Delta coal	Doc Owner: **Dave McLean (Mine Manager)**

CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan
Amendment 2
Rehabilitation Management Plan
2020-2023

Table 1 MOP Title Block

Name of Mine/s	Chain Valley Colliery and Mannering Colliery
MOP Commencement Date	01/08/2020
MOP Completion Date	31/12/2023
Name of Mining Authorisation / Authorisation holder(s)	**Chain Valley Colliery** Great Southern Energy Pty Ltd • CCL706 (part), CCL707; • ML1051, ML1052, ML1308, ML1785; and • MPL337, MPL1349, MPL1389, MPL1400 Centennial Myuna Pty Ltd (subleased to LakeCoal Pty Ltd and Fassi Coal Pty Ltd novated to Great Southern Energy Pty Ltd) • Subleases ML1370 **Mannering Colliery** Centennial Mannering Pty Ltd (subleased to LakeCoal Pty Ltd and Fassi Coal Pty Ltd novated to Great Southern Energy Pty Ltd) • Subleases CCL719, CCL721 Centennial Munmorah Pty Ltd (subleased to LakeCoal Pty Ltd and Fassi Coal Pty Ltd novated to Great Southern Energy Pty Ltd) Sublease CCL722
Name of Mine Operator	Great Southern Energy Pty Ltd (trading as Delta Coal)
Name and Contact Details of the Environmental Representative	Lachlan McWha (Environmental Coordinator) Phone: 02 4358 0800, Email: lmcwha@deltacoal.com.au
Name and Contact Details of the Mine Manager (or equivalent)	Dave McLean (Mine Manager) Phone: 02 4358 0800, Email: dmclean@deltacoal.com.au
Signature	.....
Date	12.8.2021 .....
Name of Representative of the Authorisation Holder	Stephen Gurney
Title of Representative of the Authorisation Holder	Company Secretary – Great Southern Energy Pty Ltd (trading as Delta Coal)
Signature	.....
Date	12 August 2021 .....

Note:

Mining Authorisation abbreviations CCL – Consolidated Coal Lease, ML - Mining Lease and MPL – Mining Purposes Lease

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Section 1.1.2	Table 1.2: Mannering Colliery History of Operations	N/A	Previous MOPs
Section 1.1.3	Table 1.3: Recent History of MOPs for Chain Valley and Mannering	N/A	Previous MOPs
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Appendix 1	Plan 1B - Pre-Mining Environment - Natural Environment	Plan 1B	Developed as part of MOP
Appendix 1	Plan 1C - Pre-Mining Environment - Built Environment	Plan 1C	Developed as part of MOP Amended for 2 additional sites as a result of unexpected finds during rehabilitation works at the Mine Cottages.
Appendix 1	Plan 1D - Pre-Mining Environment - Built Features (Pit Top Area)	Plan 1D	Developed as part of MOP
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1 Introduction

1.1 History of the Operations

1.1.1 Chain Valley Colliery

Chain Valley Colliery (CVC) is an underground coal mine (colliery) situated in the Newcastle coalfields of New South Wales, at the southern end of Lake Macquarie (see **Figure 1.1**). Chain Valley Colliery is located directly adjacent to the Vales Point Power Station. The below table outlines the key mining and ownership milestones over the site's 60 year history.

Table 1.1: Chain Valley Colliery History of Operations

Year	Key Mining and Ownership Milestones
1960	J&A Brown and Abermain Seaham Collieries Ltd commence site clearing, drift/shaft sinking
1962/1963	Coal Production for Wallarah seam / First coal delivery to Vales Point Power Station Mining methods commenced – Bord and Pillar first workings, partial and full secondary extraction
1963-1994	Ownership - J&A Brown and Abermain Seaham Collieries Ltd, Coal & Allied.
1980s	Peak employment of 380 people
1994	Wallarah Coal Joint Venture (WCJV)
1997	Wallarah Seam workings discontinued
1994 - 2002	WCJV – owned by Ingwe Coal, Billiton and BHP Billiton
2002 - 2006	WCJV – 80% LakeCoal Pty Ltd (Excel Coal Pty Ltd) and Sojitz Corporation
2006	Fassifern Seam workings commenced
2006 - 2009	Peabody owned 100% LakeCoal
2008	Great Northern Seam workings discontinued
2009	LDO, AMCI own LakeCoal
2011	20% Sojitz share of WCJV acquired by LDO through Fassi Coal Pty Ltd Commencement of Miniwall Mining Method
2016	RWE NSW Pty Ltd acquired percentage in Joint Venture
2018	Fassi Coal Pty Ltd and Lake Coal Pty Ltd placed into Administration.
2019	Great Southern Energy Pty Ltd acquired Chain Valley Colliery assets and leases from LakeCoal and became the operator
Present	First workings and Miniwall Mining Method in Fassifern Seam

1.1.2 Mannering Colliery

Mannering Colliery is an underground coal mine located directly adjacent to the Chain Valley Colliery (see **Figure 1.1**). The below table outlines the key mining and ownership milestones over the site's 60 year history.

Table 1.2: Mannering Colliery History of Operations

Year	Key Mining and Ownership Milestones
1960	Commencement of operations as Wyee State Coal Mine
1961	Commence Coal Production in Great Northern and Fassifern seams / First coal delivery to Vales Point Power Station Mining methods commenced – Bord and Pillar first workings, partial and full secondary extraction
1999	Great Northern Seam workings discontinued
2002	Mining operations ceased. Centennial Coal company purchased from PowerCoal Pty Ltd
2005	Mine renamed Mannering Colliery, recommenced production in Fassifern Seam
2012	Underground mining operations ceased
2013	LakeCoal Pty Ltd became the operator
2014	Development Consent Approval to develop tunnel link between Chain Valley Colliery and Mannering Colliery
2017	Underground Link Road between CVC and MC enables coal mined from Chain Valley Colliery to be conveyed to Mannering Colliery
2017 – Present	Underground coal conveyance and surface coal handling activities to Vales Point Power Station
2018	Fassi Coal Pty Ltd and Lake Coal Pty Ltd placed into Administration.
2019	Great Southern Energy Pty Ltd acquired Mannering Colliery assets and subleases from Centennial and became the operator
2020	MC continues to be used as an underground link to transfer coal from CVC to MC surface, coal crushing and handling and product coal transfer to Vales Point Power Station. Rotary Breaker was removed and primary crusher installed underground to reduce noise impacts. Other noise mitigation projects completed.

1.1.3 MOP History

The below table outlines the key Mining Operations Plans (MOP) periods for CVC and Mannering Colliery since 2008.

Table 1.3: Recent History of MOPs for Chain Valley and Mannering

Year	Key MOP Milestones
2008-2015	CVC MOP – Bord and Pillar extraction Great Northern and Fassifern seams
2013-2015	CVC MOP – Miniwall mining in Fassifern Seam
2015-2018	CVC MOP – Miniwall mining in Fassifern Seam 2 amendments for Miniwall mine plan changes
2018-2020	CVC and MC MOP – Continue first workings and secondary extraction by miniwall mining methods in the Fassifern Seam 1 amendment for Miniwall mine plan changes, demolition of legacy surface structures and construction activities associated with pollution reduction programs.
2020-2023	CVC and MC MOP - Continue first workings and secondary extraction by miniwall and bord and pillar mining methods in the Fassifern Seam. Continue coal processing and coal haulage. Exploration activities, demolition, rehabilitation and construction activities to occur.
2020-2023 Amendment 1	CVC and MC MOP - Continue first workings and secondary extraction by miniwall and bord and pillar mining methods in the Fassifern Seam. Continue coal processing and coal haulage. Exploration activities, demolition, rehabilitation and construction activities to occur.
2020-2023 Amendment 2	CVC and MC MOP - Continue first workings and secondary extraction by miniwall and bord and pillar mining methods in the Fassifern Seam. This amendment is to include the Mining Lease transfer ML1632 (Centennial) to ML1735 (Great Southern Energy) Northern Mining Area Extension (Morisset Peninsula).

Figure 1.1: Chain Valley Colliery and Mannering Colliery Surface Locations

1.2 Current Consents, Authorisations and Licences

The consents relevant to this MOP are identified in

Table 1.4. Chain Valley Colliery and Mannering Colliery are Level 1 Mines as they are both coal mines in environmentally sensitive areas of state significance and are classified as State Significant Development. The Chain Valley Colliery Holding and details of leases for Chain Valley Colliery are shown in **Plan 1A** (Appendix 1). All mining proposed within the term of this MOP is within the Chain Valley Colliery Holding, with all leases relevant to that Holding identified in **Table 1.5**.

Mannering Colliery surface facilities are included within CCL 721, which was the principle mining lease for Mannering's prior workings. Refer to **Plan 1A** for lease areas and **Plan 1C** for existing workings. Delta Coal hold two Environmental Protection Licences (EPLs) for Chain Valley Colliery and Mannering Colliery, issued by the Environment Protection Authority (EPA) under the Protection of the Environment Operations Act 1997. (

Table 1.6) A copy of the current EPL's are publicly available on the NSW EPA licensing website. Delta Coal holds two water licences for Chain Valley Colliery and Mannering Colliery, which permit extraction of groundwater for mine dewatering (

Table 1.7).

Table 1.4: Consent Details

Approval	Issued / Modified Date	Approval Authority	Project
SSD-5465	Originally issued 23/12/2013 MOD 1 Issued 27/11/2014 MOD 2 Issued 16/12/2015 MOD 3 Issued 26/06/2020 MOD 4 Issued 05/08/2021	Minister for Planning under Environmental Planning and Assessment Act 1979	Chain Valley Colliery – Extension Project MOD 1 for linkage to Mannering Colliery MOD 2 increased to 2.1Mtpa production and reorientation of Miniwall panels in Northern Mining Domain MOD 3 increase of ROM coal to 2.1Mtpa to Mannering Colliery. Mining area and Mining method to include Bord and Pillar MOD 4 approves mining in the Northern Mining Area extension covered by ML1785 and allows increased employee limit at CVC.
MP 06_0311	Original Issued 12/3/2008 MOD 1 Issued 25/10/2012 MOD 2 Issued 27/11/2014 MOD 3 Issued 3/12/2015 MOD 4 Issue 4/8/2016 MOD 5 Issued 26/06/2020	Minister for Planning under Environmental Planning and Assessment Act 1979	Mannering Colliery – Continuation of Mining Project. MOD 1 for extension of the approved Project Site. MOD 2 for linkage to Chain Valley Colliery MOD 3 increase coal handling from Chain Valley to 1.3 Mtpa. Extension of Approval to 2022 MOD 4 recommission rotary breaker MOD 5, handle 2.1Mtpa and decommission rotary breaker

Table 1.5: Leases

Current Mining tenement	Holder	Grant date / Renewal date	Lease expiry date	Applicability
CCL 706	Great Southern Energy	24 January 1990	29 April 2022	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	30 Dec 2023	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.
EL8428	Great Southern Energy	7 Dec 2015	7 Dec 2020	Future mine extension area.
ML 1051	Great Southern Energy	7 July 1941	7 July 2022	Part of the area approved under SSD-5465.
ML 1052	Great Southern Energy	7 July 1941	7 July 2022	Part of the area approved under SSD-5465.
ML 1308	Great Southern Energy	4 May 1965	4 May 2022	Mining lease for the mine drift entries.
ML 1785	Great Southern Energy	28 April 2021	13 Oct 2022	Partial transfer of previous subleased area of ML1632 from Centennial Coal to GSE.
CCL719 (sublease)	Centennial Mannering	3 July 1989	11 Dec 2029	Part CCL 719 subleased to Lakecoal (novated to Delta Coal). Incorporates historic workings within the Wallarah and Great Northern Seams utilised for passive operational activities.
CCL721 (sublease)	Centennial Mannering	28 June 1989	29 July 2026	Part CCL 721 subleased to Lakecoal (novated to Delta Coal). Incorporates part of the proposed mining area, refer Plan 1A. Includes Mannering surface facilities.
CCL722 (sublease)	Centennial Munmorah	28 June 1989	05 July 2019 (Renewal Sought)	Part CCL 721 subleased to Lakecoal (novated to Delta Coal). Incorporates part of the proposed mining area, refer Plan 1A.
ML1370 (sublease)	Centennial Myuna	26 Sep 1995	7 Mar 2033	Part ML1370 subleased to Lakecoal (novated to Delta Coal). Incorporates part of the proposed mining area, refer Plan 1A.

Current Mining tenement	Holder	Grant date / Renewal date	Lease expiry date	Applicability
MPL 337	Great Southern Energy	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 Oct 1967	5 Oct 2028	Mining purposes lease for the Chain Valley pit top area.
MPL 1389	Great Southern Energy	14 May 1970	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 Nov 1970	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.

Table 1.6: Environmental Protection Licences

Premises	EPL Number	Date of Issue	Issued to
Mannering Colliery	191	06/04/2000	Great Southern Energy Pty Ltd
Chain Valley Colliery	1770	10/11/2000	Great Southern Energy Pty Ltd

Table 1.7: Water Licences

Site	Water Licence Number	Extraction Volume	Additional Information
Mannering Colliery	WAL40461	450 ML/year	Work Approval 20AL217059
Chain Valley Colliery	WAL41508	4443 ML/year	Work Approval 20MW065025

1.3 Land Ownership and Land Use

The Chain Valley and Mannering pit top surface operational areas are on land owned by Sunset Energy (trading as Delta Electricity) and form part of the Vales Point Power Station (VPPS) buffer zone. The land is occupied under compensation agreements with Sunset Energy. In addition to the two pit top areas there are two remote surface sites associated with the Chain Valley Colliery Holding, i.e. the main ventilation fan site for Chain Valley (at Summerland Point and situated on land owned by Delta Coal) and a downcast shaft site for Mannering (adjacent to the Vales Point Ash Dam and situated on land owned by Sunset Energy). Land ownership details of the surface facilities sites are shown on **Plan 1E**.

The Chain Valley Colliery holding lies within two separate local government areas (LGAs), namely the City of Lake Macquarie LGA and Central Coast LGA (an amalgamation of the former Wyong and Gosford City LGAs). First workings and secondary extraction to be undertaken during the term of this MOP will be confined to areas under Lake Macquarie, and as such no impact to freehold land is anticipated from underground extraction.

The Chain Valley and Mannering Colliery pit top areas have been used as mining infrastructure areas for the last 60 years. The pit top facilities are primarily situated within Zone SP2 (Infrastructure – Electricity generating works) and Zone E2 (Environment Conservation). The Chain Valley ventilation fan site is listed as Zone E1 – National Parks and Nature Reserves. Zoning of the aforementioned lands under the Wyong Shire Council Local Environmental Plan 2013 is shown on **Plan 1F**. Current land-uses surrounding these sites and above the old and proposed workings include; natural waterways, infrastructure, public recreation, National Parks and nature reserves and low density residential (**Plan C**).

Table 1.8: Land Ownership

Lot	Deposited Plan	Owner	Description
A	368634	Sunset Energy	Overlies proposed first workings linkage connection
100	1065718	Transgrid	Overlies proposed first workings linkage connection
102	1065718	Sunset Energy	Overlies proposed first workings linkage connection
20	1113256	Sunset Energy	Overlies proposed first workings linkage connection
7329	1148149	The State of New South Wales (reserve)	Overlies proposed first workings linkage connection
A	379918	Sunset Energy	Chain Valley pit top facilities area
B	379918	Sunset Energy	Chain Valley pit top facilities area
C	349733	Sunset Energy	Chain Valley pit top facilities area
A	187570	Sunset Energy	Chain Valley pit top facilities area
1B	339441	Sunset Energy	Chain Valley pit top facilities area
1	226133	Great Southern Energy	Chain Valley ventilation shaft and fans site
1	379203	Sunset Energy	Mannering downcast shaft site
102	1170291	Sunset Energy	Mannering surface facilities site

1.4 Stakeholder Consultation

1.4.1 General Consultation

As stated in its Environment Policy, Delta Coal is committed to communicating and engaging with the community and other stakeholders regarding its activities. Consistent with this commitment, community consultation is ongoing and includes the website (www.deltacoal.com.au) and the Chain Valley Colliery and Mannering Colliery community consultative committees (CCC).

Delta Coal (and previously LakeCoal and Centennial Mannering) have consulted with local and state government agencies over many years in association with applications for approvals or modifications; preparation of previous MOPs and the various management plans required under the Project Approval/development consent including the preparation of the Chain Valley Rehabilitation Management Plan and in relation to other regulatory matters.

1.4.2 Consultation on Mining Activities Specific to this MOP

Mining activities proposed during the term of this MOP are consistent with the Environmental Impact Statements (EIS) for Chain Valley Colliery and Mannering Colliery (as modified). Consultation with the following individuals, groups and government departments was undertaken as part of the development of the EIS and/or subsequent modification applications:

- Mannering Colliery and Chain Valley Colliery CCC;
- Lake Munmorah and Chain Valley Bay Community Precinct Committee;
- Gwandalan and Summerland Point Community Precinct Committee;
- Registered Aboriginal Parties (RAPs)
- Department of Planning, Industry and Environment (DPIE);
- Australian Government - Department of Environment and Energy - DoEE (formerly Commonwealth Department of Sustainability, Environment, Water, Population and Communities);
- BCD Biodiversity and Conservation Division within the DPIE – (including the Heritage Branch;
- DPIE Water - Water Group within the DPIE
- NSW Environment Protection Authority (EPA);
- Division of Resources and Geoscience within the DPIE (formerly Division of Resources and Energy within the Department of Trade and Investment, Regional Infrastructure and Services);. On 2 April 2020, DRG was renamed Regional NSW – Mining, Exploration and Geoscience
- RR NSW Resources Regulator within the Department. On 2 April 2020, RR was renamed Regional NSW – Resources Regulator
- Department of Primary Industries (including the NSW Office of Water, NSW Forestry, Agriculture and Fisheries sections, Catchments and Lands (Crown Lands Division);
- TfNSW Transport for NSW formerly NSW Department of Transport (including the Centre for Transport Planning, and Roads and Maritime Services);
- SA NSW Subsidence Advisory NSW (formerly the Mine Subsidence Board)
- NSW Health;
- Central Coast Local Health District;
- Central Coast Medicare Local (now Central Coast Primary Care);
- Hunter Medicare Local (now Hunter Primary Care);
- Hunter Central Rivers Catchment Management Authority;
- Gosford/Wyong Councils' Water Authority;
- Central Coast Council (CC Council formerly Wyong Shire Council);
- Newcastle City Council (NCC); and
- Lake Macquarie City Council (LMCC).

Details of the consultation and outcomes can be found in both the EIS and Response to Submissions documents and the various modification applications. Additional consultation and public exhibition of proposed modifications to the Chain Valley and Mannering Project Approvals was undertaken as required.

Delta Coal personnel routinely consult with the primary landowner, Sunset Energy, on matters relevant to its landholding and Delta Coal's operations and obligations, including the rehabilitation plans included within this MOP.

1.4.3 Consultation during development of this MOP

In accordance with the respective operational consents, Delta Coal consulted with the following stakeholders during development of the MOP:

- Resource Regulator – Daniel Adams (April 2020, 18 June 2020, 24 June 2020, 6 July 2020 -Table 1.9 and 21 June 2020 for approval);
- Department of Planning, Industry and Environment – Colin Phillips (6 July 2020);
- EPA – Steve Clair (6 July 2020);
- Central Coast Council - 20 May 2020 – Quarterly meeting, 6 July 2020;
- Lake Macquarie City Council - 20 May 2020 – Quarterly meeting, 6 July 2020;
- The Mannering Colliery and Chain Valley Colliery CCC - 20 May 2020 – Quarterly meeting, 6 July 2020;
- BCD – 6 July 2020

Approval for this MOP was provided by the RR in July 2020 and reduced from the proposed 31 December 2023 to the 30 April 2021. The approval letter (Appendix 3) included some feedback which has been addressed in MOP amendment 1. See Table 1.9 below. Approval for MOP Amendment 1 was received on 30 April 2021.

Delta Coal has distributed copies of this amended MOP to all relevant stakeholders. If any significant matters that are raised by the stakeholders as a result of this review or in subsequent communication that warrant a change to the activities to be undertaken within the term of this MOP, Delta Coal will consult with Resources Regulator to address the matters appropriately through either amendment to the MOP or by other means acceptable to Resources Regulator.

Stakeholder	Comments	Response/Action
Resource Regulator	Terrestrial' based mining within the location of Fishery Point is proposed by MOP Plan 3B, however no detail is provided in the MOP regarding proposed subsidence monitoring, remedial measures or methods for reporting of impacts. The MOP is to be updated to provide details of these omissions. Section 9 of the MOP may also require incorporation of monitoring and remedial action measures associated with terrestrial based mining, particularly the Trigger Action Response Plan.	• See section 3.2.5 for additional detail on mining under land and proposed subsidence monitoring, remedial measures and methods for reporting impacts. • Section 9 updated to include monitoring and remediation measures • Appendix 3 – Subsidence Management TARP
Resource Regulator	'Aquatic' based mining related subsidence monitoring is mostly deferred to the relevant Extraction Plan, Seagrass Management Plan and Benthic Communities Management Plan ('Plans'). A summary of the monitoring, remediation / maintenance and reporting described by these Plans is to be provided in the next MOP submission.	• See sections 3.2.5, 3.2.8 and 3.2.9 for additional detail and requested summary
Resource Regulator	The MOP commits to the decommissioning and rehabilitation of the domain identified as the Mine Cottages. The Project Timeline provided for these works has the Mine Cottages within 'growth media development phase' from Q4 2020 until Q4 2023. The Regulator reminds Great Southern Energy Pty Ltd of its requirement to rehabilitate progressively, that includes transitioning of rehabilitated areas through the relevant phases of rehabilitation. Further justification for the delay of 'ecosystem establishment and development phase' is required.	• Consultation with the RR on the department's preference on growth media development phase timing • Mine Cottages and redundant CVC infrastructure demolished appropriately. Mine Cottage highlighting GSE's commitment to progressive rehabilitation and planned mine closure • Table 2.6 updated

Stakeholder	Comments	Response/Action
Resource Regulator	Rehabilitation monitoring is deferred to Appendix 2 - Rehabilitation Monitoring Program that describes the only monitoring to be performed prior to mine closure is that of analogue monitoring sites every four years. A program has not been devised to assess the performance of smaller rehabilitation areas such as the Mine Cottage domain that may be performed prior to closure. The MOP and Appendix 2 (where relevant) are to be updated to include a rehabilitation monitoring program for smaller areas to be rehabilitated to ensure rehabilitation performance is appropriately assessed, tracked and remedial actions taken as appropriate.	• Section 8.1.2 updated for rehabilitation monitoring for smaller rehabilitation programs performed prior to closure.
Resource Regulator	Inconsistencies regarding the removal of services and infrastructure within Table 6.1 and Section 5.3.1 are to be addressed. Moreover, the MOP does not provide differentiation as to when services / infrastructure would be removed or capped in-situ (for example, the Regulator may consider capping services in-situ should there be limited - no risk associated with remaining in-situ, these services do not inhibit post mining land uses and removal would have unacceptable risks to safety etc).	• Table 6.1 and section 5.3.1 updated • During the Mine Cottage demolition an unexpected aboriginal (midden) site was uncovered after removal of concrete. Some commentary on buried services has been included in section 5.3.1 with an appropriate heritage consideration.
Resource Regulator	Rehabilitation objectives and completion criteria are to be updated (where relevant) to incorporate 2019 baseline monitoring observations / results associated with the development of Appendix 2 - Rehabilitation Monitoring Program.	• Table 6.1 updated. Second round of monitoring of analogue rehabilitation sites proposed in 2023 to provide further data to inform the refinement of the rehabilitation objectives and completion criteria. A detailed mine closure plan will be developed two years before the cessation of mining activities as required in the CVC development approval.
Resource Regulator	Rehabilitation objectives and completion criteria are to be updated to ensure that criteria are specific, measurable, achievable, realistic and time bound (SMART) and avoid nondescript terms such as 'generally consistent with'.	• Second round of monitoring of analogue rehabilitation sites proposed in 2023 to provide further data to inform the refinement of the rehabilitation objectives and completion criteria. A detailed mine closure plan will be developed two years before the cessation of mining activities as required in the CVC development approval. • Table 6.1 updated removing 'generally consistent with' terminology however retained in Table 4.1 as this is the cited expression used by DPIE in the MC consent Table 2: Rehabilitation Objectives
Resource Regulator	Assessed Deposit - Approval of this MOP has triggered a review of the assessment of the security deposit required to secure funding for the fulfilment of rehabilitation obligations under the listed Mining Authorisation Number(s). Notice of the change in the security deposit condition related to this MOP approval will be provided separately.	• Rehabilitation Cost Estimate update provided in August 2020 and subsequently on 25 February 2021. This includes an update for the demolition of the mine cottages and CVC site coal handling infrastructure

Table 1.9: Consultation Table for MOP Amendment 1

1.4.4 Consultation for detailed mine closure and rehabilitation

Key stakeholders will also be consulted during the development of a detailed Mine Closure Plan.

Through any future consultation, it is expected that the following principles would be considered:

- Planning for mine closure could assist in mitigating the consequent reduction in access to useful infrastructure. With advanced and careful planning, it may be possible to develop capacity to maintain certain infrastructure facilities and services for future community or local government ownership or as part of arising business development opportunities.
- Planning for mine closure should be raised with the community as early as possible prior to the design phase of the closure. The planning should consider how to minimise the adverse impacts of mine closure and to optimise the opportunities for community development.
- An early and effective community engagement strategy should be established
- Planning for mine closure should ensure;
    - that the future public health and safety of the community is not compromised;
    - the community's resilience to the adverse impacts of mine closure is strengthened;
    - the community can maximise opportunities for consequential land use and
    - retain mining infrastructure of value to the community

It is expected that ongoing consultation with relevant stakeholders will occur throughout the life of the MOP through forums such as the community consultative committee meetings, the development of various management plans, annual reviews and regulatory inspections.

In addition, development of the detailed Mine Closure Plan would include, where relevant, consideration of documents such as the North Wyong Shire Structure Plan (NSW Department of Planning & Infrastructure, October 2012).

2 Proposed Mining Activities

2.1 Project Description

As this MOP relies on two separate SSD approvals, the activities proposed in this MOP reflect the current limitations and conditions of these approvals.

Delta Coal has approval to undertake mining operations, i.e. extraction, processing, handling, storage and transportation of coal until 31 December 2027, the nominated term of this MOP extends until 31 December 2023.

A summary of approved operations as permitted by Chain Valley Development Consent and Mannering Project Approval is provided in **Table 2.1**.

Table 2.1: Summary of approved operations

Aspect	Mannering Colliery	Chain Valley Colliery
Mining and reserves	Extraction of up to 1.1 Mtpa of ROM coal from the site.	Extraction of up to 2.1 Mtpa of ROM coal from the site.
Mining methods	Bord and pillar mining methods where coal recovery is limited to first workings only.	First workings and secondary extraction by miniwall mining methods
Project life	Mining operations until 31 December 2027.	Mining operations until 31 December 2027.
Surface infrastructure	Utilisation of existing surface infrastructure and upgrades as identified in the EIS.	Utilisation of existing surface infrastructure and upgrades as identified in the EIS.
Surface Coal processing	No coal processing other than use of coal crushing facility to reduce the size of ROM coal.	No coal processing other than use of coal crushing facility to reduce the size of ROM coal.
Hours of operation	24 hours, 7 days a week.	24 hours, 7 days a week.
Product coal transport	Handling and transport no more than 2.1 Mtpa of ROM coal from the site. All coal supplied directly to Vales Point Power Station via a purpose built dedicated overland conveyor, which is operated, maintained and located on land held by Sunset Energy.	Handling and transport no more than 2.1 Mtpa of ROM coal from the site. A maximum of 660,000 tonnes per year to PWCS for export, transported during restricted haulage hours on public roads. A maximum of 180,000 tonnes per year to domestic customers (other than Vales Point Power Station), transported on public roads during restricted haulage hours. Coal deliveries to Vales Point Power Station to occur via private road or via conveyor connection with Mannering Colliery.
Underground Linkage	Development and operation of an underground linkage within the Fassifern Seam to Chain Valley Colliery enabling coal to be transferred from Chain Valley Colliery to Vales	Development and operation of an underground linkage within the Fassifern Seam to Mannering Colliery enabling coal to be transferred from

Aspect	Mannering Colliery	Chain Valley Colliery
	Point Power Station via Mannering facilities.	Chain Valley Colliery to Vales Point Power Station via Mannering facilities.

Figure 2.1 shows the boundaries applicable to the Chain Valley Development Consent and Mannering Project Approval.

Coal extraction operations are continuing for the Northern Mining Area (miniwall extraction via first workings development) with all coal being transferred to the VPPS via Mannering Colliery's surface facilities and the Mannering Colliery to VPPS overland conveyor.

Extraction Plan approval of miniwall blocks S2 and S3 was received 2 July 2019, with extraction of miniwall S2 being completed in February 2020. Extraction plan approval for miniwall block S4 was received 22 June 2020, with extraction of S4 completed on 23 February 2021. Subsequently, Delta Coal sought approval and was granted approval on 06/04/2021 for an extraction plan covering miniwall S5 and Pillar Extraction for areas under Lake Macquarie in the Northern Mining Area. Extraction of miniwall S5 commenced 10 April 2021.

Delta Coal is sought approval and was granted SSD-5465 Mod 4 on 5 August 2021 for:

- First workings bord and pillar mining under Morisset Peninsular
- increase in employee levels at CVC

Early stakeholder consultation has been undertaken and scoping report drafted for the consolidation project for Chain Valley Colliery and Mannering Colliery which includes mining in the Great Northern seam in the Chain Valley Bay area.

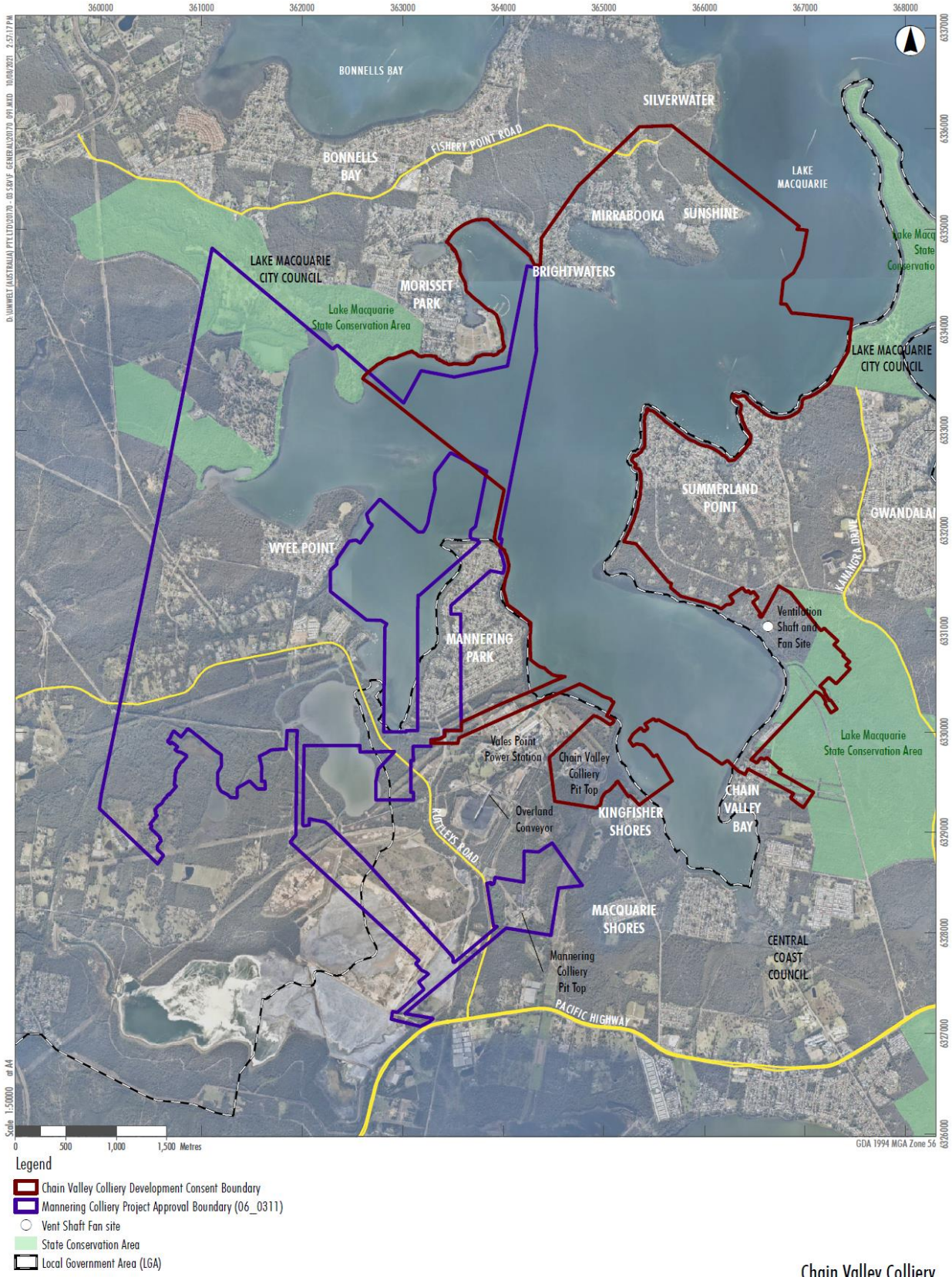

Figure 2.1: Approval Boundaries

2.2 Asset Register

Delta Coal has identified various domains applicable to this MOP in accordance with the ESG3 MOP Guidelines (September 2013). The primary domains are shown on **Plan 2** and **Plan 2A,** with secondary domains shown on **Plan 4**.

Table 2.2 provides a brief description of the features within each domain. Further detail on the domain selection is provided in Section 5.1.

Table 2.2: Domain Units

Domain Code	Domain Overview
1A	Incorporates the following areas; • Majority of the pit top at Chain Valley (areas not within the high voltage transmission line easement); • Mannering pit top area (including ventilation shaft and fan site); and • Chain Valley ventilation shaft and fan site. Post-mining land use for this domain is a return to native bushland as part of Sunset Energy buffer lands for Vales Point Power Station.
1B	Incorporates the Mannering and Chain Valley downcast shaft site locations. Post-mining land use for this domain is to provide grassed open space consistent with surrounds and in consideration of future land uses.
2A	Area of the coal stockpiles and some coal handling facilities within the pit top areas. Post-mining land use for this domain is a return to native bushland as part of Sunset Energy buffer lands for Vales Point Power Station.
3A	Area of the water management structures within the pit top areas. Post-mining land use for this domain is a return to native bushland as part of Sunset Energy buffer lands for Vales Point Power Station.
3B	Area of the water management structures within the pit top areas. Post-mining land use for this domain is to provide grassed open space consistent with surrounds and in consideration of current and future land uses (as a high voltage transmission line easement).
3C	Area of the water management structures within the pit top areas, including the pollution control dams and previous water supply dam for firefighting. Post-mining land use for this domain is retention of suitable water management structures for their ecological function and water supply value, where consistent with the overall post-mining land use as part of Sunset Energy buffer lands for Vales Point Power Station.

Table 2.3 lists the size of each domain, the major items of infrastructure within the domain and, where relevant, any specific the activities required to demolish and remove the assets.

Table 2.3: Domain Asset Register

Domain Code	Domain Area	Assets Items	Key Demolition and Removal Activities
1A	17.5 ha	Chain Valley pit top: • Men and materials drift • Conveyor drift • Workshop and store • Control room • Bunded storage areas and sumps • Air compressors (and containing shed). • Operations office • Bathhouse • Carpark • Aerated wastewater treatment system and septic systems • Training office • Administration office • Potable water tanks • Old haulage shed • Haulage room and switch room • Switch yard/Sub-station • Tube bundle monitoring room • Cable belt switch room • Conveyors and gantries • Diesel storage containers • Weighbridge and associated sheds • Hardstand area • Chemical storage sheds • Cable shed • Oil water separator • Upcast shaft site and main ventilation fans • Ventilation fan switchroom • Fencing Mannering pit top: • Main office block • Bath house, inclusive of report room and lamp cabin • Tube bundle monitoring room • Engineers offices • Cable shed • Workshop, inclusive of store and fire station • Men and materials drift • Number 1 winder room (men and materials) • Conveyor drift • Number 2 winder room (conveyor) • Coal crushing facility (including rotary breaker) • General conveyor and gantries • 1000t final product bin • Overhead stack out gantry • Reclaim tunnel and conveyor	General demolition/removal of structures Sealing, Backfilling and capping of drifts and shafts. Backfilling of tunnels and excavations Management of potentially contaminated soil. Management of combustible material. Disconnection from AusGrid 11kV supply Disconnection from Central Coast Council water supply Disconnection of telecommunications services

Domain Code	Domain Area	Assets Items	Key Demolition and Removal Activities
		• Drainage structures • Material storage areas • Substation and switch room • Storage sheds • Diesel workshop • Stonedust storage shed • Diesel storage shed • Pollution control sumps • Sewage pump station, vents and pipeline • Oil water separator and underground storage tank • Water tanks • Unpaved hardstand • Mine ventilation fans and upcast shaft • Powerpoles and overhead lines • Concrete hardstand • Paved bitumen carpark and roads • Perimeter Security Fencing • Various surface and underground services include electricity, potable water and telecommunications	
1B	0.17 ha	Mannering downcast shaft site; • Downcast shaft • Fencing Chain Valley pit top area (within the high voltage transmission line easement); • Sediment dams • Drainage structures • Downcast shaft • Fencing	Sealing, Backfilling and capping of shaft. General demolition. All dams/ponds and associated drainage structures to be backfilled, re-profiled or removed.
2A	4.9 ha	Mannering coal stockpile area; • Coal stockpile area Note: the associated coal handling infrastructure at Mannering (e.g. bin, conveyors, gantry and reclaim tunnel) is incorporated into the 1A domain. Chain Valley coal stockpile area; • Coal stockpile area • CPP facilities and switch room • 250 tonne product bin • 1000 tonne product bin • Weighbridge • Concrete sumps and subsurface drainage	Recovery and disposal of coal material from stockpile. Management of combustible material. Disconnection of services General demolition/removal of structures. Management of potentially contaminated soil.
3A	1.7 ha	Chain Valley pit top area; • Sediment dams • Drainage structures	Removal of drainage and monitoring infrastructure All dams/ponds to be backfilled.

Domain Code	Domain Area	Assets Items	Key Demolition and Removal Activities
		Mannering water management: • Pond 1, Pond 2, Pond 3	
3B	2.2 ha	Chain Valley water management (within the high voltage transmission line easement)	All dams/ponds to be backfilled.
3C	1.3 ha	Chain Valley water management: • Dam 3 • Dam 11 • Dam 13 Mannering water management: • Pond A. • Pond B • Former Firefighting Supply Dam.	Dams to be retained for ecological functions and water supply following mine closure Modification and use of dams/ponds as appropriate for use as sediment dams during rehabilitation. Firefighting Supply Dam to be retained without modification.

2.3 Activities over the MOP term

Activities to be undertaken over the MOP term of 1 August 2020 to 31 December 2023 are summarised below.

2.3.1 Mineral Exploration

There is mineral exploration planned in the MOP period for the purposes of defining underground coal mining resources and associated data collation to assist with mine planning. The initial exploration program includes low intensity activities of geological reconnaissance mapping and airborne (e.g. Magnetometer Figure 2.2) surveying and other activities as mentioned in clause 10 of the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007.

