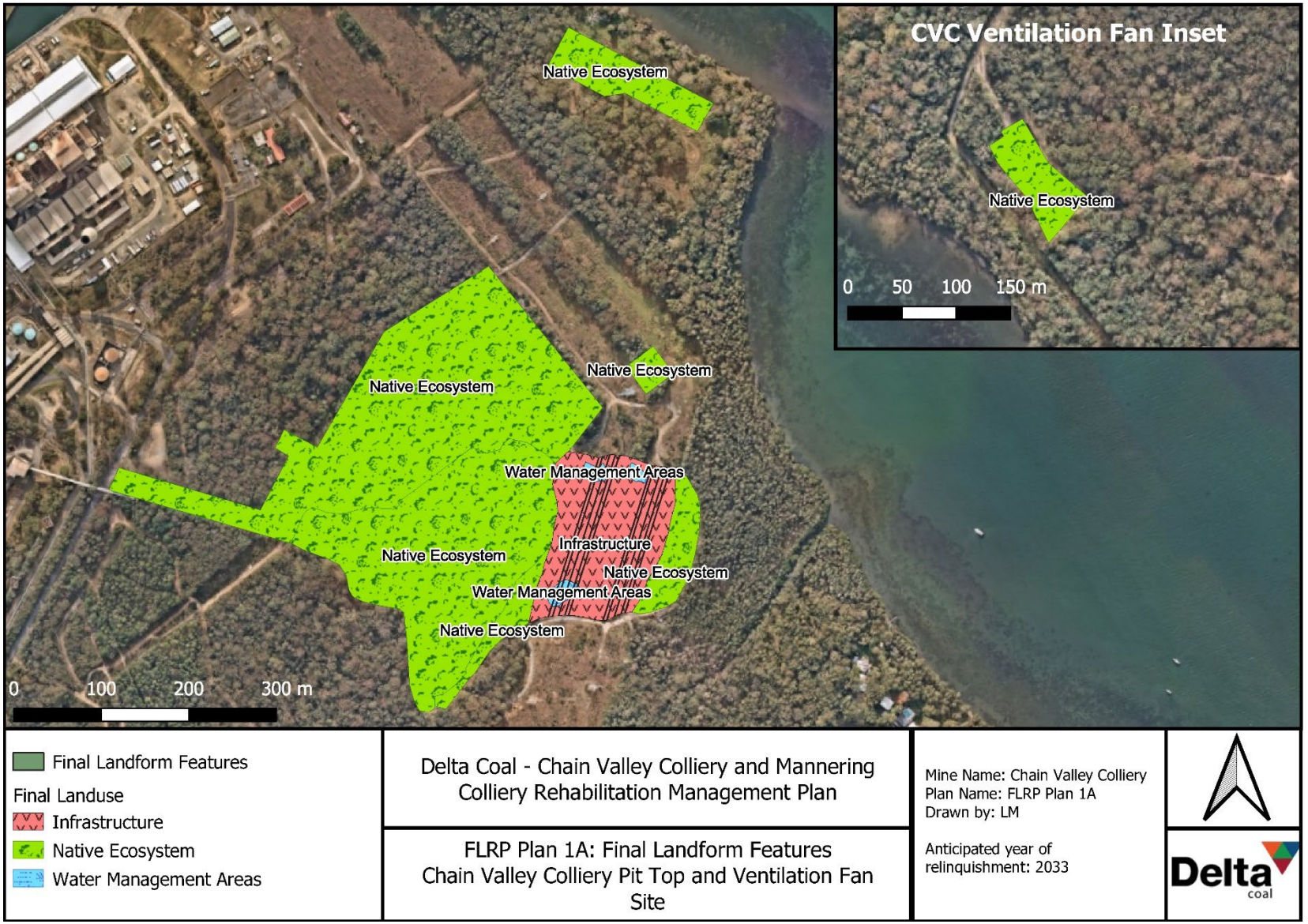
- Ecosystem and Land Use Sustainability phase, Q1 2024 – Q1 2026

Catherine Hill Bay – Possum Gulley Area Rehabilitation:

- Landform Establishment phase, current – Q2 2023
- Growth media development, Q2 2023 – Q3 2023
- Ecosystem and land use sustainability phase – Q3 2023 – Q1 2024
- Relinquishment – date to be confirmed with NPWS and RR

Notably there have been delays in the Catherine Hill Bay – Possum Gulley Area rehabilitation. Landform establishment is anticipated to be completed in Q2 2024. Growth media development by Q3 2024 and ecosystem and land use sustainability by Q1 2025.

Figure 34 - Chain Valley Colliery Final Landform Plan - 2023



8.3 Rehabilitation Trials and Research

No rehabilitation trials or research was undertaken during the reporting period.

8.4 Further Development of the Final Rehabilitation Plan

The current Rehabilitation Management Plan was updated in July 2022 following reforms to Schedule 8A of the Mining Regulation, it was provided to regulators and stakeholders as required by Condition 27, Schedule 3 of SSD-5465. The plan is publicly available on the Delta Coal website.

The proposed final rehabilitation landforms, consistent with both the Rehabilitation Management Plan and Mining Operations Plan is presented as **Figure 34.**

8.5 Post Rehabilitation Land Use(s)

As identified in the current Rehabilitation Management Plan the post mining land uses for CVC is to revegetate the surface facilities areas to a near-native ecosystem compatible with the surrounding vegetation communities. As the goal is to return the areas of disturbance to a native plant community (or communities) aligned with the surrounding bushland, no introduced species (e.g., *Melaleuca armillaris*, *Pinus radiata* and non-endemic eucalypts) would be used in the revegetation program. The focus of the works would be the use of locally occurring species plant preferentially grown from locally sourced seeds. CVC is on land owned by Delta Electricity who will, therefore, be a key stakeholder in determining the vegetation selection and landform of the area.

Some areas will be revegetated to grassland where this is consistent with the final land use and surrounds. This applies to the areas within existing high voltage power line easements, where the existing grassland vegetation communities are actively managed to ensure they have no impact to the transmission of electricity for the state. Accordingly, a grassland community is both consistent with other areas within the easement and considerate of future management requirements (as the high voltage power lines will remain following mine closure).

Rehabilitation objectives are presented in the Delta Coal Rehabilitation Management Plan (https://www.deltacoal.com.au/environment/chain-valley-colliery/chain-valley-management-plans).

8.6 Decommissioning

During mine closure the following actions will be taken with respect to the buildings and structures associated with the mining, preparation and transport of the coal:

- any plant, structures, buildings or conveyors would be preferentially sold and/or relocated for reuse at another mining operation
- the remaining surface conveyor plant, buildings and built structures will be demolished or removed. All demolition is to occur in accordance with AS 2601-2001: The Demolition of Structures (or its latest version at the time)
- concrete pads and footings will be either completely removed or removed to a minimum 1 m below surface levels and disposed of at an appropriate place or recycled, and following removal will be covered with at least 300 mm of growth medium
- roadways not required for access to the mine site or other areas for purposes such as bushfire management will be rehabilitated
- asphalt hardstand will be removed
- all services not required following mine closure will be disconnected and any stored energy dissipated;
- mining related power lines within the domains will be removed
- mining related surface services will be removed
- buried services encountered during civil works will either be completely removed or removed to 300 mm below the final landform level and remain buried. As mentioned above, all services, including buried services will be safely disconnected and have any stored energy dissipated.

These proposed actions could be subject to change during the mine closure process depending on requests by the landowner for infrastructure to be left in accordance with alternative future land use options. Additionally, it is noted that while services will be disconnected to the majority of the site during decommissioning activities, services may remain connected to a portion of the site for beneficial use during the later rehabilitation phases (such as watering tube stock) and subsequently would be disconnected following ecosystem establishment.

The decommissioning phase will also address the following:

- risks associated with any remaining combustible materials. An assessment of combustion risk will be undertaken and specific controls implemented based on report findings
- completion of Environmental Site Assessments, with specific focus on areas around storage tanks, oil storage areas, fuel dispensing locations, service areas, buildings housing powered plant and known locations of hazardous materials
- undertaking any necessary contamination remediation, if required, to ensure the land is suitable for use as buffer land for the Vales Point Power Station. As the lands will not be used as “recreation/public space”, nor is it planned to be used for “commercial/industrial” purposes which are land use scenarios

within the *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as modified in 2013)*, it is proposed that a combination of health-based investigation criteria applicable to either of these classifications will be adopted as the rehabilitation criteria should contamination requiring remediation be identified

- heritage sites, which are not anticipated to be impacted during decommissioning
- asbestos, a hazardous building material register was completed in February 2020 for the CVC pit top area.

8.7 Objectives

The rehabilitation objectives below have been compiled from Condition 25 within Schedule 3 of SSD-5465 and are listed in **Table 20**.

Table 20: Rehabilitation objectives

Feature	Objective
Mine site (as a whole of disturbed land and water)	• Safe, stable and non-polluting. • Final land use compatible with surrounding land use.
Surface Infrastructure	• To be decommissioned and removed, unless agreed otherwise with relevant regulatory authority and landowner.
Portals and ventilation shafts	• To be decommissioned and made safe and stable. • Retain habitat for threatened species (e.g. bats), where practicable (Chain Valley pit top facilities only).
Other land affected by the development	• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems: - local native plant species (unless agreed otherwise with relevant regulatory authority and landowner); and - a landform consistent with the surrounding environment.
Built features damaged by mining operations	• Repair to pre-mining condition or equivalent unless: - the owners agrees otherwise; or - the damage is fully restored, repaired or compensated under the *Mine Subsidence Compensation Act 2017*.
Community	• Ensure public safety. • Minimise the adverse socio-economic effects associated with mine closure.

8.8 Other Infrastructure

There was no other rehabilitation works completed during the reporting period.

9 Community

9.1 Community Complaints

There were no community complaints received during the reporting period.

A copy of the Complaints Register is provided on the Delta Coal website. This register includes:

- the date and time of the complaint;
- the method by which the complaint was made;
- any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
- the nature of the complaint;
- the action taken in relation to the complaint, including any follow-up contact with the complainant; and
- if no action was taken, the reasons why no action was taken.

The Annual total complaints and complaints by subject type trends are **Figure 35** and **Figure 36**.

Figure 35 - Total community complaints by year

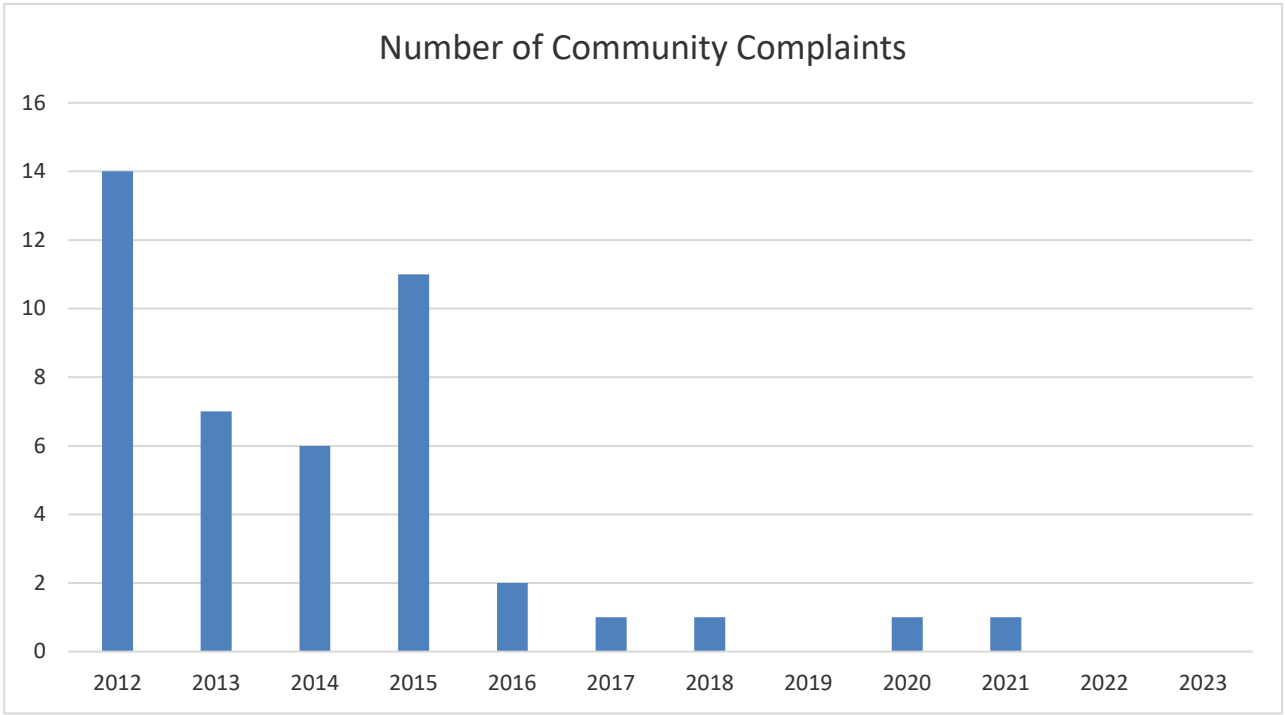
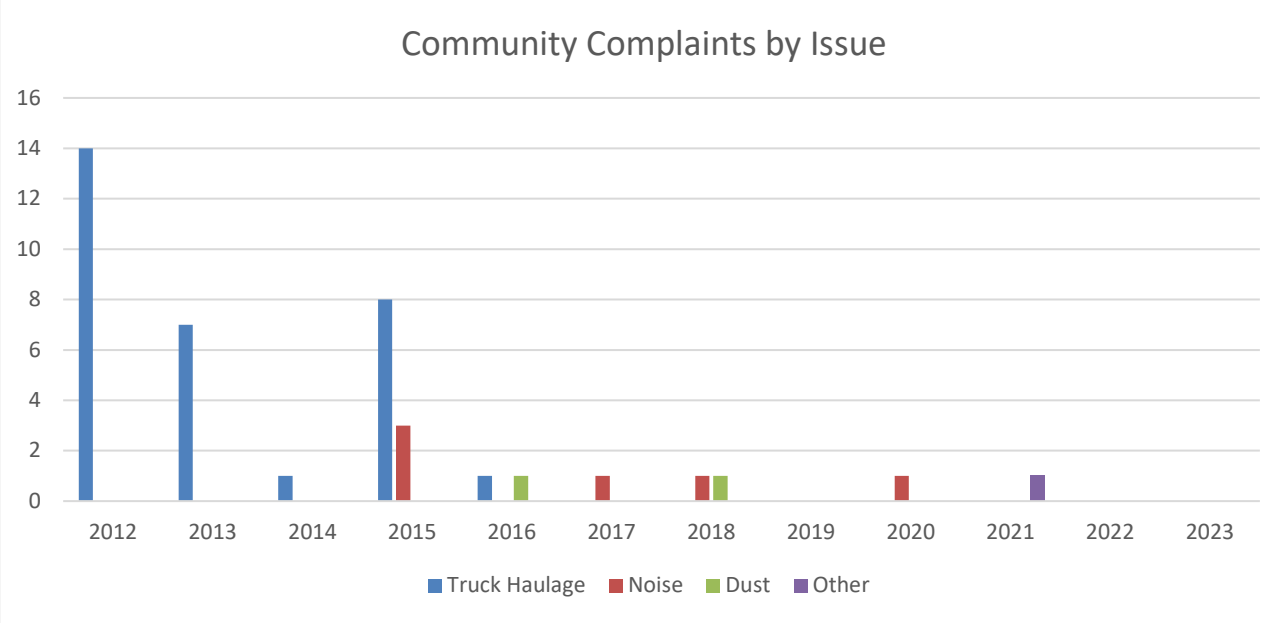


Figure 36 - Annual Community Complaints by Issue



9.2 Community Liaison

The Chain Valley Colliery and Mannering Colliery combined Community Consultative Committee (CCC) continued to operate in accordance with the *Community Consultative Guidelines for State Significant Development* (January 2019) during the reporting period.

There were four CCC meetings held during the reporting period on the 15 February 2023, 17 May 2023, 23 August 2023 and 15 November 2023. Minutes for each of the committee meetings are available on the Delta Coal website https://www.deltacoal.com.au/community/community-consultative-committee.

In addition, the Delta Coal website was updated on a monthly basis with monitoring data, management plans, reports, audits and complaint details among other items.

The community hotline number (**1800 687 260**) also remained in place during the reporting period and is displayed prominently and permanently on the website.

9.3 Voluntary Planning Agreement

A Voluntary Planning Agreement (VPA) with Central Coast Council was successfully established during 2017. Following extensive consultation with Central Coast Council, the Community Advisory Panel was established and met to plan and coordinate the framework for the VPA funding. The Chain Valley Colliery VPA fund was launched during September 2017 via the Council grants and sponsorship scheme.

The Delta Coal Community funding program was established as a joint initiative between Delta Coal and Central Coast Council to provide funding for organisations to deliver projects that improve community infrastructure and services in the following communities:

- Summerland Point
- Gwandalan
- Chain Valley Bay; and
- Mannering Park.

The VPA is subject to indexation and in the 2023 reporting period was $0.0462 per tonne of ROM coal sold, which started at $0.035 in 2017. In the 2023 reporting period, Delta Coal generated and paid $43,404 to the Central Coast Council, Voluntary Planning Agreement.

9.4 Community Support / Engagement

Delta Coal is committed to supporting and engaging with the local communities which surround its operations. While Delta Coal provides a monetary offsets associated with its VPA under its operating approvals, Delta Coal also supports the local community through a variety of additional avenues. This support is provided through in kind support, cash donations, staff time, and charitable donations.

10 Independent Audit

An independent environmental audit (IEA) was undertaken by GHD in 2022. The Response to Audit Recommendations was submitted to DPIE on 11 July 2022 (revised 19 September 2022) and accepted on 21 September 2022. The IEA is provided in **Appendix 10** and a current IEA Action Plan is provided as **Appendix 11**.

Throughout the 2023 period, Delta Coal have completed recommendations from the 2022 IEA. 1 Action and 1 Recommendation remain to be completed from the audit and are detailed in the IEA Action Plan. The remaining action and recommendation are forecasted for completion in the 2024 reporting period.

10.1 Key Audit Outcomes

Recommendations with respect to the annual review are summarised in **Table 21**.

Table 21 - Actions required from IEA with regard to the Annual Review

Item	Issue / Observation	Action	Status
Action 5	Transport	A summary of the Independent Traffic Audit findings are not included in the annual review documentation. This constitutes and administrative non-compliance	See Section 6.18

10.2 Action Plan

The IEA Action Plan has been included in **Appendix 11**.

10.3 Future Audit

The next Independent Environmental Compliance Audit is scheduled to commence in 2025.

An updated table of compliance with the 2022 Independent Environmental Audit will be completed as part of that audit.

11 Incidents and non-compliances during the reporting period

All non-compliances, exceedance, and reportable incidents relating to the site's licences and approvals are summarised below in **Table 22**.

Table 22 - Summary of reportable incidents/non-compliances for 2023

Date	Description of Incident	Approval / Condition / Clause	Actions taken to address incident
14 February 2023	Sampling on 14 February 2023 recorded a concentration of Faecal Coliforms of 240 CFU/100ml, with EPL 1770 stipulating a 200 CFU/100ml limit. It was noted that upstream sampling Faecal Coliform results were 1,400 CFU/100ml and outlet to creek results were 110 CFU/100ml. The sample was not considered odorous or turbid.	EPL 1770 – L2.4	The exceedance was reported to the NSW Environmental Protection Authority (EPA) and NSW Department of Planning and Environment (DPE). Outgoing effluent at CVC was dosed with chlorine, dosing volumes were reviewed immediately upon receipt of analytical results and dosing volumes were increased. Delta Coal was completing a connection of site effluent to Council sewer. CVC will continue to monitor discharge water quality in accordance with EPL 1770 and the sites approved Water Management Plan.
3 March 2023	There was an exceedance to the maximum total increase in deposited dust level (increase greater than 2 g/m2/month) at DDG 004 for the sampling period between 3 February 2023 and 3 March 2023. The monthly depositional dust level increased from 0.9 g/m2/month to 6.2 g/m2/month. It was noted that the 12-month rolling average result remains below the annual limit of 4g/m2/month.	SSD-5465 Schedule 3, Condition 11	The testing laboratory (ALS Environmental Pty Ltd) reported that the deposition was 'very heavy' in DDG001 and the samples were analysed to comprise the following: • Total insoluble matter – 7.3 g/m2/month • Combustible matter – 1.5 g/m2/month • Ash content – 5.8 g/m2/month • Dirt – 40 % • Insects – 30 % • Coal – 20 % • Vegetation – 10 % Site operations were typical during the monitoring period. It is noted that CVC does not undertake coal handling on-site with potential dust generation predominately due to traffic on unsealed haul roads. Throughout the monitoring period watercart operations were undertaken on haul roads as is usual for the site. DPE reviewed the incident investigation and determined the exceedance was unlikely caused by CVC due to the result of nearby

Date	Description of Incident	Approval / Condition / Clause	Actions taken to address incident
			DDG004 that is positioned closer to the site and the sample being heavily contaminated by insects and vegetation. Delta Coal will continue to undertake dust mitigation measures in line with the approved Air Quality and Greenhouse Gas Management Plan for the site.
20 March 2023	Sampling on 20 March 2023 recorded a concentration of faecal coliforms of 340 CFU/100ml, with EPL 1770 stipulating a 200 CFU/100ml limit. It was noted that upstream sampling Faecal Coliform results were 1,140 CFU/100ml. The sample was not considered odorous or turbid.	EPL 1770 – L2.4	The exceedance was reported to the NSW Environmental Protection Authority (EPA) and NSW Department of Planning and Environment (DPE). Outgoing effluent at CVC is dosed with chlorine, dosing volumes were reviewed immediately upon receipt of analytical results and dosing volumes were increased. Delta Coal was completing a connection of site effluent to Council sewer. It was noted that Enterococcus (considered a more reliable indicator of faecal contamination in marine waters) analytical results were 16 CFU/100ml which did not exceed primary or secondary contact guidelines (NHRMC, 2008). CVC will continue to monitor discharge water quality in accordance with EPL 1770 and the sites approved Water Management Plan.
3 April 2023	There was an exceedance to the maximum total increase in deposited dust level (increase greater than 2 g/m2/month) at DDG 004 for the sampling period between 3 March 2023 and 3 April 2023. The monthly depositional dust level increased from 6.2 g/m2/month to 15g/m2/month. It was noted that the 12-month rolling average result remains below the annual limit of 4g/m2/month.	SSD-5465 Schedule 3, Condition 11	The testing laboratory (ALS Environmental Pty Ltd) reported that the deposition was 'very heavy' in DDG004 and the samples were analysed to comprise the following: • Total insoluble matter – 15 g/m2/month • Combustible matter – 1.3 g/m2/month • Ash content – 13.7 g/m2/month • Dirt – 80 % • Coal – 10 % • Sand – 10% • Vegetation – <5 % • Insects – <5 % Site operations were typical during the monitoring period. It is noted that CVC does not undertake coal handling on-

Date	Description of Incident	Approval / Condition / Clause	Actions taken to address incident
			site with potential dust generation predominately due to traffic on unsealed haul roads. Throughout the monitoring period watercart operations were undertaken on haul roads as is usual for the site. Delta Coal will continue to undertake dust mitigation measures in line with the approved Air Quality and Greenhouse Gas Management Plan for the site. Delta Coal has undertaken grounds maintenance in the vicinity of DDG004 and for a period undertook daily inspections of the gauge. Ceasing after April-May depositional dust gauge monitoring.
18 September 2023	There was an exceedance to the maximum total increase in deposited dust level (increase greater than 2 g/m2/month) at DDG001 for the sampling period between 4 August 2023 and 4 September 2023. The monthly depositional dust level increased from 0.3 g/m2/month to 7.3 g/m2/month. It should be noted that the 12-month rolling average result remains below the annual limit of 4g/m2/month	SSD-5465 Schedule 3, Condition 11	The testing laboratory (ALS Environmental Pty Ltd) reported that the deposition was 'very heavy' in DDG001 and the samples were analysed to comprise the following: • Total insoluble matter – 7.3 g/m2/month • Combustible matter – 1.5 g/m2/month • Ash content – 5.8 g/m2/month • Dirt – 40 % • Insects – 30 % • Coal – 20 % • Vegetation – 10 % Site operations were typical during the monitoring period. It is noted that CVC does not undertake coal handling on-site with potential dust generation predominately due to traffic on unsealed haul roads. Throughout the monitoring period watercart operations were undertaken on haul roads as is usual for the site.
13 November 2023	Sampling on 6 November 2023 recorded a concentration of faecal coliforms of 620 CFU/100ml, with EPL 1770 stipulating a 200 CFU/100ml limit.	EPL 1770 – L2.4	The exceedance was reported to the NSW Environmental Protection Authority (EPA) and NSW Department of Planning and Environment (DPE). The incident was not considered to have caused material harm or loss to the environment as: • Upstream sampling indicated a greater concentration of Faecal Coliform than discharge waters at

Date	Description of Incident	Approval / Condition / Clause	Actions taken to address incident
			CVC, downstream and outlet to creek sampling identified a lower concentration of both upstream and EPA Point 1 discharge. • Sources of indicator bacteria were not considered to have been generated due to on-site operations as the sites waste water has been connected to municipal sewer since July 2023. • No clean-up is or was required for the event. CVC will continue to monitor discharge water quality in accordance with EPL 1770 and the sites approved Water Management Plan.
14 December 2023	There was an exceedance to the maximum total increase in deposited dust level (increase greater than 2 g/m2/month) at DDG004 for the sampling period between 1 November 2023 and 1 December 2023. The monthly depositional dust level increased from 1.2 g/m2/month to 3.5 g/m2/month. It should be noted that the 12 month rolling average result remains below the annual limit of 4g/m2/month	SSD-5465 - Schedule 3, Condition 11	The testing laboratory (ALS Environmental Pty Ltd) reported that the deposition comprised the following: • Total insoluble matter – 3.5 g/m2/month • Combustible matter – 0.7 g/m2/month • Ash content – 2.8 g/m2/month Site operations were typical during the monitoring period. It is noted that CVC does not undertake coal handling on-site with potential dust generation predominately due to traffic on unsealed haul roads. Throughout the monitoring period watercart operations were undertaken on haul roads as is usual for the site. Delta Coal will continue to undertake dust mitigation measures in line with the approved Air Quality and Greenhouse Gas Management Plan for the site.

12 Activities to be Completed in the Next Reporting Period

12.1 Activities Proposed for 2023 Reporting period

A summary of the activities that were proposed to be undertaken during the 2023 reporting period and current status is provided in **Table 23.**

Table 23: Status Update to 2022 Proposed Activities

Activity Proposed in 2022 Annual Report	Status Update	31 December 2023 update, percentage complete
Annual weed management in 2023 period Consider revision of weed action plan with site-wide mapping of to guide weed management activities on-site.	Weed management was undertaken for the sites pit-top areas on a monthly basis throughout the 2023 period. Noxious weed control works were completed by a suitably qualified and trained contractor.	Ongoing. 2020 Weed Action Plan was not revised in the reporting period.
Rehabilitation monitoring as per the requirements of the rehabilitation monitoring program to be completed in Q4 2022.	Annual rehabilitation monitoring was undertaken in the 2023 reporting period.	Ongoing.
Undertake sediment and erosion control works on the former CVC stockpile area.	Minor sediment and erosion control works completed. Operational budget maintained for 2024 reporting period.	Ongoing.
Submission of a response to submissions and meeting requirements of the Independent Planning Commission.	Completed	100% - response to submissions completed, DPHI have not yet completed their assessment of the project.
Completion of effluent connection to the Central Coast sewer system prior to 24 May 2023. Allowing for the removal of the chlorine dosing pump.	Completed	100% - Works completed on 17 July 2023.

Activity Proposed in 2022 Annual Report	Status Update	31 December 2023 update, percentage complete
Development of CVC bathhouse sewer connection anticipated to commence Q2 2023 and be completed prior to 24 May 2023.	Completed	100% - Works completed on 17 July 2023.
Connection of the administration building septic tank to the on-site sewage pump station and Council sewer (EPL 1770 - PRP 9) and be completed prior to 24 May 2023.	Completed	100% - Works completed on 17 July 2023.
Upon completion of PRP 8 and PRP 9, submission to EPA to vary EPL 1770 to remove biological monitoring requirements at the CVC Licensed Discharge Points.	Completed	100% - Submission made to EPA in October 2023, EPA have requested an additional 6-months of monitoring before re-assessing the removal of biological contaminant monitoring.

12.2 Activities Proposed to be Completed in 2024 Reporting Period

Table 24 - Activities Proposed for the 2024 Period

Proposed Activities for 2024
Ongoing monthly weed management in 2024 period Revision of weed action plan with site-wide mapping of to guide weed management activities on-site.
De-silting works to commence on CVC sedimentation dams.

Proposed Activities for 2024
Progression of CVC Consolidation Approval (consolidating approvals for CVC and MC under one State Significant Development) through the Independent Planning Commission.
Complete Noise Mitigation options Assessment for Receiver R22.
Implement a waste management strategy.

13 References

Documents used in the preparation of this report are detailed in **Table 25**.

Table 25: References

Reference	Title
Legislation and Regulations	Development consent SSD-5465 (as modified) Environment Protection Licence (EPL) 1770 *Mining Act 1992* *Protection of the Environment Operations Act, 1997*
External documents	AECOM, 2011 – *Environmental Assessment Chain Valley Colliery Domains 1 & 2 Continuation Project*. Prepared for LakeCoal Pty Ltd. EMGA Mitchell McLennan, 2013 – *Environmental Impact Statement, Chain Valley Colliery Mining Extension 1 Project.* Prepared for LakeCoal Pty Ltd. Atlantech Pty Ltd (October 2023) Biodiversity Monitoring 2023 Chain Valley Colliery. Laxton, E., 2023 – *Seagrass Survey of Chain Valley Bay, Summerland Point and Crangan Bay, Lake Macquarie, NSW (Results for 2008 to 2023)* Laxton, E. 2023 – *Lake Macquarie Benthos Survey Results No. 23 (March 2023)* NSW DPIE (January 2019) *Community Consultative Guidelines for State Significant Development* Total Earth Care Pty Ltd (January 2020) Weed Action Plan Chain Valley Colliery, Mannering Colliery and Summerland Point Ventilation Shaft. Total Earth Care Pty Ltd (August 2020) Weed Action Plan – Addendum 1, Chain Valley Colliery, Mannering Colliery and Summerland Point Ventilation Shaft.

14 Acronyms / Definitions

AEMR Annual Environmental Management Report, now known as the Annual Review

Annual Review The annual environmental report compiled for CVC, the Annual Review also fulfills the requirement for an Annual Environmental Report or an Annual Environmental Management Report required by mining leases.

CCC Community Consultative Committee

CVC Chain Valley Colliery

DP&E Department of Planning & Environment (former)

DPIE Department of Planning, Industry and Environment

EA Environmental Assessment

EMS Environmental Management System

EPA NSW Environment Protection Authority

EP&A Act *Environmental Planning and Assessment Act 1979*

EPL Environmental Protection License
kL Kilolitre

EPA Point 1 Licenced Discharge Point 1 (per EPL 1770)

MC Mannering Colliery

NGER National Greenhouse and Energy Reporting

NSW New South Wales

OEH NSW Office of Environment and Heritage

PM_{10} Particulate matter less than 10 microns in size

POEO Act *Protection of the Environment Operations Act 1997*

ROM Run of mine

Secretary Secretary of the Department, or nominee

TEOM Tapered element oscillating microbalance

t - CO_2-e Tonnes of carbon dioxide equivalent

The website The website of Delta Coal - Chain Valley Colliery, which is www.deltacoal.com.au

MP10_0161 Project approval MP 10_0161, as modified, issued under Section 75J of the Environmental Planning and Assessment Act 1979 for the Chain Valley Colliery Domains 1 & 2 Continuation Project.

SSD 5465	Development Consent SSD 5465, as modified, issued under Section 89E of the Environmental Planning and Assessment Act 1979 for the Chain Valley Colliery Mining Extension 1 Project.
VPPS	Vales Point Power Station
WCJV	Wallarah Coal Joint Venture

15 Appendices

Appendix 1: Development Consent SSD-5465

Development Consent

Section 89E of the *Environmental Planning & Assessment Act 1979*

As delegate of the Minister for Planning and Infrastructure, I approve the development application referred to in Schedule 1, subject to the conditions in Schedules 2 to 6.

These conditions are required to:

- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the ongoing environmental management of the development.

Chris Wilson
Executive Director
Development Assessment Systems and Approvals

Sydney 2013

SCHEDULE 1

Application Number:	SSD-5465
Applicant:	Great Southern Energy Pty Limited
Consent Authority:	Minister for Planning and Infrastructure
Land:	See Appendix 1
Development:	Chain Valley Extension Project

Red type represents November 2014 Modification (SSD_5465 MOD 1)
Blue type represents December 2015 Modification (SSD_5465 MOD 2)
Green type represents June 2020 Modification (SSD-5465 MOD 3)
Purple type represents July 2021 Modification (SSD-5465 MOD 4)

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DEFINITIONS

Aboriginal Object / Place	Has the same meaning as the definition of the term in section 5 of the NP&W Act
Adaptive management	Adaptive management includes monitoring subsidence impacts and subsidence effects and, based on the results, modifying the mining plan as mining proceeds to ensure that the effects, impacts and/or associated environmental consequences remain within predicted and designated ranges and in compliance with the conditions of this consent
Affected Councils	LMCC and/or CC Council
Annual Review	The review required by Condition 4 of Schedule 6
Applicant	Great Southern Energy Pty Limited, or any person carrying out development under this consent
Approved mine plan	The mine plan shown in Appendix 3, as varied by any Extraction Plan approved under this consent
APZs	The asset protection zones shown in Appendix 7A
BCA	Building Code of Australia
BCD	Biodiversity and Conservation Division within the Department
BMP	Biodiversity Management Plan
Built features	Any building or work erected or constructed on land or water, and includes dwellings and infrastructure such as any formed road, street, path, walk, marina or driveway; any pipeline, water, sewer, telephone, gas or other service main
Calendar Year	A period of 12 months from 1 January to 31 December
CCC	Community Consultative Committee
CC Council	Central Coast Council
Coal haulage route	The route proposed in the EIS for haulage of coal by trucks between the site and the Port of Newcastle (as shown in Appendix 5)
Conditions of this consent	Conditions contained in Schedules 2 to 6 inclusive
Construction	The demolition of buildings or works, carrying out of works and erection of buildings covered by this consent
Day	The period from 7am to 6pm on Monday to Saturday, and 8am to 6pm on Sundays and Public Holidays
Delta Electricity	Delta Electricity, or subsequent owners of the Vales Point Power Station
Department	Department of Planning, Industry and Environment
Development	The development described in the EIS, as amended by the SEE (Mod 1), SEE (Mod 2) and SEE (Mod 3)
DPIE Crown Lands	Crown Lands Group within the Department
DPIE Water	Water Group within the Department
EIS	Environmental Impact Statement titled '*Chain Valley Colliery Mining Extension 1 Project*' dated 28 May 2013, as modified by the response to submissions, titled '*Chain Valley Colliery Mining Extension 1 Project* Response to Submissions', dated August 2013, and the letter by EMM to the Applicant, dated 29 October 2013
Endangered population	As defined under the *Fisheries Management Act 1994*
Environment	Includes all aspects of the surroundings of humans, whether affecting any human as an individual or in his or her social groupings
Environmental consequences	The environmental consequences of subsidence impacts, including: damage to built features; loss of surface water flows to the subsurface; loss of standing pools; slope changes to streams; adverse water quality impacts; development of iron bacterial mats; landslides; damage to Aboriginal heritage sites; impacts on aquatic ecology; and ponding.
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence issued under the POEO Act
Evening	The period from 6pm to 10pm
Feasible	Means what is possible and practicable in the circumstances
First Workings	The extraction of coal from underground workings by bord and pillar mining methods (including herringbone pattern workings) and from main headings, gateroads and cut-throughs and the like, provided that such workings are long-term stable and do not generate more than 20 mm of vertical subsidence at the surface
Fisheries NSW	Fisheries Branch of the Primary Industries Group within the Department
Ha	Hectare
Heritage Item	An Aboriginal object, an Aboriginal place, or a place, building, work, relic, moveable object, tree or precinct of heritage significance, that is listed under any of the following: • the State Heritage Register under the *Heritage Act 1977*; • a state agency heritage and conservation register under section170 of the *Heritage Act 1977;*

	• a Local Environmental Plan under the EP&A Act; • the World Heritage List; • the National Heritage List or Commonwealth Heritage List under the EPBC Act; or • anything identified as a heritage item under the conditions of this consent.
High Water Mark Subsidence Barrier	The area of land defined: a) on the surface by the highwater level of Lake Macquarie and a point 2.44 metres in elevation above that highwater level; and b) in the seam, where it is intersected by lines: • drawn landwards from all points 2.44 metres elevation above the highwater level of Lake Macquarie; and • drawn lakewards from the highwater level of Lake Macquarie, at an angle of 35 degrees from the vertical.
Incident	An occurrence or set of circumstances that causes or threatens to cause material harm that may or may not be or cause a non-compliance
Land	Has the same meaning as the definition of the term in section 1.4 of the EP&A Act, except where the term is used in the noise and air quality conditions in Schedules 3 and 5 of this consent where it is defined to mean the whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at NSW Land Registry Services at the date of this consent
LMCC	Lake Macquarie City Council
Material harm	Is harm to the environment that: • involves actual or potential harm to the health or safety of human beings or to the environment that is not trivial; or • results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000, (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment)
MEG	Regional NSW – Mining, Exploration and Geoscience
Minimise	Implement all reasonable and feasible mitigation measures to reduce the impacts of the development
Mining operations	The carrying out of underground mining, including the extraction, processing, stockpiling and transportation of coal on the site and the emplacement of coarse/fine reject material resulting from underground mining
Minister	Minister for Planning and Public Spaces, or delegate
Minor	Not very large, important or serious
Mitigation	Activities associated with reducing the impacts of the development
Modification 1	The modification to the development as described in SEE (Mod 1)
Modification 2	The modification to the development as described in SEE (Mod 2)
Modification 3	The modification to the development as described in SEE (Mod 3)
Modification 4	The modification to the development as described in SEE (Mod 4)
NCC	Newcastle City Council
Negligible	Small and unimportant, such as to be not worth considering
Night	The period from 10pm to 7am on Monday to Saturday, and 10pm to 8am on Sundays and Public Holidays
Non-compliance	An occurrence, set of circumstances or development that is in breach of this consent
NP&W Act	*National Parks and Wildlife Act 1974*
Peak hour periods	7 am to 9 am and 4:30 pm to 6 pm weekdays
Planning Secretary	Planning Secretary under the EP&A Act, or nominee
POEO Act	*Protection of the Environment Operations Act 1997*
Privately-owned land	Land that is not owned by a public agency, Delta Electricity (or its subsidiary) or a mining company (or its subsidiary)
Public infrastructure	Linear and related infrastructure that provides services to the general public such as roads, railways, water supply, drainage, sewerage, gas supply, electricity, telephone, telecommunications, etc.
Reasonable	Reasonable relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements
Reasonable costs	The costs agreed between the Department and the Applicant for obtaining independent experts to review the adequacy of any aspects of the Extraction Plan, or where such costs cannot be agreed, the costs determined by a dispute resolution process
Registered Aboriginal Parties	As described in the *National Parks and Wildlife Regulation 2009*
Rehabilitation	The restoration of land disturbed by a development to a good condition, to ensure it is safe, stable and non-polluting
Remediation	Activities associated with partially or fully repairing or rehabilitating the impacts of the

	development or controlling the environmental consequences of this impact
RFS	NSW Rural Fire Service
Road Maintenance Agreement	The document prepared by McCullough Robertson Lawyers and titled '*Road Maintenance Agreement*', signed by CC Council on 1 July 2013 and by LakeCoal on 5 July 2013
ROM	Run-of-mine
RR	Regional NSW - Resources Regulator
SA NSW	Subsidence Advisory NSW
Safe, serviceable & repairable	Safe means no danger to users who are present; serviceable means available for its intended use; and repairable means damaged components can be repaired economically
Second Workings	Extraction of coal by longwall, miniwall, pillar extraction, pillar splitting or pillar reduction methods, and inclusive of any first workings methods that would generate more than 20 mm of vertical subsidence at the surface
SEE Mod 1	Statement of Environmental Effects titled *'Chain Valley Colliery – Modification 1, Statement of Environmental Effects, Section 96 Modification to SSD-5465'* dated April 2014, as modified by the associated Response to Submissions dated 15 September 2014.
SEE Mod 2	Statement of Environmental Effects titled *'Chain Valley Colliery – Modification 2, Statement of Environmental Effects, Section 96 Modification to SSD-5465'* dated 29 June 2015, including the associated Response to Submissions dated 16 September 2015.
SEE (Mod 3)	Statement of Environmental Effects titled '*Statement of Environmental Effects, Chain Valley Colliery – Modification 3*', dated May 2019, prepared by EMM Consulting, including the associated Response to Submissions dated August 2019 and prepared by EMM Consulting
SEE (Mod 4)	Statement of Environmental Effects titled "*Statement of Environmental Effects, Chain Valley Colliery Modification 4*" dated November 2020, prepared by Umwelt Consulting, including the associated Response to Submissions, dated April 2021 and prepared by Umwelt Consulting.
Site	All land within the Development Area (see Appendices 1 and 2)
SPB	Seagrass Protection Barrier is the area of land defined by: (a) on the surface by the extent of the seagrass beds; and (b) in the seam, where the seam is intersected by the lines drawn: • landwards from the landwards boundary of the seagrass beds; and • lakewards from the lakewards boundary of the seagrass beds, at an angle of 26.5 degrees from the vertical as illustrated in Figure 1A in Appendix 3
Statement of commitments	The Applicant's commitments in Appendix 9
Subsidence	The totality of subsidence effects, subsidence impacts and environmental consequences of subsidence impacts
Subsidence effects	Deformation of the ground mass due to mining, including all mining-induced ground movements, such as vertical and horizontal displacement, tilt, strain and curvature
Subsidence impacts	Physical changes to the ground and its surface caused by subsidence effects, including tensile and shear cracking of the rock mass, localised buckling of strata caused by valley closure and upsidence and surface depressions or troughs
Subsidence Zone A	The area shown as Zone A in Figure 1 in Appendix 3 in which long-term stable mining systems generating no more than 20 mm of surface subsidence may be utilised
Subsidence Zone B	The area shown as Zone B in Figure 1 in Appendix 3 in which mining systems generating no more than 780 mm of surface subsidence may be utilised
Surface facilities sites	The Chain Valley Colliery surface facilities site; the Summerland Point ventilation shaft site; and any other site subject to existing or proposed surface disturbance associated with the development
TfNSW	Transport for NSW
Threatened Species	As defined under the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*

SCHEDULE 2
ADMINISTRATIVE CONDITIONS

OBLIGATION TO MINIMISE HARM TO THE ENVIRONMENT

1. In addition to meeting the specific performance measures and criteria established under this consent, the Applicant must implement all reasonable and feasible measures to prevent, and if prevention is not reasonable and feasible, minimise, any material harm to the environment that may result from the construction and operation of the development, and any rehabilitation required under this consent.

TERMS OF CONSENT

2. The development may only be carried out:
   (a) in compliance with the conditions of this consent;
   (b) in accordance with the statement of commitments in Appendix 9;
   (c) in accordance with the Subsidence Zones in Appendix 3;
   (d) in accordance with all written directions of the Planning Secretary; and
   (e) generally in accordance with the EIS, SEE (Mod 1), SEE (Mod 2), SEE (Mod 3) and SEE (Mod 4).

3. Consistent with the requirements in this consent, the Planning Secretary may make written directions to the Applicant in relation to:
   (a) the content of any strategy, study, system, plan, program, review, audit, notification, report or correspondence submitted under or otherwise made in relation to this consent, including those that are required to be, and have been, approved by the Planning Secretary; and
   (b) the implementation of any actions or measures contained in any such document referred to in condition 3(a).

4. The conditions of this consent and directions of the Planning Secretary prevail to the extent of any inconsistency, ambiguity or conflict between them and a document/s listed in condition 2(e). In the event of an inconsistency, ambiguity or conflict between any of the document/s listed in condition 2(e), the most recent document prevails to the extent of the inconsistency, ambiguity or conflict.

LIMITS ON CONSENT

Mining Operations

5. The Applicant may carry out mining operations on the site until 31 December 2027.

   Note: Under this consent, the Applicant is required to rehabilitate the site and perform additional undertakings to the satisfaction of either the Planning Secretary or the RR. Consequently, this consent 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.

Coal Extraction

6. The Applicant must not extract more than 2.1 million tonnes of ROM coal from the site in any calendar year.

Coal Transport – Public Roads

7. The Applicant must ensure that no laden coal trucks are dispatched from the site to public roads outside of the hours of 5:30 am to 5:30 pm, Monday to Friday, and not at all on Saturdays, Sundays or public holidays.

8. The Applicant must not dispatch from the site more than:
   (a) 660,000 tonnes of product coal in any calendar year to the Port of Newcastle for export;
   (b) 180,000 tonnes of product coal in any calendar year to domestic customers other than Vales Point Power Station;
   (c) a total of 270 laden coal trucks per day by public roads;
   (d) a total of 32 laden coal trucks per hour; and
   (e) an average of 16 laden coal trucks per hour by public roads during peak hour periods, calculated monthly, until the intersection of M1 Motorway and Sparks Road Interchange (East Side - unsignalised with stop sign) is upgraded to a signalised intersection.

Coal Transport – Vales Point Power Station

9. The Applicant must ensure that only private roads are used for the transport of coal by truck to Vales Point Power Station, except in an emergency. In an emergency, product coal may be transported by public roads,

with the prior written approval of the Planning Secretary, and subject to any restrictions that the Planning Secretary may impose.

10. The Applicant must restrict the transport of coal by truck to the Vales Point Power Station between 10 pm and 5:30 am to:
    (a) 16 laden trucks per hour for the Spring and Autumn months; and
    (b) zero during Winter months.

PLANNING AGREEMENT

11. Within 12 months of the date of this consent, unless otherwise agreed by the Planning Secretary, the Applicant must enter into a planning agreement with the CC Council in accordance with Division 6 of Part 4 of the EP&A Act that provides for payment to the CC Council for community enhancement purposes.

    The agreement must include provision for those matters set out in condition 12 below.

    If there is any dispute between the Applicant and CC Council relating to the preparation or implementation of the planning agreement, then either party may refer the matter to the Planning Secretary for resolution.

COMMUNITY ENHANCEMENT

12. The Applicant must pay CC Council $0.035 for each tonne of product coal produced by the development for the purposes of improving public infrastructure and providing community projects for the communities of Summerland Point, Gwandalan, Chain Valley Bay and Mannering Park. Payments from the approval date of project approval 10_0161 must be:
    (a) made by the end of March, for coal produced in the previous calendar year;
    (b) made for each year that coal is produced by the colliery; and
    (c) subject to indexation in accordance with the Australian Bureau of Statistics Consumer Price Index.

13. Deleted.

14. Deleted.

STRUCTURAL ADEQUACY

15. The Applicant must ensure that all new buildings and structures, and any alterations or additions to existing buildings and structure, that are part of the development are constructed in accordance with:
    (a) the relevant requirements of the BCA; and
    (b) any additional requirements of the SA NSW where the building or structure is located on land within declared Mine Subsidence Districts.

Notes:

- *Under Part 8 of the EP&A Act, the Applicant is required to obtain construction and occupation certificates for the proposed building works;*
- *Part 8 of the EP&A Regulation sets out the requirements for the certification of the development; and*
- *Under section 21 of the Coal Mine Subsidence Compensation Act 2017, the Applicant is required to obtain the SA NSW's approval before constructing any improvements in a Mine Subsidence District.*

DEMOLITION

16. The Applicant must ensure that all demolition work is carried out in accordance with *Australian Standard AS 2601-2001: The Demolition of Structures,* or its latest version.

OPERATION OF PLANT AND EQUIPMENT

17. All plant and equipment used on site, or to monitor the performance of the development must be:
    (a) maintained in a proper and efficient condition; and
    (b) operated in a proper and efficient manner.

18. Deleted

ROAD MAINTENANCE CONTRIBUTION

19. The Applicant must pay Road Maintenance Fees to CC Council in accordance with its Road Maintenance Agreement with CC Council.

COMMUNITY CONSULTATIVE COMMITTEE

20. A Community Consultative Committee (CCC) must continue to operate for the development in accordance with the Department's *Community Consultative Committee Guidelines: State Significant Projects (2019)*. The CCC must continue to operate during the life of the development, or other timeframe agreed by the Planning Secretary.

Notes:

- *The CCC is an advisory committee only.*
- *In accordance with the Guidelines, the Committee should comprise an independent chair and appropriate representation from the Applicant, Affected Councils and the local community.*

21. With the approval of the Planning Secretary, the Applicant may combine the CCC required by this consent with any similar CCC required by a consent or approval for any adjoining mine subject to common, shared or related ownership or management.

EVIDENCE OF CONSULTATION

22. Where conditions of this consent require consultation with an identified party, the Applicant must:
    (a) consult with the relevant party prior to submitting the subject document;
    (b) provide details of the consultation undertaken including:
        i. the outcome of that consultation, matters resolved and unresolved; and
        ii. details of any disagreement remaining between the party consulted and the Applicant and how the Applicant has addressed the matters not resolved.

STAGING, COMBINING AND UPDATING STRATEGIES, PLANS OR PROGRAMS

23. With the approval of the Planning Secretary, the Applicant may:
    (a) prepare and submit any strategy, plan or program required by this consent on a staged basis (if a clear description is provided as to the specific stage and scope of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program);
    (b) combine any strategy, plan or program required by this consent (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined);
    (c) update any strategy, plan or program required by this consent (to ensure the strategies, plans and programs required under this consent are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the development); and
    (d) combine any strategy, plan or program required by this consent with any similar strategy, plan or program required by an adjoining mining consent or approval, in common ownership or management.

24. If the Planning Secretary agrees, a strategy, plan or program may be staged or updated without consultation being undertaken with all parties required to be consulted in the relevant condition in this consent.

25. If the Planning Secretary agrees, a strategy, plan or program may be staged without addressing particular requirements of the relevant condition of this consent if those requirements are not applicable to the particular stage.

APPLICATION OF EXISTING STRATEGIES, PLANS OR PROGRAMS

26. The Applicant must continue to apply existing management strategies, plans or monitoring programs approved prior to the approval of Modification 3, until the approval of a similar plan, strategy or program following the approval of Modification 3.

PROTECTION OF PUBLIC INFRASTRUCTURE

27. Unless the Applicant and the applicable authority agree otherwise, the Applicant must:

    (a) repair, or pay the full costs associated with repairing, any public infrastructure[a] that is damaged by carrying out the development; and
    (b) relocate, or pay the full costs associated with relocating, any public infrastructure[a] that needs to be relocated as a result of the development.

[a] *This condition does not apply to any damage to roads caused as a result of general road usage or to damage that has been compensated under the Mining Act 1992.*

COMPLIANCE

28. The Applicant must ensure that all of its employees, contractors (and their sub-contractors) are made aware of, and are instructed to comply with, the conditions of this consent relevant to activities they carry out in respect of the development.

APPLICABILITY OF GUIDELINES

29. References in the conditions of this consent to any guideline, protocol, Australian Standard or policy are to such guidelines, protocols, Standards or policies in the form they are in as at the date of inclusion (or later update) in the condition.

30. However, consistent with the conditions of this consent and without altering any limits or criteria in this consent, the Planning Secretary may, in respect of ongoing monitoring and management obligations, agree to or require compliance with an updated or revised version of such a guideline, protocol, Standard or policy, or a replacement of them.

SCHEDULE 3
ENVIRONMENTAL CONDITIONS – GENERAL

TRANSPORT

Monitoring of Coal Transport

1. The Applicant must:
   (a) keep accurate records of the amount of coal transported from the site (on a weekly basis); and
   (b) make these records publicly available on its website at the end of each calendar quarter.

Road Works

2. The Applicant must upgrade the Ruttleys Road and Construction Road intersection within 6 months of the date of this consent, unless the Planning Secretary directs otherwise, by:
   (a) installing additional signage on and adjacent to Construction Road prior to the intersection;
   (b) repairing the surface of Construction Road as required and ensuring the edge seal of the left turn lane is of sufficient width to accommodate coal trucks;
   (c) installing or replacing "Stop" signs in accordance with Austroads guidelines;
   (d) repainting road line markings and raised pavements associated with this intersection; and
   (e) installing barriers to prevent trucks parking on the gravel area adjacent to the intersection and the electricity substation located in the vicinity of this intersection.

   The design and construction of these works must be undertaken in consultation with, and to the relevant satisfaction of, CC Council, TfNSW and Delta Electricity and to the satisfaction of the Planning Secretary.

Road Transport Protocol

3. The Applicant must prepare a Road Transport Protocol to the satisfaction of the Planning Secretary. This protocol must:
   (a) be prepared in consultation with TfNSW, NCC, CC Council and CCC and submitted to the Planning Secretary for approval within 6 months of the date of this consent;
   (b) describe the designated haulage routes to be used (as shown in Appendix 5); the maximum number of road movements proposed and the haulage hours permitted under this consent;
   (c) include a Traffic Management Plan, which includes:
      - procedures to ensure that drivers adhere to the designated haulage routes;
      - measures to maximise the use of a low frequency (regular) trucking schedule rather than an intermittently-high frequency (campaign) trucking schedule, especially during the morning peak hour;
      - contingency plans to apply when (for example) the designated haulage route is disrupted, including procedures for notifying relevant agencies and affected communities of the need to implement such contingency plans;
      - procedures to ensure that all haulage vehicles associated with the development are clearly distinguishable as Chain Valley Colliery coal haulage trucks;
      - details of procedures for receiving and addressing complaints from the community concerning traffic issues associated with truck movements to and from the site;
      - measures to ensure that the provisions of the Traffic Management Plan are implemented, eg driver training in the heavy vehicle driver's Code of Conduct and contractual agreements with heavy vehicle operators; and
      - procedures for ensuring compliance with and enforcement of the heavy vehicle driver's Code of Conduct;
   (d) include a Code of Conduct for heavy vehicle drivers that addresses:
      - travelling speeds;
      - instructions to avoid grouping or convoying of trucks;
      - instructions to drivers not to overtake each other on the haulage route, as far as practicable, and to maintain appropriate distances between vehicles;
      - instruction to drivers to adhere to the designated haulage routes;
      - instruction to drivers to be properly safety conscious and to strictly obey all traffic regulations; and
      - appropriate penalties for infringements of the Code.

   The Applicant must implement the approved Road Transport Protocol as approved from time to time by the Planning Secretary.

Independent Traffic Audit

4. Prior to 31 March 2014, and every 12 months thereafter for each calendar year in which coal haulage from the site is undertaken utilising public roads, unless the Planning Secretary directs otherwise, the Applicant must commission a suitably qualified person, whose appointment has been approved by the Planning Secretary at least one month prior to undertaking the audit, to conduct an Independent Traffic Audit of the development. This audit must:
   (a) be undertaken without prior notice to the Applicant, and in consultation with TfNSW, NCC, CC Council and the CCC;
   (b) assess the impact of the development on the performance and safety of the road network, including a review of:
      - haulage records;
      - accident records on the haulage route, infringements relating to the code of conduct and any incidents involving haulage vehicles;
      - community complaints register; and
   (c) assess the effectiveness of the Road Transport Protocol; and, if necessary, recommend measures to reduce or mitigate any adverse (or potentially adverse) impacts.

5. Within 1 month of receiving the audit report, or as otherwise agreed by the Planning Secretary, the Applicant must submit a copy of the report to the Planning Secretary, with a detailed response to any of the recommendations contained in the audit report, including a timetable for the implementation of any measures proposed to address the recommendations in the audit report.

   A summary of the audit report must be included in the Annual Review.

Alternative Coal Transport Options

6. Prior to 31 December 2014, and every three years thereafter, the Applicant must prepare and submit to the Planning Secretary for approval, a study of the reasonable and feasible options to reduce or eliminate the use of public roads to transport coal from the development, unless otherwise agreed by the Planning Secretary. The assessment must include:
   (a) an analysis of the capital, construction and operating costs of the alternative transport options; and
   (b) quantified social and environmental impacts associated with road and rail transport.

NOISE

Noise Impact Assessment Criteria

7. The Applicant must ensure that the noise generated by the development at any residence on privately-owned land does not exceed the criteria for the location in Table 1 nearest to that residence.

Table 1: Noise Criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
R8	38	38	38	45
R11	49	49	49	54
R12	49	49	49	53
R13	43	43	43	49
R15	36	36	36	45
R19	37	37	37	45
R22	46	46	46	46
all other privately-owned land	35	35	35	45

Notes:
- *To interpret the locations referred to in Table 1, see Appendix 6 and the EIS; and*
- *Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 8 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.*

However, these criteria do not apply if the Applicant has a written agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

8. The Applicant must:
   (a) implement best management practice, including all reasonable and feasible noise mitigation measures, to minimise the construction, operational and transport noise generated by the development;
   (b) regularly assess the noise monitoring and meteorological data and relocate, modify, and/or stop operations on site to ensure compliance with the relevant conditions of this consent;
   (c) minimise the noise impacts of the development during meteorological conditions under which the noise limits in this consent do not apply (see Appendix 8);
   (d) use its best endeavours to achieve the long-term noise goals in Table 2, where reasonable and feasible, and report on progress towards achieving these goals in each Annual Review;
   (e) carry out a comprehensive noise audit of the development in conjunction with each independent environmental audit; and
   (f) prepare an action plan to implement any additional reasonable and feasible onsite noise mitigation measures identified by each audit;
   to the satisfaction of the Planning Secretary.

Table 2: Long-term Noise Goals dB(A)

Location	***Day***	***Evening***	***Night***
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$
R11 – R13	41	41	41
R22	40	40	40

Notes:
- *To interpret the locations referred to in Table 2, see Appendix 6 and the EIS; and*
- *Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 8 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.*

Noise Management Plan

9. The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
   (a) be prepared in consultation with the EPA and submitted to the Planning Secretary for approval within 4 months of the date of this consent, unless otherwise agreed by the Planning Secretary;
   (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
   (c) describe the proposed noise management system in detail including the mitigation measures that would be implemented to minimise noise during construction and operations, including on and off site road noise generated by vehicles associated with the development; and
   (d) include a monitoring program that:
      - uses attended monitoring to evaluate the compliance of the development against the noise criteria in this consent;
      - evaluates and reports on:
         - the effectiveness of the on-site noise management system; and
         - compliance against the noise operating conditions; and
      - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

The Applicant must implement the Noise Management Plan as approved by the Planning Secretary.

AIR QUALITY

Odour

10. The Applicant must ensure that no offensive odours are emitted from the site, as defined under the POEO Act.

Air Quality Criteria

11. The Applicant must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the development do not cause exceedances of the criteria listed in Table 3 at any residence on privately-owned land.

Table 3: Air quality criteria

Pollutant	***Averaging period***	***Criterion***	
Particulate matter < 2.5 µm ($PM_{2.5}$)	Annual	[a, c] 8 µg/m^3	
	24 hour	[b] 25 µg/m^3	
Particulate matter < 10 µm (PM_{10})	Annual	[a, c] 25 µg/m^3	
	24 hour	[b] 50 µg/m^3	
Total suspended particulate (TSP) matter	Annual	[a, c] 90 µg/m^3	
[d] Deposited dust	Annual	[b] 2 g/m^2/month	[a] 4 g/m^2/month

Notes:
[a] *Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).*
[b] *Incremental impact (i.e. incremental increase in concentrations due to the development on its own).*
[c] *Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.*
[d] *Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.*

11A. The air quality criteria in Table 3 do not apply if the Applicant has an agreement with the owner/s of the relevant residence or land to exceed the air quality criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

12. The Applicant must:
(a) implement best practice air quality management at the site, including all reasonable and feasible measures to minimise the off-site odour, fume and dust emissions generated by the development;
(b) implement best practice management to minimise the risk of spontaneous combustion and related emissions;
(c) implement all reasonable and feasible measures to minimise the release of greenhouse gas emissions from the site;
(d) operate an air quality management system on site to ensure compliance with the relevant conditions of this consent;
(e) minimise the air quality impacts of the development during adverse meteorological conditions and extraordinary events (see note c to Table 3 above);
(f) regularly assess the air quality monitoring data, and modify operations on site to ensure compliance with the relevant conditions of this consent,
to the satisfaction of the Planning Secretary.

Air Quality Management Plan

13. The Applicant must prepare an Air Quality Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
    (a) be prepared in consultation with the EPA, and submitted to the Planning Secretary for approval within 6 months of the date of this consent;
    (b) describe the measures that would be implemented to ensure compliance with the relevant air quality criteria and operating conditions of this consent;
    (c) describe the measures that would be implemented to minimise the release of greenhouse gas emissions from the site;
    (d) describe the proposed on-site air quality management system; and
    (e) include an air quality monitoring program that:
    - is capable of evaluating the operating conditions of this consent;
    - evaluates and reports on:
        - the effectiveness of the air quality management system; and
        - compliance against the air quality operating conditions;
    - defines what constitutes an air quality incident and includes a protocol for identifying and notifying the Department and relevant stakeholders of any air quality incidents.

The Applicant must implement the Air Quality Management Plan as approved by the Planning Secretary.

METEOROLOGICAL MONITORING

14. During the life of the development, the Applicant must ensure that there is a suitable meteorological station operating in the vicinity of the site that:
    (a) complies with the requirements in the *Approved Methods for Sampling of Air Pollutants in New South* Wales guideline; and
    (b) is capable of continuous real-time measurement of temperature lapse rate in accordance with the NSW Industrial Noise Policy, unless a suitable alternative is approved by the Planning Secretary following consultation with the EPA.

SOIL & WATER

Note: Under the Water Act 1912 and/or the Water Management Act 2000, the Applicant is required to obtain the necessary water licences for the development.

Water Supply

15. The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of mining operations to match its available water supply, to the satisfaction of the Planning Secretary.

Water Pollution

16. Unless an EPL authorises otherwise, the Applicant must comply with Section 120 of the POEO Act.

Sewage Management

17. The Applicant must manage sewage generated by the development in accordance with the requirements of an EPL.

Water Management Plan

18. The Applicant must prepare a Water Management Plan for the surface facilities sites to the satisfaction of the Planning Secretary. This plan must be prepared in consultation with DPIE Water and EPA, by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary and submitted to the Planning Secretary for approval within 6 months of the date of this consent. This plan must include:
    (a) a comprehensive water balance for the development that includes details of:
    - sources and security of water supply;
    - water make in the underground workings;
    - water transfers from the underground operations to the surface;
    - water use; and
    - any water discharges;
    (b) management plans for the surface facilities sites, that include:
    - a detailed description of water management systems for each site, including:
        - clean water diversion systems;

- erosion and sediment controls; and
- any water storages;

• measures to minimise potable water use and to reuse and recycle water;
• measures to manage acid sulphate soils, if encountered;
• activities that would involve ground disturbance at the site; and
• monitoring and reporting procedures.

(c) a Surface Water Management Plan which:
- includes baseline data on surface water flows and quality of Swindles Creek;
- details surface water impact assessment criteria, including trigger levels for investigating any potentially adverse impacts on surface water resources or surface water quality;
- provides a program to monitor:
  - surface water discharges;
  - surface water flows and quality; and
  - channel stability;

(d) a Ground Water Monitoring Program which includes a program to:
- monitor and report groundwater inflows to underground workings;
- predict, manage and monitor impacts to nearby groundwater bores on privately-owned land that may be impacted by the development; and

(e) a detailed review of surface water management at the site, with particular reference to the water storages within the dirty water management system, to:
- determine whether the capacity, integrity, retention time and management of the dirty water storages (particularly the final Pollution Control Dam) are sufficient to ensure that water discharged from the site meets the EPL limits and surface water impact assessment criteria within the Surface Water Management Plan; and
- propose any appropriate changes to the surface water management system.

The Applicant must implement the Water Management Plan as approved by the Planning Secretary.

Note: The Planning Secretary may require the Applicant to implement upgrades and other changes identified under paragraph (e), in accordance with condition 3 of Schedule 2.

BIODIVERSITY

Biodiversity Enhancement Strategy

19. The Applicant must implement a Biodiversity Enhancement Strategy as described in the EIS and summarised in Table 4, in consultation with BCD, and to the satisfaction of the Planning Secretary.

Table 4*: Summary of the Biodiversity Enhancement Strategy*

Area	***Offset Type***	***Minimum Size/Amount***
Biodiversity Enhancement Area	Enhancement and restoration measures, including weed and rubbish removal, return of natural hydrological regime and regeneration with native endemic species.	3 ha (in total) of Swamp Sclerophyll Floodplain Forest and Swamp Oak Floodplain Forest endangered ecological communities within the surface facilities sites

Note: To identify the Biodiversity Enhancement Area referred to in Table 4 see the applicable figures in Appendix 7.

The Applicant must implement its preferred option of the three options set out in new dot point 1 of the Terrestrial Ecology section of its Statement of Commitments by 1 December 2016, following consultation with BCD and to the satisfaction of the Planning Secretary.

Biodiversity Management Plan

20. The Applicant must prepare a Biodiversity Management Plan for the surface facilities sites, for all areas that are not, or will not, be subject to condition 7 of schedule 4, to the satisfaction of the Planning Secretary. This plan must:

(a) be prepared by a suitably qualified person approved by the Planning Secretary; in consultation with BCD, and submitted to the Planning Secretary within 6 months of the date of this consent;

(b) establish baseline data for the existing habitat in the Biodiversity Enhancement Area and elsewhere on the site;

(c) describe the short, medium, and long term measures that would be implemented to:
• manage the impacts of clearing vegetation;

- manage the remnant vegetation and habitat in the Biodiversity Enhancement Area and elsewhere on the site; and
- implement the Biodiversity Enhancement Strategy, including detailed performance and completion criteria;

(d) include a program to monitor and report on the effectiveness of these measures, and progress against the detailed performance and completion criteria;

(e) identify the potential risks to the successful implementation of the Biodiversity Enhancement Strategy, and the contingency measures that would be implemented to mitigate these risks; and

(f) include details of who would be responsible for monitoring, reviewing, and implementing the plan.

The Applicant must implement the Biodiversity Management Plan as approved by the Planning Secretary.

20A. Within 3 months of the approval of MOD 2, the Applicant must revise the Biodiversity Management Plan to incorporate the measures required to implement its commitments described in new dot point 2 of the Terrestrial Ecology section of its Statement of Commitments, and submit it to the Planning Secretary for approval.

HERITAGE

Protection of Aboriginal Heritage

21. The Applicant must ensure that the development does not cause any direct or indirect impact on any identified heritage item located outside the approved disturbance area, beyond those predicted in the documents listed in condition 2(e) of Schedule 2.

Heritage Management Plan

21A. The Applicant must prepare a Heritage Management Plan for the development to the satisfaction of the Planning Secretary. This Plan must:

(a) be prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary;

(b) be prepared in consultation with BCD and Registered Aboriginal Parties;

(c) include consideration of the Aboriginal and non-Aboriginal cultural context and significance of the site;

(d) describe the procedures and management measures to be implemented on the site or within any offset area to:

i. ensure all workers receive suitable Aboriginal cultural heritage inductions prior to carrying out any activities which may cause impacts to Aboriginal objects or Aboriginal places, and that suitable records are kept of these inductions;

ii. protect, monitor and manage identified non-Aboriginal heritage, Aboriginal objects and Aboriginal places (including any proposed archaeological investigations of potential subsurface objects and salvage of objects within the approved disturbance area) in accordance with the commitments made in the document/s listed in condition 2(e) of Schedule 2 and including the ongoing monitoring of site 45-7-0189 at Summerland Point;

iii. protect non-Aboriginal heritage, Aboriginal objects and Aboriginal places located outside the approved disturbance area from impacts of the development;

iv. manage the discovery of suspected human remains and any new Aboriginal objects or Aboriginal places, including provisions for burials, over the life of the development;

v. maintain and manage reasonable access for relevant Aboriginal stakeholders to Aboriginal objects and Aboriginal places (outside of the approved disturbance area); and

vi. facilitate ongoing consultation and involvement of Registered Aboriginal Parties in the conservation and management of Aboriginal cultural heritage on the site; and

(e) include a strategy for the care, control and storage of Aboriginal objects salvaged on site, both during the life of the development and in the long term.

The Applicant must implement the Heritage Management Plan approved by the Planning Secretary.

VISUAL

Visual Amenity and Lighting

22. The Applicant must:

(a) minimise visual impacts, and particularly the off-site lighting impacts, of the Surface facilities sites;

(b) take all reasonable and feasible measures to further mitigate off-site lighting impacts from the development; and

(c) ensure that all external lighting associated on site complies with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting,*

to the satisfaction of the Planning Secretary.

WASTE

23. The Applicant must:
    (a) minimise and monitor the waste generated by the development;
    (b) ensure that the waste generated by the development is appropriately stored, handled and disposed of; and
    (c) report on waste management and minimisation in the Annual Review,

    to the satisfaction of the Planning Secretary.

BUSHFIRE MANAGEMENT

24. The Applicant must:
    (a) ensure that the development is suitably equipped to respond to any fires on site; and
    (b) assist the Rural Fire Service and emergency services as much as possible if there is a fire in the vicinity of the Surface facilities sites.

REHABILITATION

Rehabilitation Objectives

25. The Applicant must rehabilitate the site in accordance with the conditions imposed on the mining lease(s) associated with the development under the *Mining Act 1992*. This rehabilitation must be generally consistent with the proposed rehabilitation strategy described in the EIS, and comply with the objectives in Table 5.

Table 5: Rehabilitation Objectives

Feature	***Objective***
Mine site (as a whole)	• Safe, stable and non-polluting. • Final land use compatible with surrounding land uses.
Surface infrastructure	• To be decommissioned and removed, unless the RR agrees otherwise.
Portals and ventilation shafts	• To be decommissioned and made safe and stable. • Retain habitat for threatened species (eg bats), where practicable.
Other land affected by the development	• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of: - local native plant species (unless the RR agrees otherwise); and - a landform consistent with the surrounding environment.
Built features damaged by mining operations	• Repair to pre-mining condition or equivalent unless: - the owner agrees otherwise; or - the damage is fully restored, repaired or compensated under the *Coal Mine Subsidence Compensation Act 2017*.
Community	• Ensure public safety. • Minimise the adverse socio-economic effects associated with mine closure.

Notes:

- *These rehabilitation objectives apply to all subsidence impacts and environmental consequences caused by underground mining taking place after the granting of project approval MP 10_0161, and to all development surface infrastructure that is part of the development, whether constructed prior to or following the date of this consent.*
- *Rehabilitation of subsidence impacts and environmental consequences caused by mining which took place prior to the date of project approval (MP 10_0161) may be subject to the requirements of other approvals (eg under a mining lease or a Subsidence Management Plan approval).*

Progressive Rehabilitation

26. The Applicant must carry out the rehabilitation of the site progressively, that is, as soon as reasonably practicable following disturbance.

Rehabilitation Management Plan

27. The Applicant must prepare a Rehabilitation Management Plan for the development, in accordance with the conditions imposed on the mining lease(s) associated with the development under the *Mining Act 1992*. This plan must:

(a) be prepared in consultation with BCD, DPIE Water, CC Council, LMCC and the CCC;
(b) be submitted to the RR within 12 months of the date of approval of this development consent;
(c) be prepared in accordance with any relevant RR guideline and be consistent with the rehabilitation objectives in the EIS and in Table 5;
(d) describe how the performance of the rehabilitation would be monitored and assessed against the objectives in Table 5;
(e) describe the process whereby additional measures would be identified and implemented to ensure the rehabilitation objectives are achieved;
(f) provide for detailed mine closure planning, including measures to minimise socio-economic effects due to mine closure, to be conducted prior to the site being placed on care and maintenance; and
(g) be integrated with the other management plans required under this consent.

Note: The Rehabilitation Management Plan should address all land impacted by the development whether prior to, or following, the date of this consent.

EXPLORATION ACTIVITIES AND SURFACE INFRASTRUCTURE

Exploration Activities and Minor Surface Infrastructure Management Plan

28. Prior to carrying out exploration activities on the site under this consent that would cause temporary surface disturbance, or exploration activities within the waters or lake bed of Lake Macquarie, or the construction and/or upgrade of minor surface infrastructure on the site, the Applicant must prepare an Exploration Activities and Minor Surface Infrastructure Management Plan for the development to the satisfaction of the Planning Secretary. This Plan must:
    (a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;
    (b) be prepared in consultation with MEG, NSW Maritime Division of TfNSW, NSW Fisheries and BCD;
    (c) include a description of the measures to be implemented for:
        i. managing exploration activities;
        ii. managing construction and operation of minor surface infrastructure and associated access tracks;
        iii. consulting with and if necessary compensating affected landowners;
        iv. assessing noise, air quality, traffic, biodiversity, heritage, public safety and other impacts;
        v. beneficial re-use or flaring of drained hydrocarbon gases, wherever practicable;
        vi. avoiding significant impacts and minimisation of impacts generally;
        vii. avoiding or minimising impacts on threatened species, populations or their habitats and EECs;
        viii. minimising clearance and disturbance of native vegetation (including seagrasses);
        ix. minimising and managing erosion and sedimentation; and
        x. rehabilitating disturbed areas.

    The Applicant must implement the Exploration Activities and Minor Surface Infrastructure Management Plan as approved by the Planning Secretary.

SCHEDULE 4
ENVIRONMENTAL CONDITIONS – UNDERGROUND MINING

SUBSIDENCE

1. The Applicant must ensure that vertical subsidence within the High Water Mark Subsidence Barrier and within seagrass beds is limited to a maximum of 20 millimetres (mm). If at any stage predicted subsidence levels are exceeded within these areas, an ecological monitoring program shall be initiated to assess the impacts to ecological communities and threatened species and if appropriate, offsets are to be provided for any impacts detected.

Performance Measures – Natural Environment

2. The Applicant must ensure that the development does not cause any exceedance of the performance measures in Table 6 to the satisfaction of the Planning Secretary.

Table 6: Subsidence Impact Performance Measures – Natural and Heritage Features

Biodiversity	
Threatened species or endangered populations	Negligible environmental consequences
Seagrass beds	Negligible environmental consequences including: • *negligible* change in the size and distribution of seagrass beds; • *negligible* change in the functioning of seagrass beds; and • *negligible* change to the composition or distribution of seagrass species within seagrass beds.
Benthic communities	Minor environmental consequences, including minor changes to species composition and/or distribution.
Mine workings	
First workings under an approved Extraction Plan beneath any feature where performance measures in this table require negligible environmental consequences	To remain long-term stable and non-subsiding.
Second workings	To be carried out only in accordance with an approved Extraction Plan.

Notes:

- *The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) for each of these performance measures in the various management plans that are required under this consent (see Condition 7 below).*
- *Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Planning Secretary will be the final arbiter.*
- *The requirements of this condition only apply to the impacts and consequences of mining operations, construction or demolition undertaken following the date of approval of this consent.*

Offsets

3. If the Applicant exceeds the performance measures in Table 6 and the Planning Secretary determines that:
   (a) it is not reasonable or feasible to remediate the impact or environmental consequence; or
   (b) the remediation measures implemented by the Applicant have failed to satisfactorily remediate the impact or environmental consequence;

   then the Applicant must provide a suitable offset to compensate for the impact or environmental consequence to the satisfaction of the Planning Secretary.

   Note: Any offset required under this condition must be proportionate with the significance of the impact or environmental consequence.

Performance Measures – Built Features

4. The Applicant must ensure that the development does not cause any exceedances of the performance measures in Table 7, to the satisfaction of the Planning Secretary.

Table 7: Subsidence Impact Performance Measures – Built Features

Built Features	***Performance Measure***
Trinity Point Marina Development Other built features	• Always safe. • Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. • Damage must be fully repaired, replaced or fully compensated.
Public Safety	
Public Safety.	Negligible additional risk.

Notes:

- *The Applicant will be required to define more detailed performance indicators for each of these performance measures in Built Features Management Plans or a Public Safety Management Plan (see Condition 7 below).*
- *Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Planning Secretary will be the final arbiter.*
- *The requirements of this condition only apply to the impacts and consequences of mining operations undertaken following the date of this development consent.*
- *Requirements regarding safety or serviceability do not preclude preventative actions or mitigation being taken prior to or during mining in order to achieve or maintain these outcomes.*
- *Requirements under this condition may be met by measures undertaken in accordance with the Coal Mine Subsidence Compensation Act 2017.*

5. Any dispute between the Applicant and the owner of any built feature over the interpretation, application or implementation of the subsidence performance measures in Table 7 is to be settled by the Planning Secretary, following consultation with the SA NSW and MEG. Any decision by the Planning Secretary shall be final and not subject to further dispute resolution under this consent.

Multi-Seam Mining Feasibility Investigation

6. Prior to the submission of an Extraction Plan related to the Chain Valley Bay mining area as shown in Appendix 3, the Applicant must prepare a detailed Multi-Seam Mining Feasibility Investigation to the satisfaction of the Planning Secretary. This plan must:
   (a) be prepared in consultation with MEG by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary;
   (b) assess the extent of the soft claystone floor/roof conditions within former workings in the Great Northern and Wallarah Seams;
   (c) assess the stability of remnant coal pillars within former workings in the Great Northern and Wallarah Seams;
   (d) give particular consideration to the risks of irregular subsidence, pillar run and long-term subsidence leading to subsidence outside of the predicted angle of draw;
   (e) include revised multi-seam subsidence predictions for the proposed second workings; and
   (f) recommend final design of the second workings and any necessary adaptive management measures.

Extraction Plan

7. The Applicant must prepare an Extraction Plan for all second workings on site, to the satisfaction of the Planning Secretary. Each Extraction Plan must:
   (a) be prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary;
   (b) be approved by the Planning Secretary before the Applicant carries out any second workings covered by the plan;
   (c) include detailed plans of existing and proposed first and second workings and any associated surface development, including any applicable adaptive management measures;
   (d) include detailed performance indicators for each of the performance measures in Tables 6 and 7;
   (e) provide revised predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed second workings, incorporating any relevant information obtained since this consent;
   (f) describe the measures that would be implemented to ensure compliance with the performance measures in Tables 6 and 7, and manage or remediate any impacts and/or environmental consequences;
   (g) include a Built Features Management Plan, which has been prepared in consultation with RR and the owners of affected public infrastructure, to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings, and which

- addresses in appropriate detail all items of public infrastructure and all classes of other built features;
- has been prepared following appropriate consultation with the owner/s of potentially affected feature/s;
- recommends appropriate remedial measures and includes commitments to mitigate, repair, replace or compensate all predicted impacts on potentially affected built features in a timely manner; and;

(h) include a Benthic Communities Management Plan, which has been prepared in consultation with BCD, LMCC, and DPI Fisheries, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on benthic communities, and which includes:
- surveys of the lake bed to enable contours to be produced and changes in depth following subsidence to be accurately measured;
- benthic species surveys within the area subject to second workings, as well as control sites outside the area subject to second workings (at similar depths) to establish baseline data on species number and composition within the communities;
- a program of ongoing seasonal monitoring of benthic species in both control and impact sites;
- development of a model to predict likely impact of increased depth and associated subsidence impacts and effects, including but not limited to light reduction and sediment disturbance, on benthic species number and benthic communities composition, incorporating the monitoring and survey data collected; and
- updating the model every 2 years using the most recent monitoring and survey data;

(i) include a Seagrass Management Plan, which has been prepared in consultation with BCD, LMCC, and DPI Fisheries, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on seagrass beds, and which includes:
- a program of ongoing monitoring of seagrasses in both control and impact sites; and
- a program to predict and manage subsidence impacts and environmental consequences to seagrass beds to ensure the performance measures in Table 6 are met;

(j) include a Public Safety Management Plan, which has been prepared in consultation with RR, to ensure public safety;

(k) include a Subsidence Monitoring Program which has been prepared in consultation with RR, to:
- provide data to assist with the management of the risks associated with subsidence;
- validates the subsidence predictions;
- analyses the relationship between the predicted and resulting subsidence effects and predicted and resulting impacts under the plan and any ensuing environmental consequences; and
- informs the contingency plan and adaptive management process;

(l) include a contingency plan that expressly provides for adaptive management where monitoring indicates that there has been an exceedance of any performance measure in Tables 6 and 7, or where any such exceedance appears likely;

(m) include appropriate revisions to the Rehabilitation Management Plan required under Condition 27 of Schedule 3; and

(n) include a program to collect sufficient baseline data for future Extraction Plans.

The Applicant must implement the Extraction Plan as approved by the Planning Secretary.

8. The Applicant must ensure that the management plans required under conditions 7(g)-(j) above include:

(a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this consent; and

(b) a detailed description of the measures that would be implemented to remediate predicted impacts.

First Workings

9. The Applicant may carry out first workings within Subsidence Zones A and B as shown in Appendix 3, other than in accordance with an approved Extraction Plan, provided that the first workings are designed to remain stable and non-subsiding in the long-term and do not generate more than 20 mm of vertical subsidence at the surface, except insofar as they may be impacted by approved second workings.

***Note**: The intent of this condition is to ensure that first workings are built to geotechnical and engineering standards sufficient to ensure long-term stability, with negligible direct subsidence impacts.*

9A. Within 3 months of the approval of MOD 1, the Applicant must produce and subsequently implement a Built Features Management Plan that considers surface infrastructure potentially affected by the first workings of the Underground Linkage between Chain Valley Colliery and Mannering Colliery, including WCS's MP01 sewer rising main, TransGrid's electricity transmission assets and infrastructure associated with the Vales Point Power Station, to the satisfaction of the Planning Secretary.

Payment of Reasonable Costs

10. The Applicant must pay all reasonable costs incurred by the Department to engage suitably qualified, experienced and independent experts to review the adequacy of any aspect of an Extraction Plan.

SCHEDULE 5
ADDITIONAL PROCEDURES

NOTIFICATION OF LANDOWNERS

1. As soon as practicable after obtaining monitoring results showing:
   (a) an exceedance of any relevant criteria in Schedule 3, the Applicant must notify affected landowners in writing of the exceedance, and provide regular monitoring results to each affected landowner until the development is again complying with the relevant criteria; and
   (b) an exceedance of any relevant air quality criteria in Schedule 3, the Applicant must send a copy of the NSW Health fact sheet entitled "Mine Dust and You" (*NSW Health, 2017*) (as may be updated from time to time) to the affected landowners and/or existing tenants of the land (including the tenants of any mine-owned land).

INDEPENDENT REVIEW

2. If an owner of privately-owned land considers the development to be exceeding the relevant criteria in Schedule 3, then he/she may ask the Planning Secretary in writing for an independent review of the impacts of the development on his/her land.

   If the Planning Secretary is satisfied that an independent review is warranted, then within 2 months of the Planning Secretary's decision the Applicant must:
   (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Planning Secretary, to:
      - consult with the landowner to determine his/her concerns;
      - conduct monitoring to determine whether the development is complying with the relevant criteria in Schedule 3; and
      - if the development is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and
   (b) give the Planning Secretary and landowner a copy of the independent review.

SCHEDULE 6
ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING

ENVIRONMENTAL MANAGEMENT

Environmental Management Strategy

1. The Applicant must prepare an Environmental Management Strategy for the development to the satisfaction of the Planning Secretary. This strategy must:
   (a) provide the strategic framework for environmental management of the development;
   (b) identify the statutory approvals that apply to the development;
   (c) set out the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development;
   (d) set out the procedures to be implemented to:
   - keep the local community and relevant agencies informed about the operation and environmental performance of the development;
   - receive record, handle and respond to complaints;
   - resolve any disputes that may arise during the course of the development;
   - respond to any non-compliance and any incident;
   - respond to emergencies; and

   (e) include:
   - references to any strategies, plans and programs approved under the conditions of this consent; and
   - a clear plan depicting all the monitoring to be carried out under the conditions of this consent.

   The Applicant must implement the Environmental Management Strategy as approved by the Planning Secretary.

Adaptive Management

2. The Applicant must assess and manage development-related risks to ensure that there are no exceedances of the criteria and performance measures in this consent. Any exceedance of these criteria or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation.

   Where any exceedance of these criteria or performance measures has occurred, the Applicant must, at the earliest opportunity:
   (a) take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
   (b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and
   (c) implement reasonable remediation measures as directed by the Planning Secretary.

Management Plan Requirements

3. Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:
   (a) a summary of relevant background or baseline data;
   (b) details of:
   - the relevant statutory requirements (including any relevant approval, licence or lease conditions);
   - any relevant limits or performance measures and criteria; and
   - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;

   (c) any relevant commitments or recommendations identified in the document/s listed in condition 2(e) of Schedule 2;
   (d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;
   (e) a program to monitor and report on the:
   - impacts and environmental performance of the development; and
   - effectiveness of the management measures set out pursuant to condition 2(e) of Schedule 2;

   (f) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;
   (g) a program to investigate and implement ways to improve the environmental performance of the development over time;
   (h) a protocol for managing and reporting any:
   - incident, non-compliance or exceedance of any impact assessment criterion or performance criterion;

- complaint; or
- failure to comply with other statutory requirements;

(i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and

(j) a protocol for periodic review of the plan.

Note: *The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*

4. The Applicant must ensure that management plans prepared for the development are consistent with the conditions of this consent and any EPL issued for the site.

REVISION OF STRATEGIES, PLANS AND PROGRAMS

5. Within three months of:

(a) the submission of an incident report under condition 6;

(b) the submission of an Annual Review under condition 8;

(c) the submission of an Independent Environmental Audit under condition 9; or

(d) the approval of any modification of the conditions of this consent (unless the conditions require otherwise),

the suitability of existing strategies, plans and programs required under this consent must be reviewed by the Applicant.

If necessary, to either improve the environmental performance of the development, cater for a modification or comply with a direction, the strategies, plans and programs required under this consent must be revised, to the satisfaction of the Planning Secretary. Where revisions are required, the revised document must be submitted to the Planning Secretary for approval within six weeks of the review.

Note: *This is to ensure strategies, plans and programs are updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the development.:*

REPORTING AND AUDITING

Incident Notification

6. The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing via the Department's Major Projects website and identify the development (including the development application number and name) and set out the location and nature of the incident.

Non-Compliance Notification

7. Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must be in writing via the Department's Major Projects website and identify the development (including the development application number and name), set out the condition of this consent that the development is non-compliant with, why it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.

Note*: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.*

Annual Review

8. By the end of March in each year after the commencement of the development, or other timeframe agreed by the Planning Secretary, a report must be submitted to the Department reviewing the environmental performance of the development, to the satisfaction of the Planning Secretary. This review must:

(a) describe the development (including any rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;

(b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the:
- relevant statutory requirements, limits or performance measures/criteria;
- requirements of any plan or program required under this consent;
- monitoring results of previous years; and
- relevant predictions in the document/s listed in condition 2(e) of Schedule 2;

(c) identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;

(d) evaluate and report on:
- the effectiveness of the noise and air quality management systems; and
- compliance with the performance measures, criteria and operating conditions of this consent;

(e) identify any trends in the monitoring data over the life of the development;

(f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and

(g) describe what measures will be implemented over the next calendar year to improve the environmental performance of the development.

Copies of the Annual Review must be submitted to the Affected Councils and made available to the CCC and any interested person upon request.

Independent Environmental Audit

9. By the end of February 2022, and every three years after, unless the Planning Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. The audit must:
   (a) led by a suitably qualified, experienced and independent auditor whose appointment has been endorsed by the Planning Secretary;
   (b) be led and conducted by a suitably qualified, experienced and independent team of experts (including any be expert in field/s specified by the Planning Secretary) whose appointment has been endorsed by the Planning Secretary;
   (c) be carried out in consultation with the relevant agencies and the CCC;
   (d) assess the environmental performance of the development and whether it is complying with the relevant requirements in this consent, water licences and mining leases for the development (including any assessment, strategy, plan or program required under these approvals);
   (e) review the adequacy of any approved strategy, plan or program required under the abovementioned approvals and this consent;
   (f) recommend appropriate measures or actions to improve the environmental performance of the development and any assessment, strategy, plan or program required under the abovementioned approvals and this consent; and
   (g) be conducted and reported to the satisfaction of the Planning Secretary.

10. Within three months of commencing an Independent Environmental Audit, or other timeframe agreed by the Planning Secretary, the Applicant must submit a copy of the audit report to the Planning Secretary, and any other NSW agency that requests it, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of the recommendations. The recommendations must be implemented to the satisfaction of the Planning Secretary.

Monitoring and Environmental Audits

11. Any condition of this consent that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, is taken to be a condition requiring monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act. This includes conditions in respect of incident notification, reporting and response, non-compliance notification, compliance report and independent audit.

    For the purposes of the condition, as set out in the EP&A Act, “monitoring” is monitoring of the development to provide data on compliance with the consent or on the environmental impact of the development, and an “environmental audit” is a periodic or particular documented evaluation of the development to provide information on compliance with the consent or the environmental management or impact of the development.

12. Noise and/or air quality monitoring under this consent may be undertaken at suitable representative monitoring locations instead of at privately-owned residences or other locations listed in Schedule 3, providing that these representative monitoring locations are set out in the respective management plan/s.

ACCESS TO INFORMATION

13. Until the completion of all rehabilitation required under this consent, the Applicant must:
   (a) make the following information and documents (as they are obtained, approved or as otherwise stipulated within the conditions of this consent) publicly available on its website:
      - the documents referred to in condition 2(e) of Schedule 2 of this consent;
      - all current statutory approvals for the development;
      - all approved strategies, plans and programs required under the conditions of this consent;
      - the proposed staging plans for the development if the construction, operation or decommissioning of the development is to be staged;
      - minutes of CCC meetings;
      - regular reporting on the environmental performance of the development in accordance with the reporting requirements in any plans or programs approved under the conditions of this consent;
      - a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs;
      - a summary of the current progress of the development;
      - contact details to enquire about the development or to make a complaint;

- a complaints register, updated monthly;
- the Annual Reviews of the development;
- audit reports prepared as part of any Independent Environmental Audit of the development and the Applicant's response to the recommendations in any audit report; and
- any other matter required by the Planning Secretary; and

(b) keep such information up to date, to the satisfaction of the Planning Secretary.

APPENDIX 1
SCHEDULE OF LAND

Notes:	
1.	All proposed secondary extraction for the Project (Mining Extension 1) is to occur under Lake Macquarie.
2.	The surface facilities for the Colliery are limited to “pit top area” adjacent to Vales Point Power Station, and the “ventilation shaft site” at Summerland Point.
3.	Refer to Figure 1 of Appendix 2 for the Site.

Project Related Surface Facilities				
Pit Top Area			Ventilation shaft site	
Lot	Deposited Plan		Lot	Deposited Plan
A	379918		1	226133
B	379918			
C	349733			
A	187570			
1B	339441			

All other areas within the Site				
Lot	Deposited Plan		Lot	Deposited Plan
7339	1167067		20	708344
7330	1148105		19	708344
593	727722		18	708344
594	727722		17	708344
D	349733		34	714879
1	410653		33	714879
23	708344		32	714879
21	708344		31	714879
2	1043151		64	31306
426	755266		65	31306
427	755266		66	31306
136	755266		67	31306
2	515214		68	31306
1	515214		69	31306
1	214300		70	31306
2	214300		71	31306
167	755266		72	31306
1	388154		73	31306
144	661695		74	31306
19	25593		75	31306
20	25593		76	31306
21	25593		77	31306
22	25593		78	31306
23	25593		79	31306
24	25593		139	31306
25	25593		140	31306
26	25593		141	31306
27	25593		142	31306
58	31306		143	31306
59	31306		144	31306
60	31306		145	31306
61	31306		146	31306
62	31306		147	31306
63	31306		148	31306
149	31306		175	31306
150	31306		176	31306
151	31306		177	31306
152	31306		178	31306
153	31306		179	31306
154	31306		180	31306

155	31306		181	31306
156	31306		187	31306
157	31306		188	31306
158	31306		189	31306
159	31306		190	31306
160	31306		191	31306
161	31306		192	31306
162	31306		193	31306
163	31306		194	31306
164	31306		195	31306
165	31306		238	31306
166	31306		239	31306
167	31306		240	31306
168	31306		241	31306
169	31306		242	31306
170	31306		46	31322
171	31306		47	31322
172	31306		48	31322
173	31306		78	31322
174	31306		4	981106
243	31306		3	981104
244	31306		11	13120
245	31306		12	13120
246	31306		13	13120
247	31306		14	13120
248	31306		15	13120
249	31306		16	13120
250	31306		17	13120
251	31306		18	13120
252	31306		19	13120
253	31306		20	13120
254	31306		21	13120
255	31306		22	13120
256	31306		23	13120
257	31306		24	13120
258	31306		60	13120
259	31306		30	13123
37	31322		31	13123
38	31322		A	368634
39	31322		100	1065718
40	31322		102	1065718
41	31322		20	1113256
42	31322		7329	1148149
43	31322		5	981103
44	31322		9	13120
45	31322		100	713777
32	13123		25	13120
33	13123		26	13120
34	13123		27	13120
35	13123		28	13120
36	13123		29	13120
37	13123		1	1221849
38	13123		2	1221849
39	13123		3	1221849
40	13123		4	1074358
41	13123			93941
168	13123			93945
182	31306		10	1235493
183	31306		11	1235493
184	31306		9	1235493
185	31306		189	8055
186	31306		252	8055

78	13123		186	8055
119	13123		127	13123
103	13123		47	13120
15	13123		2	806513
2	204202		135	8055
105	13123		117	8055
122	13123		2	551787
109	13123		45	15556
6	519261		71	15556
1	621171		100	790729
2	1013763		1	551787
111	13123		69	27749
69	13123		87	8055
13	13123		39	15556
3	250973		76	15556
124	13123		202	8055
23	13123		104	8055
802	1038413		197	8055
721	537942		101	790729
116	13123		53	27749
191	880592		49	27749
126	13123		254	8055
131	13123		81	8055
822	588493		199	8055
3	621171		138	8055
772	619779		41	15556
7	13120		12	15556
91	880881		44	27749
45	13120		25	27749
41	872109		54	15556
3	13120		126	8055
99	13123		1482	562711
42	872109		52	15556
37	13120		208	8055
2	621171		113	8055
39	13120		70	27749
49	13120		56	27749
153	17367		24	15556
773	619779		228	8055
771	619779		88	8055
112	13123		132	8055
82	13123		60	15556
43	13123		17	28068
141	13123		56	13123
120	13123		20	13123
108	13123		76	13123
5	981103		72	13123
66	13123		152	17367
14	28068		5	519261
106	13123		205	1017819
45	13123		92	13123
50	13123		522	543408
3	981104		80	13123
1	542486		521	543408
44	13123		30	13120

862	557889		83	13123
2	542486		34	13120
75	13123		36	13120
49	13123		351	840188
73	13123		32	13120
56	13120		101	558722
58	13120		8	524374
147	13123		102	558722
1	806513		86	13123
35	13120		821	588493
43	13120		6	13120
5	13120		2	579042
42	13120		2	270423
8	13120		6	270423
1	13120		1	270423
33	13120		4	270423
31	13120		1	1107356
46	13120		2	1107356
18	527120		1691	1110053
145	13123		1693	1110053
55	13120		1692	1110053
54	13120		2144	1124129
9	13120		7311	1141467
28	13120		7306	1146817
2	13120		101	1165194
450	818534		154	17367
3	579042		5	270423
48	13120		42	1073017
44	13120		60	1074161
84	13123		872	733417
29	13120		51	27749
52	13120		103	15556
100	713777		11	13123
4	13120		12	13123
1	579042		21	13123
51	13120		43	1073017
146	13123		41	1073017
38	13120		61	1074161
155	17367		63	1074161
57	13120		62	1074161
50	13120		3	270423
7	524374		1	1088536
861	557889		202	1093288
40	13120		201	1093288
144	13123		139	8055
911	747550		14	538780
53	13120		46	15556
912	747550		113	15556
352	840188		21	1029069
41	13120		119	8055
4	981106		230	8055
13	15556		25	15556
260	8055		211	8055
124	8055		112	8055
38	27749		142	8055

157	8055		227	8055
48	15556		28	15556
27	27749		109	15556
198	8055		142	15556
195	8055		223	8055
782	1060935		77	15556
812	816616		215	8055
32	15556		2	375836
155	8055		31	27749
134	8055		43	15556
130	8055		59	27749
75	15556		224	8055
15	15556		53	15556
3	15556		107	8055
256	8055		117	15556
26	27749		88	15556
51	15556		202	1020262
232	8055		236	8055
205	8055		19	15556
164	8055		1	250973
10	15556		47	27749
128	8055		115	8055
136	8055		89	8055
86	15556		106	8055
201	843074		35	27749
38	15556		133	8055
1	561577		34	27749
833	598304		154	8055
235	8055		42	27749
112	15556		72	15556
220	8055		21	15556
40	27749		207	8055
65	15556		98	8055
225	8055		127	8055
125	8055		120	8055
65	27749		48	27749
226	8055		101	15556
194	8055		101	8055
192	8055		234	8055
57	15556		33	524726
209	8055		832	598304
36	15556		156	8055
2061	1011261		191	1046133
121	8055		111	8055
147	8055		42	15556
115	15556		237	8055
871	733417		219	8055
47	15556		57	27749
39	27749		34	15556
40	15556		222	8055
52	27749		196	8055
28	27749		3	375836
97	8055		212	8055
200	843074		811	816616
67	27749		73	15556

58	15556		90	8055
23	15556		26	15556
120	15556		28	13123
129	13123		25	13123
1	505798		24	13123
18	28068		36	13123
10	13123		31	13123
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APPENDIX 2
DEVELOPMENT AREA

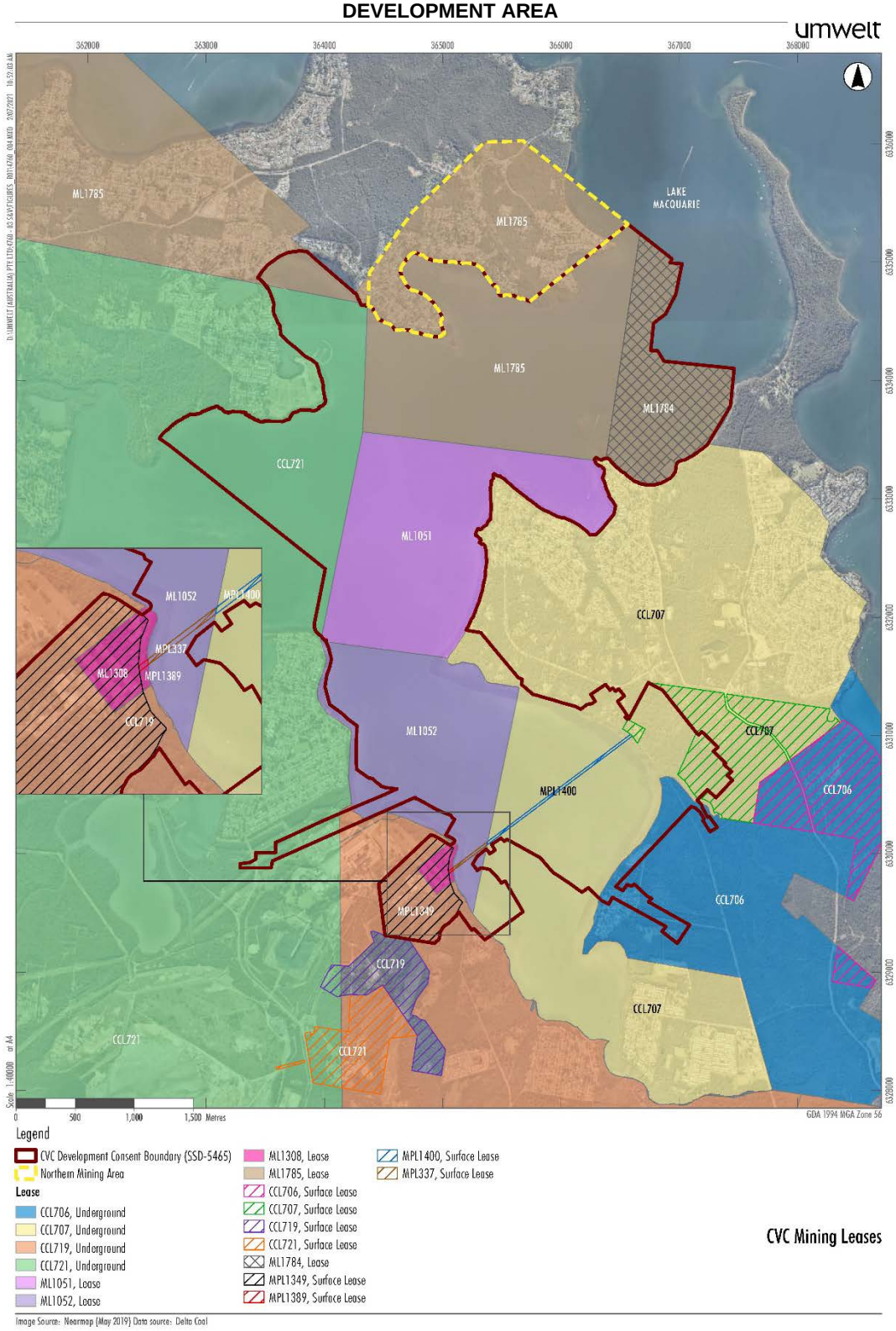


Figure 1: *Chain Valley Extension Project – Development Application Area and Lease Plan (The Site)*

APPENDIX 3
DEVELOPMENT LAYOUT

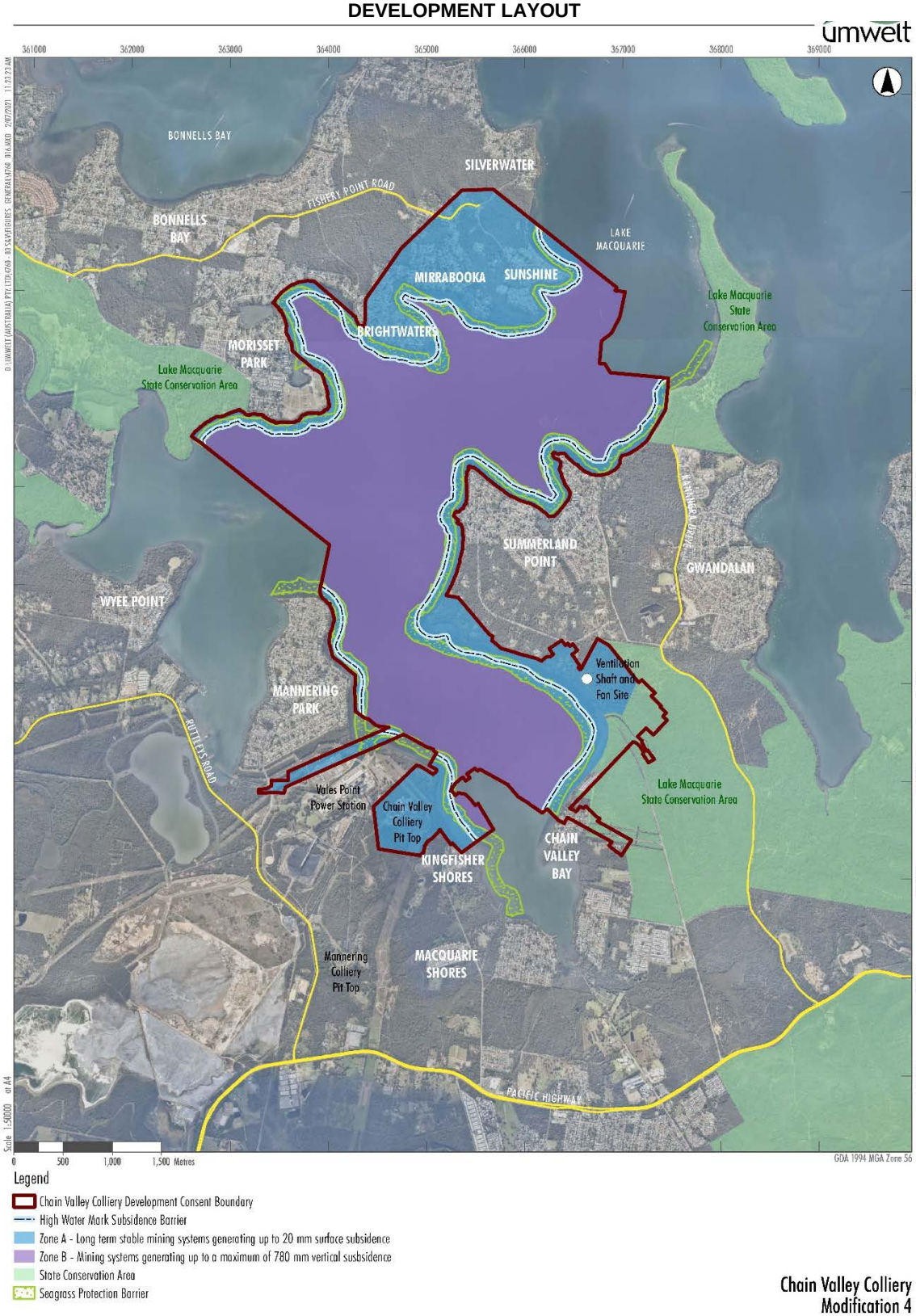


Figure 1: *Mining Areas Subsidence Management Zones*

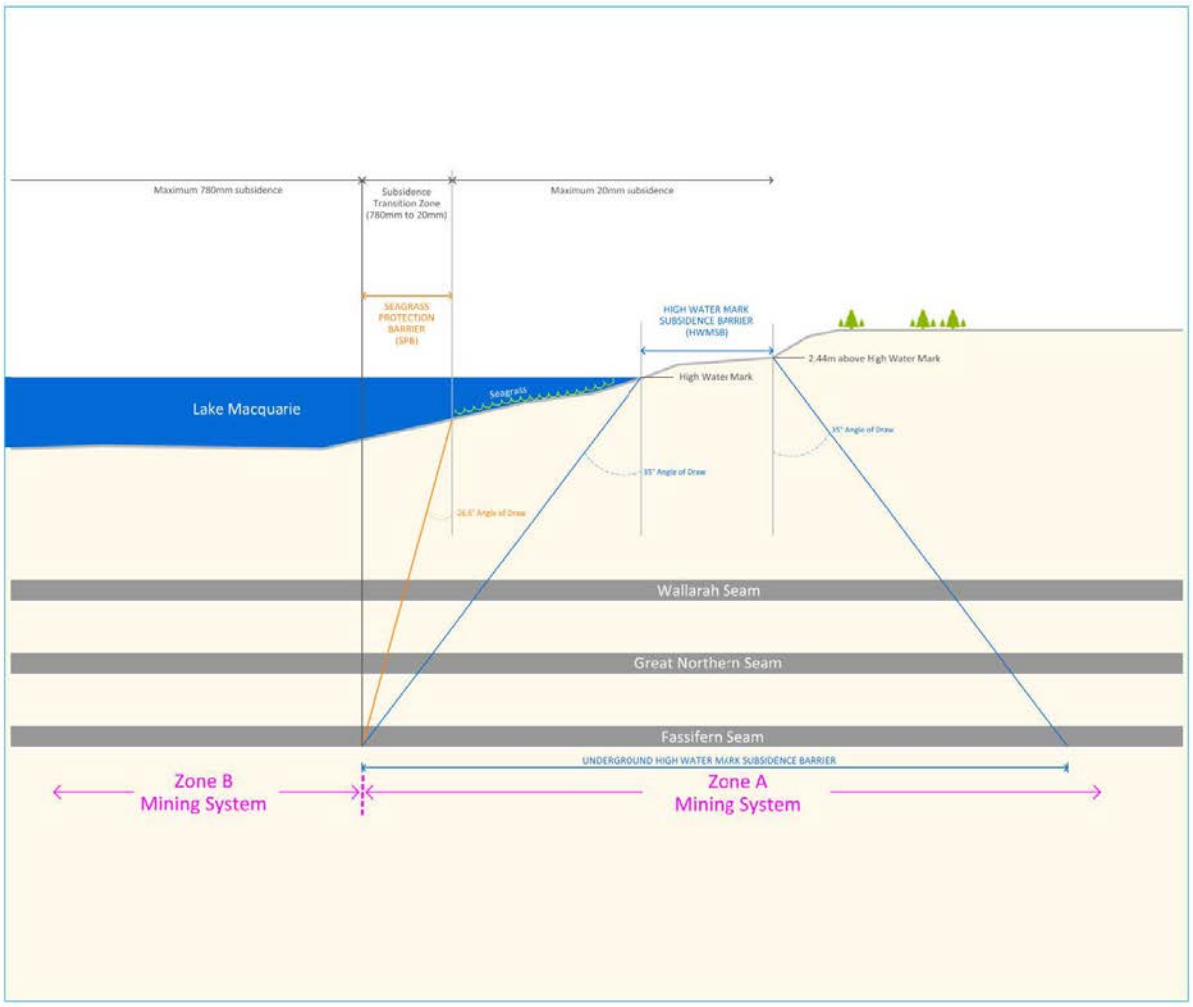


Figure 1A: *High Water Mark Subsidence Barrier and Seagrass Protection Barrier*

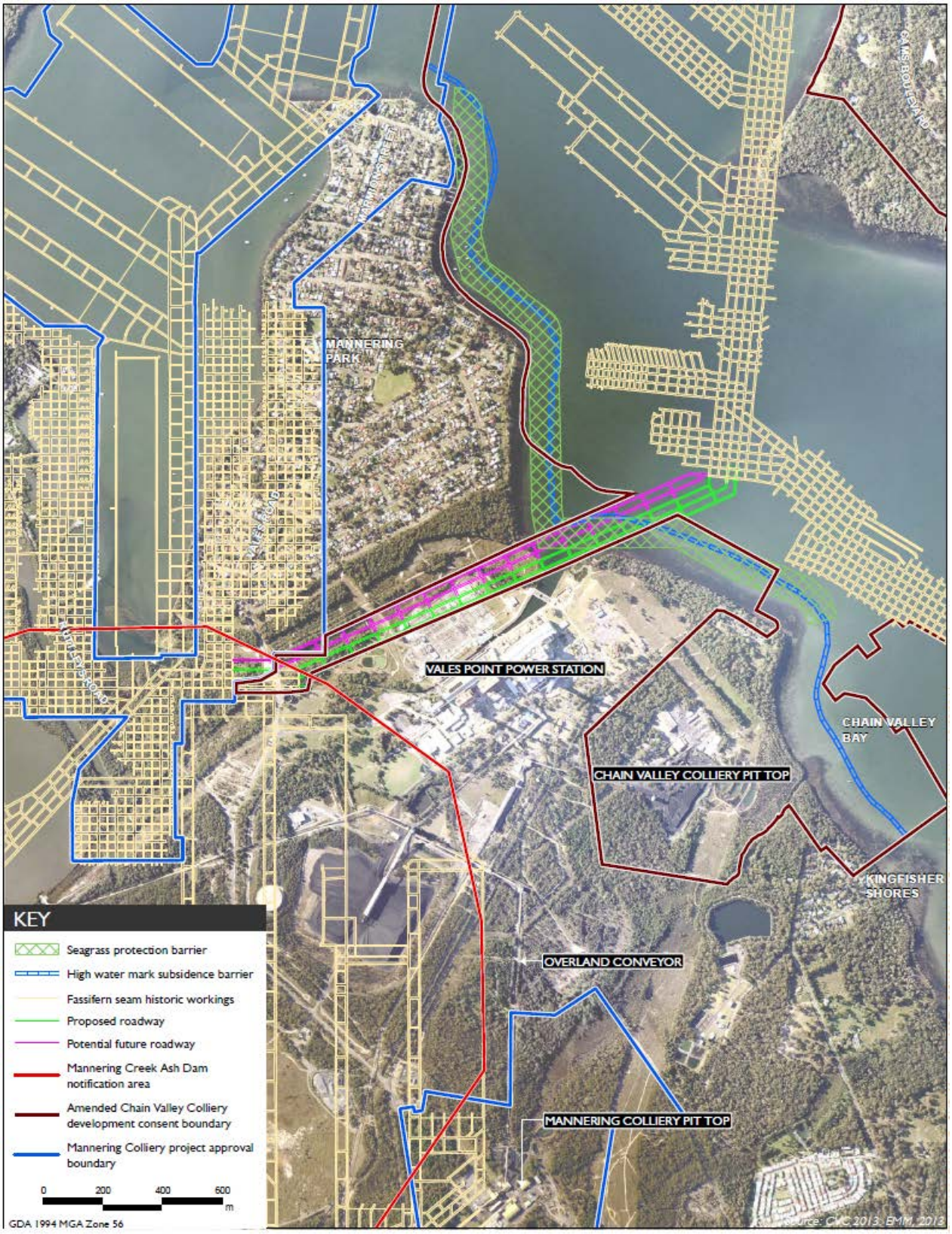


Figure 2: *Location of the underground linkage to Mannering Colliery*

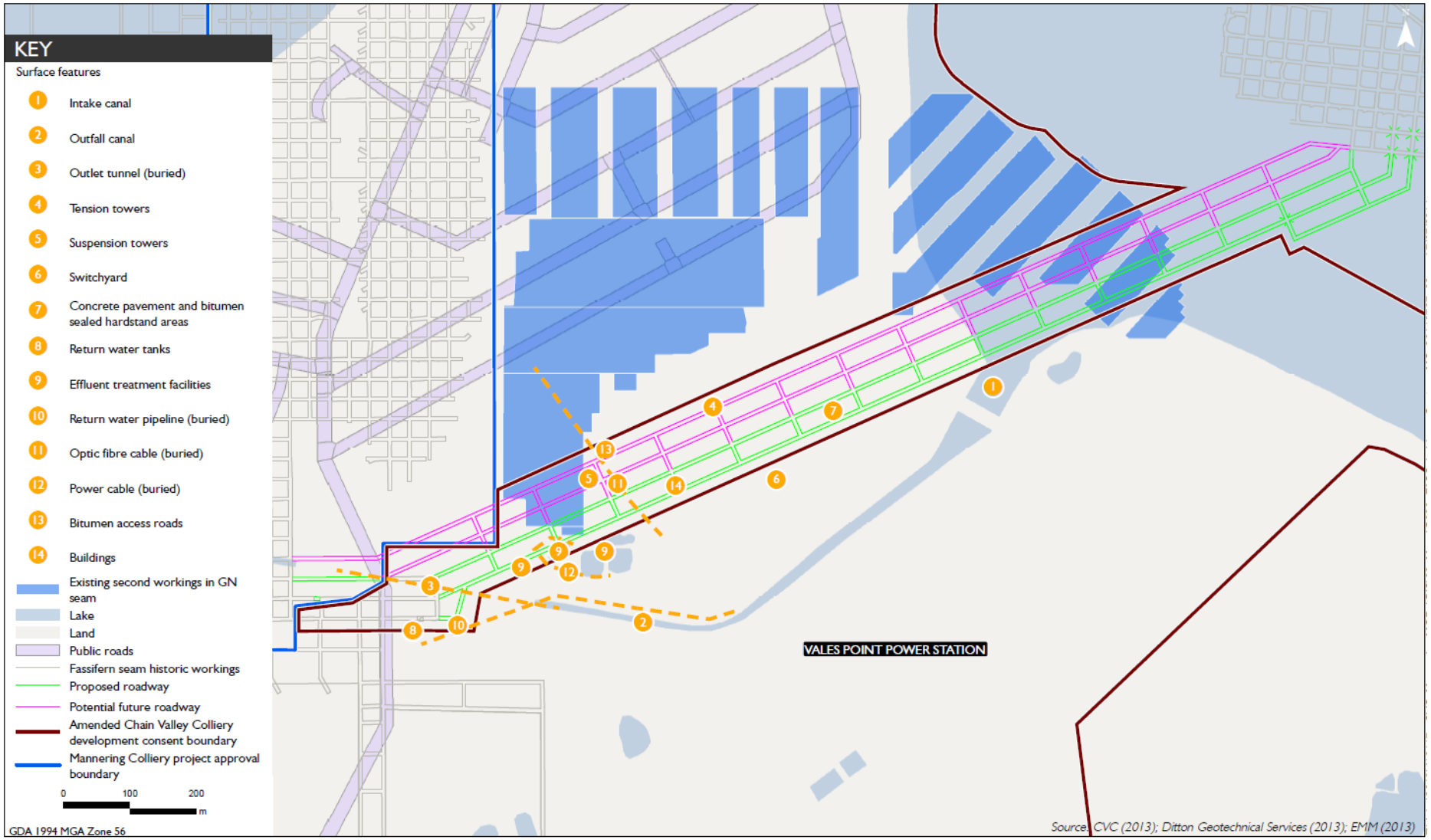


Figure 3: *Location of the underground linkage and surface infrastructure*

APPENDIX 4
KEY SURFACE FACILITIES

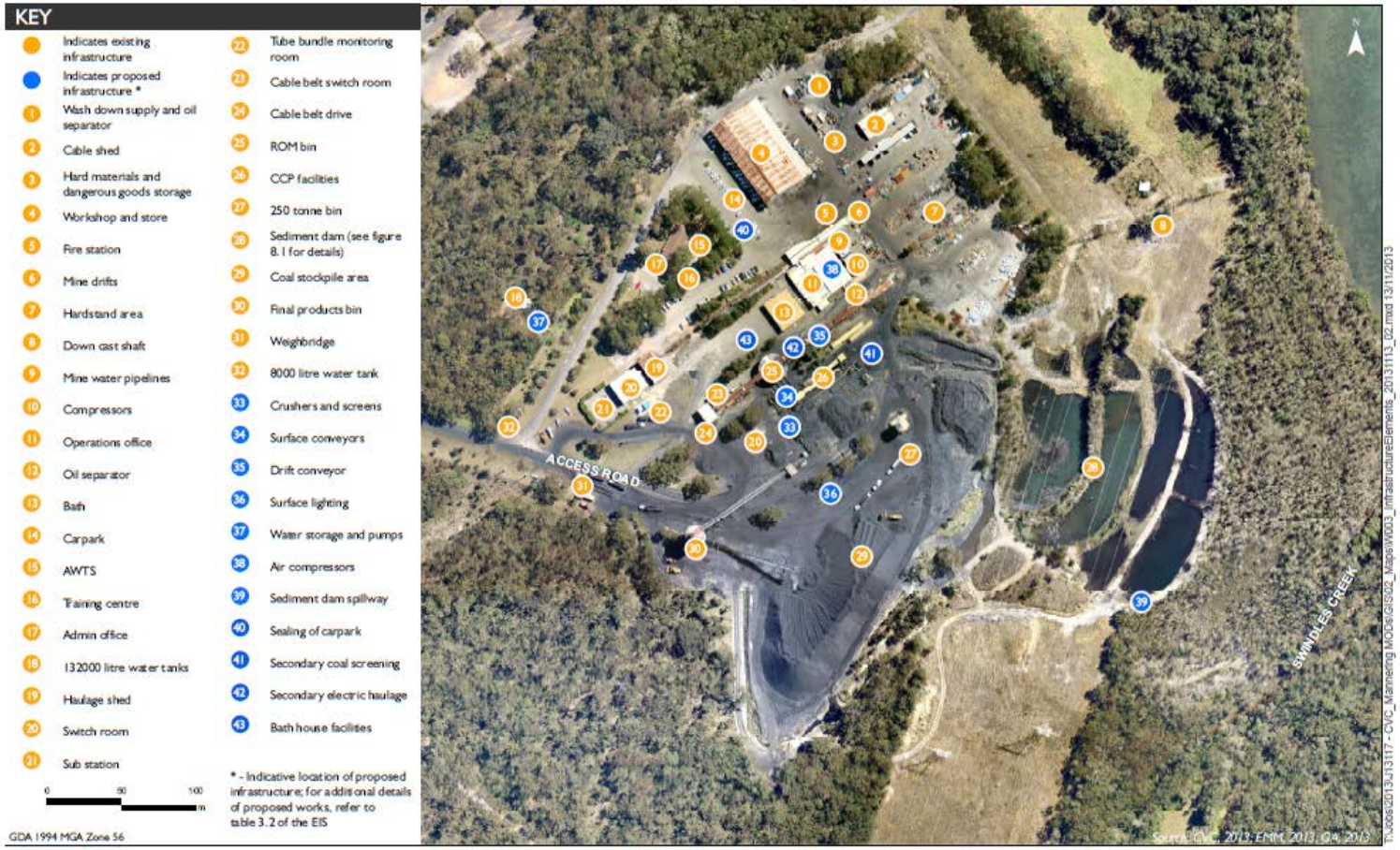
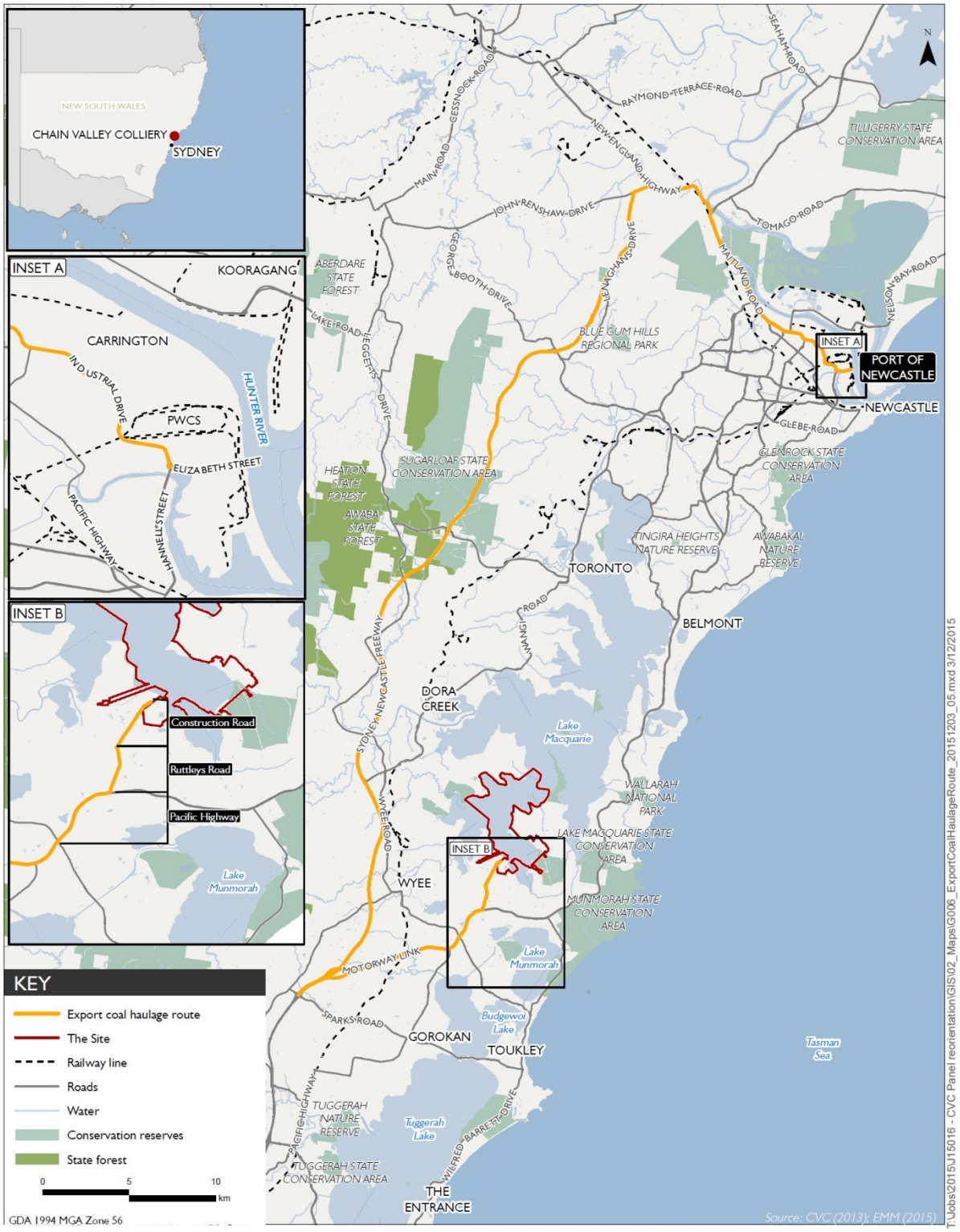


Figure 1 : General Arrangement of the Chain Valley Colliery surface facilities site

APPENDIX 5
COAL HAULAGE ROUTE – PUBLIC ROADS



EMM

Figure 1: *Export Coal Haulage Route*

APPENDIX 6
NOISE RECEIVER LOCATIONS

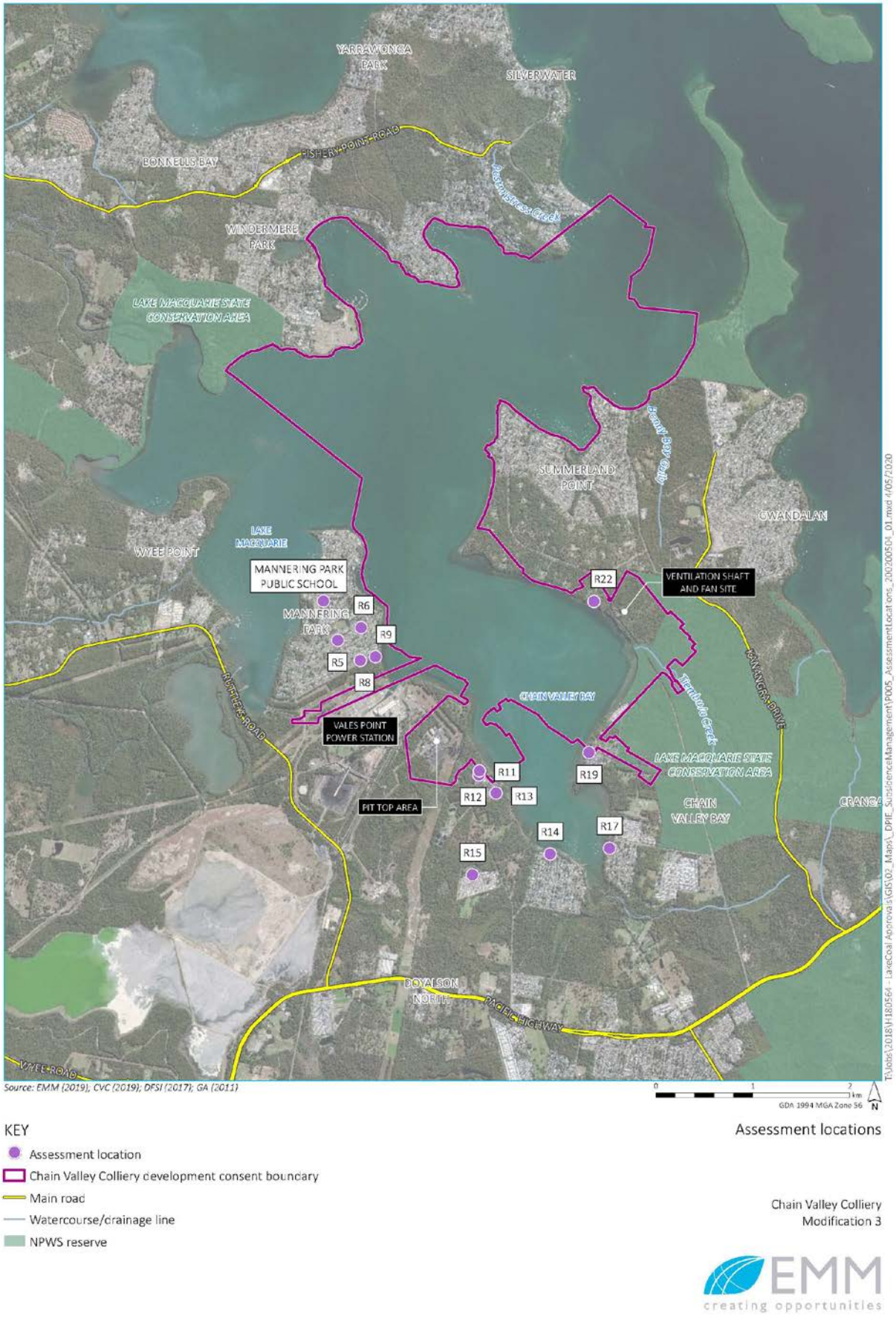


Figure 1: *Noise Receiver Locations*

APPENDIX 7
BIODIVERSITY ENHANCEMENT AREA

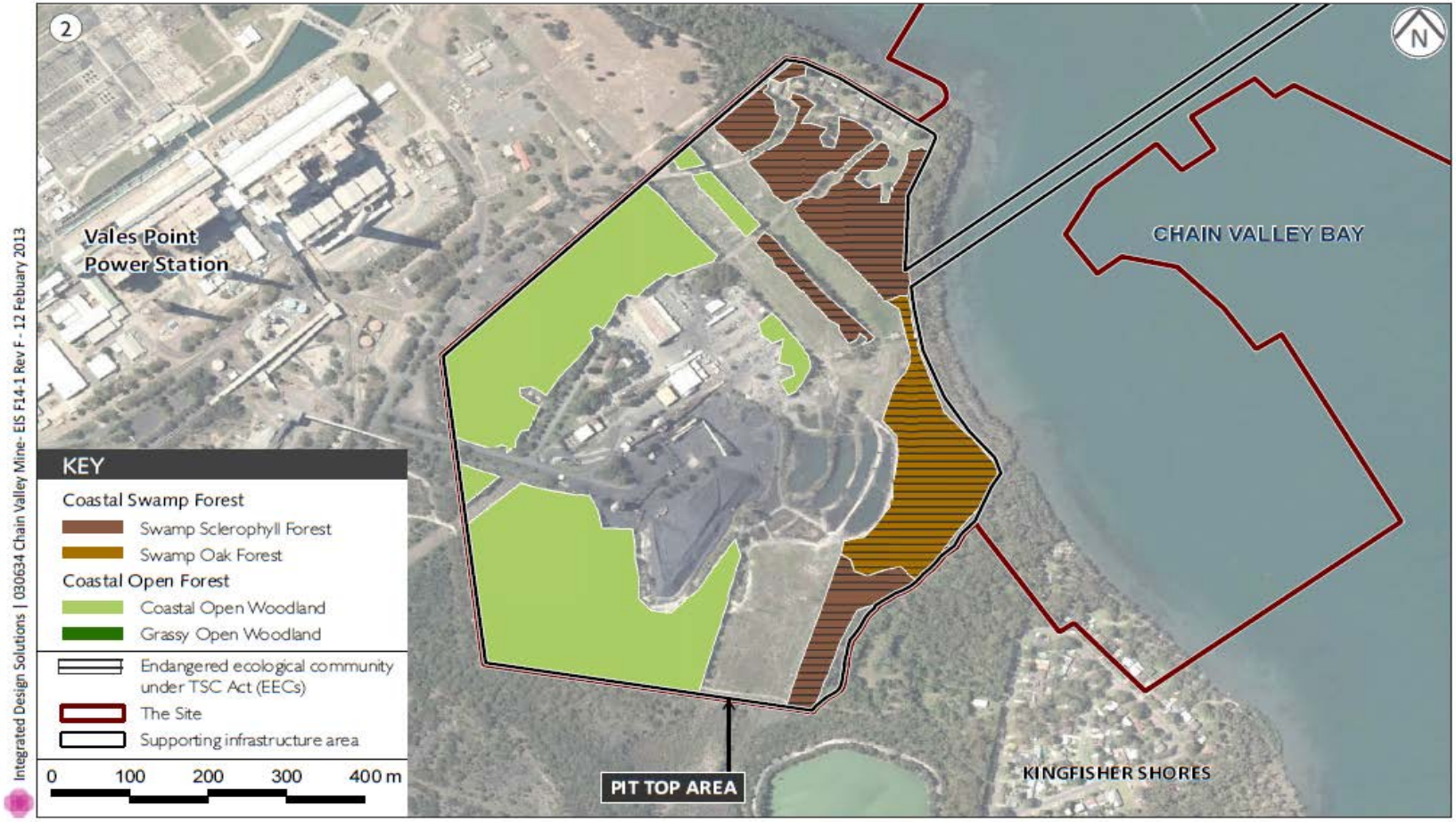


Figure 1: *Location of the Biodiversity Enhancement Area, shown in red and orange hatching*

APPENDIX 7A
ASSET PROTECTION ZONES



Figure 1. *Location of asset protection zones*

APPENDIX 8
NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 1 of the conditions are to apply under all meteorological conditions except the following:
   (a) during periods of rain or hail;
   (b) average wind speed at microphone height exceeds 5 m/s;
   (c) wind speeds greater than 3 m/s measured at 10 m above ground level; or
   (d) temperature inversion conditions greater than 3°C/100 m.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station described in condition 14 of schedule 3.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.

4. This monitoring must be carried out at least 4 times in each calendar year (ie at least once every 3 months), unless the Planning Secretary directs otherwise.

5. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
   (a) monitoring locations for the collection of representative noise data;
   (b) meteorological conditions during which collection of noise data is not appropriate;
   (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

APPENDIX 9
STATEMENT OF COMMITMENTS

Item	Commitment
Groundwater	In addition to the management and mitigation measures undertaken at the Colliery for groundwater as described in the WMP, the following commitments specific to the Proposal will be undertaken. Some commitments are already undertaken under the WMP. Great Southern Energy Pty Limited will: • assess whether abnormal or significant groundwater inflow changes occur in the active panels; • maintain the water flow monitoring appliances used to measure pumped water volumes to and from the Colliery in good working order; • maintain and plot records of daily total Colliery water pumping and annually communicate an interpretation of the findings within the Annual Review. A copy of the Annual Review will be supplied to DPIE Water; • measure water levels and quality within private bores, where access is possible, in relevant areas to assess if any adverse effects occur due to subsidence from the Proposal; and • develop groundwater assessment criteria and triggers, response protocols and contingency measures. Although it is not anticipated that private bore yields would be impacted due to subsidence, should such a situated arise, Great Southern Energy Pty Limited would provide an alternative water supply until the impacted bore recovers. Any monitored or reported adverse impacts on the yield, saturated thickness or quality of a private registered bore will be investigated by Great Southern Energy Pty Limited. In the event of a groundwater level drop of over 2 m for a period of two months or more, a notable increase in iron hydroxide, or an adverse change in salinity as a consequence of subsidence, Great Southern Energy Pty Limited will enter into negotiations with the affected landowners and SA NSW with the intent of formulating an agreement which provides for one, or a combination of: • re-establishment of saturated thickness in the affected bore(s) through bore deepening; • establishment of additional bores to provide a yield at least equivalent to the affected bore prior to mining; • provision of access to alternative sources of water; and/or • compensation to reflect increased water extraction costs (eg. due to lowering pumps or installation of additional or alternative pumping equipment).
Surface water	Management and monitoring of surface water will continue to be undertaken in accordance with the Colliery's WMP, which will be reviewed and updated as required to include the commitments made below. Great Southern Energy Pty Limited will: • update the WMP to include any changes as a result of all modifications; • limit the main underground pumps to a maximum pump out rate of 10.5 ML/day within 12 months of approval; • request an amendment of EPL1770 to include a condition on the daily discharge volume limit stating that "Exceedance of the volume limit for Point 1 is permitted only if the discharge from Point 1 occurs solely as a result of rainfall at the premises exceeding 10 mm during the 24 hours immediately prior to commencement of the discharge"; • undertake daily measurements of discharge volumes and report publicly on a monthly basis via Great Southern Energy Pty Limited's website; • continue collection of baseline water quality data to aid in the development of appropriate discharge water quality trigger values; • engage suitably qualified expert to conduct an assessment of the metals contained within discharge water in accordance with the ANZECC water quality guidelines and provide this assessment to the EPA by 31 December 2013; • investigate water saving measures to minimise the amount of potable water required from CC Council for Colliery operations; • quantify the groundwater storage capacity in the Great Northern and Wallarah Seams; • continue effluent monitoring regime of receiving soils from the AWTS in accordance with the parameters and testing frequencies identified in the Colliery's WMP. The

	results of this monitoring program will be reviewed by a suitably qualified expert and used to determine the appropriateness of the existing irrigation area to receive this effluent; • develop a program to monitor creek line channel stability and the health of riparian vegetation within Swindles Creek. Monitoring will be undertaken in accordance with Section 8.5.2 of the Surface Water Impact Assessment (EIS Appendix E) and incorporated into the Colliery's WMP or Biodiversity Management Plan; and • record monitoring data in accordance with the Colliery's WMP and EPL 1770. Monitoring data will be interpreted as it is received to ensure appropriate operational guidance on monitoring water quality within desired parameters. Results of water quality monitoring will be reported in the Annual Review and made available to the CCC, as well as CC Council and LMCC.
Noise	Management and monitoring of noise will continue to be undertaken in accordance with the Colliery's NMP, which will be reviewed and updated as required to include the commitments made below. Great Southern Energy Pty Limited will: • continue attended compliance monitoring on site which will be used to identify potential hot spots and primary noise sources; • continue real-time noise monitoring alerts to site personnel to enable implementation of any required rapid noise management initiatives; • manage potential non-compliance through a noise complaint handling and response system, including the identification of responsible sources to enable targeted remedial action; • assess if further noise mitigation options for the ventilation fans are reasonable and feasible following the receipt of attenuation proposals; and • discuss potential management measures or agreement options with the landowner at 275 Cams Boulevard, following receipt of proposals from acoustics specialists. In addition to the above, Great Southern Energy Pty Limited is committed to the progressive implementation of feasible measures to target long-term noise goals which are designed to reduce noise emissions from the Colliery. Long-term options for investigation include: • modification to belt/movement alarms; • investigation of surface conveyer and coal preparation equipment, to determine if noise reductions are possible; • identifying sound attenuation options for the surface bulldozer and front-end loader; • strategic placement of acoustic barriers; • attenuation for the surface screener/shaker; • installation of quiet rollers for surface conveyor belts; • acoustic treatments around compressors; and • the use of a conveyor stacker for product coal stockpiling.
Air Quality and greenhouse gases	Management and monitoring of air quality and greenhouse gases will continue to be undertaken in accordance with the Colliery's AQGHGMP, which will be reviewed and updated as required to include the commitments made below Great Southern Energy Pty Limited will: • investigate the use of a stacker to replace hauling between current conveyor system and stockpiles; • undertake GHG monitoring comprising measurement of carbon dioxide and methane at the ventilation shaft and fan sites; and • record and report annual diesel, oil, grease, acetylene and electricity use to fulfil National Greenhouse and Energy Reporting Scheme requirements.
Traffic and transport	Management and monitoring of traffic and transport will continue to be undertaken in accordance with the Colliery's RTP. In addition, Great Southern Energy Pty Limited will continue to investigate alternative options for transporting export coal to the Port of Newcastle, specifically the preferred rail transport option, requiring the construction of a private haul road to the VPPS coal unloading facility and associated infrastructure upgrades. In addition, Great Southern Energy Pty Limited will investigate options to reduce peak hour traffic would be investigated including potentially limiting the peak hourly volumes of the Colliery truck traffic which would be permitted to travel via this intersection should the Colliery not be using rail transport for export coal by five years from the granting of development consent. Alternatively, a pro-rata financial contribution to the cost of installing traffic signals at the southbound intersection of the F3 and Sparks Road interchange could be made commensurate with the percentage of Colliery generated traffic using the intersection.
Subsidence	Management and monitoring of subsidence will continue to be undertaken in accordance with the Colliery's SMP or Extraction Plans, which will be reviewed and

	updated as required to include the commitments made below. Great Southern Energy Pty Limited will: • provide raw subsidence survey data to BCD within 7 days of completion; • undertake six-monthly bathymetric surveys of the lake bed to determine actual subsidence and undertake a comparison with predicted levels. Should measured subsidence significantly exceed predicted levels, Great Southern Energy Pty Limited will review future secondary extraction designs to limit future impacts to acceptable levels; • install a new foreshore survey line above the first and second workings panels where the underground linkage passes beneath them and possibly extending from the foreshore to the point of connection with the MC workings; • inspect existing conditions in the Fassifern Seam and undertake geotechnical and geological mapping in the roadways proximate to the proposed linkage in both CVC and MC workings; • complete representative borehole core drilling and sampling of the Fassifern Seam floor at the start and finishing ends of the underground linkage and where the headings pass beneath the SPB. Development below the foreshore will be limited to two headings only until floor conditions can be confirmed; • develop infrastructure monitoring and management plans in consultation with infrastructure owners and other relevant stakeholders; • re-establish and re-survey Survey Line 24; • install a suitable survey line at the starting end above Great Northern Seam first workings to provide early warning monitoring data for the tension towers and switchyard structures; • monitor tension and suspension towers and switchyard conductor suspension frames directly above the panels, foreshore and adjacent inlet canal wall; • ensure that a monitoring and management plan for the MP01 sewer rising main is in place prior to commencement of mining that may impact CC Council's infrastructure; and • complete an annual subsidence report and make this report publicly available on the Colliery's website.
Marine ecology	Management and monitoring of marine ecology will continue to be undertaken in accordance with the Colliery's BCMP and SGMP, which will be reviewed and updated as required to include the commitments made below. Great Southern Energy Pty Limited will • revise the BCMP to include the sampling locations in the assessment of the Proposal; • undertake annual benthic surveys for the Site, or as required under the BCMP; • commission additional independent sampling and analysis to validate results obtained during monitoring, and review future panel design if impacts due to subsidence are determined to be moderate or greater; • revise the SGMP to include the transect locations utilised in the assessment of the Proposal; • continue annual seagrass surveys/monitoring; • continue six-monthly subsidence surveys (bathymetric surveys) and land-based surveys; • include results from the BCMP and SGMP within the Colliery's Annual Review; and • make the Annual Review and annual subsidence surveys available on the Colliery's website.
Terrestrial ecology	In addition to the management and mitigation measures undertaken at the Colliery for terrestrial ecology as described in the BMP, the following commitments specific to the Proposal will be undertaken. Some commitments are already undertaken under the BMP. Great Southern Energy Pty Limited will: • investigate one of the following options in consultation with BCD to offset the biodiversity impacts arising from the proposed modification: o provide $10,000 of funding, which is equivalent to the biodiversity being lost (i.e. 5 credits x $2,000 per credit) to existing environmental programs at the site which benefits the Swamp Sclerophyll EEC; or o consult with BCD to identify a suitable conservation program and provide $10,000 of funding; or o purchase and retire 5 credits on the Biobanking register. • update the BMP to include the following: o the completion of pre-disturbance surveys in the survey area for Black-eyed Susan, Leafless Tongue Orchid and Variable Midge Orchid during their flowering periods (July to December, November to February and September to October, respectively);

	o pre-disturbance surveys by an ecologist to determine the important components of vegetation communities and fauna habitats that should be preferentially retained in the APZs; o installation of delineation fencing around threatened flora populations (if found) to ensure their protection during development and maintenance of the APZs; o condition monitoring for threatened flora populations (if found); o retention of hollow-bearing trees in the APZs, where possible, with details to be included in a hollow tree register; o installation of nest boxes (or salvaged hollows) within the APZs under the supervision of a suitably qualified ecologist or wildlife carer to replace hollows where hollow-bearing trees cannot be retained; o measures for APZ maintenance that include weed control; o clearing of hollow-bearing trees (if required) under the supervision of a suitably qualified ecologist; o any injured fauna would be taken to the nearest veterinary hospital for treatment before release; and o relocation of suitable hollow-bearing felled trees adjacent to the APZs to create additional fauna habitat; • undertake the design of the dam embankment and spillway works in consultation with an ecologist to minimise potential impacts on the Swamp Oak Floodplain Forest EEC; • ensure pre-clearing surveys are undertaken by an ecologist to minimise the potential impact to fauna and significant vegetation prior to clearing works being undertaken within the embankment and spillway area; • clearly delineate the clearing footprint and cordon off surrounding vegetation as a 'no go' zone during works to the dam embankment and spillway; • minimise disturbance areas where possible by ensuring all stockpiling of materials, parking of machinery etc, is undertaken in previously cleared areas; • ensure that, wherever possible, dead standing timber and fallen timber will be avoided by any clearing works, or if required to be removed, be relocated into suitable habitat areas nearby; • ensure all equipment used for the earthworks associated with the dam embankment and spillway will be cleaned of excess soil potentially containing pathogens and weed seeds prior to entering the Site; • install sediment fencing surrounding the proposed earthwork areas, in accordance with a site-specific erosion and sediment control plan for the works; • ensure that in the event that sedimentation dam water is released from Dam 10 prior to the works being undertaken, it will be undertaken in a controlled manner over a number of days to ensure that the release does not result in significant erosion and sedimentation to the Swamp Oak Floodplain Forest; • continue the management and monitoring of flora and fauna in accordance with the BMP for the life of the mine, including: - the condition and composition of the Swamp Oak Floodplain Forest area; - the condition of vegetation adjacent to the ventilation shaft and fans; - the location and distribution of weed infestations; and - the abundance and distribution of feral animal use. • noxious weeds will be removed and continually controlled from the pit top area, allowing for natural regeneration of vegetation; • weed invasion will be monitored as part of the Colliery's BMP; and • the condition of the EEC areas will be monitored through the Colliery's BMP.
Heritage	Management and monitoring of heritage will continue to be undertaken in accordance with the Colliery's HMP, which will be reviewed and updated as required to include the commitments made below. Great Southern Energy Pty Limited will: • review and revise the HMP to remove site #45-7-0154 and incorporate any other changes as a result of the proposed modification; • update the HMP following approval of the Proposal to include the extended area to which it relates; • ensure that should unanticipated Aboriginal or historic heritage artefacts be found during dam embankment and diversion works, work will cease and the site assessed by an archaeologist; and • ensure that in the unlikely event that skeletal remains are found during dam embankment and diversion works, work will cease immediately in the area and the NSW Police Coroner called to determine if the material is of Aboriginal origin. BCD and relevant Aboriginal community stakeholders will be notified if the remains are positively identified as being of Aboriginal origin to determine their appropriate

	management prior to works recommencing.
Wastes	Management and monitoring of waste will continue to be undertaken in accordance with the Colliery's Waste Management Standard. In addition, Great Southern Energy Pty Limited will continue to try and improve its waste volumes and waste management practices in line with its objective for 60% of all wastes generated at the Colliery (excluding wastewater) to be recyclable or reusable.
Hazards	Management and monitoring of hazards will continue in accordance with the Colliery's existing hazard management measures. Periodic review of the effectiveness of existing measures will occur in accordance with the Colliery's safety management system and additional measures implemented as warranted.
Visual	Management and monitoring of visual impacts will continue to be undertaken in accordance with the Colliery's existing commitment. In addition, Great Southern Energy Pty Limited will: ensure additional surface lighting at the Colliery complies with *AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting.*
Soil	Management and monitoring of soils will continue to be undertaken in accordance with the Colliery's WMP, which will be reviewed and updated as required to include the commitments made below. Great Southern Energy Pty Limited will: • prevent disturbance of ASS where practicable during any construction activities; • prepare an ASSMP where there is potential that ASS will be disturbed; • test and handle any ASS disturbed in accordance with the ASSMP and treat or dispose of to an appropriately licensed facility; • limit the area of any disturbance at the surface infrastructure sites and period of exposure; • implement site management procedures such as watering of disturbed areas and unsecured stockpiles; • ensure relevant licences and management plans are in place for the correct storage and handling of hydrocarbons; • maintain suitable bunding around all hazardous liquid storage areas; • maintain oil separation facilities on the wash down sump for the treatment of oily water; and • remove all waste oil from site and dispose via a licensed external waste collection company.
Rehabilitation and mine closure	Rehabilitation will be undertaken in accordance with the Colliery's RMP and the MOP in force at the time. Detailed management and monitoring proposals for final rehabilitation will be included within a Mine Closure Plan to be prepared at least two years prior to cessation of mining activities.
Economic	Great Southern Energy Pty Limited will contribute $0.035/t of coal from the Colliery into a dedicated community fund to improve public infrastructure and for the provision of community projects in the surrounding communities of Chain Valley Bay, Mannering Park, Summerland Point and Gwandalan.
Social	Great Southern Energy Pty Limited will continue to implement management measures and monitoring programs to prevent or minimise negative impacts and enhance positive impacts in accordance with its Environment and Community Policy. Great Southern Energy Pty Limited will: • maintain open and constructive communication with affected individuals and groups; • participate in the CCC; • provide environmental monitoring data and other relevant information in a timely manner via the Great Southern Energy Pty Limited website; • be responsive to community issues and actual and/or perceived impacts from the Colliery's activities; • work in partnership with stakeholders to address community needs; • ensure effective management of Great Southern Energy Pty Limited's social impacts; • liaise regularly with relevant government agencies and councils; • provide regular Colliery updates with landowners and local residents through the CCC; • continue payments, throughout the life of the Proposal, to the community fund established; and • consider individual sponsorship opportunities throughout the life of the Proposal.
Other	Great Southern Energy Pty Limited will commit to only carrying out mining operations consistent with the development consent granted pursuant to this Proposal.

Modification 3 Commitments	Great Southern Energy Pty Limited will undertake environmental management incorporating the requirements of any modification and in accordance with the existing environmental management processes of the various approvals, licences and management plans that apply to the development. Great Southern Energy Pty Limited will apply to the EPA to vary EPL 1770 to reflect the corresponding development consent tonnage limits within EPL 1770's Mining for Coal and Coal Works activities tonnage ranges. Great Southern Energy Pty Limited will commission and undertake detailed geotechnical assessments by a suitably qualified geotechnical engineer as part of the company's detailed mine plan design process.

Appendix 2: EPL 1770

Environment Protection Licence

Licence - 1770

Licence Details	
Number:	1770
Anniversary Date:	01-April

Licensee

GREAT SOUTHERN ENERGY PTY LTD

PO BOX 7115

MANNERING PARK NSW 2259

Premises

CHAIN VALLEY COLLIERY

CONSTRUCTION ROAD

CHAIN VALLEY BAY NSW 2259

Scheduled Activity

Coal works

Mining for coal

Fee Based Activity	Scale
Coal works	> 2000000-5000000 T annual handing capacity
Mining for coal	> 2000000-3500000 T annual production capacity

Contact Us

NSW EPA

6 Parramatta Square

10 Darcy Street

PARRAMATTA NSW 2150

Phone: 131 555

Email: info@epa.nsw.gov.au

Locked Bag 5022

PARRAMATTA NSW 2124

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Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

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The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

GREAT SOUTHERN ENERGY PTY LTD
PO BOX 7115
MANNERING PARK NSW 2259

subject to the conditions which follow.

Environment Protection Licence

Licence - 1770

1 Administrative Conditions

A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Coal works	Coal works	> 2000000 - 5000000 T annual handing capacity
Mining for coal	Mining for coal	> 2000000 - 3500000 T annual production capacity

A1.2 The licensee must not extract by mining activities more than 2.1 million tonnes of ROM coal from the premises in any calendar year in line with Development Consent SSD5465 MOD 4.

A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
CHAIN VALLEY COLLIERY
CONSTRUCTION ROAD
CHAIN VALLEY BAY
NSW 2259
THE LICENSED PREMISES IS AS DEFINED IN THE FOLLOWING PLANS, "DELTA COAL CHAIN VALLEY COLLIERY, SURFACE EPA PREMISES PLAN, DRG NO:C1SO165_2, 10 AUGUST 2021" AND "DELTA COAL CHAIN VALLEY COLLIERY, FIGURE 1 PROJECT OVERVIEW, DRG NO:C1S0165_1, 10 AUGUST 2021", WHICH SHOWS THE UNDERGROUND COAL WORKINGS PREMISES BOUNDARIES VIA A LIME GREEN LINE ALONG WITH THE EASTINGS AND NORTHINGS AT "TURNAROUND" LOCATIONS. THESE PLANS ARE SAVED AS EPA DOCUMENT NO. DOC21/691135.

A3 Information supplied to the EPA

A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:
a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

2 Discharges to Air and Water and Applications to Land

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
25	Air Monitoring Point Particulate Matter PM10 Thermo Fisher Scientific TEOM 1405		TEOM Monitor located on the site of the Mannering Park Sewage Treatment Plant, shown as "EPA25" on the plan titled "Delta Coal - Chain Valley Colliery - Figure 1 - Project Overview", which as been filed as EPA document DOC21/691135

P1.2 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

P1.3 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Discharge to waters Discharge quality and volume monitoring	Discharge to waters Discharge quality and volume monitoring	Discharge to waters and monitoring from final settlement pond, gravity fed discharge pipe as identified in plan titled "Delta Coal Chain Valley Colliery, Surface EPA Premises Plan, DRG No: C1S0165_2" 10 August 2021 and saved as EPA Document DOC21/691135.

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27	Discharge to waters Discharge quality and volume monitoring	Discharge to waters Discharge quality and volume monitoring	Discharge to waters via dam spillway from final settlement pond adjacent to EPA Point 1 as identified in plan titled "Delta Coal Chain Valley Colliery, Surface EPA Premises Plan, DRG No: C1S0165_2" 10 August 2021 and saved as EPA Document DOC21/691135.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
9	Noise monitoring	Noise monitoring site R8 as defined in Development Consent SSD-5465 (MOD 3), located at 109 Griffith Street, MANNERING PARK, 2259
12	Noise monitoring	Noise monitoring site R11 as defined in Development Consent SSD-5465 (MOD 3), located at 35 Lakeshore Avenue, CHAIN VALLEY BAY, 2259
13	Noise monitoring	Noise monitoring site R12 as defined in Development Consent SSD-5465 (MOD 3), located at 20 Lakeshore Avenue, Kingfisher Shores, CHAIN VALLEY BAY, 2259
14	Noise monitoring	Noise monitoring site R13 as defined in Development Consent SSD-5465 (MOD 3), located at 33 Karoola Avenue, Kingfisher Shores, CHAIN VALLEY BAY, 2259
16	Noise monitoring	Noise monitoring site R15 as defined in Development Consent SSD-5465 (MOD 3), located at Short Street, Macquarie Shores, CHAIN VALLEY BAY, 2259
20	Noise monitoring	Noise monitoring site R19 as defined in Development Consent SSD-5465 (MOD 3), located at 2 Sunset Parade, CHAIN VALLEY BAY, 2259
23	Noise monitoring	Noise monitoring site R22 as defined in Development Consent SSD-5465 (MOD 3), located at 275a Cams Boulevard, CHAIN VALLEY BAY, 2259
26	Meteorological Station	Mannering Colliery Meteorological Station, Ruttleys Road, Doyalson 2259.

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3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 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.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.4 Water and/or Land Concentration Limits

POINT 1,27

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Faecal Coliforms	colony forming units per 100 millilitres				200
Oil and Grease	milligrams per litre				10
pH	pH				6.5-8.5
Total suspended solids	milligrams per litre				50

Note: The limit conditions for faecal coliforms will be reviewed after a period of 6 months following review of monthly results.

L3 Volume and mass limits

L3.1 For each discharge point or utilisation area specified below (by a point number), the volume/mass of:
a) liquids discharged to water; or;

b) solids or liquids applied to the area;
must not exceed the volume/mass limit specified for that discharge point or area.

Point	Unit of Measure	Volume/Mass Limit
1	kilolitres per day	12161
27	kilolitres per day	12161

L3.2 The volumetric daily discharge limit for the premises is the combined discharge measured at EPA discharge points 1 and 27 and must not exceed 12161 kilolitres per day.

L4 Waste

L4.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled “Waste” and meeting the definition, if any, in the column titled “Description” in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled “Activity” in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled “Other Limits” in the table below.
This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	General or Specific exempted waste	Waste that meets all the conditions of a resource exemption under Clause 92 of the Protection of the Environment Operations (Waste) Regulation 2014.	As specified in each particular resource recovery exemption	NA

L5 Noise limits

L5.1 Noise generated at the premises that is measured at each noise monitoring point established under this licence must not exceed the noise levels specified in Column 4 of the table below for that point during the corresponding time periods specified in Column 1 when measured using the corresponding measurement parameters listed in Column 2.

POINT 12

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	49
Evening	Evening-LAeq (15 minute)	-	49
Night	Night-LAeq (15 minute)	-	49

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Night	Night-LA1 (1 minute)	-	54

POINT 13

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	49
Evening	Evening-LAeq (15 minute)	-	49
Night	Night-LAeq (15 minute)	-	49
Night	Night-LA1 (1 minute)	-	53

POINT 14

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	43
Evening	Evening-LAeq (15 minute)	-	43
Night	Night-LAeq (15 minute)	-	43
Night	Night-LA1 (1 minute)	-	49

POINT 16

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	36
Evening	Evening-LAeq (15 minute)	-	36
Night	Night-LAeq (15 minute)	-	36
Night	Night-LA1 (1 minute)	-	45

POINT 20

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	37
Evening	Evening-LAeq (15 minute)	-	37
Night	Night-LAeq (15 minute)	-	37
Night	Night-LA1 (1 minute)	-	45

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POINT 23

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	46
Evening	Evening-LAeq (15 minute)	-	46
Night	Night-LAeq (15 minute)	-	46
Night	Night-LA1 (1 minute)	-	46

POINT 9

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	38
Evening	Evening-LAeq (15 minute)	-	38
Night	Night-LAeq (15 minute)	-	38
Night	Night-LA1 (1 minute)	-	45

L5.2 The licensee must ensure that noise generated on the premises does not exceed:

a) 35 LAeq(15min) during the day, evening or night at any privately owned land nearest to the residence apart from those receivers identified in Condition 5.1; and
b) 45 LA1(1min) during the night at any privately owned land nearest to the residence apart from those receivers identified in Condition 5.1.

Note: The licensee may provide to the EPA written evidence of any agreement with a landholder which is subject to the above noise limits. The written evidence may be submitted with a licence variation to remove the landholder from the above tables.

L5.3 For the purpose of condition L5.1 and condition L5.2:
(a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and public holidays;
(b) Evening is defined as the period 6pm to 10pm, and
(c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

L5.4 The noise limits set out in condition L5.1 and condition L5.2 apply under all meterorological conditions except for any one of the following:
(a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
(b) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
(c) Stability category G temperature inversion conditions.

(d) Or as defined under the NSW EPA Noise Policy for Industry 2017.

L5.5 For the purpose of condition L5.4:
(a) the meteorological data to be used for determining meteorological conditions is the data recorded at the meteorological station identified in this licence as EPA Identification Point 26.
(b) Stability category temperature inversion conditions are to be determined in accordance with the NSW EPA Noise Policy for Industry 2017.

Note: The weather station must be designed, commissioned and operated in a manner to obtain the necessary parameters required under the above condition.

L5.6 For the purpose of determining the noise generated at the premises the licensee must use a Class 1 or Class 2 noise monitoring device as defined by AS IEC61672.1 and AS IEC61672.2-2004, or other noise monitoring equipment accepted by the EPA in writing.

L5.7 To determine compliance:

1. With the $L_{Aeq(15\ min)}$ noise limits in condition L5.1 and condition L5.2, the licensee must locate noise monitoring equipment;

(a) within 30 metres of a dwelling facade (but not closer than 3 metres) where any dwelling on the property is situated more then 30 metres from the property boundary that is closest to the premises;

(b) approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises, or, where applicable,

(c) within approximately 50 metres if the boundary of a national park or nature reserve.

2. With the LA1(1 minute) noise limits in condition L5.1 and L5.2, the noise monitoring equipment must be located within 1 metre of a dwelling facade.

3. With the noise limits in condition L5.1 and condition L5.2, the noise monitoring equipment must be located;

(a) at the most affected point at a location where there is no dwelling at the location, or

(b) at the most affected point within an area at a location prescribed by conditions L5.7 1(a) or L5.7 1(b).

L5.8 A non-compliance of condition L5.1 or condition L5.2 will still occur where noise generated from the premises in excess of the appropriate limit is measured;
a) at a location other than an area prescribed by conditions L5.7 1(a) and L5.7 1(b), and /or
b) at a point other than the most affected point at a location.

