



UG1 LONGWALLS 101 TO 105 BUILT FEATURES MANAGEMENT PLAN AUSTRALIAN RAIL TRACK CORPORATION

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TABLE OF CONTENTS

1.0 INTRODUCTION	1
1.1 PURPOSE AND SCOPE	1
1.2 SUITABLY QUALIFIED AND EXPERIENCED PERSONS	6
1.3 STRUCTURE OF THE LONGWALLS 101-105 BFMP-ARTC.....	6
2.0 LONGWALLS 101 TO 105 BFMP-ARTC REVIEW AND UPDATE	7
2.1 ACCESS TO INFORMATION	7
3.0 STATUTORY REQUIREMENTS	8
3.1 EP&A ACT PROJECT APPROVAL	8
3.2 OTHER LEGISLATION	10
4.0 SANDY HOLLOW GULGONG RAILWAY	12
4.1 BASELINE DATA.....	12
4.2 LONGWALLS 101-105 EXTRACTION SCHEDULE	12
4.3 REVISED SUBSIDENCE AND IMPACT PREDICTIONS.....	13
4.4 RISK ASSESSMENT MEETING	14
5.0 PERFORMANCE MEASURES	18
6.0 MONITORING	19
6.1 SUBSIDENCE PARAMETERS.....	20
6.2 SUBSIDENCE IMPACTS	21
6.3 ENVIRONMENTAL CONSEQUENCES	21
7.0 MANAGEMENT MEASURES.....	22
8.0 ASSESSMENT OF PERFORMANCE INDICATORS AND MEASURES	24
9.0 CONTINGENCY PLAN.....	25
9.1 CONTINGENCY MEASURES	25
10.0 TRIGGER ACTION RESPONSE PLAN – MANAGEMENT TOOL.....	27
11.0 ROLES AND RESPONSIBILITIES.....	28
11.1 KEY CONTACTS.....	28
12.0 FUTURE EXTRACTION PLANS.....	29
13.0 ANNUAL REVIEW, REGULAR REPORTING AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE	30
13.1 AUDITS.....	31
14.0 INCIDENTS	32
15.0 COMPLAINTS	33
16.0 NON-COMPLIANCES WITH STATUTORY REQUIREMENTS	34
17.0 REFERENCES	35

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

LIST OF TABLES

Table 1	Management Plan Requirements
Table 2	Provisional Extraction Schedule
Table 3	Program for Implementation of Proposed Risk Control Measures and Procedures
Table 4	Built Features Subsidence Impact Performance Measures
Table 5	Sandy Hollow Gulgong Railway Monitoring Program Overview
Table 6	Sandy Hollow Gulgong Railway Key Management Actions
Table 7	Potential Contingency Measures
Table 8	Longwalls 101 to 105 Built Features Management Plan – Australian Rail Track Corporation Responsibility Summary
Table 9	Longwalls 101 to 105 Built Features Management Plan – Australian Rail Track Corporation Key Personnel Contact Details

LIST OF FIGURES

Figure 1	Regional Location
Figure 2	Moolarben Coal Complex Layout
Figure 3	Underground Mine 1 Longwalls 101-105 Layout
Figure 4	Australian Rail Track Corporation Assets

LIST OF ATTACHMENTS

Attachment 1	UG1 Longwalls 101 to 105 Built Features Management Plan – Australian Rail Track Corporation Trigger Action Response Plan
Attachment 2	UG1 Longwalls 101 to 105 Built Features Management Plan – Australian Rail Track Corporation Subsidence Impact Register

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

1.0 INTRODUCTION

The Moolarben Coal Complex is an open cut and underground coal mining operation located approximately 40 kilometres north of Mudgee in the Western Coalfield of New South Wales (NSW) (Figure 1).

Moolarben Coal Operations Pty Ltd (MCO) is the operator of the Moolarben Coal Complex on behalf of the Moolarben Joint Venture (Moolarben Coal Mines Pty Ltd [MCM], Sojitz Moolarben Resources Pty Ltd and a consortium of Korean power companies). MCO and MCM are wholly owned subsidiaries of Yancoal Australia Limited.

The UG1 Underground Mine is a component of the approved Moolarben Coal Complex (Figure 2). The UG1 Underground Mine commenced first workings in April 2016 and commenced secondary workings (longwall extraction) in October 2017 by longwall mining methods from the Ulan Seam within Mining Lease (ML) 1605, ML 1606, ML 1628, ML 1691 and ML 1715 (Figure 3).

Mining operations at the Moolarben Coal Complex are currently approved until 31 December 2038 in accordance with Project Approval (05_0117) (Moolarben Coal Project Stage 1) (as modified) and Project Approval (08_0135) (Moolarben Coal Project Stage 2) (as modified).

This UG1 Longwalls 101 to 105 Built Features Management Plan – Australian Rail Track Corporation (LW101-105 BFMP-ARTC) forms part of the Extraction Plan for Longwalls 101 to 105 (herein referred to as Longwalls 101-105) of the approved UG1 Underground Mine.

1.1 PURPOSE AND SCOPE

Purpose: This LW101-105 BFMP-ARTC outlines the management of potential subsidence impacts of the proposed secondary workings described in the Extraction Plan on the existing Sandy Hollow Gulgong Railway.