There is surface drilling planned to be conducted during the MOP period. An indicative exploration program was presented to MEG in the Concept Project Development Plan (Figure 2.4). The location, number and purposes of these boreholes are yet to be fully defined as their location/s will be based upon on variety of factors; drill hole spacing and data availability, field reconnaissance, geological and geophysical surveys and mapping, possible environmental and community impacts and constraints. The purposes of this drilling will be for gathering groundwater, geotechnical or exploration related data for mine planning. Although not deemed exploration, a groundwater monitoring program will be conducted to provide baseline groundwater data (Figure 2.4a) which will include similar sampling and data acquisition. Drill planning and risk assessment will be undertaken to minimise environmental and community impacts. Existing cleared tracks and sites will be utilised where possible to minimise impact and external sumps will be used during the drilling process to minimise the chance of contamination.

Shallow holes for the purposes of groundwater monitoring and piezometer installation may be drilled by hand auger or light vehicle mounted drilling equipment. Deeper boreholes will require drilling from a truck mounted drill rig to recover chip or core samples. Geotechnical and/or Exploration boreholes are drilled to acquire coal quality, gas, groundwater, geotechnical samples and data. Wireline geophysical logging will be undertaken once the hole has been drilled. There may be a requirement for groundwater and geotechnical monitoring equipment to be placed in the hole in order to gather baseline data over a period of time.

Once the boreholes have been identified as not being required for further analysis and data collection they will be sealed and rehabilitated as per the current and applicable sealing and rehabilitation standards.

As part of condition 28. SSD5465 development consent an Exploration Activities and Minor Surface Infrastructure Management Plan is required to be developed over the consent area.

The Plan will detail include a description of the measures to be implemented for: managing exploration activities; managing construction and operation of minor surface infrastructure and associated access tracks; consulting with and if necessary compensating affected landowners; assessing noise, air quality, traffic, biodiversity, heritage, public safety and other impacts; beneficial re-use or flaring of drained hydrocarbon gases, wherever practicable; avoiding significant impacts and minimisation of impacts; avoiding or minimising impacts on threatened species, populations or their habitats and EECs; minimising clearance and disturbance of native vegetation (including seagrasses); minimising and managing erosion and sedimentation and rehabilitating disturbed areas.

This management plan will be developed and implemented during the MOP term. There may be some geophysical and underground exploration drilling activities associated with the current approved mining area and seam/s.

Exploration activities are planned for outside the currently approved Chain Valley Colliery and Mannering Colliery development consents. Environmental Assessments, rehabilitation cost estimates and regulatory forms for these exploration activities will be completed as required.

Exploration or environmental assessment activities planned in the Munmorah State Conservation Area and consultation with the Resource Regulator and National Parks Wildlife Services (NPWS) commenced in April 2020. Further consultation will occur during the MOP period on exploration planning, activities and rehabilitation.

Delta Coal will seek appropriate permits, licences, approvals and consents as required under the EP&A Act, Mining Act, NPWS Act and associated legislation.

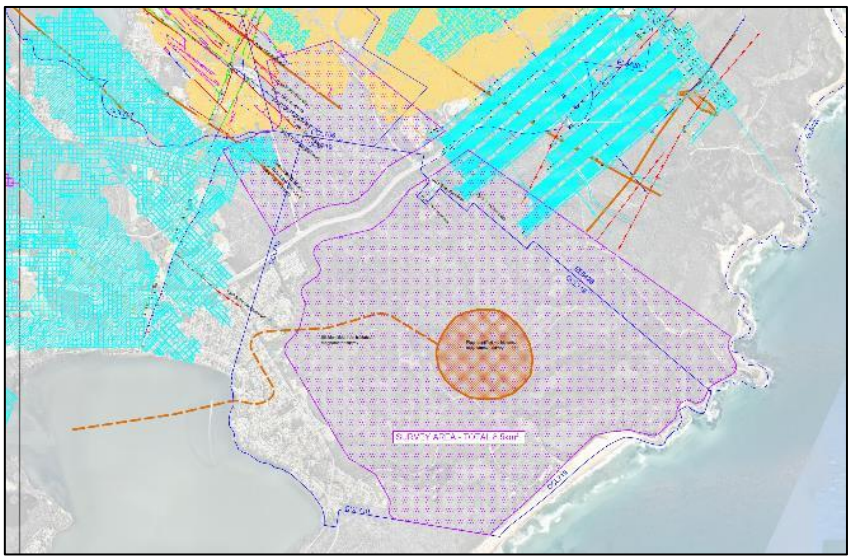

Figure 2.2: Proposed drone aerial magnetic survey over the Munmorah State Conservation Area for igneous intrusions presented in the Conceptual Project Development Plan presentation in June 2020

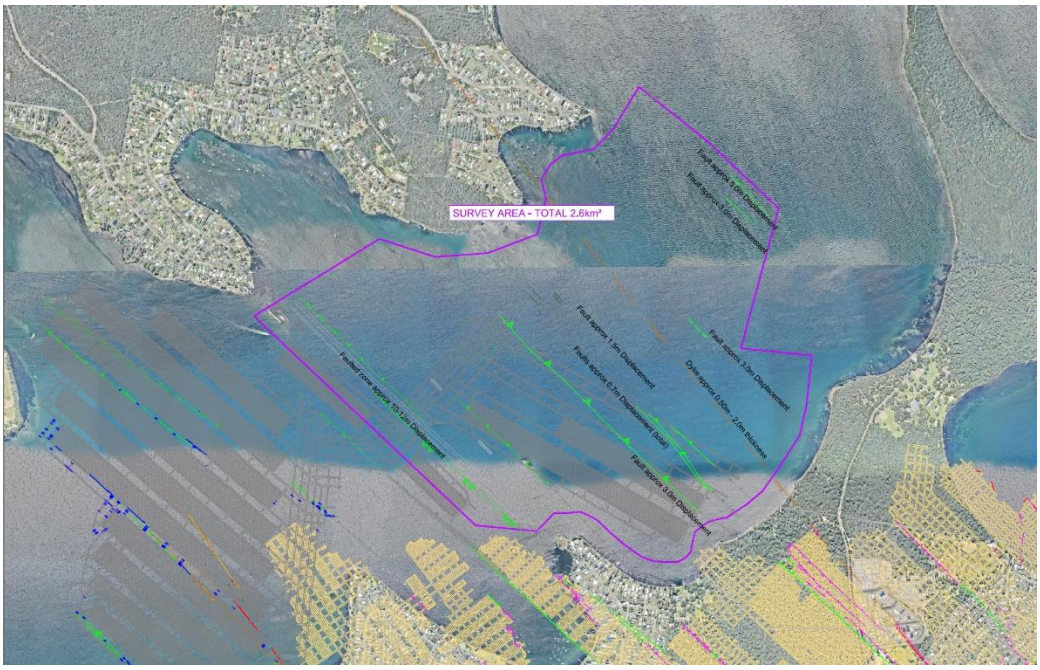

Figure 2.3: Proposed drone aerial magnetic survey over Lake Macquarie for igneous intrusions over the Northern Mining Area

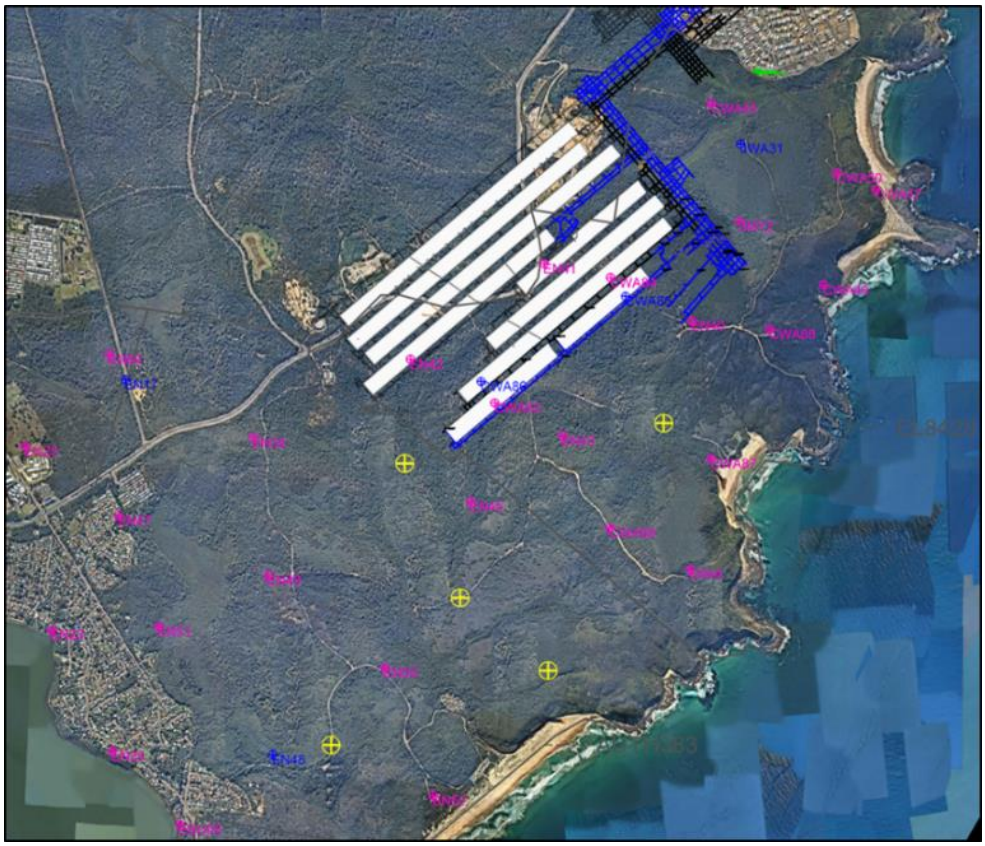

Figure 2.4: Indicative exploration drill hole plan presented in the Conceptual Project Development Plan presentation in June 2020

Figure 2.4a: Indicative groundwater monitoring drill hole location plan

2.3.2 Construction

The surface facilities at both the Chain Valley Colliery and Mannering Colliery pit tops have largely remained in place since their construction in the 1960s. No major new construction activities are proposed during the term of this MOP.

Potential minor upgrades and modifications to surface infrastructure at the Chain Valley pit top that were approved as part of the Mining Extension Project (SSD-5465) may be undertaken during the term of this MOP. Any new constructions or alterations will be undertaken in accordance with the respective approvals in place at each site.

The construction works are planned to be undertaken during the term of this MOP will be of a relatively minor nature and be focused on maintaining continuity of operations as approved.

As part of the EPL1770 Pollution Reduction Program 8, a sewerage pump station and pipeline system is being planned for construction from CVC pit top infrastructure to Tall Timbers Road into the Central Coast Council's sewerage system. CC Council approved the development application in December 2020.Construction activities will commence within the MOP period.

Due to a staged increase in employee levels at CVC and a decrease in employee levels at MC there is a requirement to increase space to the existing CVC bath house facilities, minor additions or amendments to these facilities are being undertaken to cater for additional employees reporting to the CVC Pit Top.

The CVC carpark is currently a gravelled surface and there is a proposal for resealing this surface with a two coat bitumen seal. This will provide an improvement for health and safety for employees and will provide an improvement in water quality exiting site during rainfall events from this hardstand area. Some vegetation clearing or pruning will be required as part of the above construction activities.

Figure 2.5: Proposed Sewer Pipeline installation

2.3.3 Mining operations

Mining activities within this MOP term will be consistent with those approved under the Chain Valley Development Consent (as modified) and the Mannering Project Approval (as modified).

First workings and secondary extraction by miniwall and pillar mining will continue within the Chain Valley Development Consent area. A transition from miniwall mining methods back to the historical Bord and Pillar mining methods will occur during the MOP period. Modification 3 to the Chain Valley Colliery Development Consent recognises this change in mining method. Bord and Pillar first workings are planned to extend to areas under the Morisset Peninsula as approved under Modification 4 of the Chain Valley Colliery Development Consent. Plan 2 shows the existing and proposed mine development at the end of the MOP term.

Ancillary mining works in the Wallarah seam workings and Great Northern seam workings and interconnected shafts and drifts continue as maintenance and continued access to these areas is required for inspection, ventilation, strata control and mine dewatering activities.

Mining activities within the Mannering approval boundary will be limited to those required to operate the underground linkage and supporting tunnel network to allow coal conveyance, travel and ventilation to the Mannering pit top.

2.3.3.1 Extraction Plan

An extraction plan covering Miniwall Panel's S2 and S3 was approved by DPIE in 2019. An extraction plan for Miniwall Panel S4 was approved by DPIE on 22 June 2020. An extraction plan for Miniwall S5 and Northern Pillar Area Extraction plan was approved by DPIE on 6 April 2021. Plan 2 shows the existing and proposed mine development at the end of the MOP term. Secondary Extraction proposed in the MOP period is to be undertaken in the Fassifern seam below Lake Macquarie. Geotechnical design is undertaken to determine the secondary extraction geometries as a part of the Extraction Planning process. The first workings and secondary extraction geometries take into consideration overlying workings, surface features, subsidence, inrush potential, pillar creep and windblast.

Table 2.4: Miniwall Scheduling

Miniwall Panel	Planned Start Date	Planned Finish Date
S3	6/04/2020 (actual)	25/7/20 (actual)
S4	1/8/20 (actual)	25/02/21 (actual)
S5	10/04/21 (actual)	18/08/2021

Table 2.5: Pillar Extraction Scheduling

Panel	Extraction Start date	Extraction End date	Estimated duration (months)
HB-W1	Oct 2021	December 2021	2
HB-W2	June 2022	Nov 2022	5

2.3.4 Overburden/Rock Emplacement

A negligible amount of waste from the processing plant in the form of rock, timber, steel and plastic from the Mannering CHP is managed by the waste management contractor. The waste is removed from site to a licensed waste management facility for recycling or landfill.

2.3.5 Processing residues and tailings

It is planned that Mannering Colliery will process the ROM coal from Chain Valley Colliery during the MOP period. Both Chain Valley Colliery and Mannering Colliery have Coal Handling Plants which can crush and size the ROM coal but no washing of coal takes place. There are no tailings emplacement areas designated on site. Any minor fine coal accumulations are collected in sediment traps and drains and are returned to the product coal stockpile after dewatering.

2.3.6 Waste Management

Both Chain Valley Colliery and Mannering Colliery have a total waste management contractor engaged for both operations. This is to allow for the efficient management and reporting of waste, and also greater recycling through the sorting of waste brought to the surface from underground. The recyclable material is separated out of the general waste into allocated bins for paper, steel and timber. Purpose built oil drainage bins are placed in the Oil Storage Sheds and the wash down bay for the collection of waste oil. Waste oil is removed from site by the Waste Management Contractor as per the waste tracking guidelines. Waste material from the Coal Handling Plant refuse bin is classified as general waste and transported to the appropriate waste facility by the waste contractor. There is no coal processing waste stored on site.

2.3.7 Decommissioning and Demolition activities

Following the acquisition of assets from LakeCoal, Delta Coal has rationalised existing legacy plant and structures so as to reduce risk to workers and other persons.

Delta Coal aims to continue with removal of legacy plant within the existing surface footprints of the Chain Valley Colliery and Mannering Colliery operations during the MOP period.

All demolition work will be carried out in accordance with Australian Standard AS 2601-2001: The Demolition of Structures, or its latest version as conditioned in the development consents.

2.3.8 Temporary Stabilisation

There are no temporary stabilisation works currently scheduled for the term of the MOP.

2.3.9 Progressive rehabilitation and completion

The mine cottages were demolished and rehabilitated in 2020. Surface Coal handling structures were also demolished during 2020. Additionally, a number of activities proposed in this MOP have subsequently been completed without impact, and are reflected in Figure 2.6.

Project Timeline

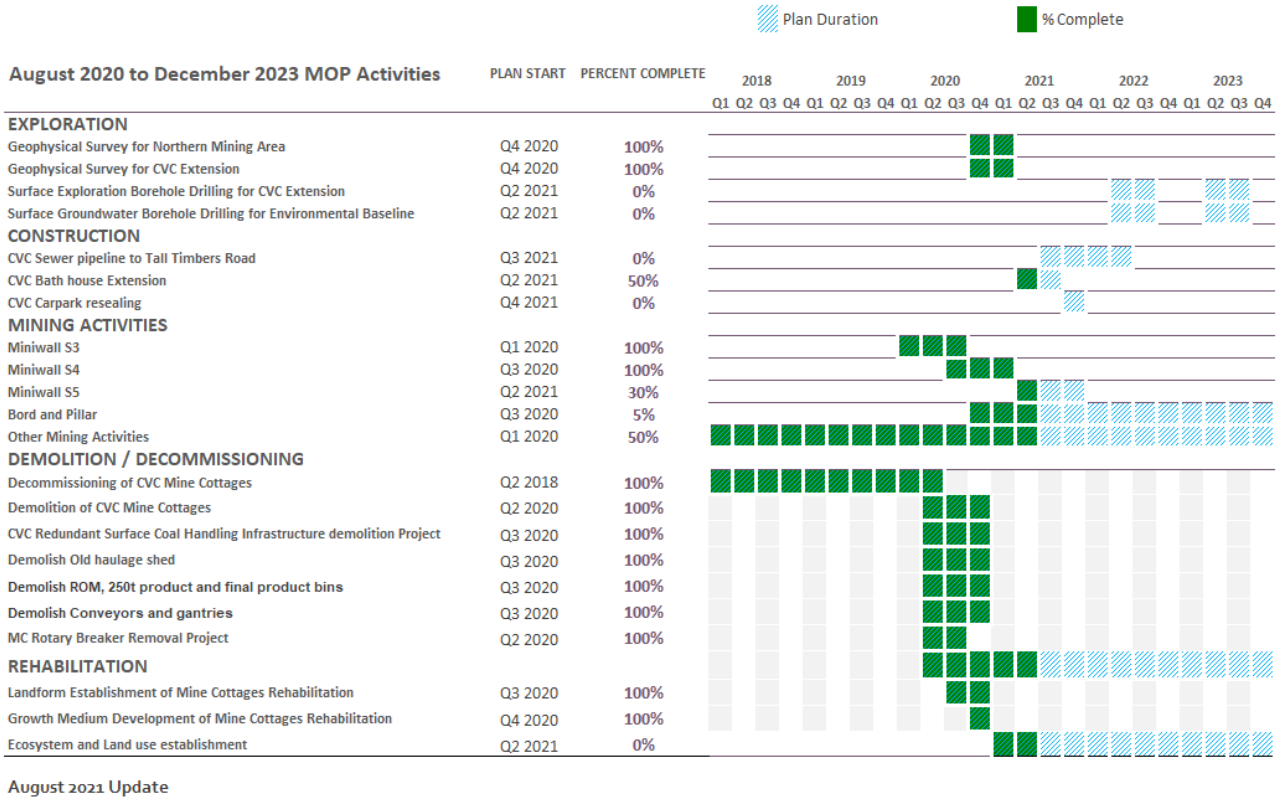

Figure 2.6: Indicative Timeline for MOP Activities

2.3.10 Material production schedule during MOP term

Forecast and Actual Material production for the MOP term is summarised in **Table 2.**.

Table 2.6: Material Production Schedule during the MOP Term

Material	Unit	Year 1 1 August 2020 – 31 Dec 2020	Year 2 1 Jan 2021 – 31 Dec 2021	Year 3 1 Jan 2022– 31 Dec 2022	Year 4 1 Jan 2023– 31 Dec 2023
Stripped topsoil	m^3	N/A	N/A	N/A	N/A
Rock/overburden	m^3	N/A	N/A	N/A	N/A
ROM coal	Mt	0.75	1.49	1.37	1.54
Reject material	Mt	0.00	0.00	0.00	0.00
Product	Mt	0.61 (Actual)	1.50	1.50	1.50

3 Environmental Issues Management

3.1 Environmental Risk Assessment

As the Chain Valley and Mannering pit tops and mining areas were previously located within separate Colliery holdings and operated under separate approvals (and associated conditions) granted under the EP&A Act, operations, separate risk assessments have previously been undertaken. **Table 3.1** summarises the multiple environmental risk assessments, which have been completed since 2014 pertaining to the domains applicable to this MOP. Prior to the exploration drilling program, a comprehensive Health, Safety, Environment and Community risk assessment will be completed to identify, assess and manage associated risks. This risk assessment will help form the basis of the Delta Coal Activities and Minor Surface Infrastructure Management Plan which is a requirement of the recent modifications.

Table 3.1: Summary of Recent Environmental Risk Assessments

Type	Project	Date	Summary
Environmental Risk assessment	Chain Valley Colliery and Mannering Colliery MOP	August 2018	Undertaken as part of the preparation of the 2018 – 2020 MOP.
Environmental Risk assessment	Chain Valley Colliery and Mannering Colliery MOP Amendment 1	Dec 2018	Undertaken as part of the preparation of the 2018 – 2020 MOP Amendment 1.
Environmental Risk assessment	Chain Valley Colliery and Mannering Colliery MOP	March 2020	Summary of key Environment and Community aspects and impacts. Section 3.2 provides an overview of the environmental risks and controls identified from the most recent assessment.

3.2 Environmental Risk Management

Delta Coal are committed to operating in an environmentally responsible manner as detailed in the Company's Environment Policy. Environmental management is supported through the implementation of the following approved management plans.

Delta Coal

- Environment Policy
- Environment Management Strategy
- Environmental Monitoring Program

Chain Valley Colliery

- Chain Valley Noise Management Plan
- Chain Valley Air Quality Management Plan
- Chain Valley Biodiversity Management Plan
- Chain Valley Water Management Plan
- Chain Valley Heritage Management Plan
- Chain Valley Built Features Management Plan
- Chain Valley Rehabilitation Management Plan
- Chain Valley Colliery Seagrass Management Plan

- Chain Valley Benthic Communities Management Plan
- Chain Valley Road Transport Protocol, which includes the Coal Haulage Traffic Management Plan and Coal Haulage Driver Code of Conduct
- Chain Valley Miniwall S2-S3 Extraction Plan (incl. Appendices).
- CVC Pollution Incident Response Management Plan

Mannering Colliery

- Mannering Air Quality Management Plan
- Mannering Noise Monitoring Program
- Mannering Water Management Plan
- Mannering Land Management Plan
- Mannering Non-Indigenous Heritage Management Plan
- Mannering Aboriginal Cultural Heritage Management Plan
- Mannering Pollution Incident Response Management Plan

3.2.1 Specific Risk relating to Rehabilitation

Table 3.2 identifies where each of the specific items listed in Section 3.2.1 of the ESG3 guideline are addressed in this document. The sections referred to in Table 3.2 contain detail on the controls referred to within the Risk Assessment.

Table 3.2: Specific Risks relating to Rehabilitation

Environmental issue (from Section 3.2.1 of the ESG3 guideline) or site risk assessment	Initial Risk Level (based on existing controls) (low, medium, high or critical)	Residual Risk Level (based on proposed controls) (low, medium, high or critical)	Where addressed in this document
Geology and geochemistry	Medium	Low	Section 3.2.1
Landform Stability	Low	Low	Section 3.2.10
Material prone to spontaneous combustion	Medium	Low	Section 3.2.3
Material prone to generating acid mine drainage	Low	Low	Section 3.2.4
Mine Subsidence	Low	Low	Section 3.2.5
Erosion and sediment control	Medium	Low	Section 3.2.6 and Section 3.2.11
Soil type(s) and suitability (Growth Medium)	Medium	Low	Section 3.2.7
Flora	Medium	Low	Section 3.2.8
Fauna	Medium	Low	Section 3.2.9
Marine ecology (Benthic and Seagrass)	Low	Low	Section 3.2.5
Weed proliferation	Low	Low	Section 3.2.8
Pest animals	Low	Low	Section 3.2.9

Environmental issue (from Section 3.2.1 of the ESG3 guideline) or site risk assessment	Initial Risk Level (based on existing controls) (low, medium, high or critical)	Residual Risk Level (based on proposed controls) (low, medium, high or critical)	Where addressed in this document
Overburden characterisation	N/A	N/A	N/A
Slopes and slope management	Low	Low	Section 3.2.10
Air quality	Low	Low	Section 3.2.11
Surface water	Medium	Medium	Section 3.2.12
Ground water	Low	Low	Section 3.2.12
Contaminated land and hydrocarbon management	Medium	Low	Section 3.2.13
Hazardous materials	Medium	Medium	Section 3.2.14
Greenhouse gases, methane drainage / venting	Low	Low	Section 3.2.15
Blasting	N/A	N/A	N/A – no surface blasting activities.
Noise	Low	Low	Section 3.2.16
Visual and lighting	Low	Low	Section 3.2.17
Heritage (Aboriginal and European)	Low	Low	Section 3.2.18
Bushfire	Medium	Low	Section 3.2.19
Other – Site security and unauthorised access	Low	Low	Section 3.2.20
Other – Waste (general)	Low	Low	Section 3.2.21

3.2.2 Geology and geochemistry

Coal processing wastes are not produced as coal extracted does not require washing or additional treatment, and all ROM coal production equates to product coal. Some waste materials (timber, plastic, steel, concrete and rock) is recovered from the site magnets and screens which is transferred to a waste facility. The surface facilities areas and surrounds are predominantly in-situ, and are not on emplaced overburden/interburden and hence there are no significant issues created by geochemistry of wastes.

Current approved mining operations are located within the Fassifern Seam, which is part of the Boolaroo Formation within the Newcastle Coal Measures. Overlying the Fassifern Seam are the Great Northern, Wallarah and Vales Point seams (and their associated conglomerates and tuffs), which are part of the Moon Island Beach Formation within the Newcastle Coal Measures. Historically, mining has occurred within one or more of the Wallarah, Great Northern and Fassifern seams at the various mines throughout the Lake Macquarie region.

Previous workings within the Wallarah, Great Northern and Fassifern seams in conjunction with exploration boreholes and geophysical surveys in the area provide a solid base of data regarding regional and local structural features, which have been considered as part of the future mine design.

The coal resource within the Fassifern Seam has a low sulphur content, which makes it suitable for both export and domestic power generation markets. Within the approved mining area, the Fassifern Seam lies at

depth of around 150 to 210 metres (based on known and inferred contour data). The Fassifern Seam is approximately 4.5 to 5.5 metres thick, with the immediate roof and floor comprising a tuffaceous claystone of varying hardness. Mining involves the extraction of a 3.5m section of coal (approximate) beneath the A and B plies. The A and B plies, which comprise approximately 1.0 to 1.2 metres of inferior coal, are left on the roof (Seedsman 2011) dependant on mining conditions. Up to approximately 0.8 m coaly shale is left in the floor. The general geology within the Chain Valley Colliery area is shown on Figure 3.1. There are no recognised aquifers within the stratigraphic sequence, except for the coal seams themselves.

Water quality monitoring will continue in accordance with the Water Management Plan and EPL requirements, which will identify any water quality issues associated with potential leachate from unexpected geochemistry of the coal materials on-site.

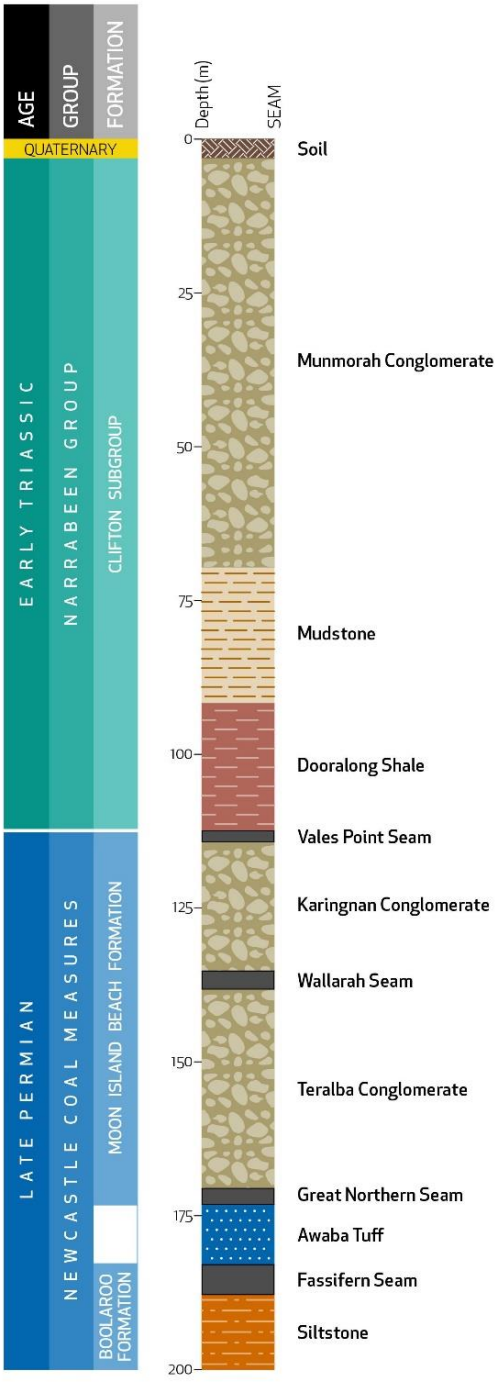

Figure 3.1: General Stratigraphic Column within Colliery Holding area

3.2.3 Material prone to Spontaneous Combustion

The R70 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 Chain Valley Colliery. The self-heating rates of the samples from the Chain Valley Colliery 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 Chain Valley Colliery 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 R70 analysis of the Fassifern seam coal at Chain Valley 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 coal mines. There are no known underground spontaneous combustion incidences in the Fassifern Seam of neighbouring mines or insitu at Chain Valley Colliery. 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.

The incidence of underground spontaneous combustion is addressed within the site specific Spontaneous Combustion Principal Hazard management plan (PMHMP - Spontaneous Combustion). Underground controls to mitigate risk of spontaneous combustion include:

- The mine has no known recorded insitu spontaneous combustion events in its 50+ year history at Chain Valley Colliery.
- A heating was discovered in the Great Northern seam at Mannering Colliery in June 2015
- Spontaneous combustion is considered at the mine design, mine development, mine maintenance and mine closure phases.
- Trigger Action Response Plans (TARPs) have been developed to identify and manage any deviation from normal operating conditions with respect to indicators of spontaneous combustion.
- The mine monitors gases using a multipoint tube bundle gas analysis system.
- Methods to suppress heating from spontaneous combustion include ventilation structure changes (sealing/appliance regulation) and introduction of appropriate, inertinising gases (nitrogen / exhaust gases) and materials (fly ash etc.)
- Regular underground inspections are conducted by Mining Officials.

Surface incidence of spontaneous combustion is considered a minimal risk given seam characteristics and limited stockpiling activities undertaken.

There are some combustible materials throughout the site (predominantly within dam embankments) which, while not prone to spontaneous combustion, still pose a combustion risk when exposed to external heat sources such as bushfires. Bushfire risk is addressed within Section 3.2.18.

Following cessation of mining:

- All remaining saleable coal material will be recovered.
- An assessment of combustion risk over surface areas within all domains, specifically focusing on Domain 2 (Coal Stockpile Area) will be undertaken and recommended actions will be implemented.

3.2.4 Material prone to generating acid mine drainage

The surface facilities areas and surrounds predominantly comprise in-situ materials, i.e. not emplaced overburden/interburden. No geochemical issues have been identified, with water monitoring undertaken in accordance with both EPL 191 and EPL 1770 indicating no acid mine drainage at the monitoring points. Water quality monitoring will continue in accordance with the site Water Management Plans and EPL requirements, which will identify any water quality issues arising from coal materials or other materials on the Chain Valley and Mannering sites.

3.2.5 Mine Subsidence

All secondary extraction is planned to occur beneath Lake Macquarie (Figure 3.2). For the proposed secondary extraction, the total maximum vertical subsidence is modelled to result in a maximum of 780 mm of subsidence. There are no threatened or endangered species or ecological communities impacted by the planned subsidence and negligible environmental impacts are expected due to mining restrictions (seagrass protection barrier and high water subsidence protection barrier) which eliminate impact to the foreshore or land based areas.

Mine workings are also planned beneath Morisset East peninsula in the vicinity of the suburbs of Brightwaters, Mirrabooka and Sunshine.

Condition 9 within Schedule 4 of SSD-5465 also states that:

"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."

A key objective of the mine design is to ensure vertical subsidence within Subsidence Zone A is limited to a negligible amount (considered less than 20mm). To ensure effectiveness of the mine design, monitoring of the land area is proposed via the installation and monitoring of fixed reference points where practical to verify subsidence performance measures.

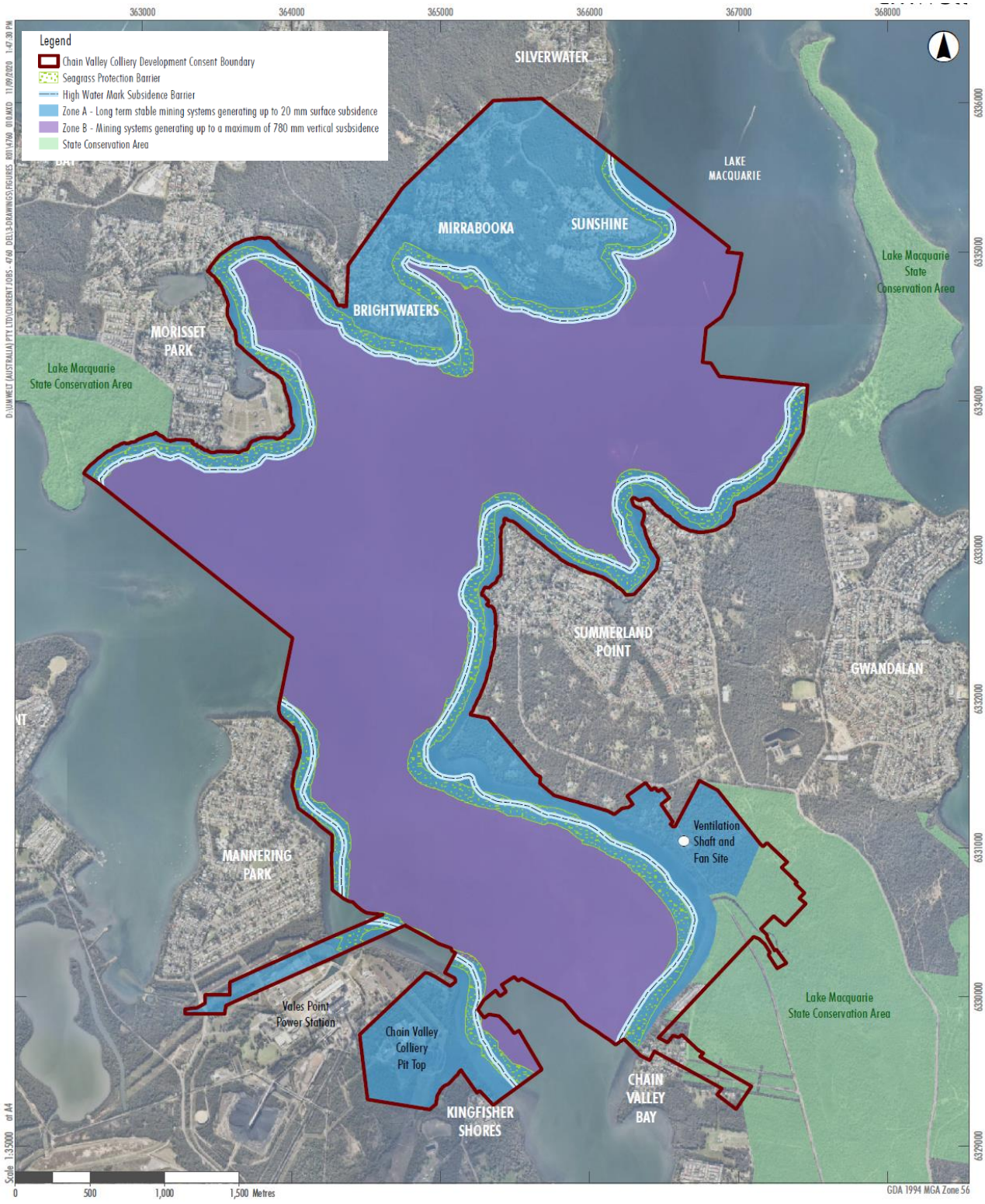

Figure 3.2: Development Layout - Mining areas subsidence management zone figure from SSD 5465

Secondary Extraction is to be conducted in accordance with an approved Subsidence Management Plan or Extraction Plan. The existing MWS5 and NMA extraction plan includes the following management plans; Groundwater Management Plan, Public Safety Management Plan, Built Features Management Plan, Heritage Management Plan, Seagrass Management Plan, Benthic Communities Management Plan and Rehabilitation Management Plan. This extraction plan also includes reference to first workings below the Morisset Peninsula with a vertical subsidence limit of a maximum 20mm. As part of SSD5465 Modification 3 a commitment was made by Great Southern Energy to commission and undertake detailed geotechnical assessments by suitable

qualified geotechnical engineers as part of the company's detailed mine plan design process. A subsidence and geotechnical assessment has been completed for the Miniwall S5, Northern Pillar extraction area and first workings under the approved area of the Morisset Peninsula. Further Geotechnical assessment and peer reviews were completed as part of the SSD 5465 Modification 4 – Morisset Peninsula extension area. The outcomes of these reviews were used to inform design criteria suitable to ensure <20mm subsidence across the NMA extension area.

A Subsidence Monitoring Program was developed in consultation with the Resource Regulator. This monitoring program details the frequency and the types of subsidence surveys. These surveys include traditional foreshore, infrastructure and land based surveys as well as bathymetric surveys. Results from this monitoring is provided regularly to the Resource Regulator Subsidence Engineers via the designated email and portal and also in the Annual Review. If a subsidence incident occurs the Resource Regulator are also notified and provided with an incident report. A Subsidence Management Trigger Action Response Plan (TARP) has been developed to provide adequate adaptive monitoring and management strategies. If a subsidence incident was to occur and required remediation or rehabilitation works the Chain Valley Colliery Rehabilitation Management Plan is the applicable management plan to consult. Chain Valley Colliery Rehabilitation Management Plan was developed in consultation with the Resource Regulator and identifies requirements under the coal mines subsidence compensation legislation to repair built features damaged by mining operations to pre-mining condition or if the owner agrees otherwise.

No secondary extraction is proposed within the High Water Mark Subsidence Barrier (HWMSB), a protection zone around the Lake Macquarie foreshore defined by a 35 degree angle of draw from the high water mark to the seam. Additionally, a Seagrass Protection Barrier (SPB) will be maintained to protect the seagrass communities around the perimeter of the lake: a 26.5 degree angle of draw has been used from mapped the seaward edge of seagrass communities to determine the extent of the barrier (Figure 3.3).

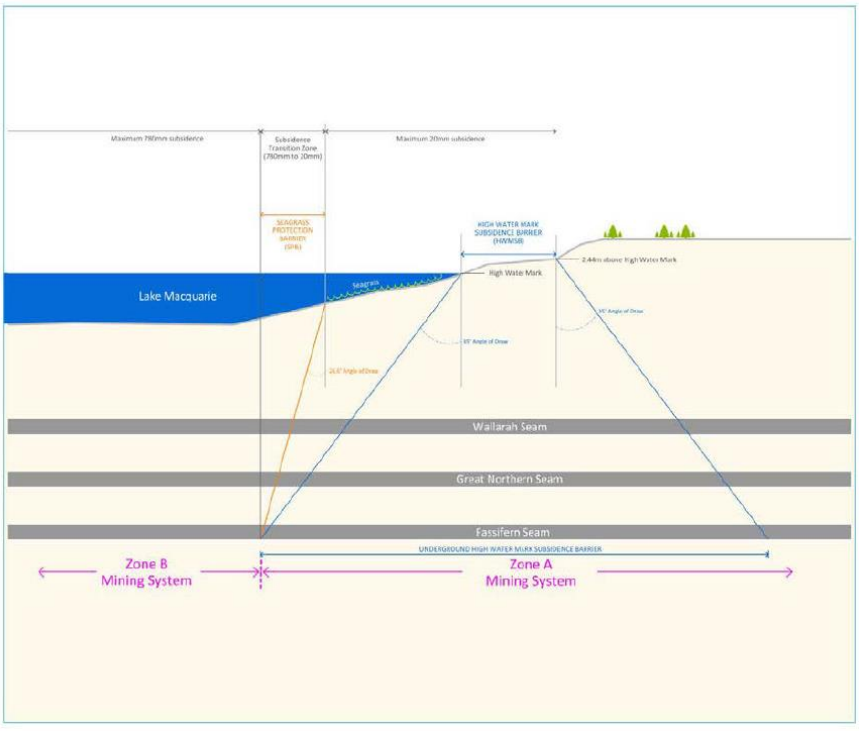

Figure 3.3: High Water Mark Subsidence Barrier and Seagrass Protection Barrier cross section figure from SSD 5465

This same SPB definition has been applied for the Fassifern Seam workings for more than 10 years and to date no subsidence or impact to the seagrass communities has been identified through monitoring. Recent updates to the subsidence models for miniwall and pillar extraction within the Fassifern Seam have accounted for the increase in measured subsidence above that predicted in the miniwall 1 to 12 area. Taking this and the subsidence development mechanisms into consideration, the mine plan for the Northern Mining Area has increased chain pillars sizes to ensure subsidence remains within currently approved limits.