L5.9 For the purposes of determining the noise generated at the premises all applicable modification factors as described in the NSW EPA Noise Policy for Industry 2017 must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

4 Operating Conditions

Environment Protection Licence

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

O3 Dust

O3.1 The premises must be maintained in a condition which minimises or prevents the emission of dust on or from the premises.

O3.2 Activities occurring in or on the premises must be carried out in a manner that will minimise the generation of wind-blown or traffic generated dust.

O3.3 All trafficable areas, coal stockpile(s) and storage areas, and vehicle manoeuvring areas in or on the premises must be maintained, at all times, in a condition that will minimise the generation of dust.

O3.4 All vehicles transporting coal from the premises must be covered immediately after loading to prevent wind blown emissions and spillage.

Note: Vehicles transporting coal on the private haul road from Chain Valley Colliery to Vales Point Power station are exempt from covering their load if surface coal moisture is above 8%.

O3.5 Activities occuring in or on the premises must be carried out in a manner that will minimise the tracking of dust from the premises.

O4 Emergency response

Note: The licensee must maintain, and implement as necessary, a current Pollution Incident Response Management Plan (PIRMP) for the premises. The PIRMP must be developed in accordance with the requirements in Part 5.7A of the *Protection of the Environment Operations* (POEO) Act 1997 and POEO Regulations. The licensee must keep the incident response plan on the premises at all times. The incident response plan must document systems and procedures to deal with all types of incidents (e.g. spills, explosions or fire) that may occur at the premises or that may be associated with activities that occur at the premises and which are likely to cause harm to the environment. The PIRMP must be tested annually or following a pollution incident.

O5 Processes and management

Bunding

O5.1 All above ground tanks containing material that is likely to cause environmental harm must be bunded or have an alternative spill containment system in place.

O5.2 Bunds must:
a) have walls and floors constructed of impervious materials;
b) be of sufficient capacity to contain 110% of the volume of the tank (or 110% volume of the largest tank where a group of tanks are installed);
c) have floors graded to a collection sump; and
d) not have a drain valve incorporated in the bund structure, or be constructed and operated in a manner that achieves the same environmental outcome.

O6 Waste management

O6.1 The licensee must ensure that any liquid and/or non liquid waste generated and/or stored at the premises is assessed in accordance with the EPA Waste Classification Guidelines as in force from time to time.

O6.2 The licensee must ensure that waste identified for recycling is stored separately from other waste.

5 Monitoring and Recording Conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:
a) in a legible form, or in a form that can readily be reduced to a legible form;
b) kept for at least 4 years after the monitoring or event to which they relate took place; and
c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
a) the date(s) on which the sample was taken;
b) the time(s) at which the sample was collected;
c) the point at which the sample was taken; and
d) the name of the person who collected the sample.

M2 Requirement to monitor concentration of pollutants discharged

M2.1 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. The licensee must use the sampling method, units of measure, and sample at the frequency,

specified opposite in the other columns:

M2.2 Air Monitoring Requirements

POINT 25

Pollutant	Units of measure	Frequency	Sampling Method
Particulate matter	micrograms per cubic metre	Continuous	AM-22

M2.3 Water and/ or Land Monitoring Requirements

POINT 1

Pollutant	Units of measure	Frequency	Sampling Method
Biochemical oxygen demand	milligrams per litre	Once a month (min. of 4 weeks)	Grab sample
Enterococci	colony forming units per 100 millilitres	Once a month (min. of 4 weeks)	Grab sample
Faecal Coliforms	colony forming units per 100 millilitres	Once a month (min. of 4 weeks)	Grab sample
Oil and Grease	milligrams per litre	Once a month (min. of 4 weeks)	Grab sample
pH	pH	Once a month (min. of 4 weeks)	Grab sample
Total suspended solids	milligrams per litre	Once a month (min. of 4 weeks)	Grab sample

POINT 27

Pollutant	Units of measure	Frequency	Sampling Method
Enterococci	colony forming units per 100 millilitres	Daily during any discharge	Grab sample
Faecal Coliforms	colony forming units per 100 millilitres	Daily during any discharge	Grab sample
Oil and Grease	milligrams per litre	Daily during any discharge	Grab sample
pH	pH	Daily during any discharge	Grab sample
Total suspended solids	milligrams per litre	Daily during any discharge	Grab sample

Note: The EPA intends on reviewing the appropriateness of the monitoring conditions for faecal coliforms and enterococci after receiving 6 months of monitoring data from the licensee.

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M3 Testing methods - concentration limits

M3.1 Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with:
a) any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or
b) if no such requirement is imposed by or under the Act, any methodology which a condition of this licence requires to be used for that testing; or
c) if no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place.

Note: The *Protection of the Environment Operations (Clean Air) Regulation 2022* requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".

M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4 Environmental monitoring

Requirement to monitor noise

M4.1 To determine compliance with condition L5.1, attended noise monitoring must be undertaken in accordance with conditions L5.7 and L5.8, and

(a) at each one of the locations listed in condition L5.1;
(b) occur quarterly within the reporting period of the Environment Protection Licence with at least 2 months between monitoring periods;
(c) occur during each day, evening and night period as defined in the NSW Industrial Noise Policy (EPA 2000) for a minimum of 15 minutes for three of the quarters;
(d) the night time 15 minute attended monitoring in accordance with c) must be undertaken between the hours of 1am and 4am;
(e) the night time LA1 (1 min) attended monitoring in accordance with c) must be undertaken between the hours of 1am and 4am;
(f) one quarterly monitoring must occur during each day, evening and night period as defined in the NSW EPA Noise Policy for Industry 2017 for a minimum of 1.5 hours during the day; 30 minutes during the evening; and 1 hours during the night, and
(g) each quarterly monitoring must be undertaken on a different day(s) of the week not including Saturdays, Sundays and public holidays; and
(h) these monitoring conditions take effect in the 2015 Reporting period.

Note: The intention of this condition is that quarterly monitoring be undertaken at each sensitive receiver. That at each sensitive receiver monitoring is undertaken over a range of different days excluding weekends and public holidays during the reporting period so as to be representative of operating hours. That night time 15 minute attended monitoring and the LA1 (1min) monitoring for three of the quarters be undertaken at worst

case being the most stable atmospheric conditions and when noise would be most intrusive to sleep. All of the sensitive receivers do not have to be monitored on the same day, evening and night for sub condition f.

M4.2 For the Annual Reporting Period ending March 2015 the EPA will accept all monitoring required by the current Department of Planning and Environment consent (usually quarterly monitoring for noise as dB(A) Leq15minutes) for compliance with noise monitoring requirements in this licence, as a single report attached to the Annual Return for the premises.

M5 Weather monitoring

M5.1 At the point(s) identified below, the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1 of the table below, using the corresponding sampling method, units of measure, averaging period and sampling frequency, specified opposite in the Columns 2, 3, 4 and 5 respectively.

POINT 26

Parameter	Sampling method	Units of measure	Averaging period	Frequency
Rainfall	AM-4	millimetres	24 hours	Continuous
Wind Direction at 10 metres	AM-2 & AM-4	Degrees	1 hour	Continuous
Wind Speed	AM-2 & AM-4	metres per second	1 hour	Continuous
Temperature at 10 metres	AM-4	degrees Celsius	1 hour	Continuous
Sigma theta	AM-2 & AM-4	Degrees	15 minutes	Continuous
Relative humidity	AM-4	percent	1 hour	Continuous

M5.2 The licensee may use the Vales Point Power Station Meteorological Station to determine compliance with condition M5.1, provided the licensee has authority from Sunset Power International Pty Ltd to access meteorological data at all times.

M6 Recording of pollution complaints

M6.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M6.2 The record must include details of the following:
a) the date and time of the complaint;
b) the method by which the complaint was made;
c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the

complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M6.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M6.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M7 Telephone complaints line

M7.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

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.

M7.3 The preceding two conditions do not apply until 3 months after: the date of the issue of this licence.

M7.4 The licensee must notify the EPA with contact details of personnel capable of a timely response to emergencies or any other exigent circumstances.
(a) the nominated contact must be available at all times.
(b) contact details must include a telephone number and must be current.
(c) such notification must be made within 14 days of receiving this licence.

M8 Requirement to monitor volume or mass

M8.1 For each discharge point or utilisation area specified below, the licensee must monitor:
a) the volume of liquids discharged to water or applied to the area;
b) the mass of solids applied to the area;
c) the mass of pollutants emitted to the air;
at the frequency and using the method and units of measure, specified below.

POINT 1

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	kilolitres per day	In line instrumentation

POINT 27

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	kilolitres per day	In line instrumentation

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6 Reporting Conditions

R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance - Licence Conditions,
4. a Statement of Compliance - Load based Fee,
5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan,
6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance - Environmental Management Systems and Practices.

At the end of each reporting period, the EPA will provide to the licensee notification that the Annual Return is due.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA via eConnect *EPA* or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

R1.7 Within the Annual Return, the Statements of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
a) the licence holder; or
b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

R2 Notification of environmental harm

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which they became aware of the incident.

R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
a) where this licence applies to premises, an event has occurred at the premises; or
b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:
a) the cause, time and duration of the event;
b) the type, volume and concentration of every pollutant discharged as a result of the event;
c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

R4 Other reporting conditions

Noise Monitoring Report

R4.1 The licensee must submit to the EPA a noise compliance assessment report at the end of each reporting

period. The report must be submitted with the Environment Protection Licence Annual Return. The report must be prepared by a suitably qualified and experienced acoustical consultant which:

(a) details the noise monitoring undertaken in accordance with condition M4;
(b) assesses compliance with noise limits presented in condition L5.1 and condition 5.2; and
(c) outlines any management actions taken within the monitoring period to address any exceedences of limits contained in condition L5.1 and condition L5.2.

Note: The licensee must provide the EPA with one report, but this report may be a combination of the monitoring undertaken by the licensee as part of their quarterly monitoring program as required by the Project Approval SSD-5456 and must include LA1(1min).

7 General Conditions

G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

G2 Contact number for incidents and responsible employees

G2.1 The licensee must operate 24-hour telephone contact lines for the purpose of enabling the EPA to directly contact one or more representatives of the licensee who can:
a) respond at all times to incidents relating to the premises; and
b) contact the licensee's senior employees or agents authorised at all times to:
i) speak on behalf of the licensee; and
ii) provide any information or document required under this licence.

G2.2 The licensee is to inform the EPA in writing of the appointment of any subsequent contact persons, or changes to the person's contact details as soon as practicable and in any event within fourteen days of the appointment or change.

G3 Other general conditions

G3.1 **Completed Programs**

Program	Description	Completed Date

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Coal Mine Particulate Matter Control Best Practice	Requires licensee to conduct a site specific Best Management Practice (BMP) determination to identify ways to reduce particle emissions.	28-September-2012
Assessment of Potential Impacts of Metals in wastewater	The licensee must conduct an assessment of metals detected in wastewater discharges from the mine in accordance with the ANZECC water quality guidelines. To obtain a greater understanding of the type and concentration of metals discharged in mine water and entering the receiving waters. To limit the concentration of metals discharged in mine water within ANZECC guidelines.	23-October-2013
Air Quality Monitoring	The licensee must evaluate best locations and install monitoring devices as defined in Project Approval MP10_0161 under the Environent Planning & Assessment Act 1979.	31-December-2013
PRP4 - Upgrade to Clean and Dirty Water Management System	The licensee must review and upgrade separation of the Clean and Dirty Water Management System and review and upgrade bunding.	14-August-2015
PRP5 - Remediation of Dam Wall and Spillway formalisation	The licensee must design and remediate the dam wall on the final control pond and formalise a spillway to prevent dam seepage and to ensure that volumetric discharge can be monitored	27-February-2015
PRP 6 Upgrade to Sewage Treatment Systems	Assessment of options for improved disinfection of effluent from STP on licenced premises.	06-January-2015
PRP7 Sewage Treatment System Concept Design	Provide the EPA with a Concept Design and Timetable for Implementation of Upgrade to the Sewage Treatment System	19-February-2016
PRP 8 - Connection of Bathouse Wastewater to Sewer	Connection of Bathhouse to Central Coast Council Sewer.	14-July-2023
PRP 9 - Office Area Wastewater Sytem Upgrades to Best Practice	Office area wastewater treatment system upgrade to best practice.	27-July-2023

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Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

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flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environmen t Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder describe d at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 mo nths. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.

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TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non-putrescible), special waste or hazardous waste
Wellhead	Has the same meaning as in Schedule 1 to the Protection of the Environment Operations (General) Regulation 2021.

Ms Debbie Maddison

Environment Protection Authority

(By Delegation)

Date of this edition: 10-November-2000

Environment Protection Licence

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End Notes

1	Licence varied by notice 1008662, issued on 24-Oct-2001, which came into effect on 24-Oct-2001.
2	Licence transferred through application 141163, approved on 24-Apr-2002, which came into effect on 20-Apr-2002.
3	Licence varied by notice 1026573, issued on 16-Apr-2003, which came into effect on 11-May-2003.
4	Condition A1.3 Not applicable varied by notice issued on <issue date> which came into effect on <effective date>
5	Licence varied by notice 1104492, issued on 11-Dec-2009, which came into effect on 11-Dec-2009.
6	Licence varied by notice 1502571 issued on 21-Dec-2011
7	Licence varied by notice 1504446 issued on 15-Apr-2013
8	Licence varied by notice 1516485 issued on 20-Aug-2013
9	Licence varied by notice 1519380 issued on 26-Sep-2014
10	Licence varied by notice 1527706 issued on 15-May-2015
11	Licence varied by notice 1535160 issued on 30-Oct-2015
12	Licence varied by notice 1540199 issued on 08-Jun-2016
13	Licence transferred through application 1578021 approved on 01-Apr-2019 , which came into effect on 02-Apr-2019
14	Licence varied by notice 1593319 issued on 30-Sep-2021
15	Licence varied by notice 1616944 issued on 24-Feb-2022
16	Licence varied by notice 1621580 issued on 10-Aug-2022
17	Licence varied by notice 1626724 issued on 01-Mar-2023
18	Licence varied by notice 1629248 issued on 05-Jun-2023
19	Licence varied by notice 1633178 issued on 24-Oct-2023

Appendix 3: Seagrass Monitoring Report (2023)

Delta Coal

Mannering & CVC Collieries

Annual seagrass survey of Chain Valley Bay, Summerland Point, Bardens Bay and Crangan Bay, Lake Macquarie, NSW



by Dr Emma Laxton

June 2023

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Summary

The annual seagrass survey was conducted from 9th to 12th June 2023 off Summerland Point, Frying Pan Bay, Sugar Bay, Chain Valley Bay, Bardens Bay and Crangan Bay, Lake Macquarie. A total of 50 transects were photographed.

The average length of transects in Chain Valley Bay, northern shore Summerland Point, and western shore Summerland Point was 65.3m, 59.9m and 40.4m respectively. The average length of transect in Bardens Bay and Sugar Bay was 26.6m and 55.1m. The transects along Crangan Bay off Gwandalan had an average of 38.9m. The transects with the greatest lengths were Transects E9 (152m), F2 (131m), S4 (105m) and C3 (91m). The transects with the shortest lengths were Transects C1, C2, T2, C6 and A6, all approximately 14m in length.

Water Temperature ranged from 16.58^{o}C to 19.04^{o}C, with a mean water temperature of 17.70^{o}C. Conductivity ranged from 55.71 mS/cm to 56.22 mS/cm. Mean conductivity was 55.98 mS/cm. Salinity ranged from 36.92 ppt to 37.33 ppt. Mean salinity was 37.16 ppt. Turbidity ranged from 9.4 NTU to 29.2 NTU, with a mean of 13.54 NTU. pH was 7.75 at T1. Dissolved oxygen (% saturation) ranged from 84.6% to 135.7%. Mean dissolved oxygen was 100.7% saturation. Super saturation of dissolved oxygen was due to the oxygen production by the seagrasses and epiphytic algae.

Two species of seagrass were identified in the study area, *Zostera capricorni* and *Halophila ovalis. Zostera capricorni* had the greatest coverage and was found along the entire length of the transects. *Halophila ovalis* was found predominantly in the shallower waters.

The growth form of *Zostera capricorni* in the Summerland Point, Frying Pan Bay and Sugar Bay region and the Crangan Bay region was predominantly short leaved. The growth form of *Zostera capricorni* in Chain Valley Bay and Bardens Bay was long leaved.

In June 2023, seagrass cover ranged from 50.2% to 96.8% on the northern shore of Summerland Point and Frying Pan Bay; 74.4% to 92.3% along the western shore of Summerland Point; 74.4% to 92.3% on the western shore of Summerland Point; 75.0% to 99.3% in Chain Valley Bay; 74.3% to 97.5% in Bardens Bay; 90.7% to 96.3% in Sugar Bay; and 82.1% to 95.2% in Crangan Bay.

At the time of survey, transects with the highest coverage of *Halophila ovalis* were E6 (5.1%), S2 (3.5%), C1 (2.8%) and A1 (2.7%).

The health and condition of the seagrasses were good, with most seagrasses free or only lightly fouled with epiphytic algae.

Three species of alga were recorded in the study area, namely *Cystoseira trinodis* (synonym *Cystophyllum onustum*), *Codium fragile* and green filamentous algae. The transects with the highest total coverage of *Cystoseira* were F2 (28.5% total coverage), A1 (9.1%), A2 (8.6%), A3 (7.1%), E1 (5.1%) and T2 (4.9%). *Codium fragile* was observed at transects A1 (0.4% total coverage) and C1 (0.9% total coverage) only. Transects E10 and S1 had the highest average total coverage of filamentous algae, 6.8% and 4.6% respectively.

Seagrass cover continues to be high and consistent, with only six transects showing a slight decline in seagrass coverage in the June 2023 survey compared to previous years. Changes in coverage were due to a high presence of the alga *Cystoseira trinodis* and changes in survey methods which are enabling the photography of seagrasses up to the water's edge. *Halophila ovalis* is often found growing in sand along shorelines in the very shallow waters. Photographing this band of sand to capture the presence of *Halophila ovalis* has affected the statistics by reducing the presence of *Zostera* and increasing the presence of bare ground.

The increase in percentage cover of seagrasses marks the decrease in bare ground in the study area. Bare ground decreased from 38.13 percent in 2011 to 9.59 percent in 2023 in the Summerland Point, Frying Pan Bay and Sugar Bay region. In the Chain Valley Bay region, bare ground decreased from 13.32 percent in 2011 to 6.41 percent in 2023. In the Crangan Bay region, bare ground decreased from 26.98 percent in 2011 to 5.35 percent in 2023. Seagrass cover in Bardens Bay has mostly been around 90 percent since 2011.

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1. Introduction

Lake Macquarie is the largest saline lake in New South Wales. It lies on the central coast between Sydney and Newcastle within the local government areas of Central Coast Council and Lake Macquarie Council. Lake Macquarie has a catchment of 700 square kilometers and a water surface area of 125 square kilometers (Bell & Edwards, 1980). The lake has a permanent entrance to coastal waters at Swansea.

The catchment of Lake Macquarie is largely rural with large areas of bushland and grazing land. The shoreline of Lake Macquarie is heavily urbanized, especially the eastern, western and northern shorelines. The region has a relatively long history of coal mining and power generation, with mining occurring since the late 1800s and the first power station at Lake Macquarie commencing operations in 1958.

Chain Valley Colliery is situated on the southern shores of Lake Macquarie near Mannering Park, NSW. The mine has been operating since 1963. Mining is continuing within the Chain Valley Coal Lease Area using the miniwall method. Prior to mining, there were three economically viable seams in the lease area, namely the Wallarah seam (not mined since 1997); the Great Northern seam, and the Fassifern seam. In 2018 Chain Valley Colliery went into voluntary receivership and was taken over by Great Southern Energy Pty Ltd (trading as Delta Coal) to provide coal for Vales Point Power Station.

Delta Coal is currently mining the Fassifern Seam beneath Lake Macquarie. To protect the lake foreshore, a protection zone has been established as part of the extraction plan. This zone, known as the High Water Mark (HWM) Subsidence Barrier, was calculated using a 35° angle of draw from the depth of mining. The zone is approximately 130 meters wide.

J.H. & E.S. Laxton – Environmental Consultants P/L was engaged by Mr. Lachlan McWha, Environmental Compliance Coordinator for Chain Valley Colliery, to assess the potential effects of underground mining on seagrasses in Lake Macquarie. The mine is currently undertaking first workings.

The annual seagrass survey was conducted from the 9th to 12th June 2023.

2. Factors affecting the depth of water in Lake Macquarie

The bathymetric chart (Figure 2.1) of Lake Macquarie shows water depths relative to AHD. The actual depth of water above the lakebed varied greatly, between 0 and 1.3m above AHD over a year.

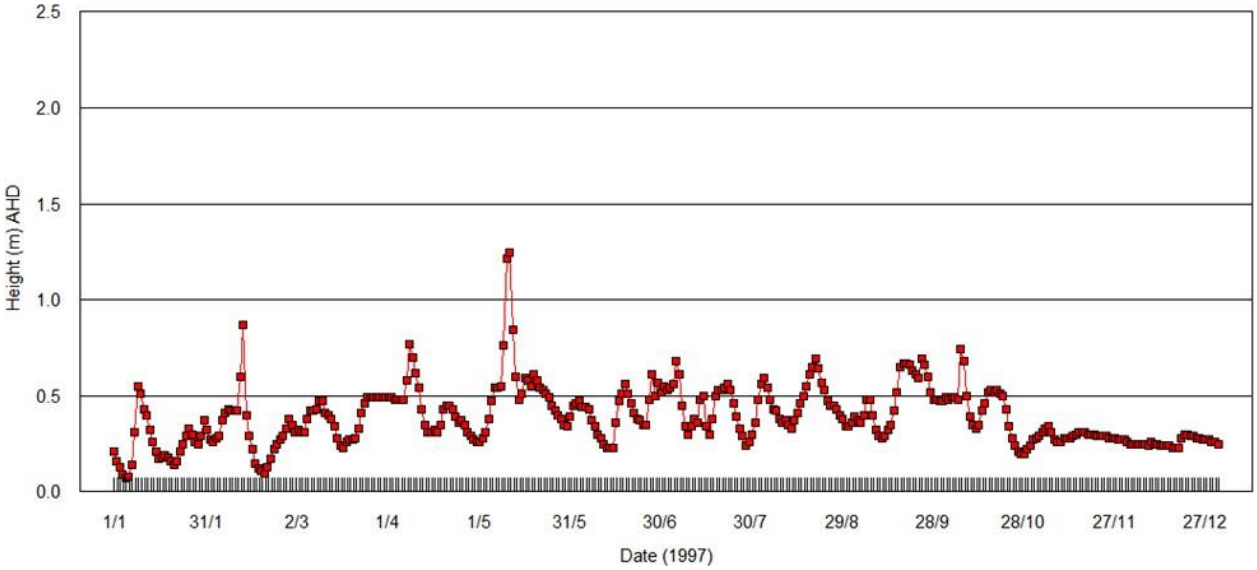


Figure 2.1 Water level changes in a coastal lagoon with an entrance open to coastal waters

Water depths in coastal saline lakes with an open entrance to coastal waters vary due to combinations of the following factors:

- The body of Lake Macquarie is subject to tidal influence. The height of the tidal prism at Swansea Head may reach almost 2m (during spring tides) but by the time the body of the lake is reached, the tidal prism has been reduced to around 0.05m.

- The height of coastal waters and coastal lakes are influenced by changes in atmospheric pressure. The Tasman Sea acts as a huge barometer. When the atmospheric pressure is high the sea surface is depressed. This causes water to drain from Lake Macquarie causing the depth of water in the body of the lake to decrease. When the atmospheric pressure over the Tasman Sea is low, the surface of the sea bulges upwards. This raising of sea level causes water to flow into Lake Macquarie, increasing the water depth.

- Low pressure systems in the Tasman Sea almost always generate strong winds and

coastal rainfall. The strong winds cause large swells to form that impact the coast. Wave setup at the entrance to Lake Macquarie causes the water level in the lake to rise as large volumes of seawater enter the system.

- Rainfall during a period of low atmospheric pressure causes runoff into catchment rivers and streams to increase. When this extra water reaches the body of Lake Macquarie, the water level rises in proportion to the runoff volume. This water is prevented from exiting the lake by wave setup at the entrance and the state of the tide. Under these circumstances, the level of the lake can rise to heights of a meter or more above AHD.

3. Factor affecting presence of seagrasses in Lake Macquarie

Observations made over many years (Laxton, 2007) show that photosynthetic benthic organisms (seagrasses and algae) are confined to the shallow water areas around the perimeter of Lake Macquarie. In Chain Valley Bay, Bardens Bay and off Summerland Point, seagrasses and benthic algae grow between 0 and -1.89m below AHD (except in September 2018 when *Halophila* and some algae were found in 4.5 to 6m of water at some stations due to low rainfall and clear water).

The water quality study of Lake Macquarie, carried out between 1983 and 1997, measured Photosynthetically Active Radiation (PAR) changes with depth monthly at twelve stations throughout the lake during the years 1983 to 1985. Data collected off Wyee Point are presented in Figure 3.1 and Figure 3.2.

It was found that only 14% of the light present at the surface reached a depth of 2.0m below the surface. By 6m below the surface only between 2% and 4% of PAR remained. Seagrasses and algae barely survived at 14% of the surface radiation. At 6m below the surface, they were not able to grow.

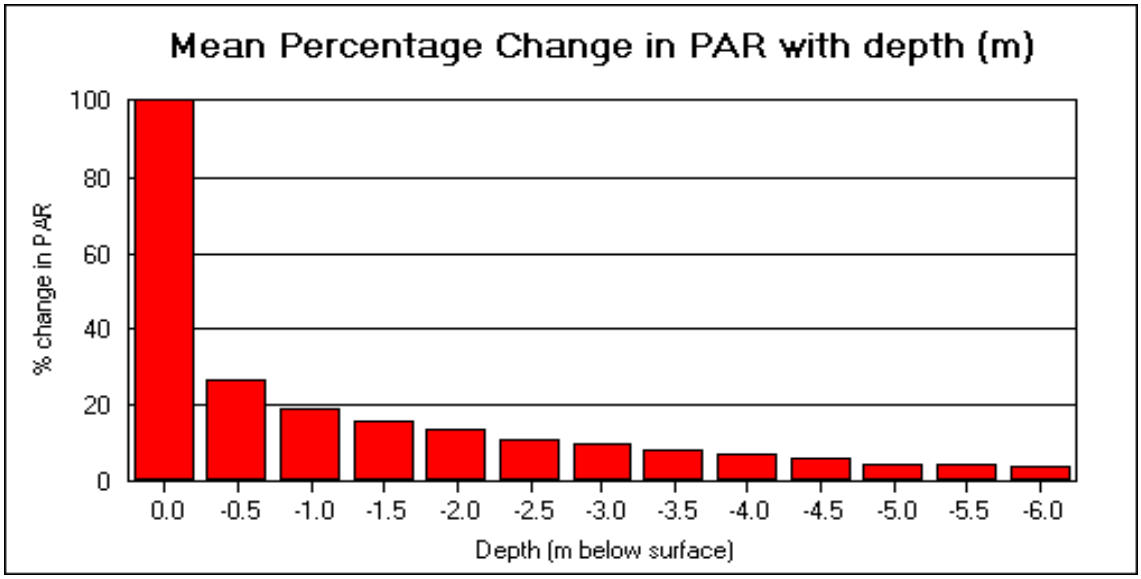


Figure 3.1 Mean percentage changes in PAR with depth at Wyee Point over 12 months

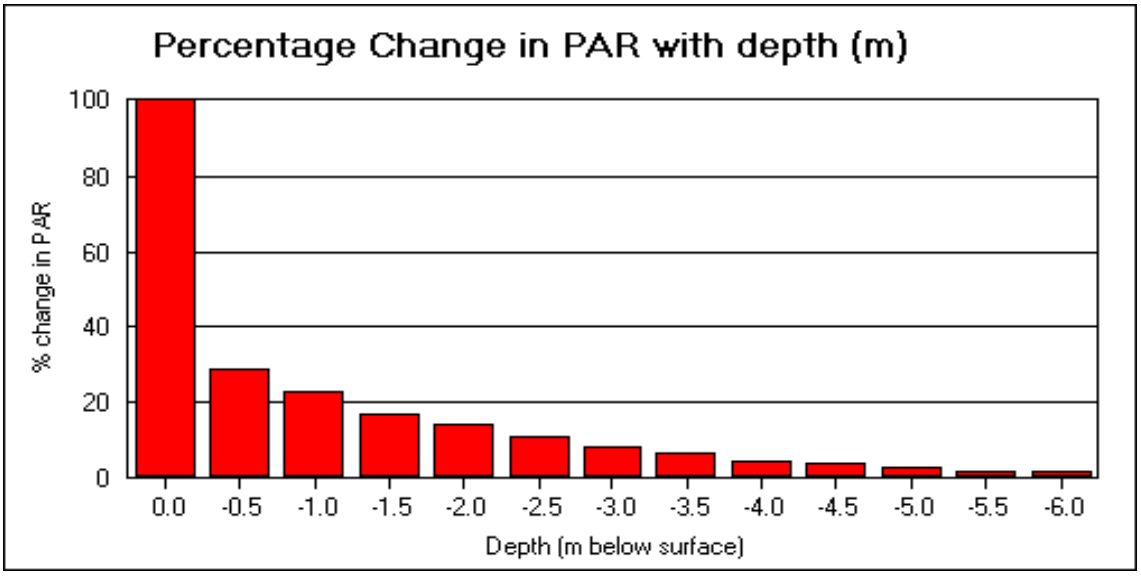


Figure 3.2 Actual percentage changes in PAR at Wyee Point (morning of 21 Apr 1983)

4. Seagrass survey methods

The seagrass survey was conducted from 9th to 12th June 2023 using a GoPro video camera.

The water depth along most of the transect lines ranged from around 0.1 to 1.8m. Transect lines were photographed from the outer end to the inner end.

The video was examined by viewing still frames approximately every 1m along the transect. The following information was recorded:

1. The transect number and the date the video was taken.
2. The percentage areas occupied by the following plants in each still photograph:
   (a) % area occupied by long leaved seagrass *Zostera capricorni*;
   (b) % area occupied by short leaved seagrass *Zostera capricorni*;
   (c) % area occupied by the small seagrass *Halophila ovalis*;
   (d) degree of fouling of the seagrass leaves by algae (0=no fouling, 1=light fouling, 2=heavy fouling);
   (e) % area occupied by the large brown alga *Cystoseira trinodis*;
   (f) % area occupied by the green alga *Codium fragile*
   (g) % area occupied by filamentous and thallous algae (green or brown algae);
   (h) % area of uncolonised ground (bare ground, no macroscopic epibenthos).

5. Location of seagrass transects

Figure 5.1 shows the location of seagrass transects in Bardens Bay, Sugar Bay, Frying Pan Bay, Summerland Point, Chain Valley Bay and Crangan Bay. From 2018 to 2023, a total of 50 transects were photographed annually:

- Transects E1 to E16 are established experimental transects in Chain Valley Bay and Summerland Point
- Transects T1 to T8 are established experimental transects along Summerland Point
- Transects C1 to C4 are established control stations in Crangan Bay
- Transect L1 was established in Chain Valley Bay in 2015
- Transects A1 to A6 are establised experimental stations in Bardens Bay. They were first surveyed in 2014
- Transects C5 to C6 were established in 2018
- Transects F1 to F7 along Summerland Point were established in 2018, and
- Transects S1 to S6 were established in Sugar Bay in 2018.



Figure 5.1 Locations of seagrass transects in Bardens Bay, Sugar Bay, Frying Pan Bay, Summerland Point, Chain Valley Bay and Crangan Bay, Lake Macquarie.

Tables 5.1 to 5.6 show the precise locations of the inner and outer ends of the permanent seagrass monitoring transects in Summerland Point, Chain Valley Bay, Bardens Bay, Sugar Bay and Crangan Bay as determined by differential GPS. The approximate lengths of the transects are also presented.

Table 5.1 Coordinates of inner and outer ends of permanent seagrass transects off northern shore Summerland Point and Frying Pan Bay

Transect No.	Easting	Northing	Transect No.	Easting	Northing	Transect Length (m)
C5 inner	56365676.16	6333038.68	C5 outer	56365702.98	6333084.58	41.57
C6 inner	56366045.20	6332831.77	C6 outer	56366058.95	6332870.63	13.67
F1 inner	56366320.96	6333281.31	F1 outer	56366285.58	6333249.79	47.11
F2 inner	56366342.19	6333330.55	F2 outer	56366290.92	6333450.31	130.55
F3 inner	56366611.11	6333163.11	F3 outer	56366621.00	6333228.01	65.64
F4 inner	56366968.01	6333242.46	F4 outer	56366918.81	6333285.18	65.04
F5 inner	56367106.95	6333361.98	F5 outer	56367068.97	6333421.28	70.46
F6 inner	56367271.10	6333493.19	F6 outer	56367202.42	6333522.83	74.81
F7 inner	56367402.36	6333682.09	F7 outer	56367374.73	6333694.93	30.47

Table 5.2 Coordinates of inner and outer ends of permanent seagrass transects along western shore Summerland Point

Transect No.	Easting	Northing	Transect No.	Easting	Northing	Transect Length (m)
E7 Inner	56385350.74	6332350.32	**E7 Outer**	56365297.96	6332344.97	52.44
T1 inner	56365439.70	6333217.30	**T1 outer**	56365442.62	6333264.67	47.48
T2 inner	56365402.69	6333100.83	**T2 outer**	56365388.27	6333100.67	14.39
T3 inner	56365400.34	6332951.79	**T3 outer**	56365384.15	6332949.28	16.32
T4 inner	56365377.42	6332816.19	**T4 outer**	56365357.10	6332831.62	25.14
T5 inner	56365350.31	6332990.09	**T5 outer**	56365309.37	6332575.63	49.14
T6 inner	56365347.91	6332380.19	**T6 outer**	56365300.00	6332337.91	63.53
T7 inner	56365320.68	6332207.46	**T7 outer**	56365267.96	6332206.74	52.90
T8 inner	56365336.86	6332262.46	**T8 outer**	56365295.11	6332270.42	42.36

Table 5.3 Coordinates of inner and outer ends of permanent seagrass transects in Chain Valley Bay

Transect No.	Easting	Northing	Transect No.	Easting	Northing	Transect Length (m)
E1 Inner	56363985.56	6331796.12	**E1 Outer**	56364003.66	6331816.06	26.25
E2 Inner	56364035.74	6331701.21	**E2 Outer**	56364076.97	6331716.45	44.60
E3 Inner	56363953.19	6331404.63	**E3 Outer**	56364027.57	6331417.71	75.09
E4 Inner	56364220.41	6331078.04	**E4 Outer**	56364259.92	6331122.01	59.30
L1 inner	56364292.62	6330367.65	**L1 outer**	56364304.40	6330399.71	20.00
E5 Inner	56365005.52	6330163.60	**E5 Outer**	56365034.44	6330225.24	67.45
E6 Inner	56365118.34	6329788.72	**E6 Outer**	56365174.56	6329802.58	57.97
E8 Inner	56365128.31	6331795.44	**E8 Outer**	56365096.58	6331811.56	35.36
E9 Inner	56365040.02	6331607.80	**E9 Outer**	56364913.26	6331523.98	152.68
E10 Inner	56365422.82	6331427.70	**E10 Outer**	56365394.86	6331361.84	71.01
E11 Inner	56365554.10	6331410.24	**E11 Outer**	56365524.31	6331343.51	73.21
E12 Inner	56365749.60	6331328.35	**E12 Outer**	56365735.31	6331284.62	46.22
E13 Inner	56365990.71	6331278.46	**E13 Outer**	56365970.44	6331190.80	89.54
E14 Inner	56366447.51	6331046.57	**E14 Outer**	56366370.49	6330984.28	98.63
E15 Inner	56366657.26	6330098.71	**E15 Outer**	56366610.88	6330167.27	82.85
E16 Inner	56366310.52	6329644.48	**E16 Outer**	56366272.93	6329666.33	44.26

Table 5.4 Coordinates of inner and outer ends of permanent seagrass transects in Bardens Bay.

Transect No.	Easting	Northing	Transect No.	Easting	Northing	Transect Length (m)
A1 inner	56364006.28	6333892.16	A1 outer	56364048.43	6333899.34	42.60
A2 inner	56363979.36	6334006.51	A2 outer	56364002.16	6334013.22	24.00
A3 inner	56363918.06	6334157.90	A3 outer	56363927.53	6334165.80	34.80
A4 inner	56363633.48	6334426.20	A4 outer	56363660.06	6334425.14	26.30
A5 inner	56363686.18	6335068.50	A5 outer	56363688.41	6335049.82	18.30
A6 inner	56364434.63	6334566.67	A6 outer	56364422.84	6334560.15	13.70

Table 5.5 Coordinates of inner and outer ends of permanent seagrass monitoring transects in Sugar Bay.

Transect No.	Easting	Northing	Transect No.	Easting	Northing	Transect Length (m)
S1 inner	56365009.02	6334470.41	S1 outer	56365077.72	6334481.77	69.64
S2 inner	56364642.29	6334943.57	S2 outer	56364673.53	6334939.82	31.46
S3 inner	56365017.76	6335008.93	S3 outer	56365041.97	6334932.70	79.98
S4 inner	56365235.10	6334992.86	S4 outer	56365217.43	6334889.31	105.05
S5 inner	56365575.20	6334709.08	S5 outer	36365569.66	6334693.44	16.60

S6 inner	56366144.58	6334765.21	S6 outer	56366172.04	6334761.92	27.67

Table 5.6 Coordinates of inner and outer ends of permanent seagrass transects in Crangan Bay.

Transect No.	Easting	Northing	Transect No.	Easting	Northing	Transect Length (m)
C1 Inner	56368596	6332235	C1 Outer	56368616	6332250	13.64
C2 Inner	56368619	6332147	C2 Outer	56368658	6332151	13.84
C3 Inner	56368524	6331811	C3 Outer	56368538	6331806	90.91
C4 Inner	56368467	6331435	C4 Outer	56368486	6331421	37.50

The average length of transects in Chain Valley Bay, northern shore Summerland Point, and western shore Summerland Point was 65.3m, 59.9m and 40.4m respectively. The average length of transect in Bardens Bay and Sugar Bay was 26.6m and 55.1m. The transects along Crangan Bay off Gwandalan had an average of 38.9m.

The transects with the greatest lengths were Transects E9 (152m), F2 (131m), S4 (105m) and C3 (91m). The transects with the shortest lengths were Transects C1, C2, C6, T2 and A6, all approximately 14m in length.

6. Physical characteristics of water in Lake Macquarie – June 2023

The physical characteristics of the waters above the seagrass beds in Lake Macquarie were measured on 9th to 12th June 2023 using a calibrated Yeo-Kal 618RU Analyser. Units of measurement were Temperature (TEMP) - degrees Celsius; Conductivity (COND) - mS/cm; Salinity (SAL) - parts per thousand; Dissolved Oxygen - % saturation and mg/L; and Turbidity (TURB) - NTU. At the time of sampling, the pH probe developed issues. pH was therefore recorded at transect T1 only.

The physical characteristics of the bottom water at each transect in the study area of Lake Macquarie are shown in **Table 6.1** and were as follows:

- Water Temperature ranged from 16.58ºC at Transect C1 to 19.04ºC at Transect A1. Mean water temperature was 17.70ºC.
- Conductivity ranged from 55.71 mS/cm at Transect E6 to 56.22 mS/cm at Transect F3. Mean conductivity was 55.98 mS/cm.

- Salinity ranged from 36.92 ppt at Transect E6 to 37.33 ppt at Transect C3. Mean salinity was 37.16 ppt.
- Turbidity ranged from 9.4 NTU at Transect S4 to 29.20 NTU at Transect S5. Mean turbidity was 13.54 NTU.
- pH was 7.75 at Transect T1.
- Dissolved oxygen (% saturation) ranged from 84.6% at Transect A4 to 135.7% at Transect C6. Mean dissolved oxygen was 100.7% saturation. Super saturation of dissolved oxygen was the result of oxygen production by the seagrasses and epiphytic algae.

Rainfall in the months preceding the survey was 101.4mm, 113.8mm and 52.0mm for March, April and May 2023 respectively (Cooranbong Lake Macquarie AWS No. 061412). By 12th June a further 1.6 mm had fallen in the catchment.

Table 6.1 Physical characteristics of waters above seagrass transects, Lake Macquarie - June 2023

Northern Shore Summerland Point and Frying Pan Bay

Station	Temperature ºC	Conductivity mS/cm	Salinity ppt	Dissolved Oxygen % sat	Dissolved Oxygen mg/L	Turbidity NTU
C5	18.02	56.01	37.18	113.9	8.64	10.1
C6	18.30	56.04	37.21	135.7	10.40	11.5
F1	18.03	56.01	37.19	104.2	7.90	22.4
F2	18.17	56.04	37.21	99.8	7.55	18.0
F3	17.75	56.22	37.32	118.5	9.01	11.2
F4	17.88	56.12	37.25	107.5	8.18	10.9
F5	17.70	56.06	37.21	105.5	8.02	10.4
F6	17.71	56.02	37.21	104.4	7.96	10.4
F7	17.64	56.04	37.20	102.7	7.85	18.1
Average	**17.91**	**56.06**	**37.22**	**110.24**	**8.39**	**13.67**
Min	**17.64**	**56.01**	**37.18**	**99.80**	**7.55**	**10.10**
Max	**18.30**	**56.22**	**37.32**	**135.70**	**10.40**	**22.40**

Western Shore Summerland Point

Station	Temperature ºC	Conductivity mS/cm	Salinity ppt	Dissolved Oxygen % sat	Dissolved Oxygen mg/L	Turbidity NTU
E7	17.96	55.98	37.15	95.5	7.24	15.1
T1	17.81	56.21	37.26	89.6	6.75	16.7
T2	17.92	56.08	37.22	98.1	7.43	14.9
T3	17.88	56.03	37.18	92.2	7.02	14.7
T4	17.91	55.92	37.15	91.7	6.98	14.8
T5	17.93	55.96	37.14	93.2	7.05	15.4
T6	17.95	55.95	37.13	94.2	7.16	15.1
T7	17.92	55.96	37.15	105.7	8.02	14.8
T8	18.03	55.95	37.13	96.0	7.29	14.4
Average	**17.92**	**56.00**	**37.17**	**95.13**	**7.22**	**15.10**
Min	**17.81**	**55.92**	**37.13**	**89.60**	**6.75**	**14.40**
Max	**18.03**	**56.21**	**37.26**	**105.70**	**8.02**	**16.70**

Chain Valley Bay

Station	Temperature ºC	Conductivity mS/cm	Salinity ppt	Dissolved Oxygen % sat	Dissolved Oxygen mg/L	Turbidity NTU
E1	18.42	55.83	37.11	110.8	8.34	11.7
E2	18.22	55.97	37.10	110.1	8.44	11.6
E3	18.13	55.93	37.14	105.6	7.98	11.5
E4	17.81	55.82	37.20	112.4	8.76	10.7
L1	17.87	55.99	37.04	103.4	7.92	20.7
E5	17.26	55.79	37.02	107.6	8.27	11.2
E6	17.33	55.71	36.92	103.2	7.94	12.4
E8	17.99	56.00	37.18	111.9	8.55	19.6
E9	17.75	55.93	37.12	88.3	6.91	14.2
E10	17.52	55.92	37.10	92.2	7.06	12.6
E11	17.53	55.95	37.13	91.9	7.04	12.6

E12	17.62	55.98	37.13	93.7	7.15	12.0
E13	17.39	55.96	37.13	93.3	7.17	10.4
E14	17.37	55.94	37.13	98.4	7.59	10.7
E15	16.59	55.80	37.03	103.9	8.10	11.5
E16	16.62	55.83	37.04	102.4	7.98	11.0
Average	**17.59**	**55.90**	**37.10**	**101.82**	**7.83**	**12.78**
Min	**16.59**	**55.71**	**36.92**	**88.30**	**6.91**	**10.40**
Max	**18.42**	**56.00**	**37.20**	**112.40**	**8.76**	**20.70**

Bardens Bay

Station	Temperature ºC	Conductivity mS/cm	Salinity ppt	Dissolved Oxygen % sat	Dissolved Oxygen mg/L	Turbidity NTU
A1	19.04	55.92	37.10	112.7	8.43	13.1
A2	18.89	55.93	37.12	112.8	8.41	13.1
A3	18.77	55.92	37.10	122.3	9.14	13.5
A4	17.31	56.08	37.19	84.6	6.46	13.7
A5	17.30	55.95	37.13	87.8	6.75	13.3
A6	17.37	55.94	37.16	88.5	6.77	12.9
Average	**18.11**	**55.96**	**37.13**	**101.45**	**7.66**	**13.27**
Min	**17.30**	**55.92**	**37.10**	**84.6**	**6.46**	**12.9**
Max	**19.04**	**56.08**	**37.19**	**122.3**	**9.14**	**13.7**

Sugar Bay

Station	Temperature ºC	Conductivity mS/cm	Salinity ppt	Dissolved Oxygen % sat	Dissolved Oxygen mg/L	Turbidity NTU
S1	17.78	55.91	37.12	92.4	7.02	13.2
S2	17.06	55.95	37.15	92.8	7.16	11.7
S3	17.50	55.92	37.12	95.7	7.33	9.7
S4	17.53	55.93	37.12	96.1	7.38	9.4
S5	17.99	55.94	37.09	99.3	7.56	29.2

S6	17.75	55.93	37.14	112.1	8.56	9.5
Average	**17.60**	**55.93**	**37.12**	**98.07**	**7.50**	**13.78**
Min	**17.06**	**55.91**	**37.09**	**92.4**	**7.02**	**9.4**
Max	**17.99**	**55.95**	**37.15**	**112.1**	**8.56**	**29.2**

Crangan Bay Gwandalan

Station	Temperature ºC	Conductivity mS/cm	Salinity ppt	Dissolved Oxygen % sat	Dissolved Oxygen mg/L	Turbidity NTU
C1	16.58	56.11	37.29	85.1	6.65	11.7
C2	16.70	56.21	37.32	89.7	6.95	10.3
C3	16.65	56.20	37.33	91.0	7.10	15.1
C4	16.68	56.12	37.26	93.3	7.29	14.4
Average	**16.65**	**56.16**	**37.30**	**89.8**	**7.00**	**12.88**
Min	**16.58**	**56.11**	**37.26**	**85.1**	**6.65**	**10.3**
Max	**16.70**	**56.21**	**37.33**	**93.3**	**7.29**	**15.1**

All Stations

	Temperature ºC	Conductivity mS/cm	Salinity ppt	Dissolved Oxygen % sat	Dissolved Oxygen mg/L	Turbidity NTU
Average	17.70	55.98	37.16	101.0	7.69	13.5
Min	16.58	55.71	36.92	84.6	6.46	9.4
Max	19.04	56.22	37.33	135.7	10.40	29.20

7. Plant species found in the study area

Plate 7.1 provides information about the plants monitored in the seagrass surveys of Lake Macquarie, NSW from 2007 to 2023. Two seagrass species and five species of alga have been identified in the study area.

Plate 7.1 Plant species found in the study area of Lake Macquarie (2007 - 2023).



Kingdom: Plantae
Phylum: Magnoliophyta
Class: Liliopsida
Order: Potamogetonales
Family: Zosteraceae
Genus: *Zostera*
Species: *Z. capricorni*

Remarks: *Zostera capricorni* is a species of eelgrass native to the seacoasts of New Guinea, Queensland, New South Wales, Victoria, South Australia, Norfolk Island and the North Island of New Zealand. It was first discovered at Moreton Bay in Queensland in 1875.



Kingdom: Plantae
Phylum: Magnoliophyta
Class: Liliopsida
Order: Hydrocharitales
Family: Hydrocharitaceae
Genus: *Halophila*
Species: *H. ovalis*

Remarks: *Halophila ovalis* commonly known as paddle weed, spoon grass or dugong grass, is a seagrass in the family Hydrocharitaceae. It is a small herbaceous plant that occurs in seabeds and other saltwater environments in the Indo-Pacific.



Kingdom: Plantae
Phylum: Phaeophyta
Class: Phaeophyceae
Order: Fucales
Family: Hormosiraceae
Genus: *Hormosira*
Species: *H. banksii*

Remarks: *Hormosira banksii*, also known as Neptune's necklace, Neptune's pearls, sea grapes, or bubbleweed is a species of brown alga native to Australia and New Zealand. It is abundant on low-energy rocky reefs at midtide levels, where it outcompetes other algal species due to its high tolerance to desiccation. First recorded at Transect C1 in Crangan Bay on 12th June 2010.



Kingdom: Plantae
Phylum: Phaeophyta
Class: Phaeophyceae
Order: Fucales
Family: Sargassaceae
Genus: *Sargassum*

Remarks: *Sargassum* is a genus of brown macroalgae in the order Fucales. Numerous species are distributed throughout the temperate and tropical oceans of the world, where they generally inhabit shallow water and coral reefs, and the genus is widely known for its planktonic species.



Kingdom: Plantae
Phylum: Phaeophyta
Class: Phaeophyceae
Order: Fucales
Family: Cystoseiraceae
Genus: *Cystoseira*
Species: *C. trinodis*
Synonym: *Cystophyllum onustum*

Remarks: A macroalgae widespread in Australia and the Indo-Pacific region. The plants vary considerably in size and form, with tall thin plants up to 1.5m high in very sheltered and estuarine waters, or more compact thicker-stemmed plants up to 30cm high in oceanic reef pools. Characterised by small peg-like projections on the lower parts of the main branches.



Kingdom: Plantae
Phylum: Chlorophyta
Class: Ulvophyceae
Order: Bryopsidales
Family: Codiaceae
Genus: *Codium*
Species: *C. fragile*

Remarks: The cylindrical, forked, dark green fronds of *C. fragile* grow to 30 cm long. When the plant is under water, fine hairs can be seen over the surface of the branches. This is a species of temperate regions, found subtidally and in intertidal pools often on rough coasts. Small red algae are often found growing on C. fragile, giving a pink colour to the fronds.



Kingdom: Plantae

Green filamentous algae

Remarks: Filamentous algae are colonies of microscopic plants that link together to form threads or mesh-like filaments. These primitive plants normally grow on the surface of hard objects or other substrates under the water but they can break loose and form floating mats.

8. Seagrass characteristics and fouling levels measured in surveys

The following plates show the various growth characteristics of the seagrass *Zostera capricorni* in regard to leaf length. In the study area, due to environmental factors, *Zostera capricorni* either had short leaf growth (**Plate 8.1**) or was long leaved (**Plate 8.4**). The plates also show the levels of fouling of seagrass beds by filamentous algae and other algal species. In this study, fouling is described as No (Level 0), Low (Level 1) or Heavy (Level 2) (**Plates 8.1- 8.6**).

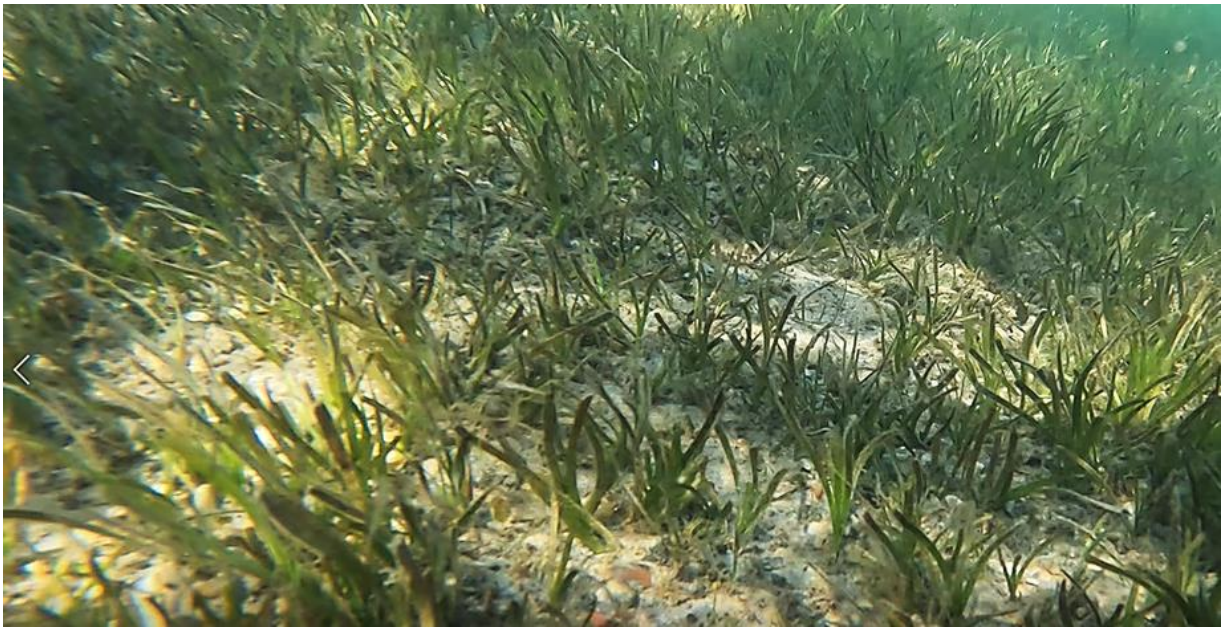


Plate 8.1 Short leaved sea grass with no fouling



Plate 8.2 Short leaved seagrass with low fouling



Plate 8.3 Short leaved seagrass with heavy fouling

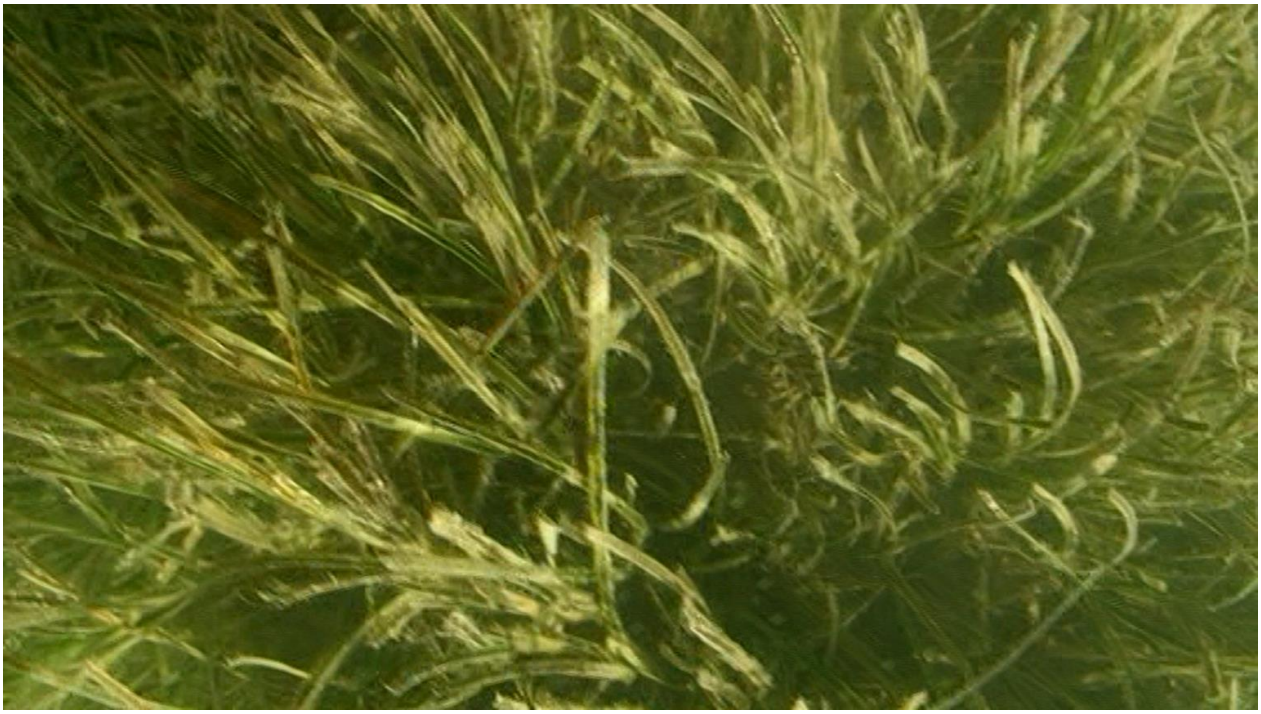


Plate 8.4 Long leaved seagrass with no fouling



Plate 8.5 Long leaved seagrass with low fouling



Plate 8.6 Long leaved seagrass with heavy fouling



Plate 8.7 Algae, *Halophila* and bare ground

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9. Analysis of photographs along permanent transects

Two species of seagrass were identified in the study area, *Zostera capricorni* and *Halophila ovalis* (Plate 7.1). The seagrass *Zostera capricorni* had the greatest coverage and was found along the entire length of the transects. *Halophila ovalis* was found predominantly in the shallower waters on the shoreline or as single plants nestled amongst less dense patches of *Zostera capricorni*. In June 2023, the average total seagrass coverage in the study area ranged from:

- 50.2% at F2 to 96.8% at F4 on the northern shore of Summerland Point and Frying Pan Bay (Table 9.1)
- 74.4% at T2 to 92.3% at T1 along the western shore of Summerland Point (Table 9.2)
- 75.0% at E6 to 99.3% at E13 in Chain Valley Bay (Table 9.3)
- 74.3% at A1 to 97.5% at A6 in Bardens Bay (Table 9.4)
- 90.7% at S1 to 96.3% at S4 in Sugar Bay (Table 9.5) and
- 82.1% at C1 to 95.2% at C4 in Crangan Bay (Table 9.6).

At the time of survey, transects with the highest coverage of *Halophila ovalis* were E6 (5.1%), S2 (3.5%), C1 (2.8%) and A1 (2.7%) (Tables 9.1-9.6).

Three species of alga were recorded in the study area, namely *Cystoseira trinodis* (synonym *Cystophyllum onustum*), *Codium fragile* and green filamentous algae. The transects with the highest total coverage of *Cystoseira* were F2 (28.5% total coverage), A1 (9.1%), A2 (8.6%), A3 (7.1%), E1 (5.1%) and T2 (4.9%). *Codium fragile* was observed at transects A1 (0.4% total coverage) and C1 (0.9% total coverage) only. Transects E10 and S1 had the highest average total coverage of filamentous algae, 6.8% and 4.6% respectively.

Table 9.1 Average percent area cover of substratum by seagrasses and algae - northern shore Summerland Point and Frying Pan Bay

Percent Area	C5	C6	F1	F2	F3	F4	F5	F6	F7
Seagrasses									
Zostera	**93.1**	**94.9**	**95.6**	**50.2**	84.0	96.3	85.6	83.2	77.1
Halophila	0.0	0.3	0.1	0.0	2.4	0.6	0.1	2.8	2.3
Total	**93.1**	**95.1**	**95.6**	**50.2**	**86.5**	**96.8**	**85.7**	**86.0**	**79.4**
Algae									
Cystoseira	1.0	0.7	0.6	28.5	1.9	0.4	3.9	1.5	0.3
Codium	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Filamentous algae	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**3.4**	**0.7**	**0.6**	**28.5**	**1.9**	**0.4**	**3.9**	**1.5**	**0.3**
Bare ground	**3.5**	**4.1**	**3.7**	**21.4**	**11.7**	**2.8**	**10.5**	**12.6**	**20.3**

Table 9.2 Average percent area cover of substratum by seagrasses and algae - western shore Summerland Point

Percent Area	E7	T1	T2	T3	T4	T5	T6	T7	T8
Seagrasses									
Zostera	**85.9**	**91.2**	**74.1**	**88.2**	90.2	82.1	84.3	83.1	81.2
Halophila	1.4	1.0	0.3	0.6	0.1	2.2	1.7	1.1	2.0
Total	**87.3**	**92.3**	**74.4**	**88.8**	**90.3**	**84.3**	**86.0**	**84.3**	**83.2**
Algae									
Cystoseira	0.2	2.6	4.9	2.1	1.1	0.6	0.1	0.2	0.0
Codium	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Filamentous algae	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.2**	**2.9**	**4.9**	**2.1**	**1.1**	**0.6**	**0.1**	**0.2**	**0.0**
Bare ground	**12.6**	**5.0**	**20.7**	**9.1**	**8.6**	**15.1**	**13.9**	**15.5**	**17.0**

Table 9.3 Average percent area cover of substratum by seagrasses and algae – Chain Valley Bay

Percent Area	E1	E2	E3	E4	L1	E5	E6	E8	E9
Seagrasses									
Zostera	85.0	85.6	96.6	90.2	92.7	96.3	69.9	86.0	95.7
Halophila	0.4	1.6	0.1	1.3	1.0	0.1	5.1	1.5	0.5
Total	**85.4**	**87.2**	**96.7**	**91.5**	**93.6**	**96.4**	**75.0**	**87.5**	**96.2**
Algae									
Cystoseira	5.1	2.4	0.0	2.6	0.8	0.3	0.1	0.1	0.3
Codium	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Filamentous algae	0.5	5.3	0.0	0.1	0.0	0.2	0.0	0.0	0.0
Total	**5.6**	**7.7**	**0.0**	**2.7**	**0.8**	**0.5**	**0.1**	**0.1**	**0.3**
Bare ground	**9.0**	**5.1**	**3.3**	**5.8**	**5.6**	**3.1**	**22.1**	**12.4**	**3.5**

Percent Area	E10	E11	E12	E13	E14	E15	E16
Seagrasses							
Zostera	**88.2**	**96.5**	**94.3**	**99.3**	92.4	88.9	95.1
Halophila	0.8	0.1	0.5	0.0	0.1	0.7	0.1
Total	**89.0**	**96.6**	**94.8**	**99.3**	**92.5**	**89.6**	**95.2**
Algae							
Cystoseira	1.5	0.1	0.0	0.2	0.4	0.2	0.1
Codium	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Filamentous algae	6.8	0.0	0.4	0.0	0.4	0.0	0.0
Total	**8.2**	**0.1**	**0.4**	**0.2**	**0.8**	**0.2**	**0.1**
Bare ground	**2.8**	**3.2**	**4.8**	**0.4**	**6.6**	**10.1**	**4.6**

Table 9.4 Average percent area cover of substratum by seagrasses and algae – Bardens Bay

Percent Area	A1	A2	A3	A4	A5	A6
Seagrasses						
Zostera	**71.6**	**84.5**	**86.0**	**94.6**	79.4	97.2
Halophila	2.7	0.9	0.8	1.8	4.0	0.3
Total	**74.3**	**82.5**	**86.8**	**96.4**	**83.5**	**97.5**
Algae						
Cystoseira	9.1	8.6	7.1	0.1	0.0	0.8
Codium	0.4	0.0	0.0	0.0	0.0	0.0
Filamentous algae	0.0	0.0	0.0	0.0	0.0	0.3
Total	**9.5**	**8.6**	**7.1**	**0.1**	**0.0**	**1.1**
Bare ground	**16.3**	**8.6**	**6.1**	**3.5**	**16.6**	**1.4**

Table 9.5 Average percent area cover of substratum by seagrasses and algae – Sugar Bay

Percent Area	S1	S2	S3	S4	S5	S6
Seagrasses						
Zostera	**90.7**	**90.8**	**92.9**	**95.7**	92.6	93.2
Halophila	0.0	3.5	2.4	0.7	0.4	0.1
Total	**90.7**	**94.3**	**95.3**	**96.3**	**92.9**	**93.4**
Algae						
Cystoseira	2.7	0.3	0.7	0.3	0.6	0.3
Codium	0.0	0.0	0.0	0.0	0.0	0.0
Filamentous algae	4.6	0.0	0.0	0.0	0.4	0.0
Total	**7.3**	**0.3**	**0.7**	**0.3**	**1.0**	**0.3**
Bare ground	**2.1**	**5.4**	**4.0**	**3.5**	**6.0**	**6.3**

Table 9.6 Average percent area cover of substratum by seagrasses and algae – Crangan Bay

Percent Area	**C1**	**C2**	**C3**	**C4**
Seagrasses				
Zostera	**79.3**	**91.6**	**94.9**	**95.2**
Halophila	2.8	0.6	0.3	0.0
Total	**82.1**	**92.2**	**95.1**	**95.2**
Algae				
Cystoseira	6.8	0.8	0.5	0.7
Codium	0.9	0.0	0.0	0.0
Filamentous algae	0.0	0.6	1.5	2.4
Total	**7.6**	**1.4**	**2.1**	**3.2**
Bare ground	**10.4**	**6.5**	**2.9**	**1.6**

Figures 9.1 to **9.6** show annual changes in the percentage cover of seagrasses off Summerland Point and in Chain Valley Bay, Bardens Bay, Sugar Bay and Crangan Bay. Numerical values are presented in Appendix 2. Seagrass cover continues to be high and consistent, with only six transects showing a slight decline in seagrass coverage in the June 2023 survey compared to 2022 findings. Changes in coverage were due to:

- A high presence of the alga *Cystoseira trinodis*. At transect F2, for instance, *C. trinodis* covers approximately 28.5 percent of the substratum. The plants have grown to an impressive size over the years.
- The presence of *Halophila ovalis.* Changes in survey methods and camera are enabling photography in very shallow water. *Halophila ovalis* prefers an environment without competition and is usually observed growing in the sand along the shoreline above the *Zostera* beds. Photographing this band of sand to capture the presence of *H. ovalis* has affected the statistics by reducing the presence of *Zostera* and increasing the presence of bare ground. The changes in survey methods are also making it possible to distinguish *H. ovalis* in deeper water from shadows. These plants, which are nestled amongst the

Zostera, are very difficult to observe, especially when the delicate leaves are covered by fine sediment.

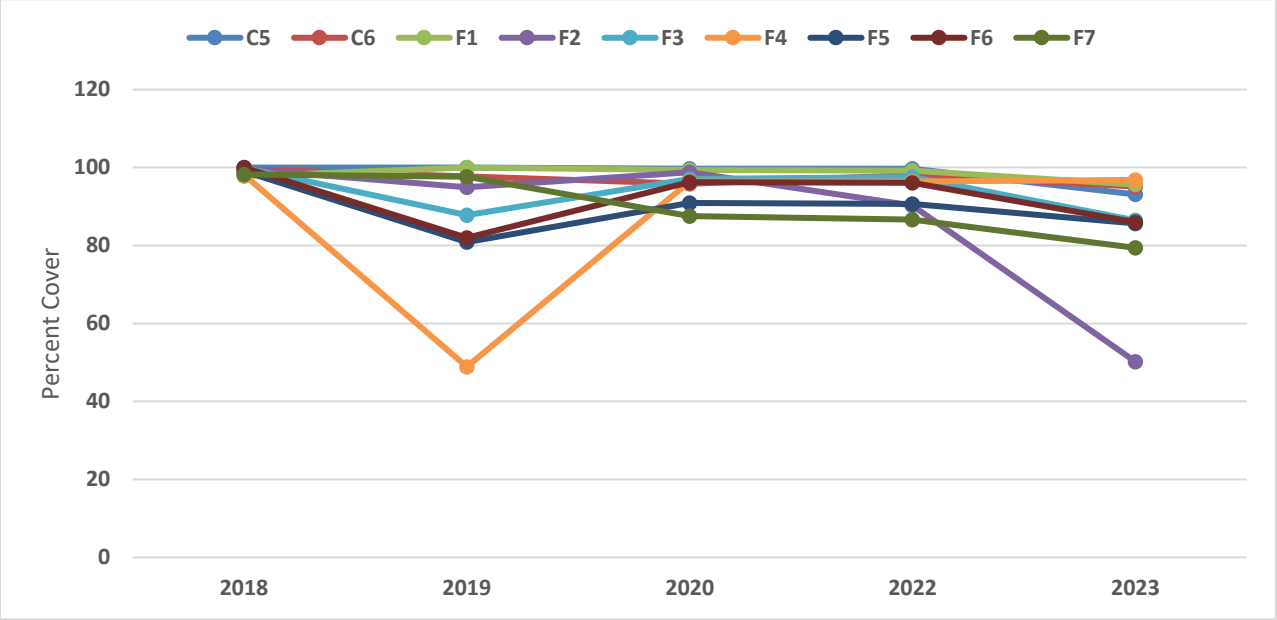


Figure 9.1 Changes in percent cover of seagrasses along Frying Pan Bay and northern shore of Summerland Point (2018-2023)

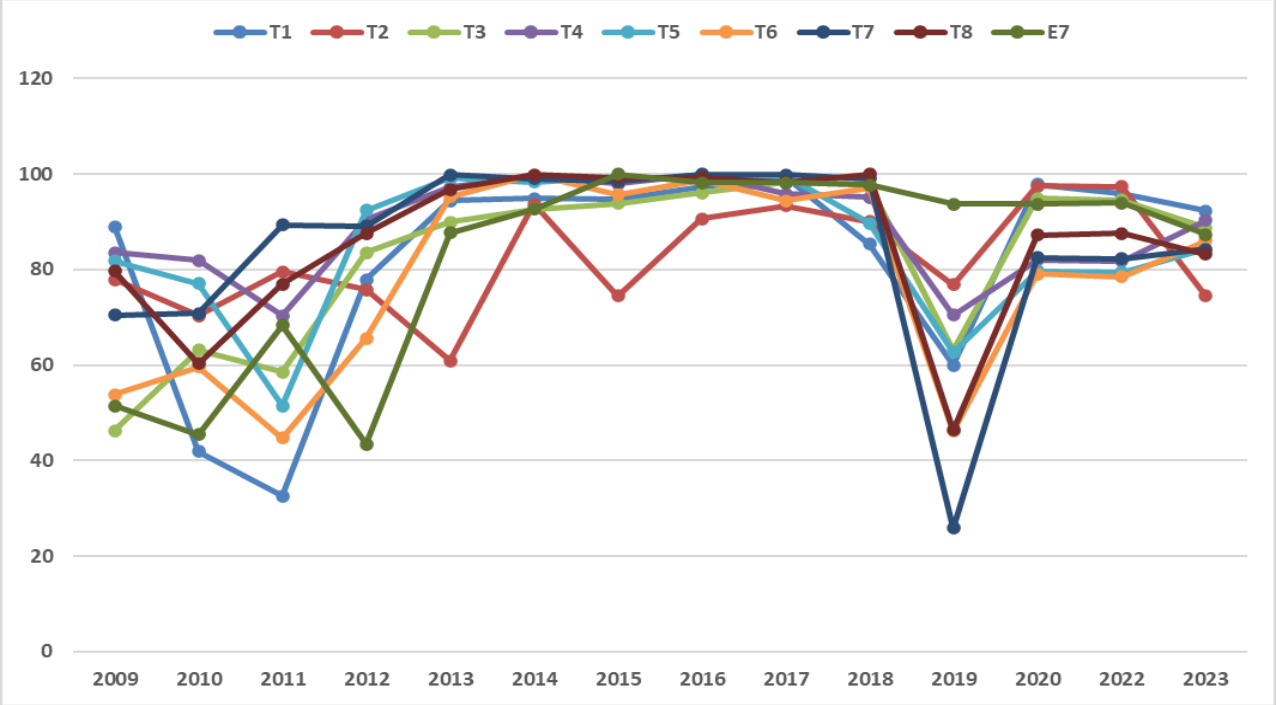


Figure 9.2 Changes in percent cover of seagrasses along western shore of Summerland Point (2009-2023)

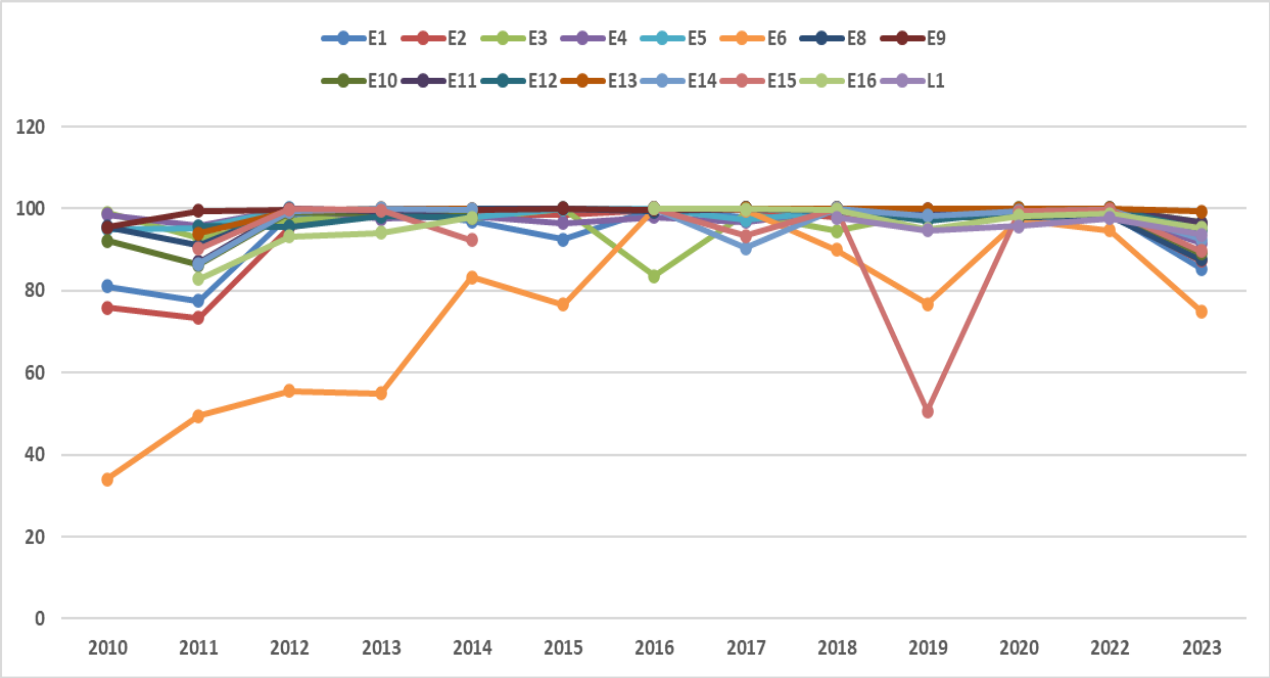


Figure 9.3 Changes in percent cover of seagrasses in Chain Valley Bay (2008-2023)

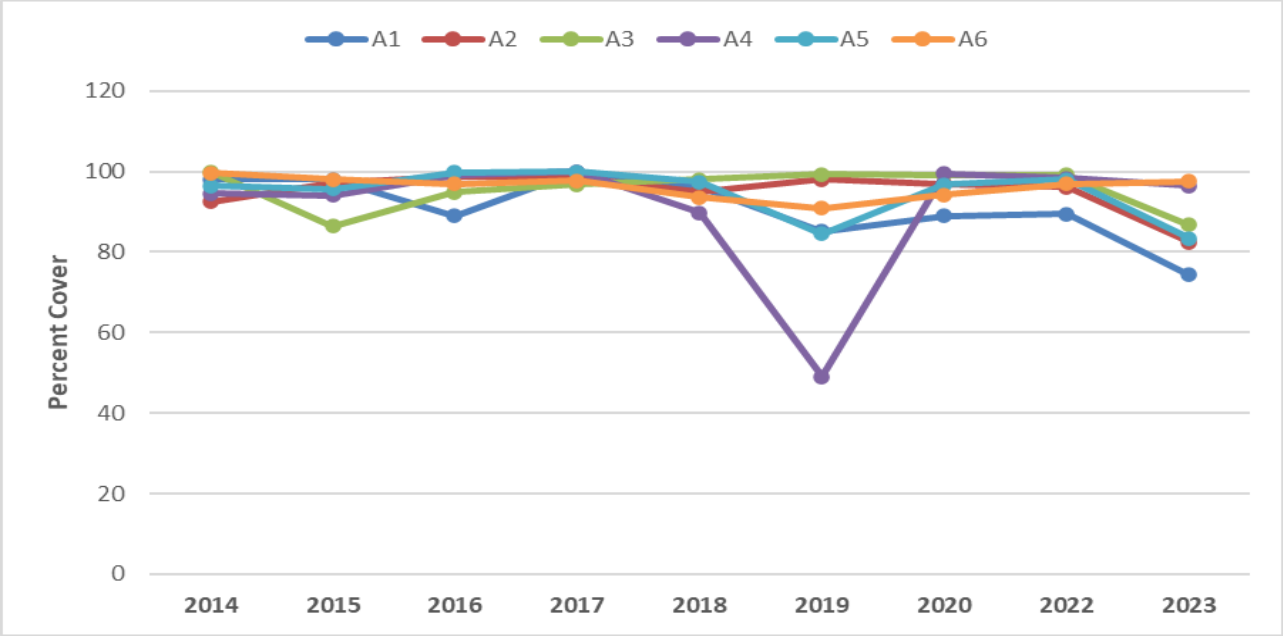


Figure 9.4 Changes in percent cover of seagrasses in Bardens Bay (2014-2023)

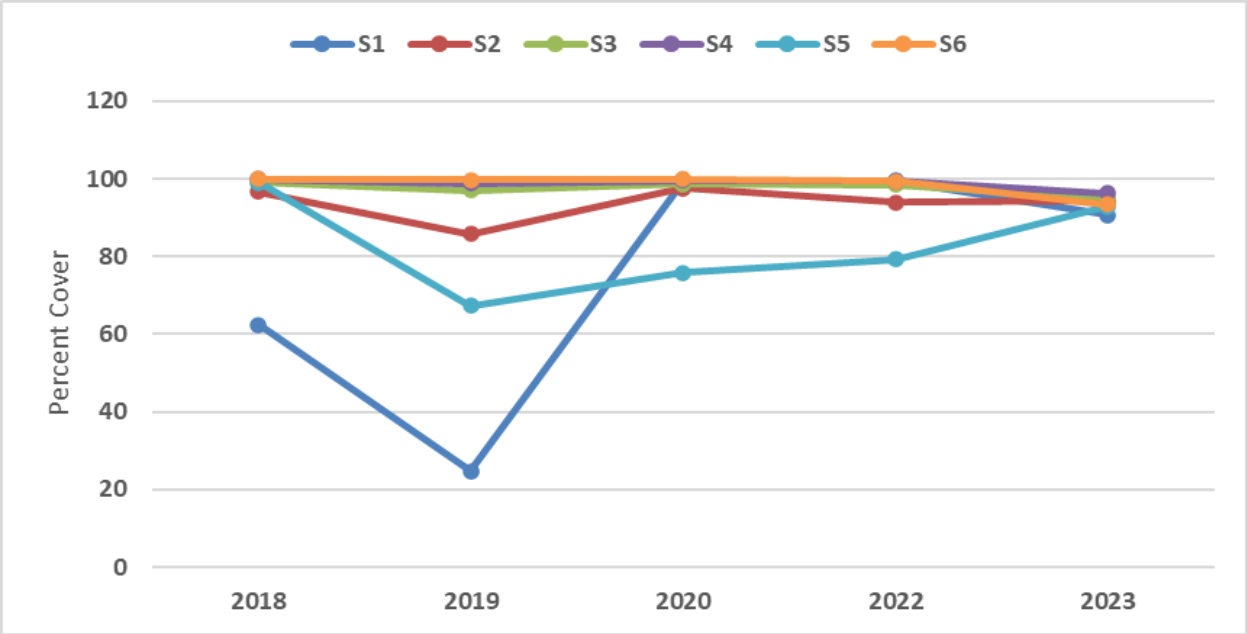


Figure 9.5 Changes in percent cover of seagrasses in Sugar Bay (2018-2023)

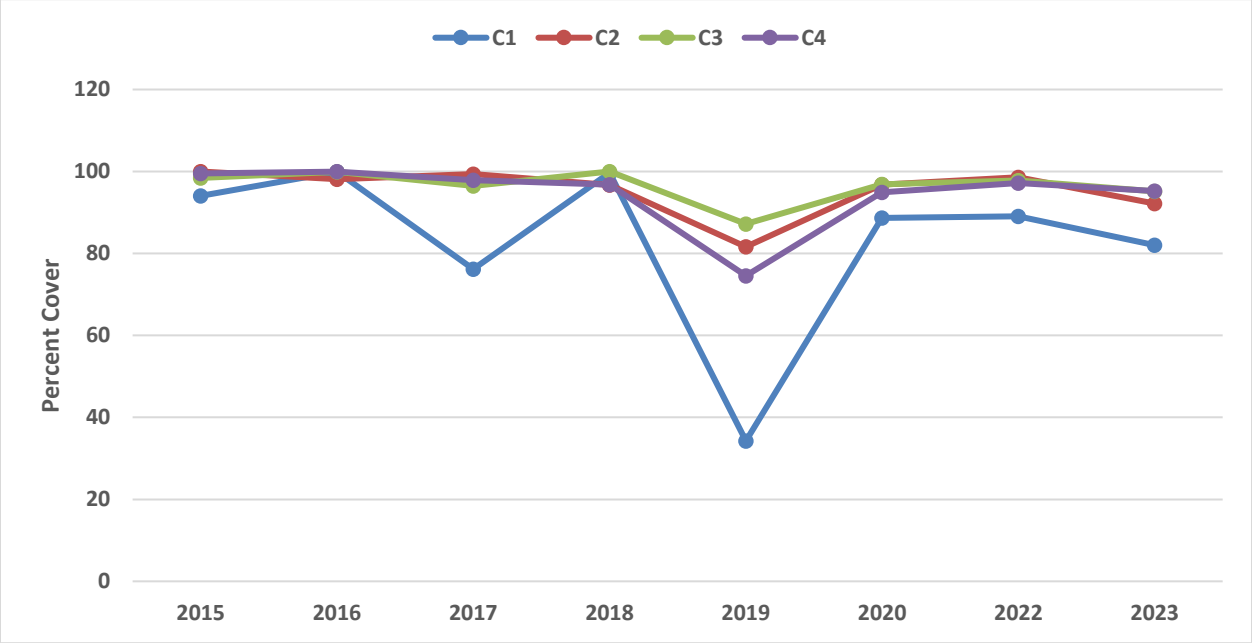


Figure 9.6 Changes in percent cover of seagrasses in Crangan Bay (2015-2023)

In June 2023, the seagrasses were in good condition, with most seagrasses lightly fouled with epiphytic algae or not fouled. Transects with high levels of fouling were E6, E10, R16, L1 and C4 (**Appendix 1**).

Table 9.7 shows the average composition, percent cover and condition of seagrass beds in the four regions of Lake Macquarie under investigation for the years 2011 to 2023. It shows that the growth form of *Zostera capricorni* in the Summerland Point, Frying Pan Bay and Crangan Bay region is predominantly short leaved. The growth form of *Z. capricorni* in Chain Valley Bay and Bardens Bay, however, is long leaved.

Table 9.7 also shows in greater detail the increase in percent cover of seagrasses, with bare ground decreasing from 38.13 percent in 2011 to 9.59 percent in 2023 in the Summerland Point, Frying Pan Bay and Sugar Bay region. In the Chain Valley Bay region, bare ground decreased from 13.32 percent in 2011 to 6.41 percent in 2023. In the Crangan Bay region, bare ground decreased from 26.98 percent in 2011 to 5.35 percent in 2023. Seagrass cover in Bardens Bay has mostly been around 90 percent since 2014.

Table 9.7 Average composition, % cover and condition of seagrass beds in the four regions of Lake Macquarie under investigation for the years 2011 to 2023.

Year	Total SG	% long	% short	% long 0	% long 1	% short 0	% short 1	algae	bare gr.
Summerland Point, Frying Pan Bay and Sugar Bay									
2011	61.74	9.88	51.86	9.98	0.00	51.86	0.00	0.27	38.13
2012	82.18	38.03	44.15	38.03	0.00	44.15	0.00	0.00	17.85
2013	90.92	25.19	65.88	25.03	0.32	64.92	0.80	0.82	8.26
2014	96.74	19.73	80.27	19.93	0.00	80.27	0.00	0.00	3.26
2015	95.06	17.31	69.33	17.31	0.00	77.75	0.00	0.00	4.93
2016	98.15	20.82	77.64	28.32	0.00	77.66	0.00	0.00	1.30
2017	97.92	17.05	80.63	14.61	2.50	65.14	15.63	0.24	1.35
2018	96.22	28.00	66.03	25.44	5.36	67.00	0.91	1.31	2.28
2019	77.37	32.99	40.16	36.46	0.00	44.00	0.00	2.11	20.51
2020	93.29	35.89	57.40	33.99	1.67	56.91	0.49	0.03	6.64
2021	97.76	48.55	48.14	17.35	26.98	11.33	33.43	0.52	2.00
2022	93.53	28.19	65.33	27.36	0.83	65.08	0.26	0.03	6.36
2023	87.84	26.85	59.54	10.01	16.58	24.58	33.83	2.6	9.59
Chain Valley Bay									
2011	85.44	41.75	43.68	40.28	1.47	43.68	0.00	0.99	13.32
2012	95.26	89.97	5.28	89.97	0.00	5.28	0.00	2.89	1.92
2013	95.63	62.25	35.84	55.83	1.06	35.84	0.00	0.25	4.00
2014	96.57	34.15	65.85	34.14	0.64	65.85	0.00	0.69	2.74
2015	94.70	70.26	18.80	58.28	11.97	24.45	0.00	1.02	5.06
2016	98.65	74.52	27.13	71.30	0.00	27.13	0.00	1.20	0.15
2017	97.63	52.60	42.79	36.35	18.19	49.82	0.11	0.60	1.62
2018	98.46	72.25	25.48	66.32	5.88	23.48	1.79	0.83	0.71
2019	93.15	84.48	8.64	84.48	0.00	15.66	0.00	0.39	6.72
2020	98.82	94.53	4.29	91.70	2.84	4.29	0.00	0.21	0.92
2021	99.65	95.35	4.30	2.84	74.63	0.21	2.51	0.00	0.26
2022	99.00	95.27	4.11	92.18	1.67	4.11	0.00	0.31	0.58
2023	91.67	59.42	31.51	3.49	52.08	4.93	25.43	1.73	6.41
Crangan Bay									
2011	72.52	28.47	44.05	28.47	0.00	43.31	0.74	0.87	26.98
2012	92.38	0.00	92.38	0.00	0.00	92.38	0.00	0.01	7.99
2013	98.82	13.79	85.52	10.84	2.96	85.52	0.00	0.02	1.02
2014	97.94	23.23	76.77	23.23	0.00	76.77	0.00	0.06	2.02
2015	98.00	23.53	74.47	23.53	0.00	74.47	0.00	0.00	2.01
2016	99.47	15.90	83.30	6.99	9.18	55.37	27.93	0.13	0.49
2017	92.48	16.73	75.75	15.99	3.20	74.71	1.05	0.02	7.57
2018	98.28	46.25	52.03	5.48	89.13	49.09	2.94	0.01	1.74
2019	69.39	39.56	29.95	39.56	0.00	29.95	0.00	0.00	30.40
2020	94.30	25.40	68.90	25.40	0.70	59.12	7.06	0.57	4.01
2021	97.87	67.28	30.59	16.54	50.74	20.66	9.93	0.00	1.32
2022	95.65	19.50	74.35	15.46	5.85	61.07	13.28	0.09	2.50
2023	91.16	18.82	71.42	3.25	5.75	28.99	48.70	3.57	5.35
Bardens Bay									
2014	96.87	54.20	45.80	54.20	0.00	45.80	0.00	1.20	2.03
2015	94.84	68.18	26.67	68.18	0.00	26.67	0.00	0.00	2.92
2016	96.40	63.48	33.01	63.98	0.00	33.01	0.00	0.00	3.61
2017	98.78	76.02	22.75	51.51	24.51	20.59	3.78	0.03	1.23
2018	94.96	55.58	39.39	38.78	16.80	37.67	2.45	2.19	2.68
2019	84.48	73.08	6.40	73.03	11.40	11.40	0.00	0.00	15.52

2020	95.89	81.08	16.04	63.26	1.69	14.60	0.22	0.00	4.11
2021	96.63	96.63	0.00	12.41	78.48	0.00	0.00	3.79	3.24
2022	96.31	81.41	16.07	79.72	1.69	14.90	0.00	0.01	3.57
2023	86.62	34.51	49.84	2.59	32.21	2.32	47.52	4.39	8.80

Plate 9.1 shows sand deposited on seagrasses along Summerland Point after strong onshore winds in June 2011. This event demonstrated how climatic conditions can affect seagrass coverage. It also shows how the movement of sand from deeper waters due to strong winds can increase water depth in some areas whilst decreasing water depth closer to shore as sediment is deposited. Lake Macquarie experienced strong onshore winds prior to the June 2022 survey. Fine sediment was also observed covering seagrasses during the June 2023 survey.

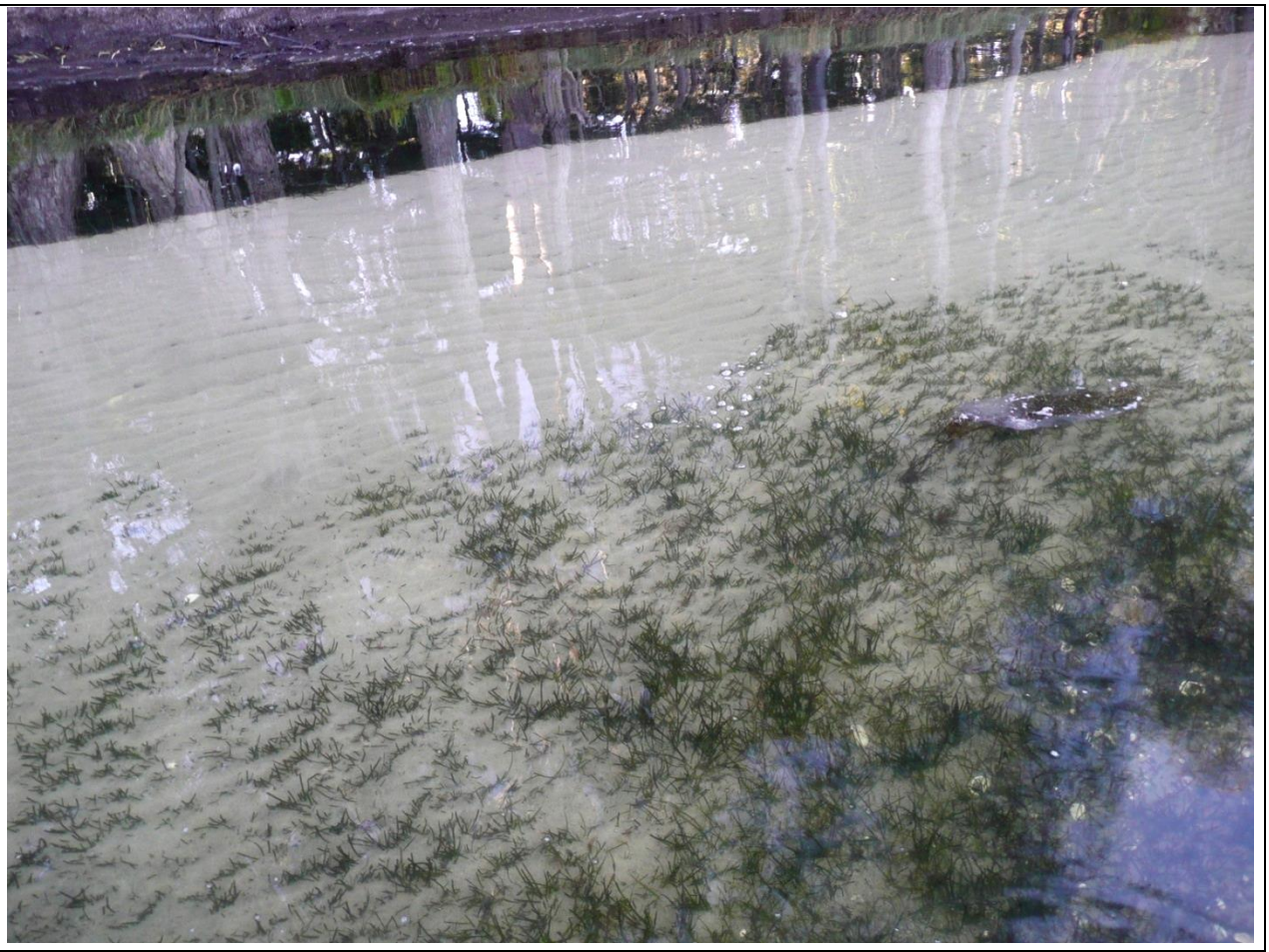


Plate 9.1 *Zostera capricorni* covered by sand along Summerland Point after strong southwesterly winds in 2011.

10. Extent of Coal Mining

Figure 10.1 shows the extent of mining up to March 2023. Mining of the Fassifern seam is currently underway in the Brightwaters and Summerland Point regions. Mining ceased in the Chain Valley Bay region on 24 December 2017.

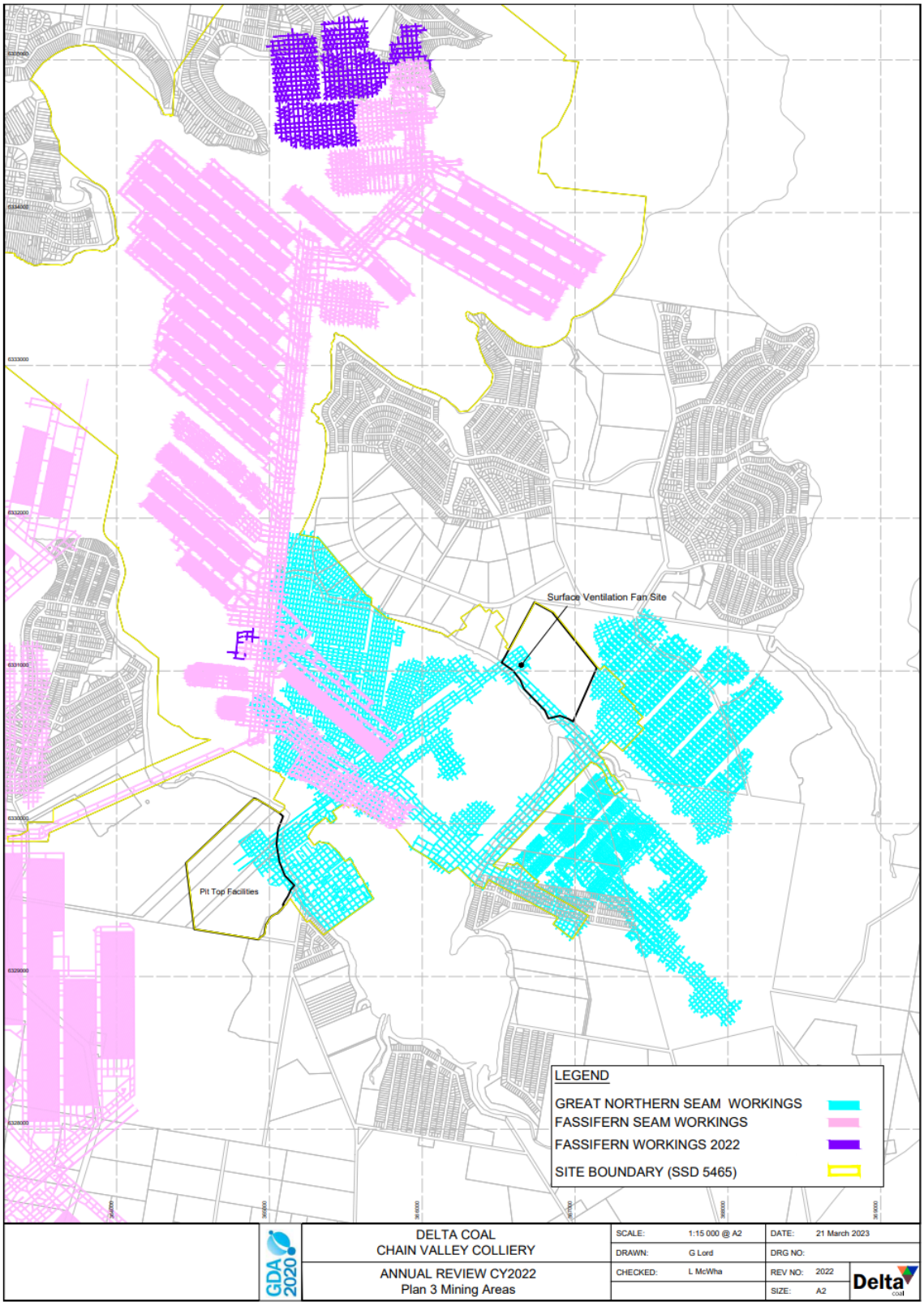


Figure 10.1 Extent of Fassifern Seam Workings – Annual Review CY2022

11. Seagrass Management Plan

The mine, in conjunction with the relevant stakeholders, has developed a Seagrass Management Plan. While the colliery is not mining beneath the seagrass beds, the purpose of the plan is to monitor any changes and identify if subsidence is the cause.

Elements of the plan require:

- That the July 2008 survey is to act as a baseline of seagrass distribution, density and condition. Since this time new seagrass transects have been added to the sampling schedule (now 50 transects in 2018-2022).
- Annual re-surveys of the permanent transect lines will be carried out.
- If, during the annual re-surveys, either:
    - Subsidence along the seagrass permanent transects greater than 150mm is detected, or
    - There are reductions in seagrass cover of 20% or more (compared to 2008 values),

then Mine Management will notify the relevant stakeholders of the event and convene a meeting to discuss the implications.

12. Conclusion

In June 2023, fifty seagrass monitoring transects located in the Summerland Point, Chain Valley Bay, Bardens Bay, Sugar Bay and Crangan Bay areas were photographed as part of a study to monitor the effects of underground coal mining on seagrass communities.

Two species of seagrass were identified in the study area, *Zostera capricorni* and *Halophila ovalis. Zostera capricorni* had the greatest coverage and was often found along the entire length of the transects. The growth form of *Zostera capricorni* was predominantly short leaved in the Summerland Point, Frying Pan Bay, Sugar Bay and Crangan Bay regions, and long leaved in Chain Valley Bay and Bardens Bay. *Halophila ovalis* was found predominantly along the water's edge, and was observed at many sites including E6, S2, C1 and A1.

At the time of the survey, total seagrass cover ranged from 50.2% to 96.8% on the northern shore of Summerland Point and Frying Pan Bay; 74.4% to 92.3% along the western shore of Summerland Point; 74.4% to 92.3% on the western shore of Summerland Point; 75.0% to 99.3% in Chain Valley Bay; 74.3% to 97.5% in Bardens Bay; 90.7% to 96.3% in Sugar Bay; and 82.1% to 95.2% in Crangan Bay.

The health and condition of the seagrasses were good, with most seagrasses free or only lightly

fouled with epiphytic algae. Transects that had seagrasses encrusted with high levels of filamentous algae and sediment were E6, E10, E16, L1 and C4.

Seagrass cover continues to be high and consistent, with only six transects showing a slight decline in seagrass coverage in the June 2023 survey. Changes in coverage were mainly due to a high presence of the alga *Cystoseira trinodis* and changes in survey methods which are enabling the photography of seagrasses up to the water edge. *Halophila ovalis* is often found growing in sand along shorelines in the very shallow waters. Photographing this band of sand to capture the presence of *Halophila ovalis* has affected the statistics by reducing the presence of *Zostera* and increasing the presence of bare ground.

Since 2011, bare ground has decreased from 38.13 percent to 9.59 percent in 2023 in the Summerland Point, Frying Pan Bay and Sugar Bay region. In the Chain Valley Bay region, bare ground decreased from 13.32 percent in 2011 to 6.41 percent in 2023. In the Crangan Bay region, bare ground decreased from 26.98 percent in 2011 to 5.35 percent in 2023. Seagrass cover in Bardens Bay has mostly been around 90 percent since 2011.

The results from the June 2023 seagrass monitoring programme show compliance to the Schedule 4 Environmental Conditions - underground mining of SSD5465 - Modification 4 in the Performance Measures table with respect to the Subsidence Impact Performance Measure for Natural Environment Biodiversity - Seagrass which display nil to minor environmental consequences due to underground mining.

The below summary of findings outline the historical basis for this compliance statement and the compliance is detailed in the table below.

Condition from SSD5465 - Mod 4	Compliance Status and Comments
Schedule 4 Environmental Conditions - underground mining Performance Measures - Natural Environment Biodiversity - Benthic Communities. Subsidence Impact Performance Measure - Minor environmental consequences, including minor changes composition and/or distribution.	Compliant - See section 16 - Conclusions

Measurements undertaken by generally accepted methods.	Compliant - See section 4 and 5
Measurements Methods fully described.	Compliant - See section 4 and 5

13. References

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Appendix 1 Analysis of photograpghs for each transect (June 2023)

Northern Shore Summerland Point, Frying Pan Bay

Transect C5 Sampled 11 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	70	0	70	0	0	0	0	30	70
2	0	25	0	25	0	0	0	0	75	25
2	0	75	0	75	0	10	0	10	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	95	0	95	0	0	0	0	5	95
2	0	80	0	80	0	15	0	15	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	80	0	80	0	0	20	20	0	100
2	0	70	0	70	0	0	30	30	0	100
2	0	80	0	80	0	0	20	20	0	100
2	0	90	0	90	0	0	10	10	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	5	0	5	0	100
2	0	70	0	70	0	0	30	30	0	100
2	0	85	0	85	0	0	15	15	0	100
2	0	90	0	90	0	0	5	5	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	85	0	85	0	5	10	15	0	100
2	0	95	0	95	0	0	5	5	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	5	0	5	0	100
2	0	98	0	98	0	2	0	2	0	100
2	0	90	0	90	0	5	0	5	5	95
2	0	100	0	100	0	0	0	0	0	100
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	0	5	5	0	100
2	0	95	0	95	0	0	5	5	0	100
2	0	90	0	90	0	0	10	10	0	100
2	0	98	0	98	0	0	0	0	2	98
2	0	90	0	90	0	5	0	5	5	95
2	0	90	0	90	0	5	0	5	5	95
2	0	95	0	95	0	5	0	5	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	5	0	5	0	100
2	0	98	0	98	0	0	0	0	2	98
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	1	98	0	98	0	0	0	0	2	98
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	98	2	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
Average		**93.1**	**0.0**	**93.1**	**0.0**	**1.0**	**2.4**	**3.4**	**3.5**	**96.5**

Transect C6									Sampled 11 June 2023	
		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	60	0	60	0	0	0	0	40	60
2	0	60	5	65	0	0	0	0	35	65
2	0	85	0	85	0	5	0	5	10	90
2	0	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	0	0	0	5	95
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	98	0	98	0	0	0	0	2	98
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	88	2	90	0	0	0	0	10	90
1	0	95	0	95	0	0	0	0	5	95
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	10	0	10	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	5	0	5	0	100
1	0	90	0	90	0	5	0	5	5	95
1	0	95	0	95	0	0	0	0	5	95
1	0	90	0	90	0	10	0	10	0	100
1	0	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	0	70	0	70	0	0	0	0	30	70
1	0	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	0	100	0	100	0	0	0	0	0	100
2	0	85	0	85	0	0	0	0	15	85
2	0	70	10	80	0	0	0	0	20	80
2	0	80	0	80	0	0	0	0	20	80
2	1	100	0	100	0	0	0	0	0	100
2	1	98	0	98	0	0	0	0	2	98
2	1	98	0	98	0	0	0	0	2	98
2	1	90	0	90	0	0	0	0	10	90
1	1	90	0	90	0	0	0	0	10	90
1	1	80	0	80	0	15	0	15	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
Average		**94.9**	**0.3**	**95.1**	**0.0**	**0.7**	**0.0**	**0.7**	**4.1**	**95.9**

Transect F1 Sampled 11 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	1	60	0	60	0	0	0	0	40	60
1	1	60	0	60	0	0	0	0	40	60
1	1	80	0	80	0	0	0	0	20	80
2	1	95	0	95	0	0	0	0	5	95
2	1	80	0	80	0	0	0	0	20	80
2	1	60	0	60	0	0	0	0	40	60
2	1	70	0	70	0	0	0	0	30	70
2	1	90	0	90	0	5	0	5	5	95
2	0	80	0	80	0	10	0	10	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	5	0	5	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	98	0	98	0	2	0	2	0	100
2	1	98	0	98	0	2	0	2	0	100
2	1	98	0	98	0	0	0	0	2	98
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	98	0	98	0	0	0	0	2	98
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
1	1	98	0	98	0	0	0	0	2	98
1	1	98	0	98	0	0	0	0	2	98
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	5	0	5	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
1	0	100	0	100	0	0	0	0	0	100
2	0	98	0	98	0	0	0	0	2	98
2	0	98	0	98	0	0	0	0	2	98
2	0	95	0	95	0	0	0	0	5	95
2	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	5	0	5	0	100
2	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	5	0	5	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	0	0	0	5	95
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
Average		**95.6**	**0.1**	**95.6**	**0.0**	**0.6**	**0.0**	**0.6**	**3.7**	**96.3**

Transect F2 Sampled 11 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	60	0	60	0	15	0	15	25	75
2	0	60	0	60	0	5	0	5	35	65
2	0	80	0	80	0	0	0	0	20	80
2	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	5	0	5	5	95
2	0	90	0	90	0	5	0	5	5	95
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	5	0	5	0	100
2	0	50	0	50	0	15	0	15	35	65
2	0	40	0	40	0	30	0	30	30	70
2	0	80	0	80	0	5	0	5	15	85
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	5	0	5	5	95
2	0	85	0	85	0	15	0	15	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	5	0	5	0	100
2	0	90	0	90	0	5	0	5	5	95
2	0	95	0	95	0	5	0	5	0	100
2	0	90	0	90	0	5	0	5	5	95
2	0	55	0	55	0	20	0	20	25	75
2	0	75	0	75	0	20	0	20	5	95
2	0	65	0	65	0	25	0	25	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	70	0	70	0	15	0	15	15	85
2	0	75	0	75	0	10	0	10	15	85
2	0	70	0	70	0	15	0	15	15	85
2	0	75	0	75	0	5	0	5	20	80
2	0	65	0	65	0	25	0	25	10	90
2	0	65	0	65	0	20	0	20	15	85
2	0	80	0	80	0	15	0	15	5	95
2	0	60	0	60	0	15	0	15	25	75
2	0	75	0	75	0	10	0	10	15	85
2	0	45	0	45	0	35	0	35	20	80
2	0	30	0	30	0	50	0	50	20	80
0	0	0	0	0	0	70	0	70	30	70
2	1	25	0	25	0	75	0	75	0	100
0	0	0	0	0	0	35	0	35	65	35
0	0	0	0	0	0	50	0	50	50	50
0	0	0	0	0	0	50	0	50	50	50
0	0	0	0	0	0	40	0	40	60	40
0	0	0	0	0	0	30	0	30	70	30
0	0	0	0	0	0	60	0	60	40	60
0	0	0	0	0	0	40	0	40	60	40
0	0	0	0	0	0	60	0	60	40	60
0	0	0	0	0	0	75	0	75	25	75
0	0	0	0	0	0	80	0	80	20	80
0	0	0	0	0	0	75	0	75	25	75
0	0	0	0	0	0	70	0	70	30	70
0	0	0	0	0	0	65	0	65	35	65
0	0	0	0	0	0	75	0	75	25	75
0	0	0	0	0	0	75	0	75	25	75
0	0	0	0	0	0	80	0	80	20	80
0	0	0	0	0	0	65	0	65	35	65
0	0	0	0	0	0	75	0	75	25	75
0	0	0	0	0	0	75	0	75	25	75
0	0	0	0	0	0	65	0	65	35	65
2	0	10	0	10	0	30	0	30	60	40
2	0	20	0	20	0	15	0	15	65	35
2	0	75	0	75	0	10	0	10	25	85
2	0	85	0	85	0	10	0	10	5	95
Average		**50.2**	**0.0**	**50.2**	**0.0**	**28.5**	**0.0**	**28.5**	**21.4**	**78.8**

Transect F3 Sampled 11 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	65	0	65	0	0	0	0	35	65
2	0	65	0	65	0	0	0	0	35	65
2	0	80	0	80	0	0	0	0	20	80
2	0	80	0	80	0	0	0	0	20	80
2	0	85	0	85	0	0	0	0	15	85
2	0	80	0	80	0	0	0	0	20	80
2	0	85	0	85	0	0	0	0	15	85
2	0	75	0	75	0	10	0	10	15	85
2	0	80	0	80	0	0	0	0	20	80
2	0	80	0	80	0	0	0	0	20	80
2	0	55	0	55	0	15	0	15	30	70
2	0	75	0	75	0	0	0	0	25	75
2	0	50	0	50	0	30	0	30	20	80
2	0	80	0	80	0	10	0	10	10	90
2	0	80	0	80	0	2	0	2	18	82
2	0	75	0	75	0	5	0	5	20	80
2	1	80	0	80	0	0	0	0	20	80
2	1	80	0	80	0	0	0	0	20	80
2	1	75	5	80	0	0	0	0	20	80
2	1	80	0	80	0	5	0	5	15	85
2	1	75	0	75	0	5	0	5	20	80
2	1	90	0	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	5	0	5	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	85	0	85	0	5	0	5	10	90
2	1	75	0	75	0	0	0	0	25	75
2	1	75	0	75	0	5	0	5	20	80
2	1	90	0	90	0	0	0	0	10	90
2	1	70	5	75	0	0	0	0	25	75
2	1	70	5	75	0	0	0	0	25	75
2	1	75	0	75	0	5	0	5	20	80
2	1	70	5	75	0	5	0	5	20	80
2	0	70	5	75	0	5	0	5	20	80
2	0	100	0	100	0	0	0	0	0	100
2	0	90	5	95	0	0	0	0	5	95
2	0	90	5	95	0	0	0	0	5	95
2	0	85	5	90	0	0	0	0	10	90
2	0	80	10	90	0	0	0	0	10	90
2	0	90	5	95	0	0	0	0	5	95
2	0	85	10	95	0	5	0	5	0	100
2	0	90	5	95	0	0	0	0	5	95
2	0	80	10	90	0	0	0	0	10	90
2	0	80	10	90	0	0	0	0	10	90
2	0	85	0	85	0	5	0	5	10	90
2	0	70	10	80	0	0	0	0	20	80
2	0	85	5	90	0	0	0	0	10	90
2	0	85	10	95	0	0	0	0	5	95
2	0	95	5	100	0	0	0	0	0	100
2	0	90	5	95	0	0	0	0	5	95
2	0	85	10	95	0	0	0	0	5	95
2	0	85	5	90	0	0	0	0	10	90
2	0	90	5	95	0	0	0	0	5	95
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	85	0	85	0	0	0	0	15	85
2	0	90	10	100	0	0	0	0	0	100
2	0	95	5	100	0	0	0	0	0	100
2	0	90	5	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
Average		**84.0**	**2.4**	**86.5**	**0.0**	**1.9**	**0.0**	**1.9**	**11.7**	**88.3**

Transect F4 Sampled 11 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	70	10	80	0	0	0	0	20	80
2	0	75	5	80	0	5	0	5	15	85
2	0	70	10	80	0	0	0	0	20	80
2	0	90	0	90	0	0	0	0	10	90
2	0	75	5	80	0	0	0	0	20	80
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	5	0	5	0	100
2	0	95	5	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	5	0	5	5	95
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	5	0	5	0	100
2	0	95	5	100	0	0	0	0	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	5	0	5	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	0	0	0	5	95
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
Average		**96.3**	**0.6**	**96.8**	**0.0**	**0.4**	**0.0**	**0.4**	**2.8**	**97.2**

Transect F5 Sampled 11 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	65	0	65	0	0	0	0	35	65
2	0	80	0	80	0	5	0	5	15	85
2	0	90	0	90	0	5	0	5	5	95
2	0	90	0	90	0	5	0	5	5	95
2	0	85	0	85	0	5	0	5	10	90
2	0	75	0	75	0	5	0	5	25	80
2	0	85	0	85	0	5	0	5	10	90
2	0	85	0	85	0	10	0	10	5	95
2	0	95	0	95	0	5	0	5	0	100
2	0	90	0	90	0	5	0	5	5	95
2	0	90	0	90	0	5	0	5	5	95
2	0	90	0	90	0	5	0	5	5	95
2	0	95	0	95	0	5	0	5	0	100
2	0	90	0	90	0	10	0	10	0	100
2	0	88	0	88	0	10	0	10	2	98
2	0	85	0	85	0	15	0	15	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	90	0	90	0	10	0	10	0	100
2	1	90	0	90	0	10	0	10	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	5	0	5	5	95
2	1	95	0	95	0	5	0	5	0	100
2	1	90	0	90	0	5	0	5	5	95
2	1	90	0	90	0	5	0	5	5	95
2	0	80	0	80	0	20	0	20	0	100
2	0	80	0	80	0	15	0	15	5	95
2	0	80	0	80	0	10	0	10	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	85	0	85	0	10	0	10	5	95
2	0	80	0	80	0	15	0	15	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	5	0	5	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	88	2	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	83	0	83	0	2	0	2	15	85
2	0	85	0	85	0	5	0	5	10	90
2	0	80	0	80	0	0	0	0	20	80
2	0	75	0	75	0	5	0	5	20	80
2	0	70	0	70	0	0	0	0	30	70
2	0	70	0	70	0	0	0	0	30	70
2	0	65	0	65	0	0	0	0	35	65
2	0	65	0	65	0	5	0	5	30	70
2	0	65	0	65	0	0	0	0	35	65
2	0	65	0	65	0	10	0	10	25	75
2	0	65	0	65	0	10	0	10	25	75
2	0	85	0	85	0	0	0	0	15	85
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	75	0	75	0	0	0	0	25	75
2	0	85	0	85	0	0	0	0	15	85
1	0	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	0	0	0	5	95
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	5	0	5	0	100
2	0	50	5	55	0	0	0	0	45	55
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	80	0	80	0	0	0	0	20	80
2	0	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	0	95	0	95	0	0	0	0	5	95
Average		**85.6**	**0.1**	**85.7**	**0.0**	**3.9**	**0.0**	**3.9**	**10.5**	**89.5**

Transect F6 Sampled 11 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	80	0	80	0	0	0	0	20	80
2	0	80	0	80	0	0	0	0	20	80
2	0	80	0	80	0	0	0	0	20	80
2	0	70	0	70	0	0	0	0	30	70
2	0	60	0	60	0	10	0	10	30	70
2	0	80	0	80	0	0	0	0	20	80
2	0	75	0	75	0	0	0	0	25	75
2	0	80	0	80	0	0	0	0	20	80
2	0	80	0	80	0	0	0	0	20	80
2	0	80	0	80	0	0	0	0	20	80
2	0	75	0	75	0	0	0	0	25	75
2	0	80	0	80	0	0	0	0	20	80
2	0	75	0	75	0	5	0	5	20	80
2	0	80	0	80	0	0	0	0	20	80
2	0	65	0	65	0	0	0	0	35	65
2	0	80	0	80	0	0	0	0	20	80
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	5	0	5	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	80	0	80	0	0	0	0	20	80
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	5	0	5	5	95
2	0	90	5	95	0	0	0	0	5	95
2	0	80	0	80	0	5	0	5	15	85
2	0	75	0	75	0	5	0	5	20	80
2	0	80	5	85	0	0	0	0	15	85
2	0	75	5	80	0	10	0	10	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	75	5	80	0	0	0	0	20	80
2	0	75	5	80	0	5	0	5	20	85
2	0	75	0	75	0	0	0	0	25	75
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	5	0	5	5	95
2	0	70	0	70	0	5	0	5	25	75
2	0	90	5	95	0	0	0	0	5	95
2	0	85	5	90	0	5	0	5	5	95
2	0	85	5	90	0	5	0	5	5	95
2	0	90	5	95	0	0	0	0	5	95
2	0	85	5	90	0	0	0	0	10	90
2	0	85	5	90	0	5	0	5	5	95
2	0	80	10	90	0	5	0	5	5	95
2	0	75	10	85	0	5	0	5	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	80	5	85	0	5	0	5	10	90
2	0	85	10	95	0	0	0	0	5	95
2	0	85	0	85	0	0	0	0	15	85
2	0	80	10	90	0	0	0	0	10	90
2	0	85	0	85	0	5	0	5	10	90
2	0	85	10	95	0	0	0	0	5	95
2	0	80	10	90	0	0	0	0	10	90
2	0	85	10	95	0	0	0	0	5	95
2	0	85	10	95	0	0	0	0	5	95
2	0	85	10	95	0	0	0	0	5	95
2	0	85	5	90	0	0	0	0	10	90
2	0	90	5	95	0	0	0	0	5	95
2	0	90	5	95	0	0	0	0	5	95
2	0	85	5	90	0	0	0	0	10	90
2	0	95	5	100	0	0	0	0	0	100
2	0	80	5	85	0	5	0	5	10	90
2	0	85	5	90	0	0	0	0	10	90
2	0	80	5	85	0	5	0	5	10	90
Average		**83.2**	**2.8**	**86.0**	**0.0**	**1.5**	**0.0**	**1.5**	**12.6**	**87.5**

Transect F7 Sampled 11 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	65	0	65	0	0	0	0	35	65
2	0	85	0	85	0	0	0	0	15	85
2	0	75	0	75	0	0	0	0	25	75
2	0	75	0	75	0	0	0	0	25	75
2	0	80	10	90	0	0	0	0	10	90
2	0	90	5	95	0	0	0	0	5	95
2	0	80	5	85	0	5	0	5	10	90
2	0	80	5	85	0	0	0	0	15	85
2	0	80	0	80	0	0	0	0	20	80
2	0	85	0	85	0	0	0	0	15	85
2	0	70	0	70	0	0	0	0	30	70
2	0	75	0	75	0	0	0	0	25	75
2	0	90	0	90	0	0	0	0	10	90
2	0	80	5	85	0	0	0	0	15	85
2	0	85	5	90	0	5	0	5	5	95
2	0	90	0	90	0	0	0	0	10	90
2	0	90	5	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	5	0	5	5	95
2	0	90	0	90	0	5	0	5	5	95
2	0	90	5	95	0	0	0	0	5	95
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	80	0	80	0	0	0	0	20	80
2	0	85	0	85	0	0	0	0	15	85
2	0	90	5	95	0	0	0	0	5	95
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	75	5	80	0	0	0	0	20	80
2	0	75	5	80	0	0	0	0	20	80
2	0	80	0	80	0	0	0	0	20	80
2	0	80	10	90	0	0	0	0	10	90
2	0	65	0	65	0	0	0	0	35	65
2	0	65	0	65	0	0	0	0	35	65
2	0	50	5	55	0	0	0	0	45	55
2	0	75	5	80	0	0	0	0	20	80
2	0	75	0	75	0	0	0	0	25	75
2	0	65	5	70	0	0	0	0	30	70
2	0	65	0	65	0	0	0	0	35	65
2	0	65	0	65	0	0	0	0	35	65
2	0	65	0	65	0	0	0	0	35	65
2	0	70	5	75	0	0	0	0	25	75
2	0	80	0	80	0	0	0	0	20	80
2	0	65	0	65	0	0	0	0	35	65
2	0	65	0	65	0	0	0	0	35	65
2	0	65	0	65	0	0	0	0	35	65
2	0	50	0	50	0	0	0	0	50	50
2	0	50	0	50	0	0	0	0	50	50
2	0	50	0	50	0	0	0	0	50	50
2	0	80	0	80	0	0	0	0	20	80
2	0	75	10	85	0	0	0	0	15	85
2	0	75	10	85	0	0	0	0	15	85
2	0	75	5	80	0	0	0	0	20	80
2	0	75	5	80	0	0	0	0	20	80
2	0	75	0	75	0	0	0	0	25	75
2	0	60	5	65	0	0	0	0	35	65
2	0	60	0	60	0	0	0	0	40	60
2	0	75	5	80	0	0	0	0	20	80
2	0	85	10	95	0	0	0	0	5	95
2	0	75	5	80	0	0	0	0	20	80
2	0	75	0	75	0	0	0	0	25	75
2	0	90	0	90	0	0	0	0	10	90
2	0	80	5	85	0	0	0	0	15	85
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	90	5	95	0	0	0	0	5	95
Average		**77.1**	**2.3**	**79.4**	**0.0**	**0.3**	**0.0**	**0.3**	**20.3**	**79.7**

Western shore Summerland Point

Transect E7										Sampled 9 June 2023
		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	80	5	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	80	0	80	0	0	0	0	20	80
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	85	5	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	85	5	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
1	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	80	5	85	0	0	0	0	15	85
2	0	75	5	80	0	0	0	0	20	80
2	0	60	0	60	0	0	0	0	40	60
2	0	70	0	70	0	0	0	0	30	70
2	0	70	5	75	0	0	0	0	25	75
2	0	80	5	85	0	0	0	0	20	85
2	0	70	5	75	0	0	0	0	25	75
2	0	80	5	85	0	0	0	0	15	85
2	0	80	0	80	0	0	0	0	20	80
2	0	85	0	85	0	0	0	0	15	85
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	85	0	85	0	0	0	0	15	85
2	0	90	5	95	0	0	0	0	10	95
2	0	85	5	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	85	5	90	0	0	0	0	10	90
2	0	75	5	80	0	0	0	0	20	80
2	0	85	0	85	0	0	0	0	15	85
2	0	80	0	80	0	0	0	0	20	80
2	0	75	0	75	0	0	0	0	25	75
2	0	80	5	85	0	0	0	0	15	85
2	0	70	5	75	0	10	0	10	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	5	0	5	5	95
2	0	70	5	75	0	0	0	0	25	75
2	0	70	10	80	0	0	0	0	20	80
2	0	90	0	90	0	0	0	0	10	90
2	0	80	5	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	0	0	0	10	90
2	0	100	0	100	0	0	0	0	0	100
Average		**85.9**	**1.4**	**87.3**	**0.0**	**0.2**	**0.0**	**0.2**	**12.6**	**87.5**

Transect T1 Sampled 9 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	70	10	80	0	0	0	0	20	80
2	0	80	5	85	0	0	0	0	15	85
2	0	90	5	95	0	0	0	0	5	95
2	0	40	10	50	0	30	0	30	20	80
2	0	85	10	95	0	0	0	0	5	95
2	1	80	10	90	0	10	0	10	0	100
2	1	90	10	100	0	0	0	0	0	100
2	1	75	5	80	0	20	0	20	0	100
2	1	85	5	90	0	10	0	10	0	100
1	1	90	0	90	0	10	0	10	0	100
1	1	85	0	85	0	0	0	0	25	85
1	1	100	0	100	0	0	0	0	0	100
1	0	85	0	85	0	15	0	15	0	100
1	0	95	0	95	0	0	0	0	5	95
1	0	95	0	95	0	0	0	0	5	95
1	0	85	0	85	0	15	0	15	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	5	0	5	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	0	5	5	0	100
1	0	95	0	95	0	0	0	0	0	95
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	85	0	85	0	15	0	15	0	100
1	0	75	0	75	0	25	0	25	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	5	0	5	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	60	0	60	0	0	0	0	40	60
1	0	50	0	50	0	0	5	5	45	55
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	5	0	5	5	95
1	1	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	5	0	5	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	1	98	0	98	0	0	2	2	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	80	0	80	0	0	0	0	20	80
1	1	80	0	80	0	0	0	0	20	80
1	1	80	0	80	0	5	0	5	15	85
1	1	85	0	85	0	0	5	5	10	90
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	85	0	85	0	0	0	0	15	85
1	1	90	0	90	0	0	0	0	10	90
1	1	90	0	90	0	0	0	0	10	90
1	1	80	0	80	0	0	0	0	20	80
Average		**91.2**	**1.0**	**92.3**	**0.0**	**2.6**	**0.3**	**2.8**	**5.0**	**95.1**

Transect T2 Sampled 9 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	50	0	50	0	5	0	5	45	55
2	1	80	0	80	0	10	0	10	10	90
2	1	70	0	70	0	15	0	15	15	85
2	1	60	0	60	0	15	0	15	25	75
2	1	65	5	70	0	10	0	10	20	80
2	0	55	0	55	0	30	0	30	15	85
2	0	65	0	65	0	20	0	20	15	85
2	0	40	0	40	0	50	0	50	10	90
2	0	20	0	20	0	70	0	70	10	90
2	0	70	0	70	0	20	0	20	10	90
2	0	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	85	0	85	0	5	0	5	10	90
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	85	0	85	0	10	0	10	5	95
1	1	60	0	60	0	40	0	40	0	100
1	1	20	0	20	0	30	0	30	50	50
0	0	0	0	0	0	0	0	0	100	0
0	0	0	0	0	0	0	0	0	100	0
0	0	0	0	0	0	0	0	0	100	0
2	0	25	0	25	0	0	0	0	75	25
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	85	5	90	0	0	0	0	10	90
2	0	85	5	90	0	0	0	0	10	90
2	0	70	5	75	0	5	0	5	20	80
2	0	70	0	70	0	0	0	0	30	70
2	1	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	40	0	40	0	0	0	0	60	40
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	85	0	85	0	0	0	0	15	85
2	0	95	0	95	0	0	0	0	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	75	0	75	0	0	0	0	25	75
2	0	75	0	75	0	0	0	0	25	75
2	1	75	0	75	0	0	0	0	25	75
2	1	60	0	60	0	0	0	0	40	60
2	1	60	0	60	0	0	0	0	40	60
2	1	80	0	80	0	0	0	0	20	80
2	1	80	0	80	0	0	0	0	20	80
2	1	90	0	90	0	0	0	0	10	90
2	1	80	0	80	0	0	0	0	20	80
2	1	70	0	70	0	0	0	0	30	70
2	1	70	0	70	0	0	0	0	30	70
2	1	90	0	90	0	0	0	0	10	90
2	1	80	0	80	0	0	0	0	20	80
2	1	80	0	80	0	0	0	0	20	80
2	1	80	0	80	0	0	0	0	20	80
2	1	90	0	90	0	0	0	0	10	90
2	1	75	0	75	0	0	0	0	25	75
2	1	85	0	85	0	0	0	0	15	85
2	1	80	0	80	0	0	0	0	20	80
2	1	80	0	80	0	0	0	0	20	80
2	1	80	0	80	0	0	0	0	20	80
2	1	90	0	90	0	0	0	0	10	90
Average		**74.1**	**0.3**	**74.4**	**0.0**	**4.9**	**0.0**	**4.9**	**20.7**	**79.3**

Transect T3 Sampled 9 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	70	0	70	0	20	0	20	10	90
2	0	50	0	50	0	25	0	25	25	75
2	0	55	0	55	0	30	0	30	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	95	5	100	0	0	0	0	0	100
2	0	95	5	100	0	5	0	5	0	105
2	1	80	5	85	0	0	0	0	15	85
2	1	85	5	90	0	0	0	0	10	90
2	1	75	15	90	0	0	0	0	10	90
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	75	0	75	0	0	0	0	25	75
2	1	70	5	75	0	0	0	0	25	75
2	1	80	0	80	0	0	0	0	15	80
2	1	85	0	85	0	0	0	0	15	85
2	1	80	0	80	0	5	0	5	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	98	0	98	0	0	0	0	2	98
2	1	85	0	85	0	0	0	0	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	75	0	75	0	20	0	20	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	0	0	0	0	90
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	95	0	95	0	0	0	0	5	95
2	1	98	0	98	0	0	0	0	2	98
2	1	98	0	98	0	0	0	0	2	98
2	1	98	0	98	0	0	0	0	2	98
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	98	0	98	0	0	0	0	2	98
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	85	0	85	0	0	0	0	15	85
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	80	0	80	0	0	0	0	20	80
2	1	70	0	70	0	0	0	0	30	70
2	1	90	0	90	0	0	0	0	10	90
0	0	0	0	0	0	25	0	25	75	25
2	1	70	0	70	0	10	0	10	20	80
2	1	65	0	65	0	0	0	0	45	65
2	1	100	0	100	0	0	0	0	0	100
2	1	85	0	85	0	5	0	5	10	90
Average		**88.2**	**0.6**	**88.8**	**0.0**	**2.1**	**0.0**	**2.1**	**9.1**	**90.9**

Transect T4 Sampled 9 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	1	95	0	95	0	0	0	0	5	95
2	1	80	0	80	0	5	0	5	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	50	0	50	0	0	0	0	50	50
2	1	75	0	75	0	0	0	0	25	75
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	60	0	60	0	30	0	30	10	90
2	1	40	0	40	0	40	0	40	20	80
2	1	45	5	50	0	0	0	0	50	50
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	98	0	98	0	0	0	0	2	98
2	1	75	0	75	0	0	0	0	25	75
2	1	75	0	75	0	0	0	0	25	75
2	1	70	0	70	0	0	0	0	30	70
2	1	70	0	70	0	0	0	0	30	70
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	75	0	75	0	0	0	0	25	75
2	1	75	0	75	0	0	0	0	25	75
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	80	0	80	0	0	0	0	20	80
2	1	80	0	80	0	0	0	0	20	80
2	1	90	0	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
Average		**90.2**	**0.1**	**90.3**	**0.0**	**1.1**	**0.0**	**1.1**	**8.6**	**91.4**

Transect T5 Sampled 9 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	1	70	0	70	0	0	0	0	30	70
1	1	75	0	75	0	0	0	0	25	75
1	1	80	0	80	0	0	0	0	20	80
2	1	70	0	70	0	0	0	0	30	70
2	1	70	0	70	0	0	0	0	30	70
2	1	70	0	70	0	0	0	0	30	70
2	1	75	0	75	0	0	0	0	25	75
2	1	75	0	75	0	0	0	0	25	75
2	1	75	0	75	0	0	0	0	25	75
2	1	75	0	75	0	0	0	0	25	75
2	1	80	5	85	0	0	0	0	15	85
2	1	80	5	85	0	5	0	5	10	90
2	1	80	5	85	0	0	0	0	15	85
2	1	75	5	80	0	0	0	0	20	80
2	1	85	5	90	0	0	0	0	10	90
2	1	80	5	85	0	0	0	0	15	85
2	1	80	5	85	0	0	0	0	15	85
2	1	80	0	80	0	0	0	0	20	80
2	1	85	0	85	0	0	0	0	15	85
2	1	80	0	80	0	0	0	0	20	80
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	90	5	95	0	0	0	0	5	95
2	1	90	5	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	85	5	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	85	0	85	0	0	0	0	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	95	5	100	0	0	0	0	0	100
2	1	90	5	95	0	0	0	0	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	75	5	80	0	0	0	0	20	80
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	85	0	85	0	0	0	0	15	85
2	1	85	5	90	0	0	0	0	10	90
2	1	80	5	85	0	0	0	0	15	85
2	1	75	5	80	0	10	0	10	10	90
2	1	80	5	85	0	0	0	0	15	85
2	1	80	10	90	0	0	0	0	10	90
2	1	80	5	85	0	0	0	0	15	85
2	1	85	5	90	0	0	0	0	10	90
2	1	75	5	80	0	0	0	0	20	80
2	1	75	0	75	0	10	0	10	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	80	5	85	0	5	0	5	10	90
2	1	80	5	85	0	0	0	0	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	75	5	80	0	0	0	0	20	80
2	1	80	0	80	0	0	0	0	20	80
2	1	75	0	75	0	5	0	5	20	80
2	1	80	0	80	0	0	0	0	20	80
2	1	85	0	85	0	0	0	0	15	85
2	1	70	10	80	0	0	0	0	20	80
2	1	75	0	75	0	0	0	0	25	75
2	1	75	0	75	0	0	0	0	25	75
2	1	75	5	80	0	0	0	0	20	80
2	1	70	10	80	0	5	0	5	15	85
Average		**82.1**	**2.2**	**84.3**	**0.0**	**0.6**	**0.0**	**0.6**	**15.1**	**84.9**

Transect T6 Sampled 9 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	0	75	0	75	0	0	0	0	25	75
1	0	85	0	85	0	0	0	0	15	85
1	0	85	0	85	0	0	0	0	15	85
1	0	90	0	90	0	0	0	0	10	90
1	0	95	0	95	0	0	0	0	5	95
1	0	95	0	95	0	0	0	0	5	95
1	0	95	0	95	0	0	0	0	5	95
1	1	90	5	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	85	0	85	0	0	0	0	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	85	0	85	0	0	0	0	15	85
2	1	80	5	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	95	0	95	0	0	0	0	5	95
2	1	80	5	85	0	5	0	5	10	90
2	1	70	5	75	0	0	0	0	25	75
2	1	75	5	80	0	0	0	0	20	80
2	1	80	5	85	0	0	0	0	15	85
2	1	85	5	90	0	0	0	0	10	90
2	1	80	5	85	0	0	0	0	15	85
1	1	80	5	85	0	0	0	0	15	85
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	0	0	0	10	90
2	1	85	0	85	0	0	0	0	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	85	5	90	0	0	0	0	10	90
2	1	75	5	80	0	0	0	0	20	80
2	1	85	0	85	0	0	0	0	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	80	0	80	0	0	0	0	20	80
1	0	75	0	75	0	0	0	0	25	75
1	1	75	0	75	0	0	0	0	25	75
1	1	75	0	75	0	0	0	0	25	75
1	1	75	0	75	0	0	0	0	25	75
1	1	70	5	75	0	0	0	0	25	75
1	1	70	5	75	0	0	0	0	25	75
1	1	95	0	95	0	0	0	0	5	95
1	0	75	5	80	0	0	0	0	20	80
1	0	75	5	80	0	0	0	0	20	80
1	0	90	0	90	0	0	0	0	10	90
1	0	95	0	95	0	0	0	0	5	95
1	0	85	5	90	0	0	0	0	10	90
1	0	80	5	85	0	0	0	0	15	85
1	0	70	10	80	0	0	0	0	20	80
2	0	65	5	70	0	0	0	0	30	70
2	0	80	5	85	0	0	0	0	15	85
2	0	75	5	80	0	0	0	0	20	80
2	0	80	5	85	0	0	0	0	15	85
2	0	75	0	75	0	0	0	0	25	75
Average		**84.3**	**1.7**	**86.0**	**0.0**	**0.1**	**0.0**	**0.1**	**13.9**	**86.1**

Transect T7 Sampled 9 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	65	5	70	0	0	0	0	30	70
2	0	80	0	80	0	0	0	0	20	80
2	0	70	5	75	0	0	0	0	25	75
2	0	70	5	75	0	0	0	0	25	75
1	0	90	5	95	0	0	0	0	5	95
1	0	95	0	95	0	0	0	0	5	95
1	0	90	0	90	0	0	0	0	10	90
1	0	90	0	90	0	0	0	0	10	90
1	0	95	0	95	0	0	0	0	5	95
1	0	95	0	95	0	0	0	0	5	95
1	0	95	0	95	0	0	0	0	5	95
1	0	100	0	100	0	0	0	0	0	100
1	0	85	0	85	0	0	0	0	15	85
1	0	95	0	95	0	0	0	0	5	95
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	0	0	0	5	95
1	0	90	0	90	0	0	0	0	10	90
1	0	90	0	90	0	0	0	0	10	90
1	0	80	0	80	0	0	0	0	20	80
1	0	90	0	90	0	0	0	0	10	90
1	0	85	0	85	0	0	0	0	15	85
1	0	95	0	95	0	0	0	0	5	95
1	0	98	0	98	0	0	0	0	2	98
1	0	90	0	90	0	0	0	0	10	90
1	0	80	0	80	0	0	0	0	20	80
2	0	90	0	90	0	0	0	0	10	90
2	0	80	5	85	0	0	0	0	15	85
2	0	75	0	75	0	0	0	0	25	75
2	0	80	5	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	85	5	90	0	0	0	0	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	75	5	80	0	0	0	0	20	80
2	0	80	5	85	0	0	0	0	15	85
2	0	93	2	95	0	0	0	0	5	95
2	0	70	4	74	0	0	0	0	26	74
2	0	70	5	75	0	0	0	0	25	75
2	0	80	0	80	0	0	0	0	20	80
1	0	75	0	75	0	0	0	0	25	75
1	0	75	0	75	0	0	0	0	25	75
1	0	80	0	80	0	0	0	0	20	80
2	0	70	0	70	0	0	0	0	30	70
2	0	80	0	80	0	0	0	0	20	80
2	0	65	0	65	0	10	0	10	25	75
2	0	80	2	82	0	0	0	0	13	82
2	0	70	0	70	0	0	0	0	30	70
2	0	80	0	80	0	5	0	5	15	85
2	0	75	5	80	0	0	0	0	20	80
2	0	80	5	85	0	0	0	0	15	85
2	0	60	5	65	0	0	0	0	35	65
1	0	85	0	85	0	0	0	0	15	85
2	0	65	0	65	0	0	0	0	35	65
2	0	70	0	70	0	0	0	0	30	70
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	80	0	80	0	0	0	0	20	80
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	75	0	75	0	0	0	0	25	75
2	0	80	5	85	0	0	0	0	15	85
1	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
1	0	80	0	80	0	0	0	0	20	80
1	0	80	0	80	0	0	0	0	20	80
1	0	70	0	70	0	0	0	0	30	70
1	0	90	0	90	0	0	0	0	10	90
Average		**83.1**	**1.1**	**84.3**	**0.0**	**0.2**	**0.0**	**0.2**	**15.5**	**84.5**

Transect T8 Sampled 9 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	55	0	55	0	0	0	0	45	55
2	0	65	0	65	0	0	0	0	35	65
1	0	70	5	75	0	0	0	0	25	75
1	0	65	5	70	0	0	0	0	30	70
2	0	60	10	70	0	0	0	0	30	70
2	0	80	10	90	0	0	0	0	10	90
1	0	70	10	80	0	0	0	0	20	80
1	0	70	10	80	0	0	0	0	20	80
1	0	60	5	65	0	0	0	0	35	65
1	0	75	10	85	0	0	0	0	25	85
2	0	90	0	90	0	0	0	0	10	90
2	0	75	5	80	0	0	0	0	20	80
1	0	75	10	85	0	0	0	0	20	85
1	0	85	0	85	0	0	0	0	15	85
1	0	70	10	80	0	0	0	0	20	80
1	0	70	15	85	0	0	0	0	15	85
1	0	73	2	75	0	0	0	0	25	75
1	0	95	0	95	0	0	0	0	5	95
1	0	80	5	85	0	0	0	0	15	85
1	0	95	0	95	0	0	0	0	5	95
1	0	85	0	85	0	0	0	0	15	85
1	0	93	2	95	0	0	0	0	5	95
1	0	80	0	80	0	0	0	0	20	80
2	0	85	5	90	0	0	0	0	10	90
1	0	80	0	80	0	0	0	0	20	80
2	0	80	0	80	0	0	0	0	20	80
1	0	75	0	75	0	0	0	0	25	75
1	0	75	0	75	0	0	0	0	25	75
1	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	80	5	85	0	0	0	0	15	85
1	0	90	0	90	0	0	0	0	10	90
2	0	80	0	80	0	0	0	0	20	80
1	0	85	5	90	0	0	0	0	10	90
1	0	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	0	0	0	5	95
1	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	75	0	75	0	0	0	0	25	75
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	90	5	95	0	0	0	0	5	95
2	0	85	0	85	0	0	0	0	15	85
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
1	0	85	0	85	0	0	0	0	15	85
1	0	80	0	80	0	0	0	0	20	80
2	0	80	5	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	80	0	80	0	0	0	0	20	80
1	0	80	0	80	0	0	0	0	20	80
1	0	75	0	75	0	0	0	0	25	75
1	0	75	0	75	0	0	0	0	25	75
2	0	75	0	75	0	0	0	0	25	75
2	0	75	0	75	0	0	0	0	25	75
2	0	75	0	75	0	0	0	0	25	75
1	0	85	0	85	0	0	0	0	15	85
1	0	80	0	80	0	0	0	0	20	80
1	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	80	0	80	0	0	0	0	20	80
Average		**81.2**	**2.0**	**83.2**	**0.0**	**0.0**	**0.0**	**0.0**	**17.0**	**83.2**

Chain Valley Bay

Transect E1										Sampled 10 June 2023
			Seagrasses			Algae				
Long=1	Fouling	*Zostera*	*Halophila*	Total	*Codium*	*Cystophyllum*	% algae	Total	% Bare	Total
Short=2	0,1,2	% cover	% cover	seagrasses	% cover	% cover	Filamentous	Algae	Ground	Cover
2	1	60	0	60	0	5	0	5	35	65
2	1	75	5	80	0	0	0	0	20	80
2	1	90	0	90	0	5	0	5	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	75	0	75	0	15	0	15	10	90
2	1	85	0	85	0	0	0	0	15	85
2	1	50	0	50	0	30	0	30	20	80
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	80	0	80	0	0	0	0	20	80
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	75	0	75	0	5	0	5	20	80
2	1	80	0	80	0	0	5	5	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	75	0	75	0	5	0	5	20	80
2	1	75	0	75	0	5	0	5	20	80
2	1	90	0	90	0	5	0	5	5	95
2	1	95	0	95	0	5	0	5	0	100
2	1	90	0	90	0	0	0	0	10	90
2	1	80	5	85	0	5	0	5	10	90
2	1	70	0	70	0	10	0	10	20	80
2	1	75	0	75	0	5	0	5	20	80
2	1	85	0	85	0	0	5	5	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	80	0	80	0	10	0	10	10	90
2	1	70	0	70	0	20	0	20	10	90
2	1	85	0	85	0	0	10	10	5	95
2	1	90	0	90	0	0	5	5	5	95
2	1	75	0	75	0	25	0	25	0	100
2	1	85	0	85	0	15	0	15	0	100
2	1	85	0	85	0	10	5	15	0	100
2	1	75	5	80	0	5	0	5	15	85
2	1	75	5	80	0	0	5	5	15	85
2	1	73	2	75	0	20	0	20	5	95
2	1	85	0	85	0	5	0	5	10	90
2	1	80	0	80	0	20	0	20	0	100
2	1	75	0	75	0	5	0	5	20	80
2	1	90	0	90	0	0	0	0	10	90
2	1	75	0	75	0	15	0	15	10	90
2	1	85	0	85	0	5	0	5	10	90
2	1	95	0	95	0	5	0	5	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	85	0	85	0	10	0	10	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	80	0	80	0	10	0	10	10	90
2	1	90	0	90	0	5	0	5	5	95
2	1	98	0	98	0	0	0	0	2	98
2	1	98	0	98	0	0	0	0	2	98
2	1	98	0	98	0	2	0	2	0	100
2	1	85	0	85	0	10	0	10	5	95
2	1	98	0	98	0	0	0	0	2	98
2	1	95	0	95	0	5	0	5	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	90	0	90	0	10	0	10	0	100
2	1	85	0	85	0	15	0	15	0	100
2	1	90	0	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	80	0	80	0	0	0	0	20	80
2	1	80	0	80	0	5	0	5	15	85
2	1	100	0	100	0	0	0	0	0	100
2	1	95	2	97	0	0	0	0	3	97
2	1	95	0	95	0	0	0	0	5	95
Average		**85.0**	**0.4**	**85.4**	**0.0**	**5.1**	**0.5**	**5.6**	**9.0**	**91.0**

Transect E2 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1	Fouling	*Zostera*	*Halophila*	Total	*Codium*	*Cystophyllum*	% algae	Total	% Bare	Total
Short=2	0,1,2	% cover	% cover	seagrasses	% cover	% cover	Filamentous	Algae	Ground	Cover
2	1	55	0	55	0	0	0	0	45	55
2	1	50	0	50	0	0	0	0	50	50
2	1	65	0	65	0	5	0	5	30	70
2	1	80	0	80	0	10	0	10	10	90
2	1	75	0	75	0	5	0	5	20	80
2	1	90	0	90	0	5	0	5	5	95
2	1	75	5	85	0	5	0	5	10	90
2	1	70	10	80	0	5	0	5	15	85
2	1	80	5	85	0	0	0	0	15	85
2	1	80	5	85	0	5	0	5	10	90
2	1	80	5	85	0	5	0	5	10	90
2	1	75	10	85	0	0	0	0	15	85
2	1	80	5	85	0	5	0	5	10	90
2	1	70	5	75	0	5	0	5	20	80
2	1	80	0	80	0	10	0	10	10	90
2	1	10	0	10	0	0	90	90	0	100
2	1	0	0	0	0	0	100	100	0	100
2	1	0	0	0	0	0	100	100	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	85	0	85	0	5	0	5	10	90
2	1	85	2	87	0	5	3	8	5	95
2	1	85	10	95	0	0	5	5	0	100
2	1	85	0	85	0	0	15	15	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	90	5	95	0	0	5	5	0	100
2	1	80	5	85	0	10	0	10	5	95
2	1	95	0	95	0	5	0	5	0	100
2	1	90	0	90	0	10	0	10	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	5	5	10	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	5	0	5	5	95
2	1	95	0	95	0	5	0	5	0	100
2	1	90	5	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	95	0	95	0	0	5	5	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	93	2	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	98	2	100	0	0	0	0	0	100
2	1	93	2	95	0	5	0	5	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	85	5	90	0	5	0	5	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	5	0	5	0	100
2	1	90	0	90	0	5	0	5	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	2	90	0	90	0	0	10	10	0	100
2	2	80	0	80	0	0	20	20	0	100
Average		**85.6**	**1.6**	**87.2**	**0.0**	**2.4**	**5.3**	**7.7**	**5.1**	**94.9**

Transect E3 Sampled 10 June 2023

Long=1 Short=2	Fouling 0,1,2	Seagrasses *Zostera* % cover	*Halophila* % cover	Total seagrasses	Algae *Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	1	90	0	90	0	0	0	0	10	90
1	1	80	0	80	0	0	0	0	20	80
1	1	90	0	90	0	0	0	0	10	90
1	1	80	0	80	0	0	0	0	20	80
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	85	0	85	0	0	0	0	15	85
1	1	80	0	80	0	0	0	0	20	80
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
1	1	90	0	90	0	0	0	0	10	90
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	80	0	80	0	0	0	0	20	80
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	50	5	55	0	0	0	0	45	55
Average		**96.6**	**0.1**	**96.7**	**0.0**	**0.0**	**0.0**	**0.0**	**3.3**	**96.7**

Transect E4										Sampled 10 June 2023
		Seagrasses			Algae					
Long=1	Fouling	*Zostera*	*Halophila*	Total	*Codium*	*Cystophyllum*	% algae	Total	% Bare	Total
Short=2	0,1,2	% cover	% cover	seagrasses	% cover	% cover	Filamentous	Algae	Ground	Cover
1	1	85	0	85	0	15	0	15	0	100
1	1	85	0	85	0	2	0	2	13	87
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	98	2	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	85	0	85	0	0	0	0	15	85
1	1	90	0	90	0	5	0	5	5	95
1	1	90	0	90	0	5	0	5	5	95
1	1	100	0	100	0	0	0	0	0	100
2	0	80	0	80	0	0	5	5	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	80	0	80	0	0	0	0	20	80
2	1	70	0	70	0	0	0	0	30	70
2	1	45	0	45	0	40	0	40	15	85
2	1	85	0	85	0	10	0	10	5	95
2	1	80	0	80	0	5	0	5	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	5	0	5	0	100
2	1	90	0	90	0	5	0	5	5	95
2	1	85	5	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	80	0	80	0	5	0	5	15	85
2	1	85	0	85	0	15	0	15	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	5	0	5	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	98	2	100	0	0	0	0	0	100
2	1	93	0	93	0	5	0	5	2	98
2	1	95	0	95	0	0	0	0	5	95
2	1	70	0	70	0	5	0	5	25	75
2	1	90	0	90	0	0	0	0	10	90
2	1	80	0	80	0	5	0	5	15	85
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	72	3	75	0	20	0	20	5	95
2	1	90	5	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	90	5	95	0	0	0	0	5	95
2	1	85	10	95	0	0	0	0	5	95
2	1	85	10	95	0	0	0	0	5	95
2	1	75	5	80	0	15	0	15	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	85	0	85	0	0	0	0	15	85
2	1	80	15	95	0	0	0	0	5	95
2	1	80	10	90	0	5	0	5	5	95
2	1	95	5	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	2	80	0	80	0	0	0	0	20	80
Average		90.2	1.3	91.5	0.0	2.6	0.1	2.7	5.8	94.2

Transect L1 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	1	80	0	80	0	0	0	0	20	80
1	1	65	0	65	0	15	0	15	20	80
1	1	40	0	40	0	5	0	5	65	45
1	1	40	0	40	0	5	0	5	55	45
1	1	60	0	60	0	0	0	0	40	60
1	2	80	0	80	0	0	0	0	20	80
1	1	85	0	85	0	5	0	5	10	90
1	2	95	0	95	0	5	0	5	0	100
1	2	95	0	95	0	0	0	0	5	95
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	95	0	95	0	0	0	0	5	95
1	2	100	0	100	0	0	0	0	0	100
1	2	95	0	95	0	0	0	0	5	95
1	2	90	0	90	0	0	0	0	10	90
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	5	100	0	0	0	0	0	100
1	1	90	5	95	0	0	0	0	5	95
1	1	90	5	95	0	0	0	0	5	95
1	1	95	5	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	5	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	85	5	90	0	0	0	0	10	90
1	1	80	10	90	0	0	0	0	10	90
1	1	80	5	85	0	0	0	0	15	85
1	1	85	5	90	0	0	0	0	10	90
1	1	85	10	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	90	5	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	85	0	85	0	0	0	0	15	85
1	1	100	0	100	0	0	0	0	0	100
1	1	98	0	98	0	0	0	0	2	98
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	80	0	80	0	20	0	20	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	0	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
Average		**92.7**	**1.0**	**93.6**	**0.0**	**0.8**	**0.0**	**0.8**	**5.6**	**94.5**

Transect E5										Sampled 10 June 2023
		Seagrasses			Algae					
Long=1	Fouling	*Zostera*	*Halophila*	Total	*Codium*	*Cystophyllum*	% algae	Total	% Bare	Total
Short=2	0,1,2	% cover	% cover	seagrasses	% cover	% cover	Filamentous	Algae	Ground	Cover
1	1	70	0	70	0	0	0	0	30	70
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	5	2	7	3	97
1	1	95	0	95	0	0	5	5	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	5	0	5	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	98	0	98	0	0	0	0	2	98
1	1	98	0	98	0	0	2	2	0	100
1	1	98	0	98	0	0	0	0	2	98
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	98	0	98	0	0	0	0	2	98
1	1	98	0	98	0	0	0	0	2	98
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	85	0	85	0	0	0	0	15	85
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	98	0	98	0	0	0	0	2	98
1	1	95	0	95	0	0	0	0	5	95
1	1	98	0	98	0	0	0	0	2	98
1	1	96	0	96	0	0	4	4	0	100
1	1	100	0	100	0	0	0	0	0	100
2	1	65	0	65	0	5	0	5	30	70
2	1	100	0	100	0	0	0	0	0	100
2	1	85	5	90	0	5	0	5	5	95
2	1	96	0	96	0	0	2	2	2	98
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	93	2	95	0	0	0	0	5	95
Average		**96.3**	**0.1**	**96.4**	**0.0**	**0.3**	**0.2**	**0.5**	**3.1**	**96.9**

Transect E6 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1	Fouling	*Zostera*	*Halophila*	Total	*Codium*	*Cystophyllum*	% algae	Total	% Bare	Total
Short=2	0,1,2	% cover	% cover	seagrasses	% cover	% cover	Filamentous	Algae	Ground	Cover
1	2	40	0	40	0	0	0	0	60	40
1	2	40	0	40	0	0	0	0	60	40
1	2	60	0	60	0	0	0	0	40	60
1	2	50	0	50	0	0	0	0	50	50
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	5	5	0	0	0	0	95	5
1	2	70	5	75	0	0	0	0	25	75
1	2	80	5	85	0	0	0	0	15	85
1	2	83	2	85	0	0	0	0	15	85
1	2	80	0	80	0	0	0	0	20	80
1	2	80	0	80	0	0	0	0	20	80
1	2	45	0	45	0	0	0	0	55	45
1	2	80	0	80	0	0	0	0	20	80
1	2	71	4	75	0	0	0	0	25	75
1	2	60	4	64	0	0	0	0	36	64
1	1	95	0	95	0	0	0	0	5	95
1	1	75	0	75	0	0	0	0	25	75
1	1	85	0	85	0	0	0	0	15	85
1	1	85	5	90	0	0	0	0	10	90
1	1	85	5	90	0	0	0	0	10	90
1	1	90	0	90	0	0	0	0	10	90
1	1	50	0	50	0	0	0	0	50	50
1	2	50	0	50	0	0	0	0	50	50
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	90	5	95	0	0	0	0	5	95
1	2	90	0	90	0	0	0	0	10	90
1	2	80	0	80	0	0	0	0	20	80
1	1	70	10	80	0	0	0	0	20	80
1	2	80	0	80	0	0	0	0	20	80
1	1	70	10	80	0	0	0	0	20	80
1	2	70	10	80	0	0	0	0	20	80
1	1	70	10	80	0	0	0	0	20	80
1	1	90	0	90	0	0	0	0	10	90
1	1	90	2	92	0	0	0	0	8	92
1	1	80	10	90	0	0	0	0	20	90
1	1	70	10	80	0	0	0	0	20	80
1	1	80	2	82	0	0	0	0	18	82
1	2	80	5	85	0	0	0	0	15	85
1	1	75	10	85	0	0	0	0	15	85
1	1	60	15	75	0	0	0	0	25	75
1	1	80	5	85	0	0	0	0	15	85
1	1	50	10	60	0	0	0	0	40	60
1	1	60	10	70	0	0	0	0	30	70
1	1	60	0	60	0	0	0	0	40	60
1	1	40	10	50	0	0	0	0	50	50
1	1	80	15	95	0	0	0	0	5	95
1	1	90	5	95	0	0	0	0	5	95
1	1	50	15	65	0	0	0	0	35	65
1	1	75	5	80	0	0	0	0	20	80
1	1	75	10	85	0	0	0	0	15	85
1	1	90	0	90	0	5	0	5	5	95
1	1	80	0	80	0	0	0	0	20	80
1	1	80	5	85	0	0	0	0	15	85
1	2	95	0	95	0	0	0	0	5	95
1	1	80	5	85	0	0	0	0	15	85
1	1	90	5	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	2	80	10	90	0	0	0	0	10	90
2	1	40	20	60	0	0	0	0	40	60
2	1	65	25	90	0	0	0	0	10	90
2	1	85	10	95	0	0	0	0	5	95
1	1	80	5	85	0	0	0	0	15	85
1	1	20	10	30	0	0	0	0	70	30
1	1	95	5	100	0	0	0	0	0	100
1	1	50	15	65	0	0	0	0	35	65
1	1	85	15	100	0	0	0	0	0	100
Average		**69.9**	**5.1**	**75.0**	**0.0**	**0.1**	**0.0**	**0.1**	**22.1**	**75.1**

Transect E8 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	0	90	0	90	0	0	0	0	10	90
1	0	40	5	45	0	0	0	0	55	45
1	0	55	5	60	0	0	0	0	40	60
1	1	55	5	60	0	0	0	0	40	60
2	1	80	0	80	0	0	0	0	20	80
2	1	80	10	90	0	0	0	0	10	90
2	1	80	5	85	0	0	0	0	15	85
2	1	80	10	90	0	0	0	0	10	90
2	0	80	0	80	0	0	0	0	20	80
2	1	90	0	90	0	0	0	0	10	90
2	1	80	10	90	0	0	0	0	10	90
1	1	90	0	90	0	0	0	0	10	90
1	1	78	2	80	0	0	0	0	20	80
1	1	85	0	85	0	0	0	0	15	85
1	1	85	0	85	0	0	0	0	15	85
1	1	95	0	95	0	0	0	0	5	95
2	1	65	5	70	0	0	0	0	30	70
2	1	70	0	70	0	0	0	0	30	70
2	1	75	0	75	0	0	0	0	25	75
2	1	80	0	80	0	0	0	0	20	80
2	1	90	0	90	0	0	0	0	10	90
2	1	88	2	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	90	5	95	0	0	0	0	5	95
1	1	85	5	90	0	0	0	0	10	90
1	1	85	5	90	0	0	0	0	10	90
1	1	90	0	90	0	0	0	0	10	90
1	1	85	5	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	98	0	98	0	0	0	0	2	98
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	85	3	88	0	0	0	0	12	88
2	0	80	5	85	0	0	0	0	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	0	90	5	95	0	0	0	0	5	95
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
1	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	80	5	85	0	0	0	0	15	85
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	5	0	5	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	85	5	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
Average		**86.0**	**1.5**	**87.5**	**0.0**	**0.1**	**0.0**	**0.1**	**12.4**	**87.6**

Transect E9 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	93	2	95	0	0	0	0	5	95
2	0	90	5	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	80	10	90	0	0	0	0	10	90
2	0	80	5	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	85	5	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	95	0	95	0	0	0	0	5	95
2	0	88	2	90	0	0	0	0	10	90
2	0	85	5	90	0	0	0	0	10	90
2	0	80	0	80	0	20	0	20	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	98	2	100	0	0	0	0	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	0	0	0	5	95
1	0	95	0	95	0	0	0	0	5	95
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	0	0	0	5	95
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	98	0	98	0	0	0	0	0	98
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
Average		**95.7**	**0.5**	**96.2**	**0.0**	**0.3**	**0.0**	**0.3**	**3.5**	**96.5**

Transect E10 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1	Fouling	*Zostera*	*Halophila*	Total	*Codium*	*Cystophyllum*	% algae	Total	% Bare	Total
Short=2	0,1,2	% cover	% cover	seagrasses	% cover	% cover	Filamentous	Algae	Ground	Cover
0	0	0	0	0	0	90	0	90	10	90
0	0	0	0	0	0	0	95	95	5	95
2	1	85	15	100	0	0	0	0	0	100
2	1	15	15	30	0	0	40	40	30	70
0	0	0	0	0	0	0	100	100	0	100
0	0	0	0	0	0	0	100	100	0	100
0	0	0	0	0	0	0	100	100	0	100
2	1	75	5	80	0	0	10	10	10	90
2	2	98	0	98	0	0	0	0	2	98
2	2	95	0	95	0	0	5	5	0	100
2	2	95	0	95	0	0	0	0	5	95
2	2	100	0	100	0	0	0	0	0	100
2	2	95	0	95	0	0	0	0	5	95
2	2	100	0	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	5	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	93	0	93	0	0	4	4	3	97
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	10	0	10	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	98	0	98	0	0	0	0	2	98
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	75	20	95	0	0	0	0	5	95
2	2	0	95	95	0	0	0	0	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
Average		**86.8**	**2.2**	**89.0**	**0.0**	**1.5**	**6.8**	**8.2**	**2.8**	**97.3**

Transect E11 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	1	100	0	100	0	0	0	0	0	100
1	1	80	0	80	0	0	0	0	20	80
1	1	80	0	80	0	0	0	0	20	80
1	1	90	0	90	0	0	0	0	10	90
1	1	70	0	70	0	0	0	0	30	70
1	1	90	0	90	0	0	0	0	10	90
1	1	85	0	85	0	0	0	0	15	85
1	1	95	0	95	0	0	0	0	5	95
1	1	45	0	45	0	0	0	0	55	45
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	85	5	90	0	0	0	0	5	90
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	98	0	98	0	0	0	0	2	98
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	98	0	98	0	0	0	0	2	98
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
Average		**96.5**	**0.1**	**96.6**	**0.0**	**0.1**	**0.0**	**0.1**	**3.2**	**96.7**

Transect E12 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1	Fouling	*Zostera*	*Halophila*	Total	*Codium*	*Cystophyllum*	% algae	Total	% Bare	Total
Short=2	0,1,2	% cover	% cover	Seagrasses	% cover	% cover	Filamentous	Algae	Ground	Cover
1	0	20	5	25	0	0	0	0	75	25
1	0	20	5	25	0	0	0	0	75	25
1	1	88	2	90	0	0	0	0	10	90
1	1	90	0	90	0	0	0	0	10	90
1	1	80	0	80	0	0	0	0	20	80
1	1	85	0	85	0	0	0	0	15	85
1	1	80	5	85	0	0	0	0	15	85
2	1	95	0	95	0	0	0	0	5	95
2	1	93	2	95	0	0	0	0	5	95
2	1	95	5	100	0	0	0	0	0	100
2	1	85	5	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	98	0	98	0	0	0	0	2	98
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	85	5	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	5	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	5	5	0	100
2	1	85	0	85	0	0	15	15	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
Average		**94.3**	**0.5**	**94.8**	**0.0**	**0.0**	**0.4**	**0.4**	**4.8**	**95.2**

Transect E13 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	80	0	80	0	0	0	0	20	80
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	80	0	80	0	10	0	10	10	90
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
Average		**99.3**	**0.0**	**99.3**	**0.0**	**0.2**	**0.0**	**0.2**	**0.4**	**99.6**

Transect E14 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1 Short=2	**Fouling 0,1,2**	***Zostera* % cover**	***Halophila* % cover**	**Total Seagrasses**	***Codium* % cover**	***Cystophyllum* % cover**	**% algae Filamentous**	**Total Algae**	**% Bare Ground**	**Total Cover**
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	50	0	50	0	0	0	0	50	50
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	80	0	80	0	0	0	0	20	80
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	0	90
1	1	40	0	40	0	0	0	0	60	40
1	1	80	0	80	0	0	0	0	20	80
1	1	80	0	80	0	0	0	0	20	80
1	1	80	0	80	0	0	0	0	20	80
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	75	0	75	0	10	15	25	0	100
1	1	70	0	70	0	0	5	5	25	75
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	5	5	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	80	5	85	0	0	0	0	15	85
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	40	0	40	0	0	0	0	60	40
1	1	40	0	40	0	0	0	0	60	40
1	1	60	0	60	0	0	0	0	40	60
1	1	60	0	60	0	0	0	0	40	60
Average		**92.4**	**0.1**	**92.5**	**0.0**	**0.4**	**0.4**	**0.7**	**6.6**	**93.2**

Transect E15 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	75	10	85	0	0	0	0	15	85
1	1	85	5	90	0	0	0	0	10	90
1	1	75	5	80	0	0	0	0	20	80
1	1	90	5	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	95	5	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
1	1	85	0	85	0	0	0	0	15	85
1	1	85	0	85	0	5	0	5	10	90
1	1	75	0	75	0	0	0	0	25	75
1	1	50	0	50	0	0	0	0	50	50
1	1	45	5	50	0	0	0	0	50	50
2	1	85	0	85	0	0	0	0	15	85
2	1	70	0	70	0	0	0	0	30	70
1	1	40	10	50	0	0	0	0	50	50
2	1	25	0	25	0	0	0	0	75	25
2	1	70	0	70	0	0	0	0	30	70
2	0	70	0	70	0	0	0	0	30	70
2	0	70	5	75	0	0	0	0	25	75
2	1	70	0	70	0	0	0	0	30	70
2	1	70	0	70	0	0	0	0	30	70
1	1	65	0	65	0	0	0	0	35	65
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	90	0	90	0	0	0	0	10	90
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	90	0	90	0	0	0	0	10	90
Average		**88.9**	**0.7**	**89.6**	**0.0**	**0.2**	**0.0**	**0.2**	**10.1**	**89.9**

Transect E16 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	2	50	0	50	0	0	0	0	50	50
1	2	80	5	85	0	0	0	0	15	85
1	2	80	0	80	0	0	0	0	20	80
1	1	90	0	90	0	0	0	0	10	90
1	2	85	0	85	0	0	0	0	15	85
1	2	70	0	70	0	0	0	0	30	70
1	2	90	0	90	0	0	0	0	10	90
1	2	100	0	100	0	0	0	0	0	100
1	2	90	0	90	0	0	0	0	10	90
1	2	100	0	100	0	0	0	0	0	100
1	2	80	0	80	0	0	0	0	20	80
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	0	0	0	10	90
1	1	85	0	85	0	0	0	0	15	85
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	0	95
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	0	95
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	5	0	5	5	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
Average		**95.1**	**0.1**	**95.2**	**0.0**	**0.1**	**0.0**	**0.1**	**4.6**	**95.3**

Bardens Bay

Transect A1 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	1	75	0	75	0	5	0	5	20	80
2	1	95	0	95	0	5	0	5	0	100
2	1	80	0	80	0	10	0	10	10	90
2	1	70	0	70	0	15	0	15	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	60	0	60	0	40	0	40	0	100
2	1	75	0	75	0	10	0	10	15	85
2	1	90	0	90	0	10	0	10	0	100
2	1	85	0	85	0	10	0	10	5	95
2	1	40	5	45	0	5	0	5	50	50
2	1	45	5	50	0	10	0	10	40	60
2	1	50	10	60	0	15	0	15	25	75
1	1	95	0	95	0	0	0	0	5	95
2	1	80	5	85	0	5	0	5	10	90
2	1	60	10	70	0	15	0	15	15	85
2	1	85	5	90	0	0	0	0	10	90
2	1	75	10	85	0	0	0	0	15	85
2	1	70	5	75	0	15	0	15	10	90
2	1	75	5	80	0	10	0	10	10	90
2	1	85	0	85	0	5	0	5	10	90
2	1	70	5	75	0	10	0	10	15	85
2	1	70	5	75	0	5	0	5	20	80
2	1	70	5	75	0	5	0	5	20	80
2	1	50	10	60	0	25	0	25	15	85
2	1	80	5	85	0	0	0	0	15	85
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	70	5	75	0	10	0	10	15	85
2	1	75	5	80	0	5	0	5	15	85
2	1	83	2	85	0	10	0	10	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	5	0	5	5	95
2	1	80	10	90	0	0	0	0	10	90
2	1	50	5	55	0	5	0	5	40	60
2	1	30	5	35	0	10	0	10	55	45
2	1	5	0	5	0	20	0	20	75	25
2	1	50	0	50	0	15	0	15	35	65
2	1	50	30	80	0	15	0	15	5	95
2	1	5	15	20	25	15	0	40	40	60
2	1	60	5	65	0	15	0	15	20	80
2	1	60	0	60	0	20	0	20	20	80
2	1	40	0	40	0	10	0	10	50	50
2	1	20	0	20	0	10	0	10	70	30
2	1	50	0	50	0	20	0	20	30	70
2	1	75	0	75	0	10	0	10	15	85
2	1	75	0	75	0	10	0	10	15	85
2	1	80	0	80	0	10	0	10	10	90
2	1	75	5	80	0	5	0	5	15	85
2	1	75	0	75	0	15	0	15	10	90
2	1	80	0	80	0	10	0	10	10	90
2	1	70	5	75	0	10	0	10	20	85
2	1	70	0	70	0	5	0	5	25	75
2	1	80	0	80	0	10	0	10	10	90
2	1	70	0	70	0	15	0	15	15	85
2	1	70	0	70	0	20	0	20	10	90
2	1	70	0	70	0	25	0	25	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	80	0	80	0	10	0	10	10	90
2	1	80	0	80	0	5	0	5	15	85
2	1	80	0	80	0	10	0	10	10	90
2	1	85	0	85	0	10	0	10	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	5	0	5	5	95
Average		**71.6**	**2.7**	**74.3**	**0.4**	**9.1**	**0.0**	**9.5**	**16.3**	**83.8**

Transect A2 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystoseira* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	1	100	0	100	0	0	0	0	0	100
1	1	65	0	65	0	30	0	30	5	95
1	1	90	0	90	0	5	0	5	5	95
1	1	95	0	95	0	5	0	5	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	85	0	85	0	15	0	15	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	75	0	75	0	25	0	25	0	100
1	1	85	0	85	0	10	0	10	5	95
1	1	85	0	85	0	15	0	15	0	100
1	1	90	0	90	0	5	0	5	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
1	1	65	0	65	0	25	0	25	10	90
1	1	85	0	85	0	15	0	15	0	100
1	1	90	0	90	0	10	0	10	0	100
2	1	60	10	70	0	5	0	5	25	75
2	1	75	5	80	0	5	0	5	15	85
2	1	70	5	75	0	10	0	10	15	85
2	1	80	0	80	0	10	0	10	10	90
2	1	70	5	75	0	10	0	10	15	85
2	1	68	2	70	0	5	0	5	25	75
2	1	75	0	75	0	10	0	10	15	85
2	1	80	0	80	0	0	0	0	20	80
2	1	75	0	75	0	5	0	5	20	80
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	5	0	5	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	75	0	75	0	20	0	20	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	85	5	90	0	5	0	5	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	90	5	95	0	0	0	0	5	95
2	1	80	5	85	0	5	0	5	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	85	0	85	0	5	0	5	10	90
2	1	80	5	85	0	5	0	5	10	90
2	1	65	5	70	0	5	0	5	25	75
2	1	55	10	65	0	0	0	0	35	65
2	1	75	0	75	0	5	0	5	20	80
2	1	85	0	85	0	0	0	0	15	85
2	1	75	0	75	0	10	0	10	15	85
2	1	75	0	75	0	15	0	15	10	90
2	1	90	0	90	0	5	0	5	5	95
2	1	93	0	93	0	2	0	2	5	95
2	1	65	0	65	0	20	0	20	15	85
2	1	90	0	90	0	10	0	10	0	100
2	1	85	0	85	0	10	0	10	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	90	0	90	0	10	0	10	0	100
2	1	73	2	75	0	15	0	15	10	90
2	1	75	0	75	0	15	0	15	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	80	0	80	0	10	0	10	10	90
2	1	75	0	75	0	15	0	15	10	90
2	1	90	0	90	0	5	0	5	5	95
2	1	85	0	85	0	10	0	10	5	95
2	1	65	0	65	0	20	0	20	15	85
2	1	60	0	60	0	20	0	20	20	80
2	1	30	0	30	0	50	0	50	20	80
2	1	65	0	65	0	20	0	20	15	85
2	1	75	0	75	0	10	0	10	15	85
2	1	75	0	75	0	10	0	10	15	85
Average		**81.5**	**0.9**	**82.5**	**0.0**	**8.6**	**0.0**	**8.6**	**8.9**	**91.1**

Transect A3 Sampled 10 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystoseira* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	50	0	50	0	0	0	0	50	50
1	1	90	0	90	0	0	0	0	10	90
1	1	90	0	90	0	0	0	0	10	90
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	50	0	50	0	50	0	50	0	100
1	1	80	0	80	0	20	0	20	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	98	0	98	0	0	0	0	2	98
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	5	0	5	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	10	0	10	0	100
1	1	98	0	98	0	0	0	0	2	98
1	1	90	0	90	0	5	0	5	5	95
1	1	80	0	80	0	10	0	10	10	90
1	1	85	0	85	0	10	0	10	5	95
1	1	90	0	90	0	5	0	5	5	95
1	1	80	0	80	0	15	0	15	5	95
1	1	95	0	95	0	5	0	5	0	100
1	1	90	0	90	0	5	0	5	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
2	1	80	0	80	0	15	0	15	5	95
2	1	80	0	80	0	10	0	10	10	90
2	1	70	0	70	0	30	0	30	0	100
2	1	90	0	90	0	5	0	5	5	95
2	1	75	0	75	0	20	0	20	5	95
2	1	83	2	85	0	5	0	5	10	90
2	1	80	5	85	0	5	0	5	10	90
2	1	75	5	80	0	10	0	10	10	90
2	1	85	5	90	0	5	0	5	5	95
2	1	70	5	75	0	5	0	5	20	80
2	1	75	5	80	0	15	0	15	5	95
2	1	60	5	65	0	25	0	25	10	90
2	1	75	0	75	0	10	0	10	15	85
2	1	75	0	75	0	15	0	15	10	90
2	1	80	0	80	0	15	0	15	5	95
2	1	90	0	90	0	10	0	10	5	100
2	1	70	0	70	0	30	0	30	0	100
2	1	85	0	85	0	10	0	10	5	95
2	1	90	5	95	0	5	0	5	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	85	0	85	0	5	0	5	10	90
2	1	70	10	80	0	10	0	10	10	90
2	1	70	0	70	0	5	0	5	25	75
2	1	60	0	60	0	20	0	20	20	80
2	1	50	0	50	0	25	0	25	25	75
2	1	75	0	75	0	15	0	15	10	90
2	1	85	5	90	0	5	0	5	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	70	0	70	0	5	0	5	25	75
2	1	95	0	95	0	0	0	0	0	95
2	1	95	0	95	0	0	0	0	0	95
2	1	95	0	95	0	0	0	0	5	95
Average		**86.0**	**0.8**	**86.8**	**0.0**	**7.1**	**0.0**	**7.1**	**6.1**	**93.8**

Transect A4 Sampled 11 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystoseira* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	1	80	0	80	0	0	0	0	20	80
1	1	80	0	80	0	0	0	0	20	80
1	1	60	0	60	0	5	0	5	35	65
1	1	75	0	75	0	0	0	0	25	75
1	1	85	0	85	0	0	0	0	15	85
1	1	95	0	95	0	0	0	0	5	95
1	1	85	0	85	0	0	0	0	15	85
1	1	80	0	80	0	0	0	0	20	80
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
2	0	5	60	65	0	0	0	0	35	65
2	0	15	60	75	0	0	0	0	25	75
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
Average		**94.6**	**1.8**	**96.4**	**0.0**	**0.1**	**0.0**	**0.1**	**3.5**	**96.5**

Transect A5 Sampled 11 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystoseira* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	0	60	10	70	0	0	0	0	30	70
1	0	70	5	75	0	0	0	0	25	75
1	0	70	10	80	0	0	0	0	20	80
1	0	85	0	85	0	0	0	0	15	85
1	0	75	0	75	0	0	0	0	25	75
1	0	85	0	85	0	0	0	0	15	85
1	1	85	0	85	0	0	0	0	15	85
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	80	0	80	0	0	0	0	20	80
1	1	75	0	75	0	0	0	0	25	75
1	1	85	5	90	0	0	0	0	10	90
1	1	30	15	45	0	0	0	0	55	45
1	1	65	5	70	0	0	0	0	30	70
1	1	70	5	75	0	0	0	0	25	75
1	1	80	5	85	0	0	0	0	15	85
2	0	95	0	95	0	0	0	0	5	95
2	0	80	0	80	0	0	0	0	20	80
2	0	100	0	100	0	0	0	0	0	100
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	85	0	85	0	0	0	0	15	85
2	0	85	5	90	0	0	0	0	10	90
2	0	85	5	90	0	0	0	0	10	90
2	0	50	25	75	0	0	0	0	25	75
2	0	80	0	80	0	0	0	0	20	80
2	0	80	0	80	0	0	0	0	20	80
2	1	25	5	30	0	0	0	0	70	30
2	1	20	25	45	0	0	0	0	55	45
2	1	50	15	65	0	0	0	0	35	65
2	1	35	10	45	0	0	0	0	55	45
2	1	60	10	70	0	0	0	0	30	70
2	1	60	10	70	0	0	0	0	30	70
2	1	85	0	85	0	0	0	0	15	85
2	1	65	5	70	0	0	0	0	30	70
2	1	80	5	85	0	0	0	0	15	85
2	1	60	5	65	0	0	0	0	35	65
2	1	50	5	55	0	0	0	0	45	55
2	1	70	10	80	0	0	0	0	20	80
2	1	70	5	75	0	0	0	0	25	75
2	1	85	0	85	0	0	0	0	15	85
2	1	90	5	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	75	0	75	0	0	0	0	25	75
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	90	5	95	0	0	0	0	5	95
2	1	95	5	100	0	0	0	0	5	100
2	1	90	5	95	0	0	0	0	5	95
2	1	90	5	95	0	0	0	0	5	95
2	1	85	5	90	0	0	0	0	10	90
2	1	90	5	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	80	10	90	0	0	0	0	10	90
2	1	80	0	80	0	0	0	0	20	80
2	1	90	5	95	0	0	0	0	5	95
2	1	85	10	95	0	0	0	0	5	95
2	1	95	5	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	90	5	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
Average		**79.4**	**4.0**	**83.5**	**0.0**	**0.0**	**0.0**	**0.0**	**16.6**	**83.5**

Transect A6 Sampled 11 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystoseira* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	5	5	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	10	0	10	0	100
1	1	80	0	80	0	10	0	10	10	90
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	95	0	95	0	5	0	5	0	100
2	1	95	0	95	0	0	5	5	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	80	0	80	0	5	0	5	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	5	0	5	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	5	5	0	100
2	1	95	0	95	0	0	5	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	80	20	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	95	2	97	0	0	0	0	3	97
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	80	0	80	0	0	0	0	20	80
Average		**97.2**	**0.3**	**97.6**	**0.0**	**0.8**	**0.3**	**1.1**	**1.4**	**98.6**

Sugar Bay

Transect S1 Sampled 11 June 2023

		Seagrasses			Algae					
Long=1	Fouling	*Zostera*	*Halophila*	Total	*Codium*	*Cystoseira*	% algae	Total	% Bare	Total
Short=2	0,1,2	% cover	% cover	seagrasses	% cover	% cover	Filamentous	Algae	Ground	Cover
1	1	75	0	75	0	10	0	10	15	85
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	85	0	85	0	0	0	0	15	85
1	1	90	0	90	0	0	10	10	0	100
1	1	80	0	80	0	10	5	15	5	95
1	1	87	0	87	0	3	10	13	0	100
1	1	87	0	87	0	3	5	8	5	95
1	1	85	0	85	0	5	5	10	5	95
1	1	90	0	90	0	5	0	5	5	95
1	1	95	0	95	0	0	5	5	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	85	0	85	0	0	0	0	15	85
1	1	90	0	90	0	10	0	10	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	90	0	90	0	0	10	10	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	90	0	90	0	5	5	10	0	100
1	1	95	0	95	0	0	5	5	0	100
1	1	90	0	90	0	0	10	10	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	90	0	90	0	8	2	10	0	100
1	1	90	0	90	0	0	10	10	0	100
1	1	95	0	95	0	2	3	5	0	100
1	1	85	0	85	0	0	15	15	0	100
1	1	90	0	90	0	0	10	10	0	100
1	1	95	0	95	0	0	5	5	0	100
1	1	95	0	95	0	0	5	5	0	100
1	1	98	0	98	0	0	2	2	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	95	0	95	0	0	5	5	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	2	3	5	0	100
1	1	90	0	90	0	0	10	10	0	100
1	1	85	0	85	0	0	15	15	0	100
1	1	90	0	90	0	0	10	10	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	5	5	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	95	0	95	0	0	5	5	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	5	5	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	85	0	85	0	0	15	15	0	100
1	1	85	0	85	0	0	15	15	0	100
1	1	95	0	95	0	5	0	5	0	100
2	1	85	0	85	0	0	0	0	15	85
2	1	90	0	90	0	5	0	5	5	95
2	1	75	0	75	0	12	10	22	3	97
2	1	90	0	90	0	8	0	8	2	98
2	1	70	0	70	0	10	20	30	0	100
2	1	85	0	85	0	0	10	10	5	95
2	1	90	0	90	0	0	10	10	0	100
2	1	90	0	90	0	0	10	10	0	100
2	1	85	0	85	0	15	0	15	0	100
2	1	95	0	95	0	0	5	5	0	100
2	1	90	0	90	0	5	0	5	5	95
2	1	85	0	85	0	5	10	15	5	100
2	1	90	0	90	0	0	10	10	0	100
2	1	80	0	80	0	10	10	20	0	100
2	1	90	0	90	0	10	0	10	0	100
2	1	90	0	90	0	0	10	10	0	100
Average		**90.7**	**0.0**	**90.7**	**0.0**	**2.7**	**4.6**	**7.3**	**2.1**	**98.0**

Transect S2											Sampled 11 June 2023
		Seagrasses			Algae						
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total seagrasses	*Codium* % cover	*Cystoseira* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover	
0	0	0	40	40	0	0	0	0	60	40	
0	0	0	60	60	0	0	0	0	40	60	
1	0	45	10	55	0	0	0	0	45	55	
1	1	98	2	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	90	0	90	0	10	0	10	0	100	
1	1	95	0	95	0	0	0	0	5	95	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	95	0	95	0	0	0	0	5	95	
1	1	50	15	65	0	0	0	0	35	65	
1	1	90	0	90	0	10	0	10	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
1	1	100	0	100	0	0	0	0	0	100	
2	0	75	0	75	0	0	0	0	25	75	
2	0	15	60	75	0	0	0	0	25	75	
2	0	93	2	95	0	0	0	0	5	95	
2	1	95	5	100	0	0	0	0	0	100	
2	1	95	5	100	0	0	0	0	0	100	
2	1	90	5	95	0	0	0	0	5	95	
2	1	65	10	75	0	0	0	0	25	75	
2	1	100	0	100	0	0	0	0	0	100	
2	1	100	0	100	0	0	0	0	0	100	
2	1	100	0	100	0	0	0	0	0	100	
2	1	95	5	100	0	0	0	0	0	100	
2	1	98	2	100	0	0	0	0	0	100	
2	1	98	2	100	0	0	0	0	0	100	
2	1	95	0	95	0	0	0	0	5	95	
2	1	85	0	85	0	0	0	0	15	85	
2	1	75	5	80	0	0	0	0	20	80	
2	1	90	0	90	0	0	0	0	10	90	
2	1	75	0	75	0	0	0	0	25	75	
2	1	100	0	100	0	0	0	0	0	100	
2	1	100	0	100	0	0	0	0	0	100	
2	1	90	0	90	0	0	0	0	10	90	
2	1	95	5	100	0	0	0	0	0	100	
2	1	90	5	95	0	0	0	0	5	95	
Average		**90.8**	**3.5**	**94.3**	**0.0**	**0.3**	**0.0**	**0.3**	**5.4**	**94.6**	

Transect S3										Sampled 11 June 2023
		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total seagrasses	*Codium* % cover	*Cystoseira* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	85	5	90	0	5	0	5	5	95
1	1	95	5	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	90	5	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	2	97	0	0	0	0	3	97
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	98	2	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	5	0	5	0	100
1	2	100	0	100	0	0	0	0	0	100
2	1	25	40	65	0	0	0	0	35	65
2	1	60	15	75	0	0	0	0	25	75
2	1	70	10	80	0	5	0	5	15	85
2	1	60	15	75	0	0	0	0	25	75
2	1	75	5	80	0	5	0	5	15	85
2	1	75	0	75	0	5	0	5	20	80
2	1	70	0	70	0	5	0	5	25	75
2	1	90	5	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	5	0	5	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	5	0	5	0	100
2	1	90	5	95	0	0	0	0	10	95
2	1	85	5	90	0	5	0	5	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	90	5	95	0	0	0	0	5	95
2	1	95	5	100	0	0	0	0	0	100
2	1	85	5	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	0	0	0	10	90
2	1	90	5	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	5	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
Average		**92.9**	**2.4**	**95.3**	**0.0**	**0.7**	**0.0**	**0.7**	**4.0**	**96.1**

Transect S4										Sampled 11 June 2023
		Seagrasses			Algae					
Long=1	Fouling	*Zostera*	*Halophila*	Total	*Codium*	*Cystoseira*	% algae	Total	% Bare	Total
Short=2	0,1,2	% cover	% cover	seagrasses	% cover	% cover	Filamentous	Algae	Ground	Cover
1	0	50	0	50	0	0	0	0	50	50
1	0	40	5	45	0	0	0	0	60	45
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	5	0	5	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	95	0	95	0	0	0	0	5	95
2	1	90	5	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	90	5	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	90	5	95	0	0	0	0	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	90	5	95	0	0	0	0	5	95
2	1	95	5	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
Average		**95.7**	**0.7**	**96.3**	**0.0**	**0.3**	**0.0**	**0.3**	**3.5**	**96.6**

Transect S5										Sampled 11 June 2023
		Seagrasses			Algae					
Long=1	Fouling	*Zostera*	*Halophila*	Total	*Codium*	*Cystoseira*	% algae	Total	% Bare	Total
Short=2	0,1,2	% cover	% cover	seagrasses	% cover	% cover	Filamentous	Algae	Ground	Cover
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	5	5	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	5	5	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	85	0	85	0	0	0	0	15	85
1	1	65	0	65	0	0	5	5	30	70
1	1	90	0	90	0	0	0	0	10	90
1	2	100	0	100	0	0	0	0	0	100
1	2	95	5	100	0	0	0	0	0	100
1	2	90	5	95	0	0	0	0	5	95
2	0	80	0	80	0	0	0	0	20	80
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	90	0	90	0	10	0	10	0	100
2	0	95	0	95	0	0	0	0	0	95
2	0	90	0	90	0	5	0	5	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	5	0	5	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	5	0	5	0	100
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	5	0	5	0	100
2	1	85	0	85	0	0	5	5	10	90
2	1	85	0	85	0	0	5	5	10	90
2	1	80	0	80	0	0	5	5	15	85
2	1	25	15	40	0	0	0	0	60	40
2	1	25	0	25	0	0	0	0	75	25
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	2	75	0	75	0	0	0	0	25	75
2	2	95	0	95	0	0	0	0	5	95
2	2	100	0	100	0	0	0	0	0	100
Average		**92.6**	**0.4**	**92.9**	**0.0**	**0.6**	**0.4**	**1.0**	**6.0**	**94.0**

Transect S6										Sampled 11 June 2023
		Seagrasses			Algae					
Long=1	Fouling	*Zostera*	*Halophila*	Total	*Codium*	*Cystoseira*	% algae	Total	% Bare	Total
Short=2	0,1,2	% cover	% cover	seagrasses	% cover	% cover	Filamentous	Algae	Ground	Cover
1	0	90	0	90	0	0	0	0	10	90
1	0	95	0	95	0	0	0	0	5	95
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
1	1	90	0	90	0	0	0	0	10	90
1	1	85	0	85	0	0	0	0	15	85
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	80	0	80	0	0	0	0	20	80
1	1	85	0	85	0	0	0	0	15	85
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
1	1	95	0	95	0	5	0	5	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	90	0	90	0	0	0	0	10	90
1	1	85	0	85	0	0	0	0	15	85
1	1	85	0	85	0	0	0	0	15	85
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	0	0	5	95
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	95	0	95	0	0	0	0	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	90	0	90	0	0	0	0	10	90
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	10	0	10	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	85	5	90	0	5	0	5	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	85	0	85	0	0	0	0	15	85
2	1	95	0	95	0	0	0	0	5	95
2	1	90	5	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
Average		**93.2**	**0.1**	**93.4**	**0.0**	**0.3**	**0.0**	**0.3**	**6.3**	**93.7**

Crangan Bay

Transect C1										Sampled 12 June 2023
			Seagrasses			Algae				
Long=1	Fouling	*Zostera*	*Halophila*	Total	*Codium*	*Cystophyllum*	% algae	Total	% Bare	Total
Short=2	0,1,2	% cover	% cover	Seagrasses	% cover	% cover	Filamentous	Algae	Ground	Cover
2	1	60	0	60	0	20	0	20	20	80
2	0	80	0	80	0	5	0	5	15	85
2	0	80	0	80	0	10	0	10	10	90
2	0	70	0	70	0	20	0	20	10	90
2	2	70	0	70	0	30	0	30	0	100
2	1	5	0	5	0	80	0	80	15	85
0	0	0	0	0	0	60	0	60	40	60
2	1	10	0	10	0	15	0	15	75	25
2	1	70	0	70	0	30	0	30	0	100
2	1	90	0	90	0	5	0	5	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	0	0	0	10	90
2	1	80	0	80	0	0	0	0	20	80
2	1	85	0	85	0	0	0	0	15	85
2	1	95	0	95	0	5	0	5	0	100
2	1	90	0	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	98	0	98	0	0	0	0	2	98
2	1	65	0	65	0	0	0	0	35	65
2	1	80	0	80	0	0	0	0	20	80
2	1	80	0	80	0	15	0	15	5	95
2	1	85	0	85	0	5	0	5	10	90
2	1	75	0	75	0	0	0	0	25	75
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	0	0	0	10	90
2	1	98	0	98	0	0	0	0	2	98
2	1	90	0	90	0	5	0	5	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	5	0	5	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	80	0	80	0	5	0	5	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	85	0	85	0	0	0	0	15	85
2	1	75	0	75	25	0	0	25	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	85	0	85	0	0	0	0	15	85
2	1	65	0	65	0	5	0	5	30	70
2	1	50	20	70	25	0	0	25	5	95
2	1	10	20	30	10	5	0	15	55	45
2	1	5	35	40	0	40	0	40	25	80
0	0	0	40	40	0	0	0	0	60	40
2	1	10	20	30	0	30	0	30	40	60
2	1	15	35	50	0	30	0	30	20	80
2	1	40	20	60	0	10	0	10	30	70
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
Average		**79.3**	**2.8**	**82.1**	**0.9**	**6.8**	**0.0**	**7.6**	**10.4**	**89.7**

Transect C2 Sampled 12 June 2023

		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	5	0	5	10	90
2	0	70	0	70	0	0	10	10	20	80
2	0	70	0	70	0	0	10	10	20	80
2	0	70	0	70	0	0	10	10	20	80
2	0	70	0	70	0	0	10	10	20	80
2	0	80	0	80	0	0	0	0	20	80
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	75	5	80	0	5	0	5	15	85
2	0	80	5	85	0	0	0	0	15	85
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	95	0	95	0	0	0	0	5	95
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	90	0	90	0	10	0	10	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	5	0	5	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	95	0	95	0	5	0	5	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	80	0	80	0	20	0	20	0	100
2	0	100	0	100	0	0	0	0	0	100
2	0	95	5	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	65	0	65	0	5	0	5	30	70
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	85	0	85	0	0	0	0	15	85
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	5	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	70	10	80	0	0	0	0	30	80
2	1	80	0	80	0	0	0	0	20	80
2	1	90	0	90	0	0	0	0	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	70	0	70	0	0	0	0	30	70
2	1	60	0	60	0	0	0	0	40	60
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	0	0	0	10	90
2	1	95	0	95	0	0	0	0	5	95
2	1	90	0	90	0	0	0	0	10	90
2	1	85	5	90	0	0	0	0	10	90
2	1	93	2	95	0	0	0	0	5	95
2	1	93	2	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
Average		**91.6**	**0.6**	**92.2**	**0.0**	**0.8**	**0.6**	**1.4**	**6.5**	**93.6**

Transect C3										Sampled 12 June 2023
		Seagrasses			Algae					
Long=1 Short=2	Fouling 0,1,2	*Zostera* % cover	*Halophila* % cover	Total Seagrasses	*Codium* % cover	*Cystophyllum* % cover	% algae Filamentous	Total Algae	% Bare Ground	Total Cover
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	0	0	0	10	90
2	0	95	0	95	0	0	0	0	5	95
2	0	85	0	85	0	0	0	0	15	85
2	0	95	0	95	0	0	0	0	5	95
2	0	100	0	100	0	0	0	0	0	100
2	0	90	0	90	0	0	0	0	10	90
2	0	90	0	90	0	5	0	5	5	95
2	0	85	0	85	0	0	0	0	15	85
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	0	5	5	10	90
2	0	80	5	85	0	0	0	0	15	85
2	0	60	10	70	0	5	0	5	25	75
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	85	5	90	0	5	0	5	10	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	2	100	0	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
2	2	80	0	80	0	0	20	20	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	80	0	80	0	0	10	10	10	90
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	0	0	5	95
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	5	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	5	5	0	100
2	1	80	0	80	0	0	20	20	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	90	0	90	0	0	10	10	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	5	0	5	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	5	5	0	100
2	1	95	0	95	0	0	5	5	0	100
2	1	95	0	95	0	0	5	5	0	100
2	1	95	0	95	0	0	5	5	0	100
2	1	85	0	85	0	5	0	5	10	90
2	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	95	0	95	0	0	5	5	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	0	95	0	95	0	0	5	5	0	100
1	0	90	0	90	0	10	0	10	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
1	0	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
Average		**94.9**	**0.3**	**95.1**	**0.0**	**0.5**	**1.5**	**2.1**	**2.9**	**97.2**

Transect C4 Sampled 12 June 2023

		Seagrasses			Algae					
Long=1 Short=2	**Fouling 0,1,2**	***Zostera* % cover**	***Halophila* % cover**	**Total Seagrasses**	***Codium* % cover**	***Cystophyllum* % cover**	**% algae Filamentous**	**Total Algae**	**% Bare Ground**	**Total Cover**
2	0	70	0	70	0	0	0	0	30	70
2	0	90	0	90	0	0	0	0	10	90
2	0	85	0	85	0	0	0	0	15	85
2	0	85	0	85	0	0	0	0	15	85
2	0	75	0	75	0	10	0	10	15	85
2	0	85	0	85	0	10	0	10	5	95
2	0	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	100	0	100	0	0	0	0	0	100
2	1	95	0	95	0	0	5	5	0	100
1	1	90	0	90	0	0	10	10	0	100
1	1	90	0	90	0	0	10	10	0	100
1	1	90	0	90	0	0	10	10	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	80	0	80	0	0	0	0	20	80
1	2	70	0	70	0	30	0	30	0	100
1	2	60	0	60	0	0	40	40	0	100
1	2	80	0	80	0	0	20	20	0	100
1	2	80	0	80	0	0	20	20	0	100
2	2	80	0	80	0	0	20	20	0	100
2	2	70	0	70	0	0	30	30	0	100
2	2	100	0	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
2	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	2	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
1	1	100	0	100	0	0	0	0	0	100
Average		**95.2**	**0.0**	**95.2**	**0.0**	**0.7**	**2.4**	**3.2**	**1.6**	**98.4**

Appendix 2 Changes in percent cover of seagrasses in the study area from 2008 to 2023

Changes in percent cover of the substratum by seagrasses off the northern shore of Summerland Point and Frying Pan Bay (2018-2023)

Transect C5	2018	2019	2020	2021	2022	2023
% seagrass	100.0	100.0	99.71	99.71	99.71	93.12
% bare ground	0.00	0.00	0.29	0.00	0.29	3.47
Transect C6	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	99.56	97.76	95.88	98.60	98.09	95.13
% bare ground	0.44	2.24	4.11	1.25	1.91	4.13
Transect F1	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	97.81	100.0	99.34	99.41	99.19	95.65
% bare ground	2.19	0.00	0.66	0.59	0.81	3.71
Transect F2	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	99.63	94.93	98.82	96.03	90.29	50.23
% bare ground	0.37	5.07	1.18	2.13	9.71	21.38
Transect F3	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	99.93	87.82	97.06	97.65	97.53	86.47
% bare ground	0.07	12.18	2.94	2.35	2.47	11.66
Transect F4	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	98.16	48.90	96.40	97.94	96.40	96.84
% bare ground	1.84	51.1	3.60	2.06	3.60	2.79
Transect F5	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	99.04	80.80	90.96	96.40	90.66	85.68
% bare ground	0.96	19.2	9.04	3.53	9.34	10.54
Transect F6	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	100.0	81.99	96.25	95.96	96.10	85.96
% bare ground	10.00	18.01	3.75	3.97	3.90	12.57
Transect F7	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	98.24	97.65	87.57	95.22	86.62	79.41
% bare ground	1.76	2.35	12.43	4.78	13.38	20.29

Changes in percent cover of the substratum by seagrasses off the western shore of Summerland Point (2008-2023)

Transect E7	2008	2010	2011	2012	2013	2015	2016	2017	2018	2019	2020
% seagrass	97.93	51.40	45.47	68.31	43.38	92.65	100.0	98.16	98.16	97.65	93.75
% bare ground	2.07	48.60	54.53	31.69	56.62	7.35	0.00	1.84	1.84	2.35	6.25
Transect T1	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	88.94	41.90	32.60	77.91	94.41	94.65	97.35	99.47	85.29	59.92	97.87
% bare ground	11.06	58.10	67.40	22.09	5.59	5.35	2.65	0.53	14.71	40.08	2.13
Transect T2	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	77.91	70.29	7.95	75.74	60.83	74.41	90.59	93.31	90.00	76.87	97.50
% bare ground	22.09	29.71	92.05	24.26	39.17	25.59	9.41	6.69	10.00	23.13	2.5

Transect T3	2008	2010	2011	2012	2013	2015	2016	2017	2018	2019	2020
% seagrass	46.20	63.16	58.53	83.53	89.93	93.82	96.10	98.19	97.57	63.01	94.85
% bare ground	53.80	36.84	41.47	16.47	10.07	6.18	3.90	1.81	2.43	36.99	5.14
Transect T4	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	83.51	81.89	70.37	90.37	97.28	97.94	99.85	95.76	95.07	70.44	82.06
% bare ground	16.49	18.01	29.63	9.63	2.72	2.06	0.15	4.24	4.93	29.56	17.94
Transect T5	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	81.78	77.00	51.40	92.35	99.12	99.41	98.82	99.56	89.63	62.65	79.71
% bare ground	18.22	23.00	48.60	7.65	0.88	0.59	1.18	0.44	10.37	37.35	20.29
Transect T6	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	53.82	59.63	44.77	65.59	95.22	95.74	98.82	94.41	97.13	46.18	79.12
% bare ground	46.18	40.37	53.23	34.41	4.78	4.26	1.18	5.59	2.87	53.82	20.88
Transect T7	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	97.93	70.79	89.34	89.09	99.78	98.38	100.0	99.85	98.97	25.88	82.50
% bare ground	2.07	29.51	10.66	10.91	0.22	1.62	0.00	0.15	1.03	74.12	17.50
Transect T8	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	95.94	60.29	76.99	87.64	96.76	99.26	99.26	98.24	100.0	46.32	87.21
% bare ground	4.06	39.71	23.01	13.26	3.24	0.74	0.74	1.76	0.00	53.68	12.79

Transect E7	2021	2022	2023
% seagrass	93.75	93.90	87.28
% bare ground	6.18	6.10	12.65
Transect T1	**2021**	**2022**	**2023**
% seagrass	90.96	95.81	92.25
% bare ground	7.06	4.19	5.00
Transect T2	**2021**	**2022**	**2023**
% seagrass	98.31	97.35	74.41
% bare ground	1.32	2.65	20.66
Transect T3	**2021**	**2022**	**2023**
% seagrass	98.68	94.56	88.75
% bare ground	1.32	5.44	9.12
Transect T4	**2021**	**2022**	**2023**
% seagrass	99.93	89.85	90.26
% bare ground	0.07	10.15	8.63

Transect T5	2021	2022	2023
% seagrass	98.97	86.40	84.26
% bare ground	1.03	13.6	15.15
Transect T6	**2021**	**2022**	**2023**
% seagrass	98.16	81.47	86.03
% bare ground	1.84	18.53	13.90
Transect T7	**2021**	**2022**	**2023**
% seagrass	100.0	82.28	84.25
% bare ground	0.00	17.72	15.46
Transect T8	**2021**	**2022**	**2023**
% seagrass	98.82	87.50	83.24
% bare ground	1.18	12.50	16.99

Changes in percent cover of the substratum by seagrasses in Chain Valley Bay (2008-2023)

Transect E1	2008	2010	2011	2012	2013	2015	2016	2017	2018	2019	2020
% seagrass	84.15	81.01	77.75	98.62	99.44	92.44	99.88	97.96	97.87	99.12	99.04
% bare ground	15.85	18.99	22.25	1.38	0.56	7.56	0.12	2.04	2.13	0.88	0.96
Transect E2	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	83.72	75.87	73.38	95.49	99.09	98.49	99.71	100.0	97.94	97.94	98.53
% bare ground	16.28	24.13	26.62	4.49	0.91	1.51	0.29	0.00	2.06	2.06	1.47
Transect E3	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**

% seagrass	98.29	98.97	92.76	96.97	99.16	100.0	83.53	98.90	94.56	98.97	100.0
% bare ground	1.71	1.03	7.24	1.54	0.84	0.00	16.47	1.10	5.44	1.03	0.00
Transect E4	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	80.16	98.54	95.74	100.0	97.50	96.43	98.01	96.76	99.71	99.85	98.82
% bare ground	19.84	1.46	4.26	0.00	2.50	3.57	1.99	3.24	0.29	0.15	1.18
Transect L1	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass						99.12	99.71	97.87	97.87	94.63	95.74
% bare ground						0.88	0.29	2.13	2.13	5.37	4.26
Transect E5	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	95.88	94.93	95.19	100.0	98.82	99.82	100.0	97.22	99.41	98.97	100.0
% bare ground	4.12	5.07	4.81	0.00	1.18	0.18	0.00	2.78	0.59	1.03	0.00
Transect E6	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	17.74	34.06	49.56	55.51	54.93	76.62	100.0	99.56	89.91	76.69	97.35
% bare ground	82.16	65.94	50.44	44.49	45.07	23.38	0.00	0.44	10.09	23.31	2.65
Transect E8	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	99.32	84.26	95.56	90.96	99.93	99.85	100.0	99.34	100.0	99.34	97.87
% bare ground	0.68	15.74	4.44	9.04	0.07	0.15	0.00	0.66	0.00	0.66	2.13
Transect E9	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	95.94	99.39	95.51	99.49	99.71	99.56	100.0	99.78	100.0	100.0	99.71
% bare ground	4.06	0.61	4.49	0.51	0.29	0.44	0.00	0.22	0.00	0.00	0.29
Transect E10	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	97.94	92.21	86.25	98.99	98.82	NS	100.0	100.0	100.0	98.21	97.94
% bare ground	2.06	7.79	13.75	1.01	1.18		0.00	0.00	0.00	1.79	2.06
Transect E11	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass			86.93	99.85	99.49	NS	100.0	100.0	100.0	98.94	99.63
% bare ground			13.07	0.15	0.51		0.00	0.00	0.00	1.06	0.37
Transect E12	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass			95.68	95.53	98.09	NS	100.0	100.0	100.0	97.0	99.26
% bare ground			7.32	4.47	1.91		0.00	0.00	0.00	3.0	0.74
Transect E13	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass			93.97	99.26	100.0	NS	100.0	100.0	100.0	99.95	100
% bare ground			6.03	0.74	0.00		0.00	0.00	0.00	0.05	0.00
Transect E14	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass			86.54	99.34	100.0	NS	100.0	90.44	100.0	98.24	99.41
% bare ground			13.46	0.56	0.00		0.00	9.56	0.00	1.76	0.59
Transect E15	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass			90.29	99.93	99.66	NS	100.0	93.31	99.85	50.66	99.34
% bare ground			9.71	0.07	0.34		0.00	6.69	0.15	49.34	0.66
Transect E16	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass			82.79	93.22	94.12	NS	100.0	99.94	99.71	95.0	98.31
% bare ground			17.21	6.78	5.88		0.00	0.06	0.29	5.0	1.69

Transect E1	**2021**	**2022**	**2023**
% seagrass	99.34	98.81	85.35
% bare ground	0.66	1.19	9.03

Transect E9	**2021**	**2022**	**2023**
% seagrass	100.0	99.71	96.22
% bare ground	0.00	0.29	3.46

Transect E2	2021	2022	2023
% seagrass	99.26	98.74	87.24
% bare ground	0.37	1.26	5.07
Transect E3	**2021**	**2022**	**2023**
% seagrass	99.93	100.0	96.69
% bare ground	0.66	0.00	3.31
Transect E4	**2021**	**2022**	**2023**
% seagrass	98.68	98.68	91.51
% bare ground	0.88	1.32	5.81
Transect L1	**2021**	**2022**	**2023**
% seagrass	99.85	97.65	93.65
% bare ground	0.15	2.35	5.62
Transect E5	**2021**	**2022**	**2023**
% seagrass	100.0	99.54	96.37
% bare ground	0.00	0.46	3.12
Transect E6	**2021**	**2022**	**2023**
% seagrass	99.78	94.71	75.04
% bare ground	0.00	5.29	22.09
Transect E8	**2021**	**2022**	**2023**
% seagrass	99.78	98.09	87.51
% bare ground	0.00	1.91	12.41

Transect E10	2021	2022	2023
% seagrass	100.0	99.72	89.03
% bare ground	0.00	0.28	2.75
Transect E11	**2021**	**2022**	**2023**
% seagrass	100.0	100	96.56
% bare ground	0.00	0.00	3.22
Transect E12	**2021**	**2022**	**2023**
% seagrass	100.0	100	94.82
% bare ground	0.00	0.00	4.81
Transect E13	**2021**	**2022**	**2023**
% seagrass	99.71	100	99.34
% bare ground	0.29	0.00	0.44
Transect E14	**2021**	**2022**	**2023**
% seagrass	99.78	99.63	92.50
% bare ground	0.22	0.37	6.62
Transect E15	**2021**	**2022**	**2023**
% seagrass	100.0	99.78	89.63
% bare ground	0.00	0.22	10.15
Transect E16	**2021**	**2022**	**2023**
% seagrass	98.75	98.75	95.22
% bare ground	1.25	1.25	4.63

Changes in percent cover of the substratum by seagrasses in Bardens Bay (2014-2023)

Transect A1	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
% seagrass	97.97	98.09	88.97	99.85	96.18	85.15	88.88	97.87	89.41	74.26
% bare ground	2.03	1.91	11.03	0.15	3.82	14.85	11.10	1.91	10.59	16.32
Transect A2	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	92.38	96.99	98.75	98.38	94.93	98.09	96.91	97.13	96.18	82.47
% bare ground	7.62	3.01	1.25	1.62	5.07	1.91	3.09	2.28	3.82	8.90
Transect A3	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	100.0	86.40	94.85	96.69	98.01	99.26	99.12	91.03	99.19	86.78
% bare ground	0.00	13.60	5.15	3.31	1.99	0.74	0.88	8.97	0.81	6.09
Transect A4	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	94.51	93.97	99.12	100.0	89.78	48.98	99.41	100.0	98.31	96.40
% bare ground	5.49	6.03	0.88	0.00	10.22	51.02	0.59	0.00	1.69	3.53
Transect A5	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	96.37	95.59	99.71	100.0	97.35	84.50	96.76	97.13	97.96	83.46
% bare ground	3.63	4.41	0.29	0.00	2.65	15.50	3.24	2.87	2.04	16.62
Transect A6	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	99.56	98.01	96.97	97.65	93.53	90.88	94.26	96.62	96.84	97.57
% bare ground	0.44	1.99	3.03	2.35	6.47	9.12	5.74	3.38	3.16	1.35

Changes in percent cover of the substratum by seagrasses in Sugar Bay (2018-2023)

Transect S1	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	62.50	24.71	99.63	97.79	99.63	90.69
% bare ground	37.50	75.29	0.37	0.74	0.37	2.06
Transect S2	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	96.62	85.83	97.50	96.54	93.90	94.34
% bare ground	3.38	14.17	2.50	3.46	6.10	5.37
Transect S3	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	99.19	97.13	98.75	100.0	98.53	95.32
% bare ground	0.81	2.87	1.25	0.00	1.47	4.01
Transect S4	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	99.97	98.82	99.56	100.0	99.41	96.32
% bare ground	0.03	1.18	0.44	0.00	0.59	3.46
Transect S5	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	99.12	67.08	75.88	94.56	79.34	92.94
% bare ground	0.88	32.92	24.11	5.37	20.66	5.96
Transect S6	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
% seagrass	100.0	99.78	100.0	98.57	99.41	93.38
% bare ground	0.00	0.22	0.00	1.32	0.59	6.32

Changes in percent cover of the substratum by seagrasses in Crangan Bay (2008-2023)

Transect C1	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	48.60	80.53	68.71	85.38	99.31	94.04	99.94	76.18	99.68	34.26	88.68
% bare ground	51.40	19.47	31.29	14.62	0.69	5.96	0.06	23.82	0.32	65.74	11.32
Transect C2	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	93.09	98.03	67.79	95.21	97.24	100.0	98.09	99.40	96.69	81.62	96.76
% bare ground	6.91	1.97	32.21	4.79	2.76	0.00	1.91	0.60	3.31	18.38	3.24
Transect C3	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	95.59	88.75	94.41	97.16	99.93	98.46	99.90	96.47	100.0	87.21	96.84
% bare ground	4.41	11.25	5.59	2.84	0.07	1.54	0.10	3.53	0.00	12.79	3.16
Transect C4	**2008**	**2010**	**2011**	**2012**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
% seagrass	87.25	86.56	58.09	90.40	100.0	99.49	99.96	96.47	96.76	74.56	94.93
% bare ground	12.75	13.44	41.91	9.60	0.00	0.51	0.04	3.53	3.24	25.44	5.07

Transect C1	2021	2022	2023
% seagrass	93.90	89.04	82.07
% bare ground	3.90	10.96	10.35
Transect C2	**2021**	**2022**	**2023**
% seagrass	97.72	98.60	92.21
% bare ground	1.25	1.40	6.54
Transect C3	**2021**	**2022**	**2023**
% seagrass	100.0	97.81	95.15
% bare ground	0.00	2.19	2.87
Transect C4	**2021**	**2022**	**2023**
% seagrass	99.85	97.15	95.22
% bare ground	0.15	2.85	1.62

Appendix 4: Biodiversity Monitoring Report

DELTA COAL ANNUAL BIODIVERSITY MONITORING 2023

30 October 2023

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Abstract

Annual Biodiversity Monitoring Report composed by Atlantech Pty Ltd for Delta Coal – Chain Valley Colliery.

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D6. Tree Monitoring Point 2 _____ 30

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1. Executive summary

Atlantech was requested by Delta Coal to undertake the annual biodiversity monitoring at Chain Valley Colliery (CVC). Atlantech inspected the pit top eastern management zone and ventilation shaft area on 30 October 2023.

The purpose of the survey was to assess vegetation condition and composition in the swamp oak forest biodiversity enhancement area and ventilation shaft area. Weed occurrence, feral animal presence and potential uncontrolled public assess issues were also assessed.

Following the inspection, Atlantech recommends the following:

- Undertake targeted weed control of ground asparagus in the pit top eastern management zone.
- Undertake targeted weed control of ground asparagus, lantana, agave spp., and rhodes grass at the ventilation shaft site.
- Review security around the ventilation shaft site and consider upgrading the access gate to deter pedestrian and motorbike access.
- Continue annual biodiversity monitoring in line with the CVC Biodiversity Management Plan (2022).

Please do not hesitate to contact me if you require any further information regarding this project.

Sincerely,



Samantha Hovar
Atlantech Pty Ltd
Senior Environmental Consultant

Technical Peer Reviewer:	**Date:**
	18/12/2023
Jason Desmond Director / Principal Environmental Consultant	

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2. Introduction

Chain Valley Colliery (CVC) is an underground coal mine operated by Great Southern Energy Pty Ltd (trading as Delta Coal) and is situated in the Newcastle coalfields of New South Wales. The mine operates in accordance with Development Consent SSD-5465.

The CVC Biodiversity Management Plan (BMP) was developed to address the requirements of Schedule 3, Condition 20 of SSD-5465. Atlantech was commissioned by Delta Coal to undertake the annual biodiversity monitoring program for CVC specified within the BMP (v6).

This report details the results of the monitoring program which have been assessed against the trigger values outlined in the BMP.

3. Scope and Objectives

In accordance with the Delta Coal CVC BMP, the objectives of the monitoring program were to assess:

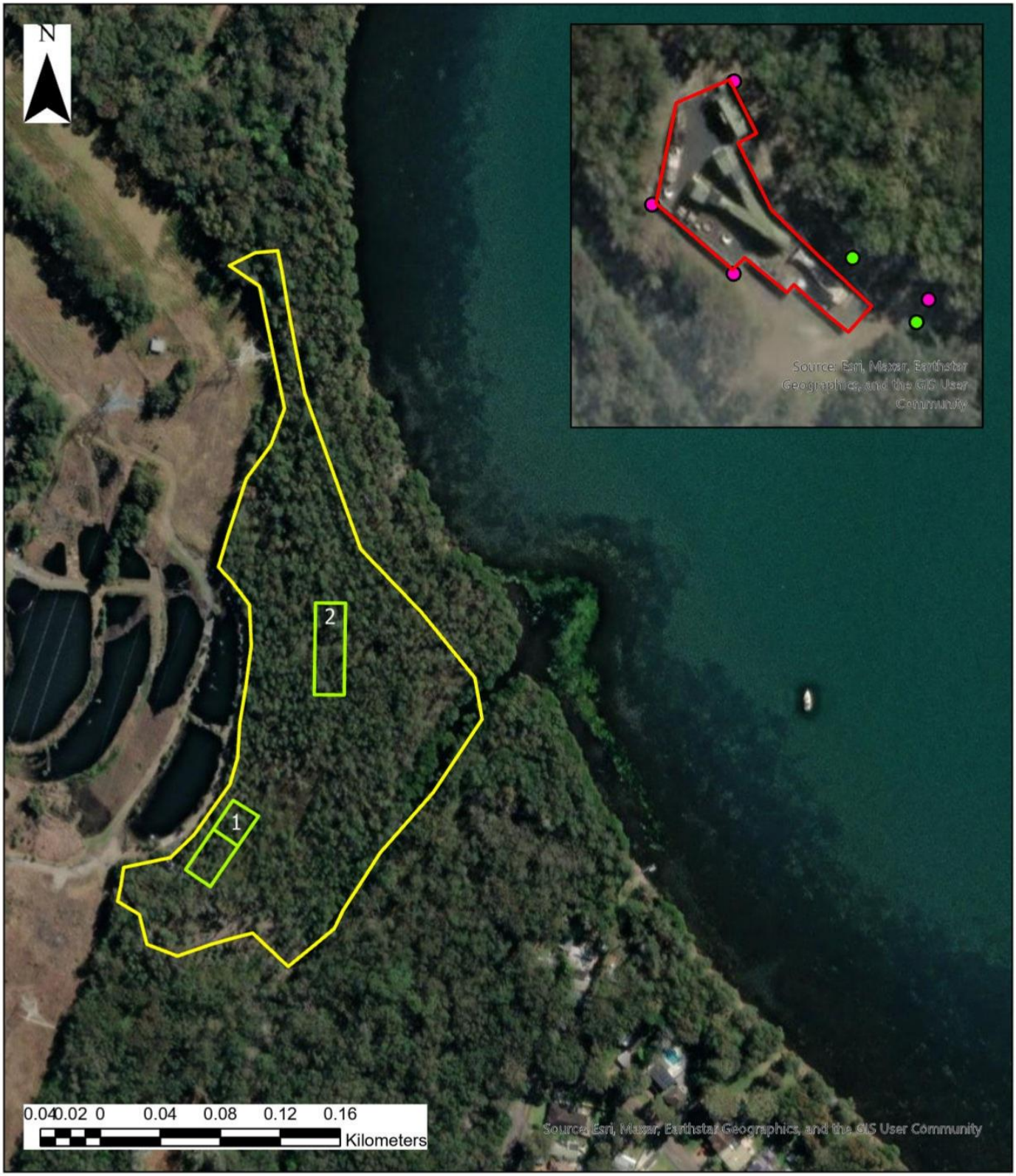
- Weed occurrence and control effectiveness in the pit top eastern management zone and ventilation shaft areas.
- Presence of feral animals in the pit top eastern management zone and ventilation shaft areas.
- Potential uncontrolled public assess issues in the pit top eastern management zone and ventilation shaft areas.
- Vegetation health and condition surrounding the ventilation shaft area.
- Photo and tree monitoring points in the ventilation shaft area.
- Vegetation condition, structure and composition in the swamp oak forest BioBanking plots.

Monitoring of bushfire risk and receiving waters was excluded from the current survey.

The survey areas are shown in Figure 1.

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DELTA COAL - CHAIN VALLEY COLLIERY
Biodiversity Monitoring
October 2023



Legend

- Biodiversity Enhancement Area
- Ventilation Shaft Area
- Plot (20 x 20 m) and Transect (50 x 50 m)
- Tree Monitoring Point
- Photo Point

Date created: 13/12/2023
Map created by: jdesmond
Map size: A4 Portrait
Coordinate system: GDA2020 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA2020

Figure 1: CVC biodiversity monitoring areas inspected in October 2023.

4. Methodology

The walkover inspection was conducted on the 30 October 2023 by Atlantech Principal Environmental Consultant, Jason Desmond with the assistance of Senior Environmental Consultant, Samantha Hovar and Graduate Environmental Consultant, Joshua Pawson.

All data was collected in-field using an iPad with GIS software.

It is important to note that the previous two surveys for the 2021 and 2022 programs were completed in January 2022 and January 2023 respectively. Therefore, seasonal timing of the current program differs to that of the 2021 and 2022 surveys.

4.1 Ventilation Shaft Area Vegetation Health and Condition

The following data surrounding the ventilation shaft area was collected:

- Georeferenced photos and general observations of tree health and condition recorded at the two tree monitoring locations.
- Georeferenced photos collected at the four photo monitoring locations and compared against 2013 baseline photos.
- The dominant species in each vegetation layer present around the ventilation shaft was recorded.

4.2 Swamp Oak Forest Vegetation Condition, Structure and Composition

Vegetation data was collected from the two swamp oak forest plots and transects using Biobanking methodology in accordance with Section 11.2 of the BMP.

The following data was collected within the 20 by 50 metre plots:

- Number of native plant species
- Number of trees with hollows
- Proportion of over-storey species occurring as regeneration (%)
- Total length of fallen logs (metres)
- Species occurrence
- Evidence of canopy dieback
- Georeferenced photos.

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The following data was collected within the 20 by 20 metre sub plots:

- Native midstorey cover (%)
- Native ground (grasses) cover (%)
- Native ground (shrubs) cover (%)
- Native ground (other) cover (%)
- Exotics cover (%).

The following data was collected along the 50 metre transects:

- Transect start and finish coordinates
- Native overstory cover (%) every five (5) metres.

The plot attributes were scored using the condition criteria in Appendix B. The combined weighted score for the two plots was then calculated and assessed against the local benchmarks (refer to Appendix C) and BMP trigger value for remedial works which is less than 60%.

4.3 Weed Occurrence and Control Effectiveness

The pit top eastern management zone and ventilation shaft area were surveyed on foot. The number of individual weeds, the estimated size of infestation (metres squared), the estimated distance of each infestation to native vegetation and recommended control measures were recorded in each area.

4.4 Feral Animal Presence

Feral animal monitoring was conducted across the pit top eastern management zone and ventilation shaft area. Sightings of individuals were recorded as well as signs of presence including tracks, diggings, scats and burrows.

4.5 Uncontrolled Public Access

The pit top eastern management zone and ventilation shaft area were surveyed on foot. Any evidence of uncontrolled public access or potential uncontrolled public access issues were recorded such as damaged fencing, vandalism, gates and signage.

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5. Findings

The findings of the biodiversity monitoring program are provided in the following sub sections. Associated spatial files are provided in Appendix A.

5.1 Ventilation Shaft Area Vegetation Health and Condition

Photos collected at the photo and tree monitoring points are provided in Appendix D.

Vegetation condition was generally similar compared to the results of the 2022 survey. Vegetation appeared to be in good health and no further dieback was evident. Minimal weed growth was present, and evidence of recent weed control was observed.

Vegetation was diverse throughout the ventilation shaft area. However, the dominant species included the following:

- **Canopy layer** – Red Bloodwood (*Eucalyptus gumifera*) and Broad-leaved Paperbark (*Melaleuca quinquenervia*) and Smooth-barked apple (*Angophera costata*).
- **Mid-storey** – Hopbush (*Dodonaea triquetra*).
- **Groundcover** – Tall Saw Sedge (*Gahnia clarkei*).

No remedial action in relation to vegetation required at this site.

5.2 Swamp Oak Forest Vegetation Condition, Structure and Composition

Detailed monitoring results are provided in Appendix C.

The weighted site attribute score for the Swamp Oak Forest plots is 77.8%. This result indicates a 10% increase in condition compared to 2022 results (67.8%). No additional management is required in the Swamp Oak Forest area as the weighted score is above the minimum trigger value of 60%.

A comparison of 2022 and 2023 attribute scores is provided in Table 1. A summary of the key changes is provided below:

- The native over-storey cover attribute score has increased as a result of a decrease in percentage cover, which has placed the site in alignment with benchmark conditions.
- A decrease in percentage cover of native grasses to below benchmark conditions was observed. Unlike the previous survey, no Marine Couch (*Sporobolus virginicus*) was sighted in either of the plots. A strong dominance of rush species was instead recorded in the groundcover layers.
- The total length of fallen logs significantly increased compared to the 2022 survey. This could potentially be linked to the decrease in native over-storey cover recorded.
- Native plant species richness decreased overall but remained on par or slightly below baseline conditions. Several species previously recorded were not sighted during the current

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survey, including twig rush (*Baumea juncea*), tall saw-sedge (*Gahnia clarkei*), swamp weed (*Selliera radicans*), marine couch (*Sporobolus virginicus*) and rusty sedge (*Fimbristylis ferruginea*).

It is noted that a score of one has previously been assigned to plots with no tree hollows. However, as per Table 8 of the CVC Biodiversity Management Plan, the local benchmark for this attribute is equal to or greater than zero. Therefore, a value of zero has been assigned an attribute score of four in the current survey, resulting in the increase recorded.

Table 1: Comparison of 2022 and 2023 weighted scores.

Site Attribute	2022 Scores	2023 Scores	Change
Native plant species richness	25	22	↓
Native over-storey cover	8	10	↑
Native mid-storey cover	3	3	–
Native groundcover (grasses)	3	1	↓
Native groundcover (shrubs)	3	3	–
Native groundcover (other)	1	1	–
Exotic plant cover	5	5	–
Trees with hollows	13	20	↑
Over-storey regeneration	5	5	–
Total length of fallen logs	5	10	↑

↑ *Indicates the weighted score has increased compared to 2022.*
↓ *Indicates the weighted score has decreased compared to 2022.*
– *Indicates the weighted score has remained the same compared to 2022.*

5.3 Weed Occurrence and Control Effectiveness

Weeds recorded during the survey are detailed in Table 2 and shown in Figure 2.

Table 2: Weed occurrence recordings.

Map ref	Weed species	Location	# of individual plants	Area (m2)	Distance to native veg (m)	Recommended control measures
Weed 1	Ground Asparagus (*Asparagus aethiopicus*)	Pit top eastern management zone	1	0.5	0	As per the Biodiversity Management Plan, cut underground tubers with secateurs out of ground around
Weed 2	Ground Asparagus (*Asparagus aethiopicus*)	Pit top eastern management zone	12	5	0	

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Weed 3	Ground Asparagus (*Asparagus aethiopicus*)	Pit top eastern management zone	1	0.5	0	root base and remove from site.
Weed 4	Lantana (*Lantana camara*)	Ventilation shaft	8	4	0	As per the Biodiversity Management Plan, cut and paint stems with Glyphosate.
Weed 5	Exotic species – Agave spp.	Ventilation shaft	2	1	0	Dig out plants completely and appropriately dispose.
Weed 6	Lantana (*Lantana camara*)	Ventilation shaft	3	4	0	As above.
Weed 7	Lantana (*Lantana camara*)	Ventilation shaft	6	3	0	
Weed 8	Lantana (*Lantana camara*)	Ventilation shaft	1	0.5	0	
Weed 9	Lantana (*Lantana camara*)	Ventilation shaft	1	0.5	0	
Weed 10	Lantana (*Lantana camara*)	Ventilation shaft	1	0.5	0	
Weed 11	Lantana (*Lantana camara*)	Ventilation shaft	1	0.5	0	
Weed 12	Lantana (*Lantana camara*)	Ventilation shaft	5	3	0	
Weed 13	Ground Asparagus (*Asparagus aethiopicus*)	Ventilation shaft	1	0.5	0	As above.
Weed 14	Exotic species – Rhodes grass (*Chloris gayana*)	Ventilation shaft	Large density patch	173	0	Spray patch with Glyphosate and/or dig out larger clumps.
Weed 15	Exotic species – Rhodes grass (*Chloris gayana*)	Ventilation shaft	1	0.5	3	
Weed 16	Lantana (*Lantana camara*)	Ventilation shaft	4	4	0	As above.

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Biodiversity Monitoring
October 2023



Legend

- Ventilation Shaft Area
- Plot (20 x 20 m) and Transect (50 x 50 m)
- Weed species

Date created: 13/12/2023
Map created by: jdesmond
Map size: A4 Portrait
Coordinate system: GDA2020 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA2020

Figure 2: Weed occurrence recordings.

5.4 Feral Animal Presence

Feral animal observations recorded during the survey are detailed in Table 3 and shown in Figure 3.

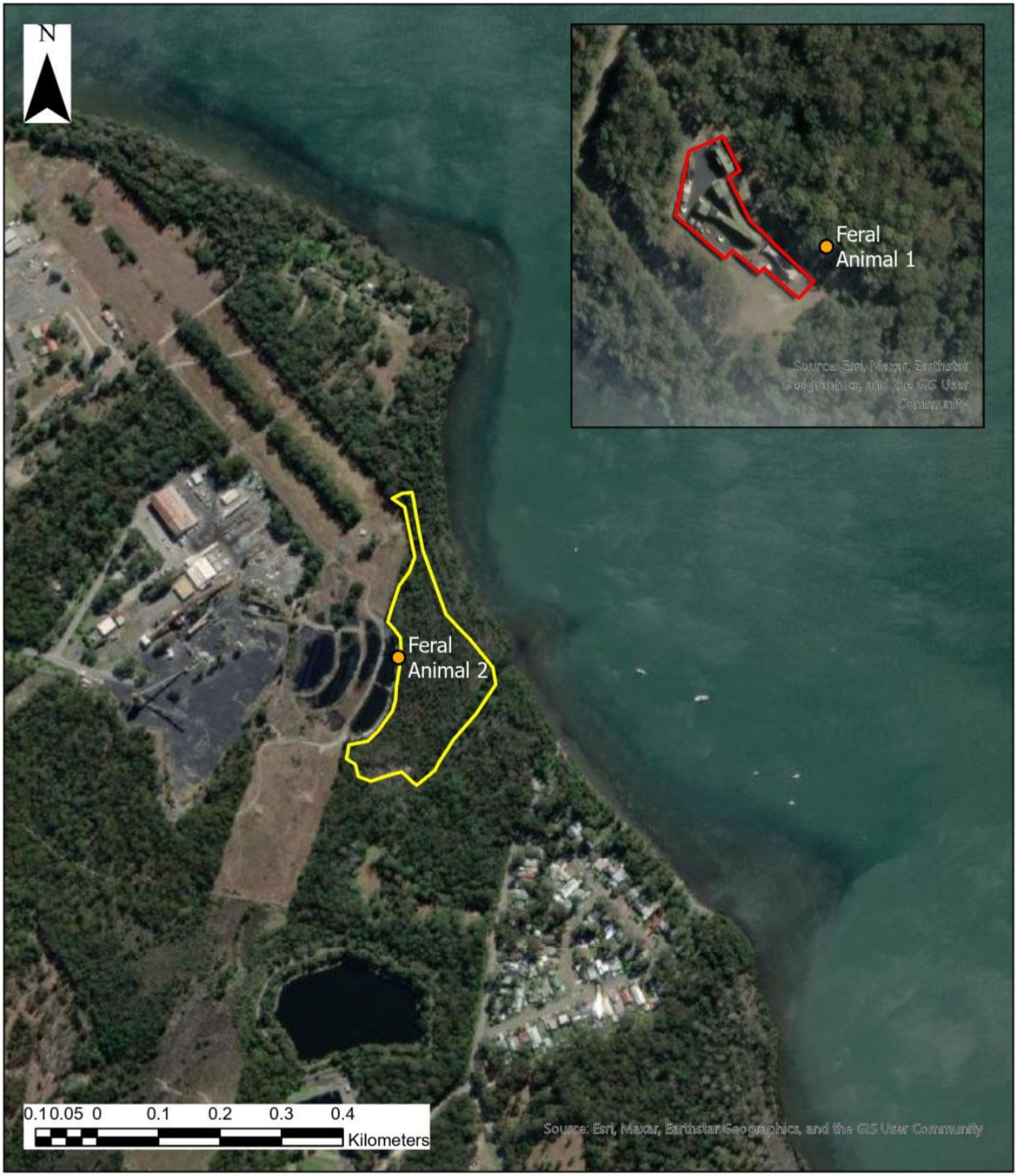
Table 3: Feral animal recordings.

Map ref	Feral animal species	Location	Observation type*	Recommended control measures
Feral Animal 1	Dog (*Canis lupus familiaris*)	Ventilation shaft	Scat	Continue monitoring and if number of recordings increase, consider undertaking a control program.
Feral Animal 2	Dog (*Canis lupus familiaris*)	Pit top eastern management zone	Track	

**Observation type – sighting, tracks, diggings, burrows, scats or other.*

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October 2023



Legend

- Feral animal
- Biodiversity Enhancement Area
- Ventilation Shaft Area

Date created: 13/12/2023
Map created by: jdesmond
Map size: A4 Portrait
Coordinate system: GDA2020 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA2020

Figure 3: Feral animal observations.

5.5 Uncontrolled Public Access

Uncontrolled public access issues identified during the survey are detailed in Table 4 and shown in Figure 4.

Table 4: Uncontrolled public access issues identified.

Map ref	Location	Public access issue	Recommended action
Public Access 1	Ventilation shaft	Graffiti and spray cans observed around the perimeter of the ventilation shaft fence indicating unauthorised access to the site.	Review security around the ventilation shaft site and consider upgrading the access gate to deter pedestrian and motorbike access. The current gate in place only prevents vehicle access.
Public Access 2	Ventilation shaft	Beer bottle sighted indicating unauthorised access to the site.	

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Biodiversity Monitoring
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Legend

Public access - Fence

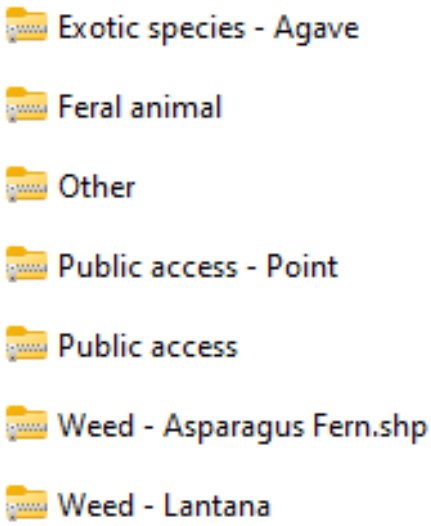
Public access - Point

Date created: 13/12/2023
Map created by: jdesmond
Map size: A4 Portrait
Coordinate system: GDA2020 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA2020

Figure 4: Uncontrolled public access issues identified.

APPENDIX A – Spatial Data

The following GIS zip files have been provided with this report to Delta Coal in GDA2020 format:



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APPENDIX B – Condition Criteria and Local Benchmarks

In line with biobanking methodology, the local benchmarks that have been developed as a baseline for the Swamp Oak Forest at CVC and the associated site-specific condition criteria are provided in Table 5.

Table 5: CVC Vegetation Condition Criteria and Local Benchmarks.

Site Attribute		Local Benchmark	Site Attribute Score				Weighting for site score attribute
			1	2	3	4	
A	Native plant species richness	≥6	0	0 to <3	3 to <6	≥6	25%
B	Native over-storey cover	5 to 18	0 to 0.5 or >36	>0.5 to <2.5 or >27 to 36	2.5 - <5 or >18 to 27	5 to 18	10%
C	Native mid-storey cover	36 to 48	0 to 3.6 or >96	>3.6 to <18 or >72 to 96	18 - <36 or >48 to 72	36 to 48	10%
D	Native ground-cover (grasses)	3 to 21	0 to 0.3 or >42	>0.3 to <1.5 or >31.5 to 42	1.5 - <3 or >21 to 31.5	3 to 21	2.5%
E	Native groundcover (shrubs)	0 to 0				0	2.5%
F	Native groundcover (other)	1 to 13	0 to 0.1 or >26	>0.1 to <0.5 or >19.5 to 26	0.5 - <1 or >13 to 19.5	1 to 13	2.5%
G	Exotic plant cover (all strata)	N/A	>66%	>33% to 66%	>5% to 33%	0 - 5%	5%
H	Number of trees with hollows	≥0	N/A	N/A	N/A	≥0	20%
I	Proportion of over-storey species occurring as regeneration	N/A	0	>0 to <50%	50% to <100%	100%	12.5%
J	Total length of fallen logs	≥20	0 to 2	>2 to <10	10 to <20	≥20	10%
						Total weighted score	100%

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APPENDIX C – Swamp Oak Forest Plot Data

Table 6: Swamp oak forest plot scores

ID	Site Attribute	Local Benchmark	Plot 1 Data	Plot 1 Score	Plot 2 Data	Plot 2 Score	Average	Attribute Weighting	Weighted Score
A	Native plant species richness	≥6	6	4	5	3	4	25.0	22
B	Native over-storey cover	5 to 18	6	4	14	4	4	10.0	10
C	Native mid-storey cover	36 to 48	0	1	0	1	1	10.0	2.5
D	Native ground-cover (grasses)	3 to 21	0	1	0	1	1	2.5	0.6
E	Native groundcover (shrubs)	0 to 0	0	4	0	4	4	2.5	2.5
F	Native groundcover (other)	1 to 13	95	1	90	1	1	2.5	0.6
G	Exotic plant cover (all strata)	N/A	0	4	0	4	4	5.0	5.0
H	Number of trees with hollows	≥0	0	4	1	4	4	20.0	20.0
I	Proportion of over-storey species occurring as regeneration	N/A	1%	2	0%	1	1.5	12.5	4.7
J	Total length of fallen logs	≥20	30	4	34	4	4	10.0	10.0
							Final weighted site score		**77.8%**

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Table 7: Plot one field sheet

Plot Number:	One	**Date:**	30/10/2023	**Time:**	15:30
20 x 20 metre sub plot			20 x 50 metre plot		
Native mid-storey cover (%)	0		Number of native plant species	6	
Native ground-cover – grasses (%)	0		Number of trees with hollows	0	
Native groundcover – shrubs (%)	0		Proportion of over-storey species occurring as regeneration (%)	1	
Native groundcover – other (%)	95		Combined total length of all fallen logs (m)	30	
Exotic plant cover (%)	0		Evidence of canopy dieback (Y/N)	Yes	
50 metre transect – Native overstorey cover (%)			Plant species recorded		
Transect start coordinates:	E 365085.13, N 6329629.28		Swamp Oak (*Casuarina glauca*), Broad-leaved Paperbark (*Melaleuca quinquenervia*), Juncus spp., Sea Rush (*Juncus krausii*), Creeping Brookweed (*Samolus repens*) and Beaded Samphire (*Salicornia quinqueflora*).		
Transect end coordinates:	E 365085.18, N 6329578.82				
0 m	10				
5 m	15				
10 m	5				
15 m	0				
20 m	5		General observations		
25 m	5		Lack of diversity and overhead canopy observed. Highly waterlogged, with evidence of active discharge occurring to the area. No evidence of feral animals or public access issues. Active waterline with flow recorded at the transect 35 metre point.		
30 m	5				
35 m	0				
40 m	10				
45 m	0				
50 m	10				

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Table 8: Plot two field sheet

Plot Number:	Two	**Date:**	30/10/2023	**Time:**	13:15
20 x 20 metre sub plot			20 x 50 metre plot		
Native mid-storey cover (%)	0		Number of native plant species	5	
Native ground-cover – grasses (%)	0		Number of trees with hollows	1	
Native groundcover – shrubs (%)	0		Proportion of over-storey species occurring as regeneration (%)	0	
Native groundcover – other (%)	90		Combined total length of all fallen logs (m)	34.1	
Exotic plant cover (%)	0		Evidence of canopy dieback (Y/N)	No	
50 metre transect – Native overstorey cover (%)			Plant species recorded		
Transect start coordinates:	E 365039.06, N 6329514.86		Swamp Oak (*Casuarina glauca*), Broad-leaved Paperbark (*Melaleuca quinquenervia*), Juncus spp., Sea Rush (*Juncus krausii*), Creeping Brookweed (*Samolus repens*) and Ground Asparagus (*Asparagus aethiopicus*).		
Transect end coordinates:	E 365013.57, N 6329475.8				
0 m	20				
5 m	15				
10 m	5				
15 m	0				
20 m	30		General observations		
25 m	5		Only standing trees with hollows were counted. Area was waterlogged. No signs of feral animals and or unauthorised public access. Vegetation consistent throughout the area. Lacking mid-storey growth. Minimal weeds observed; ground asparagus found within plot but outside of the 20 x 20 metre subplot.		
30 m	20				
35 m	15				
40 m	10				
45 m	0				
50 m	30				

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Plate 1: Plot one north-eastern transect point.



Plate 2: Plot one south-western transect point.



Plate 3: Plot two southern transect point.



Plate 4: Plot two northern transect point.

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APPENDIX D – Photo and Tree Monitoring

D1. Photo Monitoring Point 1



Plate 5: Photo monitoring point 1 facing south-east.

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Plate 6: Photo monitoring point 1 facing north-west.



Plate 7: Photo monitoring point 1 facing north-east.

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D2. Photo Monitoring Point 2



Plate 8: Photo monitoring point 2 facing south-west.

D3. Photo Monitoring Point 3



Plate 9: Photo monitoring point 3 facing north-west.

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Plate 10: Photo monitoring point 3 facing south-west.



Plate 11: Photo monitoring point 3 facing south-east.

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D4. Photo Monitoring Point 4



Plate 12: Photo monitoring point 4 facing north-west.



Plate 13: Photo monitoring point 4 facing west.

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Plate 14: Photo monitoring point 4 facing south-east.

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D5. Tree Monitoring Point 1



Plate 15: Tree monitoring point 1.

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D6. Tree Monitoring Point 2



Plate 16: Tree monitoring point 2.

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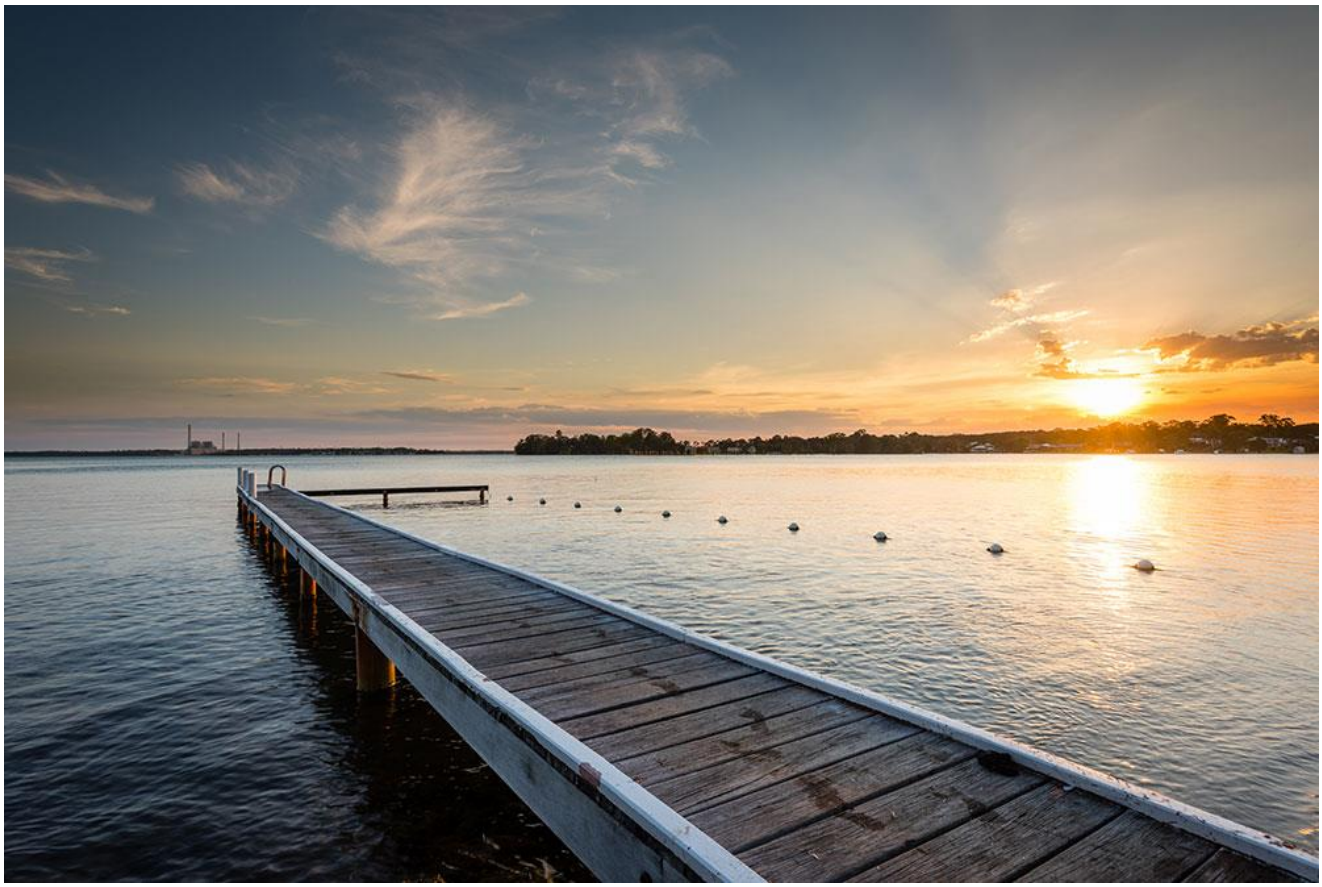
Appendix 5: Benthic Communities Monitoring Reports

Delta Coal

Mannering & CVC Collieries

Lake Macquarie Benthos Survey

Results No. 23



By Dr Emma Laxton

March 2023

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Summary

J.H. & E.S. Laxton – Environmental Consultants P/L was engaged by Mr. Lachlan McWha of Chain Valley Colliery to assess the potential effects of bord and pillar extraction mining beneath Lake Macquarie on benthic fauna.

The benthic survey was conducted on 11th and 15th March 2023 by Dr Emma Laxton of J.H. & E.S. Laxton – Environmental Consultants P/L. The survey involved the collection of benthos at 22 stations. The stations consisted of seven Control, eight Reference and seven Impact stations.

A total of 1287 benthic marine organisms greater than 1 mm in size were captured in the study area of Lake Macquarie during the survey. These organisms represented thirteen species. The fauna included six species of polychaete worm; five species of bivalve; one species of gastropod; and one crab species. The greatest numbers of organisms were collected at station R10 (193 organisms), and the least numbers of organisms at station C4 (18 total).

The bivalve *Soletellina alba* was the most commonly encountered organism. A total of 808 *Soletellina* were recorded during the survey, representing 63 percent of the organisms collected. Polychaete worms were also common in the benthos. A total of 284 were recorded, representing 22 percent of the organisms collected. Other species recorded, in small numbers only, included the bivalves *Paphia undulata*, *Corbula truncata* and *Dosinia sculpta*; the gastropod *Nassarius jonassii*; and juvenile crabs.

Very few mussels were found alive during the survey. *Trichomya hirsuta* was found alive at IM1 only. No living mussels were collected from the beds located at R7, IM2 or IM5.

Species diversity at each station ranged from 4 to 9 species and was comparable with previous years. In March 2023, Control stations had a range of 5 to 6 species; Reference stations had a range of 4 to 6 species; and the Impact stations had a range of 4 to 9 species.

In March 2023, the polychaete worm *Sthenelais petitiboneae* was recorded at all stations in the study area. However, the species occurred in greater numbers at stations C2, R11 and IM1. The polychaete worm designated as mud (P2) was also found in relatively large numbers throughout the survey area, particularly stations C7, R11 and IM5. Cirratulid worms characterized the fauna at stations C7, R1, R10 and IM5.

The bivalve *Soletellina alba* was found at all stations, and characterized the fauna at stations

C2, C3, R10, IM7 and IM8. *Corbula truncata* occurred in greater numbers at C1, C6, R2 and IM7. *Trichomya hirsuta* characterized station IM1.

There was variation between the sediments collected at each station within the study area. For most stations, the sediment collected off Summerland Point, Chain Valley Bay and Bardens Bay was largely composed of fine grey silt with small to large shell fragments. However, sediment collected at stations C7 and R1 also contained a large amount of coarse grey sand. Stations IM2 and IM3 had a high portion of shell in the sediment, 47% and 41% respectively.

In March 2023, water temperature, conductivity, salinity and pH were uniform throughout the water column. The concentration of dissolved oxygen declined with water depth at many stations. Testing of the bottom water at each station found dissolved oxygen ranged from 69.60% to 100.8%. Mean dissolved oxygen of bottom waters was 88.35% saturation. Water temperature ranged from 26.18^{o}C to 28.01^{o}C, with a mean water temperature of 26.90^{o}C. Conductivity ranged from 56.97 mS/cm to 57.86 mS/cm. Mean conductivity of bottom water was 57.48 mS/cm. Salinity ranged from 34.85 ppt to 35.57 ppt, with a mean salinity of 35.28 ppt. Turbidity ranged from 14.20 NTU to 43.60 NTU. Mean turbidity was 27.46 NTU. pH ranged from 7.57 and 7.84, mean pH was 7.73.

Rainfall in the months preceding the survey of March 2023 were 124.6mm and 90.8mm for January and February 2023 respectively (Cooranbong Lake Macquarie AWS No. 061412). By 15th March a further 28.2 mm had fallen in the catchment.

These finding are comparable to previous water quality testing of bottom waters. For instance, in March 2021 and March 2022, average dissolved oxygen concentrations of bottom waters were 84.4% saturation and 68% saturation respectively. Average water temperature of bottom waters was 24.6^{o}C in March 2021 and 25.41^{o}C in March 2022. Average conductivity of bottom waters was 51.9 mS/cm in March 2021 and 50.05 mS/cm in March 2022. Salinity of bottom waters had a mean of 34.1 ppt in March 2021 and an average of 32.9 ppt in March 2022. pH of bottom waters in March 2021 and March 2022 averaged 7.99 and 7.83 respectively.

Note water temperature is increasing in Lake Macquarie.

1. Introduction

Lake Macquarie is the largest saline lake in New South Wales. It lies on the central coast between Sydney and Newcastle within the local government areas of Central Coast Council and Lake Macquarie Council. Lake Macquarie has a catchment of 700 square kilometers and a water surface area of 125 square kilometers (Bell & Edwards, 1980). The lake has a permanent entrance to coastal waters at Swansea.

The catchment of Lake Macquarie is largely rural with large areas of bushland and grazing land. The shoreline of Lake Macquarie is heavily urbanized, especially the eastern, western and northern shorelines. The region has a relatively long history of coal mining and power generation, with mining occurring since the late 1800s and the first power station at Lake Macquarie commencing operations in 1958.

Chain Valley Colliery is situated on the southern shores of Lake Macquarie near Mannering Park, NSW. The mine has been operating since 1963. Mining is continuing within the Chain Valley Coal Lease Area using the miniwall method. Prior to mining, there were three economically viable seams in the lease area, namely the Wallarah seam (not mined since 1997); the Great Northern seam, and the Fassifern seam. In 2018 Chain Valley Colliery went into voluntary receivership and was taken over by Great Southern Energy Pty Ltd (trading as Delta Coal) to provide coal for Vales Point Power Station.

Delta Coal is currently mining the Fassifern Seam beneath Lake Macquarie. To protect the lake foreshore, a protection zone has been established as part of the extraction plan. This zone, known as the High Water Mark (HWM) Subsidence Barrier, was calculated using a 35° angle of draw from the depth of mining. The zone is approximately 130 meters wide. J.H. & E.S. Laxton – Environmental Consultants P/L was engaged by Mr. Lachlan McWha, Environmental Compliance Coordinator for Chain Valley Colliery, to assess the impact of previous miniwall mining on benthic fauna in Lake Macquarie. The mine in currently undertaking first workings.

The monitoring programme consists of 22 stations, seven Control, eight Reference and seven Impact stations. Control stations are in areas of lakebed sufficiently remote from previous or proposed mining. Reference stations are located in areas of lakebed above subsidence areas of previous mining. Impact stations are in areas of lakebed where subsidence is expected/ experienced from previous workings or proposed future workings. Two depth zones within the mud basin were sampled, -4.5m AHD and -5.5 to -6.0m AHD.

This report presents the results of the just completed 23rd sampling of stations situated off

Summerland Point, in Chain Valley Bay, Bardens Bay and Sugar Bay. These results will be compared with those obtained from the previous twenty-two surveys (February 2012 to September 2022). The March 2023 benthic survey was conducted between the 11th and 15th March. Water quality variables were measured on 11th and 15th March 2023.

2. Location of Sampling Stations

Figure 2.1 shows the location of sampling stations, depth contours of the lake, and the locations of existing and proposed underground mine workings prepared by Mr Lachlan McWha and the Delta Coal team in January 2023. **Table 2.1** provides the exact location of each sampling station by latitude and longitude and by eastings and northings using WGS84 datum. The table also shows the depth of water at each station. **Figure 2.2** shows the extent of mining from March 2021 to March 2022.

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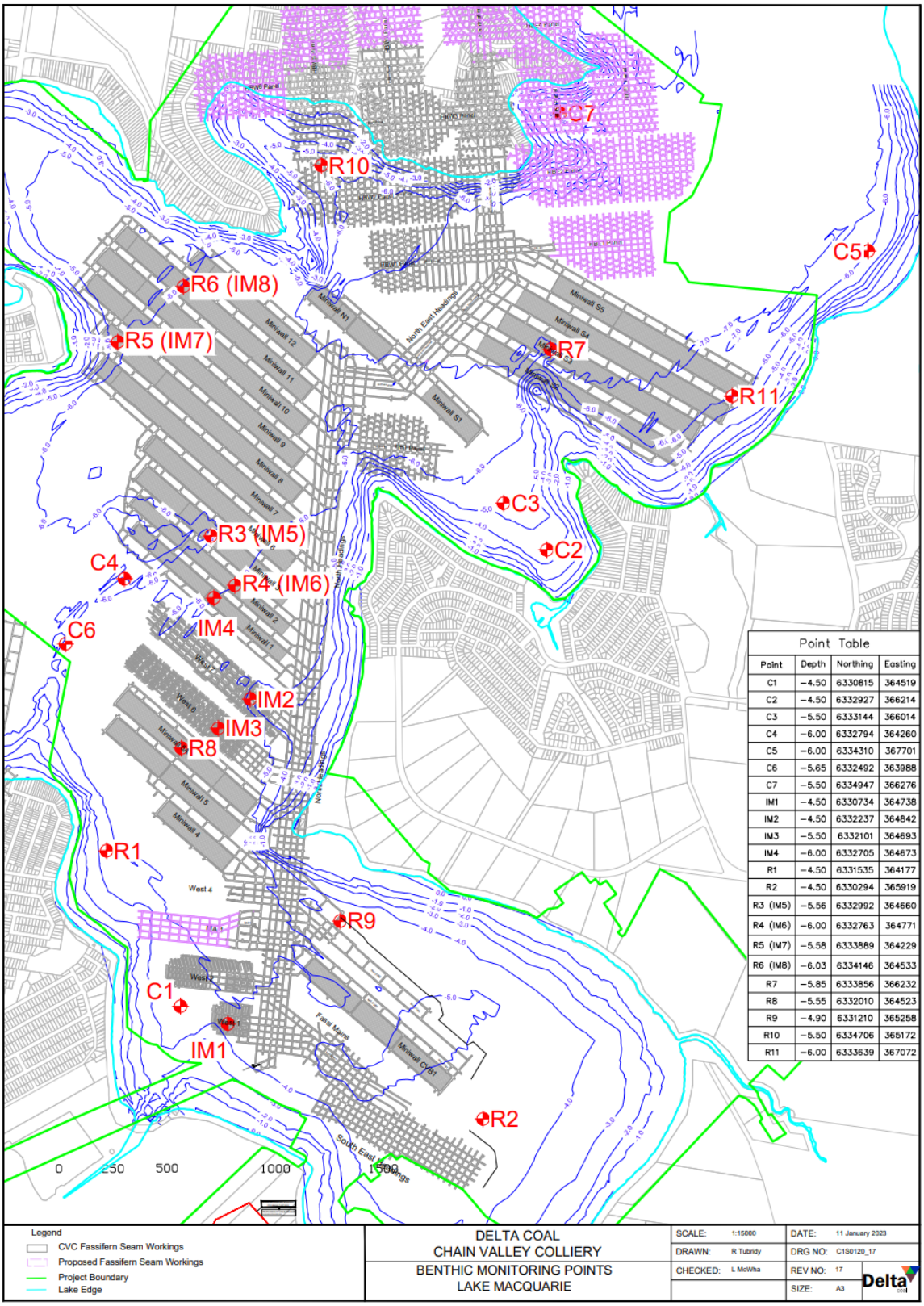


Figure 2.1 Location of benthic sampling stations

Table 2.1 Co-ordinates and water depth at each benthic sampling station

Station	Sample depth (m) AHD	Latitude	Longitude	MG-56 Easting	MG56 Northing
C1	-4.50	S33º 09' 10.69"	E151º 32' 50.11"	364519	6330815
C2	-4.50	S33º 08' 02.89"	E151º 33' 56.65"	366214	6332927
C3	-5.50	S33º 07' 55.78"	E151º 33' 49.05"	366014	6333144
C4	-6.00	S33º 08' 06.35"	E151º 32' 41.17"	364260	6332794
C5	-6.00			367701	6334310
C6	-5.50			363988	6332492
C7	-5.50			366276	6334947
IM1	-4.50	S33º 09' 13.44"	E151º 32' 58.51"	364738	6330734
IM2	-4.50	S33º 08' 24.67"	E151º 33' 03.34"	364842	6332237
IM3	-5.50	S33º 08' 29.02"	E151º 32' 57.52"	364693	6332101
IM4	-6.00	S33º 08' 09.42"	E151º 32' 57.04"	364873	6332705
R1	-4.50	S33º 08' 47.18"	E151º 32' 37.31"	364177	6331535
R2	-4.50	S33º 09' 28.23"	E151º 33' 43.87"	365919	6330294
R3 (IM5)	-5.50	S33º 08' 00.10"	E151º 32' 56.72"	364660	6332992
R4 (IM6)	-6.00	S33º 08' 07.58"	E151º 33' 00.88"	364771	6332763
R5(IM7)	-5.50	S33º 07' 30.78"	E151º 32' 40.55"	364229	6333889
R6 (IM8)	-6.00	S33º 07' 22.56"	E151º 32' 52.42"	364533	6334146
R7	-6.00			366232	6333856
R8	-5.50			364523	6332010
R9	-4.50			365258	6331210
R10	-5.50			365172	6334706
R11	-6.00			367072	6333639

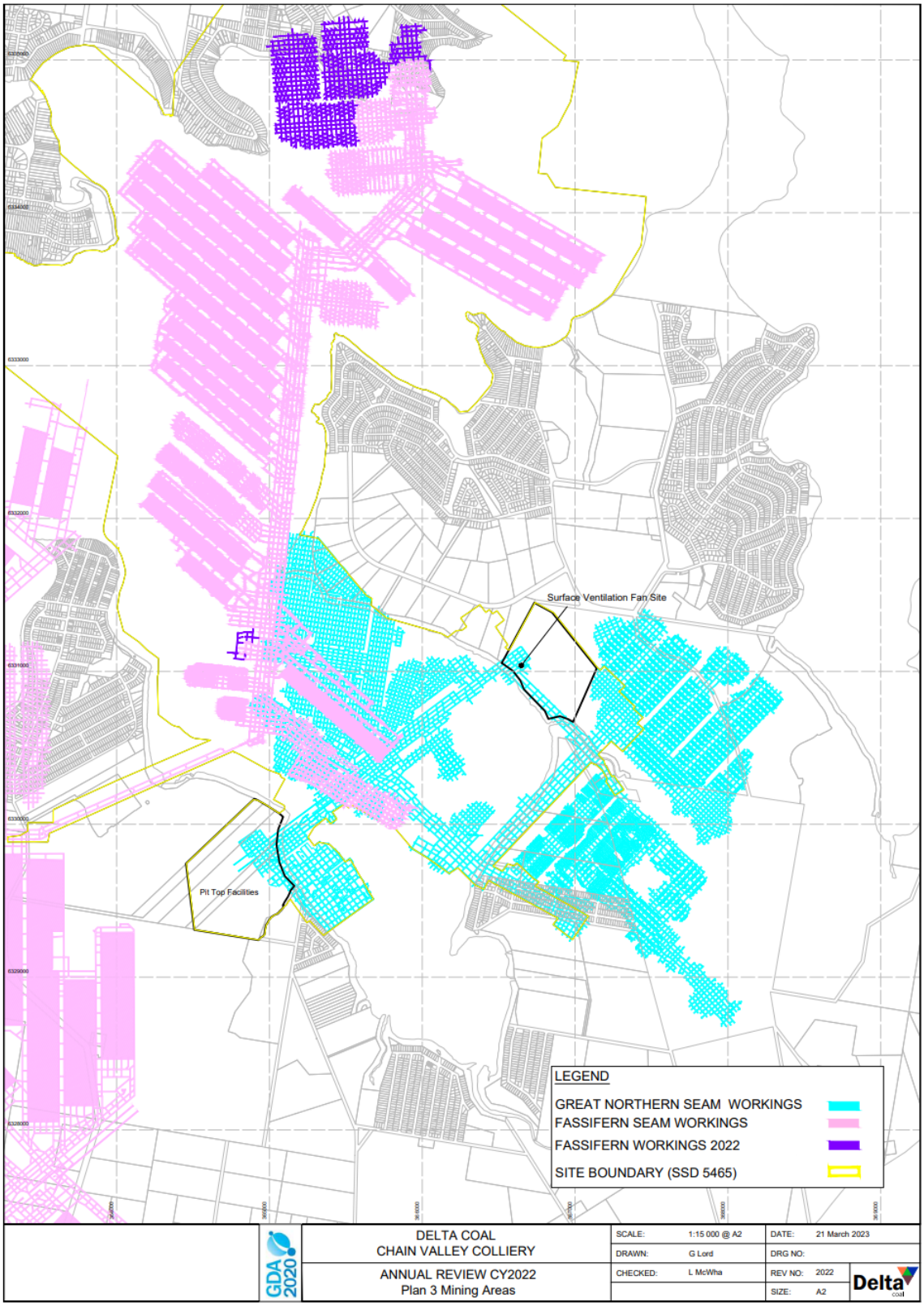


Figure 2.2 Extent of Fassifern Seam Workings – Annual Review CY2022

3. Sampling Procedure

Twenty-two stations were sampled in March 2023. At each station the following procedure was carried out:

- A GPS unit was used to locate the sampling station.
- A line with five sieve boxes (five replicates of 200 x 200 x 100 mm collection boxes with 1 mm mesh) and two core samplers (100 x 200 mm cylinders with 1 mm mesh) was cast overboard and secured as the boat drifted into position.
- The sieve boxes were filled using the forward momentum of the work boat.
- The samplers were then hauled to the surface, and the contents of each sampler placed in a clean, labeled zip-lock plastic bag.
- A 250mL jar was filled using the sediment collected from the core samplers.
- Processing of samples occurred in the laboratory.
- A water quality profile from surface to bottom was measured using a calibrated Yeo-Kal 618RU Water Quality Analyser. Water temperature, conductivity, salinity, pH, dissolved oxygen, turbidity and depth were measured. Each line of data was stored in the memory of the machine.

In the laboratory the marine benthic samples were treated in the following way:

- Each sample was tipped into a 1 mm mesh sieve and washed free of mud.
- The washed material from each sample was then placed into a tray and sorted for animals.
- Organisms and parts of organisms were removed, counted, identified and the results entered into a spread sheet. This process was repeated until the debris of the entire sample had been examined.
- Sorted organisms were preserved in formaldehyde solution.
- All shell remaining in the sample was kept for later examination.

The 250mL samples of whole sediment were treated in the following way:

- Each sample was tipped into a 1L measuring cylinder and the volume made up to 800mL with freshwater.
- The cylinders were stoppered and shaken vigorously to suspend the sediment in the freshwater.

- The cylinders were then placed on the laboratory bench to allow the fractions of the sediment to settle.
- Fractions were decanted into separate measuring cylinders and allowed to settle.
- Once settled the volumes of each fraction (silt, sand, gravel and shell) were calculated and recorded. Results were displayed relative to the final volume of sediment collected.

4. Factors affecting the depth of water in Lake Macquarie

The bathymetric chart (**Figure 4.1**) of Lake Macquarie shows water depths relative to AHD throughout the year 1997. The actual depth of water above the lakebed varied greatly, between 0 and 1.3m above AHD.

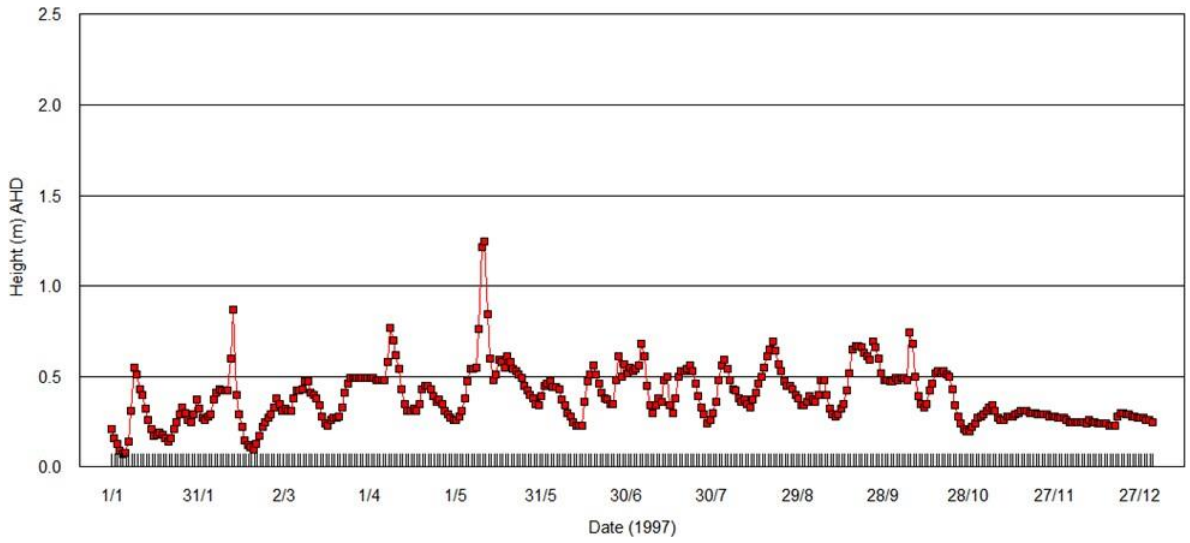


Figure 4.1 Water level changes in a coastal lagoon with an entrance open to coastal waters.

Water depths in coastal saline lakes with an open entrance to coastal waters vary due to combinations of the following factors:

- The body of Lake Macquarie is subject to tidal influence. The height of the tidal prism at Swansea Head may reach almost 2m (during spring tides) but by the time the body of the lake is reached, the tidal prism has been reduced to around 0.05m.

- The height of coastal waters and coastal lakes are influenced by changes in atmospheric pressure. The Tasman Sea acts as a huge barometer. When the atmospheric pressure is high the sea surface is depressed. This causes water to drain from Lake Macquarie causing the depth of water in the body of the lake to decrease. When the atmospheric pressure over the Tasman Sea is low, the surface of the sea bulges upwards. This raising of sea level causes water to flow into Lake Macquarie, increasing the water depth.

- Low pressure systems in the Tasman Sea almost always generate strong winds and coastal rainfall. The strong winds cause large swells to form that impact the coast. Wave setup at the entrance to Lake Macquarie causes the water level in the lake to rise as large volumes of seawater enter the system.

- Rainfall during a period of low atmospheric pressure causes runoff into catchment rivers and streams to increase. When this extra water reaches the body of Lake Macquarie, the water level rises in proportion to the runoff volume. This water is prevented from exiting the lake by wave setup at the entrance and the state of the tide. Under these circumstances, the level of the lake can rise to heights of a meter or more above AHD (**Figure 4.1**).

5. Benthos of the study area – February 2012 to March 2023

Table 5.1 shows the organisms found in the sediment samples collected off Summerland Point and in Chain Valley Bay between February 2012 and March 2023.

Plates 5.1 to **5.6** provide information about the benthic organisms present in the basin mud of Lake Macquarie, NSW.

Table 5.1 Organisms found in Benthos of Lake Macquarie (2012-2023)

Designated name	Family or Species	Comments
Anemone	Coelenterata	Found associated with mussel shells.
Planaria (Flat worm)	Platyhelminthes	Two specimens found in 2017.
Polychaete thin	*Sthenelais pettiboneae*	Most common polychaete present.
Polychaete	Cirratulidae	Present in small numbers.
Polychaete (mud tube)	Not yet identified	Present in small numbers.
Polychaete	*Chaetopterus sp*	Common.
Polychaete	*Diopatra sp*	Common.
Polychaete	*Pectinaria sp*	First found in March 2019
Gastropod	*Nassarius jonasii*	Present in small numbers.
Gastropod	*Lepsiella* (*Bedeva*) *hanleyi*	Present in small numbers.
Gastropod	Bullimorph slug	One specimen found in August 2014.
Bivalve	*Corbula truncata*	Common as live animals and dead shells.
Bivalve	*Soletellina alba*	Common
Bivalve	*Paphia undulata*	Uncommon as live animals. Common as dead shells.
Bivalve	*Cyamiomactra mactroides*	Uncommon as live animals.
Bivalve	*Mactra sp*	First collected in December 2022 off Pulbah Island.
Bivalve	*Anadara trapezia*	Uncommon.
Bivalve	*Dosinia sculpta*	Found in sandy sediments.
Bivalve	*Trichomya hirsuta*	Common as dead shells. Found in large clumps.
Bivalve	*Saccostrea glomerata*	Occasionally found on mussel shells.
Ophuroid	Brittle star	Found amongst mussel clumps and on mud.
Echinoid	Sea urchins	Encountered in sandy sediments.
Echinoid	*Echinocardium cordatum*	Encountered in sandy sediments.
Sponge	White calcareous sponge	Specimen found associated with mussels.
Sponge	Pink sponge	Small species found on mud surface.
Sponge	Red sponge	Several specimens found in 2019.
Crabs	Small	Captured occasionally.
Prawn	Small	Captured occasionally.

Plate 5.1 Annelid species found in the benthos of Lake Macquarie (February 2012 – March 2023).



Phylum: Annelida
Class: Polychaeta
Subclass: Errantia
Order: Phyllodocida
Family: Sigalionidae
Genus: *Sthenelais*
Species: *Sthenelais petitiboneae*

Remarks: Found in marine environments



Phylum: Annelida
Class: Polychaeta
Subclass: Canalipalpata
Order: Terebellida
Family: Cirratulidae

Remarks: Cirratulids vary in size from 1-20 cm long. They are mostly burrowers in soft sediments but some live in rock crevices. The head is conical or wedge-shaped and has no antennae. The body is generally cylindrical, tapering at both ends. Cirratulids are characterised by many simple elongate filaments along the body. The genera are poorly defined.



Phylum: Annelida
Class: Polychaeta
Subclass: Canalipalpata
Order: Terebellida
Family: Chaetopteridae
Genus: *Chaetopterus*

Remarks: *Chaetopterus* or the parchment worm or parchment tube worm is a genus of marine polychaete worm that lives in a tube it constructs in sediments or attaches to a rocky or coral reef substrate. The common name arises from the parchment-like appearance of the tubes that house these worms.



Phylum: Annelida
Class: Polychaeta
Subclass: Canalipalpata
Order: Terebellida
Family: Pectinariidae

Remarks: Pectinariidae live vertically, head-down in sandy sediments, with the narrow tip of the conical tube at about the sediment surface. They feed on buried organic matter within the sediments. *Pectinaria anitpoda* is one of the most common and widespread member of this family. Found in inshore waters and off the continental shelf to a depth of about 90 m.



Phylum: Annelida
Class: Polychaeta
Subclass: Errantia
Order: Eunicida
Family: Onuphidae
Genus: *Diopatra*

Remarks: Members of this genus live in thick, parchment-like tubes that project from the sediment on the seabed. The tubes comprise of fragments of shell, algae, fibers and other small objects collected by the worm and stuck in place by mucus.

Plate 5.2 Gastropod species found in the benthos of Lake Macquarie (Feb 2012 – March 2023)



Phylum: Mollusca
Class: Gastropoda
Superfamily: Buccinoidea
Family: Nassariidae
Genus: *Nassarius*
Species: *Nassarius jonasii*

Remarks: Endemic to Australia; Noosa Heads, Qld, to SA. Inhabit sand and mud flats in estuaries and lagoons, intertidal down to 100 m. Most *Nassarius* species are very active scavengers. They often burrow into marine substrates and then wait with only their siphon protruding, until they smell nearby food.



Phylum: Mollusca
Class: Gastropoda
Order: Neogastropoda
Family: Muricidae
Genus: *Lepsiella* (*Bedeva*)
Species: *Lepsiella hanleyi*

Remarks: Common name mussel drill. Shell up to 32 mm, with angulated whorls, a high spire and moderately long anterior canal and with both spiral threads and axial ribs. Endemic to Australia. Found in temperate and southern parts of tropical Australia. Lives mainly on sheltered shores, including estuaries and often in association with mangroves. Feeds by drilling holes in bivalves. Lays lens-shaped capsules and development is direct.

Plate 5.3 Bivalve species found in the benthos of Lake Macquarie (February 2012 – March 2023).



Phylum: Mollusca
Class: Bivalvia
Order: Myoida
Family: Corbulidae
Species: *Corbula truncata*

Remarks: Marine bivalve mollusc.



Phylum: Mollusca
Class: Bivalvia
Order: Veneroida
Family: Psammobiidae
Species: *Soletellina alba*

Remarks: Posterior and anterior margins almost parallel. Shell thin and normally bluish, rarely white. Lives intertidally and subtidally in sand and mud, especially in sheltered environments. Occurs all around Australia; not recorded elsewhere.



Phylum: Mollusca
Class: Bivalvia
Order: Veneroida
Family: Veneridae
Species: *Paphia undulata*

Remarks: Saltwater clam, marine bivalve mollusc. Inhabits inshore shallow sandy seabeds.



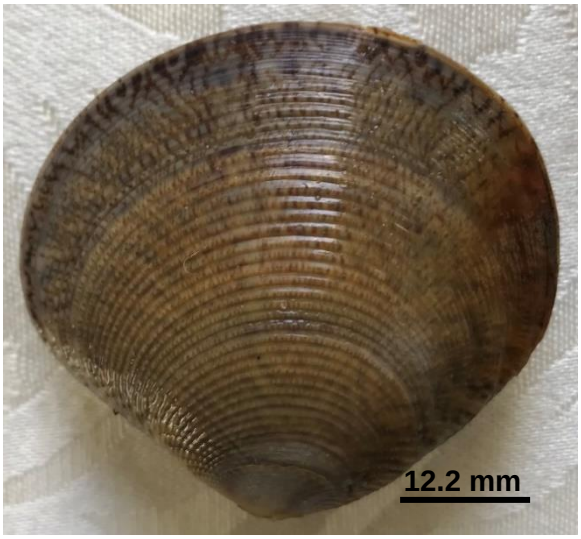
Phyllum: Mollusca
Class: Bivalvia
Order: Veneroida
Family: Veneridae
Species: *Dosinia sculpta*

Remarks: *Dosinia* is a genus of saltwater clam or marine bivalve molluscs in the sub-family Dosiniinae. The shell of *Dosinia* species is disc-like in shape, usually white, and therefore is reminiscent of the shells of Lucinid bivalves.

Typically found in the intertidal zone at the water's edge at a mean distance from sea level of -15 meters (-50 feet)



Phylum: Mollusca
Class: Bivalvia
Order: Veneroida
Family: Cyamiidae
Species: *Cyamiomactra mactroides*



Phylum: Mollusca
Class: Bivalvia
Order: Veneroida
Family: Mactridae
Species: *Mactra*

Remarks: Large genus of medium-sized marine bivalve mollusc or clam, commonly known as trough shells or duck clams. The word "trough" refers to the large ligamental pit at the hinge line, which contains a large internal ligament. Most bivalves in other families have an external ligament.



Phylum: Mollusca
Class: Bivalvia
Order: Arcoida
Family: Arcidae
Species: *Anadara trapezia*

Remarks: Sydney cockle, or ark cockle is an estuarine filter-feeding bivalve. Its calcareous, heavily-ribbed, shell can grow to approximately 7 to 8 cm across. Its current range is along the east coast of Australia, from Queensland to Victoria. It has been used as an indicator species to study levels of the metals selenium, copper and cadmium.



Phylum: Mollusca
Class: Bivalvia
Order: Mytiloida
Family: Mytilidae
Species: *Trichomya hirsuta*

Remarks: The hairy mussel is a major part of the megafauna of Lake Macquarie. It is tolerant of low oxygen levels in the water and its temperature tolerance range has been researched in connection with using the waters of the lake for cooling power stations.

Hairy mussels have been used as bioindicators to monitor concentrations of heavy metals (namely Pb, Cd, Cu, Zn, Co, Ni, and Ag) in marine environments.



Phylum: Mollusca
Class: Bivalvia
Order: Ostreoida
Family: Pectinidae
Species: *Saccostrea glomerata*

Remarks: Sydney rock oysters are endemic to Australia and New Zealand. In Australia it is found in bays, inlets and sheltered estuaries from Wingan Inlet in eastern Victoria, along the east coast of NSW and up to Hervey Bay QLD, around northern Australia and down the west coast to Shark Bay in WA. Sydney rock oysters are capable of tolerating a wide range of salinities. They are usually found in the intertidal zone to 3 metres below the low water mark.

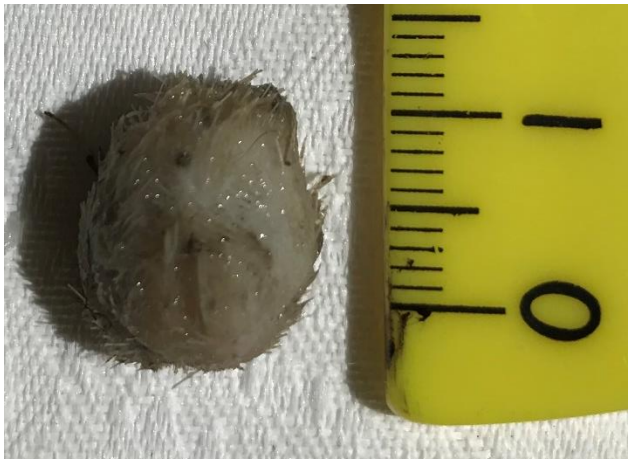
Plate 5.4 Brittle stars found in Lake Macquarie, NSW



Phylum: Echinodermata
Class: Ophiuroidea
Order: Ophiurida
Family: Ophionereididae
Species: *Ophionereis schayeri*

Remarks: Largest and most common brittle star found in Sydney waters. Brittle stars have five long, slender arms which radiate out from a central disc. The mouth is located in the centre of the underside of the disc. There is no anus. Offshore, brittle stars form dense aggregations. In intertidal zones, they are typically found as single individuals in crevices, under stones and amongst seaweed. They feed by raising their arms above the substrate; extending tube-feet; and removing particles from the water. They pass food along the arms to the mouth. They also scavenge on decaying matter.

Plate 5.5 Sea urchins found in Lake Macquarie, NSW



Phylum: Echinodermata
Class: Echinoidea
Order: Clypeasteroida
Family: Spatangidae
Species: *Echinocardium cordatum*

Remarks: Sand dollars are small in size. They possess a rigid skeleton called a test. The test consists of calcium carbonate plates arranged in a fivefold symmetric pattern.



Phylum: Echinodermata
Class: Echinoidea
Order: Cidaroida

Plate 5.6 Crab species found in Lake Macquarie, NSW



Phylum: Arthropoda
Class: Malacostraca
Order: Decapoda

6. Molluscs found as dead shells

Benthic organism samples collected between February 2012 and March 2023 included a large component of shell. **Plates 6.1** and **6.2** show the mass of shell obtained from the sixty 200x200x100mm samples of sediment taken in February 2012.



Plate 6.1 Large shell removed from samples during sorting process - February 2012 survey.



Plate 6.2 Small shells removed from samples during sorting process - February 2012 survey.

Similar masses of shell were found in the samples of the September 2013 to March 2023 surveys. The following organisms were identified amongst the shell:

1	*Paphia undulata*	7	*Chlamys sp.*
2	*Anomia sp.*	8	*Saccostrea glomerata*
3	*Dosinia sculpta*	9	*Corbula truncata*
4	*Trichomya hirsuta*	10	*Batillaria (Velacumantis) australis*
5	*Katelysia rhytiphora*	11	*Conuber sp.*
6	*Pecten sp.*	12	*Anadara trapezia*

Plates 6.3 and **6.4** provide information about the mollusc and gastropod species found as dead shells in the basin mud of Lake Macquarie, New South Wales during the periods of monitoring.

Plate 6.3 Mollusc species found as dead shells in the benthos of Lake Macquarie, NSW.



Phylum: Mollusca
Class: Bivalvia
Order: Ostreoida
Family: Anomiidae
Genus: *Anomia*

Remarks: Genus of saltwater clam, marine bivalve mollusc. Known as "jingle shells". Common in both tropical and temperate oceans and live primarily attached to rock or other shells via a calcified byssus that extends through the lower valve. *Anomia* shells tend to take on the surface shape of what they are attached to; thus if an *Anomia* is attached to a scallop shell, the shell of the *Anomia* will also show ribbing.



Phylum: Mollusca
Class: Bivalvia
Order: Veneroida
Family: Veneridae
Genus: *Katelysia*
Species: *Katelysia rhytiphora*

Remarks: Commonly known as mud cockles, this group of commercially important bivalves often represents a major faunal component of shallow estuarine and marine embayments. *K. rhytiphora* is broadly distributed around Australia's temperate coastline from Augusta, Western Australia to Port Jackson, NSW.



Phylum: Mollusca
Class: Bivalvia
Order: Ostreoida
Family: Pectinidae
Genus: *Pecten*

Remarks: Genus of large saltwater clams or scallops. Marine bivalve mollusc.



Phylum: Mollusca
Class: Bivalvia
Order: Ostreoida
Family: Pectinidae
Genus: *Chlamys*

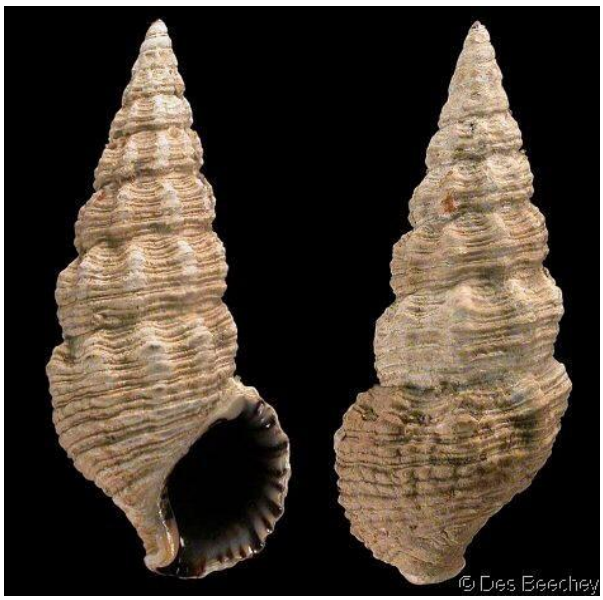
Remarks: Genus of saltwater clams or scallops. Marine bivalve mollusc.

Plate 6.4 Gastropod species found as dead shells in the benthos of Lake Macquarie, NSW.



Phylum: Mollusca
Class: Gastropoda
Family: Naticidae
Genus: *Conuber*
Species: *Conuber sordidum*

Remarks: Species of predatory sea snail. A marine gastropod mollusc known commonly as the moon snail. Lives on intertidal muddy sand flats near mangroves or sea weed.



Phylum: Mollusca
Class: Gastropoda
Family: Batillariidae
Species: Batillaria australis

Remarks: The Australian Mud Whelk is a marine gastropod found on mud flats in estuaries, river mouths and mangrove swamps. The snail has a high resistance to predation and environmental tolerance, which may partially explain its success as an invasive species. This species is one of the hosts for the flatworm parasite *Austrobilharzia*. Larvae of the flatworm are discharged from the snail into the surrounding water. They normally burrow into the legs of wading birds and complete their life cycle, but may burrow though the skin of humans, causing "bathers itch".

7. Benthic organisms in the study area – March 2023

Table 7.1 shows the organisms found at each station sampled off Summerland Point and in Chain Valley Bay and Bardens Bay in March 2023.

A total of 1287 benthic marine organisms greater than 1 mm in size were captured in the study area of Lake Macquarie during the March 2023 survey of 22 stations (**Table 7.1**). Thirteen species of benthic marine organisms were found. The fauna included six species of polychaete worm (**Plate 5.1**); five species of bivalve (**Plate 5.3**); one species of gastropod (**Plate 5.4**); and one crab species.

In March 2023, the greatest numbers of organisms were collected at stations R10 (193 organisms), C2 (175 organisms) and C3 (107 organisms). The stations with the least numbers of organisms were C4 (18 total), IM6 (19 total), IM2 (21 total), IM4 (22 organisms) and IM5 (23 organisms) (**Table 7.1**).

The bivalve *Soletellina alba* was the most commonly encountered organism. A total of 808 *Soletellina* were recorded during the survey, representing 63 percent of the organisms collected. The number of *S. alba* at each station ranged from 1 to 177. The bivalve was present at every station (**Fig 7.2**). Polychaete worms were also common in the benthos (**Table 7.1**). A total of 284 were recorded, representing 22 percent of the organisms collected. Other species recorded, in small numbers only, included the bivalves *Paphia undulata*, *Corbula truncata* and *Dosinia sculpta*; the gastropod *Nassarius jonassii*; and juvenile crabs.

Very few mussels were found alive during the survey. *Trichomya hirsuta* was found alive at IM1 only. No living mussels were collected from the beds located at R7, IM2 or IM5 (**Table 7.1**).

Table 7.1 Organisms found at sampling stations on 11th and 15th March 2023.

Control Station C1 Depth -4.50m AHD 56 364519 6330815 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
C1.1	2	1	1	0	0	0	0	0	3	9	0	0	0	0	0	0
C1.2	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0
C1.3	2	0	0	0	0	0	1	0	3	2	0	0	0	0	0	0
C1.4	1	0	3	0	0	0	0	0	1	8	0	0	0	0	0	0
C1.5	1	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0
Total	**6**	**1**	**4**	**0**	**0**	**0**	**1**	**0**	**7**	**35**	**0**	**0**	**0**	**0**	**0**	**0**
Mean/station	1.2	0.2	0.8	0.0	0.0	0.0	0.2	0.0	1.4	7.0	0.0	0.0	0.0	0.0	0.0	0.0
no./m2	30	5	20	0	0	0	5	0	35	175	0	0	0	0	0	0
No. species	**6**												**Total Organisms at Station**			**54**

Control Station C2 Depth -4.50m AHD 56 366214 6332927 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
C2.1	1	0	2	0	0	0	1	0	0	17	0	0	0	0	0	0
C2.2	5	0	2	0	0	0	0	0	0	16	0	0	0	0	0	0
C2.3	3	0	2	0	0	0	0	0	0	44	0	5	0	0	0	0
C2.4	1	0	1	0	0	0	0	0	1	35	0	0	0	0	0	0
C2.5	5	0	0	0	0	0	0	0	1	33	0	0	0	0	0	0
Total	**15**	**0**	**7**	**0**	**0**	**0**	**1**	**0**	**2**	**145**	**0**	**5**	**0**	**0**	**0**	**0**
Mean/station	3.0	0.0	1.4	0.0	0.0	0.0	0.2	0.0	0.4	29.0	0.0	1.0	0.0	0.0	0.0	0.0
no./m2	75	0	35	0	0	0	5	0	10	725	0	25	0	0	0	0
No. species	**6**												**Total Organisms at Station**			**175**

Control Station C3 Depth -5.50m AHD 56 366014 6333144 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
C3.1	2	0	1	1	0	0	0	0	0	12	0	0	0	0	0	0
C3.2	2	0	1	0	0	0	0	0	2	26	0	0	0	0	0	0
C3.3	3	0	2	0	0	0	0	0	1	13	0	0	0	0	0	0
C3.4	3	0	1	0	0	0	0	0	1	33	0	0	0	0	0	0
C3.5	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Total	**11**	**0**	**5**	**1**	**0**	**0**	**0**	**0**	**4**	**86**	**0**	**0**	**0**	**0**	**0**	**0**
Mean/station	2.2	0.0	1.0	0.2	0.0	0.0	0.0	0.0	0.8	17.2	0.0	0.0	0.0	0.0	0.0	0.0
no./m2	55	0	25	5	0	0	0	0	20	430	0	0	0	0	0	0
No. species	**5**												**Total Organisms at Station**			**107**

Control Station C4 Depth -5.50m AHD 56 364260 6332794 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
C4.1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
C4.2	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
C4.3	1	0	1	0	0	0	0	0	3	0	0	0	0	0	0	0
C4.4	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0
C4.5	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0
Total	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**4**	**7**	**3**	**0**	**0**	**0**	**0**	**0**
Mean/station	0.4	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.8	1.4	0.6	0.0	0.0	0.0	0.0	0.0
no./m2	10	5	5	0	0	0	0	0	20	35	15	0	0	0	0	0
No. species	**6**											**Total Organisms at Station**				**18**

Control Station C5 Depth -5.50m AHD 56 367701 6334510 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
C5.1	1	0	2	0	0	1	1	0	0	2	0	0	0	0	0	0
C5.2	2	0	2	1	0	0	0	0	0	6	0	0	0	0	0	0
C5.3	3	0	2	0	0	0	0	0	0	4	0	0	0	0	0	0
C5.4	0	0	2	0	0	0	0	0	0	3	0	0	0	0	0	0
C5.5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**9**	**0**	**8**	**1**	**0**	**1**	**1**	**0**	**0**	**15**	**0**	**0**	**0**	**0**	**0**	**0**
Mean/station	1.8	0.0	1.6	0.2	0.0	0.2	0.2	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
no./m2	45	0	40	5	0	5	5	0	0	75	0	0	0	0	0	0
No. species	**6**											**Total Organisms at Station**				**35**

Control Station C6 Depth -5.50m AHD 56 363988 6332492 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
C6.1	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0
C6.2	0	0	0	0	0	0	0	0	2	4	0	0	0	0	0	0
C6.3	0	0	0	0	0	0	0	0	3	4	0	0	0	0	0	0
C6.4	1	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0
C6.5	0	0	0	0	0	0	0	0	3	1	1	0	0	0	0	0
Total	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**14**	**1**	**0**	**0**	**0**	**0**	**0**
Mean/station	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.8	0.2	0.0	0.0	0.0	0.0	0.0
no./m2	5	0	0	0	0	0	0	0	50	70	5	0	0	0	0	0
No. species	**4**											**Total Organisms at Station**				**26**

Control Station C7 Depth -5.50m AHD 56 364736 6334947 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
C7.1	2	1	7	0	0	0	0	0	0	0	0	0	0	0	0	1
C7.2	0	1	1	0	0	0	0	0	0	3	0	0	0	0	0	2
C7.3	3	0	5	0	0	0	0	0	0	5	0	0	0	0	0	2
C7.4	2	0	6	0	0	0	0	0	0	0	0	0	0	0	0	2
C7.5	1	0	4	3	0	0	0	0	0	0	0	0	0	0	0	0
Total	**8**	**2**	**23**	**3**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**7**
Mean/station	1.6	0.4	4.6	0.6	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	1.4
no./m2	40	10	115	15	0	0	0	0	0	40	0	0	0	0	0	35
No. species	**6**											**Total Organisms at Station**				**51**

Station R1 Depth -4.50m AHD 56 364177 6331535 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
R1.1	3	0	3	0	0	0	0	0	0	2	1	0	0	0	0	0
R1.2	3	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0
R1.3	2	0	1	0	0	0	0	0	1	17	0	0	0	0	0	0
R1.4	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
R1.5	1	0	1	0	0	0	0	0	3	18	0	0	0	0	0	0
Total	**11**	**0**	**5**	**2**	**0**	**0**	**0**	**0**	**4**	**42**	**1**	**0**	**0**	**0**	**0**	**0**
Mean/station	2.2	0.0	1.0	0.4	0.0	0.0	0.0	0.0	0.8	8.4	0.2	0.0	0.0	0.0	0.0	0.0
no./m2	55	0	25	10	0	0	0	0	20	210	5	0	0	0	0	0
No. species	**6**											**Total Organisms at Station**				**65**

Station R2 Depth -4.50m AHD 56 365919 6330294 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
R2.1	2	0	0	0	0	0	1	0	1	8	0	0	0	0	0	0
R2.2	1	0	0	0	0	0	0	0	2	5	0	0	0	0	0	0
R2.3	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
R2.4	0	0	0	0	0	0	0	0	4	6	0	0	0	0	0	0
R2.5	4	0	0	0	0	0	0	0	0	5	0		0	0	0	0
Total	**9**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**7**	**24**	**0**	**0**	**0**	**0**	**0**	**0**
Mean/station	1.8	0.0	0.0	0.0	0.0	0.0	0.4	0.0	1.4	4.8	0.0	0.0	0.0	0.0	0.0	0.0
no./m2	45	0	0	0	0	0	10	0	35	120	0	0	0	0	0	0
No. species	**4**											**Total Organisms at Station**				**42**

Station R7 Depth -6.00m AHD 56 366232 6333856 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
R7.1	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
R7.2	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0
R7.3	1	0	2	0	0	0	0	0	0	1	3	0	0	0	0	0
R7.4	0	0	2	0	0	0	0	0	0	10	0	1	0	0	0	0
R7.5	1	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
Total	**4**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**23**	**3**	**1**	**0**	**0**	**0**	**0**
Mean/station	0.8	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	4.6	0.6	0.2	0.0	0.0	0.0	0.0
no./m2	20	0	20	0	0	0	0	0	0	115	15	5	0	0	0	0
No. species	**5**											**Total Organisms at Station**				**35**

Station R8 Depth -6.00m AHD 56 364323 63322010 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
R8.1	0	0	1	0	0	0	0	0	0	7	1	0	0	0	0	0
R8.2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
R8.3	1	0	0	0	0	0	0	0	1	8	0	0	0	0	0	0
R8.4	2	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0
R8.5	0	0	0	0	0	0	0	0	0	12	0	3	0	0	0	0
Total	**3**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**39**	**1**	**3**	**0**	**0**	**0**	**0**
Mean/station	0.6	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2	7.8	0.2	0.6	0.0	0.0	0.0	0.0
no./m2	15	0	5	0	0	0	0	0	5	195	5	15	0	0	0	0
No. species	**6**											**Total Organisms at Station**				**48**

Station R9 Depth -6.00m AHD 56 366232 6331210 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
R9.1	3	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
R9.2	1	0	0	0	0	0	1	0	2	6	0	0	0	0	0	0
R9.3	3	0	0	0	0	0	1	0	1	2	0	0	0	0	0	0
R9.4	3	0	0	0	0	0	0	0	3	6	1	0	0	0	0	0
R9.5	3	0	2	0	0	0	0	0	0	5	1	0	0	0	0	0
Total	**13**	**0**	**6**	**0**	**0**	**0**	**2**	**0**	**6**	**19**	**2**	**0**	**0**	**0**	**0**	**0**
Mean/station	2.6	0.0	1.2	0.0	0.0	0.0	0.4	0.0	1.2	3.8	0.4	0.0	0.0	0.0	0.0	0.0
no./m2	65	0	30	0	0	0	10	0	30	95	10	0	0	0	0	0
No. species	**6**											**Total Organisms at Station**				**48**

Station R10 Depth -6.00m AHD 56 365172 6334708 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
R10.1	1	0	1	0	0	0	0	0	1	50	0	0	0	0	0	0
R10.2	2	0	2	1	0	0	0	0	1	20	0	0	0	0	0	0
R10.3	2	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0
R10.4	0	0	2	0	0	0	0	0	0	49	0	0	0	0	0	0
R10.5	1	0	0	0	0	0	0	0	2	41	0	0	0	0	0	0
Total	**6**	**0**	**5**	**1**	**0**	**0**	**0**	**0**	**4**	**177**	**0**	**0**	**0**	**0**	**0**	**0**
Mean/station	1.2	0.0	1.0	0.2	0.0	0.0	0.0	0.0	0.8	35.4	0.0	0.0	0.0	0.0	0.0	0.0
no./m2	30	0	25	5	0	0	0	0	20	885	0	0	0	0	0	0
No. species	**5**											**Total Organisms at Station**				**193**

Station R11 Depth -6.00m AHD 56 367072 6333638 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
R11.1	2	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
R11.2	1	0	3	0	0	0	0	0	0	9	0	0	0	0	0	0
R11.3	3	0	1	0	0	0	0	0	0	11	0	0	0	0	0	0
R11.4	5	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0
R11.5	5	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0
Total	**16**	**0**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**22**	**1**	**0**	**0**	**0**	**0**	**0**
Mean/station	3.2	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	0.2	0.0	0.0	0.0	0.0	0.0
no./m2	80	0	50	0	0	0	0	0	0	110	5	0	0	0	0	0
No. species	**4**											**Total Organisms at Station**				**49**

Station IM1 Depth -4.50m AHD 56 364738 6330734 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
IM1.1	7	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
IM1.2	2	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0
IM1.3	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
IM1.4	4	0	1	0	0	0	0	0	0	2	0	0	0	0	2	0
IM1.5	0	0	0	0		0	0	0	1	0	0	0	0	0	0	0
Total	**14**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**2**	**3**	**0**	**1**	**0**	**0**	**7**	**0**
Mean/station	2.8	0.0	0.2	0.2	0.0	0.0	0.2	0.0	0.4	0.6	0.0	0.2	0.0	0.0	1.4	0.0
no./m2	70	0	5	5	0	0	5	0	10	15	0	5	0	0	35	0
No. species	**8**											**Total Organisms at Station**				**30**

Station IM2 Depth -4.50m AHD 56 364842 6332237 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
IM2.1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
IM2.2	2	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
IM2.3	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	1
IM2.4	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
IM2.5	3	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Total	**10**	**1**	**2**	**1**	**1**	**0**	**0**	**0**	**3**	**1**	**0**	**1**	**0**	**0**	**0**	**1**
Mean/station	2.0	0.2	0.4	0.2	0.2	0.0	0.0	0.0	0.6	0.2	0.0	0.2	0.0	0.0	0.0	0.2
no./m2	50	5	10	5	5	0	0	0	15	5	0	5	0	0	0	5
No. species	**9**												**Total Organisms at Station**			**21**

Station IM3 Depth -5.50m AHD 56 364693 6332101 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
IM3.1	1	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0
IM3.2	0	0	0	0	0	0	0	0	1	8	0	0	0	0	0	0
IM3.3	1	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0
IM3.4	2	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0
IM3.5	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0
Total	**4**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**3**	**22**	**0**	**0**	**0**	**0**	**0**	**0**
Mean/station	0.8	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.6	4.4	0.0	0.0	0.0	0.0	0.0	0.0
no./m2	20	0	5	0	0	0	0	0	15	110	0	0	0	0	0	0
No. species	**4**												**Total Organisms at Station**			**30**

Station IM4 Depth -6.00m AHD 56 364673 6332705 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
IM4.1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IM4.2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IM4.3	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
IM4.4	2	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0
IM4.5	3	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0
Total	**9**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**0**
Mean/station	1.8	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0
no./m2	45	0	5	0	0	0	0	0	0	60	0	0	0	0	0	0
No. species	**3**												**Total Organisms at Station**			**22**

Station R3 (now IM5) Depth -5.50m AHD 56 364660 6332992 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
R3.1	0	0	2	1	0	0	0	0	1	0	0	0	0	0	0	0
R3.2	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
R3.3	1	1	2	0	0	0	0	0	1	1	0	0	0	0	0	0
R3.4	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
R3.5	1	0	2	1	0	0	1	0	1	0	0	0	0	0	0	0
Total	**6**	**1**	**9**	**2**	**0**	**0**	**1**	**0**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
Mean/station	1.2	0.2	1.8	0.4	0.0	0.0	0.2	0.0	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0
no./m2	30	5	45	10	0	0	5	0	15	5	0	0	0	0	0	0
No. species	**7**												**Total Organisms at Station**			**23**

Station R4 (now IM6) Depth -6.00m AHD 56 364771 6332763 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
R4.1	0	0	2	0	0	0	0	0	1	1	0	0	0	0	0	0
R4.2	0	0	2	0	0	0	0	0	2	1	0	0	0	0	0	0
R4.3	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
R4.4	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
R4.5	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Total	**4**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**5**	**5**	**0**	**0**	**0**	**0**	**0**	**0**
Mean/station	0.8	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
no./m2	20	0	25	0	0	0	0	0	25	25	0	0	0	0	0	0
No. species	**4**												**Total Organisms at Station**			**19**

Station R5 (now IM7) Depth -6.00m AHD 56 364229 6333889 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
R5.1	0	0	1	0	0	0	0	0	1	7	0	0	0	0	0	0
R5.2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
R5.3	1	0	0	0	0	0	0	0	1	15	0	0	0	0	0	0
R5.4	0		0	0	0	0	0	0	0	11	0	0	0	0	0	0
R5.5	0	0	0	0	0	0	0	0	4	14	0	0	0	0	0	0
Total	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**6**	**50**	**0**	**0**	**0**	**0**	**0**	**0**
Mean/station	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	1.2	10.0	0.0	0.0	0.0	0.0	0.0	0.0
no./m2	5	0	5	0	0	0	0	0	30	250	0	0	0	0	0	0
No. species	**4**												**Total Organisms at Station**			**58**

Station R6 (now IM8) Depth -6.00m AHD 56 364533 6334146 Sampled 11 - 15 March 2023

Replicates	Polychaete *Sthenelais*	Polychaete thin	Polychaete mud	Polychaete Cirratulidae	Polychaete *Chaetopterus*	Polychaete Pectinariidae	Gastropod *Nassarius*	Gastropod *Bedeva*	Bivalve *Corbula*	Bivalve *Soletellina*	Bivalve *Paphia*	Bivalve *Dosinia*	Bivalve *Anadara*	Bivalve *Cyamiomactra*	Bivalve *Trichomya*	Crab
R6.1	0	0	1	0	0	0	0	0	1	20	0	0	0	0	0	0
R6.2	0	0	0	0	0	0	0	0	3	10	1	0	0	0	0	0
R6.3	0	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0
R6.4	0	0	0	0	0	0	0	0	0	15	1	0	0	0	0	0
R6.5	1	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0
Total	**1**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**5**	**58**	**2**	**0**	**0**	**0**	**0**	**0**
Mean/station	0.2	0.0	0.4	0.0	0.0	0.0	0.0	0.0	1.0	11.6	0.4	0.0	0.0	0.0	0.0	0.0
no./m2	5	0	10	0	0	0	0	0	25	290	10	0	0	0	0	0
No. species	**5**											**Total Organisms at Station**				**68**

Total Organisms collected **1287**
Total number of species recorded **13**

At the time of survey, species diversity at each station ranged from 4 to 9 species and was comparable to previous years (**Table 7.2**). In March 2023, Control stations had a range of 5 to 6 species; Reference stations had a range of 4 to 6 species; and the Impact stations had a range of 4 to 9 species.

Table 7.2 Number of species found at each Station from February 2012 to March 2023

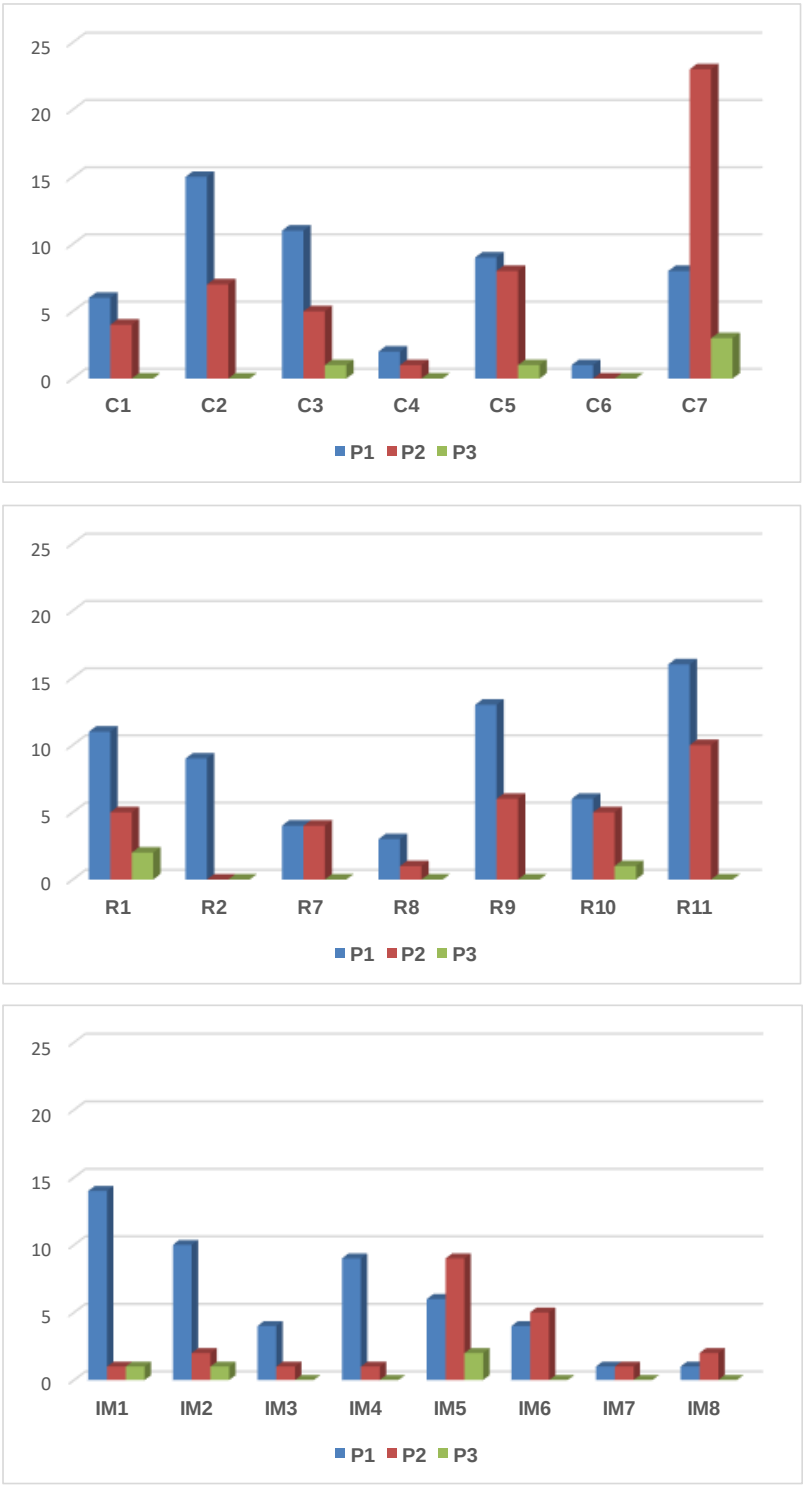
Station	C1	C2	C3	C4	C5	C6	C7	R1	R2	R7	R8
Feb 2012	10	5	5	7				8	8		
Sept 2012	3	6	4	4				6	3		
March 2013	4	5	7	7				6	5		
Sept 2013	6	6	3	7				5	6		
March 2014	4	3	5	5				6	4		
Sept 2014	3	4	4	8				6	5		
March 2015	3	3	5	3				5	3		
Sept 2015	5	4	4	3				5	3		
March 2016	6	4	5	5	5			6	5	8	
Sept 2016	7	3	6	5	4	8		8	4	7	5
March 2017	2	4	5	3	5	5		4	5	4	3
Sept 2017	4	4	4	4	4	5		4	3	4	5
March 2018	4	4	8	4	4	3	5	7	8	4	3
Sept 2018	3	4	4	6	5	5	5	4	4	6	4
March 2019	6	3	4	4	6	5	3	4	5	4	4
Sept 2019	5	6	5	5	4	5	6	4	3	5	4
March 2020	5	6	6	4	7	3	6	6	6	8	3
August 2020	6	5	4	4	3	5	5	4	5	8	4
March 2021	5	6	3	4	5	2	2	5	4	5	4
Sept 2021	4	4	7	6	7	7	6	5	4	7	3
March 2022	5	6	4	7	6	7	4	6	4	8	3
Sept 2022	5	5	7	7	6	5	6	6	5	4	6
March 2023	6	6	5	6	6	4	6	6	4	5	6

Station	R9	R10	R11	IM1	IM2	IM3	IM4	IM5	IM6	IM7	IM8
Feb 2012				7	4	4	5	5	5		
Sept 2012				4	4	3	5	4	5		
March 2013				7	5	5	5	6	5		
Sept 2013				4	3	4	5	5	4		
March 2014				5	9	4	5	5	3	4	3
Sept 2014				5	6	3	6	6	6	3	3
March 2015				5	4	4	5	6	5	3	3
Sept 2015				5	5	4	4	4	6	5	4
March 2016				6	6	3	4	6	4	4	4
Sept 2016	8			6	4	6	3	5	6	6	7
March 2017	5			3	4	3	4	4	5	4	4
Sept 2017	4			5	5	5	5	6	5	4	4
March 2018	4	4	4	5	7	3	4	5	4	6	3
Sept 2018	5	4	4	4	8	4	4	5	5	5	4
March 2019	4	6	6	5	5	2	4	7	3	5	4
Sept 2019	4	4	3	6	5	7	5	7	4	4	4
March 2020	4	4	4	7	7	4	4	7	4	4	4
August 2020	5	5	4	5	6	4	6	7	4	7	5
March 2021	6	5	8	7	7	5	7	7	4	5	5
Sept 2021	4	6	7	3	7	4	4	8	3	4	4
March 2022	5	6	6	5	6	5	6	9	7	4	4
Sept 2022	7	6	5	6	8	6	3	7	6	5	4
March 2023	6	5	4	8	9	4	7	4	4	4	5

In March 2023, the polychaete worm *Sthenelais petitiboneae* was recorded at all stations in the study area. However, the species occurred in greater numbers at stations C2, R11 and IM1. The polychaete worm designated as mud (P2) was also found in relatively large numbers throughout the survey area, particularly stations C7, R11 and IM5. Cirratulid worms characterized the fauna at stations C7, R1, R10 and IM5 (**Figure 7.1**).

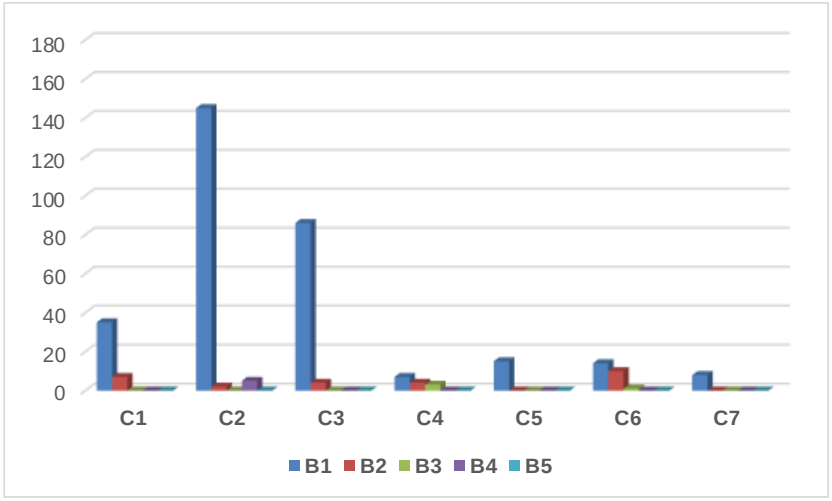
The bivalve *Soletellina alba* was found at all stations, and characterized the fauna at stations C2, C3, R10, IM7 and IM8. *Corbula truncata* occurred in greater numbers at C1, C6, R2 and IM7. *Trichomya hirsuta* characterized station IM1 (**Figure 7.2**).

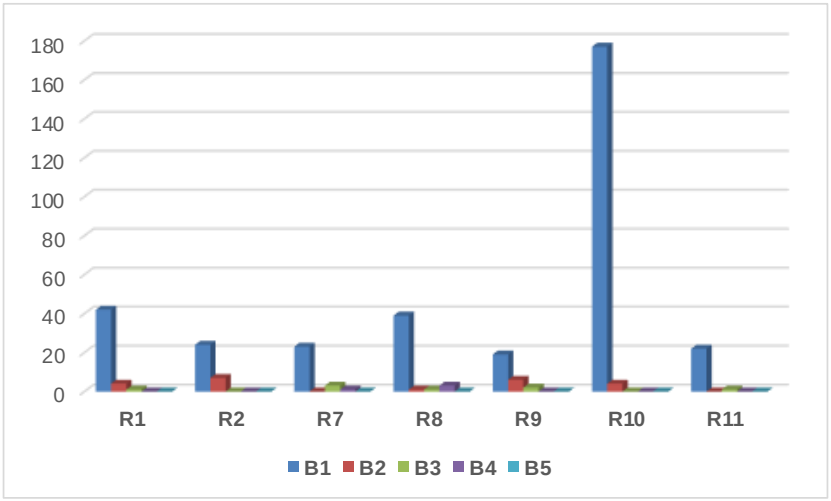
Figure 7.1 Number of polychaetes found at each Control, reference and Impact Station, March 2023

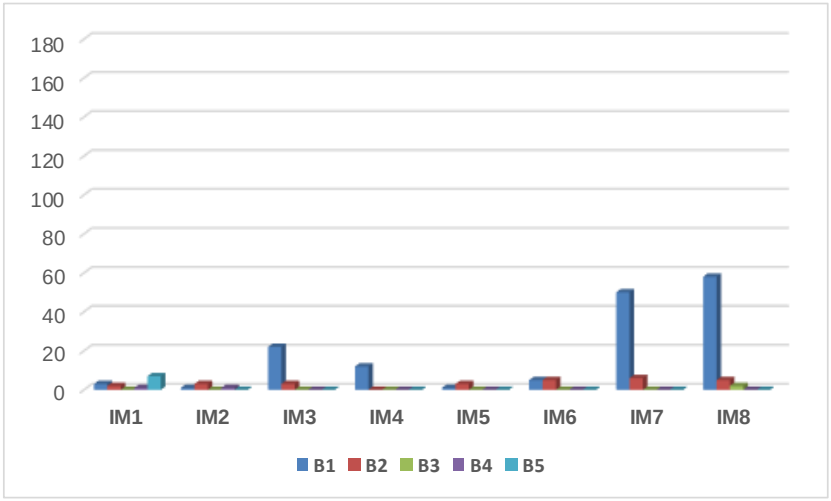


Key: P1 *Sthenelais pettiboneae* P2 Polychaete mud P3 Cirratulidae

Figure 7.2 Number of bivalves found at each control, reference and impact Station, March 2023







Key: B1 *Soletellina* B2 *Corbula* B3 *Paphia* B4 *Dosinia* B5 *Trichomya*

8. Sediment Analysis

In March 2023, the sediment in the mud basin of Lake Macquarie off Summerland Point, Chain Valley Bay and Bardens Bay was largely composed of fine grey silt that was mildly plastic in nature (able to be molded into a coherent shape). Small to large shell fragments were present in the sediment at most stations (**Table 8.1**).

Sediment collected at stations C7 contained a large amount of coarse grey sand (**Table 8.2**). The sediment samples collected at IM2, IM3, C1 and C2 comprised a high portion of shell (**Table 8.2**).

Table 8.1 Description of sediment collected from sampling stations in March 2023.

Station	Description
C1	Dark grey silt with some small sized shell fragments.
C2	Dark grey silt with some small sized shell fragments.
C3	Dark grey silt with some shell fragments.
C4	Dark grey silt with some small to large shell fragments.
C5	Dark grey silt with some coarse grey sand and shell fragments.
C6	Dark grey silt with some small to large shell fragments. Mud plastic in nature.
C7	Coarse grey sand and dark grey silt.
R1	Dark grey silt with fine grey sand. No shell fragments or gravel.
R2	Dark grey silt with some shell fragments. No sand or gravel.
R6	Dark grey silt. Mud plastic in nature.
R7	Dark grey silt with some small to medium shell fragments.
R8	Dark grey silt with some large shell fragments.
R9	Dark grey silt with some shell.
R10	Dark grey silt with some small shell fragments.
R11	Dark grey silt with some small shell fragments.
IM1	Dark grey silt with medium to large shell fragments and some coarse sand.
IM2	Dark grey silt with large shell fragments.
IM3	Dark grey silt with large shell fragments.
IM4	Dark grey silt with some large shell fragments.
R3 (IM5)	Dark grey silt with some large shell fragments.
R4 (IM6)	Dark grey silt with some shell fragments.
R5 (IM7)	Dark grey silt with some sand and shell fragments.

Table 8.2 Percentage of silt, sand, gravel and shell for control, reference and impact stations

	% Silt	% Sand	% Grave	%Shell
C1	83	0	0	17
C2	83	0	0	17
C3	95	0	0	5
C4	95	0	0	5
C5	97	1	0	2
C6	99	0	0	1
C7	42	58	0	0
R1	89	11	0	0
R2	99	0	0	1
R6	100	0	0	0
R7	99	0	0	1
R8	99	0	0	1
R9	95	0	0	5
R10	99	0	0	1
R11	99	0	0	1
IM1	91	1	0	8
IM2	52	1	0	47
IM3	59	1	0	41
IM4	98	0	0	2
R3 (IM5)	98	0	0	2
R4 (IM6)	90	0	0	10
R5 (IM7)	100	0	0	0

9. Physical characteristics of water in Lake Macquarie – March 2023

At each station, a water quality profile was taken using a calibrated Yeo-Kal 618RU Analyser. The physical characteristics were measured on 11th and 15th March 2023. Units of measurement were temperature - degrees Celsius, conductivity - mS/cm; salinity - parts per thousand, pH, dissolved oxygen - % saturation and mg/L, and turbidity - NTU.

The water quality profile for each station is presented in **Appendix 1**. At the time of sampling, the water profile had the following characteristics:

Water temperature was very high and uniform throughout the water column and throughout the study area. For instance:

- C6, water temperature ranged from 27.77ºC at the surface to 28.01ºC at -6.5m AHD.
- R3 (now IM5), water temperature ranged from 27.00ºC at the surface to 27.04ºC at -6.5m AHD.
- R4 (now IM6), water temperature ranged from 27.47ºC at the surface to 27.26ºC at -6.5m AHD.
- R9, water temperature ranged from 28.07ºC at the surface to 27.27ºC at -4.5m AHD.

Conductivity was relatively uniform throughout the water column and the study area. For instance:

- C1, conductivity ranged from 57.52 mS/cm at the surface to 57.64 mS /cm at -5.0m AHD.
- C2, conductivity ranged from 56.10 mS /cm at the surface to 56.40 mS at -5.5m AHD.
- IM1, conductivity ranged from 57.53 mS /cm at the surface to 57.61 mS /cm at -5.0m AHD.
- IM2, conductivity ranged from 57.57 mS /cm at the surface to 57.55 mS /cm at -6.1m AHD.
- R1, conductivity ranged from 57.55 mS /cm at the surface to 57.59 mS /cm at -4.5m AHD.

Salinity was relatively uniform throughout the water column and the study area. For instance:

- C3, salinity ranged from 33.98 ppt at the surface to 35.11 ppt at -6.5m AHD.
- IM3, salinity ranged from 35.32 ppt at the surface to 35.31 ppt at -6.5m AHD.
- R2, salinity ranged from 35.38 ppt at the surface to 35.40 ppt at -5.0m AHD.
- R7, salinity ranged from 33.94 ppt at the surface to 35.45 ppt at -8.0m AHD.

pH was relatively uniform throughout the water column and the study area. For instance:

- C4, pH ranged from 7.78 at the surface to 7.80 at -6.0m AHD.
- C5, pH ranged from 7.75 at the surface to 7.63 at -6.5m AHD
- IM4, pH ranged from 7.79 at the surface to 7.80 at -7.5m AHD.
- R8, pH ranged from 7.81 at the surface to 7.81 at -7.0m AHD.

Dissolved oxygen decreased with depth or was uniform throughout the water column and the study area. For instance:

- C7, dissolved oxygen decreased from 94.9% saturation at the surface to 89.4% saturation at --6.0m AHD.

- R5 (now IM7), dissolved oxygen decreased from 91.9% saturation at the surface to 69.6% saturation at -7.5m AHD.
- R6 (now IM8), dissolved oxygen decreased from 94.2% saturation at the surface to 75.8% saturation at -6.5m AHD
- R10, dissolved oxygen decreased from 94.6% saturation at the surface to 80.0 % saturation at -6.5m AHD (**Appendix 1**).

The physical characteristics of the bottom waters of Lake Macquarie in March 2023 were as follows:

- Water Temperature ranged from 26.18^{o}C to 28.01^{o}C. Mean water temperature was 26.90^{o}C.
- Conductivity ranged from 56.97 mS/cm to 57.86 mS/cm. Mean conductivity was 57.48 mS/cm.
- Salinity ranged from 34.85 ppt to 35.57 ppt. Mean salinity was 35.28 ppt.
- Turbidity ranged from 14.20 NTU to 43.60 NTU. Mean turbidity was 27.46 NTU.
- pH ranged from 7.57 and 7.84. Mean pH was 7.73.
- Dissolved oxygen (% saturation) ranged from 69.60% to 100.8%. Mean dissolved oxygen was 88.35% saturation.
- Dissolved oxygen (mg/L) ranged from 4.51 mg/L to 6.45 mg/L. Mean dissolved oxygen was 5.68 mg/L (**Table 9.1**).

Rainfall in the months preceding the survey were 124.6mm and 90.8mm for January and February 2023 respectively (Cooranbong Lake Macquarie AWS No. 061412). By 15th March a further 28.2 mm had fallen in the catchment.

Table 9.2 provides the averages for bottom water quality variables from 2013 to 2022. Average conductivity, salinity, dissolved oxygen and turbidity were comparable to current levels. Average water temperatures of bottom waters in the study area, however, have increased since March 2017.

Table 9.1 Physical characteristics of the bottom water – March 2023

Station	Temperature °C	Conductivity mS/cm	Salinity ppt	DO % sat	DO mg/L	pH	Turbidity NTU	Depth m
Control Stations								
C1	26.72	57.65	35.41	93.3	6.00	7.83	34.2	5.00
C2	26.33	56.97	34.85	85.6	5.58	7.64	33.0	5.50
C3	26.46	57.27	35.12	77.3	5.05	7.62	29.0	6.50
C4	27.54	57.54	35.36	97.6	6.20	7.80	23.7	6.00
C5	26.32	57.16	35.04	74.7	4.85	7.63	22.3	6.50
C6	28.01	57.69	35.44	89.6	5.65	7.79	19.7	6.50
C7	26.18	56.98	34.91	90.2	5.88	7.70	21.1	6.00
Mean	**26.79**	**57.32**	**35.16**	**86.90**	**5.60**	**7.72**	**26.14**	**6.00**
Min	**26.18**	**56.97**	**34.85**	**74.7**	**4.85**	**7.62**	**19.7**	**5**
Max	**28.01**	**57.69**	**35.44**	**97.6**	**6.2**	**7.83**	**34.2**	**6.5**
Reference Stations								
R1	27.34	57.61	35.37	83.5	5.36	7.75	22.6	4.50
R2	26.45	57.62	35.40	90.2	5.78	7.81	32.8	5.00
R7	26.55	57.71	35.45	69.6	4.58	7.58	43.6	8.00
R8	27.35	57.51	35.31	94.6	6.03	7.81	20.1	7.00
R9	27.25	57.63	35.40	99.7	6.36	7.83	17.0	4.50
R10	26.45	57.45	35.25	80.8	5.21	7.64	40.8	6.50
R11	26.36	57.30	35.14	90.9	5.90	7.68	20.9	7.50
Mean	**26.82**	**57.55**	**35.33**	**87.04**	**5.60**	**7.73**	**28.26**	**6.14**
Min	**26.36**	**57.3**	**35.14**	**69.6**	**4.58**	**7.58**	**17**	**4.50**
Max	**27.35**	**57.71**	**35.45**	**99.7**	**6.36**	**7.83**	**43.6**	**8.00**
Impact Stations								
IM1	26.69	57.62	35.38	93.8	6.04	7.84	33.5	5.00
IM2	27.35	57.56	35.34	100.8	6.45	7.80	29.1	4.50
IM3	27.31	57.50	35.31	94.4	6.01	7.80	14.2	6.50
IM4	27.4	57.46	35.26	98.5	6.29	7.80	26.3	7.50
R3 (IM5)	27.05	57.34	35.19	97.8	6.26	7.82	27.6	6.50
R4 (IM6)	27.29	57.40	35.20	95.0	6.06	7.79	24.1	6.50
R5 (IM7)	26.64	57.86	35.57	70.4	4.51	7.57	33.4	7.50
R6 (IM8)	26.79	57.64	35.40	75.5	4.88	7.59	35.1	6.50
Mean	**27.07**	**57.55**	**35.33**	**90.78**	**5.81**	**7.75**	**27.91**	**6.31**
Min	**26.64**	**57.34**	**35.19**	**70.4**	**4.51**	**7.57**	**14.2**	**4.50**
Max	**27.4**	**57.86**	**35.57**	**100.8**	**6.45**	**7.84**	**35.1**	**7.50**
Bottom Water Quality - all stations								
Mean	**26.90**	**57.48**	**35.28**	**88.35**	**5.68**	**7.73**	**27.46**	**6.16**
Min	**26.18**	**56.97**	**34.85**	**69.60**	**4.51**	**7.57**	**14.20**	**4.50**
Max	**28.01**	**57.86**	**35.57**	**100.8**	**6.45**	**7.84**	**43.60**	**8.00**

Table 9.2 Average water quality of bottom waters - 2013 to 2022.