3.2.6 Erosion and sediment control

Erosion and sediment control is managed within the overall water management system for each pit top in accordance with the respective Water Management Plans as described in Section 3.2.12. The Water Management Plans incorporate an Erosion and Sediment Control Plan.

There are no significant changes, clearing or construction work proposed during the term of the MOP that would create potential erosion and sediment control issues. Water quality monitoring and reporting is undertaken in accordance with Chain Valley and Mannering EPLs and Water Management Plan requirements to ensure water discharges comply with the total suspended solids; limit as defined in the EPLs, currently 50 mg/L.

The detailed mine closure plan will include details on the erosion and sediment controls to be implemented for closure activities and identify structures to remain following mine closure. This will be prepared in accordance with “Blue Book” requirements.

3.2.7 Soil type(s) and Suitability

Due to the disturbed nature of the pit top areas there is potential for poorly structured soils or soils with high clay content to be present. Either condition is likely to hamper growth of new plantings by reducing opportunities for root growth and establishment. Where poor conditions are evident, unsuitable soil profiles will be supplemented with virgin excavated natural material (VENM), growth medium ameliorants or suitable top soil distributed from existing stockpiles onsite.

Due to the age of the sites and soil management practices adopted historically, only limited amounts of previously stripped and stored topsoil are available for the rehabilitation of the pit top areas.

Growth media development is detailed within Section 5.3.3.

3.2.8 Flora

The key consideration in relation to flora is the establishment and maintenance of vegetation communities in the post mining landform (see Section 5.3).

Construction, Exploration, Mining and Processing and Demolition activities are planned to occur during the MOP period. Appropriate ecological expertise will be utilised to plan, assess and manage possible impacts to flora.

Whilst threatened flora species are known to occur within the region, none have been recorded on site. It is noted that existing vegetation communities which adjoins the Chain Valley and Mannering infrastructure areas are primarily as follows.

- Mannering pit top - Broad-Leaved Scribbly Gum Open Forest;
- Mannering downcast shaft - Managed exotic grassland;
- Chain Valley pit top - Coastal Open Woodland and managed exotic grassland (within existing high voltage power line easements); and
- Chain Valley upcast shaft - Swamp Sclerophyll Forest.

Sunset Energy, as owner of the land, have indicated that the preferred final land use option for the Mannering and Chain Valley infrastructure areas is to provide an additional buffer zone for VPPS by the demolition and removal of all infrastructure followed by the establishment of vegetation consistent with surrounding bushland.

To further assist with definition of the rehabilitation criteria, the following actions are proposed during the term of this MOP:

- Further definition of completion criteria and performance measures, following monitoring of analogue sites to be included in the Mine Closure Plan

Due to the prior disturbance of the pit top facilities, past conditions have been conducive to the spread of weeds. To control weed populations, weed management is undertaken in accordance with the weed control programs outlined in the Land Management Plan for Mannering and within the Biodiversity Management Plan for Chain Valley. These works are undertaken by suitably qualified contractors who spray weeds or undertake other treatment measures in the correct window periods. The primary focus of weed management activities is the control or elimination of those weeds listed under the Biosecurity Act, 2015. Declared noxious plants are those that have a detrimental effect, or cause serious economic loss to agriculture or harm to the environment and have the likelihood of spreading from their present location(s) to other areas. As identified in the Delta Coal Weed Management Plan, MC Land Management and CVC Biodiversity Management Plans weed control, has and will continue to focus on Lantana, Blackberry, Crofton Weed, Pampas Grass, Bitou Bush, Coolatai, Fireweed, Bamboo and Scotch Thistle.

Site inductions also specifically identify that no unauthorised clearing is to occur.

As detailed in the Section 3.2 Mine Subsidence, seagrass monitoring is undertaken, by a suitably qualified ecologist in Lake Macquarie, as per the Seagrass Management Plan to determine seagrass health, diversity and density and potential impact from mine subsidence on the seagrasses located within the project area. The seagrass monitoring points are also measured for subsidence and bathymetric surveys are undertaken which assists with measuring subsidence limit compliance.

3.2.9 Fauna

Previous environmental assessments and field surveys have identified the following in the vicinity of the surface facilities areas:

- Through database searches - 28 terrestrial or wetland fauna species listed under the *Environmental Protection and Biodiversity Conservation Act 1999* and/or the *Threatened Species Conservation Act 1995*, comprising:
- *Environmental Protection and Biodiversity Conservation Act 1999*: 14 species (three endangered species and eleven vulnerable species); and
- *Threatened Species Conservation Act 1995*: 17 species (seven endangered species, ten vulnerable species) and one endangered population, with 3 species listed under both pieces of legislation.

The likelihood of the listed species occurring in the pit top areas and surrounding areas was assessed on the basis of their distribution patterns, habitat preferences, and past records, with the following species assessed as having a moderate to high potential to occur in or around the surface facilities areas:

- Amphibians
  Crinia tinnula, Wallum Froglet

- Birds
  Anthochaera phrygia, Regent Honeyeater
  Calyptorhynchus lathami, Glossy Black-cockatoo
  Lathamus discolour, Swift Parrot
  Ninox connivens, Barking Owl
  Ninox strenua, Powerful Owl
  Pandion haliaetus, Osprey
  Tyto novaehollandiae, Masked Owl
  Tyto tenebricosa, Sooty Owl

- Mammals
  Falsistrellus tasmaniensis, Eastern False Pipistrelle
  Miniopterus australis, Little Bentwing-bat
  Miniopterus schreibersii oceanensis, Eastern Bentwing-bat
  Mormopterus norfolkensis, Eastern Freetail-bat
  Petaurus norfolcensis, Squirrel Glider
  Pteropus poliocephalus, Greyheaded Flying-fox

All of the above listed species could potentially visit or use the pit top areas due primarily to the range of vegetation communities within and contiguous with the pit top area, including the Lake Macquarie State Conservation Area, and the high mobility of most species listed. Field surveys in 1997 and 2012 have identified the Squirrel Glider (*Petaurus norfolcensis*), Grey-headed Flying Fox (*Pteropus poliocephalus*) and the Osprey (*Pandion haliaetus*) within or adjacent to the surface facilities sites.

During biodiversity surveys and environmental walkover inspections presence of pest animals is noted and management controls are implemented if required.

No clearing activities that would impact threatened fauna are currently proposed during the term of the MOP.

Benthic communities monitoring is undertaken, by a suitably qualified ecologist in Lake Macquarie, as per the Benthic Communities Management Plan to determine benthic communities health, diversity and density and potential impact from mine subsidence on the benthic communities located within the project area. The benthic communities monitoring points are also measured for subsidence and bathymetric surveys are undertaken which assists with measuring subsidence limit compliance.

3.2.10 Slopes and Slope Management

With the exception of constructed dams, the site areas within the domains identified within this MOP comprise stable terraces with intervening shallow slopes or retaining walls formed during the site establishment works undertaken in the 1960s and subsequently, with reshaping through the use of localised cut and fill to occur during the shaping of the final landform.

More extensive cut and fill may be required in the vicinity of those dams at both the Chain Valley and Mannering pit tops which are not to be retained in the final landform.

3.2.11 Air quality

Management of air quality is undertaken in accordance with both the Mannering and Chain Valley Air Quality Management Plans, which are implemented to comply with the requirements of MP06_0311 and SSD-5465 respectively, with both depositional dust and real-time particulate monitoring undertaken.

Control measures implemented to minimise the potential for dust generation include:

- Induction and training in responsible procedures for environmental protection;
- Vacuum sweeping of roads and paved surfaces;
- Enclosure of numerous conveyor systems and transfer points;
- Use of a water cart;
- Water sprays at various points along the conveyor systems;
- Limiting speeds of vehicles, plant and equipment; and
- Use of tarps/covers for all coal haulage vehicles, whether hauling on public or private roads.

Air quality limits are prescribed within the Project Approval and Development Consent, with historic monitoring indicating that levels of dust generation are well below the prescribed limits. Air quality results are obtained monthly and provided within monthly environmental reports, which are made available on the Delta Coal website. Annual results are also provided in the Annual Reviews, which are also made publicly available on the website.

Delta Coal will continue to employ the management strategies and mitigation measures that are currently in place to minimise air quality emissions and to monitor air quality in accordance with the approved management plans.

3.2.12 Water Management (Surface and Ground water)

Due to the separate locations of the two pit top areas, water management details vary significantly between the sites, and accordingly and are presented as two discrete subsections below. Section 3.2.12.1 covers the Mannering pit top while Section 3.2.12.2 covers the Chain Valley pit top.

3.2.12.1 Mannering Water Management

Sources of water at Mannering include potable water supply by Central Coast Council, rainfall runoff from the surface facilities and groundwater inflow to the underground mine workings. The primary water demands at Mannering are for underground operations, dust suppression, machinery wash-down, fire-fighting storage and staff amenities. No coal washing is undertaken at Mannering.

Delta Coal holds Water Access licence (WAL40461) for the purpose of mine dewatering up to 450 ML annually.

The initial objective of the Mannering water management system is the separation of clean and dirty water, with surface water management based on the following key water management strategies:

- Diversion of clean surface water runoff away from areas disturbed by surface infrastructure;
- Collection of surface water runoff from disturbed areas in catch drains and its direction to sediment traps and settlement ponds for detention and settlement of suspended particles prior to discharge off-site; and
- Collection of runoff from industrial areas in catch drains and direction to the settlement ponds for control of suspended sediment prior to discharge off-site.

The key features of Mannering Colliery's surface water management system are:

- Settlement Pond B system (comprising Ponds 1, 2 and 3 and Pond B), with a combined capacity of 7.52 megalitres.

Mannering's EPL 191, which includes both volumetric and concentration limits, permits the discharge of water from the site via a licensed discharge point, LDP1 (overflow from Pond B) into an unnamed creek and subsequently Lake Macquarie. LDP1 is licensed to discharge a maximum of 4,000 kilolitres per day. **Plan 1D** identifies the built features associated with both the Mannering and Chain Valley pit tops, Mannering licenced discharge point LDP1 is shown of **Plan 1D** with the prefix MC.

All mine water and runoff from the south and east of the surface facilities, with the exception of runoff from the car park area, is directed via drive-in sediment sumps to the Settlement Pond B system. This system comprises four in-series sediment control ponds, being Ponds 1, 2 and 3 and Pond B, and facilitates sediment detention and settlement. The water that passes through this system is discharged off-site via LDP1.

The sediment control dams are proactively kept at low levels to maximise available storage capacity prior to rainfall events, i.e. enable detention and storage of rainfall runoff until it is of a suitable quality to be discharged. Once of a satisfactory quality, a valve is opened on Pond B to release water offsite via LDP1 and then closed to provide storage for the next rainfall event.

Delta Coal undertakes water quality monitoring at LDP1 and a location downstream of LDP1. Monitoring is undertaken monthly in accordance with EPL requirements and currently includes analysis of conductivity, oil and grease, total suspended solids and pH. Results are reported publically on the Delta Coal website on a monthly basis with more details and trends provided on an annual basis in the Annual Review, which is also made available on the website.

Water entering the linkage between Chain Valley and Mannering Collieries, is directed to and managed through the Chain Valley water management system. With the exception of this, water released from the coal seams and surrounding strata collects in the Mannering underground workings which, combined with any additional run off from water used in the mining process, is pumped from the workings to the surface.

The mine water collects at low points in the workings and passes through an extensive goaf system that allows filtration and settlement prior to pumping to the surface, where real time monitoring for turbidity is undertaken prior to the water being directly pumped to LDP1. If the real time monitoring determines that the water quality is unsuitable for discharge (a turbidity reading of above 40 NTU) then it causes the underground pump to shut down.

3.2.12.2 Chain Valley Water Management

Sources of water at Chain Valley include potable water supply by Central Coast Council, rainfall runoff from the surface facilities and groundwater inflow to the underground mine workings. The primary water demand at Chain Valley is for underground operations, dust suppression, machinery wash-down and amenities. No coal washing is undertaken at Chain Valley.

The most significant input to the Chain Valley water management system is the groundwater pumped from the mine workings, which currently averages approximately 6 ML/day. However, dewatering is expected to reach 10.5 ML/day with the full development of the mine as currently approved. Delta Coal holds Water Access licence (WAL41508) for the purpose of mine dewatering up to 4443 ML annually.

The underground mine water originating from the Wallarah, Great Northern and Fassifern seams and adjacent strata migrates naturally into the underground mine water management network and is pumped to a central underground sump area before being pumped to a purpose underground storage dam. It is then pumped to the surface and mixed with septic treated bathhouse wastewater and storm water runoff in the dams to the east of the pit top area, as shown on **Plan 1D**.

The dams act as a series of settling and diffusing ponds prior to the water discharging into an un-named waterway which leads to Lake Macquarie. Chain Valley Colliery's EPL 1770 permits the discharge of up to 12,161 kilolitres of water per day (85 ML per week). The water monitoring required under the licence is undertaken on a monthly basis from the monitoring point designated by the licence and shown on **Plan 1D.**

In order to minimise the volume of clean water affected by the Colliery and subsequently reduce the volume of dirty water that requires management, clean run-on water is diverted where possible into clean water drainage lines to be directed off-site. This not only reduces the potential for erosion to occur on disturbed areas, but also reduces the pressure on the dirty and mine water management controls, which are required to treat sediment-laden runoff to an acceptable standard prior to discharge.

All surface water runoff potentially containing sediment; septic treated bathhouse wastewater; treated water from the oil water separator and underground mine water is captured by the site sediment control dams prior to discharge under EPL 1770. These dams have been constructed with a mixture of earth, crushed rock, crushed recycled brick and stone and are interconnected through a series of overflow pipes and spillways. The ponds ultimately discharge via an erosion protected discharge point into native vegetation and flow to an unnamed tributary prior to draining into Lake Macquarie on the western shoreline of Chain Valley Bay.

As shown on **Plan 1D**, water is directed through the treatment ponds from a number of main inlet locations. Runoff from the stockpile area is collected primarily by dams D1, D2 and D6 and is combined in D4 and D5, which then discharges into D9. Runoff from the storage yard is directed to D11, D12 and D13 before overflowing into D9. The underground mine water is essentially salt water and results from the infiltration of ground water into the mines workings. This water is pumped to a pit adjacent the compressor house where it combines with the septic treated wastewater from the bathhouse, the treated compressor condensate water and runoff from the ROM bin area. From this pit the water is piped to D8 for settling and diffusion. Water within D8 spills into D7 via a spillway at the southern end of the pond. However, due to the construction materials used, an unknown amount of water also diffuses through the dam wall. The water in D7 flows into D9 in a similar manner. In D9 the underground water is combined with the runoff from other areas on site. The primary spillway from D9 to D10 is at the northern end of D9. Once in D10, the water travels over a shallow buffer spillway to the main discharge spillway and offsite.

Table 3.3 lists the water storages and sediment dams which form part of the site water management system, together with their capacities as determined by detailed survey undertaken by Pearson and Associates Pty. Ltd in 2009.

Table 3.3: Chain Valley Water Storage Volumes

Dam ID	Storage Capacity (KL)	Dam ID	Storage Capacity (KL)	Dam ID	Storage Capacity (KL)
D1	80.3	D6	Unknown	D10	4801.5
D2	50.5	D7	3855.6	D11	296.8
D3	284.1	D8	2933.3	D12	229.1
D4	547.4	D9	3796.4	D13	168.4
D5	770				

In 2015, the spillway at Chain Valley's Licenced Discharge Point was upgraded and now has the capacity to pass the equivalent of a 1:100 year ARI rainfall event.

The ponds provide improvement to the site wastewater and runoff quality through the settlement of fines and suspended solids and prevention of off-site discharge of potential hydrocarbon spills to Lake Macquarie. Based on the volume of the ponds and the average daily discharge, the estimated residence time of the water in the control ponds is currently 1 – 2 days.

Historically these control ponds have been effective at controlling the water quality to meet to the conditions of the EPL with water quality monitoring undertaken to ensure that an exceedance of any relevant limit is detected and appropriate actions taken to prevent a reoccurrence. Drains and dams that accumulate sediment are scheduled for quarterly cleaning as part of the Colliery's work order system, which ensures adequate storage levels within the dams and the functionality of the drains are maintained.

3.2.13 Contaminated land and Hydrocarbon management

Management of potential land contamination is afforded by the following controls:

- Bunding around the main hydrocarbon storage tank;
- Storage of hydrocarbons within bunded areas;
- A designated covered and bunded area for the draining and disposal of oil drums;
- The use of a washdown sumps and oil separator systems;
- Availability of hydrocarbon absorbent material and emergency spill kits;
- Weekly inspection of spill kits by waste contractor; and
- Training and awareness.

A Phase 1 Environmental Site Assessment (ESA) has been completed for the Mannering pit top area, which identified areas of potential contamination based on desktop review. While a Phase 1 ESA has not yet been undertaken for the Chain Valley pit top area, given the similarity of the operations, it is likely these findings would be similar.

Phase 2 investigations and assessments are not planned to be carried out until the decommissioning stage at end of mine life. Potential areas of investigation would be those where hydrocarbons and other chemicals are stored and used, such as areas surrounding the diesel storages and the surface workshops. The development of a Remedial Action Plan following the Phase 2 assessment would occur, if required, based on the results from the site assessment.

Any contaminants identified that exceed Australian Standards for the final land use option will be remediated on site or disposed of in an appropriate and safe manner as identified in the remedial action plan that would

be developed, if required, following the determination of the extent and quantity of contaminated material needing remediation.

Bulk hydrocarbon materials are stored within dedicated storage areas, with emergency spill stations located nearby.

Training in spill response is provided as part of the induction programs for both Mannering and Chain Valley, prerequisites before undertaking any work at the respective areas. Pollution Incident Response instructions are currently contained in the site Emergency Management Plan to respond to pollution incidents.

3.2.14 Hazardous materials

A hazardous chemicals and dangerous goods register is maintained onsite to assist in management of risks to health and the environment. This register utilises an online chemicals database 'ChemAlert', which provides for ease of access to detailed information pertaining to hazardous chemicals and dangerous goods used on-site.

Safety data sheets (SDSs) are indexed on site and kept in the First Aid Room. It is a condition of entry, as specified during the induction process, that no chemicals or hazardous materials are allowed on site unless previously approved and accompanied by an SDS.

Small amounts of explosives will be used underground during the term of this MOP. Storage and use of explosives will be undertaken in accordance with the *NSW Explosives Act, 2003*, Explosives Regulation, 2013 and Australian standard AS 2187 – Explosives: storage, transport and use. A purpose built explosives storage shed exists on the surface at the Mannering pit top (as shown on **Plan 1D**). Explosives are preferentially stored underground. No explosives are to remain at premises following closure.

A COALSCAN 2100 ash analyser, a fixed radiation gauge which contains one Am241 source of 3.7 GBq and one Cs137 source of 0.185 GBq activity, is present at the Mannering pit top. Delta Coal holds a Radiation Management Licence under the *Radiation Control Act, 1990* (licence number 5092392) which is renewed annually, with the current licence being valid until the 11th April 2021.

Hazardous materials audits of the Mannering pit top were undertaken in 2012 by URS and in 2020 by EHO Consulting. Asbestos was identified as present in most of the buildings, as would be expected due to the age of the Colliery. A register of these hazardous materials was created and is available within the report completed by EHO Consulting titled "Hazardous Materials Survey and Register – Mannering Colliery" (dated March 2020).

Similar reports and findings were also prepared for the Chain Valley pit top in 2007 and later re-inspected and updated reports and registers developed in 2012 by AECOM. The most recent inspection was undertaken in 2020 by EHO Consulting. Asbestos was identified as present in most of the buildings, as would be expected due to the age of the Colliery. A register of these hazardous materials was created and is available within the report completed by EHO Consulting titled "Hazardous Materials Survey and Register – Chain Valley Colliery" (dated March 2020).

An Asbestos Management Standard and Asbestos Register are in place to manage the asbestos risks during mining operations. Asbestos risks associated with mine closure will need to be considered following the determination of exactly which, if any, buildings and infrastructure are to remain. Appropriate disposal of asbestos material will be required and clearance certificates obtained from licenced asbestos demolition contractors. All work will be undertaken to conform to Work Cover NSW Guidelines and approval requirements.

3.2.15 Greenhouse Gases and Ventilation Management

The Chain Valley workings are ventilated with two main mine ventilation fans located at Summerland Point. The Mannering workings are ventilated by two main mine ventilation fans located at the Mannering pit top area.

Ventilation management for Chain Valley and Mannering is managed through Segregation Ventilation Control Devices, allowing air to ventilate the Link Road between Chain Valley and Mannering. The ventilation control devices have the ability to handle pressure changes from either direction. Should there be a failure of either

Chain Valley or Mannering's main mine ventilation fans, an automated segregation door has been installed with the ability to segregate the mines into two separate ventilation systems. Gas concentration and ventilation (pressure and flow) monitoring will be undertaken within the underground linkage roadways.

Seam gas is predominantly methane and, at both operations, is principally managed through the mine ventilation arrangements, which enable methane levels to be maintained at appropriate levels. This is achievable because of the gas reservoir characteristics (predominantly low virgin content) of the Fassifern Seam and other proximate coal seams, in the mining area. No pre- or post-gas drainage is utilised at either mine.

The main sources of greenhouse gases on site have been identified as mine ventilation air (methane (CH_4), carbon dioxide (CO_2), on-site electricity consumption and diesel consumption.

CH_4 and CO_2 emissions from the mines, and emissions from electricity and diesel use are reported as CO_2 equivalents. Monitoring of all necessary parameters to calculate mine ventilation air emissions is undertaken throughout the year, primarily by automated monitoring and data recording systems and from information collected by the Ventilation Officer.

Monitoring and subsequent reporting is undertaken in accordance with the *National Greenhouse and Energy Reporting Act, 2007*, National Greenhouse and Energy Reporting Regulations, 2008, and the National Greenhouse and Energy Reporting (Measurement) Determination, 2008.

3.2.16 Noise

Both Mannering's Project Approval and Chain Valley's Development Consent have prescribed noise limits at specific receiver locations, with each having a specific Noise Management Plan.

Noise control at the Mannering pit top facilities is largely managed by:

- the limited amount of surface activities;
- directly transferring coal to VPPS and minimizing coal stockpiling where practicable;
- enclosed transfer points;
- noise attenuation on the unenclosed section of the coal transfer house by means of a conveyor curtain to surround the structure;
- the use of noise curtains where possible to dampen impact noise;
- use of covered conveyors to transport all coal from the pit top site;
- undertaking the primary crushing of coal underground;
- use of a real time noise monitor, with assessment and response to any noise alarms

Some of the noise management controls in place for the Chain Valley pit top area and ventilation compound include:

- acoustic modifications and attenuation of the main fans;
- where required, coal haulage undertaken by road registered trucks;
- the linkage of both CVC and MC underground in August 2017 has resulted in significantly reduced coal transferred to the surface at CVC. All ROM coal is processed at Mannering and transferred to VPPS via overland conveyor;
- there is some remnant coal remaining at the Chain Valley product coal stockpile area. It is planned to be screened and trucked to VPPS in 2020 via private, internal roads;
- use of a real time noise monitor, with assessment and response to any noise alarms.

Attended noise monitoring is also undertaken to ensure compliance with existing noise criteria as established by the Project Approval and Development Consent. Currently, monitoring is undertaken monthly in accordance with the approved Noise Monitoring Program for Mannering and quarterly under the approved Noise Management Plan for Chain Valley.

Delta Coal will continue to employ the management strategies and mitigation measures that are currently in place to minimise noise emissions. Noise monitoring results are reported on the website and on an annual basis within each Annual Review.

3.2.17 Visual and Lighting

The pit top areas and Chain Valley ventilation shaft are screened by surrounding vegetation which help prevent any stray lighting leaving the site. The Chain Valley and Mannering pit top facilities have also been part of the local environment for nearly 60 years and there is no new infrastructure proposed at either site that would create a significant visual impact.

Any lighting changes that are made will be completed in accordance with *Australian Standard AS4282 (INT) 2019 – Control of Obtrusive Effects of Outdoor Lighting*.

A lighting audit was undertaken at the Chain Valley and Mannering pit top areas in 2019 to determine visual impacts. The results of the audit were at low-levels and displayed compliance with AS4282.

3.2.18 Heritage (Aboriginal and European)

Aboriginal heritage site survey work for the both the Chain Valley and Mannering pit top areas, as well as proposed mining areas has been undertaken during 2012, 2013 and 2020 with registered Aboriginal stakeholder groups invited to attend and participate.

The location of known Aboriginal sites (AHIMS sites) within Chain Valley Colliery Lease Holding, are shown on **Plan 1C**.The risk of impacting on Aboriginal heritage sites is minimal as:

- The areas of the existing Mannering and Chain Valley surface facilities have been heavily disturbed in the past and, in the case of Chain Valley, fencing has been installed around the only identified site. There are no known heritage sites present in or around the Mannering pit top area;
- The site induction details the importance and significance of the Aboriginal heritage and that no clearing is permitted without a permit;
- All monitoring of Aboriginal heritage sites, including those overlying areas of underground workings, is undertaken in accordance with an approved Heritage Management Plan, which has been developed in consultation with Aboriginal groups;
- There are no proposed surface disturbance activities outside of the current approved development footprints; and
- The heritage sites within the areas where underground workings are proposed within the term of this MOP are to be first workings only and a maximum of 20mm vertical subsidence.

As identified within the Heritage Management Plans there is only a single Aboriginal heritage site located within the Chain Valley surface facilities site, which is adjacent to the sediment dams. It is not anticipated that this site would be impacted during operation or closure activities.

Searches over the pit top facilities and within the local area, including proposed mining areas, for items of non-indigenous cultural heritage have also been undertaken. While a number of items were identified within the lease holding, none of these items are present over areas where the surface facilities exist, and accordingly would not be impacted by the future decommissioning activities. The closest listed items were the “Eatons Bulk Store Building” at 464 Ruttleys Road and the “Wyee Coal Conveyor to Vales Point”.

Due to the age and type of construction of the surface infrastructure facilities, no buildings represent significant heritage value. Consequently, the provisions of the *NSW Heritage Act 1977* do not apply.

Aboriginal heritage will continue to be managed in accordance with the approved Heritage Management Plans. The Heritage Management Plans applicable to the pit top areas detail procedures, resources, responsibilities and reporting requirements in the event that a heritage item is encountered. These management plans would be applied during decommissioning and demolition of the site.

3.2.19 Bushfire

The pit top areas are surrounded by vegetation mapped by the former Wyong Shire Council as bushfire prone (including Category 1 and Category 2 as well as buffer vegetation).

The Chain Valley Development Consent identifies a requirement that Delta Coal be sufficiently equipped to respond to fires on site and to assist the NSW Rural Fire Service (RFS) in the event of a fire in the vicinity of the surface facilities.

There is also a statutory responsibility under the *Rural Fires Act 1997* that requires the owners of land to prevent the ignition and spread of bushfires on their land. This act provides for the prevention, mitigation and suppression of bush and other fires in NSW.

In October 2013 an intense bushfire swept through the area including the north-eastern boundary of the Mannering pit top site and adjacent to the Chain Valley ventilation fans. As a result of the bushfire, consultation with the Rural Fire Service (RFS) was conducted to identify any previously unforeseen bushfire hazards and controls to mitigate those hazards to as low as reasonably practicable, whilst at the same time reviewing existing bushfire hazard controls. Actions taken following the fire included a:

- Fire Safety Walk conducted on 14th November 2013 with RFS Fire Mitigation Officer, RFS Inspector / Deputy Fire Control Officer, LakeCoal Fire Officer and LDO Group HSEC Manager;
- Review of Fire Management Risk Assessment (D-16949) conducted on 19th November 2013 with Statutory Officials and Workers; and
- Identification and prioritisation of actions arising from the Fire Management Risk Assessment by risk ranking. This review concluded that improvements to the sites APZ's around the pit top area and ventilation fan site were required. The proposed improvements to the existing APZ's were approved as part of the most recent approval modification in December 2015.

Delta Coal has, and will continue to, implement appropriate controls to assist in the management of bushfires that may impact the mining operations, including:

- Defendable Space - A buffer or Asset Protection Zone (APZ) is provided between areas of vegetation and the main offices, workshops and infrastructure at the pit top and, currently, in areas around the perimeter of ventilation facility. Within the pit top, the APZ is landscaped to minimise fuel loads and reduce potential radiant heat levels, flame, ember and smoke attack to the buildings. The size of the protection zones will take into consideration matters such as the type of vegetation, slope of the land, fuel load source and criticality of the asset to the operation. The APZ areas will be maintained and inspected prior to the start of the fire season. In the event additional bush fire hazard reductions works are proposed, they will be undertaken only after obtaining the requisite Bushfire Hazard Reduction Certificate from the NSW RFS. Regular training of mine firefighting crews is also undertaken.
- Access - Fire trails and access roads provide an important line of defence for fighting bushfires. An extensive array of fire trails and tracks are located around the pit top area to provide access for emergency services in case of a bush fire. These also provide access to easements throughout the area which are maintained by TransGrid to provide vertical clearance and buffers for high-voltage transmission lines. Though there is an existing road access to the ventilation facility and some fire trails, the November 2013 risk assessment and review of the October fires incident identified a risk due to access and an inadequate turnaround for fire tankers at the facility. Fire trails will be inspected annually prior to the start of the high fire season by the NSW RFS.
- Water Supply - Existing fire management infrastructure surrounds the pit top areas, with water tanks and a distribution system (100 millimetre diameter water reticulation line). Fire hydrants, fire reels and depots are also placed in strategic positions to enable rapid response to fires on site. Though no reticulated water is available at the ventilation facility, its proximity to Lake Macquarie provides an emergency source of water if required. A water cart, equipped with sprays is also operated on site which could be utilised as an asset for fighting bushfires should it be required.

Following the cessation of mining Delta Coal will consider maintenance of applicable controls during rehabilitation establishment (e.g. maintain APZs or other controls until rehabilitation vegetation is adequately established).

3.2.20 Site Security and Unauthorised Access

Public safety is primarily a concern around the surface facilities at the pit top areas, ventilation shaft site and downcast shaft site.

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

- restricting access;
- the presence of a security fence and signage around the perimeter of the compounds, with locked access gates; and
- security monitoring.

In relation to the pit top areas, there is only one (sealed) access road into each of the areas, with both accesses having 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. Site security also incorporates external fencing, sign posting, lighting, back to base monitoring, regular patrols and static guards as required.

Public access will be monitored and managed during the operation of the mine through the standard incident reporting process, which would include reporting of unauthorised access.

A visitor login system on-site ensures that all employees, contractors and authorised visiting members of the public are able to be accounted for when on-site.

3.2.21 Waste (General)

Waste streams are managed in accordance with the relevant site waste management plans.

The management of the waste is undertaken through the implementation of a total waste management system, which currently includes the following waste streams:

- General waste;
- Recyclables;
- Scrap steel;
- Oily rags;
- Waste rock
- Air/oil filters;
- Batteries;
- Waste oil; and
- Timber.

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 of waste management processes.

Sewage generated by on-site amenities at the Mannering pit top is pumped directly to Mannering Park Waste Water Treatment Works via a dedicated pipeline under a Trade Waste Agreement with the former Wyong Shire Council. Sewage generated at the Chain Valley pit top is currently managed through septic systems and an aerated wastewater management system. However, Delta Coal is currently in the process of obtaining approval to construct a new sewer line to the nearby wastewater treatment plant.

Additional details of waste management activities to occur within the term of this MOP are described in **Table 3.4**.

Table 3.4: Waste Management Activities

Waste Type	Waste management activities
General Waste	All general wastes (including putrescible wastes) and routine maintenance consumables from the daily servicing of equipment are collected on a regular basis by an appropriately licensed contractor for off-site disposal within a waste facility approved to accept such waste. Recyclable material

Waste Type	Waste management activities
	is also collected by a licensed contractor for recycling on an irregular (as needs) basis. Collections of general waste and recyclables are coordinated by the waste management contractors, who also undertake weekly waste inspections at the site.
Waste Oil and Grease	The generation of waste oils and grease is limited to maintenance of plant and equipment. Waste oils and greases are generally stored at the workshop area, along with parts and packaging (for example, cartridges, filters and waste oil drums), which are collected by a licensed waste contractor on a regular basis for recycling and/or off-site disposal. Oily water is contained within drive-in-sumps and treated by oil-water separators located on the mine surface. Licensed contractors regularly service and maintain the separators and remove all waste hydrocarbons from the site for recycling.
Recyclables	Recyclables are collected in colour coded front-lift bins, 240 L MGBs and smaller office bins. The smaller bins are emptied into the front-lift bins, which are inspected weekly and serviced as required.
Scrap Steel	Scrap steel bins are provided in the storage yard area, which enable them to be filled with scrap steel during the on-site waste sorting process.
Waste Rock	Waste rock is managed onsite or disposed offsite to a general licenced waste management facility.
Oily rags and oil filters	Oily rags and oil filters are collected in 240 L MGBs which are placed in locations that typically generate these waste streams, such as the workshop and service bay. These bins are inspected weekly and serviced as required.
Batteries	Waste batteries are collected either in a colour coded 120 L MGB (for smaller batteries such as cap lamp batteries) or stored on a pallet (in the case of large batteries) prior to collection. As with other waste streams, the waste management contractor monitors levels of waste batteries and arranges collection as required.
Timber	A large timber skip is used to ensure segregation of timber from the general waste stream. Timber waste sources typically comprise packaging, broken pallets and disused timber products typically used for temporary underground roof support. The timber bin is monitored weekly and collection undertaken as required.

4 Post Mining Land Use

4.1 Regulatory Requirements

The current consents, authorisations and licences relevant are described in Section 1.3. The conditions and commitments made in relation post mining land use are listed in **Table 4.1**.

Table 4.1: Conditions and Commitments relating to post mining land use

Source	Commitment/Condition
Condition 7 of CCL 721	*Disturbed land must be rehabilitated to a sustainable/agreed end land use to the satisfaction of the Director- General*
Condition 25 of CCL 719	*Upon completion of operations on the surface of the subject area or upon the expiry or sooner determination of this lease or any renewal thereof, the registered holder shall remove from such surface such buildings, machinery, plant, equipment, constructions and works as may be directed by the Minister and such surface shall be rehabilitated and left in a clean, tidy and safe condition to the satisfaction of the Minister.*
Condition 26 of CCL 719	*Subject to any specific condition of this lease providing for rehabilitation of any particular part of the subject area affected by mining or activities associated therewith, the registered holder shall;-* *a) reinstate, level, regrass, reforest and contour to the satisfaction of the Minister, any part of the subject area that may, in the opinion of the Minister, have been damaged or deleteriously affected by mining operations and to ensure such areas are permanently stabilised; and* *b) fill in, seal or fence, to the satisfaction of the Minister, any excavation within the subject area.*
Condition 21 of CCL 722	*If so directed by the Minister the lease holder shall rehabilitate to the satisfaction of the Minister any lands within the subject area which may have been disturbed by the lease holder.*
Condition 22 of CCL 722	*Upon completion of operations on the surface of the subject area or upon the expiry or sooner determination of this authority or any renewal thereof, the lease holder shall remove from such surface such buildings, machinery, plant, equipment, constructions and works as may be directed by the Minister and such surface shall be rehabilitated and left in a clean, tidy and safe condition to the satisfaction of the Minister.*
Condition 23 of CCL 721	*If so directed by the Minister the lease holder shall rehabilitate to the satisfaction of the Minister and within such time as may be allowed by the Minister any lands within the subject area which may have been disturbed by mining or prospecting operations whether such operations were or were not carried out by the lease holder.*
Schedule 2, Condition 10 of Project Approval MP 06_0311	*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.*
Schedule 3, Condition 13 of Project Approval MP 06_0311	*The Applicant must rehabilitate the site in accordance with the conditions imposed on the mining leases (s) associated with the development under the Mining Act 1992. Rehabilitation must be generally consistent with the*

<table>
<tr><th>Source</th><th>Commitment/Condition</th></tr>
<tr><td></td><td>proposed rehabilitation described in the EA and the Statement of Commitments, and the comply with the objectives in Table 2.

Table 2: Rehabilitation Objectives
<table>
<tr><th>Feature</th><th>Objective</th></tr>
<tr><td>Mine site (as a whole of disturbed land and water)</td><td>Safe, stable and non-polluting, for the purpose of the intended post-mining land use(s).</td></tr>
<tr><td>Rehabilitation materials</td><td>Material (including topsoils, substrates and seeds of the disturbed area) are recovered, appropriately managed and used effectively as resources in the rehabilitation.</td></tr>
<tr><td>Surface Infrastructure</td><td>To be decommissioned and removed, unless the DRE agrees otherwise.</td></tr>
<tr><td>Portals and ventilation shafts</td><td>To be decommissioned and made safe and stable.</td></tr>
<tr><td>Other land affected by the development</td><td>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.</td></tr>
<tr><td>Built features damaged by mining operations</td><td>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 1961.</td></tr>
<tr><td>Community</td><td>Ensure public safety.</td></tr>
</table></td></tr>
<tr><td>Schedule 3, Condition 13A of Project Approval MP 06_0311</td><td>The Applicant must carry out all the surface disturbance activities in a manner that, as far as practicable, minimises potential for dust emissions and must carry out rehabilitation of disturbed areas progressively, that is, as soon as reasonably practicable following disturbance.</td></tr>
<tr><td>Schedule 3, Condition 15 of Project Approval MP 06_0311</td><td>The Proponent must prepare and implement a Rehabilitation Management Plan for the site 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 submitted within 3 months of approval of Mod 2 to the RR prior to carrying out any disturbing activities of the development, unless otherwise agreed by the Secretary;

(b) be prepared in accordance with RR guidelines and in consultation with the Department, BCD, EPA, DPI Water, affected councils and the mine's CCC.

(c) incorporate and be consistent with the rehabilitation objectives in the EA, Statement of Commitments and Table 2 above;

(d) integrate and build on, to the maximum extent practicable, the other management plans required under this consent; and</td></tr>
</table>

<table>
<tr><th>Source</th><th>Commitment/Condition</th></tr>
<tr><td></td><td>(e) address all aspects of mine closure and rehabilitation, including post-mining land use domains rehabilitation objectives, completion criteria and rehabilitation monitoring and management.

The Proponent must implement the approved management plan as approved from time to time by the Secretary.

Note: The approved Mining Operations Plan (which will become the REMP once the Mining Act Amendments have commenced) required as a condition of the Mining Lease(s) issued in relation to this development, will satisfy the requirements of this condition for a Rehabilitation Plan.</td></tr>
<tr><td>Schedule 3, Condition 25 of SSD-5465</td><td>The Applicant must rehabilitate the site in accordance with the conditions imposed on the mining leases (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
<table>
<tr><th>Feature</th><th>Objective</th></tr>
<tr><td>Mine site (as a whole)</td><td>• Safe, stable and non-polluting.
• Final land use compatible with surrounding land uses.</td></tr>
<tr><td>Rehabilitation materials</td><td>• Material (including topsoils, substrates and seeds of the disturbed area) are recovered, appropriately managed and used effectively as resources in the rehabilitation.</td></tr>
<tr><td>Surface Infrastructure</td><td>• To be decommissioned and removed, unless RR agrees otherwise.</td></tr>
<tr><td>Portals and ventilation shafts</td><td>• To be decommissioned and made safe and stable.
• Retain habitat for threatened species (eg bats), where practicable.</td></tr>
<tr><td>Other land affected by the development</td><td>• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of:
- local native plant species (unless the DRE agrees otherwise); and
- a landform consistent with the surrounding environment.</td></tr>
<tr><td>Built features damaged by mining operations</td><td>• Repair to pre-mining condition or equivalent unless:
- the owners agrees otherwise; or
- the damage is fully restored, repaired or compensated under the Coal Mine Subsidence Compensation Act 2017.</td></tr>
<tr><td>Community</td><td>• Ensure public safety.
• Minimise the adverse socio-economic effects associated with mine closure.</td></tr>
</table></td></tr>
<tr><td>Schedule 3, Condition 26 of SSD-5465</td><td>The Applicant must carry out the rehabilitation of the site progressively, that is, as soon as reasonably practicable following disturbance.</td></tr>
</table>

Source	Commitment/Condition
Schedule 3, Condition 27 of SSD-5465	*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, DPI Water, CC Council, LMCC, and the CCC;* *(b) Be submitted to the RR for approval 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.* *The applicant shall implement the approved management plan as approved from time to time by the Secretary.* *Note: The Rehabilitation Plan should address all land impacted by the development whether prior to, or following, the date of this consent.*
Schedule 3. Condition 28 of SSD5465	*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;*

Source	Commitment/Condition
	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.*
Condition 7 of ML 1051, Condition 7 of ML 1052, Condition 7 of MPL 1349, Condition 7 of MPL 337, Condition 7 of MPL 1389, Condition 7 of MPL 1400, Condition 7 of ML 1632, Condition 7 of ML 1370	*Disturbed land must be rehabilitated to a sustainable/agreed end land use to the satisfaction of the Director-General.*
Condition 13 of CCL 706, Condition 13 of CCL 707	*(a) Land disturbed must be rehabilitated to a stable and permanent form suitable for a subsequent land use acceptable to the Director-General and in accordance with the Mining Operations Plan so that:-* • *there is no adverse environmental effect outside the disturbed area and that the land is properly drained and protected from soil erosion.* • *the state of the land is compatible with the surrounding land and land use requirements.* • *the landforms, soils, hydrology and flora require no greater maintenance than that in the surrounding land.* • *in cases where revegetation is required and native vegetation has been removed or damaged, the original species must be re-established and close reference to the flora survey included in the Mining Operations Plan. If the original vegetation was not native, any re-established vegetation must be appropriate to the area and at an acceptable density.* • *the land does not pose a threat to public safety.* *(b) Any topsoil that is removed must be stored and maintained in a manner acceptable to the Director-General.*
SOC's of Project Approval MP 06_0311	*The Mining Operations Plan will be amended to reflect the proposed modification and will include integrated rehabilitation and environmental management.*
SOC's of SSD-5465	*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 the cessation of mining activities.*

Further detail on the rehabilitation and final land use commitments made within the relevant Environmental Assessment and Environmental Impact Statements is contained within Section 4.2.

4.2 Post Mining Land Use Goal

The post mining land uses for the Mannering and Chain Valley Colliery pit top facilities and ancillary infrastructure sites are identified in the *Mannering Colliery Continuation of Mining Environmental Assessment* (Hansen Bailey 2007) and the *Chain Valley Colliery – Mining Extension Project Environmental Impact Statement* (EMM 2013) respectively. Although both post mining land uses are largely consistent, they are differentiated below for clarity.

The principal post mining land use goal for the Mannering pit top area is to return the land to vegetated buffer zone for the VPPS. It was noted, however, that the dams and water management structures on site are to be retained where possible to provide natural habitat and a water source for fauna in the area, and that sufficient vehicle access will also be maintained so that these dams can be accessed for future fire-fighting, inspection and maintenance purposes, as relevant.

The above is understood to still be the current landowner's (Sunset Energy's) preferred final land use; Achievement of this final land use would involve demolition and removal of all Mannering infrastructure followed by revegetation with endemic native plant species consistent with surrounding bushland. Should Sunset Energy wish to utilise any or all of the infrastructure, they will be retained subject to the approval of DPIE and other relevant authorities, as appropriate.

The proposed post mining land use as identified within the EIS for the Chain Valley pit top areas is largely consistent with the above. That is, it is proposed 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. Rather, the focus of the works would be the use of locally occurring species plant preferentially grown from locally sourced seeds. The Colliery is on land owned by Sunset Energy who will, therefore, be a key stakeholder in determining the vegetation selection and landform of the area.

Further to the above, 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). One other small area of grassland is proposed at the Mannering downcast shaft site, which is consistent with grassed areas surrounding the site.

The final land use for each of the secondary domains is:

- Domain A - Establishment of a native bushland ecosystem compatible with the surrounding vegetation communities, which includes targeting a final vegetation community comparable to:
  - Broad-Leaved Scribbly Gum Open Forest (for Mannering pit top).
  - Coastal Open Woodland (for majority of Chain Valley pit top).
  - Swamp Sclerophyll Forest (for Chain Valley upcast shaft).
- Domain B - Establishment of grass cover consistent with surrounding grass species for the:
  - Areas of the Chain Valley site that are within existing high voltage power line easements.
  - Mannering downcast shaft site.
- Domain C – Retention of water management structures.

The proposed post mining land use for the domains, consistent with the above, is shown on **Plan 4** and the rehabilitation objectives are discussed in Section 4.3.

4.3 Rehabilitation Objectives

The rehabilitation objectives below have been compiled from Condition 13 within Schedule 3 of MP 06_0311 and Condition 25 within Schedule 3 of SSD-5465 and are listed in **Table 4.2**.

Table 4.2: 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 comprising: - 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 1961*.
Community	• Ensure public safety. • Minimise the adverse socio-economic effects associated with mine closure.

5 Rehabilitation Planning and Management

5.1 Domain Selection

Domains have been defined in accordance with the methodology prescribed in ESG3, which defines Primary and Secondary domains as follows:

- The Primary domains (Operational Domains) are to be defined on the basis of land management units within the mine site, usually with unique operational and functional purpose and therefore similar geophysical characteristics (i.e. during mining); and
- The Secondary domains (Post Mining Land Use Domains) are defined as land management units characterised by a similar post mining land use objective (i.e. following mining).

The domains defined for term of this MOP are shown on a number of the MOP plans (**Appendix 1**), listed in **Table 5.1** and **Table 5.2** and discussed in the following sections.

Table 5.1: Primary Domain Codes/Names

Primary Domain Code	Primary Domain Name	Description
1	Infrastructure Area (General)	This relates to the general infrastructure located within the: • Chain Valley pit top area; • Mannering pit top area; • Chain Valley ventilation shaft and fan site; and • Mannering downcast shaft site.
2	Coal Stockpile Area	This relates to the coal stockpile within the Mannering Colliery pit top and the coal stockpile area, including some coal handling facilities within the Chain Valley pit top area.
3	Water Management Area	This relates to water storage and sediment control dams at both the Chain Valley and Mannering Colliery pit top areas.

Table 5.2: Secondary Domain Codes/Names

Secondary Domain Code	Secondary Domain Name	Description
A	Rehabilitation Area (Bushland)	The areas which will be rehabilitated to native bushland (as part of the Vales Point Power Station buffer lands)
B	Rehabilitation Area (Grass)	The areas which will be rehabilitated to a grass cover consistent with surrounding grass species.
C	Water Management Area	The areas in which dams or other water management structures will be retained.

A brief description of the features of each domain is included in **Table 2.2** and the assets within each domain area are listed in **Table 2.3**. There are no activities planned to be undertaken or mining related disturbance within other areas of the surface leases outside of the domains nominated above. Accordingly, a primary domain has not been assigned to areas that are not subject to mining related disturbance. It should also be noted that:

- Small earthen bunds and soil stockpiles are located at various locations around the sites, primarily at the boundary between the coal stockpile domain and water management domain, i.e. within the primary domains, and a specific domain for soil stockpiles is not currently practical for the sites but would be included in a future MOP following completion of soil characterisation as described in Section 8.1;
- Predicted subsidence will not result in any surface environmental impacts requiring remediation or rehabilitation.

The specific objectives and rehabilitation methods for each domain are discussed in the following sections.

5.2 Domain Rehabilitation Objectives

Domain specific rehabilitation objectives have been developed based on the requirements of the approval conditions and regulatory requirements (see Section 4). The rehabilitation objectives for each domain are presented in **Table 5.3**.

Table 5.3: Domain Rehabilitation Objectives

Domain Code	Features	Objectives
1A	Infrastructure - refer to **Table 2.3** for detailed list of features	Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Portals, ventilation shafts and exploration boreholes to be: • Sealed, decommissioned and made safe and stable, or • where practicable , retained as habitat for threatened species (e.g. bats), (applied to Chain Valley Colliery pit top facilities only). Final land use of site to be compatible with surrounding land use. Establish a final landform that is: • Compatible with surrounding land use and final land use of the site. • Safe, stable and non-polluting. Establish soil/growth medium suitable for establishment of vegetation compatible with final land use of the site (i.e. native bushland). Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising local native plant species.
1B	Downcast shaft	Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Portals and ventilation shafts to be sealed, decommissioned and made safe and stable. Final land use of site to be compatible with surrounding land use. Establish a final landform that is: • Compatible with surrounding land use and final land use of the site. • Safe, stable and non-polluting.

Domain Code	Features	Objectives
		Establish soil/growth medium suitable for establishment of vegetation compatible with final land use of the site (grassed open space for downcast shaft). Establishing managed open space grass comprising typical species as in adjacent lands.
2A	Coal stockpile area - refer to **Table 2.3** for detailed list of features	Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Final land use of site to be compatible with surrounding land use. Establish a final landform that is: • Compatible with surrounding land use and final land use of site. • Safe, stable and non-polluting. Establish soil/growth medium suitable for establishment of vegetation compatible with final land use of site (i.e. native bushland). Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising local native plant species.
3A	Water Management	Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Final land use of site to be compatible with surrounding land use. Establish a final landform that is: • Compatible with surrounding land use and final land use of the site. • Safe, stable and non-polluting. Establish soil/growth medium suitable for establishment of vegetation compatible with final land use of site (i.e. native bushland). Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising local native plant species.
3B	Water Management	Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Final land use of site to be compatible with surrounding land use. Establish soil/growth medium suitable for establishment of vegetation compatible with final land use of site (i.e. grassed open space). Establishing managed open space grass comprising typical species as in adjacent lands.

Domain Code	Features	Objectives
3C	Water Management	Site to be safe, stable and non-polluting. Surface infrastructure to be retained for water supply purposes. Final land use of site to be compatible with surrounding land use.

5.3 Rehabilitation Phases

The typical phases of rehabilitation as defined within ESG3 are:

- Decommissioning (including sealing of underground workings, demolition of surface infrastructure, and site remediation);
- Landform Establishment;
- Growth Medium Development;
- Ecosystem and Land Use Establishment;
- Ecosystem and Land Use Sustainability; and
- Land Relinquishment.

The following sub-sections provide a general overview of the rehabilitation to be undertaken within each of these phases as they apply to the domain areas within this MOP.

Table 5.4 provides a summary of the completed phases of rehabilitation for each domain at the end of the MOP term.

Table 5.4: Summary of rehabilitation phases for proposed completion at the end of the MOP (by domain)

Domain / Phase	1A Infrastructure - Bushland	1B Infrastructure - Grass	2A Coal Stockpile - Bushland	3A Water Mgmt. - Bushland	3B Water Mgmt. - Grass	3C Water Mgmt. - Water Mgmt.
Active Mining Area	✓	✓	✓	✓	✓	✓
Decommissioning	✓	X	X	X	X	X
Landform Establishment	✓	X	X	X	X	X
Growth Medium Development	✓	X	X	X	X	X
Ecosystem and Land use Establishment	X	X	X	X	X	X
Ecosystem and Land use Sustainability	X	X	X	X	X	X
Relinquished Lands	X	X	X	X	X	X

As shown in **Table 5.4,** all domains are active mining areas and Delta Coal will not substantially commence rehabilitation actives within the term of this MOP. There are some infrastructure decommissioning and demolition works proposed. The demolition of the mine cottages will provide a minor area for rehabilitation.

To provide an indication of the rehabilitation and methodologies that will be implemented when Delta Coal does commence the rehabilitation phases (under a future MOP), the following sections provide information relevant to each of the rehabilitation phases.

5.3.1 Decommissioning

Decommissioning and Sealing of Underground Workings

Following the recovery of equipment from underground, sealing of the mine entries would be undertaken.

The shaft and drift entries will be sealed as per the DRG guidelines, "MDG 6001: Guidelines for the Permanent Filling and Capping of Surface Entries to Coal Seams (February 2012)", and any boreholes will be sealed as per the "EDG01: Borehole Sealing Requirements on Land: Coal Exploration (April 2012)" or the latest versions.

Prior to the sealing of underground workings being undertaken, sealing plans will be prepared in consultation with, and approved by, the Chief Inspector.

Demolition and Removal of Surface infrastructure

All mining related infrastructure, with the exception of items specifically requested by landowners to remain and approved for retention by the relevant authority/s, will ultimately be removed or made safe for the post-mining land use at mine closure. The infrastructure items and hardstand surfaces within the various domains are listed within **Table 2.3**.

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 coal bins, 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);
- Concrete pads and footings will be either completely removed (RR preference) or removed to a minimum 1m below surface levels and disposed of in an appropriate place or recycled, and following removal will be covered with at least 300mm 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; and
- All services, including buried services will be safely disconnected and have any stored energies dissipated.Buried services will either be removed or if there is limited risk associated with the pipelines/cables remaining in-situ and that these old services do not inhibit post mining land uses and removal would have unacceptable risks to community, heritage, safety and environment they will be capped and de-energised and remain buried beneath the final rehabilitation landform surface
-

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 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 classifications within the National Environment Protection (Assessment of Site Contamination) Measure 1999, 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

As identified in Section 3.2.17, there are Aboriginal heritage sites relevant, which are located within the Chain Valley Colliery surface facilities site. Impacts would be avoided where possible during the decommissioning, or landform establishment or alternatives made in consultation with the Registered Aboriginal Parties and Heritage NSW as per the Heritage Management Plan. Learnings from the mine cottage demolition unexpected midden sites find should be taken into account during demolition, land management and mine closure activities.

Asbestos

As noted in Section 3.2.13, hazardous materials surveys and registers are available for each pit top area. Notwithstanding, asbestos risks associated with mine closure will need to be considered following the determination of exactly which, if any, buildings and infrastructure are to remain. Appropriate disposal of asbestos material will be required and clearance certificates obtained from licensed asbestos demolition contractors. All work will be undertaken to conform to SafeWork NSW Guidelines and approval requirements.

Remediation

Contamination remediation will be undertaken if required to ensure the land is suitable for use as buffer land for the VPPS. As the lands will not be used as "recreation/public space", nor is it planned to be used for "commercial/industrial" purposes which are classifications within the *National Environment Protection (Assessment of Site Contamination) Measure 1999*, 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.

5.3.2 Landform Establishment

Following decommission, final landforms will be developed that are safe, stable, permanent and compatible with subsequent land use as determined through consultation with stakeholders, including landowners and the relevant Government departments.

In the context of this MOP, landform establishment is the process involved in achieving stable landforms including slopes, erosion controls and drainage lines, with integrated landscape features, which are compatible with the surrounding landform, whilst ensuring that the areas of native vegetation established link with surrounding vegetation communities.

Landforms to be established during the mine closure and rehabilitation will be contoured to match the surrounding topography and to control and direct runoff to sediment basins and natural existing drainage lines. No significant changes to the pre-mining landform will result from the contouring of the land following the removal of all surface infrastructure.

Final contouring of the land will remove terraced areas and provide drainage consistent with the general fall of the land to the north and east. The design of run-off and sediment controls will be incorporated in the final surface planning. General contour design is shown on **Plan 4A**.

Erosion Control

The removal of large areas of sealed surfaces and buildings at mine closure could result in increased sediment load in the runoff during the early stages of the rehabilitation program. Conversely, the removal of the majority of the coal stockpiles, the associated reduction in the batter heights and the removal of historically compacted surfaces will result in increased infiltration rates during the first few months of the rehabilitation program and reduce the amount of runoff reporting to the sediment dams. Control of erosion is important during the landform construction and revegetation program, with the principal objective prior to an adequate cover of vegetation is established achieved being to prevent erosion.

There are 10 basic principles that will be followed to ensure effective soil and water management during the decommissioning phase. These are to:

- Plan for erosion and sediment control with project design and well in advance of earthworks;
- Minimise the area of soil exposure;
- Conserve available topsoil - introduce topsoil or suitable growth medium where required;
- Control water flow;
- Divert clean runoff away from disturbed areas;
- Minimise slope gradient and length;
- Minimise water runoff velocities;
- Trap sediments and pollutants;
- Revegetate disturbed areas as soon as possible; and
- Maintain and monitor erosion controls to ensure the quality of water released is acceptable.

To ensure effective erosion control during removal of structures, contouring, capping and revegetation of the site, the following practices are to be adopted:

- The Water Management Plan will be reviewed prior to closure works being undertaken, or a specific erosion and sediment control plan will be developed for closure works.
- Slopes created through removal of retaining structures are to be left in a roughened state to slow and direct water flow as well as increase infiltration rates;
- Surface runoff is to be directed to existing sediment ponds. Excess water stored in these ponds may be used as irrigation for establishing vegetation or discharged subject to its satisfaction of EPL limits;
- Runoff from areas under development would be directed away from revegetated areas where possible;
- Drainage patterns are to be designed to direct flows through erosion and sediment control structures and so keep the sediment as close as possible to the source;
- Sediment control structures are to be maintained and kept in place until rehabilitation of the relevant catchment area is completed (see further detail below); and
- Other methods of erosion control may be employed as required, including the use of mulching, sediment fence and the installation of hay bale barriers. Where water control is deemed to be a problem and native revegetation may not be able to establish rapidly enough, a fast growing cover crop would be sown.

The primary mechanism for erosion control will be the retention of the current drainage system and sediment dams during the initial stages of the rehabilitation program. Once the primary earthworks and initial revegetation works are completed, including the removal of the hardstand areas, bitumen, concrete and the bulk of the coal stockpiles, a program of dam rationalisation will be undertaken.

Where appropriate, the former dams will be used as receptacles for excavated or crushed inert material. Once these are filled, the wall and batter materials will be used to cap the dams. These surfaces will then be stabilised using a cover crop comprising fast growing sterile species and the seed of longer-lived native species.

At this stage it is intended to fill and cap, or otherwise remove, all dams that are not within Domain 3C as shown on **Plan 4**. A suitable growth medium would be established over decommissioned dams, while at the same time establishing contours which will enable surface flows to enter the natural drainage lines adjacent to the site. It is expected that at the completion of the rehabilitation process, some of the sediment dams would be retained for ecological purposes.

During the detailed closure planning phase, further consideration will, however, need to be to the potential retention and/or construction of small dams or ponds which could either continue to provide habitat or allow fauna to relocate to these areas when the main sediment dams are rehabilitated during closure. At this stage, and as shown on **Plan 4**, it is proposed to retain all dams within Domain 3C in the final landform.

5.3.3 Growth Medium Development

As noted within Section 4.2 and shown on **Plan 4**, Delta Coal proposes to vegetate the majority of disturbed areas to either bushland or grass compatible with the future land uses. Accordingly, the establishment of the growth medium will be different for the areas proposed for revegetation to a bushland compared to those areas proposed for revegetation to a grassland.

Growth media development incorporates the processes involved to achieve a soil which is capable of supporting a sustainable plant community. It includes consideration of the chemical, physical and biological properties of the media and takes into account the necessity or desirability for specialist treatments such as the importation of appropriate virgin excavated natural material (VENM) or the application of soil ameliorants aligned to the revegetation of the disturbed areas.

Due to the age of the sites and prior soil management practices, only limited amounts of previously stripped and stored topsoil is available for the pit top areas. Suitable amounts of material will however be available to reprofile terraces and fill dam voids, which will be largely completed by undertaking localised cut and fill in some areas to be rehabilitated. The development of growth medium will rely on re-spreading existing on-site material and/or the importing of suitable material. It is noted however, that there are a substantial number of recycled organics that have been successfully utilised in mine rehabilitation (Kelly 2006), including fly ash, a ready source of which is available from the nearby VPPS. Nevertheless, it is expected that the importation of topsoil or other growth medium material will likely be required to achieve the closure objectives.

As discussed in Section 8.1, during the term of this MOP, Delta Coal will undertake soil characterisation of the existing soil stockpiles and in-situ subsoils to determine the suitability of the material for use in final rehabilitation activities.

Final soil characterisation will occur following cessation of mining, with details of any soil amelioration requirements to be included within the detailed mine closure plan and implemented prior to use of soil in rehabilitation activities. This is further discussed in Section 6 and in the performance criteria tables.

5.3.4 Ecosystem and Land Use Establishment

The objective of the rehabilitation program for the pit top areas is to create a landform and vegetation assemblage consistent with those in the local area in order to enhance the buffer zone surrounding the VPPS and provide habitat for native fauna.

For those areas to be returned to bushland, Delta Coal aims to establish a native bushland ecosystem compatible with that of the surrounding vegetation communities, which includes targeting final vegetation communities comparable to the :

- Broad-Leaved Scribbly Gum Open Forest (for Mannering pit top);
- Coastal Open Woodland (for majority of Chain Valley pit top); and
- Swamp Sclerophyll Forest (for Chain Valley upcast shaft).

It should be noted that, for some areas, a grass cover will be established consistent with surrounding grass species (i.e. those areas of the Chain Valley site that are within existing high voltage power line easements and the Mannering downcast shaft site).

Preparation for ecosystem establishment would be able to commence once a decision for mine closure has been made, but prior to the completion of the detailed mine closure plan. This preparation would include undertaking longer lead time activities that will be nominated in the detailed mine closure plan but are already known, such as undertaking native seed collection and propagation of species specifically to be used in ecosystem establishment.

Following mine closure, vegetation will be progressively established as areas are made available following the

decommissioning, landform establishment and growth medium development stages. This is to be achieved by establishing endemic tree, shrub and grass species.

The specific species to be used in the rehabilitation will be determined in consultation with ecologists familiar with the local area and by suitably competent personnel experienced in native vegetation identification, establishment, seed collection and propagation. This will then inform the detailed mine closure plan to the extent that the species list can be commensurate with the availability of seed from endemic species in the vicinity of the site. These species may include, but not be limited to the following (which have been associated with the vegetation community mapped in the vicinity of the site):

- Dominant tree species: *Eucalyptus haemastoma, Corymbia gummifera, Eucalyptus capitellata, Casuarina glauca and Angophora costata.* Other tree species include *Eucalyptus robusta, Eucalyptus oblonga, Melaleuca sieberi, Melaleuca quinquenervia, Eucalyptus teretcornis* and *Banksia serrata*.
- Understory species (shrubs): *Acacia longifolia, Acacia suaveolens, Acacia terminalis, Hakea bakeriana, Hakea dactyloides, Gompholobium latifolium, Banksia spinulosa var. collina, Isopogon anemonifolius* and *Lambertia formosa*.
- Understory species (herbs): *Patersonia sericea, Hibbertia vestita, Dampiera stricta, Lepidosperma laterale, Stylidium graminifolium, Entolasia stricta, Themeda australis, Anisopogon avenaceus* and *Lomandra obliqua*.

As discussed in Section 8.1, during the term of this MOP, Delta Coal will be implementing a program to establish and monitor analogue/reference sites to inform the development of specific species lists for future rehabilitation.

The preferred method of establishment is by direct seeding, with supplementary tube stock plantings. Cover crops of annual and perennial grasses are to be used where rapid stabilisation of the soil surface is required.

Weed Management

Weed management will be undertake as described in Section 3.2.5, in accordance with the DC Weed Management Plan, MC Land Management and CVC Biodiversity Management Plans. It is anticipated that an initial spray control program will be undertaken prior to earth works in order to minimise the subsequent distribution of weed material. For rehabilitation areas, the early control of weeds will minimise competition and maximise early growth and survival of desired species. This can be achieved by physical removal and mulching or by chemical control where appropriate.

As an outcome of community consultation, it is also proposed to remove the existing radiata pines (*Pinus radiata*) from the rehabilitation domains during the rehabilitation and weed control programs undertaken at mine closure.

5.3.5 Ecosystem and Land Use Sustainability

This phase of development includes rehabilitation monitoring as described in Section 8, and the ongoing management of the rehabilitated areas as determined through the rehabilitation monitoring and may include one or more of the following activities, as appropriate.

- Weed and feral animal control;
- Erosion control and rectification works;
- Maintenance fertilizing;
- Re-seeding or replanting; and
- Improvements to site security.

6 Performance Indicators, and Completion / Relinquishment Criteria

The specific rehabilitation performance indicators and completion criteria to be applied are listed in **Table 6.1**. This table provides the indicators and criteria that will be used to measure the successful achievement of the nominated rehabilitation objectives.

Table 6.1: Rehabilitation Completion Criteria

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
Phase 1 - Decommissioning							
Domain 1 – Infrastructure Area (General)							
Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Portals and ventilation shafts to be: • decommissioned and made safe and stable, or • where practicable, retained as habitat for threatened species (e.g. bats), (applied to Chain Valley Colliery pit top facilities only). Final land use of site to be compatible with surrounding land use.	No risk to public safety - All plant and equipment removed	All mining related plant and equipment removed from site (unless approved to remain)	Visual inspection and photos of site confirm plant and equipment has been removed. Photos included within Closure Report.	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	To commence in MOP – Some parts of CVC surface infrastructure	Post MOP	-
	No risk to public safety - All buildings and structures removed	Buildings and structures removed (unless approved to remain). All services terminated and disconnected (power, water and telecommunications) Perimeter fencing to be retained as required to restrict public access. Light vehicle access to remaining dams/ponds to be retained for fire-fighting and maintenance purposes.	Visual inspection and photos of site confirm buildings have been removed. Photos included within Closure Report.		To commence in MOP – Some parts of CVC surface infrastructure	Post MOP	-
	No risk to public safety - All underground infrastructure (protruding above ground surface) removed.	Visible surface components of buried infrastructure removed (unless approved to remain). Remaining underground material to be capped to depth ≥ 0.3 m.	Visual inspection and photos of site confirm infrastructure has been removed. Photos included within Closure Report.		To commence in MOP – Some parts of CVC surface infrastructure	Post MOP	-
	No risk to public safety - Access to	All surface entries (drifts and shafts) to mine are sealed in accordance with	Closure report includes evidence that sealing has been completed in		Not Commenced	Post MOP	-

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
	former workings prevented	MDG 6001 (Guidelines for the Permanent Filling and Capping of Surface Entries to Coal Seams).	accordance with MDG 6001.				
	No risk to public safety - All borehole connectivity to former workings sealed	All boreholes to the mine are sealed in accordance with EDG01 (Borehole Sealing Requirements on Land: Coal Exploration).	Closure report includes evidence that sealing has been completed to EDG01.		Exploration drilling planned in MOP period to seal to EDG01 standard	Post MOP	-
	Non-polluting - clean-up of potential/actual contamination.	Hydrocarbons less than assessment criteria. Heavy metals less than assessment criteria. No asbestos remains (unless bonded within buildings approved to remain)	Contamination validation report (Phase 2 ESA) completed and identifies any levels of contamination are below the relevant acceptable levels. Contamination validation report appended to Closure Report.		Not Commenced	Post MOP	6
	No risk to public safety - clean-up of combustible material that could pose a fire risk	All combustible material to be removed or managed appropriately (e.g. blending with non-combustibles or capping)	Assessment of combustion risk (to be undertaken following cessation of mining) identifies that materials on site will not pose an unacceptable combustion risk.		Not Commenced	Post MOP	1
	No risk to public safety - removal of explosives	All explosive material to be removed from site.	Closure report includes evidence that explosives removed from site in accordance with Explosives Act 2003		Not Commenced	Post MOP	7
Domain 2 – Coal Stockpile Area							

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Final land use of site to be compatible with surrounding land use.	No risk to public safety - All plant and equipment removed	All mining related plant and equipment removed from site (unless approved to remain) Fill or remove underground reclaim tunnel beneath Mannering Coal stockpile	Visual inspection and photos of site confirm plant and equipment has been removed. Photos included within Closure Report.	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	-
	No risk to public safety - All buildings and structures removed	Buildings and structures removed (unless approved to remain). All services terminated and disconnected (power, water and telecommunications)	Visual inspection and photos of site confirm buildings have been removed. Photos included within Closure Report.		Not Commenced	Post MOP	-
	No risk to public safety - All underground infrastructure (protruding above ground surface) removed.	Visible surface components of buried infrastructure removed (unless approved to remain). Remaining underground material to be capped to depth ≥ 0.3 m.	Visual inspection and photos of site confirm infrastructure has been removed. Photos included within Closure Report.		Not Commenced	Post MOP	-
	No risk to public safety - clean-up of combustible material that could pose a fire risk	Recover all saleable coal material from stockpiles All remaining combustible material to be removed or managed appropriately (e.g. blending with non-combustibles or capping)	Assessment of combustion risk (to be undertaken following cessation of mining) identifies that materials on site will not pose an unacceptable combustion risk.		Not Commenced	Post MOP	1
Domain 3 – Water Management Area							
Site to be safe, stable and non-polluting.	Mine water discharges discontinued.	No discharge of underground mine water/water impacted by mining operations	Discharge water flow monitoring and reporting. Pipes that deliver water from underground to	Schedule 3, Condition 13 of Project Approval MP 06_0311	Not Commenced	Post MOP	5

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority. Final land use of site to be compatible with surrounding land use.			surface are disconnected	Schedule 3, Condition 25 of SSD-5465			
	No risk to public safety - All infrastructure removed	Water management structures removed (unless approved to remain). Ancillary surface equipment and infrastructure to be decommissioned and removed All services terminated and disconnected (power, water and telecommunications)	Visual inspection and photos of site confirm surface infrastructure has been removed. Photos included within Closure Report		Not Commenced	Post MOP	-
	No risk to public safety - clean-up of combustible material that could pose a fire risk	All combustible material to be removed or managed appropriately (e.g. blending with non-combustibles or capping)	Assessment of combustion risk (to be undertaken following cessation of mining) identifies that materials on site will not pose an unacceptable combustion risk.		Majority of remnant coal and carbonaceous material on CVC Stockpile being removed in 2020.	Post MOP	1
Phase 2 – Landform Establishment							
Domain 1 – Infrastructure Area (General)							
Establish a final landform that is: • Compatible with surrounding landform and final land use of site.	Slopes are stable	Cut and fill batters to be re-profiled. Soil stockpiles to be re-spread over site as required for growth media establishment. Re-profiled areas are stable with slopes not exceeding 18°.	No evidence of slumping of slopes. Survey of rehabilitated site confirms no slopes exceed 18°. Final landform survey detail included within Closure Report.	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	-

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
• Safe, stable and non-polluting.	Final landform contours similar to surrounding land contours	Mapping confirms that final landform contours are similar with surrounding land contours	Plans prepared by surveyors and photographs within Closure Report.		Post mine cottage demolition final landform to be shaped	Post MOP	-
	Sediment controls to be implemented to manage surface water	Surface runoff to be directed to sediment control structures prior to discharge (either retained sediment dams within Water Management Area or new temporary sediment controls) Diversion channels/drains to remain are stable and non-eroding (based on "blue Book' requirements).	Visual inspection and photos of dams/drains to confirm flow paths and non-eroding. Photos included within Closure Report.		Not Commenced	Post MOP	2
Domain 2 – Coal Stockpile Area							
Establish a final landform that is: • Compatible with surrounding landform and final land use of site. • Safe, stable and non-polluting.	Slopes are stable	Soil stockpiles to be re-spread over site as required for growth media establishment. Re-profiled areas are stable with slopes not exceeding 18°.	No evidence of slumping of slopes. Survey of rehabilitated site confirms no slopes exceed 18°. Final landform survey detail included within Closure Report.	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	-
	Final landform contours similar to surrounding land contours	Mapping confirms that final landform contours are consistent with surrounding land contours	Plans prepared by surveyors and photographs within Closure Report.		Not Commenced	Post MOP	-
	Sediment controls to be implemented to manage surface water	Surface runoff to be directed to sediment control structures prior to discharge (either retained sediment dams within Water Management Area	Visual inspection and photos of dams/drains to confirm flow paths and non-eroding. Photos included within Closure Report.		Not Commenced	Post MOP	2

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
		or new temporary sediment controls) Diversion channels/drains to remain are stable and non-eroding (based on "blue Book' requirements).					
Domain 3 – Water Management Area							
Establish a final landform that is: • Compatible with surrounding landform and final land use of site. • Safe, stable and non-polluting.	Slopes are stable	Re-profiled areas are stable with slopes not exceeding 18°.	No evidence of slumping of slopes. Survey of rehabilitated site confirms no slopes exceed 18°. Final landform survey detail included within Closure Report.	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	-
	Final landform contours similar to surrounding land contours	Mapping confirms that final landform contours are consistent with surrounding land contours	Plans prepared by surveyors and photographs within Closure Report.		Not Commenced	Post MOP	-
	Sediment controls to be implemented to manage surface water	Diversion channels/drains to remain are stable and non-eroding (based on "blue Book' requirements). Adequate sediment dams are retained (based on 'Blue Book' requirements). Remaining dams are stable and non-eroding. ESCP to developed and implemented for any structures to be removed that do not report to remaining sediment dams (such as the final pollution control dams to be removed)	ESCP documented. Visual inspection and photos of dams/drains to confirm flow paths and non-eroding. Photos included within Closure Report.		Not Commenced	Post MOP	2

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
	Surface water discharges to be non-polluting	Off-site discharge to be less than 50 mg/L TSS	Surface water monitoring and reporting for downstream locations in unnamed creek.		Not Commenced	Post MOP	5
Phase 3 – Growth Medium Development							
Domain 1 – Infrastructure Area (General) and *Domain 2 – Coal Stockpile Area* and *Domain 3 – Water Management Area*							
Establish soil/growth medium suitable for establishment of vegetation compatible with final land use of site (i.e. Native bushland for all areas except for grassed open space for Mannering downcast shaft and within the high voltage power line easements)	Compacted surfaces deep ripped along contour	Photographs of ripped areas	Photos included within Closure Report.	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	3
	Growth medium replacement to permit vegetation establishment	Depth of growing medium to be ≥ 100 mm. Depth of topsoil to be ≥ 50 mm unless advice of suitable rehabilitation specialist recommends an alternate thickness is acceptable. Note: Suitable growth medium depth to be refined following further soil characterisation and establishment of analogue sites (refer to Section 8.1).	Sampling/testing regime following placement and spreading of material to confirm depths and documented in soil analysis report.		Not Commenced	Post MOP	3
	Key growth medium characteristics in range to permit vegetation establishment	Note: Completion Criteria Not Available (suitable growth medium characteristics are to be nominated following further soil characterisation and establishment of analogue sites) (refer to Section 8.1).	Sampling/testing regime following placement and spreading of material to confirm depths and documented in soil analysis report.		Not Commenced	Post MOP	3
Phase 4 – Ecosystem and Land Use Establishment							
Domain A – Rehabilitation Area (Bushland)							

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising local native plant species	Vegetation communities to be established to have key species consistent with the adjacent • *Broad-Leaved Scribbly Gum Open Forest* (Mannering Colliery) • *Coastal Open Woodland* (Chain Valley Colliery) • *Swamp Sclerophyll Forest* (Chain Valley Colliery upcast shaft) Note: Delta Coal to implement a monitoring program including establishment of analogue sites to be used as a basis for future identification	Vegetation becomes established Majority (i.e. >50%) of established species are present in surrounding communities	Visual inspection and photos of rehabilitation confirm species established. Monitoring and comparison to adjacent analogue/reference sites Details of monitoring included within Closure Report.	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	4, 8

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
	of suitable species list.						
	The rehabilitated area does not constitute an erosion hazard	Any site erosion is insignificant in that it is not resulting in pollution or unstable landforms Surface area cover is consistent with adjacent analogue/reference sites	Visual inspection and photos of rehabilitated area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Mine cottages area on gentle slope, sediment fence installation	Post MOP	2
	Weeds and feral animals are not competing or impacting the rehabilitated area	Implementation of weed and feral animal control program to achieve number of weeds/ferals consistent with adjacent analogue/reference sites.	Visual inspection and photos of rehabilitated area by suitably qualified specialist. Monitoring and comparison to adjacent analogue/reference sites Monitoring results included within Closure Report.		Weed treatment. Crown land licence to allow adjacent land management	Post MOP	4
Domain B – Rehabilitation Area (Grass)							
Establishing open space grassland consistent with surrounds.	Vegetation community to be established to have key species consistent with the adjacent managed grassland. Note: Delta Coal to implement a monitoring program including establishment of analogue sites to be	Vegetation becomes established Majority (i.e. >50%) of established species are present in surrounding communities	Visual inspection and photos of rehabilitation confirm species established. Monitoring and comparison to adjacent analogue/reference sites Monitoring results included within Closure Report.	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	4

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
	used as a basis for future identification of suitable species list.						
	The rehabilitated area does not constitute and erosion hazard	Any site erosion is insignificant in that it is not resulting in pollution or unstable landforms Surface area cover is consistent with adjacent analogue/reference sites	Visual inspection and photos of rehabilitated area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	2
	Weeds and feral animals are not competing or impacting the rehabilited area	Implementation of weed and feral animal control program to achieve number of weeds/ferals consistent with adjacent analogue/reference sites.	Visual inspection and photos of rehabilited area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	4
Domain C – Water Management Area							
No ecosystem and land use establishment activities to this domain							
Phase 5 – Ecosystem and Land Use Sustainability							
Domain A – Rehabilitation Area (Bushland)							
Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising local native plant species	Vegetation communities to be established to have key species consistent with the adjacent • *Broad-Leaved*	Majority (i.e. >50%) of established species are present in surrounding communities	Visual inspection and photos of rehabilitation confirm species established. Monitoring and comparison to adjacent analogue/reference sites	Schedule 3, Condition 13 of Project Approval MP 06_0311	Not Commenced	Post MOP	4, 8

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
	Scribbly Gum Open Forest (Mannering Colliery) • *Coastal Open Woodland* (Chain Valley Colliery) • *Swamp Sclerophyll Forest* (Chain Valley Colliery upcast shaft) Note: Delta Coal to implement a monitoring program including establishment of analogue sites to be used as a basis for future identification of suitable species list.		Details of monitoring included within Closure Report.	Schedule 3, Condition 25 of SSD-5465			
	Vegetation to be self sustaining	Self-propagation in revegetated areas. Clear trend of • increasing species diversity • increasing vegetation density			Not Commenced	Post MOP	4

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
		• increasing foliage cover					
	The rehabilitated area does not constitute and erosion hazard	Any site erosion is insignificant in that it is not resulting in pollution or unstable landforms Surface area vegetation cover is consistent with adjacent analogue/reference sites No further erosion control activities required.	Visual inspection and photos of rehabilitated area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	2
		Absence of gullies >300mm wide or deep and gullies stable.			Not Commenced	Post MOP	2
		Landscape function analysis (or other methodology) shows continued ecosystem function improvements			Not Commenced	Post MOP	2
	Weeds and feral animals are not competing or adversely impacting the rehabilitated area.	Number of weeds/ferals consistent with adjacent analogue/reference sites. No further weed control required (other than what would be required for analogue/reference sites)	Visual inspection and photos of rehabilitation area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	4
Domain B – Rehabilitation Area (Grass)							

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
Establishing open space grasslands consistent with surrounds	Vegetation community to be established to have key species consistent with the adjacent managed grassland.	Majority (i.e. >50%) of established species are present in surrounding communities	Visual inspection and photos of rehabilitation confirm species established. Monitoring and comparison to adjacent analogue/reference sites		Not Commenced	Post MOP	4
	Vegetation to be self sustaining	Self-propagation in revegetated areas. Clear trend of • increasing vegetation density • increasing foliage cover.	Monitoring results included within Closure Report.		Not Commenced	Post MOP	4
	The rehabilitation area does not constitute and erosion hazard	Any site erosion is insignificant in that it is not resulting in pollution or unstable landforms Surface area vegetation cover is consistent with adjacent analogue/reference sites No further erosion control activities required.	Visual inspection and photos of rehabilitation area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	2
		Absence of gullies >300mm wide or deep and gullies stable.			Not Commenced	Post MOP	2
		Landscape function analysis (or other methodology) shows continued ecosystem function improvements			Not Commenced	Post MOP	2

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
	Weeds and feral animals are not competing or adversely impacting the rehabilitated area.	Number of weeds/ferals consistent with adjacent analogue/reference sites. No further weed control required (other than what would be required for analogue/reference sites)	Visual inspection and photos of rehabilitation area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	4
Domain C – Water Management Area							
No ecosystem and land use sustainability activities to this domain							
Phase 6 – Land Relinquishment							
All domains	Demonstrated compliance with all of the above	Demonstrated compliance with all of the above	Relinquishment report prepared by suitable qualified and experience person(s)		No Commenced	Post MOP	-

7 Rehabilitation Implementation

7.1 Status at MOP Commencement

Areas of surface disturbance are limited to relatively small areas due to the inherent nature of underground mining and limited coal processing on-site. As no coal beneficiation occurs on-site and, as a result, no major sources of reject or tailings are generated, the areas of direct surface disturbance within the Chain Valley and Mannering are able to be maintained at a minimum. As a consequence, the opportunities for the rehabilitation of areas of disturbance have been limited, with the surface features remaining largely unchanged since the 1960s.