	Temperature ºC	Conductivity mS/cm	Salinity ppt	Dissolved Oxygen % sat	Dissolved Oxygen Mg/L	pH	Turbidity MTU
Sep-13	17.34	53.23	35.11	95.43	7.41	8.69	11.83
Mar-14		49.60	32.40	92.3		8.10	7.8
Mar-16	27.54	51.00	33.40	99.2	6.50	8.20	4.0
Mar-17	23.90	57.10	38.00	109.5	7.42	8.30	7.5
Mar-18	25.73	58.47	39.04	87.7	5.73	8.96	46.5
Mar-19	26.20	58.39	38.97	83.3	5.39	9.74	1.6
Mar-20	24.86	50.52	33.33	63.6	4.36	8.69	6.88
Mar-21	24.93	51.88	34.11	88.9	6.05	7.98	5.02
Mar-22	24.36	53.77	35.55	90.0	6.12	8.58	11.39

10. Conclusions

The results from the March 2023 benthic communities monitoring results show compliance to the Schedule 4 Environmental Conditions - underground mining of SSD5465 - Modification 4 in the Performance Measures table with respect to the Subsidence Impact Performance Measure for Benthic communities which display nil to minor environmental consequences due to underground mining.

The below summary of findings outlines the historical basis for this compliance statement and the compliance is detailed in the table below.

Conditions from SSD-5465 – Mod 4	Compliance Status and Comments
Schedule 4 Environmental Conditions – underground mining Performance Measures – Natural Environment Biodiversity – Benthic Communities Subsidence Impact Performance Measure – Minor environmental consequences, including minor changes composition and/or distribution.	Compliant – See section 16 - Conclusions
Measurements undertaken by generally accepted methods. Measures Methods fully described.	Compliant – See section 4 and 5 Compliant – See section 4 and 5

In March 2023, 22 benthic stations were sampled in the study area. A total of 1287 organisms

greater than 1mm in size were found, comprising 13 species. This compares with the results from March 2018, March 2019, March 2020, March 2021 and March 2022 where 1160, 832, 1032, 797 and 1196 organisms respectively were recorded representing approximately twelve species. As in previous years, polychaete worms and bivalve molluscs were the most frequently encountered animals. Although it should be noted that the bivalve *Soletellina alba* comprised 63 percent of the fauna collected. Stations were distinguished by the relative abundance of the dominant species. Water depth does not appear to be determining species composition.

Physical variables such as salinity, conductivity and turbidity of the bottom water had little influence on the species composition of the benthos. Dissolved oxygen concentration, however, can have a major effect on abundance. Major extinction events have occurred in the mud basin of Lake Macquarie. The evidence for this lies in the presence of large numbers of intact but dead bivalve shells entombed in the mud. The cause of extinction events appears to be prolonged dissolved oxygen depletion of bottom water. Prolonged dissolved oxygen depletion of the bottom water was measured during the water quality study conducted by Laxton and Laxton (1983 to 1997) and low dissolved oxygen levels were measured during the March 2020 benthic survey. In March 2023, dissolved oxygen levels of Lake Macquarie ranged from 4.50 mg/L to 6.49 mg/L or 69.6% to 101.1% saturation. Surface waters generally had higher concentrations of dissolved oxygen than the bottom waters.

Bottom sediment in the study area was composed of fine black mud with varying proportions of black sand and shell fragments.

These results appear to support the notion that increasing the water depth within the subsidence limit of 0.78m defined in Development Consent SSD-5465 (MOD 4) has, to date, had little to no discernible effect on the composition and abundance of organisms making up the benthos of the mud basin.

11. References

Laxton, J.H. and Emma Laxton (2007). Aquatic Biology of Chain Valley Bay Lake Macquarie, NSW. Report to Peabody/Lake Coal Chain Valley Colliery.

12. Acknowledgements

We wish to acknowledge the help of Mr Lachlan McWha in facilitating the study.

Appendix 1 – Water quality profiles for control, impact and reference stations Mar 23

C1	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	11/03/2023	10:30:53	27.52	57.54	19.7	7.81	35.33	95.3	6.06	0.5
	11/03/2023	10:31:16	27.44	57.52	20.0	7.81	35.32	96.8	6.17	1.0
	11/03/2023	10:31:19	27.43	57.53	20.1	7.81	35.32	96.8	6.17	1.5
	11/03/2023	10:31:40	27.40	57.56	20.0	7.81	35.34	97.6	6.23	2.0
	11/03/2023	10:32:14	27.34	57.57	19.8	7.81	35.36	98.4	6.28	2.5
	11/03/2023	10:32:32	27.14	57.61	19.9	7.82	35.38	99.4	6.36	3.0
	11/03/2023	10:32:56	26.92	57.62	20.7	7.82	35.39	98.9	6.35	3.5
	11/03/2023	10:33:14	26.76	57.66	22.9	7.82	35.42	97.7	6.30	4.0
	11/03/2023	10:33:30	26.72	57.64	28.8	7.82	35.40	97.5	6.29	4.5
	11/03/2023	10:35:13	26.72	57.64	43.4	7.83	35.40	92.6	5.97	5.0
		Average	**27.14**	**57.59**	**23.53**	**7.82**	**35.37**	**97.10**	**6.22**	**2.75**
		Min	**26.72**	**57.52**	**19.70**	**7.81**	**35.32**	**92.60**	**5.97**	**0.50**
		Max	**27.52**	**57.66**	**43.40**	**7.83**	**35.42**	**99.40**	**6.36**	**5.00**

C2	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	15/03/2023	11:57:36	26.20	56.10	17.6	7.67	34.25	94.2	6.16	0.5
	15/03/2023	11:57:39	26.19	56.10	17.6	7.67	34.25	94.0	6.15	1.0
	15/03/2023	11:57:59	25.94	56.23	17.5	7.71	34.35	98.4	6.47	1.5
	15/03/2023	11:58:19	25.89	56.23	17.2	7.72	34.35	100.7	6.62	2.0
	15/03/2023	11:58:44	25.82	56.22	16.9	7.72	34.34	102.3	6.74	2.5
	15/03/2023	11:59:01	25.77	56.22	16.8	7.72	34.34	103.0	6.79	3.0
	15/03/2023	11:59:45	25.76	56.27	18.6	7.71	34.37	100.8	6.64	3.5
	15/03/2023	12:00:05	25.82	56.30	22.2	7.70	34.40	101.1	6.66	4.0
	15/03/2023	12:00:31	26.09	56.76	32.8	7.64	34.75	87.9	5.75	4.5
	15/03/2023	12:00:34	26.08	56.76	33.4	7.64	34.75	87.7	5.74	5.0
	15/03/2023	12:02:00	25.96	56.40	31.5	7.68	34.47	91.0	5.97	5.5
		Average	**25.96**	**56.33**	**22.01**	**7.69**	**34.42**	**96.46**	**6.34**	**3.00**
		Min	**25.76**	**56.10**	**16.80**	**7.64**	**34.25**	**87.70**	**5.74**	**0.50**
		Max	**26.20**	**56.76**	**33.40**	**7.72**	**34.75**	**103.00**	**6.79**	**5.50**

C3	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	15/03/2023	11:35:03	25.57	55.75	16.6	7.74	33.98	96.9	6.42	0.5
	15/03/2023	11:35:37	25.58	56.03	16.6	7.74	34.19	96.7	6.40	1.0
	15/03/2023	11:35:58	25.72	56.16	16.8	7.74	34.29	97.3	6.42	1.5
	15/03/2023	11:36:28	25.78	56.26	17.1	7.73	34.37	98.2	6.47	2.0
	15/03/2023	11:36:56	26.11	56.55	17.7	7.72	34.59	97.3	6.36	2.5
	15/03/2023	11:37:33	26.17	56.66	18.5	7.72	34.67	99.2	6.48	3.0
	15/03/2023	11:38:09	26.26	56.78	18.1	7.72	34.76	100.0	6.52	3.5
	15/03/2023	11:38:12	26.26	56.78	18.1	7.72	34.76	100.0	6.52	4.0
	15/03/2023	11:38:36	26.34	56.90	18.3	7.71	34.85	100.1	6.51	4.5
	15/03/2023	11:39:04	26.45	57.05	18.5	7.70	34.96	99.3	6.45	5.0
	15/03/2023	11:39:24	26.53	57.21	18.6	7.69	35.08	98.6	6.39	5.5
	15/03/2023	11:39:43	26.51	57.22	21.5	7.66	35.09	94.3	6.11	6.0
	15/03/2023	11:41:25	26.48	57.25	29.3	7.62	35.11	78.9	5.12	6.5
		Average	**26.14**	**56.66**	**18.90**	**7.71**	**34.67**	**96.68**	**6.32**	**3.50**
		Min	**25.57**	**55.75**	**16.60**	**7.62**	**33.98**	**78.90**	**5.12**	**0.50**
		Max	**26.53**	**57.25**	**29.30**	**7.74**	**35.11**	**100.10**	**6.52**	**6.50**

C4	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	11/03/2023	7:04:09	27.96	57.69	22.0	7.78	35.44	93.3	5.89	0.5
	11/03/2023	7:04:17	27.98	57.70	21.1	7.78	35.45	94.5	5.97	1.0
	11/03/2023	7:04:40	27.92	57.66	22.0	7.78	35.42	93.3	5.90	1.5
	11/03/2023	7:05:11	27.89	57.66	21.7	7.78	35.42	97.4	6.16	2.0
	11/03/2023	7:05:52	27.83	57.58	23.8	7.79	35.36	95.0	6.02	2.5
	11/03/2023	7:06:14	27.69	57.61	21.5	7.79	35.38	97.6	6.20	3.0
	11/03/2023	7:06:39	27.68	57.60	22.3	7.79	35.38	98.1	6.23	3.5
	11/03/2023	7:07:02	27.57	57.57	21.6	7.80	35.36	99.5	6.33	4.0
	11/03/2023	7:07:27	27.57	57.58	22.2	7.80	35.36	100.0	6.36	4.5
	11/03/2023	7:07:48	27.56	57.58	23.5	7.80	35.36	100.3	6.38	5.0
	11/03/2023	7:08:06	27.54	57.58	25.8	7.80	35.36	100.5	6.40	5.5
	11/03/2023	7:09:23	27.54	57.56	26.2	7.80	35.34	96.7	6.15	6.0
		Average	**27.73**	**57.61**	**22.81**	**7.79**	**35.39**	**97.18**	**6.17**	**3.25**
		Min	**27.54**	**57.56**	**21.10**	**7.78**	**35.34**	**93.30**	**5.89**	**0.50**
		Max	**27.98**	**57.70**	**26.20**	**7.80**	**35.45**	**100.50**	**6.40**	**6.00**

C5	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	15/03/2023	10:11:13	25.58	55.86	18.6	7.75	34.07	95.7	6.34	0.5
	15/03/2023	10:11:31	25.58	55.85	18.5	7.76	34.06	96.3	6.38	1.0
	15/03/2023	10:11:45	25.69	56.02	18.8	7.75	34.19	97.0	6.41	1.5
	15/03/2023	10:12:04	25.78	56.18	19.1	7.75	34.31	98.0	6.46	2.0
	15/03/2023	10:12:21	25.81	56.26	19.1	7.75	34.37	98.7	6.50	2.5
	15/03/2023	10:12:37	25.90	56.38	19.2	7.74	34.46	99.1	6.51	3.0
	15/03/2023	10:12:53	25.96	56.50	19.3	7.74	34.55	99.5	6.53	3.5
	15/03/2023	10:13:30	26.28	56.93	19.8	7.71	34.87	97.5	6.35	4.0
	15/03/2023	10:14:02	26.36	57.05	20.1	7.70	34.97	94.7	6.16	4.5
	15/03/2023	10:14:30	26.37	57.09	20.2	7.69	34.99	93.6	6.09	5.0
	15/03/2023	10:14:50	26.34	57.13	21.8	7.65	35.02	86.8	5.64	5.5
	15/03/2023	10:15:03	26.32	57.16	31.3	7.60	35.05	77.1	5.01	6.0
	15/03/2023	10:16:39	26.34	57.14	22.2	7.63	35.03	75.0	4.87	6.5
		Average	**26.02**	**56.58**	**20.62**	**7.71**	**34.61**	**93.00**	**6.10**	**3.50**
		Min	**25.58**	**55.85**	**18.50**	**7.60**	**34.06**	**75.00**	**4.87**	**0.50**
		Max	**26.37**	**57.16**	**31.30**	**7.76**	**35.05**	**99.50**	**6.53**	**6.50**

C6	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	11/03/2023	6:36:52	27.77	57.67	20.1	7.78	35.43	91.7	5.81	0.5
	11/03/2023	6:36:55	27.77	57.66	20.0	7.78	35.42	91.7	5.81	0.5
	11/03/2023	6:37:14	27.78	57.65	20.4	7.78	35.42	91.3	5.78	1.0
	11/03/2023	6:37:42	27.75	57.65	47.2	7.78	35.42	93.8	5.95	1.5
	11/03/2023	6:38:11	27.75	57.65	19.8	7.78	35.41	95.5	6.06	2.0
	11/03/2023	6:38:33	27.71	57.64	19.3	7.79	35.41	97.2	6.17	2.5
	11/03/2023	6:38:52	27.69	57.63	19.6	7.79	35.40	98.5	6.25	3.0
	11/03/2023	6:39:10	27.68	57.63	19.6	7.79	35.40	99.5	6.31	3.5
	11/03/2023	6:39:27	27.59	57.62	18.7	7.80	35.39	101.6	6.46	4.0
	11/03/2023	6:39:48	27.57	57.62	21.2	7.80	35.39	104.0	6.61	4.5
	11/03/2023	6:40:04	27.56	57.61	19.5	7.80	35.39	104.4	6.64	5.0
	11/03/2023	6:40:35	27.51	57.60	22.3	7.80	35.38	103.5	6.59	5.5
	11/03/2023	6:41:17	27.52	57.60	30.7	7.80	35.37	99.9	6.36	6.0
	11/03/2023	7:03:31	28.01	57.69	19.7	7.79	35.44	89.6	5.65	6.5
		Average	**27.69**	**57.64**	**22.72**	**7.79**	**35.41**	**97.30**	**6.18**	**3.29**
		Min	**27.51**	**57.60**	**18.70**	**7.78**	**35.37**	**89.60**	**5.65**	**0.50**
		Max	**28.01**	**57.69**	**47.20**	**7.80**	**35.44**	**104.40**	**6.64**	**6.50**

C7	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	15/03/2023	9:46:33	24.92	55.62	17.7	7.77	33.89	94.9	6.36	0.5
	15/03/2023	9:46:55	24.97	55.74	18.5	7.77	33.98	95.2	6.37	1.0
	15/03/2023	9:47:14	25.00	55.75	18.5	7.77	33.99	95.6	6.40	1.5
	15/03/2023	9:47:33	25.05	55.82	18.8	7.77	34.04	96.4	6.44	2.0
	15/03/2023	9:47:51	25.06	55.86	18.8	7.77	34.07	97.3	6.50	2.5
	15/03/2023	9:48:09	25.17	55.96	18.9	7.76	34.14	97.9	6.52	3.0
	15/03/2023	9:48:38	25.36	56.28	19.4	7.75	34.38	97.0	6.44	3.5
	15/03/2023	9:48:57	25.40	56.35	19.4	7.75	34.43	97.3	6.45	4.0
	15/03/2023	9:49:13	25.88	56.87	20.5	7.73	34.83	96.7	6.34	4.5
	15/03/2023	9:49:35	26.11	56.96	20.2	7.72	34.89	97.6	6.38	5.0
	15/03/2023	9:49:48	26.18	57.01	21.6	7.70	34.93	95.8	6.25	5.5
	15/03/2023	9:51:32	26.17	56.99	20.8	7.70	34.91	89.4	5.83	6.0
		Average	**25.44**	**56.27**	**19.43**	**7.75**	**34.37**	**95.93**	**6.36**	**3.25**
		Min	**24.92**	**55.62**	**17.70**	**7.70**	**33.89**	**89.40**	**5.83**	**0.50**
		Max	**26.18**	**57.01**	**21.60**	**7.77**	**34.93**	**97.90**	**6.52**	**6.00**

IM1	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	11/03/2023	10:56:26	27.88	57.53	19.8	7.82	35.33	96.4	6.10	0.5
	11/03/2023	10:56:47	27.63	57.54	20.2	7.83	35.33	97.5	6.20	1.0
	11/03/2023	10:57:50	27.48	57.55	19.1	7.83	35.34	98.6	6.28	1.5
	11/03/2023	10:58:06	27.38	57.57	18.9	7.83	35.35	99.3	6.34	2.0
	11/03/2023	10:58:21	27.19	57.60	18.8	7.84	35.38	100.8	6.45	2.5
	11/03/2023	10:58:34	26.90	57.69	19.0	7.85	35.44	101.9	6.55	3.0
	11/03/2023	10:58:47	26.71	57.64	20.8	7.85	35.41	101.6	6.55	3.5
	11/03/2023	10:58:58	26.69	57.63	22.9	7.85	35.40	100.9	6.51	4.0
	11/03/2023	10:59:13	26.69	57.63	28.3	7.84	35.40	99.7	6.43	4.5
	11/03/2023	11:00:37	26.71	57.61	24.4	7.84	35.39	93.1	6.01	5.0
		Average	**27.13**	**57.60**	**21.22**	**7.84**	**35.38**	**98.98**	**6.34**	**2.75**
		Min	**26.69**	**57.53**	**18.80**	**7.82**	**35.33**	**93.10**	**6.01**	**0.50**
		Max	**27.88**	**57.69**	**28.30**	**7.85**	**35.44**	**101.90**	**6.55**	**5.00**

IM2	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	11/03/2023	8:55:35	27.51	57.57	19.8	7.79	35.36	93.0	5.92	0.5
	11/03/2023	8:56:05	27.50	57.55	20.5	7.79	35.34	94.1	5.99	0.5
	11/03/2023	8:56:22	27.49	57.56	20.7	7.79	35.35	95.2	6.06	1.0
	11/03/2023	8:56:38	27.47	57.58	20.1	7.79	35.36	98.5	6.27	1.5
	11/03/2023	8:56:57	27.41	57.61	24.5	7.80	35.39	99.3	6.33	2.0
	11/03/2023	8:57:18	27.44	57.55	20.7	7.80	35.34	101.3	6.45	2.5
	11/03/2023	8:57:33	27.39	57.56	20.6	7.80	35.35	102.3	6.53	3.0
	11/03/2023	8:57:54	27.36	57.55	20.7	7.80	35.34	103.8	6.63	3.5
	11/03/2023	8:58:12	27.35	57.55	20.9	7.80	35.34	105.7	6.75	4.0
	11/03/2023	8:59:33	27.35	57.55	22.5	7.80	35.34	100.7	6.43	4.5
		Average	**27.43**	**57.56**	**21.10**	**7.80**	**35.35**	**99.39**	**6.34**	**2.30**
		Min	**27.35**	**57.55**	**19.80**	**7.79**	**35.34**	**93.00**	**5.92**	**0.50**
		Max	**27.51**	**57.61**	**24.50**	**7.80**	**35.39**	**105.70**	**6.75**	**4.50**

IM3	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	11/03/2023	9:17:18	27.54	57.53	20.2	7.79	35.32	91.7	5.83	0.5
	11/03/2023	9:17:40	27.54	57.51	20.4	7.79	35.31	92.7	5.90	1.0
	11/03/2023	9:17:55	27.51	57.52	21.0	7.79	35.31	94.2	6.00	1.5
	11/03/2023	9:18:15	27.50	57.51	20.3	7.79	35.31	96.1	6.12	2.0
	11/03/2023	9:18:36	27.48	57.51	20.3	7.79	35.31	96.6	6.15	2.5
	11/03/2023	9:18:53	27.47	57.52	20.3	7.79	35.31	97.8	6.23	3.0
	11/03/2023	9:19:14	27.42	57.52	21.2	7.80	35.31	99.0	6.31	3.5
	11/03/2023	9:19:36	27.39	57.51	20.3	7.80	35.31	100.1	6.39	4.0
	11/03/2023	9:19:54	27.36	57.51	20.0	7.80	35.31	100.9	6.44	4.5
	11/03/2023	9:20:19	27.35	57.51	20.7	7.80	35.31	100.8	6.44	5.0
	11/03/2023	9:20:45	27.32	57.50	25.6	7.80	35.30	100.2	6.40	5.5
	11/03/2023	9:20:48	27.32	57.50	25.5	7.80	35.30	100.0	6.39	6.0
	11/03/2023	9:22:33	27.30	57.51	14.0	7.80	35.31	93.6	5.98	6.5
		Average	**27.42**	**57.51**	**20.75**	**7.80**	**35.31**	**97.21**	**6.20**	**3.50**
		Min	**27.30**	**57.50**	**14.00**	**7.79**	**35.30**	**91.70**	**5.83**	**0.50**
		Max	**27.54**	**57.53**	**25.60**	**7.80**	**35.32**	**100.90**	**6.44**	**6.50**

IM4	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	11/03/2023	8:17:52	27.38	57.48	21.4	7.79	35.28	96.2	6.14	0.5
	11/03/2023	8:17:55	27.37	57.48	21.0	7.79	35.28	96.4	6.16	1.0
	11/03/2023	8:18:18	27.38	57.47	20.9	7.80	35.28	94.0	6.00	1.5
	11/03/2023	8:18:36	27.38	57.48	21.2	7.80	35.28	93.6	5.98	2.0
	11/03/2023	8:18:59	27.39	57.47	21.1	7.80	35.28	95.8	6.11	2.5
	11/03/2023	8:19:28	27.39	57.47	21.1	7.80	35.28	96.1	6.13	3.0
	11/03/2023	8:19:46	27.40	57.46	20.8	7.80	35.27	97.0	6.19	3.5
	11/03/2023	8:20:04	27.39	57.47	21.2	7.80	35.28	98.2	6.26	4.0
	11/03/2023	8:20:23	27.39	57.47	23.4	7.80	35.28	101.5	6.48	4.5
	11/03/2023	8:20:40	27.39	57.47	20.7	7.80	35.28	103.3	6.59	5.0
	11/03/2023	8:20:55	27.39	57.47	21.0	7.80	35.28	104.2	6.65	5.5
	11/03/2023	8:21:11	27.40	57.47	20.8	7.80	35.28	104.7	6.68	6.0
	11/03/2023	8:21:28	27.40	57.46	20.5	7.80	35.27	106.0	6.77	6.5
	11/03/2023	8:21:44	27.39	57.46	24.6	7.80	35.27	106.0	6.77	7.0
	11/03/2023	8:23:48	27.40	57.46	32.2	7.80	35.27	95.9	6.12	7.5
		Average	**27.39**	**57.47**	**22.13**	**7.80**	**35.28**	**99.26**	**6.34**	**4.00**
		Min	**27.37**	**57.46**	**20.50**	**7.79**	**35.27**	**93.60**	**5.98**	**0.50**
		Max	**27.40**	**57.48**	**32.20**	**7.80**	**35.28**	**106.00**	**6.77**	**7.50**

R3 (IM5)	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	11/03/2023	7:27:53	27.00	57.37	21.6	7.83	35.20	91.0	5.85	0.5
	11/03/2023	7:28:23	27.02	57.36	21.6	7.82	35.19	93.4	6.00	1.0
	11/03/2023	7:28:44	27.04	57.36	22.0	7.82	35.20	97.5	6.26	1.5
	11/03/2023	7:29:00	27.04	57.36	23.6	7.82	35.19	98.2	6.30	2.0
	11/03/2023	7:29:17	27.05	57.41	23.3	7.82	35.23	97.6	6.27	2.5
	11/03/2023	7:29:20	27.06	57.40	23.8	7.82	35.23	97.7	6.27	3.0
	11/03/2023	7:29:36	27.05	57.35	21.9	7.82	35.19	99.0	6.36	3.5
	11/03/2023	7:29:53	27.04	57.36	21.7	7.82	35.19	100.3	6.44	4.0
	11/03/2023	7:30:07	27.04	57.35	21.7	7.83	35.19	100.6	6.46	4.5
	11/03/2023	7:30:30	27.05	57.35	24.8	7.82	35.19	100.9	6.48	5.0
	11/03/2023	7:30:56	27.04	57.36	21.7	7.82	35.20	101.1	6.49	5.5
	11/03/2023	7:31:16	27.04	57.35	23.1	7.82	35.19	101.2	6.50	6.0
	11/03/2023	7:32:19	27.04	57.36	30.0	7.82	35.19	97.0	6.23	6.5
		Average	**27.04**	**57.36**	**23.14**	**7.82**	**35.20**	**98.12**	**6.30**	**3.50**
		Min	**27.00**	**57.35**	**21.60**	**7.82**	**35.19**	**91.00**	**5.85**	**0.50**
		Max	**27.06**	**57.41**	**30.00**	**7.83**	**35.23**	**101.20**	**6.50**	**6.50**

R4 (IM6)	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	11/03/2023	7:53:22	27.47	57.52	21.2	7.78	35.32	88.5	5.64	0.5
	11/03/2023	7:53:39	27.48	57.51	23.1	7.79	35.31	91.1	5.80	1.0
	11/03/2023	7:53:55	27.47	57.50	21.8	7.79	35.30	92.3	5.88	1.5
	11/03/2023	7:54:12	27.47	57.50	21.9	7.79	35.30	93.5	5.96	2.0
	11/03/2023	7:54:29	27.46	57.50	21.5	7.79	35.30	95.1	6.06	2.5
	11/03/2023	7:54:55	27.44	57.49	23.2	7.79	35.30	96.1	6.13	3.0
	11/03/2023	7:55:22	27.45	57.50	21.9	7.80	35.30	96.6	6.16	3.5
	11/03/2023	7:55:43	27.46	57.50	22.2	7.79	35.30	97.5	6.21	4.0
	11/03/2023	7:56:08	27.48	57.51	21.3	7.79	35.30	97.9	6.24	4.5
	11/03/2023	7:56:27	27.42	57.48	23.0	7.79	35.29	98.5	6.28	5.0
	11/03/2023	7:56:44	27.29	57.39	22.6	7.79	35.22	99.1	6.34	5.5
	11/03/2023	7:56:58	27.26	57.37	23.7	7.79	35.20	99.7	6.38	6.0
	11/03/2023	7:58:10	27.26	57.39	24.0	7.80	35.21	94.3	6.03	6.5
		Average	**27.42**	**57.47**	**22.42**	**7.79**	**35.28**	**95.40**	**6.09**	**3.50**
		Min	**27.26**	**57.37**	**21.20**	**7.78**	**35.20**	**88.50**	**5.64**	**0.50**
		Max	**27.48**	**57.52**	**24.00**	**7.80**	**35.32**	**99.70**	**6.38**	**6.50**

R5 (IM7)	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	15/03/2023	8:30:20	27.41	57.12	19.7	7.65	35.01	91.9	5.87	0.5
	15/03/2023	8:30:57	27.41	57.12	19.6	7.65	35.01	91.9	5.87	1.0
	15/03/2023	8:31:18	27.37	57.15	19.3	7.65	35.04	93.0	5.94	1.5
	15/03/2023	8:31:39	27.26	57.10	18.7	7.65	35.00	95.3	6.10	2.0
	15/03/2023	8:32:02	27.03	57.11	19.0	7.67	35.01	97.5	6.27	2.5
	15/03/2023	8:32:19	26.63	57.08	17.9	7.69	34.98	99.4	6.43	3.0
	15/03/2023	8:32:35	26.86	57.40	18.1	7.67	35.23	99.0	6.37	3.5
	15/03/2023	8:32:57	26.99	57.45	18.0	7.66	35.26	98.8	6.35	4.0
	15/03/2023	8:33:21	27.04	57.51	18.9	7.64	35.31	95.4	6.12	4.5
	15/03/2023	8:33:49	27.04	57.88	21.5	7.60	35.58	85.7	5.49	5.0
	15/03/2023	8:33:52	27.04	57.86	21.5	7.60	35.57	85.4	5.48	5.5
	15/03/2023	8:34:27	26.71	57.85	20.0	7.59	35.57	79.1	5.10	6.0
	15/03/2023	8:35:00	26.64	57.86	26.7	7.57	35.57	74.1	4.78	6.5
	15/03/2023	8:35:26	26.64	57.85	28.3	7.57	35.57	73.3	4.73	7.0
	15/03/2023	8:36:50	26.64	57.86	32.4	7.57	35.57	69.6	4.49	7.5
		Average	**26.98**	**57.48**	**21.31**	**7.63**	**35.29**	**88.63**	**5.69**	**4.00**
		Min	**26.63**	**57.08**	**17.90**	**7.57**	**34.98**	**69.60**	**4.49**	**0.50**
		Max	**27.41**	**57.88**	**32.40**	**7.69**	**35.58**	**99.40**	**6.43**	**7.50**

R6 (IM8)	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	15/03/2023	8:56:26	27.15	57.20	20.8	7.66	35.07	94.2	6.04	0.5
	15/03/2023	8:57:24	27.17	57.19	21.4	7.66	35.06	95.7	6.14	1.0
	15/03/2023	8:58:01	27.18	57.17	21.2	7.66	35.05	96.4	6.18	1.5
	15/03/2023	8:58:26	27.18	57.16	21.2	7.66	35.04	97.2	6.23	2.0
	15/03/2023	8:58:49	27.16	57.17	21.0	7.66	35.05	98.8	6.34	2.5
	15/03/2023	8:59:09	27.15	57.16	21.1	7.66	35.04	99.8	6.40	3.0
	15/03/2023	8:59:29	27.10	57.15	20.6	7.67	35.04	101.1	6.49	3.5
	15/03/2023	9:00:14	26.71	57.31	19.7	7.67	35.16	97.6	6.30	4.0
	15/03/2023	9:00:46	26.91	57.44	19.8	7.66	35.25	97.0	6.24	4.5
	15/03/2023	9:01:10	26.92	57.50	19.9	7.65	35.30	94.0	6.04	5.0
	15/03/2023	9:01:42	26.98	57.64	20.4	7.63	35.40	91.3	5.86	5.5
	15/03/2023	9:02:05	26.79	57.63	26.4	7.59	35.40	82.8	5.33	6.0
	15/03/2023	9:03:44	26.77	57.64	23.7	7.59	35.41	75.8	4.88	6.5
		Average	**27.01**	**57.34**	**21.32**	**7.65**	**35.17**	**93.98**	**6.04**	**3.50**
		Min	**26.71**	**57.15**	**19.70**	**7.59**	**35.04**	**75.80**	**4.88**	**0.50**
		Max	**27.18**	**57.64**	**26.40**	**7.67**	**35.41**	**101.10**	**6.49**	**6.50**

R1	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	11/03/2023	10:05:20	27.55	57.55	20.9	7.81	35.34	93.1	5.92	0.5
	11/03/2023	10:05:49	27.54	57.57	21.1	7.80	35.35	93.9	5.98	1.0
	11/03/2023	10:06:12	27.56	57.56	20.5	7.81	35.35	94.9	6.04	1.5
	11/03/2023	10:06:32	27.44	57.59	21.2	7.79	35.37	92.8	5.92	2.0
	11/03/2023	10:06:59	27.46	57.58	20.4	7.80	35.36	94.2	6.00	2.5
	11/03/2023	10:07:28	27.36	57.58	19.9	7.77	35.36	90.1	5.75	3.0
	11/03/2023	10:07:51	27.35	57.60	21.4	7.75	35.37	86.3	5.51	3.5
	11/03/2023	10:08:17	27.32	57.62	43.9	7.74	35.39	81.5	5.20	4.0
	11/03/2023	10:09:33	27.35	57.59	21.4	7.76	35.37	83.3	5.32	4.5
		Average	**27.44**	**57.58**	**23.41**	**7.78**	**35.36**	**90.01**	**5.74**	**2.50**
		Min	**27.32**	**57.55**	**19.90**	**7.74**	**35.34**	**81.50**	**5.20**	**0.50**
		Max	**27.56**	**57.62**	**43.90**	**7.81**	**35.39**	**94.90**	**6.04**	**4.50**

R2	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	11/03/2023	11:20:51	27.49	57.60	16.9	7.79	35.38	98.3	6.26	0.5
	11/03/2023	11:21:21	27.46	57.64	16.9	7.80	35.41	99.0	6.30	1.0
	11/03/2023	11:21:48	27.29	57.66	16.6	7.81	35.42	100.4	6.41	1.5
	11/03/2023	11:22:16	27.11	57.61	16.0	7.82	35.39	101.9	6.53	2.0
	11/03/2023	11:22:46	26.96	57.61	18.1	7.83	35.39	101.4	6.51	2.5
	11/03/2023	11:23:04	26.83	57.64	18.8	7.83	35.41	100.8	6.49	3.0
	11/03/2023	11:23:19	26.77	57.60	17.6	7.83	35.38	100.8	6.49	3.5
	11/03/2023	11:23:35	26.48	57.59	26.5	7.82	35.37	98.4	6.37	4.0
	11/03/2023	11:23:53	26.59	57.77	46.1	7.80	35.50	92.8	6.00	4.5
	11/03/2023	11:25:11	26.44	57.64	33.0	7.82	35.40	88.7	5.75	5.0
		Average	**26.94**	**57.64**	**22.65**	**7.82**	**35.41**	**98.25**	**6.31**	**2.75**
		Min	**26.44**	**57.59**	**16.00**	**7.79**	**35.37**	**88.70**	**5.75**	**0.50**
		Max	**27.49**	**57.77**	**46.10**	**7.83**	**35.50**	**101.90**	**6.53**	**5.00**

R7	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	15/03/2023	11:08:34	25.68	55.69	18.1	7.75	33.94	97.8	6.47	0.5
	15/03/2023	11:08:59	25.66	55.69	17.2	7.76	33.94	98.9	6.54	1.0
	15/03/2023	11:09:23	25.48	55.64	17.1	7.77	33.90	100.3	6.66	1.5
	15/03/2023	11:09:50	25.44	55.65	16.9	7.77	33.91	101.4	6.74	2.0
	15/03/2023	11:10:17	25.98	56.47	17.7	7.74	34.53	99.8	6.55	2.5
	15/03/2023	11:10:42	26.22	56.70	18.4	7.73	34.70	99.1	6.47	3.0
	15/03/2023	11:11:03	26.27	56.76	18.6	7.71	34.74	97.9	6.39	3.5
	15/03/2023	11:11:28	26.37	56.96	19.6	7.69	34.89	94.3	6.13	4.0
	15/03/2023	11:11:57	26.50	57.26	21.5	7.66	35.12	88.8	5.76	4.5
	15/03/2023	11:12:19	26.52	57.30	22.7	7.66	35.15	89.0	5.76	5.0
	15/03/2023	11:12:38	26.52	57.30	23.0	7.65	35.15	88.5	5.74	5.5
	15/03/2023	11:13:05	26.52	57.39	22.2	7.64	35.22	86.8	5.62	6.0
	15/03/2023	11:13:36	26.52	57.40	21.1	7.64	35.23	86.5	5.60	6.5
	15/03/2023	11:14:01	26.58	57.65	23.7	7.60	35.42	79.4	5.13	7.0
	15/03/2023	11:14:31	26.56	57.71	30.7	7.59	35.46	74.4	4.81	7.5
	15/03/2023	11:16:06	26.56	57.70	34.6	7.58	35.45	69.6	4.50	8.0
		Average	**26.21**	**56.83**	**21.44**	**7.68**	**34.80**	**90.78**	**5.93**	**4.25**
		Min	**25.44**	**55.64**	**16.90**	**7.58**	**33.90**	**69.60**	**4.50**	**0.50**
		Max	**26.58**	**57.71**	**34.60**	**7.77**	**35.46**	**101.40**	**6.74**	**8.00**

R8	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	11/03/2023	9:40:30	27.57	57.52	20.6	7.81	35.32	95.1	6.05	0.5
	11/03/2023	9:41:09	27.55	57.52	21.1	7.81	35.31	96.3	6.13	1.0
	11/03/2023	9:41:34	27.56	57.51	20.4	7.80	35.31	97.6	6.21	1.5
	11/03/2023	9:41:55	27.52	57.49	21.6	7.81	35.30	97.8	6.23	2.0
	11/03/2023	9:42:17	27.47	57.50	22.8	7.81	35.30	97.8	6.23	2.5
	11/03/2023	9:42:42	27.43	57.51	23.3	7.81	35.31	98.6	6.29	3.0
	11/03/2023	9:43:04	27.41	57.50	22.8	7.81	35.30	99.1	6.32	3.5
	11/03/2023	9:43:27	27.39	57.50	21.6	7.81	35.30	100.0	6.38	4.0
	11/03/2023	9:43:46	27.37	57.51	21.4	7.81	35.31	101.0	6.44	4.5
	11/03/2023	9:44:02	27.35	57.50	20.5	7.81	35.30	101.8	6.50	5.0
	11/03/2023	9:44:25	27.34	57.50	22.2	7.81	35.30	102.0	6.51	5.5
	11/03/2023	9:44:50	27.35	57.51	39.6	7.80	35.31	100.5	6.42	6.0
	11/03/2023	9:46:38	27.34	57.51	21.0	7.81	35.31	94.3	6.02	6.5
	11/03/2023	9:46:41	27.34	57.51	20.8	7.81	35.31	94.3	6.02	7.0
		Average	**27.43**	**57.51**	**22.84**	**7.81**	**35.31**	**98.30**	**6.27**	**3.75**
		Min	**27.34**	**57.49**	**20.40**	**7.80**	**35.30**	**94.30**	**6.02**	**0.50**
		Max	**27.57**	**57.52**	**39.60**	**7.81**	**35.32**	**102.00**	**6.51**	**7.00**

R9	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	11/03/2023	11:47:11	28.07	57.62	18.3	7.78	35.39	97.2	6.13	0.5
	11/03/2023	11:47:35	27.82	57.60	17.9	7.79	35.38	98.1	6.21	1.0
	11/03/2023	11:47:59	27.63	57.61	17.7	7.81	35.38	100.0	6.35	1.5
	11/03/2023	11:48:22	27.56	57.61	17.2	7.82	35.38	101.7	6.47	2.0
	11/03/2023	11:48:44	27.40	57.58	16.7	7.83	35.36	103.5	6.60	2.5
	11/03/2023	11:49:09	27.26	57.61	16.6	7.83	35.39	102.6	6.55	3.0
	11/03/2023	11:49:31	27.26	57.63	16.5	7.83	35.40	102.6	6.56	3.5
	11/03/2023	11:49:53	27.30	57.68	47.1	7.83	35.44	102.3	6.53	4.0
	11/03/2023	11:50:59	27.27	57.62	16.2	7.83	35.39	99.2	6.34	4.5
		Average	**27.51**	**57.62**	**20.47**	**7.82**	**35.39**	**100.80**	**6.42**	**2.50**
		Min	**27.26**	**57.58**	**16.20**	**7.78**	**35.36**	**97.20**	**6.13**	**0.50**
		Max	**28.07**	**57.68**	**47.10**	**7.83**	**35.44**	**103.50**	**6.60**	**4.50**

R10	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	15/03/2023	9:23:29	24.87	55.62	17.4	7.77	33.89	94.6	6.35	0.5
	15/03/2023	9:23:53	24.87	55.64	17.9	7.77	33.91	95.5	6.41	1.0
	15/03/2023	9:25:01	25.05	55.80	18.2	7.77	34.03	95.8	6.40	1.5
	15/03/2023	9:25:24	25.22	55.88	18.2	7.77	34.08	96.6	6.44	2.0
	15/03/2023	9:25:39	25.39	56.08	18.4	7.76	34.24	97.6	6.48	2.5
	15/03/2023	9:25:52	25.58	56.24	18.5	7.74	34.36	97.6	6.45	3.0
	15/03/2023	9:26:12	25.71	56.54	19.0	7.73	34.58	96.9	6.39	3.5
	15/03/2023	9:26:32	26.12	56.86	19.8	7.71	34.82	96.0	6.27	4.0
	15/03/2023	9:26:51	26.43	57.20	20.0	7.70	35.08	98.0	6.36	4.5
	15/03/2023	9:27:08	26.59	57.29	20.2	7.69	35.14	98.1	6.35	5.0
	15/03/2023	9:27:31	26.55	57.39	20.6	7.68	35.21	95.9	6.21	5.5
	15/03/2023	9:28:04	26.44	57.44	38.8	7.64	35.26	84.9	5.50	6.0
	15/03/2023	9:29:21	26.45	57.44	43.0	7.64	35.26	80.0	5.19	6.5
		Average	**25.79**	**56.57**	**22.31**	**7.72**	**34.60**	**94.42**	**6.22**	**3.50**
		Min	**24.87**	**55.62**	**17.40**	**7.64**	**33.89**	**80.00**	**5.19**	**0.50**
		Max	**26.59**	**57.44**	**43.00**	**7.77**	**35.26**	**98.10**	**6.48**	**6.50**

R11	Date	Time	Temp (oC)	Cond ms/cm	Turb (ntu)	pH (pH)	Sal (ppt)	D.O. (%sat)	DO (mg/L)	Depth (m)
	15/03/2023	10:46:01	25.55	55.82	17.8	7.76	34.04	94.8	6.28	0.5
	15/03/2023	10:46:21	25.55	55.81	17.9	7.76	34.03	94.6	6.27	1.0
	15/03/2023	10:46:36	25.52	55.83	17.9	7.76	34.04	95.0	6.30	1.5
	15/03/2023	10:46:47	25.54	55.85	17.9	7.76	34.06	96.2	6.38	2.0
	15/03/2023	10:46:58	25.75	56.17	18.2	7.76	34.30	97.6	6.43	2.5
	15/03/2023	10:47:17	25.98	56.43	18.4	7.75	34.49	99.5	6.53	3.0
	15/03/2023	10:47:36	26.14	56.60	18.8	7.74	34.62	100.9	6.60	3.5
	15/03/2023	10:47:53	26.36	56.96	19.3	7.73	34.90	100.6	6.54	4.0
	15/03/2023	10:48:18	26.39	57.12	19.8	7.70	35.02	96.3	6.26	4.5
	15/03/2023	10:48:41	26.39	57.11	19.8	7.69	35.01	94.9	6.17	5.0
	15/03/2023	10:48:59	26.32	57.11	20.2	7.68	35.01	92.7	6.03	5.5
	15/03/2023	10:49:27	26.36	57.21	19.5	7.70	35.08	96.9	6.29	6.0
	15/03/2023	10:49:47	26.38	57.24	19.3	7.70	35.11	97.7	6.35	6.5
	15/03/2023	10:50:00	26.37	57.28	19.8	7.69	35.14	97.0	6.30	7.0
	15/03/2023	10:51:23	26.36	57.28	21.3	7.69	35.14	90.6	5.88	7.5
		Average	**26.06**	**56.65**	**19.06**	**7.72**	**34.67**	**96.35**	**6.31**	**4.00**
		Min	**25.52**	**55.81**	**17.80**	**7.68**	**34.03**	**90.60**	**5.88**	**0.50**
		Max	**26.39**	**57.28**	**21.30**	**7.76**	**35.14**	**100.90**	**6.60**	**7.50**

Appendix 6: 2022 Benthic Communities Statistical Review

Benthic Communities Monitoring - Statistical Review 2022

Chain Valley Colliery

Prepared for Delta Coal

January 2023

Benthic Communities Monitoring - Statistical Review 2022

Chain Valley Colliery

Delta Coal

E220729 RP#1

January 2023

Version	Date	Prepared by	Approved by	Comments
1	29 November 2022	Dr Paul.Goldsworthy	Nathan Garvey	Draft
2	27 January 2023	Dr Paul Goldsworthy	Nathan Garvey	Final

Approved by



Nathan Garvey
Associate Director - Ecology
27 January 2023

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This report has been prepared in accordance with the brief provided by Delta Coal and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of Delta Coal and no responsibility will be taken for its use by other parties. Delta Coal may, at its discretion, use the report to inform regulators and the public.

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Executive Summary

Chain Valley Colliery (CVC) is an underground coal mine located beneath the southern end of Lake Macquarie, approximately 60 kilometres (km) south of Newcastle, NSW. CVC produces thermal coal for the domestic and export markets. As part of CVC's environmental performance, and to satisfy Condition 7(h), Schedule 4 of Development Consent for SSD-5465 (Modification 2), a Benthic Communities Management Plan (BCMP) was developed (CVC 2019).

Since 2012, CVC has monitored the soft sediment benthic community in shallow lake environments above their coal workings. The overall aim of the monitoring is to assess potential impacts of underground coal operations (primarily subsidence) on aquatic ecology using benthic communities as the specific indicator of impact. CVC undertakes six-monthly sampling of lake sediments for analysis of benthic community composition and environmental variables (water depth and sediment grain size). Samples are collected in Spring (March) and Autumn (September) at (potential) Impact, Reference, and Control sites.

At each site, Laxton Environmental Consultants P/L collected five replicate sediment samples by diver using 200 x 200 x 100 millimetre (mm) sieve boxes with 1 mm mesh. Samples were sieved to remove particles less than 1 mm and captured material preserved for laboratory sorting and enumeration of infauna. Sediment grain size analysis was undertaken on one 250 millilitre (mL) sample of sediment from each site. Infauna were categorised into operational taxonomic units (OTUs) comprising molluscs, polychaete worms and various higher taxa, such as terebellids, ophiuroids, echinoids, sponges, crabs, barnacles and fish.

EMM Consulting Pty Ltd (EMM) conducted statistical analysis on the full benthic dataset from September 2012–September 2022. Descriptive statistics (means, standard deviations, standard errors, minimums, maximums, and counts) were calculated within MS Excel. Summary statistics were subsequently used for visualisation of trends by site and by treatment (Impact versus Control versus Reference).

Raw abundance data were imported into PRIMER v6 for univariate and multivariate analysis. Raw benthic counts were used to calculate univariate diversity indices comprising total number of species (S), total number of individuals (N), species richness (Margalef, d), evenness (Pielou, J') and diversity (Shannon-Wiener, log e, H'). Multivariate analysis of the benthic community data included non-metric multidimensional scaling (nMDS), analysis of similarities (ANOSIM) and similarity percentage analysis (SIMPER), correlated with environmental variables (water depth and grain size) using principal components analysis (PCA).

From 19 sampling events between September 2012 and September 2022, a total of 24,265 benthic individuals from the 26 OTUs were counted in sediment samples from across the study area. The three most abundant taxa were the bivalve mollusc *Soletellina* (7,021 individuals), bivalve *Corbula* (6,167 individuals) and polychaetes-thin (6,126 individuals). Together these taxa accounted for 79% of the total number of benthic individuals collected. Each of these biodiversity indices were broadly similar across the sampling sites.

Ongoing development of CVC's underground coal extraction led to the redesignation of several Reference sites as Impact sites, with R3, R4, R5 and R6 becoming IM5, IM6, IM7 and IM8, respectively. To help discern greater relationship information, EMM focused univariate and multivariate statistical analysis of the different site treatments (Impact, Reference, and Control) for the monitoring period after redesignation of these sites (from September 2016 onwards).

From 13 sampling events between September 2016 and September 2022, a total of 16,347 benthic individuals from 26 OTUs were counted. Between 7 and 16 OTUs (mean 12.0) were reported per site, with the lowest number of OTUs at IM4 (7) and C2 (8) and the highest number of OTUs at IM2 and R7 (16). There was no clear spatial pattern associated with the number of OTUs per site treatments.

The total number of individuals per site varied between 494 (R8 and R11) and 1,152 (IM2). Abundances were lowest (<500 individuals) at R8 and R11 (494) and highest (>1,000 individuals) at C2 (1,017), IM2 (1,152) and IM5 (1,046). There was no clear spatial pattern associated with the abundance of benthic species per site treatments.

Multivariate pairwise test results (ANOSIM) indicated highly non-significant differences between all treatment pairs – Control versus Reference (99.2%), Control versus Impact (25.4%) and Reference versus Impact (30.1%) with a global R value of –0.019 at a significance level (p) of 0.6. Negative R-values are attributed to benthic habitats that are patchy and exhibit high variability between replicates (Chapman & Underwood 1999).

Cluster analysis of pair-wise Bray Curtis similarity between sites indicated that at 75% similarity level there were four site clusters: C5-C7-R11; IM2-IM5-R7; R10; and all remaining sites. Importantly, the Impact sites did not cluster together as a discrete group but were spread along the x-axis, interspersed amongst Reference and Control sites. Similarity patterns evident in the cluster analysis were further explored using an nMDS plot for abundance data at each site. The distribution (in nMDS space) of Impact, Reference and Control sites did not indicate site groupings attributed to impacts from CVC operations since benthic communities at most sites were tightly grouped (similar) and, except for IM2 and IM5, most sites with benthic communities that were significantly different to the main cluster of sites were Reference (R7, R10, R11) and Control (C5 and C7) sites.

SIMPER analysis of square-root transformed biological data indicated that more than 80% of the differences between the site clusters were mostly attributed to abundances of two polychaetes (mud and thin) and three bivalve molluscs, *Corbula*, *Soletellina* and *Trichomya*.

Mud polychaete abundances varied between site groups and over time, with notably lower abundances (and variability) apparent in the IM2-IM5-R7 cluster and at R10 compared to the other site clusters. Thin polychaete abundances were broadly similar for three of the four site clusters at each monitoring event, with higher abundances apparent within the 'all other' site cluster at most sampling times.

Abundances of bivalves *Corbula* and *Soletellina* were significantly higher within the 'all other' site cluster compared to the other three site clusters. *Trichomya* abundances were significantly higher within the IM2-IM5-R7 site cluster, driving the separation of this site's benthic community from the other sites. *Trichomya* abundances varied across time, being notably higher in samples collected in 2020 and 2021. This may be driven by changes in benthic habitats, such as higher levels of fine sediment, or a recruitment pulse due to favourable conditions in previous years. The exact cause is difficult to determine.

Importantly, the IM2-IM5-R7 cluster, that differed in benthic community structure from all other sites, did not change consistently over time (abundances neither increasing or decreasing) and therefore was not indicative of impacts from the CVC operations.

PCA, undertaken on the normalised environmental data, indicated that the three main site groups differentiated primarily due to silt, sand, and shell content, with minor differences in water depth being less important. The site groupings based on environmental variables (PCA) were different to the site groupings evident in benthic community structure (nMDS) which suggests that factors other than, or in addition to, sediment composition are driving the benthic structure.

From an ecological perspective, the benthic assemblages across the monitoring area fell into several groups that did not appear to be a response to CVC operations but were most likely due to subtle environmental variations driven by unknown environmental factors.

Monitoring sites C5-C7-R11 and R10 are furthest north and likely to be exposed to greater water circulation within greater Lake Macquarie that may provide increased food availability and/or better water quality that influences benthic community composition. Three of these sites – C5, C7 and R10 – had sediments with higher sand content which may support different benthic communities compared to the high silt areas further south and/or reflect greater water circulation likely at those sites.

Statistical analysis of CVC's benthic monitoring data did not indicate exceedance of the BCMP (CVC 2019) subsidence impact performance measure of "minor environmental consequences, including minor changes to species composition and/or distribution" has occurred.

EMM recommends that benthic monitoring could be scaled-back to annual data collection (in March) since the non-photosynthetic benthic communities are unlikely to exhibit strong seasonal variability.

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1 Introduction

Chain Valley Colliery (CVC) is an underground coal mine located beneath the southern end of Lake Macquarie, approximately 60 kilometres (km) south of Newcastle, NSW. CVC produces thermal coal for the domestic and export markets.

As part of CVC's environmental performance, and to satisfy Condition 7(h), Schedule 4 of Development Consent for SSD-5465 (Modification 2), a Benthic Communities Management Plan (BCMP) has been developed (CVC 2019). The stated purpose of this BCMP is to:

- outline details of the benthic communities monitoring data collected;
- outline existing and predicted subsidence levels;
- outline the methodology to be used to identify depth changes at monitoring locations;
- identify benthic community monitoring locations;
- identify reporting requirements;
- detail benthic community management measures;
- identify the requirements for incident or exceedances reporting and reviews of the document; and
- identify persons responsible for implementation of requirements.

Since 2012, CVC has monitored the soft sediment benthic community in shallow lake environments above their coal workings. The overall aim of the monitoring is to assess potential impacts of underground coal operations (primarily subsidence) on aquatic ecology, with benthic community composition as the specific indicator of impact.

CVC undertakes six-monthly sampling of lake sediments for analysis of benthic community composition and environmental variables (water depth and sediment grain size). Samples are collected in Spring (March) and Autumn (September) at (potential) Impact, Reference, and Control sites (**Appendix A**).

The BCMP defines the three site types:

- Impact sites – potentially currently or historically impacted upon by subsidence.
- Reference sites – not currently impacted by subsidence but fall within the proposed future mining footprint. Following undermining, Reference sites are redesignated as Impact sites.
- Control sites - will not be impacted upon by subsidence, comprising those areas lying outside the footprint of current and future coal workings.

Full details of the benthic sampling and analysis regime are provided in Section 4 of the BCMP (CVC 2019). At each site, five replicate sediment samples are collected by diver using 200 x 200 x 100 mm sieve boxes with 1 mm mesh. Samples are sieved to remove particles less than 1 mm and captured material is preserved in formaldehyde for laboratory sorting and enumeration of infauna. Sediment grain size analysis is undertaken on one 250 millilitres (mL) sample of sediment from each site.

The BCMP prescribes statistical analysis methods for univariate and multivariate analysis of the benthic monitoring data – biological and environmental (Table 1.1).

Table 1.1 Benthic monitoring data statistical methods (BCMP, CVC 2019)

Variable type	Analysis	Description
Environmental: Water Quality	ANZECC/ARMCANZ Guidelines	Trigger values for slightly – moderately disturbed
Biotic and Environmental	Univariate	Descriptive graphical statistics Analysis of Variance (2-way nested) Analysis of Similarity (2-way nested)
Biotic and Environmental	Multivariate	Square-root transformed, Bray-Curtis similarity matrices, Cluster analysis and dendrograms
	Multidimensional Scaling Ordination	Sites represented as points in space, relative distances indicate similarity
	BIOENV	Correlation between biotic and environmental data using PRIMER

EMM has undertaken statistical analysis of the supplied benthic monitoring data in accordance with the BCMP.

2 Methods

Statistical analysis was undertaken on the full benthic dataset (September 2012–September 2022) from Laxton Environmental, who undertake the field sampling programs on behalf of Delta Coal. The supplied benthic data were checked and reordered within multiple MS Excel worksheets to facilitate statistical analysis in accordance with the BCMP (CVC 2019).

Descriptive statistics (ie means, standard deviations, standard errors, minimums, maximums and counts) were calculated within MS Excel. Summary statistics were subsequently used for visualisation of trends by site and by treatment (impact versus control versus reference sites). For the purposes of analysis, the control and reference groups have been kept separate.

Raw data were imported into PRIMER v6 for univariate and multivariate analysis. PRIMER (Plymouth Routines in Multivariate Ecological Research) consists of a "wide range of univariate, graphical and multivariate routines for analysing arrays of species-by-samples data from community ecology" (Clarke & Gorley 2006) and is the software of choice for benthic ecology.

Univariate diversity indices were calculated from the raw benthic count data. Total number of species (S), total number of individuals (N), species richness (Margalef, d), evenness (Pielou, J') and diversity (Shannon-Wiener, log e, H') were calculated within PRIMER v6 (DIVERSE) and graphically presented to identify any site-by-site trends in benthic community structure.

Due to the high frequency of zeros in the benthic count data, the data were square root transformed to downplay taxa with comparatively high counts and to increase the statistical visibility of the rarer taxonomic groups. Bray-Curtis similarity (resemblance) matrices were subsequently developed from the transformed data and statistical analysis of these multivariate data was undertaken using PRIMER v6 routines.

Simple agglomerative hierarchical clustering was undertaken, producing dendrograms to visually identify distinct data groups based on different levels of similarity in benthic community structure. Dendrograms (also known as tree diagrams) display groups of samples in successively smaller numbers of clusters as the threshold of similarity at which two groups merge decreases. Groups (clusters) of sites (or other factors) can be identified for further data exploration with respect to the potential drivers of the groupings.

Non-metric multidimensional scaling (nMDS) was undertaken using PRIMER v6. nMDS is a powerful multivariate tool used to analyse benthic community data whereby points (eg sites) are plotted in 2-dimensional space such that the relative distance between points is relative to the same rank order as relative dissimilarities of each sample; ie points close together represent samples that are very similar in community composition and points further apart are more different. Distance between points cannot be used an absolute measure of similarity or dissimilarity, rather relative distance between points indicates relative similarity/dissimilarity.

The PRIMER v6 routine for analysis of similarities (ANOSIM) provides an approximate analogue of standard univariate analysis of variance (ANOVA). Using the resemblance matrix calculated from benthic count data, ANOSIM was used to test the null hypothesis that there are no differences between treatments (ie CVC's Impact, Reference and Control sites) allowing for potential differences between individual sites. A two-way crossed design – sites within treatments – was used. ANOSIM produces p and R values, where p indicates the level of significance for differences between benthic communities, in this case grouped into the three different site types, and R values indicate the strength of any differences. As R values approach 1 the strength of the difference between groups increases. R values close to zero indicate no difference between the groups. This is an important consideration given the inherently variable nature of benthic community data where small-scale variability (between replicates) can often be as great (or greater) than the larger scale differences between sites.

Subsequent interpretation of which individual benthic taxa are driving any of the observed differences between treatments and/or sites was undertaken using similarity percentage analysis (SIMPER) within PRIMER v6. SIMPER outputs indicate the percentage that each taxa contributes to the observed pairwise differences and informs the investigation of why the abundance (or absence) of certain species occur at individual sites.

Environmental data – water depth and sediment grain size – collected at each of CVC's benthic monitoring sites were investigated as potential influencing factors in benthic community composition. The environmental data were normalised (subtract mean and divide by standard deviation) to allow comparison between factors with different units of measure, such as metres water depth, percent silt and percent sand. Principle components analysis (PCA) was used to visualise site-by-site groupings based on water depth and sediment grain size (PRIMER v6).

The variation in environmental data was subsequently used to help identify potential factors, for example water depth, that are driving the development of the benthic assemblages. This approach is critical in defining the potential reasons for variation in benthic community structure within the context of natural variability, driven by environmental factors, and potential impacts from project-related activities.

Ongoing development of CVC's underground coal extraction has led to the redesignation of several of the early Reference sites as Impact sites (Table 2.1). Sites R3, R4, R5 and R6 have become IM5, IM6, IM7 and IM8, respectively and to compensate for the loss of reference sites, additional reference and control sites were added.

Changing the 'treatment' designation of sites is necessary to account for the ongoing expansion of the coal workings but it does complicate the statistical analysis process since the potential for impacts from subsidence at these sites changes over time. To help discern greater relationship information, EMM focused statistical analysis of the different site types (impact, reference, and control) for the monitoring period after redesignation of the earlier reference sites to impact sites and after the addition of most of the new reference and control sites (from September 2016 onwards).

Table 2.1 List of benthic monitoring sites indicating sites redesignated due to expansion of CVC mining operations

Reference sites	Control sites	Potential impact sites
R1	**C1**	**IM1**
R2	**C2**	**IM2**
R3 *(becomes IM5 in March 2014)*	**C3**	**IM3**
R4 *(becomes IM6 in March 2014)*	**C4**	**IM4**
R5 *(becomes IM7 in September 2015)*	**C5** *(added in March 2016)*	**IM5** *(=R3 prior to September 2015)*
R6 *(becomes IM8 in September 2015)*	**C6** *(added in September 2016)*	**IM6** *(=R4 prior to September 2015)*
R7 *(added in March 2016)*	**C7** *(added in March 2018)*	**IM7** *(=R5 prior to September 2015)*
R8 *(added in September 2016)*		**IM8** *(=R6 prior to September 2015)*
R9 *(added in September 2016)*		
R10 *(added in March 2018)*		
R11 *(added in March 2018)*		

3 Analysis results

In the laboratory, biological samples were sorted into different taxonomic groups - operational taxonomic units (OTUs) – comprising, molluscs and four polychaete worms sorted to genus level and all other fauna split into broader groups. These broader groups were higher taxa (such as terebellids, ophiuroids), general organism groups (sponges, crabs, barnacles, fish) or specific descriptive types (such as mud polychaetes, thin polychaetes and thick polychaetes).

Infauna were categorised into 26 OTUs (Table 3.1) and these have been used to differentiate sites during statistical analysis.

Table 3.1 Operational taxonomic units (OTUs) derived for CVC benthos, 2016-2022

Polychaetes – thin (P)	*Nassarius jonasii* (G)	prawns (C)
Polychaetes – thick (P)	*Anadara trapezia* (B)	crabs (C)
Polychaetes – mud (P)	*Corbula truncata* (B)	barnacles (C)
terebellids (P)	*Cyamiomactra mactroides* (B)	ophiuroids (E)
Chaetopterus sp. (P)	*Dosinia sculpta* (B)	echinoids (E)
Cirratulidae (P)	*Paphia undulata* (B)	planaria (F)
Pectinaria sp. (P)	*Saccostrea glomerata* (B)	sponges
Sthenelais pettiboneae (P)	*Soletellina alba* (B)	fish
Lepsiella (Bedeva) hanleyi (G)	*Trichomya hirsuta* (B)	

Key: (P) = polychaete worm
(G) = gastropod mollusc
(B) = bivalve mollusc
(C) = crustacean
(E) = Echinoderm
(F) = flatworm (Platyhelminth)

3.1 Benthic data 2012-2022

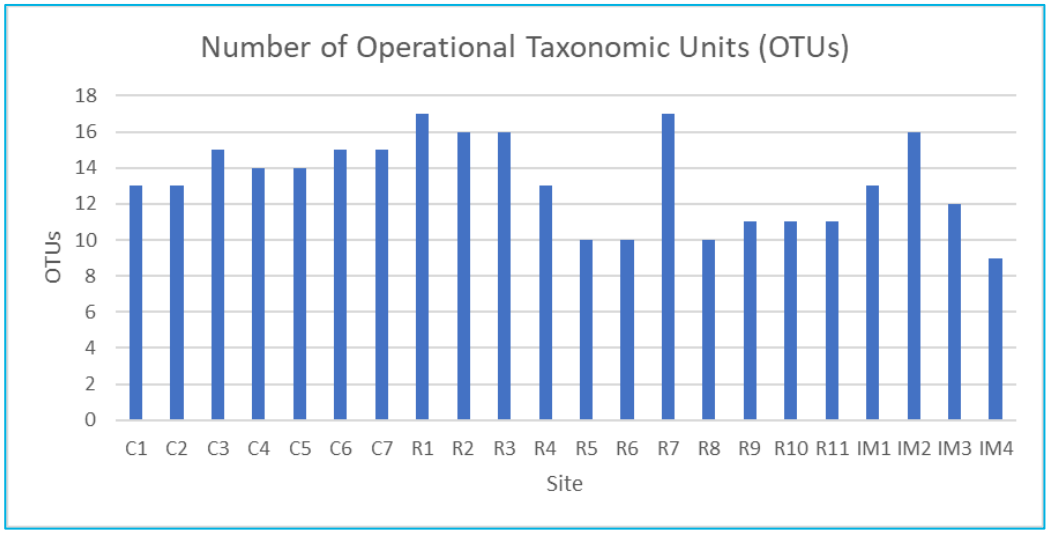
From 19 sampling events between September 2012 and September 2022, a total of 24,265 benthic individuals from the 26 different taxonomic groups were counted in sediment samples from across the study area. The three most abundant taxa were the bivalve mollusc *Soletellina* (7,021 individuals), bivalve *Corbula* (6,167 individuals), and polychaetes-thin (6,126 individuals). Together these taxa account for 79% of the total number of benthic individuals collected in sediment samples throughout the monitoring period. The most speciose faunal group is bivalve molluscs, with seven species collected.

The number of OTUs and individuals identified for each site over time are shown in Figure 3.1. In these figures the site numbering reflects the original reference site designations rather than changes that were made due to subsequent undermining.

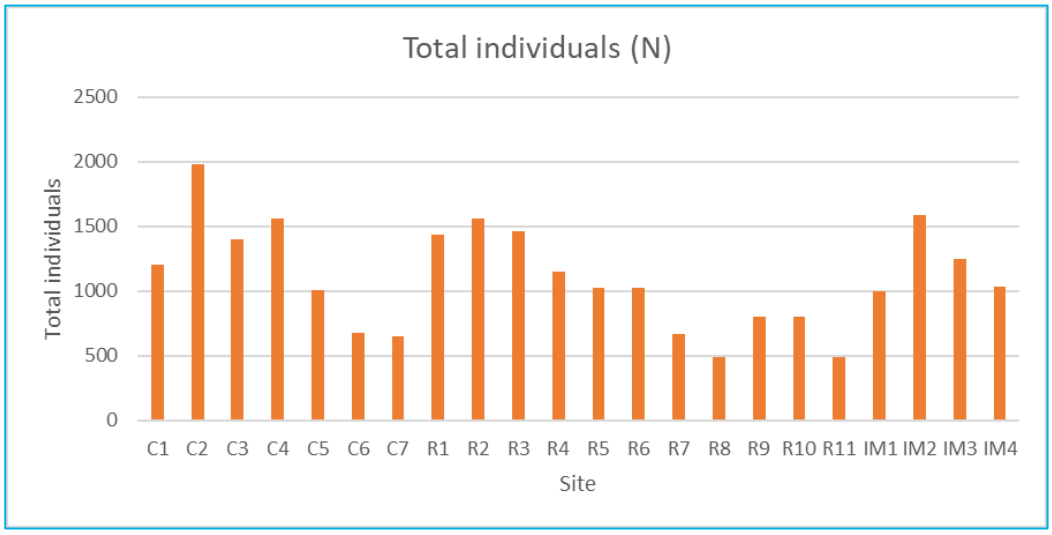
Between 9 and 17 OTUs (mean 13.2) were reported per site. The lowest number of OTUs was at IM4 (9) and R5, R6 and R8 (10), and the highest number of OTUs was at R1 and R7 (17) and R2, R3 and IM2 (16). There is no clear spatial pattern associated with the number of OTUs per site type.

The total number of individuals per site varied between 494 (R8 and R11) and 1,976 (C2). Abundances were lowest (<750 individuals) at C6 (679), C7 (648), R7 (666), R8 (494) and R11 (494).

Abundances were highest (>1,500) at C2 (1,976), C4 (1,559), R2 (1,557) and IM2 (1,583). There is no clear spatial pattern associated with the abundance of benthic species per site type.



(a)



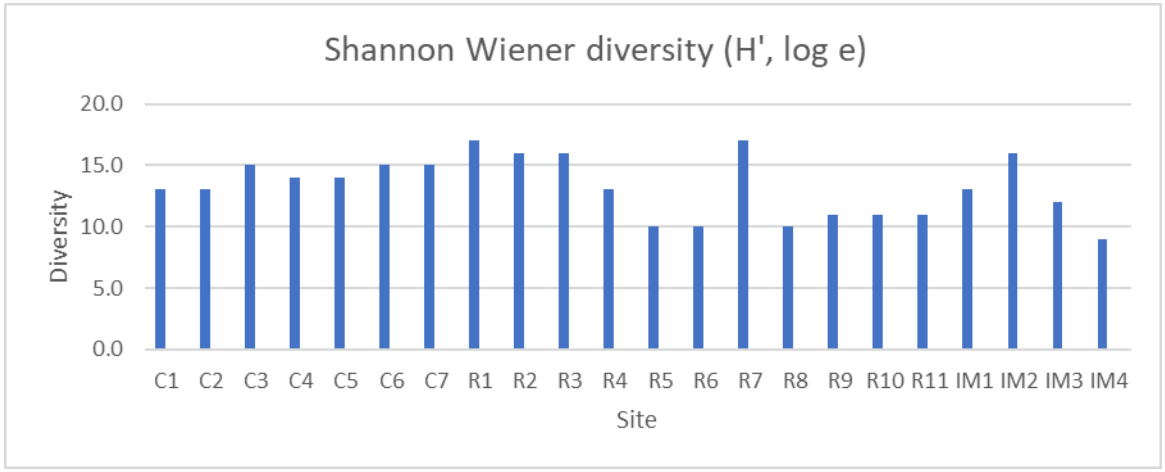
(b)

C = control sites R = reference sites IM = impact sites

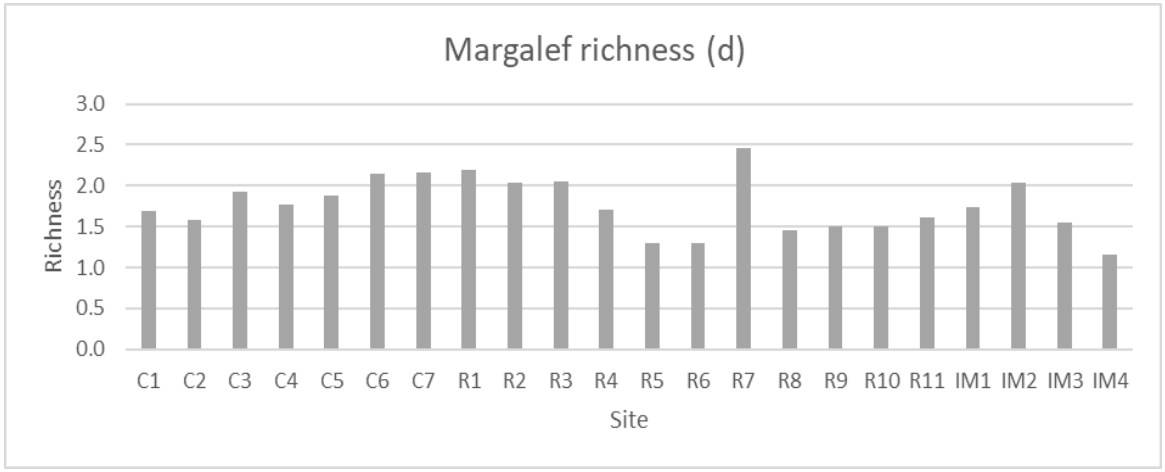
Figure 3.1 Total number of (a) operational taxonomic units (OTUs) and (b) individuals identified in benthic samples from each CVC monitoring site for the period 2012–2022

Shannon Wiener diversity (H', log e), Margalef richness (d) and Pielou's evenness (J') values for each site over time are shown in Figure 3.2.

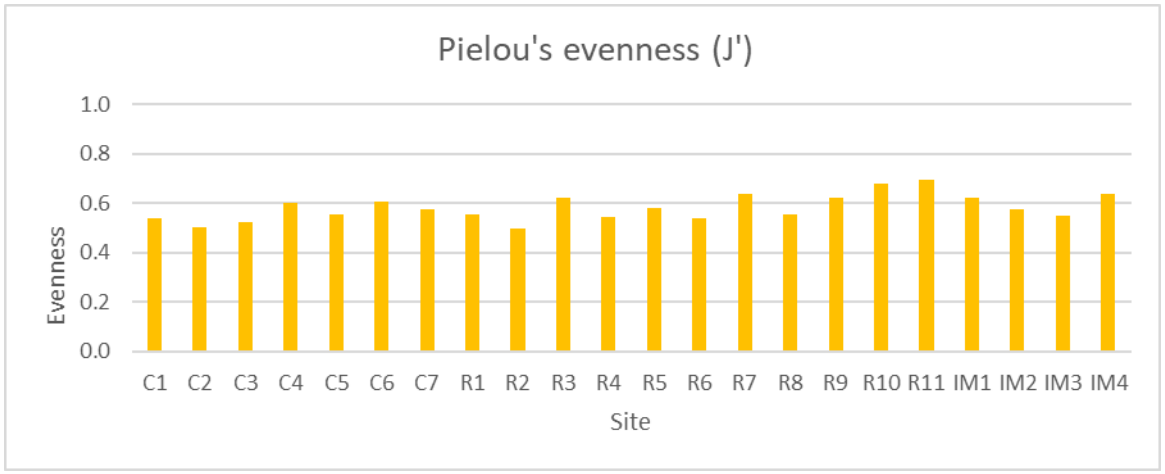
Each of these biodiversity indices are broadly similar across all sampling sites. Margalef richness most closely follows the distribution of OTUs per site, with marginally lower richness (<1.3) apparent at R5, R6 and IM4. The diversity and evenness vary across the sites within a narrow range of 1.24−1.81 and 0.49−0.69, respectively.



(a)



(b)



(c)

C = Control sites R = Reference sites IM = Impact sites

Figure 3.2 **(a) Shannon Weiner diversity, (b) Margalef's richness and (c) Pielou's evenness for benthic samples from each CVC monitoring site for the period 2012-2022**

As indicated in Methods (Section 2), to help discern greater relationship information EMM has focused statistical analysis of the different site types (Impact, Reference, and Control) on the monitoring period after redesignation of sites R3, R4, R5 and R6 as IM5, IM6, IM7 and IM8, respectively. The analysis focus was shifted to the monitoring period from September 2016 onwards.

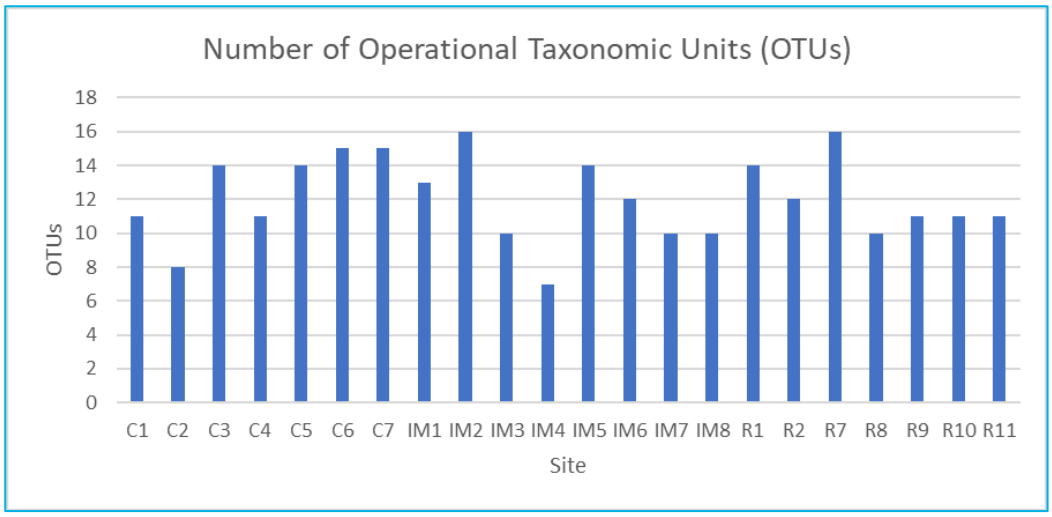
3.2 Benthic data 2016–2022

From 13 sampling events between September 2016 and September 2022, a total of 16,347 benthic individuals from 26 different taxonomic groups were counted in sediment samples from across the study area.

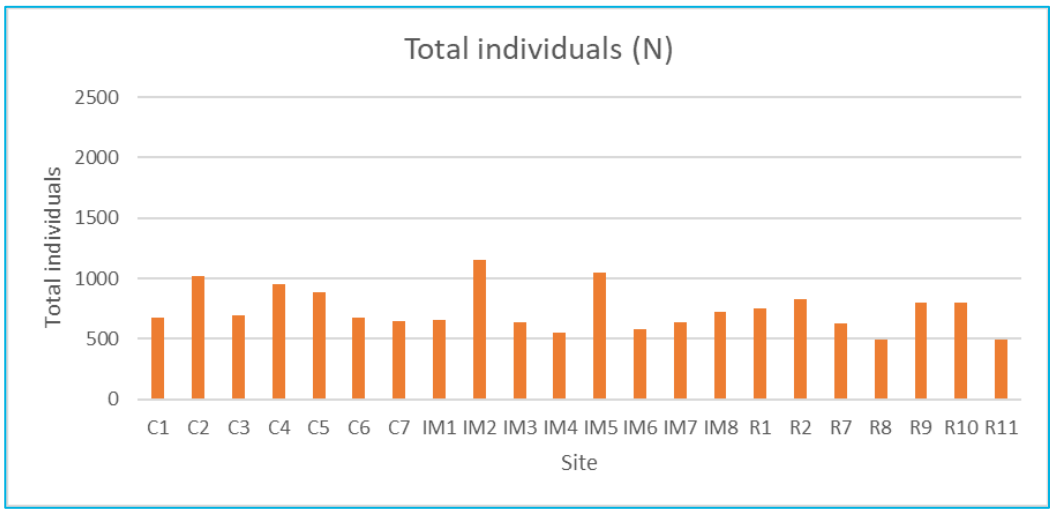
The number of OTUs and individuals identified for each site over time is shown in Figure 3.3. In these figures the site numbering reflects the redesignation of reference sites (R3-R6) as impact sites (IM5-IM8) due to ongoing expansion of the underground coal workings.

Between 7 and 16 OTUs (mean 12.0) were reported per site. The lowest number of OTUs were at IM4 (7) and C2 (8) and the highest number of OTUs were at IM2 and R7 (16). There is no clear spatial pattern associated with the number of OTUs per site.

The total number of individuals per site varied between 494 (R8 and R11) and 1,152 (IM2). Abundances were lowest (<500 individuals) at R8 and R11 (494). Abundances were highest (>1,000 individuals) at C2 (1,017), IM2 (1,152) and IM5 (1,046). There is no clear spatial pattern associated with the abundance of benthic species per site.



(a)



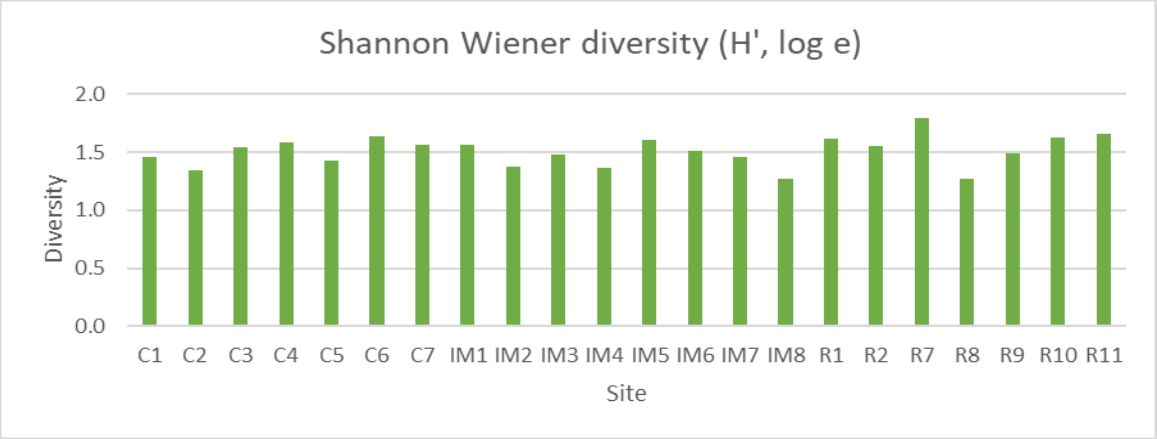
(b)

C = Control sites IM = Impact sites R = Reference sites

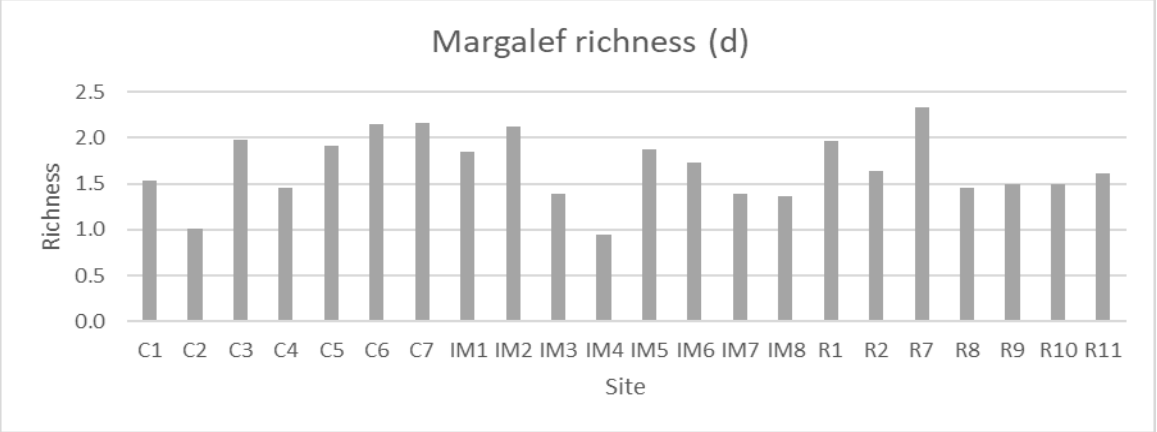
Figure 3.3 Total number of (a) operational taxonomic units (OTUs) and (b) individuals identified in benthic samples from each CVC monitoring site for the period 2016-2022

Shannon Wiener diversity, Margalef richness and Pielou's evenness values for each site over time (2016−2022) are shown in Figure 3.4.

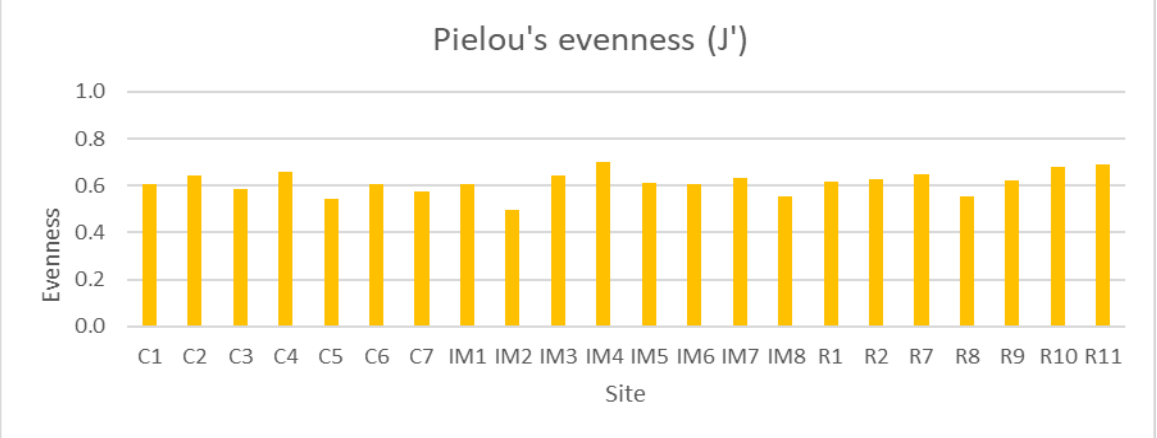
Each of these biodiversity indices are broadly similar across all sampling sites. Margalef richness most closely follows the distribution of OTUs per site, with marginally lower richness (<1.0) apparent at C2 and IM4. The diversity and evenness vary across the sites within a narrow range of 1.27−1.79 and 0.50−0.70, respectively.



(a)



(b)



(c)

C = Control sites R = Reference sites IM = Impact sites

Figure 3.4 **(a) Shannon Weiner diversity, (b) Margalef's richness and (c) Pielou's evenness for benthic samples from each CVC monitoring site for the period 2016-2022**

3.3 Analysis of similarity

In accordance with the statistical analysis suite identified in Table 1.1 of the BCMP, benthic data were explored using ANOSIM, cluster analysis and nMDS.

For ANOSIM, a two-way nested design was used to test for similarities between the three different site types (Impact, Reference and Control). Testing for differences in benthic communities between the three site types during the period September 2016 to September 2022 derived a global R value of -0.019 at a significance level (p) of 0.6 (well above the statistical significance level of 0.05). Pairwise test results indicate highly non-significant differences between all treatment pairs – Control versus Reference (0.992), Control versus Impact (0.254) and Reference versus Impact (0.301). Negative R-values are attributed to benthic habitats that are patchy and exhibit high variability between replicates (Chapman & Underwood 1999).

The ANOSIM plot indicates that there are no significant differences between the three site types (Figure 3.5) since the global R value (black vertical line) falls within the wider distribution of R values (blue bars).

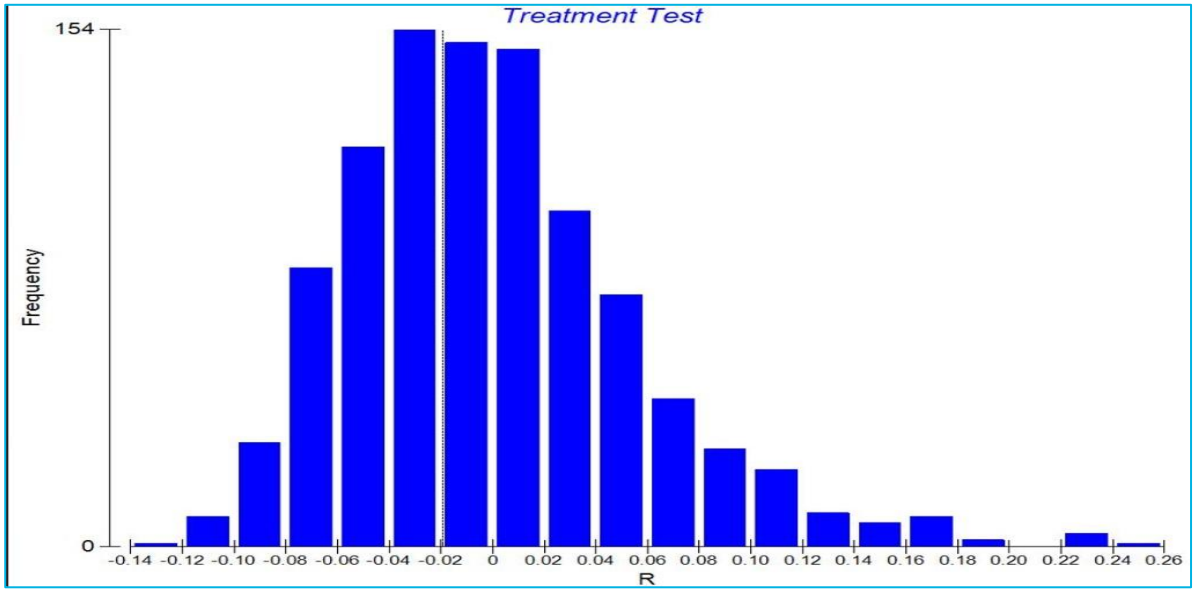


Figure 3.5 ANOSIM test results for benthic data across site types, September 2016 to September 2022. Vertical line indicates the global R value of -0.019

3.4 Cluster analysis

Cluster analysis was used to visualise pair-wise similarity between sites based on levels of Bray Curtis similarity for the monitoring period September 2016 to September 2022 (Figure 3.6). The dendrogram indicates that at 75% similarity level there are four clusters: C5-C7-R11; IM2-IM5-R7; R10; and all remaining sites.

Importantly, the Impact sites do not cluster together as a discrete cluster but rather are spread along the x-axis, interspersed amongst Reference and Control sites.

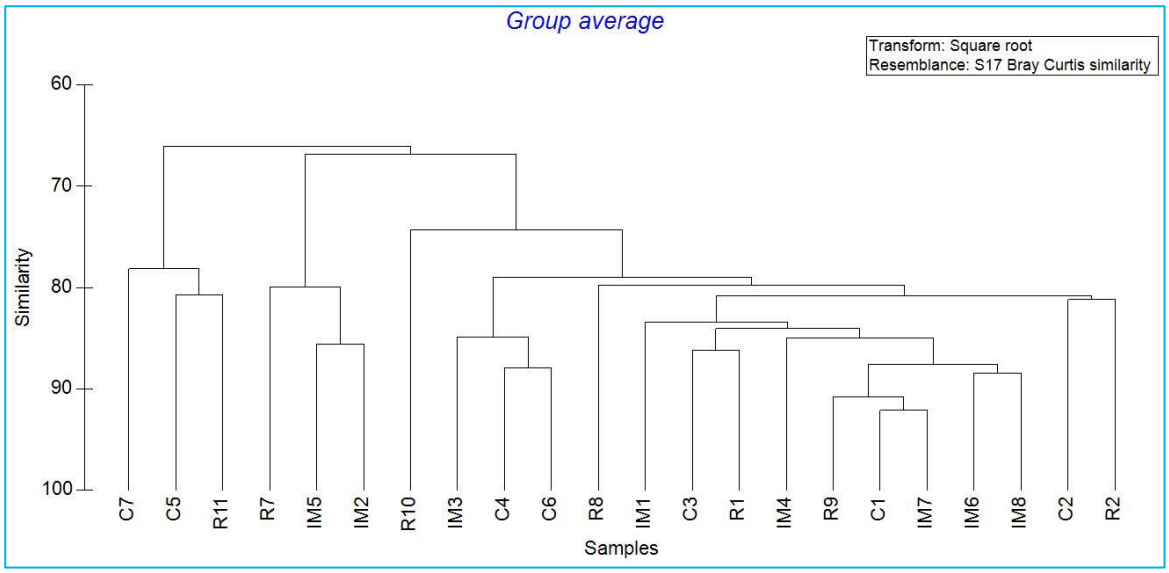


Figure 3.6 **Dendrogram derived from cluster analysis of CVC benthic community monitoring data across all sites between September 2016 and September 2022**

3.5 Multi-dimensional scaling

Non-metric multi-dimensional scaling (nMDS) is used to represent samples as points in 2D space such that points that are close together represent samples that are very similar in community composition (Clarke & Gorley 2006). The similarity patterns indicated in the cluster analysis are further explored using an nMDS plot for abundance data at each site (Figure 3.7). The green circles indicate site groupings that correspond to the 75% similarity level.

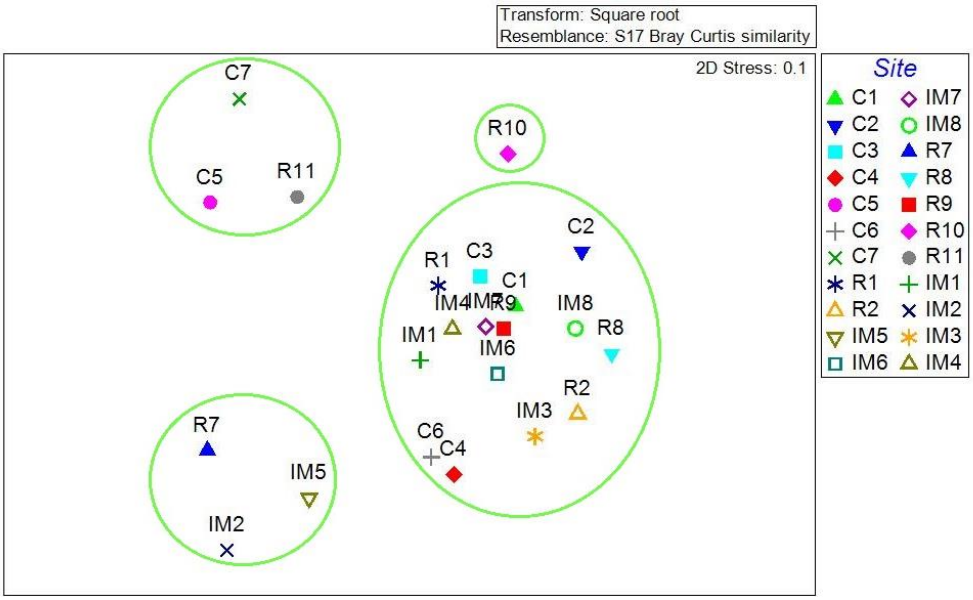


Figure 3.7 **Patterns in community structure depicted as nMDS plot based on square-root transformed abundance data of all taxa (OTUs) for each site, September 2016–September 2022**

The distribution (in nMDS space) of Impact, Reference and Control sites does not indicate site groupings that could be attributed to impacts from CVC operations since most sites have similar benthic communities (tightly grouped). Except for IM2 and IM5, most of the sites that exhibit significantly different benthic communities to the main group are designated as reference (R7, R10, R11) and control (C5 and C7) site types.

3.6 SIMPER

SIMPER analysis was undertaken on the square-root transformed biological data to identify which taxa are contributing to the separation between benthic communities evident at the C5-C7-R11, IM2-IM5-R7 and R10 site clusters identified during cluster analysis and confirmed by nMDS.

SIMPER results indicate that more than 80% of the differences between the site clusters are mostly attributed to abundances of two polychaetes (mud and thin) and three bivalve molluscs, *Corbula*, *Soletellina* and *Trichomya*.

Specific differences between the clusters are:

- C5-C7-R11 (Cluster A):
  - much higher abundances of polychaete-mud compared to other site clusters; and
  - lower abundances of *Corbula and Soletellina* compared to Cluster D.
- IM2-IM5-R7 (Cluster B):
  - higher abundances of *Trichomya* compared to other site clusters;
  - lower abundances of *Soletellina* compared to Cluster C; and
  - lower abundances of *Corbula* compared to Cluster D.
- R10 (Cluster C):
  - higher abundances of *Soletellina* compared to other site clusters; and
  - higher abundances of *Corbula* compared to Cluster A and Cluster B.
- All other sites (Cluster D):
  - higher abundances of polychaete thin, *Corbula* and *Soletellina* compared to other clusters at most sampling times.

3.7 Temporal comparison of site groups

Comparison of temporal variation in abundances (mean + standard deviation) for each site cluster (C5-C7-R11, IM2-IM5-R7, R10, and 'all other') are provided for the five most abundant OTUs reported across the benthic monitoring area (Figure 3.8 and Figure 3.9).

Mud polychaete abundances are variable between site clusters and over time. The notable differences are lower abundances (and variability) apparent in the IM2-IM5-R7 cluster and at R10 compared to the other site clusters.

Thin polychaete abundances are broadly similar for three of the four site clusters at each monitoring event, with higher abundances apparent within the 'all other' site cluster at most sampling times.

Abundances of bivalves *Corbula* and *Soletellina* are significantly higher within the 'all other' site cluster compared to the other three site clusters.

Trichomya abundances are significantly higher within the IM2-IM5-R7 site cluster, which drives the separation of this site's benthic community from the other sites. Abundances vary across time, notably higher in samples collected in 2020 and 2021.

The important aspect to note from these plots is that the IM2-IM5-R7 cluster, that differs in benthic community structure from all other sites, is not changing consistently over time (abundances neither increasing or decreasing) and therefore is not indicative of an impact from the CVC operations.

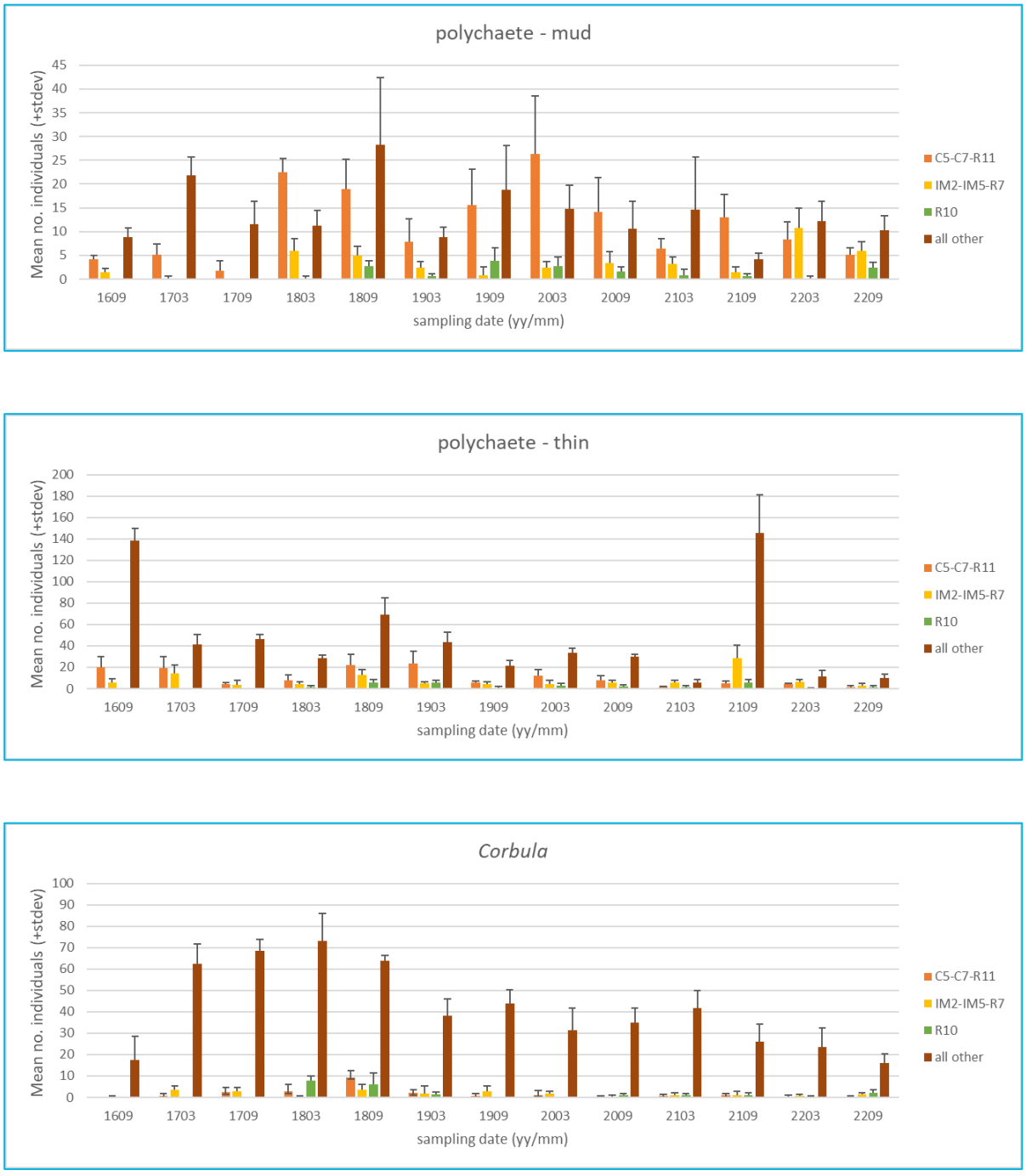


Figure 3.8 **Temporal comparison of benthic abundances by site group for mud and thin polychaetes and the bivalve mollusc *Corbula***



Figure 3.9 **Temporal comparison of benthic abundances by site group for the bivalve molluscs *Soletellina* and *Trichomya***

3.8 Environmental data

Water depths and sediment grain size were reported for each site and these environmental variables were analysed alongside the biological data to discern potential environmental drivers of the observed variation in benthic community structure (Figure 3.10).

The sediments at all sites sampled in September 2022 were described as *'largely composed of fine grey silt'* with *'small to large shell fragments…at most stations'* (Laxton & Laxton 2022).

PCA was undertaken on the normalised environmental data (Figure 3.10). The results indicate three main site groups that are differentiated primarily due to silt, sand, and shell content, with minor differences in water depth being less important:

- Group 1: high shell (98%), no sand (0%) and low silt (2%) – R7.
- Group 2: low shell (<1%), moderate sand (39–43%) and medium silt (56–61%) – C7 and R10.
- Group 3: variable shell (<20%), low sand (<4%) and high silt (>80%) – all other sites.

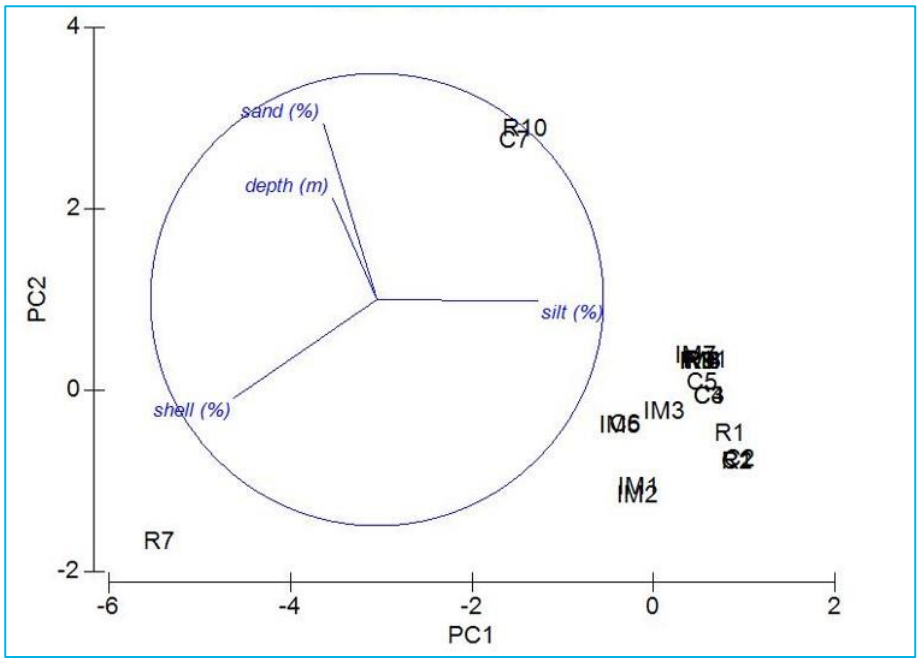


Figure 3.10 **Principle components analysis (PCA) plot for normalised September 2022 environmental data – water depth (m), percentage shell, sand and silt for all sites**

The site groupings based on environmental variables (PCA) are different to the site groupings evident in benthic community structure (nMDS). This suggests that factors other than, or in addition to, sediment composition are driving the benthic structure.

4 Discussion and recommendations

4.1 Discussion

Benthic communities are inherently variable across different spatial and temporal scales, typically in response to differences in local environmental conditions such as water depths, water circulation, tides and sediment characteristics. When assessing potential impacts from project activities it is important not to attribute site-by-site differences to project impacts without due consideration of the environmental and biological context.

The soft sediment benthic communities within the CVC monitoring area are dominated by polychaete worms and bivalve molluscs. Fauna abundances and diversity indices (richness, evenness, and diversity) differ between each site (as expected) although were found to be within a relatively narrow range across the monitoring area. Statistical analysis of the benthic data indicates a level of variability within the treatment groups (Impact, Reference and Control) that is similar to or greater than the variability between treatment groups. There are no significant differences between the treatment groups – Impact versus Reference versus Control.

From an ecological perspective, the benthic assemblages across the monitoring area fall into several groups that do not appear to be a response to CVC operations but are most likely grouping because of currently unconfirmed environmental factors.

For example, monitoring sites C5-C7-R11 and R10 are furthest north and likely to be exposed to greater water circulation within greater Lake Macquarie that may provide increased food availability and/or better water quality that is reflected in benthic community composition. In addition, three of these sites – C5, C7 and R10 – have sediments with higher sand content which may support different benthic communities compared to the high silt areas further south. Higher sand content is often correlated with higher water movement.

Monitoring sites IM2-IM5-R7 have benthic communities that are statistically distinct from the other monitoring sites although the contributing factors driving the differences are unclear, as evidenced by the results of the PCA. Importantly, these monitoring sites are not distinctly associated with CVC operations and the differences in benthic community are unlikely to be attributed to mining activities. Differences are more likely associated with local environmental conditions such as a combination of water depth, sediment characteristics, water circulation and/or water quality.

Statistical analysis of CVC's benthic monitoring data, primarily undertaken for the period September 2016 to September 2022, did not identify statistical differences between the benthic assemblages evident at sites designated as Impact, Reference and Control.

In conclusion, the results of statistical analysis of CVC's benthic monitoring data indicate that no exceedance of the BCMP (CVC 2019) subsidence impact performance measure of "minor environmental consequences, including minor changes to species composition and/or distribution" has occurred. Consequently, CVC is not required to implement any additional investigations of benthic communities within the project study area at this time and should continue the routine monitoring of benthic assemblages.

4.2 Recommendations

Currently, CVC conducts twice annual (seasonal) monitoring of benthic communities in southern Lake Macquarie. The overarching aim of the project is to monitor for detectable changes in benthic assemblages associated with potential subsidence of the lakebed due to undermining.

Subtidal benthic habitats, like those monitored by CVC, that are not dominated by benthic primary producers (such as seagrass and/or macroalgae), typically do not exhibit strong seasonal variation since the benthic species do not photosynthesise (and are therefore largely unaffected by changing light levels). Additionally, benthic environments are often quite stable with respect to sediment conditions that do not change on a regular cyclical nature with the seasons.

For these reasons and given the current absence of statistically relevant differences between benthic assemblages at CVC's impact monitoring sites when compared to the reference and control sites, EMM recommends that the frequency of CVC's benthic monitoring could be reduced to once per year. The recommended timing of annual monitoring is March (Autumn) to capture any variation in benthic assemblages that might occur following summer temperature extremes, while allowing ongoing statistical analysis of the historical and future March monitoring data.

Importantly, the frequency of monitoring should be reviewed if future monitoring results indicate impacts to benthic assemblages that are potentially associated with CVC operations, or if the local benthic environmental conditions change substantially.

5 References

Chapman MG & Underwood MJ (1999) Ecological patterns in multivariate assemblages: information and interpretation of negative values in ANOSIM tests. *Mar Ecol Prog Ser* 180:257-265

Clarke KR & Gorley RN (2006) *PRIMER v6: User Manual/Tutorial*. PRIMER-E, Plymouth 190pp.

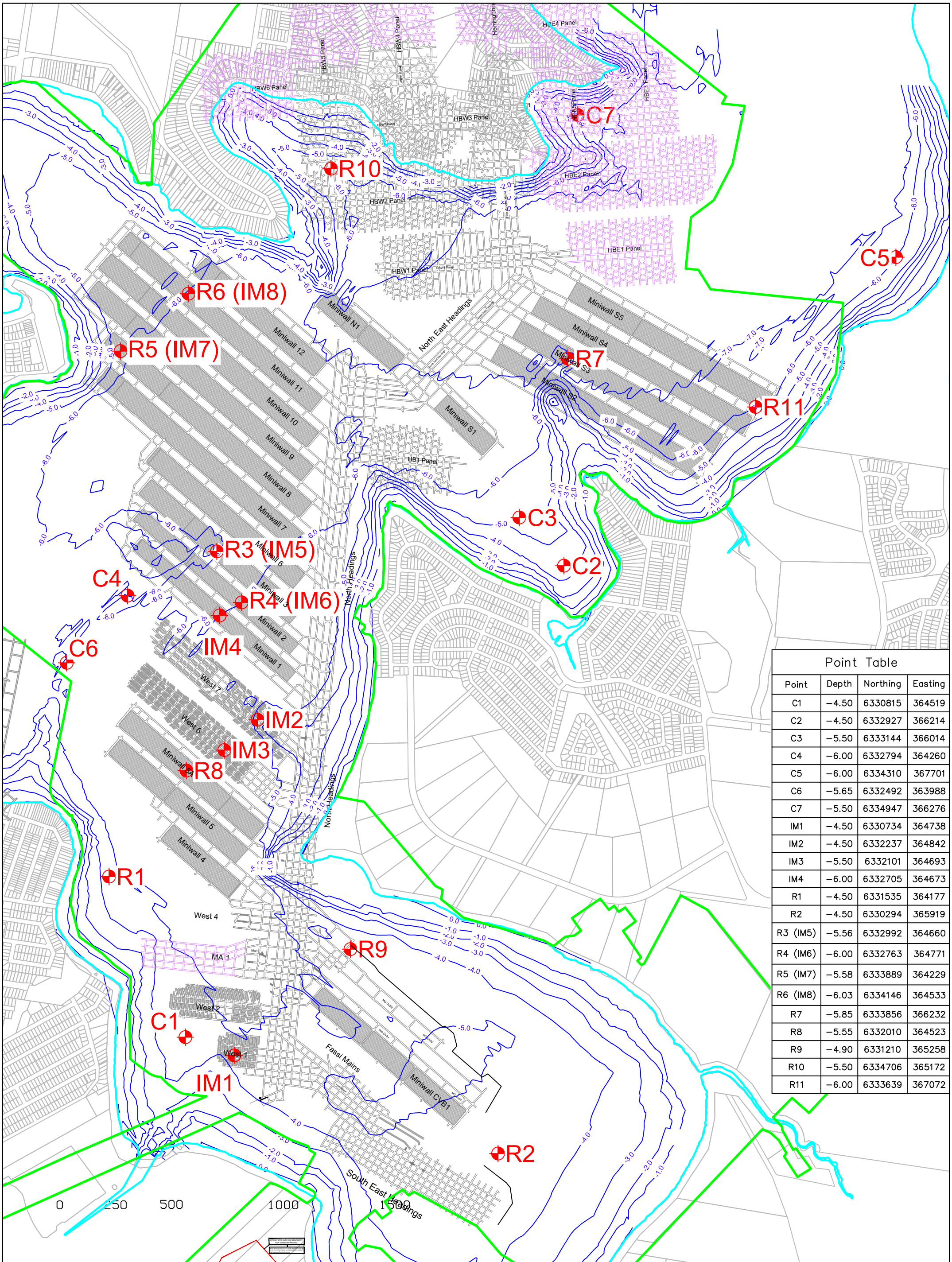
CVC (2019) *Benthic Communities Management Plan – Environmental Management Plan*, Chain Valley Colliery (14 November 2019)

Laxton JH & Laxton ES (2022) *Lake Macquarie Benthos Survey Results No. 22.* Report prepared for Delta Coal, Mannering & CVC Collieries by JH & ES Laxton Environmental Consultants P/L, September 2022. 54pp.

Appendix A

CVC benthic monitoring sites map

EMM
creating opportunities



Point Table			
Point	Depth	Northing	Easting
C1	−4.50	6330815	364519
C2	−4.50	6332927	366214
C3	−5.50	6333144	366014
C4	−6.00	6332794	364260
C5	−6.00	6334310	367701
C6	−5.65	6332492	363988
C7	−5.50	6334947	366276
IM1	−4.50	6330734	364738
IM2	−4.50	6332237	364842
IM3	−5.50	6332101	364693
IM4	−6.00	6332705	364673
R1	−4.50	6331535	364177
R2	−4.50	6330294	365919
R3 (IM5)	−5.56	6332992	364660
R4 (IM6)	−6.00	6332763	364771
R5 (IM7)	−5.58	6333889	364229
R6 (IM8)	−6.03	6334146	364533
R7	−5.85	6333856	366232
R8	−5.55	6332010	364523
R9	−4.90	6331210	365258
R10	−5.50	6334706	365172
R11	−6.00	6333639	367072

Legend

- CVC Fassifern Seam Workings
- Proposed Fassifern Seam Workings
- Project Boundary
- Lake Edge

DELTA COAL
CHAIN VALLEY COLLIERY
BENTHIC MONITORING POINTS
LAKE MACQUARIE

SCALE:	1:15000	DATE:	11 January 2023
DRAWN:	R Tubridy	DRG NO:	C1S0120_17
CHECKED:	L McWha	REV NO:	17
		SIZE:	A3

Delta coal

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Canberra City ACT 2601

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Melbourne VIC 3000
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Appendix 7: Weed Action Plan

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Weed Action Plan

Chain Valley Colliery, Mannering Colliery and Summerland Point Ventilation Shaft

Total Earth Care Pty Ltd

January 20

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Weed Action Plan

Chain Valley Colliery, Mannering Colliery and Summerland Point Ventilation Shaft

January 20

Quality Control	© Total Earth Care Pty Ltd 2019		
Revision/Version No.	Final	**Date of revision**	17 January 2020
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Approved by	G Barron, W Thurston		
Prepared for:	Delta Coal		
TEC Job No.	C11483		

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1 INTRODUCTION

1.1 Background

Total Earth Care (TEC) has been commissioned by Delta Coal to prepare this update for the Weed Action Plan for the three (3) Delta Coal sites: Chain Valley Colliery, Mannering Colliery and Summerland Point Ventilation Shaft. The site is within the Central Coast LGA (formerly Wyong LGA).

A Weed Action Plan was developed for Lake Coal in 2016 to guide weed management of the aforementioned sites in a consolidated report. The sites are now managed by Delta Coal and an updated Weed Action Plan is required to assess the current weed densities on the site and provide relevant management actions that will assist in the development of updated Biodiversity Management Plans for each site. The Weed Action Plan will guide on ground weed management and assist in tracking the progress of since the previous Weed Action Plan developed in 2016.

1.2 Subject Sites and Study Area

The “Study Area” has been defined as each of the three (3) sites: Chain Valley Colliery, Mannering Colliery and Summerland Point Ventilation Shaft. Management Zones have previously been defined for these sites. Please see the Maps 1 to 3 below which indicate the boundaries of the Project Area and the existing management zones.

All three (3) sites fall within the Local Land Services Greater Sydney Region, bordering on the Hunter Region.

1.3 Goals and Objectives

The objectives of this management program are to:

- Describe the existing flora and fauna within the subject site based on current survey effort and database searches of the subject site and surveys of the wider study area.
- Provide ground-truthed weed density maps, highlighting priority weeds under the *NSW Biosecurity Act 2015.*
- Report any threats to Endangered Ecological Communities.
- Provide a program for ongoing weed management and/or eradication.

Title: Chain Valley Colliery: Subject Site & Survey Effort

Map No: 1

Site: Chain Valley Colliery

Client: Delta Coal

Date: November 2019

Project No: 11483

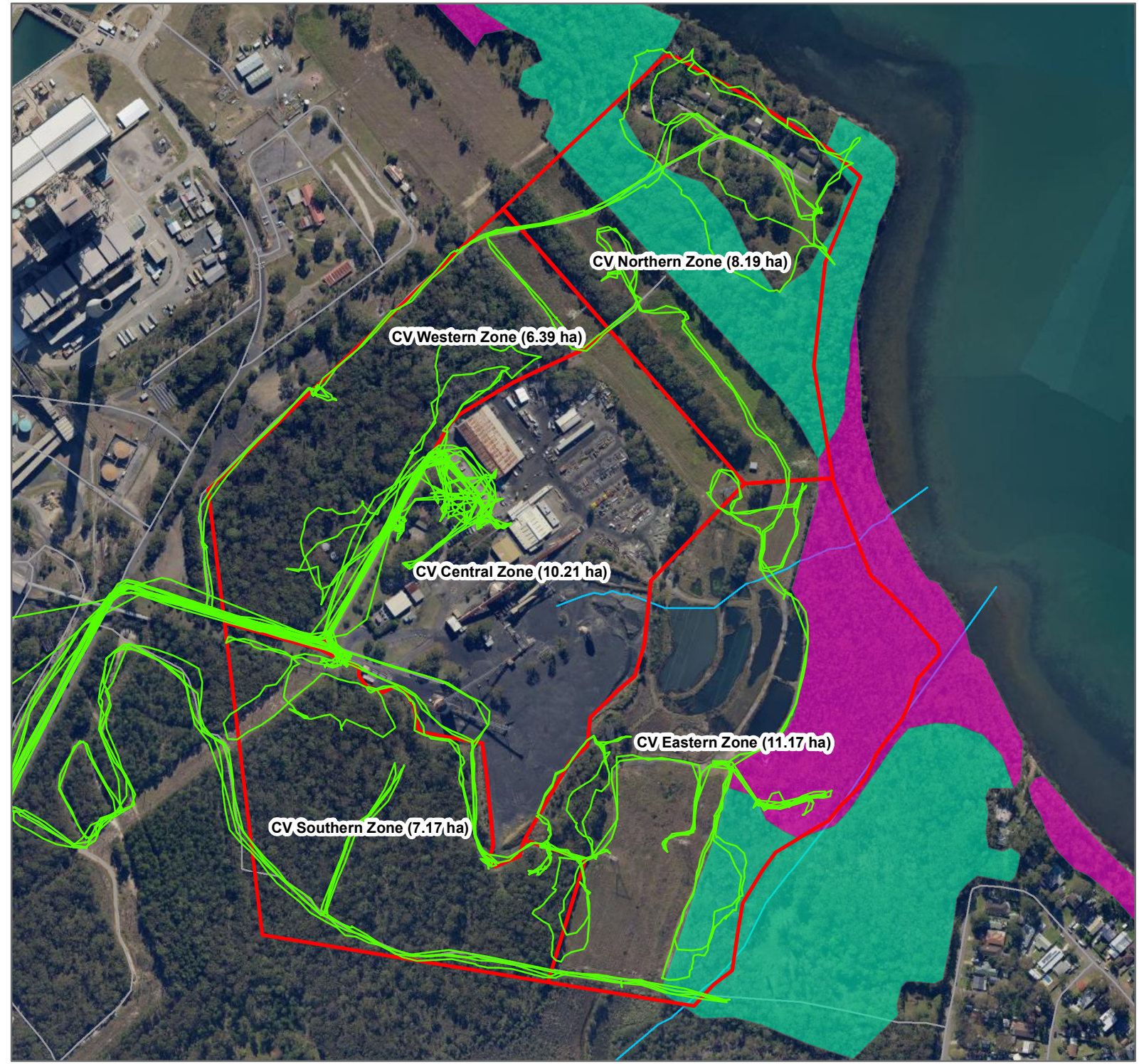
Author: G Barron

Legend

- Management Zones
- Road
- Creek
- Survey Effort

EEC under BC Act 2016

- Swamp Oak Floodplain Forest
- Swamp Sclerophyll Forest on Coastal Floodplains EEC



0 50 100 200 Meters

N

Data Source:
Total Earth Care
Nearmap
Wyong ELA 2016 v2

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Tel: 02 9913 1432 Fax: 02 9913 1434

Title: Mannering Colliery:
Subject Site & Survey Effort

Map No: 2
Site: Mannering Colliery
Client: Delta Coal
Date: November 2019
Project No: 11483
Author: G Barron

Legend

- Management Zones
- Road
- Creek
- Survey Effort

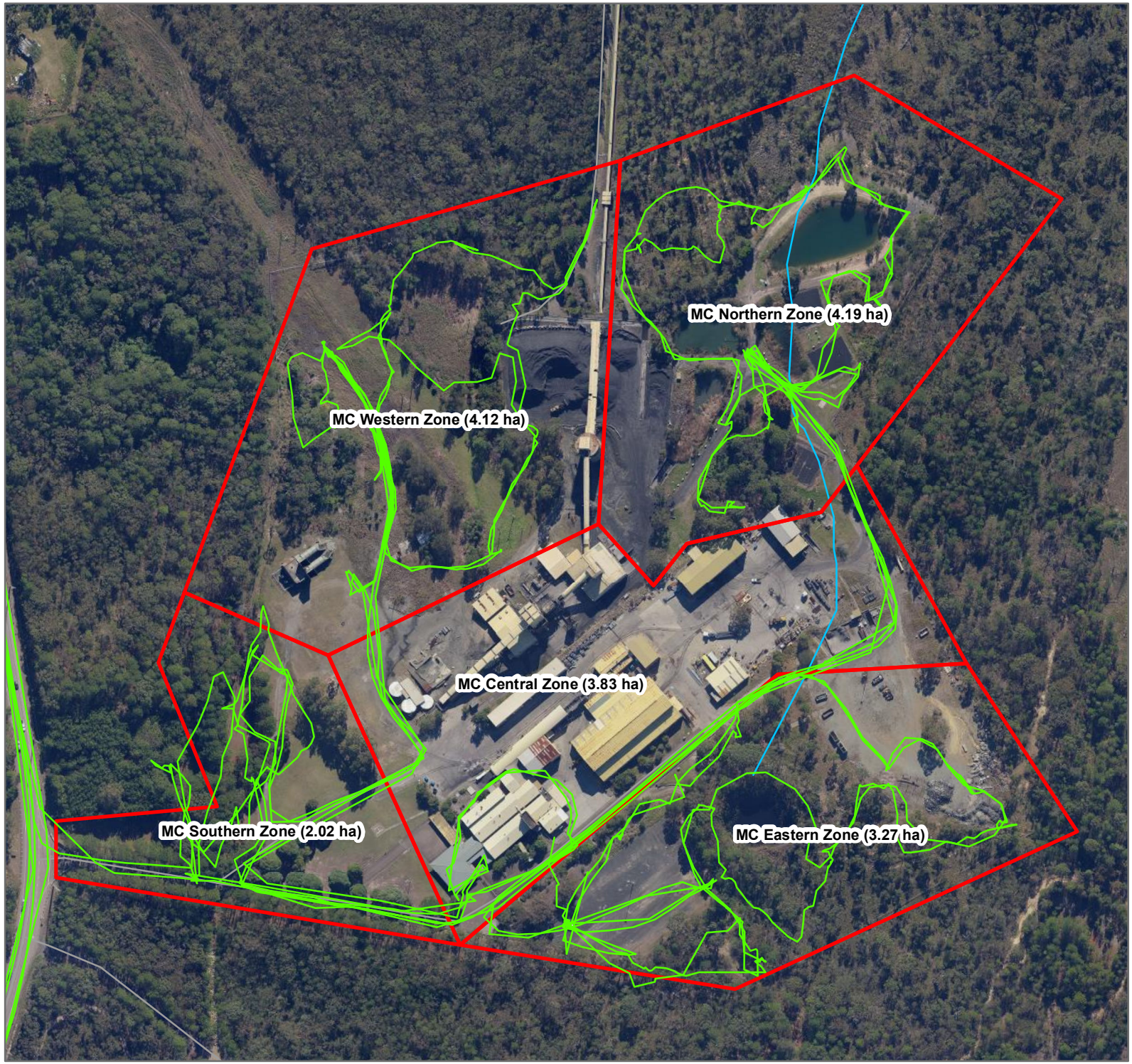
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Nearmap

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Title: **Summerland Point Ventilation Shaft: Subject Site, EECs & Survey Effort**

Map No: 3

Site: Summerland Point Ventilation Shaft

Client: Delta Coal

Date: November 2019

Project No: 11483

Author: G Barron

Legend

- Summerland Point
- Road
- Creek
- Survey Effort

EEC under BC Act 2016

- Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion
- Swamp Sclerophyll Forest on Coastal Floodplains EEC

0 25 50 100 Meters

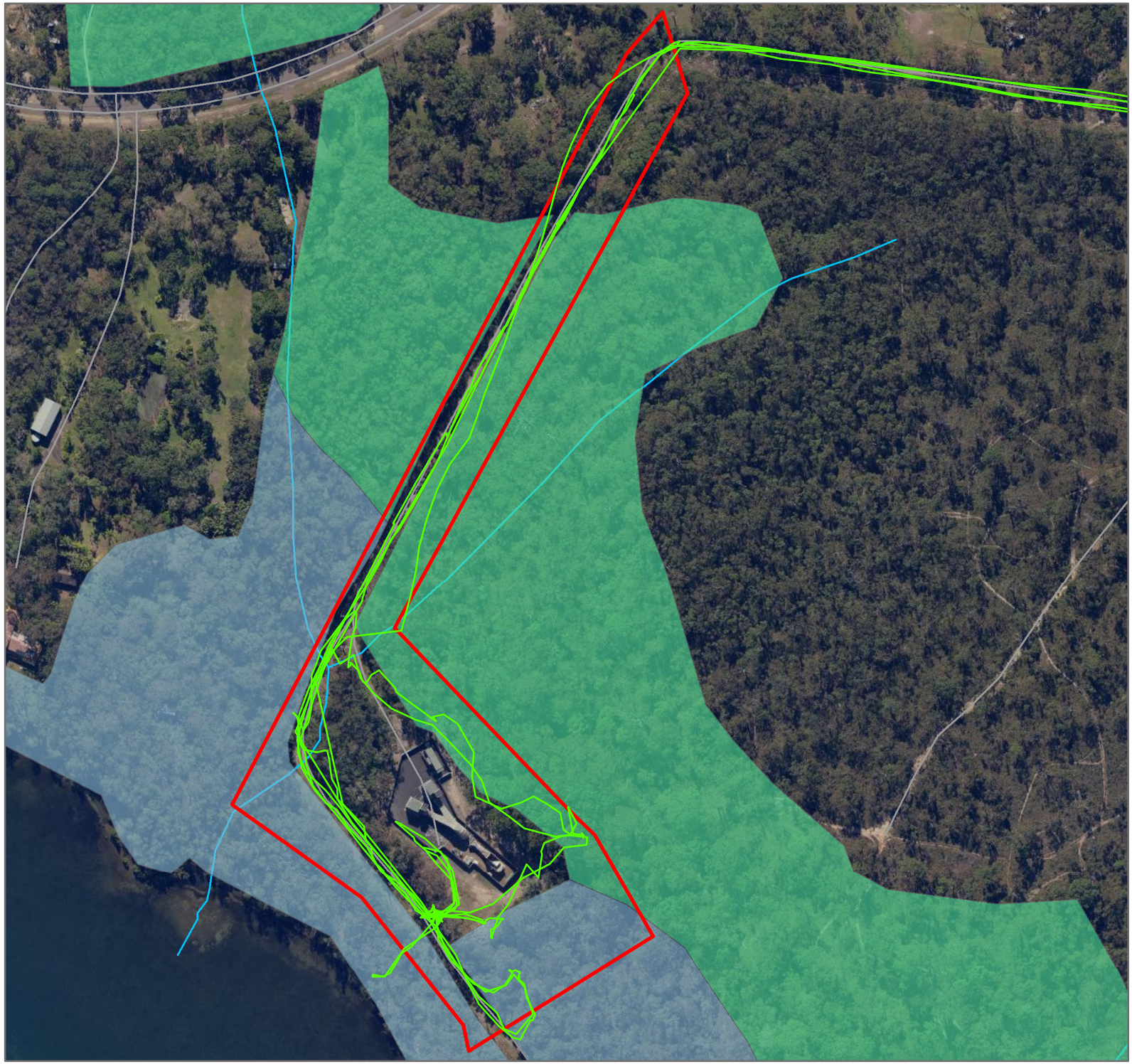
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Data Source:
Total Earth Care
SIX Maps
Wyong ELA 2016 v2

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1.4 Relevant Legislation and Strategies

This Weed Action Plan will be written in accordance with:

1 Commonwealth laws including:
   a. *Environment Protection and Biodiversity Conservation Act 1999*
2 NSW laws including:
   a. *Biodiversity Conservation Act 2016*
   b. *Biosecurity Act 2015*
3 Local laws LGA:
   a. *Wyong Local Environment Plan 2013*
   b. *Wyong Development Control Plan 2013*
4 Weed Strategies
   a. *Australian Weeds Strategy 2017-2027*
   b. *Greater Sydney Regional Strategic Management Plan*

1.4.1 NSW Biosecurity Act 2015 – Weeds

The NSW *Biosecurity Act 2015*, repealed the NSW *Noxious Weeds Act 1993* on the 1st of July 2017.

The purpose of the NSW *Biosecurity Act 2015* is to provide framework for risk-based prevention, elimination and minimisation of biosecurity risks. These include pests, diseases, contaminants, non-indigenous animals, bees, weeds and other biosecurity matter. One of the main objectives of the Biosecurity Act 2015 is to promote biosecurity issues as a shared responsibility between government, industry, and communities, i.e. private and public land managers have the same obligations under the Act. Local Council is the control authority who enforces this Act. A State Weeds Committee has been established, as well as eleven (11) Regional Weeds Committees who will provide guidance and facilitate community and stake holder input into weed management.

Under the *Biosecurity Act 2015*, the definition of a weed is a plant that is a pest, and the definition of a pest is a plant or animal (other than a human) that has an adverse effect on, or is suspected of having an adverse effect on, the environment, the economy or the community.

Schedule 1 describes the special provisions relating to weeds. Under this Schedule, land occupiers have a duty to:

- control weeds on roads which bound their occupied land;
- control aquatic weeds along a watercourse, river, or inland water which bound their occupied land; and
- control weeds on land extended from their occupied land if that land is an irrigation area forming any part of a public road, public reserve or public channel, or watercourse, river or inland water.

Regional Strategic Weed Management Plans have been developed which describe the land occupier's expectations for managing weeds and form the basis for an enforceable general biosecurity duty. The three (3) Delta Coal sites fall within the Greater Sydney Local Land Services area, therefore the *Greater Sydney Regional Strategic Management Plan* applies to these sites.

1.4.2 Australian Weeds Strategy – Weeds of National Significance (WoNS)

Australian Weeds Strategy provides a national framework for addressing weed issues. It lists thirty-two (32) weed species or genera that are required to be managed under state legislation. These are Weeds of National Significance (WoNS). Five (5) of these have been identified on site and are listed in Section 3 of this management plan.

1.4.3 NSW Biodiversity Conservation Act 2016

The NSW *Biodiversity Conservation Act 2016* (BC Act), with associated regulations and maps, repealed the *Threatened Species Conservation Act 1995* on the 25th of August 2017. The BC Act is now the key piece of legislation protecting threatened species, populations and ecological communities within NSW.

There are a number of Endangered Ecological Communities (EEC) mapped on the Delta Coal sites (ELA 2016). These include;

- *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions;*
- *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*; and

- *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion.*

Refer to Maps 1, 2 and 3 for mapped EECs. The Mannering Colliery does not contain any EECs.

One aim of the BC Act is to eliminate or manage certain Key Threatening Processes (KTPs) that threaten the survival or evolutionary development of threatened species, populations and ecological communities.

KTPs listed by the BC Act are identified as having significant impacts on the conservation of native flora and fauna. There are currently thirty-seven (37) KTPs listed under the BC Act including:

i. Invasion and establishment of exotic vines and scramblers.
ii. Invasion, establishment and spread of *Lantana camara*.
iii. Invasion of native plant communities by *Chrysanthemoides monilifera* (Bitou Bush and Boneseed).
iv. Invasion of native plant communities by exotic perennial grasses.
v. Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.

2 METHODS

2.1 Desktop Research

A preliminary desktop study was conducted to assess the previously mapped weed locations (Kleinfelder 2016) and existing plant community types using the Wyong ELA 2016 PCT (ELA, 2016) mapping.

2.2 Site Survey

A site survey was conducted over two (2) days on the 15th and 16th October 2019. Weather conditions were clear with maximum temperatures of approximately 25˚C on the 15th and 24˚C on the 16th. See Maps 1, 2 and 3 for survey effort.

A general weed survey was conducted using random meanders. Edges of bushland, creek lines, disturbed areas and any other areas likely to contain weeds were targeted as were areas where weeds were previously identified in the 2016 Weed Action Plan.

- The identification of native and exotic plant species according to *Field Guide to the Native Plants of Sydney* (Robinson, 2003), Flora of NSW, Volumes 1-4 (Harden 1992, 1993, 2000, 2002), *Weeds of the south-east: an identification guide for Australia* (Richardson et al, 2006) and PlantNET (2019), with reference to recent taxonomic changes;

Any “weed infestations” found during survey were recorded using a hand held GPS. Weed infestations are defined as:

- Areas where weeds make up >80% percentage foliage cover.
- Weeds of national significance
- Priority weeds and other weeds of regional concern as listed in the Greater Sydney Regional Strategic Weed Management Plan

Any WoNS and/or any priority weeds for the Greater Sydney Region which were identified on site, are listed in Appendix A which includes their biosecurity status under the *Biosecurity Act 2015*.

2.3 Weed Density Mapping

Weed density maps were developed for each zone. All weeds present were considered when determining the weed densities for each area.

GPS locations were mapped to provide clear locations for WoNS, significant weed infestation and Priority Weeds.

2.4 Priorities

The priorities of targeted weed work detailed in Section 4 - Management Zones, were determined by the species listing and the landholder’s obligations under the *Biosecurity Act 2015* and the Greater Sydney Regional Strategic Weed Management Plan. Species listed as WoNS are considered a high priority. Other weeds that were deemed to have the potential to significantly impact biodiversity were also included as Priority Weeds.

Priority areas were determined by the resilience and condition of existing bushland and the location of weed infestations. Infestation or small outbreaks of weeds in high quality, undisturbed or resilient bushland are considered a high priority to conserve the existing biodiversity values and to prevent further spread which could become more costly to address in the future. Infestations along property boundaries, creek lines and waterways are considered high priority as weeds are more susceptible to spread onto neighbouring properties downstream or across boundary edges.

2.5 Limitations

The diurnal field survey was conducted over two (2) days during October 2019. Random meanders were conducted across the site and targeted searches for weeds along creek line, bushland edges and disturbed areas where weeds are likely to occur. Some areas were not searched due to access issues and time constraints. The central zones mainly consist of infrastructure and planted species and were not surveyed for this report.

When reviewing maps please note that the hand-held GPS equipment used is only accurate to 3 metres.

3 RESULTS

The weed survey identified thirty-six (36) weed species under the *Biosecurity Act 2015.* These are listed in Appendix A along with the land holder's obligations under the Act. Of these, five (5) are WoNS. These are:

- Asparagus Fern (*Asparagus aethiopicus*)
- Bitou Bush (*Chrysanthemoides monilifera subsp rotundata*)
- Lantana (*Lantana camara*)
- Blackberry (*Rubus fruticosus* aggregate)
- Fireweed (*Senecio madagascariensis*)

Bitou Bush, Lantana and Fireweed are also listed as State Priority Weeds. Six (6) weeds are listed as Priority Weeds under the Greater Sydney Regional Strategic Weed Management Plan. These include Giant Reed (*Arundo donax*), Pampas Grass (*Cortaderia jubata*) and the above mentioned WoNS.

Weeds are mostly contained to disturbed areas, bushland edges, tracks and riparian areas across all three (3) sites. There are some small outbreaks within large resilient bushland areas which have been prioritised within this Plan. Many of these have been treated as part of primary bush regeneration efforts and require follow up treatment of new shoots.

Two (2) areas with two (2) to three (3) individual orchids of the genus Microtis were identified. One (1) area is located in the easement of the eastern zone of Chain Valley Colliery and another along the disturbed edges of the eastern zone at Mannering Colliery. These have been mapped in Map 7 and Map 11.

The current condition, locations of weed infestation and weed densities have been discussed in detail within Section 4 - Management Zones.

4 MANAGEMENT ZONES

TEC have based the management zones on those created for the 2016 Weed Action Plan (Kleinfelder, 2016). The boundaries have been adjusted slightly to follow existing structural boundaries such as roads, tracks, clearings, easements and fences to allow for clearer delineation of management zones during on ground works.

The Central Zone of both the Chain Valley Colliery and Mannering Park Colliery are entirely disturbed and contain the site infrastructure. The zones are mostly void of native vegetation except for remnant canopy trees and planted native and ornamental species, as such these zones were not included in the weed survey.

4.1 Chain Valley Colliery

The Chain Valley Colliery site is made up of the following EECs:

- *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions;* and
- *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*

See Map 1 for EEC locations.

Chain Valley Colliery contains high quality resilient bushland in most zones. Managing weed outbreaks in these areas is a high priority to prevent degradation and further encroachment on bushland areas. Most weed outbreaks occur in the disturbed areas including cleared easements, easement edges, along tracks, creek lines and dam edges. These outbreaks are small and in their early stages of growth and therefore should be targeted before they progress any further. Bush regeneration efforts targeting Lantana and Pampas Grass (*Cortaderia selloana*) are evident throughout the site but now require follow up treatment. The following maps and tables provide further details on each management zone including priority weeds and management issues.



Figure 1. Eastern Zone of Chain Valley Colliery along creek line.



Figure 2. Treated Lantana and Blackberry in Northern Zone of Chain Valley Colliery near cottages.



Figure 3. Fishbone Fern and Crofton Weed in Western Zone Area B of Chain Valley Colliery along drainage area.

4.1.1 Chain Valley Colliery – Northern Zone

Table 1. Chain Valley Colliery – Northern Zone Area Descriptions

Description	This zone is approximately 8.2 ha and includes cleared powerline easements and modified areas surrounding the cottages and bushland. **Area A – <5% weed cover** The most resilient area of the zone with low weed densities. Some weed encroachments on the edges of the bushland. A small area of treated Lantana and Blackberry is located to the south-east of this zone. **Area B – 5-25% weed cover** Highest weed densities are found along the edge of the bushland and species present include Blackberry, Asparagus Fern, Fishbone Fern (*Nephrolepis cordifolia*), *Monstera deliciosa* and *Senna pendula var. glabrata.* **Area C – 25-50% weed cover** Dense area of Blackberry, Lantana, Ochna serrulata, Wild Tobacco (*Solanum mauritianum)* and herbaceous weeds. Evidence of Blackberry and Pampas Grass being treated. Appears to have been the focus area of Bush Regeneration efforts. **Area D – 5-25% weed cover** Mostly ornamental exotic plant species in front of houses. **Area E – 5-25% weed cover** Dense patch of *Monstera deliciosa*. **Area F – 5-25% weed cover** Patch of Camphor Laurel (*Cinnamomum camphora*) and Coral trees (*Erythrina x sykesii*) including several saplings. **Area G – 5-25% weed cover** Bushland strip between powerline easements containing scattered small outbreaks of weeds including *Senna pendula var. glabrata* and Lantana. **Area H – 5-25% weed cover** Powerline easement with scattered Fireweed and Purple Top (*Verbena bonariensis*).
Priority Weeds	Lantana, Blackberry, Pampas Grass and Asparagus Fern
Priority Areas	Area A and B has the most resilience and is connected to larger tracts of bushland. Weeds should be controlled to prevent further spread.
Key Management Issues	• Follow up treatment of Lantana, Blackberry, *Senna pendula var. glabrata* in Areas A and C. • Primary treatment of Asparagus Fern particularly along edges in Area B. • Primary treatment of *Senna pendula var. glabrata* and *Monstera deliciosa,* and untreated areas of Lantana and Pampas Grass.
Notes	Access to this zone via dirt road from near CVC site entry. Key required. Caution to be taken driving around cottages due to rubbish and debris hidden by long grass.

Title: Chain Valley Northern Zone Weed Density

Map No: 4

Site: Chain Valley Colliery

Client: Delta Coal

Date: November 2019

Project No: 11483

Author: G Barron

Road

Management Zones

Weed Density

- < 5%
- 5 - 25%
- 25 - 50%

Key Points

- Blackberry
- Blackberry & Lantana camara - treated
- Blackberry, Lantana camara & Pampas Grass - treated
- Blackberry, Lantana camara, Senna pendula var. glabrata & Wild Tobacco
- Camphor Laurel
- Coral Tree
- Coral Tree - treated
- Coral Tree, Lantana camara & Senna pendula var. glabrata
- Coral Tree, Ochna serrulata & Senna pendula var. glabrata
- Lantana camara
- Lantana camara & Senna pendula var. glabrata
- Lantana camara - treated

0 20 40 80 Meters

N

Data Source:
Total Earth Care
Nearmap

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4.1.2 Chain Valley Colliery – Western Zone

Table 2. Chain Valley Colliery – Western Zone Area Descriptions

Description	This zone is approximate 6.4 ha of highly resilient bushland with predominantly low weed densities. Evidence throughout of bush regeneration efforts. **Area A – <5% weed cover** Highly resilient bushland with a very low weed density. Scattered outbreaks of Blackberry and Lantana on the side of the road that runs along the north-west boundary. All identified scattered Lantana thickets in the south-east part of the area have been treated. Some juvenile Lantana coming up in these treated areas. **Area B – 5-25% weed cover** Damp drainage areas in some places have encourage weed growth. Lantana, Crofton Weed, Asparagus Fern, Fishbone Fern and herbaceous weed species scattered throughout this zones (see Figure 3). All identified Lantana patches have been treated. Some juvenile Lantana coming up in these treated areas. Pampas Grass and some Fishbone Fern has been treated but requiring follow up treatment.
Priority Weeds	Lantana, Blackberry, Pampas Grass, Asparagus Fern and Crofton Weed.
Priority Areas	Both Area A and B. The surrounding bushland is highly resilient and further weed outbreaks should be prevented.
Key Management Issues	• Follow up treatment of Lantana and Pampas Grass. • Primary treatment of Crofton Weed and Fishbone Fern. • Hand weeding and spraying. • Priority zone. Edges and tracks should be monitored regularly.
Notes	Access to the track along the north-west boundary of this zone via dirt road from near CVC site entry. Key required.

Title: Chain Valley Western Zone Weed Density

Map No: 5

Site: Chain Valley Colliery

Client: Delta Coal

Date: November 2019

Project No: 11483

Author: G Barron

Road

Management Zones

Weed Density

< 5%

5 - 25%

25 - 50%

Key Points

- Asparagus Fern
- Blackberry & Fireweed
- Crofton Weed
- Crofton Weed & Lantana camara
- Lantana camara
- Lantana camara - treated
- Pampas Grass & Lantana camara - treated and Asparagus Fern & Crofton Weed
- Senna pendula var. glabrata

0 20 40 80 Meters

N

Data Source:
Total Earth Care
Nearmap

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4.1.3 Chain Valley Colliery – Southern Zone

Table 3. Chain Valley Colliery – Southern Zone Area Descriptions

Description	This zone is approximate 7.2 ha of highly resilient and mostly undisturbed bushland with predominantly low weed densities. **Area A – 5-25% weed cover** Scattered small outbreaks of *Senna pendula var. glabrata*, Blackberry, Bitou Bush, Ochna and Lantana, Lantana has been treated but some small shoots are coming up. Most weeds are along the track edge to the north and the eastern boundary of the bush and powerline easement. **Area B – <5% weed cover** Highly resilient bushland. Some *Pinus radiata* saplings coming up adjacent to the track that runs along the southern part of the area. **Area C – 5-25% weed cover** Powerline easement containing scattered *Pinus radiata* saplings, herbaceous weeds and Oleander. **Area D – <5% weed cover** Resilient bushland with scattered *Pinus radiata* saplings along easement edge. **Area E – 5-25% weed cover** Mostly managed lawn along driveway. Scattered *Pinus radiata* saplings, African Lovegrass (*Eragrostis curvula*) and Oleander (*Nerium oleander*) on bushland edges. **Area F – 25-50% weed cover** Disturbed bushland edges with scattered small outbreaks of Bitou Bush, Lantana, Pampas Grass, Banana Trees and African Love Grass. Most Pampas Grass in this area has been treated.
Priority Weeds	Lantana, Pampas Grass, Bitou Bush and *Pinus radiata* saplings
Priority Areas	Area B is highly resilient and has very few weed outbreaks. All other areas of this management zone should be managed to prevent further spread of weeds into Area B.
Key Management Issues	• Follow up treatment of Pampas Grass • Follow up and primary treatment of Lantana. Small shoots can be hand pulled. • Primary treatment of Bitou Bush. Most can be hand pulled. • Primary treatment of *Pinus radiata* saplings particularly along the track in Area B. This is a highly resilient area and invasion of Pines in this area should be prevented. • High priority zone. Monitor tracks for any weed out breaks.
Notes	Access to the track within this zone is via a locked gate or through powerline easement.

Title: Chain Valley Southern Zone Weed Density

Map No: 6

Site: Chain Valley Colliery

Client: Delta Coal

Date: November 2019

Project No: 11483

Author: G Barron

Road

Management Zones

Weed Density

- < 5%
- 5 - 25%
- 25 - 50%

Key points

- African Lovegrass & Pampas Grass
- African Lovegrass & Pinus radiata
- Asparagus Fern & Lantana camara
- Asparagus Fern, Senna pendula var. glabrata & Bitou Bush
- Bitou Bush
- Bitou Bush & Lantana camara
- Bitou Bush & Senna pendula var. glabrata
- Bitou Bush - removed
- Lantana camara
- Lantana camara & Senna pendula var. glabrata
- Lantana camara (treated), African Lovegrass & Bitou Bush
- Lantana camara - treated
- Ochna serrulata
- Ochna serrulata & Senna pendula var. glabrata
- Pamas Grass (treated) & Lantana camara
- Pampas Grass (treated)
- Pinus radiata
- Senna pendula var. glabrata
- Senna pendula var. glabrata - removed

0 15 30 60 Meters

N

Data Source:
Total Earth Care
Nearmap

total earth care

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4.1.4 Chain Valley Colliery – Eastern Zone

Table 4. Chain Valley Colliery – Eastern Zone Area Descriptions

Description	This zone is approximate 11.17 ha of bushland cleared powerline easements and sediment ponds. These ponds consistently discharge across the bushland in Area H and into the lake.to the north-east. **Area A – <5% weed cover** Small occurrences of Caster Oil and Lantana on dam walls. Scattered occurrences of *Senna pendula var. glabrata* and Narrow-leafed Cotton Bush (*Gomphocarpus fruticosus*) in the easements to the north. **Area B – 5-25% weed cover** Small amounts of scattered Whiskey Grass (*Andropogon virginicus*), Pampas Grass and Bitou Bush on easement edges and damp areas. **Area C – <5% weed cover** Small amounts of scattered Whiskey Grass, Pampas Grass, Bitou Bush and other herbaceous weeds on easement edges. **Area D – 5-25% weed cover** Encroachments of weeds from the track to the south of the area and the easement edges. Scattered small outbreaks of Asparagus Fern, *Senna pendula var. glabrata*, Lantana, African Love Grass, Blackberry Nightshade and Bitou Bush. A small Lantana thicket has been treated. **Area E – 5-25% weed cover** Dense areas of Pampas Grass in this area and across property boundary. Scattered occurrences of Crofton Weed, Lantana and Bitou Bush. **Area F – 5-25% weed cover** Cleared powerline easement containing scattered Whiskey Grass, Cotton Bush, Fireweed and herbaceous weeds. Small lantana thicket and Pampas Grass under powerline pylon. **Area G – 25-50% weed cover** Dense stand of Wild Tobacco. Asparagus Fern starting to come up. Scattered small occurrences of Bitou Bush, Lantana, Ginger Lily, Ochna, Inkweed, Crofton and *Senna pendula var. glabrata*. Large stands of Lantana have been treated. Coral trees, Fishbone Fern, *Monstera deliciosa*, *Senna pendula var. glabrata* and Ginger Lily along creek line in southern corner. **Area H – <5% weed cover** Parts of this area have been recently burnt and are coming up with early successional native species such as *Dodonaea triquetra.* Track edges south-east of the dam have scattered small occurrences of Bitou Bush, Asparagus Fern, Lantana, Crofton Weed and Fireweed. Some sporadic occurrences of Lantana, Bitou Bush and *Senna pendula var. glabrata* along the edges of the easement in the north of this area.
Priority Weeds	Lantana, Asparagus Fern, Bitou Bush, Pampas Grass and *Senna pendula var. glabrata*.
Priority Areas	Area G along creek line should be targeted to prevent weed propagules travelling downstream. Area H is mostly resilient bushland that has been mapped as two EECs (see Map 1).

Key Management Issues	• Prioritise treating weeds in the southern half of this zone. • Follow up treatment of Lantana. Small shoots can be hand pulled. • Primary treatment of Bitou Bush, Asparagus Fern, *Senna pendula var. glabrata* and Pampas Grass along track and easement edges.
Notes	Vehicle access via the tracks near the sediment ponds and via the track through the south-west corner of the zone.

Title: Chain Valley Eastern Zone Weed Density

Map No: 7

Site: Chain Valley Colliery

Client: Delta Coal

Date: November 2019

Project No: 11483

Author: G Barron

Road

Creek

Management Zones

Weed Density

< 5%

5 - 25%

25 - 50%

Key Points

- Asparagus Fern
- Asparagus Fern, Crofton Weed, Lantana Camara, Ochna serrulata, Senna pendula var. glabrata & Wild Tobacco
- Bitou Bush
- Bitou Bush & Lantana camara
- Bitou Bush & Senna pendula var. glabrata
- Fireweed, Crofton Weed & Asparagus Fern
- Orchid - Microtis sp.
- Pampas Grass
- Pampas Grass, Lantana camara & Fireweed

0 25 50 100 Meters

N

Data Source:
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SIX Maps

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4.2 Mannering Colliery

Mannering Colliery has more disturbed areas and fewer large tracts of undisturbed bushland then the Chain Valley Colliery. However, the site is surrounded by bushland and therefore it is imperative that weeds are prevented from spreading into neighbouring resilient areas. Most outbreaks are small and should be targeted before they progress any further. Bush regeneration efforts targeting Lantana and Pampas Grass are evident throughout the site but now require follow up treatment. This site does not contain any EECs.

The following maps and tables provide further details on each management zone including priority weeds, priority areas and management issues.



Figure 4. Resilient bushland in Eastern Zone Area D of Mannering Colliery.



Figure 5. Bamboo and Crofton Weed in Western Zone Area F of Mannering Colliery.



Figure 6. Crofton Weed and *Juncus acutus* in wetland area of Northern Zone Area B of Mannering Colliery.

4.2.1 Mannering Colliery – Northern Zone

Table 5. Mannering Colliery – Northern Zone Area Descriptions

Description	This zone is approximate 4.24 ha and consists of four (4) dams, access tracks and some patches of disturbed bushland. Water is discharged from the ponds across Area A, B and G. **Area A – 5-25% weed cover** *Pinus radiata* saplings, Whiskey Grass and Fireweed along track edges. Treated *Acacia saligna.* Dense stands of *Juncus acutus* in low lying areas. **Area B – 50-75% weed cover** Dense area of weeds including Lantana, Bitou Bush, Crofton Weed, Pampas Grass, Senna and *Juncus acutus.* Lantana and some Pampas Grass has been treated. **Area C – 25-50% weed cover** High density of herbaceous weeds. *Acacia saligna* present, most of which has been treated. *Juncus acutus* present. Pampas Grass present most of which has been treated. Whiskey Grass along track edges. **Area D – 25-50% weed cover** High density of herbaceous weeds across disturbed area. **Area E – 5-25% weed cover** Hydrocotyl is scattered along the dam edges and Typha within the dam. **Area F – 5-25% weed cover** Typha within the dam. **Area G – 5-25% weed cover** The edges of Area G contains *Pinus radiata* saplings. Within the low lying damp wetland areas Large stands of Lantana and Pampas Grass have been treated. **Area H – <5% weed cover** Limited access due to fencing. Scattered Crofton Weed, Lantana, Bitou Bush, Camphor Laurel trees and mature and sapling *Pinus radiata.* A Resource Regulator identified Coolatai Grass (*Hyparrhenia hirta*) present on the western wall of the largest dam. EMM consultants confirmed the species ID. **Area I – <5% weed cover** Mostly disturbed and cleared areas. Herbaceous weeds, Whiskey Grass and Fireweed along track edges. **Area J – 50-75% weed cover** Dense and scattered stands of Bitou Bush, Lantana, Crofton and Senna. Lantana has been treated but new young shoots are coming up. Large and sapling *Pinus radiata* present. Scattered herbaceous weeds including *Bidens pilosa*, Fleabane (*Conyza sp.*) and Purple Top.
Priority Weeds	Lantana, Bitou Bush, Pampas Grass, Crofton Weed, Fireweed, Senna, *Pinus radiata, Juncus acutus, Coolatai Grass* and Senna
Priority Areas	Area J to follow up from primary weed treatment in this area. Area B to follow up primary treatment of Lantana and Pampas Grass and prevent propagules form spreading downstream.

Key Management Issues	• Follow up treatment of Lantana. Young, small shoots can be hand pulled. • Follow up treatment for Pampas Grass and Crofton Weed using cut/paint, hand removal and spraying. • Primary treatment of *Juncus acutus* • Hand pull Fireweed opportunistically. • Prioritise areas A, E, G and J.
Notes	Easy vehicle access to most areas. No obvious access to Area H due to fence.

Title: Mannering Colliery
Northern Zone Weed Density

Map No: 8
Site: Mannering Colliery
Client: Delta Coal
Date: November 2019
Project No: 11483
Author: G Barron

Management Zones
Road
Creek

Weed Density
< 5%
5 - 25%
25 - 50%
50 - 75%

Key Points
- Acacia saligna
- Acacia saligna (treated) & Juncus acutus
- Acacia saligna, Bitou Bush & Crofton Weed,
- Bitou Bush
- Bitou Bush & Crofton Weed
- Bitou Bush & Lantana camara
- Bitou Bush - removed
- Coolatai Grass
- Crofton Weed & Senna pendula var. glabrata
- Crofton Weed, Juncus acutus & Pampas Grass (treated)
- Fireweed
- Juncus acutus
- Lantana camara
- Lantana camara - treated
- Pampas Grass - treated
- Pinus radiata
- Senna pendula var. glabrata

0 15 30 60 Meters

N

Data Source:
Total Earth Care
Nearmap

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4.2.2 Mannering Colliery – Western Zone

Table 6. Mannering Colliery – Western Zone Area Descriptions

Description	This zone is approximately 4.12 ha including cleared powerline easements, a dam, and disturbed patches of remnant bushland some of which connect to greater bushland extents. **Area A – 5-25% weed cover** Scattered herbaceous weeds and exotic grasses. Small scattered patches of Asparagus Fern. **Area B – 5-25% weed cover** Powerline easements mostly consisting of exotic grasses, some Lantana patches, *Senna pendula var. glabrata* and Fireweed, particularly closer to the dam edges. **Area C – 5-25% weed cover** Small scattered outbreaks of Crofton Weed, Pampas Grass, Bitou Bush, Whiskey Grass and African Love Grass throughout this area. **Area D – 25-50% weed cover** Scattered outbreaks of Lantana, Crofton Weed, Bitou Bush, Whiskey Grass and herbaceous weeds. Lantana thickets have been treated. New shoots are coming requiring treatment. **Area E – <5% weed cover** Isolated patch of vegetation containing a small thicket of Lantana. **Area F – 25-50% weed cover** Lantana, Crofton Weed, Bitou Bush, and a large outbreak of Bamboo are dominating this area. **Area G – 5-25% weed cover** A fence divides this area from the rest of the western zone. A large area of Lantana is located in the northern part of this area.
Priority Weeds	Asparagus Fern, Lantana, Senna, Crofton Weed, Bitou Bush and Bamboo.
Priority Areas	Areas C, F and G are a priority within this zone due to their proximity to remnant bushland and potential for WoNS and Priority Weeds under the Biosecurity Act to spread.
Key Management Issues	• Follow up and primary treatment of Lantana. • Primary treatment of Bamboo, Crofton Weed, Asparagus Fern. • Opportunistic hand pulling of Fireweed.
Notes	Easy vehicle access to most areas. Area G is separated from the rest of the zone by a fence so vehicle access is limited. On foot access is possible by following the fence from the main driveway entrance to the south.

Title: Mannering Colliery
Western Zone Weed Density

Map No: 9
Site: Mannering Colliery
Client: Delta Coal
Date: November 2019
Project No: 11483
Author: G Barron

Management Zones
Road
Creek

Weed Density
< 5%
5 - 25%
25 - 50%
50 - 75%

Key Points
- African Lovegrass & Bitou Bush
- Asparagus Fern
- Bamboo
- Bamboo, Lantana camara & Pampas Grass
- Bitou Bush
- Bitou Bush & Lantana camara
- Crofton Weed
- Crofton Weed & Pampas Grass
- Crofton Weed, Fireweed, Lantana camara & Senna pendula var. glabrata
- Crofton Weed, Lantana camara & Senna pendula var. glabrata
- Lantana camara
- Lantana camara - treated
- Pinus radiata
- Senna pendula var. glabrata

0 12.5 25 50 Meters

N

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Total Earth Care
Nearmap

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4.2.3 Mannering Colliery – Southern Zone

Table 7. Mannering Colliery – Southern Zone Area Descriptions

Description	This zone is approximately 2.02 ha. It is mostly dominated by mature *Pinus radiata* and Bamboo. This zone is a low priority due to the lack of remnant bushland and the extent of the pine forest. **Area A – 50-75% weed cover** Mature and sapling *Pinus radiata* lining the driveways. **Area B – 25-50% weed cover** High densities of mature *Pinus radiata* and Bamboo on western side of fence. Other exotic ornamental species including Oleander and Agave. Camphor Laurel trees on western side of fence. Whiskey Grass and Fireweed across managed lawn. Low priority area as dominated by *Pinus radiata.* **Area C – 5-25% weed cover** Mostly herbaceous weeds and exotic grasses.
Priority Weeds	Bamboo, Fireweed, Camphor Laurel trees.
Priority Areas	All areas within this zone are low priority. Other zones of the Mannering Colliery are to be prioritised over this one.
Key Management Issues	• Primary treatment of Fireweed and *Pinus radiata* saplings in Area C
Notes	Fence divides Area B. Western side of Area B can be accessed from southern end near driveway.

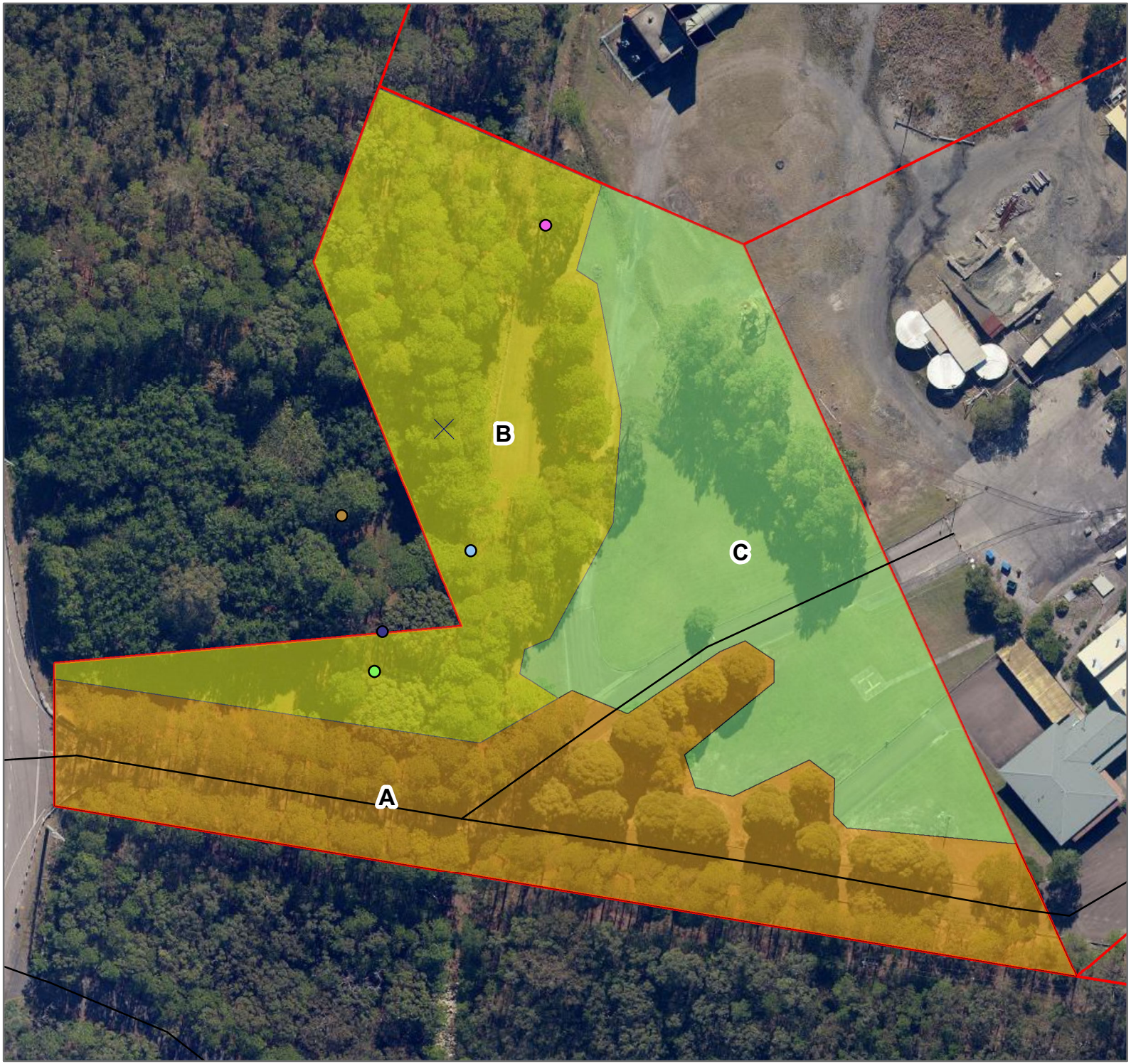
Title: Mannering Colliery
Southern Zone Weed Density

Map No: 10
Site: Mannering Colliery
Client: Delta Coal
Date: November 2019
Project No: 11483
Author: G Barron

Management Zones
Road
Creek

Weed Density
< 5%
5 - 25%
25 - 50%
50 - 75%

Key points
African Lovegrass
Bamboo
Bamboo & Coral Tree
Fireweed
Senna pendula var. glabrata



0 10 20 40 Meters

N

Data Source:
Total Earth Care
Nearmap

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4.2.4 Mannering Colliery – Eastern Zone

Table 8. Mannering Colliery – Eastern Zone Area Descriptions

Description	This zone is approximately 3.29 ha. This zone contains a carpark, cleared stockpile areas and dam, all bordered by bushland. The bushland is contiguous with adjacent bushland beyond the property boundary to the south. Weeds are generally confined to the bushland edges and disturbed areas. **Area A – 5-25% weed cover** Mostly planted ornamental exotics and some natives. Herbaceous weeds, exotic grasses and Fireweed across lawn. **Area B – 25-50% weed cover** Scattered herbaceous weeds, exotic and weedy grasses around edges of disturbed area. **Area C – 5-25% weed cover** Small area of weed encroachment including Crofton Weed. Evidence of treated Pampas Grass. Small outbreaks of Crofton Weed and Lantana present. **Area D – <5% weed cover** Mostly weed free bushland with some *Pinus radiata* saplings and African Lovegrass in the south-west corner of the area. **Area E – 25-50% weed cover** Dominated by mature and sapling *Pinus radiata.*
Priority Weeds	Crofton Weed, Lantana, Pampas Grass, *Pinus radiata* and Fireweed.
Priority Areas	Area C and D. These areas are highly resilient and connected to bushland to the south.
Key Management Issues	• Follow up treatment of Pampas Grass. • Primary treatment of Lantana and Crofton Weed.
Notes	Site easily accessible.

Title: Mannering Colliery
Eastern Zone Weed Density

Map No: 11
Site: Mannering Colliery
Client: Delta Coal
Date: November 2019
Project No: 11483
Author: G Barron

Management Zones
Road
Creek

Weed Density
< 5%
5 - 25%
25 - 50%
50 - 75%

Key Points
- Acacia saligna
- African Lovegrass
- African Lovegrass & Senna pendula var. glabrata
- Bitou Bush
- Crofton Weed
- Fireweed
- Lantana camara
- Orchid - Microtis sp.
- Pampas Grass
- Pinus radiata
- Senna pendula var. glabrata

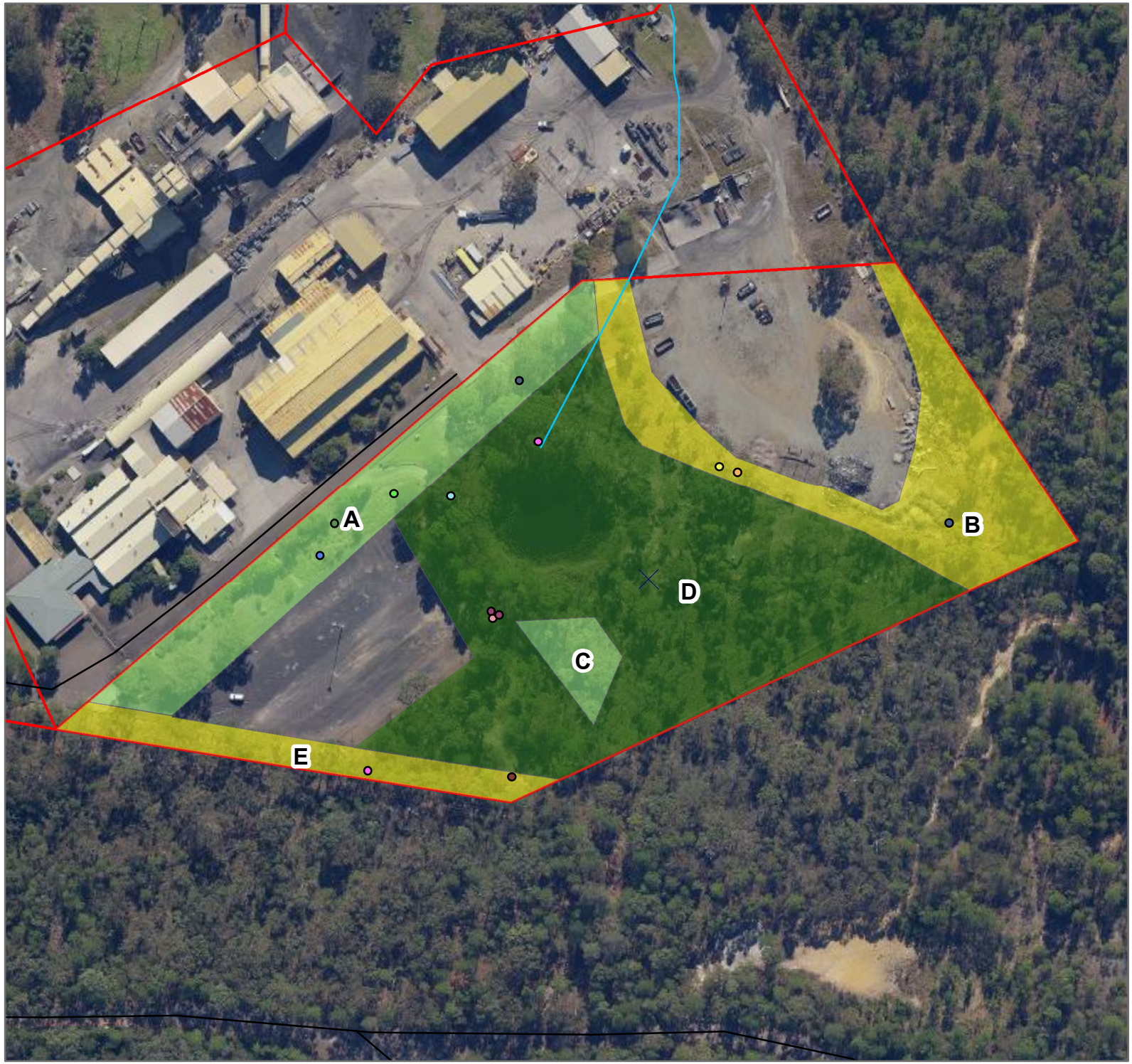
0 15 30 60 Meters

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Nearmap

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4.3 Summerland Point Ventilation Shaft

The Summerland Point Ventilation Shaft site is made up of the following EECs:

- *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions;* and
- *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregions.*

See Map 3 for EEC locations.

The site contains an unsealed road that provides access to a cleared area where the ventilation shaft infrastructure sits. The areas surrounding the ventilation shaft have been cleared and contain most of the weed species identified on the site. The site is surrounded by highly resilient bushland. Areas along the unsealed road have also been subject to some weed invasion.



Figure 7. Giant Reed within bushland at the Summerland Ventilation Shaft site. .



Figure 8. Unsealed road and easement within the Summerland Ventilation Shaft site.



Figure 9. Vegetation adjacent to road on the Summerland Ventilation Shaft site.

Table 9. Summerland Point Ventilation Shaft – Area Descriptions

Description	This zone is approximately 3.73 ha. This zone contains an unsealed road, a cleared area for the ventilation shaft infrastructure and remnant adjacent bushland. Weeds are generally confined to the bushland edges and disturbed areas. **Area A – 5-25% weed cover** Mostly bushland and road edges effected by weeds. Lantana thickets have been treated but required follow up treatment. Scattered small shoots of Lantana and Bitou Bush andherbaceous weeds.
Priority Weeds	Lantana, Giant Reed, Bitou Bush
Priority areas	Entire site – small weeds outbreaks on edges of highly resilient bushland must be targeted to prevent further spread.
Key Management Issues	• Follow up treatment of Lantana and Bitou Bush. Small shoots can be hand pulled. • Primary treatment of a small area of Giant Reed. • Monitor bushland edges and road edges for new outbreaks.
Notes	Easy vehicle access. Key required. Red-bellied black snake observed on site.

Title: Summerland Point Ventilation Shaft Weed Density

Map No: 12

Site: Summerland Point Ventilation Shaft

Client: Delta Coal

Date: November 2019

Project No: 11483
Author: G Barron

Summerland Point

Road

Creek

Weed Density

5 - 25%

Key Points

- Arundo donax & Lantana camara
- Bitou Bush
- Bitou Bush - removed
- Crofton Weed
- Fireweed
- Lantana camara
- Lantana camara & Senna pendula var. glabrata
- Lantana camara (treated) & Senna pendula var. glabrata
- Lantana camara - treated
- Senna pendula var. glabrata

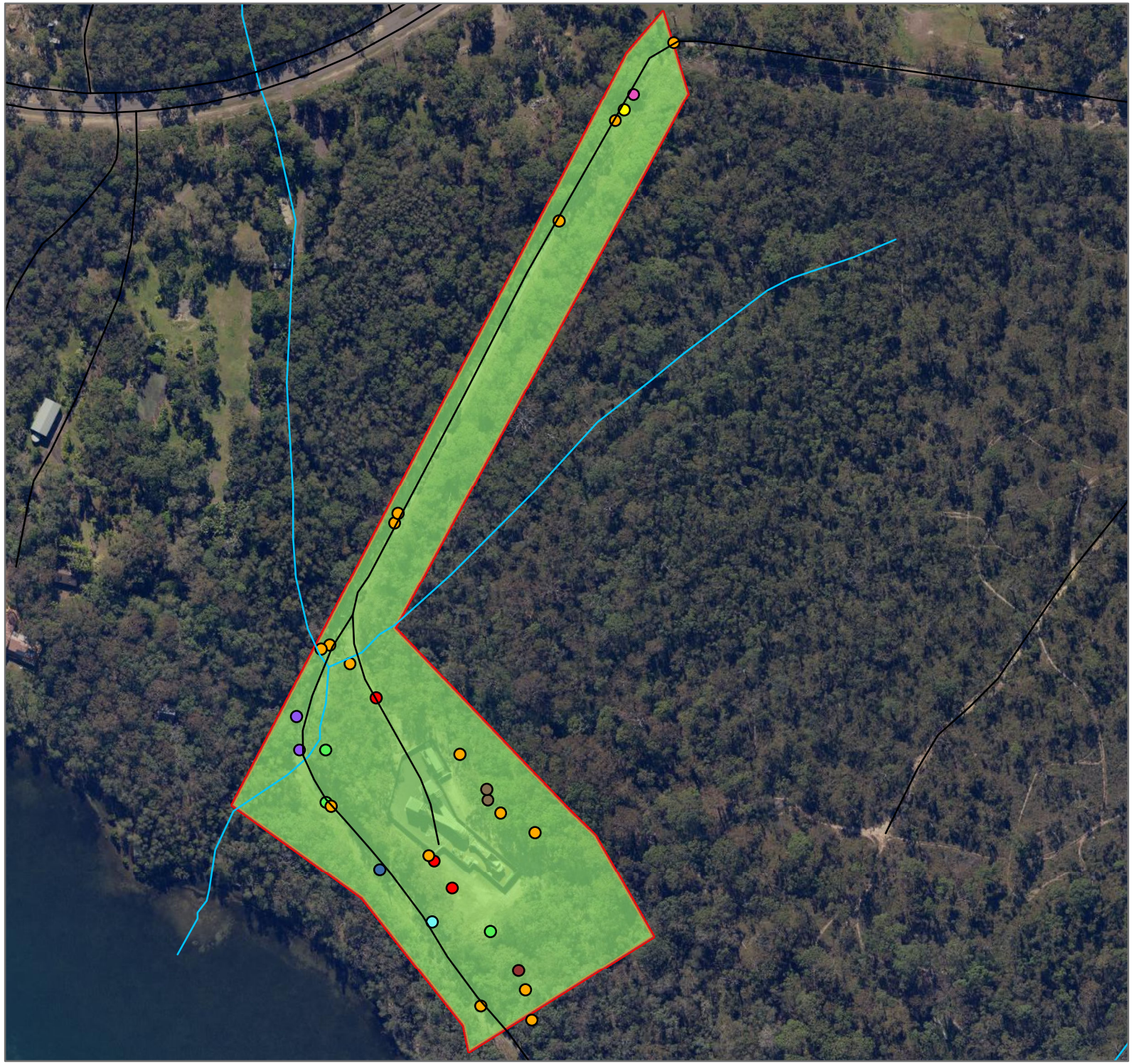
0 25 50 100 Meters

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SIX Maps

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5 WEED MANAGEMENT

Species specific recommended weeding techniques including recommended herbicides and ratios are included Appendix B.

Weed recruitment and outbreaks are often triggered by disturbance or clearing. Weed management is a form of disturbance that can trigger additional recruitment of weeds as areas are cleared. Therefore secondary treatment is essential to successful weeding and bush regeneration methods.

All weeding management actions on these sites must be carried out by trained bush regenerators. Bush Regeneration contractors must comply with the *Pesticides Act 1999 and the Pesticides Regulation 2017.*

7 MONITORING GUIDELINES

Monitoring is required to assess the outcomes of the weed management work and help determine if management strategies should be amended. Monitoring should be completed every six (6) months by a qualified ecologist or bush regeneration supervisor using the following methods:

- Assessment of weed control works, native regeneration and revegetation success via permanent repeatable photographic monitoring points; and
- Mapping of weed density per zone to assess the progress of the work. The mapping included in this report can assist in the development of baseline data.

Monitoring reports must include:

- Details of the work carried out including weed management techniques and herbicide used;
- Photo monitoring points – baseline and follow up photos; and
- Recommendations for corrective measures and/or specific vegetation management required.

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Appendix A. Weed Species listed as a Biosecurity Risk

Table 10. Categories of Management under the Greater Sydney Regional Strategic Weed Management Plan 2017-2022 under the NSW Biosecurity Act 2015

Category	Management Action
Prevention (Prevent)	To prevent the weed species arriving and establishing in the Region.
Eradication (Eliminate)	To permanently remove the species and its propagules from the Region, OR to destroy infestations to reduce the extent of the weed in the region with the aim of local eradication.
Containment (Minimise)	To prevent the ongoing spread of the species in all or part of the Region.
Asset Protection (Manage)	To prevent the spread of weeds to key sites/ assets of high economic, environmental and social value, or to reduce their impact on these sites if spread.
GBD (General Biosecurity Duty)	All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable."
RRM (Regional Recommended Measure)	Specific details for each species included in table.
PoD (Prohibition on Dealings)	Must not be imported into the State or sold.
B Zone (Biosecurity Zone)	Specific details for each species included in table.
PM (Prohibited Matter)	A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries.

Table 11. Weeds under the Biosecurity Act recorded within the subject site listed as State or Regional Priority Weeds in the Greater Sydney Regional Strategic Weed Management Plan 2017-2022

Common Name	Botanical Name	WONS	State Priority Weed-Mgmt. Actions	Regional Priority Weeds-Mgmt. Actions	Other Regional Weeds-Asset/value at risk	Duties for Priority Weeds of Greater Sydney
Golden Wreath Wattle	*Acacia saligna*				Environment	
Crofton Weed	*Ageratina adenophora*				Environment, Agriculture	
Scarlet Pimpernel	*Anagallis arvensis*					
Whisky Grass	*Andropogon virginicus*				Environment	
Giant Reed	*Arundo donax*			Asset Protection		RRM; Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment.
Asparagus Fern	*Asparagus aethiopicus*	Yes				PoD
Cobblers Pegs	*Bidens pilosa*					
Buffalo Grass	*Bouteloua dactyloides*					
Bitou Bush	*Chrysanthemoides monilifera subsp rotundata*	Yes	Containment			PoD, B Zone; The Bitou Bush Biosecurity Zone is established for all land within the State except land within 10 kilometres of the mean high water mark of the Pacific Ocean between Cape Byron in the north and Point Perpendicular in the south.
Camphor Laurel	*Cinnamomum camphora*				Environment, Agriculture, Human health	

Common Name	Botanical Name	WONS	State Priority Weed-Mgmt. Actions	Regional Priority Weeds-Mgmt. Actions	Other Regional Weeds-Asset/value at risk	Duties for Priority Weeds of Greater Sydney
Spear Thistle	*Cirsium vulgare*					
Fleabane	*Conyza bonariensis*					
Pampas Grass	*Cortaderia jubata*			Asset Protection		RRM: Land managers mitigate the risk of the plant being introduced to their land. Land managers prevent spread from their land where feasible. Land managers reduce the impact on priority assets. The plant should not be bought, sold, grown, carried or released into the environment. This Regional Recommended Measure applies to Cortaderia jubata (pink pampas grass)
Panic Veldgrass	*Ehrharta erecta*					
African Lovegrass	*Eragrostis curvula*				Environment	
Coral Tree, Common Coral Tree	*Erythrina x sykesii*				Environment	
Fennel	*Foeniculum vulgare*					
Narrow-Leaf Cotton Bush / Swan Plant	*Gomphocarpus fruticosus*					
Ginger Lily	*Hedychium gardnerianum*				Environment	
Pennywort	*Hydrocotyle bonariensis*					
Coolatai Grass	*Hyparrhenia hirta*				Environment, Agriculture	
Spiny Rush, Spike Rush, Sharp Rush	*Juncus acutus*				Environment	

Common Name	Botanical Name	WONS	State Priority Weed-Mgmt. Actions	Regional Priority Weeds-Mgmt. Actions	Other Regional Weeds-Asset/value at risk	Duties for Priority Weeds of Greater Sydney
Lantana	*Lantana camara*	Yes	Asset Protection			PoD
Fishbone Fern	*Nephrolepis cordifolia*				Environment	
Ochna	*Ochna serrulata*				Environment	
Bamboo, Black Bamboo, Rhizomatous Bamboo,	*Phyllostachys nigra*				Environment	
Inkweed	*Phytolacca octandra*					
Radiata Pine, Pine Wildings	*Pinus radiata*				Environment	
Plantain	*Plantago lanceolata*					
Castor Oil Plant	*Ricinus communis*					
Blackberry	*Rubus fruticosus aggregate*	Yes				PoD; All species in the Rubus fruiticosus species aggregate have this requirement, except for the varietals Black Satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan, Smooth Stem, and Thornfree
Fireweed	*Senecio madagascariensis*	Yes	Asset Protection			PoD
Senna / Cassia	*Senna pendula*				Environment	
Paddy's Lucerne	*Sida rhombifolia*					
Tobacco Bush/ Wild Tobacco	*Solanum mauritianum*				Environment, Agriculture	

Common Name	Botanical Name	WONS	State Priority Weed-Mgmt. Actions	Regional Priority Weeds-Mgmt. Actions	Other Regional Weeds-Asset/value at risk	Duties for Priority Weeds of Greater Sydney
Blackberry Night Shade	*Solanum nigrum*					
Purpletop	*Verbena bonarensis*					

Appendix B. Species Specific Weeding Techniques

Common Name	Botanical Name	Weeding Technique	Recommended Timing for Treatment	Herbicide Application	Herbicide Group	Ratio
Golden Wreath Wattle	*Acacia saligna*	Chainsaw and paint with neat Glyphosate.	All year round	Glyphosate 360g/L	M	Neat
Crofton Weed	*Ageratina adenophora*	Hand removal, brush cut and foliar sprayed with Glyphosate	All year round	Glyphosate 360g/L	M	1/100
Scarlet Pimpernel	*Anagallis arvensis*	Hand removal, spot spraying with Glyphosate.	All year round	Glyphosate 360g/L	M	1/100
Whisky Grass	*Andropogon virginicus*	Remove seed and crown out with knife or spot spray	Prior to flowering in March to May	Glyphosate 360g/L	M	1/100
Giant Reed	*Arundo donax*	Cut and paint with neat Glyphosate.	All year round	Glyphosate 360g/L	M	Neat
Asparagus Fern	*Asparagus aethiopicus*	Small single specimens to be crowned or Sprayed with Glyphosate/metsulfuron methyl	All year round	Glyphosate 360g/L & Metsulfuron-Methyl 600 g/kg	M & B	1/100 & 1g/10L
Cobblers Pegs	*Bidens pilosa*	Foliar spraying using Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Buffalo Grass	*Bouteloua dactyloides*	Hand removal, brush cut and foliar sprayed with Glyphosate	All year round	Glyphosate 360g/L	M	1/100
Bitou Bush	*Chrysanthemoides monilifera subsp rotundata*	Small single specimens hand pulled or larger shrubs cut and painted with neat Glyphosate	All year round	Glyphosate 360g/L	M	Neat
Camphor Laurel	*Cinnamomum camphora*	Scrape and paint or drill and fill with neat Glyphosate	All year round	Glyphosate 360g/L	M	Neat
Spear Thistle	*Cirsium vulgare*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Fleabane	*Conyza bonariensis*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Pampas Grass	*Cortaderia jubata*	Foliar spraying or cut/paint with Glyphosate or hand removed.	Prior to flowering in March to May	Glyphosate 360g/L	M	1/100 & Neat
Panic Veldgrass	*Ehrharta erecta*	Foliar spraying with Glyphosate	All year round	Glyphosate 360g/L	M	1/100

Common Name	Botanical Name	Weeding Technique	Recommended Timing for Treatment	Herbicide Application	Herbicide Group	Ratio
African Lovegrass	*Eragrostis curvula*	Hand pulled or brush cut and foliar sprayed with Glyphosate	All year round	Glyphosate 360g/L	M	1/100
Coral Tree, Common Coral Tree	*Erythrina x sykesii*	<80mm cut & painted; >80mm will be drilled/frilled with neat Glyphosate	All year round	Glyphosate 360g/L	M	Neat
Fennel	*Foeniculum vulgare*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Narrow-Leaf Cotton Bush / Swan Plant	*Gomphocarpus fruticosus*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100 & Neat
Ginger Lily	*Hedychium gardnerianum*	Physical removal. Large stands cut and painted with Glyphosate/Metsulfuron-Methyl.	All year round	Glyphosate 360g/L & Metsulfuron-Methyl 600 g/kg	M & B	Neat
Pennywort	*Hydrocotyle bonariensis*	Hand pulled or spot sprayed with Dicamba	All year round			
Coolatai Grass	*Hyparrhenia hirta*	Hand pulled or brush cut and foliar sprayed with Glyphosate. Up to three applications of Glyphosate in the same growing season will be required.	All year round	Glyphosate 360g/L	M	200ml/10l
Spiny Rush, Spike Rush, Sharp Rush	*Juncus acutus*	Juvenile single specimens to be dug out. Large infestations foliar spraying with Glyphosate.	All year round	Glyphosate 360g/L	M	1/100
Lantana	*Lantana camara*	Cut and paint, sprayed or splattered with Glyphosate. Hand pull small shoots.	All year round	Glyphosate 360g/L	M	Neat
Fishbone Fern	*Nephrolepis cordifolia*	Hand removal. Brush cut then sprayed with Glyphosate.	All year round	Glyphosate 360g/L	M	1/100
Ochna	*Ochna serrulata*	Double side scrape and paint all stems to 75% coverage.	All year round	Glyphosate 360g/L	M	Neat
Bamboo, Black Bamboo, Rhizomatous Bamboo,	*Phyllostachys nigra*	Chainsaw/cut close to base. Allow new shoots to return. Cut and paint new shoots with neat Glyphosate.	All year round	Glyphosate 360g/L	M	Neat
Inkweed	*Phytolacca octandra*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Radiata Pine, Pine Wildings	*Pinus radiata*	<80mm cut & painted; >80mm will be drilled/frilled with neat Glyphosate	All year round	Glyphosate 360g/L	M	Neat

Common Name	Botanical Name	Weeding Technique	Recommended Timing for Treatment	Herbicide Application	Herbicide Group	Ratio
Plantain	*Plantago lanceolata*	Foliar spraying with Glyphosate	All year round	Glyphosate 360g/L	M	1/100
Castor Oil Plant	*Ricinus communis*	Hand pulled and cut & painted with neat Glyphosate	All year round	Glyphosate 360g/L	M	Neat
Blackberry	*Rubus fruticosus aggregate*	Brush cut, crowned and scraped & painted with neat Glyphosate	Between flowering and fruiting from November to January	Glyphosate 360g/L	M	Neat
Fireweed	*Senecio madagascariensis*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Senna / Cassia	*Senna pendula*	Small individuals hand removed, larger plants cut and painted with neat Glyphosate	All year round	Glyphosate 360g/L	M	Neat
Paddy's Lucerne	*Sida rhombifolia*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Tobacco Bush/ Wild Tobacco	*Solanum mauritianum*	Cut & paint with Glyphosate	All year round	Glyphosate 360g/L	M	Neat
Blackberry Night Shade	*Solanum nigrum*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Purpletop	*Verbena bonarensis*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100

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Weed Action Plan – Addendum

Chain Valley Colliery, Mannering Colliery and Summerland Point Ventilation Shaft

Total Earth Care Pty Ltd

August 2020

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Weed Action Plan - Addendum

Chain Valley Colliery, Mannering Colliery and Summerland Point Ventilation Shaft

August 2020

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Revision/Version No.	Addendum 1	**Date of revision**	28 August 2020
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Prepared for:	Delta Coal		
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1 INTRODUCTION

1.1 Background

Total Earth Care (TEC) previously prepared the Weed Action Plan (WAP) in January 2020 for the three (3) Delta Coal sites: Chain Valley Colliery, Mannering Colliery and Summerland Point Ventilation Shaft. This Addendum is developed to incorporate an additional area on the Lake Macquarie foreshore at the Chain Valley Colliery in the WAP. Delta Coal was granted a licence by the Minister for Water, Property & Housing on 11th June 2020 under Section 2.20 of the Crown Land Management Act 2016 for the use of the licensed area for *Environmental Rehabilitation – Vegetation Management.*

This Addendum provides guidance for managing the weeds within the license's foreshore area. Current weed densities of the licence's area are provided as well as the relevant management actions.

1.2 Subject Sites and Study Area

The "Study Area" for this Addendum includes the licensed area of Crown Land (Lot 2, DP1198253) that abuts the Chain Valley Colliery site managed by Delta Coal. This will be referred to as the "Foreshore Zone". The area included in the license extends along the foreshore of the neighbouring Delta Electricity site to the north-west, but this area was not part of the scope of this project. Please see the Map 1 below which indicates the boundaries of the Study Area. The site falls within the Local Land Services Greater Sydney Region, bordering on the Hunter Region.

2 METHODS

2.1 Desktop Research

A preliminary desktop study was conducted to assess the previously mapped weed locations (Kleinfelder 2016) and existing plant community types using the Wyong ELA 2016 PCT (ELA, 2016) mapping.

2.2 Site Survey

A site survey was conducted over one (1) day on the 4th August 2020. Weather conditions were clear with maximum temperatures of approximately 18˚C. See Map 1 for survey effort. Survey methodology followed that outlined in the WAP 2020.

3 RESULTS

The weed survey identified twenty-five (25) weed species under the *Biosecurity Act 2015.* These are listed in Appendix A along with the landholder's obligations under the Act. Of these, four (4) are listed as Weeds of National Significance (WoNS). These are:

- Asparagus Fern (*Asparagus aethiopicus*);
- Bitou Bush (*Chrysanthemoides monilifera subsp rotundata*);
- Lantana (*Lantana camara*); and
- Fireweed (*Senecio madagascariensis*).

Bitou Bush, Lantana and Fireweed are also listed as State Priority Weeds. The above listed weeds are also listed as Priority Weeds under the Greater Sydney Regional Strategic Weed Management Plan.

Weeds are mostly encroaching from the lot boundaries of the land, which is managed by Delta Coal. There are some small outbreaks within large resilient bushland areas which have been prioritised within this Plan.

Approximately six (6) *Dendrobium teretifolium,* an epiphytic orchid, were recorded at the southern end of this zone attached to the trunks of Casuarinas. These have been mapped in Map 2 of this Addendum.

The current condition, locations of weed infestations and weed densities have been discussed in detail within Section 4 - Management Zones.

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Title: Chain Valley Colliery: Subject Site & Survey Effort

Map No: Addendum Map 1

Site: Chain Valley Colliery

Client: Delta Coal

Date: August 2020

Project No: J4925

Author: G Teear

Legend

- Management Zones
- Survey Track
- Road
- Creek

EEC under BC Act 2016

- Swamp Oak Floodplain Forest
- Swamp Sclerophyll Forest on Coastal Floodplains EEC



Data Source:
Total Earth Care
Nearmap
Wyong ELA 2016 v2

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4 MANAGEMENT ZONE

The Foreshore Area is the Crown Land foreshore of the southern end of Lake Macquarie. The Foreshore area forms an additional management zone to those outlined in the WAP 2020. A detailed description of the zone and the weed presence is included in Table 1.

4.1.1 Chain Valley Colliery – Foreshore Area

Table 1. Chain Valley Colliery – Foreshore Area Description

Description	This zone is approximately 2.7 ha and runs along the foreshore of Lake Macquarie abutting the north-east boundary of the Chain Valley Colliery. **Area A – <5% weed cover** The most resilient area of this zone with low weed densities. Scattered occurrences of Bitou Bush (*Chrysanthemoides monilifera*) and Asparagus Fern (*Asparagus aethiopicus*), mostly along the lake edge. Approximately six (6) *Dendrobium teretifolium,* an epiphytic orchid, were recorded at the southern end of this zone attached to the trunks of Casuarinas. **Area B – 50 – 75% weed cover** Area with the highest weed density within this zone, which this mostly within the ground and shrub layer. Weed occurrences in this area mostly consist of *Lantana camara, Ochna serrulata*, Wild Tobacco (*Solanum mauritianum),* Bitou Bush (*Chrysanthemoides monilifera*), *Tradescantia fluminensis* and Asparagus Fern (*Asparagus aethiopicus*). The areas of densest weeds are along the western boundary of Area B. **Area C – 50 – 75% weed cover** Weeds are mostly within the ground layer which consists of exotic grasses, Watsonia (*Watsonia meriana var. bulbillifera*), Fireweed (*Senecio madagascariensis*), Asparagus Fern (*Asparagus aethiopicus*) and herbaceous weeds. Scattered occurrences and small patches of *Senna pendula var. glabrata,* Fishbone Fern (*Nephrolepis cordifolia*), *Ochna serrulata*, Coolatai Grass (*Hyparrhenia hirta*), *Lantana camara,* Rhodes Grass (*Chloris gayana*) and Crofton Weed (*Ageratina adenophora*) occur along the front of the cottages. Other ornamental exotic plant species are present here, most likely as plantings installed by previous residents of the cottages. **Area D – 5-25% weed cover** Scattered occurrences of *Lantana camara, Ochna serrulata*, and Asparagus Fern (*Asparagus aethiopicus*).
Priority Weeds	*Lantana camara*, Bitou Bush (*Chrysanthemoides monilifera*), Fireweed (*Senecio madagascariensis*) and Asparagus Fern (*Asparagus aethiopicus).*
Priority Areas	Area A and B has the most resilience. Weeds should be controlled to prevent further spread. Working from the lake edge towards the Chain Valley Colliery lot boundaries will help in containing weeds within the Delta Coal's land and follow best practice of working from areas of highest resilience to lowest.
Key Management Issues	• Targeted treatment of Bitou Bush (*Chrysanthemoides monilifera)* and Asparagus Fern (*Asparagus aethiopicus)* particularly along lake edges in Areas A and B. • Primary and targeted treatment of *Senna pendula var. glabrata,* Fishbone Fern **(***Nephrolepis cordifolia***)**, *Ochna serrulata*, Coolatai Grass (*Hyparrhenia hirta*), *Lantana camara,* Rhodes Grass (*Chloris gayana*) and Crofton Weed (*Ageratina adenophora*).
Notes	Access to this zone via dirt road from near the Chain Valley Colliery site entry. Key required. Caution to be taken driving around cottages due to rubbish and debris hidden by long grass.



Figure 1. Area C showing the small patch of Coolatai Grass present.



Figure 2. Boundary of Area B and D.

Title: **Chain Valley Colliery: Foreshore Zone Weeds**

Map No: Addendum Map 2

Site: Chain Valley Colliery

Client: Delta Coal

Date: August 2020

Project No: J4925

Author: G Teear

Legend

Management Zones

Road

Creek

Key Points

- Asparagus Fern
- Asparagus Fern, Senna, Coral Trees
- Asparagus fern
- Bitou Bush
- Bitou Bush, Asparagus Fern, Senna
- Coolatai Grass
- Dendrobium teretifolium
- Easter Daisy, Bitou Bush, Asparagus Fern
- Fishbone Fern, Buffalo, Couch
- Grevellia robusta
- Lantana Thicket
- Lantana camara, Asparagus Fern, Senna, Buffalo
- Lantana, Crofton Weed, Bidens, Watsonia, Senna
- Narrow-leaved Cotton Bush
- Ochna
- Ochna, Lantana, Asparagus Fern
- Ochna, Roads Grass
- Spear Thistle, Lantana
- Treated Bitou Bush
- Wild Tobacco, Senna

Weed Density

- < 5%
- 5 - 25%
- 25 - 50%
- 50 - 75%



Data Source:
Total Earth Care
Nearmap

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5 MONITORING GUIDELINES

Monitoring is required to assess the outcomes of the weed management work and help determine if management strategies should be amended. Monitoring should be completed every six (6) months by a qualified ecologist or bush regeneration supervisor using the following methods:

- Assessment of weed control works, native regeneration and revegetation success via permanent repeatable photographic monitoring points; and
- Mapping of weed density per zone to assess the progress of the work. The mapping included in this report can assist in the development of baseline data.

Monitoring reports must include:

- Details of the work carried out including weed management techniques and herbicide used;
- Photo monitoring points – baseline and follow up photos; and
- Recommendations for corrective measures and/or specific vegetation management required.

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Appendix A. Weed Species listed as a Biosecurity Risk

Table 2. Categories of Management under the Greater Sydney Regional Strategic Weed Management Plan 2017-2022 under the NSW Biosecurity Act 2015

Category	Management Action
Prevention (Prevent)	To prevent the weed species arriving and establishing in the Region.
Eradication (Eliminate)	To permanently remove the species and its propagules from the Region, OR to destroy infestations to reduce the extent of the weed in the region with the aim of local eradication.
Containment (Minimise)	To prevent the ongoing spread of the species in all or part of the Region.
Asset Protection (Manage)	To prevent the spread of weeds to key sites/ assets of high economic, environmental and social value, or to reduce their impact on these sites if spread.
GBD (General Biosecurity Duty)	All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable."
RRM (Regional Recommended Measure)	Specific details for each species included in table.
PoD (Prohibition on Dealings)	Must not be imported into the State or sold.
B Zone (Biosecurity Zone)	Specific details for each species included in table.
PM (Prohibited Matter)	A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries.

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Table 3. Weeds recorded within the subject site with respective categories listed in the Greater Sydney Regional Strategic Weed Management Plan 2017-2022

Common Name	Botanical Name	WONS	State Priority Weed-Mgmt. Actions	Regional Priority Weeds-Mgmt. Actions	Other Regional Weeds-Asset/value at risk	Duties for Priority Weeds of Greater Sydney
Crofton Weed	*Ageratina adenophora*				Environment, Agriculture	
Whisky Grass	*Andropogon virginicus*				Environment	
Asparagus Fern	*Asparagus aethiopicus*	Yes				PoD
Cobblers Pegs	*Bidens pilosa*					
Buffalo Grass	*Bouteloua dactyloides*					
Bitou Bush	*Chrysanthemoides monilifera subsp rotundata*	Yes	Containment			PoD, B Zone; The Bitou Bush Biosecurity Zone is established for all land within the State except land within 10 kilometres of the mean high water mark of the Pacific Ocean between Cape Byron in the north and Point Perpendicular in the south.
Spear Thistle	*Cirsium vulgare*					
Fleabane	*Conyza bonariensis*					
Panic Veldgrass	*Ehrharta erecta*					
African Lovegrass	*Eragrostis curvula*				Environment	
Coral Tree, Common Coral Tree	*Erythrina x sykesii*				Environment	
Narrow-Leaf Cotton Bush / Swan Plant	*Gomphocarpus fruticosus*					
Pennywort	*Hydrocotyle bonariensis*					

Common Name	Botanical Name	WONS	State Priority Weed-Mgmt. Actions	Regional Priority Weeds-Mgmt. Actions	Other Regional Weeds-Asset/value at risk	Duties for Priority Weeds of Greater Sydney
Coolatai Grass	*Hyparrhenia hirta*				Environment, Agriculture	
Lantana	*Lantana camara*	Yes	Asset Protection			PoD
Fishbone Fern	*Nephrolepis cordifolia*				Environment	
Ochna	*Ochna serrulata*				Environment	
Fireweed	*Senecio madagascariensis*	Yes	Asset Protection			PoD
Senna / Cassia	*Senna pendula*				Environment	
Paddy's Lucerne	*Sida rhombifolia*					
Tobacco Bush/ Wild Tobacco	*Solanum mauritianum*				Environment, Agriculture	
Blackberry Night Shade	*Solanum nigrum*					
Purpletop	*Verbena bonarensis*					

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Appendix B. Species Specific Weeding Techniques

Common Name	Botanical Name	Weeding Technique	Recommended Timing for Treatment	Herbicide Application	Herbicide Group	Ratio
Crofton Weed	*Ageratina adenophora*	Hand removal, brush cut and foliar sprayed with Glyphosate	All year round	Glyphosate 360g/L	M	1/100
Whisky Grass	*Andropogon virginicus*	Remove seed and crown out with knife or spot spray	Prior to flowering in March to May	Glyphosate 360g/L	M	1/100
Asparagus Fern	*Asparagus aethiopicus*	Small single specimens to be crowned or Sprayed with Glyphosate/metsulfuron methyl	All year round	Glyphosate 360g/L & Metsulfuron-Methyl 600 g/kg	M & B	1/100 & 1g/10L
Cobblers Pegs	*Bidens pilosa*	Foliar spraying using Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Buffalo Grass	*Bouteloua dactyloides*	Hand removal, brush cut and foliar sprayed with Glyphosate	All year round	Glyphosate 360g/L	M	1/100
Bitou Bush	*Chrysanthemoides monilifera subsp rotundata*	Small single specimens hand pulled or larger shrubs cut and painted with neat Glyphosate	All year round	Glyphosate 360g/L	M	Neat
Spear Thistle	*Cirsium vulgare*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Fleabane	*Conyza bonariensis*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Panic Veldgrass	*Ehrharta erecta*	Foliar spraying with Glyphosate	All year round	Glyphosate 360g/L	M	1/100
African Lovegrass	*Eragrostis curvula*	Hand pulled or brush cut and foliar sprayed with Glyphosate	All year round	Glyphosate 360g/L	M	1/100
Coral Tree, Common Coral Tree	*Erythrina x sykesii*	<80mm cut & painted; >80mm will be drilled/frilled with neat Glyphosate	All year round	Glyphosate 360g/L	M	Neat
Narrow-Leaf Cotton Bush / Swan Plant	*Gomphocarpus fruticosus*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100 & Neat
Pennywort	*Hydrocotyle bonariensis*	Hand pulled or spot sprayed with Dicamba	All year round			
Coolatai Grass	*Hyparrhenia hirta*	Hand pulled or brush cut and foliar sprayed with Glyphosate. Up to three applications of Glyphosate in the same growing season will be required.	All year round	Glyphosate 360g/L	M	200ml/10l

Common Name	Botanical Name	Weeding Technique	Recommended Timing for Treatment	Herbicide Application	Herbicide Group	Ratio
Lantana	*Lantana camara*	Cut and paint, sprayed or splattered with Glyphosate. Hand pull small shoots.	All year round	Glyphosate 360g/L	M	Neat
Fishbone Fern	*Nephrolepis cordifolia*	Hand removal. Brush cut then sprayed with Glyphosate.	All year round	Glyphosate 360g/L	M	1/100
Ochna	*Ochna serrulata*	Double side scrape and paint all stems to 75% coverage.	All year round	Glyphosate 360g/L	M	Neat
Fireweed	*Senecio madagascariensis*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Senna / Cassia	*Senna pendula*	Small individuals hand removed, larger plants cut and painted with neat Glyphosate	All year round	Glyphosate 360g/L	M	Neat
Paddy's Lucerne	*Sida rhombifolia*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Tobacco Bush/ Wild Tobacco	*Solanum mauritianum*	Cut & paint with Glyphosate	All year round	Glyphosate 360g/L	M	Neat
Blackberry Night Shade	*Solanum nigrum*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100
Purpletop	*Verbena bonarensis*	Foliar spraying with Glyphosate, hand pulled and brush cut	All year round	Glyphosate 360g/L	M	1/100

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Appendix 8: Noise Monitoring Results

Chain Valley Colliery

Quarterly attended noise monitoring - Q1 2023

Prepared for Great Southern Energy Pty Ltd (trading as Delta Coal)

April 2023

Chain Valley Colliery

Quarterly attended noise monitoring - Q1 2023

Great Southern Energy Pty Ltd (trading as Delta Coal)

E220750 RP2

April 2023

Version	Date	Prepared by	Reviewed by	Comments
2	12 April 2023	Lucas Adamson	Najah Ishac	Final

Approved by



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12 April 2023

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1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Great Southern Energy Pty Ltd (trading as Delta Coal) to conduct a quarterly noise survey of operations at Chain Valley Colliery (CVC) located at Vales Rd, Mannering Park NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

Attended environmental noise monitoring described in this report was done during the day, evening and night periods on 21 and 22 March 2023 at nine monitoring locations.

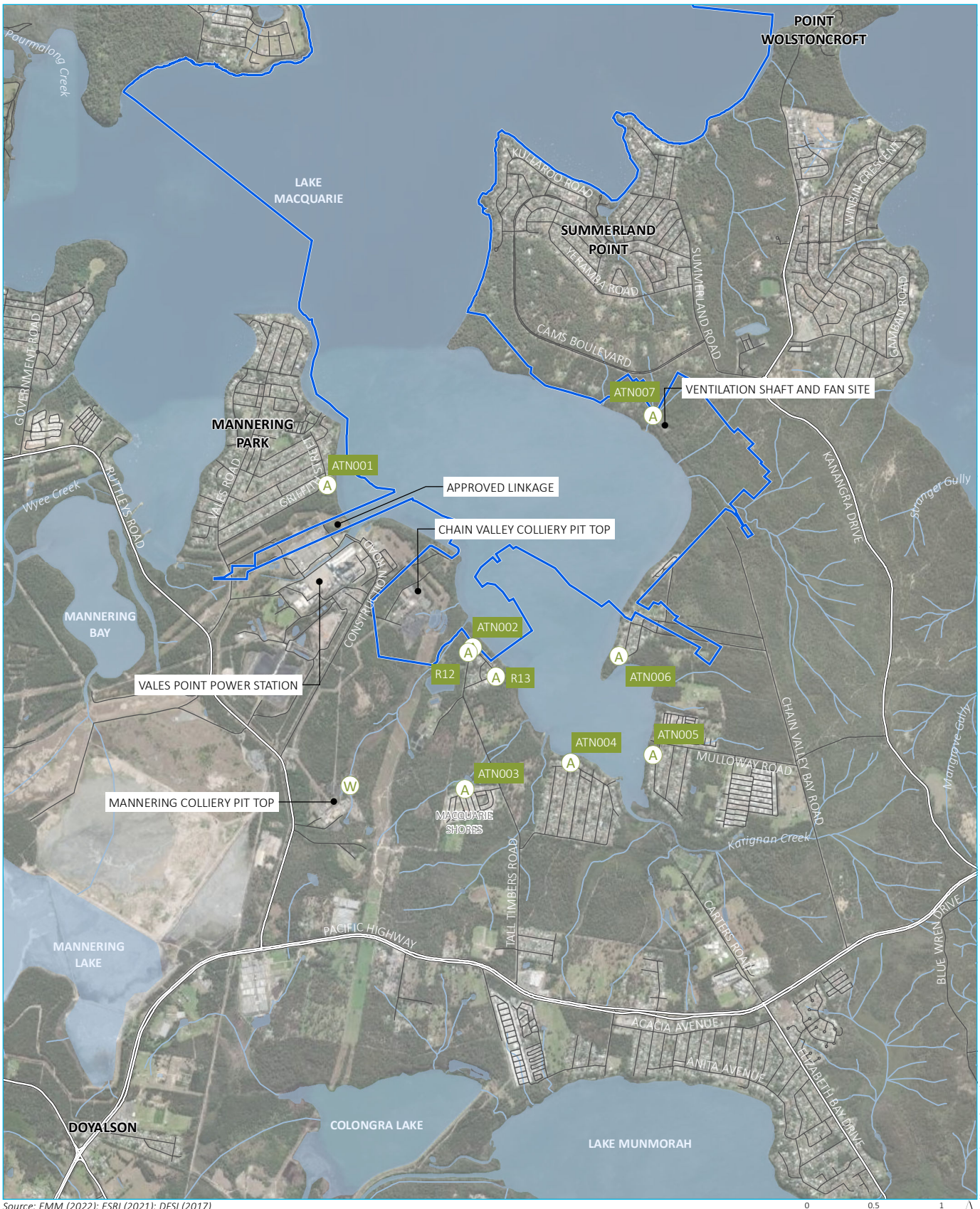
1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor	Description	Coordinates (MGA56)	
		Easting	Northing
ATN001	Griffith Street, Mannering Park	363990	6330529
ATN002	Lakeshore Avenue, Kingfisher Shores	365218	6329388
ATN003	Short Street, Macquarie Shores	365165	6328323
ATN004	Lloyd Avenue, Chain Valley Bay	365949	6328530
ATN005	Teragalin Drive, Chain Valley Bay	366560	6328590
ATN006	Sunset Parade, Chain Valley Bay	366305	6329321
ATN007[1]	Cams Boulevard, Chain Valley Bay	366559	6331109
R12	Lakeshore Avenue, Kingfisher Shores	365185	6329352
R13	Karoola Avenue, Kingfisher Shores	365391	6329169

Notes: 1. Due to access issues, ATN007 is an intermediate location within the site boundary and site noise contributions were calculated back to R22 (EPL Point 23).



Source: EMM (2022); ESRI (2021); DFSI (2017)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

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KEY

- (A) Noise monitoring location
- (W) Meteorological station
- CVC Consent Boundary
- Major road
- Minor road
- Watercourse/drainage line
- Waterbody

CVC attended noise monitoring locations

Chain Valley Colliery
Quarterly attended noise monitoring
Figure 1.1

EMM
creating opportunities

1.3 Terminology and abbreviations

Definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The energy average A-weighted noise level.
$L_{Aeq,15minute}$	The energy average A-weighted noise level over the specified time period of 15 minutes.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Noise limits for CVC are provided in Table 1, Condition 7 of Schedule 3 of the development consent SSD-5465 (DC). Long-term goals for CVC are provided in Condition 8(d) of Schedule 3 of the DC. Relevant sections of the DC are reproduced in Appendix **Error! Reference source not found.**.

2.2 Environment protection licence

Noise limits for CVC are provided in Conditions L5.1 and L5.2 of environment protection licence 1770 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

Table 5 in the approved Noise Management Plan (NMP) adopts nine operator-attended noise monitoring (NM) locations that are representative of residences outlined in the DC. Where several assessment locations are in one NM catchment, representative noise limits have been adopted to ensure that the lowest (most stringent) criterion within the NM catchment can be achieved. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise impact limits based on the DC and EPL are provided in Table 2.1.

Table 2.1 Noise impact limits, dB

Noise monitoring location	Assessment location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
ATN001	R8 (EPL Point 9)	38	38	38	45
ATN002	R11 (EPL Point 12)	49	49	49	54
ATN003	R15 (EPL Point 16)	36	36	36	45
ATN004	R14	35	35	35	45
ATN005	R17	35	35	35	45
ATN006	R19 (EPL Point 20)	37	37	37	45
ATN007	R22 (EPL Point 23)	46	46	46	46
R12	R12 (EPL Point 13)	49	49	49	53
R13	R13 (EPL Point 14)	43	43	43	49

2.5 Meteorological conditions

Appendix 8 of the DC states meteorological conditions under which noise limits do not apply as follows:

- during periods of rain or hail;
- average wind speed at microphone height exceeds 5 m/s;

- wind speeds greater than 3 m/s at 10 m above ground level; or
- temperature inversion conditions greater than 3°C/100 m.

Condition L5.4 of the EPL states meteorological conditions under which noise limits do not apply as follows:

- wind speeds greater than 3 m/s at 10 m above ground level;
- stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 m above ground level;
- stability category G temperature inversion conditions; or
- as defined under the NPfI.

The last point refers to 'very noise-enhancing' conditions which are considered outside the 'standard' or 'noise-enhancing' meteorological conditions defined in Table D1 of Fact Sheet D of the NPfI.

Further, Fact Sheet E of the NPfI (point 6 of Section E1) provides additional guidance on monitoring the performance of a site against 'suitable' noise limits placed in the consent/environment protection licence. Noise limits are based on 'achievable' noise levels under the 'standard' and/or 'noise-enhancing' meteorological conditions. Where meteorological conditions are considered 'very noise-enhancing', a positive adjustment of 5 dB applies to noise limits for 'standard' or 'noise-enhancing' meteorological conditions.

In accordance with the NPfI and for consistency between the DC and EPL, where 'very noise-enhancing' meteorological conditions were present during a noise measurement, a positive adjustment of 5 dB has been applied to the noise limits stated in the DC and EPL. This approach means that noise limits almost always be applicable, with or without a positive adjustment of 5 dB, depending on whether meteorological conditions are 'very noise-enhancing' or not.

2.6 Additional requirements

2.6.1 Noise monitoring

Condition M4.1 of the EPL specifies additional noise monitoring requirements to determine compliance, including the following:

- locations of monitoring – EPL points listed in Table 2.1;
- frequency of monitoring – quarterly and at least two months between monitoring periods;
- periods of monitoring:
  - for three out of four quarterly periods – each day, evening and night periods for a minimum of 15 minutes. Night period monitoring must be undertaken between the hours of 1 am and 4 am; and
  - for one out of four quarterly periods – day period monitoring must be undertaken for a minimum of 1.5 hours (six 15-minute periods); evening period monitoring must be undertaken for a minimum of 30 minutes (two 15-minue periods); night period monitoring must be undertaken for a minimum of 1 hour (four 15-minute periods).
- days of monitoring – each quarterly monitoring must be undertaken on a different day of the week excluding Saturday, Sundays and public holidays.

In accordance with the preceding, this round of quarterly attended noise monitoring (Q1 2023) was undertaken on Tuesday 21 and Wednesday 22 March 2023 which is more than two months since the last quarterly round of monitoring (Q4 2022) conducted on Wednesday 14, Thursday 15 and Friday 16 December 2022.

As per the approved NMP, attended noise monitoring is scheduled considering the occurrence of regular operations at CVC. Noise monitoring avoids scheduled down-time or maintenance. Regular operations were occurring during this round of noise monitoring (Q1 2023).

Monitoring and reporting have been done in accordance with the NPfI issued in October 2017 and the EPA's 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

2.6.2 CVC long-term goals

Long-term goals for CVC are provided in Condition 8(d) of Schedule 3 of the DC, which states:

> 8. The Applicant must:
>
> (d) use its best endeavours to achieve the long-term noise goals in Table 2, where reasonable and feasible, and report on progress towards achieving these goals in each Annual Review;

The long-term goals for CVC in Table 2 of the DC are summarised in Table 2.2 for the relevant assessment locations.

Table 2.2 CVC long-term goals

Assessment location	Day $L_{Aeq,15minute}$, dB	Evening $L_{Aeq,15minute}$, dB	Night $L_{Aeq,15minute}$, dB
R11 (EPL Point 12)	41	41	41
R12 (EPL Point 13)	41	41	41
R13 (EPL Point 14)	41	41	41
R22 (EPL Point 23)	40	40	40

As stated in Appendix 9 of the DC, Delta Coal is committed to the progressive implementation of feasible measures to target long-term noise goals which are designed to reduce noise emissions from CVC. For the purpose of this compliance noise monitoring assessment, site $L_{Aeq,15minute}$ contributions have also been compared to the long-term goals in Section 4.2.3.

2.7 Very noise-enhancing meteorological conditions

In accordance with the Approved Methods, monthly noise monitoring for the site is scheduled to occur during forecasted meteorological conditions where noise limits in Table 2.1 will be applicable. However, in cases where actual meteorological conditions do not align with forecasts and noise limits are subsequently not directly applicable, it is the expectation of regulators that noise impact still be managed.

The NPfI states that:

> "Noise limits derived for consents and licences will apply under the meteorological conditions used in the environmental assessment process, that is, standard or noise-enhancing meteorological conditions. For 'very noise-enhancing meteorological conditions' … a limit is set based on the limit derived under standard or noise-enhancing conditions (whichever is adopted in the assessment) plus 5 dB. In this way a development is subject to noise limits under all meteorological conditions."

Therefore, if monthly noise monitoring occurs during meteorological conditions outside of those specified in Section 2.5, site noise limits will be adjusted based on Table 2.1 plus 5 dB.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Mannering Colliery automatic weather station (AWS) which allowed correlation of atmospheric parameters with measured site noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the day, evening and night periods at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site's contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

If the exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range, but site noise was determined to be at least 5 dB lower than relevant limits, then a maximum estimate of site noise may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means site noise was audible but could not be quantified. All results noted as NM in this report were due to one or more of the following:

- Site noise levels were extremely low and unlikely, in many cases, to be noticed.
- Site noise levels were masked by other more dominant noise sources that are characteristic of the environment, such as breeze in foliage or continuous road traffic noise, that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

This assessment determined stability categories throughout attended monitoring period using the sigma-theta (ST) method as per Fact Sheet D of the NPfI (EPA 2017). This data was sourced from the site's AWS, in accordance with requirements of EPL 1770.

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is undertaken at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor adjustments have been reported and added to measured site-only L_{Aeq} noise levels.

Low-frequency modifying factor adjustments have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

Equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	2759405	2/2/2024	IEC 61672-1:2002
Brüel & Kjær 2250 sound level meter	3029363	3/11/2024	IEC 61672-1:2002
Svantek SV-36 calibrator	79952	29/9/2023	IEC 60942:2003
Svantek SV-36 calibrator	86311	17/10/2023	IEC 60942:2003

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1.

Table 4.1 Total measured noise levels – Quarter 1 2023[1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
ATN001	21/03/2023 15:09	80	67	56	55	47	45	43
ATN001	21/03/2023 19:48	75	61	47	50	46	45	43
ATN001	22/03/2023 3:35	54	46	46	45	45	44	43
ATN002	21/03/2023 15:34	82	70	61	59	41	36	32
ATN002	21/03/2023 18:00	74	65	53	52	42	37	33
ATN002	22/03/2023 2:47	48	41	40	39	39	38	36
ATN003	21/03/2023 16:10	73	56	50	47	44	38	34
ATN003	21/03/2023 21:15	42	39	37	35	35	33	30
ATN003	22/03/2023 2:15	45	37	35	34	34	33	31
ATN004	21/03/2023 16:30	67	63	56	54	52	50	47
ATN004	21/03/2023 18:35	83	63	54	56	43	36	32
ATN004	21/03/2023 22:42	49	36	34	32	32	29	26
ATN005	21/03/2023 16:53	74	57	45	49	38	35	33
ATN005	21/03/2023 19:01	65	59	52	49	45	42	40
ATN005	21/03/2023 23:08	45	40	38	36	35	33	31
ATN006	21/03/2023 17:13	60	48	45	42	40	38	34
ATN006	21/03/2023 19:20	63	45	41	40	39	37	35
ATN006	22/03/2023 1:43	53	36	34	33	33	31	29
ATN007	22/03/2023 17:43	67	51	48	48	47	47	45
ATN007	22/03/2023 18:00	57	49	48	47	47	47	45
ATN007	22/03/2023 1:00	50	49	48	48	48	47	46
R12	21/03/2023 15:34	82	70	61	59	41	36	32
R12	21/03/2023 18:00	74	65	53	52	42	37	33
R12	22/03/2023 2:47	48	41	40	39	39	38	36
R13	21/03/2023 15:51	65	57	48	46	42	37	32
R13	21/03/2023 18:16	75	65	50	52	39	34	32
R13	22/03/2023 3:05	55	40	39	39	38	38	37

Notes: 1. Levels in this table are not necessarily the result of activity at site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Measured atmospheric conditions – Quarter 1 2023

Location	Start date and time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north [1]	Cloud cover 1/8s
ATN001	21/03/2023 15:09	23.8	0.3	50	8
ATN001	21/03/2023 19:48	19.7	0.4	190	8
ATN001	22/03/2023 3:35	18.5	Calm	-	8
ATN002	21/03/2023 15:34	23.4	0.8	180	8
ATN002	21/03/2023 18:00	20.8	0.4	190	8
ATN002	22/03/2023 2:47	18.7	Calm	-	8
ATN003	21/03/2023 16:10	22.9	8	190	8
ATN003	21/03/2023 21:15	19.7	1	155	7
ATN003	22/03/2023 2:15	18.7	Calm	-	8
ATN004	21/03/2023 16:30	22.9	0.4	180	8
ATN004	21/03/2023 18:35	20.4	0.3	170	8
ATN004	21/03/2023 22:42	19.2	1	135	8
ATN005	21/03/2023 16:53	22.8	0.6	190	8
ATN005	21/03/2023 19:01	20.3	0.4	180	8
ATN005	21/03/2023 23:08	18.9	Calm	-	8
ATN006	21/03/2023 17:13	22.7	0.7	180	8
ATN006	21/03/2023 19:20	20.1	0.3	180	8
ATN006	22/03/2023 1:43	18.8	Calm	-	8
ATN007	22/03/2023 17:43	23.1	1	45	7
ATN007	22/03/2023 18:00	23.0	Calm	-	7
ATN007	22/03/2023 1:00	18.9	Calm	-	8
R12	21/03/2023 15:34	23.4	0.8	180	8
R12	21/03/2023 18:00	20.8	0.4	190	8
R12	22/03/2023 2:47	21.6	Calm	-	8
R13	21/03/2023 15:51	23.0	0.4	195	8
R13	21/03/2023 18:16	20.7	0.9	190	8
R13	22/03/2023 3:05	18.7	Calm	-	8

Notes: 1. "-" indicates calm conditions at monitoring location.

4.2 Site only noise levels

4.2.1 Modifying factors

With regard to LFN modifying factor adjustments, these have not been applied to locations where CVC was inaudible. At ATN007 (R22), where CVC noise was audible, measured site noise levels exceeded the relevant LFN threshold levels during the day, evening and night period measurements. Therefore, in accordance with the NPfI, a 2 dB positive adjustment was applied to the estimated site $L_{Aeq,15minute}$ for the measurement during the day period and a 5 dB positive adjustment was applied to the estimated site $L_{Aeq,15minute}$ for the measurements during the evening and night period.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing weather conditions as defined by the NPfI.

Table 4.3 Site noise levels and limits – Quarter 1 2023

Location	Start Date and Time	Period	Wind		Stability Class	Very enhancing?[1]	Limits, dB		Site levels, dB		Exceedances, dB [1]	
			Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$ [2]	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
ATN001	21/03/2023 15:09	Day	3.2	164	A	Yes	43	N/A	IA	N/A	Nil	N/A
ATN001	21/03/2023 19:48	Evening	0.8	167	F	No	38	N/A	IA	N/A	Nil	N/A
ATN001	22/03/2023 3:35	Night	0.4	194	F	No	38	45	IA	IA	Nil	Nil
ATN002	21/03/2023 15:34	Day	2.6	163	A	No	49	N/A	IA	N/A	Nil	N/A
ATN002	21/03/2023 18:00	Evening	1.3	153	F	No	49	N/A	IA	N/A	Nil	N/A
ATN002	22/03/2023 2:47	Night	0.6	231	F	No	49	54	<30	40	Nil	Nil
ATN003	21/03/2023 16:10	Day	2.1	165	A	No	36	N/A	IA	N/A	Nil	N/A
ATN003	21/03/2023 21:15	Evening	0.8	155	F	No	36	N/A	IA	N/A	Nil	N/A
ATN003	22/03/2023 2:15	Night	0.5	207	F	No	36	45	<30	31	Nil	Nil
ATN004	21/03/2023 16:30	Day	1.9	160	A	No	35	N/A	IA	N/A	Nil	N/A
ATN004	21/03/2023 18:35	Evening	1.9	159	F	No	35	N/A	IA	N/A	Nil	N/A
ATN004	21/03/2023 22:42	Night	0.8	290	F	No	35	45	IA	IA	Nil	Nil
ATN005	21/03/2023 16:53	Day	1.9	148	A	No	35	N/A	IA	N/A	Nil	N/A
ATN005	21/03/2023 19:01	Evening	1.1	164	F	No	35	N/A	IA	N/A	Nil	N/A
ATN005	21/03/2023 23:08	Night	1.2	248	F	No	35	45	IA	IA	Nil	Nil

Table 4.3 Site noise levels and limits – Quarter 1 2023

Location	Start Date and Time	Period	Wind		Stability Class	Very enhancing?[1]	Limits, dB		Site levels, dB		Exceedances, dB [1]	
			Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$ [2]	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
ATN006	21/03/2023 17:13	Day	1.9	150	A	No	37	N/A	IA	N/A	Nil	N/A
ATN006	21/03/2023 19:20	Evening	1.1	155	F	No	37	N/A	IA	N/A	Nil	N/A
ATN006	22/03/2023 1:43	Night	0.7	250	F	No	37	45	IA	IA	Nil	Nil
ATN007	22/03/2023 17:43	Day	2.1	70	F	Yes	51	N/A	38 (36 + 2)	N/A	Nil	N/A
ATN007	22/03/2023 18:00	Evening	2.0	52	F	No	46	N/A	41 (36 + 5)	N/A	Nil	N/A
ATN007	22/03/2023 1:00	Night	0.7	232	F	No	46	46	41 (36 + 5)	37	Nil	Nil
R12	21/03/2023 15:34	Day	2.6	163	A	No	49	N/A	IA	N/A	Nil	N/A
R12	21/03/2023 18:00	Evening	1.3	153	F	No	49	N/A	IA	N/A	Nil	N/A
R12	22/03/2023 2:47	Night	0.6	231	F	No	49	53	IA	IA	Nil	Nil
R13	21/03/2023 15:51	Day	2.1	158	A	No	43	N/A	IA	N/A	Nil	N/A
R13	21/03/2023 18:16	Evening	1.2	160	F	No	43	N/A	IA	N/A	Nil	N/A
R13	22/03/2023 3:05	Night	0.6	262	F	No	43	49	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very noise-enhancing meteorological conditions' in accordance with the NPfI.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor adjustments if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

4.2.3 Long term noise goals

Site $L_{Aeq,15minute}$ were also compared to the long-term noise goals (refer to Table 2.2) for the relevant locations (i.e. R11, R12, R13 and R22). Site $L_{Aeq,15minute}$ measured at ATN002 (R11), R12 and R13 satisfied the relevant long-term goals during the day, evening and night periods. At ATN007 (R22), the measured site $L_{Aeq,15minute}$ complied with the relevant long term noise goal during the day period, however exceeded the relevant long-term goal by 1 dB during the evening and night period measurements.

5 Summary

EMM was engaged by Great Southern Energy Pty Ltd (trading as Delta Coal) to conduct a quarterly noise survey of operations at CVC. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the day, evening and night periods on 21 and 22 March 2023 at nine monitoring locations.

Noise levels from site complied with relevant limits at all monitoring locations during the Q1 2023 survey.

CVC $L_{Aeq,15minute}$ were also compared to the long-term noise goals applicable at R11 (ATN002), R12, R13 and R22 (ATN007). CVC $L_{Aeq,15minute}$ satisfied these during all measurements at R11 (ATN002), R12 and R13. At R22, the measured site $L_{Aeq,15minute}$ complied with the relevant long term noise goal during the day period, however the CVC $L_{Aeq,15minute}$ exceeded the relevant long-term goal by 1 dB during the evening and night period measurements.

Appendix A
Noise perception and examples

EMM
creating opportunities

A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or quarter) as loud

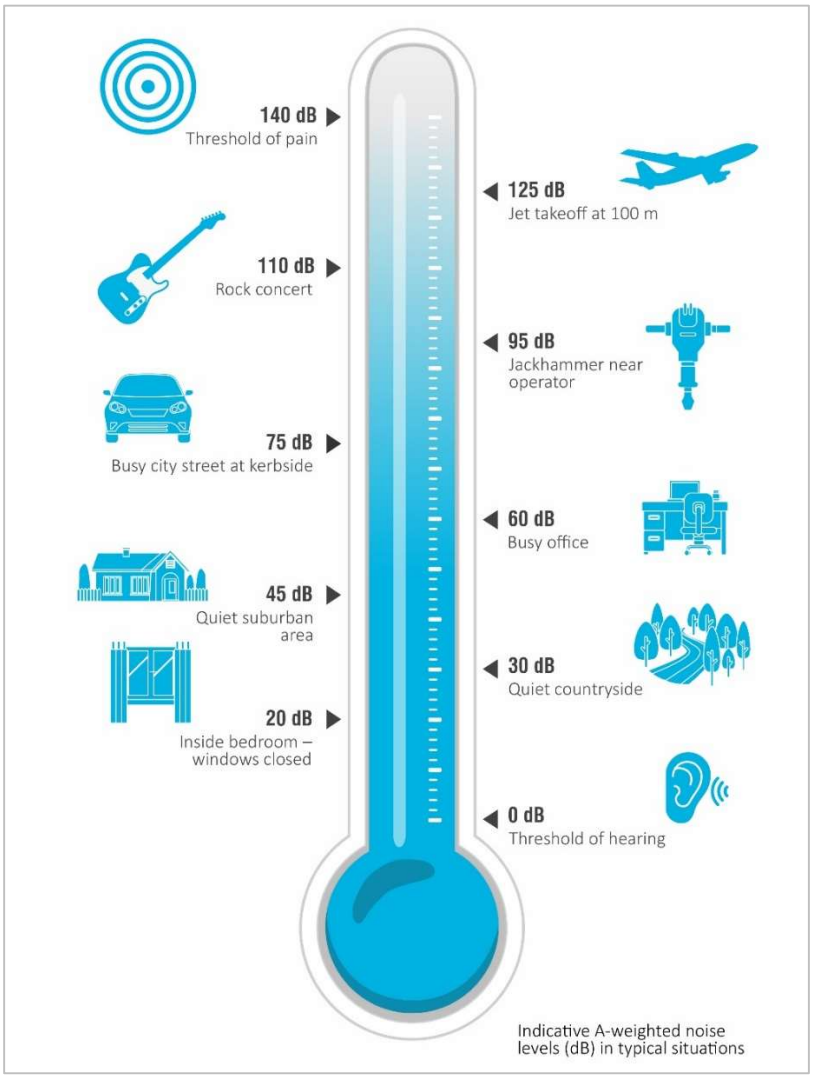


Figure A.1 Common noise levels

Appendix B
Regulator documents

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4. Prior to 31 March 2014, and every 12 months thereafter for each calendar year in which coal haulage from the site is undertaken utilising public roads, unless the Planning Secretary directs otherwise, the Applicant must commission a suitably qualified person, whose appointment has been approved by the Planning Secretary at least one month prior to undertaking the audit, to conduct an Independent Traffic Audit of the development. This audit must:
   (a) be undertaken without prior notice to the Applicant, and in consultation with TfNSW, NCC, CC Council and the CCC;
   (b) assess the impact of the development on the performance and safety of the road network, including a review of:
      - haulage records;
      - accident records on the haulage route, infringements relating to the code of conduct and any incidents involving haulage vehicles;
      - community complaints register; and
   (c) assess the effectiveness of the Road Transport Protocol; and, if necessary, recommend measures to reduce or mitigate any adverse (or potentially adverse) impacts.

5. Within 1 month of receiving the audit report, or as otherwise agreed by the Planning Secretary, the Applicant must submit a copy of the report to the Planning Secretary, with a detailed response to any of the recommendations contained in the audit report, including a timetable for the implementation of any measures proposed to address the recommendations in the audit report.

   A summary of the audit report must be included in the Annual Review.

Alternative Coal Transport Options

6. Prior to 31 December 2014, and every three years thereafter, the Applicant must prepare and submit to the Planning Secretary for approval, a study of the reasonable and feasible options to reduce or eliminate the use of public roads to transport coal from the development, unless otherwise agreed by the Planning Secretary. The assessment must include:
   (a) an analysis of the capital, construction and operating costs of the alternative transport options; and
   (b) quantified social and environmental impacts associated with road and rail transport.

NOISE

Noise Impact Assessment Criteria

7. The Applicant must ensure that the noise generated by the development at any residence on privately-owned land does not exceed the criteria for the location in Table 1 nearest to that residence.

Table 1: Noise Criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
R8	38	38	38	45
R11	49	49	49	54
R12	49	49	49	53
R13	43	43	43	49
R15	36	36	36	45
R19	37	37	37	45
R22	46	46	46	46
all other privately-owned land	35	35	35	45

Notes:
- *To interpret the locations referred to in Table 1, see Appendix 6 and the EIS; and*
- *Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 8 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.*

However, these criteria do not apply if the Applicant has a written agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

8. The Applicant must:
   (a) implement best management practice, including all reasonable and feasible noise mitigation measures, to minimise the construction, operational and transport noise generated by the development;
   (b) regularly assess the noise monitoring and meteorological data and relocate, modify, and/or stop operations on site to ensure compliance with the relevant conditions of this consent;
   (c) minimise the noise impacts of the development during meteorological conditions under which the noise limits in this consent do not apply (see Appendix 8);
   (d) use its best endeavours to achieve the long-term noise goals in Table 2, where reasonable and feasible, and report on progress towards achieving these goals in each Annual Review;
   (e) carry out a comprehensive noise audit of the development in conjunction with each independent environmental audit; and
   (f) prepare an action plan to implement any additional reasonable and feasible onsite noise mitigation measures identified by each audit;
   to the satisfaction of the Planning Secretary.

Table 2: Long-term Noise Goals dB(A)

Location	***Day***	***Evening***	***Night***
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$
R11 – R13	41	41	41
R22	40	40	40

Notes:
- *To interpret the locations referred to in Table 2, see Appendix 6 and the EIS; and*
- *Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 8 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.*

Noise Management Plan

9. The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
   (a) be prepared in consultation with the EPA and submitted to the Planning Secretary for approval within 4 months of the date of this consent, unless otherwise agreed by the Planning Secretary;
   (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
   (c) describe the proposed noise management system in detail including the mitigation measures that would be implemented to minimise noise during construction and operations, including on and off site road noise generated by vehicles associated with the development; and
   (d) include a monitoring program that:
      - uses attended monitoring to evaluate the compliance of the development against the noise criteria in this consent;
      - evaluates and reports on:
         - the effectiveness of the on-site noise management system; and
         - compliance against the noise operating conditions; and
      - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

The Applicant must implement the Noise Management Plan as approved by the Planning Secretary.

AIR QUALITY

Odour

10. The Applicant must ensure that no offensive odours are emitted from the site, as defined under the POEO Act.

APPENDIX 6
NOISE RECEIVER LOCATIONS

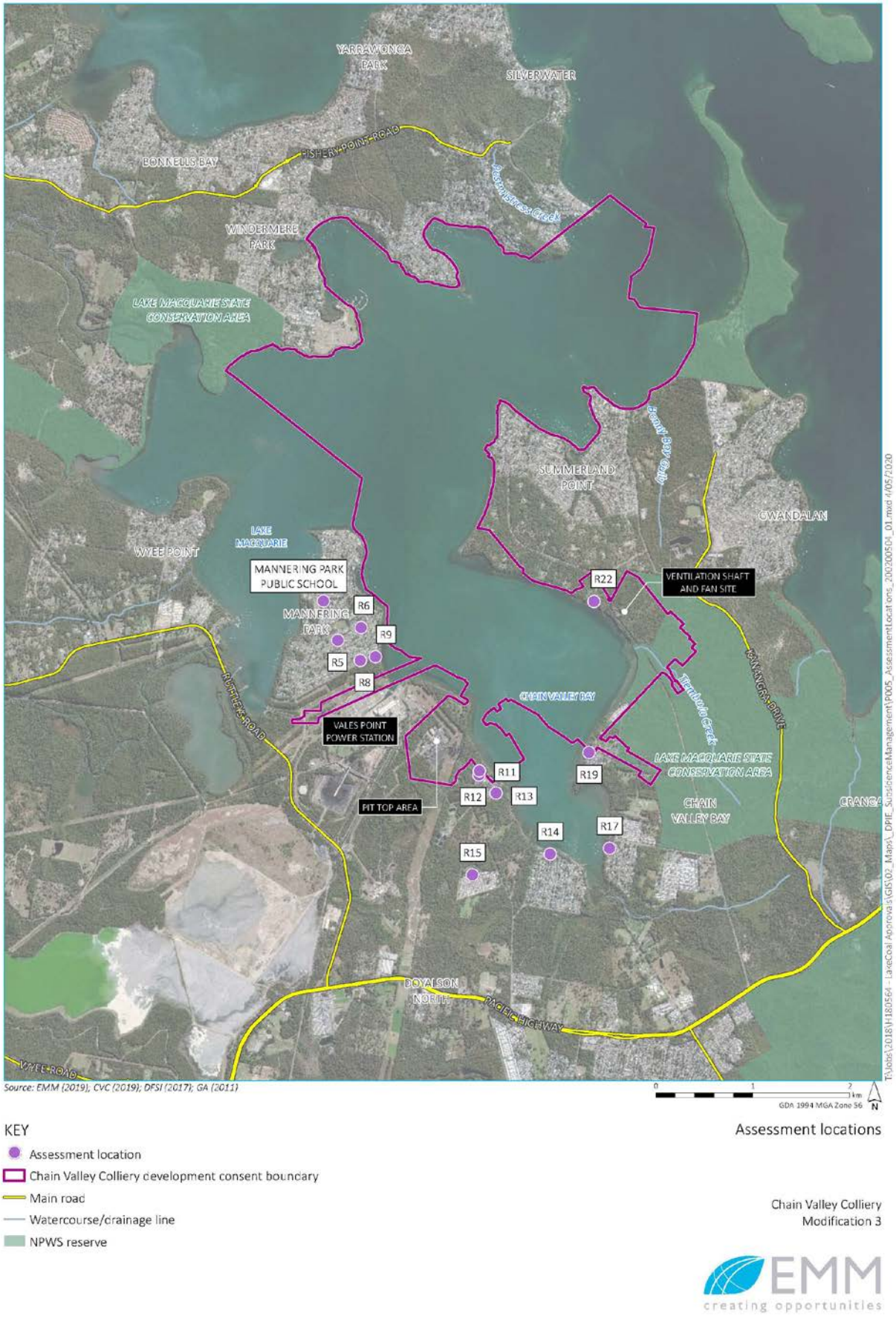


Figure 1: *Noise Receiver Locations*

APPENDIX 8
NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 1 of the conditions are to apply under all meteorological conditions except the following:
   (a) during periods of rain or hail;
   (b) average wind speed at microphone height exceeds 5 m/s;
   (c) wind speeds greater than 3 m/s measured at 10 m above ground level; or
   (d) temperature inversion conditions greater than 3°C/100 m.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station described in condition 14 of schedule 3.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.

4. This monitoring must be carried out at least 4 times in each calendar year (ie at least once every 3 months), unless the Planning Secretary directs otherwise.

5. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
   (a) monitoring locations for the collection of representative noise data;
   (b) meteorological conditions during which collection of noise data is not appropriate;
   (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

	results of this monitoring program will be reviewed by a suitably qualified expert and used to determine the appropriateness of the existing irrigation area to receive this effluent; • develop a program to monitor creek line channel stability and the health of riparian vegetation within Swindles Creek. Monitoring will be undertaken in accordance with Section 8.5.2 of the Surface Water Impact Assessment (EIS Appendix E) and incorporated into the Colliery's WMP or Biodiversity Management Plan; and • record monitoring data in accordance with the Colliery's WMP and EPL 1770. Monitoring data will be interpreted as it is received to ensure appropriate operational guidance on monitoring water quality within desired parameters. Results of water quality monitoring will be reported in the Annual Review and made available to the CCC, as well as CC Council and LMCC.
Noise	Management and monitoring of noise will continue to be undertaken in accordance with the Colliery's NMP, which will be reviewed and updated as required to include the commitments made below. Great Southern Energy Pty Limited will: • continue attended compliance monitoring on site which will be used to identify potential hot spots and primary noise sources; • continue real-time noise monitoring alerts to site personnel to enable implementation of any required rapid noise management initiatives; • manage potential non-compliance through a noise complaint handling and response system, including the identification of responsible sources to enable targeted remedial action; • assess if further noise mitigation options for the ventilation fans are reasonable and feasible following the receipt of attenuation proposals; and • discuss potential management measures or agreement options with the landowner at 275 Cams Boulevard, following receipt of proposals from acoustics specialists. In addition to the above, Great Southern Energy Pty Limited is committed to the progressive implementation of feasible measures to target long-term noise goals which are designed to reduce noise emissions from the Colliery. Long-term options for investigation include: • modification to belt/movement alarms; • investigation of surface conveyer and coal preparation equipment, to determine if noise reductions are possible; • identifying sound attenuation options for the surface bulldozer and front-end loader; • strategic placement of acoustic barriers; • attenuation for the surface screener/shaker; • installation of quiet rollers for surface conveyor belts; • acoustic treatments around compressors; and • the use of a conveyor stacker for product coal stockpiling.
Air Quality and greenhouse gases	Management and monitoring of air quality and greenhouse gases will continue to be undertaken in accordance with the Colliery's AQGHGMP, which will be reviewed and updated as required to include the commitments made below Great Southern Energy Pty Limited will: • investigate the use of a stacker to replace hauling between current conveyor system and stockpiles; • undertake GHG monitoring comprising measurement of carbon dioxide and methane at the ventilation shaft and fan sites; and • record and report annual diesel, oil, grease, acetylene and electricity use to fulfil National Greenhouse and Energy Reporting Scheme requirements.
Traffic and transport	Management and monitoring of traffic and transport will continue to be undertaken in accordance with the Colliery's RTP. In addition, Great Southern Energy Pty Limited will continue to investigate alternative options for transporting export coal to the Port of Newcastle, specifically the preferred rail transport option, requiring the construction of a private haul road to the VPPS coal unloading facility and associated infrastructure upgrades. In addition, Great Southern Energy Pty Limited will investigate options to reduce peak hour traffic would be investigated including potentially limiting the peak hourly volumes of the Colliery truck traffic which would be permitted to travel via this intersection should the Colliery not be using rail transport for export coal by five years from the granting of development consent. Alternatively, a pro-rata financial contribution to the cost of installing traffic signals at the southbound intersection of the F3 and Sparks Road interchange could be made commensurate with the percentage of Colliery generated traffic using the intersection.
Subsidence	Management and monitoring of subsidence will continue to be undertaken in accordance with the Colliery's SMP or Extraction Plans, which will be reviewed and

Environment Protection Licence

1	Discharge to waters Discharge quality and volume monitoring	Discharge to waters Discharge quality and volume monitoring	Discharge to waters and monitoring from final settlement pond, gravity fed discharge pipe as identified in plan titled "Delta Coal Chain Valley Colliery, Surface EPA Premises Plan, DRG No: C1S0165_2" 10 August 2021 and saved as EPA Document DOC21/691135.
27	Discharge to waters Discharge quality and volume monitoring	Discharge to waters Discharge quality and volume monitoring	Discharge to waters via dam spillway from final settlement pond adjacent to EPA Point 1 as identified in plan titled "Delta Coal Chain Valley Colliery, Surface EPA Premises Plan, DRG No: C1S0165_2" 10 August 2021 and saved as EPA Document DOC21/691135.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
9	Noise monitoring	Noise monitoring site R8 as defined in Development Consent SSD-5465 (MOD 3), located at 109 Griffith Street, MANNERING PARK, 2259
12	Noise monitoring	Noise monitoring site R11 as defined in Development Consent SSD-5465 (MOD 3), located at 35 Lakeshore Avenue, CHAIN VALLEY BAY, 2259
13	Noise monitoring	Noise monitoring site R12 as defined in Development Consent SSD-5465 (MOD 3), located at 20 Lakeshore Avenue, Kingfisher Shores, CHAIN VALLEY BAY, 2259
14	Noise monitoring	Noise monitoring site R13 as defined in Development Consent SSD-5465 (MOD 3), located at 33 Karoola Avenue, Kingfisher Shores, CHAIN VALLEY BAY, 2259
16	Noise monitoring	Noise monitoring site R15 as defined in Development Consent SSD-5465 (MOD 3), located at Short Street, Macquarie Shores, CHAIN VALLEY BAY, 2259
20	Noise monitoring	Noise monitoring site R19 as defined in Development Consent SSD-5465 (MOD 3), located at 2 Sunset Parade, CHAIN VALLEY BAY, 2259

23	Noise monitoring	Noise monitoring site R22 as defined in Development Consent SSD-5465 (MOD 3), located at 275a Cams Boulevard, CHAIN VALLEY BAY, 2259
26	Meteorological Station	Mannering Colliery Meteorological Station, Ruttleys Road, Doyalson 2259.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 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.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.4 Water and/or Land Concentration Limits

POINT 1,27

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Faecal Coliforms	colony forming units per 100 millilitres				200
pH	pH				6.5-8.5
Total suspended solids	milligrams per litre				50

Environment Protection Licence

L3 Volume and mass limits

L3.1 For each discharge point or utilisation area specified below (by a point number), the volume/mass of:
a) liquids discharged to water; or;
b) solids or liquids applied to the area;
must not exceed the volume/mass limit specified for that discharge point or area.

Point	Unit of Measure	Volume/Mass Limit
1	kilolitres per day	12161
27	kilolitres per day	12161

L3.2 The volumetric daily discharge limit for the premises is the combined discharge measured at EPA discharge points 1 and 27 and must not exceed 12161 kilolitres per day.

L4 Waste

L4.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled “Waste” and meeting the definition, if any, in the column titled “Description” in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled “Activity” in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled “Other Limits” in the table below.
This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	General or Specific exempted waste	Waste that meets all the conditions of a resource exemption under Clause 92 of the Protection of the Environment Operations (Waste) Regulation 2014.	As specified in each particular resource recovery exemption	NA

L5 Noise limits

L5.1 Noise generated at the premises that is measured at each noise monitoring point established under this licence must not exceed the noise levels specified in Column 4 of the table below for that point during the corresponding time periods specified in Column 1 when measured using the corresponding measurement parameters listed in Column 2.

POINT 12

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)

Environment Protection Licence

Day	Day-LAeq (15 minute)	-	49
Evening	Evening-LAeq (15 minute)	-	49
Night	Night-LAeq (15 minute)	-	49
Night	Night-LA1 (1 minute)	-	54

POINT 13

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	49
Evening	Evening-LAeq (15 minute)	-	49
Night	Night-LAeq (15 minute)	-	49
Night	Night-LA1 (1 minute)	-	53

POINT 14

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	43
Evening	Evening-LAeq (15 minute)	-	43
Night	Night-LAeq (15 minute)	-	43
Night	Night-LA1 (1 minute)	-	49

POINT 16

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	36
Evening	Evening-LAeq (15 minute)	-	36
Night	Night-LAeq (15 minute)	-	36
Night	Night-LA1 (1 minute)	-	45

POINT 20

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	37
Evening	Evening-LAeq (15 minute)	-	37
Night	Night-LAeq (15 minute)	-	37

Night	Night-LA1 (1 minute)	-	45

POINT 23

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	46
Evening	Evening-LAeq (15 minute)	-	46
Night	Night-LAeq (15 minute)	-	46
Night	Night-LA1 (1 minute)	-	46

POINT 9

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	38
Evening	Evening-LAeq (15 minute)	-	38
Night	Night-LAeq (15 minute)	-	38
Night	Night-LA1 (1 minute)	-	45

L5.2 The licensee must ensure that noise generated on the premises does not exceed:

a) 35 LAeq(15min) during the day, evening or night at any privately owned land nearest to the residence apart from those receivers identified in Condition 5.1; and
b) 45 LA1(1min) during the night at any privately owned land nearest to the residence apart from those receivers identified in Condition 5.1.

Note: The licensee may provide to the EPA written evidence of any agreement with a landholder which is subject to the above noise limits. The written evidence may be submitted with a licence variation to remove the landholder from the above tables.

L5.3 For the purpose of condition L5.1 and condition L5.2:
(a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and public holidays;
(b) Evening is defined as the period 6pm to 10pm, and
(c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

L5.4 The noise limits set out in condition L5.1 and condition L5.2 apply under all meterorological conditions except for any one of the following:

(a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
(b) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
(c) Stability category G temperature inversion conditions.
(d) Or as defined under the NSW EPA Noise Policy for Industry 2017.

L5.5 For the purpose of condition L5.4:
(a) the meteorological data to be used for determining meteorological conditions is the data recorded at the meteorological station identified in this licence as EPA Identification Point 26.
(b) Stability category temperature inversion conditions are to be determined in accordance with the NSW EPA Noise Policy for Industry 2017.

Note: The weather station must be designed, commissioned and operated in a manner to obtain the necessary parameters required under the above condition.

L5.6 For the purpose of determining the noise generated at the premises the licensee must use a Class 1 or Class 2 noise monitoring device as defined by AS IEC61672.1 and AS IEC61672.2-2004, or other noise monitoring equipment accepted by the EPA in writing.

L5.7 To determine compliance:

1. With the $L_{Aeq(15\ min)}$ noise limits in condition L5.1 and condition L5.2, the licensee must locate noise monitoring equipment;

(a) within 30 metres of a dwelling facade (but not closer than 3 metres) where any dwelling on the property is situated more then 30 metres from the property boundary that is closest to the premises;

(b) approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises, or, where applicable,

(c) within approximately 50 metres if the boundary of a national park or nature reserve.

2. With the LA1(1 minute) noise limits in condition L5.1 and L5.2, the noise monitoring equipment must be located within 1 metre of a dwelling facade.

3. With the noise limits in condition L5.1 and condition L5.2, the noise monitoring equipment must be located;

(a) at the most affected point at a location where there is no dwelling at the location, or

(b) at the most affected point within an area at a location prescribed by conditions L5.7 1(a) or L5.7 1(b).

L5.8 A non-compliance of condition L5.1 or condition L5.2 will still occur where noise generated from the premises in excess of the appropriate limit is measured;
a) at a location other than an area prescribed by conditions L5.7 1(a) and L5.7 1(b), and /or
b) at a point other than the most affected point at a location.

L5.9 For the purposes of determining the noise generated at the premises all applicable modification factors as described in the NSW EPA Noise Policy for Industry 2017 must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4 Environmental monitoring

Requirement to monitor noise

M4.1 To determine compliance with condition L5.1, attended noise monitoring must be undertaken in accordance with conditions L5.7 and L5.8, and

(a) at each one of the locations listed in condition L5.1;
(b) occur quarterly within the reporting period of the Environment Protection Licence with at least 2 months between monitoring periods;
(c) occur during each day, evening and night period as defined in the NSW Industrial Noise Policy (EPA 2000) for a minimum of 15 minutes for three of the quarters;
(d) the night time 15 minute attended monitoring in accordance with c) must be undertaken between the hours of 1am and 4am;
(e) the night time LA1 (1 min) attended monitoring in accordance with c) must be undertaken between the hours of 1am and 4am;
(f) one quarterly monitoring must occur during each day, evening and night period as defined in the NSW EPA Noise Policy for Industry 2017 for a minimum of 1.5 hours during the day; 30 minutes during the evening; and 1 hours during the night, and
(g) each quarterly monitoring must be undertaken on a different day(s) of the week not including Saturdays, Sundays and public holidays; and
(h) these monitoring conditions take effect in the 2015 Reporting period.

Note: The intention of this condition is that quarterly monitoring be undertaken at each sensitive receiver. That at each sensitive receiver monitoring is undertaken over a range of different days excluding weekends and public holidays during the reporting period so as to be representative of operating hours. That night time 15 minute attended monitoring and the LA1 (1min) monitoring for three of the quarters be undertaken at worst case being the most stable atmospheric conditions and when noise would be most intrusive to sleep. All of the sensitive receivers do not have to be monitored on the same day, evening and night for sub condition f.

M4.2 For the Annual Reporting Period ending March 2015 the EPA will accept all monitoring required by the current Department of Planning and Environment consent (usually quarterly monitoring for noise as dB(A) Leq15minutes) for compliance with noise monitoring requirements in this licence, as a single report attached to the Annual Return for the premises.

M5 Weather monitoring

M5.1 At the point(s) identified below, the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1 of the table below, using the corresponding sampling method, units of measure, averaging period and sampling frequency, specified opposite in the Columns 2, 3, 4 and 5 respectively.

2.4 Chain Valley Colliery Environmental Protection License 1770

CVC operates under EPL 1770 issued by the NSW EPA under the POEO Act. The EPL has been modified, most recently on 2 April 2019 acknowledging the transfer of ownership from LakeCoal Pty Ltd to Great Southern Energy Pty Ltd.

Noise related requirements of EPL 1770 together with where they are addressed in this NMP are provided in **Appendix E**.

2.5 Mannering Colliery Environmental Protection License 191

Mannering Colliery operates under EPL 191 issued by the NSW EPA under the POEO Act. The EPL has been modified, most recently on 1 April 2019 following the statutory five-year review and consisting of a number of variations which were mostly administrative in nature.

Condition L5 of EPL 191 notes that noise limits are not specified, with the Department of Planning, Industry and Environment being the appropriate authority for regulating noise conditions under Project Approval 06_0311.

2.6 Operational Noise Criteria

Noise limits within CVC Development Consent SSD-5465 and MC Project Approval 06_0311 have been outlined in **Table 2**.

Table 2: Consented Operational Noise Criteria dB(A) for Delta Coal Collieries

Consent/Approval/EPL Location	Day		Evening		Night		
	$L_{Aeq\ (15\ min)}$		$L_{Aeq\ (15\ min)}$		$L_{Aeq\ (15\ min)}$		$L_{A1\ (1\ min)}$
Chain Valley Colliery							
R8 (EPL Point 8)	38		38		38		45
R11 (EPL Point 11)	49	41^	49	41^	49	41^	54
R12 (EPL Point 12)	49	41^	49	41^	49	41^	53
R13 (EPL Point 13)	43	41^	43	41^	43	41^	49
R15 (EPL Point 15)	36		36		36		45
R19 (EPL Point 19)	37		37		37		45
R22 (EPL Point 22)	46	40^	46	40^	46	40^	46
All other privately-owned land	35		35		35		45
Mannering Colliery							
4 – di Rocco	40		36		36		46
5 – Keighran	40		39		39		49
6 – Swan	40		37		37		47
7 – Druitt	40		35		35		45
8 – Macquarie Shores Home Village	42		42		42		47
9 – Jeans	40		37		37		47
11 – Jeans	40		36		36		46
18 – Jeans	40		36		36		46
20 – Knight and all other privately-owned residences	40		36		36		46

^ = Long Term Noise Goals (where long-term goals differ from consented criteria)

Noise criteria outlined in **Table 2** do not apply if Delta Coal has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria and Delta Coal has advised the EPA and DPIE in writing of the terms of this agreement.

As CVC has been operating for approximately 58 years, some of the predicted noise impacts at local receivers are greater than would usually be permissible without the requirement to offer noise treatments or voluntary acquisition. Notably the relocation of coal handling from CVC to MC in 2017 significantly improved CVC progression toward realising the long-term goals at receivers R11 to R13, where currently monitoring typically notes that occasional forklift and plant start-up warnings can be heard during monitoring at these receivers, while typically the site is inaudible. Consistent with noise monitoring results, community complaints from residents at these receivers regarding noise emissions has significantly decreased.

4.2.2 Chain Valley Colliery

Consistent with the noise impact assessment prepared by AECOM Pty Ltd for CVC in 2011 and undertaken as part of the Environmental Impact Statement (EIS) for Development Consent of SSD-5465, residential receivers have been divided into seven (7) noise catchment areas with similar geographical and acoustic features. The following points are considered representative of each noise catchment area:

- ATN001, representative of EPL 1770 monitoring point identification number 9, also identified in Development Consent SSD-5465 as receiver 'R8'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Mannering Park, northwest of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN002, representative of EPL 1770 monitoring point identification number 12, also identified in Development Consent SSD-5465 as receiver 'R11'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Kingfisher Shores, south-east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN003, representative of EPL 1770 monitoring point identification number 16, also identified in Development Consent SSD-5465 as receiver 'R15'. The attended monitoring point captures noise emissions at privately-owned relocatable residences within MSHV, south of the Chain Valley Colliery pit top. The dominant noise sources in this receiver area are birds, insects, traffic and other industrial sources. Activities at Mannering Colliery are also audible at times;
- ATN004, representative of Development Consent SSD-5465 receiver 'R14'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Chain Valley Bay South, south-east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN005, representative of Development Consent SSD-5465 receiver 'R17'. The attended monitoring point captured noise emissions at privately-owned residential properties located in Chain Valley Bay East, south-east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN006, representative of EPL 1770 monitoring point identification number 20, also identified in Development Consent SSD-5465 as receiver 'R19'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Chain Valley Bay North, east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources
- ATN007, representative of EPL 1770 monitoring point identification number 23, also identified in Development Consent SSD-5465 as receiver 'R22'. The attended monitoring point captured

noise emissions at privately-owned residential properties located in Summerland Point, surrounding Chain Valley Colliery's Summerland Point ventilation shaft and fan site. The dominant noise sources in this area are birds, insects, traffic and the Summerland Point ventilation shaft and fan site.

It is noted that, with reference to the requirements of the EPL, two receivers were not considered to be captured by the seven (7) noise catchment areas outlined in the EIS and as such, monitoring is to be undertaken at the following points in addition to locations ATN001 to ATN007:

- R12, identified in EPL 1770 as noise monitoring point 13, noted to be adjacent to ATN002 at Kingfisher Shores on Lakeshore Avenue, Kingfisher Shores; and
- R13, identified in EPL 1770 as noise monitoring point 14, located on Karoola Avenue, Kingfisher Shores.

The spatial locations of the CVC attended monitoring locations and relevant noise criteria are detailed in **Table 5** below.

Table 5: Noise Monitoring Locations and Limits for Chain Valley Colliery

Location	Receivers Represented EPL 1770 ID SSD-5465 ID	Coordinates	Day $L_{Aeq(15\ min)}$ dB (A)	Evening $L_{Aeq(15\ min)}$ dB (A)	Night $L_{Aeq(15\ min)}$ dB (A)	Night $L_{A1(1\ min)}$ dB (A)
ATN001	EPL #9 R8	364140 E 6330594 N	35	35	35	35
ATN002	EPL #12 R11	365218 E 6329388 N	49	49	49	54
ATN003	EPL#16 R15	365165 E 6328323 N	36	36	36	45
ATN004	N/A R14	365949 N 6328530 E	35	35	35	45
ATN005	N/A R17	366560 N 6328590 E	35	35	35	45
ATN006	20 R19	366305 N 6329321 E	37	37	37	45
ATN007	23 R22	366425 N 6331135 E	46	46	46	46
R12	13 R12	365185 N 6329352 E	49	49	49	53
R13	14 R13	365391 N 6329169 E	43	43	43	49

Appendix C
Calibration certificates

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Certificate Of Calibration

Certificate No: SLM31670

Equipment Tested: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	2759405
Mic. Type:	4189	**Serial No:**	2983733
Pre-Amp. Type:	ZC0032	**Serial No:**	22666
Filter Type:	1/3 Octave	**Test No:**	F031671

Owner: EMM Consulting
Level 3, 175 Scott Street
Newcastle, NSW 2300

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

Conditions Of Test:

Ambient Pressure	992	hPa ±1 hPa	**Date of Receipt :**	02/02/2022
Temperature	26	°C ±1° C	**Date of Calibration :**	02/02/2022
Relative Humidity	48	% ±5%	**Date of Issue :**	03/02/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

Checked By: ..... **Authorised Signature:** .....

Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration
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Acu-Vib Electronics
CALIBRATIONS SALES RENTALS REPAIRS

Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34169

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	3029363
Mic. Type:	4189	**Serial No:**	3260501
Pre-Amp. Type:	ZC0032	**Serial No:**	30109
Filter Type:	1/3 Octave	**Test No:**	F034175

Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	02/11/2022
Temperature	24	°C ±1° C	**Date of Calibration :**	03/11/2022
Relative Humidity	35	% ±5%	**Date of Issue :**	04/11/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C33872

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 **Serial No:** 79952
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.09 dB	1000.00 Hz	1.12 %
Level2:	NA	N	114.06 dB	1000.00 Hz	0.71 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure 1004 hPa ±1 hPa
Temperature 23 °C ±1° C
Relative Humidity 55 % ±5%

Date of Receipt : 26/09/2022
Date of Calibration : 29/09/2022
Date of Issue : 29/09/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C34022

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 **Serial No:** 86311
Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.01 dB	1000.00 Hz	2.00 %
Level2:	NA	N	113.92 dB	1000.00 Hz	0.35 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure 1013 hPa ±1 hPa
Temperature 22 °C ±1° C
Relative Humidity 56 % ±5%

Date of Receipt : 17/10/2022
Date of Calibration : 17/10/2022
Date of Issue : 17/10/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....

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Chain Valley Colliery

Quarterly attended noise monitoring - Q2 2023

Prepared for Great Southern Energy Pty Ltd (trading as Delta Coal)

August 2023

Chain Valley Colliery

Quarterly attended noise monitoring - Q2 2023

Great Southern Energy Pty Ltd (trading as Delta Coal)

E220750 RP2

August 2023

Version	Date	Prepared by	Reviewed by	Comments
1	30 June 2023	Teanuanua Villierme	Tony Welbourne	Draft
2	3 July 2023	Teanuanua Villierme	Tony Welbourne	Final
3	21 August 2023	Teanuanua Villierme	Tony Welbourne	Final (updated)

Approved by



Tony Welbourne
Associate Director
21 August 2023

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1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Great Southern Energy Pty Ltd (trading as Delta Coal) to conduct a quarterly noise survey of operations at Chain Valley Colliery (CVC) located at Vales Road, Mannering Park NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

Attended environmental noise monitoring described in this report was done during the day, evening and night periods on 15, 19 and 21 June 2023 at nine monitoring locations.

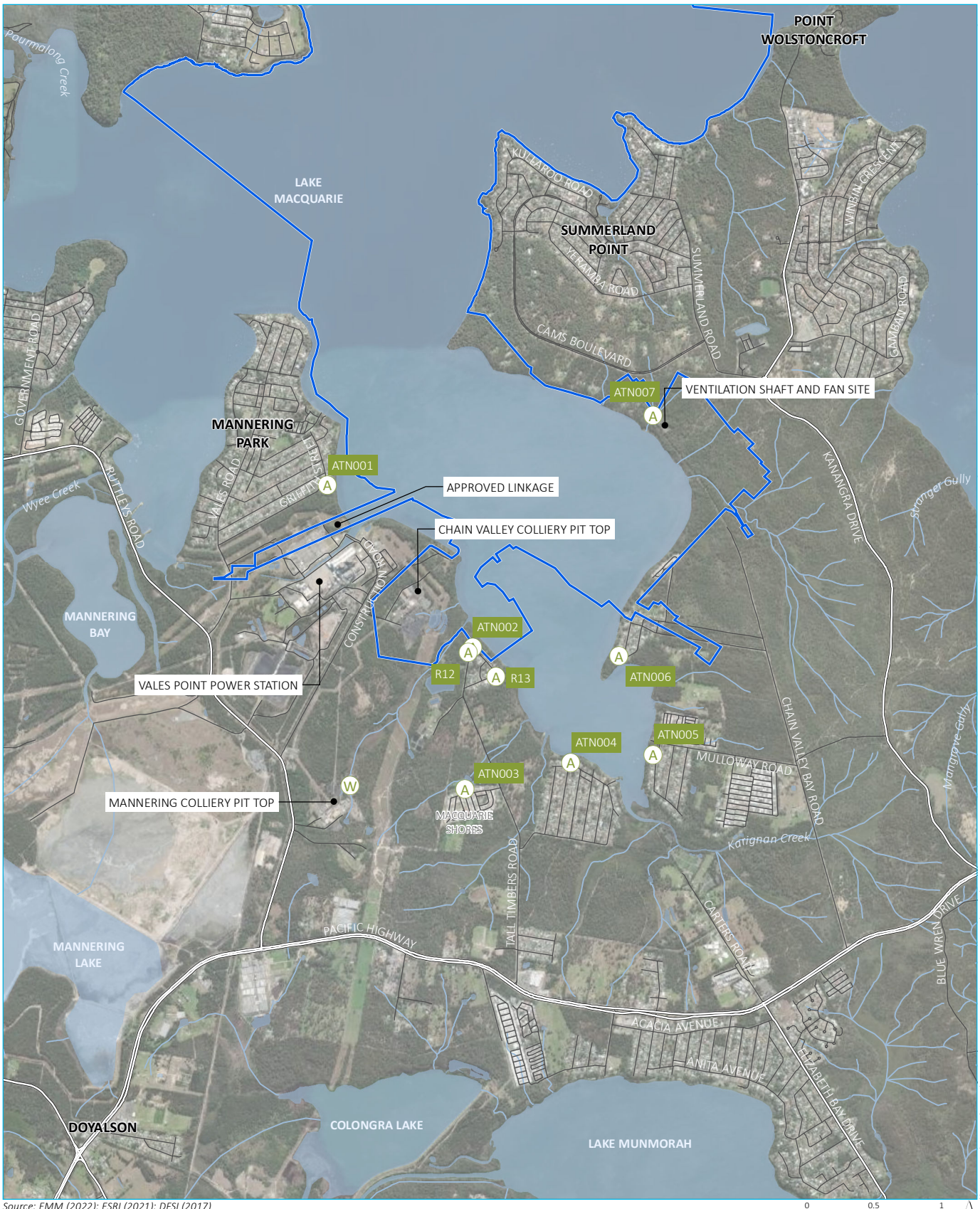
1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor	Description	Coordinates (MGA56)	
		Easting	Northing
ATN001	Griffith Street, Mannering Park	363990	6330529
ATN002	Lakeshore Avenue, Kingfisher Shores	365218	6329388
ATN003	Short Street, Macquarie Shores	365165	6328323
ATN004	Lloyd Avenue, Chain Valley Bay	365949	6328530
ATN005	Teragalin Drive, Chain Valley Bay	366560	6328590
ATN006	Sunset Parade, Chain Valley Bay	366305	6329321
ATN007[1]	Cams Boulevard, Chain Valley Bay	366559	6331109
R12	Lakeshore Avenue, Kingfisher Shores	365185	6329352
R13	Karoola Avenue, Kingfisher Shores	365391	6329169

Notes: 1. Due to access issues, ATN007 is an intermediate location within the site boundary and site noise contributions were calculated back to R22 (EPL Point 23).



Source: EMM (2022); ESRI (2021); DFSI (2017)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM2\2022\E220750 - Delta Coal Noise FY22-23\8 GIS\02_Maps\N002_CVCNoiseMonitoringLocations_20221111_02.mxd 11/11/2022

KEY

- (A) Noise monitoring location
- (W) Meteorological station
- CVC Consent Boundary
- Major road
- Minor road
- Watercourse/drainage line
- Waterbody

CVC attended noise monitoring locations

Chain Valley Colliery
Quarterly attended noise monitoring
Figure 1.1

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1.3 Terminology and abbreviations

Definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The energy average A-weighted noise level.
$L_{Aeq,15minute}$	The energy average A-weighted noise level over the specified time period of 15 minutes.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Noise limits for CVC are provided in Table 1, Condition 7 of Schedule 3 of the development consent SSD-5465 (DC). Long-term goals for CVC are provided in Condition 8(d) of Schedule 3 of the DC. Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Noise limits for CVC are provided in Conditions L5.1 and L5.2 of environment protection licence 1770 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved Noise Management Plan (NMP) was prepared in line with the Mod 4 approval and in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017. Table 5 of the NMP adopts nine operator-attended noise monitoring (NM) locations that are representative of residences outlined in the DC. Where several assessment locations are in one NM catchment, representative noise limits have been adopted to ensure that the lowest (most stringent) limits within the NM catchment can be achieved. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise impact limits based on the DC and EPL are provided in Table 2.1.

Table 2.1 Noise impact limits, dB

Noise monitoring location	Assessment location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
ATN001	R8 (EPL Point 9)	38	38	38	45
ATN002	R11 (EPL Point 12)	49	49	49	54
ATN003	R15 (EPL Point 16)	36	36	36	45
ATN004	R14	35	35	35	45
ATN005	R17	35	35	35	45
ATN006	R19 (EPL Point 20)	37	37	37	45
ATN007	R22 (EPL Point 23)	46	46	46	46
R12	R12 (EPL Point 13)	49	49	49	53
R13	R13 (EPL Point 14)	43	43	43	49

2.5 Meteorological conditions

Appendix 8 of the DC states meteorological conditions under which noise limits do not apply as follows:

- during periods of rain or hail

- average wind speed at microphone height exceeds 5 m/s
- wind speeds greater than 3 m/s at 10 m above ground level
- temperature inversion conditions greater than 3°C/100 m.

Condition L5.4 of the EPL states meteorological conditions under which noise limits do not apply as follows:

- wind speeds greater than 3 m/s at 10 m above ground level
- stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 m above ground level
- stability category G temperature inversion conditions
- as defined under the NPfI.

The last point refers to 'very noise-enhancing' conditions which are considered outside the 'standard' or 'noise-enhancing' meteorological conditions defined in Table D1 of Fact Sheet D of the NPfI.

Further, Fact Sheet E of the NPfI (point 6 of Section E1) provides additional guidance on monitoring the performance of a site against 'suitable' noise limits placed in the consent/environment protection licence. Noise limits are based on 'achievable' noise levels under the 'standard' and/or 'noise-enhancing' meteorological conditions. Where meteorological conditions are considered 'very noise-enhancing', a positive adjustment of 5 dB applies to noise limits for 'standard' or 'noise-enhancing' meteorological conditions.

In accordance with the NPfI and for consistency between the DC and EPL, where 'very noise-enhancing' meteorological conditions were present during a noise measurement, a positive adjustment of 5 dB has been applied to the noise limits stated in the DC and EPL. This approach means that noise limits are always applicable, with or without a positive adjustment of 5 dB, depending on whether meteorological conditions are 'very noise-enhancing' or not.

2.6 Additional requirements

2.6.1 Attended noise monitoring

Condition M4.1 of the EPL specifies additional noise monitoring requirements to determine compliance, including the following:

- locations of monitoring – EPL points listed in Table 2.1;
- frequency of monitoring – quarterly and at least two months between monitoring periods;
- periods of monitoring:
  - for three out of four quarterly periods – each day, evening and night periods for a minimum of 15 minutes. Night period monitoring must be undertaken between the hours of 1 am and 4 am; and
  - for one out of four quarterly periods – day period monitoring must be undertaken for a minimum of 1.5 hours (six 15-minute periods); evening period monitoring must be undertaken for a minimum of 30 minutes (two 15-minue periods); night period monitoring must be undertaken for a minimum of 1 hour (four 15-minute periods).
- days of monitoring – each quarterly monitoring must be undertaken on a different day of the week excluding Saturday, Sundays and public holidays.

In accordance with the preceding, this round of quarterly attended noise monitoring (Q2 2023) was undertaken on Thursday 15, Monday 19 and Wednesday 21 June 2023 which is more than two months since the last quarterly round of monitoring (Q1 2023) conducted on Tuesday 21 and Wednesday 22 March 2023.

As per the approved NMP, attended noise monitoring is scheduled considering the occurrence of regular operations at CVC. Noise monitoring avoids scheduled down-time or maintenance. Regular operations were occurring during this round of noise monitoring (Q2 2023).

Monitoring and reporting have been done in accordance with the NPfI and the EPA's 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

2.6.2 CVC long-term goals

Long-term goals for CVC are provided in Condition 8(d) of Schedule 3 of the DC, which states:

> 8. The Applicant must:
>
> (d) use its best endeavours to achieve the long-term noise goals in Table 2, where reasonable and feasible, and report on progress towards achieving these goals in each Annual Review;

The long-term goals for CVC in Table 2 of the DC are summarised in Table 2.2 for the relevant assessment locations.

Table 2.2 CVC long-term goals

Assessment location	Day $L_{Aeq,15minute}$, dB	Evening $L_{Aeq,15minute}$, dB	Night $L_{Aeq,15minute}$, dB
R11 (EPL Point 12)	41	41	41
R12 (EPL Point 13)	41	41	41
R13 (EPL Point 14)	41	41	41
R22 (EPL Point 23)	40	40	40

As stated in Appendix 9 of the DC, Delta Coal is committed to the progressive implementation of feasible measures to target long-term noise goals which are designed to reduce noise emissions from CVC. For the purpose of this compliance noise monitoring assessment, site $L_{Aeq,15minute}$ noise levels have also been compared to the long-term goals as discussed in Section 4.2.3.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Mannering Colliery automatic weather station (AWS) which allowed correlation of atmospheric parameters with measured site noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the day, evening and night periods at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source-to-receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If the exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

This assessment determined stability categories throughout attended monitoring period using the sigma-theta (ST) method as per Fact Sheet D of the NPfI. This data was sourced from the Mannering Colliery AWS, in accordance with requirements of EPL 1770.

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is undertaken at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor adjustments have been reported and added to measured site-only L_{Aeq}.

Low-frequency modifying factor adjustments have only been applied to site-only L_{Aeq} level if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

Equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	2759405	2/2/2024	IEC 61672-1:2002
Brüel & Kjær 2250 sound level meter	3029363	3/11/2024	IEC 61672-1:2002
Svantek SV-36 calibrator	79952	29/9/2024	IEC 60942:2003
Svantek SV-36 calibrator	86311	17/10/2024	IEC 60942:2003

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1.

Table 4.1 Total measured noise levels[1] – Quarter 2 2023

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
ATN001	15/06/2023 15:04	82	70	51	56	44	43	42
ATN001	15/06/2023 20:23	77	69	50	54	45	44	42
ATN001	21/06/2023 2:33	64	48	47	47	47	46	44
ATN002	15/06/2023 15:48	69	63	52	51	46	43	41
ATN002	15/06/2023 20:20	69	54	50	49	48	47	46
ATN002	21/06/2023 2:36	54	49	48	47	47	45	43
ATN003	15/06/2023 15:29	62	54	46	43	39	35	31
ATN003	19/06/2023 21:45	50	45	44	42	42	41	39
ATN003	21/06/2023 2:10	52	46	44	43	42	41	39
ATN004	15/06/2023 16:25	66	58	50	47	40	36	33
ATN004	15/06/2023 19:27	65	51	43	43	41	40	38
ATN004	15/06/2023 22:00	59	41	38	37	37	36	34
ATN005	15/06/2023 16:50	67	56	51	47	43	39	37
ATN005	15/06/2023 18:48	65	47	45	44	43	42	41
ATN005	15/06/2023 22:00	65	45	43	43	42	41	40
ATN006	15/06/2023 17:10	61	47	42	40	38	36	34
ATN006	15/06/2023 18:27	55	48	44	43	43	41	39
ATN006	21/06/2023 1:43	62	45	42	40	40	38	37
ATN007	15/06/2023 17:37	64	52	51	50	50	50	49
ATN007	15/06/2023 18:00	65	52	51	51	51	50	49
ATN007	21/06/2023 1:16	54	53	52	51	51	50	49
R12	15/06/2023 15:48	69	63	52	51	46	43	41
R12	15/06/2023 20:20	69	54	50	49	48	47	46
R12	21/06/2023 2:36	54	49	48	47	47	45	43
R13	15/06/2023 16:05	77	64	53	54	41	38	35
R13	15/06/2023 19:58	66	57	48	47	46	45	42
R13	21/06/2023 2:08	64	49	48	47	47	46	45

Notes: 1. Levels in this table are not necessarily the result of activity at site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 m above ground. Attended noise monitoring is not done during rain, hail, or average wind speeds above 5 m/s at microphone height.

Table 4.2 Measured atmospheric conditions – Quarter 2 2023

Location	Start date and time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north[1]	Cloud cover 1/8s
ATN001	15/06/2023 15:04	17	0.3	-	0
ATN001	15/06/2023 20:23	12	0.3	-	0
ATN001	21/06/2023 2:33	8	0.2	-	0
ATN002	15/06/2023 15:48	16	0.2	-	0
ATN002	15/06/2023 20:20	9	0.0	-	0
ATN002	21/06/2023 2:36	4	0.0	-	0
ATN003	15/06/2023 15:29	17	0.3	-	0
ATN003	19/06/2023 21:45	10	0.0	-	8
ATN003	21/06/2023 2:10	5	0.0	-	0
ATN004	15/06/2023 16:25	15	0.2	-	0
ATN004	15/06/2023 19:27	12	0.2	-	0
ATN004	15/06/2023 22:00	11	0.0	-	0
ATN005	15/06/2023 16:50	15	0.2	-	0
ATN005	15/06/2023 18:48	13	0.3	-	0
ATN005	15/06/2023 22:00	11	0.1	-	0
ATN006	15/06/2023 17:10	14	0.1	-	0
ATN006	15/06/2023 18:27	14	0.2	-	0
ATN006	21/06/2023 1:43	8	0.1	-	0
ATN007	15/06/2023 17:37	15	0.3	-	0
ATN007	15/06/2023 18:00	14	0.2	-	0
ATN007	21/06/2023 1:16	8	0.2	-	0
R12	15/06/2023 15:48	16	0.2	-	0
R12	15/06/2023 20:20	9	0.0	-	0
R12	21/06/2023 2:36	4	0.0	-	0
R13	15/06/2023 16:05	16	0.2	-	0
R13	15/06/2023 19:58	12	0.1	-	0
R13	21/06/2023 2:08	8	0.2	-	0

Notes: 1. "-" indicates calm conditions at monitoring location.

4.2 Site only noise levels

4.2.1 Modifying factors

With regard to LFN modifying factor adjustments, these have not been applied to locations where CVC was inaudible.

At ATN007 (R22), where CVC noise was audible, measured site noise levels exceeded the relevant LFN threshold levels during the day, evening and night period measurements. Therefore, in accordance with the NPfI, a 2 dB positive adjustment was applied to the estimated site $L_{Aeq,15minute}$ for the measurement during the day period and a 5 dB positive adjustment was applied to the estimated site $L_{Aeq,15minute}$ for the measurements during the evening and night period.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the Mannering Colliery AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing weather conditions (where relevant) as defined in the NPfI.

Table 4.3 Site noise levels and limits – Quarter 2 2023

Location	Start date and time	Period	Wind		Stability class	Very noise-enhancing?[1]	Limits, dB		Site levels, dB		Exceedances, dB	
			Speed m/s	Direction[3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$[2]	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
ATN001	15/06/2023 15:04	Day	1.6	261	A	No	43	N/A	IA	N/A	Nil	N/A
ATN001	15/06/2023 20:23	Evening	0.8	269	F	No	38	N/A	IA	N/A	Nil	N/A
ATN001	21/06/2023 2:33	Night	1.0	199	F	No	38	45	IA	IA	Nil	Nil
ATN002	15/06/2023 15:48	Day	0.6	275	A	No	49	N/A	IA	N/A	Nil	N/A
ATN002	15/06/2023 20:20	Evening	0.8	267	F	No	49	N/A	IA	N/A	Nil	N/A
ATN002	21/06/2023 2:36	Night	1.0	199	F	No	49	54	IA	IA	Nil	Nil
ATN003	15/06/2023 15:29	Day	0.9	322	A	No	36	N/A	IA	N/A	Nil	N/A
ATN003	19/06/2023 21:45	Evening	1.0	301	F	No	36	N/A	IA	N/A	Nil	N/A
ATN003	21/06/2023 2:10	Night	0.9	193	F	No	36	45	IA	IA	Nil	Nil
ATN004	15/06/2023 16:25	Day	0.4	167	C	No	35	N/A	IA	N/A	Nil	N/A
ATN004	15/06/2023 19:27	Evening	0.4	247	F	No	35	N/A	IA	N/A	Nil	N/A
ATN004	15/06/2023 22:00	Night	0.7	258	E	No	35	45	IA	IA	Nil	Nil
ATN005	15/06/2023 16:50	Day	0.5	175	B	No	35	N/A	IA	N/A	Nil	N/A
ATN005	15/06/2023 18:48	Evening	0.3	282	F	No	35	N/A	IA	N/A	Nil	N/A
ATN005	15/06/2023 22:00	Night	0.7	258	E	No	35	45	IA	IA	Nil	Nil
ATN006	15/06/2023 17:10	Day	0.6	184	A	No	37	N/A	IA	N/A	Nil	N/A
ATN006	15/06/2023 18:27	Evening	0.5	180	E	No	37	N/A	IA	N/A	Nil	N/A
ATN006	21/06/2023 1:43	Night	0.9	226	F	No	37	45	IA	IA	Nil	Nil

Table 4.3 Site noise levels and limits – Quarter 2 2023

Location	Start date and time	Period	Wind		Stability class	Very noise-enhancing?[1]	Limits, dB		Site levels, dB		Exceedances, dB	
			Speed m/s	Direction[3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$[2]	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
ATN007	15/06/2023 17:37	Day	0.4	260	A	No	51	N/A	41 (39 + 2)[4]	N/A	Nil	N/A
ATN007	15/06/2023 18:00	Evening	0.4	177	F	No	46	N/A	44 (39 + 5)[4]	N/A	Nil	N/A
ATN007	21/06/2023 1:16	Night	1.4	265	F	No	46	46	44 (39 + 5)[4]	39[5]	Nil	Nil
R12	15/06/2023 15:48	Day	0.6	275	A	No	49	N/A	IA	N/A	Nil	N/A
R12	15/06/2023 20:20	Evening	0.8	267	F	No	49	N/A	IA	N/A	Nil	N/A
R12	21/06/2023 2:36	Night	1.0	199	F	No	49	53	IA	IA	Nil	Nil
R13	15/06/2023 16:05	Day	0.4	303	A	No	43	N/A	IA	N/A	Nil	N/A
R13	15/06/2023 19:58	Evening	0.5	279	F	No	43	N/A	IA	N/A	Nil	N/A
R13	21/06/2023 2:08	Night	0.9	193	F	No	43	49	IA	IA	Nil	Nil

Notes:
1. Noise limits are adjusted by +5 dB during 'very noise-enhancing meteorological conditions' in accordance with the NPfI.
2. Site-only $L_{Aeq,15minute}$, includes modifying factor adjustments if applicable.
3. Degrees magnetic north, "-" indicates calm conditions.
4. Calculated back to R22 from data measured at ATN007.
5. Modifying factor adjustments do not apply to site L_{Amax}.

4.2.3 Long term noise goals

Site $L_{Aeq,15minute}$ were also compared to the long-term noise goals (refer to Table 2.2) for the relevant locations (i.e. R11, R12, R13 and R22). Site $L_{Aeq,15minute}$ measured at ATN002 (R11), R12 and R13 satisfied the relevant long-term goals during the day, evening and night periods. At ATN007 (R22), the measured site $L_{Aeq,15minute}$ (inclusive of modifying factor adjustment for LFN) exceeded the relevant long-term $L_{Aeq,15minute}$ 40 dB goal by 1 dB during the day period measurement and 4 dB during the evening and night period measurements.

5 Summary

EMM was engaged by Great Southern Energy Pty Ltd (trading as Delta Coal) to conduct a quarterly noise survey of operations at CVC. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the day, evening and night periods on 15, 19 and 21 June 2023 at nine monitoring locations.

Noise levels from site complied with relevant limits at all monitoring locations during the Q2 2023 survey.

CVC $L_{Aeq,15minute}$ were also compared to the long-term noise goals applicable at R11 (ATN002), R12, R13 and R22 (ATN007). CVC $L_{Aeq,15minute}$ satisfied these during all measurements at R11 (ATN002), R12 and R13. At R22 (ATN007), the measured site $L_{Aeq,15minute}$ (inclusive of modifying factor adjustment for LFN) exceeded the relevant long-term $L_{Aeq,15minute}$ 40 dB goal by 1 dB during the day period measurement and 4 dB during the evening and night period measurements.

Appendix A
Noise perception and examples

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A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or quarter) as loud

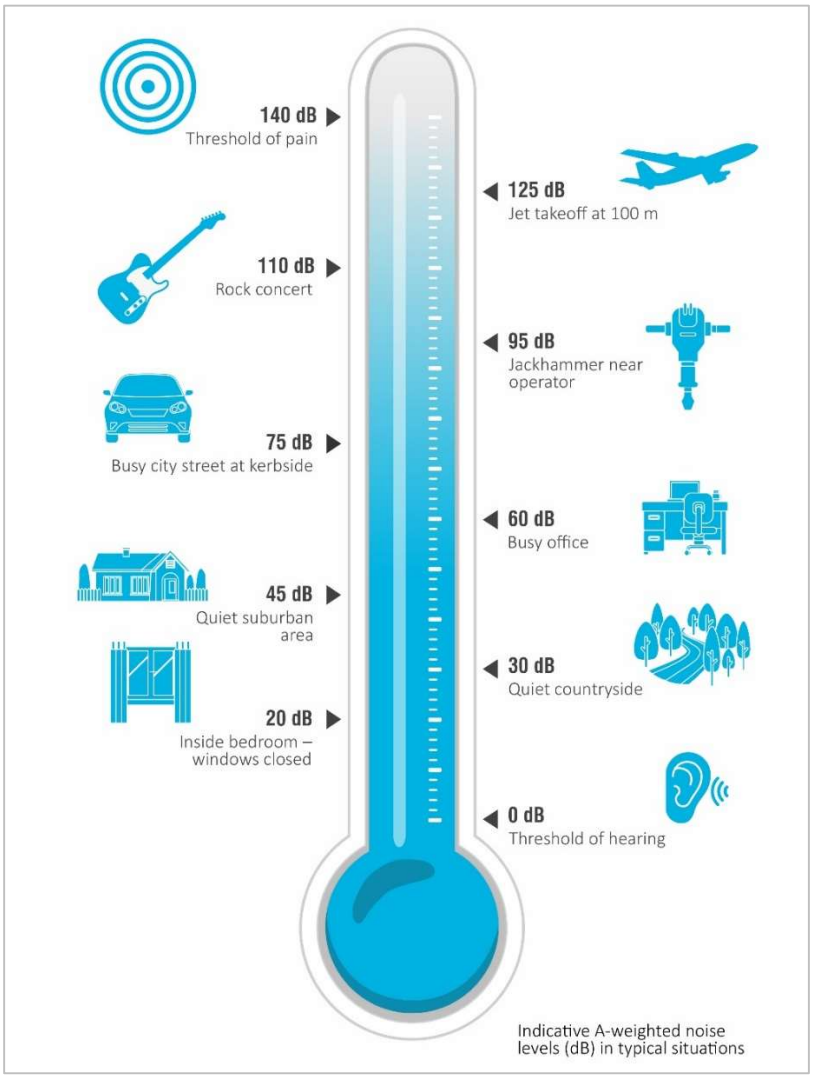


Figure A.1 Common noise levels

Appendix B
Regulator documents

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4. Prior to 31 March 2014, and every 12 months thereafter for each calendar year in which coal haulage from the site is undertaken utilising public roads, unless the Planning Secretary directs otherwise, the Applicant must commission a suitably qualified person, whose appointment has been approved by the Planning Secretary at least one month prior to undertaking the audit, to conduct an Independent Traffic Audit of the development. This audit must:
   (a) be undertaken without prior notice to the Applicant, and in consultation with TfNSW, NCC, CC Council and the CCC;
   (b) assess the impact of the development on the performance and safety of the road network, including a review of:
      - haulage records;
      - accident records on the haulage route, infringements relating to the code of conduct and any incidents involving haulage vehicles;
      - community complaints register; and
   (c) assess the effectiveness of the Road Transport Protocol; and, if necessary, recommend measures to reduce or mitigate any adverse (or potentially adverse) impacts.

5. Within 1 month of receiving the audit report, or as otherwise agreed by the Planning Secretary, the Applicant must submit a copy of the report to the Planning Secretary, with a detailed response to any of the recommendations contained in the audit report, including a timetable for the implementation of any measures proposed to address the recommendations in the audit report.

   A summary of the audit report must be included in the Annual Review.

Alternative Coal Transport Options

6. Prior to 31 December 2014, and every three years thereafter, the Applicant must prepare and submit to the Planning Secretary for approval, a study of the reasonable and feasible options to reduce or eliminate the use of public roads to transport coal from the development, unless otherwise agreed by the Planning Secretary. The assessment must include:
   (a) an analysis of the capital, construction and operating costs of the alternative transport options; and
   (b) quantified social and environmental impacts associated with road and rail transport.

NOISE

Noise Impact Assessment Criteria

7. The Applicant must ensure that the noise generated by the development at any residence on privately-owned land does not exceed the criteria for the location in Table 1 nearest to that residence.

Table 1: Noise Criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
R8	38	38	38	45
R11	49	49	49	54
R12	49	49	49	53
R13	43	43	43	49
R15	36	36	36	45
R19	37	37	37	45
R22	46	46	46	46
all other privately-owned land	35	35	35	45

Notes:
- *To interpret the locations referred to in Table 1, see Appendix 6 and the EIS; and*
- *Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 8 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.*

However, these criteria do not apply if the Applicant has a written agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

8. The Applicant must:
   (a) implement best management practice, including all reasonable and feasible noise mitigation measures, to minimise the construction, operational and transport noise generated by the development;
   (b) regularly assess the noise monitoring and meteorological data and relocate, modify, and/or stop operations on site to ensure compliance with the relevant conditions of this consent;
   (c) minimise the noise impacts of the development during meteorological conditions under which the noise limits in this consent do not apply (see Appendix 8);
   (d) use its best endeavours to achieve the long-term noise goals in Table 2, where reasonable and feasible, and report on progress towards achieving these goals in each Annual Review;
   (e) carry out a comprehensive noise audit of the development in conjunction with each independent environmental audit; and
   (f) prepare an action plan to implement any additional reasonable and feasible onsite noise mitigation measures identified by each audit;
   to the satisfaction of the Planning Secretary.

Table 2: Long-term Noise Goals dB(A)

Location	***Day***	***Evening***	***Night***
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$
R11 – R13	41	41	41
R22	40	40	40

Notes:
- *To interpret the locations referred to in Table 2, see Appendix 6 and the EIS; and*
- *Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 8 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.*

Noise Management Plan

9. The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
   (a) be prepared in consultation with the EPA and submitted to the Planning Secretary for approval within 4 months of the date of this consent, unless otherwise agreed by the Planning Secretary;
   (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
   (c) describe the proposed noise management system in detail including the mitigation measures that would be implemented to minimise noise during construction and operations, including on and off site road noise generated by vehicles associated with the development; and
   (d) include a monitoring program that:
      - uses attended monitoring to evaluate the compliance of the development against the noise criteria in this consent;
      - evaluates and reports on:
         - the effectiveness of the on-site noise management system; and
         - compliance against the noise operating conditions; and
      - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

The Applicant must implement the Noise Management Plan as approved by the Planning Secretary.

AIR QUALITY

Odour

10. The Applicant must ensure that no offensive odours are emitted from the site, as defined under the POEO Act.

APPENDIX 6
NOISE RECEIVER LOCATIONS

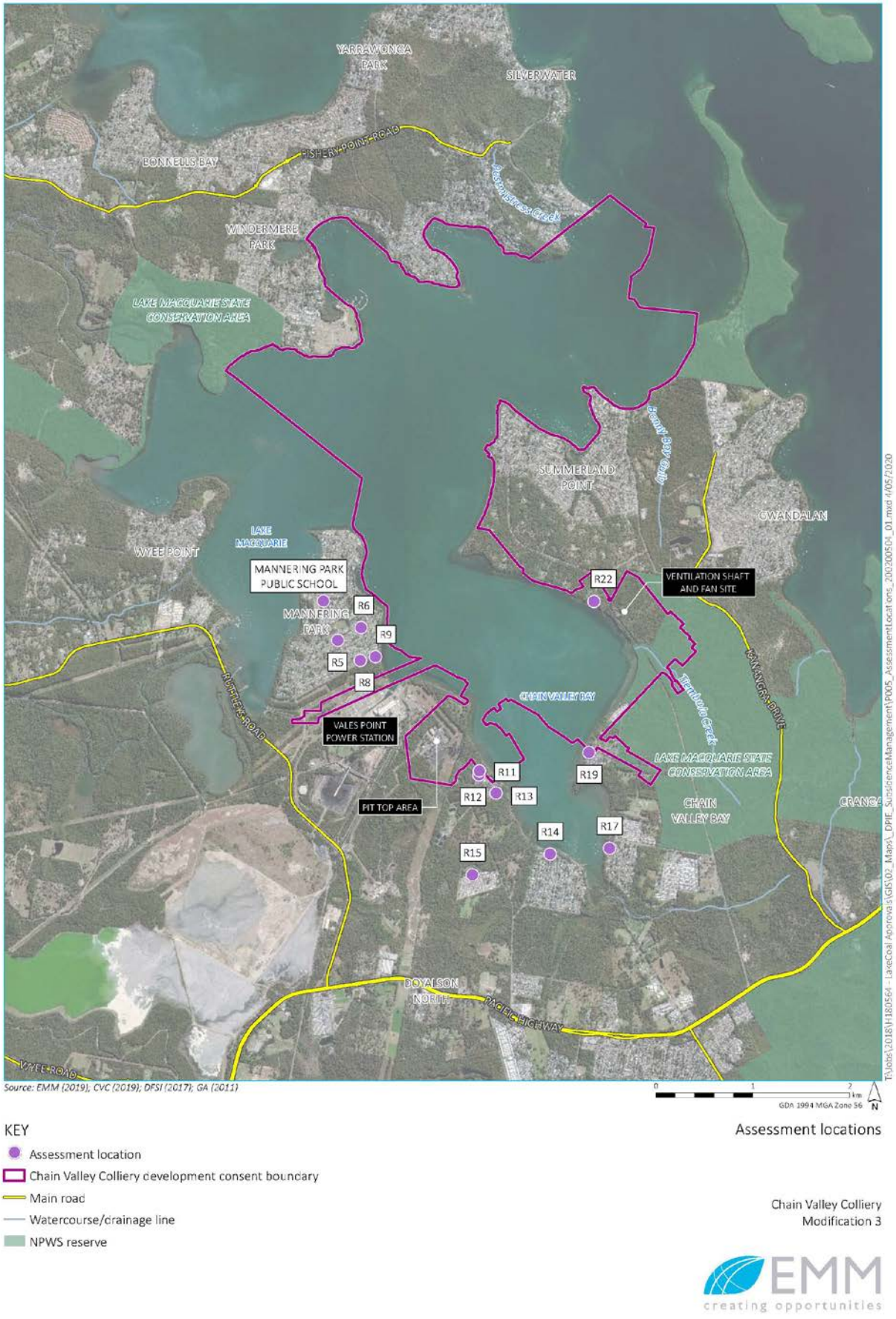


Figure 1: *Noise Receiver Locations*

APPENDIX 8
NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 1 of the conditions are to apply under all meteorological conditions except the following:
   (a) during periods of rain or hail;
   (b) average wind speed at microphone height exceeds 5 m/s;
   (c) wind speeds greater than 3 m/s measured at 10 m above ground level; or
   (d) temperature inversion conditions greater than 3°C/100 m.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station described in condition 14 of schedule 3.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.

4. This monitoring must be carried out at least 4 times in each calendar year (ie at least once every 3 months), unless the Planning Secretary directs otherwise.

5. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
   (a) monitoring locations for the collection of representative noise data;
   (b) meteorological conditions during which collection of noise data is not appropriate;
   (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

	results of this monitoring program will be reviewed by a suitably qualified expert and used to determine the appropriateness of the existing irrigation area to receive this effluent; • develop a program to monitor creek line channel stability and the health of riparian vegetation within Swindles Creek. Monitoring will be undertaken in accordance with Section 8.5.2 of the Surface Water Impact Assessment (EIS Appendix E) and incorporated into the Colliery's WMP or Biodiversity Management Plan; and • record monitoring data in accordance with the Colliery's WMP and EPL 1770. Monitoring data will be interpreted as it is received to ensure appropriate operational guidance on monitoring water quality within desired parameters. Results of water quality monitoring will be reported in the Annual Review and made available to the CCC, as well as CC Council and LMCC.
Noise	Management and monitoring of noise will continue to be undertaken in accordance with the Colliery's NMP, which will be reviewed and updated as required to include the commitments made below. Great Southern Energy Pty Limited will: • continue attended compliance monitoring on site which will be used to identify potential hot spots and primary noise sources; • continue real-time noise monitoring alerts to site personnel to enable implementation of any required rapid noise management initiatives; • manage potential non-compliance through a noise complaint handling and response system, including the identification of responsible sources to enable targeted remedial action; • assess if further noise mitigation options for the ventilation fans are reasonable and feasible following the receipt of attenuation proposals; and • discuss potential management measures or agreement options with the landowner at 275 Cams Boulevard, following receipt of proposals from acoustics specialists. In addition to the above, Great Southern Energy Pty Limited is committed to the progressive implementation of feasible measures to target long-term noise goals which are designed to reduce noise emissions from the Colliery. Long-term options for investigation include: • modification to belt/movement alarms; • investigation of surface conveyer and coal preparation equipment, to determine if noise reductions are possible; • identifying sound attenuation options for the surface bulldozer and front-end loader; • strategic placement of acoustic barriers; • attenuation for the surface screener/shaker; • installation of quiet rollers for surface conveyor belts; • acoustic treatments around compressors; and • the use of a conveyor stacker for product coal stockpiling.
Air Quality and greenhouse gases	Management and monitoring of air quality and greenhouse gases will continue to be undertaken in accordance with the Colliery's AQGHGMP, which will be reviewed and updated as required to include the commitments made below Great Southern Energy Pty Limited will: • investigate the use of a stacker to replace hauling between current conveyor system and stockpiles; • undertake GHG monitoring comprising measurement of carbon dioxide and methane at the ventilation shaft and fan sites; and • record and report annual diesel, oil, grease, acetylene and electricity use to fulfil National Greenhouse and Energy Reporting Scheme requirements.
Traffic and transport	Management and monitoring of traffic and transport will continue to be undertaken in accordance with the Colliery's RTP. In addition, Great Southern Energy Pty Limited will continue to investigate alternative options for transporting export coal to the Port of Newcastle, specifically the preferred rail transport option, requiring the construction of a private haul road to the VPPS coal unloading facility and associated infrastructure upgrades. In addition, Great Southern Energy Pty Limited will investigate options to reduce peak hour traffic would be investigated including potentially limiting the peak hourly volumes of the Colliery truck traffic which would be permitted to travel via this intersection should the Colliery not be using rail transport for export coal by five years from the granting of development consent. Alternatively, a pro-rata financial contribution to the cost of installing traffic signals at the southbound intersection of the F3 and Sparks Road interchange could be made commensurate with the percentage of Colliery generated traffic using the intersection.
Subsidence	Management and monitoring of subsidence will continue to be undertaken in accordance with the Colliery's SMP or Extraction Plans, which will be reviewed and

Environment Protection Licence

1	Discharge to waters Discharge quality and volume monitoring	Discharge to waters Discharge quality and volume monitoring	Discharge to waters and monitoring from final settlement pond, gravity fed discharge pipe as identified in plan titled "Delta Coal Chain Valley Colliery, Surface EPA Premises Plan, DRG No: C1S0165_2" 10 August 2021 and saved as EPA Document DOC21/691135.
27	Discharge to waters Discharge quality and volume monitoring	Discharge to waters Discharge quality and volume monitoring	Discharge to waters via dam spillway from final settlement pond adjacent to EPA Point 1 as identified in plan titled "Delta Coal Chain Valley Colliery, Surface EPA Premises Plan, DRG No: C1S0165_2" 10 August 2021 and saved as EPA Document DOC21/691135.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
9	Noise monitoring	Noise monitoring site R8 as defined in Development Consent SSD-5465 (MOD 3), located at 109 Griffith Street, MANNERING PARK, 2259
12	Noise monitoring	Noise monitoring site R11 as defined in Development Consent SSD-5465 (MOD 3), located at 35 Lakeshore Avenue, CHAIN VALLEY BAY, 2259
13	Noise monitoring	Noise monitoring site R12 as defined in Development Consent SSD-5465 (MOD 3), located at 20 Lakeshore Avenue, Kingfisher Shores, CHAIN VALLEY BAY, 2259
14	Noise monitoring	Noise monitoring site R13 as defined in Development Consent SSD-5465 (MOD 3), located at 33 Karoola Avenue, Kingfisher Shores, CHAIN VALLEY BAY, 2259
16	Noise monitoring	Noise monitoring site R15 as defined in Development Consent SSD-5465 (MOD 3), located at Short Street, Macquarie Shores, CHAIN VALLEY BAY, 2259
20	Noise monitoring	Noise monitoring site R19 as defined in Development Consent SSD-5465 (MOD 3), located at 2 Sunset Parade, CHAIN VALLEY BAY, 2259

23	Noise monitoring	Noise monitoring site R22 as defined in Development Consent SSD-5465 (MOD 3), located at 275a Cams Boulevard, CHAIN VALLEY BAY, 2259
26	Meteorological Station	Mannering Colliery Meteorological Station, Ruttleys Road, Doyalson 2259.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 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.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.4 Water and/or Land Concentration Limits

POINT 1,27

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Faecal Coliforms	colony forming units per 100 millilitres				200
pH	pH				6.5-8.5
Total suspended solids	milligrams per litre				50

Environment Protection Licence

L3 Volume and mass limits

L3.1 For each discharge point or utilisation area specified below (by a point number), the volume/mass of:
a) liquids discharged to water; or;
b) solids or liquids applied to the area;
must not exceed the volume/mass limit specified for that discharge point or area.

Point	Unit of Measure	Volume/Mass Limit
1	kilolitres per day	12161
27	kilolitres per day	12161

L3.2 The volumetric daily discharge limit for the premises is the combined discharge measured at EPA discharge points 1 and 27 and must not exceed 12161 kilolitres per day.

L4 Waste

L4.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled “Waste” and meeting the definition, if any, in the column titled “Description” in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled “Activity” in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled “Other Limits” in the table below.
This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	General or Specific exempted waste	Waste that meets all the conditions of a resource exemption under Clause 92 of the Protection of the Environment Operations (Waste) Regulation 2014.	As specified in each particular resource recovery exemption	NA

L5 Noise limits

L5.1 Noise generated at the premises that is measured at each noise monitoring point established under this licence must not exceed the noise levels specified in Column 4 of the table below for that point during the corresponding time periods specified in Column 1 when measured using the corresponding measurement parameters listed in Column 2.

POINT 12

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)

Environment Protection Licence

Day	Day-LAeq (15 minute)	-	49
Evening	Evening-LAeq (15 minute)	-	49
Night	Night-LAeq (15 minute)	-	49
Night	Night-LA1 (1 minute)	-	54

POINT 13

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	49
Evening	Evening-LAeq (15 minute)	-	49
Night	Night-LAeq (15 minute)	-	49
Night	Night-LA1 (1 minute)	-	53

POINT 14

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	43
Evening	Evening-LAeq (15 minute)	-	43
Night	Night-LAeq (15 minute)	-	43
Night	Night-LA1 (1 minute)	-	49

POINT 16

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	36
Evening	Evening-LAeq (15 minute)	-	36
Night	Night-LAeq (15 minute)	-	36
Night	Night-LA1 (1 minute)	-	45

POINT 20

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	37
Evening	Evening-LAeq (15 minute)	-	37
Night	Night-LAeq (15 minute)	-	37

Night	Night-LA1 (1 minute)	-	45

POINT 23

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	46
Evening	Evening-LAeq (15 minute)	-	46
Night	Night-LAeq (15 minute)	-	46
Night	Night-LA1 (1 minute)	-	46

POINT 9

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	38
Evening	Evening-LAeq (15 minute)	-	38
Night	Night-LAeq (15 minute)	-	38
Night	Night-LA1 (1 minute)	-	45

L5.2 The licensee must ensure that noise generated on the premises does not exceed:

a) 35 LAeq(15min) during the day, evening or night at any privately owned land nearest to the residence apart from those receivers identified in Condition 5.1; and
b) 45 LA1(1min) during the night at any privately owned land nearest to the residence apart from those receivers identified in Condition 5.1.

Note: The licensee may provide to the EPA written evidence of any agreement with a landholder which is subject to the above noise limits. The written evidence may be submitted with a licence variation to remove the landholder from the above tables.

L5.3 For the purpose of condition L5.1 and condition L5.2:
(a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and public holidays;
(b) Evening is defined as the period 6pm to 10pm, and
(c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

L5.4 The noise limits set out in condition L5.1 and condition L5.2 apply under all meterorological conditions except for any one of the following:

(a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
(b) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
(c) Stability category G temperature inversion conditions.
(d) Or as defined under the NSW EPA Noise Policy for Industry 2017.

L5.5 For the purpose of condition L5.4:
(a) the meteorological data to be used for determining meteorological conditions is the data recorded at the meteorological station identified in this licence as EPA Identification Point 26.
(b) Stability category temperature inversion conditions are to be determined in accordance with the NSW EPA Noise Policy for Industry 2017.

Note: The weather station must be designed, commissioned and operated in a manner to obtain the necessary parameters required under the above condition.

L5.6 For the purpose of determining the noise generated at the premises the licensee must use a Class 1 or Class 2 noise monitoring device as defined by AS IEC61672.1 and AS IEC61672.2-2004, or other noise monitoring equipment accepted by the EPA in writing.

L5.7 To determine compliance:

1. With the $L_{Aeq(15\ min)}$ noise limits in condition L5.1 and condition L5.2, the licensee must locate noise monitoring equipment;

(a) within 30 metres of a dwelling facade (but not closer than 3 metres) where any dwelling on the property is situated more then 30 metres from the property boundary that is closest to the premises;

(b) approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises, or, where applicable,

(c) within approximately 50 metres if the boundary of a national park or nature reserve.

2. With the LA1(1 minute) noise limits in condition L5.1 and L5.2, the noise monitoring equipment must be located within 1 metre of a dwelling facade.

3. With the noise limits in condition L5.1 and condition L5.2, the noise monitoring equipment must be located;

(a) at the most affected point at a location where there is no dwelling at the location, or

(b) at the most affected point within an area at a location prescribed by conditions L5.7 1(a) or L5.7 1(b).

L5.8 A non-compliance of condition L5.1 or condition L5.2 will still occur where noise generated from the premises in excess of the appropriate limit is measured;
a) at a location other than an area prescribed by conditions L5.7 1(a) and L5.7 1(b), and /or
b) at a point other than the most affected point at a location.

L5.9 For the purposes of determining the noise generated at the premises all applicable modification factors as described in the NSW EPA Noise Policy for Industry 2017 must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4 Environmental monitoring

Requirement to monitor noise

M4.1 To determine compliance with condition L5.1, attended noise monitoring must be undertaken in accordance with conditions L5.7 and L5.8, and

(a) at each one of the locations listed in condition L5.1;
(b) occur quarterly within the reporting period of the Environment Protection Licence with at least 2 months between monitoring periods;
(c) occur during each day, evening and night period as defined in the NSW Industrial Noise Policy (EPA 2000) for a minimum of 15 minutes for three of the quarters;
(d) the night time 15 minute attended monitoring in accordance with c) must be undertaken between the hours of 1am and 4am;
(e) the night time LA1 (1 min) attended monitoring in accordance with c) must be undertaken between the hours of 1am and 4am;
(f) one quarterly monitoring must occur during each day, evening and night period as defined in the NSW EPA Noise Policy for Industry 2017 for a minimum of 1.5 hours during the day; 30 minutes during the evening; and 1 hours during the night, and
(g) each quarterly monitoring must be undertaken on a different day(s) of the week not including Saturdays, Sundays and public holidays; and
(h) these monitoring conditions take effect in the 2015 Reporting period.

Note: The intention of this condition is that quarterly monitoring be undertaken at each sensitive receiver. That at each sensitive receiver monitoring is undertaken over a range of different days excluding weekends and public holidays during the reporting period so as to be representative of operating hours. That night time 15 minute attended monitoring and the LA1 (1min) monitoring for three of the quarters be undertaken at worst case being the most stable atmospheric conditions and when noise would be most intrusive to sleep. All of the sensitive receivers do not have to be monitored on the same day, evening and night for sub condition f.

M4.2 For the Annual Reporting Period ending March 2015 the EPA will accept all monitoring required by the current Department of Planning and Environment consent (usually quarterly monitoring for noise as dB(A) Leq15minutes) for compliance with noise monitoring requirements in this licence, as a single report attached to the Annual Return for the premises.

M5 Weather monitoring

M5.1 At the point(s) identified below, the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1 of the table below, using the corresponding sampling method, units of measure, averaging period and sampling frequency, specified opposite in the Columns 2, 3, 4 and 5 respectively.

4.2.2 Chain Valley Colliery

Consistent with the noise impact assessment prepared by AECOM Pty Ltd for CVC in 2011 and undertaken as part of the Environmental Impact Statement (EIS) for Development Consent of SSD-5465, residential receivers have been divided into seven (7) noise catchment areas with similar geographical and acoustic features. The following points are considered representative of each noise catchment area:

- ATN001, representative of EPL 1770 monitoring point identification number 9, also identified in Development Consent SSD-5465 as receiver 'R8'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Mannering Park, northwest of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN002, representative of EPL 1770 monitoring point identification number 12, also identified in Development Consent SSD-5465 as receiver 'R11'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Kingfisher Shores, south-east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN003, representative of EPL 1770 monitoring point identification number 16, also identified in Development Consent SSD-5465 as receiver 'R15'. The attended monitoring point captures noise emissions at privately-owned relocatable residences within MSHV, south of the Chain Valley Colliery pit top. The dominant noise sources in this receiver area are birds, insects, traffic and other industrial sources. Activities at Mannering Colliery are also audible at times;
- ATN004, representative of Development Consent SSD-5465 receiver 'R14'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Chain Valley Bay South, south-east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN005, representative of Development Consent SSD-5465 receiver 'R17'. The attended monitoring point captured noise emissions at privately-owned residential properties located in Chain Valley Bay East, south-east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN006, representative of EPL 1770 monitoring point identification number 20, also identified in Development Consent SSD-5465 as receiver 'R19'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Chain Valley Bay North, east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources
- ATN007, representative of EPL 1770 monitoring point identification number 23, also identified in Development Consent SSD-5465 as receiver 'R22'. The attended monitoring point captured

noise emissions at privately-owned residential properties located in Summerland Point, surrounding Chain Valley Colliery's Summerland Point ventilation shaft and fan site. The dominant noise sources in this area are birds, insects, traffic and the Summerland Point ventilation shaft and fan site.

It is noted that, with reference to the requirements of the EPL, two receivers were not considered to be captured by the seven (7) noise catchment areas outlined in the EIS and as such, monitoring is to be undertaken at the following points in addition to locations ATN001 to ATN007:

- R12, identified in EPL 1770 as noise monitoring point 13, noted to be adjacent to ATN002 at Kingfisher Shores on Lakeshore Avenue, Kingfisher Shores; and
- R13, identified in EPL 1770 as noise monitoring point 14, located on Karoola Avenue, Kingfisher Shores.

The spatial locations of the CVC attended monitoring locations and relevant noise criteria are detailed in **Table 5** below.

Table 5: Noise Monitoring Locations and Limits for Chain Valley Colliery

Location	Receivers Represented EPL 1770 ID SSD-5465 ID	Coordinates	Day $L_{Aeq(15\ min)}$ dB (A)	Evening $L_{Aeq(15\ min)}$ dB (A)	Night $L_{Aeq(15\ min)}$ dB (A)	Night $L_{A1(1\ min)}$ dB (A)
ATN001	EPL #9 R8	364140 E 6330594 N	35	35	35	35
ATN002	EPL #12 R11	365218 E 6329388 N	49	49	49	54
ATN003	EPL#16 R15	365165 E 6328323 N	36	36	36	45
ATN004	N/A R14	365949 N 6328530 E	35	35	35	45
ATN005	N/A R17	366560 N 6328590 E	35	35	35	45
ATN006	20 R19	366305 N 6329321 E	37	37	37	45
ATN007	23 R22	366425 N 6331135 E	46	46	46	46
R12	13 R12	365185 N 6329352 E	49	49	49	53
R13	14 R13	365391 N 6329169 E	43	43	43	49

Appendix C
Calibration certificates

EMM
creating opportunities

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C34022

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 **Serial No:** 86311
Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.01 dB	1000.00 Hz	2.00 %
Level2:	NA	N	113.92 dB	1000.00 Hz	0.35 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure 1013 hPa ±1 hPa
Temperature 22 °C ±1° C
Relative Humidity 56 % ±5%

Date of Receipt : 17/10/2022
Date of Calibration : 17/10/2022
Date of Issue : 17/10/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

NATA
WORLD RECOGNISED ACCREDITATION
Accredited Lab No. 9262
Acoustic and Vibration Measurements

Acu-Vib Electronics
CALIBRATIONS SALES RENTALS REPAIRS

Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C33872

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 **Serial No:** 79952
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.09 dB	1000.00 Hz	1.12 %
Level2:	NA	N	114.06 dB	1000.00 Hz	0.71 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure 1004 hPa ±1 hPa
Temperature 23 °C ±1° C
Relative Humidity 55 % ±5%

Date of Receipt : 26/09/2022
Date of Calibration : 29/09/2022
Date of Issue : 29/09/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

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Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34169

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	3029363
Mic. Type:	4189	**Serial No:**	3260501
Pre-Amp. Type:	ZC0032	**Serial No:**	30109
Filter Type:	1/3 Octave	**Test No:**	F034175

Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	02/11/2022
Temperature	24	°C ±1° C	**Date of Calibration :**	03/11/2022
Relative Humidity	35	% ±5%	**Date of Issue :**	04/11/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Acu-Vib Electronics
CALIBRATIONS SALES RENTALS REPAIRS

Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

Certificate Of Calibration

Certificate No: SLM31670

Equipment Tested: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	2759405
Mic. Type:	4189	**Serial No:**	2983733
Pre-Amp. Type:	ZC0032	**Serial No:**	22666
Filter Type:	1/3 Octave	**Test No:**	F031671

Owner: EMM Consulting
Level 3, 175 Scott Street
Newcastle, NSW 2300

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

Conditions Of Test:

Ambient Pressure	992	hPa ±1 hPa	**Date of Receipt :**	02/02/2022
Temperature	26	°C ±1° C	**Date of Calibration :**	02/02/2022
Relative Humidity	48	% ±5%	**Date of Issue :**	03/02/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

Checked By: ..... **Authorised Signature:** .....

Jack Kielt

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Chain Valley Colliery

Quarterly attended noise monitoring - Q3 2023

Prepared for Great Southern Energy Pty Ltd (trading as Delta Coal)

October 2023

Chain Valley Colliery

Quarterly attended noise monitoring - Q3 2023

Great Southern Energy Pty Ltd (trading as Delta Coal)

E230753 RP2

October 2023

Version	Date	Prepared by	Reviewed by	Comments
1	25 September 2023	Teanuanua Villierme	Tony Welbourne	Draft
2	11 October 2023	Teanuanua Villierme	Tony Welbourne	Final

Approved by



Tony Welbourne
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11 October 2023

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1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Great Southern Energy Pty Ltd (trading as Delta Coal) to conduct a quarterly noise survey of operations at Chain Valley Colliery (CVC) located at Vales Road, Mannering Park NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

Attended environmental noise monitoring described in this report was done during the day, evening and night periods on 13, 14 and 15 September 2023 at nine monitoring locations.

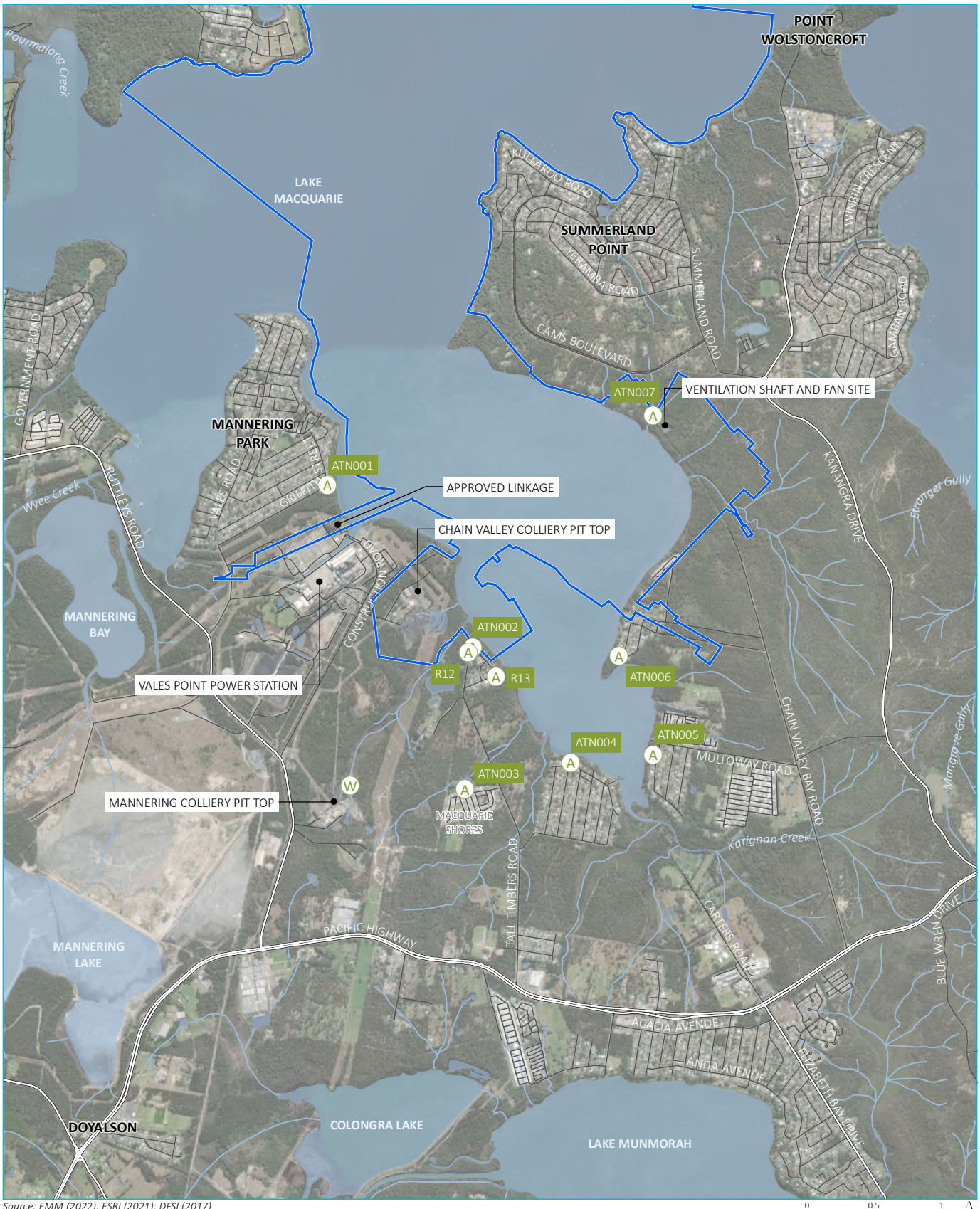
1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor	Description	Coordinates (MGA56)	
		Easting	Northing
ATN001	Griffith Street, Mannering Park	363990	6330529
ATN002	Lakeshore Avenue, Kingfisher Shores	365218	6329388
ATN003	Short Street, Macquarie Shores	365165	6328323
ATN004	Lloyd Avenue, Chain Valley Bay	365949	6328530
ATN005	Teragalin Drive, Chain Valley Bay	366560	6328590
ATN006	Sunset Parade, Chain Valley Bay	366305	6329321
ATN007[1]	Cams Boulevard, Chain Valley Bay	366559	6331109
R12	Lakeshore Avenue, Kingfisher Shores	365185	6329352
R13	Karoola Avenue, Kingfisher Shores	365391	6329169

Notes: 1. Due to access issues, ATN007 is an intermediate location within the site boundary and site noise contributions were calculated back to R22 (EPL Point 23).



Source: EMM (2022); ESRI (2021); DFSI (2017)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

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KEY

- (A) Noise monitoring location
- (W) Meteorological station
- CVC Consent Boundary
- Major road
- Minor road
- Watercourse/drainage line
- Waterbody

CVC attended noise monitoring locations

Chain Valley Colliery
Quarterly attended noise monitoring
Figure 1.1

EMM
creating opportunities

1.3 Terminology and abbreviations

Definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The energy average A-weighted noise level.
$L_{Aeq,15minute}$	The energy average A-weighted noise level over the specified time period of 15 minutes.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Noise limits for CVC are provided in Table 1, Condition 7 of Schedule 3 of the development consent SSD-5465 (DC). Long-term goals for CVC are provided in Condition 8(d) of Schedule 3 of the DC. Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Noise limits for CVC are provided in Conditions L5.1 and L5.2 of environment protection licence 1770 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved Noise Management Plan (NMP) was prepared in line with the Mod 4 approval and in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017. Table 5 of the NMP adopts nine attended noise monitoring (NM) locations that are representative of residences outlined in the DC. Where several assessment locations are in one NM catchment, representative noise limits have been adopted to ensure that the lowest (most stringent) limits within the NM catchment can be achieved. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise impact limits based on the DC and EPL are provided in Table 2.1.

Table 2.1 Noise impact limits, dB

Noise monitoring location	Assessment location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
ATN001	R8 (EPL Point 9)	38	38	38	45
ATN002	R11 (EPL Point 12)	49	49	49	54
ATN003	R15 (EPL Point 16)	36	36	36	45
ATN004	R14	35	35	35	45
ATN005	R17	35	35	35	45
ATN006	R19 (EPL Point 20)	37	37	37	45
ATN007	R22 (EPL Point 23)	46	46	46	46
R12	R12 (EPL Point 13)	49	49	49	53
R13	R13 (EPL Point 14)	43	43	43	49

2.5 Meteorological conditions

Appendix 8 of the DC states meteorological conditions under which noise limits do not apply as follows:

- during periods of rain or hail

- average wind speed at microphone height exceeds 5 m/s
- wind speeds greater than 3 m/s at 10 m above ground level
- temperature inversion conditions greater than 3°C/100 m.

Condition L5.4 of the EPL states meteorological conditions under which noise limits do not apply as follows:

- wind speeds greater than 3 m/s at 10 m above ground level
- stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 m above ground level
- stability category G temperature inversion conditions
- as defined under the NPfI.

The last point refers to 'very noise-enhancing' conditions which are considered outside the 'standard' or 'noise-enhancing' meteorological conditions defined in Table D1 of Fact Sheet D of the NPfI.