At the commencement of this MOP, rehabilitation has not commenced for any of the domains within this MOP. All the domains are expected to be utilised until such a time as mine closure occurs.

The assets within each of the domains are described within Section 2.2, and a brief description for each domain is contained in the sections below.

7.1.1 Primary Domain 1 – Infrastructure Area

This domain includes the:

- Main operational area at CVC (administration, stores, storage areas, workshop, drifts, switchyard, car parking, operations offices, bathhouse etc.);
- Main operational area at Mannering (administration, fans, stores, storage areas, workshop, drifts, switchyard, car parking, operations offices, bathhouse etc.);
- Mannering downcast shaft site (located adjacent to VPPS ash dam;
- CVC upcast shaft and ventilation fan site (located at Summerland Point); and
- CVC downcast shaft (located in the north eastern section of the main pit top facilities)

The CVC pit top is gently sloping to the east with no significant changes in surface elevations. Retaining walls are utilised only beneath the winder rope for the man and materials drift. The CVC ventilation shaft site at Summerland Point slopes gently toward the south west, toward Lake Macquarie, with clean water diversion drains in place on the upslope side of the site which direct water around the ventilation fan site compound.

Domain 1 at the Mannering pit top is benched down from the south eastern border with retaining walls (3.5 to 4 m high) separating the carpark from the main operational area, and also separating the main operational area from the coal handling area. The unpaved storage yard is used as a lay down area for equipment and an explosives magazine (not currently utilised). Overall, the domain area falls from south to north and cross contour to the northwest flowing to containment sumps and ponds.

The downcast shaft site is remote to the MC pit top and is located within the boundaries of VPPS ash dam area. The shaft site is relatively small with surrounding areas all managed by Delta Electricity.

Representative photos of the domain are presented in **Plate 7.1** to **Plate 7.17**

Plate 7.1: Mannering workshop and winder house

Plate 7.2: Mannering workshop

Plate 7.3: Mannering hardstand area

Plate 7.4: Mannering coal clearance and processing facilities

Plate 7.5: Mannering hardstand (eastern storage area)

Plate 7.6: Mannering main ventilation fans

Plate 7.7: Mannering carpark

Plate 7.8: Mannering retaining wall below main carpark

Plate 7.9: Mannering downcast shaft site

Plate 7.10: Chain Valley workshop and control room

Plate 7.11: Chain Valley men and materials drift

Plate 7.12: Chain Valley storage yard

Plate 7.13: Chain Valley compressor sheds

Plate 7.14: Chain Valley tube bundle monitoring (main winder and switchroom building behind)

Plate 7.15: Chain Valley operations building

Plate 7.16: Chain Valley administration building and OWSS

Plate 7.17: Chain Valley main ventilation fans

7.1.2 Primary Domain 2 – Coal Stockpile Area

Domain 2 comprises the coal stockpile area and some associated coal handing facilities within the CVC pit top and the coal stockpile area at the Mannering Colliery pit top.

At the MC the coal stockpile emplacement area has a nominal capacity of approximately 25,000 tonnes and is used to store ROM coal when the VPPS is unable to accept the coal or during extended maintenance periods. The coal pad is a constructed area up to 3.5 m higher than the surrounding areas, with high banks on the western and southern boundaries, which can be used as backfill for other areas during closure.

This area has drainage including concrete drains and sumps, which ultimately report to the Pond B water control system. A representative photo showing the Mannering coal stockpile area is presented in **Plate 7.18**. Note: The coal handling infrastructure evident in **Plate 7.19** (e.g. bin, conveyors, gantry) and reclaim tunnel are incorporated into the 1A domain.

CVC has a substantially larger coal stockpile area, which has a capacity of approximately 150,000 tonnes and coal is fed onto the stockpile area by the stacker conveyor shown in Error! Reference source not found.. Sediment laden water is drained from the coal handling and stockpile area into the sediment dams directly to the east of the stockpile location.

Plate 7.18: Mannering coal stockpile area

7.1.3 Primary Domain 3 - Water Management Area

The water management area at the Chain Valley pit top area includes dams 1 to 13 (as detailed in Section 3.2.12.2).

Both surface and groundwater are transferred to the sediment dam system, which enables retention and settlement of fines prior to water being discharged offsite. Flows into the dams occur via pumping (groundwater from the underground workings), gravity flow through subsurface drains and surface flows from dirty water drains established around the coal stockpile area to divert water into the dams. The network of sediment dams can be seen on **Plan 4**.

At the Mannering pit top the water management area includes:

- Dirty water management control system (including Pond B, Pond 1, Pond 2, Pond 3); and
- Former firefighting supply dam (Dam 4).

Ponds B, 1, 2, 3 Dam 4 are shown on **Plan 1B**. The Pond B pollution control system, comprising four pollution control ponds (B, 1, 2,and 3) manages runoff from the pit top. The retention and settlement of storm water takes place within these ponds before water is discharged offsite via LDP1 (**Plan 1B**).

A photo of the domain (from a number of years ago) is presented in **Plate 7.19**.

Plate 7.19: Pond B water management control system

7.2 Proposed Rehabilitation Activities during the MOP Term

Mining operations will continue at CVC. While no coal mining is currently proposed for MC, the MC facilities will remain operational throughout the term of the MOP as MC receives coal from within the CVC holding and transfers it to the VPPS.

During the term of this MOP, all domain areas will remain active. As described within Section 2.1, activities at Mannering within the term of this MOP include the operation of the underground linkage including the use the coal handling facilities at the Mannering Colliery pit top.

Due to the continuing need for the infrastructure at both operations, it is anticipated that all areas of surface disturbance will remain active until the cessation of both Chain Valley and Mannering's mining activities, with the subsequent rehabilitation forming part of the mine closure activities.

Rehabilitation activities will not be substantially commenced within the MOP term, and minor activities related to site rehabilitation within the term of this MOP are expected to be limited to:

- Maintenance of the existing surface facilities, including monitoring of weeds and feral animals along with control activities in accordance with the Land Management and Biodiversity Management Plans.

Plan 4 and **Plan 4A** shows the conceptual final landform and revegetation status at the surface facilities for lease relinquishment.

The total area of disturbance (as defined by the extent of the active domain areas of this MOP) at the commencement of this MOP is 27.8 ha. An area of 0.5ha which includes the mine cottages which are planned to be demolished and rehabilitated during the MOP period, the 27.3 ha of total disturbance will remain at the completion of this MOP term. Demolition of aging infrastructure is planned for CVC during the MOP period. The MC rotary breaker was removed in June 2020 and an underground crushing station is being installed underground at MC and due for commissioning by August 2020.

7.3 Summary of Rehabilitation Areas during the MOP Term

The rehabilitation areas are summarised in **Table 7.1** for each domain.

Table 7.1: Rehabilitation Areas

Domain Code	Rehabilitation Phase	Area at start of MOP (ha)	Area at end of MOP (ha)
1A	Active	17.5	17.0
	Decommissioning	0	0.5
	Landform Establishment	0	0.5
	Growth Medium Development	0	0.5
	Ecosystem and Land Use Establishment	0	0.5
	Ecosystem and Land Use Sustainability	0	0
	Relinquished Lands	0	0
	Total	**17.5**	**17.5**
1B	Active	0.17	0.17
	Decommissioning	0	0
	Landform Establishment	0	0
	Growth Medium Development	0	0
	Ecosystem and Land Use Establishment	0	0
	Ecosystem and Land Use Sustainability	0	0
	Relinquished Lands	0	0
	Total	**0.17**	**0.17**
2A	Active	4.9	4.9
	Decommissioning	0	0
	Landform Establishment	0	0
	Growth Medium Development	0	0
	Ecosystem and Land Use Establishment	0	0
	Ecosystem and Land Use Sustainability	0	0
	Relinquished Lands	0	0
	Total	**4.9**	**4.9**
3A	Active	1.7	1.7
	Decommissioning	0	0
	Landform Establishment	0	0
	Growth Medium Development	0	0
	Ecosystem and Land Use Establishment	0	0
	Ecosystem and Land Use Sustainability	0	0
	Relinquished Lands	0	0
	Total	**1.7**	**1.7**
3B	Active	2.2	2.2

Domain Code	Rehabilitation Phase	Area at start of MOP (ha)	Area at end of MOP (ha)
	Decommissioning	0	0
	Landform Establishment	0	0
	Growth Medium Development	0	0
	Ecosystem and Land Use Establishment	0	0
	Ecosystem and Land Use Sustainability	0	0
	Relinquished Lands	0	0
	Total	**2.2**	**2.2**
3C	Active	1.3	1.3
	Decommissioning	0	0
	Landform Establishment	0	0
	Growth Medium Development	0	0
	Ecosystem and Land Use Establishment	0	0
	Ecosystem and Land Use Sustainability	0	0
	Relinquished Lands	0	0
	Total	**1.3**	**1.3**
Total		**27.8**	**27.8**

7.4 Relinquishment Phase achieved during MOP Term

It is not planned for relinquishment of leases to be achieved during the term of this MOP for any domains.

8 Rehabilitation Monitoring and Research

8.1 Rehabilitation Monitoring

8.1.1 Mine Closure Records

Records of mine closure activities will be kept to assist with the monitoring and assessment of rehabilitation success, including:

- Demolition activities;
- Removal and disposal (e.g. quantities, treatment, location) of demolition materials;
- Clearance certificate(s) for asbestos materials;
- Validation of contaminated material management (if required under a Remedial Action Plan);
- Landform establishment (e.g. materials, timing, drainage) and stability;
- Surface preparation (e.g. growth medium source, treatment and depth);
- Revegetation methods;
- Maintenance activities;
- Photographs; and
- Weather conditions.

During the term of this MOP, Delta Coal will commence a program to investigate and maintain records relating to available soil material for use as growth media on-site, including:

- Soil characterisation of existing soil stockpiles on-site
- Subsoil characterisation over domain areas to determine suitability as growth medium

8.1.2 Vegetation Monitoring

In addition to maintaining the above records, vegetation establishment will be assessed in accordance with a site specific rehabilitation monitoring program which has been developed and is reproduced in **Appendix 2**.

Vegetation monitoring activities will be undertaken periodically at a frequency commensurate with the progress of revegetation, i.e. more frequently following initial revegetation efforts and at a reduced frequency once vegetation is adequately established and natural regeneration is evident. For small scale rehabilitation projects prior to closure (example mine cottage area rehabilitation), visual inspections and photo monitoring will be undertaken quarterly in the first year and annual walkover inspections to determine if rehabilitation is progressing adequately.

The monitoring program for the areas undergoing revegetation to a native bushland, includes:

- a quantitative assessment of revegetation success based on landscape function analysis or other similar methodology proposed by specialist consultants;
- monitoring of analogue/reference sites outside the domain (see Section 8.2);
- assessment of weed species present and feral animal occurrence;
- taking photographs from series of fixed photo points which will enable a qualitative/visual analysis of changes in vegetation structure, condition and regeneration over the lifetime of the rehabilitation strategy; and
- general field observations including the identification of significant rehabilitation issues.

8.1.3 Annual Monitoring

Once closure has commenced and broad scale rehabilitation for the sites has been conducted, annual rehabilitation monitoring will be undertaken to assess the overall rehabilitation success against the established

rehabilitation planning criteria (refer Section 6.0) and other commitments made within this MOP, including a review of the above records and monitoring described in Section 8.1.1 and 8.1.2.

8.2 Research and Rehabilitation Trials and Use of Analogue Sites

Major rehabilitation trials or research programs are considered unnecessary at both operations given the limited disturbance footprint. However, it is expected that the specific rehabilitation methodologies used will be based on experience at other Collieries in the local (Lake Macquarie) area. These will be adapted and modified based on the experience obtained during the closure process.

The analogue/reference site(s) for use in the rehabilitation monitoring program (refer Section 8.1.2) was commenced in 2019. Delta Coal commenced a program establishing and monitoring analogue/reference sites, including:

- Development of analogue/reference sites for Mannering including site(s) within the following adjacent vegetation community:
  - Broad-Leaved Scribbly Gum Open Forest (for pit top).
  - Grass land (for downcast shaft).
- Development of analogue/reference sites for Chain Valley, including site(s) within the following adjacent vegetation communities:
  - Coastal Open Woodland (for pit top).
  - Swamp Sclerophyll Forest (for upcast shaft).
  - Grass land (for pit top area under high voltage power line).

9 Intervention and Adaptive Management

9.1 Update from New Risk Assessment

Risks to rehabilitation and the management of those risks was addressed in the Risk Assessment undertaken as part of the preparation of this MOP (refer to Section 3). **Table 3.2** lists all the potential threats to rehabilitation, the relevant risk ranking assigned to the item within the Risk Assessment and where each of the items is addressed in this document. **Table 9.1** identifies the key threats to rehabilitation, which are those items from the Risk Assessment with an initial risk ranking of 'medium' or higher.

Table 9.1: Key Threats Relating to Rehabilitation

Key threat	Initial Risk Level (based on existing controls) (low, medium, high or critical)	Residual Risk Level (based on proposed controls) (low, medium, high or critical)	Where addressed in this document
Geology/geochemistry and Material prone to spontaneous combustion *Geochemistry of coal materials which may cause combustion risk (through spontaneous combustion or other ignition sources post mine closure – e.g. bushfire)*	Medium	Low	Section 3.2.1
Erosion and sediment control *Water quality impacts to local environment due to less than adequate erosion and sediment control during rehabilitation*	Medium	Low	Section 3.2.6 and Section 3.2.11
Soil type(s) and suitability (Growth Medium) *Insufficient growth medium material available to achieve final land use objectives.* *Soils / growth medium pH*	Medium	Low	Section 3.2.7, Section 8.1
Flora and Fauna *Failure to establish suitable vegetation communities as per MOP*	Medium	Low	Section 3.2.9, Section 8.1
Surface water *Discharge from the site water management system resulting in contamination of water resources*	Medium	Medium	Section 3.2.12
Contaminated land and hydrocarbon management *Contamination remains following closure*	Medium	Low	Section 3.2.13
Bushfire	Medium	Low	Section 3.2.19

Key threat	Initial Risk Level (based on existing controls) (low, medium, high or critical)	Residual Risk Level (based on proposed controls) (low, medium, high or critical)	Where addressed in this document
Significant impact to rehabilitation as a result of bushfire occurring prior to successful establishment of re-vegetation			

9.2 Subsidence Monitoring and Response

Delta Coal has established through approved extraction plans systems for the monitoring and control of mine subsidence over the mining domains where subsidence impacts are predicted. Other areas of land are also planned to be monitored via Delta's Subsidence Monitoring Program (**Appendix 3**) developed for the Northern Mining Area where mining activities occur under surface and built features. This includes a Subsidence Monitoring TARP (**Appendix 4**) detailing specific performance measures and appropriate responses.

9.3 Rehabilitation Trigger Action Response Plan

Table 9.2 presents the Rehabilitation Trigger Action Response Plan (TARP) for each of the rehabilitation threats identified in **Table 9.1**.

Table 9.2: Rehabilitation TARP

Issue	Potential Hazard	Trigger	Action/Response	TARP Ref #
Geology/geochemistry and Material prone to spontaneous combustion	*Geochemistry of coal materials which may cause combustion risk (through spontaneous combustion or other ignition sources post mine closure – e.g. bushfire)*	Assessment of combustion risk (to be undertaken following cessation of mining) identifies materials on site which may pose a combustion risk.	Assessment of combustion risk to include recommendations for management of materials which may pose a combustion risk. Recommendations to be implemented.	1
Erosion and sediment control	*Water quality impacts to local environment due to less than adequate erosion and sediment control during rehabilitation*	Site inspection identifies that erosion and/or controls are not in accordance with completion criteria/ESCP.	Delta Coal personnel investigate to identify inadequate controls, and make recommendations to repair or upgrade site controls (specialist to be engaged as required) to ensure compliance with: • ESCP; • Completion criteria; • "Blue Book'. Recommendations to be implemented.	2
Soil type(s) and suitability (Growth Medium)	*Insufficient growth medium material available to achieve final land use objectives.* *Soils / growth medium pH*	Final soil characterisation (to occur following cessation of mining) identifies that growth medium on-site is not adequate to meet completion criteria.	Soil characterisation assessment to include management recommendations such as details of any soil amelioration requirements. Recommendations to be implemented.	3
Flora and Fauna	*Failure to establish suitable vegetation communities as per MOP*	Vegetation monitoring identifies that vegetation communities established do not meet completion criteria (e.g. not comparable to adjacent/analogue vegetation/final land use objectives).	Notify DPIE. Rehabilitation specialist to be engaged to identify reason for failed vegetation , and recommend actions to improve vegetation outcomes, which may include the following: • Weed and feral animal control; • Erosion control works; • Maintenance fertilizing; • Re-seeding or replanting; • Site security. Controls to be implemented in consultation with DPIE. Where feasible controls cannot be identified, revision of the completion criteria should be considered while still ensuring these criteria achieve the domain rehabilitation objectives.	4
Surface water	*Discharge from the site water management system resulting in contamination of water resources*	Surface water quality monitoring identifies water parameters outside the completion range criteria and/or EPL.	Notify relevant regulatory authorities (e.g. EPA/DPIE). Delta Coal personnel investigate to identify source of pollution, and make recommendations to repair or upgrade site water management controls (specialist to be engaged as required). Controls to be implemented and details of incident and actions taken or to be implemented provided to relevant regulatory authorities.	5

Issue	Potential Hazard	Trigger	Action/Response	TARP Ref #
Contaminated land and hydrocarbon management	*Contamination remains following closure*	Completion of Phase 2 ESAs (to be undertaken following completion of mining) identifies contamination remaining on site.	Remedial action plan to be developed if required based on results of Phase 2 ESAs. Any contamination identified from the site investigations to be remediated in accordance with the requirements identified within the Phase 2 ESA reports and remedial action plan. Validation Report (indicating completion of any required remediation work) is provided to DPIE and other relevant stakeholders.	6
Hazardous materials	*Explosives remain following closure and present public safety risk.* *Note: No explosives to remain at premises following closure.*	Delta Coal becomes aware that: • explosives are remaining on site. • explosives have not been licensed and/or management not in accordance with *Explosives Act 2003*.	Trained and competent personnel (WorkCover accreditation) investigate to identify potential remaining explosives. Actions taken to manage any remaining explosives in accordance with *Explosives Act 2003*.	7
Bushfire	*Significant impact to rehabilitation as a result of bushfire occurring prior to successful establishment of revegetation*	Bushfire occurs on-site and vegetation is destroyed or significantly damaged.	Rehabilitation specialist to be engaged to identify likelihood of bushfire to cause long-term damage to establishment of vegetation communities (resulting in failure to establish vegetation). If necessary, provide recommend actions to improve vegetation outcomes, which may include the following: • Maintenance fertilizing; • Re-seeding or replanting; • Site security; • Amended bushfire controls.	8

10 Reporting

All records and monitoring undertaken in accordance with this MOP will be documented within the Annual Review and submitted to DPIE for review of progress against the MOP. The Annual Review will address monitoring outcomes against rehabilitation planning criteria and compliance with regulatory requirements and commitments.

11 Review and Implementation of the MOP

11.1 Review of the MOP

A review of the MOP will be undertaken during the preparation of the Annual Reviews and also as conditions change over time. This will enable assessment of its continued relevance and adequacy.

This MOP will be reviewed, and if necessary revised in response to:

- any changes to the regulatory requirements affecting the site;
- any modifications of the approvals issued under the EP&A Act; or
- any significant proposed changes to the activities described in this MOP or relinquishment criteria.

11.2 Implementation

Delta Coal personnel responsible for the monitoring, review and implementation of this MOP are detailed in **Table** 11.1.

Table 11.1: Responsibilities for Implementation of the MOP

Position	Responsibility
Mining Engineering Manager	• Allocate adequate resources to undertake activities, including monitoring in accordance with this MOP • Provide high level oversight to ensure mining activities are undertaken consistent with those identified in the MOP
Technical Services Manager	• Develop mine plans and manage authority to mine process to ensure mining activities are consistent with the MOP • Provide input into MOP development and future mine planning to ensure alignment and consistency
Registered Mine Surveyor	• Develop MOP Plans for mine closure activities in accordance with this MOP • Develop relinquishment plans for lease relinquishment when closure criteria are achieved
Environmental Compliance Officer	• Consultation with Technical Services Manager and Registered Mine Surveyor during development of the MOP • Review and update the MOP for consistency with any future approvals or modifications • Coordinate and supervise mine closure activities, monitoring and procedures in accordance with this MOP • Coordinate the environmental monitoring programs in accordance with this MOP • Consult with regulatory authorities and other stakeholders as required • Report the progress of mine closure and rehabilitation in the Annual Review in accordance with this MOP • Monitor and report on the implementation of closure and rehabilitation activities to the Manager of Mining Engineering • Coordinate and supervise mine progressive site rehabilitation in accordance with this MOP
Approvals Coordinator	• Ensure MOP documentation is current and reviewed as required to support CVC and MC operations

12 References

Documents used in the preparation of this management plan are detailed in **Table 12.1**.

Table 12.1: References

Reference	Title
Standards and guidelines	NSW Trade & Investment (2012), MDG 6001: Guideline for the Permanent Filling and Capping of Surface Entries to Coal Seams
Legislation and Regulations	Environment Protection Licence (EPL) 1770 *Mining Act 1992* *National Greenhouse and Energy Reporting Act 2007* National Greenhouse and Energy Regulations 2008 National Greenhouse and Energy Reporting (Measurement) Determination Development consent SSD-5465 (as modified) NSW EPA (18/06/2016) Chain Valley Colliery Environmental Protection Licence (EPL) 1770 NSW EPA (12/05/2017) Mannering Colliery Environmental Protection Licence (EPL) 191 *Protection of the Environment Operations Act, 1997* Protection of the Environment Operations (Clean Air) Regulation 2010
Delta Coal documents	Delta Coal Environmental Management Strategy Mannering Colliery Land Management Plan Mannering Colliery Air Quality Management Plan Mannering Colliery Noise Monitoring Program Mannering Colliery Water Management Plan Chain Valley Water Management Plan Chain Valley Air Quality Management Plan Chain Valley Noise Management Plan Chain Valley Heritage Management Plan Chain Valley Biodiversity Management Plan Chain Valley Rehabilitation Management Plan

Reference	Title
	Delta Coal Chain Valley Colliery Subsidence Monitoring Program
External documents	AECOM (2012), Asbestos Re-Inspection Survey Report Chain Valley Colliery EHO Consulting (2020), Hazardous Material Survey and Register – Chain Valley Colliery EHO Consulting (2020), Hazardous Material Survey and Register - Mannering Colliery EMM (2013), Chain Valley Colliery – Mining Extension Project Environmental Impact Statement. EMM (2014b), Chain Valley Colliery – Modification 1 Statement of Environmental Effects. EMM (2015), Chain Valley Colliery – Modification 2 Statement of Environmental Effects. EMM (2019), Chain Valley Colliery – Modification 3 Statement of Environmental Effects. Umwelt (2020), Chain Valley Colliery – Modification 4 Statement of Environmental Effects EMM (2015), Mannering Colliery – Modification 3 Environmental Assessment. EMM (2016), Mannering Colliery – Modification 4 Environmental Assessment. EMM (2016), Mannering Colliery – Modification 5 Statement of Environmental Effects GSSE (2012), Mannering Colliery - Extension of Mine Project Environmental Assessment Hansen Bailey (2007), Mannering Colliery Continuation of Mining Environmental Assessment. Hansen Bailey (2007), Mannering Environmental Assessment, Response to Submissions Seedsman Geotechnics Pty Ltd (2011), Centennial Mannering Pty Ltd, Section 75W Assessment, Great Northern and Fassifern Seams URS (2012), Hazardous Materials Survey and Register Mannering Colliery

13 Appendix 1 Plans

Manager of Mining Engineering
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Signed _____ Date 10.8.21

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- Chain Valley Holding - Fassifern Seam
- Chain Valley Holding - Surface
- Local Government Area - Boundary
- Mining Leases

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 1A - Pre-Mining Environment - Project Locality

SCALE:	1 : 14 000 @ A0	DATE:	10 August 2021
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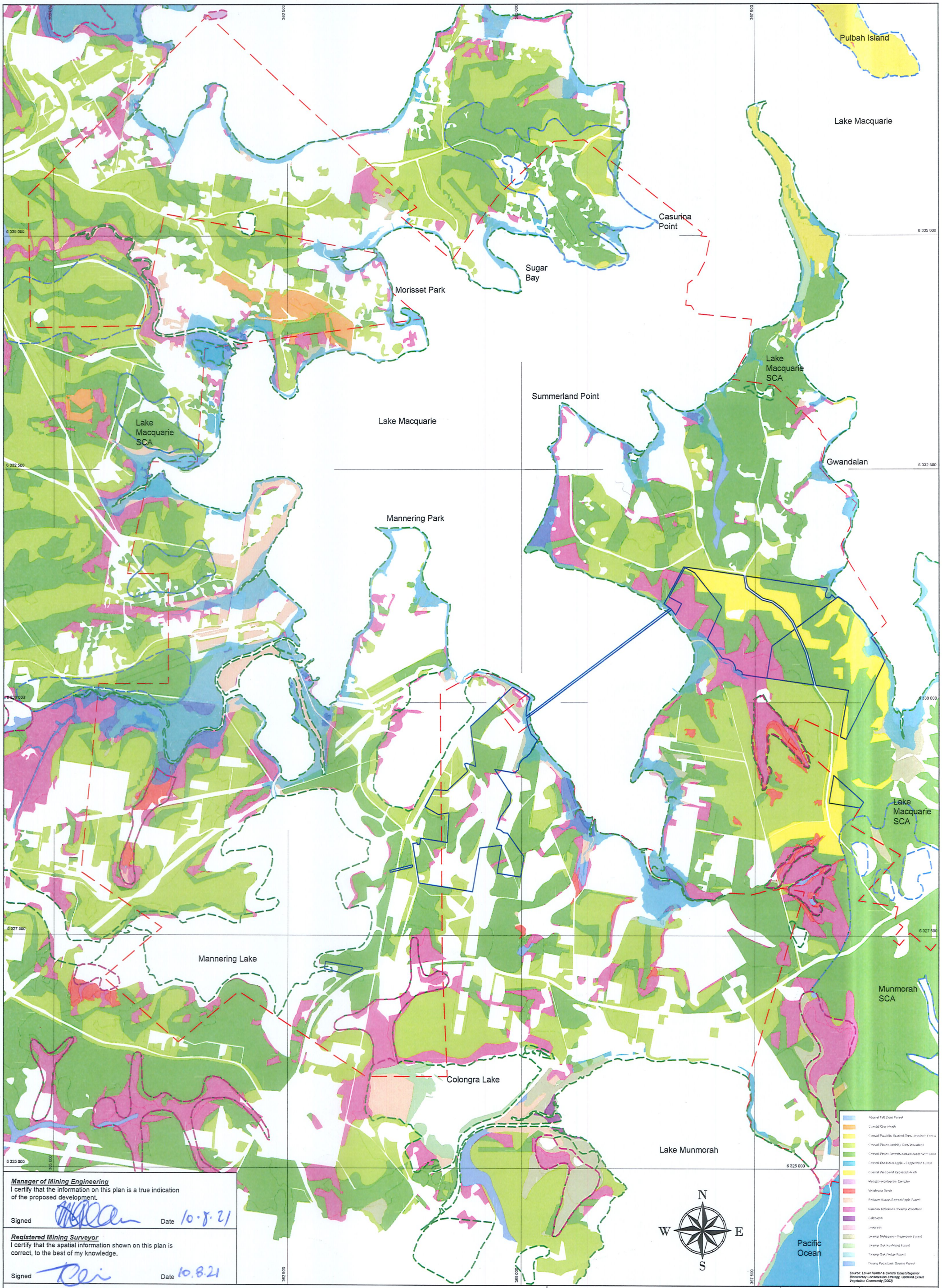
CHECKED:	C Nicholas	REV NO:	0
APPROVED:	D McLean	SIZE	A0

Delta coal



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Chain Valley Holding - Fassifern Seam
Chain Valley Holding - Surface
Flood Prone Land (<2m AHD)

Land Capability Classes
IV VI VIII
Source: *Land and Soil Capability Mapping for NSW*, OEH (2017)

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 1B - Pre-Mining Environment - Natural Environment

SCALE:	1 : 12 500	DATE:	10 August 2021
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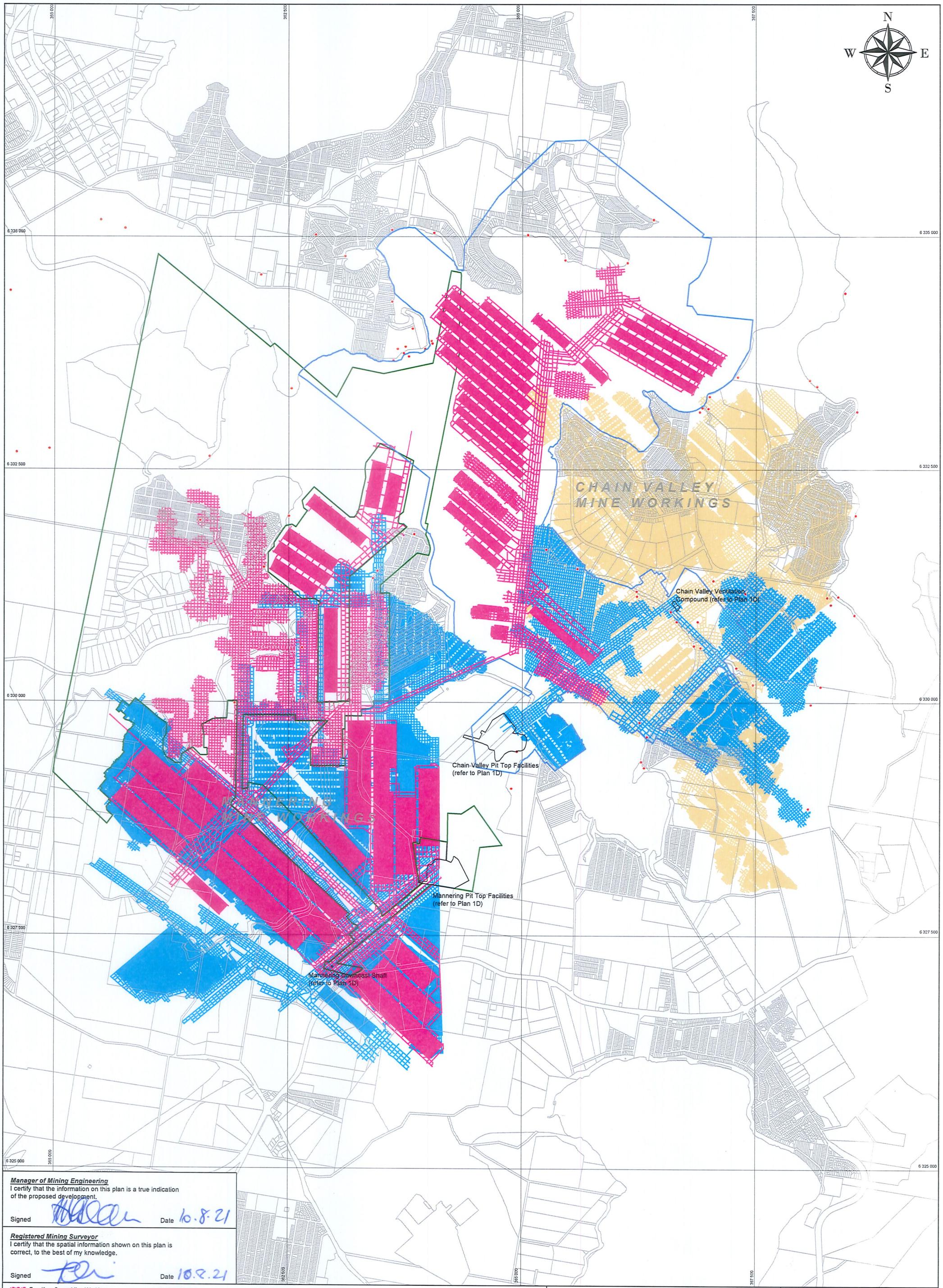
CHECKED:	C Nicholas	REV NO:	0
SIGNED:	D McLean	SIZE:	A0

Delta coal



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- Fassifern Seam Mine Workings
- Great Northern Seam Mine Workings
- Wallarah Seam Mine Workings
- AHIMS Site
- SSD-5465 Consent Boundary
- MP06_0311 Approval Boundary

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 1C - Pre-Mining Environment - Regional Built Environment

SCALE:	1 : 12 500	DATE:	10 August 2021
DRAWN:	T Chisholm	DRG NO:	C1B0043_1C
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Date of aerial photo: 19/10/2019

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 1D - Pre Mining Environment - Built Features (Pit Top Area)

SCALE:	1 : 2500 (main plan) 1 : 1000 (inset)	DATE:	10 August 2021
DRAWN:	T Chisholm	DRG NO:	C1B0043_1D
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Delta coal

Chain Valley Colliery
Entry Drifts & Coal
Handling Facilities

Mannering Colliery
Entry Drifts & Coal
Handling Facilities

N
W E
S

Mannering Colliery
Downcast Shaft

N
W E
S

Chain Valley Colliery Ventilation
Compound

N
W E
S

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Land Ownership Key
- Delta Electricity
- Transgrid
- State of NSW

Land Ownership Key
- Delta Coal

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 1E - Pre-Mining Environment - Land Ownership

SCALE:	1 : 4000	DATE	10 August 2021
DRAWN:	T Chisholm	DRG NO:	C1B0043_1E
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E2 Environmental Conservation
E3 Environmental Management
IN2 Light Industrial
R2 Low Density Residential
RE1 Public Recreation
RE2 Private Recreation
RU6 Transition
SP2 Infrastructure
W2 Recreational Waterways

Source: Wyong Local Environmental Plan 2013 (WLEP 2013)

Date of aerial photo: 19/10/2019

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 1F - Pre Mining Environment - Council Zoning Areas

SCALE:	1 : 2500 (main plan) 1 : 1000 (inset)	DATE:	10 August 2021
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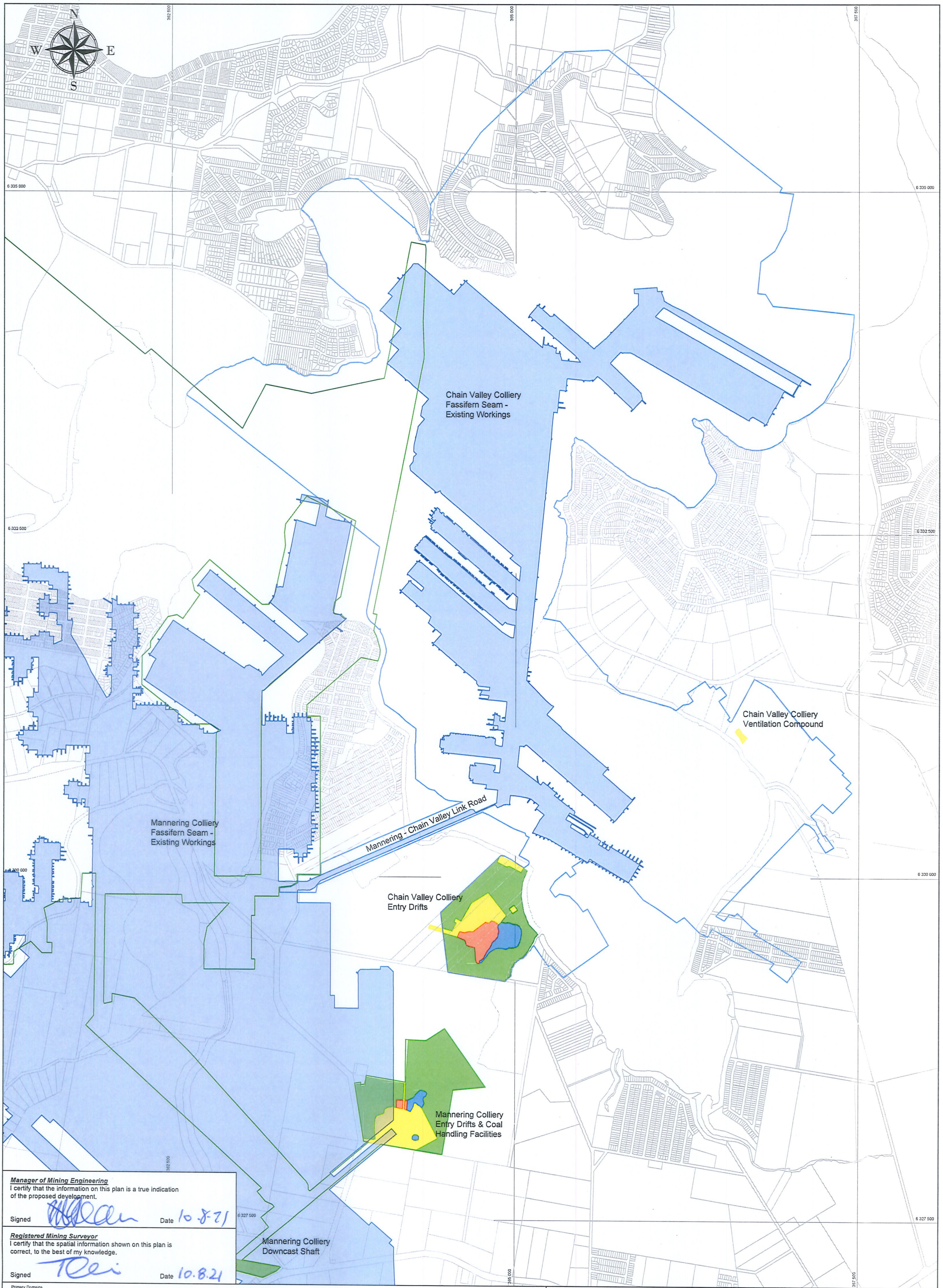
SIGNED:	D McLean	SIZE:	A0