Further, Fact Sheet E of the NPfI (point 6 of Section E1) provides additional guidance on monitoring the performance of a site against 'suitable' noise limits placed in the DC/EPL. Noise limits are based on 'achievable' noise levels under the 'standard' and/or 'noise-enhancing' meteorological conditions. Where meteorological conditions are considered 'very noise-enhancing', a positive adjustment of 5 dB applies to noise limits for 'standard' or 'noise-enhancing' meteorological conditions.

In accordance with the NPfI and for consistency between the DC and EPL, where 'very noise-enhancing' meteorological conditions were present during a noise measurement, a positive adjustment of 5 dB has been applied to the noise limits stated in the DC and EPL. This approach means that noise limits are always applicable, with or without a positive adjustment of 5 dB, depending on whether meteorological conditions are 'very noise-enhancing' or not.

2.6 Additional requirements

2.6.1 Attended noise monitoring

Condition M4.1 of the EPL specifies additional noise monitoring requirements to determine compliance, including the following:

- locations of monitoring – EPL points listed in Table 2.1;
- frequency of monitoring – quarterly and at least two months between monitoring periods;
- periods of monitoring:
  - for three out of four quarterly periods – each day, evening and night periods for a minimum of 15 minutes. Night period monitoring must be undertaken between the hours of 1 am and 4 am; and
  - for one out of four quarterly periods – day period monitoring must be undertaken for a minimum of 1.5 hours (six 15-minute periods); evening period monitoring must be undertaken for a minimum of 30 minutes (two 15-minue periods); night period monitoring must be undertaken for a minimum of 1 hour (four 15-minute periods).
- days of monitoring – each quarterly monitoring must be undertaken on a different day of the week excluding Saturday, Sundays and public holidays.

In accordance with the preceding, this round of quarterly attended noise monitoring (Q3 2023) was undertaken on Wednesday 13, Thursday 14 and Friday 15 September 2023 which is more than two months since the last quarterly monitoring (Q2 2023) conducted on Thursday 15, Monday 19 and Wednesday 21 June 2023.

As per the approved NMP, attended noise monitoring is scheduled considering the occurrence of regular operations at CVC. Noise monitoring avoids scheduled down-time or maintenance. Regular operations were occurring during this round of monitoring (Q3 2023).

Monitoring and reporting have been done in accordance with the NPfI and 'Approved methods for the measurement and analysis of environmental noise in NSW' (the approved methods) (EPA 2022).

2.6.2 CVC long-term goals

Long-term goals for CVC are provided in Condition 8(d) of Schedule 3 of the DC, which states:

> 8. The Applicant must:
>
> (d) use its best endeavours to achieve the long-term noise goals in Table 2, where reasonable and feasible, and report on progress towards achieving these goals in each Annual Review;

The long-term goals for CVC in Table 2 of the DC are summarised in Table 2.2 for the relevant assessment locations.

Table 2.2 CVC long-term goals

Assessment location	Day $L_{Aeq,15minute}$, dB	Evening $L_{Aeq,15minute}$, dB	Night $L_{Aeq,15minute}$, dB
R11 (EPL Point 12)	41	41	41
R12 (EPL Point 13)	41	41	41
R13 (EPL Point 14)	41	41	41
R22 (EPL Point 23)	40	40	40

As stated in Appendix 9 of the DC, Delta Coal is committed to the progressive implementation of feasible measures to target long-term noise goals which are designed to reduce noise emissions from CVC. For the purpose of this compliance noise monitoring assessment, site $L_{Aeq,15minute}$ have also been compared to the long-term goals as discussed in Section 4.2.3.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Mannering Colliery automatic weather station (AWS) which allowed correlation of atmospheric parameters with measured site noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the day, evening and night periods at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source-to-receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If the exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

This assessment determined stability categories throughout attended monitoring period using the sigma-theta (ST) method as per Fact Sheet D of the NPfI. This data was sourced from the Mannering Colliery AWS, in accordance with requirements of EPL 1770.

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is undertaken at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor adjustments have been reported and added to measured site-only L_{Aeq}.

Low-frequency modifying factor adjustments have only been applied to site-only L_{Aeq} if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

Equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	2759405	2/2/2024	IEC 61672-1:2013
Brüel & Kjær 2250 sound level meter	3029363	3/11/2024	IEC 61672-1:2013
Svantek SV-36 calibrator	79952	29/9/2024	IEC 60942:2017
Svantek SV-36 calibrator	86311	17/10/2024	IEC 60942:2017

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1.

Table 4.1 Total measured noise levels[1], dB – Quarter 3 2023

Location	Start date and time	L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	L_{Amin}
ATN001	15/9/2023 11:10	75	67	47	53	44	43	42
ATN001	14/9/2023 18:00	74	66	48	52	45	44	43
ATN001	15/9/2023 1:31	54	47	46	46	46	45	44
ATN002	15/9/2023 11:34	73	62	44	49	39	37	35
ATN002	13/9/2023 21:05	60	45	43	42	41	40	38
ATN002	15/9/2023 2:20	50	43	42	41	41	41	39
ATN003	15/9/2023 12:10	58	52	47	44	42	38	34
ATN003	13/9/2023 20:45	57	48	41	40	39	37	35
ATN003	15/9/2023 2:00	52	40	39	38	38	36	34
ATN004	15/9/2023 12:29	67	52	43	42	38	36	34
ATN004	13/9/2023 21:45	68	60	40	46	37	36	33
ATN004	13/9/2023 22:01	56	43	38	37	36	34	32
ATN005	15/9/2023 12:54	64	57	47	46	42	40	37
ATN005	14/9/2023 18:25	50	43	39	38	37	36	33
ATN005	13/9/2023 23:35	52	45	44	43	43	41	39
ATN006	15/9/2023 13:15	63	47	41	39	37	34	32
ATN006	14/9/2023 18:45	53	46	36	36	34	33	31
ATN006	15/9/2023 3:08	51	41	39	38	38	37	35
ATN007	15/9/2023 13:43	64	55	51	51	50	49	48
ATN007	14/9/2023 19:12	55	50	49	48	48	48	47
ATN007	15/9/2023 3:44	55	50	50	49	49	49	48
R12	15/9/2023 11:34	73	62	44	49	39	37	35
R12	13/9/2023 21:05	60	45	43	42	41	40	38
R12	15/9/2023 2:20	50	43	42	41	41	41	39
R13	15/9/2023 11:51	72	61	46	49	38	36	34
R13	13/9/2023 21:23	50	44	43	41	41	39	37
R13	15/9/2023 2:39	48	47	46	44	44	41	39

Notes: 1. Levels in this table are not necessarily the result of activity at site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 m above ground. Attended noise monitoring is not done during rain, hail, or average wind speeds above 5 m/s at microphone height.

Table 4.2 Measured atmospheric conditions – Quarter 3 2023

Location	Start date and time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north[1]	Cloud cover 1/8s
ATN001	15/9/2023 11:10	25	1.5	355	0
ATN001	14/9/2023 18:00	17	≤0.5	-	0
ATN001	15/9/2023 1:31	12	≤0.5	-	0
ATN002	15/9/2023 11:34	23	≤0.5	-	0
ATN002	13/9/2023 21:05	12	≤0.5	-	0
ATN002	15/9/2023 2:20	11	≤0.5	-	0
ATN003	15/9/2023 12:10	25	1.1	5	0
ATN003	13/9/2023 20:45	12	≤0.5	-	0
ATN003	15/9/2023 2:00	12	≤0.5	-	0
ATN004	15/9/2023 12:29	23	≤0.5	-	0
ATN004	13/9/2023 21:45	12	≤0.5	-	0
ATN004	13/9/2023 22:01	12	≤0.5	-	0
ATN005	15/9/2023 12:54	23	0.9	80	0
ATN005	14/9/2023 18:25	16	≤0.5	-	0
ATN005	13/9/2023 23:35	12	≤0.5	-	0
ATN006	15/9/2023 13:15	24	1.1	10	0
ATN006	14/9/2023 18:45	17	≤0.5	-	0
ATN006	15/9/2023 3:08	11	≤0.5	-	0
ATN007	15/9/2023 13:43	23	≤0.5	-	0
ATN007	14/9/2023 19:12	17	≤0.5	-	0
ATN007	15/9/2023 3:44	10	≤0.5	-	0
R12	15/9/2023 11:34	23	≤0.5	-	0
R12	13/9/2023 21:05	12	≤0.5	-	0
R12	15/9/2023 2:20	11	≤0.5	-	0
R13	15/9/2023 11:51	24	≤0.5	-	0
R13	13/9/2023 21:23	13	≤0.5	-	0
R13	15/9/2023 2:39	11	≤0.5	-	0

Notes: 1. "-" indicates calm conditions at monitoring location.

4.2 Site only noise levels

4.2.1 Modifying factors

With regard to LFN modifying factor adjustments, these have not been applied to locations where CVC was inaudible.

At ATN003, where CVC was audible during the evening period measurement, measured site noise levels were below the relevant LFN threshold levels and therefore no adjustments applied.

At ATN007 (R22), where CVC noise was audible, measured site noise levels exceeded the relevant LFN threshold levels during the day, evening and night period measurements. Therefore, in accordance with the NPfI, a 2 dB positive adjustment was applied to the estimated site $L_{Aeq,15minute}$ for the day period measurement and a 5 dB positive adjustment was applied to the estimated site $L_{Aeq,15minute}$ for evening and night period measurements.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the Mannering Colliery AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing weather conditions (where relevant) as defined in the NPfI.

Table 4.3 Site noise levels and limits – Quarter 3 2023

Location	Start date and time	Period	Wind		Stability class	Very noise-enhancing?[1]	Limits, dB		Site levels, dB		Exceedances, dB	
			Speed m/s	Direction[3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$[2]	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
ATN001	15/9/2023 11:10	Day	2.0	54	A	No	43	N/A	IA	N/A	Nil	N/A
ATN001	14/9/2023 18:00	Evening	0.3	141	F	No	38	N/A	IA	N/A	Nil	N/A
ATN001	15/9/2023 1:31	Night	0.3	249	F	No	38	45	IA	IA	Nil	Nil
ATN002	15/9/2023 11:34	Day	2.2	49	A	No	49	N/A	IA	N/A	Nil	N/A
ATN002	13/9/2023 21:05	Evening	0.2	154	F	No	49	N/A	IA	N/A	Nil	N/A
ATN002	15/9/2023 2:20	Night	0.3	218	F	No	49	54	IA	IA	Nil	Nil
ATN003	15/9/2023 12:10	Day	2.2	27	A	No	36	N/A	IA	N/A	Nil	N/A
ATN003	13/9/2023 20:45	Evening	0.2	158	F	No	36	N/A	IA	N/A	Nil	N/A
ATN003	15/9/2023 2:00	Night	0.2	178	F	No	36	45	IA	IA	Nil	Nil
ATN004	15/9/2023 12:29	Day	3.0	44	A	No	35	N/A	IA	N/A	Nil	N/A
ATN004	13/9/2023 21:45	Evening	0.4	222	F	No	35	N/A	IA	N/A	Nil	N/A
ATN004	13/9/2023 22:01	Night	0.4	214	F	No	35	45	IA	IA	Nil	Nil
ATN005	15/9/2023 12:54	Day	2.2	47	A	No	35	N/A	IA	N/A	Nil	N/A
ATN005	14/9/2023 18:25	Evening	0.4	159	F	No	35	N/A	IA	N/A	Nil	N/A
ATN005	13/9/2023 23:35	Night	0.4	201	F	No	35	45	IA	IA	Nil	Nil
ATN006	15/9/2023 13:15	Day	2.6	49	A	No	37	N/A	IA	N/A	Nil	N/A
ATN006	14/9/2023 18:45	Evening	0.3	158	F	No	37	N/A	IA	N/A	Nil	N/A
ATN006	15/9/2023 3:08	Night	0.6	231	F	No	37	45	IA	IA	Nil	Nil

Table 4.3 Site noise levels and limits – Quarter 3 2023

Location	Start date and time	Period	Wind		Stability class	Very noise-enhancing?[1]	Limits, dB		Site levels, dB		Exceedances, dB	
			Speed m/s	Direction[3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$[2]	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
ATN007	15/9/2023 13:43	Day	2.0	44	A	No	46	N/A	41 (39 + 2)[4]	N/A	Nil	N/A
ATN007	14/9/2023 19:12	Evening	0.3	61	F	No	46	N/A	42 (37 + 5)[4]	N/A	Nil	N/A
ATN007	15/9/2023 3:44	Night	0.3	201	F	No	46	46	43 (38 + 5)[4]	38[5]	Nil	Nil
R12	15/9/2023 11:34	Day	2.2	49	A	No	49	N/A	IA	N/A	Nil	N/A
R12	13/9/2023 21:05	Evening	0.2	154	F	No	49	N/A	IA	N/A	Nil	N/A
R12	15/9/2023 2:20	Night	0.3	218	F	No	49	53	IA	IA	Nil	Nil
R13	15/9/2023 11:51	Day	2.2	55	A	No	43	N/A	IA	N/A	Nil	N/A
R13	13/9/2023 21:23	Evening	0.4	238	F	No	43	N/A	IA	N/A	Nil	N/A
R13	15/9/2023 2:39	Night	0.7	246	D	No	43	49	IA	IA	Nil	Nil

Notes:
1. Noise limits are adjusted by +5 dB during 'very noise-enhancing meteorological conditions' in accordance with the NPfI.
2. Site-only $L_{Aeq,15minute}$, includes modifying factor adjustments if applicable.
3. Degrees magnetic north, "-" indicates calm conditions.
4. Calculated back to R22 from data measured at ATN007.
5. Modifying factor adjustments do not apply to site L_{Amax}.

4.2.3 Long term noise goals

Site $L_{Aeq,15minute}$ were also compared to the long-term noise goals (refer to Table 2.2) for the relevant locations (i.e. R11, R12, R13 and R22). Site $L_{Aeq,15minute}$ measured at ATN002 (R11), R12 and R13 satisfied the relevant long-term goals during the day, evening and night periods. At ATN007 (R22), the measured site $L_{Aeq,15minute}$ (inclusive of modifying factor adjustment for LFN) exceeded the relevant long-term $L_{Aeq,15minute}$ 40 dB goal by 1, 2 and 3 dB during the day, evening and night period measurements respectively.

5 Summary

EMM was engaged by Great Southern Energy Pty Ltd (trading as Delta Coal) to conduct a quarterly noise survey of operations at CVC. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the day, evening and night periods on 13, 14 and 15 September 2023 at nine monitoring locations.

Noise levels from site complied with relevant limits at all monitoring locations during the Q3 2023 survey.

CVC $L_{Aeq,15minute}$ were also compared to the long-term noise goals applicable at R11 (ATN002), R12, R13 and R22 (ATN007). CVC $L_{Aeq,15minute}$ satisfied these during all measurements at R11 (ATN002), R12 and R13. At R22 (ATN007), the measured site $L_{Aeq,15minute}$ (inclusive of modifying factor adjustment for LFN) exceeded the relevant long-term $L_{Aeq,15minute}$ 40 dB goal by 1, 2 and 3 dB during the day, evening and night period measurements respectively.

Appendix A
Noise perception and examples

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A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or quarter) as loud

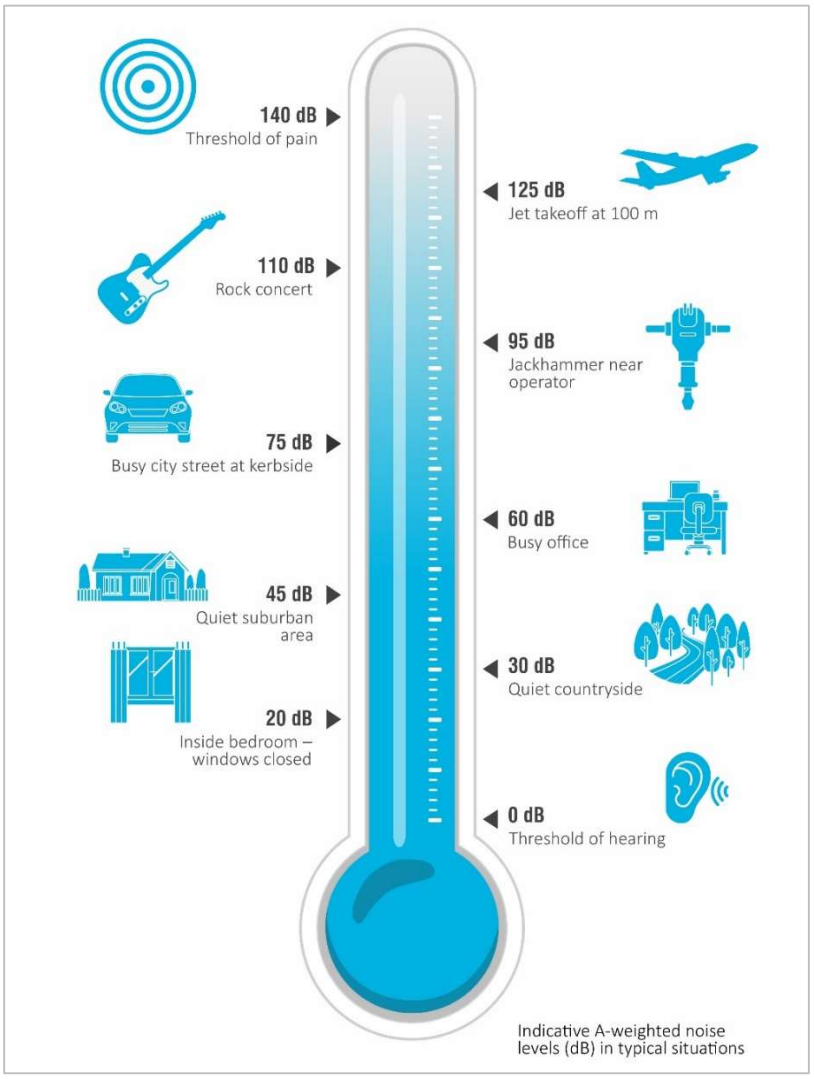


Figure A.1 Common noise levels

Appendix B
Regulator documents

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4. Prior to 31 March 2014, and every 12 months thereafter for each calendar year in which coal haulage from the site is undertaken utilising public roads, unless the Planning Secretary directs otherwise, the Applicant must commission a suitably qualified person, whose appointment has been approved by the Planning Secretary at least one month prior to undertaking the audit, to conduct an Independent Traffic Audit of the development. This audit must:
   (a) be undertaken without prior notice to the Applicant, and in consultation with TfNSW, NCC, CC Council and the CCC;
   (b) assess the impact of the development on the performance and safety of the road network, including a review of:
      - haulage records;
      - accident records on the haulage route, infringements relating to the code of conduct and any incidents involving haulage vehicles;
      - community complaints register; and
   (c) assess the effectiveness of the Road Transport Protocol; and, if necessary, recommend measures to reduce or mitigate any adverse (or potentially adverse) impacts.

5. Within 1 month of receiving the audit report, or as otherwise agreed by the Planning Secretary, the Applicant must submit a copy of the report to the Planning Secretary, with a detailed response to any of the recommendations contained in the audit report, including a timetable for the implementation of any measures proposed to address the recommendations in the audit report.

   A summary of the audit report must be included in the Annual Review.

Alternative Coal Transport Options

6. Prior to 31 December 2014, and every three years thereafter, the Applicant must prepare and submit to the Planning Secretary for approval, a study of the reasonable and feasible options to reduce or eliminate the use of public roads to transport coal from the development, unless otherwise agreed by the Planning Secretary. The assessment must include:
   (a) an analysis of the capital, construction and operating costs of the alternative transport options; and
   (b) quantified social and environmental impacts associated with road and rail transport.

NOISE

Noise Impact Assessment Criteria

7. The Applicant must ensure that the noise generated by the development at any residence on privately-owned land does not exceed the criteria for the location in Table 1 nearest to that residence.

Table 1: Noise Criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
R8	38	38	38	45
R11	49	49	49	54
R12	49	49	49	53
R13	43	43	43	49
R15	36	36	36	45
R19	37	37	37	45
R22	46	46	46	46
all other privately-owned land	35	35	35	45

Notes:
- *To interpret the locations referred to in Table 1, see Appendix 6 and the EIS; and*
- *Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 8 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.*

However, these criteria do not apply if the Applicant has a written agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

8. The Applicant must:
   (a) implement best management practice, including all reasonable and feasible noise mitigation measures, to minimise the construction, operational and transport noise generated by the development;
   (b) regularly assess the noise monitoring and meteorological data and relocate, modify, and/or stop operations on site to ensure compliance with the relevant conditions of this consent;
   (c) minimise the noise impacts of the development during meteorological conditions under which the noise limits in this consent do not apply (see Appendix 8);
   (d) use its best endeavours to achieve the long-term noise goals in Table 2, where reasonable and feasible, and report on progress towards achieving these goals in each Annual Review;
   (e) carry out a comprehensive noise audit of the development in conjunction with each independent environmental audit; and
   (f) prepare an action plan to implement any additional reasonable and feasible onsite noise mitigation measures identified by each audit;
   to the satisfaction of the Planning Secretary.

Table 2: Long-term Noise Goals dB(A)

Location	***Day***	***Evening***	***Night***
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$
R11 – R13	41	41	41
R22	40	40	40

Notes:
- *To interpret the locations referred to in Table 2, see Appendix 6 and the EIS; and*
- *Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 8 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.*

Noise Management Plan

9. The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
   (a) be prepared in consultation with the EPA and submitted to the Planning Secretary for approval within 4 months of the date of this consent, unless otherwise agreed by the Planning Secretary;
   (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
   (c) describe the proposed noise management system in detail including the mitigation measures that would be implemented to minimise noise during construction and operations, including on and off site road noise generated by vehicles associated with the development; and
   (d) include a monitoring program that:
      - uses attended monitoring to evaluate the compliance of the development against the noise criteria in this consent;
      - evaluates and reports on:
         - the effectiveness of the on-site noise management system; and
         - compliance against the noise operating conditions; and
      - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

The Applicant must implement the Noise Management Plan as approved by the Planning Secretary.

AIR QUALITY

Odour

10. The Applicant must ensure that no offensive odours are emitted from the site, as defined under the POEO Act.

APPENDIX 6
NOISE RECEIVER LOCATIONS

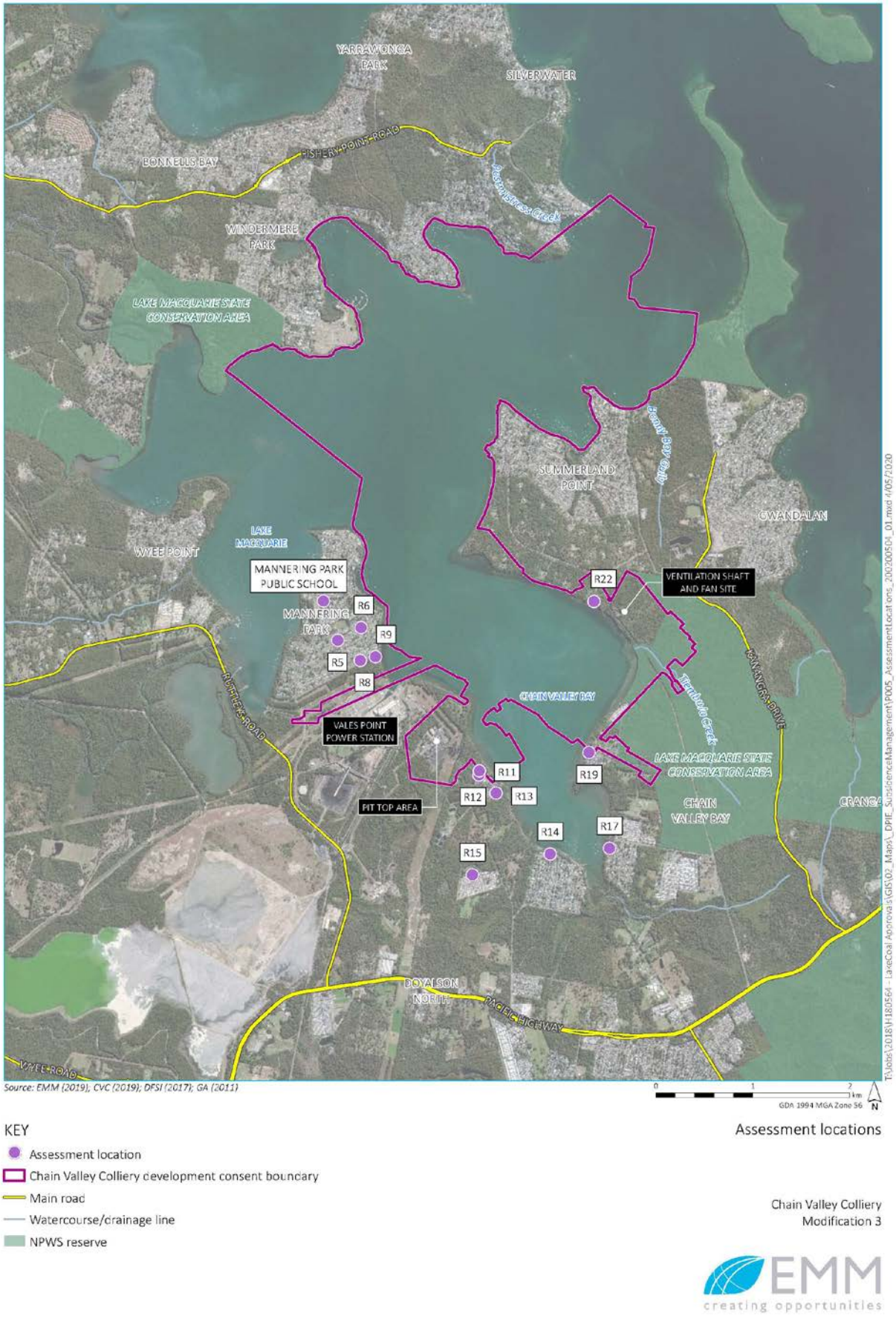


Figure 1: *Noise Receiver Locations*

APPENDIX 8
NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 1 of the conditions are to apply under all meteorological conditions except the following:
   (a) during periods of rain or hail;
   (b) average wind speed at microphone height exceeds 5 m/s;
   (c) wind speeds greater than 3 m/s measured at 10 m above ground level; or
   (d) temperature inversion conditions greater than 3°C/100 m.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station described in condition 14 of schedule 3.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.

4. This monitoring must be carried out at least 4 times in each calendar year (ie at least once every 3 months), unless the Planning Secretary directs otherwise.

5. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
   (a) monitoring locations for the collection of representative noise data;
   (b) meteorological conditions during which collection of noise data is not appropriate;
   (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

	results of this monitoring program will be reviewed by a suitably qualified expert and used to determine the appropriateness of the existing irrigation area to receive this effluent; • develop a program to monitor creek line channel stability and the health of riparian vegetation within Swindles Creek. Monitoring will be undertaken in accordance with Section 8.5.2 of the Surface Water Impact Assessment (EIS Appendix E) and incorporated into the Colliery's WMP or Biodiversity Management Plan; and • record monitoring data in accordance with the Colliery's WMP and EPL 1770. Monitoring data will be interpreted as it is received to ensure appropriate operational guidance on monitoring water quality within desired parameters. Results of water quality monitoring will be reported in the Annual Review and made available to the CCC, as well as CC Council and LMCC.
Noise	Management and monitoring of noise will continue to be undertaken in accordance with the Colliery's NMP, which will be reviewed and updated as required to include the commitments made below. Great Southern Energy Pty Limited will: • continue attended compliance monitoring on site which will be used to identify potential hot spots and primary noise sources; • continue real-time noise monitoring alerts to site personnel to enable implementation of any required rapid noise management initiatives; • manage potential non-compliance through a noise complaint handling and response system, including the identification of responsible sources to enable targeted remedial action; • assess if further noise mitigation options for the ventilation fans are reasonable and feasible following the receipt of attenuation proposals; and • discuss potential management measures or agreement options with the landowner at 275 Cams Boulevard, following receipt of proposals from acoustics specialists. In addition to the above, Great Southern Energy Pty Limited is committed to the progressive implementation of feasible measures to target long-term noise goals which are designed to reduce noise emissions from the Colliery. Long-term options for investigation include: • modification to belt/movement alarms; • investigation of surface conveyer and coal preparation equipment, to determine if noise reductions are possible; • identifying sound attenuation options for the surface bulldozer and front-end loader; • strategic placement of acoustic barriers; • attenuation for the surface screener/shaker; • installation of quiet rollers for surface conveyor belts; • acoustic treatments around compressors; and • the use of a conveyor stacker for product coal stockpiling.
Air Quality and greenhouse gases	Management and monitoring of air quality and greenhouse gases will continue to be undertaken in accordance with the Colliery's AQGHGMP, which will be reviewed and updated as required to include the commitments made below Great Southern Energy Pty Limited will: • investigate the use of a stacker to replace hauling between current conveyor system and stockpiles; • undertake GHG monitoring comprising measurement of carbon dioxide and methane at the ventilation shaft and fan sites; and • record and report annual diesel, oil, grease, acetylene and electricity use to fulfil National Greenhouse and Energy Reporting Scheme requirements.
Traffic and transport	Management and monitoring of traffic and transport will continue to be undertaken in accordance with the Colliery's RTP. In addition, Great Southern Energy Pty Limited will continue to investigate alternative options for transporting export coal to the Port of Newcastle, specifically the preferred rail transport option, requiring the construction of a private haul road to the VPPS coal unloading facility and associated infrastructure upgrades. In addition, Great Southern Energy Pty Limited will investigate options to reduce peak hour traffic would be investigated including potentially limiting the peak hourly volumes of the Colliery truck traffic which would be permitted to travel via this intersection should the Colliery not be using rail transport for export coal by five years from the granting of development consent. Alternatively, a pro-rata financial contribution to the cost of installing traffic signals at the southbound intersection of the F3 and Sparks Road interchange could be made commensurate with the percentage of Colliery generated traffic using the intersection.
Subsidence	Management and monitoring of subsidence will continue to be undertaken in accordance with the Colliery's SMP or Extraction Plans, which will be reviewed and

Environment Protection Licence

1	Discharge to waters Discharge quality and volume monitoring	Discharge to waters Discharge quality and volume monitoring	Discharge to waters and monitoring from final settlement pond, gravity fed discharge pipe as identified in plan titled "Delta Coal Chain Valley Colliery, Surface EPA Premises Plan, DRG No: C1S0165_2" 10 August 2021 and saved as EPA Document DOC21/691135.
27	Discharge to waters Discharge quality and volume monitoring	Discharge to waters Discharge quality and volume monitoring	Discharge to waters via dam spillway from final settlement pond adjacent to EPA Point 1 as identified in plan titled "Delta Coal Chain Valley Colliery, Surface EPA Premises Plan, DRG No: C1S0165_2" 10 August 2021 and saved as EPA Document DOC21/691135.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
9	Noise monitoring	Noise monitoring site R8 as defined in Development Consent SSD-5465 (MOD 3), located at 109 Griffith Street, MANNERING PARK, 2259
12	Noise monitoring	Noise monitoring site R11 as defined in Development Consent SSD-5465 (MOD 3), located at 35 Lakeshore Avenue, CHAIN VALLEY BAY, 2259
13	Noise monitoring	Noise monitoring site R12 as defined in Development Consent SSD-5465 (MOD 3), located at 20 Lakeshore Avenue, Kingfisher Shores, CHAIN VALLEY BAY, 2259
14	Noise monitoring	Noise monitoring site R13 as defined in Development Consent SSD-5465 (MOD 3), located at 33 Karoola Avenue, Kingfisher Shores, CHAIN VALLEY BAY, 2259
16	Noise monitoring	Noise monitoring site R15 as defined in Development Consent SSD-5465 (MOD 3), located at Short Street, Macquarie Shores, CHAIN VALLEY BAY, 2259
20	Noise monitoring	Noise monitoring site R19 as defined in Development Consent SSD-5465 (MOD 3), located at 2 Sunset Parade, CHAIN VALLEY BAY, 2259

23	Noise monitoring	Noise monitoring site R22 as defined in Development Consent SSD-5465 (MOD 3), located at 275a Cams Boulevard, CHAIN VALLEY BAY, 2259
26	Meteorological Station	Mannering Colliery Meteorological Station, Ruttleys Road, Doyalson 2259.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 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.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.4 Water and/or Land Concentration Limits

POINT 1,27

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Faecal Coliforms	colony forming units per 100 millilitres				200
pH	pH				6.5-8.5
Total suspended solids	milligrams per litre				50

Environment Protection Licence

L3 Volume and mass limits

L3.1 For each discharge point or utilisation area specified below (by a point number), the volume/mass of:
a) liquids discharged to water; or;
b) solids or liquids applied to the area;
must not exceed the volume/mass limit specified for that discharge point or area.

Point	Unit of Measure	Volume/Mass Limit
1	kilolitres per day	12161
27	kilolitres per day	12161

L3.2 The volumetric daily discharge limit for the premises is the combined discharge measured at EPA discharge points 1 and 27 and must not exceed 12161 kilolitres per day.

L4 Waste

L4.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled “Waste” and meeting the definition, if any, in the column titled “Description” in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled “Activity” in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled “Other Limits” in the table below.
This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	General or Specific exempted waste	Waste that meets all the conditions of a resource exemption under Clause 92 of the Protection of the Environment Operations (Waste) Regulation 2014.	As specified in each particular resource recovery exemption	NA

L5 Noise limits

L5.1 Noise generated at the premises that is measured at each noise monitoring point established under this licence must not exceed the noise levels specified in Column 4 of the table below for that point during the corresponding time periods specified in Column 1 when measured using the corresponding measurement parameters listed in Column 2.

POINT 12

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)

Environment Protection Licence

Day	Day-LAeq (15 minute)	-	49
Evening	Evening-LAeq (15 minute)	-	49
Night	Night-LAeq (15 minute)	-	49
Night	Night-LA1 (1 minute)	-	54

POINT 13

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	49
Evening	Evening-LAeq (15 minute)	-	49
Night	Night-LAeq (15 minute)	-	49
Night	Night-LA1 (1 minute)	-	53

POINT 14

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	43
Evening	Evening-LAeq (15 minute)	-	43
Night	Night-LAeq (15 minute)	-	43
Night	Night-LA1 (1 minute)	-	49

POINT 16

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	36
Evening	Evening-LAeq (15 minute)	-	36
Night	Night-LAeq (15 minute)	-	36
Night	Night-LA1 (1 minute)	-	45

POINT 20

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	37
Evening	Evening-LAeq (15 minute)	-	37
Night	Night-LAeq (15 minute)	-	37

Night	Night-LA1 (1 minute)	-	45

POINT 23

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	46
Evening	Evening-LAeq (15 minute)	-	46
Night	Night-LAeq (15 minute)	-	46
Night	Night-LA1 (1 minute)	-	46

POINT 9

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	38
Evening	Evening-LAeq (15 minute)	-	38
Night	Night-LAeq (15 minute)	-	38
Night	Night-LA1 (1 minute)	-	45

L5.2 The licensee must ensure that noise generated on the premises does not exceed:

a) 35 LAeq(15min) during the day, evening or night at any privately owned land nearest to the residence apart from those receivers identified in Condition 5.1; and
b) 45 LA1(1min) during the night at any privately owned land nearest to the residence apart from those receivers identified in Condition 5.1.

Note: The licensee may provide to the EPA written evidence of any agreement with a landholder which is subject to the above noise limits. The written evidence may be submitted with a licence variation to remove the landholder from the above tables.

L5.3 For the purpose of condition L5.1 and condition L5.2:
(a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and public holidays;
(b) Evening is defined as the period 6pm to 10pm, and
(c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

L5.4 The noise limits set out in condition L5.1 and condition L5.2 apply under all meterorological conditions except for any one of the following:

(a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
(b) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
(c) Stability category G temperature inversion conditions.
(d) Or as defined under the NSW EPA Noise Policy for Industry 2017.

L5.5 For the purpose of condition L5.4:
(a) the meteorological data to be used for determining meteorological conditions is the data recorded at the meteorological station identified in this licence as EPA Identification Point 26.
(b) Stability category temperature inversion conditions are to be determined in accordance with the NSW EPA Noise Policy for Industry 2017.

Note: The weather station must be designed, commissioned and operated in a manner to obtain the necessary parameters required under the above condition.

L5.6 For the purpose of determining the noise generated at the premises the licensee must use a Class 1 or Class 2 noise monitoring device as defined by AS IEC61672.1 and AS IEC61672.2-2004, or other noise monitoring equipment accepted by the EPA in writing.

L5.7 To determine compliance:

1. With the $L_{Aeq(15\ min)}$ noise limits in condition L5.1 and condition L5.2, the licensee must locate noise monitoring equipment;

(a) within 30 metres of a dwelling facade (but not closer than 3 metres) where any dwelling on the property is situated more then 30 metres from the property boundary that is closest to the premises;

(b) approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises, or, where applicable,

(c) within approximately 50 metres if the boundary of a national park or nature reserve.

2. With the LA1(1 minute) noise limits in condition L5.1 and L5.2, the noise monitoring equipment must be located within 1 metre of a dwelling facade.

3. With the noise limits in condition L5.1 and condition L5.2, the noise monitoring equipment must be located;

(a) at the most affected point at a location where there is no dwelling at the location, or

(b) at the most affected point within an area at a location prescribed by conditions L5.7 1(a) or L5.7 1(b).

L5.8 A non-compliance of condition L5.1 or condition L5.2 will still occur where noise generated from the premises in excess of the appropriate limit is measured;
a) at a location other than an area prescribed by conditions L5.7 1(a) and L5.7 1(b), and /or
b) at a point other than the most affected point at a location.

L5.9 For the purposes of determining the noise generated at the premises all applicable modification factors as described in the NSW EPA Noise Policy for Industry 2017 must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4 Environmental monitoring

Requirement to monitor noise

M4.1 To determine compliance with condition L5.1, attended noise monitoring must be undertaken in accordance with conditions L5.7 and L5.8, and

(a) at each one of the locations listed in condition L5.1;
(b) occur quarterly within the reporting period of the Environment Protection Licence with at least 2 months between monitoring periods;
(c) occur during each day, evening and night period as defined in the NSW Industrial Noise Policy (EPA 2000) for a minimum of 15 minutes for three of the quarters;
(d) the night time 15 minute attended monitoring in accordance with c) must be undertaken between the hours of 1am and 4am;
(e) the night time LA1 (1 min) attended monitoring in accordance with c) must be undertaken between the hours of 1am and 4am;
(f) one quarterly monitoring must occur during each day, evening and night period as defined in the NSW EPA Noise Policy for Industry 2017 for a minimum of 1.5 hours during the day; 30 minutes during the evening; and 1 hours during the night, and
(g) each quarterly monitoring must be undertaken on a different day(s) of the week not including Saturdays, Sundays and public holidays; and
(h) these monitoring conditions take effect in the 2015 Reporting period.

Note: The intention of this condition is that quarterly monitoring be undertaken at each sensitive receiver. That at each sensitive receiver monitoring is undertaken over a range of different days excluding weekends and public holidays during the reporting period so as to be representative of operating hours. That night time 15 minute attended monitoring and the LA1 (1min) monitoring for three of the quarters be undertaken at worst case being the most stable atmospheric conditions and when noise would be most intrusive to sleep. All of the sensitive receivers do not have to be monitored on the same day, evening and night for sub condition f.

M4.2 For the Annual Reporting Period ending March 2015 the EPA will accept all monitoring required by the current Department of Planning and Environment consent (usually quarterly monitoring for noise as dB(A) Leq15minutes) for compliance with noise monitoring requirements in this licence, as a single report attached to the Annual Return for the premises.

M5 Weather monitoring

M5.1 At the point(s) identified below, the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1 of the table below, using the corresponding sampling method, units of measure, averaging period and sampling frequency, specified opposite in the Columns 2, 3, 4 and 5 respectively.

2.4 Chain Valley Colliery Environmental Protection License 1770

CVC operates under EPL 1770 issued by the NSW EPA under the POEO Act. The EPL has been modified, most recently on 2 April 2019 acknowledging the transfer of ownership from LakeCoal Pty Ltd to Great Southern Energy Pty Ltd.

Noise related requirements of EPL 1770 together with where they are addressed in this NMP are provided in **Appendix E**.

2.5 Mannering Colliery Environmental Protection License 191

Mannering Colliery operates under EPL 191 issued by the NSW EPA under the POEO Act. The EPL has been modified, most recently on 1 April 2019 following the statutory five-year review and consisting of a number of variations which were mostly administrative in nature.

Condition L5 of EPL 191 notes that noise limits are not specified, with the Department of Planning, Industry and Environment being the appropriate authority for regulating noise conditions under Project Approval 06_0311.

2.6 Operational Noise Criteria

Noise limits within CVC Development Consent SSD-5465 and MC Project Approval 06_0311 have been outlined in **Table 2**.

Table 2: Consented Operational Noise Criteria dB(A) for Delta Coal Collieries

Consent/Approval/EPL Location	Day		Evening		Night		
	$L_{Aeq\ (15\ min)}$		$L_{Aeq\ (15\ min)}$		$L_{Aeq\ (15\ min)}$		$L_{A1\ (1\ min)}$
Chain Valley Colliery							
R8 (EPL Point 8)	38		38		38		45
R11 (EPL Point 11)	49	41^	49	41^	49	41^	54
R12 (EPL Point 12)	49	41^	49	41^	49	41^	53
R13 (EPL Point 13)	43	41^	43	41^	43	41^	49
R15 (EPL Point 15)	36		36		36		45
R19 (EPL Point 19)	37		37		37		45
R22 (EPL Point 22)	46	40^	46	40^	46	40^	46
All other privately-owned land	35		35		35		45
Mannering Colliery							
4 – di Rocco	40		36		36		46
5 – Keighran	40		39		39		49
6 – Swan	40		37		37		47
7 – Druitt	40		35		35		45
8 – Macquarie Shores Home Village	42		42		42		47
9 – Jeans	40		37		37		47
11 – Jeans	40		36		36		46
18 – Jeans	40		36		36		46
20 – Knight and all other privately-owned residences	40		36		36		46

^ = Long Term Noise Goals (where long-term goals differ from consented criteria)

Noise criteria outlined in **Table 2** do not apply if Delta Coal has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria and Delta Coal has advised the EPA and DPIE in writing of the terms of this agreement.

As CVC has been operating for approximately 58 years, some of the predicted noise impacts at local receivers are greater than would usually be permissible without the requirement to offer noise treatments or voluntary acquisition. Notably the relocation of coal handling from CVC to MC in 2017 significantly improved CVC progression toward realising the long-term goals at receivers R11 to R13, where currently monitoring typically notes that occasional forklift and plant start-up warnings can be heard during monitoring at these receivers, while typically the site is inaudible. Consistent with noise monitoring results, community complaints from residents at these receivers regarding noise emissions has significantly decreased.

4.2.2 Chain Valley Colliery

Consistent with the noise impact assessment prepared by AECOM Pty Ltd for CVC in 2011 and undertaken as part of the Environmental Impact Statement (EIS) for Development Consent of SSD-5465, residential receivers have been divided into seven (7) noise catchment areas with similar geographical and acoustic features. The following points are considered representative of each noise catchment area:

- ATN001, representative of EPL 1770 monitoring point identification number 9, also identified in Development Consent SSD-5465 as receiver 'R8'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Mannering Park, northwest of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN002, representative of EPL 1770 monitoring point identification number 12, also identified in Development Consent SSD-5465 as receiver 'R11'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Kingfisher Shores, south-east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN003, representative of EPL 1770 monitoring point identification number 16, also identified in Development Consent SSD-5465 as receiver 'R15'. The attended monitoring point captures noise emissions at privately-owned relocatable residences within MSHV, south of the Chain Valley Colliery pit top. The dominant noise sources in this receiver area are birds, insects, traffic and other industrial sources. Activities at Mannering Colliery are also audible at times;
- ATN004, representative of Development Consent SSD-5465 receiver 'R14'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Chain Valley Bay South, south-east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN005, representative of Development Consent SSD-5465 receiver 'R17'. The attended monitoring point captured noise emissions at privately-owned residential properties located in Chain Valley Bay East, south-east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN006, representative of EPL 1770 monitoring point identification number 20, also identified in Development Consent SSD-5465 as receiver 'R19'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Chain Valley Bay North, east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources
- ATN007, representative of EPL 1770 monitoring point identification number 23, also identified in Development Consent SSD-5465 as receiver 'R22'. The attended monitoring point captured

noise emissions at privately-owned residential properties located in Summerland Point, surrounding Chain Valley Colliery's Summerland Point ventilation shaft and fan site. The dominant noise sources in this area are birds, insects, traffic and the Summerland Point ventilation shaft and fan site.

It is noted that, with reference to the requirements of the EPL, two receivers were not considered to be captured by the seven (7) noise catchment areas outlined in the EIS and as such, monitoring is to be undertaken at the following points in addition to locations ATN001 to ATN007:

- R12, identified in EPL 1770 as noise monitoring point 13, noted to be adjacent to ATN002 at Kingfisher Shores on Lakeshore Avenue, Kingfisher Shores; and
- R13, identified in EPL 1770 as noise monitoring point 14, located on Karoola Avenue, Kingfisher Shores.

The spatial locations of the CVC attended monitoring locations and relevant noise criteria are detailed in **Table 5** below.

Table 5: Noise Monitoring Locations and Limits for Chain Valley Colliery

Location	Receivers Represented EPL 1770 ID SSD-5465 ID	Coordinates	Day $L_{Aeq(15\ min)}$ dB (A)	Evening $L_{Aeq(15\ min)}$ dB (A)	Night $L_{Aeq(15\ min)}$ dB (A)	Night $L_{A1(1\ min)}$ dB (A)
ATN001	EPL #9 R8	364140 E 6330594 N	35	35	35	35
ATN002	EPL #12 R11	365218 E 6329388 N	49	49	49	54
ATN003	EPL#16 R15	365165 E 6328323 N	36	36	36	45
ATN004	N/A R14	365949 N 6328530 E	35	35	35	45
ATN005	N/A R17	366560 N 6328590 E	35	35	35	45
ATN006	20 R19	366305 N 6329321 E	37	37	37	45
ATN007	23 R22	366425 N 6331135 E	46	46	46	46
R12	13 R12	365185 N 6329352 E	49	49	49	53
R13	14 R13	365391 N 6329169 E	43	43	43	49

Appendix C
Calibration certificates

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Certificate Of Calibration

Certificate No: SLM31670

Equipment Tested: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	2759405
Mic. Type:	4189	**Serial No:**	2983733
Pre-Amp. Type:	ZC0032	**Serial No:**	22666
Filter Type:	1/3 Octave	**Test No:**	F031671

Owner: EMM Consulting
Level 3, 175 Scott Street
Newcastle, NSW 2300

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

Conditions Of Test:

Ambient Pressure	992	hPa ±1 hPa	**Date of Receipt :**	02/02/2022
Temperature	26	°C ±1° C	**Date of Calibration :**	02/02/2022
Relative Humidity	48	% ±5%	**Date of Issue :**	03/02/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

Checked By: ..... **Authorised Signature:** .....

Jack Kielt

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Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34169

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	3029363
Mic. Type:	4189	**Serial No:**	3260501
Pre-Amp. Type:	ZC0032	**Serial No:**	30109
Filter Type:	1/3 Octave	**Test No:**	F034175

Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	02/11/2022
Temperature	24	°C ±1° C	**Date of Calibration :**	03/11/2022
Relative Humidity	35	% ±5%	**Date of Issue :**	04/11/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C33872

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 **Serial No:** 79952
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.09 dB	1000.00 Hz	1.12 %
Level2:	NA	N	114.06 dB	1000.00 Hz	0.71 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure 1004 hPa ±1 hPa
Temperature 23 °C ±1° C
Relative Humidity 55 % ±5%

Date of Receipt : 26/09/2022
Date of Calibration : 29/09/2022
Date of Issue : 29/09/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C34022

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 **Serial No:** 86311
Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.01 dB	1000.00 Hz	2.00 %
Level2:	NA	N	113.92 dB	1000.00 Hz	0.35 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure 1013 hPa ±1 hPa
Temperature 22 °C ±1° C
Relative Humidity 56 % ±5%

Date of Receipt : 17/10/2022
Date of Calibration : 17/10/2022
Date of Issue : 17/10/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....

Hein Soe

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Chain Valley Colliery

Quarterly attended noise monitoring - Q4 2023

Prepared for Great Southern Energy Pty Ltd (trading as Delta Coal)

January 2024

Chain Valley Colliery

Quarterly attended noise monitoring - Q4 2023

Great Southern Energy Pty Ltd (trading as Delta Coal)

E230753 RP2

January 2024

Version	Date	Prepared by	Reviewed by	Comments
1	20 December 2023	Teanuanua Villierme	Tony Welbourne	Draft
2	5 January 2024	Teanuanua Villierme	Tony Welbourne	Final

Approved by



Tony Welbourne
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5 January 2024

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1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Great Southern Energy Pty Ltd (trading as Delta Coal) to conduct a quarterly noise survey of operations at Chain Valley Colliery (CVC) located at Vales Road, Mannering Park NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

Attended environmental noise monitoring described in this report was done during the day, evening and night periods on 5, 6 and 7 December 2023 at nine monitoring locations.

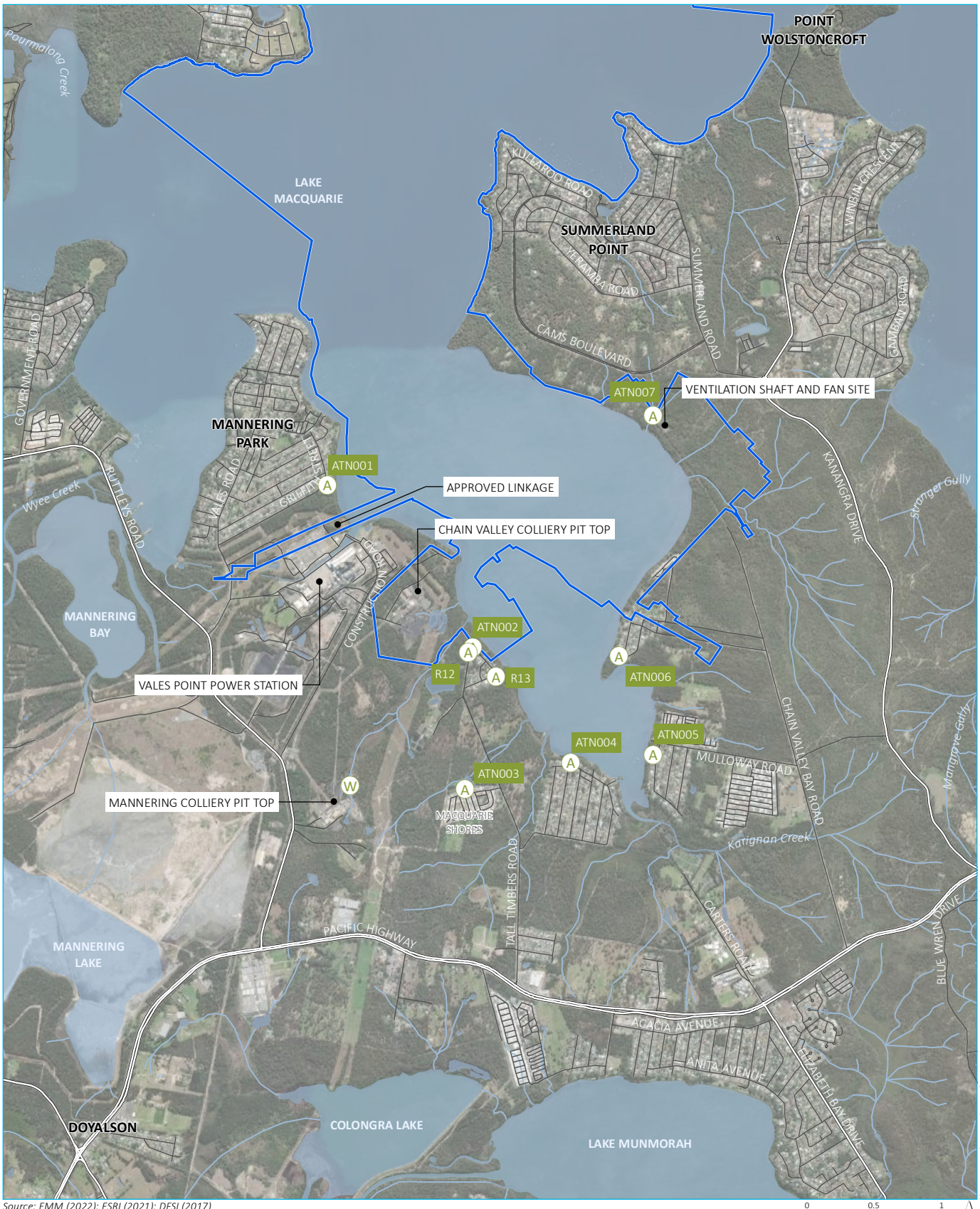
1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor	Description	Coordinates (MGA56)	
		Easting	Northing
ATN001	Griffith Street, Mannering Park	363990	6330529
ATN002	Lakeshore Avenue, Kingfisher Shores	365218	6329388
ATN003	Short Street, Macquarie Shores	365165	6328323
ATN004	Lloyd Avenue, Chain Valley Bay	365949	6328530
ATN005	Teragalin Drive, Chain Valley Bay	366560	6328590
ATN006	Sunset Parade, Chain Valley Bay	366305	6329321
ATN007[1]	Cams Boulevard, Chain Valley Bay	366559	6331109
R12	Lakeshore Avenue, Kingfisher Shores	365185	6329352
R13	Karoola Avenue, Kingfisher Shores	365391	6329169

Notes: 1. Due to access issues, ATN007 is an intermediate location within the site boundary and site noise contributions were calculated back to R22 (EPL Point 23).



Source: EMM (2022); ESRI (2021); DFSI (2017)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM2\2022\E220750 - Delta Coal Noise FY22-23\8 GIS\02_Maps\N002_CVCNoiseMonitoringLocations_20221111_02.mxd 11/11/2022

KEY

- (A) Noise monitoring location
- (W) Meteorological station
- CVC Consent Boundary
- Major road
- Minor road
- Watercourse/drainage line
- Waterbody

CVC attended noise monitoring locations

Chain Valley Colliery
Quarterly attended noise monitoring
Figure 1.1

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1.3 Terminology and abbreviations

Definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The energy average A-weighted noise level.
$L_{Aeq,15minute}$	The energy average A-weighted noise level over the specified time period of 15 minutes.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Noise limits for CVC are provided in Table 1, Condition 7 of Schedule 3 of the development consent SSD-5465 (DC). Long-term goals for CVC are provided in Condition 8(d) of Schedule 3 of the DC. Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Noise limits for CVC are provided in Conditions L5.1 and L5.2 of environment protection licence 1770 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved noise management plan (NMP) was prepared in line with the Mod 4 approval and in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017. Table 5 of the NMP adopts nine attended noise monitoring (NM) locations that are representative of residences outlined in the DC. Where several assessment locations are in one NM catchment, representative noise limits have been adopted to ensure that the lowest (most stringent) limits within the NM catchment can be achieved. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise impact limits based on the DC and EPL are provided in Table 2.1.

Table 2.1 Noise impact limits, dB

Noise monitoring location	Assessment location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
ATN001	R8 (EPL Point 9)	38	38	38	45
ATN002	R11 (EPL Point 12)	49	49	49	54
ATN003	R15 (EPL Point 16)	36	36	36	45
ATN004	R14	35	35	35	45
ATN005	R17	35	35	35	45
ATN006	R19 (EPL Point 20)	37	37	37	45
ATN007	R22 (EPL Point 23)	46	46	46	46
R12	R12 (EPL Point 13)	49	49	49	53
R13	R13 (EPL Point 14)	43	43	43	49

2.5 Meteorological conditions

Appendix 8 of the DC states meteorological conditions under which noise limits do not apply as follows:

- during periods of rain or hail

- average wind speed at microphone height exceeds 5 m/s
- wind speeds greater than 3 m/s at 10 m above ground level
- temperature inversion conditions greater than 3°C/100 m.

Condition L5.4 of the EPL states meteorological conditions under which noise limits do not apply as follows:

- wind speeds greater than 3 m/s at 10 m above ground level
- stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 m above ground level
- stability category G temperature inversion conditions
- as defined under the NPfI.

The last point refers to 'very noise-enhancing' conditions which are considered outside the 'standard' or 'noise-enhancing' meteorological conditions defined in Table D1 of Fact Sheet D of the NPfI.

Further, Fact Sheet E of the NPfI (point 6 of Section E1) provides additional guidance on monitoring the performance of a site against 'suitable' noise limits placed in the DC/EPL. Noise limits are based on 'achievable' noise levels under the 'standard' and/or 'noise-enhancing' meteorological conditions. Where meteorological conditions are considered 'very noise-enhancing', a positive adjustment of 5 dB applies to noise limits for 'standard' or 'noise-enhancing' meteorological conditions.

In accordance with the NPfI and for consistency between the DC and EPL, where 'very noise-enhancing' meteorological conditions were present during a noise measurement, a positive adjustment of 5 dB has been applied to the noise limits stated in the DC and EPL. This approach means that noise limits are always applicable, with or without a positive adjustment of 5 dB, depending on whether meteorological conditions are 'very noise-enhancing' or not.

2.6 Additional requirements

2.6.1 Attended noise monitoring

Condition M4.1 of the EPL specifies additional noise monitoring requirements to determine compliance, including the following:

- locations of monitoring – EPL points listed in Table 2.1
- frequency of monitoring – quarterly and at least two months between monitoring periods
- periods of monitoring:
  - For three out of four quarterly periods – each day, evening and night periods for a minimum of 15 minutes. Night period monitoring must be undertaken between the hours of 1 am and 4 am.
  - For one out of four quarterly periods – day period monitoring must be undertaken for a minimum of 1.5 hours (six 15-minute periods); evening period monitoring must be undertaken for a minimum of 30 minutes (two 15-minue periods); night period monitoring must be undertaken for a minimum of 1 hour (four 15-minute periods).
- days of monitoring – each quarterly monitoring must be undertaken on a different day of the week excluding Saturday, Sundays and public holidays.

In accordance with the preceding, this round of quarterly attended noise monitoring (Q4 2023) was undertaken on Tuesday 5, Wednesday 6 and Thursday 7 December 2023 which is more than two months since the last quarterly monitoring (Q3 2023) which finished on Friday 15 September 2023. Furthermore, this was one of the quarterly periods when monitoring at each monitoring location (as per the EPL) was conducted for a minimum of 1.5 hours during the day period, a minimum of 30 minutes during the evening period and a minimum of 1 hour during the night period.

As per the approved NMP, attended noise monitoring is scheduled considering the occurrence of regular operations at CVC. Noise monitoring avoids scheduled down-time or maintenance. Regular operations were occurring during this round of monitoring (Q4 2023).

Monitoring and reporting have been done in accordance with the NPfI and 'Approved methods for the measurement and analysis of environmental noise in NSW' (the approved methods) (EPA 2022).

2.6.2 CVC long-term goals

Long-term goals for CVC are provided in Condition 8(d) of Schedule 3 of the DC, which states:

> 8. The Applicant must:
>
> (d) use its best endeavours to achieve the long-term noise goals in Table 2, where reasonable and feasible, and report on progress towards achieving these goals in each Annual Review;

The long-term goals for CVC in Table 2 of the DC are summarised in Table 2.2 for the relevant assessment locations.

Table 2.2 CVC long-term goals

Assessment location	Day $L_{Aeq,15minute}$, dB	Evening $L_{Aeq,15minute}$, dB	Night $L_{Aeq,15minute}$, dB
R11 (EPL Point 12)	41	41	41
R12 (EPL Point 13)	41	41	41
R13 (EPL Point 14)	41	41	41
R22 (EPL Point 23)	40	40	40

As stated in Appendix 9 of the DC, Delta Coal is committed to the progressive implementation of feasible measures to target long-term noise goals which are designed to reduce noise emissions from CVC. For this compliance noise monitoring assessment, site $L_{Aeq,15minute}$ have also been compared to the long-term goals as discussed in Section 4.2.2.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Mannering Colliery automatic weather station (AWS) which allowed correlation of atmospheric parameters with measured site noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the day, evening and night periods at each location. Minimum monitoring periods at each location was in accordance with the EPL; 1.5 hours during the day period, 30 minutes during the evening period and 1 hour during the night period. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source-to-receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If the exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

This assessment determined stability categories throughout attended monitoring period using the sigma-theta method as per Fact Sheet D of the NPfI. This data was sourced from the Mannering Colliery AWS, in accordance with requirements of EPL 1770.

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is undertaken at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor adjustments have been reported and added to measured site-only L_{Aeq}.

Low-frequency modifying factor adjustments have only been applied to site-only L_{Aeq} if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

Equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	2759405	2/2/2024	IEC 61672-1:2013
Brüel & Kjær 2250 sound level meter	3029363	3/11/2024	IEC 61672-1:2013
Svantek SV-36 calibrator	79952	27/9/2025	IEC 60942:2017
Svantek SV-36 calibrator	86311	13/10/2025	IEC 60942:2017

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1.

Table 4.1 Total measured noise levels[1], dB – Quarter 4 2023

Location	Period	Start date and time	L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	L_{Amin}
ATN001	Day	5/12/2023 11:53	74	66	54	54	50	48	46
ATN001	Day	5/12/2023 12:08	73	64	57	55	53	50	47
ATN001	Day	5/12/2023 12:23	76	66	53	54	49	46	44
ATN001	Day	5/12/2023 12:38	73	67	57	55	51	48	46
ATN001	Day	5/12/2023 12:53	72	64	58	56	54	51	49
ATN001	Day	5/12/2023 13:08	88	67	57	60	52	47	44
ATN001	Evening	5/12/2023 20:04	76	73	71	67	64	50	46
ATN001	Evening	5/12/2023 20:19	74	67	60	56	49	47	45
ATN001	Night	7/12/2023 0:38	62	47	46	45	45	44	43
ATN001	Night	7/12/2023 0:53	47	47	46	45	45	44	43
ATN001	Night	7/12/2023 1:08	47	46	46	45	45	45	44
ATN001	Night	7/12/2023 1:23	59	46	45	45	45	44	43
ATN002	Day	5/12/2023 13:47	66	53	49	45	41	39	35
ATN002	Day	5/12/2023 14:02	77	59	52	52	41	39	36
ATN002	Day	5/12/2023 14:17	72	61	55	53	52	42	39
ATN002	Day	5/12/2023 14:32	75	60	50	49	41	39	37
ATN002	Day	5/12/2023 14:47	83	72	52	59	44	39	36
ATN002	Day	5/12/2023 15:02	60	52	48	44	40	37	35
ATN002	Evening	5/12/2023 18:51	73	63	54	52	48	43	37
ATN002	Evening	5/12/2023 19:06	56	50	48	45	44	41	38
ATN002	Night	6/12/2023 22:24	61	43	42	41	40	38	36
ATN002	Night	6/12/2023 22:39	44	43	42	40	40	38	36
ATN002	Night	6/12/2023 22:54	65	52	42	43	40	38	36
ATN002	Night	6/12/2023 23:09	47	43	42	40	40	38	36
ATN003	Day	7/12/2023 14:00	64	58	54	50	48	43	36
ATN003	Day	7/12/2023 14:15	65	58	54	50	48	41	36
ATN003	Day	7/12/2023 14:30	70	58	54	50	47	43	39
ATN003	Day	7/12/2023 14:45	68	58	54	50	48	42	37

Table 4.1 Total measured noise levels[1], dB – Quarter 4 2023

Location	Period	Start date and time	L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	L_{Amin}
ATN003	Day	7/12/2023 15:01	64	58	53	49	46	42	35
ATN003	Day	7/12/2023 15:16	64	57	52	49	46	40	36
ATN003	Evening	5/12/2023 19:00	63	55	51	49	48	44	40
ATN003	Evening	5/12/2023 19:15	71	68	52	53	48	44	39
ATN003	Night	6/12/2023 22:00	66	50	48	46	46	44	41
ATN003	Night	6/12/2023 22:15	55	50	48	46	45	43	39
ATN003	Night	6/12/2023 22:30	52	50	48	46	45	43	39
ATN003	Night	6/12/2023 22:45	55	48	47	45	44	42	40
ATN004	Day	7/12/2023 13:39	70	62	53	50	44	39	35
ATN004	Evening	6/12/2023 21:49	56	46	41	36	32	30	29
ATN004	Night	6/12/2023 22:05	56	48	41	38	33	30	28
ATN005	Day	5/12/2023 17:01	60	48	46	43	42	39	37
ATN005	Evening	5/12/2023 18:00	78	66	46	51	42	41	39
ATN005	Night	6/12/2023 23:33	61	43	41	40	40	38	35
ATN006	Day	7/12/2023 11:55	70	68	62	58	53	44	36
ATN006	Day	7/12/2023 12:10	63	62	56	52	49	42	37
ATN006	Day	7/12/2023 12:25	59	55	50	46	44	40	38
ATN006	Day	7/12/2023 12:40	69	65	53	53	48	43	38
ATN006	Day	7/12/2023 12:55	71	70	65	60	50	42	38
ATN006	Day	7/12/2023 13:11	72	71	57	56	46	43	39
ATN006	Evening	5/12/2023 20:25	66	60	59	53	44	40	35
ATN006	Evening	5/12/2023 20:40	52	46	44	43	43	41	35
ATN006	Night	5/12/2023 23:20	63	43	42	41	40	39	37
ATN006	Night	5/12/2023 23:35	53	45	43	42	41	40	37
ATN006	Night	5/12/2023 23:50	47	43	40	38	37	36	35
ATN006	Night	6/12/2023 0:05	43	41	39	37	37	36	34
ATN007	Day	7/12/2023 10:02	80	78	75	71	69	65	61
ATN007	Day	7/12/2023 10:17	78	76	73	69	67	65	63
ATN007	Day	7/12/2023 10:32	77	75	73	69	67	63	61
ATN007	Day	7/12/2023 10:47	76	75	71	69	68	66	64
ATN007	Day	7/12/2023 11:02	77	73	71	68	67	65	63
ATN007	Day	7/12/2023 11:18	76	73	70	68	67	66	64

Table 4.1 Total measured noise levels[1], dB – Quarter 4 2023

Location	Period	Start date and time	L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	L_{Amin}
ATN007	Evening	5/12/2023 21:15	56	50	50	49	49	49	48
ATN007	Evening	5/12/2023 21:30	52	50	50	49	49	49	48
ATN007	Night	5/12/2023 22:00	54	51	50	49	49	49	48
ATN007	Night	5/12/2023 22:15	56	51	50	49	49	49	48
ATN007	Night	5/12/2023 22:30	53	50	50	49	49	49	48
ATN007	Night	5/12/2023 22:45	53	50	50	49	49	49	48
R12	Day	5/12/2023 13:47	66	53	49	45	41	39	35
R12	Day	5/12/2023 14:02	77	59	52	52	41	39	36
R12	Day	5/12/2023 14:17	72	61	55	53	52	42	39
R12	Day	5/12/2023 14:32	75	60	50	49	41	39	37
R12	Day	5/12/2023 14:47	83	72	52	59	44	39	36
R12	Day	5/12/2023 15:02	60	52	48	44	40	37	35
R12	Evening	5/12/2023 18:51	73	63	54	52	48	43	37
R12	Evening	5/12/2023 19:06	56	50	48	45	44	41	38
R12	Night	6/12/2023 22:24	61	43	42	41	40	38	36
R12	Night	6/12/2023 22:39	44	43	42	40	40	38	36
R12	Night	6/12/2023 22:54	65	52	42	43	40	38	36
R12	Night	6/12/2023 23:09	47	43	42	40	40	38	36
R13	Day	5/12/2023 15:20	77	64	50	54	43	38	36
R13	Day	5/12/2023 15:35	57	52	46	44	42	41	39
R13	Day	5/12/2023 15:50	61	54	49	48	47	43	40
R13	Day	5/12/2023 16:05	75	64	54	53	47	43	41
R13	Day	5/12/2023 16:20	66	59	47	46	43	41	36
R13	Day	5/12/2023 16:35	75	61	57	54	45	42	40
R13	Evening	5/12/2023 19:24	61	57	51	47	44	39	34
R13	Evening	5/12/2023 19:39	59	57	54	49	49	39	34
R13	Night	6/12/2023 23:27	52	37	36	34	34	33	30
R13	Night	6/12/2023 23:42	64	42	37	36	35	33	31
R13	Night	6/12/2023 23:57	48	47	43	39	37	34	31
R13	Night	7/12/2023 0:12	45	41	38	36	36	33	31

Notes: 1. Levels in this table are not necessarily the result of activity at site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 m above ground. Attended noise monitoring is not done during rain, hail, or average wind speeds above 5 m/s at microphone height.

Table 4.2 Measured atmospheric conditions – Quarter 4 2023

Location	Period	Start date and time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north[1]	Cloud cover 1/8s
ATN001	Day	5/12/2023 11:53	30	1.1	0	0
ATN001	Day	5/12/2023 12:08	30	1.1	0	0
ATN001	Day	5/12/2023 12:23	30	1.1	0	0
ATN001	Day	5/12/2023 12:38	30	1.1	0	0
ATN001	Day	5/12/2023 12:53	30	1.1	0	0
ATN001	Day	5/12/2023 13:08	30	1.1	0	0
ATN001	Evening	5/12/2023 20:04	22	≤0.5	-	0
ATN001	Evening	5/12/2023 20:19	22	≤0.5	-	0
ATN001	Night	7/12/2023 0:38	20	≤0.5	-	3
ATN001	Night	7/12/2023 0:53	20	≤0.5	-	3
ATN001	Night	7/12/2023 1:08	20	≤0.5	-	3
ATN001	Night	7/12/2023 1:23	20	≤0.5	-	3
ATN002	Day	5/12/2023 13:47	30	1.3	0	0
ATN002	Day	5/12/2023 14:02	30	1.3	0	0
ATN002	Day	5/12/2023 14:17	30	1.3	0	0
ATN002	Day	5/12/2023 14:32	30	1.3	0	0
ATN002	Day	5/12/2023 14:47	30	1.3	0	0
ATN002	Day	5/12/2023 15:02	30	1.3	0	0
ATN002	Evening	5/12/2023 18:51	23	≤0.5	-	0
ATN002	Evening	5/12/2023 19:06	23	≤0.5	-	0
ATN002	Night	6/12/2023 22:24	20	≤0.5	-	3
ATN002	Night	6/12/2023 22:39	20	≤0.5	-	3
ATN002	Night	6/12/2023 22:54	20	≤0.5	-	3
ATN002	Night	6/12/2023 23:09	20	≤0.5	-	3
ATN003	Day	7/12/2023 14:00	27	0.8	135	1
ATN003	Day	7/12/2023 14:15	26	0.9	135	2
ATN003	Day	7/12/2023 14:30	26	1.0	135	2
ATN003	Day	7/12/2023 14:45	26	13	135	2
ATN003	Day	7/12/2023 15:01	25	1.2	135	1

Table 4.2 Measured atmospheric conditions – Quarter 4 2023

Location	Period	Start date and time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north[1]	Cloud cover 1/8s
ATN003	Day	7/12/2023 15:16	26	1.3	135	1
ATN003	Evening	5/12/2023 19:00	26	≤0.5	-	0
ATN003	Evening	5/12/2023 19:15	26	≤0.5	-	0
ATN003	Night	6/12/2023 22:00	21	≤0.5	-	0
ATN003	Night	6/12/2023 22:15	20	≤0.5	-	0
ATN003	Night	6/12/2023 22:30	19	≤0.5	-	0
ATN003	Night	6/12/2023 22:45	19	≤0.5	-	0
ATN004	Day	7/12/2023 13:39	29	0.6	135	1
ATN004	Evening	6/12/2023 21:49	20	≤0.5	-	3
ATN004	Night	6/12/2023 22:05	20	≤0.5	-	0
ATN005	Day	5/12/2023 17:01	27	2.7	0	0
ATN005	Evening	5/12/2023 18:00	24	1.2	0	0
ATN005	Night	6/12/2023 23:33	20	≤0.5	-	0
ATN006	Day	7/12/2023 11:55	27	1.0	45	0
ATN006	Day	7/12/2023 12:10	27	0.9	45	0
ATN006	Day	7/12/2023 12:25	27	0.6	135	0
ATN006	Day	7/12/2023 12:40	25	0.8	135	0
ATN006	Day	7/12/2023 12:55	26	0.9	135	0
ATN006	Day	7/12/2023 13:11	27	0.8	135	0
ATN006	Evening	5/12/2023 20:25	24	≤0.5	-	0
ATN006	Evening	5/12/2023 20:40	24	≤0.5	-	0
ATN006	Night	5/12/2023 23:20	22	≤0.5	-	0
ATN006	Night	5/12/2023 23:35	23	≤0.5	-	0
ATN006	Night	5/12/2023 23:50	24	≤0.5	-	0
ATN006	Night	6/12/2023 0:05	24	≤0.5	-	0
ATN007	Day	7/12/2023 10:02	24	≤0.5	-	0
ATN007	Day	7/12/2023 10:17	27	≤0.5	-	0
ATN007	Day	7/12/2023 10:32	27	0.6	45	0
ATN007	Day	7/12/2023 10:47	27	0.6	45	0
ATN007	Day	7/12/2023 11:02	27	0.7	45	0
ATN007	Day	7/12/2023 11:18	28	0.7	45	0
ATN007	Evening	5/12/2023 21:15	23	≤0.5	-	0

Table 4.2 Measured atmospheric conditions – Quarter 4 2023

Location	Period	Start date and time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north[1]	Cloud cover 1/8s
ATN007	Evening	5/12/2023 21:30	23	≤0.5	-	0
ATN007	Night	5/12/2023 22:00	22	≤0.5	-	0
ATN007	Night	5/12/2023 22:15	21	≤0.5	-	0
ATN007	Night	5/12/2023 22:30	21	≤0.5	-	0
ATN007	Night	5/12/2023 22:45	21	≤0.5	-	0
R12	Day	5/12/2023 13:47	30	1.3	0	0
R12	Day	5/12/2023 14:02	30	1.3	0	0
R12	Day	5/12/2023 14:17	30	1.3	0	0
R12	Day	5/12/2023 14:32	30	1.3	0	0
R12	Day	5/12/2023 14:47	30	1.3	0	0
R12	Day	5/12/2023 15:02	30	1.3	0	0
R12	Evening	5/12/2023 18:51	23	≤0.5	-	0
R12	Evening	5/12/2023 19:06	23	≤0.5	-	0
R12	Night	6/12/2023 22:24	20	≤0.5	-	3
R12	Night	6/12/2023 22:39	20	≤0.5	-	3
R12	Night	6/12/2023 22:54	20	≤0.5	-	3
R12	Night	6/12/2023 23:09	20	≤0.5	-	3
R13	Day	5/12/2023 15:20	30	1.0	0	0
R13	Day	5/12/2023 15:35	30	1.0	0	0
R13	Day	5/12/2023 15:50	30	1.0	0	0
R13	Day	5/12/2023 16:05	30	1.0	0	0
R13	Day	5/12/2023 16:20	30	1.0	0	0
R13	Day	5/12/2023 16:35	30	1.0	0	0
R13	Evening	5/12/2023 19:24	22	≤0.5	-	0
R13	Evening	5/12/2023 19:39	22	≤0.5	-	0
R13	Night	6/12/2023 23:27	20	≤0.5	-	3
R13	Night	6/12/2023 23:42	20	≤0.5	-	3
R13	Night	6/12/2023 23:57	20	≤0.5	-	3
R13	Night	7/12/2023 0:12	20	≤0.5	-	3

Notes: 1. "-" indicates calm conditions at monitoring location.

4.2 Site only noise levels

4.2.1 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the Mannering Colliery AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing weather conditions, where relevant, as defined in the NPfI.

Table 4.3 Site noise levels and limits – Quarter 4 2023

Location	Start date and time	Period	Wind		Stability class	Very noise-enhancing?[1]	Limits, dB		Site levels, dB		Exceedances, dB	
			Speed m/s	Direction[3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$[2]	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
ATN001	5/12/2023 11:53	Day	2.3	49	A	N	43	N/A	IA	N/A	Nil	N/A
ATN001	5/12/2023 12:08	Day	2.4	39	A	N	43	N/A	IA	N/A	Nil	N/A
ATN001	5/12/2023 12:23	Day	2.5	48	A	N	43	N/A	IA	N/A	Nil	N/A
ATN001	5/12/2023 12:38	Day	2.4	45	A	N	43	N/A	IA	N/A	Nil	N/A
ATN001	5/12/2023 12:53	Day	3.0	44	A	N	43	N/A	IA	N/A	Nil	N/A
ATN001	5/12/2023 13:08	Day	2.9	48	A	N	43	N/A	IA	N/A	Nil	N/A
ATN001	5/12/2023 20:04	Evening	2.0	48	F	N	38	N/A	IA	N/A	Nil	N/A
ATN001	5/12/2023 20:19	Evening	1.7	51	F	N	38	N/A	IA	N/A	Nil	N/A
ATN001	7/12/2023 0:38	Night	0.2	204	F	N	38	45	IA	IA	Nil	Nil
ATN001	7/12/2023 0:53	Night	0.2	219	F	N	38	45	IA	IA	Nil	Nil
ATN001	7/12/2023 1:08	Night	0.3	223	F	N	38	45	IA	IA	Nil	Nil
ATN001	7/12/2023 1:23	Night	0.3	225	F	N	38	45	IA	IA	Nil	Nil
ATN002	5/12/2023 13:47	Day	2.8	50	A	N	49	N/A	IA	N/A	Nil	N/A
ATN002	5/12/2023 14:02	Day	2.5	56	A	N	49	N/A	IA	N/A	Nil	N/A
ATN002	5/12/2023 14:17	Day	2.6	38	A	N	49	N/A	IA	N/A	Nil	N/A
ATN002	5/12/2023 14:32	Day	2.7	52	A	N	49	N/A	IA	N/A	Nil	N/A
ATN002	5/12/2023 14:47	Day	2.8	55	A	N	49	N/A	IA	N/A	Nil	N/A
ATN002	5/12/2023 15:02	Day	2.8	72	A	N	49	N/A	IA	N/A	Nil	N/A
ATN002	5/12/2023 18:51	Evening	2.6	46	F	Y	54 (49+5)	N/A	IA	N/A	Nil	N/A

Table 4.3 Site noise levels and limits – Quarter 4 2023

Location	Start date and time	Period	Wind		Stability class	Very noise-enhancing?[1]	Limits, dB		Site levels, dB		Exceedances, dB	
			Speed m/s	Direction[3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$[2]	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
ATN002	5/12/2023 19:06	Evening	2.2	42	E	N	49	N/A	IA	N/A	Nil	N/A
ATN002	6/12/2023 22:24	Night	0.3	69	F	N	49	54	IA	IA	Nil	Nil
ATN002	6/12/2023 22:39	Night	0.2	134	F	N	49	54	IA	IA	Nil	Nil
ATN002	6/12/2023 22:54	Night	0.4	178	F	N	49	54	IA	IA	Nil	Nil
ATN002	6/12/2023 23:09	Night	0.2	211	F	N	49	54	IA	IA	Nil	Nil
ATN003	7/12/2023 14:00	Day	1.6	82	A	N	36	N/A	IA	N/A	Nil	N/A
ATN003	7/12/2023 14:15	Day	2.6	91	A	N	36	N/A	IA	N/A	Nil	N/A
ATN003	7/12/2023 14:30	Day	2.8	93	A	N	36	N/A	IA	N/A	Nil	N/A
ATN003	7/12/2023 14:45	Day	2.4	109	A	N	36	N/A	IA	N/A	Nil	N/A
ATN003	7/12/2023 15:01	Day	2.9	119	A	N	36	N/A	IA	N/A	Nil	N/A
ATN003	7/12/2023 15:16	Day	2.4	101	A	N	36	N/A	IA	N/A	Nil	N/A
ATN003	5/12/2023 19:00	Evening	2.2	42	E	N	36	N/A	IA	N/A	Nil	N/A
ATN003	5/12/2023 19:15	Evening	1.7	44	F	N	36	N/A	IA	N/A	Nil	N/A
ATN003	6/12/2023 22:00	Night	0.4	141	F	N	36	45	IA	IA	Nil	Nil
ATN003	6/12/2023 22:15	Night	0.4	155	F	N	36	45	IA	IA	Nil	Nil
ATN003	6/12/2023 22:30	Night	0.3	69	F	N	36	45	IA	IA	Nil	Nil
ATN003	6/12/2023 22:45	Night	0.2	134	F	N	36	45	IA	IA	Nil	Nil
ATN004	7/12/2023 13:39	Day	2.2	31	A	N	35	N/A	IA	N/A	Nil	N/A
ATN004	6/12/2023 21:49	Evening	0.8	173	F	N	35	N/A	IA	N/A	Nil	N/A

Table 4.3 Site noise levels and limits – Quarter 4 2023

Location	Start date and time	Period	Wind		Stability class	Very noise-enhancing?[1]	Limits, dB		Site levels, dB		Exceedances, dB	
			Speed m/s	Direction[3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$[2]	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
ATN004	6/12/2023 22:05	Night	0.4	141	F	N	35	45	IA	IA	Nil	Nil
ATN005	5/12/2023 17:01	Day	2.6	48	A	N	35	N/A	IA	N/A	Nil	N/A
ATN005	5/12/2023 18:00	Evening	2.5	51	E	N	35	N/A	IA	N/A	Nil	N/A
ATN005	6/12/2023 23:33	Night	0.3	221	F	N	35	45	IA	IA	Nil	Nil
ATN006	7/12/2023 11:55	Day	2.1	48	A	N	37	N/A	IA	N/A	Nil	N/A
ATN006	7/12/2023 12:10	Day	1.8	96	A	N	37	N/A	IA	N/A	Nil	N/A
ATN006	7/12/2023 12:25	Day	2.7	85	A	N	37	N/A	IA	N/A	Nil	N/A
ATN006	7/12/2023 12:40	Day	3.2	71	A	Y	42 (37+5)	N/A	IA	N/A	Nil	N/A
ATN006	7/12/2023 12:55	Day	2.9	63	A	N	37	N/A	IA	N/A	Nil	N/A
ATN006	7/12/2023 13:11	Day	3.1	74	A	Y	42 (37+5)	N/A	IA	N/A	Nil	N/A
ATN006	5/12/2023 20:25	Evening	0.8	54	F	N	37	N/A	IA	N/A	Nil	N/A
ATN006	5/12/2023 20:40	Evening	0.7	92	F	N	37	N/A	IA	N/A	Nil	N/A
ATN006	5/12/2023 23:20	Night	0.3	26	F	N	37	45	IA	IA	Nil	Nil
ATN006	5/12/2023 23:35	Night	0.9	57	F	N	37	45	IA	IA	Nil	Nil
ATN006	5/12/2023 23:50	Night	1.0	44	F	N	37	45	IA	IA	Nil	Nil
ATN006	6/12/2023 0:05	Night	0.9	40	F	N	37	45	IA	IA	Nil	Nil
ATN007	7/12/2023 10:02	Day	2.0	29	A	N	46	N/A	38 (36 + 2)[4]	N/A	Nil	N/A
ATN007	7/12/2023 10:17	Day	2.5	18	A	N	46	N/A	38 (36 + 2)[4]	N/A	Nil	N/A
ATN007	7/12/2023 10:32	Day	2.8	28	A	N	46	N/A	38 (36 + 2)[4]	N/A	Nil	N/A

Table 4.3 Site noise levels and limits – Quarter 4 2023

Location	Start date and time	Period	Wind		Stability class	Very noise-enhancing?[1]	Limits, dB		Site levels, dB		Exceedances, dB	
			Speed m/s	Direction[3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$[2]	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
ATN007	7/12/2023 10:47	Day	2.2	38	A	N	46	N/A	38 (36 + 2)[4]	N/A	Nil	N/A
ATN007	7/12/2023 11:02	Day	2.2	24	A	N	46	N/A	38 (36 + 2)[4]	N/A	Nil	N/A
ATN007	7/12/2023 11:18	Day	2.2	61	A	N	46	N/A	38 (36 + 2)[4]	N/A	Nil	N/A
ATN007	5/12/2023 21:15	Evening	0.8	64	F	N	46	N/A	42 (37 + 5)[4]	N/A	Nil	N/A
ATN007	5/12/2023 21:30	Evening	0.9	31	F	N	46	N/A	42 (37 + 5)[4]	N/A	Nil	N/A
ATN007	5/12/2023 22:00	Night	0.9	21	F	N	46	46	42 (37 + 5)[4]	37[5]	Nil	Nil
ATN007	5/12/2023 22:15	Night	0.5	19	F	N	46	46	42 (37 + 5)[4]	37[5]	Nil	Nil
ATN007	5/12/2023 22:30	Night	0.7	45	F	N	46	46	42 (37 + 5)[4]	38[5]	Nil	Nil
ATN007	5/12/2023 22:45	Night	0.5	57	F	N	46	46	42 (37 + 5)[4]	38[5]	Nil	Nil
R12	5/12/2023 13:47	Day	2.8	50	A	N	49	N/A	IA	N/A	Nil	N/A
R12	5/12/2023 14:02	Day	2.5	56	A	N	49	N/A	IA	N/A	Nil	N/A
R12	5/12/2023 14:17	Day	2.6	38	A	N	49	N/A	IA	N/A	Nil	N/A
R12	5/12/2023 14:32	Day	2.7	52	A	N	49	N/A	IA	N/A	Nil	N/A
R12	5/12/2023 14:47	Day	2.8	55	A	N	49	N/A	IA	N/A	Nil	N/A
R12	5/12/2023 15:02	Day	2.8	72	A	N	49	N/A	IA	N/A	Nil	N/A
R12	5/12/2023 18:51	Evening	2.6	46	F	Y	54 (49+5)	N/A	IA	N/A	Nil	N/A
R12	5/12/2023 19:06	Evening	2.2	42	E	N	49	N/A	IA	N/A	Nil	N/A
R12	6/12/2023 22:24	Night	0.3	69	F	N	49	53	IA	IA	Nil	Nil
R12	6/12/2023 22:39	Night	0.2	134	F	N	49	53	IA	IA	Nil	Nil

Table 4.3 Site noise levels and limits – Quarter 4 2023

Location	Start date and time	Period	Wind		Stability class	Very noise-enhancing?[1]	Limits, dB		Site levels, dB		Exceedances, dB	
			Speed m/s	Direction[3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$[2]	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
R12	6/12/2023 22:54	Night	0.4	178	F	N	49	53	IA	IA	Nil	Nil
R12	6/12/2023 23:09	Night	0.2	211	F	N	49	53	IA	IA	Nil	Nil
R13	5/12/2023 15:20	Day	2.7	54	A	N	43	N/A	IA	N/A	Nil	N/A
R13	5/12/2023 15:35	Day	2.7	65	A	N	43	N/A	IA	N/A	Nil	N/A
R13	5/12/2023 15:50	Day	2.1	50	A	N	43	N/A	IA	N/A	Nil	N/A
R13	5/12/2023 16:05	Day	2.9	46	A	N	43	N/A	IA	N/A	Nil	N/A
R13	5/12/2023 16:20	Day	3.9	65	B	Y	48 (43+5)	N/A	IA	N/A	Nil	N/A
R13	5/12/2023 16:35	Day	2.8	51	A	N	43	N/A	IA	N/A	Nil	N/A
R13	5/12/2023 19:24	Evening	2.7	49	E	N	43	N/A	IA	N/A	Nil	N/A
R13	5/12/2023 19:39	Evening	2.5	48	F	Y	48 (43+5)	N/A	IA	N/A	Nil	N/A
R13	6/12/2023 23:27	Night	0.3	221	F	N	43	49	IA	IA	Nil	Nil
R13	6/12/2023 23:42	Night	0.3	191	F	N	43	49	IA	IA	Nil	Nil
R13	6/12/2023 23:57	Night	0.2	334	F	N	43	49	IA	IA	Nil	Nil
R13	7/12/2023 0:12	Night	0.2	313	F	N	43	49	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very noise-enhancing meteorological conditions' in accordance with the NPfI.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor adjustments if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

4. Calculated back to R22 from data measured at ATN007. A 2 dB positive adjustment for the day period measurements and a 5 dB positive adjustment for evening and night period measurements are conservatively applied to the estimated site $L_{Aeq,15minute}$ based on monitoring previously undertaken at the R22 residence.

5. Modifying factor adjustments do not apply to site L_{Amax}.

4.2.2 Long term noise goals

Site $L_{Aeq,15minute}$ were also compared to the long-term noise goals (refer to Table 2.2) for the relevant locations (i.e. R11, R12, R13 and R22). Site $L_{Aeq,15minute}$ measured at ATN002 (R11), R12 and R13 satisfied the relevant long-term goals during the day, evening and night periods. At ATN007 (R22), the measured site $L_{Aeq,15minute}$ (inclusive of modifying factor adjustment for LFN) exceeded the relevant long-term $L_{Aeq,15minute}$ 40 dB goal by 2 dB during the evening and night period measurements.

5 Summary

EMM was engaged by Great Southern Energy Pty Ltd (trading as Delta Coal) to conduct a quarterly noise survey of operations at CVC. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the day, evening and night periods on 5, 6 and 7 December 2023 at nine monitoring locations.

Noise levels from site complied with relevant limits at all monitoring locations during the Q4 2023 survey.

CVC $L_{Aeq,15minute}$ were also compared to the long-term noise goals applicable at R11 (ATN002), R12, R13 and R22 (ATN007). CVC $L_{Aeq,15minute}$ satisfied these during all measurements at R11 (ATN002), R12 and R13. At R22 (ATN007), the measured site $L_{Aeq,15minute}$ (inclusive of modifying factor adjustment for LFN) exceeded the long-term $L_{Aeq,15minute}$ 40 dB goal by 2 dB during the evening and night period measurements.

Appendix A
Noise perception and examples

EMM
creating opportunities

A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or quarter) as loud

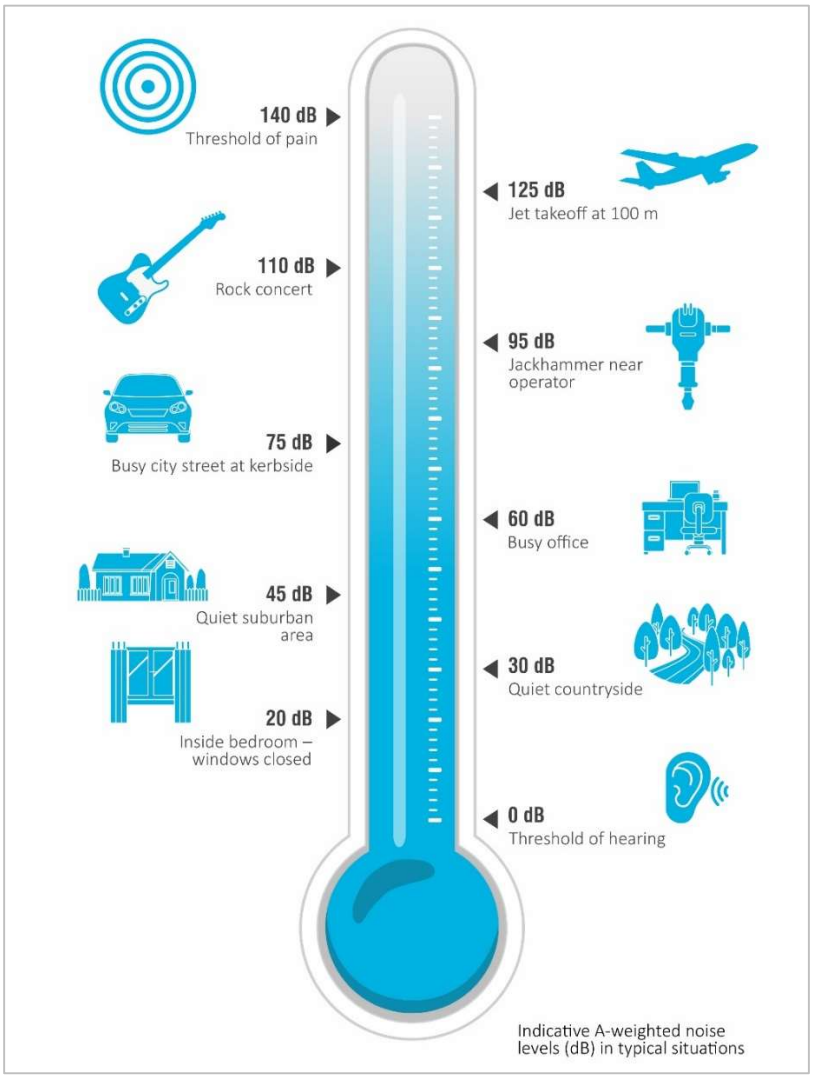


Figure A.1 Common noise levels

Appendix B
Regulator documents

EMM
creating opportunities

4. Prior to 31 March 2014, and every 12 months thereafter for each calendar year in which coal haulage from the site is undertaken utilising public roads, unless the Planning Secretary directs otherwise, the Applicant must commission a suitably qualified person, whose appointment has been approved by the Planning Secretary at least one month prior to undertaking the audit, to conduct an Independent Traffic Audit of the development. This audit must:
   (a) be undertaken without prior notice to the Applicant, and in consultation with TfNSW, NCC, CC Council and the CCC;
   (b) assess the impact of the development on the performance and safety of the road network, including a review of:
      - haulage records;
      - accident records on the haulage route, infringements relating to the code of conduct and any incidents involving haulage vehicles;
      - community complaints register; and
   (c) assess the effectiveness of the Road Transport Protocol; and, if necessary, recommend measures to reduce or mitigate any adverse (or potentially adverse) impacts.

5. Within 1 month of receiving the audit report, or as otherwise agreed by the Planning Secretary, the Applicant must submit a copy of the report to the Planning Secretary, with a detailed response to any of the recommendations contained in the audit report, including a timetable for the implementation of any measures proposed to address the recommendations in the audit report.

   A summary of the audit report must be included in the Annual Review.

Alternative Coal Transport Options

6. Prior to 31 December 2014, and every three years thereafter, the Applicant must prepare and submit to the Planning Secretary for approval, a study of the reasonable and feasible options to reduce or eliminate the use of public roads to transport coal from the development, unless otherwise agreed by the Planning Secretary. The assessment must include:
   (a) an analysis of the capital, construction and operating costs of the alternative transport options; and
   (b) quantified social and environmental impacts associated with road and rail transport.

NOISE

Noise Impact Assessment Criteria

7. The Applicant must ensure that the noise generated by the development at any residence on privately-owned land does not exceed the criteria for the location in Table 1 nearest to that residence.

Table 1: Noise Criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
R8	38	38	38	45
R11	49	49	49	54
R12	49	49	49	53
R13	43	43	43	49
R15	36	36	36	45
R19	37	37	37	45
R22	46	46	46	46
all other privately-owned land	35	35	35	45

Notes:
- *To interpret the locations referred to in Table 1, see Appendix 6 and the EIS; and*
- *Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 8 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.*

However, these criteria do not apply if the Applicant has a written agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

8. The Applicant must:
   (a) implement best management practice, including all reasonable and feasible noise mitigation measures, to minimise the construction, operational and transport noise generated by the development;
   (b) regularly assess the noise monitoring and meteorological data and relocate, modify, and/or stop operations on site to ensure compliance with the relevant conditions of this consent;
   (c) minimise the noise impacts of the development during meteorological conditions under which the noise limits in this consent do not apply (see Appendix 8);
   (d) use its best endeavours to achieve the long-term noise goals in Table 2, where reasonable and feasible, and report on progress towards achieving these goals in each Annual Review;
   (e) carry out a comprehensive noise audit of the development in conjunction with each independent environmental audit; and
   (f) prepare an action plan to implement any additional reasonable and feasible onsite noise mitigation measures identified by each audit;
   to the satisfaction of the Planning Secretary.

Table 2: Long-term Noise Goals dB(A)

Location	***Day***	***Evening***	***Night***
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$
R11 – R13	41	41	41
R22	40	40	40

Notes:
- *To interpret the locations referred to in Table 2, see Appendix 6 and the EIS; and*
- *Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 8 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.*

Noise Management Plan

9. The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
   (a) be prepared in consultation with the EPA and submitted to the Planning Secretary for approval within 4 months of the date of this consent, unless otherwise agreed by the Planning Secretary;
   (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
   (c) describe the proposed noise management system in detail including the mitigation measures that would be implemented to minimise noise during construction and operations, including on and off site road noise generated by vehicles associated with the development; and
   (d) include a monitoring program that:
      - uses attended monitoring to evaluate the compliance of the development against the noise criteria in this consent;
      - evaluates and reports on:
         - the effectiveness of the on-site noise management system; and
         - compliance against the noise operating conditions; and
      - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

The Applicant must implement the Noise Management Plan as approved by the Planning Secretary.

AIR QUALITY

Odour

10. The Applicant must ensure that no offensive odours are emitted from the site, as defined under the POEO Act.

APPENDIX 6
NOISE RECEIVER LOCATIONS

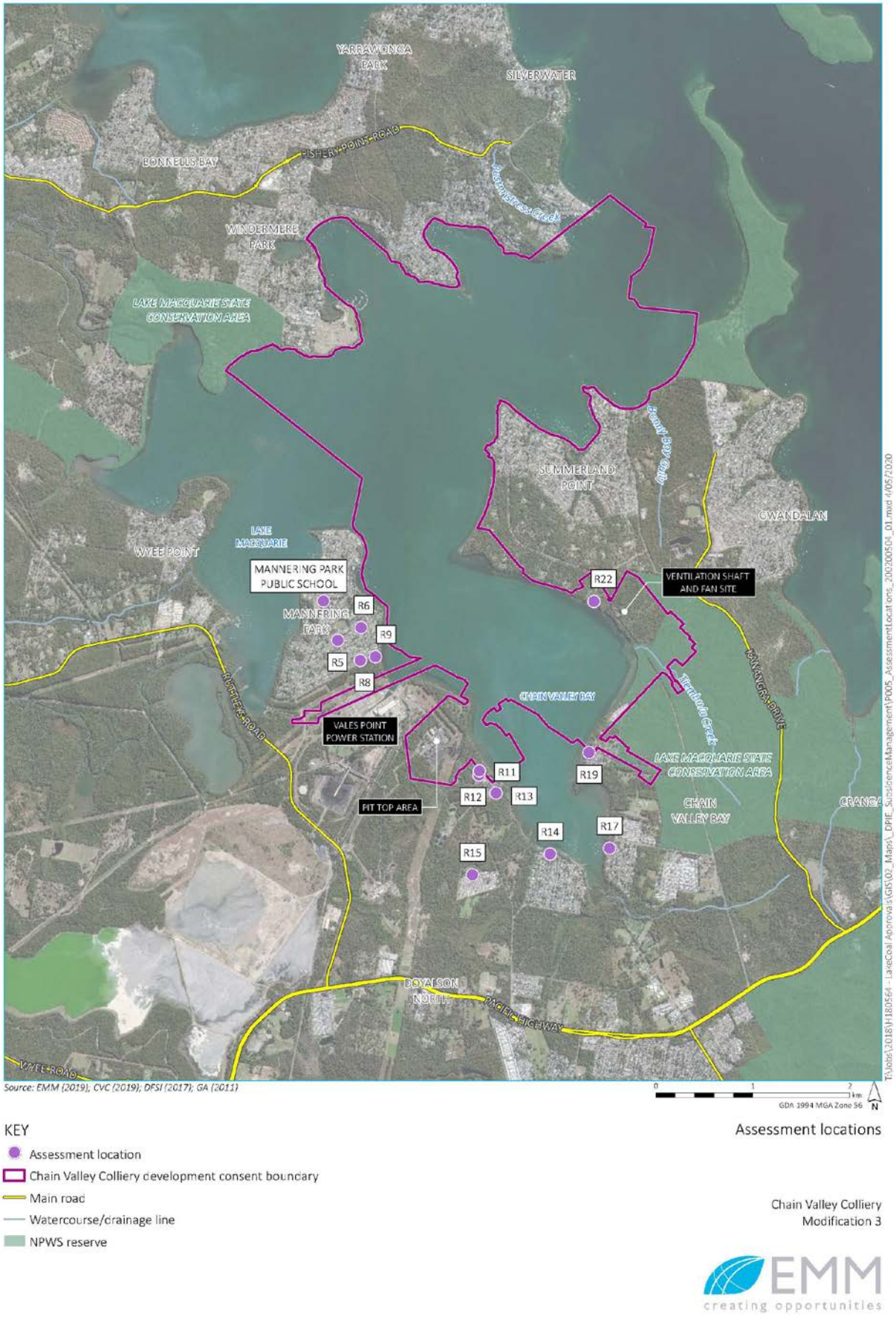


Figure 1: *Noise Receiver Locations*

APPENDIX 8
NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 1 of the conditions are to apply under all meteorological conditions except the following:
   (a) during periods of rain or hail;
   (b) average wind speed at microphone height exceeds 5 m/s;
   (c) wind speeds greater than 3 m/s measured at 10 m above ground level; or
   (d) temperature inversion conditions greater than 3°C/100 m.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station described in condition 14 of schedule 3.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.

4. This monitoring must be carried out at least 4 times in each calendar year (ie at least once every 3 months), unless the Planning Secretary directs otherwise.

5. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
   (a) monitoring locations for the collection of representative noise data;
   (b) meteorological conditions during which collection of noise data is not appropriate;
   (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

	results of this monitoring program will be reviewed by a suitably qualified expert and used to determine the appropriateness of the existing irrigation area to receive this effluent; • develop a program to monitor creek line channel stability and the health of riparian vegetation within Swindles Creek. Monitoring will be undertaken in accordance with Section 8.5.2 of the Surface Water Impact Assessment (EIS Appendix E) and incorporated into the Colliery's WMP or Biodiversity Management Plan; and • record monitoring data in accordance with the Colliery's WMP and EPL 1770. Monitoring data will be interpreted as it is received to ensure appropriate operational guidance on monitoring water quality within desired parameters. Results of water quality monitoring will be reported in the Annual Review and made available to the CCC, as well as CC Council and LMCC.
Noise	Management and monitoring of noise will continue to be undertaken in accordance with the Colliery's NMP, which will be reviewed and updated as required to include the commitments made below. Great Southern Energy Pty Limited will: • continue attended compliance monitoring on site which will be used to identify potential hot spots and primary noise sources; • continue real-time noise monitoring alerts to site personnel to enable implementation of any required rapid noise management initiatives; • manage potential non-compliance through a noise complaint handling and response system, including the identification of responsible sources to enable targeted remedial action; • assess if further noise mitigation options for the ventilation fans are reasonable and feasible following the receipt of attenuation proposals; and • discuss potential management measures or agreement options with the landowner at 275 Cams Boulevard, following receipt of proposals from acoustics specialists. In addition to the above, Great Southern Energy Pty Limited is committed to the progressive implementation of feasible measures to target long-term noise goals which are designed to reduce noise emissions from the Colliery. Long-term options for investigation include: • modification to belt/movement alarms; • investigation of surface conveyer and coal preparation equipment, to determine if noise reductions are possible; • identifying sound attenuation options for the surface bulldozer and front-end loader; • strategic placement of acoustic barriers; • attenuation for the surface screener/shaker; • installation of quiet rollers for surface conveyor belts; • acoustic treatments around compressors; and • the use of a conveyor stacker for product coal stockpiling.
Air Quality and greenhouse gases	Management and monitoring of air quality and greenhouse gases will continue to be undertaken in accordance with the Colliery's AQGHGMP, which will be reviewed and updated as required to include the commitments made below Great Southern Energy Pty Limited will: • investigate the use of a stacker to replace hauling between current conveyor system and stockpiles; • undertake GHG monitoring comprising measurement of carbon dioxide and methane at the ventilation shaft and fan sites; and • record and report annual diesel, oil, grease, acetylene and electricity use to fulfil National Greenhouse and Energy Reporting Scheme requirements.
Traffic and transport	Management and monitoring of traffic and transport will continue to be undertaken in accordance with the Colliery's RTP. In addition, Great Southern Energy Pty Limited will continue to investigate alternative options for transporting export coal to the Port of Newcastle, specifically the preferred rail transport option, requiring the construction of a private haul road to the VPPS coal unloading facility and associated infrastructure upgrades. In addition, Great Southern Energy Pty Limited will investigate options to reduce peak hour traffic would be investigated including potentially limiting the peak hourly volumes of the Colliery truck traffic which would be permitted to travel via this intersection should the Colliery not be using rail transport for export coal by five years from the granting of development consent. Alternatively, a pro-rata financial contribution to the cost of installing traffic signals at the southbound intersection of the F3 and Sparks Road interchange could be made commensurate with the percentage of Colliery generated traffic using the intersection.
Subsidence	Management and monitoring of subsidence will continue to be undertaken in accordance with the Colliery's SMP or Extraction Plans, which will be reviewed and

Environment Protection Licence

1	Discharge to waters Discharge quality and volume monitoring	Discharge to waters Discharge quality and volume monitoring	Discharge to waters and monitoring from final settlement pond, gravity fed discharge pipe as identified in plan titled "Delta Coal Chain Valley Colliery, Surface EPA Premises Plan, DRG No: C1S0165_2" 10 August 2021 and saved as EPA Document DOC21/691135.
27	Discharge to waters Discharge quality and volume monitoring	Discharge to waters Discharge quality and volume monitoring	Discharge to waters via dam spillway from final settlement pond adjacent to EPA Point 1 as identified in plan titled "Delta Coal Chain Valley Colliery, Surface EPA Premises Plan, DRG No: C1S0165_2" 10 August 2021 and saved as EPA Document DOC21/691135.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
9	Noise monitoring	Noise monitoring site R8 as defined in Development Consent SSD-5465 (MOD 3), located at 109 Griffith Street, MANNERING PARK, 2259
12	Noise monitoring	Noise monitoring site R11 as defined in Development Consent SSD-5465 (MOD 3), located at 35 Lakeshore Avenue, CHAIN VALLEY BAY, 2259
13	Noise monitoring	Noise monitoring site R12 as defined in Development Consent SSD-5465 (MOD 3), located at 20 Lakeshore Avenue, Kingfisher Shores, CHAIN VALLEY BAY, 2259
14	Noise monitoring	Noise monitoring site R13 as defined in Development Consent SSD-5465 (MOD 3), located at 33 Karoola Avenue, Kingfisher Shores, CHAIN VALLEY BAY, 2259
16	Noise monitoring	Noise monitoring site R15 as defined in Development Consent SSD-5465 (MOD 3), located at Short Street, Macquarie Shores, CHAIN VALLEY BAY, 2259
20	Noise monitoring	Noise monitoring site R19 as defined in Development Consent SSD-5465 (MOD 3), located at 2 Sunset Parade, CHAIN VALLEY BAY, 2259

23	Noise monitoring	Noise monitoring site R22 as defined in Development Consent SSD-5465 (MOD 3), located at 275a Cams Boulevard, CHAIN VALLEY BAY, 2259
26	Meteorological Station	Mannering Colliery Meteorological Station, Ruttleys Road, Doyalson 2259.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 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.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.4 Water and/or Land Concentration Limits

POINT 1,27

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Faecal Coliforms	colony forming units per 100 millilitres				200
pH	pH				6.5-8.5
Total suspended solids	milligrams per litre				50

Environment Protection Licence

L3 Volume and mass limits

L3.1 For each discharge point or utilisation area specified below (by a point number), the volume/mass of:
a) liquids discharged to water; or;
b) solids or liquids applied to the area;
must not exceed the volume/mass limit specified for that discharge point or area.

Point	Unit of Measure	Volume/Mass Limit
1	kilolitres per day	12161
27	kilolitres per day	12161

L3.2 The volumetric daily discharge limit for the premises is the combined discharge measured at EPA discharge points 1 and 27 and must not exceed 12161 kilolitres per day.

L4 Waste

L4.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled “Waste” and meeting the definition, if any, in the column titled “Description” in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled “Activity” in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled “Other Limits” in the table below.
This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	General or Specific exempted waste	Waste that meets all the conditions of a resource exemption under Clause 92 of the Protection of the Environment Operations (Waste) Regulation 2014.	As specified in each particular resource recovery exemption	NA

L5 Noise limits

L5.1 Noise generated at the premises that is measured at each noise monitoring point established under this licence must not exceed the noise levels specified in Column 4 of the table below for that point during the corresponding time periods specified in Column 1 when measured using the corresponding measurement parameters listed in Column 2.

POINT 12

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)

Environment Protection Licence

Day	Day-LAeq (15 minute)	-	49
Evening	Evening-LAeq (15 minute)	-	49
Night	Night-LAeq (15 minute)	-	49
Night	Night-LA1 (1 minute)	-	54

POINT 13

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	49
Evening	Evening-LAeq (15 minute)	-	49
Night	Night-LAeq (15 minute)	-	49
Night	Night-LA1 (1 minute)	-	53

POINT 14

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	43
Evening	Evening-LAeq (15 minute)	-	43
Night	Night-LAeq (15 minute)	-	43
Night	Night-LA1 (1 minute)	-	49

POINT 16

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	36
Evening	Evening-LAeq (15 minute)	-	36
Night	Night-LAeq (15 minute)	-	36
Night	Night-LA1 (1 minute)	-	45

POINT 20

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	37
Evening	Evening-LAeq (15 minute)	-	37
Night	Night-LAeq (15 minute)	-	37

Night	Night-LA1 (1 minute)	-	45

POINT 23

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	46
Evening	Evening-LAeq (15 minute)	-	46
Night	Night-LAeq (15 minute)	-	46
Night	Night-LA1 (1 minute)	-	46

POINT 9

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	38
Evening	Evening-LAeq (15 minute)	-	38
Night	Night-LAeq (15 minute)	-	38
Night	Night-LA1 (1 minute)	-	45

L5.2 The licensee must ensure that noise generated on the premises does not exceed:

a) 35 LAeq(15min) during the day, evening or night at any privately owned land nearest to the residence apart from those receivers identified in Condition 5.1; and
b) 45 LA1(1min) during the night at any privately owned land nearest to the residence apart from those receivers identified in Condition 5.1.

Note: The licensee may provide to the EPA written evidence of any agreement with a landholder which is subject to the above noise limits. The written evidence may be submitted with a licence variation to remove the landholder from the above tables.

L5.3 For the purpose of condition L5.1 and condition L5.2:
(a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and public holidays;
(b) Evening is defined as the period 6pm to 10pm, and
(c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

L5.4 The noise limits set out in condition L5.1 and condition L5.2 apply under all meterorological conditions except for any one of the following:

(a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
(b) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
(c) Stability category G temperature inversion conditions.
(d) Or as defined under the NSW EPA Noise Policy for Industry 2017.

L5.5 For the purpose of condition L5.4:
(a) the meteorological data to be used for determining meteorological conditions is the data recorded at the meteorological station identified in this licence as EPA Identification Point 26.
(b) Stability category temperature inversion conditions are to be determined in accordance with the NSW EPA Noise Policy for Industry 2017.

Note: The weather station must be designed, commissioned and operated in a manner to obtain the necessary parameters required under the above condition.

L5.6 For the purpose of determining the noise generated at the premises the licensee must use a Class 1 or Class 2 noise monitoring device as defined by AS IEC61672.1 and AS IEC61672.2-2004, or other noise monitoring equipment accepted by the EPA in writing.

L5.7 To determine compliance:

1. With the $L_{Aeq(15\ min)}$ noise limits in condition L5.1 and condition L5.2, the licensee must locate noise monitoring equipment;

(a) within 30 metres of a dwelling facade (but not closer than 3 metres) where any dwelling on the property is situated more then 30 metres from the property boundary that is closest to the premises;

(b) approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises, or, where applicable,

(c) within approximately 50 metres if the boundary of a national park or nature reserve.

2. With the LA1(1 minute) noise limits in condition L5.1 and L5.2, the noise monitoring equipment must be located within 1 metre of a dwelling facade.

3. With the noise limits in condition L5.1 and condition L5.2, the noise monitoring equipment must be located;

(a) at the most affected point at a location where there is no dwelling at the location, or

(b) at the most affected point within an area at a location prescribed by conditions L5.7 1(a) or L5.7 1(b).

L5.8 A non-compliance of condition L5.1 or condition L5.2 will still occur where noise generated from the premises in excess of the appropriate limit is measured;
a) at a location other than an area prescribed by conditions L5.7 1(a) and L5.7 1(b), and /or
b) at a point other than the most affected point at a location.

L5.9 For the purposes of determining the noise generated at the premises all applicable modification factors as described in the NSW EPA Noise Policy for Industry 2017 must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4 Environmental monitoring

Requirement to monitor noise

M4.1 To determine compliance with condition L5.1, attended noise monitoring must be undertaken in accordance with conditions L5.7 and L5.8, and

(a) at each one of the locations listed in condition L5.1;
(b) occur quarterly within the reporting period of the Environment Protection Licence with at least 2 months between monitoring periods;
(c) occur during each day, evening and night period as defined in the NSW Industrial Noise Policy (EPA 2000) for a minimum of 15 minutes for three of the quarters;
(d) the night time 15 minute attended monitoring in accordance with c) must be undertaken between the hours of 1am and 4am;
(e) the night time LA1 (1 min) attended monitoring in accordance with c) must be undertaken between the hours of 1am and 4am;
(f) one quarterly monitoring must occur during each day, evening and night period as defined in the NSW EPA Noise Policy for Industry 2017 for a minimum of 1.5 hours during the day; 30 minutes during the evening; and 1 hours during the night, and
(g) each quarterly monitoring must be undertaken on a different day(s) of the week not including Saturdays, Sundays and public holidays; and
(h) these monitoring conditions take effect in the 2015 Reporting period.

Note: The intention of this condition is that quarterly monitoring be undertaken at each sensitive receiver. That at each sensitive receiver monitoring is undertaken over a range of different days excluding weekends and public holidays during the reporting period so as to be representative of operating hours. That night time 15 minute attended monitoring and the LA1 (1min) monitoring for three of the quarters be undertaken at worst case being the most stable atmospheric conditions and when noise would be most intrusive to sleep. All of the sensitive receivers do not have to be monitored on the same day, evening and night for sub condition f.

M4.2 For the Annual Reporting Period ending March 2015 the EPA will accept all monitoring required by the current Department of Planning and Environment consent (usually quarterly monitoring for noise as dB(A) Leq15minutes) for compliance with noise monitoring requirements in this licence, as a single report attached to the Annual Return for the premises.

M5 Weather monitoring

M5.1 At the point(s) identified below, the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1 of the table below, using the corresponding sampling method, units of measure, averaging period and sampling frequency, specified opposite in the Columns 2, 3, 4 and 5 respectively.

2.4 Chain Valley Colliery Environmental Protection License 1770

CVC operates under EPL 1770 issued by the NSW EPA under the POEO Act. The EPL has been modified, most recently on 2 April 2019 acknowledging the transfer of ownership from LakeCoal Pty Ltd to Great Southern Energy Pty Ltd.

Noise related requirements of EPL 1770 together with where they are addressed in this NMP are provided in **Appendix E**.

2.5 Mannering Colliery Environmental Protection License 191

Mannering Colliery operates under EPL 191 issued by the NSW EPA under the POEO Act. The EPL has been modified, most recently on 1 April 2019 following the statutory five-year review and consisting of a number of variations which were mostly administrative in nature.

Condition L5 of EPL 191 notes that noise limits are not specified, with the Department of Planning, Industry and Environment being the appropriate authority for regulating noise conditions under Project Approval 06_0311.

2.6 Operational Noise Criteria

Noise limits within CVC Development Consent SSD-5465 and MC Project Approval 06_0311 have been outlined in **Table 2**.

Table 2: Consented Operational Noise Criteria dB(A) for Delta Coal Collieries

Consent/Approval/EPL Location	Day		Evening		Night		
	$L_{Aeq\ (15\ min)}$		$L_{Aeq\ (15\ min)}$		$L_{Aeq\ (15\ min)}$		$L_{A1\ (1\ min)}$
Chain Valley Colliery							
R8 (EPL Point 8)	38		38		38		45
R11 (EPL Point 11)	49	41^	49	41^	49	41^	54
R12 (EPL Point 12)	49	41^	49	41^	49	41^	53
R13 (EPL Point 13)	43	41^	43	41^	43	41^	49
R15 (EPL Point 15)	36		36		36		45
R19 (EPL Point 19)	37		37		37		45
R22 (EPL Point 22)	46	40^	46	40^	46	40^	46
All other privately-owned land	35		35		35		45
Mannering Colliery							
4 – di Rocco	40		36		36		46
5 – Keighran	40		39		39		49
6 – Swan	40		37		37		47
7 – Druitt	40		35		35		45
8 – Macquarie Shores Home Village	42		42		42		47
9 – Jeans	40		37		37		47
11 – Jeans	40		36		36		46
18 – Jeans	40		36		36		46
20 – Knight and all other privately-owned residences	40		36		36		46

^ = Long Term Noise Goals (where long-term goals differ from consented criteria)

Noise criteria outlined in **Table 2** do not apply if Delta Coal has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria and Delta Coal has advised the EPA and DPIE in writing of the terms of this agreement.

As CVC has been operating for approximately 58 years, some of the predicted noise impacts at local receivers are greater than would usually be permissible without the requirement to offer noise treatments or voluntary acquisition. Notably the relocation of coal handling from CVC to MC in 2017 significantly improved CVC progression toward realising the long-term goals at receivers R11 to R13, where currently monitoring typically notes that occasional forklift and plant start-up warnings can be heard during monitoring at these receivers, while typically the site is inaudible. Consistent with noise monitoring results, community complaints from residents at these receivers regarding noise emissions has significantly decreased.

4.2.2 Chain Valley Colliery

Consistent with the noise impact assessment prepared by AECOM Pty Ltd for CVC in 2011 and undertaken as part of the Environmental Impact Statement (EIS) for Development Consent of SSD-5465, residential receivers have been divided into seven (7) noise catchment areas with similar geographical and acoustic features. The following points are considered representative of each noise catchment area:

- ATN001, representative of EPL 1770 monitoring point identification number 9, also identified in Development Consent SSD-5465 as receiver 'R8'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Mannering Park, northwest of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN002, representative of EPL 1770 monitoring point identification number 12, also identified in Development Consent SSD-5465 as receiver 'R11'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Kingfisher Shores, south-east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN003, representative of EPL 1770 monitoring point identification number 16, also identified in Development Consent SSD-5465 as receiver 'R15'. The attended monitoring point captures noise emissions at privately-owned relocatable residences within MSHV, south of the Chain Valley Colliery pit top. The dominant noise sources in this receiver area are birds, insects, traffic and other industrial sources. Activities at Mannering Colliery are also audible at times;
- ATN004, representative of Development Consent SSD-5465 receiver 'R14'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Chain Valley Bay South, south-east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN005, representative of Development Consent SSD-5465 receiver 'R17'. The attended monitoring point captured noise emissions at privately-owned residential properties located in Chain Valley Bay East, south-east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources;
- ATN006, representative of EPL 1770 monitoring point identification number 20, also identified in Development Consent SSD-5465 as receiver 'R19'. The attended monitoring point captures noise emissions at privately-owned residential properties located in Chain Valley Bay North, east of the Chain Valley Colliery pit top. The dominant noise sources in this area are birds, insects, traffic and other industrial sources
- ATN007, representative of EPL 1770 monitoring point identification number 23, also identified in Development Consent SSD-5465 as receiver 'R22'. The attended monitoring point captured

noise emissions at privately-owned residential properties located in Summerland Point, surrounding Chain Valley Colliery's Summerland Point ventilation shaft and fan site. The dominant noise sources in this area are birds, insects, traffic and the Summerland Point ventilation shaft and fan site.

It is noted that, with reference to the requirements of the EPL, two receivers were not considered to be captured by the seven (7) noise catchment areas outlined in the EIS and as such, monitoring is to be undertaken at the following points in addition to locations ATN001 to ATN007:

- R12, identified in EPL 1770 as noise monitoring point 13, noted to be adjacent to ATN002 at Kingfisher Shores on Lakeshore Avenue, Kingfisher Shores; and
- R13, identified in EPL 1770 as noise monitoring point 14, located on Karoola Avenue, Kingfisher Shores.

The spatial locations of the CVC attended monitoring locations and relevant noise criteria are detailed in **Table 5** below.

Table 5: Noise Monitoring Locations and Limits for Chain Valley Colliery

Location	Receivers Represented EPL 1770 ID SSD-5465 ID	Coordinates	Day $L_{Aeq(15\ min)}$ dB (A)	Evening $L_{Aeq(15\ min)}$ dB (A)	Night $L_{Aeq(15\ min)}$ dB (A)	Night $L_{A1(1\ min)}$ dB (A)
ATN001	EPL #9 R8	364140 E 6330594 N	35	35	35	35
ATN002	EPL #12 R11	365218 E 6329388 N	49	49	49	54
ATN003	EPL#16 R15	365165 E 6328323 N	36	36	36	45
ATN004	N/A R14	365949 N 6328530 E	35	35	35	45
ATN005	N/A R17	366560 N 6328590 E	35	35	35	45
ATN006	20 R19	366305 N 6329321 E	37	37	37	45
ATN007	23 R22	366425 N 6331135 E	46	46	46	46
R12	13 R12	365185 N 6329352 E	49	49	49	53
R13	14 R13	365391 N 6329169 E	43	43	43	49

Appendix C
Calibration certificates

EMM
creating opportunities

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C37642

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV 36 **Serial No:** 86311
Class: 1
Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure	1003	hPa ±1 hPa	**Date of Receipt :**	11/10/2023
Temperature	23	°C ±1° C	**Date of Calibration :**	13/10/2023
Relative Humidity	38	% ±5%	**Date of Issue :**	13/10/2023

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Accredited Lab No. 9262
Acoustic and Vibration Measurements

Acu-Vib Electronics
CALIBRATIONS SALES RENTALS REPAIRS

Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C37508

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV 36 **Serial No:** 79952
Class: 1
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure	1005	hPa ±1 hPa	**Date of Receipt :**	26/09/2023
Temperature	23	°C ±1° C	**Date of Calibration :**	27/09/2023
Relative Humidity	47	% ±5%	**Date of Issue :**	28/09/2023

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34169

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	3029363
Mic. Type:	4189	**Serial No:**	3260501
Pre-Amp. Type:	ZC0032	**Serial No:**	30109
Filter Type:	1/3 Octave	**Test No:**	F034175

Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	02/11/2022
Temperature	24	°C ±1° C	**Date of Calibration :**	03/11/2022
Relative Humidity	35	% ±5%	**Date of Issue :**	04/11/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Jack Kielt

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Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
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Certificate Of Calibration

Certificate No: SLM31670

Equipment Tested: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	2759405
Mic. Type:	4189	**Serial No:**	2983733
Pre-Amp. Type:	ZC0032	**Serial No:**	22666
Filter Type:	1/3 Octave	**Test No:**	F031671

Owner: EMM Consulting
Level 3, 175 Scott Street
Newcastle, NSW 2300

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

Conditions Of Test:

Ambient Pressure	992	hPa ±1 hPa	**Date of Receipt :**	02/02/2022
Temperature	26	°C ±1° C	**Date of Calibration :**	02/02/2022
Relative Humidity	48	% ±5%	**Date of Issue :**	03/02/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

Checked By: ..... **Authorised Signature:** .....

Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

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Spring Hill QLD 4000
T 07 3648 1200

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Suite 2.04 Level 2
15 London Circuit
Canberra City ACT 2601

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Adelaide SA 5000
T 08 8232 2253

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Melbourne VIC 3000
T 03 9993 1900

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T 604 999 8297

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emmconsulting.com.au

Appendix 9: Annual Subsidence Report 2023

SITE:	Chain Valley Colliery and Mannering Colliery
Department:	Technical Services
REPORT TITLE:	2023 Annual Subsidence Report
Prepared by:	Lachlan McWha – Environment & Approvals Coordinator
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1 Introduction

1.1 Background

Chain Valley Colliery (CVC) and Mannering Colliery (MC) are underground coal mines on the southern side of Lake Macquarie, approximately 60 kilometres (km) south of Newcastle and 80 km north of Sydney.

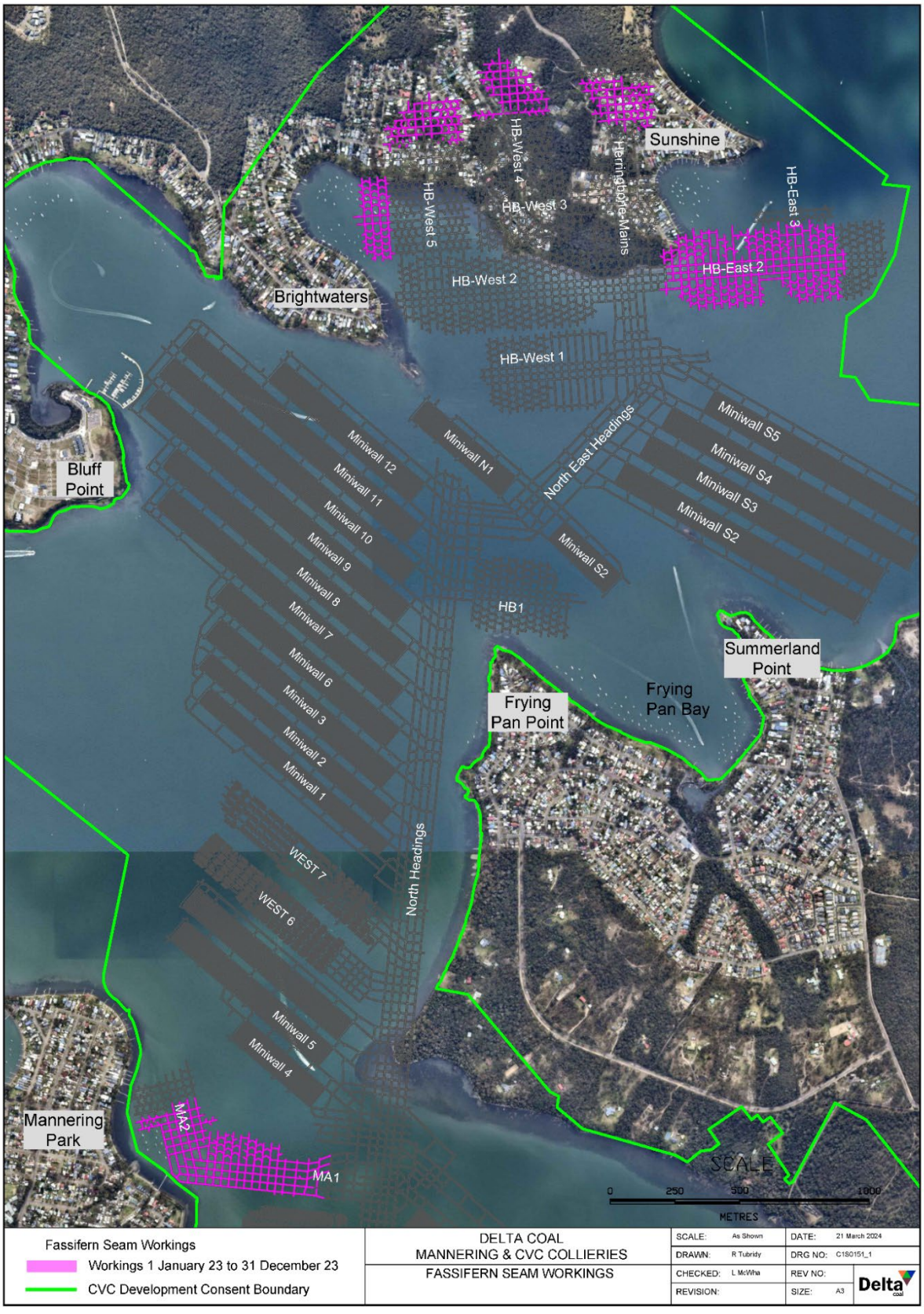
CVC operates under Development Consent SSD-5465, as modified, which was originally granted on 23 December 2013 by the then Minister for Planning and Infrastructure under Part 4, Division 4.1 of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act), which relates to State significant development (SSD). The consent permits underground bord and pillar mining as well as Miniwall mining in the Fassifern Seam at a maximum rate of 2.1 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal, with all secondary extraction confined to areas under the Lake Macquarie water body.

MC was granted Project Approval (MP06_0311) under Part 3A of the EP&A Act on 12 March 2008 and, as modified, permits the extraction of up to 1.1 Mtpa of ROM coal until 31 December 2027. It also permits the handling of up to 2.1 Mtpa ROM coal with that coal transported via a dedicated overland conveyor to Delta Electricity's Vales Point Power Station (VPPS) for domestic energy generation.

1.2 Purpose

This Annual Subsidence Report (ASR) provides an overview of subsidence monitoring data and management performance for CVC and MC in the 2023 calendar year and has been prepared as an appendix to the Chain Valley Colliery and Mannering Colliery Annual reviews.

Figure 1 - CVC Fassifern Workings (pink represents 2023 extraction)



1.3 Approvals and Legislation

This ASR has been prepared to meet the annual subsidence report requirement within the CVC SSD-5465 Statement of Commitments.

Subsidence monitoring is undertaken in accordance with Chain Valley Colliery's approved Subsidence Monitoring Programs (SMP):

- Chain Valley Colliery, Subsidence Monitoring Program, Northern Mining Area First Workings and Lake Macquarie Extraction, August 2021.
- Chain Valley Colliery, Subsidence Monitoring Program, Miniwall S5 and Northern Mining Area Pillar Extraction, November 2020 (forms part of the approved CVC MWS5 and NMA Extraction Plan).

1.4 Stakeholder Engagement

Delta Coal has consulted with the local community via the CVC and MC Community Consultative Committee (CCC) on subsidence results at the four quarterly meetings undertaken in 2023. This report is appended to the 2023 Chain Valley Colliery and Mannering Colliery Annual Reviews and will be provided to the CCC and applicable stakeholders as well as being made publicly available on the Delta Coal website.

1.5 Supporting Documentation

This ASR is informed by the relevant sections of the following documents:

- March 2023, Lake Macquarie Benthos Survey Report No. 23. Report prepared by J.H. & E.S. Laxton – Environmental Consultants P/L for Delta Coal
- June 2023, Seagrass Survey of Chain Valley Bay, Summerland Point, Bardens Bay and Crangan Bay, Lake Macquarie, NSW (Results for 2008 to 2023). Report prepared by J.H. & E.S. Laxton – Environmental Consultants P/L for Delta Coal
- 2023 Benthic Communities Management Plan, Delta Coal
- 2021 Seagrass Management Plan, Delta Coal
- 2020 Subsidence Monitoring Program, Delta Coal (Extraction Plan Miniwall S5 and Northern Pillar Extraction)
- 2021 Subsidence Monitoring Program, Delta Coal (Northern Mining Area First Workings and Lake Macquarie Pillar Extraction)
- 2020 Chain Valley Colliery Miniwall S5 and Northern Pillar Area Extraction Plan
- 2021 Built Features Management Plan, Delta Coal

- 2021 Public Safety Management Plan, Delta Coal
- 2022 Benthic Communities Monitoring Statistical Analysis Report prepared by EMM Consulting for Delta Coal

2 Monitoring and Comparison

2.1 Monitoring Overview

As detailed in Section 1.4.1, CVC has a two actively approved Subsidence Monitoring Programs, with one program addressing Miniwall S5 and pillar extraction and the other addressing first-workings and pillar extraction in Lake Macquarie. Scope of Subsidence Monitoring.

Monitoring undertaken in 2023 comprised:

- Shoreline and terrestrial monitoring of fixed reference points installed prior to underground mining to determine levels of vertical subsidence;
- Bathymetric scans of the lake bed in areas of secondary extraction, surveys are undertaken prior to, during and following secondary extraction; and
- Visual inspections undertaken of areas overlying mining zones, with particular focus on steep slopes and cliffs in built areas, for signs of possible surface disturbance.

2.1.1 Shoreline (High Water Subsidence Control Zones)

In accordance with Condition 1, Schedule 4 of SSD-5465, vertical subsidence within the HWMSB is limited to a maximum subsidence (S_{max}) of 20 mm. The primary control to achieve this limit is the implementation of a conservative mine design, utilising first workings only with long term stable pillars in this zone.

To monitor the effectiveness of the mine design, monitoring of the shoreline is carried out at fixed reference marks (subsidence marks) which are surveyed at regular intervals. The frequency is dependent on the proximity to active operations.

2.1.2 Seagrass

Condition 2, Schedule 4 of SSD-5465 specifies negligible environmental impacts on the species of seagrass found within the current area of mining operations as a condition of approval. Surveys of the seagrass extents are undertaken in order to monitor impacts on the seagrass population.

Delta Coal's *Seagrass Management Plan* (2021) outlines the methodology used to determine changes to composition and quantity of seagrass populations in Lake Macquarie as a result of mining activities at CVC.

Subsidence monitoring of the lakebed is undertaken via bathymetric survey over CVC's current mining area in order to validate subsidence predictions.

2.1.3 Benthic Communities

Seasonal surveys of the lake bed are undertaken in order to monitor variations in the composition and density of benthos due to mining, environmental and/or other seasonal factors. Condition 2, Schedule 4 of SSD-5465 requires nil or minor environmental consequences on benthic communities as a result of mining induced subsidence.

Delta Coal's *Benthic Communities Management Plan* (Delta Coal 2023) outlines the methodology used to determine changes to species diversity and abundance.

Subsidence monitoring of the lakebed is undertaken via bathymetric survey over CVC's current mining area in order to validate subsidence predictions and to determine approximate levels of subsidence on specific benthic sample locations.

2.1.4 Methods of Subsidence Monitoring

2.1.4.1 Overview

Subsidence monitoring at CVC includes a combination of bathymetric surveys and terrestrial level monitoring. Results are used to validate modelled outcomes; enable early detection of subsidence trends which allows adaptive management and the implementation of contingency measures.

2.1.4.2 Bathymetric Surveys

A third party is commissioned to undertake bathymetric surveys over the areas of past, current and proposed workings at CVC and MC. Baseline bathymetric data was provided to NSW Office of Environment and Heritage (OEH) in 2010. The accuracy of the bathymetric surveys are ±0.1 m.

Since 2012, bathymetric surveys have been completed on at least an annual basis with ongoing surveys providing accurate details of the lake depth within CVC's mining areas. During the 2017 survey it was identified that the site had exceeded vertical subsidence predictions over the MW7-12 mining area by approximately 370mm. LakeCoal (the operator at that time) notified the relevant authorities of the exceedance and submitted an incident report on 11 November 2017. Subsidence associated with MW7-12 has proven to have stabilised since, with no discernible affect identified within seagrass and benthic communities monitoring.

Table 1 - Chain Valley Colliery Secondary Extraction Subsidence Monitoring Commitments

Secondary Extraction Panel	Approved S_{max}(mm)	Predicted S_{max} (mm)	Measured S_{max} (mm)	Extraction Completion date	Post Extraction Bathymetric Scanning Commitment
Miniwall S1	780	420	<200	September 2018	Annual for 3 years unless TARP triggered
Miniwall S2	780	300	200-250	March 2020	Annual for 3 years unless TARP triggered
Miniwall S3	780	300	350-400	July 2020	Annual for 3 years unless TARP triggered
Miniwall S4	780	300	500-550	February 2021	Annual for 3 years unless TARP triggered
Miniwall S5	780	500	350-400	August 2021	Annual for 3 years unless TARP triggered
NMA Pillar Extraction	780	500	n/a	Not commenced in 2023.	Annual for 3 years unless TARP triggered

Monitoring will continue in accordance with the approved *Miniwall S5 and Northern Pillar Extraction Plan* in the 2024 period.

A software error was identified in the bathymetric survey results in the 2023 reporting period, which altered the survey height results. Unfortunately, this software error resulted in a -0.15m height discrepancy between the old and new projects.

This was a software developer error for that particular version (2012) of the software and was corrected in the 2023 bathymetric data, but was present in previous surveys (excluding the baseline survey). Going forward, Delta Coal will keep the old project levels and adjust survey values by +0.15m to align with the old data. All data will be remain relevant to the original baseline survey.

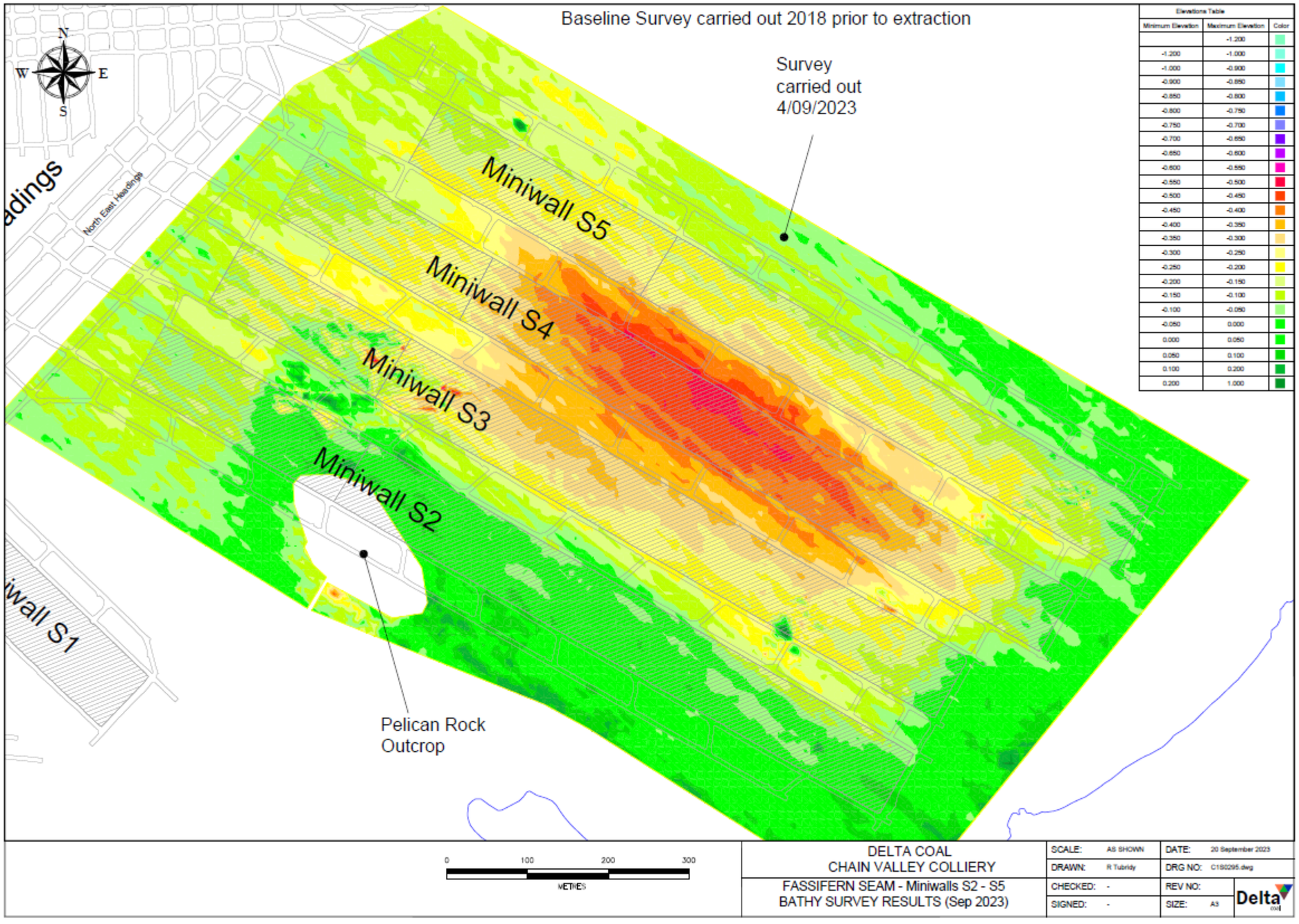
3 Bathymetric Monitoring

Bathymetric scans undertaken in September 2023 have been provided as **Figure 2** and includes:

- MWS1, MWS2, MWS3, MWS4, MWS5 and NMA Mains (annual survey) undertaken in September 2023.

Figure 2 presents Bathymetric surveys over the Miniwall S1-S5 extraction area which have indicated subsidence of up to 500-550 mm directly over the extracted area of MWS4 which prompted a independent geotechnical review to ensure ongoing compliance with the subsidence limit of 780mm.

Figure 2 - Miniwalls N1, S1, S2, S3, S4, S5 Bathymetric Scan - September 2023

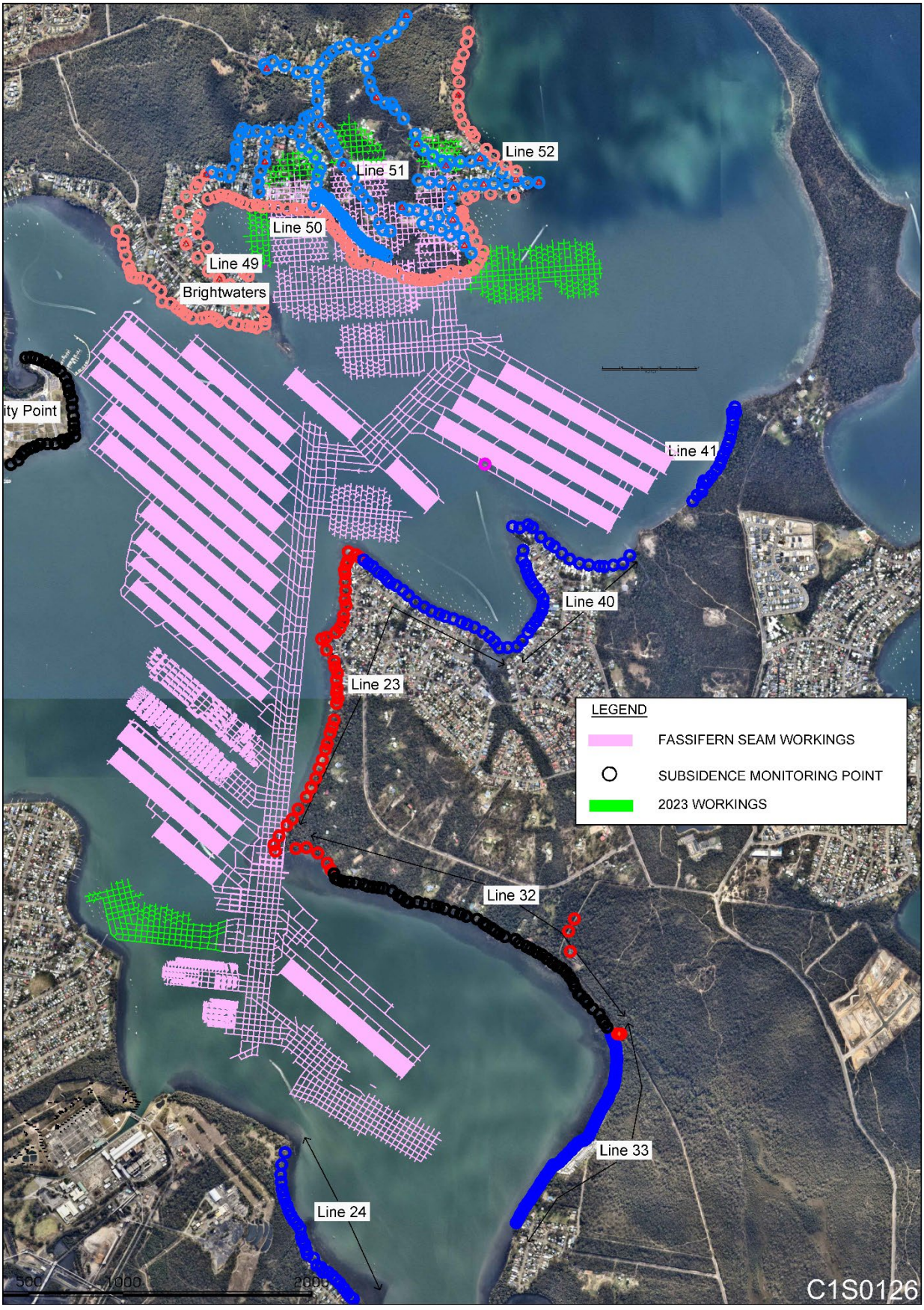


4 Foreshore Monitoring

Delta Coal completes subsidence monitoring around Trinity Point, Brightwaters, Mirrabooka, Sunshine Frying Pan Bay, Summerland Point & Chain Valley Bay (**Figure 3**). Monitoring points occur along the foreshore at approximately 20 m – 30 m intervals where practicable / achievable. Monitoring survey results are uploaded to the Resources Regulator SSIMS portal within 10 days of survey.

A Visual Subsidence Inspection Proforma is completed at monthly intervals over the current mining areas under an agreement between Delta Coal and the Resources Regulator. These visual inspections, look for any signs of impacts or changes to public safety and include visual inspection of steep slopes, ponding and other potential effects of mine subsidence. Annual foreshore surveying was undertaken throughout 2023.

Figure 3 - Foreshore Subsidence Monitoring Points



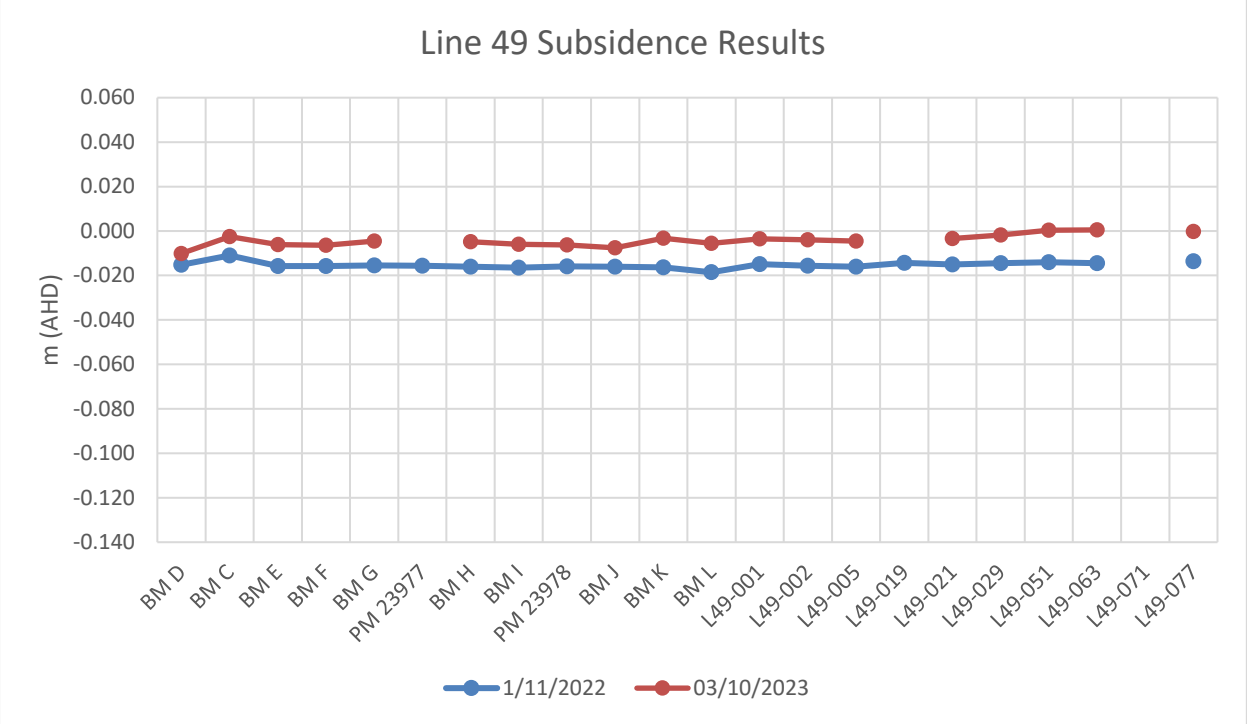
4.1 Chain Valley Colliery

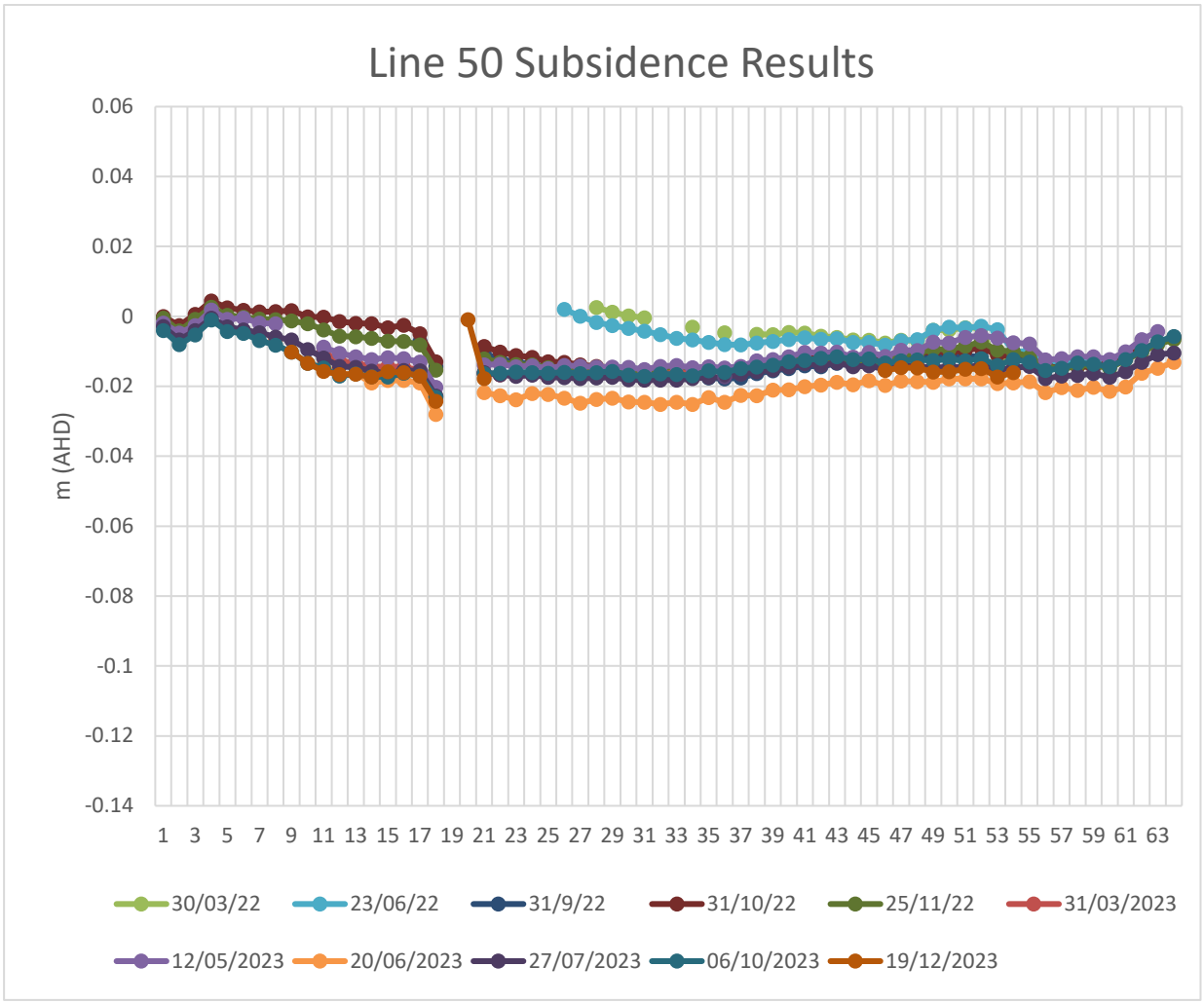
4.1.1 Morisset Peninsula Line 49, 50, 51 and 52

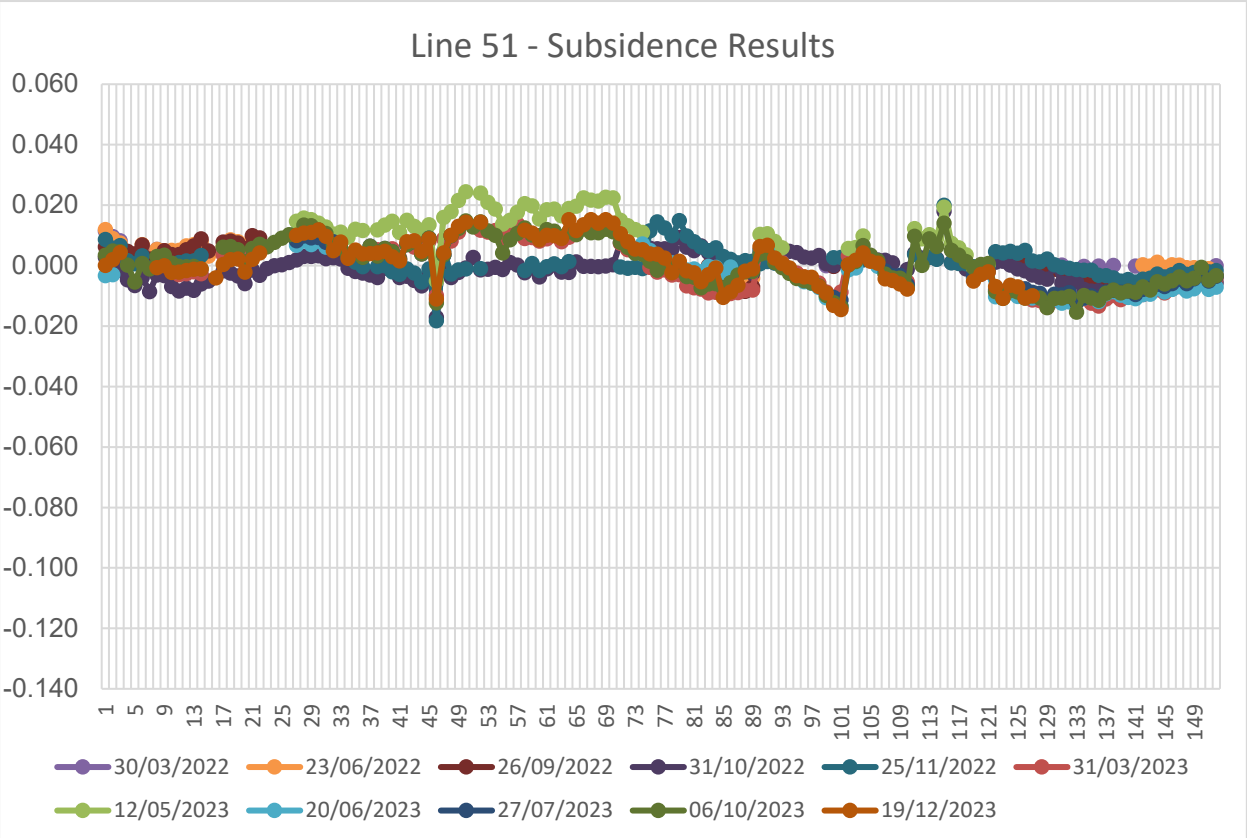
Foreshore monitoring lines 49, 50 and 51 were installed in 2021, for the purpose of monitoring potential subsidence associated with future northern mining area workings. Line 52 was installed in 2022 to cover the foreshore as mining extends to the north. Surveys are carried out over the current mining areas quarterly, with annual surveys over the full grid.

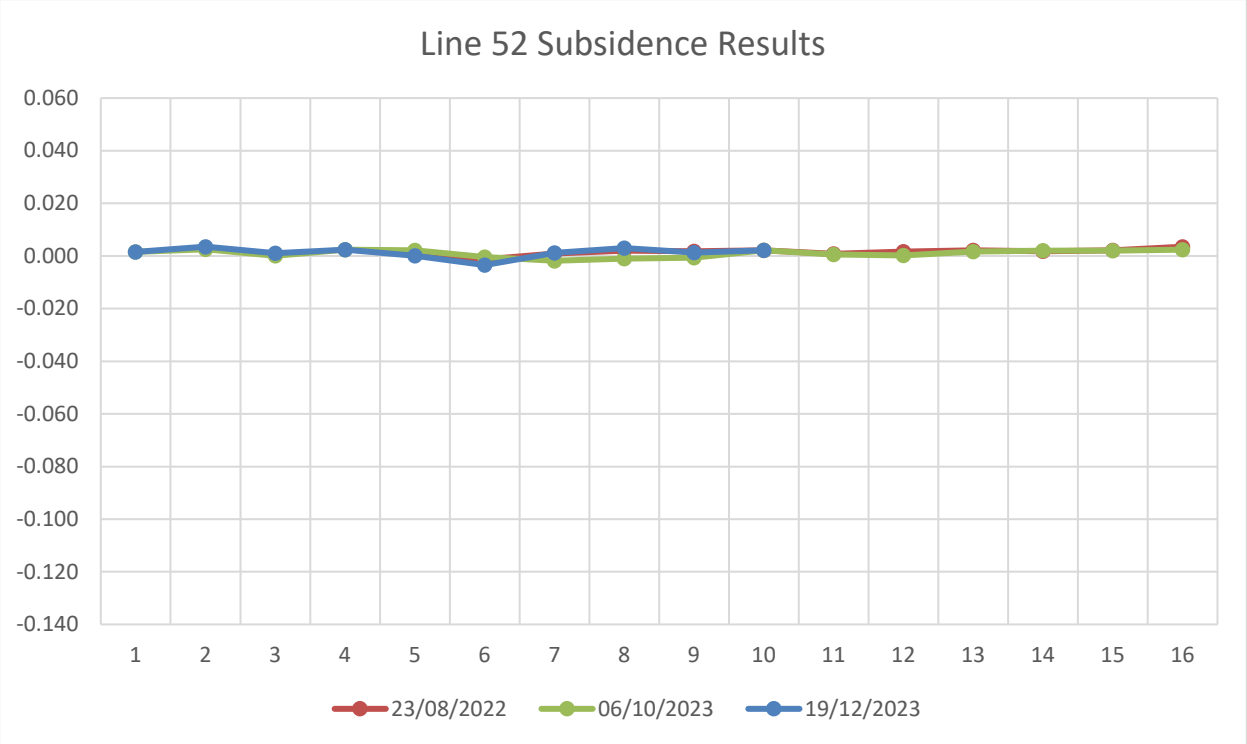
Survey results in the charts below show less than 20mm movement, with exception to:

- Anomalous results from L50-18.
- Anomalous results received from L50 June 2023 survey, presumed to be natural ground movement as subsequent survey results were compliant with the 20mm subsidence limit (July 2023, October 2023 and December 2023).