Delta coal



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Primary Domains
- (1) Surface Infrastructure
- (2) Coal Handling & Stockpile
- (3) Water Management
- Mining Disturbance Area
- Disturbance Area - End of MOP
- Non-mining surface disturbance
- SSD-5465 Consent Boundary
- MP06_0311 Approval Boundary

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 2 - Pre-Mining Environment - Mine Domains (Regional)

SCALE:	1 : 8500	DATE:	10 August 2021
DRAWN:	T Chisholm	DRG NO:	C1B0043_2
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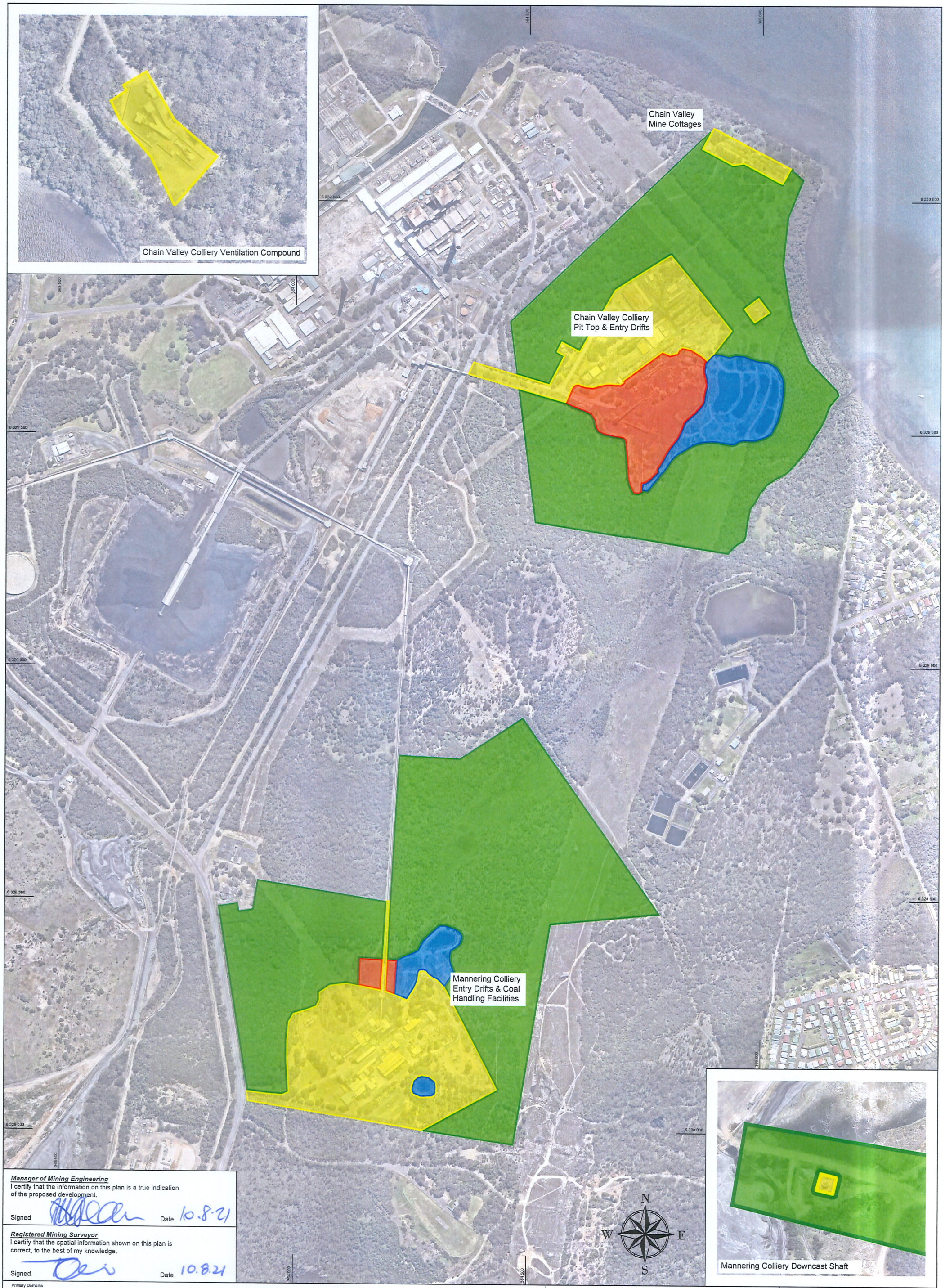
Delta coal



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Primary Domains
- (1) Surface Infrastructure
- (2) Coal Handling & Stockpile
- (3) Water Management
- Non-mining surface area

Date of aerial photo: 19/10/2019

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 2A - Pre Mining Environment - Mine Domains (Surface Facilities)

SCALE:	1 : 2500 (main plan) 1 : 1000 (inset)	DATE:	10 August 2021
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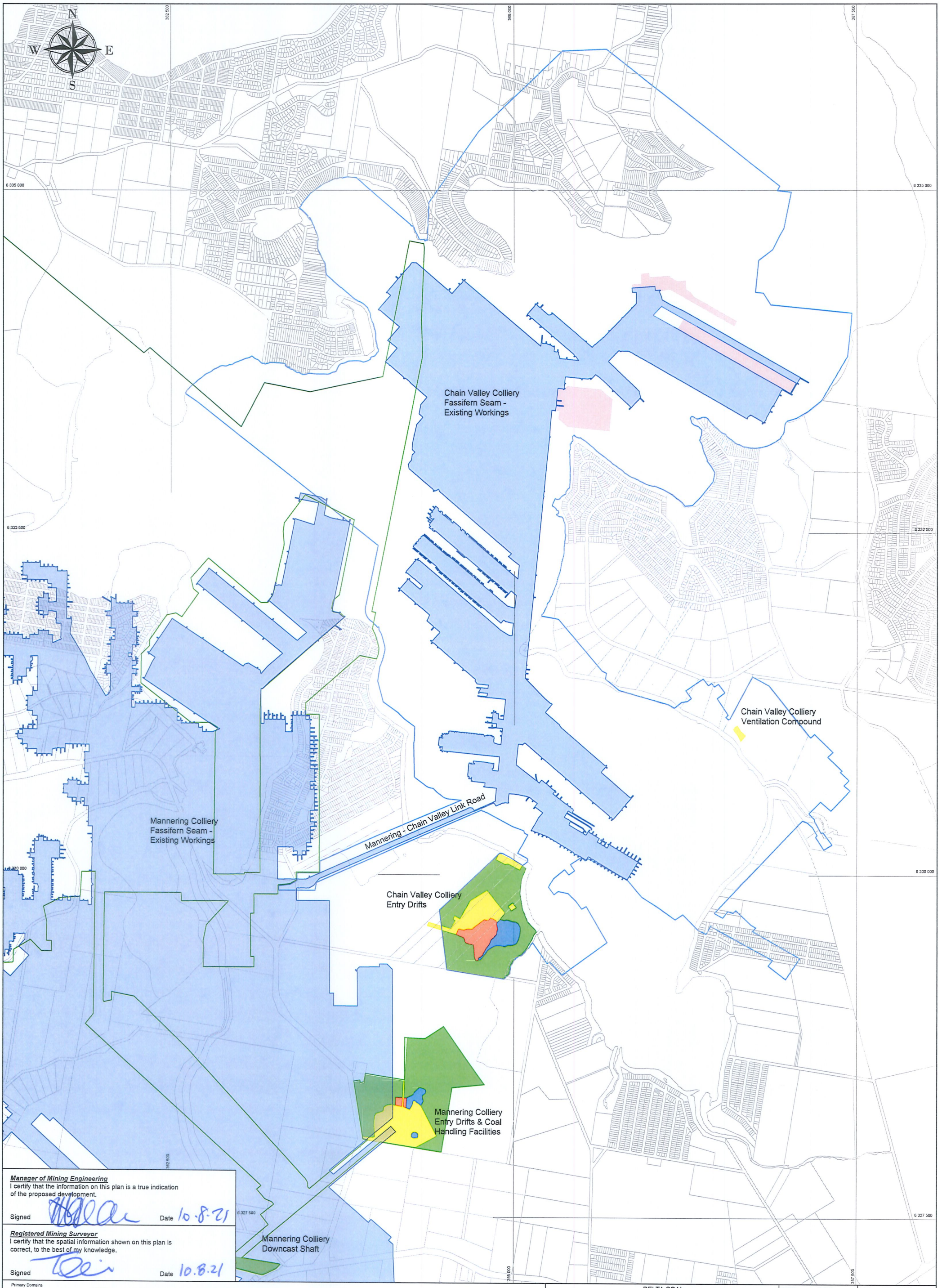
CHECKED:	C Nicholas	REV NO:	0
SIGNED:	D McLean	SIZE	A0

Delta coal



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Primary Domains

(1) Surface Infrastructure
(2) Coal Handling & Stockpile
(3) Water Management
Mining Disturbance Area
Disturbance Area - End of Period
Non-mining surface disturbance
SSD-5465 Consent Boundary
MP06_0311 Approval Boundary

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 3A - Mining Disturbance Area - Year 1 (31/08/2020 - 31/12/2020)

SCALE:	1 : 8500	DATE:	10 August 2021
DRAWN:	T Chisholm	DRG NO:	C1B0043_3A
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Delta coal

N
W
E
S

352 500
355 000
357 500
6 335 000
6 332 500
6 330 000
6 327 500

Chain Valley Colliery
Fassifern Seam -
Existing Workings

Mannering Colliery
Fassifern Seam -
Existing Workings

Mannering - Chain Valley Link Road

Chain Valley Colliery
Ventilation Compound

Chain Valley Colliery
Entry Drifts

Mannering Colliery
Entry Drifts & Coal
Handling Facilities

Mannering Colliery
Downcast Shaft

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Primary Domains
- (1) Surface Infrastructure
- (2) Coal Handling & Stockpile
- (3) Water Management
- Mining Disturbance Area
- Disturbance Area - End of Period
- Non-mining surface disturbance
- SSD-5465 Consent Boundary
- MP06_0311 Approval Boundary

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 3B - Mining Disturbance Area - Year 2 (1/01/2021 - 31/12/2021)

SCALE:	1 : 8500	DATE:	10 August 2021
DRAWN:	T Chisholm	DRG NO:	C1B0043_3B
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SIGNED:	D McLean	SIZE:	A0

Delta coal

N
W
E
S

362 500
365 000
367 500
6 335 000
6 332 500
6 330 000
6 327 500

Chain Valley Colliery
Fassifern Seam -
Existing Workings

Mannering Colliery
Fassifern Seam -
Existing Workings

Mannering - Chain Valley Link Road

Chain Valley Colliery
Ventilation Compound

Chain Valley Colliery
Entry Drifts

Mannering Colliery
Entry Drifts & Coal
Handling Facilities

Mannering Colliery
Downcast Shaft

Manager of Mining Engineering
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Primary Domains
(1) Surface Infrastructure
(2) Coal Handling & Stockpile
(3) Water Management
Mining Disturbance Area
Disturbance Area - End of Period
Non-mining surface disturbance
SSD-5465 Consent Boundary
MP06_0311 Approval Boundary

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 3C - Mining Disturbance Area - Year 3 (1/01/2022 - 31/12/2022)

SCALE:	1 : 8500	DATE:	10 August 2021
DRAWN:	T Chisholm	DRG NO:	C1B0043_3C
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Delta coal

N
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352 500
355 000
357 500
6 335 000
6 332 500
6 330 000
6 327 500

Chain Valley Colliery
Fassifern Seam -
Existing Workings

Mannering Colliery
Fassifern Seam -
Existing Workings

Mannering - Chain Valley Link Road

Chain Valley Colliery
Ventilation Compound

Chain Valley Colliery
Entry Drifts

Mannering Colliery
Entry Drifts & Coal
Handling Facilities

Mannering Colliery
Downcast Shaft

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Signed _____ Date 10.8.21

Primary Domains
- (1) Surface Infrastructure
- (2) Coal Handling & Stockpile
- (3) Water Management
- Mining Disturbance Area
- Disturbance Area - End of Period
- Non-mining surface disturbance
- SSD-5465 Consent Boundary
- MP06_0311 Approval Boundary

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 3D - Mining Disturbance Area - Year 4 (1/01/2023 - 31/12/2023)

SCALE:	1 : 8500	DATE:	10 August 2021
DRAWN:	T Chisholm	DRG NO:	C1B0043_3D
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Delta coal

Chain Valley Mine Cottages

Ground levelled to suit

1B

Chain Valley Colliery Pit Top & Entry Drifts

1A

1B

3C

3B

3A

2A

3C

3A

3C

3C

3A

2A

1A

Mannering Colliery Entry Drift & Coal Handling Facilities

N

W

E

S

Manager of Mining Engineering

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Registered Mining Surveyor

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Secondary Domains

(A) Rehabilitation - Bushland

(B) Rehabilitation - Grassland

(C) Water Management

Non-mining surface area - rehab not required

Date of aerial photo: 19/10/2019

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 4 - Final Rehabilitation Domains

SCALE:	1 : 2500 (main plan) 1 : 1000 (inset)	DATE:	10 August 2021
DRAWN:	T Chisholm	DRG NO:	C1B0043_4
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Delta coal

Chain Valley Mine Cottages

Ground levelled to suit

Chain Valley Colliery Pit Top & Entry Drifts

Mannering Colliery Entry Drift & Coal Handling Facilities

N
W
E
S

Manager of Mining Engineering
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Registered Mining Surveyor
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22.0 - Contours AHD

Date of aerial photo: 19/10/2019

DELTA COAL
CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

Mining Operations Plan 2020-2023 Amendment 2
Plan 4A - Final Landform Contours

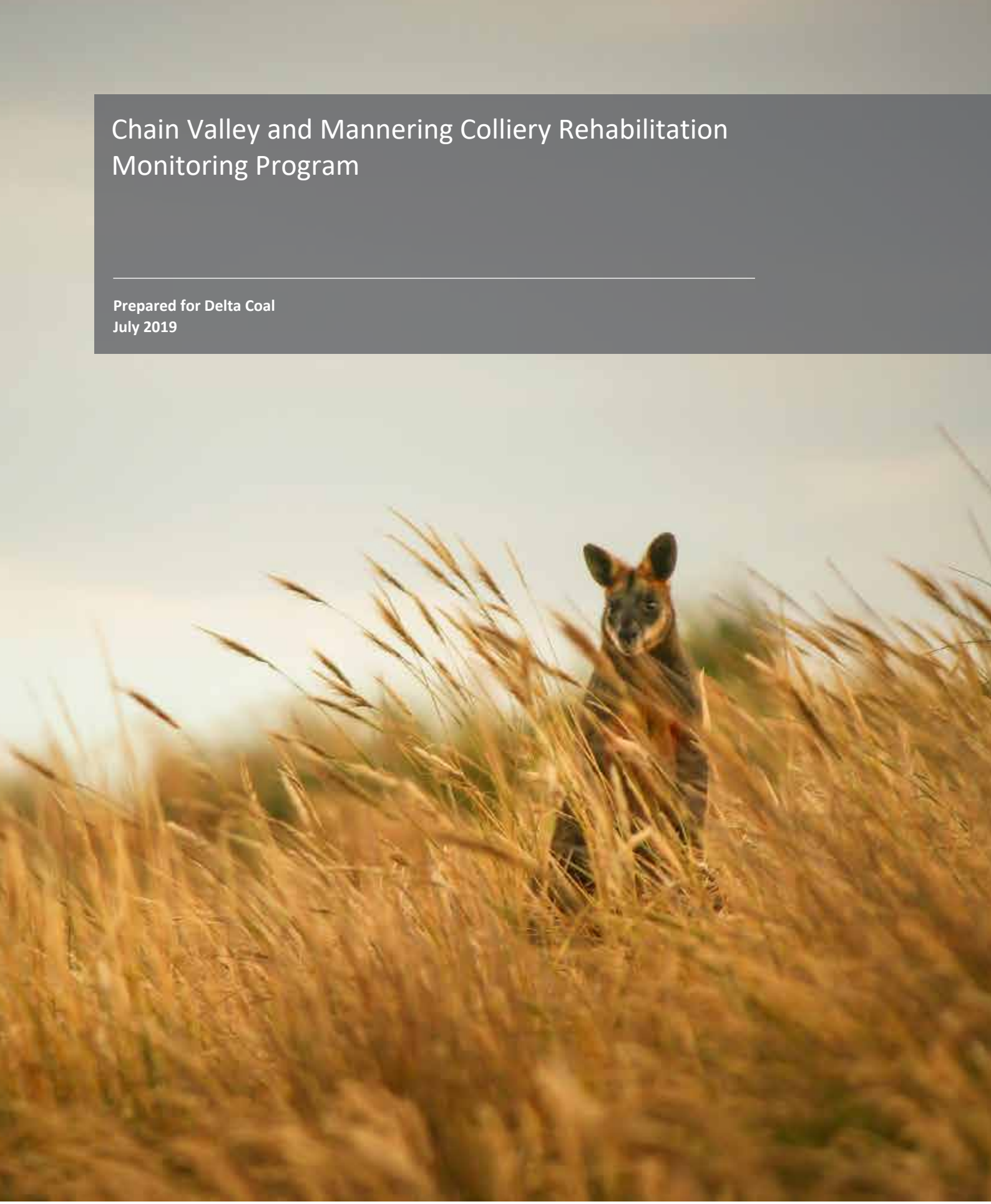
SCALE:	1 : 2500 (main plan) 1 : 1000 (inset)	DATE:	10 August 2021
DRAWN:	T Chisholm	DRG NO:	C1B0043_4A
CHECKED:	C Nicholas	REV NO:	0
SIGNED:	D McLean	SIZE:	A0

Delta coal

14 Appendix 2 - Rehabilitation Monitoring Program

Chain Valley and Mannering Colliery Rehabilitation Monitoring Program

Prepared for Delta Coal
July 2019



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South Melbourne VIC 3205

PERTH
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Fremantle WA 6160

CANBERRA
PO Box 9148
Deakin ACT 2600

Chain Valley and Mannering Colliery Rehabilitation Monitoring Program

Report Number

H190028 RP

Client

Delta Coal

Date

4 July 2019

Version

v3 Final

Prepared by

Eugene Dodd
Senior Ecologist
4 July 2019

Approved by

Katie Diver
National Technical Leader - Ecology
4 July 2019

Table of Contents

Appendices

Tables

Figures

1 Introduction

1.1 Introduction

Chain Valley Colliery (CVC) and Mannering Colliery (MC) (the mines) are underground coal mines located at the southern extent of Lake Macquarie, approximately 60 km south of Newcastle. The mines are operated by Delta Coal Pty Ltd (Delta Coal) and produce thermal coal for the domestic and export markets.

The mines operate in accordance with Chain Valley and Mannering Collieries Mining Operation Plan and rehabilitation management plan (MOP) 2018 to 2021 (ENV 00028). Operations at CVC and MC are not planned to cease during the term of this MOP. Significant changes to the surface facilities were not proposed to occur during the MOP term. Delta Coal has approached DRE with the intention to demolish the Mine Cottages in Q4 2019. In addition, there is an intention to seek modifications to the CVC and MC project approval permits. At a minimum Delta Coal plan to continue operations at MC beyond the 30 June 2022 limit to align with the current approval for CVC, that is, until the 31 December 2027. During this time all surface operation areas will be utilised therefore no restoration is likely until after 2027. Following 2027, decommissioning may occur if no further development approval is granted, which would include rehabilitation of the entire surface operation areas (27 ha).

This report outlines the vegetation monitoring program (VMP) and methods proposed to assess compliance with the rehabilitation objectives. The success of the rehabilitation will be compared against analogue sites in comparatively undisturbed areas of equivalent vegetation around the surface operation areas. The baseline data from the analogue sites provide relative benchmarks for rehabilitation and act as a control against environmental variability throughout the monitoring program.

This report also includes the baseline results from the initial survey of analogue sites (Appendix A). Soil testing required by the MOP has been commissioned separately by Delta Coal and will be documented in a separate report to this VMP.

1.2 Rehabilitation monitoring plan requirements

Chapter 8 of the MOP requires that a monitoring program is conducted to assess vegetation establishment in the revegetation areas. Specific requirements stated in Section 8.1.2 are outlined in Table 1.1.

Table 1.1 Vegetation monitoring requirements

Requirement	Section addressed
A quantitative assessment of revegetation success based on landscape function analysis or other similar methodology proposed by specialist consultants	Chapter 2 describes a modified BioBanking plot and transect method to detect rehabilitation trends, and particularly progression to benchmark values. Delta Coal has engaged a specialist soil consultant that will undertake soil monitoring of the rehabilitation sites using landscape function analysis. This will be documented in a separate report to the VMP.
Monitoring of analogue/reference sites outside the domain	Section 1.4, Chapter 2 and Appendix B
Assessment of weed species present and feral animal occurrence	Section 2.3, and 2.8
Taking photographs from series of fixed photo points which will enable a qualitative/visual analysis of changes in vegetation structure, condition and regeneration over the lifetime of the rehabilitation strategy	Section 2.2 and 2.7
General field observations including the identification of significant rehabilitation issues.	Section 2.8 and Section 2.11.2

1.2.1 Consultation

The Department of Planning and Environment (DPE) were provided with a draft rehabilitation monitoring program on 12 March 2019. Their submissions were returned on 10 April 2019 and are outlined below (Table 1.2). Responses are summarised in the table with relevant section of the report referenced.

Table 1.2 Summary of DPE submissions and corresponding responses

DPE comments	Response
There is no detail as to how many analogue sites will be established per rehabilitation domain or detail regarding the appropriateness of analogue sites being selected based on rehab domain attributes (ie slope / aspect)	The rehabilitation areas will be flat or very slightly sloping, consistent with the both the original landform and the surrounding landforms (where the analogue sites are located). Therefore, the four analogue sites are appropriate based on landform attributes, as detailed in Section 1.3.
Monitoring is proposed to be undertaken during 2019 and then when rehabilitation at CVC and MC is being performed (est. 2027). The Monitoring Plan does not identify:	
• How analogue sites will be managed during this time;	Star pickets will be used to mark the location of the analogue site, in addition to GPS locations (Section 2.2). These sites are not currently managed, and no maintenance is required.
• How variability (eg rainfall / drought etc) within the analogue sites will be recorded and monitored (ie should baseline results from 2019 be impacted by drought, whether these will be low commensurate to required criteria eg low groundcover results. This may subsequently set inappropriate benchmarks);	Coastal areas had rainfall preceding the baseline analogue surveys with many species actively growing and detectable. Anecdotal observation during repeated field surveys over the last five years, had not detected significant variation in the community composition owing to climatic conditions. Moreover, the analogue site will be surveyed simultaneously with the rehabilitation sites, therefore any climatic variation will apply to both sites. Therefore, results including apparent anomalies in rehabilitation sites, will be able to be interpreted considered in context with the analogue site.
• How continued appropriateness of analogue sites will be demonstrated (ie should analogue sites transition between vegetation communities / become dominated by weeds / disturbances etc). As such, additional justification for one monitoring event during 2019 until rehabilitation of CVC/MC (est. 2027) is required.	In order to ensure continued appropriateness of analogue sites until mine closure, analogue sites will be monitored every four years. If the analogue site is substantially altered (such as significant weed invasion, fire etc), then suitable management measures will be undertaken, or an alternative site selected. Three of the analogue sites are located in the same community therefore if one is affected by stochastic factors, data can be used from the other analogue sites.
• Section 2.8 Monitoring event conditions. “During each monitoring event, any observations which help to inform the success of the rehabilitation or provide context to quantitative results should be recorded. Such observations may include but are not limited to weed prevalence, erosion…” It’s the Regulators view that these observations are of considerable value, therefore wording such as ‘should’ and ‘may’ require reconsideration.	Section 2.8 updated in accordance with regulator comments.

1.3 Rehabilitation of surface operation areas

The purpose of rehabilitation of the surface operation areas at CVC and Mannering is to restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of local native plant species and produce a landform consistent with the surrounding environment (MOP 2018).

Rehabilitation will be designed to match the original plant community type prior to disturbance, based on landforms and the surrounding vegetation communities present. In addition, seed will be preferentially sourced from local provenance. Further to the above, 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 and require periodic maintenance following mine closure).

The total of area of rehabilitation is approximately 27 ha with Plan 4 and Plan 4A in the MOP detailing the conceptual final landform and revegetation status at the surface operation areas for lease relinquishment. The plans currently detail areas which will either be grassland, bushland, or water management and are summarised below.

At MC, rehabilitation is stated to include:

- Broad-Leaved Scribbly Gum Open Forest (for pit top); and
- Grassland (for downcast shaft).

At CVC, rehabilitation will include:

- Coastal Open Woodland (for pit top);
- Swamp Sclerophyll Forest (for upcast shaft); and
- Grassland (for pit top area under high voltage power line).

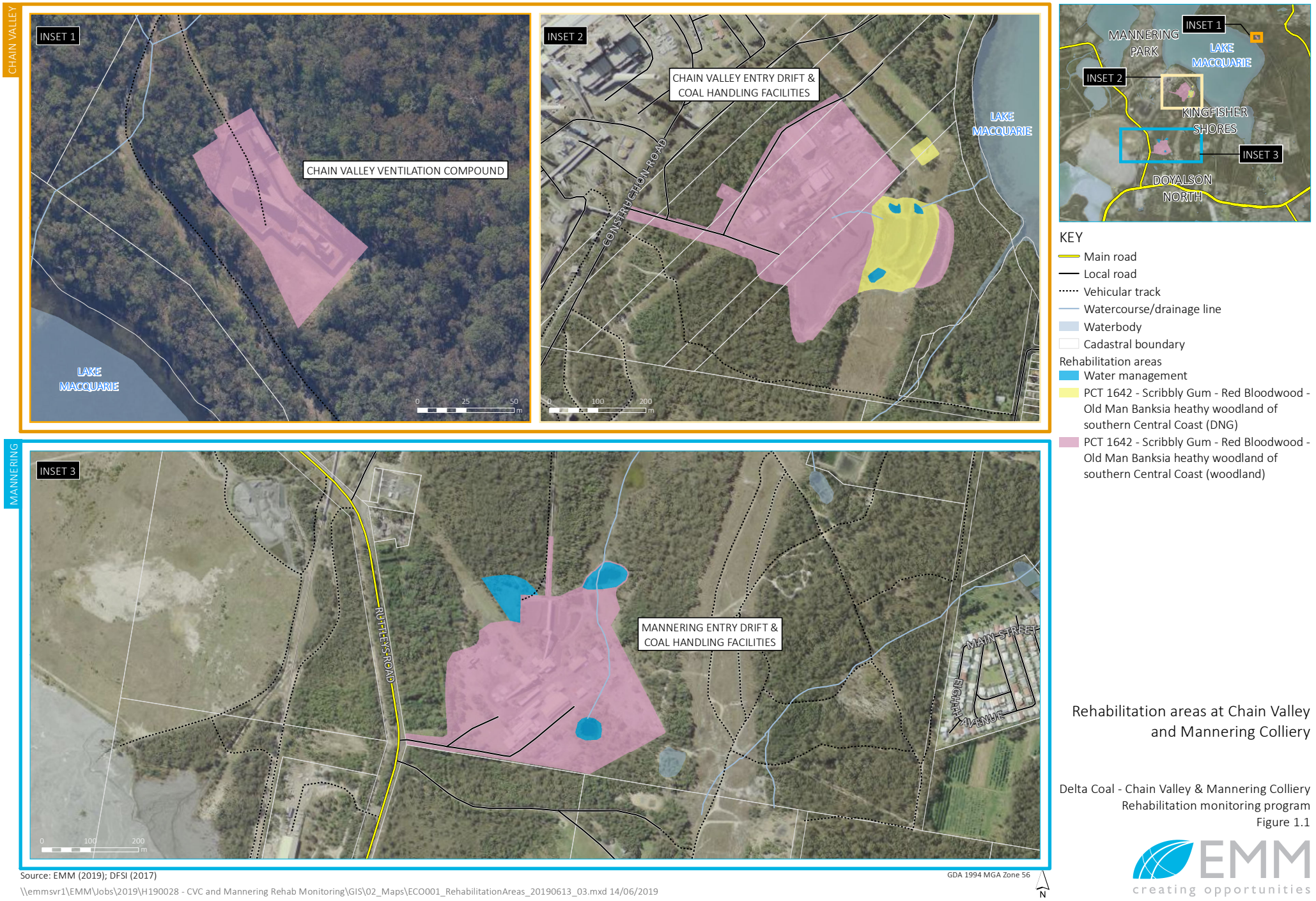
1.3.1 Updates to rehabilitation areas

The broad vegetation types detailed in the MOP does not assign vegetation to Plant Community Types (PCT), which is the current method for categorising vegetation communities within NSW. Furthermore appropriate PCT attribution is necessary for obtaining benchmark data (see Section 2.10). Each PCT also assigned a zone, which indicates a broad condition class.

Based on collection of detailed plot data and our knowledge of the site, rehabilitation areas were assigned to the PCT and zones shown in Table 1.3

Table 1.3 Assignment of PCT to the rehabilitation areas

Location	Rehabilitation area in MOP	Rehabilitation area – this monitoring program	Rationale
MC pit top	Broad-Leaved Scribbly Gum Open Forest	PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_woodland	Species composition aligns with PCT 1642 and the intent of the rehabilitation is to establish woodland.
MC Downcast shaft	Grassland	N/A	Not considered further as this area will be incorporated into the Delta Power Station ash dam and will not be rehabilitated as part of the MC process.
CVC pit top	Coastal Open Woodland	PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_woodland	Species composition aligns with PCT 1642 and the intent of the rehabilitation is to establish woodland.
CVC upcast shaft	Swamp Sclerophyll Forest	PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_woodland	Judging by the surrounding communities and landforms, PCT 1642 appear to be the most appropriate rehabilitation aim. The area is somewhat ecotonal, however Swamp Sclerophyll forest is largely distributed immediately downslope of the upcast shaft rehabilitation area.
CVC pit top area under high voltage power line	Grassland	PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_DNG	PCT 1642_DNG (derived native grassland) has been assigned given that the grassland is likely derived from the surrounding woodland.



Source: EMM (2019); DFSI (2017)

GDA 1994 MGA Zone 56

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\\emmsvr1\EMM\Jobs\2019\H190028 - CVC and Mannering Rehab Monitoring\GIS\02_Maps\ECO001_RehabilitationAreas_20190613_03.mxd 14/06/2019

Rehabilitation areas at Chain Valley and Mannering Colliery

Delta Coal - Chain Valley & Mannering Colliery
Rehabilitation monitoring program
Figure 1.1

EMM
creating opportunities

1.4 Establishment of analogue sites

Analogue sites are required in retained bushland areas adjacent to future rehabilitation areas. These provide local benchmarks for vegetation, inform completion criteria and act as a control against environmental variation when directly compared with rehabilitation monitoring results.

In alignment with the revegetation community types, analogue sites will be established at MC within the following adjacent vegetation zones:

- PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_woodland.

In alignment with the revegetation community types, analogue sites will be established at CVC within the following adjacent vegetation communities:

- PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_woodland; and
- PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_DNG

The location of analogue sites is provided in the baseline report (Appendix A).

2 Monitoring program

This section outlines the monitoring program designed to assess rehabilitation success, in particular the coverage and diversity of native vegetation, and a progression toward benchmark values of the intended community type.

An adapted BioBanking plot and transect method will be used in both the analogue sites and the rehabilitation sites. This method is repeatable and provides reliable estimates of percentage cover. Detailed data will be collected on species composition, structure and function.

2.1 Plot stratification

Plots will be stratified according to the vegetation types, with two plots conducted for each intended vegetation type within each rehabilitation area. The exception is the vent shaft area, where the rehabilitation area is of insufficient size to accommodate more than one plot, requiring two plots at MC and five at CVC. A single plot is proposed for each vegetation community per analogue site, with one plot proposed at MC and three at CVC.

Table 2.1 Plot and transects stratified per community

Community type	Rehabilitation area	Analogue site
Mannering		
PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_woodland	2	1
Chain Valley		
PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_woodland (pit top)	2	1
PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_woodland (pit top)	2	1
PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_DNG (vent shaft)	1	1
Total	**7**	**5**

2.2 Plot establishment

Plots will be established in each rehabilitated vegetation type, ensuring that they are representative of the overall condition and not within a transitional area into another vegetation type. Plots will not be located across tracks or other areas of disturbance.

A transect of 50 m will bisect the middle of the plot, orientated from north (start) to south). This will be marked by GPS and a permanent start picket at each end. A metric 50 m measuring tape will be laid the full length of the transect.

A total of four landscape photos will be taken at the start point. These will be taken facing north, east, south and west (in that order). A copy of the original baseline photos will be taken on all subsequent events to ensure a similar frame is captured.

At each monitoring event, a 20 m x 20 m plot will be arranged from the start of the 50 m transect. At a minimum, a 60 m measuring tape should be used to bound three of the sides.

2.3 Species composition – 20 m x 20 m plot

A comprehensive species list will be recorded for the plot.

An estimate of the cover will also be recorded for each species, using the following scale:

- Less than 1%: increments of 0.1;
- 1% to 10%: nearest whole number; and
- 10 to 100%: nearest 5%.

An estimate of the abundance of each species will be recorded using the following intervals:

- 1-10, 20, 50, 100, 500, 1000 +.

Note that the cover and abundance estimate will not be used for quantitative analysis. Rather, it will allow for broad interpretation of any changes over time – for example if particular species is driving increases in coverage.

2.4 Structure and coverage 50 m transect

A point intersect method will be used at 1 m intervals to record the ground cover vegetation. At each point, the presence of groundcover vegetation will be recorded, defined by vegetation less than 1 m in height. Species will be assigned to one of six categories, comprising native shrubs, exotic shrubs, native grasses, exotic grass, native other and exotic other. A maximum of one is recorded per category, per point, yet more than one category may be recorded at a single point. The total number of hits per category is multiplied by 2 to provide a % cover.

At 5m intervals (10 points), percentage cover of mid-story (shrubs >m) and canopy cover is estimated. The average of the 10 points provides the percentage cover for both mid-story and canopy cover.

2.5 Structural attributes 50 m x 20 m plot

Within the 50 m x 20 m area the following is recorded:

- number of hollow bearing trees;
- length of fallen timber (those greater than 10 cm diameter and to the nearest meter); and
- regeneration, the number of sapling species compared to the number of tree species.

2.6 Leaf litter plots

A total of five quadrats (1 m x 1 m) are spaced regularly along 50 m transect; at 5, 15, 25, 35 and 45 m. The first plot is deployed perpendicular to the midline, offset by 5 m to the left. Subsequent plots are then laid alternately, 5 m either side of the midline. Within each plot, the percentage of leaf litter is estimated with a photograph taken encompassing the quadrat.

2.7 Photo points

In addition to the seven photo points taken during the seven plots, a further photo point will be implemented at both CVC and MC pit top areas (nine in total). Each of these photo points will be marked with GPS and a star picket. Four landscape photos will be taken, consistent with the method for plot photopoints

Photopoints will be orientated north, east, south and west (in that order). A copy of the original baseline photos should be taken on all subsequent events to ensure a similar frame is captured.

2.8 Monitoring event conditions

During each monitoring event, any observations which help to inform the success of the rehabilitation or provide context to quantitative results will be recorded. Such observations will include but are not limited to weed prevalence, erosion, dieback of vegetation, herbivory (native or exotic), evidence of pest species, overall vigour of vegetation, and relevant environmental conditions such as drought.

Scat and track searches will also be undertaken to provide an indication of feral species such as Domestic Cat (*Felis catus domestica*) and European Fox (*Vulpes vulpes*). The location of any recording and number of observations will be recorded.

2.9 Schedule

i Analogue sites

A baseline survey of the analogue sites was completed in May 2019. The baseline report is provided in Appendix A.

It is envisaged that analogue site surveys will be repeated concurrent with each rehabilitation works monitoring event.

ii Rehabilitation area

Once rehabilitation is completed (timeframe not known) monitoring will be conducted at a frequency determined at that time.

2.10 Assessment against benchmarks

The results from analogue sites were used to verify the plant community type for the vegetation adjacent to the rehabilitation area. The results were consistent with the target plant community type, namely PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast

BioBanking benchmarks were obtained for the PCT, which is provided in Appendix B. A second set of benchmarks were established for the DNG, given that there will be an absence of trees or midstory or shrub species. Biobanking benchmarks were adjusted to be relevant Following each monitoring event plot, attributes will be scored and weighted, according to the benchmarks relevant to the PCT. This will allow a single score per plot to be generated (refer to Table 2.2).

The score for each plot provides a baseline against which rehabilitation success can be judged over time.

Table 2.2 Site attribute scores and weighting

Site attribute		Site attribute score				Weighting for site score attribute
		1	2	3	4	
A	Native plant species richness	0	0-<50% of benchmark	50-<100% of benchmark	≥ benchmark	25%
B	Native over-storey cover	0-10% or >200% of benchmark	10-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	10%
C	Native mid-storey cover	0-10% or >200% of benchmark	0-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	10%
D	Native ground-cover (grasses)	0-10% or >200% of benchmark	0-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	2.50%
E	Native groundcover (shrubs)	0-10% or >200% of benchmark	0-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	2.50%
F	Native groundcover (other)	0-10% or >200% of benchmark	0-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	2.50%
G	Exotic plant cover (all strata)	>66%	>33-66%	>5-33%	0-5%	5%
H	Number of trees with hollows	0 (unless benchmark includes 0)	0-<50% of benchmark	50-<100% of benchmark	≥ benchmark	20%
I	Proportion of over-storey species occurring as regeneration	0	>0-<50%	50-<100%	100%	12.50%
J	Total length of fallen logs	0-10% of benchmark	>10-<50% of benchmark	50-<100% of benchmark	≥ benchmark	10%

2.11 Reporting and data analysis

2.11.1 Baseline report – Analogue site

A report detailing the baseline results at the analogue sites is provided in Appendix A.

2.11.2 Monitoring report

A monitoring report will be produced following monitoring of analogue and rehabilitation sites. The first report following rehabilitation will document the level of vegetation establishment. It will provide analysis of the planting success rate and survival. Average survival assessment of less than 70% will require review planting activities, including abiotic factors, to determine if poor survival is due to climatic conditions or operational matters. Further site assessment may be required if the cause cannot be identified. A review of the procedure should be made considering the findings with replanting during favourable conditions.

For the subsequent monitoring reports, both rehabilitation and analogue sites will be compared against the prior scores. It is anticipated that the score of each rehabilitation monitoring site should improve on an annual basis, with the analogue site remaining relatively consistent. If the score for any rehabilitation sites does not increase year on year, further analysis should be undertaken to determine the likely cause. This will include drilling down into specific monitoring attributes, the observations recorded and comparison of the photo points. Remediation actions with specific follow up monitoring may be required to rectify the problem.

The current MOP and rehabilitation management plan should also be updated in line with any relevant management actions and improvements. It is intended that this vegetation management plan is adaptive, and able to incorporate any on-site learnings.