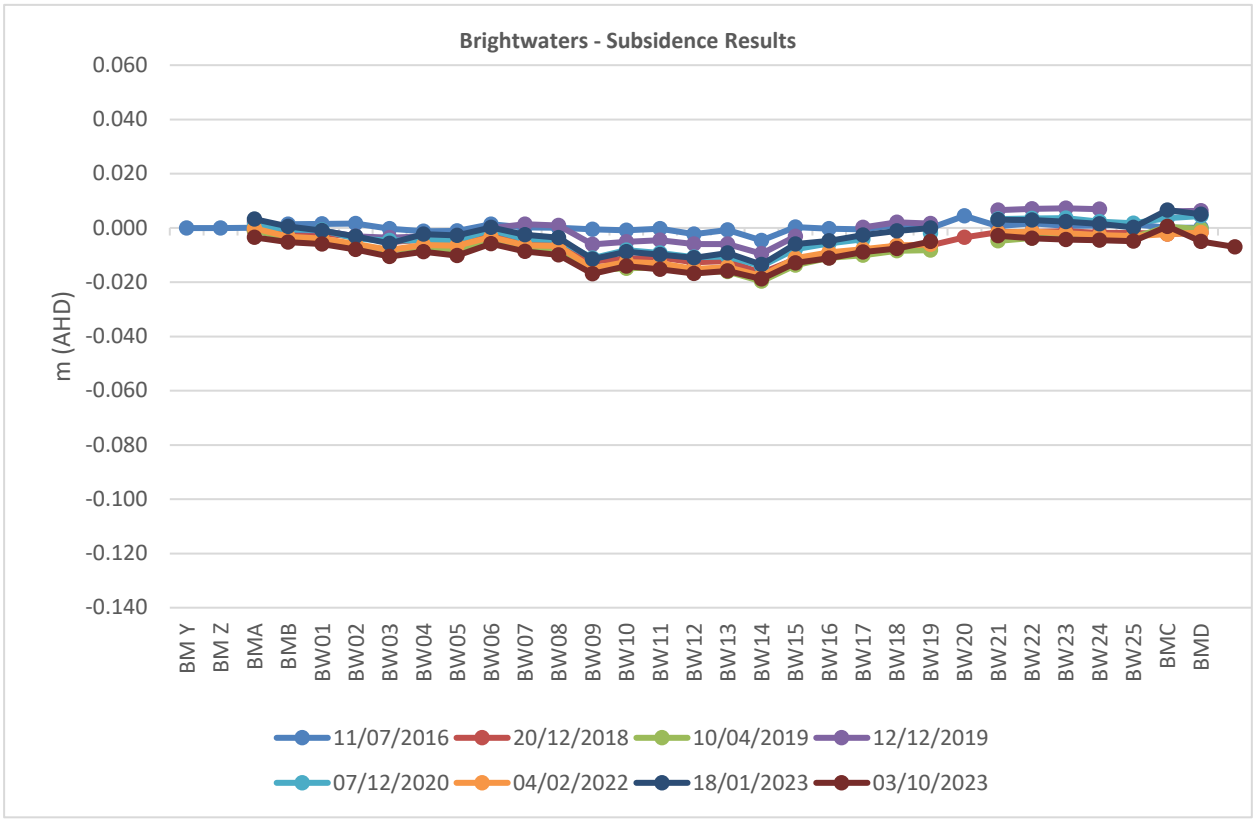

Line 50 Subsidence Results
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
-0.12
-0.14
m (AHD)
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63
30/03/22
23/06/22
31/9/22
31/10/22
25/11/22
31/03/2023
12/05/2023
20/06/2023
27/07/2023
06/10/2023
19/12/2023


Line 51 - Subsidence Results
0.060
0.040
0.020
0.000
-0.020
-0.040
-0.060
-0.080
-0.100
-0.120
-0.140
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97 101 105 109 113 117 121 125 129 133 137 141 145 149
30/03/2022
23/06/2022
26/09/2022
31/10/2022
25/11/2022
31/03/2023
12/05/2023
20/06/2023
27/07/2023
06/10/2023
19/12/2023


Line 52 Subsidence Results
0.060
0.040
0.020
0.000
-0.020
-0.040
-0.060
-0.080
-0.100
-0.120
-0.140
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
23/08/2022
06/10/2023
19/12/2023

4.1.2 Brightwaters

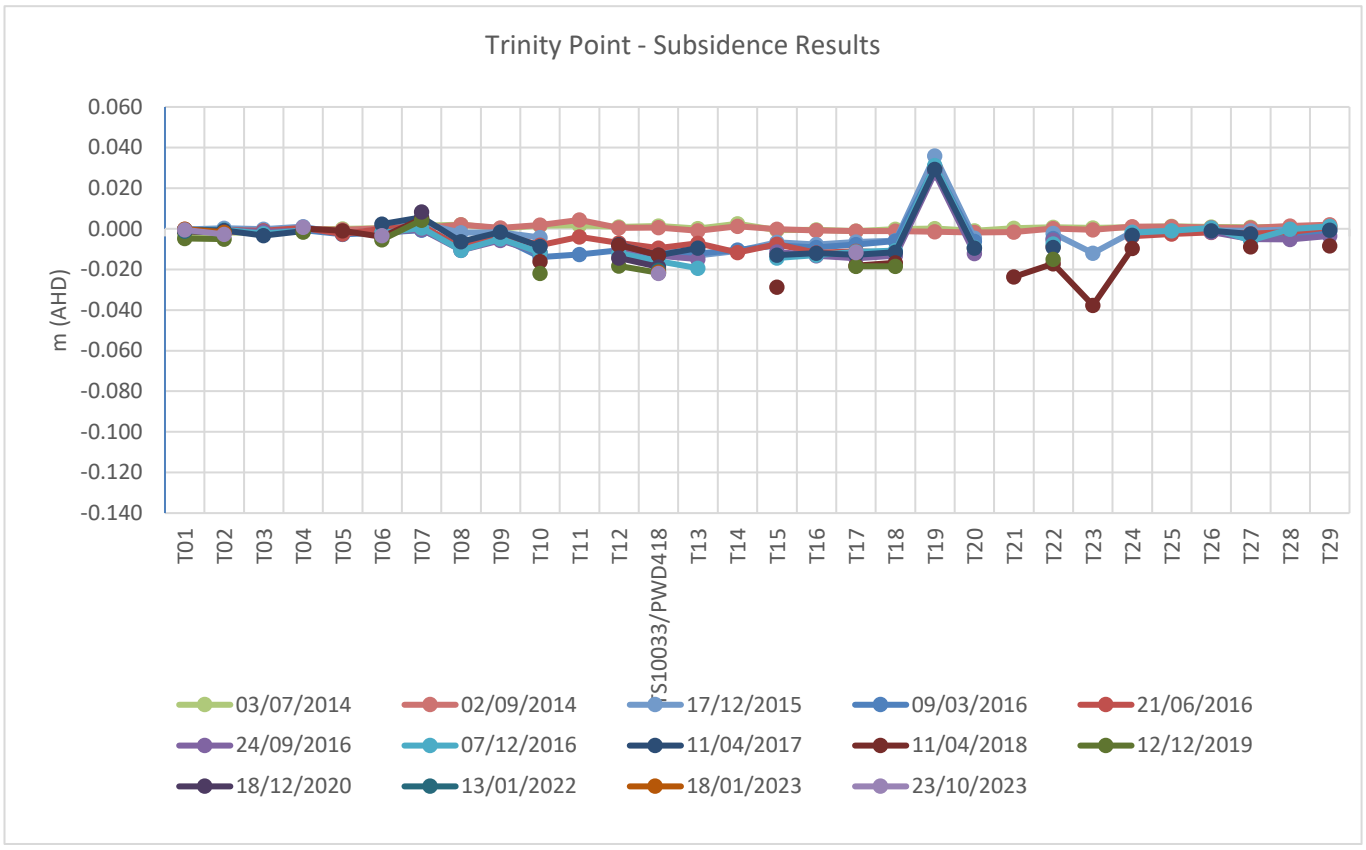
Monitoring points were installed along the Brightwaters peninsula in June 2016 to monitor the effects of Miniwall 11 and 12 extraction. Surveys are carried out over the Brightwaters foreshore annually.



4.1.3 Trinity Point

Monitoring points were installed in the Trinity Point area in 2014 for shoreline monitoring during extraction of Miniwalls 7-12 panels. Since 2018 a number of marks have been disturbed or destroyed due to development along the foreshore in the area. The 2023 annual survey shows only 7 marks that were able to be identified, however nil movement attributable to subsidence has been detected. A few anomalous marks show greater than 20mm movement but all can be attributed to local disturbance of the mark. These anomalous marks are PWD418, T15, T21 and T23.

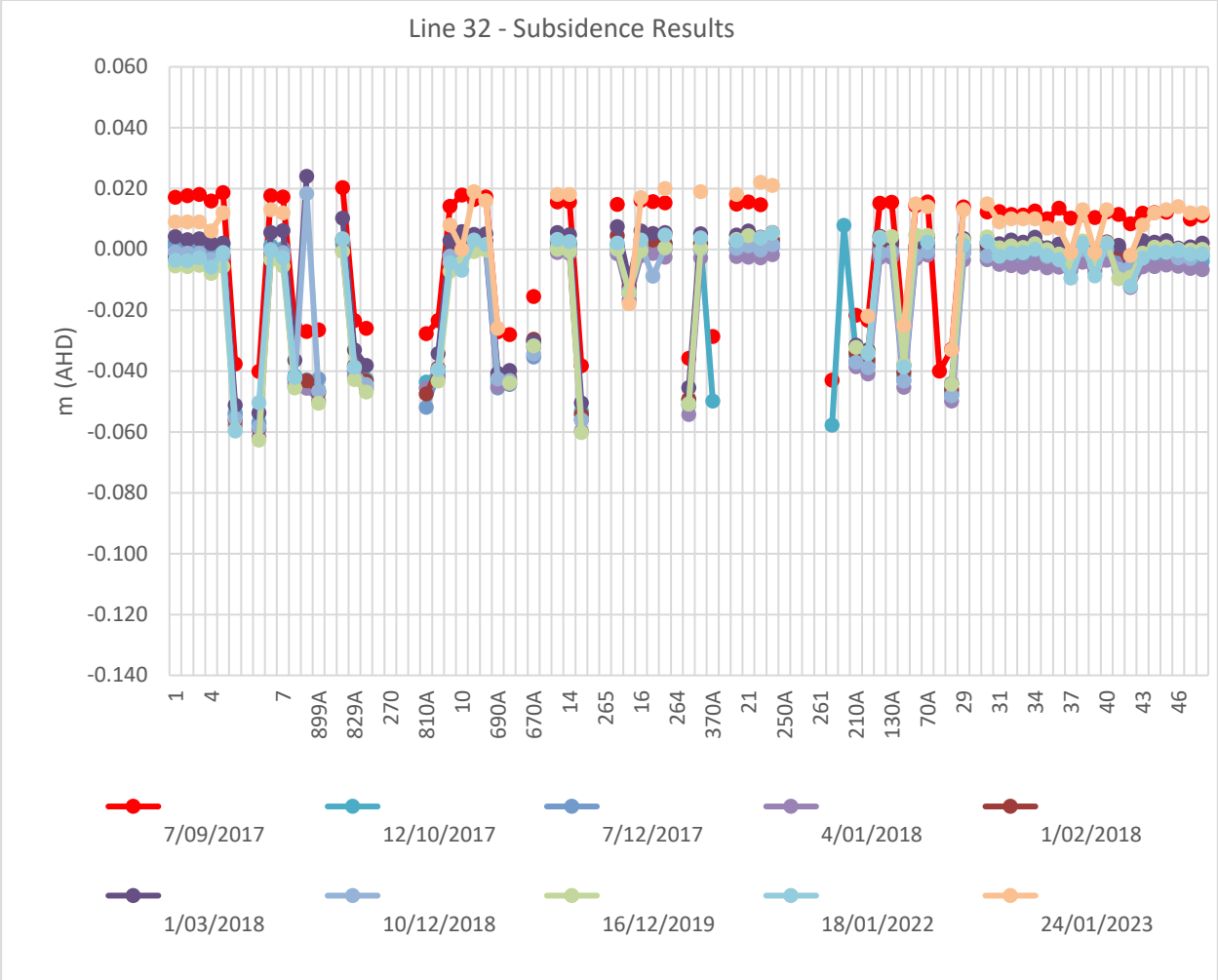
This monitoring line is surveyed annually.



4.1.4 Summerland Point, Lines 32, 23, 40 and 41

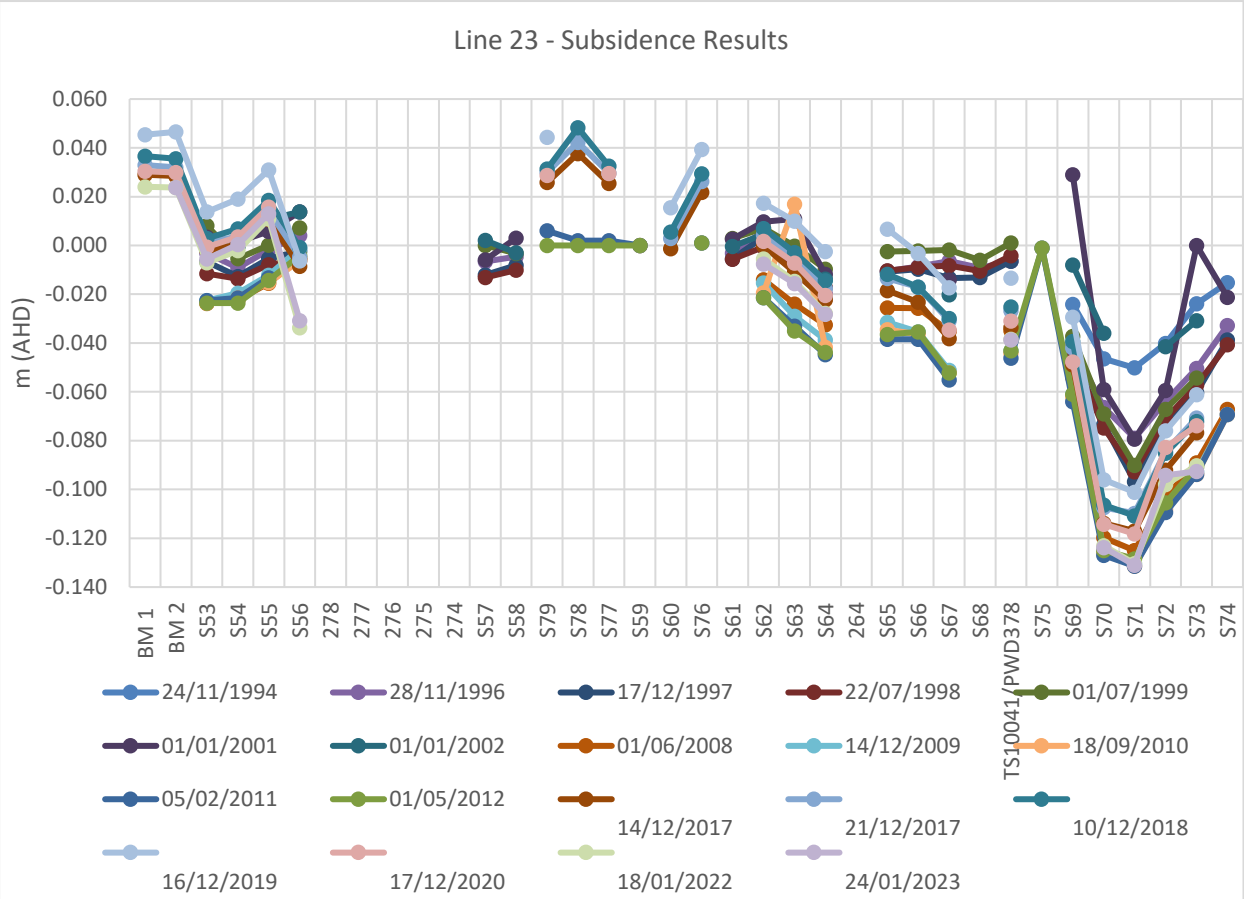
Line 32

Line 32 was originally installed in 1989. Due to their age and that a number of the marks are steel star pickets, the integrity of some of the marks has been affected. Monitoring data shows that the area has been stable for the past few years. Line 32 monitoring marks are surveyed annually.



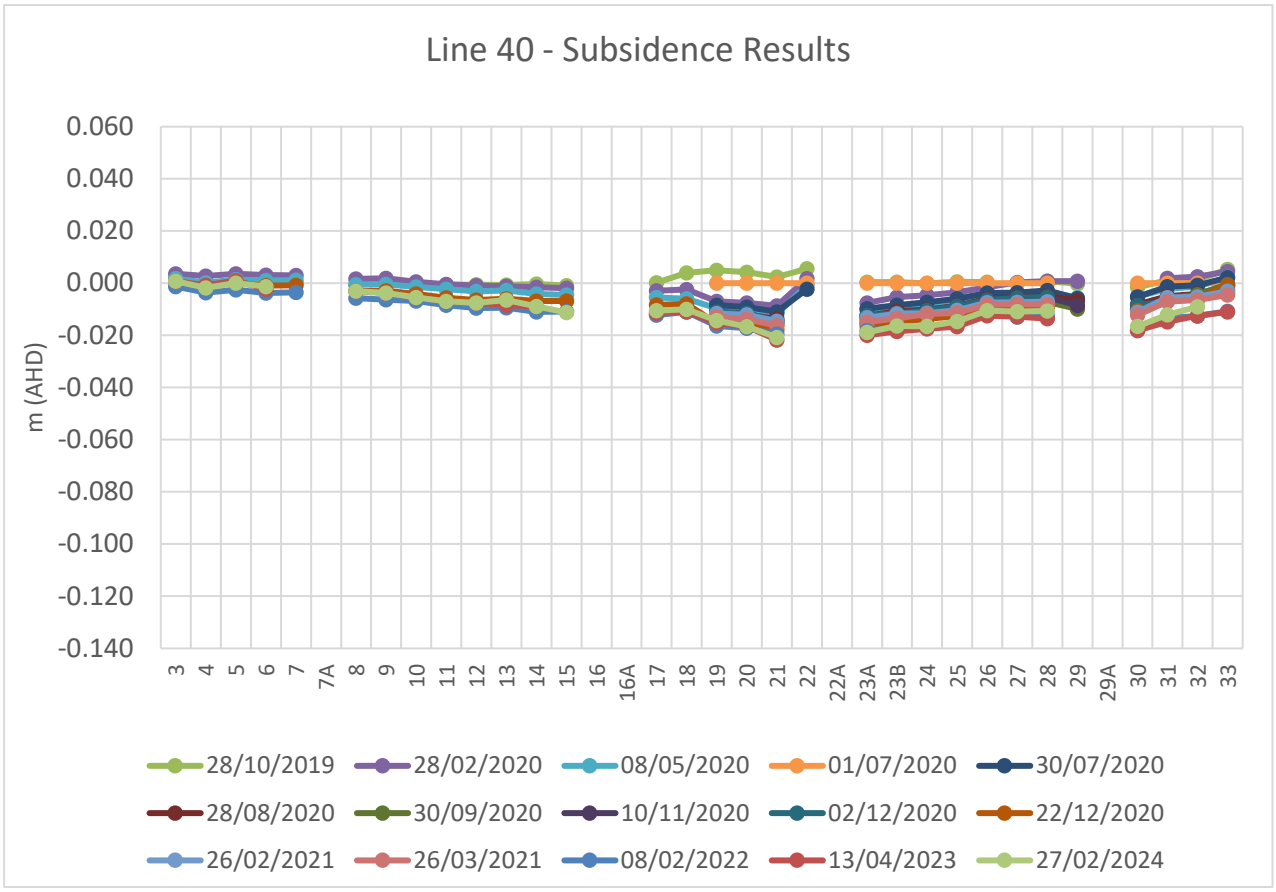
Line 23

The foreshore along Summerland Point has been monitored since 1994, after secondary extraction was undertaken in the Wallarah Seam beneath the south-western point (corresponding to mark S63 – 74 of Line 23). Approximately 130mm to 150mm of subsidence was measured (Point S71 - Line 23). There has been no observable movement from the 2008 datasets to the current (Figure 11). Line 23 monitoring marks are surveyed annually.



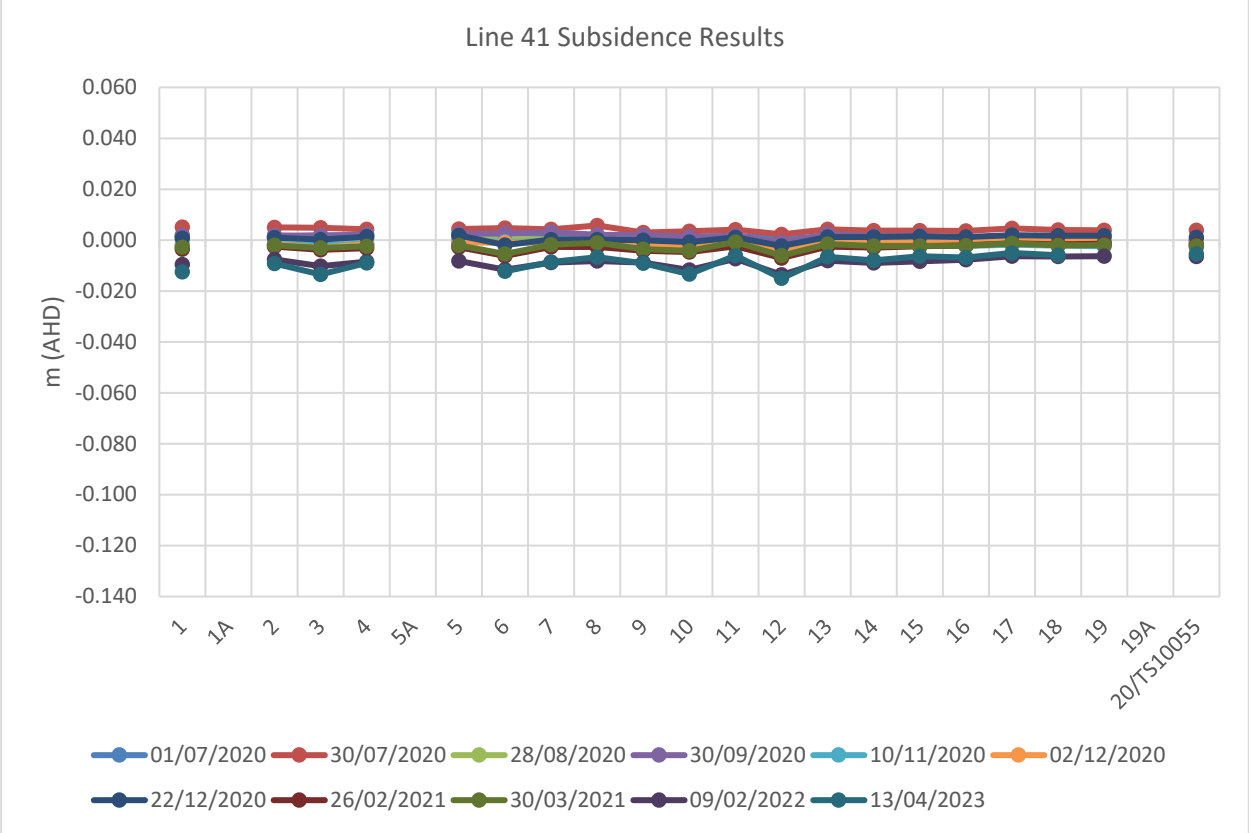
Line 40

Monitoring points along Line 40 were established in 2018 to monitor the shoreline adjacent to Miniwall S1. This line was extended in 2019 as part of the subsidence monitoring program for Miniwalls S2 and S3. Minor ground movement along the line appears seasonal, with movement limited to <20mm. Monitoring of Line 40 is undertaken annually. Point 21 and 24 recorded results of 22 mm and 20 mm respective, given these results met or exceeded the 20mm subsidence limit Chain Valley Colliery is continuing to monitor the survey line. The 20mm of recorded subsidence is not all believed to be mining induced with the results for Point 21 and Point 24 in January 2024 monitoring was 21mm and 19mm of recorded subsidence from the baseline.


Line 40 - Subsidence Results
m (AHD)
0.060
0.040
0.020
0.000
-0.020
-0.040
-0.060
-0.080
-0.100
-0.120
-0.140
3
4
5
6
7
7A
8
9
10
11
12
13
14
15
16
16A
17
18
19
20
21
22
22A
23A
23B
24
25
26
27
28
29
29A
30
31
32
33
28/10/2019
28/02/2020
08/05/2020
01/07/2020
30/07/2020
28/08/2020
30/09/2020
10/11/2020
02/12/2020
22/12/2020
26/02/2021
26/03/2021
08/02/2022
13/04/2023
27/02/2024

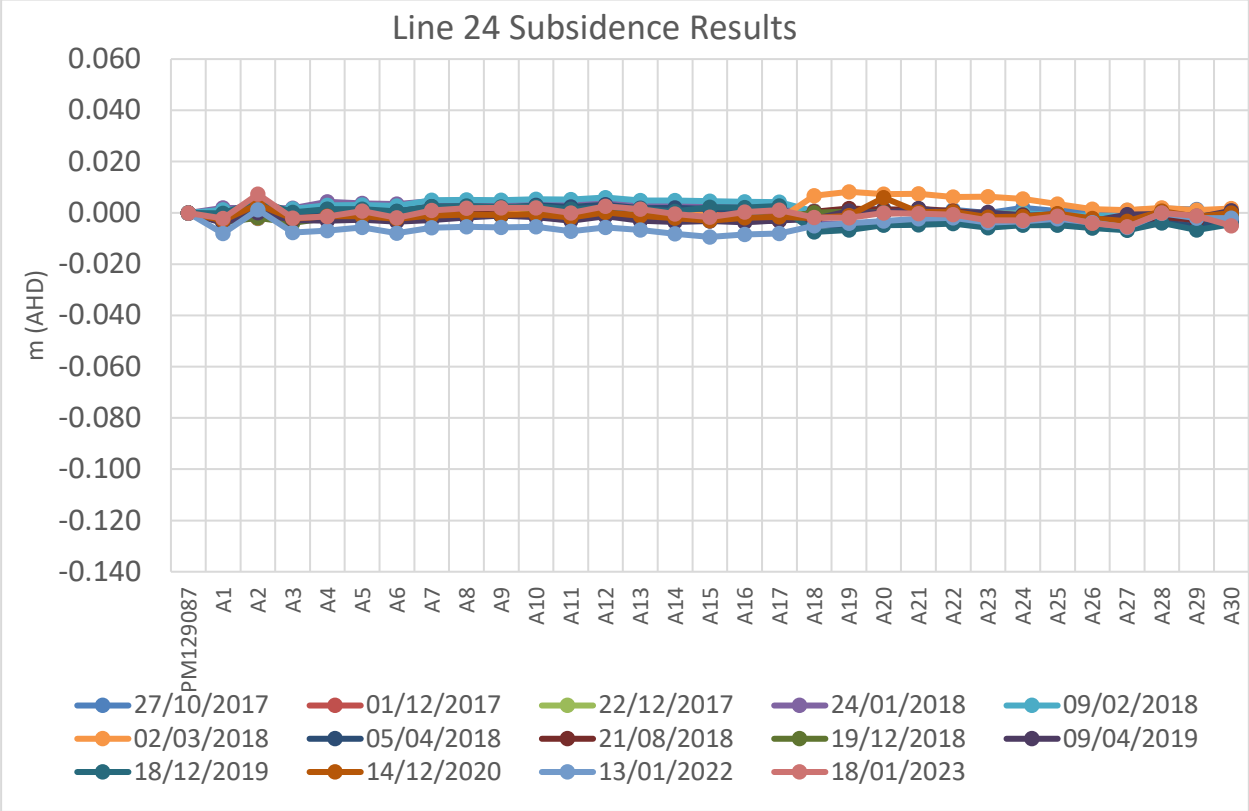
Line 41

Line 41 was established in July 2020 to monitor the shoreline adjacent Miniwall S4. Monitoring is undertaken annually, with surveys indicating negligible (<20mm) movement within compliance limits.



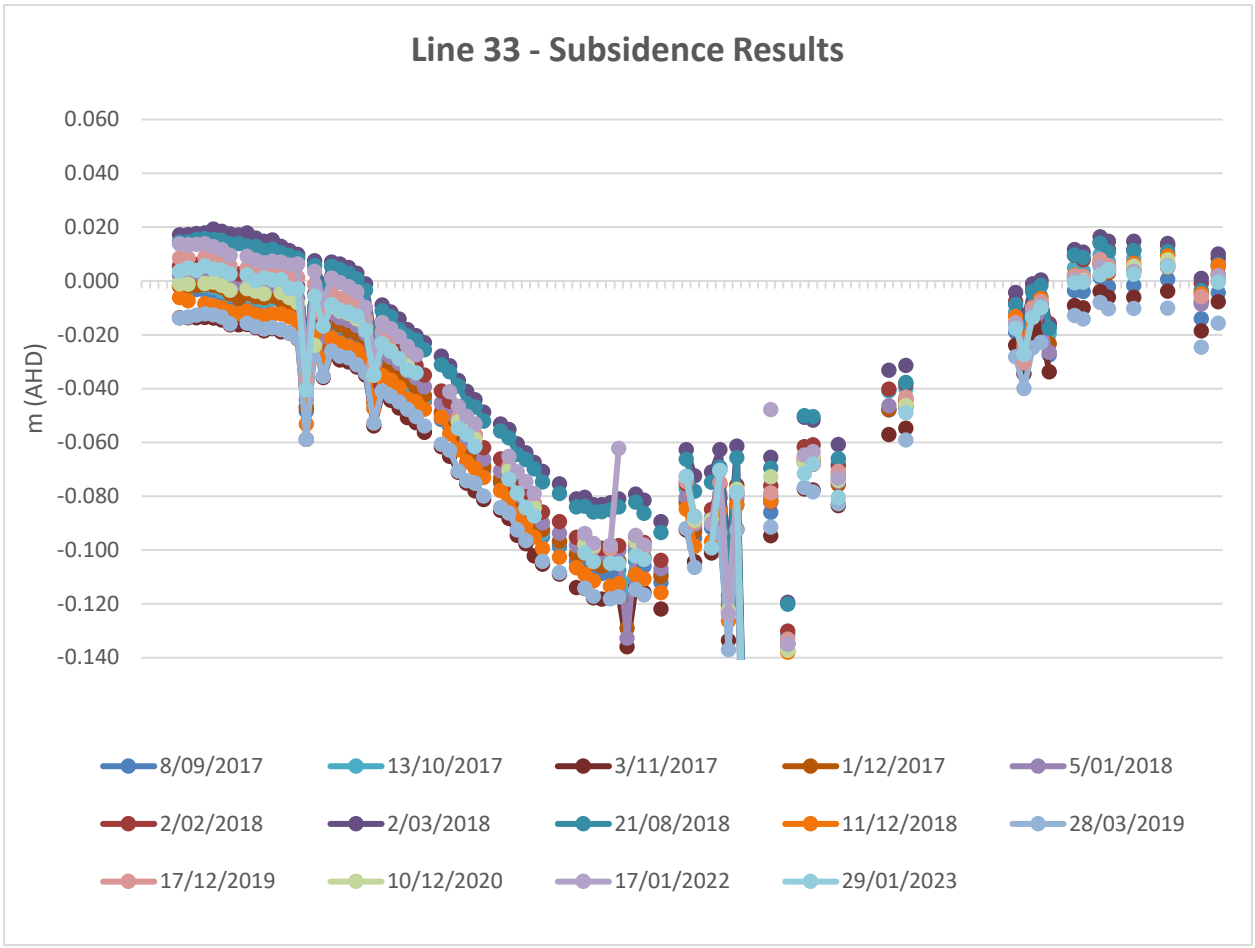
4.1.5 Chain Valley Bay, Lines 24 and 33

Line 24 lies on the western foreshore of Chain Valley Bay. Monitoring results have not identified mining induced vertical movement (< 20mm). Line 24 monitoring points are surveyed annually.



Line 33

Line 33 is underlain with old mine workings in the upper seams and many of the historically monitored subsidence marks have experienced greater than negligible (20mm) subsidence. The Line 33 baseline survey was conducted in 1991. No additional subsidence movement was detected during the miniwall extraction in CVB. No additional subsidence was observed at Line 33A within the reporting period. The monitoring indicates compliance to limits with one monitoring location (A63) impacted by surface activities unrelated to the mine site.


Line 33 - Subsidence Results
0.060
0.040
0.020
0.000
-0.020
-0.040
-0.060
-0.080
-0.100
-0.120
-0.140
m (AHD)
8/09/2017
13/10/2017
3/11/2017
1/12/2017
5/01/2018
2/02/2018
2/03/2018
21/08/2018
11/12/2018
28/03/2019
17/12/2019
10/12/2020
17/01/2022
29/01/2023

4.1.6 Timing of Subsidence Monitoring

Timing of subsidence monitoring at CVC is defined in approved extraction plans and is summarised in **Table 2**. CVC has also made subsidence monitoring commitments to first-workings, also presented in **Table 2**.

Table 2 - Frequency of Subsidence Monitoring for Secondary Extraction

Type of monitoring	Pre-extraction requirements	During extraction requirements	Post extraction requirements
Secondary Extraction			
Bathymetric surveys	Single baseline survey prior to extraction	End of panel (of relevance to S2, S3, S4 and S5) Annual surveys over areas of pillar extraction (not commenced)	Annual for three years unless TARP triggered
Foreshore monitoring	Baseline survey prior to commencement of extraction	Monthly intervals	Annual for three years unless TARP triggered
Pelican Rock Navigation Marker	Baseline RL and tilt measurements	End of panel (of relevance to S2 and S3)	Visual inspection and confirmation from RMS of nil impacts
Seagrass survey points	Survey of concrete monitoring points during regular seagrass monitoring		
First Workings			
Terrestrial based subsidence monitoring (foreshore)	Baseline prior to extraction	Annual surveys during extraction unless TARP triggered	Annual surveys ongoing unless TARP triggered
Terrestrial based subsidence monitoring (along main roads in suburbs of Brightwaters, Mirrabooka and Sunshine)	Baseline prior to extraction	Annual surveys during extraction unless TARP triggered	Annual surveys ongoing unless TARP triggered

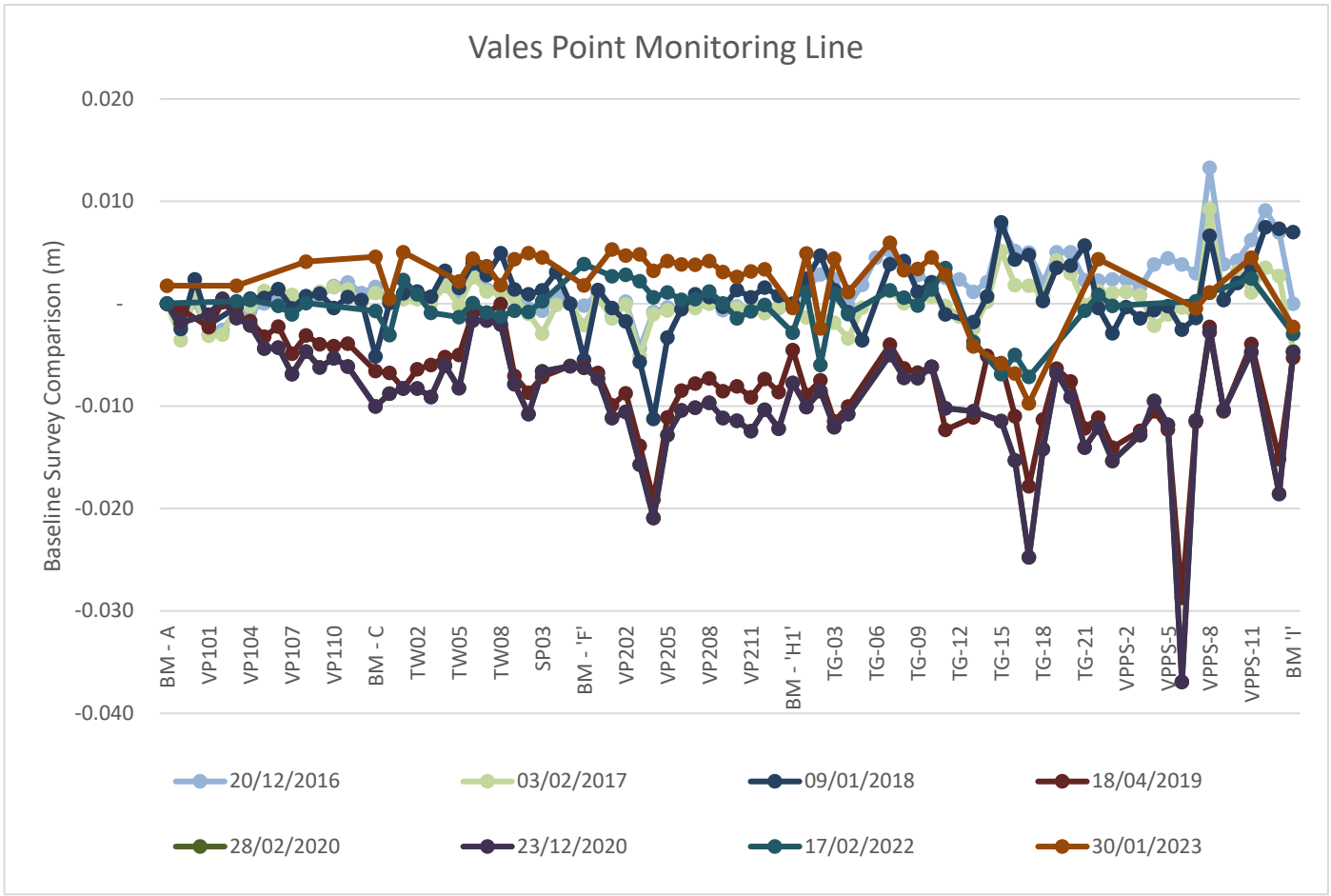
4.2 Mannering Colliery

4.2.1 Monitoring Overview

At the commencement of mining operations associated with the link road project between CVC and MC, a subsidence monitoring program was implemented. Due to the sensitive nature of the infrastructure being undermined (ie VPPS), subsidence monitoring was undertaken on a weekly basis within a 250 m radius of the mining activity. At the completion of mining, the frequency of subsidence monitoring of the link road development was reduced to an annual survey. Monitoring results have been presented in **Figure 16** and indicate <30 mm subsidence recorded to date, with anomalous readings recorded at monitoring point VPPS-6 from 18/04/2019.

There was no mining undertaken at Mannering Colliery during 2023.

Figure 3 - Vales Point Power Station Subsidence Results



5 Impacts to Built Features from 2023 Mining Activities

5.1 Chain Valley Colliery

No built features have been identified as requiring direct subsidence management from mining activities undertaken at CVC during 2023.

First workings were undertaken beneath the Morisset Peninsula within the NMA with no subsidence impacts to surface facilities or infrastructure reported to date.

5.1.1 Pelican Rock Navigational Marker

As described in CVC's Subsidence Monitoring Program, the Pelican Rock Navigation Marker is expected to be impacted by approximately 90 mm of subsidence from mining within Miniwall panels S2 and S3.

NSW Roads and Maritime Services (RMS) has indicated a functional impact on the marker is likely to occur at 500 mm of subsidence and 5° or 87 mm/m of tilt.

A survey for RL and tilt was conducted on 10 July 2019 by Daly Smith Surveyors prior to mining and measured Pelican Rock Navigation Marker was 1.14m Australian Height Datum (AHD) and the navigational pole was vertical.

A final survey was undertaken on 16 June 2023, recording the level at 1.09 mAHD, indicating an impact of 50 mm. Miniwall mining methods were ceased at Chain Valley Colliery in August 2021, with MWS3 completed in July 2020.

Following completion of the June 2023 survey of Pelican Rock navigational marker, Delta Coal contacted Transport for NSW (formerly RMS), seeking confirmation that the navigational marker was deemed still suitable for operation and to confirm monitoring of the marker could cease, provided no further subsidence impacts where anticipated.

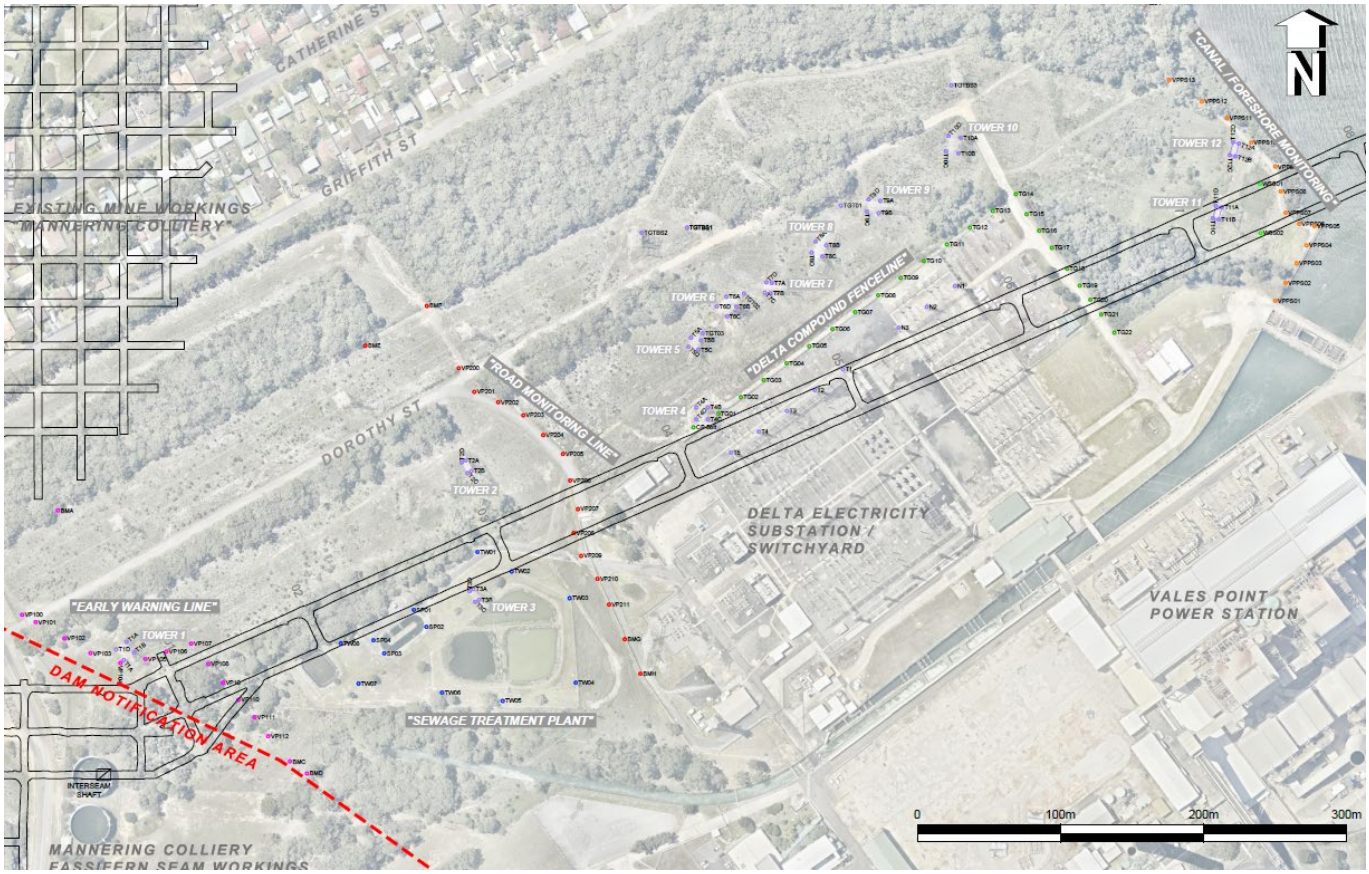


5.2 Mannering Colliery

There were no built features identified as requiring direct subsidence management as a result of MC former workings during 2023.

No discernible subsidence impact from the Linkage Road Project workings was observed in 2023.

Figure 4 – Vales Point Power Station Monitoring Locations



6 Impacts to Natural Features

6.1 Chain Valley Colliery

Subsidence impact performance measures to natural and heritage features are detailed in SSD-5465 Modification 4, Table 6 as below.

Biodiversity	
Threatened species or endangered populations	Negligible environmental consequences
Seagrass beds	Negligible environmental consequences including: • *negligible* change in the size and distribution of seagrass beds; • *negligible* change in the functioning of seagrass beds; and • *negligible* change to the composition or distribution of seagrass species within seagrass beds.
Benthic communities	Minor environmental consequences, including minor changes to species composition and/or distribution.

6.1.1 Seagrass Bed Monitoring

Annual seagrass bed monitoring was undertaken in June 2023 as per the approved Seagrass Management Plan. The Seagrass monitoring report is publicly available at www.deltacoal.com.au. **Table 3** is taken from the report and displays compliance to the subsidence impact performance measures table for 2023.

Table 3 - Seagrass Monitoring Compliance

Condition from SSD5465 - Mod 4	Compliance Status and Comments
Schedule 4 Environmental Conditions - underground mining Performance Measures - Natural Environment Biodiversity - Benthic Communities. Subsidence Impact Performance Measure - Minor environmental consequences, including minor changes composition and/or distribution.	Compliant - See section 16 - Conclusions
Measurements undertaken by generally accepted methods.	Compliant - See section 4 and 5
Measurements Methods fully described.	Compliant - See section 4 and 5

6.1.2 Benthic Communities Monitoring

Benthic monitoring was undertaken in March 2023. The Benthic Communities reports are publicly available at www.deltacoal.com.au. The below table is taken from the March 2023 report and displays compliance to the subsidence impact performance measures table for 2023.

The results from the March 2023 benthic communities monitoring show compliance to SSD5465 (Mod 4) with respect to the Subsidence Impact Performance Measures for Benthic communities, which display nil to minor environmental consequences due to underground mining.

Table 4 - Benthic Communities Compliance

Conditions from SSD-5465 – Mod 4	Compliance Status and Comments
Schedule 4 Environmental Conditions – underground mining Performance Measures – Natural Environment Biodiversity – Benthic Communities Subsidence Impact Performance Measure – Minor environmental consequences, including minor changes composition and/or distribution.	Compliant – See section 16 - Conclusions
Measurements undertaken by generally accepted methods. Measures Methods fully described.	Compliant – See section 4 and 5 Compliant – See section 4 and 5

During the reporting period, the monitoring frequency for benthic communities was reduced from twice per year, to once per year, in Autumn. The reduction in monitoring frequency was supported by statistical analysis of benthic communities monitoring results for the 2020-2022 period.

7 Adaptive Management – Subsidence Management Trigger Action Response Plan (TARP) Implementation and Remediation

7.1 Chain Valley Colliery

Adaptive management includes monitoring subsidence impacts and subsidence effects. based on the results, modifying the mining plan as mining proceeds to ensure that the effects, impacts and/or associated environmental consequences remain within predicted and designated ranges and in compliance with the conditions of this consent. The subsidence Monitoring TARPs for Miniwall S5 and Northern Pillar Extraction has been provided as **Figure 6**.

Triggers and performance indicators (including measured subsidence and inspections for environmental impact) are provided across a number of different management plans at CVC and include specific information regarding:

- subsidence monitoring requirements (including baseline monitoring)
- remediation
- adaptive management techniques and
- contingency plans.

A summary of these are provided in CVC's Subsidence Management TARP which aims to consolidate all subsidence management requirements into a central location, triggering a response or set of responses commensurate with the nature of the measurement or the impact that has been identified.

There were no subsidence related remediation activities undertaken during 2023 as a result of mining activities at CVC.

7.2 Mannering Colliery

There is no subsidence management TARP at MC.

There were no subsidence related remediation activities undertaken during 2023 as associated with Mannering Colliery.

Figure 5 - CVC Subsidence Management TARP

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CHAIN VALLEY COLLIERY- SUBSIDENCE MANAGEMENT TRIGGER ACTION RESPONSE PLAN (TARP 00136)

SUBSIDENCE MANAGEMENT NORTHERN MINING AREA DOMAIN (S5 and Northern Pillar Area)

	DETAILED PERFORMANCE INDICATORS	MONITORING REQUIREMENTS	CONTAINMENT / REMEDIATION MEASURES	ADAPTIVE MANAGEMENT MEASURES	CONTINGENCY PLANS
SUBSIDENCE PARAMETERS (Bathymetric Survey)	**Normal** Subsidence ≤ 500mm	As per Subsidence Monitoring (SM) Program			
	Trigger Level 1 Subsidence > 500mm to ≤ 780mm	6 monthly surveys until subsidence stabilises, then as per SM Program		Update subsidence predictions based on monitoring data Identify controlling mechanisms Review potential change in impact on natural and built features & update management plans if required	Review ability to limit further increases based on understood mechanisms including; Extraction heights, panel widths, panel recovery
	Trigger Level 2 Subsidence >780mm	6 monthly until subsidence stabilises then as per SM Program	Review if increase likely to create impact at foreshore/seagrass or exceed final subsidence prediction Notify immediately DPIE if incident and within 7 days for non-compliance Notify RR, BCD, affected landholders or infrastructure owner	Implement further controls as applicable from review Update subsidence predictions based on monitoring data Update impact assessment on natural and built features	Immediately review mine plan including panel width, pillar widths, extraction height and panel length Consult with DPIE and RR Review and update Extraction Plan
SUBSIDENCE PARAMETERS (Foreshore / Land Based Survey over minimum of 2 adjacent pegs)	**Normal** <20mm recorded movement	Monitoring as per SM Program			
	Trigger Level 1 <20mm recorded movement with slow (3-5mm/month) creep	Validate increase with additional monthy survey/s then as per SM program		Update subsidence predictions based on monitoring data Identify controlling mechanisms Review potential change in impact on natural and built features & update management plans if reqd	
	Trigger Level 2 >20mm recorded movement (assoicated with mining)	Implement Ecological Monitoring program for HWMSB exceedance Increase frequency of subsidence parameter monitoring to until rates stabilises. Then as per SM program	**Cease extraction in panel in question until review conducted in consultation with DPIE and DRE** Notify immediately DPIE if incident and within 7 days for non-compliance Notify RR, OEH, affected landholders or infrastructure owner	Investigate cause of exceedance (ie validate impact due to FAS extraction or not). Update subsidence predictions based on monitoring data Update impact assessment on natural and built features	Provide offsets for any ecological communities or threatened species in the HWMSB if impacts detected Immediately review mine plan including panel width, pillar widths, extraction height in consultation. Consult with DPIE and RR Review and update Extraction Plan
BUILT FEATURES	**Normal** No damage requiring remediation	Monitoring as per Subsidence Monitoring Program RMS routine monitoring navigation markers			
	Trigger Level 1 Subsidence parameters exceeded such that Fassifern workings indicated to have potential impact on foreshore Private bore capacity reduced	Monitoring as per BFMP (Built Feature Management Plan)	Review navigational marker freeboard and notify Transport for NSW if impacted Notify immediately DPIE if incident and within 7 days for non-compliance Notify RR and potentially affected landholders or infrastructure owner. Provide temporary water if required.		Develop BFMP in conjunction with owner for built features surrounding potential impact area
	Trigger Level 2 Impact to built feature	Monitoring as per BFMP	**Cease extraction in panel in question until review conducted in consultation with DPIE and RR** Assist owner with information to aid in Subsidence Advisory NSW claim in accordance with BFMP	Update impact assessment based on observed damage	Immediately review mine plan including panel width, pillar widths Consult with DPIE and RR Review and update Extraction Plan

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CHAIN VALLEY COLLIERY- SUBSIDENCE MANAGEMENT TRIGGER ACTION RESPONSE PLAN (TARP 00136)

SUBSIDENCE MANAGEMENT NORTHERN MINING AREA DOMAIN (S5 and Northern Pillar Area)

		DETAILED PERFORMANCE INDICATORS	MONITORING REQUIREMENTS	CONTAINMENT / REMEDIATION MEASURES	ADAPTIVE MANAGEMENT MEASURES	CONTINGENCY PLANS
Triggers	PUBLIC SAFETY (Foreshore / Land Based areas and steep slopes)	**Normal** No impact	Monitoring as per SM Program and Public Safety MP			
		Trigger Level 1 Subsidence parameters exceeded such that Fassifern workings indicated to have potential impact on foreshore / land based areas	Increase visual inspection of foreshore to daily until public safety risk quantified as low Inspect Foreshore / Land Based areas in vicinity of steep slopes and retaining walls for signs of movement ASAP. Implement TARP as required.		Review potential of flooding and drainage impacts about foreshore or Land Based areasor stability concerns at steep slopes/ retaining walls. Undertake appropriate risk assessments	
		Trigger Level 2 Area around foreshore or other land based areas becomes unstable or shows signs of mining induced impact Flooding or drainage impacts considered likely as result of Fassifern extraction	Visual inspections frequency to be commensurate with level of risk (ie increase until controls put in place) Inspect Foreshore / Land Based areas in vicinity of other steep slopes and retaining walls for signs of movement ASAP. Implement TARP as required.	**Cease extraction in panel in question until review conducted in consultation with DPIE and RR** Immediately implement temporary safety controls (barricades and signage available from mine site). Arrange for assistance and stay at site if immediate risk to public exists Inform ECC as to result of inspection Geotechnical Engineer to inspect area immediately. Notify LMCC and Transport for NSW Notify BCD, DPIE and RR	Implement longer term safety controls	Foreshore / Land based area stabilisation of unsafe areas in consultation with LMCC/CC Council and RR as soon as possible Flooding and drainage rectification works in consultation with infrastructure owner as soon as possible
	BENTHIC COMMUNITIES	**Normal** ANOVA/ANOSIM >5%	Monitoring as per Benthic MP			
		Trigger Level 1 ANOVA/ANOSIM level is approaching 5%	Liaise with monitoring consultant & undertake internal review to determine if impacts are related to mining Arrange a peer review of the monitoring results and statistical analysis			
		Trigger Level 2 ANOVA/ANOSIM <5%	Undertake follow up monitoring at affected sites to obtain confirmation of impacts. Incident Report to be completed and distributed to relevant agencies	Notify DPIE-Fisheries, LMCC and DPIE Notify immediately DPIE if incident and within 7 days for non-compliance	Consult with relevant authorities about monitoring and management controls	Consult with relevant authorities to identify if offsets are required and how these are to be implemented.
	SEAGRASS	**Normal** Negligible impact	Monitoring as per Seagrass MP			
		Trigger Level 1 Approaching 20% decline in condition Approaching 20mm of additional mine induced subsidence within mapped seagrass	Liaise with monitoring consultant & undertake internal review to determine if impacts are related to mining		Review if variation is within broader background variation range for the site.	
		Trigger Level 2 >20% decline in conditions from year baseline survey >150mm of additional mine induced subsidence at survey location	Incident Report to be completed and distributed to relevant agencies	Notify immediately DPIE if incident and within 7 days for non-compliance Notify DPIE-Fisheries and LMCC	Consult with relevant authorities about monitoring and management controls	Consult with relevant authorities to identify if offsets are required and how these are to be implemented.
	THREATENED SPECIES AND ENDANGERED POPULATIONS	**Normal** Negligible environmental consequences	Monitoring as per Subsidence Monitoring Program, Benthic Communities Management Plan and Seagrass Management Plan			
		Trigger Level 1 As per Seagrass and Benthic Community Management Plans Monitoring Level 1 triggers	Liaise with monitoring consultant & undertake internal review to determine if impacts are related to mining and greater than neglible environmental consequences.		Review if variation is within broader background variation range for the site.	
		Trigger Level 2 As per Seagrass and Benthic Community Management Plans Monitoring Level 2 triggers >780mm subsidence	Incident Report to be completed and distributed to relevant agencies	Notify immediately DPIE if incident and within 7 days for non-compliance Notify DPIE-Fisheries and LMCC	Initiate ecological monitoring program to assess the impacts to ecological communities and threatened species. Consult with relevant authorities about monitoring and management controls	Consult with relevant authorities to identify if offsets or rehabilitation is required and how this is to be implemented.
	WATER INFLOW	Ongoing monitoring of water inflows and site water management through operational Water Management and Monitoring TARP process				

		Revision 4 - 10/08/2021 CHAIN VALLEY COLLIERY- SUBSIDENCE MANAGEMENT TRIGGER ACTION RESPONSE PLAN (TARP 00136) **SUBSIDENCE MANAGEMENT NORTHERN MINING AREA DOMAIN (S5 and Northern Pillar Area)**
Responsibilities	**Environment Compliance Coordinator**	Coordinate and undertake all environmental monitoring as outlined in TARP Implement TARP actions in consultation with regulatory agencies as/if required Notify the relevant Government agencies and other affected parties of exceedance of performance measures Coordinate Subsidence Review as a part of Annual Environmental Reporting Arrange for subsidence prediction and impact updates as required Update Extraction Plan as required Audit public safety controls regularly
	Mine Surveyor	Coordinate subsidence monitoring as outlined in TARP Review subsidence monitoring results against TARP triggers Inform relevant stakeholders as to subsidence monitoring trends and exceedances
	Mine Manager	Ensure adequate financial and personnel resources are made available for implementation of this plan Review and approve required mine plan changes

Appendix 10: Chain Valley Colliery Independent Environmental Audit



Chain Valley Colliery

Independent Environmental Audit for SSD-5465

Delta Coal

16 September 2022

The Power of Commitment

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1. Introduction

1.1 Introduction and purpose of this report

The Chain Valley Colliery (CVC) is an underground coal mine located at the southern end of Lake Macquarie, approximately 60 km south of Newcastle, New South Wales (NSW). CVC is owned and operated by Great Southern Energy Pty Ltd (trading as 'Delta Coal').

The mine operated under existing use rights until 23 January 2012 when major project approval (MP 10_0161) was issued under the *Environmental Planning and Assessment Act 1979* (EP&A Act). The approval was subsequently modified on 30 August 2012, to permit a revised mine layout associated with the introduction of wider miniwalls within the Domain 1 and 2 areas.

In 2013 the mine lodged an application for the Chain Valley Colliery Mining Extension 1 Project (SSD-5465) under Part 4 of the EP&A Act, which was approved on 23 December 2013.

This audit covers a period of time from 10 April 2019 to 12 April 2022. The site inspection component of the IEA was conducted on 12 April 2022. This report provides an outline of the audit methodology and results and provides recommended actions for achieving full compliance with environmental approvals.

The audit was led by *Elliot Holland*, Lead Auditor – Environmental Management Systems (number: 115351) with assistance from *Lachlan Taylor*. A technical review was completed by *Michelle Kiejda* - Technical Director – Environment.

Schedule 6, Condition 9 of SSD-5465 requires an IEA to be commissioned by the end of February 2022, and every three years thereafter. Schedule 6, Condition 9 constitutes the audit scope and requires that:

By the end of February 2022, and every three years after, unless the Planning Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. The audit must:

(a) led by a suitably qualified, experienced and independent auditor whose appointment has been endorsed by the Planning Secretary;

(b) be led and conducted by a suitably qualified, experienced and independent team of experts (including any be expert in field/s specified by the Planning Secretary) whose appointment has been endorsed by the Planning Secretary;

(c) be carried out in consultation with the relevant agencies and the CCC;

(d) assess the environmental performance of the development and whether it is complying with the relevant requirements in this consent, water licences and mining leases for the development (including any assessment, strategy, plan or program required under these approvals);

(e) review the adequacy of any approved strategy, plan or program required under the abovementioned approvals and this consent;

(f) recommend appropriate measures or actions to improve the environmental performance of the development and any assessment, strategy, plan or program required under the abovementioned approvals and this consent; and

(g) be conducted and reported to the satisfaction of the Planning Secretary.

As required by Schedule 6, Condition 9 of SSD-5465 the audit team was approved by the Department of Planning and Environment (DPE) to undertake the audit on 23 February 2022 (see Appendix A).

1.2 Scope of the audit

The audit took the following form:

– An initial start-up teleconference was held with relevant Delta Coal representatives to discuss the audit methodology, identify relevant personnel involved in the project, key activities and systems occurring on the Mine, documentation for review and to schedule a date for the Mine inspection.
– Relevant agencies and the Community Consultative Committee chair (CCC chair), including the Department of Planning and Environment (DPE), DPE – Water, Department of Primary Industries – Fisheries (DPI – Fisheries), Environment Protection Authority (EPA), Biodiversity Conservation Division (BCD), the NSW Resources Regulator, Lake Macquarie City Council (LMCC), and Central Coast Council (CC Council) were requested to provide comment on the performance and/or compliance of the project with relevant requirements and/or approvals.
– A review of available key documentation including the Environmental Assessment (EA) documentation, Development Consent, Environment Protection Licence (EPL) and other relevant site and environmental information (such as correspondence with relevant agencies and management plans and/or monitoring results) was undertaken prior to interviews with Delta Coal representatives and the Mine inspection. Additional documents were reviewed during and following the interviews with Delta Coal representatives and the Mine inspection.
– A one-day site inspection, including interviews, to assess the general environmental performance of site and discuss Development Consent and EPL compliance with key site-based personnel.
– Preparation of a draft audit report for Delta Coal to review.
– Finalisation of the audit report and submission to Delta Coal.

1.3 Audit participants

The personnel listed in Table 1.1 were involved over the course of the audit.

Table 1.1 Audit team members

Audit team members	Organisation	Role
Michelle Kiejda	GHD	Technical Review
Elliot Holland	GHD	Lead Auditor
Lachlan Taylor	GHD	Assistant auditor
Lachlan McWha	Delta Coal	Environmental Compliance Coordinator

1.4 Limitations

This report: has been prepared by GHD for Delta Coal and may only be used and relied on by Delta Coal for the purpose agreed between GHD and Delta Coal as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Delta Coal arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

2. Methodology

2.1 Audit inception

An initial start-up teleconference for the audit was held on 11 March 2022 with relevant Delta Coal representatives to discuss the audit methodology, identify relevant personnel involved in the project, key activities and systems occurring on site, documentation for review and to schedule a date for the site inspection.

2.2 Document review

Environmental documentation associated with the Mine was reviewed by the auditors prior to site visit. Delta Coal personnel provided a number of documents for review including:

- Road Transport Protocol, including Traffic Management Plan (TMP) and Code of Conduct
- Noise Management Plan (NMP)
- Air Quality Management Plan (AQMP)
- Water Management Plan, including Surface Water Management Plan (SWMP) and Groundwater Monitoring Program (GWMP)
- Biodiversity Management Plan (BMP)
- Biodiversity Enhancement Strategy
- Heritage Management Plan (HMP)
- Rehabilitation Management Plan (RMP)
- Pollution Incident Response Management Plan (PIRMP)
- Environmental Management Strategy (EMS)
- Mining Operations Plan (MOP)
- Extraction Plan, including Built Features Management Plan, Benthic Communities Management Plan, Seagrass Management Plan, Pubic Safety Management Plan, and Subsidence Monitoring Program
- SSD-5465
- EPL 1770
- Consolidated Coal Lease (CCL) 706, 707; Mining Lease (ML) 1051, 1052, 1308, 1370, 1632 and 1992; and Mining Production lease (MPL) 1349, 1389, 1400 and 337
- EA documentation
- Correspondence to/from relevant agencies and CCC Chairperson

Additional documents were provided during and following the audit as evidence of compliance with SSD-5465, the EPL, and relevant lease(s).

2.3 Agency consultation

As part of the audit process, the following agencies were invited to provide comment in regard to Development Consent conditions requiring specific consultation with the particular agencies, including:

- DPE
- NSW Resources Regulator
- DPE – Water
- BCD
- EPA
- LMCC
- CC Council
- DPI – Fisheries
- The CCC Chairperson

Letters requesting comment from the agencies were emailed on 23 March 2022. Correspondence was received from DPE, NSW Resources Regulator, EPA, and CCC Chairperson.

Copies of this correspondence are provided in Appendix B. A summary of the auditors response to issues raised by the agencies is included in Section 4.7.

2.4 Site inspection and interviews

2.4.1 Opening and closing meeting

GHD undertook a site visit of CVC on 12 April 2022. The audit team used the site inspection to review compliance with various environmental requirements of the Mine.

Conditions on the day of the site inspection were noted to be up to 23.9 degrees Celsius (°C), with slight winds up to 22 km/hr, from the south-east.

The opening and closing meetings were held at the CVC offices. The list of participants is provided in Table 2.1.

Table 2.1 Opening and closing meeting attendees

Audit team members	Organisation	Role
Elliot Holland	GHD	Lead Auditor
Lachlan Taylor	GHD	Assistant auditor
Lachlan McWha	Delta Coal	Environmental Compliance Coordinator
Pieter Van Rooyen	Delta Coal	Technical Services Manager

Following the opening meeting, a site inspection was undertaken of the Mine and operations.

The objectives of the closing meeting were to discuss any outstanding matters, present preliminary findings and outline the process for finalising the audit report.

2.4.2 Audit interviews

During the on-site component of the audit, interviews were conducted with the Delta Coal staff identified in Table 2.1.

2.4.3 Data collection and verification

Where possible, documents and data collected during the audit process were reviewed whilst on-site. A number of documents were provided to the audit team prior to the on-site component of the audit. Several documents that were not available during the on-site component were provided following the audit.

All information obtained during the audit process was verified by the audit team where possible. For example, statements made by site personnel were verified by viewing documentation and/or via visual observations made during the site inspection. Where suitable verification was unable to be obtained, this has been identified.

2.4.4 Site inspection

A detailed site inspection of CVC was undertaken on 12 April 2022. The following locations were inspected:

- Sewage treatment discharge area
- Above ground tanks and bunding
- Oily water separator
- Workshop
- Hazardous and dangerous goods storage area
- Coal stockpile area
- CCP facilities
- Water storage dams
- EPL licensed discharge locations
- Ventilation fan compound

2.5 Reporting

This report has been prepared on an exception basis, highlighting the compliance issues identified along with any areas where action or improvement is required. The IEA has been prepared in accordance with the *NSW Government Independent Audit Guideline* (NSW Government, 2015).

Table 2.2 details where the key requirements of the guidelines have been addressed.

Table 2.2 Independent Audit Guideline Requirements

Section	Description	Where addressed
2	Assess the operator's compliance with the requirements of regulatory approvals, including (as applicable): – The Development Consent – The Environment Protection Licence – The Mining Lease – Water licences and approvals	Section 4
2, 3	The scope of the audit and the audit team (including any technical specialists) to be determined by the lead regulator.	Sections 1.2 and 1.3
3.3	The auditor must be independent of the development being audited and audit findings must be based on verifiable evidence.	Appendix C
4.2	The compliance status of each requirement or commitment should be assessed in accordance with the compliance assessment criteria and risk levels in the audit guidelines.	Section 4. However, compliance assessment criteria is in accordance with DPE's audit team approval letter (see Appendix A).
5.1	The audit outcomes to be documented in a thorough, accessible and accurate audit report that is written in a neutral tone reflecting facts gathered by the audit team.	This audit report
5.1	The audit report should include the following sections: – Introduction, providing a brief overview of the development, audit scope and objectives. – Methodology, describing the audit team, methodology applied, document reviews, site inspections and interviews. – Audit findings, including documentation of consultation, outcome of actions from the previous audit, assessment of compliance status against the conditions and commitments in relevant documents and discussion of environmental incidents and performance. – Recommendations, identifying any opportunities for improvement identified in the audit.	This audit report

Section	Description	Where addressed
5.2	Audit reports submitted to the lead regulator must be certified by the lead auditor on an attached 'Independent Audit Submission Form'	See Appendix D
5.3	Copies of the final audit report to be distributed to regulator agencies within two weeks of finalisation and placed on the development's website	Delta Coal to complete
6	The operator of the development to response to the lead regulator responding to the audit findings and recommendations with an action plan within four weeks of receiving the final audit report.	Delta Coal to complete

2.6 Definitions

Reporting results from the 2020 IEA was generally based on *NSW Government Independent Audit Guideline* (NSW Government, 2015); however, as per the request of DPE (see Appendix A), only the following descriptors have been used.

Compliant

Where sufficient verifiable evidence has been gathered to demonstrate that the intent and all elements of the requirement of the regulatory approval have been complied with within the scope of the audit.

Non-Compliant

Where sufficient verifiable evidence has been gathered to demonstrate that the intent of one or more specific elements of the regulatory approval have not been complied with within the scope of the audit.

Table 2.3 details the risk levels for non-compliances.

Table 2.3 Risk level for non-compliances

Risk level	Colour code	Description
High		Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence.
Medium		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-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		Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions).

Not triggered

A regulatory approval requirement has an activation or timing trigger that had not been met at the time of the audit inspection, therefore a determination of compliance could not be made.

Note

A statement or fact, where no assessment of compliance is required.

Note: while 'note' was not identified as a relevant descriptor, a number of conditions of SSD-5465, EPL 1770, and relevant leases do not have any relevant compliance requirements. Therefore, note has been used to identify these conditions where no assessment of compliance is applicable.

3. Previous independent audit and status

The recommendations made in the 2019 IEA prepared by SLR Consulting Australia Pty Ltd (2019), and the status of recommendations as at 12 April 2022 are detailed in Table 3.1 below.

Table 3.1 2019 IEA findings/recommendations

Reference	2019 findings/recommendations	2022 status	Status (closed/open)
EPL 1770 – Condition L2.1	2019 Audit recommendation: The Annual Reviews need to provide a clear statement regarding whether discharge criteria have been met.	In regard to recommendation from the previous audit, the Annual Review includes a statement whether the discharge criteria have been met. This recommendation has been closed out.	Closed
EPL 1770 – Condition O1.1 & O7.2	Ensure the minor waste management issues identified during the audit are rectified: – Improve bin labelling – Ensure all hydrocarbon containers (empty or full) are stored within bunds	While bin labelling and availability of appropriate receptacles was identified. A non-compliance with this condition in relation to on-site waste disposal has been found. Refer to findings for Condition O1.1 in Section 4.4. In regard to hydrocarbon containers, all hydrocarbon waste containers were stored within a bund. As a result, **Corrective action 2** has been made in this audit.	Open
EPL 1770 – Condition O3.1	Ensure exceedances and other incidents are reported as per this condition (Detailed Incident Report within 7 days).	Several incident reports were viewed during the audit. Appropriate action was taken by Delta Coal in responding to incidents.	Closed
	Ensure TEOM is setup with alarms/notifications for when results are approaching or have exceeded the short term criterion for particulate matter. This will ensure exceedances are immediately detected and reported as soon as possible to the EPA and DPE.	Delta Coal provided evidence that the TEOM is set up with alarms and notifications when the short-term criterion for particulate matter is approached or exceeded, and this recommendation is considered closed out.	Closed
EPL 1770 – Condition O5	Update PIRMP to include: – Current site contacts; – Email details for government contacts; and – Figures that clearly show the location of hazardous substances and where pollution response equipment is stored.	A review of the PIRMP found that the recommendations of the 2019 IEA have been incorporated and are closed out.	Closed

Reference	2019 findings/recommendations	2022 status	Status (closed/open)
EPL 1770 – Condition O8.2	– Include additional detail in the Water Management Plan regarding sewage management. – Include an update of sewage system during the audit period in the Annual Review. – Ensure servicing is completed and records kept onsite.	Review of relevant documentation verifies the relevant recommendations have been addressed. However, a non-compliance with Condition O8.4 has been identified in Section 4.4, with it noted by the auditors that the servicing for Q4 2020 was not completed on time, therefore constituting an administrative non-compliance. However, the servicing event occurred seven days following the end of Q4 2020 and has subsequently been completed as per Condition O8.4. Therefore, no corrective action is proposed.	Closed
EPL 1770 – Condition M2.2 & SSD-5465, Schedule 3, Conditions 11, 12 & 13, and Schedule 6, Condition 6	Improve data capture for PM10. Review possibilities of backup power supply. Ensure issues with data capture are reported in Section 1 and 7 of the Annual Review. Ensure TEOM is setup with alarms/notifications for when results are approaching or have exceeded the short term criterion for particulate matter. This will ensure exceedances are immediately detected and reported as soon as possible to the EPA and DPE.	With the exception of back-up power supply for capture of PM10 data, these recommendations have been closed out. Therefore, the recommendation for back-up power supply has been re-produced in Section 5. This forms **Recommendation 3** of this audit.	Open
EPL 1770 – Condition M4.1	Update Noise Management Plan. Ensure monitoring is completed in accordance with Noise Management Plan.	While this was addressed at the time of the site inspection, it is understood an updated NMP was approved by DPE in mid-April 2022, which addresses this recommendation.	Closed.
EPL 1770 – Condition M4.2	For future Annual Returns a single noise monitoring report should be prepared and attached to the Annual Return.	Consolidated noise reports were completed for 2019, 2020 and 2021 over the reporting period.	Closed
EPL 1770 – Condition M6.2	Ensure all complaints are recorded in the internal database on site and the relevant details required under this condition are outlined in the Annual Review.	The auditor viewed the complaints and incidents register on the website and the internal complaints database and was found to be compliant.	Closed
EPL 1770 – Condition M7.2	With the new ownership an advertisement should be placed in the paper/newsletter providing a link to the Delta Coal website and outlining the complaint management details.	The Community Newsletter from July 2019 fulfilled the 2019 IEA recommendation.	Closed
EPL 1770 – Condition M7.4	Update the details of designated representatives of the company in the PIRMP.	The PIRMP has been updated within the reporting period. Designated representatives are nominated in Table 3 of the PIRMP.	Closed
EPL 1770 – Condition R1.3	LakeCoal and Delta Coal to prepare Annual Returns based on the period of the Annual Return and dates of the sale of Chain Valley.	The licence was transferred from LakeCoal to Delta Coal on 1 April 2019, which is outside the reporting period.	Closed
EPL 1770 – Condition R1.5	Ensure Annual Returns are completed as per the EPA requirements and submitted within the due date.	Review of relevant data indicates compliance with the requirements of this condition.	Closed
EPL 1770 – Condition R4.1	Send a combined noise report for the Annual Return period to the EPA.	Consolidated noise reports were completed for 2019, 2020 and 2021 over the reporting period via the EPA eConnect portal.	Closed

Reference	2019 findings/recommendations	2022 status	Status (closed/open)
EPL 1770 – Condition U1.1	Liaise with the EPA regarding the current status of the Sewage System Project. Implement any agreed actions in terms of timing.	This upgrade is in the process of being completed and is on track to be completed by 26 August 2022, as per the requirements of this condition. **Corrective action 1** and **Recommendation 5** have been made in relation to these works.	Open
SSD-5465 – Schedule 2, Conditions 7, 8, 9 & 10 Schedule 3, Condition 1	Ensure detailed records of coal transportation are recorded and able to be provided to auditors upon request. The spreadsheets should cover the requirements of the key conditions of the Development Consent.	Review of relevant data indicates this recommendation is closed out, with coal generally transferred to Vales Point Power Station via conveyor. Some haulage trucks were used over the reporting period to supplement the conveyor transport.	Closed
SSD-5465 – Schedule 2, Condition 23 and Schedule 6 Condition 3	All management plans require updating due to the length of time since the previous reviews. All should be in a Delta Coal template. Ensure there is a cross referencing table covering this condition in management plans. Additional detail including TARPs (contingency plan) should be developed in the next round of management plan updates.	The recommendation of the previous audit to ensure that Trigger Action Response Plans (TARPs) are added into the management plans has not been followed though in the audit for the AQMP, HMP, Seagrass Management Plan, Benthic Communities Management Plan and WMP. A non-compliance with clause (c) of this condition is recorded in Section 4.3. Therefore, the recommendation for TARPs to be included in management plan updates has been reproduced in Section 5. This has been reproduced as **Corrective action 4** of this audit.	Partially open
SSD-5465 – Schedule 3, Condition 1	Ensure transport records from this Audit period (January 2016) onwards are recorded on the website. This could be appended to the Annual Review summarising the weekly transport.	Weekly Coal Haulage has been reported on the website adequately over the reporting period.	Closed
SSD-5465 – Schedule 3, Condition 3	Ensure Coal Haulage TMP is reviewed as per the requirements of the consent and commitments in the management plan. Attach Driver Code of Conduct to the management plan.	The recommendation of the previous audit has been incorporated into the plan.	Closed
SSD-5465 – Schedule 3, Condition	Ensure Traffic Audits are completed annually in accordance with this condition.	The independent traffic audits were undertaken on an annual basis over the reporting period and were in compliance with the requirements of this condition.	Closed
SSD-5465 – Schedule 3, Condition 5	Ensure the report is submitted to the DPE.	The recommendation of the previous audit has been closed out.	Closed
SSD-5465 – Schedule 3, Condition 6	Ensure the Alternative Transport Options Report is completed as per the frequency in this condition.	Delta Coal received correspondence from DPE on 15 December 2020 granting an exception from conducting the Alternative Coal Transport Options Assessment. The exception applies until such time coal haulage via public roads is proposed to re-commence.	Closed

Reference	2019 findings/recommendations	2022 status	Status (closed/open)
SSD-5465 – Schedule 3, Condition 7	Continue investigations of any noise issues and, where practicable, implement reasonable and feasible mitigation measures. Ensure accurate/consistent monitoring results are presented in Annual Reviews.	The recommendation of the previous audit has been closed out.	Closed
SSD-5465 – Schedule 3, Condition 8	The real-time noise monitor should be re-established for the site. Liaise with the DPE regarding the best location, as the majority of noise complaints have resulted from Mannering Colliery operations, not CVC. Mannering Colliery is also owned by Delta Coal. Update the Noise Management Plan.	The real – time noise monitor was re-established on site in October 2019. Photographic evidence was provided for its installation. Data was also provided to show its implementation. Therefore, the recommendation of the previous audit is considered closed.	Closed.
SSD-5465 – Schedule 3, Condition 17	Include additional detail in the WMP regarding sewage management. Include an update of sewage system during the audit period in the Annual Review. Ensure servicing is completed and records kept onsite.	Additional details have been included in the WMP regarding the wastewater system. The proposed upgrades are not discussed as at the time of audit they have not been constructed. However, update on the progress of this project is included in Section 12.2 of the Annual Reviews.	Closed
SSD-5465 – Schedule 3, Condition 18	Update the water balance or justify why the current water balance is still applicable to the current operations.	The WMP includes a Water Balance that adequately fulfils the requirements of clause (a). The Water Balance has been updated since the previous IEA fulfilling the recommendation.	Closed
	Ensure dams and drainage lines are free on silt. Establish a maintenance schedule.	The implementation of the plan on site was generally adequate. It is noted that maintenance schedules are currently not established for desilting dams on site. Therefore, the recommendation of the previous IEA is still applicable. This has been reproduced as **Recommendation 6** of this audit.	Open
SSD-5465 – Schedule 3, Conditions 19 & 20	Include the biodiversity monitoring reports as appendices to the Annual Review. The current monitoring is provided in a spreadsheet with an email summary. Prepare a small Biodiversity Monitoring Report outlining results, a comparison against trigger levels and potential reasons for changes.	The recommendations of the 2019 IEA have been closed out, whereby a standalone annual Biodiversity Report is appended to the Annual Review.	Closed
SSD-5465 – Schedule 3, Condition 20	Prepare a separate section with short, medium and long-term measures in the BMP.	Short, medium and long term measures are described adequate within the BMP. Therefore, the recommendation of the previous IEA is closed.	Closed
SSD-5465 – Schedule 3, Condition 21A	Update the HMP, including the removal of Site #45-7-0154.	Review of the current HMP indicates the recommendation of the previous IEA is closed.	Closed

Reference	2019 findings/recommendations	2022 status	Status (closed/open)
SSD-5465 – Schedule 3, Condition 22	Complete a visual and lighting assessment against the Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting.	Delta Coal undertook a lighting survey to assess the sites compliance with this condition and Australian Standards. The survey found that the development is being carried out in compliance with this condition.	Closed
SSD-5465 – Schedule 3, Condition 27	Ensure a copy of the approved Rehabilitation Management Plan is put on the website.	The RMP was updated in 2020 following the 2019 IEA. The RMP is available on the project website, therefore closing out the 2019 IEA Recommendation.	Closed
SSD-5465 – Schedule 4, Conditions 1, 2, 3 & 4	A more conservative approach to assessing future impacts from further mining is recommended to build confidence that the subsidence processes in play are understood and impacts that rely on the subsidence impacts can be suitably assessed prior to mining. A significant upgrade of subsidence monitoring systems and reporting protocols at CVC is recommended. The use of three dimensional surveying with total station survey and high quality global positioning system (GPS) control is recommended. This technology is readily available and widely used for subsidence monitoring in NSW.	Review of relevant documentation indicates this recommendation has been addressed.	Closed
	For sensitive high value features such as the marina or similar features, real-time continuous GNSS monitoring is available at relatively low cost and can be used to provide high confidence subsidence monitoring in three dimensions.	Review of relevant data indicates this recommendation for improvement has not been adopted. It is noted this is a recommendation for improvement and not a corrective action, as this recommendation is beyond the requirements of relevant conditions of SSD-5465. Therefore, while the recommendation is still open, it has not been reproduced in this audit report.	Open
	A thorough review of the survey data and monitoring approach for Line 23 along the northern lakeshore of CVC Bay is recommended.	Review of relevant data indicates this recommendation is closed.	Closed
	A review of benthic and seagrass community monitoring systems is recommended to confirm that the monitoring is capable of discriminating minor and negligible impacts as required by the development consent conditions.	Review of the 2019 IEA does not provide a justification for this recommendation, there is simply the recommendation without any discussion as to why the auditor felt the recommendation was necessary or relevant. Review of relevant documentation for the audit period does not indicate this recommendation is necessary. Therefore, this recommendation has not been reproduced in this audit report.	Closed

Reference	2019 findings/recommendations	2022 status	Status (closed/open)
	A separate subsidence impact assessment report should be prepared annually and appended to the Annual Review. Presentation of all future survey data in Annual Reviews would benefit from a thorough and comprehensive analysis of the subsidence monitoring being undertaken by an external consultant so that the data can be meaningfully interpreted and is comprehensible by anyone with an interest in the outcomes. The report should: – Assess performance against subsidence impact performance measures from the Development Consent as well as any other commitments, triggers and management measures from Extraction Plans. – Assess how the Extraction Plans tracked against Trigger Action Response Plan (TARP's).	An annual subsidence report is appended to Annual Reviews for the audit period, addressing the requirements of this recommendation.	Closed
	Include how the site is tracking against subsidence performance criteria (Schedule 4 Condition 4) in the Biodiversity Monitoring Reports, Annual Seagrass Monitoring Report and the Annual Review. This should include a table outlining if performance criteria have been met and where further information can be found.	Reporting in relation to subsidence performance and the inclusion of Biodiversity Monitoring Reports, Annual Seagrass Monitoring Report in Annual Reviews was observed during document review for the audit.	Closed
	Develop a TARP when updating the Benthic Communities Management Plan. This should address the wording of Schedule 4 Condition 2 SSD 5465. A series of triggers should be developed based on quantitative data and this should be reported in the bi-annual monitoring reports and the Annual Review. An example of a trigger would be '% change in organisms between monitoring events'.	This recommendation has not been addressed during the audit period, as noted in Section 4.3. This forms **Recommendation 10** of this audit.	Open
	Assess the triggers from the Extraction Plans e.g. ANOVA/ANOSIM level is approaching 5% in the bi-annual monitoring reports.	Review of relevant document indicates this comment has not been closed during the audit period. This forms **Recommendation 9** of this audit.	Open
SSD-5465 – Schedule 5, Condition 1	Define who are potentially 'affected landowners' in the Air Quality Management Plan. Affected landowners should be contacted when there is a non - compliance relating to dust or noise. This should be completed even if it is a regional dust event as Delta Coal are still recording it as a non-compliance in the Annual Review.	In response to the recommendations of the previous IEA, the updated AQMP adequately defines 'potentially affected landowners' in Section 6.3. The auditor disagrees with the 2019 recommendation to contact landowners affected by regional dust events. Regardless of how it is reported in Annual Reviews, Schedule 3, Condition 11 of SSD-5465 specifically notes that exceedances at any residence on privately-owned land do not apply in relation to extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary of DPE.	Closed

Reference	2019 findings/recommendations	2022 status	Status (closed/open)
SSD-5465 – Schedule 6, Condition 1	Prepare a cross referencing table outlining where sub conditions have been covered.	Cross referencing tables are provided in Appendix 3 and Appendix 4 of the EMS.	Closed
	Ensure plans are reviewed as per Schedule 6 Condition 5.	The EMS has been reviewed within the reporting period and is compliant with the required revision timeframe.	Closed
	Include Schedule 5 Condition 2 requirement in the EMS to notify landowners of exceedances 'as soon as practical'. Define a time period for as soon as practical.	The recommendation from the previous audit to notify land owners has not been incorporated into the EMS. This therefore remains outstanding.	Closed
SSD-5465 – Schedule 6, Condition 8	The Annual Reviews are set out differently to the DPE Annual Review Guidelines (2015). Ensure table of contents matches the guidelines. Include the biodiversity monitoring reports as appendices to the Annual Review.	The form of the Annual Reports has been updated since the previous IEA and is consistent with DPE Annual Review Guidelines (2015). The recommendations of the 2019 IEA have been closed out, whereby a standalone annual Biodiversity Report is appended to the Annual Review.	Closed
SSD-5465 – Schedule 6, Condition 13	Ensure all relevant information is brought across to the Delta Coal website.	A review of the documentation on the website found that it generally contained the information listed in this clause. The information was up to date, and generally easy to find. There were however some documents on the website that were not the most up to date versions available, as discussed in Section 4.3, with **Corrective action 8** identified.	Open
Statement of Commitments recommendations	A separate report should be completed for Stream Health Channel Flow and Riparian Vegetation Monitoring. This should compare results from previous inspections. Information to be included in the Annual Review.	This data is presented in Annual Reviews. It is noted the requirement for this information to be presented in a separate report is not a commitment or requirement of the project, but rather a component of the previous auditor's recommendation. Therefore, this component of the recommendation has not been considered and this recommendation is considered closed.	Closed
	The real - time noise monitor should be re-established for the site. Liaise with the DPE regarding the best location as the majority of noise complaints have resulted from Mannering Colliery operations, not CVC. Mannering Colliery is also owned by Delta Coal. Update the Noise Management Plan.	The real-time monitor was re-established in October 2019, addressing the requirements of this recommendation.	Closed
CCL 721	Report against compliance with the MOP in future Annual Reviews.	Review of Annual Reviews for the reporting period verifies this recommendation has been closed.	Closed
Additional recommendation	The Annual Reviews need to provide a clear statement regarding whether discharge criteria have been met	Review of Annual Reviews for the reporting period verifies this recommendation has been closed.	Closed

4. Audit findings

4.1 Context of compliance assessment

CVC operates under SSD-5465, which initially provided approval for:

- An extension of the currently approved extraction area to allow underground mining to continue within the Fassifern Seam.
- The increase of the approved maximum rate of production from 1.2 million tonnes per annum (Mtpa) to 1.5 Mtpa of run-of-mine (ROM) coal.
- An increase in the approved hours for haulage of coal from the Colliery on private roads to Delta Electricity's VPPS.
- Minor upgrades and modifications to existing approved infrastructure.
- An extension of the approved mining by a period of approximately 14 years (i.e. to around 2027).
- The consolidation of the above with all the operations and environmental activities currently approved under MP10_0161, as modified, within a single development consent.

SSD-5465 has been modified five times during the operation of the mine:

- **Modification 1 (approved 27 November 2014):** Development of an underground linkage between Chain Valley Colliery and Mannering Colliery.
- **Modification 2 (approved 16 December 2015):** The modification approved the following changes to the CVC operations:
  - An increase in the maximum rate of ROM coal extraction at the mine from 1.5 Mtpa to 2.1 Mtpa.
  - Mine design changes, primarily the re-orientation of miniwall panels in the mine's northern area.
  - An increase in full-time personnel from approximately 160 to approximately 220.
  - Construction of asset protection zones (APZs) around critical infrastructure to protect from bushfires.
- **Modification 3 and Modification 5 (approved 26 June 2020):** Allowed for the following changes to the CVC operations:
  - The use of alternate bord and pillar mine designs.
  - An extension of allowed operations until 31 December 2027.
- **Modification 4 (approved 5 August 2021):** Allowed for the following changes in CVC operations:
  - Extend the currently approved underground mining area by approximately 117 hectares (ha) into an area termed the Northern Mining Area, which is located under the suburbs of Brightwater, Mirrabooka and Sunshine, to extract an additional 2.6 Mt of ROM coal from the Fassifern Seam.
  - Access the proposed extension area via existing Chain Valley Colliery underground workings.
  - Undertake first workings coal extraction using herringbone bord and pillar underground mining methods.
  - Transport ROM coal extracted from the Northern Mining Area via underground workings to either the Chain Valley Colliery or Mannering Colliery surface facilities for processing.
  - Increase the maximum number of employees reporting to the Chain Valley Colliery pit top by 110 to 330 FTE.

The site is regulated by EPL1770, with the current version last varied on 21 February 2022.

Operations at CVC currently takes place in accordance with CCL 706, CCL 707, CCL 719, CCL 1721, ML 1051, ML 1052, ML 1308, ML 1632, MPL 1370, MPL 1349, MPL 1389, MPL 1400, and MPL 337.

4.2 Summary of compliance

Review of compliance with the requirements of relevant SSD-5465 identified:

– 12 non-compliances associated with SSD-5465, including:
  - Two deemed to represent a low risk
  - 10 deemed administrative non-compliances (ANC)
– 14 non-compliances associated with EPL 1770, including:
  - Eight (8) deemed to represent a low risk
  - Six (6) deemed ANC

4.2.1 General environmental compliance

Delta Coal was generally compliant in terms of environmental performance during the audit period and site inspection. The site did not have any serious incidents or non-compliances deemed medium risk or higher.

4.2.1.1 Air quality

The AQGGMP was revised in January 2022, with review of the indicating monitoring is in accordance with the requirements of EPL 1770 and SSD-5465. During the audit period, CVC experienced a number of exceedances of air quality criteria, all noted to be as a result of contamination of samples or extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents, etc.

These exceedances are therefore not considered non-compliances. This notwithstanding, they were reported as incidents and are covered in Section 4.2.3.

During 2020, the TEOM had a short period of not recording data in December 2020 due to severe thunderstorms. The gap in monitoring were recorded as a non-compliance against EPL 1770 Condition M2.2. Delta Coal have since rectified the system; however, the 2019 IEA recommendation to investigate back-up power supply for the TEOM is deemed as still relevant to this audit also.

4.2.1.2 Noise

With the exception of administrative non-compliances, the auditor found noise generated on-site is compliant with the requirements of EPL 1770.

In relation to SSD-5465, noise monitoring results over the audit period indicate that the premises is operating within the limits of this condition. The noise monitoring reports note a technical non-compliance for ATN007 for every monitoring event due to access issues. Noise monitoring for ATN007 was conducted at representative locations. Total noise levels shown were measured at the representative and site contributions were calculated back to ATN007. The use of representative locations is allowed via operation of Schedule 6, Condition 12 of SSD-5465.

Review of relevant documentation during conduct of the audit, including complaints and incident data (see Sections 4.2.2 and 4.2.3 respectively) would indicate appropriate noise management is undertaken on-site. While only one noise complaint received in the audit period, the response in this instance was proactive and resulted in a positive community response.

It is understood Delta Coal are currently in the process of undertaking a noise mitigation study in consultation with DPE – Compliance, the results of which should assist in further mitigating and managing noise from the site, particularly during adverse meteorological conditions. The outcomes of this study should be captured in a revised noise management plan and reflect any changes to monitoring, as relevant.

4.2.1.3 Water management

Several non-compliances with EPL 1770 discharge criteria and volume limits, including simultaneously on a number of occasions, were recorded during the audit period. In addition, volumetric monitoring ceased between 26 December 2021 and 10 January 2022 due to vandalism and damage sustained to the discharge flow monitor. This has since been fixed and monitoring has recommenced. These incidents are discussed in Section 4.2.3.

As per the findings of the 2019 IEA, the site inspection observed siltation of on-site water storage dams, some of which were observed to be overgrown with bullrush. A recommendation to establish a maintenance schedule to ensure dams and drainage lines are free of silt was made in the 2019 IEA.

The auditor believes completing this recommendation may address the exceedances of combined daily discharge volume limits by ensuring water storage in dams is maximised.

The exceedances of faecal coliform may be related to on-site septic systems covered by EPL 1770. A temporary chlorine dosing unit was added to this septic in June 2020 (though exceedances are noted to have continued). This system would be decommissioned once works under CC Council approval DA 845-2020 are completed, which allows connection to the CC Council sewer network and decommissioning of on-site septics.

In relation to the above, the auditor notes the following:

– Review of relevant data indicates elevated faecal coliforms are observed at upstream baseline locations. The draft surface water impact assessment for the Chain Valley Colliery Consolidation Project identifies elevated faecal coliforms and Enterococci are highest at upstream baseline background monitoring locations and does not appear to be site related; however, could indicate an influence on water sampling results from the EPL 1770 licensed discharge point located downstream.
– The *Australian Drinking Water Guidelines 6* (Version 3.7, updated January 2022) and the *Guidelines for Managing Risks in Recreational Water* (2008) state faecal coliforms:
    - May be derived from sewage effluents. However, it may also be derived from livestock, industrial processes, farming activities, domestic animals and wildlife. Furthermore, they note faecal coliforms may include organisms not faecally derived.
    - Are unsuitable as regulatory parameters.
– NSW Health notes monitoring of faecal coliforms are no longer recommended by the *Australian Drinking Water Guidelines,* as updated in January 2022. They note this is because members of this bacteria can occur naturally in soil and water in the absence of faecal contamination.

The above points notwithstanding, a non-compliance has been found in relation to these exceedances. It is considered works under DA 845-2020 would address the potential for site contribution to elevated faecal coliform downstream of the discharge point once works are completed by 26 August 2020. **Corrective action 1** and **Recommendation 5** have been made in relation to these works.

Delta holds a groundwater bore license WAL41508 under the *Water Act, 1912*, which permits the industrial dewatering of groundwater up to volume of 4,443 megalitres (ML) per year. Based on the information in the Annual Reviews for the audit period, the site was within extraction licence limits allowed by WAL41508.

4.2.1.4 Biodiversity

The recommendations of the 2019 IEA to include a Biodiversity Monitoring Report in the Annual Reviews have been closed out. The results of these monitoring reports for 2019, 2020 and 2021 indicate vegetation and habitat values have remained generally consistent across the audit period and indicated no need for remedial actions. However, the monitoring reports, while noting successful weed control each year, did also note the need to continue weed control activities to prevent re-establishment.

4.2.1.5 Heritage

During the 2020 reporting period two previously unidentified Aboriginal Heritage Sites were disturbed during the demolition of former mine cottages. An incident report was submitted to DPE-compliance, BCD, the EPA and to Registered Aboriginal Parties (RAPs) on 22 October 2020. An independent heritage consultant inspected the site to provide further management recommendations. The sites were added to the AHIMS register as CV002 (AHIMS Site ID 45-7-0412) and CV003 (45-7-0413), with access to the sites prevented by locked gates and fencing to prevent further damage.

Review of relevant documentation indicates appropriate management of this issue was undertaken. It is noted the HMP was revised to cover these additional sites; and has been approved.

4.2.1.6 Visual

No new structures or works have occurred within the reporting period that would negatively impact visual amenity, and therefore no changes to visual factors have occurred.

4.2.1.7 Waste

Remondis manages waste streams on-site, providing waste receipts which identify the types and quantities of wastes generated and where they are disposed.

Waste systems were viewed on site during the site inspection. There were adequate, clearly marked receptacles placed around the site for waste; however, it was observed that staff were not segregating waste appropriately (see Plate 4.3, Plate 4.4 and Plate 4.14). This therefore constitutes a non-compliance with a number of conditions of EPL 1770 and SSD-5465, with **Corrective action 2** identified to address.

Therefore, a low risk non-compliance has been identified and corrective action 2 has been identified.

4.2.1.8 Rehabilitation

Review of the current approved MOP indicates minimal rehabilitation is proposed during the MOP period, with rehabilitation goals generally related to mine closure and addressing subsidence impacts, the consent allows operation up to 31 December 2027; therefore, closure planning in accordance with SSD-5465 is not required to commence until 31 December 2022.

The site is currently in the process of preparing a Rehabilitation Management Plan (RMP) and Annual Rehabilitation Report and Forward Program (as now required by the NSW Resources Regulator instead of a MOP from 2 July 2022). As part of the RMP preparation, it is also recommended that this document discuss topsoil storage and estimated volumes required for rehabilitation.

Review of relevant documentation indicates minor rehabilitation has been undertaken in relation to demolition works undertaken during 2021 (i.e. demolition of former mine cottages and infrastructure pertaining to coal conveyors & ROM coal handling facilities).

4.2.2 Complaints

Review of complaints records for CVC identified complaints as follows:

– 9 October 2020 – The complainant noted noise from the CVC. At the time of the complaint, demolition of redundant site infrastructure was being undertaken. The Environmental Compliance Coordinator attended the residence and met with the complainant, who was satisfied knowing the works were temporary and the noise was not related to on-going mining operations at the CVC.
– 6 June 2021 – The complainant noted suspected damage sustained to the property. The complainant was issued a letter response on 8 June 2021, noting no active or former CVC mining was occurring beneath the property. A review of mine plans indicated the property was underlain by former Wallarah Colliery workings, progressed in the late 1970's. The complainant was referred to Subsidence Advisory NSW to make a claim for damages suspected to be caused by 1970's mine workings.

4.2.3 Incidents

Review of incidents records for CVC identified incidents is summarise in Table 4.1 below.

Table 4.1 Summary of incidents during the audit period

Issue	Date(s)	Description
Licensed water discharge	30/08/2019	Exceedance of EPL 1770 – Volumetric Discharge Limit. The incident was reported to relevant authorities.
	18/09/2019 and 17/12/2019	Exceedance of EPL 1770 – Faecal Coliform Concentration Limit. The incident was reported to relevant authorities.
	09/02/2020, 18/03/2021, 21/03/2021	Exceedance of EPL 1770 – Volumetric Discharge Limit, and Total suspended solids (TSS) & Faecal Coliform Concentration Limits. The exceedances were noted to have all occurred during significant rainfall events. The incident was reported to relevant authorities.
	26/07/2020	Exceedance of EPL 1770 – Volumetric Discharge Limit. The exceedance was noted to have occurred during a significant rainfall event (131.2 mm in 24hr). The incident was reported to relevant authorities.
	24/12/2021	Telemetry for LDP1 went offline, with an inspection indicating vandalism of the meter, damaging the MACE FloPro unit and solar panel. This incident was reported to relevant authorities, repairs were undertaken to the unit on 10/01/2022 when replacement parts became available. The unit resumed functionality on the date of repairs.
	18/01/2022	Exceedance of EPL 1770 Faecal Coliform Limit at CVC LDP1. The incident was reported to relevant authorities, with Delta reviewing and updating its chlorine dosing units for the bathhouse and shower septic, including consideration of dosage, timing, and volume of CVC effluent.
	30/03/2022	Exceedance of EPL 1770 Faecal Coliform Limit (200 CFU/100ml) at LDP 27 (CVC spillway) during a significant rainfall event. The incident was reported to relevant authorities, with Delta reviewing the chlorine dosing system for the bathhouse and shower septic, noting it had recently increased dosage volumes, with field testing identifying chlorine presenting in concentrations that would disinfect water during routine monthly sampling.
Heritage	21/09/2020	This incident is discussed in Section 4.2.1.5.

Issue	Date(s)	Description
Air quality exceedances	10/12/2019	Exceedance of depositional dust criteria, reported to relevant authorities. The exceedance was identified as contaminated, with no need for an incident report.
	2019: 26/10/2019, 30/10/2019, 31/10/2019, 7/11/2019, 12/11/2019, 19/11/2019, 22/11/2019, 28/11/2019, 29/11/2019, 30/11/2019, 2/12/2019, 3/12/2019, 4/12/2019, 5/12/2019, 6/12/2019, 10/12/2019, 19/12/2019 & 31/12/2019 **2020:** 4/01/2020, 5/01/2020, 8/01/2020, 24/01/2020,	Exceedances of PM10 air quality criteria during the audit period, all of which were reported to relevant authorities. All exceedances were identified as extraordinary events, with no need for an incident report.
	9/04/2020, 5/06/2020, 7/07/2020, 7/09/2020, 18/11/2020, 11/12/2020, 31/12/2020, 18/02/2021 & 21/04/2021	Exceedance of depositional dust criteria, with each incident reported to relevant authorities. The formal incident reports to DPE for each incident identified the exceedances as being due to contamination. Consultation from DPE to Delta during the audit period noted DDG005 (which was installed in February 2020 at the same general location as DDG005) provided better representation of potential emissions from the CVC ventilation fan site. The AQMP was revised during the audit period to replace monitoring at DDG005 with DDG006.
	3, 6, 16, 18, 19, 20 and 24 January 2022	PM2.5 daily average exceedances, with Delta determining, based on operations at the time and meteorological conditions that its operations did not contribute with any significance to the non-compliances recorded at Tingley Road, Wyee. Further calibration and replacement of filters was undertaken by the maintenance contractor and the unit's performance to be monitored. Delta has committed to developing a TARP to further detail the management procedures for the newly established PM2.5 alarms, see **Corrective action 4**.

4.2.4 Site inspection observations



Plate 4.1 *Treated effluent discharge location within CVC*



Plate 4.2 *Treated effluent system within CVC*



Plate 4.3 *Inappropriate waste disposal, with general waste in an oil rags bin*



Plate 4.4 *Inappropriate waste disposal, with general waste in an emergency spill kit bin*



Plate 4.5 *Groundwater discharge location at D8, part of the sediment dam catchment*



Plate 4.6 *Hazardous materials and oil storage bay*



Plate 4.7 Chlorine dosing pump



Plate 4.8 Above ground, bunded diesel storage tank



Plate 4.9 Licensed discharge point for EPL 1770



Plate 4.10 Dam D10 spillway to licensed discharge point for EPL 1770



Plate 4.11 Coal stockpile area, with no active stockpiling undertaken at present



Plate 4.12 Bunded oil storage bay



Plate 4.13 *Oil water separator capturing runoff from the oil storage facilities, diesel tank storage, workshop / maintenance areas and wash bay*



Plate 4.14 *Inappropriate waste disposal within the diesel particulate filters bin*



Plate 4.15 *Grouted drain valve, removing ability to drain diesel storage bund, in accordance with the EPL*



Plate 4.16 *Oily water separator for compressors*

4.3 Compliance with SSD-5465

4.3.1 Summary of non-compliances

The review of compliance with SSD-5465 identified 12 non-compliances. Two non-compliances were deemed to represent a low risk, while 10 were deemed administrative in nature.

A summary of non-compliances is detailed in Table 4.2.

Table 4.2 Summary of SSD-5465 non-compliances

Condition	Reason for non-compliance	Risk rating
Schedule 2, Condition 2	The following conditions of this licence were identified as being non-compliant over the reporting period: – Schedule 2, Condition 2 – Schedule 2, Condition 23 – Schedule 3, Condition 5 – Schedule 3, Condition 9 – Schedule 3, Condition 17 – Schedule 3, Condition 18 – Schedule 3, Condition 23 – Schedule 6, Condition 3 – Schedule 6, Condition 4 – Schedule 6, Condition 5 – Schedule 6, Condition 12 – Schedule 6, Condition 13 As these conditions of the licence have not been complied with, this condition is also non-compliant. Refer to corrective actions and recommendations on each condition.	Low
Schedule 2, Condition 23	As the recommendation of the 2019 IEA audit to ensure that Trigger Action Response Plans (TARPs) are added into the management plans has not been followed though in the audit for the following plans: – AQGGMP – HMP – Seagrass Management Plan – Benthic Communities Management Plan – WMP A non-compliance with clause (c) of this condition is recorded and **Corrective action 4** has been made.	Administrative
Schedule 3, Condition 5	A summary of the Independent Traffic Audit findings are not included in the annual review documentation. This constitutes and administrative non-compliance. Therefore, **Corrective action 5** has been made.	Administrative
Schedule 3, Condition 9	A review of the approved NMP for the site found it generally compliant with the requirements of this condition. The plan however has not been updated since 2014, and therefore does not accurately reflect the activities and conditions occurring on site (including relevant monitoring locations), therefore an administrative non-compliance has been identified. The auditor notes a revised NMP was approved by DPE following conduct of the site inspection, addressing this non-compliance.	Administrative
Schedule 3, Condition 17	The wastewater system was generally being operated in accordance with this condition and of the conditions of the EPL. However, quarterly servicing regimes were not followed at times during the reporting period, constituting a non-compliance against the condition of the EPL (refer to discussion for Condition O8.4)	Administrative

Condition	Reason for non-compliance	Risk rating
Schedule 3, Condition 18	As above, the wastewater system was generally being operated in accordance with this condition and of the conditions of the EPL. However, quarterly servicing regimes were not followed at times during the reporting period, constituting a non-compliance with the approved WMP. Quarterly servicing was missed due to scheduling and contractor delay.	Administrative
Schedule 3, Condition 23	Waste systems were viewed on site during the site inspection. There were adequate, clearly marked receptacles placed around the site for waste; however, it was noticed that staff were not segregating waste appropriately. This therefore constitutes a non-compliance with clause (b). Therefore, a low risk non-compliance has been identified and corrective action 2 has been identified.	Low
Schedule 6, Condition 3	Refer to discussion for Schedule 2, Condition 23 and Schedule 3, Condition 9.	Administrative
Schedule 6, Condition 4	Refer to discussion for Schedule 2, Condition 23 and Schedule 3, Condition 9. Failure to complete a review and (as necessary) a revision of the relevant plans has resulted in an administrative non-compliance with Schedule 6, Condition 4 and clauses (c) and (d) of Schedule 6, Condition 5, with **Corrective action 6** made.	Administrative
Schedule 6, Condition 5		
Schedule 6, Condition 12	Refer to discussion for Schedule 3, Condition 9.	Administrative
Schedule 6, Condition 13	A review of the documentation on the website found that it generally contained the information listed in this clause. The information was up to date, and generally easy to find. There were however some documents on the website that were not the most up to date versions available. These were: – Benthic Communities Management Plan, with the website revision dated 17 June 2019, but the current revision dated 6 April 2021. – Seagrass Management Plan, with the website revision dated 10 July 2020, but the current revision dated 6 April 2021. – Built Features Management Plan, with the website revision dated 12 May 2020, but the current revision dated 6 April 2021. This therefore constitutes a non-compliance against clause (b) of this condition and **Corrective action 7**.	Administrative

4.4 Compliance with EPL 1770

4.4.1 Summary of non-compliances

A review of compliance against EPL 1770 identified 14 non-compliances. Eight (8) non-compliances were deemed to represent a low risk, while six (6) were deemed administrative in nature.

A summary of non-compliances are detailed in Table 4.3 below.

Table 4.3 Summary of EPL 1770 Non-Compliances

Condition	Reason for non-compliance	Risk rating
P1.4	Monitoring locations are shown in Figure 2 of the Noise Management Plan and are described in Section 5.2. These locations are generally consistent with the requirements of this condition; however, point 13 (R12) and point 14 (R13) are not shown, thus forming an administrative non-compliance. The auditor notes that a revision to the NMP was approved by DPE following the site inspection on 12 April 2022, which adequately describes the monitoring locations. Therefore, no corrective action is required.	Administrative
L1.1	Several incidents related to water pollution occurred over the reporting period. These are described below in L2.4, L3.1 and L3.2	Low
L2.1	Several non-compliances have occurred within the reporting period. Refer to condition L2.4, L3.1 and L3.2	Low

Condition	Reason for non-compliance	Risk rating
L2.4	Several non-compliances were recorded against this condition over the reporting period: – Exceedance of faecal coliform limit at LDP01 on 31 August 2019 – Exceedance of faecal coliform limit at LDP01 on 18 September 2019 – Exceedance of faecal coliform limit at LDP01 on 17 December 2019 – Exceedance of faecal coliform and TSS limit at LDP27 on 7 February 2020 – Exceedance of faecal coliform and TSS limit at LDP27 on 26 July 2020 – Exceedance of faecal coliform and TSS limit at LDP27 on 9 September 2020 – Exceedance of faecal coliform and TSS limit at LDP27 on 18 March 2021 – Exceedance of faecal coliform and TSS limit at LDP27 on 21 March 2021 – Exceedance of faecal coliform limit at LDP01 on 18 January 2022 – Exceedance of faecal coliform limit at LDP27 on 31 March 2022 These exceedances therefore form a non-compliance against this condition, with **Corrective Action 1** made address the non-compliance.	Low
L3.1	Exceedance of the daily volume limit at LDP01 on 30 August 2019. This exceedance therefore forms a non-compliance against this condition, with **Recommendation 6** made to address.	Low
L3.2	Several non-compliances were recorded against this condition over the reporting period: – Exceedance of combined daily volume limit at LDP1 and LDP27 on 9 February 2020. – Exceedance of combined daily volume limit at LDP1 and LDP27 on 26 July 2020 – there was also an exceedance of faecal coliforms and TSS at LDP27 on this day. This forms a medium risk non-compliance. – Exceedance of combined daily volume limit at LDP1 and LDP27 on 18 March 2021 – there was also an exceedance of faecal coliforms and TSS at LDP27 on this day. This forms a medium risk non-compliance. – Exceedance of combined daily volume limit at LDP1 and LDP27 on 21 March 2021- there was also an exceedance of faecal coliforms and TSS at LDP27 on this day. This forms a medium risk non-compliance. – Volumetric monitoring also ceased between 26 December 2021 and 10 January 2022 due to the volumetric flow met. This has been fixed and monitoring has recommenced. **Corrective Action 1** has therefore been made to address the non-compliance.	Low
L5.1	A review of the data presented in the quarterly noise monitoring reports and the annual compliance assessments found that Chain Valley Colliery is operating within the noise limits defined by this condition, with the exception of Point 23 (ATN007). It was noted that there appears to be a typographical error in the limits for Point 23 (ATN007) and that the noise limits of the EPL were not consistent with the noise limits in SSD-5465. The EPL was modified on 30 September 2021 so that the noise limits for Point 23 (ATN007) were consistent with those presented in SSD-5465. Even so, noise monitoring results did not compare findings against previous EPL criteria, thus constituting an administrative non-compliance. As this issue with the EPL has been resolved, no corrective actions are required.	Administrative
L5.7	Monitoring for LA1(1minute) noise levels is not completed at 1 m from a façade; however, such noise monitoring is generally not practical due to disturbance to residents during the sensitive night-time period. Furthermore, operation of Schedule 6, Condition 12 of SSD-5465 allows monitoring from representative locations.	Administrative
O1.1	Waste tracking sheets were viewed during the audit and were found to be adequate and in compliance with this condition. During the site inspection, the auditor noted that waste disposal was generally non-compliant with the requirements of this condition, with inappropriate waste disposal identified at a number of waste storage locations (see Section 4.2.4). As a result **Corrective action 2** has been made.	Low
O7.2	The site inspection identified that there were adequate vessels for recycling on site; however, recycling was not adequately implemented by staff. There were several instances of incorrect waste being placed into a clearly labelled waste stream bin. As a result **Corrective action 2** has been made.	Low

Condition	Reason for non-compliance	Risk rating
O8.4	Servicing records were provided showing evidence of regular servicing. It was noted by the auditors that the servicing for Q4 2020 was not completed on time, therefore constituting an administrative non-compliance. However, the servicing event occurred 7 days following the end of Q4 2020 and subsequent servicing has been undertaken at quarterly intervals. Therefore, no corrective action is proposed.	Administrative
M1.3	Review of air quality monitoring sheets were found to be generally compliant with the requirements of this condition; however, they did not include a sample time, thus a non-compliance against clause (b) is recorded. Therefore, **Corrective action 3** has been made.	Administrative
M2.2	The TEOM stopped recording data for a short period in December 2020 due to severe thunderstorms. The gap in monitoring is recorded as a non-compliance against this condition. Delta Coal have since rectified the system and no corrective action is required. The 2019 IEA recommended that the TEOM is set up with alarms and notifications when the short term criterion for particulate matter is approached or exceeded. Delta Coal provided evidence that this has occurred, and this recommendation is considered closed out. The 2019 IEA recommendation to investigate back up power supply for the TEOM has not been carried out in the reporting period. Therefore, this recommendation has been reproduced as part of this audit.	Low
M8.1	A review of the Annual Review and monitoring data has found that monitoring of discharge points was generally adequate over the reporting period. The exception being volumetric monitoring also ceased between 26 December 2021 and 10 January 2022 due to the vandalism of the volumetric flow measuring equipment. This constitutes a non-compliance against condition (a). This has been fixed and monitoring has recommenced. As Delta Coal have been prompt in addressing this issue, no corrective action is recommended.	Administrative

4.5 Compliance with relevant leases

4.5.1 Summary of non-compliances

The review of compliance with the relevant leases (CCL 706, CCL 707, CCL 719, CCL 1721, ML 1051, ML 1052, ML 1308, ML 1632, MPL 1370, MPL 1349, MPL 1389, MPL 1400, and MPL 337) did not identify any non-compliances during the audit period.

4.6 Adequacy of any strategies/plans and programs

A number of strategies, plans and programs have been developed for the Mine in accordance with SSD-5465 and EPL 1770. Table 4.4 provides a summary of the key monitoring and management practices on site and areas recommended for improvement.

Table 4.4 Status of key monitoring and management

Environmental aspect	Reference	Implementation	Recommendation
General compliance	EMS Management plans listed in this table	Management plans prepared for the site are generally compliant with the requirements of the project approval and the EPL. The EPL was reissued in February 2022 to reflect current mining operations and minor changes to the requirements of the EPL. The EMS was generally compliant with the requirements of SSD-5465; however, the recommendation from the previous audit to notify land owners has not been incorporated into the EMS. This therefore remains outstanding and has been reproduced as a recommendation in this audit.	Recommendation 7
Traffic and transport	Road Transport Protocol, including TMP and Code of Conduct	Review of relevant data indicates negligible impacts on traffic and transport as a result of CVC operation, with independent traffic audits undertaken on annual basis over the audit period and in compliance with the requirements SSD-5465. Relevant recommendations from the 2019 IEA relating to this plan were also noted to have been closed out. However, it is noted independent traffic audits are not reported in annual reviews in accordance with Schedule 3, Condition 5. Therefore, corrective action 5 has been made.	Corrective action 5
Noise management plan	NMP	Review of relevant documentation indicated the 2014 NMP was still the relevant management plan for the site during the audit period, with non-compliances consistent with the 2019 IEA. However, it is noted a 2022 version was approved by DPE following the conduct of the site inspection on 12 April 2022, addressing relevant non-compliances and recommendations associated with the 2014 NMP. A review of the complaints register found that one noise complaints was received over the reporting period. This complaint occurred in October 2020 and did not occur again over the reporting period. This indicates that adaptive noise management is being undertaken by Delta Coal.	N/A
AQMP	AQMP	A review of the AQMP prepared for the site found it to be generally compliant with SSD-5465 and EPL 1770.	N/A
Water management	WMP, including SWMP and GWMP	The implementation of the WMP on site was generally considered adequate. However, as discussed in Section 4.2.1.3, a number of non-compliances with the requirements of EPL 1770 have occurred during the reporting period. As per the findings of the 2019 IEA, the site inspection observed siltation of on-site water storage dams, some of which were observed to be overgrown with bullrush. A recommendation to establish a maintenance schedule to ensure dams and drainage lines are free of silt was made in the 2019 IEA. The auditor believes completing this recommendation may address the exceedances of combined daily discharge volume limits and TSS by ensuring water storage in dams is maximised. Furthermore, a non-compliance a non-compliance has been found in relation to exceedances of faecal coliform criteria in EPL 1770. It is considered works under DA 845-2020 to connect to the CC Council sewer network rather than relying on on-site septics would address the potential for site contribution to elevated faecal coliform downstream of the discharge point once works are completed by 26 August 2020.	Corrective actions 1 and 4 Recommendations 5 and 6

Environmental aspect	Reference	Implementation	Recommendation
Biodiversity	BMP	A review of the BMP prepared for the site found it to be generally compliant with SSD-5465 and EPL 1770.	N/A
	Biodiversity Enhancement Strategy	A review of the Biodiversity Enhancement Strategy prepared for the site found it to be generally compliant with SSD-5465.	N/A
Heritage	HMP	During the 2020 reporting period, two previously unidentified Aboriginal Heritage Sites were disturbed during the demolition of former mine cottages. An incident report was submitted to DPE-compliance, BCD, the EPA and to Registered Aboriginal Parties (RAPs) on 22 October 2020. Review of relevant documentation indicate appropriate management of this issue was undertaken. It is noted the HMP was revised to cover these additional sites and has been approved.	N/A
Rehabilitation	RMP	A review of the MOP found them compliant with the requirements of SSD-5465. The RMP was also found to be generally compliant with the requirements of SSD-5465. There were no areas of the site under active rehabilitation over the reporting period. General maintenance vegetation maintenance and weed management have been undertaken. It is noted Delta are in the process of preparing a Rehabilitation Management Plan (RMP) and Annual Rehabilitation Report and Forward Program (as now required by the NSW Resources Regulator instead of a MOP from 2 July 2022). This RMP is recommended to ensure to discuss topsoil storage and estimated volumes required for rehabilitation.	Recommendation 8
Pollution incident response	PIRMP	A review of the PIRMP found that the recommendations of the 2019 IEA have been incorporated and are closed out. The PIRMP was tested three times in the audit period: – 17 December 2019 – 22 December 2020 – 22 December 2021 The PIRMP was produced in the site inspection.	N/A

4.7 Auditor's response to any matters raised by agencies/stakeholders

4.7.1 DPE

A consultation letter was provided to the DPE Compliance Team on 23 March 2022, with a subsequent response received 28 March 2022 and is summarised in Table 4.5.

Table 4.5 DPE comments and auditor's response

NSW Resource Regulator comments	Auditor response
Implementation of approved management plans	Sections 4.2 and 4.6
Noise management and monitoring – in particular, is the current monitoring regime adequate for the surrounding receivers and are the monitoring locations most representative of the nearest residential receivers?	Section 4.2.1.2
Surface water management and discharge events	Section 4.2.1.3
Complaints management and responses	Section 4.2.2

4.7.2 NSW Resources Regulator

A consultation letter was provided to the NSW Resources Regulator on 23 March 2022, with a subsequent response received 23 March 2022 and is summarised in Table 4.6.

Table 4.6 NSW Resources Regulator comments and auditor's response

NSW Resource Regulator comments	Auditor response
Review relevant mining leases and exploration licences as agreed with Resources Regulator.	Noted
Undertake an assessment of compliance against the conditions of title related to environmental management.	Noted
Verify that there is a current Mining Operations Plan (MOP) in place and it has been approved by the Regulator – review compliance against any conditions of approval of the MOP.	The existing MOP which applies to CVC is Amendment 2 dated 12 August 2021. However, it is noted while the current MOP period ends in 2023, the new RMP and Annual Report & Forward Program are in the process of being prepared for submission by 2 July 2022.
Undertake a critical review of the MOP, including an assessment of its compatibility with the description of operations contained in the planning approval. In particular.	Review of the existing MOP indicates consistency with the requirements of SSD-5465 and the associated EA, including subsequent modification EAs. Review of these documents indicate relevant rehabilitation commitments and objectives for CVC relate to addressing any potential subsidence impacts, for which relevant performance measures detailed under Schedule 5, Conditions 2 and 4 of SSD-5465 have been met during the audit period. Otherwise, relevant rehabilitation committed to in the EA relates to rehabilitation to be undertaken at completion of mining activities, which is not relevant to the audit period. Review of relevant documentation for the audit period otherwise indicates compliance with the rehabilitation objectives and completion criteria identified in the existing MOP.
Review the rehabilitation strategy as outlined in the MOP to determine if it is consistent with the Project Approval in terms of progressive rehabilitation schedule; and proposed final land use(s).	
Review the rehabilitation objectives and completion criteria as outlined in the MOP to determine if they have been developed in accordance with the proposed final land use(s) as outlined in the Project Approval.	
Review the development and implementation of any rehabilitation monitoring programs to assess performance against the nominated objectives and completion criteria – verified by reviewing monitoring reports and rehabilitation inspection records.	As above

NSW Resource Regulator comments	Auditor response
Determine if a rehabilitation care and maintenance program has been developed and implemented based on the outcomes of monitoring program – verified by reviewing Annual Rehabilitation Programs or similar documentation.	A rehabilitation care and maintenance program has not been developed as part of the existing MOP. It has been recommended Delt include a rehabilitation care and maintenance program as part of the RMP and Annual Rehabilitation Report and Forward Program currently being prepared (as now required by the NSW Resources Regulator instead of a MOP).
Confirm that mining operations are being conducted in accordance with the approved MOP (production, mining sequence etc.), including within the designated MOP approval boundary – to be verified by site plans and site inspection.	Review of relevant documentation and conduct of the site inspection on 12 April 2022 indicates operations at CVC are being undertaken in accordance with the existing MOP.
Confirm that rehabilitation progress is consistent with the approved MOP as verified by site plans and a site inspection. This should include an evaluation against rehabilitation targets and whether the final landform is being developed in accordance with conceptual final landform in the Project Approval.	As discussed, review of the existing MOP indicates minimal rehabilitation is proposed during the MOP period (noting that it will be superseded in July 2022), as an underground mine site there is minimal surface area requiring progressive rehabilitation. Subsidence issues would be the primary requirement for rehabilitation during the audit period, with no subsidence occurring during the audit period requiring rehabilitation. This notwithstanding, review of relevant documentation indicates minor rehabilitation in relation to demolition works undertaken during 2021 (i.e. demolition of former mine cottages and infrastructure pertaining to coal conveyors & ROM coal handling facilities). This area has been rehabilitated to open grasslands, with ongoing priority weed management. Delta notes they do not intend to relinquish these rehabilitated areas from the mining lease.
Based on a visual inspection, determine if there are any rehabilitation areas that appear to have failed or that have incurred an issue that may result in a delay in achieving the successful rehabilitation outcomes.	

4.7.3 CCC Chair

A consultation letter was provided to the CCC Chair on 23 March 2022, with a response (including input of CCC members) received on 1 April 2022. This response indicated no one raised any matters of concern for the auditor to investigate.

The CCC Chair noted general consensus that CVC operations and performance are in accordance with the relevant approvals.

4.7.4 EPA

A consultation letter was provided to the EPA on 23 March 2022, with a response received 25 March 2022 noting the EPA did not have any comments.

4.7.5 Other agencies

A consultation letter was provided to the BCD, DPI – Fisheries, Heritage NSW, DPI – Water, CC Council and LMCC on 23 March 2022, with no response received to date.

5. Corrective actions and recommendations

Table 5.1 and Table 5.2 summarise the corrective actions and recommendations respectively made based on the findings of the audit.

Table 5.1 Corrective actions

Number	Condition	Corrective action
EPL 1770		
1	L2.4 and L3.2	Keep DPE up-to-date on the progress of works under DA 845-2020 to address exceedances associated with licensed discharges.
2	O1.1 & O7.2	As bins are clearly labelled and adequate disposal facilities are available across the site, Delta should investigate means to address the workforce culture in relation to inadequate disposal of waste that has persisted across this, and the previous, audit.
3	M1.3	Ensure contractors record sample time when recording air quality monitoring data in accordance with the requirements of Condition M1.3.
SSD-5465		
4	Schedule 2, Condition 23	Ensure that TARPs are included in the AQMP, HMP, Seagrass Management Plan, Benthic Communities Management Plan and WMP in the next update. This includes developing a TARP to further detail the management procedures for the newly established PM2.5 alarms within the AQMP.
5	Schedule 3, Condition 5	Ensure a summary of the results of Independent Traffic Audits are included in Annual Reviews.
6	Schedule 6, Condition 5	Ensure plans are updated within three months of submission of this IEA and otherwise in accordance with the requirements of Schedule 6, Condition 5.
7	Schedule 6, Condition 13	Ensure that the most up to date management plans are uploaded onto the website.

Table 5.2 Recommendations

Number	Condition	Recommendation
EPL1770		
1	P1.1	As part of updates required to the AQMP, update Figure 3 to show the location of the meteorological station.
2	L2.4	There is an inconsistent naming convention for the discharge locations between sites. It is recommended that they are consistently referenced across management plans and annual reviews.
3	M2.2	To improve data capture for PM10, review possibilities of backup power supply for the system.
SSD-5465		
4	Schedule 2, Condition 22	The outcome of consultation is not included in the BMP, it is recommended a statement be added to indicate no comments were received to be included in the plan.
5	Schedule 3, Condition 17 and Condition 18	The WMP has not been implemented as approved in relation to sewage management. Ensure the WMP is updated to reflect the changes to on-site sewage management, which are scheduled to be completed by 26 August 2022.
6	Schedule 3, Condition 18	Ensure a maintenance schedule is established to ensure dams and drainage lines are free of silt and water storage is maximised.
7	Schedule 6, Condition 1	Include a requirement in the EMS to notify landowners of exceedances 'as soon as practical'. Define a time period for as ‘soon as practical’.

Number	Condition	Recommendation
8	Schedule 3, Condition 27	Ensure the RMP required by SSD-5465 is updated to consider the requirements of the RMP and Annual Rehabilitation Report and Forward Program currently being prepared (as now required by the NSW Resources Regulator instead of a MOP) and documents where topsoil will be stored and the estimated volumes required for rehabilitation.
9	Schedule 3, Condition 9	The outcomes of the noise mitigation study currently being completed should be captured in a revised noise management plan and reflect any changes to monitoring, as relevant.
Still relevant 2019 IEA recommendations		
10	Schedule 4, Condition 1-4	Assess the triggers from the Extraction Plans e.g. ANOVA/ANOSIM level is approaching 5% in the bi-annual monitoring reports.
11	Schedule 4, Condition 2	Develop a TARP when updating the Benthic Communities Management Plan. This should address the wording of Schedule 4 Condition 2 SSD 5465. A series of triggers should be developed based on quantitative data and this should be reported in the bi - annual monitoring reports and the Annual Review. An example of a trigger would be '% change in organisms between monitoring events'.

Appendices

Appendix A

Audit team approval letter

Department of Planning and Environment

Mr Lachlan McWha
Environmental Compliance Coordinator
Great Southern Energy Pty Ltd (t/a Delta Coal)
Chain Valley Colliery
Awabakal Country
PO Box 7115
Mannering Park NSW 2259

23/02/2022

Dear Mr McWha

Chain Valley Extension - IEA Auditor Endorsement Request (SSD-5463 and MP 06_0311)

I refer to your request (SSD-5465-PA-70) submitted to the Department of Planning and Environment (the Department) on 17 February 2022 requesting the Secretary's endorsement of suitably qualified persons to prepare the Independent Environmental Audit (IEA) for the Chain Valley Colliery in accordance with Schedule 6 Condition 9 of SSD-5465, as modified and Schedule 5 Condition 9 of MP 06_0311, as modified (the consents).

The Department has reviewed the nominations and information you have provided and is satisfied that these experts are suitably qualified and experienced. Consequently, I can advise that the Secretary endorses the appointment of the following audit team to prepare the IEA for the Chain Valley Colliery:

- Mr Elliot Holland (Lead Auditor); and
- Ms Michelle Kiejda (Technical Review).

Please ensure this correspondence is appended to the Independent Audit Report.

The Independent Audit must be prepared, undertaken and finalised in accordance with the Department's *Independent Audit Guideline – Post approval requirements for state significant developments* (October 2016). Failure to meet these requirements will require revision and resubmission.

The Department reserves the right to request an alternate auditor or audit team for future audits.

Notwithstanding the agreement for the above listed audit team, each respective project approval or consent requires a request for the agreement to the auditor or audit team be submitted to the Department, for consideration of the Secretary. Each request is reviewed and depending on the complexity of future projects, the suitability of a proposed auditor or audit team will be considered.

Should you wish to discuss the matter further, please contact James Epstein, Senior Compliance Officer, on (02) 6575 3419 or via email compliance@planning.nsw.gov.au

Yours sincerely



Heidi Watters
Team Leader Northern
Compliance
As nominee of the Planning Secretary

Appendix B

Agency consultation

GHD Tower, Level 3, 24 Honeysuckle Drive
Newcastle, New South Wales 2300
Australia
www.ghd.com

Your ref: 0001
Our ref: 12572751

23 March 2022

James Epstein
Senior Compliance Officer
Locked Bag 5022
Parramatta, NSW, 2124

Chain Valley Colliery (SSD-5465) and Mannering Colliery (PA06_0311) Independent Environmental Audit

Dear James

Great Southern Energy Pty Ltd (trading as 'Delta Coal') has engaged GHD to undertake independent environmental audits of their underground operations Chain Valley Colliery (CVC) and Mannering Colliery. These audits would be prepared in accordance with Schedule 6, Condition 9 of SSD-5465 (as modified) and Schedule 5, Condition 9 of PA06_0311 (as modified, respectively. The scope of the audit is to:

– Assess the environmental performance of the development and whether it is complying with the relevant requirements of the consent and any relevant EPLs or Mining Leases (including any assessment, plan or program required under these approvals)
– Review the adequacy of strategies, plans or programs required under the Development Consent
– Recommend measures or actions to improve the environmental performance of the project and/or any assessment, plan or program required under the approval

I am writing to you to invite comment from yourself in regard to CVC operations (as they relate to SSD-5465 (as modified)) and Mannering Colliery operations (as they relate to PA06_0311)), as well as Delta Coal's performance with other requirements for each site, as you may deem appropriate.

It would be appreciated if you could provide your comments in regard to the performance of Delta Coal's in meeting these obligations under the following headings:

– Compliance with requirements
– Progress to meeting requirements
– Details of incidents of non-compliance
– Adequacy of actions taken
– Adequacy of the requirements of the licence

I also invite you to comment on Delta Coal's performance with other requirements, as you may deem appropriate.

The site visit for the audit is currently scheduled to be conducted the Thursday/Friday, 7 and 8 April 2022. We wish to invite you to provide comment on Delta Coal's compliance/performance so that we may adequately address any concerns during the audit.

It would be appreciated if you could submit your written comments by close of business Wednesday, 6 April 2022.

All correspondence in relation to this matter should be directed to Elliot Holland, GHD Lead Auditor on 02 4979 9923 or elliot.holland@ghd.com.

Regards



Elliot Holland
Exemplar Global – Lead Auditor: EMS

(02) 4979 9923
elliot.holland@ghd.com

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Newcastle, New South Wales 2300
Australia
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Your ref: 0001
Our ref: 12572751

23 March 2022

Biodiversity Conservation Division
Locked Bag 1002
Dangar, NSW, 2259

Chain Valley Colliery (SSD-5465) and Mannering Colliery (PA06_0311) Independent Environmental Audit

To whom it may concern

Great Southern Energy Pty Ltd (trading as 'Delta Coal') has engaged GHD to undertake independent environmental audits of their underground operations Chain Valley Colliery (CVC) and Mannering Colliery. These audits would be prepared in accordance with Schedule 6, Condition 9 of SSD-5465 (as modified) and Schedule 5, Condition 9 of PA06_0311 (as modified, respectively. The scope of the audit is to:

- Assess the environmental performance of the development and whether it is complying with the relevant requirements of the consent and any relevant EPLs or Mining Leases (including any assessment, plan or program required under these approvals)
- Review the adequacy of strategies, plans or programs required under the Development Consent
- Recommend measures or actions to improve the environmental performance of the project and/or any assessment, plan or program required under the approval.

I am writing to you to invite comment from the Biodiversity Conservation Division (BCD) in regard to CVC operations (as they relate to SSD-5465 (as modified)) and Mannering Colliery operations (as they relate to PA06_0311)), as well as Delta Coal's performance with other requirements for each site, as you may deem appropriate.

It would be appreciated if you could provide your comments in regard to the performance of Delta Coal's in meeting these obligations under the following headings:

- Compliance with requirements
- Progress to meeting requirements
- Details of incidents of non-compliance
- Adequacy of actions taken
- Adequacy of the requirements of the licence.

I also invite you to comment on Delta Coal's performance with other requirements, as you may deem appropriate.

The site visit for the audit is currently scheduled to be conducted the week commencing Monday, 7 April 2022. We wish to invite you to provide comment on Delta Coal's compliance/performance so that we may adequately address any concerns during the audit.

Upon receipt of this letter, please advise GHD of the primary contact within your organisation that will be coordinating this request. It would be appreciated if you could submit your written comments by close of business Wednesday, 6 April 2022.

All correspondence in relation to this matter should be directed to Elliot Holland, GHD Lead Auditor on 02 4979 9923 or elliot.holland@ghd.com.

Regards



Elliot Holland
Exemplar Global – Lead Auditor: EMS

(02) 4979 9923
Elliot.holland@ghd.com

GHD Tower, Level 3, 24 Honeysuckle Drive
Newcastle, New South Wales 2300
Australia
www.ghd.com

Your ref: 0001
Our ref: 12572751

23 March 2022

Margaret MacDonald-Hill
Committee Independent Chair

Chain Valley Colliery (SSD-5465) and Mannering Colliery (PA06_0311) Independent Environmental Audit

Dear Margaret

Great Southern Energy Pty Ltd (trading as 'Delta Coal') has engaged GHD to undertake independent environmental audits of their underground operations Chain Valley Colliery (CVC) and Mannering Colliery. These audits would be prepared in accordance with Schedule 6, Condition 9 of SSD-5465 (as modified) and Schedule 5, Condition 9 of PA06_0311 (as modified, respectively. The scope of the audit is to:

- Assess the environmental performance of the development and whether it is complying with the relevant requirements of the consent and any relevant EPLs or Mining Leases (including any assessment, plan or program required under these approvals)
- Review the adequacy of strategies, plans or programs required under the Development Consent
- Recommend measures or actions to improve the environmental performance of the project and/or any assessment, plan or program required under the approval.

I am writing to you to invite comment from yourself in regard to CVC operations (as they relate to SSD-5465 (as modified)) and Mannering Colliery operations (as they relate to PA06_0311), as well as Delta Coal's performance with other requirements for each site, as you may deem appropriate.

It would be appreciated if you could provide your comments in regard to the performance of Delta Coal's in meeting these obligations under the following headings:

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- Details of incidents of non-compliance
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I also invite you to comment on Delta Coal's performance with other requirements, as you may deem appropriate.

The site visit for the audit is currently scheduled to be conducted the week commencing Monday, 7 April 2022. We wish to invite you to provide comment on Delta Coal's compliance/performance so that we may adequately address any concerns during the audit.

Upon receipt of this letter, please advise GHD of the primary contact within your organisation that will be coordinating this request. It would be appreciated if you could submit your written comments by close of business Wednesday, 6 April 2022.

All correspondence in relation to this matter should be directed to Elliot Holland, GHD Lead Auditor on 02 4979 9923 or elliot.holland@ghd.com.

Regards



Elliot Holland
Exemplar Global – Lead Auditor: EMS

(02) 4979 9923
Elliot.holland@ghd.com

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Newcastle, New South Wales 2300
Australia
www.ghd.com

Your ref: 0001
Our ref: 12572751

23 March 2022

General Manager
Central Coast Council
PO Box 20
Wyong, NSW, 2259

Chain Valley Colliery (SSD-5465) and Mannering Colliery (PA06_0311) Independent Environmental Audit

To whom it may concern

Great Southern Energy Pty Ltd (trading as 'Delta Coal') has engaged GHD to undertake independent environmental audits of their underground operations Chain Valley Colliery (CVC) and Mannering Colliery. These audits would be prepared in accordance with Schedule 6, Condition 9 of SSD-5465 (as modified) and Schedule 5, Condition 9 of PA06_0311 (as modified, respectively. The scope of the audit is to:

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- Review the adequacy of strategies, plans or programs required under the Development Consent
- Recommend measures or actions to improve the environmental performance of the project and/or any assessment, plan or program required under the approval.

I am writing to you to invite comment from Central Coast Council in regard to CVC operations (as they relate to SSD-5465 (as modified)) and Mannering Colliery operations (as they relate to PA06_0311), as well as Delta Coal's performance with other requirements for each site, as you may deem appropriate.

It would be appreciated if you could provide your comments in regard to the performance of Delta Coal's in meeting these obligations under the following headings:

- Compliance with requirements
- Progress to meeting requirements
- Details of incidents of non-compliance
- Adequacy of actions taken
- Adequacy of the requirements of the licence.

I also invite you to comment on Delta Coal's performance with other requirements, as you may deem appropriate.

The site visit for the audit is currently scheduled to be conducted the week commencing Monday, 7 April 2022. We wish to invite you to provide comment on Delta Coal's compliance/performance so that we may adequately address any concerns during the audit.

Upon receipt of this letter, please advise GHD of the primary contact within your organisation that will be coordinating this request. It would be appreciated if you could submit your written comments by close of business Wednesday, 6 April 2022.

All correspondence in relation to this matter should be directed to Elliot Holland, GHD Lead Auditor on 02 4979 9923 or elliot.holland@ghd.com.

Regards



Elliot Holland
Exemplar Global – Lead Auditor: EMS

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Elliot.holland@ghd.com

GHD Tower, Level 3, 24 Honeysuckle Drive
Newcastle, New South Wales 2300
Australia
www.ghd.com

Your ref: 0001
Our ref: 12572751

23 March 2022

James Epstein
Senior Compliance Officer
Locked Bag 5022
Parramatta, NSW, 2124

Chain Valley Colliery (SSD-5465) and Mannering Colliery (PA06_0311) Independent Environmental Audit

Dear James

Great Southern Energy Pty Ltd (trading as 'Delta Coal') has engaged GHD to undertake independent environmental audits of their underground operations Chain Valley Colliery (CVC) and Mannering Colliery. These audits would be prepared in accordance with Schedule 6, Condition 9 of SSD-5465 (as modified) and Schedule 5, Condition 9 of PA06_0311 (as modified, respectively. The scope of the audit is to:

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I am writing to you to invite comment from yourself in regard to CVC operations (as they relate to SSD-5465 (as modified)) and Mannering Colliery operations (as they relate to PA06_0311)), as well as Delta Coal's performance with other requirements for each site, as you may deem appropriate.

It would be appreciated if you could provide your comments in regard to the performance of Delta Coal's in meeting these obligations under the following headings:

- Compliance with requirements
- Progress to meeting requirements
- Details of incidents of non-compliance
- Adequacy of actions taken
- Adequacy of the requirements of the licence.

I also invite you to comment on Delta Coal's performance with other requirements, as you may deem appropriate.

The site visit for the audit is currently scheduled to be conducted the Thursday/Friday, 7 and 8 April 2022. We wish to invite you to provide comment on Delta Coal's compliance/performance so that we may adequately address any concerns during the audit.

It would be appreciated if you could submit your written comments by close of business Wednesday, 6 April 2022.

All correspondence in relation to this matter should be directed to Elliot Holland, GHD Lead Auditor on 02 4979 9923 or elliot.holland@ghd.com.

Regards



Elliot Holland
Exemplar Global – Lead Auditor: EMS

(02) 4979 9923
Elliot.holland@ghd.com

GHD Tower, Level 3, 24 Honeysuckle Drive
Newcastle, New South Wales 2300
Australia
www.ghd.com

Your ref: 0001
Our ref: 12572751

23 March 2022

Department of Planning and Environment – Water
Locked Bag 5022
Parramatta, NSW, 2124

Chain Valley Colliery (SSD-5465) and Mannering Colliery (PA06_0311) Independent Environmental Audit

To whom it may concern

Great Southern Energy Pty Ltd (trading as 'Delta Coal') has engaged GHD to undertake independent environmental audits of their underground operations Chain Valley Colliery (CVC) and Mannering Colliery. These audits would be prepared in accordance with Schedule 6, Condition 9 of SSD-5465 (as modified) and Schedule 5, Condition 9 of PA06_0311 (as modified, respectively. The scope of the audit is to:

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- Review the adequacy of strategies, plans or programs required under the Development Consent
- Recommend measures or actions to improve the environmental performance of the project and/or any assessment, plan or program required under the approval.

I am writing to you to invite comment from the Department of Planning and Environment – Water in regard to CVC operations (as they relate to SSD-5465 (as modified)) and Mannering Colliery operations (as they relate to PA06_0311)), as well as Delta Coal's performance with other requirements for each site, as you may deem appropriate.

It would be appreciated if you could provide your comments in regard to the performance of Delta Coal's in meeting these obligations under the following headings:

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I also invite you to comment on Delta Coal's performance with other requirements, as you may deem appropriate.

The site visit for the audit is currently scheduled to be conducted the week commencing Monday, 7 April 2022. We wish to invite you to provide comment on Delta Coal's compliance/performance so that we may adequately address any concerns during the audit.

Upon receipt of this letter, please advise GHD of the primary contact within your organisation that will be coordinating this request. It would be appreciated if you could submit your written comments by close of business Wednesday, 6 April 2022.

All correspondence in relation to this matter should be directed to Elliot Holland, GHD Lead Auditor on 02 4979 9923 or elliot.holland@ghd.com.

Regards



Elliot Holland
Exemplar Global – Lead Auditor: EMS

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Elliot.holland@ghd.com

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Newcastle, New South Wales 2300
Australia
www.ghd.com

Your ref: 0001
Our ref: 12572751

23 March 2022

Department of Primary Industries – Fisheries
Locked Bag 1
Nelson Bay, NSW, 2315

Chain Valley Colliery (SSD-5465) and Mannering Colliery (PA06_0311) Independent Environmental Audit

To whom it may concern

Great Southern Energy Pty Ltd (trading as 'Delta Coal') has engaged GHD to undertake independent environmental audits of their underground operations Chain Valley Colliery (CVC) and Mannering Colliery. These audits would be prepared in accordance with Schedule 6, Condition 9 of SSD-5465 (as modified) and Schedule 5, Condition 9 of PA06_0311 (as modified, respectively. The scope of the audit is to:

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- Recommend measures or actions to improve the environmental performance of the project and/or any assessment, plan or program required under the approval.

I am writing to you to invite comment from DPI – Fisheries in regard to CVC operations (as they relate to SSD-5465 (as modified)) and Mannering Colliery operations (as they relate to PA06_0311)), as well as Delta Coal's performance with other requirements for each site, as you may deem appropriate.

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Regards



Elliot Holland
Exemplar Global – Lead Auditor: EMS

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Elliot.holland@ghd.com

GHD Tower, Level 3, 24 Honeysuckle Drive
Newcastle, New South Wales 2300
Australia
www.ghd.com

Your ref: 0001
Our ref: 12572751

23 March 2022

Environment Protection Authority
Locked Bag 5022
Parramatta, NSW, 2124

Chain Valley Colliery (SSD-5465) and Mannering Colliery (PA06_0311) Independent Environmental Audit

To whom it may concern

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I am writing to you to invite comment from the EPA in regard to CVC operations (as they relate to SSD-5465 (as modified)) and Mannering Colliery operations (as they relate to PA06_0311)), as well as Delta Coal's performance with other requirements for each site, as you may deem appropriate.

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Regards



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Exemplar Global – Lead Auditor: EMS

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Newcastle, New South Wales 2300
Australia
www.ghd.com

Your ref: 0001
Our ref: 12572751

23 March 2022

General Manager
Lake Macquarie City Council
PO Box 1906
Hunter Regional Mail Centre, NSW, 2310

Chain Valley Colliery (SSD-5465) and Mannering Colliery (PA06_0311) Independent Environmental Audit

To whom it may concern

Great Southern Energy Pty Ltd (trading as 'Delta Coal') has engaged GHD to undertake independent environmental audits of their underground operations Chain Valley Colliery (CVC) and Mannering Colliery. These audits would be prepared in accordance with Schedule 6, Condition 9 of SSD-5465 (as modified) and Schedule 5, Condition 9 of PA06_0311 (as modified, respectively. The scope of the audit is to:

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I am writing to you to invite comment from Lake Macquarie City Council in regard to CVC operations (as they relate to SSD-5465 (as modified)) and Mannering Colliery operations (as they relate to PA06_0311), as well as Delta Coal's performance with other requirements for each site, as you may deem appropriate.

It would be appreciated if you could provide your comments in regard to the performance of Delta Coal's in meeting these obligations under the following headings:

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Regards



Elliot Holland
Exemplar Global – Lead Auditor: EMS

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Elliot.holland@ghd.com

GHD Tower, Level 3, 24 Honeysuckle Drive
Newcastle, New South Wales 2300
Australia
www.ghd.com

Your ref: 0001
Our ref: 12572751

23 March 2022

NSW Resource Regulator
516 High St,
Maitland, NSW, 2320

Chain Valley Colliery (SSD-5465) and Mannering Colliery (PA06_0311) Independent Environmental Audit

To whom it may concern

Great Southern Energy Pty Ltd (trading as 'Delta Coal') has engaged GHD to undertake independent environmental audits of their underground operations Chain Valley Colliery (CVC) and Mannering Colliery. These audits would be prepared in accordance with Schedule 6, Condition 9 of SSD-5465 (as modified) and Schedule 5, Condition 9 of PA06_0311 (as modified, respectively. The scope of the audit is to:

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I am writing to you to invite comment from the NSW Resources Regulator in regard to CVC operations (as they relate to SSD-5465 (as modified)) and Mannering Colliery operations (as they relate to PA06_0311)), as well as Delta Coal's performance with other requirements for each site, as you may deem appropriate.

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All correspondence in relation to this matter should be directed to Elliot Holland, GHD Lead Auditor on 02 4979 9923 or elliot.holland@ghd.com.

Regards



Elliot Holland
Exemplar Global – Lead Auditor: EMS

(02) 4979 9923
Elliot.holland@ghd.com

Jane Mackintosh

From: Heidi Watters <Heidi.Watters@Planning.nsw.gov.au> on behalf of DPE PSVC Compliance Mailbox <compliance@planning.nsw.gov.au>
Sent: Friday, 25 March 2022 9:27 AM
To: Elliot Holland
Subject: RE: 12572751 - Chain Valley Colliery (CVC) and Mannering Colliery Independent Environmental Audits

Dear Elliot

Thank you for the invitation to comment on the upcoming IEA for CVC and Mannering Colliery.

In addition to the requirements of the IEA conditions for both sites, the department would like the audit team to pay particular attention to the following:

- Implementation of approved management plans
- Noise management and monitoring – in particular, is the current monitoring regime adequate for the surrounding receivers and are the monitoring locations most representative of the nearest residential receivers?
- Surface water management and discharge events
- Complaints management and responses

Regards

Heidi Watters
Team Leader Compliance

Planning & Assessment | Department of Planning and Environment
T 02 6575 3401 | **M** 0472 820 374 | **E** heidi.watters@planning.nsw.gov.au
Suite 14, Level 1, 1 Civic Avenue, Singleton NSW 2333
www.dpie.nsw.gov.au

The Department of Planning and Environment acknowledges that it stands on Aboriginal land.
We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

From: Elliot Holland <Elliot.Holland@ghd.com>
Sent: Wednesday, 23 March 2022 11:55 AM
To: DPE PSVC Compliance Mailbox <compliance@planning.nsw.gov.au>
Subject: 12572751 - Chain Valley Colliery (CVC) and Mannering Colliery Independent Environmental Audits

Hi,

As per the attached, GHD has been engaged by Great Southern Energy Pty Ltd (trading as 'Delta Coal') to undertake independent environmental audits of their underground operations Chain Valley Colliery (CVC) and Mannering Colliery, in accordance with relevant requirements of their consents.

I am writing to the Compliance team at Department of Planning and Environment (DPE) to invite comment in regard to CVC operations (as they relate to SSD-5465 (as modified)) and Mannering Colliery operations (as they relate to PA06_0311)), as well as Delta Coal's performance with other requirements for each site, as you may deem appropriate.

A copy of consolidated consent conditions for each site have been attached for your reference.

Regards

Elliot Holland
B Env. Sc. & Mgt.
Exemplar Global – Lead Auditor: EMS
Senior Environmental Scientist

GHD
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D +612 4979 9923 **E** elliot.holland@ghd.com

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Jane Mackintosh

From: Steven James <Steven.James@epa.nsw.gov.au>
Sent: Friday, 25 March 2022 1:23 PM
To: Elliot Holland
Subject: RE: 12572751 - Chain Valley Colliery (CVC) and Mannering Colliery Independent Environmental Audits

You don't often get email from steven.james@epa.nsw.gov.au. Learn why this is important

Hi Elliot,

Thanks for your email. The EPA does not have any comments at this time.

Regards,

Steve.

Steven James
Unit Head Regulatory Operations – Metro North
NSW Environment Protection Authority
+61 2 4908 6823 +61 413 450 328

www.epa.nsw.gov.au @NSW_EPA EPA YouTube
Report pollution and environmental incidents 131 555 (NSW only) or +61 2 9995 5555

From: Elliot Holland <Elliot.Holland@ghd.com>
Sent: Wednesday, 23 March 2022 10:26 AM
To: EPA RSD Hunter Region Mailbox <hunter.region@epa.nsw.gov.au>
Subject: 12572751 - Chain Valley Colliery (CVC) and Mannering Colliery Independent Environmental Audits

Hi,

As per the attached, GHD has been engaged by Great Southern Energy Pty Ltd (trading as 'Delta Coal') to undertake independent environmental audits of their underground operations Chain Valley Colliery (CVC) and Mannering Colliery, in accordance with relevant requirements of their consents.

I am writing to you to invite comment in regard to CVC operations (as they relate to SSD-5465 (as modified)) and Mannering Colliery operations (as they relate to PA06_0311)), as well as Delta Coal's performance with other requirements for each site, as you may deem appropriate.

A copy of consolidated consent conditions for each site have been attached for your reference.

Regards

Elliot Holland
B Env. Sc. & Mgt.
Exemplar Global – Lead Auditor: EMS
Senior Environmental Scientist

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This email is intended for the addressee(s) named and may contain confidential and/or privileged information.
If you are not the intended recipient, please notify the sender and then delete it immediately.
Any views expressed in this email are those of the individual sender except where the sender expressly and with authority states them to be the views of the Environment Protection Authority.

PLEASE CONSIDER THE ENVIRONMENT BEFORE PRINTING THIS EMAIL

Jane Mackintosh

From: mmacdonald-hill@bigpond.com
Sent: Friday, 1 April 2022 1:58 PM
To: Elliot Holland
Subject: RE: 12572751 - Chain Valley Colliery (CVC) and Mannering Colliery Independent Environmental Audits

Hi Elliot,

I have forwarded the information and scope of the IEA to the CCC members and as expected, no one has raised any matters of concern they wish you to investigate. The general consensus received is that the mine's operations and performance are in accordance with the relevant approvals.
All minutes and presentations of the Committee are available on the Delta Coal website.
Thank you for the opportunity to comment.

Margaret MacDonald-Hill
0448 414 888

From: Elliot Holland <Elliot.Holland@ghd.com>
Sent: Thursday, 24 March 2022 5:49 AM
To: mmacdonald-hill@bigpond.com
Subject: RE: 12572751 - Chain Valley Colliery (CVC) and Mannering Colliery Independent Environmental Audits

Hi Margaret,

Correct, audit period considered will be from 10 April 2019 to the site inspection date (7/8 April 2022)

Elliot Holland
B Env. Sc. & Mgt.
Exemplar Global – Lead Auditor: EMS
Senior Environmental Scientist

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24 Honeysuckle Drive Newcastle NSW 2300 Australia
D +612 4979 9923 **E** elliot.holland@ghd.com

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Please consider the environment before printing this email.

From: mmacdonald-hill@bigpond.com <mmacdonald-hill@bigpond.com>
Sent: Wednesday, 23 March 2022 5:09 PM
To: Elliot Holland <Elliot.Holland@ghd.com>
Subject: RE: 12572751 - Chain Valley Colliery (CVC) and Mannering Colliery Independent Environmental Audits

Hi Elliot,

Thanks for your email. Before I pass this on to the CCC members, I take it the audit period is from April 2019 to April 2022?

Margaret MacDonald-Hill
0448 414 888

From: Elliot Holland <Elliot.Holland@ghd.com>
Sent: Wednesday, 23 March 2022 11:04 AM
To: mmacdonald-hill@bigpond.com
Subject: 12572751 - Chain Valley Colliery (CVC) and Mannering Colliery Independent Environmental Audits

Hi Margaret

As per the attached, GHD has been engaged by Great Southern Energy Pty Ltd (trading as 'Delta Coal') to undertake independent environmental audits of their underground operations Chain Valley Colliery (CVC) and Mannering Colliery, in accordance with relevant requirements of their consents.

I am writing to you to invite you, and by extension CCC members, to comment in regard to CVC operations (as they relate to SSD-5465 (as modified)) and Mannering Colliery operations (as they relate to PA06_0311)), as well as Delta Coal's performance with other requirements for each site, as you may deem appropriate.

A copy of consolidated consent conditions for each site have been attached for your reference.

Regards,

Elliot Holland
B Env. Sc. & Mgt.
Exemplar Global – Lead Auditor: EMS
Senior Environmental Scientist

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AREQ0026557

Mr Elliot Holland
GHD Pty Ltd
GHD Tower
Level 3, 24 Honeysuckle Drive
Newcastle NSW 2300

By email: elliot.holland@ghd.com

Dear Mr Holland

Subject: Chain Valley Colliery and Mannering Colliery – Independent Environmental Audit

Thank you for your email dated 23 March 2022 requesting consultation on the independent audits to be undertaken of the Chain Valley Colliery and Mannering Colliery which are covered by the following mining leases:

Chain Valley Colliery

- CCL706 (1973)
- CCL707 (1973)
- ML1051 (1906)
- ML1052 (1906)
- ML1308 (1906)
- ML1785 (1992)
- MPL1349 (1906)
- MPL1389 (1906)
- MPL1400 (1906)
- MPL337 (1973)

Mannering Colliery

- CCL719 (1973)
- CCL 721 (1973)

The Resources Regulator requires that the following issues be addressed in independent environmental audits undertaken in accordance with a planning consent condition.

- Review relevant mining leases and exploration licences as agreed with Resources Regulator
- Undertake an assessment of compliance against the conditions of title related to environmental management

- Verify that there is a current Mining Operations Plan (MOP) in place and it has been approved by the Regulator – review compliance against any conditions of approval of the MOP
- Undertake a critical review of the MOP, including an assessment of its compatibility with the description of operations contained in the planning approval. In particular:
    - Review the rehabilitation strategy as outlined in the MOP to determine if it is consistent with the Project Approval in terms of progressive rehabilitation schedule; and proposed final land use(s)
    - Review the rehabilitation objectives and completion criteria as outlined in the MOP to determine if they have been developed in accordance with the proposed final land use(s) as outlined in the Project Approval
- Review the development and implementation of any rehabilitation monitoring programs to assess performance against the nominated objectives and completion criteria – verified by reviewing monitoring reports and rehabilitation inspection records
- Determine if a rehabilitation care and maintenance program has been developed and implemented based on the outcomes of monitoring program – verified by reviewing Annual Rehabilitation Programs or similar documentation
- Confirm that mining operations are being conducted in accordance with the approved MOP (production, mining sequence etc.), including within the designated MOP approval boundary – to be verified by site plans and site inspection
- Confirm that rehabilitation progress is consistent with the approved MOP as verified by site plans and a site inspection. This should include an evaluation against rehabilitation targets and whether the final landform is being developed in accordance with conceptual final landform in the Project Approval
- Based on a visual inspection, determine if there are any rehabilitation areas that appear to have failed or that have incurred an issue that may result in a delay in achieving the successful rehabilitation outcomes.

In addition to the above, the audit should note observations where rehabilitation procedures, practices and outcomes represent best industry practice.

It would be appreciated if a copy of the final audit report could be sent to the Regulator at nswresourcesregulator@service-now.com upon completion of the audit.

Yours sincerely

Jenny Ehmsen
Principal Compliance Auditor

23 March 2022

Appendix C

Compliance tables

1. Chain Valley

1.1 EPL 1770

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td>1</td><td>1 Administrative Conditions</td><td></td><td></td><td></td></tr>
<tr><td>A1</td><td>A1 What the licence authorises and regulates</td><td></td><td></td><td></td></tr>
<tr><td>A1.1</td><td>A1.1 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.
Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.
<table>
<tr><th>Scheduled Activity</th><th>Fee Based Activity</th><th>Scale</th></tr>
<tr><td>Coal works</td><td>Coal works</td><td>> 2000000 - 5000000 T annual handing capacity</td></tr>
<tr><td>Mining for coal</td><td>Mining for coal</td><td>> 2000000 - 3500000 T annual production capacity</td></tr>
</table></td><td>Compliant</td><td>Site interviews conducted 12/13 April 2022
Site inspection conducted 12 April 2022
Annual Returns for 2019, 2020 and 2021</td><td>The development is being conducted in generally in accordance with this licence.</td></tr>
<tr><td>A1.2</td><td>A1.2 The licensee must not extract by mining activities more than 2.1 million tonnes of ROM coal from the premises in any calendar year in line with Development Consent SSD5465 MOD 4.</td><td>Compliant</td><td>Annual Reviews for 2019, 2020 and 2021</td><td>Delta Coal produced coal within the limits of this condition.
– 2019: 0.79 million tonnes
– 2020: 1.38 million tonnes
– 2021: 1.25 million tonnes
Compliance for 2022 was not assessed as the reporting period did not encompass the entire calendar year.</td></tr>
</table>

Condition	Details	Compliance status	Relevant evidence	Commentary
A2	A2 Premises or plant to which this licence applies			
A2.1	A2.1 The licence applies to the following premises: **Premises Details** CHAIN VALLEY COLLIERY CONSTRUCTION ROAD CHAIN VALLEY BAY NSW 2259 THE LICENSED PREMISES IS AS DEFINED IN THE FOLLOWING PLANS, "DELTA COAL CHAIN VALLEY COLLIERY, SURFACE EPA PREMISES PLAN, DRG NO:C1SO165_2, 10 AUGUST 2021" AND "DELTA COAL CHAIN VALLEY COLLIERY, FIGURE 1 PROJECT OVERVIEW, DRG NO:C1S0165_1, 10 AUGUST 2021", WHICH SHOWS THE UNDERGROUND COAL WORKINGS PREMISES BOUNDARIES VIA A LIME GREEN LINE ALONG WITH THE EASTINGS AND NORTHINGS AT "TURNAROUND" LOCATIONS. THESE PLANS ARE SAVED AS EPA DOCUMENT NO. DOC21/691135.	Note	SIX Maps/SEED Portal	Noted
A3	A3 Other activities			
A3.1	A3.1 This licence applies to all other activities carried on at the premises, including: **Ancillary Activity** Sewage Treatment Systems	Compliant	Site interviews conducted 12/13 April 2022 Annual Reviews for 2019, 2020 and 2021	There is a sewage treatment system being operated on site, which was viewed in the site inspection.
A4	A4 Information supplied to the EPA			
A4.1	A4.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence. In this condition the reference to "the licence application" includes a reference to: a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.	Compliant	Site interviews conducted 12/13 April 2022 Site inspection conducted 12 April 2022	Review of relevant documentation verifies compliance with the requirements of this condition

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td>2</td><td>2 Discharges to Air and Water and Applications to Land</td><td></td><td></td><td></td></tr>
<tr><td>P1</td><td>P1 Location of monitoring/discharge points and areas</td><td></td><td></td><td></td></tr>
<tr><td>P1.1</td><td>P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.
Air
<table><tr><th>EPA identification no.</th><th>Type of Monitoring Point</th><th>Type of Discharge Point</th><th>Location Description</th></tr><tr><td>25</td><td>Air Monitoring Point
Particulate Matter PM10
Thermo Fisher Scientific TEOM 1405</td><td></td><td>TEOM Monitor located on the site of the Mannering Park Sewage Treatment Plant, shown as "EPA25" on the plan titled "Delta Coal - Chain Valley Colliery - Figure 1 - Project Overview", which as been filed as EPA document DOC21/691135</td></tr></table></td><td>Compliant</td><td>Air Quality and Greenhouse Gas Management Plan (V2 – dated 21 January 2022), including DPE approval 21/03/2022
Noise Management Plan (Rev 2– Dated 12 March 2014)</td><td>Delta Coal operate a meteorological station that collects data continually.
Whilst not a non-compliance, the AQGGMP does not show the location of the meteorological station.
Recommendation 1: As part of updates required to the AQMP, update figure 3 to show the location of the meteorological station.</td></tr>
<tr><td>P1.2</td><td>P1.2 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.</td><td>Note</td><td></td><td>Noted</td></tr>
<tr><td>P1.3</td><td>P1.3 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.
Water and land
<table><tr><th>EPA Identification no.</th><th>Type of Monitoring Point</th><th>Type of Discharge Point</th><th>Location Description</th></tr><tr><td>1</td><td>Discharge to waters
Discharge quality and volume monitoring</td><td>Discharge to waters
Discharge quality and volume monitoring</td><td>Discharge to waters and monitoring from final settlement pond, gravity fed discharge pipe as identified in plan titled "Delta Coal Chain Valley Colliery, Surface EPA Premises Plan, DRG No: C1S0165_2" 10 August 2021 and saved as EPA Document DOC21/691135.</td></tr><tr><td>27</td><td>Discharge to waters
Discharge quality and volume monitoring</td><td>Discharge to waters
Discharge quality and volume monitoring</td><td>Discharge to waters via dam spillway from final settlement pond adjacent to EPA Point 1 as identified in plan titled "Delta Coal Chain Valley Colliery, Surface EPA Premises Plan, DRG No: C1S0165_2" 10 August 2021 and saved as EPA Document DOC21/691135.</td></tr></table></td><td>Compliant</td><td>Water Management Plan (Rev 5– Dated 24 August 2021)
Monthly website report
Annual Reviews for 2019, 2020 and 2021</td><td>Discharge data is presented in annual reviews and the monthly website reports.
Discharge locations were viewed in the site audit.</td></tr>
</table>

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td>P1.4</td><td>P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.
Noise/Weather<table><tr><th>EPA identification no.</th><th>Type of monitoring point</th><th>Location description</th></tr><tr><td>9</td><td>Noise monitoring</td><td>Noise monitoring site R8 as defined in Development Consent SSD-5465 (MOD 3), located at 109 Griffith Street, MANNERING PARK, 2259</td></tr><tr><td>12</td><td>Noise monitoring</td><td>Noise monitoring site R11 as defined in Development Consent SSD-5465 (MOD 3), located at 35 Lakeshore Avenue, CHAIN VALLEY BAY, 2259</td></tr><tr><td>13</td><td>Noise monitoring</td><td>Noise monitoring site R12 as defined in Development Consent SSD-5465 (MOD 3), located at 20 Lakeshore Avenue, Kingfisher Shores, CHAIN VALLEY BAY, 2259</td></tr><tr><td>14</td><td>Noise monitoring</td><td>Noise monitoring site R13 as defined in Development Consent SSD-5465 (MOD 3), located at 33 Karoola Avenue, Kingfisher Shores, CHAIN VALLEY BAY, 2259</td></tr><tr><td>16</td><td>Noise monitoring</td><td>Noise monitoring site R15 as defined in Development Consent SSD-5465 (MOD 3), located at Short Street, Macquarie Shores, CHAIN VALLEY BAY, 2259</td></tr><tr><td>20</td><td>Noise monitoring</td><td>Noise monitoring site R19 as defined in Development Consent SSD-5465 (MOD 3), located at 2 Sunset Parade, CHAIN VALLEY BAY, 2259</td></tr><tr><td>23</td><td>Noise monitoring</td><td>Noise monitoring site R22 as defined in Development Consent SSD-5465 (MOD 3), located at 275a Cams Boulevard, CHAIN VALLEY BAY, 2259</td></tr><tr><td>26</td><td>Meteorological Station</td><td>Mannering Colliery Meteorological Station, Ruttleys Road, Doyalson 2259.</td></tr></table></td><td>Non-compliance (administrative)</td><td>Noise Management Plan (Rev 2– Dated 12 March 2014)
Annual noise compliance assessment reports for 2019, 2020 and 2021
Quarterly noise monitoring reports
Annual Reviews for 2019, 2020 and 2021</td><td>Monitoring locations are shown in Figure 2 of the Noise Management Plan and are described in Section 5.2. These locations are generally consistent with the requirements of this condition, however point 13 (R12) and point 14 (R13) are not shown, thus forming an administrative non-compliance.
The auditor notes that a new noise management plan is being prepared for the site, which adequately describes the monitoring locations. Therefore, no corrective action is required.</td></tr>
<tr><td>3</td><td>3 Limit Conditions</td><td></td><td></td><td></td></tr>
<tr><td>L1</td><td>L1 Pollution of waters</td><td></td><td></td><td></td></tr>
<tr><td>L1.1</td><td>L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.</td><td>Non-compliant (low-risk)</td><td>Annual Reviews for 2019, 2020 and 2021</td><td>Several incidents related to water pollution occurred over the reporting period. These are described below in L2.4. L3.1 and L3.2</td></tr>
</table>

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td>L2</td><td>L2 Concentration limits</td><td></td><td></td><td></td></tr>
<tr><td>L2.1</td><td>L2.1 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.</td><td>Non-compliant (low risk)t</td><td>Annual Reviews for 2019, 2020 and 2021
Monitoring data for 2019, 2020, 2021 and 2022</td><td>2019 Audit recommendation: The Annual Reviews need to provide a clear statement regarding whether discharge criteria have been met.
Several non-compliances have occurred within the reporting period. Refer to condition L2.4, L3.1 and L3.2
In regard to recommendation from the previous audit, the Annual Review includes a statement whether the discharge criteria have been met,. If any exceedances occurred in a reporting year, they are detailed in section 6.1.2. This recommendation has been closed out.</td></tr>
<tr><td>L2.2</td><td>L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.</td><td>Compliant</td><td>Annual Reviews for 2019, 2020 and 2021
Monitoring data for 2019, 2020, 2021 and 2022</td><td>Whilst several non-compliances occurred over the reporting period, no exceedances of pH quality has occurred.</td></tr>
<tr><td>L2.3</td><td>L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.</td><td>Note</td><td></td><td>Note</td></tr>
<tr><td>L2.4</td><td>L2.4 Water and/or Land Concentration Limits
POINT 1,27<table><tr><th>Pollutant</th><th>Units of Measure</th><th>50 percentile concentration limit</th><th>90 percentile concentration limit</th><th>3DGM concentration limit</th><th>100 percentile concentration limit</th></tr><tr><td>Faecal Coliforms</td><td>colony forming units per 100 millilitres</td><td></td><td></td><td></td><td>200</td></tr><tr><td>pH</td><td>pH</td><td></td><td></td><td></td><td>6.5-8.5</td></tr><tr><td>Total suspended solids</td><td>milligrams per litre</td><td></td><td></td><td></td><td>50</td></tr></table></td><td>Non-compliant (low-risk)</td><td>Annual Reviews for 2019, 2020 and 2021
Monitoring data for 2019, 2020, 2021 and 2022</td><td>Several non-compliances were recorded against this condition over the reporting period:
– Exceedance of faecal coliform limit at LDP01 on 31 August 2019
– Exceedance of faecal coliform limit at LDP01 on 18 September 2019
– Exceedance of faecal coliform limit at LDP01 on 17 December 2019
– Exceedance of faecal coliform and TSS limit at LDP27 on 7 February 2020
– Exceedance of faecal coliform and TSS limit at LDP27 on 26 July 2020
– Exceedance of faecal coliform and TSS limit at LDP27 on 9 September 2020
– Exceedance of faecal coliform and TSS limit at LDP27 on 18 March 2021
– Exceedance of faecal coliform and TSS limit at LDP27 on 21 March 2021
– Exceedance of faecal coliform limit at LDP01 on 18 January 2022
– Exceedance of faecal coliform limit at LDP27 on 31 March 2022.</td></tr>
</table>

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td></td><td></td><td></td><td></td><td>These exceedances therefore form a non-compliance against this condition.
Corrective action 1: Keep DPE up-to-date on the progress of works under DA 845-2020 to address exceedances associated with licensed discharges.
Recommendation 2: There is an inconsistent naming convention for the discharge locations between sites. It is recommended that they are consistently referenced across management plans and annual reviews.</td></tr>
<tr><td>L3</td><td>L3 Volume and mass limits</td><td></td><td></td><td></td></tr>
<tr><td>L3.1</td><td>L3.1 For each discharge point or utilisation area specified below (by a point number), the volume/mass of:
a) liquids discharged to water; or;
b) solids or liquids applied to the area; must not exceed the volume/mass limit specified for that discharge point or area.
<table><tr><th>Point</th><th>Unit of Measure</th><th>Volume/Mass Limit</th></tr><tr><td>1</td><td>kilolitres per day</td><td>12161</td></tr><tr><td>27</td><td>kilolitres per day</td><td>12161</td></tr></table></td><td>Non-compliant (low risk)</td><td>Annual Reviews for 2019, 2020 and 2021
Monitoring data for 2019, 2020, 2021 and 2022</td><td>Several non-compliances were recorded against this condition over the reporting period:
– Exceedance of daily volume limit at LDP01 on 30 August 2019
This exceedance therefore forms a non-compliance against this condition.</td></tr>
<tr><td>L3.2</td><td>L3.2 The volumetric daily discharge limit for the premises is the combined discharge measured at EPA discharge points 1 and 27 and must not exceed 12161 kilolitres per day.</td><td>Non-compliant (low risk)</td><td>Annual Reviews for 2019, 2020 and 2021
Monitoring data for 2019, 2020, 2021 and 2022</td><td>Several non-compliances were recorded against this condition over the reporting period:
– Exceedance of combined daily volume limit at LDP1 and LDP27 on 9 February 2020
– Exceedance of combined daily volume limit at LDP1 and LDP27 on 26 July 2020 – there was also an exceedance of faecal coliforms and TSS at LDP27 on this day. This forms a medium risk non-compliance.
– Exceedance of combined daily volume limit at LDP1 and LDP27 on 18 March 2021 – there was also an exceedance of faecal coliforms and TSS at LDP27 on this day. This forms a medium risk non-compliance.
– Exceedance of combined daily volume limit at LDP1 and LDP27 on 21 March 2021- there was also an exceedance of faecal coliforms and TSS at LDP27 on this day. This forms a medium risk non-compliance.
In addition, volumetric monitoring ceased between 26 December 2021 and 10 January 2022 due to vandalism and damage sustained to the discharge flow monitor. This has since been fixed and monitoring has recommenced.
Corrective action 1: Refer to L2.4</td></tr>
</table>

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td>L4</td><td>L4 Waste</td><td></td><td></td><td></td></tr>
<tr><td>L4.1</td><td>L4.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled “Waste” and meeting the definition, if any, in the column titled “Description” in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled “Activity” in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled “Other Limits” in the table below.
This condition does not limit any other conditions in this licence.
<table>
<tr><th>Code</th><th>Waste</th><th>Description</th><th>Activity</th><th>Other Limits</th></tr>
<tr><td>NA</td><td>General or Specific exempted waste</td><td>Waste that meets all the conditions of a resource exemption under Clause 92 of the Protection of the Environment Operations (Waste) Regulation 2014.</td><td>As specified in each particular resource recovery exemption</td><td>NA</td></tr>
</table></td><td>Compliant</td><td>Annual Reviews for 2019, 2020 and 2021
Waste tracking register
Site interviews conducted 12/13 April 2022
Site inspection conducted 12 April 2022</td><td>No waste has been received at the premises over the reporting period.</td></tr>
<tr><td>L5</td><td>L5 Noise limits</td><td></td><td></td><td></td></tr>
<tr><td>L5.1</td><td>L5.1 Noise generated at the premises that is measured at each noise monitoring point established under this licence must not exceed the noise levels specified in Column 4 of the table below for that point during the corresponding time periods specified in Column 1 when measured using the corresponding measurement parameters listed in Column 2.
POINT 12
<table>
<tr><th>Time period</th><th>Measurement parameter</th><th>Measurement frequency</th><th>Noise level dB(A)</th></tr>
<tr><td>Day</td><td>Day-LAeq (15 minute)</td><td>-</td><td>49</td></tr>
<tr><td>Evening</td><td>Evening-LAeq (15 minute)</td><td>-</td><td>49</td></tr>
<tr><td>Night</td><td>Night-LAeq (15 minute)</td><td>-</td><td>49</td></tr>
<tr><td>Night</td><td>Night-LA1 (1 minute)</td><td>-</td><td>54</td></tr>
</table>
POINT 13
<table>
<tr><th>Time period</th><th>Measurement parameter</th><th>Measurement frequency</th><th>Noise level dB(A)</th></tr>
<tr><td>Day</td><td>Day-LAeq (15 minute)</td><td>-</td><td>49</td></tr>
<tr><td>Evening</td><td>Evening-LAeq (15 minute)</td><td>-</td><td>49</td></tr>
<tr><td>Night</td><td>Night-LAeq (15 minute)</td><td>-</td><td>49</td></tr>
<tr><td>Night</td><td>Night-LA1 (1 minute)</td><td>-</td><td>53</td></tr>
</table></td><td>Non-compliance (administrative)</td><td>Noise Management Plan (Rev 2– Dated 12 March 2014)
Annual noise compliance assessment reports for 2019, 2020 and 2021
Quarterly noise monitoring reports
Annual Reviews for 2019, 2020 and 2021</td><td>A review of the data presented in the quarterly noise monitoring reports and the annual compliance assessments found that Chain Valley Colliery is operating within the noise limits defined by this condition, with the exception of Point 23 (ATN007).
There was noted that there appears to be a typographical error in the limits for Point 23 (ATN007) and that the noise limits of the EPL were not consistent with the noise limits in SSD-5465.
The EPL was modified on 30 September 2021 so that the noise limits for Point 23 (ATN007) were consistent with those presented in SSD-5465. Even so, noise monitoring results did not compare findings against previous EPL criteria, thus constituting an administrative non-compliance.
As this issue with the EPL has been resolved, no corrective actions are required.</td></tr>
</table>

Condition	Details	Compliance status	Relevant evidence	Commentary

POINT 14

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	43
Evening	Evening-LAeq (15 minute)	-	43
Night	Night-LAeq (15 minute)	-	43
Night	Night-LA1 (1 minute)	-	49

POINT 16

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	36
Evening	Evening-LAeq (15 minute)	-	36
Night	Night-LAeq (15 minute)	-	36
Night	Night-LA1 (1 minute)	-	45

POINT 20

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	37
Evening	Evening-LAeq (15 minute)	-	37
Night	Night-LAeq (15 minute)	-	37
Night	Night-LA1 (1 minute)	-	45

POINT 23

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	46
Evening	Evening-LAeq (15 minute)	-	46
Night	Night-LAeq (15 minute)	-	46
Night	Night-LA1 (1 minute)	-	46

POINT 9

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	-	38
Evening	Evening-LAeq (15 minute)	-	38
Night	Night-LAeq (15 minute)	-	38
Night	Night-LA1 (1 minute)	-	45

Condition	Details	Compliance status	Relevant evidence	Commentary
L5.2	L5.2 The licensee must ensure that noise generated on the premises does not exceed: a) 35 LAeq(15min) during the day, evening or night at any privately owned land nearest to the residence apart from those receivers identified in Condition 5.1; and b) 45 LA1(1min) during the night at any privately owned land nearest to the residence apart from those receivers identified in Condition 5.1. Note: The licensee may provide to the EPA written evidence of any agreement with a landholder which is subject to the above noise limits. The written evidence may be submitted with a licence variation to remove the landholder from the above tables.	Compliant	Annual Reviews for 2019, 2020 and 2021 Annual noise compliance assessment reports for 2019, 2020 and 2021 Quarterly noise monitoring reports for 2019, 2020 and 2021	Monitoring results over the reporting period were in compliance with condition L5.1, therefore no further monitoring at residences were required.
L5.3	L5.3 For the purpose of condition L5.1 and condition L5.2: (a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and public holidays; (b) Evening is defined as the period 6pm to 10pm, and (c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.	Note		Noted
	L5.4 The noise limits set out in condition L5.1 and condition L5.2 apply under all meterorological conditions except for any one of the following: (a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or (b) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or (c) Stability category G temperature inversion conditions. (d) Or as defined under the NSW EPA Noise Policy for Industry 2017.	Note		Noted
L5.5	L5.5 For the purpose of condition L5.4: (a) the meteorological data to be used for determining meteorological conditions is the data recorded at the meteorological station identified in this licence as EPA Identification Point 26. (b) Stability category temperature inversion conditions are to be determined in accordance with the NSW EPA Noise Policy for Industry 2017. Note: The weather station must be designed, commissioned and operated in a manner to obtain the necessary parameters required under the above condition.	Complaint	Annual Reviews for 2019, 2020 and 2021 Noise Management Plan (Rev 2– Dated 12 March 2014) Quarterly noise monitoring reports for 2019, 2020 and 2021	The onsite meteorological station is used to determine weather parameters for the site during monitoring events in compliance with the requirements of this condition.
L5.6	L5.6 For the purpose of determining the noise generated at the premises the licensee must use a Class 1 or Class 2 noise monitoring device as defined by AS IEC61672.1 and AS IEC61672.2-2004, or other noise monitoring equipment accepted by the EPA in writing.	Compliant	Quarterly noise monitoring reports for 2019, 2020 and 2021	Quarterly noise monitoring reports indicate that measurements are being taken using calibrated machinery compliant with the requirements of this condition.

Condition	Details	Compliance status	Relevant evidence	Commentary
L5.7	L5.7 To determine compliance: 1. With the LAeq(15 min) noise limits in condition L5.1 and condition L5.2, the licensee must locate noise monitoring equipment; (a) within 30 metres of a dwelling facade (but not closer than 3 metres) where any dwelling on the property is situated more then 30 metres from the property boundary that is closest to the premises; (b) approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises, or, where applicable, (c) within approximately 50 metres if the boundary of a national park or nature reserve. 2. With the LA1(1 minute) noise limits in condition L5.1 and L5.2, the noise monitoring equipment must be located within 1 metre of a dwelling facade. 3. With the noise limits in condition L5.1 and condition L5.2, the noise monitoring equipment must be located; (a) at the most affected point at a location where there is no dwelling at the location, or (b) at the most affected point within an area at a location prescribed by conditions L5.7 1(a) or L5.7 1(b).	Administrative non-compliance	Noise Management Plan (Rev 2– Dated 12 March 2014) Quarterly noise monitoring reports for 2019, 2020 and 2021	Monitoring for LA1(1minute) noise levels is not completed at 1m from a façade; however, such noise monitoring is generally not practical due to disturbance to residents during the sensitive night-time period. Furthermore, operation of Schedule 6, Condition 12 of SSD-5465 allows monitoring from representative locations.
L5.8	L5.8 A non-compliance of condition L5.1 or condition L5.2 will still occur where noise generated from the premises in excess of the appropriate limit is measured; a) at a location other than an area prescribed by conditions L5.7 1(a) and L5.7 1(b), and /or b) at a point other than the most affected point at a location.	Note		Noted
L5.9	L5.9 For the purposes of determining the noise generated at the premises all applicable modification factors as described in the NSW EPA Noise Policy for Industry 2017 must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.	Compliant	Quarterly noise monitoring reports for 2019, 2020 and 2021	The NSW EPA Noise Policy for Industry is referenced in the noise management reports, as well as a discussion on its applicability with the data from the monitoring period.
4	4 Operating Conditions			
O1	O1 Activities must be carried out in a competent manner	Compliant	Site interviews conducted 12/13 April 2022 Site inspection conducted 12 April 2022 Induction Servicing record samples on Pulse	During the conduct of the audit, documentation reviewed, and the site inspection indicates general compliance with the requirements of this condition.

Condition	Details	Compliance status	Relevant evidence	Commentary
O1.1	O1.1 Licensed activities must be carried out in a competent manner. This includes: a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.	Non-compliance (low risk)	Site interviews conducted 12/13 April 2022 Site inspection conducted 12 April 2022 Waste tracking sheet	*Recommendation from 2019 IEA:* *Ensure the minor waste management issues identified during the audit are rectified:* – *Improve bin labelling;* – *Ensure all hydrocarbon containers (empty or full) are stored within bunds* 2022 IEA findings: Waste tracking sheets were viewed during the site audit and were found to be adequate and in compliance with this condition. During the site inspection, the auditor noted that waste was not always appropriately sorted on site – for example rubbish in the oily rags bin. In regard to the previous audit, it was noted that all hydrocarbon waste containers were stored within a bund. ***Corrective Action 2: As bins are clearly labelled and adequate disposal facilities are available across the site, Delta should investigate means to address the workforce culture in relation to inadequate disposal of waste that has persisted across this, and the previous, audit.***
O2	O2 Maintenance of plant and equipment			
O2.1	O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity: a) must be maintained in a proper and efficient condition; and b) must be operated in a proper and efficient manner.	Compliant	Site interviews conducted 12/13 April 2022 Site inspection conducted 12 April 2022 Servicing records	During the conduct of the audit, documentation reviewed, and the site inspection indicates general compliance with the requirements of this condition.

Condition	Details	Compliance status	Relevant evidence	Commentary
O3	O3 Dust			
O3.1	O3.1 The premises must be maintained in a condition which minimises or prevents the emission of dust on or from the premises.	Compliant	Annual Review for 2019, 2020 and 2021 Site inspection conducted 12 April 2022 Monitoring data for 2019, 2020, 2021 and 2022	*Recommendation from 2019 IEA:* *Ensure TEOM is setup with alarms/notifications for when results are approaching or have exceeded the short term criterion for particulate matter. This will ensure exceedances are immediately detected and reported as soon as possible to the EPA and DPE.* *Ensure exceedances and other incidents are reported as per this condition (Detailed Incident Report within 7 days).* 2022 IEA findings: There were several non-compliances against depositional dust and 24 hour PM_{10} criteria as presented in SSD-5465. These exceedances were investigated and all but one exceedance was attributed to factors outside the site. This exceedance has not occurred again over the reporting period, showing that steps have been taken to manage dust at the premises. There were also exceedances of the PM2.5 daily limits as defined by SSD-5465 in 2022, however these were found to be attributed to other factors outside the site. Several incident reports were viewed during the audit. Appropriate action was taken by Delta Coal in responding to incidents. During the site inspection some dust being generated on site was observed. It was noted that on dry days a watercart would be employed to keep dust down, and that as rain was forecast on the day of the audit, it had not been used. The 2019 IEA recommended that the TEOM is set up with alarms and notifications when the short term criterion for particulate matter is approached or exceeded. Delta Coal provided evidence that this has occurred, and this recommendation is considered closed out.
O3.2	O3.2 Activities occurring in or on the premises must be carried out in a manner that will minimise the generation of wind-blown or traffic generated dust.	Compliant	Annual Review for 2019, 2020 and 2021 Site inspection conducted 12 April 2022	Trafficable areas were generally sealed or gravel roads. During the site inspection some dust being generated on site was observed. It was noted that on dry days a watercart would be employed to keep dust down, and that as rain was forecast on the day of the audit, it had not been used. Given the circumstances, the auditor considers Delta Coal compliant with this condition.

Condition	Details	Compliance status	Relevant evidence	Commentary
O3.3	O3.3 All trafficable areas, coal stockpile(s) and storage areas, and vehicle manoeuvring areas in or on the premises must be maintained, at all times, in a condition that will minimise the generation of dust.	Compliant	Site inspection conducted 12 April 2022 Site interviews conducted 12/13 April 2022	Refer to condition O3.2
O3.4	O3.4 All vehicles transporting coal from the premises must be covered immediately after loading to prevent wind blown emissions and spillage Note: Vehicles transporting coal on the private haul road from Chain Valley Colliery to Vales Point Power station are exempt from covering their load if surface coal moisture is above 8%.	Compliant	Coal Haulage Reports for 2019, 2020, 2021 and 2022 Site inspection conducted 12 April 2022 Site interviews conducted 12/13 April 2022	Delta Coal have generally used conveyor systems to transport coal. There have been several limited occasions over the reporting period where coal has been transported via haul trucks. When haul trucks were used, no transport on public roads occurred.
O3.5	O3.5 Activities occurring in or on the premises must be carried out in a manner that will minimise the tracking of dust from the premises.	Compliant	Site inspection conducted 12 April 2022 Site interviews conducted 12/13 April 2022	Given that coal transport is predominantly done by conveyor and not haul truck, there is limited scope for dust to be tracked off the premises.
O4	O4 Effluent application to land			
O4.1	O4.1 An area must be provided for the use of effluent from the office building sewage treatment system. The design of the effluent irrigation area must be in accordance with the EPA's Environmental Guideline: Use of Effluent by Irrigation.	Compliant	Water Management Plan (Rev 5– Dated 24 August 2021)	There are two separate wastewater systems on site, each with their own treatment systems. Following treatment of water, it is used for irrigating grassed areas.
O4.2	O4.2 The quantity of wastewater applied to the utilisation area(s) must not exceed the capacity of the utilisation area(s) to effectively utilise the effluent. For the purpose of this condition. "effectively utilise" includes the ability of the soil to absorb the nutrient, salt and hydraulic loads and the applied organic material without causing harm to the environment.	Compliant	Site inspection conducted 12 April 2022 Site interviews conducted 12/13 April 2022 Monitoring data for 2019, 2020, 2021 and 2022 Annual Review for 2019, 2020 and 2021	As discussed above, the wastewater system comprises of two systems with independent treatment systems. The system is serviced regularly and operates below capacity.

Condition	Details	Compliance status	Relevant evidence	Commentary
O5	O5 Emergency response			
	Note: The licensee must maintain, and implement as necessary, a current Pollution Incident Response Management Plan (PIRMP) for the premises. The PIRMP must be developed in accordance with the requirements in Part 5.7A of the Protection of the Environment Operations (POEO) Act 1997 and POEO Regulations. The licensee must keep the incident response plan on the premises at all times. The incident response plan must document systems and procedures to deal with all types of incidents (e.g. spills, explosions or fire) that may occur at the premises or that may be associated with activities that occur at the premises and which are likely to cause harm to the environment. The PIRMP must be tested annually or following a pollution incident.	Compliant	Pollution Incident Response Plan (Rev 2.4 – Dated 15 December 2021) Site inspection conducted 12 April 2022	*2019 IEA Recommendation: Update PIRMP to include:* – *Current site contacts;* – *Email details for government contacts; and* – *Figures that clearly show the location of hazardous substances and where pollution response equipment is stored.* 2022 IEA findings: A review of the PIRMP found that the recommendations of the 2019 IEA have been incorporated and are closed out. The PIRMP was tested 3 times in the reporting period: – 17 December 2019 – 23 December 2020 – 21 December 2021
O6	O6 Processes and management			
	Bunding			
O6.1	O6.1 All above ground tanks containing material that is likely to cause environmental harm must be bunded or have an alternative spill containment system in place.	Compliant	Site inspection conducted 12 April 2022	All above ground storage tanks observed during the audit were surrounded by bunds.
O6.2	O6.2 Bunds must: a) have walls and floors constructed of impervious materials; b) be of sufficient capacity to contain 110% of the volume of the tank (or 110% volume of the largest tank where a group of tanks are installed); c) have floors graded to a collection sump; and d) not have a drain valve incorporated in the bund structure, or be constructed and operated in a manner that achieves the same environmental outcome.	Compliant	Site inspection conducted 12 April 2022	Bunds were viewed in the site inspection and were compliant with the requirements of this condition.
O7	O7 Waste management			
O7.1	O7.1 The licensee must ensure that any liquid and/or non liquid waste generated and/or stored at the premises is assessed in accordance with the EPA Waste Classification Guidelines as in force from time to time.	Compliant	Site inspection conducted 12 April 2022 Site interviews conducted 12/13 April 2022	Wastewater and oil water separator systems viewed in site audit. Septic systems were adequate.

Condition	Details	Compliance status	Relevant evidence	Commentary
O7.2	O7.2 The licensee must ensure that waste identified for recycling is stored separately from other waste.	Non-compliance (low risk)	Site inspection conducted 12 April 2022	*2019 Audit recommendation: Ensure the minor waste management issues identified during the audit are rectified. Including:* – *Improve bin labelling;* – *Ensure all hydrocarbon containers (empty or full) are stored within bunds.* 2022 IEA Findings: The site audit identified that there were adequate vessels for recycling on site, however recycling was not adequately implemented by staff. There were several instances of incorrect waste being placed into a clearly labelled waste stream bin. ***Refer to Corrective Action 2 at Condition O1.1***
O8	O8 Other operating conditions			
	Sewage Treatment			
O8.1	O8.1 All sewage generated on the premises must be directed, collected and treated by the sewage treatment system(s).	Compliant	Annual Review for 2019, 2020 and 2021 Servicing records Waste tracking sheet	Servicing records were provided showing evidence of regular servicing. Disposal effluent is tracked in the waste tracking sheet.
O8.2	O8.2 The licensee is responsible for the correct operation of the sewage treatment system(s) on their premises.	Compliant	Water Management Plan (Rev 5– Dated 24 August 2021) Annual Review for 2019, 2020 and 2021 Servicing records	*2019 Audit recommendation:* – *Include additional detail in the Water Management Plan regarding sewage management.* – *Include an update of sewage system during the audit period in the Annual Review.* – *Ensure servicing is completed and records kept onsite.* 2022 IEA findings: Records of servicing were provided to the auditor during the audit. No incidents or emergencies have occurred with the sewage system during the reporting period. The sewage system is described in the WMP. The Annual Reviews include sufficient detail regarding the amendments to the sewage system on site.
O8.3	O8.3 Correct operation involves regular supervision and system maintenance. The licensee must be aware of the system requirements and must ensure that the necessary service contracts are in place.	Compliant	Servicing records	Servicing records were provided showing evidence of regular servicing.

Condition	Details	Compliance status	Relevant evidence	Commentary
O8.4	O8.4 The sewage treatment system(s) must be serviced by a suitably qualified and experienced waste water technician at least once each quarterly period and a minimum of four times per year.	Non-compliance (administrative)	Servicing records	Servicing records were provided showing evidence of regular servicing. It was noted by the auditors that the servicing for Q4 2020 was not completed on time, therefore constituting an administrative non-compliance. However, the servicing event occurred 7 days following the end of Q4 2020, and therefore no corrective action is proposed.
O8.5	O8.5 The licensee must record each inspection and any actions required or recommended by the technician; including all results from tests performed on the sewage treatment system(s) by the technician as defined in Condition O8.4.	Compliant	Servicing records	Sampling records have been provided to the auditor, which contained no actions or recommendations required.
O8.6	O8.6 All treated sewage that is discharged from the premises must be discharged through licensed discharge point "EPA Identification no. 1", as defined in condition P1.3.	Compliant	Water Management Plan (Rev 5– Dated 24 August 2021) Annual Review for 2019, 2020 and 2021 Site inspection conducted 12 April 2022	Conduct of the site inspection verified compliance with the requirements of this condition.
5	Monitoring and Recording Conditions			
M1	M1 Monitoring records			
M1.1	M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition	Compliant	Monitoring data for 2019, 2020, 2021 and 2022 Annual Return for 2019, 2020 and 2021	A review of the published data and the raw data provided found Delta Coal to be compliant with this condition.
M1.2	M1.2 All records required to be kept by this licence must be: a) in a legible form, or in a form that can readily be reduced to a legible form; b) kept for at least 4 years after the monitoring or event to which they relate took place; and c) produced in a legible form to any authorised officer of the EPA who asks to see them.	Compliant	Monitoring data for 2019, 2020, 2021 and 2022 Annual Return for 2019, 2020 and 2021	Evidence of data going back four years from the data of the audit have been sighted.

Condition	Details	Compliance status	Relevant evidence	Commentary
M1.3	M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence: a) the date(s) on which the sample was taken; b) the time(s) at which the sample was collected; c) the point at which the sample was taken; and d) the name of the person who collected the sample.	Non-compliance (administrative)	Depositional dust monitoring sheets Monitoring data for 2019, 2020, 2021 and 2022	Water sampling sheets were viewed during the site audit. They were found to be compliant with the requirements of this condition. Air quality sheets were found to be generally compliant, however they did not include a sample time, thus a non-compliance against clause (b) is recorded. ***Corrective action 3: Ensure contractors record sample time when recording air quality monitoring data in accordance with the requirements of Condition M1.3.***
M2	M2 Requirement to monitor concentration of pollutants discharged			
M2.1	M2.1 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. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:	Compliant	Annual reviews for 2019, 2020 and 2021 Monitoring data for 2019, 2020, 2021 and 2022 Monthly website reports	Data capture is presented in the Annual Reviews and on the website in the monthly data reports. Review of relevant data indicates compliance.
M2.2	M2.2 Air Monitoring Requirements POINT 25 Pollutant / Units of measure / Frequency / Sampling Method Particulate matter / micrograms per cubic metre / Continuous / AM-22	Non-compliant (low risk)	Air Quality and Greenhouse Gas Management Plan (V2 – dated 21 January 2022 Monitoring data for 2019, 2020, 2021 and 2022 Annual reviews for 2019, 2020 and 2021	*2019 IEA Recommendation: Update the Air Quality Management Plan following this audit.* *Improve data capture for PM10. Review possibilities of backup power supply.* *Ensure issues with data capture are reported in Section 1 and 7 of the Annual Review.* *Ensure TEOM is setup with alarms/notifications for when results are approaching or have exceeded the short term criterion for particulate matter. This will ensure exceedances are immediately detected and reported as soon as possible to the EPA and DPE.* 2022 IEA findings: The AQGGMP has been updated in January 2022.A review of the monitoring data provided indicates that the development is monitoring in accordance with the requirements of this condition. The TEOM stopped recording data for a short period in December 2020 due to severe thunderstorms. The gap in monitoring is recorded as a non-compliance against this condition. Delta Coal have since rectified the system and no corrective action is required. The 2019 IEA recommended that the TEOM is set up with alarms and notifications when the short term criterion for particulate matter is approached or exceeded. Delta Coal provided evidence that this has occurred, and this recommendation is considered closed out. The 2019 IEA

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td></td><td></td><td></td><td></td><td>recommendation to investigate back up power supply for the TEOM has not been carried out in the reporting period.
Recommendation 3: Improve data capture for PM10. Review possibilities of backup power supply.</td></tr>
<tr><td>M2.3</td><td>M2.3 Water and/ or Land Monitoring Requirements

POINT 1
<table><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Method</th></tr><tr><td>Biochemical oxygen demand</td><td>milligrams per litre</td><td>Once a month (min. of 4 weeks)</td><td>Grab sample</td></tr><tr><td>Enterococci</td><td>colony forming units per 100 millilitres</td><td>Once a month (min. of 4 weeks)</td><td>Grab sample</td></tr><tr><td>Faecal Coliforms</td><td>colony forming units per 100 millilitres</td><td>Once a month (min. of 4 weeks)</td><td>Grab sample</td></tr><tr><td>pH</td><td>pH</td><td>Once a month (min. of 4 weeks)</td><td>Grab sample</td></tr><tr><td>Total suspended solids</td><td>milligrams per litre</td><td>Once a month (min. of 4 weeks)</td><td>Grab sample</td></tr></table>POINT 27
<table><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Method</th></tr><tr><td>Enterococci</td><td>colony forming units per 100 millilitres</td><td>Daily during any discharge</td><td>Grab sample</td></tr><tr><td>Faecal Coliforms</td><td>colony forming units per 100 millilitres</td><td>Daily during any discharge</td><td>Grab sample</td></tr><tr><td>pH</td><td>pH</td><td>Daily during any discharge</td><td>Grab sample</td></tr><tr><td>Total suspended solids</td><td>milligrams per litre</td><td>Daily during any discharge</td><td>Grab sample</td></tr></table></td><td>Compliant</td><td>Water Management Plan (Rev 5– Dated 24 August 2021)
Annual Review for 2019, 2020 and 2021
Monitoring data for 2019, 2020, 2021 and 2022</td><td>A review of the data provided indicates that samples are being taken in compliance with this condition.</td></tr>
</table>

Condition	Details	Compliance status	Relevant evidence	Commentary
M3	M3 Testing methods - concentration limits			
M3.1	M3.1 Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with: a) any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or b) if no such requirement is imposed by or under the Act, any methodology which a condition of this licence requires to be used for that testing; or c) if no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place. Note: The Protection of the Environment Operations (Clean Air) Regulation 2021 requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".	Compliant	Air Quality and Greenhouse Gas Management Plan DRAFT (V2 – dated 21 January 2022 Monitoring data for 2019, 2020, 2021 and 2022	Monitoring methodology is being undertaken in compliance with the requirements of this EPL, SSD – 5465 and the POEO Act.
M3.2	M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted	Compliant	Water Management Plan (Rev 5– Dated 24 August 2021) Annual Review for 2019, 2020 and 2021 Monitoring data for 2019, 2020, 2021 and 2022	A review of the data provided indicates that water monitoring is being undertaken as per the requirements of this condition.
M4	M4 Environmental monitoring			
	Requirement to monitor noise			
M4.1	M4.1 To determine compliance with condition L5.1, attended noise monitoring must be undertaken in accordance with conditions L5.7 and L5.8, and (a) at each one of the locations listed in condition L5.1; (b) occur quarterly within the reporting period of the Environment Protection Licence with at least 2 months between monitoring periods; (c) occur during each day, evening and night period as defined in the NSW Industrial Noise Policy (EPA 2000) for a minimum of 15 minutes for three of the quarters; (d) the night time 15 minute attended monitoring in accordance with c) must be undertaken between the hours of 1am and 4am; (e) the night time LA1 (1 min) attended monitoring in accordance with c) must be undertaken between the hours of 1am and 4am;	Compliant	Noise Management Plan (Rev 2– Dated 12 March 2014) Quarterly Noise Monitoring Reports for 2019, 2020, 2021 and 2022	*2019 Audit Recommendation: Update Noise Management Plan. Ensure monitoring is completed in accordance with Noise Management Plan.* *2022 IEA Findings :*A review of the quarterly noise monitoring reports found that noise monitoring was being undertaken consistent with the requirements of this condition.

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td></td><td>(f) one quarterly monitoring must occur during each day, evening and night period as defined in the NSW EPA Noise Policy for Industry 2017 for a minimum of 1.5 hours during the day; 30 minutes during the evening; and 1 hours during the night, and
(g) each quarterly monitoring must be undertaken on a different day(s) of the week not including Saturdays, Sundays and public holidays; and
(h) these monitoring conditions take effect in the 2015 Reporting period.
Note: The intention of this condition is that quarterly monitoring be undertaken at each sensitive receiver. That at each sensitive receiver monitoring is undertaken over a range of different days excluding weekends and public holidays during the reporting period so as to be representative of operating hours. That night time 15 minute attended monitoring and the LA1 (1min) monitoring for three of the quarters be undertaken at worst case being the most stable atmospheric conditions and when noise would be most intrusive to sleep. All of the sensitive receivers do not have to be monitored on the same day, evening and night for sub condition f.</td><td></td><td></td><td></td></tr>
<tr><td>M4.2</td><td>M4.2 For the Annual Reporting Period ending March 2015 the EPA will accept all monitoring required by the current Department of Planning and Environment consent (usually quarterly monitoring for noise as dB(A) Leq15minutes) for compliance with noise monitoring requirements in this licence, as a single report attached to the Annual Return for the premises.</td><td>Compliant</td><td>Annual noise compliance assessment reports for 2019, 2020 and 2021</td><td>2019 IEA Recommendation: For future Annual Returns a single noise monitoring report should be prepared and attached to the Annual Return.
2022 IEA Findings: Consolidated noise reports were completed for 2019, 2020 and 2021 over the reporting period.</td></tr>
<tr><td>M5</td><td>M5 Weather monitoring</td><td></td><td></td><td></td></tr>
<tr><td>M5.1</td><td>M5.1 At the point(s) identified below, the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1 of the table below, using the corresponding sampling method, units of measure, averaging period and sampling frequency, specified opposite in the Columns 2, 3, 4 and 5 respectively

POINT 26
<table><tr><th>Parameter</th><th>Sampling method</th><th>Units of measure</th><th>Averaging period</th><th>Frequency</th></tr><tr><td>Rainfall</td><td>AM-4</td><td>millimetres</td><td>24 hours</td><td>Continuous</td></tr><tr><td>Wind Direction at 10 metres</td><td>AM-2 & AM-4</td><td>Degrees</td><td>1 hour</td><td>Continuous</td></tr><tr><td>Wind Speed</td><td>AM-2 & AM-4</td><td>metres per second</td><td>1 hour</td><td>Continuous</td></tr><tr><td>Temperature at 10 metres</td><td>AM-4</td><td>degrees Celsius</td><td>1 hour</td><td>Continuous</td></tr><tr><td>Sigma Theta</td><td>AM-2 & AM-4</td><td>Degrees</td><td>15 minutes</td><td>Continuous</td></tr><tr><td>Relative humidity</td><td>AM-4</td><td>percent</td><td>1 hour</td><td>Continuous</td></tr></table></td><td>Compliant</td><td>Air Quality and Greenhouse Gas Management Plan (V2 – dated 21 January 2022), including DPE approval 21/03/2022
Noise Management Plan (Rev 2– Dated 12 March 2014)
Annual Review for 2019, 2020 and 2021
Raw data export from meteorological station</td><td>Weather data is presented in the Annual Review documents with relevant data recorded in accordance with this condition.</td></tr>
</table>

Condition	Details	Compliance status	Relevant evidence	Commentary
M5.2	M5.2 The licensee may use the Vales Point Power Station Meteorological Station to determine compliance with condition M5.1, provided the licensee has authority from Sunset Power International Pty Ltd to access meteorological data at all times.	Not triggered		The Delta Coal weather station at Mannering Colliery is used to collect weather data. This condition remains not triggered.
M6	M6 Recording of pollution complaints			
M6.1	M6.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.	Compliant	Complaint and incident register (https://www.deltacoal.com.au/community/complaint-and-incident-register)	The complaints register is kept on the project website.
M6.2	M6.2 The record must include details of the following: a) the date and time of the complaint; b) the method by which the complaint was made; c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect; d) the nature of the complaint; e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and f) if no action was taken by the licensee, the reasons why no action was taken.	Compliant	Complaint and incident register (https://www.deltacoal.com.au/community/complaint-and-incident-register)	*2019 IEA Recommendation: Ensure all complaints are recorded in the internal database on site and the relevant details required under this condition are outlined in the Annual Review.* 2022 IEA Findings: The auditor viewed the complaints and incidents register on the website and the internal complaints database and was found to be compliant with the requirements of this condition.
M6.3	M6.3 The record of a complaint must be kept for at least 4 years after the complaint was made.	Compliant	Complaint and incident register (https://www.deltacoal.com.au/community/complaint-and-incident-register)	Complaint records back to April 2018 are available to view on the website.
M6.4	M6.4 The record must be produced to any authorised officer of the EPA who asks to see them.	Not triggered	Site interviews dated 12/13 April 2022	No request of this nature has been made over the reporting period. This condition remains not triggered.
M7	M7 Telephone complaints line			
M7.1	M7.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.	Compliant	Community information line web page https://www.deltacoal.com.au/media/community-information-line	The community information line functions as the complaints line. The number is 1800 115 277.

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td>M7.2</td><td>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.</td><td>Compliant</td><td>July 2019 Community Newsletter
Community information line web page
https://www.deltacoal.com.au/media/community-information-line</td><td>2019 IEA Recommendation: With the new ownership an advertisement should be placed in the paper/newsletter providing a link to the Delta Coal website and outlining the complaint management details.

2022 IEA findings: The community information line is advertised on the website in an easy to find location.
The Community Newsletter from July 2019 fulfilled the 2019 IEA recommendation.</td></tr>
<tr><td>M7.3</td><td>M7.3 The preceding two conditions do not apply until 3 months after: the date of the issue of this licence.</td><td>Note</td><td></td><td>Noted</td></tr>
<tr><td>M7.4</td><td>M7.4 The licensee must notify the EPA with contact details of personnel capable of a timely response to emergencies or any other exigent circumstances.
(a) the nominated contact must be available at all times.
(b) contact details must include a telephone number and must be current.
(c) such notification must be made within 14 days of receiving this licence.</td><td>Compliant</td><td>Pollution Incident Response Plan (Rev 2.4 – Dated 15 December 2021)</td><td>2019 IEA Recommendation Update the details of designated representatives of the company in the PIRMP.

2022 IEA Findings: The PIRMP has been updated within the reporting period. Designated representatives are nominated in Table 3.</td></tr>
<tr><td>M8</td><td>M8 Requirement to monitor volume or mass</td><td></td><td></td><td></td></tr>
<tr><td>M8.1</td><td>M8.1 For each discharge point or utilisation area specified below, the licensee must monitor:
a) the volume of liquids discharged to water or applied to the area;
b) the mass of solids applied to the area;
c) the mass of pollutants emitted to the air; at the frequency and using the method and units of measure, specified below.

POINT 1<table><tr><th>Frequency</th><th>Unit of Measure</th><th>Sampling Method</th></tr><tr><td>Continuous during discharge</td><td>kilolitres per day</td><td>In line instrumentation</td></tr></table>POINT 27<table><tr><th>Frequency</th><th>Unit of Measure</th><th>Sampling Method</th></tr><tr><td>Continuous during discharge</td><td>kilolitres per day</td><td>In line instrumentation</td></tr></table></td><td>Non-compliance (administrative)</td><td>Annual Review for 2019, 2020 and 2021
Monitoring data for 2019, 2020, 2021 and 2022</td><td>A review of the Annual Review and monitoring data has found that monitoring of discharge points was generally adequate over the reporting period.
The exception being volumetric monitoring also ceased between 26 December 2021 and 10 January 2022 due to the vandalism of the volumetric flow measuring equipment. This constitutes a non-compliance against condition (a)
This has been fixed and monitoring has recommenced. As Delta Coal have been prompt in addressing this issue, no corrective action is recommended.</td></tr>
</table>

Condition	Details	Compliance status	Relevant evidence	Commentary
6	6 Reporting Conditions			
R1	R1 Annual return documents			
R1.1	R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising: 1. a Statement of Compliance, 2. a Monitoring and Complaints Summary, 3. a Statement of Compliance - Licence Conditions, 4. a Statement of Compliance - Load based Fee, 5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan, 6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and 7. a Statement of Compliance - Environmental Management Systems and Practices. At the end of each reporting period, the EPA will provide to the licensee notification that the Annual Return is due.	Compliant	Annual Return for 2019, 2020 and 2021	Review of relevant data indicates compliance with the requirements of this condition.
R1.2	R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below. Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.	Compliant	Annual Return for 2019, 2020 and 2021	Review of relevant data indicates compliance with the requirements of this condition.
R1.3	R1.3 Where this licence is transferred from the licensee to a new licensee: a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period. Note: An application to transfer a licence must be made in the approved form for this purpose.	Not triggered	Annual Return for 2019, 2020 and 2021	*2019 IEA Recommendation: LakeCoal and Delta Coal to prepare Annual Returns based on the period of the Annual Return and dates of the sale of Chain Valley.* 2022 IEA Findings: The licence was transferred from LakeCoal to Delta Coal on 1 April 2019, which is outside the reporting period.
R1.4	R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on: a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.	Not triggered	Annual Return for 2019, 2020 and 2021	Delta Coal have not surrendered the licence within the reporting period, and therefore this condition remains not triggered.
R1.5	R1.5 The Annual Return for the reporting period must be supplied to the EPA via eConnect EPA or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').	Compliant	Annual Return for 2019, 2020 and 2021	*2019 IEA Recommendation: Ensure Annual Returns are completed as per the EPA requirements and submitted within the due date.* Review of relevant data indicates compliance with the requirements of this condition.

Condition	Details	Compliance status	Relevant evidence	Commentary
R1.6	R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.	Compliant	Annual Return for 2019, 2020 and 2021	Review of relevant data indicates compliance with the requirements of this condition.
R1.7	R1.7 Within the Annual Return, the Statements of Compliance must be certified and the Monitoring and Complaints Summary must be signed by: a) the licence holder; or b) by a person approved in writing by the EPA to sign on behalf of the licence holder.	Compliant	Annual Return for 2019, 2020 and 2021	Review of relevant data indicates compliance with the requirements of this condition.
R2	R2 Notification of environmental harm			
	Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.	Note		Noted
R2.1	R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.	Compliant	Incident reports Annual Reviews for 2019, 2020 and 2021.	Notifications were made to the environment line as required, whilst there were environmental incidents occurring the audit period, none of these incidents required the PIRMP to be enacted.
R2.2	R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which they became aware of the incident.	Compliant	Incident reports Annual Reviews for 2019, 2020 and 2021.	Notifications were made to the environment line as required, whilst there were environmental incidents occurring the audit period, none of these incidents required the PIRMP to be enacted.
R3	R3 Written report			
R3.1	R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that: a) where this licence applies to premises, an event has occurred at the premises; or b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence, and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.	Not triggered		No requests of this nature have been made over the reporting period. This condition remains not triggered.
R3.2	R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.	Not triggered		As above
R3.3	R3.3 The request may require a report which includes any or all of the following information: a) the cause, time and duration of the event; b) the type, volume and concentration of every pollutant discharged as a result of the event; c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;	Not triggered		As above

Condition	Details	Compliance status	Relevant evidence	Commentary
	d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort; e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants; f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and g) any other relevant matters.			
R3.4	R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.	Not triggered		As above
R4	R4 Other reporting conditions			
	Noise Monitoring Report			
R4.1	R4.1 The licensee must submit to the EPA a noise compliance assessment report at the end of each reporting period. The report must be submitted with the Environment Protection Licence Annual Return. The report must be prepared by a suitably qualified and experienced acoustical consultant which: (a) details the noise monitoring undertaken in accordance with condition M4; (b) assesses compliance with noise limits presented in condition L5.1 and condition 5.2; and (c) outlines any management actions taken within the monitoring period to address any exceedences of limits contained in condition L5.1 and condition L5.2. Note: The licensee must provide the EPA with one report, but this report may be a combination of the monitoring undertaken by the licensee as part of their quarterly monitoring program as required by the Project Approval SSD-5456 and must include LA1(1min).	Compliant	Annual noise compliance assessment reports for 2019, 2020 and 2021	*2019 IEA Recommendation:* *Send a combined noise report for the Annual Return period to the EPA.* 2022 IEA Findings: Consolidated noise reports were completed for 2019, 2020 and 2021 over the reporting period via the EPA eConnect portal.
7	General Conditions			
G1	G1 Copy of licence kept at the premises or plant	Compliant	Site inspection conducted 12 April 2022	Conduct of the site inspection verified compliance with the requirements of this condition.
G1.1	G1.1 A copy of this licence must be kept at the premises to which the licence applies	Compliant	Site inspection conducted 12 April 2022	Conduct of the site inspection verified compliance with the requirements of this condition.
G1.2	G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.	Not triggered		An EPA officer has not asked to see the licence over the reporting period. This condition remains not triggered.
G1.3	G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.	Compliant	Site inspection conducted 12 April 2022	Conduct of the site inspection verified compliance with the requirements of this condition.

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td>G2</td><td>G2 Contact number for incidents and responsible employees</td><td></td><td></td><td></td></tr>
<tr><td>G2.1</td><td>G2.1 The licensee must operate 24-hour telephone contact lines for the purpose of enabling the EPA to directly contact one or more representatives of the licensee who can:
a) respond at all times to incidents relating to the premises; and
b) contact the licensee’s senior employees or agents authorised at all times to:
i) speak on behalf of the licensee; and
ii) provide any information or document required under this licence.</td><td>Compliant</td><td></td><td>Changes of personnel at Chain Velley Colliery have been updated via the EPA eConnect portal.</td></tr>
<tr><td>G2.2</td><td>G2.2 The licensee is to inform the EPA in writing of the appointment of any subsequent contact persons, or changes to the person’s contact details as soon as practicable and in any event within fourteen days of the appointment or change.</td><td>Compliant</td><td></td><td>Changes of personnel at Chain Velley Colliery have been updated via the EPA eConnect portal.</td></tr>
<tr><td>G3</td><td>G3 Other general conditions</td><td></td><td></td><td></td></tr>
<tr><td>G3.1</td><td>G3.1 Completed Programs<table><tr><th>Program</th><th>Description</th><th>Completed Date</th></tr><tr><td>Coal Mine Particulate Matter Control Best Practice</td><td>Requires licensee to conduct a site specific Best Management Practice (BMP) determination to identify ways to reduce particle emissions.</td><td>28-September-2012</td></tr><tr><td>Assessment of Potential Impacts of Metals in wastewater</td><td>The licensee must conduct an assessment of metals detected in wastewater discharges from the mine in accordance with the ANZECC water quality guidelines. To obtain a greater understanding of the type and concentration of metals discharged in mine water and entering the receiving waters. To limit the concentration of metals discharged in mine water within ANZECC guidelines.</td><td>23-October-2013</td></tr><tr><td>Air Quality Monitoring</td><td>The licensee must evaluate best locations and install monitoring devices as defined in Project Approval MP10_0161 under the Environent Planning & Assessment Act 1979.</td><td>31-December-2013</td></tr><tr><td>PRP4 - Upgrade to Clean and Dirty Water Management System</td><td>The licensee must review and upgrade separation of the Clean and Dirty Water Management System and review and upgrade bunding.</td><td>14-August-2015</td></tr><tr><td>PRP5 - Remediation of Dam Wall and Spillway formalisation</td><td>The licensee must design and remediate the dam wall on the final control pond and formalise a spillway to prevent dam seepage and to ensure that volumetric discharge can be monitored</td><td>27-February-2015</td></tr><tr><td>PRP 6 Upgrade to Sewage Treatment Systems</td><td>Assessment of options for improved disinfection of effluent from STP on licenced premises.</td><td>06-January-2015</td></tr><tr><td>PRP7 Sewage Treatment System Concept Design</td><td>Provide the EPA with a Concept Design and Timetable for Implementation of Upgrade to the Sewage Treatment System</td><td>19-February-2016</td></tr></table></td><td>Not triggered</td><td></td><td>The projects listed in the table were completed prior to the scope of the audit, and therefore this condition is not triggered.</td></tr>
</table>

Condition	Details	Compliance status	Relevant evidence	Commentary
8	8 Pollution Studies and Reduction Programs			
U1	U1 PRP 8 – Connection of Bathouse Wastewater to Sewer			
U1.1	U1.1 Background The licensee has historically treated and disposed of effluent and grey water generated by activities at the premises through the surface water management system. The licensee has committed to undertaking scoping works and planning pathways to enable the connection of the bathhouse wastewater at the premises to the Central Coast Council sewer. The EPA understands that in 2021 the licensee was granted approval by Central Coast Council to undertake the necessary works to discharge effluent and grey water generated at the bathhouse to sewer. Deliverables The licensee must undertake all works proposed and specified under the planning approval by Central Coast Council to enable all bathhouse effluent and greywater to be disposed to the Central Coast Council sewerage network by no later than Friday 26 August 2022. Upon completion of the sewerage connection the licensee must provide the EPA with a letter report identifying all works completed under this PRP.	Compliant	Site interviews conducted 12/13 April 2022	*IEA Recommendation: Liaise with the EPA regarding the current status of the Sewage System Project. Implement any agreed actions in terms of timing* 2022 IEA Findings: This upgrade is in the process of being completed and is on track to be completed by 26 August 2022 as per the requirements of this condition.
U2	U2 PRP 9 - Office Area Wastewater System Upgrades to Best Practice			
U2.1	U2.1 Background Wastewater from the premises office is currently managed by a sewage treatment system that employs surface irrigation of effluent via an above ground sprinkler system. The EPA understand that the sewage treatment system services around four office staff. The EPA understand that the effluent currently irrigated is not disinfected. The EPA considers that the current effluent irrigation system is in need of upgrades to reduce any potential impact to public health and the environment. Deliverables The licensee must gain any necessary approvals and upgrade the current sewage management system servicing the office building to a current best practice sewage management system. This may include upgrades to the effluent irrigation system to sub-surface irrigation or other best practice methods. The licensee must upgrade the current wastewater management system servicing the office building to best practice by no later than Friday 26 August 2022. Upon completion of all works required by this PRP the licensee must supply the EPA with a letter report identifying all works and actions taken to upgrade the office building sewage management system.	Compliant	Site interviews conducted 12/13 April 2022	This upgrade is in the process of being completed and is on track to be completed by 26 August 2022 as per the requirements of this condition.

1.2 SSD-5465

Condition	Details	Compliance status	Relevant evidence	Commentary
	Schedule 2 – Administrative conditions			
	OBLIGATION TO MINIMISE HARM TO THE ENVIRONMENT			
1	1. In addition to meeting the specific performance measures and criteria established under this consent, the Applicant must implement all reasonable and feasible measures to prevent, and if prevention is not reasonable and feasible, minimise, any material harm to the environment that may result from the construction and operation of the development, and any rehabilitation required under this consent.	Compliant	Site inspection conducted 12 April 2022 Site interview conducted 12/13 April 2022	Conduct of the audit verifies compliance with the requirements of this condition.
	TERMS OF APPROVAL			
2	2. The development may only be carried out: (a) in compliance with the conditions of this consent; (b) in accordance with the statement of commitments in Appendix 9; (c) in accordance with the Subsidence Zones in Appendix 3; (d) in accordance with all written directions of the Planning Secretary; and (e) generally in accordance with the EIS, SEE (Mod 1), SEE (Mod 2), SEE (Mod 3) and SEE (Mod 4).	Non-compliance (low risk)	Site inspection conducted 12 April 2022 Site interview conducted 12/13 April 2022	The following conditions of this licence were identified as being non-compliant over the reporting period: Schedule 2, Condition 2 Schedule 2, Condition 23 Schedule 3, Condition 5 Schedule 3, Condition 9 Schedule 3, Condition 17 Schedule 3, Condition 18 Schedule 3, Condition 23 Schedule 6, Condition 3 Schedule 6, Condition 4 Schedule 6, Condition 5 Schedule 6, Condition 12 Schedule 6, Condition 13 As these conditions of the licence have not been complied with, this condition is also non-compliant. Refer to corrective actions and recommendations on each condition.

Condition	Details	Compliance status	Relevant evidence	Commentary
3	3. Consistent with the requirements in this consent, the Planning Secretary may make written directions to the Applicant in relation to: (a) the content of any strategy, study, system, plan, program, review, audit, notification, report or correspondence submitted under or otherwise made in relation to this consent, including those that are required to be, and have been, approved by the Planning Secretary; and (b) the implementation of any actions or measures contained in any such document referred to in condition 3(a).	Not triggered	Annual Review for 2019, 2020 and 2021	No directions have been given to Delta Coal over the reporting period.
4	4. The conditions of this consent and directions of the Planning Secretary prevail to the extent of any inconsistency, ambiguity or conflict between them and a document/s listed in condition 2(e). In the event of an inconsistency, ambiguity or conflict between any of the document/s listed in condition 2(e), the most recent document prevails to the extent of the inconsistency, ambiguity or conflict.	Note		Noted
	LIMITS ON CONSENT			
	Mining Operations			
5	5. The Applicant may carry out mining operations on the site until 31 December 2027. Note: Under this consent, the Applicant is required to rehabilitate the site and perform additional undertakings to the satisfaction of either the Planning Secretary or the RR. Consequently, this consent 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.	Compliant		Mining operations were undertaken within the audit period.
	Coal Extraction			
6	6. The Applicant must not extract more than 2.1 million tonnes of ROM coal from the site in any calendar year.	Compliant	Annual Review for 2019, 2020 and 2021	Delta Coal produced coal within the limits of this condition. – 2019: 0.79 million tonnes – 2020: 1.38 million tonnes – 2021: 1.25 million tonnes Compliance for 2022 was not assessed as the reporting period did not encompass the entire calendar year.
	Coal Transport – Public Roads			
7	7. The Applicant must ensure that no laden coal trucks are dispatched from the site to public roads outside of the hours of 5:30 am to 5:30 pm, Monday to Friday, and not at all on Saturdays, Sundays or public holidays.	Compliant	Site interview conducted 12/13 April 2022	*2019 IEA Recommendation: Ensure detailed records of coal transportation are recorded and able to be provided to auditors upon request. The spreadsheets should cover the requirements of the key conditions of the Development Consent.* 2022 IEA Findings: Coal was generally transferred to Vales Point Power Station via conveyor. Some haulage trucks were used over the reporting period to supplement the conveyor transport.

Condition	Details	Compliance status	Relevant evidence	Commentary
8	8. The Applicant must not dispatch from the site more than: (a) 660,000 tonnes of product coal in any calendar year to the Port of Newcastle for export; (b) 180,000 tonnes of product coal in any calendar year to domestic customers other than Vales Point Power Station; (c) a total of 270 laden coal trucks per day by public roads; (d) a total of 32 laden coal trucks per hour; and (e) an average of 16 laden coal trucks per hour by public roads during peak hour periods, calculated monthly, until the intersection of M1 Motorway and Sparks Road Interchange (East Side - unsignalised with stop sign) is upgraded to a signalised intersection.	Compliant	Site interview conducted 12/13 April 2022	*2019 IEA Recommendation: Ensure detailed records of coal transportation are recorded and able to be provided to auditors upon request. The spreadsheets should cover the requirements of the key conditions of the Development Consent.* 2022 IEA Findings: No export to Port of Newcastle and generally no laden trucks by public roads. Small exceptions were during 2020 and 2021 where stockpiled coal was transported off site for treatment due to contamination. Volumes were within limits of this condition.
	Coal Transport – Vales Point Power Station			
9	9. The Applicant must ensure that only private roads are used for the transport of coal by truck to Vales Point Power Station, except in an emergency. In an emergency, product coal may be transported by public roads, with the prior written approval of the Planning Secretary, and subject to any restrictions that the Planning Secretary may impose.	Compliant	Site interview conducted 12/13 April 2022 Annual Review for 2019, 2020 and 2021 Coal haulage register for 2019, 2020, 2021 and 2022	*2019 IEA Recommendation: Ensure detailed records of coal transportation are recorded and able to be provided to auditors upon request. The spreadsheets should cover the requirements of the key conditions of the Development Consent.* 2022 IEA Findings: Small exceptions were during 2020 and 2021 where stockpiled coal was transported off site for treatment due to contamination. Volumes were within limits of this condition.
10	10. The Applicant must restrict the transport of coal by truck to the Vales Point Power Station between 10 pm and 5:30 am to: (a) 16 laden trucks per hour for the Spring and Autumn months; and (b) zero during Winter months	Compliant	Site interview conducted 12/13 April 2022 Road Transport Protocol (Rev 3 – Dated 1 December 2019).	*2019 IEA Recommendation: Ensure detailed records of coal transportation are recorded and able to be provided to auditors upon request. The spreadsheets should cover the requirements of the key conditions of the Development Consent.* 2022 IEA Findings: Coal is not transported to Vales Point Power Station between these hours. This is outlined in Section 2 of the Road Transport Protocol Driver Code of Conduct.

Condition	Details	Compliance status	Relevant evidence	Commentary
	PLANNING AGREEMENT			
11	11. Within 12 months of the date of this consent, unless otherwise agreed by the Planning Secretary, the Applicant must enter into a planning agreement with the CC Council in accordance with Division 6 of Part 4 of the EP&A Act that provides for payment to the CC Council for community enhancement purposes. The agreement must include provision for those matters set out in condition 12 below. If there is any dispute between the Applicant and CC Council relating to the preparation or implementation of the planning agreement, then either party may refer the matter to the Planning Secretary for resolution.	Not triggered		Not triggered as this was executed in 2016, which is outside reporting period.
	COMMUNITY ENHANCEMENT			
12	12. The Applicant must pay CC Council $0.035 for each tonne of product coal produced by the development for the purposes of improving public infrastructure and providing community projects for the communities of Summerland Point, Gwandalan, Chain Valley Bay and Mannering Park. Payments from the approval date of project approval 10_0161 must be: (a) made by the end of March, for coal produced in the previous calendar year; (b) made for each year that coal is produced by the colliery; and (c) subject to indexation in accordance with the Australian Bureau of Statistics Consumer Price Index.	Compliant	Annual Review for 2019, 2020 and 2021 VPA Tracking spreadsheet Payment receipts	Table 1 in the Annual Review details the money accrued for the Voluntary Planning Agreement with Council. – 2019 $29,982.33 – 2020 $48,205.00 – 2021 $52, 360.00 A comparison of production statistics and required contributions found that Delta Coal were operating in compliance with the requirements of this condition. Evidence of payment was provided during the audit. Compliance for 2022 was not assessed as the reporting period did not encompass the entire calendar year.
13	Deleted			
14	Deleted			
	STRUCTURAL ADEQUACY			
15	15. The Applicant must ensure that all new buildings and structures, and any alterations or additions to existing buildings and structure, that are part of the development are constructed in accordance with: (a) the relevant requirements of the BCA; and (b) any additional requirements of the SA NSW where the building or structure is located on land within declared Mine Subsidence Districts. Notes: • Under Part 8 of the EP&A Act, the Applicant is required to obtain construction and occupation certificates for the proposed building works; • Part 8 of the EP&A Regulation sets out the requirements for the certification of the development; and • Under section 21 of the Coal Mine Subsidence Compensation Act 2017, the Applicant is required to obtain the SA NSW's approval before constructing any improvements in a Mine Subsidence District.	Not triggered		No new buildings have been constructed over the audit period. This condition is not triggered.

Condition	Details	Compliance status	Relevant evidence	Commentary
	DEMOLITION			
16	16. The Applicant must ensure that all demolition work is carried out in accordance with Australian Standard AS 2601-2001: The Demolition of Structures, or its latest version.	Compliant	Demolition documentation	Demolition of some old mine cottages and ROM coal bin occurred over the reporting period. Demolition was undertaken by Novocastrian Demolition. Demolition documentation was viewed in the audit and was found to be compliant with this condition.
	OPERATION OF PLANT AND EQUIPMENT			
17	17. All plant and equipment used on site, or to monitor the performance of the development must be: (a) maintained in a proper and efficient condition; and (b) operated in a proper and efficient manner.	Compliant	Calibration certificates Pulse tracking system	Calibration certificates for noise loggers and the TEOM were provided. While the Pulse tracking system was also reviewed while completing the site inspection.
18	Deleted			
	ROAD MAINTENANCE CONTRIBUTION			
19	19. The Applicant must pay Road Maintenance Fees to CC Council in accordance with its Road Maintenance Agreement with CC Council.	Compliant	Correspondence with Lake Macquarie Council	Correspondence with council regarding the payment of Road Maintenance Fees was provided.
	COMMUNITY CONSULTATIVE COMMITTEE			
20	20. A Community Consultative Committee (CCC) must continue to operate for the development in accordance with the Department's Community Consultative Committee Guidelines: State Significant Projects (2019). The CCC must continue to operate during the life of the development, or other timeframe agreed by the Planning Secretary. Notes: • The CCC is an advisory committee only. • In accordance with the Guidelines, the Committee should comprise an independent chair and appropriate representation from the Applicant, Affected Councils and the local community.	Compliant	Community Consultative Committee (CCC) Meeting Minutes CCC Annual reports for 2019, 2020 and 2021	The Community Consultative Committee (CCC) were held quarterly over the reporting period and in compliance with the requirements of this condition.
21	21. With the approval of the Planning Secretary, the Applicant may combine the CCC required by this consent with any similar CCC required by a consent or approval for any adjoining mine subject to common, shared or related ownership or management.	Compliant	Community Consultative Committee (CCC) Meeting Minutes CCC Annual reports for 2019, 2020 and 2021	The CCC for the Chain Valley Colliery is combined with Mannering Colliery

Condition	Details	Compliance status	Relevant evidence	Commentary
	EVIDENCE OF CONSULTATION			
22	22. Where conditions of this consent require consultation with an identified party, the Applicant must: (a) consult with the relevant party prior to submitting the subject document; (b) provide details of the consultation undertaken including: i. the outcome of that consultation, matters resolved and unresolved; and ii. details of any disagreement remaining between the party consulted and the Applicant and how the Applicant has addressed the matters not resolved.	Compliant	Coal Haulage Traffic Management System Plan (Rev 3) – Dated 25 September 2020 Independent Traffic Audits Air Quality and Greenhouse Gas Management Plan DRAFT (V2 – dated 21 January 2022 Benthic Communities Management Plan (Rev 5 – 6 April 2021) Biodiversity Management Plan (Rev 5 – Dated 1 December 2019) Built Features Management Plan (Rev 0 – Dated 6 April 2021) Heritage Management Plan (Rev 4 – Dated 6 November 2020) Noise Management Plan (Rev 2–	Consultation requirements were generally in compliance with the requirements of this condition. The BMP was sent to the parties outlined in Schedule 3 Condition 20. No comments were received. ***Recommendation 4: The outcome of consultation is not included in the BMP, it is recommended that a statement saying that no comments were received is included in the plan.***

Condition	Details	Compliance status	Relevant evidence	Commentary
			Dated 12 March 2014) Miniwall S5 and Northern Pillar Area Extraction Plan (Rev 1.2 – Dated10 March 2020) Public Safety Management Plan (Dated 19 March 2021) Rehabilitation Management Plan (Rev 5 – Dated 10 March 2020) Seagrass Management Plan (Rev 8 – Dated 6 April 2021) Subsidence Monitoring Program (Dated 20 November 2020) Water Management Plan (Rev 5– Dated 24 August 2021)	
	STAGING, COMBINING AND UPDATING STRATEGIES, PLANS OR PROGRAMS			
23	23. With the approval of the Planning Secretary, the Applicant may: (a) prepare and submit any strategy, plan or program required by this consent on a staged basis (if a clear description is provided as to the specific stage and scope of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program);	Non-compliance (administrative)	Air Quality and Greenhouse Gas Management Plan (V2 – dated 21 January 2022)	*2019 IEA Recommendation: All management plans require updating due to the length of time since the previous reviews. All should in a Delta Coal template.* *Ensure there is a cross referencing table covering this condition in management plans.*

Condition	Details	Compliance status	Relevant evidence	Commentary
	(b) combine any strategy, plan or program required by this consent (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined); (c) update any strategy, plan or program required by this consent (to ensure the strategies, plans and programs required under this consent are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the development); and (d) combine any strategy, plan or program required by this consent with any similar strategy, plan or program required by an adjoining mining consent or approval, in common ownership or management.		Biodiversity Management Plan (Rev 5 - Dated 1 December 2019) Environmental Management Strategy (Rev 1 – Dated 24 March 2021) Heritage Management Plan (Rev 3 – Dated 27 April 2020) Noise Management Plan (Rev 2– Dated 12 March 2014)) Seagrass Management Plan (Rev 8 – Dated 10 July 2020) Water Management Plan (Rev 5 – Dated 24 August 2021) Benthic Communities Management Plan (Dated 6 April 2021)	*Additional detail including Trigger, Action, Response Tables (contingency plan) should be developed in the next round of management plan updates.'* 2022 IEA Findings: The following management plans were completed for Chain Valley Colliery: – Environmental Management Strategy (EMS): The EMS was published in March 2021. Attachment 1 contains a table of compliance with the conditions of approval. – AQGGMP: This plan was most recently updated January 2022 to be combined with Mannering Colliery and cover both sites. The recommendation of the previous audit to incorporate Trigger Action Response Tables has not been incorporated into the plan. – BMP: This plan was updated recently and is not due for review until December 2022. Appendix 2 contains a table outlining how the relevant conditions of approval are satisfied in the document. Table 9 contains the Trigger Action Response Tables recommended by the previous audit. – HMP: This plan was updated recently and is not due for review until December 2022. Appendix 2 contains a table outlining how the relevant conditions of approval are satisfied in the document. There is no inclusion of the Trigger Action Response Tables recommended by the previous audit. – NMP: The NMP for the site has not been updated within the reporting period and is therefore non-compliant with Clause (c). The NMP does not include Trigger Action Response Plans or a compliance table. The auditor notes that a new NMP is being prepared that satisfies the 2019 IEA Recommendations and the requirements of this condition. Therefore, no corrective actions are required. – Seagrass Management Plan: This plan was most recently updated in July 2020 and was due for review in July 2021. .Appendix 2 contains a table outlining how the relevant conditions of approval are addressed in the plan. There is no inclusion of the Trigger Action Response Tables recommended by the previous audit. – Benthic Communities Management Plan: This plan was most recently updated in 6 April 2021. Appendix 2 contains a table outlining how the relevant conditions of approval are addressed in the plan. There is no inclusion of the Trigger Action Response Tables recommended by the previous audit. – WMP: This plan has been reviewed and updated recently and is not due for review until 2024. Appendix 3 contains a table outlining how the relevant conditions of approval are satisfied

Condition	Details	Compliance status	Relevant evidence	Commentary
				in the document. There is no inclusion of the Trigger Action Response Tables recommended by the previous audit. As the recommendation of the previous audit to ensure that Trigger Action Response Plans are added into the management plans has not been followed though in the audit, a non-compliance with clause (c) of this condition is recorded. ***Corrective action 4: Ensure that TARPs are included in the AQMP, HMP, Seagrass Management Plan, Benthic Communities Management Plan and WMP in the next update. This includes developing a TARP to further detail the management procedures for the newly established PM2.5 alarms within the AQMP.*** Correspondence was received from DPIE on 9 October 2020 to provide approval for the AQGGMP, HMP, Land Management Plan (LMP) and NMP to be combined for Chain Valley Colliery and Mannering Colliery in the next update. As above, the AQGGMP has been updated, however the other three plans have not at the time of audit.
24	24. If the Planning Secretary agrees, a strategy, plan or program may be staged or updated without consultation being undertaken with all parties required to be consulted in the relevant condition in this consent.	Not triggered		Delta Coal have not received directions such as this over the reporting period. This condition remains not triggered.
25	25. If the Planning Secretary agrees, a strategy, plan or program may be staged without addressing particular requirements of the relevant condition of this consent if those requirements are not applicable to the particular stage.	Not triggered		Delta Coal have not received directions such as this over the reporting period. This condition remains not triggered.
	APPLICATION OF EXISTING STRATEGIES, PLANS OR PROGRAMS			
26	26. The Applicant must continue to apply existing management strategies, plans or monitoring programs approved prior to the approval of Modification 3, until the approval of a similar plan, strategy or program following the approval of Modification 3.	Compliant	Biodiversity Management Plan (Rev 5 - Dated 1 December 2019) Heritage Management Plan (Rev 3 - Dated 1 December 2019) Noise Management Plan (Rev 2– Dated 12 March 2014))	Modification 3 (MOD3) was issued in June 2020. The current consent is MOD4 issued July 2021.

Condition	Details	Compliance status	Relevant evidence	Commentary
	PROTECTION OF PUBLIC INFRASTRUCTURE			
27	27. Unless the Applicant and the applicable authority agree otherwise, the Applicant must: (a) repair, or pay the full costs associated with repairing, any public infrastructure a that is damaged by carrying out the development; and (b) relocate, or pay the full costs associated with relocating, any public infrastructure a that needs to be relocated as a result of the development. a This condition does not apply to any damage to roads caused as a result of general road usage or to damage that has been compensated under the Mining Act 1992.	Not triggered.		No public infrastructure has been damaged over the reporting period. This condition remains not triggered.
	COMPLIANCE			
28	28. The Applicant must ensure that all of its employees, contractors (and their sub-contractors) are made aware of, and are instructed to comply with, the conditions of this consent relevant to activities they carry out in respect of the development.	Compliant	Site interview conducted 12/13 April 2022	Conduct of the site inspection and review of relevant documentation verifies compliance with the requirements of this condition.
	APPLICABILITY OF GUIDELINES			
29	29. References in the conditions of this consent to any guideline, protocol, Australian Standard or policy are to such guidelines, protocols, Standards or policies in the form they are in as at the date of inclusion (or later update) in the condition.	Note		
30	30. However, consistent with the conditions of this consent and without altering any limits or criteria in this consent, the Planning Secretary may, in respect of ongoing monitoring and management obligations, agree to or require compliance with an updated or revised version of such a guideline, protocol, Standard or policy, or a replacement of them.	Not triggered		No directions of this manner have been received during the audit period. This condition remains not triggered.
	SCHEDULE 3 **ENVIRONMENTAL CONDITIONS – GENERAL**			
	TRANSPORT			
	Monitoring of Coal Transport			
1	1. The Applicant must: (a) keep accurate records of the amount of coal transported from the site (on a weekly basis); and (b) make these records publicly available on its website at the end of each calendar quarter.	Compliant	Environmental Reporting webpage (https://www.deltacoal.com.au/environment/chain-valley-colliery/chain-valley-colliery-environmental-reporting)	*2019 IEA Recommendation: See recommendation regarding detailed transport records.* *Ensure transport records from this Audit period (January 2016) onwards are recorded on the website. This could be appended to the Annual Review summarising the weekly transport.* 2022 IEA findings: Weekly Coal Haulage has been reported on the website adequately over the reporting period.

Condition	Details	Compliance status	Relevant evidence	Commentary
	Road Works			
2	2. The Applicant must upgrade the Ruttleys Road and Construction Road intersection within 6 months of the date of this consent, unless the Planning Secretary directs otherwise, by: (a) installing additional signage on and adjacent to Construction Road prior to the intersection; (b) repairing the surface of Construction Road as required and ensuring the edge seal of the left turn lane is of sufficient width to accommodate coal trucks; (c) installing or replacing "Stop" signs in accordance with Austroads guidelines; (d) repainting road line markings and raised pavements associated with this intersection; and (e) installing barriers to prevent trucks parking on the gravel area adjacent to the intersection and the electricity substation located in the vicinity of this intersection. The design and construction of these works must be undertaken in consultation with, and to the relevant satisfaction of, CC Council, TfNSW and Delta Electricity and to the satisfaction of the Planning Secretary.	Not triggered		Not triggered as this was executed outside the reporting period
	Road Transport Protocol			
3	3. The Applicant must prepare a Road Transport Protocol to the satisfaction of the Planning Secretary. This protocol must: (a) be prepared in consultation with TfNSW, NCC, CC Council and CCC and submitted to the Planning Secretary for approval within 6 months of the date of this consent; (b) describe the designated haulage routes to be used (as shown in Appendix 5); the maximum number of road movements proposed and the haulage hours permitted under this consent; (c) include a Traffic Management Plan, which includes: • procedures to ensure that drivers adhere to the designated haulage routes; • measures to maximise the use of a low frequency (regular) trucking schedule rather than an intermittently-high frequency (campaign) trucking schedule, especially during the morning peak hour; • contingency plans to apply when (for example) the designated haulage route is disrupted, including procedures for notifying relevant agencies and affected communities of the need to implement such contingency plans; • procedures to ensure that all haulage vehicles associated with the development are clearly distinguishable as Chain Valley Colliery coal haulage trucks; • details of procedures for receiving and addressing complaints from the community concerning traffic issues associated with truck movements to and from the site; • measures to ensure that the provisions of the Traffic Management Plan are implemented, eg driver training in the heavy vehicle driver's Code of Conduct and contractual agreements with heavy vehicle operators; and	Compliant	Coal Haulage Traffic Management System Plan (Rev 3) – Dated 25 September 2020	*2019 IEA Recommendations: Ensure Coal Haulage Traffic Management Plan is reviewed as per the requirements of the consent and commitments in the management plan. Attach Driver Code of Conduct to the management plan.* 2022 IEA Findings: The Coal Haulage Management System Plan. Evidence of consultation is provided in Appendix A . Designated haul routes are described in the Driver Code of Conduct, which is appended to the plan in Appendix 2. The Traffic Management Plan is detailed in Section 3, 4, 5 and 6 and is compliant with the requirements of this condition. The recommendations of the previous audit have been incorporated into the plan.

Condition	Details	Compliance status	Relevant evidence	Commentary
	• procedures for ensuring compliance with and enforcement of the heavy vehicle driver's Code of Conduct; (d) include a Code of Conduct for heavy vehicle drivers that addresses: • travelling speeds; • instructions to avoid grouping or convoying of trucks; • instructions to drivers not to overtake each other on the haulage route, as far as practicable, and to maintain appropriate distances between vehicles; • instruction to drivers to adhere to the designated haulage routes; • instruction to drivers to be properly safety conscious and to strictly obey all traffic regulations; and • appropriate penalties for infringements of the Code. The Applicant must implement the approved Road Transport Protocol as approved from time to time by the Planning Secretary.			
4	4. Prior to 31 March 2014, and every 12 months thereafter for each calendar year in which coal haulage from the site is undertaken utilising public roads, unless the Planning Secretary directs otherwise, the Applicant must commission a suitably qualified person, whose appointment has been approved by the Planning Secretary at least one month prior to undertaking the audit, to conduct an Independent Traffic Audit of the development. This audit must: (a) be undertaken without prior notice to the Applicant, and in consultation with TfNSW, NCC, CC Council and the CCC; (b) assess the impact of the development on the performance and safety of the road network, including a review of: • haulage records; • accident records on the haulage route, infringements relating to the code of conduct and any incidents involving haulage vehicles; • community complaints register; and (c) assess the effectiveness of the Road Transport Protocol; and, if necessary, recommend measures to reduce or mitigate any adverse (or potentially adverse) impacts.	Compliant	Chain Valley Traffic Audit – Eight Independent Traffic Audit – Dated December 2019 Chain Valley Traffic Audit – Ninth Independent Traffic Audit - 2020 – Dated February 2021 Chain Valley Traffic Audit – Tenth Independent Traffic Audit – Dated 11 February 2022	*2019 IEA Recommendation: Ensure Traffic Audits are completed annually in accordance with this condition.* 2022 IEA Findings: The independent traffic audits were undertaken on annual basis over the reporting period and were in compliance with the requirements of this condition.
5	5. Within 1 month of receiving the audit report, or as otherwise agreed by the Planning Secretary, the Applicant must submit a copy of the report to the Planning Secretary, with a detailed response to any of the recommendations contained in the audit report, including a timetable for the implementation of any measures proposed to address the recommendations in the audit report. A summary of the audit report must be included in the Annual Review.	Non-compliance (administrative)	Annual Review for 2019, 2020 and 2021	*2019 IEA Recommendation: Ensure the report is submitted to the DPE.* A summary of the Independent Traffic Audit findings are not included in the annual review documentation. This constitutes and administrative non-compliance. ***Corrective action 5: Ensure a summary of the results of Independent Traffic Audits are included in Annual Reviews.***

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td></td><td>Alternative Coal Transport Options</td><td></td><td></td><td></td></tr>
<tr><td>6</td><td>6. Prior to 31 December 2014, and every three years thereafter, the Applicant must prepare and submit to the Planning Secretary for approval, a study of the reasonable and feasible options to reduce or eliminate the use of public roads to transport coal from the development, unless otherwise agreed by the Planning Secretary. The assessment must include:
(a) an analysis of the capital, construction and operating costs of the alternative transport options; and
(b) quantified social and environmental impacts associated with road and rail transport.</td><td>Compliant</td><td>Correspondence from DPIE received 15 December 2020.</td><td>2019 IEA Recommendation: Ensure the Alternative Transport Options Report is completed as per the frequency in this condition.

2022 IEA findings: Delta Coal received correspondence from DPE on 15 December 2020 granting an exception from conducting the Alternative Coal Transport Options Assessment. The exception applies until such time coal haulage via public roads is proposed.</td></tr>
<tr><td></td><td>NOISE</td><td></td><td></td><td></td></tr>
<tr><td></td><td>Noise Impact Assessment Criteria</td><td></td><td></td><td></td></tr>
<tr><td>7</td><td>7. The Applicant must ensure that the noise generated by the development at any residence on privately-owned land does not exceed the criteria for the location in Table 1 nearest to that residence.

Table 1: Noise Criteria dB(A)
<table><tr><th rowspan="2">Location</th><th>Day</th><th>Evening</th><th colspan="2">Night</th></tr><tr><th>$L_{Aeq(15\ min)}$</th><th>$L_{Aeq(15\ min)}$</th><th>$L_{Aeq(15\ min)}$</th><th>$L_{A1(1\ min)}$</th></tr><tr><td>R8</td><td>38</td><td>38</td><td>38</td><td>45</td></tr><tr><td>R11</td><td>49</td><td>49</td><td>49</td><td>54</td></tr><tr><td>R12</td><td>49</td><td>49</td><td>49</td><td>53</td></tr><tr><td>R13</td><td>43</td><td>43</td><td>43</td><td>49</td></tr><tr><td>R15</td><td>36</td><td>36</td><td>36</td><td>45</td></tr><tr><td>R19</td><td>37</td><td>37</td><td>37</td><td>45</td></tr><tr><td>R22</td><td>46</td><td>46</td><td>46</td><td>46</td></tr><tr><td>all other privately-owned land</td><td>35</td><td>35</td><td>35</td><td>45</td></tr></table>
Notes:
• To interpret the locations referred to in Table 1, see Appendix 6 and the EIS; and
• Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 8 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.
However, these criteria do not apply if the Applicant has a written agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.</td><td>Compliant</td><td>Noise Management Plan (Rev 2– Dated 12 March 2014)
Annual reviews for 2019, 2020 and 2021
Quarterly Noise Monitoring Reports for 2019, 2020, 2021 and 2022</td><td>2019 IEA Recommendation: Continue investigations of any noise issues and, where practicable, implement reasonable and feasible mitigation measures. Ensure accurate/consistent monitoring results are presented in Annual Reviews.
2022 IEA findings: Noise monitoring results over the reporting period indicate that the premises is operating within the limits of this condition. The noise management plans noted that a technical non-compliance for ATN007 for every monitoring event due to access issues. Noise monitoring for ATN007 was conducted at intermediate locations. Total noise levels shown were measured at the alternative locations and site contributions were calculated back to ATN007. Operation of Schedule 6, Condition 12 of SSD-5465 allows monitoring from representative locations.</td></tr>
</table>

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td></td><td>Operating Conditions</td><td></td><td></td><td></td></tr>
<tr><td>8</td><td>8. The Applicant must:
(a) implement best management practice, including all reasonable and feasible noise mitigation measures, to minimise the construction, operational and transport noise generated by the development;
(b) regularly assess the noise monitoring and meteorological data and relocate, modify, and/or stop operations on site to ensure compliance with the relevant conditions of this consent;
(c) minimise the noise impacts of the development during meteorological conditions under which the noise limits in this consent do not apply (see Appendix 8);
(d) use its best endeavours to achieve the long-term noise goals in Table 2, where reasonable and feasible, and report on progress towards achieving these goals in each Annual Review;
(e) carry out a comprehensive noise audit of the development in conjunction with each independent environmental audit; and
(f) prepare an action plan to implement any additional reasonable and feasible onsite noise mitigation measures identified by each audit; to the satisfaction of the Planning Secretary.

Table 2: Long-term Noise Goals dB(A)<table><tr><th rowspan="2">Location</th><th>Day</th><th>Evening</th><th>Night</th></tr><tr><th>$L_{Aeq(15\ min)}$</th><th>$L_{Aeq(15\ min)}$</th><th>$L_{Aeq(15\ min)}$</th></tr><tr><td>R11 – R13</td><td>41</td><td>41</td><td>41</td></tr><tr><td>R22</td><td>40</td><td>40</td><td>40</td></tr></table>Notes:
• To interpret the locations referred to in Table 2, see Appendix 6 and the EIS; and
• Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 8 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.</td><td>Compliant</td><td>Noise Management Plan (Rev 2– Dated 12 March 2014)
Site interviews conducted 12/13 April 2022
Annual reviews for 2019, 2020 and 2021
Complaints and Incident Register
Quarterly Noise Monitoring Reports for 2019, 2020, 2021</td><td>2019 IEA Recommendation: The real - time noise monitor should be re-established for the site. Liaise with the DPE regarding the best location as the majority of noise complaints have resulted from Mannering Colliery operations, not CVC. Mannering Colliery is also owned by Delta Coal. Update the Noise Management Plan.
2022 IEA Findings: Operations were generally compliant over the reporting period. Exceedances of the long-term noise goals were recorded at R22 during:
– 2021 Q3 -3 dB exceedance during the evening and night period
– 2021 Q4 – 2 dB exceedance during the day and 4 dB exceedance during evening and night period.
A review of the complaints register found that one noise complaints was received over the reporting period. This complaint occurred in October 2020 and did not occur again over the reporting period. This indicates that adaptive noise management is being undertaken by Delta Coal.
As 8(d) does not require absolute compliance, instead being based on complying where reasonable and feasible, a non-compliance with this condition has not been identified.
The real – time noise monitor was re-established on site in October 2019. Photographic evidence was provided for its installation. Data was also provided to show its implementation, therefore, the recommendation of the previous audit is considered closed.
Real time monitoring was reported upon in the relevant Annual Reviews for the audit period.</td></tr>
<tr><td></td><td>Noise Management Plan</td><td></td><td></td><td></td></tr>
<tr><td>9</td><td>9. The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
(a) be prepared in consultation with the EPA and submitted to the Planning Secretary for approval within 4 months of the date of this consent, unless otherwise agreed by the Planning Secretary;
(b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;</td><td>Non-compliance (administrative)</td><td>Noise Management Plan (Rev 2– Dated 12 March 2014)
Quarterly Noise Monitoring Reports for</td><td>A review of the approved management plan for the site found it generally compliant with the requirements of this condition. The plan however has not been updated since 2014, and therefore does not accurately reflect the activities and conditions occurring on site, therefore a non-compliance against condition (c).
The auditor notes that this plan is in the process of being updated, and that no corrective action is necessary.
Recommendation 9:The outcomes of the noise mitigation study currently being completed should be captured in a</td></tr>
</table>

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td></td><td>(c) describe the proposed noise management system in detail including the mitigation measures that would be implemented to minimise noise during construction and operations, including on and off site road noise generated by vehicles associated with the development; and
(d) include a monitoring program that:
• uses attended monitoring to evaluate the compliance of the development against the noise criteria in this consent;
• evaluates and reports on:
- the effectiveness of the on-site noise management system; and
- compliance against the noise operating conditions; and
• defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
The Applicant must implement the Noise Management Plan as approved by the Planning Secretary.</td><td></td><td>2019, 2020, 2021</td><td>revised noise management plan and reflect any changes to monitoring, as relevant.</td></tr>
<tr><td></td><td>AIR QUALITY</td><td></td><td></td><td></td></tr>
<tr><td></td><td>Odour</td><td></td><td></td><td></td></tr>
<tr><td>10</td><td>10. The Applicant must ensure that no offensive odours are emitted from the site, as defined under the POEO Act.</td><td>Compliant</td><td>Complaints and Incidents Register</td><td>No complaints regarding odours have been received over the reporting period.</td></tr>
<tr><td></td><td>Air Quality Criteria</td><td></td><td></td><td></td></tr>
<tr><td>11</td><td>11. The Applicant must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the development do not cause exceedances of the criteria listed in Table 3 at any residence on privately-owned land.
Table 3: Air quality criteria
<table>
<tr><th>Pollutant</th><th>Averaging period</th><th colspan="2">Criterion</th></tr>
<tr><td rowspan="2">Particulate matter < 2.5 µm ($PM_{2.5}$)</td><td>Annual</td><td colspan="2">[a, c] 8 µg/m³</td></tr>
<tr><td>24 hour</td><td colspan="2">[b] 25 µg/m³</td></tr>
<tr><td rowspan="2">Particulate matter < 10 µm (PM_{10})</td><td>Annual</td><td colspan="2">[a, c] 25 µg/m³</td></tr>
<tr><td>24 hour</td><td colspan="2">[b] 50 µg/m³</td></tr>
<tr><td>Total suspended particulate (TSP) matter</td><td>Annual</td><td colspan="2">[a, c] 90 µg/m³</td></tr>
<tr><td>[d] Deposited dust</td><td>Annual</td><td>[b] 2 g/m²/month</td><td>[a] 4 g/m²/month</td></tr>
</table>
Notes:
a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).</td><td>Compliant</td><td>Air Quality and Greenhouse Gas Management Plan (V2 – dated 21 January 2022
Annual reviews for 2019, 2020 and 2021
Monitoring data for 2019, 2020, 2021 and 2022</td><td>2019 IEA Recommendation: Update the Air Quality Management Plan following this audit.
Improve data capture for PM10. Review possibilities of backup power supply.
Ensure issues with data capture are reported in Section 1 and 7 of the Annual Review.
Ensure TEOM is setup with alarms/notifications for when results are approaching or have exceeded the short term criterion for particulate matter. This will ensure exceedances are immediately detected and reported as soon as possible to the EPA and DPE.

2022 IEA findings:
Several exceedances of criteria were recorded for 24 hour PM^{10} over the reporting period:
– 19 exceedances during 2019, between 26 October and 31 December. Exceedances were reported to DPIE who considered them representative of regional bushfires and dust storms and not non-compliances attributed to the site.</td></tr>
</table>

Condition	Details	Compliance status	Relevant evidence	Commentary
	b Incremental impact (i.e. incremental increase in concentrations due to the development on its own). c Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary. d Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.			– Four exceedances during 2020, between 4 January and 24 January. As per the 2019 exceedances, these were reported to DPIE who considered them representative of regional bushfires and dust storms and not non-compliances attributed to the site. Seven exceedances of $PM^{2.5}$ criteria occurred during January 2022. Investigation of these exceedances found that they were attributed to factors off site and not activities occurring at Chain Valley Colliery. Several exceedances of depositional dust occurred over the reporting period, including exceedances of monthly criteria during 2020 at DDG005 in February, April, June, July, September, November and December. Exceedances at this location also occurred in February, April, August, September and December of 2021. The annual average depositional dust for this location was exceeded as well. These exceedances were attributed to contamination. DDG005 is proposed to be moved in the latest revision of the AQGGMP yet to be approved by DPE. These exceedances are not considered non-compliances. The 2019 IEA recommended that the TEOM is set up with alarms and notifications when the short term criterion for particulate matter is approached or exceeded. Delta Coal provided evidence that this has occurred, and this recommendation is considered closed out. Therefore, in accordance with note c of this condition. These exceedances are not considered non-compliances with this condition.
11A	11A. The air quality criteria in Table 3 do not apply if the Applicant has an agreement with the owner/s of the relevant residence or land to exceed the air quality criteria, and the Applicant has advised the Department in writing of the terms of this agreement.	Note		Noted
	Operating Conditions			
12	12. The Applicant must: (a) implement best practice air quality management at the site, including all reasonable and feasible measures to minimise the off-site odour, fume and dust emissions generated by the development; (b) implement best practice management to minimise the risk of spontaneous combustion and related emissions; (c) implement all reasonable and feasible measures to minimise the release of greenhouse gas emissions from the site; (d) operate an air quality management system on site to ensure compliance with the relevant conditions of this consent;	Compliant	Air Quality and Greenhouse Gas Management Plan (V2 – dated 21 January 2022 Site inspection 12 April 2022	*2019 IEA Recommendation: Update the Air Quality Management Plan following this audit.* *Improve data capture for PM10. Review possibilities of backup power supply.* *Ensure issues with data capture are reported in Section 1 and 7 of the Annual Review.* *Ensure TEOM is setup with alarms/notifications for when results are approaching or have exceeded the short term criterion for particulate matter. This will ensure exceedances are immediately detected and reported as soon as possible to the EPA and DPE.*

Condition	Details	Compliance status	Relevant evidence	Commentary
	(e) minimise the air quality impacts of the development during adverse meteorological conditions and extraordinary events (see note c to Table 3 above); (f) regularly assess the air quality monitoring data, and modify operations on site to ensure compliance with the relevant conditions of this consent, to the satisfaction of the Planning Secretary.		Annual reviews for 2019, 2020 and 2021 Monitoring data for 2019, 2020, 2021 and 2022	2022 IEA findings: As discussed in Schedule 3 Condition 11, there have been numerous exceedances of air quality criteria. The majority of these exceedances have been attributed to contamination or regional events. A single exceedance at DG001 was reported in December 2020, which has not occurred since demonstrating that adaptive management has been undertaken. A review of the controls and monitoring program in the AQGGMP found them satisfactory with the requirements of this condition. The site inspection identified that the site produces limited dust, and that measures such as water carts are used on days where rain is not forecast. In regard to spontaneous combustion (clause (b)), there have been no incidents occurring over the reporting period. Controls such as sealing of extracted panels and monitoring of mine gasses occur to mitigate the risk of spontaneous combustion on site.
	Air Quality Management Plan			
13	13. The Applicant must prepare an Air Quality Management Plan for the development to the satisfaction of the Planning Secretary. This plan must: (a) be prepared in consultation with the EPA, and submitted to the Planning Secretary for approval within 6 months of the date of this consent; (b) describe the measures that would be implemented to ensure compliance with the relevant air quality criteria and operating conditions of this consent; (c) describe the measures that would be implemented to minimise the release of greenhouse gas emissions from the site; (d) describe the proposed on-site air quality management system; and (e) include an air quality monitoring program that: • is capable of evaluating the operating conditions of this consent; • evaluates and reports on: - the effectiveness of the air quality management system; and - compliance against the air quality operating conditions; • defines what constitutes an air quality incident and includes a protocol for identifying and notifying the Department and relevant stakeholders of any air quality incidents. The Applicant must implement the Air Quality Management Plan as approved by the Planning Secretary.	Compliant	Air Quality and Greenhouse Gas Management Plan DRAFT (V2 – dated 21 January 2022 Site inspection 12 April 2022 Annual reviews for 2019, 2020 and 2021 Monitoring data for 2019, 2020, 2021 and 2022	*2019 IEA Recommendation: Update the Air Quality Management Plan following this audit.* *Improve data capture for PM10. Review possibilities of backup power supply.* *Ensure issues with data capture are reported in Section 1 and 7 of the Annual Review.* *Ensure TEOM is setup with alarms/notifications for when results are approaching or have exceeded the short term criterion for particulate matter. This will ensure exceedances are immediately detected and reported as soon as possible to the EPA and DPE* 2022 IEA Findings: The AQGGMP has been updated in January 2022. The plan adequately describes measures to be implemented on the site to minimise the impact of dust generation and air quality modifiers. These measures are adequately described in Section 3. Greenhouse gas management is adequately described in Section 5. The monitoring program presented in Section 4 reflects the removal of DG005 as requested by Delta Coal due to ongoing contamination issues. The monitoring program also adequately described

Condition	Details	Compliance status	Relevant evidence	Commentary
	METEOROLOGICAL MONITORING			
14	14. During the life of the development, the Applicant must ensure that there is a suitable meteorological station operating in the vicinity of the site that: (a) complies with the requirements in the Approved Methods for Sampling of Air Pollutants in New South Wales guideline; and (b) is capable of continuous real-time measurement of temperature lapse rate in accordance with the NSW Industrial Noise Policy, unless a suitable alternative is approved by the Planning Secretary following consultation with the EPA.	Compliant	Air Quality and Greenhouse Gas Management Plan DRAFT (V2 – dated 21 January 2022 Noise Management Plan (Rev 2– Dated 12 March 2014)	Delta Coal operate a meteorological station that collects data continually. Whilst not a non-compliance, the AQGGMP does not show the location of the meteorological station.
	SOIL & WATER			
	Note: Under the Water Act 1912 and/or the Water Management Act 2000, the Applicant is required to obtain the necessary water licences for the development.	Compliant	Annual reviews for 2019, 2020 and 2021	Annual reviews indicate Water Access Licence 41508/Work Approval 20MW065025 have been obtained for the project
	Water Supply			
15	15. The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of mining operations to match its available water supply, to the satisfaction of the Planning Secretary.	Compliant	Annual reviews for 2019, 2020 and 2021	Annual reviews indicate Water Access Licence 41508/Work Approval 20MW065025 have been obtained for the project
	Water Pollution			
16	16. Unless an EPL authorises otherwise, the Applicant must comply with Section 120 of the POEO Act.	Compliant		There were no pollution events over the reporting period, and therefore Delta Coal complied with Section 120 of the POEO Act.
	Sewage Management			
17	17. The Applicant must manage sewage generated by the development in accordance with the requirements of an EPL.	Non-compliant (Administrative)	Water Management Plan (Rev 5– Dated 24 August 2021) Annual Review for 2019, 2020 and 2021	*2019 IEA Recommendation: Include additional detail in the Water Management Plan regarding sewage management.* *Include an update of sewage system during the audit period in the Annual Review. Ensure servicing is completed and records kept onsite.* 2022 IEA Findings: The wastewater system was viewed during the site audit. The sewage system installation is proposed to be completed by 26 August 2022 as per condition U1.1 and U1.2 of EPL 1770. An update on the progress of this project is included in

Condition	Details	Compliance status	Relevant evidence	Commentary
			Monitoring data for 2019, 2020, 2021 and 2022 Site inspection on 12 April 2022 Servicing records	Section 12.2 of the Annual Review, In regard to the recommendation from the 2019 IEA, additional details have been included in the WMP regarding the wastewater system. The proposed upgrades are not discussed as at the time of audit they have not been constructed. ***Recommendation 5: Ensure the WMP is updated to reflect the changes to on-site sewage management, which are scheduled to be completed by 26 August 2022.*** The wastewater system was generally being operated in accordance with this condition and of the conditions of the EPL. However, quarterly servicing regimes were not followed at times during the reporting period, constituting a non-compliance against the condition of the EPL (refer to condition O8.4). Quarterly servicing was missed due to scheduling and contractor delay.
	Water Management Plan			
18	18. The Applicant must prepare a Water Management Plan for the surface facilities sites to the satisfaction of the Planning Secretary. This plan must be prepared in consultation with DPIE Water and EPA, by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary and submitted to the Planning Secretary for approval within 6 months of the date of this consent. This plan must include: (a) a comprehensive water balance for the development that includes details of: • sources and security of water supply; • water make in the underground workings; • water transfers from the underground operations to the surface; • water use; and • any water discharges; (b) management plans for the surface facilities sites, that include: • a detailed description of water management systems for each site, including: - clean water diversion systems; - erosion and sediment controls; and - any water storages; • measures to minimise potable water use and to reuse and recycle water; • measures to manage acid sulphate soils, if encountered; • activities that would involve ground disturbance at the site; and • monitoring and reporting procedures. (c) a Surface Water Management Plan which: • includes baseline data on surface water flows and quality of Swindles Creek;	Non-compliant (Administrative)	Water Management Plan (Rev 5– Dated 24 August 2021) Site inspection on 12 April 2022	*2019 IEA Recommendations: Update the water balance or justify why the current water balance is still applicable to the current operations.* *Ensure dams and drainage lines are free on silt. Establish a maintenance schedule.* 2022 IEA findings: The WMP includes a Water Balance that adequately fulfils the requirements of clause (a). The Water Balance has been updated since the previous IEA fulfilling the recommendation. Surface water management is described in Section 4 and satisfies the requirements of (b). Inspection and maintenance are described in Section 5.8. The implementation of the plan on site was generally adequate. It is noted that maintenance schedules are currently not established for desilting dams on site. Therefore the recommendation of the previous IEA is still applicable. ***Recommendation 6: Ensure a maintenance schedule is established to ensure dams and drainage lines are free of silt and water storage is maximised.*** In addition, per commentary on Condition 17 Schedule 3 above, the WMP is considered to not be implemented as approved in relation to onsite sewage management and therefore the WMP should be updated to reflect the current practices onsite. This is in line with Recommendation 5 above.

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td></td><td>• details surface water impact assessment criteria, including trigger levels for investigating any potentially adverse impacts on surface water resources or surface water quality;
• provides a program to monitor:
- surface water discharges;
- surface water flows and quality; and
- channel stability;
(d) a Ground Water Monitoring Program which includes a program to:
• monitor and report groundwater inflows to underground workings;
• predict, manage and monitor impacts to nearby groundwater bores on privately-owned land that may be impacted by the development; and
(e) a detailed review of surface water management at the site, with particular reference to the water storages within the dirty water management system, to:
• determine whether the capacity, integrity, retention time and management of the dirty water storages (particularly the final Pollution Control Dam) are sufficient to ensure that water discharged from the site meets the EPL limits and surface water impact assessment criteria within the Surface Water Management Plan; and
• propose any appropriate changes to the surface water management system.
The Applicant must implement the Water Management Plan as approved by the Planning Secretary.
Note: The Planning Secretary may require the Applicant to implement upgrades and other changes identified under paragraph (e), in accordance with condition 3 of Schedule 2.</td><td></td><td></td><td></td></tr>
<tr><td></td><td>BIODIVERSITY</td><td></td><td></td><td></td></tr>
<tr><td></td><td>Biodiversity Enhancement Strategy</td><td></td><td></td><td></td></tr>
<tr><td>19</td><td>19. The Applicant must implement a Biodiversity Enhancement Strategy as described in the EIS and summarised in Table 4, in consultation with BCD, and to the satisfaction of the Planning Secretary.
Table 4: Summary of the Biodiversity Enhancement Strategy
<table><tr><th>Area</th><th>Offset Type</th><th>Minimum Size/Amount</th></tr><tr><td>Biodiversity Enhancement Area</td><td>Enhancement and restoration measures, including weed and rubbish removal, return of natural hydrological regime and regeneration with native endemic species.</td><td>3 ha (in total) of Swamp Sclerophyll Floodplain Forest and Swamp Oak Floodplain Forest endangered ecological communities within the surface facilities sites</td></tr></table>Note: To identify the Biodiversity Enhancement Area referred to in Table 4 see the applicable figures in Appendix 7.
The Applicant must implement its preferred option of the three options set out in new dot point 1 of the Terrestrial Ecology section of its Statement of Commitments by 1 December 2016, following consultation with BCD and to the satisfaction of the Planning Secretary.</td><td>Compliant</td><td>Biodiversity Management Plan (Rev 5 – Dated 1 December 2019)
Annual Review for 2019, 2020 and 2021</td><td>2019 IEA Recommendations: Include the biodiversity monitoring reports as appendices to the Annual Review.
The current monitoring is provided in a spreadsheet with an email summary. Prepare a small Biodiversity Monitoring Report outlining results, a comparison against trigger levels and potential reasons for changes
2022 IEA Findings: The Biodiversity Enhancement Strategy is described in section 6 of the Biodiversity Management Plan.
The recommendations of the 2019 IEA have been closed out, whereby a standalone annual Biodiversity Report is appended to the Annual Review.</td></tr>
</table>

Condition	Details	Compliance status	Relevant evidence	Commentary
	Biodiversity Management Plan			
20	20. The Applicant must prepare a Biodiversity Management Plan for the surface facilities sites, for all areas that are not, or will not, be subject to condition 7 of schedule 4, to the satisfaction of the Planning Secretary. This plan must: (a) be prepared by a suitably qualified person approved by the Planning Secretary; in consultation with BCD, and submitted to the Planning Secretary within 6 months of the date of this consent; (b) establish baseline data for the existing habitat in the Biodiversity Enhancement Area and elsewhere on the site; (c) describe the short, medium, and long term measures that would be implemented to: • manage the impacts of clearing vegetation; • manage the remnant vegetation and habitat in the Biodiversity Enhancement Area and elsewhere on the site; and • implement the Biodiversity Enhancement Strategy, including detailed performance and completion criteria; (d) include a program to monitor and report on the effectiveness of these measures, and progress against the detailed performance and completion criteria; (e) identify the potential risks to the successful implementation of the Biodiversity Enhancement Strategy, and the contingency measures that would be implemented to mitigate these risks; and (f) include details of who would be responsible for monitoring, reviewing, and implementing the plan. The Applicant must implement the Biodiversity Management Plan as approved by the Planning Secretary.	Compliant	Biodiversity Management Plan (Rev 5 – Dated 1 December 2019) Annual Review for 2019, 2020 and 2021	*2019 IEA Recommendations: Include the biodiversity monitoring reports as appendices to the Annual Review.* *The current monitoring is provided in a spreadsheet with an email summary. Prepare a small report outlining results, a comparison against trigger levels and potential reasons for changes.* *Prepare a separate section with short, medium and long-term measures in the Biodiversity Management Plan.* 2022 IEA Findings: As discussed in Schedule 3 Condition 19, the recommendations of the 2019 IEA to include a Biodiversity Monitoring Report in the Annual Reviews have been closed out. The BMP was prepared by a suitably qualified person. The BMP was submitted to the EPA, BCD and DPIE on 1 December for review and comment. There is no record of response from agencies to the BMP. Baseline data is adequately described in section 3.2, satisfying the requirements of clause (b) Short-, medium- and long-term measures are described adequate within the report. The biodiversity monitoring program is described in Section 11 and is consistent with clause (d). The main risks to implementation are described in Table 3, with appropriate corrective actions provided that fulfil the requirements of (e). Roles and responsibilities for implementation are described in Section 17 consistent with clause (f).
20A	20A. Within 3 months of the approval of MOD 2, the Applicant must revise the Biodiversity Management Plan to incorporate the measures required to implement its commitments described in new dot point 2 of the Terrestrial Ecology section of its Statement of Commitments, and submit it to the Planning Secretary for approval.	Not triggered		Conduct of the audit indicates this condition has not been triggered.

Condition	Details	Compliance status	Relevant evidence	Commentary
	HERITAGE			
	Protection of Aboriginal Heritage			
21	21. The Applicant must ensure that the development does not cause any direct or indirect impact on any identified heritage item located outside the approved disturbance area, beyond those predicted in the documents listed in condition 2(e) of Schedule 2.	Compliant	Heritage Management Plan (Rev 4 – Dated 6 November 2020) Annual Review for 2019, 2020 and 2021	During the 2020 reporting period 2 previously unidentified Aboriginal Heritage Sites were disturbed during the demolition of former mine cottages. Incident report was submitted to DPIE-compliance, BCD, the EPA and to Registered Aboriginal Parties (RAPs) on 22 October 2020. An independent heritage consultant inspected the site to provide further management recommendations. The sites were added to the AHIMS register as CV002 (AHIMS Site ID 45-7-0412) and CV003 (45-7-0413). Access to sites CV002 and CV003 is prevented by locked gates, and the sites were fenced off to prevent any further accidental damage.
	Heritage Management Plan			
21A	21A. The Applicant must prepare a Heritage Management Plan for the development to the satisfaction of the Planning Secretary. This Plan must: (a) be prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary; (b) be prepared in consultation with BCD and Registered Aboriginal Parties; (c) include consideration of the Aboriginal and non-Aboriginal cultural context and significance of the site; (d) describe the procedures and management measures to be implemented on the site or within any offset area to: i. ensure all workers receive suitable Aboriginal cultural heritage inductions prior to carrying out any activities which may cause impacts to Aboriginal objects or Aboriginal places, and that suitable records are kept of these inductions; ii. protect, monitor and manage identified non-Aboriginal heritage, Aboriginal objects and Aboriginal places (including any proposed archaeological investigations of potential subsurface objects and salvage of objects within the approved disturbance area) in accordance with the commitments made in the document/s listed in condition 2(e) of Schedule 2 and including the ongoing monitoring of site 45-7-0189 at Summerland Point; iii. protect non-Aboriginal heritage, Aboriginal objects and Aboriginal places located outside the approved disturbance area from impacts of the development; iv. manage the discovery of suspected human remains and any new Aboriginal objects or Aboriginal places, including provisions for burials, over the life of the development; v. maintain and manage reasonable access for relevant Aboriginal stakeholders to Aboriginal objects and Aboriginal places (outside of the approved disturbance area); and	Compliant	Heritage Management Plan (Rev 4 – Dated 6 November 2020)	*2019 IEA Recommendations: Update the Heritage Management Plan, including the removal of Site #45-7-0154.* 2022 IEA Findings: Section 1.5 outlines the consultation completed in the preparation of the plan, which is satisfactory of clause (b). The Aboriginal cultural context is adequately described in Section 3. Section 8.1 of the HMP details that the plan should be reviewed, and if necessary, updated if an incident report has been submitted. As discussed in Schedule 3 Condition 21, an incident report was submitted to DPIE during 2020 as an unexpected find occurred. In addition, the HMP was revised to cover these additional sites and was approved as part of the Extraction Plan for Miniwall S5 and NPA Extraction Plan on 6 April 2021. Non-Aboriginal cultural context is described in Section 4 satisfying the requirements of clause c. Management measures for Aboriginal Heritage are described in Section 5.1. non-Aboriginal heritage is described in Section 5.2. Both sections are compliant with clause (d). Management of Aboriginal item salvage is described in Section 5.1.3 and is compliant with the requirements of this condition.

Condition	Details	Compliance status	Relevant evidence	Commentary
	vi. facilitate ongoing consultation and involvement of Registered Aboriginal Parties in the conservation and management of Aboriginal cultural heritage on the site; and (e) include a strategy for the care, control and storage of Aboriginal objects salvaged on site, both during the life of the development and in the long term. The Applicant must implement the Heritage Management Plan approved by the Planning Secretary.			
	VISUAL			
	Visual Amenity and Lighting			
22	22. The Applicant must: (a) minimise visual impacts, and particularly the off-site lighting impacts, of the Surface facilities sites; (b) take all reasonable and feasible measures to further mitigate off-site lighting impacts from the development; and . (c) ensure that all external lighting associated on site complies with Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting, to the satisfaction of the Planning Secretary.	Compliant	Chain Valley and Mannering Lighting Survey (July 2019)	*2019 IEA Recommendations: Complete a visual and lighting assessment against the Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting.* 2022 IEA findings: Delta Coal undertook a lighting survey to assess the sites compliance with this condition and Australian Standards. The survey found that the development is being carried out in compliance with this condition. This survey closed out the recommendation from the previous IEA.
	WASTE			
23	23. The Applicant must: (a) minimise and monitor the waste generated by the development; (b) ensure that the waste generated by the development is appropriately stored, handled and disposed of and (c) report on waste management and minimisation in the Annual Review, to the satisfaction of the Planning Secretary.	Non-compliant (low)	Annual Review for 2019, 2020 and 2021 Waste tracking register Site inspection conducted 12 April 2022	A review of the Waste Tracking register found that waste was being adequately tracked as per clause (a). Waste management is reported in section 3.6 in the Annual Reviews as per clause (c) Waste systems were viewed on site during the site inspection. There were adequate, clearly marked receptacles placed around the site for waste, however it was noticed that staff were not segregating waste appropriately. This therefore constitutes a non-compliance with clause (b).

Condition	Details	Compliance status	Relevant evidence	Commentary
	BUSHFIRE MANAGEMENT			
24	24. The Applicant must: (a) ensure that the development is suitably equipped to respond to any fires on site; and (b) assist the Rural Fire Service and emergency services as much as possible if there is a fire in the vicinity of the Surface facilities sites.	Compliant	Site interviews conducted 12 April 2022 Site inspection conducted 12 April 2022 STD 00110 – Standards Template – Fire Water Reticulation and Bushfire Fighting (Rev 1) – Dated 23 April 2018	STD 00110 – Standards Template – Fire Water Reticulation and Bushfire Fighting (Rev 1) outlines the procedure for bushfire fighting and water reticulation for the site. It was noted during audit interviews the Land Management Plan (combined with Mannering) has been revised and will be submitted to RFS soon for comment/information.
	REHABILITATION			
	Rehabilitation Objectives			
25	25. The Applicant must rehabilitate the site in accordance with the conditions imposed on the mining lease(s) associated with the development under the Mining Act 1992. This rehabilitation must be generally consistent with the proposed rehabilitation strategy described in the EIS, and comply with the objectives in Table 5.	Compliant	Mining Operations Plan Amendment 1 – Rehabilitation Management Plan 2021-2023 (Dated 23 February 2021) Mining Operations Plan Rehabilitation Management Plan 2020-2023 (Dated 10 June 2020) Mining Operations Plan Amendment 1 –	Minor rehabilitation works have been undertaken though the demolition of former mine cottages in Mining Domain 1A has occurred over the reporting period. Land is being returned to open grasslands. Rehabilitation has been undertaken in compliance with the approved MOP.

Condition	Details	Compliance status	Relevant evidence	Commentary
	Table 5: Rehabilitation Objectives **Feature** / **Objective** Mine site (as a whole): • Safe, stable and non-polluting. • Final land use compatible with surrounding land uses. Surface infrastructure: • To be decommissioned and removed, unless the RR agrees otherwise. Portals and ventilation shafts: • To be decommissioned and made safe and stable. • Retain habitat for threatened species (eg bats), where practicable. Other land affected by the development: • Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of: – local native plant species (unless the RR agrees otherwise); and – a landform consistent with the surrounding environment. Built features damaged by mining operations: • Repair to pre-mining condition or equivalent unless: – the owner agrees otherwise; or – the damage is fully restored, repaired or compensated under the *Coal Mine Subsidence Compensation Act 2017*. Community: • Ensure public safety. • Minimise the adverse socio-economic effects associated with mine closure. *Notes:* • *These rehabilitation objectives apply to all subsidence impacts and environmental consequences caused by underground mining taking place after the granting of project approval MP 10_0161, and to all development surface infrastructure that is part of the development, whether constructed prior to or following the date of this consent.* • *Rehabilitation of subsidence impacts and environmental consequences caused by mining which took place prior to the date of project approval (MP 10_0161) may be subject to the requirements of other approvals (eg under a mining lease or a Subsidence Management Plan approval).*		Rehabilitation Management Plan 2018 - 2020 (23 December 2019) Annual Review for 2019, 2020 and 2021	
	Progressive Rehabilitation			
26	26. The Applicant must carry out the rehabilitation of the site progressively, that is, as soon as reasonably practicable following disturbance.	Compliant	Mining Operations Plan Amendment 1 – Rehabilitation Management Plan 2021-2023 (Dated 23 February 2021) Mining Operations Plan Rehabilitation Management Plan 2020-2023 (Dated 10 June 2020) Mining Operations Plan Amendment 1	The former mine cottages in Mining Domain 1A are being progressively rehabilitation in accordance with the approved MOP. This area is currently being rehabilitated to open grassland.

Condition	Details	Compliance status	Relevant evidence	Commentary
			– Rehabilitation Management Plan 2018 - 2020 (23 December 2019)	
	Rehabilitation Management Plan			
27	27. The Applicant must prepare a Rehabilitation Management Plan for the development, in accordance with the conditions imposed on the mining lease(s) associated with the development under the Mining Act 1992. This plan must: (a) be prepared in consultation with BCD, DPIE Water, CC Council, LMCC and the CCC; (b) be submitted to the RR within 12 months of the date of approval of this development consent; (c) be prepared in accordance with any relevant RR guideline and be consistent with the rehabilitation objectives in the EIS and in Table 5; (d) describe how the performance of the rehabilitation would be monitored and assessed against the objectives in Table 5; (e) describe the process whereby additional measures would be identified and implemented to ensure the rehabilitation objectives are achieved; (f) provide for detailed mine closure planning, including measures to minimise socio-economic effects due to mine closure, to be conducted prior to the site being placed on care and maintenance; and (g) be integrated with the other management plans required under this consent. Note: The Rehabilitation Management Plan should address all land impacted by the development whether prior to, or following, the date of this consent.	Compliant	Rehabilitation Management Plan (Rev 5 – Dated 10 March 2020)	*2019 IEA Recommendations: Ensure a copy of the approved Rehabilitation Management Plan is put on the website* **2022 IEA Findings**: The RMP was updated in 2020 following the 2019 IEA. The RMP is available on the project website, therefore closing out the 2019 IEA Recommendation. Consultation with relevant parties is detailed in Section 1.4 and included in Appendix 1. This is compliant with clause (a) Clause (b) is not applicable as the scope of the audit. In regard to clause (d), (e) and (f), the RMP does not contain extensive details about closure, rehabilitation monitoring and adaptive measures due to the site still being operational over the course of the reporting period, and being an underground mine there is no rehabilitation that can be completed except that required due to subsidence. Integration with other management plans is discussed in Section 4.5. ***Recommendation 8: Ensure the RMP required by SSD-5465 is updated to consider the requirements of the RMP and Annual Rehabilitation Report and Forward Program currently being prepared (as now required by the NSW Resources Regulator instead of a MOP) and documents where topsoil will be stored and the estimated volumes required for rehabilitation.***
	EXPLORATION ACTIVITIES AND SURFACE INFRASTRUCTURE			
	Exploration Activities and Minor Surface Infrastructure Management Plan			
28	28. Prior to carrying out exploration activities on the site under this consent that would cause temporary surface disturbance, or exploration activities within the waters or lake bed of Lake Macquarie, or the construction and/or upgrade of minor surface infrastructure on the site, the Applicant must prepare an Exploration Activities and Minor Surface Infrastructure Management Plan for the development to the satisfaction of the Planning Secretary. This Plan must: (a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary; (b) be prepared in consultation with MEG, NSW Maritime Division of TfNSW, NSW Fisheries and BCD;	Not triggered		No physical exploration has occurred over the reporting period. This condition is not triggered.

Condition	Details	Compliance status	Relevant evidence	Commentary
	(c) include a description of the measures to be implemented for: i. managing exploration activities; ii. managing construction and operation of minor surface infrastructure and associated access tracks; iii. consulting with and if necessary compensating affected landowners; iv. assessing noise, air quality, traffic, biodiversity, heritage, public safety and other impacts; v. beneficial re-use or flaring of drained hydrocarbon gases, wherever practicable; vi. avoiding significant impacts and minimisation of impacts generally; vii. avoiding or minimising impacts on threatened species, populations or their habitats and EECs; viii. minimising clearance and disturbance of native vegetation (including seagrasses); ix. minimising and managing erosion and sedimentation; and x. rehabilitating disturbed areas. The Applicant must implement the Exploration Activities and Minor Surface Infrastructure Management Plan as approved by the Planning Secretary.			
	SCHEDULE 4 **ENVIRONMENTAL CONDITIONS – UNDERGROUND MINING**			
	SUBSIDENCE			
1	1. The Applicant must ensure that vertical subsidence within the High Water Mark Subsidence Barrier and within seagrass beds is limited to a maximum of 20 millimetres (mm). If at any stage predicted subsidence levels are exceeded within these areas, an ecological monitoring program shall be initiated to assess the impacts to ecological communities and threatened species and if appropriate, offsets are to be provided for any impacts detected.	Compliant	Annual Review for 2019, 2020 and 2021 Subsidence Monitoring Program (Dated 20 November 2020)	*2019 Audit Recommendations: See Section 5.2 of the 2019 IEA Report for Subsidence Recommendations.* Subsidence reporting is presented in section 6.13 of the Annual Review and in Appendix 8. A review of the data presented found that subsidence impacts remained in compliance with the requirements of this condition.

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td></td><td>Performance Measures – Natural Environment</td><td></td><td></td><td></td></tr>
<tr><td>2</td><td>2. The Applicant must ensure that the development does not cause any exceedance of the performance measures in Table 6 to the satisfaction of the Planning Secretary.
Table 6: Subsidence Impact Performance Measures – Natural and Heritage Features
<table>
<tr><td colspan="2">Biodiversity</td></tr>
<tr><td>Threatened species or endangered populations</td><td>Negligible environmental consequences</td></tr>
<tr><td>Seagrass beds</td><td>Negligible environmental consequences including:
• negligible change in the size and distribution of seagrass beds;
• negligible change in the functioning of seagrass beds; and
• negligible change to the composition or distribution of seagrass species within seagrass beds.</td></tr>
<tr><td>Benthic communities</td><td>Minor environmental consequences, including minor changes to species composition and/or distribution.</td></tr>
<tr><td>Mine workings</td><td></td></tr>
<tr><td>First workings under an approved Extraction Plan beneath any feature where performance measures in this table require negligible environmental consequences</td><td>To remain long-term stable and non-subsiding.</td></tr>
<tr><td>Second workings</td><td>To be carried out only in accordance with an approved Extraction Plan.</td></tr>
</table>
Notes:
• The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) for each of these performance measures in the various management plans that are required under this consent (see Condition 7 below).
• Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Planning Secretary will be the final arbiter.
• The requirements of this condition only apply to the impacts and consequences of mining operations, construction or demolition undertaken following the date of approval of this consent.</td><td>Compliant</td><td>Annual Review for 2019, 2020 and 2021
Benthic Communities monitoring report 2021
Seagrass monitoring reports for 2019, 2020 and 2021
Subsidence Monitoring Program (Dated 20 November 2020)</td><td>2019 Audit Recommendations: See Section 5.2 of the 2019 IEA Report for Subsidence Recommendations.
A review of Annual Reviews and Seagrass, Benthic and the Annual Subsidence Reports are that the criteria in Table 6 has not been exceeded in the reporting period.</td></tr>
<tr><td></td><td>Offsets</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>3. If the Applicant exceeds the performance measures in Table 6 and the Planning Secretary determines that:
(a) it is not reasonable or feasible to remediate the impact or environmental consequence; or
(b) the remediation measures implemented by the Applicant have failed to satisfactorily remediate the impact or environmental consequence;
then the Applicant must provide a suitable offset to compensate for the impact or environmental consequence to the satisfaction of the Planning Secretary.
Note: Any offset required under this condition must be proportionate with the significance of the impact or environmental consequence.</td><td>Not triggered</td><td>Annual Review for 2019, 2020 and 2021</td><td>2019 Audit Recommendations: See Section 5.2 of the 2019 IEA Report for Subsidence Recommendations.
2022 IEA Findings: As subsidence monitoring did not exceed criteria presented in Table 6, this condition is not triggered.</td></tr>
</table>

<table>
<tr><th>Condition</th><th>Details</th><th>Compliance status</th><th>Relevant evidence</th><th>Commentary</th></tr>
<tr><td></td><td>Performance Measures – Built Features</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>4. The Applicant must ensure that the development does not cause any exceedances of the performance measures in Table 7, to the satisfaction of the Planning Secretary.

Table 7: Subsidence Impact Performance Measures – Built Features
<table><tr><th>Built Features</th><th>Performance Measure</th></tr><tr><td>Trinity Point Marina Development
Other built features</td><td>• Always safe.
• Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated.
• Damage must be fully repaired, replaced or fully compensated.</td></tr><tr><td colspan="2">Public Safety</td></tr><tr><td>Public Safety.</td><td>Negligible additional risk.</td></tr></table>
Notes:
• The Applicant will be required to define more detailed performance indicators for each of these performance measures in Built Features Management Plans or a Public Safety Management Plan (see Condition 7 below).
• Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Planning Secretary will be the final arbiter.
• The requirements of this condition only apply to the impacts and consequences of mining operations undertaken following the date of this development consent.
• Requirements regarding safety or serviceability do not preclude preventative actions or mitigation being taken prior to or during mining in order to achieve or maintain these outcomes.
• Requirements under this condition may be met by measures undertaken in accordance with the Coal Mine Subsidence Compensation Act 2017.</td><td>Compliant</td><td>Annual Review for 2019, 2020 and 2021</td><td>2019 Audit Recommendations: See Section 5.2 of the 2019 IEA Report for Subsidence Recommendations.
Review of relevant documentation indicates compliance with the requirements of this condition.</td></tr>
<tr><td>5</td><td>5. Any dispute between the Applicant and the owner of any built feature over the interpretation, application or implementation of the subsidence performance measures in Table 7 is to be settled by the Planning Secretary, following consultation with the SA NSW and MEG. Any decision by the Planning Secretary shall be final and not subject to further dispute resolution under this consent.</td><td>Not triggered</td><td></td><td>No disputes of this nature have occurred over the reporting period and therefore this condition remains not triggered.</td></tr>
</table>

Condition	Details	Compliance status	Relevant evidence	Commentary
	Multi-Seam Mining Feasibility Investigation			
6	6. Prior to the submission of an Extraction Plan related to the Chain Valley Bay mining area as shown in Appendix 3, the Applicant must prepare a detailed Multi-Seam Mining Feasibility Investigation to the satisfaction of the Planning Secretary. This plan must: (a) be prepared in consultation with MEG by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary; (b) assess the extent of the soft claystone floor/roof conditions within former workings in the Great Northern and Wallarah Seams; (c) assess the stability of remnant coal pillars within former workings in the Great Northern and Wallarah Seams; (d) give particular consideration to the risks of irregular subsidence, pillar run and long-term subsidence leading to subsidence outside of the predicted angle of draw; (e) include revised multi-seam subsidence predictions for the proposed second workings; and (f) recommend final design of the second workings and any necessary adaptive management measures.	Not triggered	Annual Review for 2019, 2020 and 2021	Mining in the Chain Valley Bay area has not recommenced, and therefore the requirement to undertake the Multi-Seam Mining Feasibility Investigation has not been triggered.
	Extraction Plan			
7	7. The Applicant must prepare an Extraction Plan for all second workings on site, to the satisfaction of the Planning Secretary. Each Extraction Plan must: (a) be prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary; (b) be approved by the Planning Secretary before the Applicant carries out any second workings covered by the plan; (c) include detailed plans of existing and proposed first and second workings and any associated surface development, including any applicable adaptive management measures; (d) include detailed performance indicators for each of the performance measures in Tables 6 and 7; (e) provide revised predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed second workings, incorporating any relevant information obtained since this consent; (f) describe the measures that would be implemented to ensure compliance with the performance measures in Tables 6 and 7, and manage or remediate any impacts and/or environmental consequences; (g) include a Built Features Management Plan, which has been prepared in consultation with RR and the owners of affected public infrastructure, to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings, and which	Compliant	Miniwall S5 and Northern Pillar Area Extraction Plan (Rev 1.2 – Dated10 March 2020) Benthic Communities Management Plan (Rev 5 – 6 April 2021) Seagrass Management Plan (Rev 8 – Dated 6 April 2021) Subsidence Monitoring Program (Dated 20 November 2020)	The Miniwall S5 and Northern Pillar Area Extraction Plan (Extraction Plan) was prepared in 2020. Compliance against the requirements of this condition are detailed below: a) A letter of approval of plan authors was received from DPIE on 22 October 2020. This is included in Appendix 16 b) Approval of the plan was granted on 6 April 2021. This approval letter is included in Appendix 16 c) Existing and proposed first and second workings are shown on the plans in Appendix 14 d) Performance measures and requirements of this consent are outlined in Section 3.3 e) Subsidence predictions are described in Section 3.2 f) Section 3.4 outlines general measures that Delta Coal will take to manage environmental impact. Section 4 lists related plans that would also form part of the management framework. There is no discussion on how these will be implemented to directly relate to Tables 6 and 7 in this consent. g) A review of the Built Features Management plan found it to be generally compliant with the requirements of this condition.

Condition	Details	Compliance status	Relevant evidence	Commentary
	• addresses in appropriate detail all items of public infrastructure and all classes of other built features; • has been prepared following appropriate consultation with the owner/s of potentially affected feature/s; • recommends appropriate remedial measures and includes commitments to mitigate, repair, replace or compensate all predicted impacts on potentially affected built features in a timely manner; and; (h) include a Benthic Communities Management Plan, which has been prepared in consultation with BCD, LMCC, and DPI Fisheries, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on benthic communities, and which includes: • surveys of the lake bed to enable contours to be produced and changes in depth following subsidence to be accurately measured; • benthic species surveys within the area subject to second workings, as well as control sites outside the area subject to second workings (at similar depths) to establish baseline data on species number and composition within the communities; • a program of ongoing seasonal monitoring of benthic species in both control and impact sites; • development of a model to predict likely impact of increased depth and associated subsidence impacts and effects, including but not limited to light reduction and sediment disturbance, on benthic species number and benthic communities composition, incorporating the monitoring and survey data collected; and • updating the model every 2 years using the most recent monitoring and survey data; (i) include a Seagrass Management Plan, which has been prepared in consultation with BCD, LMCC, and DPI Fisheries, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on seagrass beds, and which includes: • a program of ongoing monitoring of seagrasses in both control and impact sites; and • a program to predict and manage subsidence impacts and environmental consequences to seagrass beds to ensure the performance measures in Table 6 are met; (j) include a Public Safety Management Plan, which has been prepared in consultation with RR, to ensure public safety; (k) include a Subsidence Monitoring Program which has been prepared in consultation with RR, to: • provide data to assist with the management of the risks associated with subsidence; • validates the subsidence predictions;		Built Features Management Plan (Rev 0 – Dated 6 April 2021) Public Safety Management Plan (Dated 19 March 2021)	h) A review of the Benthic Communities Management Plan against the requirements of the requirements of this condition found that its satisfactory. i) A review of the Seagrass Management Plan against the requirements of the requirements of this condition found that its satisfactory. j) The Public Management Plan was prepared with RR (as well as other parties) to ensure public safety. Evidence of consultation is provided in the plan. k) The subsidence monitoring program is compliant with the requirement of this condition. l) The contingency plan is located in the form of Trigger Action Response Plans in Appendix 4 of the Extraction Plan. m) Rehabilitation Management Plan is included in Appendix n) Subsidence monitoring is discussed in Section 5.2 and Appendix 13 of the Extraction Plan. Plans appended contain monitoring criteria for assessment that would feed into future extraction plans.

Condition	Details	Compliance status	Relevant evidence	Commentary
	• analyses the relationship between the predicted and resulting subsidence effects and predicted and resulting impacts under the plan and any ensuing environmental consequences; and • informs the contingency plan and adaptive management process; (l) include a contingency plan that expressly provides for adaptive management where monitoring indicates that there has been an exceedance of any performance measure in Tables 6 and 7, or where any such exceedance appears likely; (m) include appropriate revisions to the Rehabilitation Management Plan required under Condition 27 of Schedule 3; and (n) include a program to collect sufficient baseline data for future Extraction Plans. The Applicant must implement the Extraction Plan as approved by the Planning Secretary.			
8	8. The Applicant must ensure that the management plans required under conditions 7(g)-(j) above include: (a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this consent; and (b) a detailed description of the measures that would be implemented to remediate predicted impacts.	Compliant	Benthic Communities Management Plan (Rev 5 – 6 April 2021) Seagrass Management Plan (Rev 8 – Dated 6 April 2021) Subsidence Monitoring Program (Dated 20 November 2020) Built Features Management Plan (Rev 0 – Dated 6 April 2021) Public Safety Management Plan (Dated 19 March 2021	A review of the plans required under condition 7(g)-(j) found that they were revised to include the potential environmental consequences of the action plan. Measures for the relevant environmental factors are adequately proposed.

Condition	Details	Compliance status	Relevant evidence	Commentary
	First Workings			
9	9. The Applicant may carry out first workings within Subsidence Zones A and B as shown in Appendix 3, other than in accordance with an approved Extraction Plan, provided that the first workings are designed to remain stable and non-subsiding in the long-term and do not generate more than 20 mm of vertical subsidence at the surface, except insofar as they may be impacted by approved second workings. Note: The intent of this condition is to ensure that first workings are built to geotechnical and engineering standards sufficient to ensure long-term stability, with negligible direct subsidence impacts.	Compliant	2021 Annual Subsidence Review	First have been undertaken in Zone B over the reporting period. The workings were made in compliance with the requirements of this condition.
9A	9A. Within 3 months of the approval of MOD 1, the Applicant must produce and subsequently implement a Built Features Management Plan that considers surface infrastructure potentially affected by the first workings of the Underground Linkage between Chain Valley Colliery and Mannering Colliery, including WCS's MP01 sewer rising main, TransGrid's electricity transmission assets and infrastructure associated with the Vales Point Power Station, to the satisfaction of the Planning Secretary.	Not triggered		Not triggered – outside of audit period
	Payment of Reasonable Costs			
10	10. The Applicant must pay all reasonable costs incurred by the Department to engage suitably qualified, experienced and independent experts to review the adequacy of any aspect of an Extraction Plan.	Not triggered		DPE have not required Delta Coal to engage an independent expert to review the adequacy of the Extraction Plan. This condition is not triggered.
	SCHEDULE 5 **ADDITIONAL PROCEDURES**			
	NOTIFICATION OF LANDOWNERS			
1	1. As soon as practicable after obtaining monitoring results showing: (a) an exceedance of any relevant criteria in Schedule 3, the Applicant must notify affected landowners in writing of the exceedance, and provide regular monitoring results to each affected landowner until the development is again complying with the relevant criteria; and (b) an exceedance of any relevant air quality criteria in Schedule 3, the Applicant must send a copy of the NSW Health fact sheet entitled "Mine Dust and You" (NSW Health, 2017) (as may be updated from time to time) to the affected landowners and/or existing tenants of the land (including the tenants of any mine-owned land).	Compliant	Air Quality and Greenhouse Gas Management Plan (V2 – dated 21 January 2022	*2019 IEA Recommendations: Define who are potentially 'affected landowners' in the Air Quality Management Plan?* *Affected landowners should be contacted when there is a non - compliance relating to dust or noise. This should be completed even if it is a regional dust event as Delta Coal–are still recording it as a non - compliance in the Annual Review.* 2022 IEA findings: In response to the recommendations of the previous IEA, the updated AQMP adequately defines 'potentially affected landowners' in Section 6.3 The auditor disagrees with the 2019 recommendation to contact landowners affected by regional dust events. Regardless of how it is reported in Annual Reviews, Schedule 3, Condition 11 of SSD-5465 specifically notes that exceedances at any residence on privately-owned land do not apply in relation to extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary of DPE.

Condition	Details	Compliance status	Relevant evidence	Commentary
	INDEPENDENT REVIEW			
2	2. If an owner of privately-owned land considers the development to be exceeding the relevant criteria in Schedule 3, then he/she may ask the Planning Secretary in writing for an independent review of the impacts of the development on his/her land. If the Planning Secretary is satisfied that an independent review is warranted, then within 2 months of the Planning Secretary's decision the Applicant must: (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Planning Secretary, to: • consult with the landowner to determine his/her concerns; • conduct monitoring to determine whether the development is complying with the relevant criteria in Schedule 3; and • if the development is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and (b) give the Planning Secretary and landowner a copy of the independent review.	Not triggered		A request of this nature has not been received over the reporting period. This condition remains not triggered
	SCHEDULE 6 **ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING**			
	ENVIRONMENTAL MANAGEMENT **Environmental Management Strategy**			
1	1. The Applicant must prepare an Environmental Management Strategy for the development to the satisfaction of the Planning Secretary. This strategy must: (a) provide the strategic framework for environmental management of the development; (b) identify the statutory approvals that apply to the development; (c) set out the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development; (d) set out the procedures to be implemented to: • keep the local community and relevant agencies informed about the operation and environmental performance of the development; • receive record, handle and respond to complaints; • resolve any disputes that may arise during the course of the development; • respond to any non-compliance and any incident; • respond to emergencies; and (e) include: • references to any strategies, plans and programs approved under the conditions of this consent; and • a clear plan depicting all the monitoring to be carried out under the conditions of this consent.	Compliant	Environmental Management Strategy – Chain Valley Colliery and Mannering Colliery (Rev 1 – Dated 16 March 2021)	*2019 IEA Recommendations: Prepare a cross referencing table outlining where sub conditions have been covered.* *Ensure plans are reviewed as per Schedule 6 Condition 5.* *Include Schedule 5 Condition 2 requirement in the EMS to notify landowner's of exceedances 'as soon as practical'. Define a time period for as soon as practical.* 2022 Findings: The EMS document provides an overview of the strategic framework and statutory approvals for the development in Appendix 3 and 4. The Environmental policy is provided in Appendix 1. The roles and responsibilities for implementation are outlined in Section 3.10. Community communication is adequately discussed in Section 4. Emergency response is described in Section 5.2 and 5.3. Non-compliance and incident response is adequately described in Section 5.4. The EMS adequately outlines the Environmental Management Plans required under this consent in Section 3.1. Monitoring requirements briefly covered in Appendix 7. In regard to the recommendations of the previous audit, cross referencing tables are provided in Appendix 3 and Appendix 4.

Condition	Details	Compliance status	Relevant evidence	Commentary
	The Applicant must implement the Environmental Management Strategy as approved by the Planning Secretary.			The EMS has been reviewed within the reporting period and is compliant with the required revision timeframe. The recommendation from the previous audit to notify land owners has not been incorporated into the EMS. This therefore remains outstanding. ***Recommendation 7: Include a requirement in the EMS to notify landowner's of exceedances 'as soon as practical'. Define a time period for as 'soon as practical'.***
	Adaptive Management			
2	2. The Applicant must assess and manage development-related risks to ensure that there are no exceedances of the criteria and performance measures in this consent. Any exceedance of these criteria or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation. Where any exceedance of these criteria or performance measures has occurred, the Applicant must, at the earliest opportunity: (a) take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur; (b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and (c) implement reasonable remediation measures as directed by the Planning Secretary.	Compliant	Annual Review for 2019, 2020 and 2021 Quarterly Noise Monitoring Reports for 2019, 2020, 2021 Monitoring data for 2019, 2020, 2021 and 2022 Incident reports	A review of the monitoring data and the Annual Review found that exceedances occurring over the reporting period were formally investigated. The majority of exceedances were air quality related, however most of these were not attributed to the site as discussed in Schedule 3 Condition 11. The exceedance of air quality criteria attributed to the site was adequately addressed, and has not occurred again over the reporting period.
	Management Plan Requirements			
3	3. Management plans required under this consent must be prepared in accordance with relevant guidelines, and include: (a) a summary of relevant background or baseline data; (b) details of: • the relevant statutory requirements (including any relevant approval, licence or lease conditions); • any relevant limits or performance measures and criteria; and • the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures; (c) any relevant commitments or recommendations identified in the document/s listed in condition 2(e) of Schedule 2; (d) a description of the measures to be implemented to comply with the relevant statutory requirements limits, or performance measures and criteria;	Non-compliant (Administrative)	Coal Haulage Traffic Management System Plan (Rev 3) – Dated 25 September 2020 Independent Traffic Audits Air Quality and Greenhouse Gas Management Plan DRAFT (V2 – dated	*2019 IEA Recommendations: All management plans require updating due to the length of time since the previous reviews. Include in a Delta Coal template.* *Ensure there is a cross referencing table covering this condition in management plans.* *Additional detail including Trigger, Action, Response Tables (contingency plan) should be developed in the next round of management plan updates.* 2022 IEA findings: Below is a summary of Management Plans prepared under this consent and their compliance against the requirements of this condition. – AQGGMP: This plan was found to be generally compliant with the requirements of this condition. The recommendation of the previous audit to incorporate Trigger Action Response Tables has not been incorporated into the plan.

	(e) a program to monitor and report on the: • impacts and environmental performance of the development; and • effectiveness of the management measures set out pursuant to condition 2(e) of Schedule 2; (f) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible; (g) a program to investigate and implement ways to improve the environmental performance of the development over time; (h) a protocol for managing and reporting any: • incident, non-compliance or exceedance of any impact assessment criterion or performance criterion; • complaint; or • failure to comply with other statutory requirements; (i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and (j) a protocol for periodic review of the plan. Note: The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.		21 January 2022 Benthic Communities Management Plan (Rev 5 – 6 April 2021) Biodiversity Management Plan (Rev 5 – Dated 1 December 2019) Built Features Management Plan (Rev 0 – Dated 6 April 2021) Heritage Management Plan (Rev 4 – Dated 6 November 2020) Noise Management Plan (Rev 2– Dated 12 March 2014) Public Safety Management Plan (Dated 19 March 2021) Rehabilitation Management Plan (Rev 5 – Dated 10 March 2020) Seagrass Management Plan (Rev 8 – Dated 6 April 2021) Water Management Plan (Rev 5–	– Benthic Communities Management Plan: This plan was found to be compliant with the requirements of this condition. The recommendation of the previous audit to incorporate Trigger Action Response Tables has not been incorporated into the plan. – BMP: This plan was found to be compliant with the requirements of this condition. – Built Features Management Plan: This plan was found to be compliant with the requirements of this condition. – HMP: This plan was found to be compliant with the requirements of this condition. – NMP: The plan being implemented on site is date 12 March 2014 and has not been reviewed or updated over the audit period. This forms a non-compliance against clause (f) as the plan has not been periodically reviewed. The auditor notes that this plan is in the process of being updated and that no corrective action is required to be undertaken. – Public Safety Management Plan: This plan was found to be compliant with the requirements of this condition. – Rehabilitation Management Plan: This plan was found to be compliant with the requirements of this condition. – Seagrass Management Plan: This plan was found to be generally compliant with the requirements of this condition. The recommendation of the previous audit to incorporate Trigger Action Response Tables has not been incorporated into the plan, however the Trigger Action Response Tables in the overarching Extraction Plan cover requirements of this plan. – WMP: This plan was found to be generally compliant with the requirements of this condition. The WMP however does not adequately describe the baseline conditions for flows in Swindles Creek. Refer to Schedule 3 Condition 18 for corrective action. The recommendation of the previous audit to incorporate Trigger Action Response Tables has not been incorporated into the plan, however the Trigger Action Response Tables in the overarching Extraction Plan cover requirements of this plan. The recommendations of the previous IEA were generally carried forward in the revised management plan, with the exceptions listed above.

Condition	Details	Compliance status	Relevant evidence	Commentary
			Dated 24 August 2021)	
4	4. The Applicant must ensure that management plans prepared for the development are consistent with the conditions of this consent and any EPL issued for the site.	Non-compliant (Administrative)		Refer to discussion for Schedule 2, Condition 23 and Schedule 3, Condition 9.
	REVISION OF STRATEGIES, PLANS AND PROGRAMS			
5	5. Within three months of: (a) the submission of an incident report under condition 6; (b) the submission of an Annual Review under condition 8; (c) the submission of an Independent Environmental Audit under condition 9; or (d) the approval of any modification of the conditions of this consent (unless the conditions require otherwise), the suitability of existing strategies, plans and programs required under this consent must be reviewed by the Applicant. If necessary, to either improve the environmental performance of the development, cater for a modification or comply with a direction, the strategies, plans and programs required under this consent must be revised, to the satisfaction of the Planning Secretary. Where revisions are required, the revised document must be submitted to the Planning Secretary for approval within six weeks of the review. Note: This is to ensure strategies, plans and programs are updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the development.:	Non-compliant (Administrative)	Site interviews conducted 12 April 2022	Refer to discussion for Schedule 2, Condition 23 and Schedule 3, Condition 9. Failure to complete a review and (as necessary) a revision of the relevant plans has resulted in an administrative non-compliance with clauses (c) and (d). ***Corrective action 6: Ensure plans are updated within three months of submission of this IEA and otherwise in accordance with the requirements of Schedule 6, Condition 5.***
	REPORTING AND AUDITING **Incident Notification**			
6	6. The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing via the Department's Major Projects website and identify the development (including the development application number and name) and set out the location and nature of the incident.	Compliant	Complaints and incidents register Incident reports	*2019 IEA Recommendation: Ensure TEOM is setup with alarms/notifications for when results are approaching or have exceeded the short term criterion for particulate matter. This will ensure exceedances are immediately detected and reported as soon as possible to the EPA and DPE.* *Ensure exceedances and other incidents are reported as per this condition (Detailed Incident Report within 7 days)* 2022 IEA findings: Several exceedances occurred over the reporting period, which are detailed in conditions above. A review of several incident reports provided by Delta Coal have found that the reporting procedures are satisfactory with the requirements of this condition.

Condition	Details	Compliance status	Relevant evidence	Commentary
	Non-Compliance Notification			
7	7. Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must be in writing via the Department's Major Projects website and identify the development (including the development application number and name), set out the condition of this consent that the development is non-compliant with, why it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. Note: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance	Compliant	Complaints and incidents register Incident reports	Review of relevant data verifies compliance with the requirements of this condition.
	Annual Review			
8	8. By the end of March in each year after the commencement of the development, or other timeframe agreed by the Planning Secretary, a report must be submitted to the Department reviewing the environmental performance of the development, to the satisfaction of the Planning Secretary. This review must: (a) describe the development (including any rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year; (b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the: • relevant statutory requirements, limits or performance measures/criteria; • requirements of any plan or program required under this consent; • monitoring results of previous years; and • relevant predictions in the document/s listed in condition 2(e) of Schedule 2; (c) identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence; (d) evaluate and report on: • the effectiveness of the noise and air quality management systems; and • compliance with the performance measures, criteria and operating conditions of this consent; (e) identify any trends in the monitoring data over the life of the development; (f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and (g) describe what measures will be implemented over the next calendar year to improve the environmental performance of the development. Copies of the Annual Review must be submitted to the Affected Councils and made available to the CCC and any interested person upon request.	Compliant	Annual Review for 2019, 2020 and 2021	*2019 IEA Recommendations: The Annual Reviews are set out differently to the DPE Annual Review Guidelines (2015).* *Ensure table of contents matches the guidelines.* *Ensure transport records from this Audit period (January 2016) onwards are recorded on the website. This could be appended to the Annual Review summarising the weekly transport.* *Include the biodiversity monitoring reports as appendices to the Annual Review.* *See Section 5.2 of the Main Audit Report for Subsidence Recommendations.* 2022 IEA findings: A review of the Annual Reports for 2019, 2020 and 2021 found that they were generally prepared in compliance with this condition. The form of the Annual Reports has been updated since the previous IEA and is consistent with *DPE Annual Review Guidelines (2015).* Activities undertaken during the reporting period are adequately described in Section 4 of the Annual Review. Monitoring results are included in Section 6 and 7. The monitoring results presented compare results against criteria and predictions and are satisfactory with clause (b), (d) and (f) of this condition. Complaints are included adequately in 9.1. Non-compliances are briefly outlined in the Statement of Compliance and are detailed adequately in Section 11. Activities proposed over the subsequent reporting are described adequately in Section 12.

Condition	Details	Compliance status	Relevant evidence	Commentary
	Independent Environmental Audit			
9	9. By the end of February 2022, and every three years after, unless the Planning Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. The audit must: (a) led by a suitably qualified, experienced and independent auditor whose appointment has been endorsed by the Planning Secretary; (b) be led and conducted by a suitably qualified, experienced and independent team of experts (including any be expert in field/s specified by the Planning Secretary) whose appointment has been endorsed by the Planning Secretary; (c) be carried out in consultation with the relevant agencies and the CCC; (d) assess the environmental performance of the development and whether it is complying with the relevant requirements in this consent, water licences and mining leases for the development (including any assessment, strategy, plan or program required under these approvals); (e) review the adequacy of any approved strategy, plan or program required under the abovementioned approvals and this consent; (f) recommend appropriate measures or actions to improve the environmental performance of the development and any assessment, strategy, plan or program required under the abovementioned approvals and this consent; and (g) be conducted and reported to the satisfaction of the Planning Secretary.	Compliant		This audit. Delta Coal commissioned the auditors prior to February 2022.
10	10. Within three months of commencing an Independent Environmental Audit, or other timeframe agreed by the Planning Secretary, the Applicant must submit a copy of the audit report to the Planning Secretary, and any other NSW agency that requests it, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of the recommendations. The recommendations must be implemented to the satisfaction of the Planning Secretary.	Compliant	IEA submission email dated 25 June 2019	The previous IEA was submitted on 25 June 2019, within 3 months of it being conducted.
	Monitoring and Environmental Audits			
11	11. Any condition of this consent that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, is taken to be a condition requiring monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act. This includes conditions in respect of incident notification, reporting and response, non-compliance notification, compliance report and independent audit. For the purposes of the condition, as set out in the EP&A Act, “monitoring” is monitoring of the development to provide data on compliance with the consent or on the environmental impact of the development, and an “environmental audit” is a periodic or particular documented evaluation of the development to provide information on compliance with the consent or the environmental management or impact of the development.	Note		

Condition	Details	Compliance status	Relevant evidence	Commentary
12	12. Noise and/or air quality monitoring under this consent may be undertaken at suitable representative monitoring locations instead of at privately-owned residences or other locations listed in Schedule 3, providing that these representative monitoring locations are set out in the respective management plan/s.	Non-compliance (administrative)		A review of the approved NMP for the site found it generally compliant with the requirements of this condition. The plan however has not been updated since 2014, and therefore does not accurately reflect the activities and conditions occurring on site (including relevant monitoring locations), therefore an administrative non-compliance has been identified. The current NMP does not currently identify the representative site being used for noise monitoring at site ATN007. Delta Coal advise that noise monitoring has been undertaken at this location since Q2 2019. The auditor notes a revised NMP was approved by DPE following conduct of the site inspection, addressing this non-compliance.
	ACCESS TO INFORMATION			
13	13. Until the completion of all rehabilitation required under this consent, the Applicant must: (a) make the following information and documents (as they are obtained, approved or as otherwise stipulated within the conditions of this consent) publicly available on its website: • the documents referred to in condition 2(e) of Schedule 2 of this consent; • all current statutory approvals for the development; • all approved strategies, plans and programs required under the conditions of this consent; • the proposed staging plans for the development if the construction, operation or decommissioning of the development is to be staged; • minutes of CCC meetings; • regular reporting on the environmental performance of the development in accordance with the reporting requirements in any plans or programs approved under the conditions of this consent; • a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs; • a summary of the current progress of the development; • contact details to enquire about the development or to make a complaint; • a complaints register, updated monthly; • the Annual Reviews of the development; • audit reports prepared as part of any Independent Environmental Audit of the development and the Applicant's response to the recommendations in any audit report; and • any other matter required by the Planning Secretary; and (b) keep such information up to date, to the satisfaction of the Planning Secretary.	Non-compliance (administrative)	Delta Coal Website (https://www.deltacoal.com.au/)	*2019 IEA Recommendation: Ensure all relevant information is brought across to the Delta Coal website.* A review of the documentation on the website found that it generally contained the information listed in this clause. The information was up to date, and generally easy to find. There were however some documents on the website that were not the most up to date versions available. These were: – Benthic Communities Management Plan – Seagrass Management Plan – Built Features Management Plan – Noise Management Plan This therefore constitutes a non-compliance against clause (b) of this condition. **Corrective action 7: Ensure that the most up to date management plans are uploaded onto the website.**

Appendix D

Independent audit submission form

Independent Audit Declaration Form	
Project name	Chain Valley Colliery Extension Project
Consent Number	SSD-5465
Description of project	Refer to Section 1.1
Project address	Off Construction Road, Vales Point, NSW, 2259
Proponent	Great Southern Energy Pty Ltd (trading as 'Delta Coal')
Title of audit	Independent Environmental Audit for SSD-5465
Date	20 June 2022

I certify that I have undertaken the independent audit and prepared the contents of the attached independent audit report and to the best of my knowledge:

– The audit has been undertaken in accordance with relevant approval condition(s) and in accordance with the auditing standard AS/NZS ISO 19011:2014 and Post Approval Guidelines – Independent Audits.

– The findings of the audit are reported truthfully, accurately and completely.

– I have exercised due diligence and professional judgement in conducting the audit.

– I have acted professionally, in an unbiased manner and did not allow undue influence to limit or over-ride objectivity in conducting the audit.

– I am not related to any owner or operator of the development as an employer, business partner, employee, sharing a common employer, having a contractual arrangement outside the audit, spouse, partner, sibling, parent, or child.

– I do not have any pecuniary interest in the audited development, including where there is a reasonable likelihood or expectation of financial gain or loss to me or to a person to whom I am closely related (i.e. immediate family).

– Neither I nor my employer have provided consultancy services for the audited development that were subject to this audit except as otherwise declared to the lead regulator prior to the audit.

– I have not accepted, nor intend to accept any inducement, commission, gift or any other benefit (apart from fair payment) from any owner or operator of the development, their employees or any interested party. I have not knowingly allowed, nor intend to allow my colleagues to do so.

Notes:

a. The Independent Audit 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.

b. 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 Lead auditor	Elliot Holland
Signature	
Qualification	Lead Auditor – Environmental Management Systems
Email address	Elliot.holland@ghd.com
Company and address	GHD Pty Ltd (GHD) GHD Tower, Level 3, 24 Honeysuckle Drive Newcastle NSW 2300
Date	20 June 2022

ghd.com

The Power of Commitment

Appendix 11: Independent Environmental Audit Action Plan

Chain Valley Colliery Independent Environmental Audit 2022 - Action Tracker.

Last Update 25 March 2024

Action/Rec #	Requirement	Proposed Completion Date	Person Responsible	Percentage Complete	Comments
CVC A1	Delta Coal to provide DPE and EPA a quarterly progress report on works under DA 845-2020 – Chain Valley Colliery sewage connection.	Date: 31 July 2022 Quarterly thereafter A completion report will be issued	Environmental Compliance Coordinator	100%	Last Quarterly report proided on 6 Feb 23, next report due in May. Project due to be completed 24 May 2023.
CVC A2	Delta Coal will implement a waste management system to address this non-compliance.	30-Jun-23	Environmental Compliance Coordinator	20%	Works in preparing proposed waste management area
CVC A3	Delta Coal have instructed third party contractor to include sampling times on depositional dust sampling field sheets.	Completed	Environmental Compliance Coordinator	100%	
CVC A4	Include TARPS in Delta Coal AQGHGMP, Seagrass MP, Heritage MP, LMP, CVC WMP	23-Nov-22	Environmental Compliance Coordinator	100%	Pending DPE approval on AQGHGMP, Seagrass MP, Heritage MP and LMP.
CVC A5	Ensure summary of Idependent traffic audit are included in Annual Review	31-Mar-23	Environmental Compliance Coordinator	100%	
CVC A6	Ensure plans are reviewed within three months of IEA submission	12-Oct-22	Environmental Compliance Coordinator	100%	All plans reviewed and revised plans submitted to DPE for approval
CVC A7	Ensure that the most up to date managemnt plans are uploaded onto the website.	11-Jul-22	Environmental Compliance Coordinator	100%	
CVC R1	As part of updates required to the AQMP, update Figure 3 to show the location of the meteorological station.	23-Nov-22	Environmental Compliance Coordinator	100%	Included in AQGHGMP Revision
CVC R2	Delta Coal will update naming of discharge points to be consistently referenced.	12-Oct-22	Environmental Compliance Coordinator	100%	All updated to EPA ID's
CVC R3	N/A - removed recommendation		Environmental Compliance Coordinator	100%	
CVC R4	Include consultation in the BdMP	12-Oct-22	Environmental Compliance Coordinator	100%	Previous consultation included and Biodiversity MP submitted for additional consultation following revision.
CVC R5	Ensure WMP is updated to reflect changes to on-site effluent management.	23-Nov-22	Environmental Compliance Coordinator	0%	Pending Sewer Project completion (PRP 8 and 9).
CVC R6	Ensure a maintenance schedule is established to ensure dams and drainage lines are free of silt and water storage is maximised.	23-Nov-22	Environmental Compliance Coordinator	100%	Maintenance schedule developed in CVC WMP, with revised WMP approved 22/12/2022
CVC R7	Include a requirement in the EMS to notify landowners of exceedances 'as soon as practical'. Define a time period for as 'soon as practical'.	23-Nov-22	Environmental Compliance Coordinator	100%	Included in EMS revision currently pending DPE approval.
CVC R8	Ensure the RMP required by SSD-5465 is updated to consider the requirements of the RMP and Annual Rehabilitation Report and Forward Program currently being prepared (as now required by the NSW Resources Regulator instead of a MOP) and documents where topsoil will be stored and the estimated volumes required for rehabilitation.	01-Jul-22	Environmental Compliance Coordinator	100%	Completed and available on website.
CVC R9	The outcomes of the noise mitigation study currently being completed should be captured in a revised noise management plan and reflect any changes to monitoring, as relevant.	23-Nov-22	Environmental Compliance Coordinator	30%	Noise Mitigation Options Assessment on-going in consultation with DPE. Outcomes of NMOA will be included in a revised Noise Management Plan.

Action/Rec #	Requirement	Proposed Completion Date	Person Responsible	Percentage Complete	Comments
CVC R10	Assess the triggers from the Extraction Plans e.g. ANOVA/ANOSIM level is approaching 5% in the bi-annual monitoring reports.	31-Dec-22	Environmental Compliance Coordinator	100%	Statistical analysis for 2022 completed and no issues identified in reference to TARP triggers.
CVC R11	Develop a TARP when updating the Benthic Communities Management Plan. This should address the wording of Schedule 4 Condition 2 SSD 5465. A series of triggers should be developed based on quantitative data and this should be reported in the bi - annual monitoring reports and the Annual Review. An example of a trigger would be '% change in organisms between monitoring events'.	23-Nov-22	Environmental Compliance Coordinator	100%	TARP included in revised Benthic Communities Management Plan. Pending DPE approval.

Appendix 12: 2023 Chain Valley Colliery - Coal Haulage Records

Chain Valley Colliery
2023 Coal haulage (Via Roadways)

Last Update: 04/01/2024

Week Ending	Coal Transport via Public Roads (t)	Coal Transport via Private Roads (t)
08/01/2023	0	0
15/01/2023	0	0
22/01/2023	0	0
29/01/2023	0	0
05/02/2023	0	0
12/02/2023	0	0
19/02/2023	0	0
26/02/2023	0	0
05/03/2023	0	0
12/03/2023	0	0
19/03/2023	0	0
26/03/2023	0	0
02/04/2023	0	0
09/04/2023	0	0
16/04/2023	0	0
23/04/2023	0	0
30/04/2023	0	0
07/05/2023	0	0
14/05/2023	0	0
21/05/2023	0	0
28/05/2023	0	0
04/06/2023	0	0
11/06/2023	0	0
18/06/2023	0	0
25/06/2023	0	0
02/07/2023	0	0
09/07/2023	0	0
16/07/2023	0	0
23/07/2023	0	0
30/07/2023	0	0
06/08/2023	0	0
13/08/2023	0	0
20/08/2023	0	0
27/08/2023	0	0
03/09/2023	0	0
10/09/2023	0	0
17/09/2023	0	0
24/09/2023	0	0
01/10/2023	0	0
08/10/2023	0	0
15/10/2023	0	0
22/10/2023	0	0
29/10/2023	0	0
05/11/2023	0	0
12/11/2023	0	0
19/11/2023	0	0
26/11/2023	0	0
03/12/2023	0	0
10/12/2023	0	0
17/12/2023	0	0
24/12/2023	0	0
31/12/2023	0	0

Appendix 13: DPIE Letter – 2023 Annual Review Approval

To be Provided