Appendix A

Analogue sites - baseline report

Analogue baseline monitoring report

Chain Valley Colliery and Mannering Colliery

Prepared for Delta Coal
July 2019

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Newcastle NSW 2300

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Analogue baseline monitoring report

Chain Valley Colliery and Mannering Colliery

Report Number

H190028 RP#

Client

Delta Coal

Date

3 July 2019

Version

v2 Final

Prepared by

Eugene Dodd
Senior Ecologist
3 July 2019

Approved by

Katie Diver
National Technical Leader - Ecology
3 July 2019

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Photographs

1 Introduction

Chain Valley Colliery (CVC) and Mannering Colliery (the mines) are underground coal mines located at the southern extent of Lake Macquarie, approximately 60 km south of Newcastle. The mines are operated by Delta Coal Pty Ltd (Delta Coal) and produce thermal coal for the domestic and export markets.

The mines operate in accordance with Chain Valley and Mannering Collieries Mining Operation Plan and rehabilitation management plan (MOP) 2018 to 2021 (ENV 00028). A vegetation monitoring program (VMP) has recently been prepared (EMM 2019), which includes the requirement to conduct baseline monitoring of analogue site. This report details the locations and results for the initial baseline survey of the analogue site.

2 Method

The baseline monitoring was undertaken in accordance with the Section 2 of the Rehabilitation monitoring program (EMM 2019). The monitoring was conducted on 9 May 2019, by two senior EMM ecologists.

Plot 1 could not be permanently marked with starpickets, owing to its location in a maintained transmission easement. The location of Plot 1 was recorded using hand-held GPS, whilst the remaining three plots were marked with GPS and starpickets. Refer to Figure 3.1 for the plot locations.

A total of four plots were surveyed. Plot locations were selected based on their proximity to the proposed rehabilitation areas, whilst avoiding edge effects from cleared areas (in the case of woodland sites). Plot were also selected based on their similarity of landform and on the assumption that the rehabilitation area would aim to have similar characteristics and community composition.

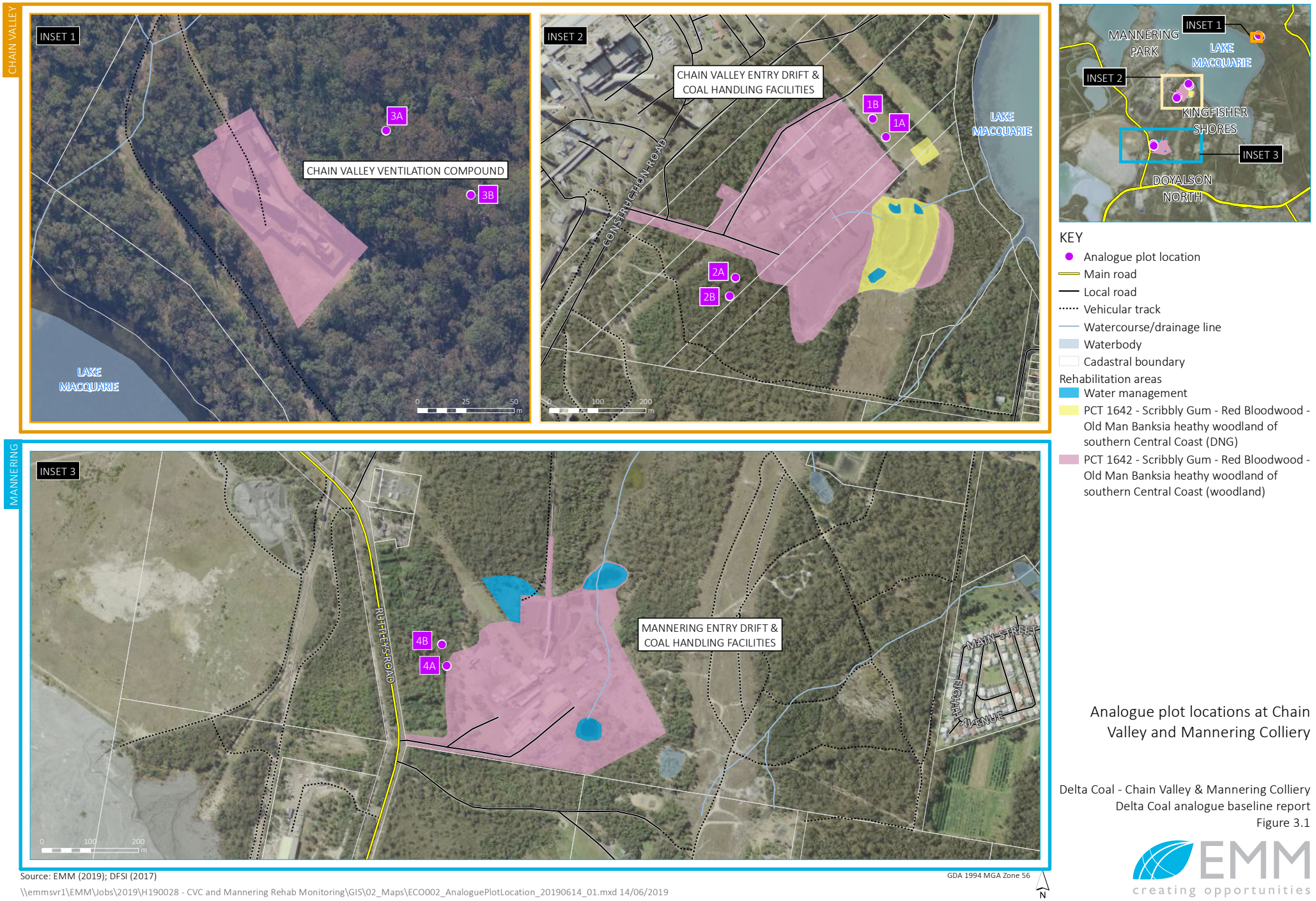
3 Results

Analysis of Plant Community Types (PCTs) present within the Mannering, Chain Valley Colliery and Summerland Point site concluded that PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast, was the most appropriate PCT to assign to all of the plot locations and rehabilitation areas. Previously it has been stated that the Summerland Point vent shaft will become Swamp Sclerophyll Forest when rehabilitated. The majority of the vent shaft area is upslope of the swamp sclerophyll forest, despite being in a somewhat ecotonal situation, it was concluded that drier PCT 1642 is more appropriate than selecting swamp sclerophyll PCT.

A summary of the plot characteristics are provided below (Table 3.1) with location provided in Figure 3.1. The full baseline results and plot photographs are provided in Appendix A and B respectively.

Table 3.1 Plot location and plant community zone

Plot number	Start location (0 m)	End location (50 m)	PCT	Zone
1	0364907 m E, 6329798 m S	0364879 m E, 6329836 m S	1642	Derived native grassland (DNG)
2	0364596 m E, 6329507 m S	036484 m E, 6329489 m S	1642	Woodland
3	0366697 m E, 6331081 m S	0366741 m E, 6331050 m S	1642	Woodland
4	363986 m E, 6328229 m S	363976 m E, 6328273 m S	1642	Woodland



Source: EMM (2019); DFSI (2017)

GDA 1994 MGA Zone 56

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Analogue plot locations at Chain Valley and Mannering Colliery

Delta Coal - Chain Valley & Mannering Colliery
Delta Coal analogue baseline report
Figure 3.1

EMM
creating opportunities

4 Summary and recommendations

A total of four plots have been established to provide analogue sites for the future rehabilitation of Chain Valley Colliery, Manning Colliery and associated infrastructure. Given that there is potential for a long lag between this baseline survey and the rehabilitation of the collieries, it is recommended that the analogue sites are resurveyed in conjunction with the first monitoring event of the rehabilitation area.

Appendix A

Plot data sheets

CVC Biodiversity rehabilitation monitoring - Transect

Site ID	**Date:**	**Data collectors:**
Plot 1	9/05/2019	ED & EL

20 x 20 m plot - Survey species and provide cover abundance scores

Species	Cover	Abun	**Species**	Cover	Abunda
*Andropogon virginicus**	40	1000			
Capillipedium parviflorum	10	500			
Casuarina glauca	0.1	4			
*Chloris gayana**	0.5	20			
Conyza bonariensis	0.1	1			
*Cortaderia selloana**	0.1	8			
Cymbopogon refractus	2	50			
Cynodon dactylon	40	1000			
Glycine tabacina	0.1	1			
*Hydrocotyle bonariensis**	0.1	5			
Imperata cylindrica	5	500			
*Lilium formosanum**	0.5	20			
*Medicago lupulina**	0.1	1			
*Paspalum urvillei**	2	100			
*Plantago lanceolata**	0.1	8			
*Richardia brasiliensis**	0.1	10			
*Setaria parviflora**	2	100			
Sporobolus creber	0.1	20			
*Verbena rigida**	2	50			

Cover: <1% entered as estimate (eg 0.4). 1-5% entered as number. >5% entered as nearest 5%
Abundance: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000+

*Denotes exotic species.

CVC Biodiversity rehabilitation monitoring - Transect

Site ID: Plot 1	**Date:** 9/5/19
PCT: 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_dng	**Data collectors:** ED & EL
Waypoint number	1a (start) & 1b (end)
Transect start: Easting/Northing	0364907 m E, 6329798 m S
Transect end: Easting/Northing	0364879 m E, 6329836 m S
Transect start photo	B.1
Transect end photo	B.2

Five quadrats (1m x 1m) spaced regularly along 50m transect, offset by 5m and alternate perpendicular to midline.

Quadrat number	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Mean**
Leaf litter cover (%)	10	5	20	5	25	13
Photo number	B.3	B.4	B.5	B.6	B.7	

50 m x 20 m plot

HBT's (count) (only hollows > 5 cm):	0
Fallen Logs length (>10 cm, 0.5 m):	0
Regen (no. spp and no. regenerating)	1 1

50 m Transect (every 5 m)	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**Avg (%)**
Canopy Cover (% - see Specht)	0	0	0	0	0	0	0	0	0	0	0
Mid Storey Cover (shrubs > 1m)	0	0	0	0	0	0	0	0	0	0	0

50 m Transect Groundcover (every 1 m)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**%**
Native shrubs (< 1m)																																		x																	2
Native grasses				x	x	x	x			x	x	x	x	x	x		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x				x						x	x	66
Native other (forbs, fern etc)																																																			0
Exotics	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x				x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		86

Notes: (eg weed prevelance, erosion, dieback, herbivory, evideince of pest species, overall vigour of vegetation, relevant envionmental conditions)	The plot is located in a maintained transmission easement, which is periodically slashed/mown. Tree and shrub species are limited to occasional seedlings. Ground cover is mixture of native and exotic grasses and forbs. The majority of grasses were seeding and tall in height. The maintainaence regime will need to be taken into consideration during subsequent monitoring and analysis of results.

CVC Biodiversity rehabilitation monitoring - Transect

Site ID	**Date:**	**Data collectors:**
Plot 2	9/05/2019	ED & EL

20 x 20 m plot - Survey species and provide cover abundance scores

Species	Cover	Abun	**Species**	Cover	Abunda
Acacia stricta	4	10	*Imperata cylindrica*	10	100
Actinotus minor	0.1	20	*Isopogon anemonifolius*	0.1	2
*Andropogon virginicus**	2	100	*Isopogon anethifolius*	0.1	1
Angophora costata	5	2	*Lambertia formosa*	3	20
Banksia serrata	10	5	*Lepidosperma laterale*	5	20
Banksia spinulosa	3	4	*Lindsaea linearis*	0.1	5
Billardiera scandens	0.1	20	*Macrozamia communis*	0.1	1
Cassytha pubescens	0.1	2	*Micrantheum ericoides*	0.1	20
Clematis aristata	0.1	5	*Parsonsia straminea*	0.1	1
Corymbia gummifera	15	4	*Polyscias sambucifolia*	0.1	8
Cryptostylis erecta	0.1	20	*Pratia purpurascens*	0.1	20
Darwinia spp.	0.1	10	*Pteridium esculentum*	20	50
Daucus glochidiatus	0.1	50	*Richardia brasiliensis**	0.1	4
Desmodium varians	0.1	10	*Themeda australis*	15	500
Dodonaea triquetra	5	20	*Xanthorrhoea latifolia*	2	20
*Ehrharta erecta**	0.1	5			
Entolasia stricta	10	500			
Epacris pulchella	1	50			
Eragrostis brownii	1	20			
Eucalyptus capitellata	5	2		`	
Eucalyptus haemastoma	20	8			
Gahnia clarkei	1	3			
Geranium solanderi	0.1	20			
Glochidion ferdinandi	5	4			
Glycine clandestina	0.1	5			
Glycine tabacina	0.1	10			
Gompholobium pinnatum	0.1	8			
Hardenbergia violacea	0.1	10			
*Hypochaeris radicata**	0.1	1			

Cover: <1% entered as estimate (eg 0.4). 1-5% entered as number. >5% entered as nearest 5%

Abundance: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000+

*Denotes exotic species.

CVC Biodiversity rehabilitation monitoring - Transect	
Site ID: Plot 2	**Date:** 9/5/19
PCT: 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_woodland	**Data collectors:** ED/EL
Waypoint number	2a (start) & 2b (end)
Transect start: Easting/Northing	0364596 m E, 6329507 m S
Transect end: Easting/Northing	036484 m E, 6329489 m S
Transect start photo	B.8
Transect end photo	B.9

Five quadrats (1m x 1m) spaced regularly along 50m transect, offset by 5m and alternate perpendicular to midline.

Quadrat number	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Mean**
Leaf litter cover (%)	100	100	95	70	80	89
Photo number	B.10	B.11	B.12	B.13	B.13	B.14

50 m x 20 m plot		
HBT's (count) (only hollows > 5 cm):		0
Fallen Logs length (>10 cm, 0.5 m):		14
Regen (no. spp and no. regenerating)	4	4

50 m Transect (every 5 m)	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**Avg (%)**
Canopy Cover (% - see Specht)	10	20	40	35	35	25	30	30	20	15	26
Mid Storey Cover (shrubs > 1m)	2	3	0	3	3	0	0	15	0	2	2.8

50 m Transect Groundcover (every 1 m)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**%**
Native shrubs (< 1m)				x				x										x							x		x									x														x	18
Native grasses	x	x	x		x	x	x	x	x	x	x	x	x	x		x	x	x		x	x	x	x		x			x		x		x		x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	80
Native other (forbs, fern etc)	x	x	x	x	x				x		x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	88
Exotics																																																				0

Notes: (eg weed prevelance, erosion, dieback, herbivory, evideince of pest species, overall vigour of vegetation, relevant envionmental conditions)	Largely intact woodland, with little influence of exotic species. Overall condition was good with no recent disturbance observed. No signs of pest species.

CVC Biodiversity rehabilitation monitoring - Transect

Site ID	**Date:**	**Data collectors:**
Plot 3	9/05/2019	ED & EL

20 x 20 m plot - Survey species and provide cover abundance scores

Species	Cover	Abun	**Species**	Cover	Abunda
Acacia longifolia	10	50			
Allocasuarina littoralis	0.1	3			
Angophora costata	2	1			
Baumea acuta	0.1	20			
Billardiera scandens	0.1	10			
Corymbia gummifera	4	2			
Desmodium varians	0.1	5			
Dodonaea triquetra	30	100			
*Ehrharta erecta**	0.1	20			
Entolasia stricta	2	100			
Eucalyptus haemastoma	15	8			
Eucalyptus microcorys	20	12			
Eucalyptus pilularis	15	2			
Glycine clandestina	0.1	5			
Gompholobium pinnatum	0.1	3			
Imperata cylindrica	4	50			
Lepidosperma laterale	3	100			
Leptospermum spp.	1	20			
Lomandra filiformis	0.5	20			
Melaleuca quinquenervia	4	1			
Pimelea linifolia	0.1	10			
Pratia purpurascens	0.1	10			
Pteridium esculentum	0.5	10			
Pultenaea spp.	0.5	50			
Themeda australis	4	50			

Cover: <1% entered as estimate (eg 0.4). 1-5% entered as number. >5% entered as nearest 5%
Abundance: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000+

*Denotes exotic species.

CVC Biodiversity rehabilitation monitoring - Transect	
Site ID: Plot 3	**Date:** 9/5/19
PCT: 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_woodland	**Data collectors:** ED & EL
Waypoint number	3a (start) & 3b (end)
Transect start: Easting/Northing	0366697 m E, 6331081 m S
Transect end: Easting/Northing	0366741 m E, 6331050 m S
Transect start photo	B.15
Transect end photo	B.16

Five quadrats **(1m x 1m)** spaced regularly along 50m transect, offset by 5m and alternate perpendicular to midline.

Quadrat number	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Mean**
Leaf litter cover (%)	100	60	95	90	75	84
Photo number	B.17	B.18	B.19	B.20	B.21	

50 m x 20 m plot		
HBT's (count) (only hollows > 5 cm):		3
Fallen Logs length (>10 cm, 0.5 m):		63
Regen (no. spp and no. regenerating)	6	6

50 m Transect (every 5 m)	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**Avg (%)**
Canopy Cover (% - see Specht)	30	30	40	50	50	50	50	35	35		37
Mid Storey Cover (shrubs > 1m)	3	0	3	4	2	4	0	2	2		2

50 m Transect Groundcover (every 1 m)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**%**
Native shrubs (< 1m)	x	x	x	x	x	x	x	x				x		x	x	x	x	x	x	x	x									x			x		x	x	x	x	x	x	x	x	x	x						60
Native grasses	x	x	x							x								x		x	x											x		x	x		x				x				x	x	x	x			32
Native other (forbs, fern etc)									x	x	x	x		x	x		x		x		x	x	x	x		x	x			x	x	x	x	x	x			x		x	x	x	x	x						58
Exotics																																																				0

Notes: (eg weed prevelance, erosion, dieback, herbivory, evideince of pest species, overall vigour of vegetation, relevant envionmental conditions)	Largely intact forest with very low presence of exotic species and no signs of pest species. Conditon of vegetation good. Strong regeneration of tree species of a similar age class and dense shrubs (especially Dodonaea triquetra), indicates a single disturbace event such as a fire or clearance several years ago. The PCT was attributed based on best fit, though several canopy species are not indicative of the PCT.

CVC Biodiversity rehabilitation monitoring - Transect

Site ID	**Date:**	**Data collectors:**
Plot 4	9/05/2019	ED & EL

20 x 20 m plot - Survey species and provide cover abundance scores

Species	Cover	Abun	**Species**	Cover	Abunda
Allocasuarina littoralis	15	20	*Themeda australis*	5	100
*Andropogon virginicus**	4	100	*Trachymene incisa*	0.1	5
Angophora costata	15	2	*Wahlenbergia stricta*	0.1	1
Aristida spp.	0.5	10			
Banksia integrifolia	3	1			
Baumea acuta	10	100			
Cassytha pubescens	0.1	10			
Corymbia gummifera	15	2			
Cryptostylis erecta	1	50			
Dianella caerulea	0.1	2			
Epacris pulchella	0.1	10			
Eragrostis brownii	2	50			
Eragrostis leptostachya	4	10			
Eucalyptus haemastoma	15	3			
Gahnia clarkei	1	2			
Glochidion ferdinandi	2	3			
Imperata cylindrica	0.5	20			
Isopogon anethifolius	1	10			
Lambertia formosa	0.1	2			
Lepidosperma laterale	8	500			
Leptospermum polygalifolium	3	3			
Lomandra filiformis	3	50			
Lomandra obliqua	0.5	10			
Parsonsia straminea	1	3			
Pimelea linifolia	0.1	1			
*Pinus radiata**	20	500			
Pratia purpurascens	0.1	20			
Scaevola ramosissima	0.1	1			
*Sonchus spp.**	0.1	1			

Cover: <1% entered as estimate (eg 0.4). 1-5% entered as number. >5% entered as nearest 5%
Abundance: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000+

*Denotes exotic species.

CVC Biodiversity rehabilitation monitoring - Transect	
Site ID: Plot 4	**Date:** 9/5/19
PCT: 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_woodland	**Data collectors:** ED & EL
Waypoint number	4a (start) & 4b (end)
Transect start: Easting/Northing	363986 m E, 6328229 m S
Transect end: Easting/Northing	363976 m E, 6328273 m S
Transect start photo	B.22
Transect end photo	B.23

Five quadrats (1m x 1m) spaced regularly along 50m transect, offset by 5m and alternate perpendicular to midline.

Quadrat number	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Mean**
Leaf litter cover (%)	99	100	95	95	95	96.8
Photo number	B.24	B.25	B.26	B.27	B.28	

50 m x 20 m plot		
HBT's (count) (only hollows > 5 cm):		0
Fallen Logs length (>10 cm, 0.5 m):		5
Regen (no. spp and no. regenerating)	4	1

50 m Transect (every 5 m)	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**Avg (%)**
Canopy Cover (% - see Specht)	40	30	35	5	10	10	30	20	5	40	22.5
Mid Storey Cover (shrubs > 1m)	2	0	2	0	3	5	0	0	0	0	1.2

50 m Transect Groundcover (every 1 m)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**%**
Native shrubs (< 1m)							x																		x																											4
Native grasses		x		x	x	x	x	x	x	x		x		x		x	x	x		x								x	x	x	x	x	x	x	x	x	x		x	x	x		x		x	x	x	x	x	66
Native other (forbs, fern etc)	x	x	x			x			x	x	x	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x				x			x		x		72
Exotics	x							x																																			x								6

Notes: (eg weed prevelance, erosion, dieback, herbivory, evideince of pest species, overall vigour of vegetation, relevant envionmental conditions)	Some evidence of rubbish dumping. High abbundace of Radiata Pine (Pinus radiata) trees and seedlings, otherwise mostly native species present.

Appendix B

Plot photographs

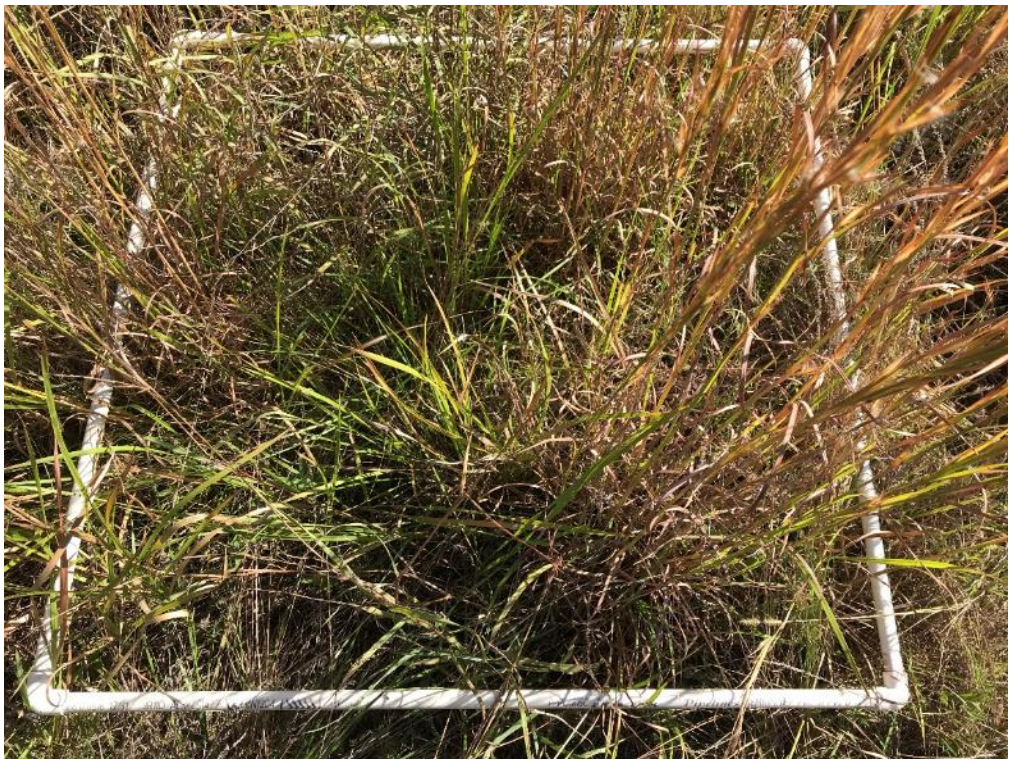
B.1 Plot 1

Photograph B.1 Plot 1 start

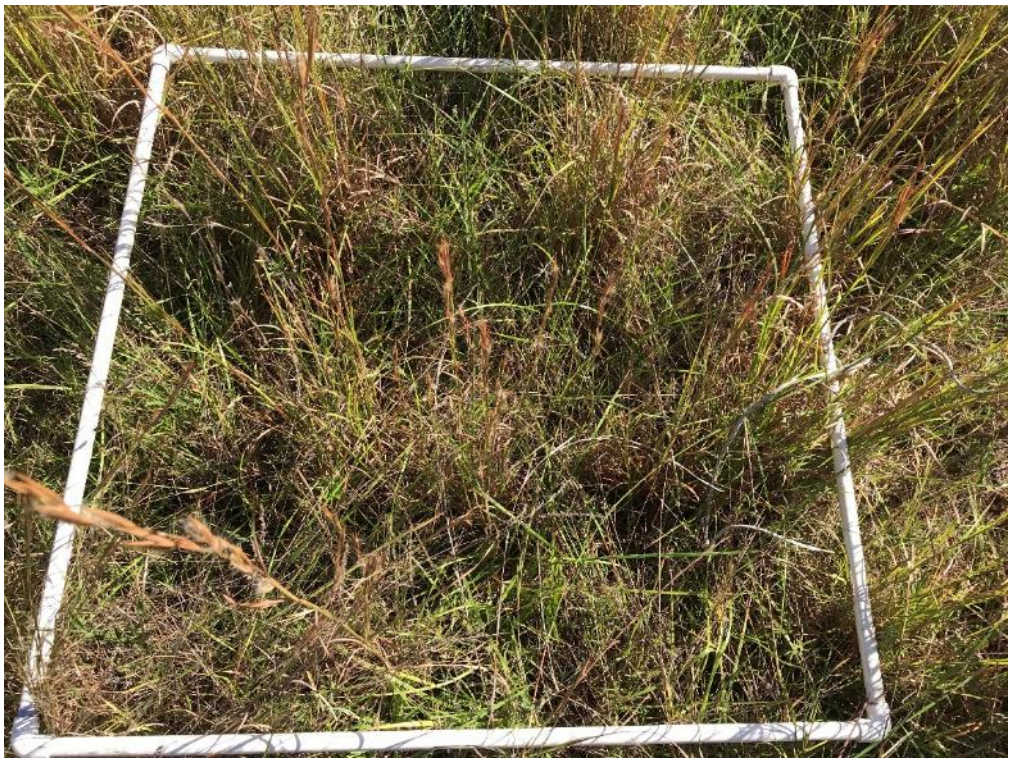
Photograph B.2 Plot 1 end

Photograph B.3 Subplot 1

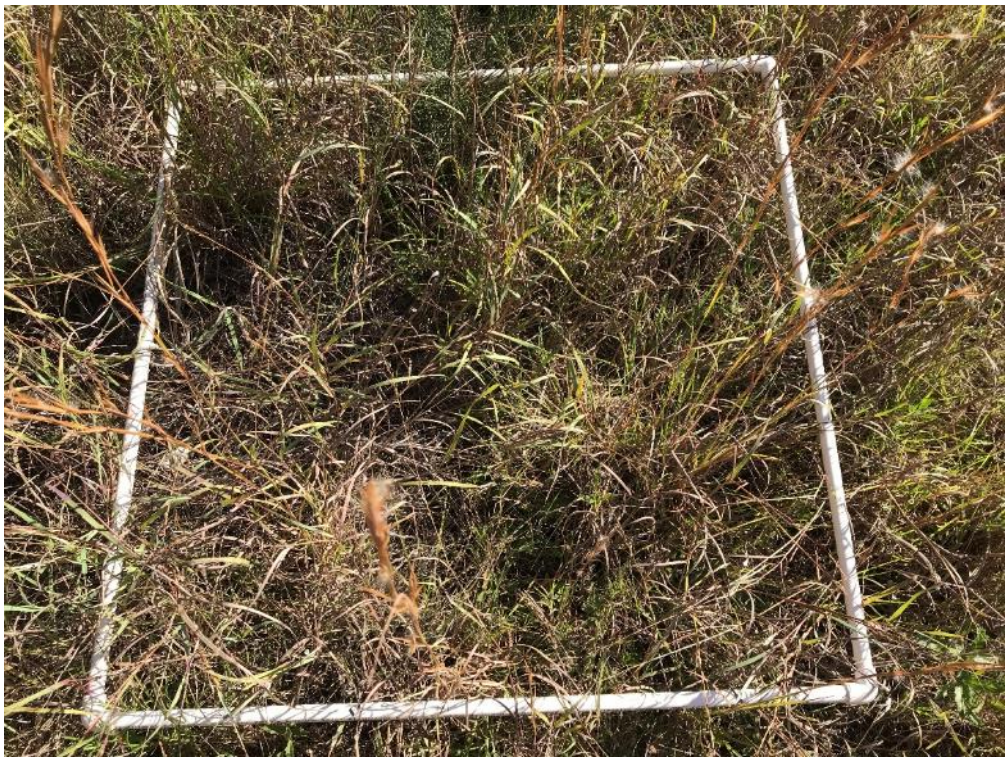
Photograph B.4 Subplot 2



Photograph B.5 Subplot 3



Photograph B.6 Subplot 4



Photograph B.7 Subplot 5

B.2 Plot 2

Photograph B.8 Plot 2 start

Photograph B.9 Plot 2 end

Photograph B.10 Subplot 1

Photograph B.11 Subplot 2

Photograph B.12 Subplot 3

Photograph B.13 Subplot 4

Photograph B.14 Subplot 5

B.3 Plot 3

Photograph B.15 Plot 3 start

Photograph B.16 Plot 3 end

Photograph B.17 Subplot 1

Photograph B.18 Subplot 2

Photograph B.19 Subplot 3

Photograph B.20 Subplot 4

Photograph B.21 Subplot 5

B.4 Plot 4

Photograph B.22 Plot 4 start

Photograph B.23 Plot 4 end

Photograph B.24 Subplot 1

Photograph B.25 Subplot 2

Photograph B.26 Subplot 3

Photograph B.27 Subplot 4

Photograph B.28 Subplot 5

Appendix B

PCT 1642 Benchmarks

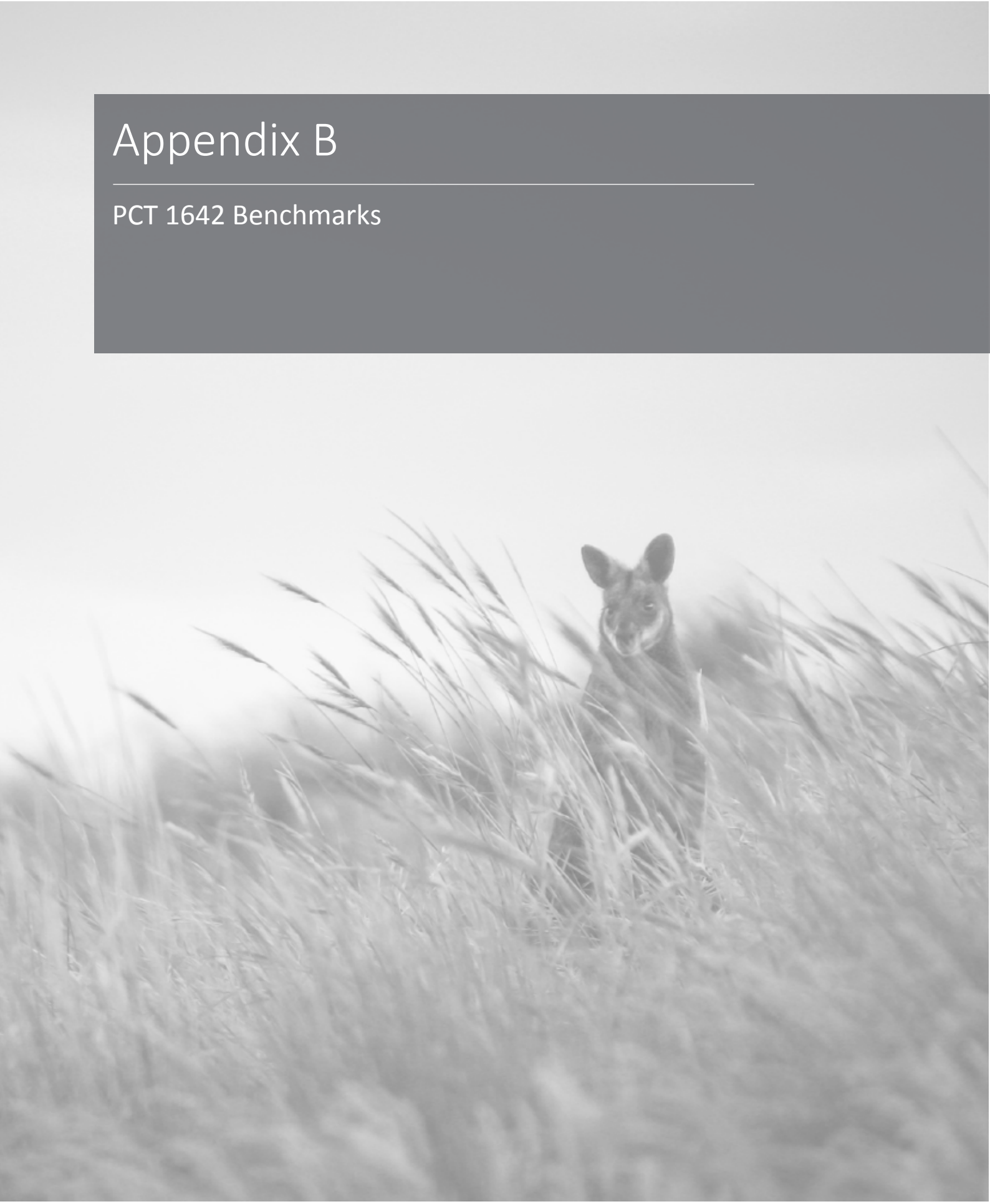


Table B.1 PCT 1642 Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_woodland – condition benchmarks and attributes.

Characteristic	Benchmarks
Formation (Keith 2004)	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation Class ID (Keith 2004)	Sydney Coastal Dry Sclerophyll Forests
Former Catchment Management Area region (now Local Land Services Area)	Hunter Central Rivers
NativePlantSpRichness	35
NativeOSCoverMIN	18
NativeOSCoverMAX	45
NativeMSCoverMIN	13
NativeMSCoverMAX	60
NativeGCGrassMIN	1
NativeGCGrassMAX	30
NativeGCShrubsMIN	5
NativeGCShrubsMAX	30
NativeGCOtherMIN	3
NativeGCOtherMAX	30
NumberTreesWithHollows	3
TotalLengthFallenLogs	70
CMA Percent Cleared Estimate	30

Table B.2 PCT 1642 Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast_DNG – condition benchmarks and attributes.

Characteristic	Benchmarks
Formation (Keith 2004)	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation ClassID (Keith 2004)	Sydney Coastal Dry Sclerophyll Forests
Former Catchment Management Area region (now Local Land Services Area)	Hunter Central Rivers
NativePlantSpRichness	20
NativeOSCoverMIN	0
NativeOSCoverMAX	0
NativeMSCoverMIN	0
NativeMSCoverMAX	0
NativeGCGrassMIN	50
NativeGCGrassMAX	80
NativeGCShrubsMIN	0
NativeGCShrubsMAX	0
NativeGCOtherMIN	5
NativeGCOtherMAX	40
NumberTreesWithHollows	0
TotalLengthFallenLogs	0
CMA Percent Cleared Estimate	30

Appendix C

Field sheet template

CVC Biodiversity rehabilitation monitoring - Transect

Site ID	**Date:**	**Data collectors:**

20 x 20 m plot **- Survey species** and provide cover abundance scores

Species	Cover	Abun	**Species**	Cover	Abunda

Cover: <1% entered as estimate (eg 0.4). 1-5% entered as number. >5% entered as nearest 5%
Abundance: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000+

CVC Biodiversity rehabilitation monitoring - Transect	
Site ID:	**Date:**
PCT:	**Data collectors:**
Waypoint number	
Transect start: Easting/Northing	
Transect end: Easting/Northing	
Transect start photo (portrait/landscape)	
Transect end photo (portrait/landscape)	

Five quadrats (1m x 1m) spaced regularly along 50m transect, offset by 5m and alternate perpendicular to midline.

Quadrat number	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Mean**
Leaf litter cover (%)						
Photo number						

50 m x 20 m plot	
HBT's (count) (only hollows > 5 cm):	
Fallen Logs length (>10 cm, 0.5 m):	
Regen (no. spp and no. regenerating)	

50 m Transect (every 5 m)	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**Avg (%)**
Canopy Cover (% - see Specht)											0
Mid Storey Cover (shrubs > 1m)											0

50 m Transect Groundcover (every 1 m)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**%**
Native shrubs (< 1m)																																																			
Exotic shrubs (< 1m)																																																			
Native grasses																																																			
Exotic grasses																																																			
Native other (forbs, fern etc)																																																			
Exotic other																																																			

Notes: (eg weed prevelance, erosion, dieback, herbivory, evideince of pest species, overall vigour of vegetation, relevant envionmental conditions)	

15 Appendix 3 – Chain Valley Colliery: Subsidence Monitoring Program - Northern Mining Area

Delta coal	Doc Owner: **Mine Surveyor**

CHAIN VALLEY COLLIERY

Subsidence Monitoring Program

Northern Mining Area First Workings and Lake Macquarie Extraction

Author	Tim Chisholm Registered Mine Surveyor Delta Coal – Chain Valley Colliery
Authorised by:	 David Mclean Manager Mining Engineering Delta Coal – Chain Valley Colliery
Date:	10 August 2021

Table of Contents

List of Figures / Tables

1 Introduction

Chain Valley Colliery is an underground coal mine located on the southern end of Lake Macquarie, approximately 100km north of Sydney and 60km south of Newcastle, adjacent to the Vales Point Power Station, producing thermal coal for the domestic and export markets.

A formal Extraction Management Plan has been developed in order to manage the process of mining layout design and mitigate any subsidence impacts on surface infrastructure and/or stakeholders.

The Subsidence Monitoring Program is an element of the Chain Valley Colliery Extraction Management Plan, and has been developed to satisfy the requirements of Development Consent SSD-5465, condition 7(k) and Tables 6-7 in Schedule 4, which states:

"7. The Applicant shall prepare and implement an Extraction Plan for all second workings on site, to the satisfaction of the Director-General. Each Extraction Plan must:

(k) include a Subsidence Monitoring Program which has been prepared in consultation with DRE, which:

- Provides 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;

Condition 1, Schedule 4 of SSD5465 states:

"The Proponent shall ensure that vertical subsidence within the High Water Mark Subsidence Barrier and within Seagrass beds is limited to a maximum of 20 millimetres (mm)."

In addition to the above, Condition 2 within Schedule 4 of SSD-5465 also requires that:

"The Applicant shall ensure that the development does not cause any exceedance of the performance measures in Table 8 to the satisfaction of the Director-General."

The relevant subsidence monitoring requirements from Table 6 within Schedule 4 of the Development Consent, including the relevant notes, are recreated in Table 1.

Table 1 - Subsidence Impact Performance Measures - Natural and Heritage Features

Biodiversity	
Threatened species or endangered populations	Negligible environmental consequences
Seagrass beds	Negligible environmental consequences including: • Negligible changes in size and distribution of seagrass beds; • Negligible change in the function 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 and 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 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*

Condition 4 within Schedule 4 of SSD-5465 also requires that:

"The Applicant shall ensure that the development does not cause any exceedances of the performance measures in Table 7, to the satisfaction of the Director-General.

The relevant subsidence monitoring requirements from Table 9 within Schedule 4 of the Development Consent, including the relevant notes (Table 2).

Table 2 - Subsidence Impact Performance Measures – Built Features

Built Features	
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 compensated
Public Safety	
Public Safety	Negligible additional risk

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 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.*
- *Requirement's 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.*
- *Requirement's under this condition may be met by measures undertaken in accordance with the Mine Subsidence Compensation Act 1961.*

Condition 9 within Schedule 4 of SSD-5465 also states that:

"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."

All first workings developed within Subsidence Zone A (**Figure 1**) will be designed in accordance with relevant geotechnical and engineering standards to ensure negligible direct subsidence impacts to surface and built features.

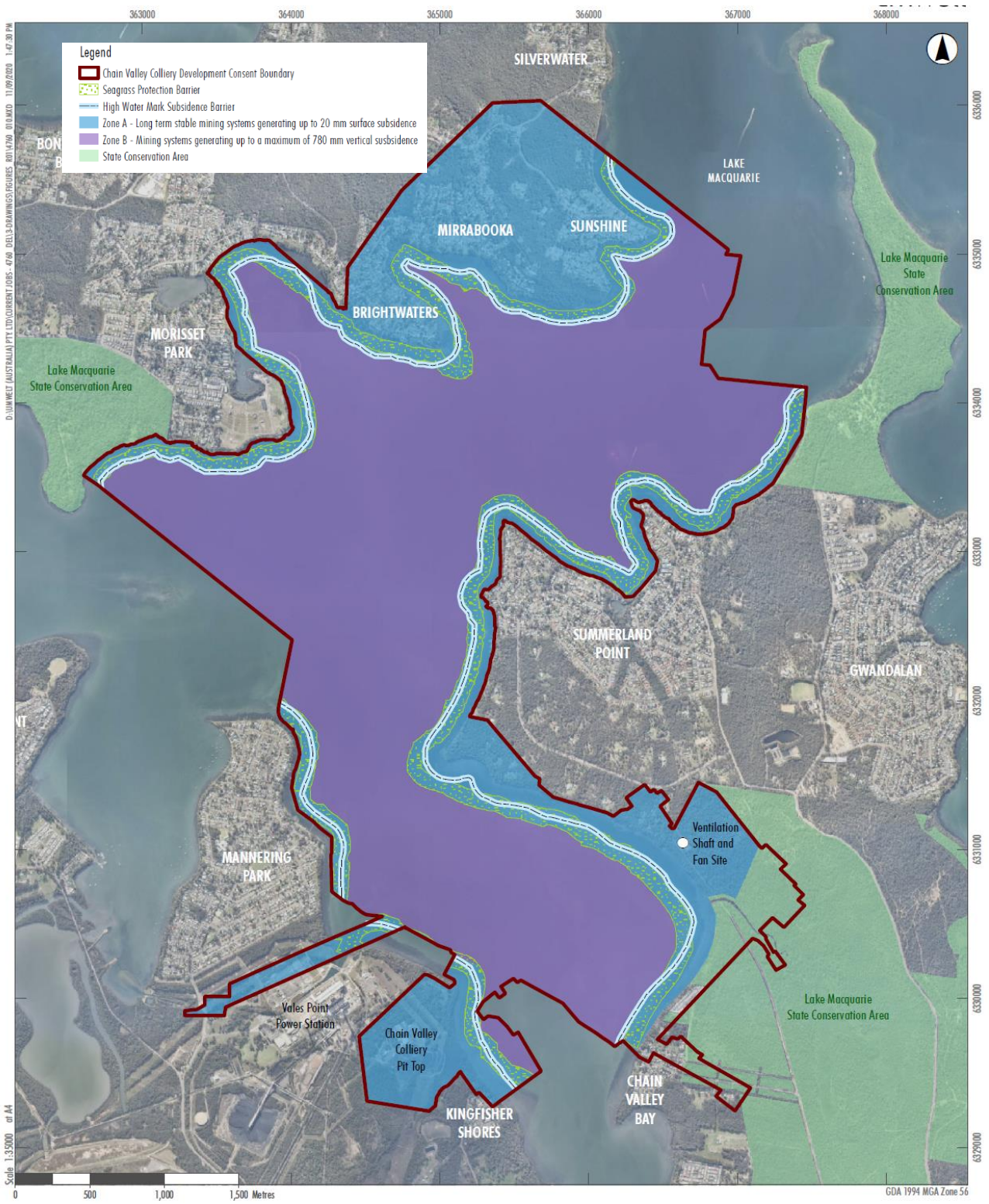


Figure 1 - Layout of the Chain Valley Project, showing Subsidence Zones A and B

2 Purpose

The purpose of this Subsidence Monitoring Program is to:

- define the subsidence monitoring scope;
- outline subsidence predictions;
- outline the methodology to be used to monitor subsidence impacts
- identify subsidence monitoring locations;
- identify reporting requirements;
- analyse the relationship between predicted and resulting subsidence effects;
- identify the requirements for incident or exceedances reporting.

3 Background

3.1 Operations

Chain Valley Colliery is an underground coal mine with current coal mining methods including development of roadways in the coal seam known as first workings and secondary extraction. These first workings develop panels to support the installation of a miniwall, a modern secondary coal extraction method.

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 Wyong and Lake Macquarie. 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 and has an average depth of around 6 meters (Laxton, 2005).

The catchment of Lake Macquarie is largely rural with large areas of bush land and grazing land. The shoreline of Lake Macquarie is heavily urbanised, 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.

The Chain Valley Colliery is situated on the southern shores of Lake Macquarie near Mannering Park, NSW. The mine has been operating since 1962. Mining is currently undertaken using extraction methods within 'Zone B' where subsidence of up to 780mm is permitted, and first workings in 'Zone A' where nil surface impacts are approved. All mining is currently occurring in the Fassifern seam, in line with Development Consent SSD–5465. The general layout of the Chain Valley Extension Project in respect to Lake Macquarie is shown on **Figure 1**.

3.2 Subsidence Predictions

This management plan references reports completed by Mr David Hill of Strata2 Ground Control Consulting for extraction under Lake Macquarie.

- "*Geotechnical Aspects of S2 and S3 Panel Design"* Strata2 Report: CHV-006 (Hill, 2018)
- *"Geotechnical Aspects of S4 Panel Design"* Strata2 Report: CHV-010 (Hill, 2019)
- *"S5 Panel - Geotechnical Environment, Subsidence Estimates and Impacts"* Strata2 Report: CHV-019 (Hill, 2020)
- *"Miniwall S5 and the Adjacent Herringbone Panels of the Northern Mining Area (NMA) - Geotechnical Environment, Subsidence Estimates and Impacts"* Strata2 Report: CHV-024 (Hill, 2020)

  Subsidence modelling has predicted up to approximately 500mm of subsidence to the Lake floor associated with the planned miniwall mining in S2 to S5 and adjacent pillar extraction (Figure 2).No additional subsidence is expected to occur within the seagrass or foreshore areas as a result of Fassifern extraction. *(Hill, 2018, 2019, 2020).* Areas where multiple pillar extraction panel are planned has been assessed at 400-500mm, against an approved maximum of 780mm (SSD 5465).

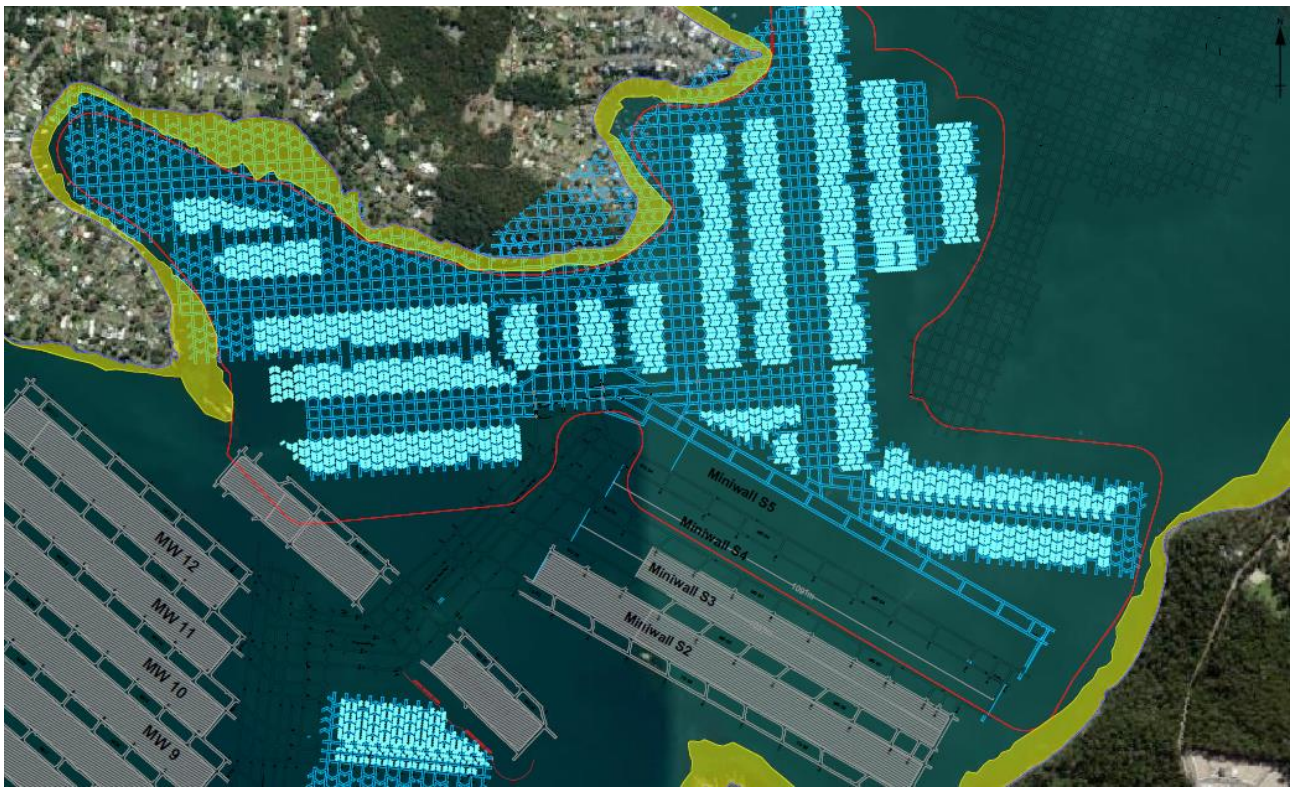


Figure 2 - Predicted Subsidence impact areas due to extraction methods under Lake Macquarie (Hill, 2020)

Respective triggers points for additional monitoring and response are included in the Subsidence Management TARP.

3.3 Surface Monitoring - Scope

3.3.1 Shoreline (High Water Mark)

The shoreline of Lake Macquarie is protected under Mining Lease Conditions requiring Ministerial Approval to carry out mining operations within the High Water Mark Subsidence Barrier (HWMSB). The HWMSB is defined in the seam by a line defined by an angle of draw of 35° drawn lakewards from the high water level of Lake Macquarie, and on the land side, a line drawn from the 2.44m contour at 35° towards the land (Figure 5).

Condition 1, Schedule 4 of SSD5465 states:

“The Proponent shall ensure that vertical subsidence within the High Water Mark Subsidence Barrier and within Seagrass beds is limited to a maximum of 20 millimetres(mm)….”

A key objective of the mine design is to minimise vertical subsidence within the HWMSB and prevent additional subsidence above the high water mark. To ensure effectiveness of the mine design, monitoring of the shoreline is proposed via the installation and monitoring of fixed reference marks surveyed at regular intervals.

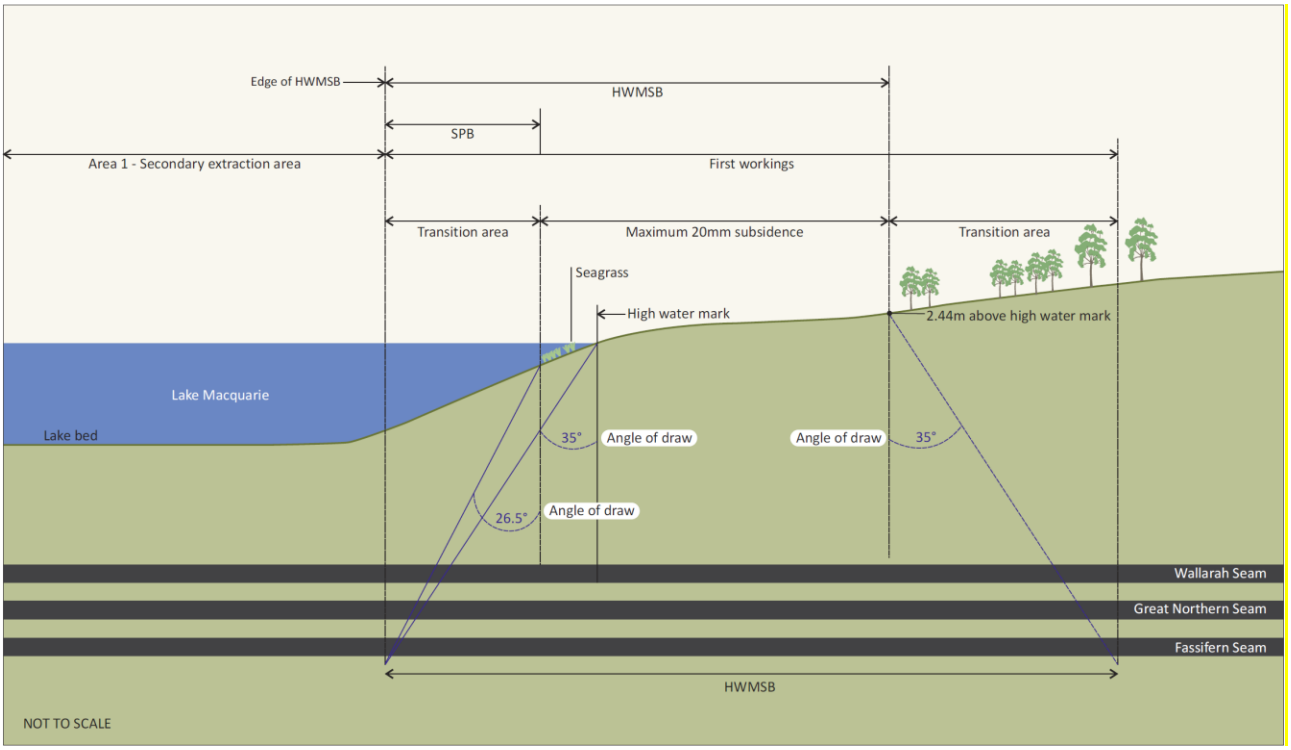


Figure 3 - High Water Mark Subsidence Barrier Typical Diagram

3.3.2 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.

Seagrass distribution within estuaries is naturally influenced by light penetration, depth, salinity, nutrient status, bed stability, wave energy, estuary type, and the evolutionary stage of the estuary.

Surveys of the seagrass extents are undertaken in order to monitor impacts on the seagrass population. Delta Coal's *Seagrass Management Plan* outlines the methodology used to determine changes to composition and quantity of seagrass populations in Lake Macquarie.

A 26.5° line taken from the lake side of the mapped seagrass location projected to the Fassifern Seam has been defined as a protection barrier, and no miniwall extraction is to take place within this barrier.

Subsidence Monitoring of the lakebed is also proposed via bathymetric survey over the current mining area in order to validate the subsidence prediction model.

3.3.3 Benthic Communities

The basin is inhabited by a diverse number of marine organisms. Condition 2, Schedule 4 of SSD-5465 specifies minor environmental consequences on the Benthic communities, including minor changes to species composition and/or distribution as a condition of approval. Regular 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. Delta Coal's *Benthic Communities Management Plan* outlines the methodology used to determine changes to species diversity and abundance.

Subsidence monitoring of the lakebed is also proposed via bathymetric survey over the current mining area in order to validate the subsidence prediction model, and to determine approximate levels of subsidence on specific benthic sample locations.

3.3.4 Surface Built Features

Mine workings beneath Morisset East peninsula is planned in the vicinity of the suburbs of Brightwaters, Mirrabooka and Sunshine.

Condition 9 within Schedule 4 of SSD-5465 also states that:

"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."

A key objective of the mine design is to ensure vertical subsidence within Subsidence Zone A is limited to a negligible amount (considered less than 20mm). To ensure effectiveness of the mine design, monitoring of the land area is proposed via the installation and monitoring of fixed reference along a number of the major access roads (**Figure 4**) where practical to verify subsidence performance measures.

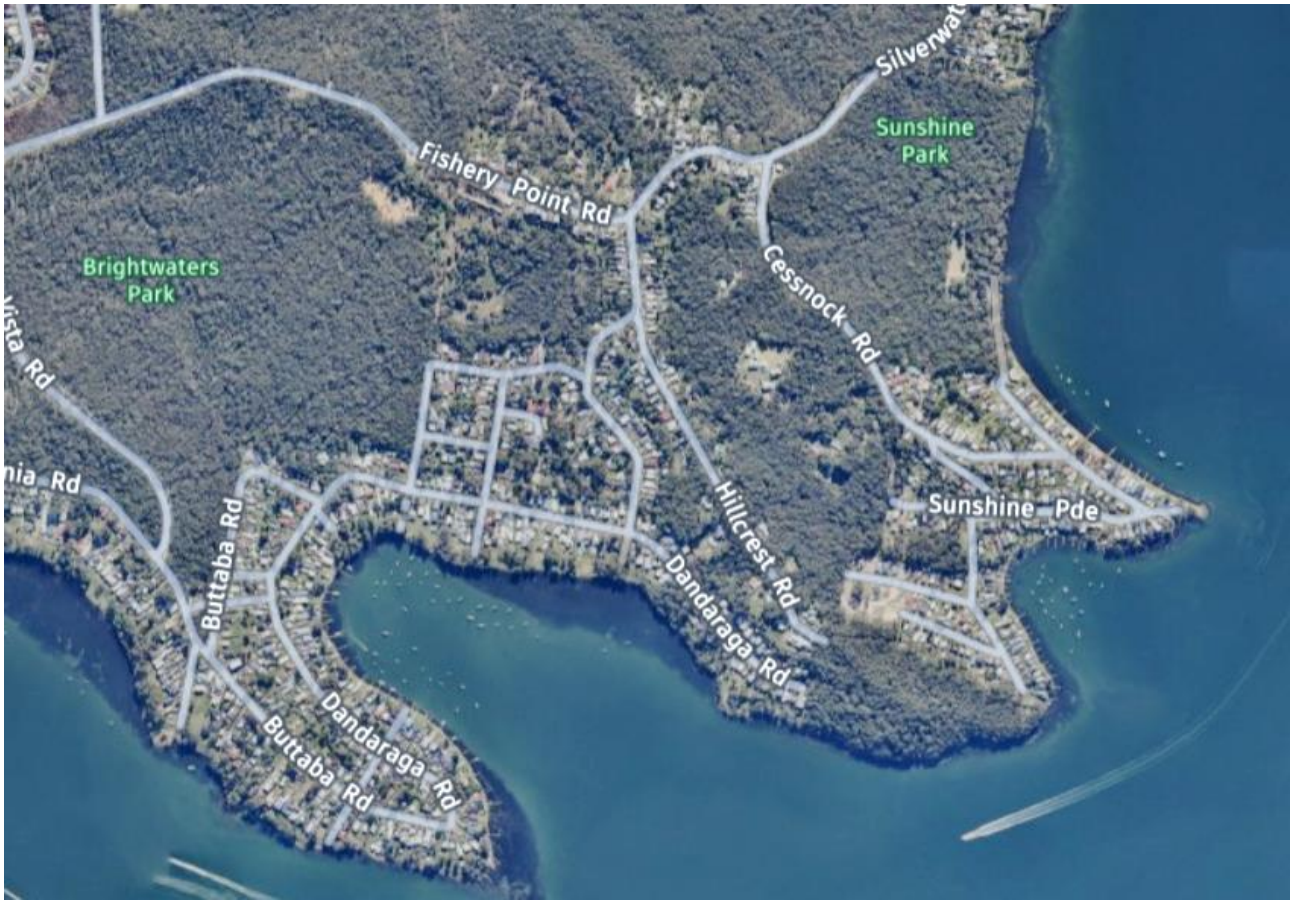


Figure 4 - Morisset East Peninsula

4 Subsidence Monitoring

4.1 Subsidence Monitoring Methods

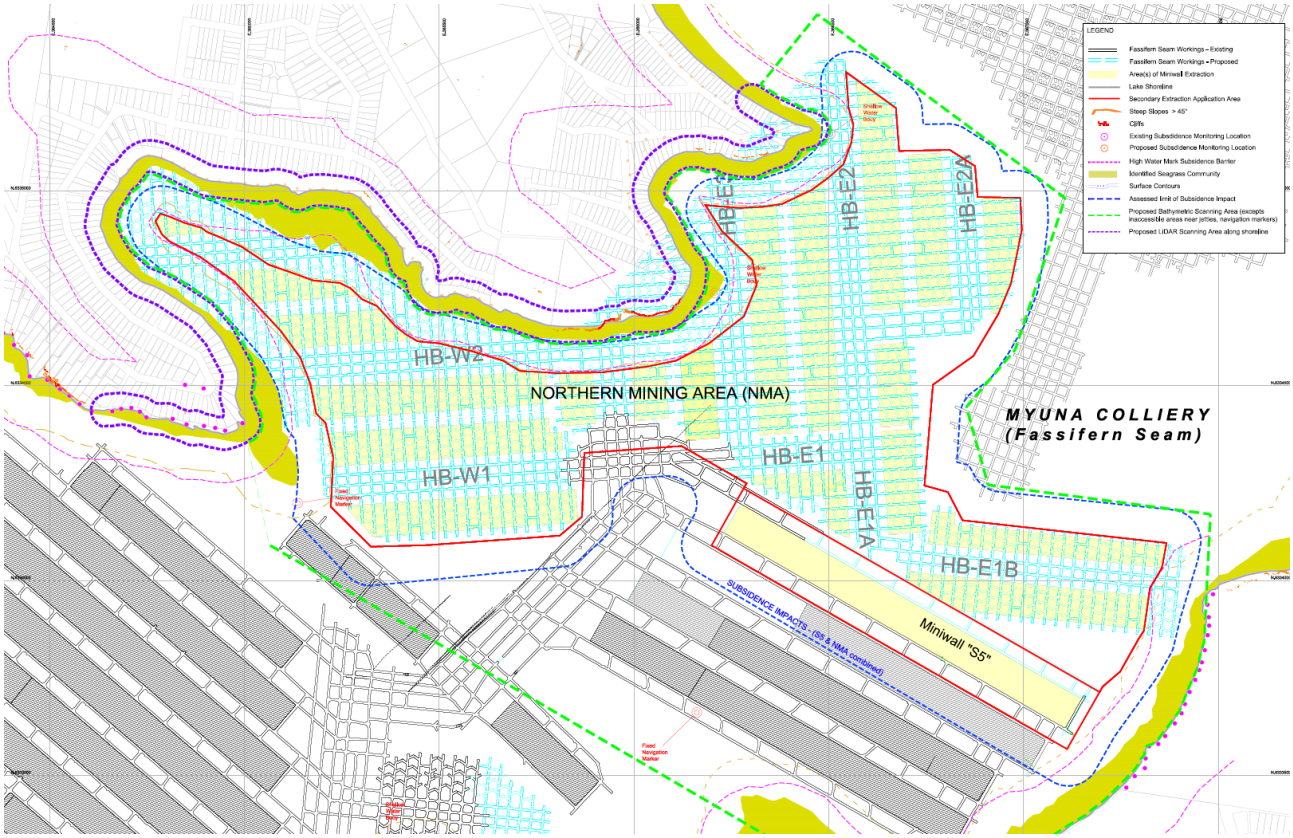


Figure 5 - Proposed Shoreline Subsidence Monitoring Locations, Summerland Point (Delta Coal Plan C4A0099_7)

4.1.1 Bathymetric Surveys

Bathymetric data from the NSW Office of Environment and Heritage (OEH) was obtained in draft format during 2012. Delta Coal was granted a license to use this OEH data for the purposes of monitoring changes in the bed of Lake Macquarie, and acknowledges the OEH's data which has enabled the subsidence comparison to be undertaken based on this 2010 data and data subsequently obtained in 2012 by Delta Coal. OEH notes that the data was obtained via use of differential GPS and a 200 kHz echosounder, which is noted to provide general data accuracy of 0.1m.

Delta Coal commissioned Astute Surveying in 2012 to undertake a bathymetric survey annually over the areas of current and proposed workings. The primary purpose of this survey was to obtain accurate baseline data for future subsidence assessments and to enable comparison with the draft OEH data from 2010. Importantly, the ongoing surveys provided accurate details of the Lake depth within the proposed mining areas, which would enable future surveys to use as baseline data to monitor the future subsidence levels as a result of mining activities.

Comparative analysis of the surveys highlights some elevation changes which are unrelated to mining, generally however these appear to be minor movements, perhaps related to movement of sediment as a result of the wave climate in the Lake. The surveys have shown that subsidence from the miniwall mining can be monitored with a useful level of accuracy and annual surveys over the extraction area will be continued to cover future mining areas and areas where mining has been completed.

4.1.2 Fixed Monitoring Surveys

Subsidence monitoring around Pt Wolstoncroft and Brightwaters peninsula have already been established due to previous mining operations to the immediate south of the extraction area (**Figure 5**). Additional monitoring points will be established along the foreshore in relevant locations at approximately 20-30m intervals and will be reestablished where missing. New monitoring locations will be subject to landholder access arrangements and permission.

The foreshore monitoring points will be monitored as follows:

- The points are to be established as per **Miniwall S5 & NMA Pillars Extraction Plan - Plan 7**.
- X and Y locations will be measured using GPS equipment for plotting purposes (±0.050m)
- AHD RL (Z) component will be leveled using Automatic or Digital levelling equipment to an accuracy of 5mm/km.
- Surveys are to be conducted at intervals prescribed in **Table 3**, during mining operations and after completion of a panel.
- The results are uploaded to DRE's online subsidence web portal within 14 days of survey.

Additionally, monitoring of the Morisset East peninsula area is proposed via the installation and monitoring of fixed reference along a number of the major access roads where practical to verify subsidence performance measures.

4.1.3 Remote LiDAR Monitoring Methods

Due to the nature of the shoreline in the vicinity of the mine subsidence monitoring areas, it may at times not be practical to install fixed monitoring marks due to access arrangements, environmental/cultural sensitivity and worker safety concerns. It is planned to utilise airborne LiDAR (Light Ranging and Detection) techniques to monitor areas of the shoreline where land access may not be available. Calibration, or 'ground-truthed' locations will be established and monitored with the same techniques utilised for the fixed foreshore monitoring surveys.

The remote scanning methodology would be carried out by:

- Utilising a survey ground crew to ground truth designated control sites
- LiDAR and imagery flown
- Low level drone imagery collected of the steep slope / cliff face areas
- Filtering drone imagery data and merge with LiDAR information

Areas to be monitored via these remote LiDAR techniques are shown on **Plan 7** of the **Miniwall S5 & NMA Pillars Extraction Plan** figures.

Results of the post mining monitoring will be provided to the DRE once surveys have been completed and all digital data processed.

4.1.4 Visual Inspection Methods

Additional as a part of the foreshore survey monitoring, observations will be made for visual impact or changes to public safety risk. A Subsidence Inspection Proforma will be completed with each survey. The proforma includes visual inspection of steep slopes, boulder or tree instability, ponding and other potential effects of mine subsidence.

4.2 Subsidence Monitoring Frequency Requirements

Due to the general locality of the mining subsidence monitoring areas, it may be at times not reasonably practical to install, maintain and access fixed monitoring points for shoreline monitoring, due to environmentally sensitive areas, landowner or physical access issues. Where fixed foreshore monitoring surveys cannot be carried out, bathymetric surveys are planned to be substituted to confirm nil impacts outside the proposed subsidence impact area. If fixed monitoring points are to be installed after commencement of extraction, a baseline survey of these points will be undertaken coinciding with a bathymetric monitoring survey to calibrate the monitoring results.

Based on the monitoring program outlined above, the following monitoring frequencies are to be established to validate model outcomes, enable early detection of subsidence trending to increased impact levels over that predicted, allow early application of containment, adaptive and contingency measures to prevent impact outside approved and particularly increased impact to the foreshore.

All evaluations are to be made against the criteria outlined in the Subsidence Monitoring TARP.

Table 3 - Subsidence Monitoring Frequencies (S2-S5, NMA Pillar extraction Panels)

	Areas	Pre-Extraction	During Extraction	Post Extraction
Bathymetric surveys	Area per Plan 7 of the Miniwall S5 & NMA Pillars Extraction Plan	Baseline survey prior to commencement of extraction	End of panel survey for S5 Annual surveys over areas of pillar extraction	Annual for 3 years unless TARP triggered
Terrestrial based subsidence monitoring (foreshore)	Points Plan 7 of the Miniwall S5 & NMA Pillars Extraction Plan, subject to land access Monitoring points along main roads in suburbs of Brightwaters, Mirrabooka and Sunshine	Baseline survey prior to commencement of extraction	End of panel survey for S5 Annual surveys during extraction unless TARP triggered	Annual for 3 years unless TARP triggered
Terrestrial based subsidence monitoring (general)	Monitoring points along main roads in suburbs of Brightwaters, Mirrabooka and Sunshine	Baseline survey prior to commencement of extraction	Annual surveys during extraction unless TARP triggered	Annual surveys ongoing unless TARP triggered
Remote Sensing LiDAR	As per Plan 7 of the Miniwall S5 & NMA Pillars Extraction Plan	Baseline survey prior to commencement of pillar extraction	Annual surveys during extraction unless TARP triggered	Annual for 3 years unless TARP triggered

4.3 Subsidence Monitoring Review

Chain Valley Colliery will undertake a review of available subsidence monitoring data against predictions and expected outcomes annually within its Annual Review as required by SSD-5465.

4.4 Consultation

The Subsidence Monitoring Plan is required to be prepared in consultation with DRE. DRE have been consulted during the preparation and approval process for SSD-5465 (Modification 4) and will also be consulted as a part of preparation of a Mining Operations Plan for the proposed mining areas.

Roads and Maritime Services Project Officer (North Area) has previously been contacted during the development of the secondary Extraction Plan(s) and referred the matter to the RMS asset team, with monitoring program(s) developed in consultation with RMS representatives.

The Community Consultative Committee (CCC) for the mine will be routinely updated on subsidence monitoring results and any change in impact or public safety concern.

5 Roles and Responsibilities

Roles, responsibilities specific to completing the requirements of this Subsidence Monitoring Program are identified in **Table 4**.

Table 4: Subsidence Monitoring Program Roles and Responsibilities

Role	Responsibilities
Mine Manager	• Ensure that adequate financial and personnel resources are made available for the implementation of the Subsidence Monitoring Program

Mine Surveyor	• Co-ordinate subsidence monitoring, through the use of bathymetric surveys, conventional surveys along foreshore and in relevant mining areas and underground data collection.
	• Review subsidence monitoring results against Subsidence Management TARP triggers
	• Inform relevant stakeholders as to the subsidence monitoring results
	• Review, and if necessary revise this document:
	  ○ In the event of any exceedance in impact thresholds
	  ○ Following any modification to the development consent

Environment Compliance Coordinator	• Develop management actions in consultation with regulatory agencies as/if required from the monitoring results. • Respond to any potential or actual non-compliance and report these as required to regulatory bodies and other stakeholders. • Notify the relevant Government Agencies and other affected parties of any exceedances of the performance measures • Coordinate the meeting of the Subsidence Review Committee • Ensure complaint handling and response is undertaken, including determination of sources and potential remedial action to avoid recurrence.

16 Appendix 4 – S5 and NMA Subsidence Monitoring TARP

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

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)

		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

17 Approval Letter

Our ref: MAAG0007901
LETT0004763

Great Southern Energy Pty Ltd
Level 7, 287 Elizabeth Street
SYDNEY NSW 2000
Attn: Chris Armit

Dear Chris Armit

ML 1051, ML 1052, ML 1308, MPL 1349, MPL 1389, MPL 1400 (1906), Part CCL 706, CCL 707, MPL 337 (1973), Great Southern Energy Pty Ltd, ML 1370 & ML 1632 (1992) (held by Centennial Myuna Pty Ltd); CCL 719 & CCL 721 (1973) (held by Centennial Mannering Pty Ltd), CCL 722 (1973) (held by Centennial Munmorah Pty Ltd) - Approval of Mining Operations Plan

NOTICE OF APPROVAL

Pursuant to the relevant Condition of ML 1051 (1906), ML 1052 (1906), ML 1308 (1906), MPL 1349 (1906), MPL 1389 (1906), MPL 1400 (1906), Part CCL 706 (1973), CCL 707 (1973), MPL 337 (1973), CCL 719 (1973), CCL 721 (1973) and CCL 722 (1973) the Mining Operations Plan (MOP) that was submitted to the Resources Regulator ('the Regulator') on 21 July 2020 (Department Reference: MAAG0007901) is approved for the period from the date of this approval until 30 April 2021.

The Regulator notes that workings associated with S4 and S5 Miniwalls are included in MOP with the extraction plan not yet currently endorsed by the Department of Planning, Industry & Environment (DPIE). The Regulator reminds Great Southern Energy Pty Ltd of the obligation to ensure the relevant extraction plan has been endorsed by DPIE prior to commencement.

The assessment of the MOP performed by the Regulator has identified several knowledge gaps / limitations. Great Southern Energy Pty Ltd must address these knowledge gaps / limitations in the next MOP / MOP Amendment for Chain Valley and Mannering Collieries:

1. 'Terrestrial' based mining within the location of Fishery Point is proposed by MOP Plan 3B, however no detail is provided in the MOP regarding proposed subsidence monitoring, remedial measures or methods for reporting of impacts. The MOP is to be updated to provide details of these omissions. Section 9 of the MOP may also require incorporation of monitoring and remedial action measures associated with terrestrial based mining, particularly the Trigger Action Response Plan.
2. 'Aquatic' based mining related subsidence monitoring is mostly deferred to the relevant Extraction Plan, Seagrass Management Plan and Benthic Communities Management Plan ('Plans'). A summary of the monitoring, remediation / maintenance and reporting described by these Plans is to be provided in the next MOP submission.

3. The MOP commits to the decommissioning and rehabilitation of the domain identified as the Mine Cottages. The Project Timeline provided for these works has the Mine Cottages within 'growth media development phase' from Q4 2020 until Q4 2023. The Regulator reminds Great Southern Energy Pty Ltd of its requirement to rehabilitate progressively, that includes transitioning of rehabilitated areas through the relevant phases of rehabilitation. Further justification for the delay of 'ecosystem establishment and development phase' is required.
4. Rehabilitation monitoring is deferred to Appendix 2 - Rehabilitation Monitoring Program that describes the only monitoring to be performed prior to mine closure is that of analogue monitoring sites every four years. A program has not been devised to assess the performance of smaller rehabilitation areas such as the Mine Cottage domain that may be performed prior to closure. The MOP and Appendix 2 (where relevant) are to be updated to include a rehabilitation monitoring program for smaller areas to be rehabilitated to ensure rehabilitation performance is appropriately assessed, tracked and remedial actions taken as appropriate.
5. Inconsistencies regarding the removal of services and infrastructure within Table 6.1 and Section 5.3.1 are to be addressed. Moreover, the MOP does not provide differentiation as to when services / infrastructure would be removed or capped in-situ (for example, the Regulator may consider capping services in-situ should there be limited - no risk associated with remaining in-situ, these services do not inhibit post mining land uses and removal would have unacceptable risks to safety etc).
6. Rehabilitation objectives and completion criteria are to be updated (where relevant) to incorporate 2019 baseline monitoring observations / results associated with the development of Appendix 2 - Rehabilitation Monitoring Program.
7. Rehabilitation objectives and completion criteria are to be updated to ensure that criteria are specific, measurable, achievable, realistic and time bound (SMART) and avoid nondescript terms such as 'generally consistent with'.

It is the responsibility of the Authorisation Holder to ensure that all mining and mining related operations described in this MOP are as approved within the relevant Project Approval or Development Consent and all necessary approvals, consents or permits required under the relevant NSW or Commonwealth regulations have been obtained prior to carrying out the operations.

It is the responsibility of the Authorisation Holder to fulfil their obligations and commitments to the rehabilitation outcomes and performance standards as approved by the relevant consent authority to ensure the rehabilitation outcomes identified are achieved.

ASSESSED DEPOSIT

Approval of this MOP has triggered a review of the assessment of the security deposit required to secure funding for the fulfilment of rehabilitation obligations under the listed Mining Authorisation Number(s). Notice of the change in the security deposit condition related to this MOP approval will be provided separately.

DEFINITIONS

In this letter, words have the meaning given to those terms in the Mining Act 1992, unless otherwise specified below.

Authorisation Holder means the holder of the relevant authorisation(s).

Mining Operations Plan means the project, mining and mining related operations described in the Chain Valley Colliery and Mannering Colliery Mining Operations Plan Rehabilitation Management Plan 2020-2023 prepared by Great Southern Energy Pty Ltd and dated 11 June 2020.

Signed under delegation from the Minister for Resources and the Secretary of the NSW Department of Regional New South Wales.

If you require additional information, please contact the Resources Regulator on 1300 814 609 (Option 2, then 5), or via email at nswresourcesregulator@service-now.com.

Yours sincerely,

Peter Ainsworth
Manager Environmental Operations
Mining Act Inspectorate
Resources Regulator

5 August 2020

Other copies provided by email to: David McLean

Our ref: MAAG0010171
LETT0005951

Great Southern Energy Pty Ltd
Level 7, 287 Elizabeth Street
SYDNEY NSW 2000
Attn: Great Southern Energy Pty Ltd

Dear Great Southern Energy Pty Ltd

ML 1051, ML 1052, ML 1308, MPL 1349, MPL 1389, MPL 1400 (1906), Part CCL 706, CCL 707, MPL 337 (1973), Great Southern Energy Pty Ltd, ML 1370 & ML 1632 (1992) (held by Centennial Myuna Pty Ltd); CCL 719 & CCL 721 (1973) (held by Centennial Mannering Pty Ltd), CCL 722 (1973) (held by Centennial Munmorah Pty Ltd) - Approval of Mining Operations Plan Amendment

NOTICE OF APPROVAL

Pursuant to the relevant Condition of ML 1051 (1906), ML 1052 (1906), ML 1308 (1906), MPL 1349 (1906), MPL 1389 (1906), MPL 1400 (1906), Part CCL 706 (1973), CCL 707 (1973), MPL 337 (1973), CCL 719 (1973), CCL 721 (1973) and CCL 722 (1973) the Mining Operations Plan (MOP) Amendment that was submitted to the Resources Regulator ('the Regulator') on 22 April 2021 (Department Reference: MAAG0010171) is approved for the period from the date of this approval until 31 December 2023.

It is the responsibility of the Authorisation Holder to ensure that all mining and mining related operations described in this MOP are as approved within the relevant Project Approval or Development Consent and all necessary approvals, consents or permits required under the relevant NSW or Commonwealth regulations have been obtained prior to carrying out the operations.

It is the responsibility of the Authorisation Holder to fulfil their obligations and commitments to the rehabilitation outcomes and performance standards as approved by the relevant consent authority to ensure the rehabilitation outcomes identified are achieved.

ASSESSED DEPOSIT

Approval of this MOP has triggered a review of the assessment of the security deposit required to secure funding for the fulfilment of rehabilitation obligations under the listed Mining Authorisation Number(s). Notice of the change in the security deposit condition related to this MOP approval will be provided separately.

DEFINITIONS

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Mining Operations Plan means the project, mining and mining related operations described in the Chain Valley Colliery and Mannering Colliery Mining Operations Plan Amendment 1 Rehabilitation Management Plan 2020-2023 prepared by Great Southern Energy Pty Ltd and dated 22 April 2021.

Signed under delegation from the Minister for Resources and the Secretary of the NSW Department of Regional New South Wales.

If you require additional information, please contact the Resources Regulator on 1300 814 609 or via email at nswresourcesregulator@service-now.com.

Yours sincerely,

Peter Ainsworth
Manager Environmental Operations
Resources Regulator

23 April 2021

Other copies provided by email to: Chris Armit, David McLean, Chris Nicholas