Scope: This LW101-105 BFMP-ARTC covers the section of the Sandy Hollow Gulgong Railway in the vicinity of the Study Area¹, which relates to the extent of subsidence effects resulting from the secondary extraction of Longwalls 101-105 (Figure 4).

¹ Longwalls 101-105 and the area of land within the furthest extent of the 26.5 degree (°) angle of draw and 20 millimetres (mm) predicted subsidence contour. The Australian Rail Track Corporation (ARTC) assets are not located within the Study Area.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

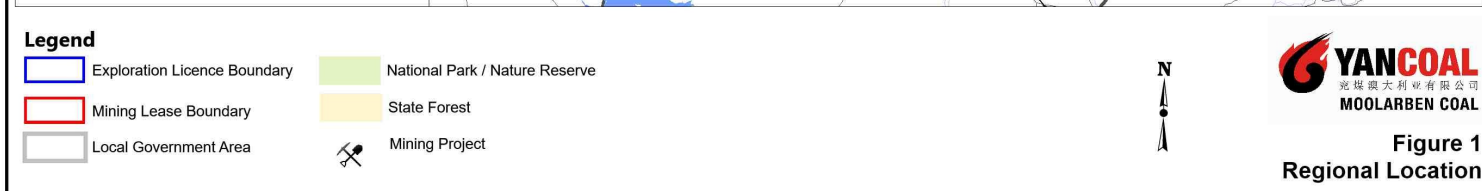
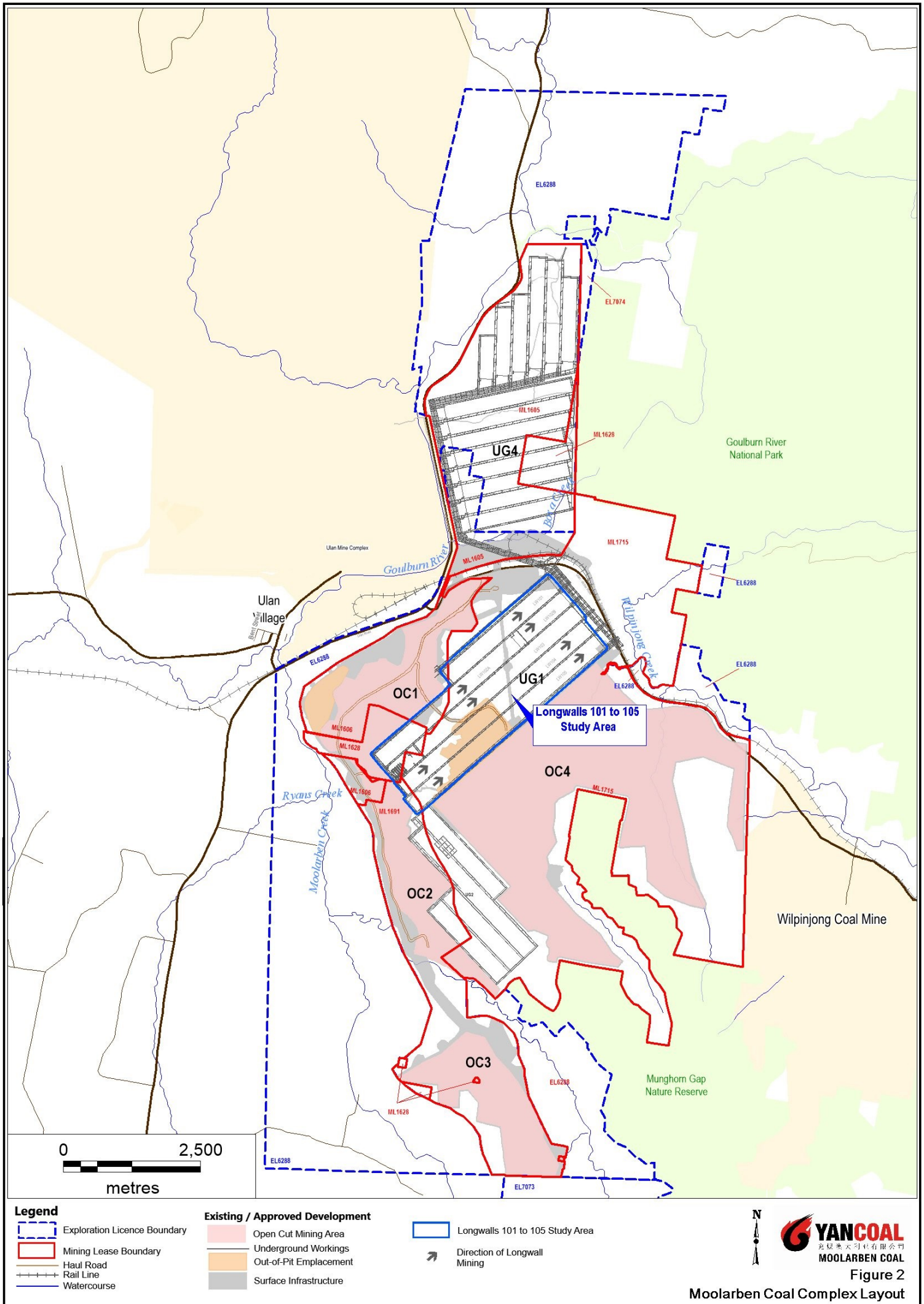
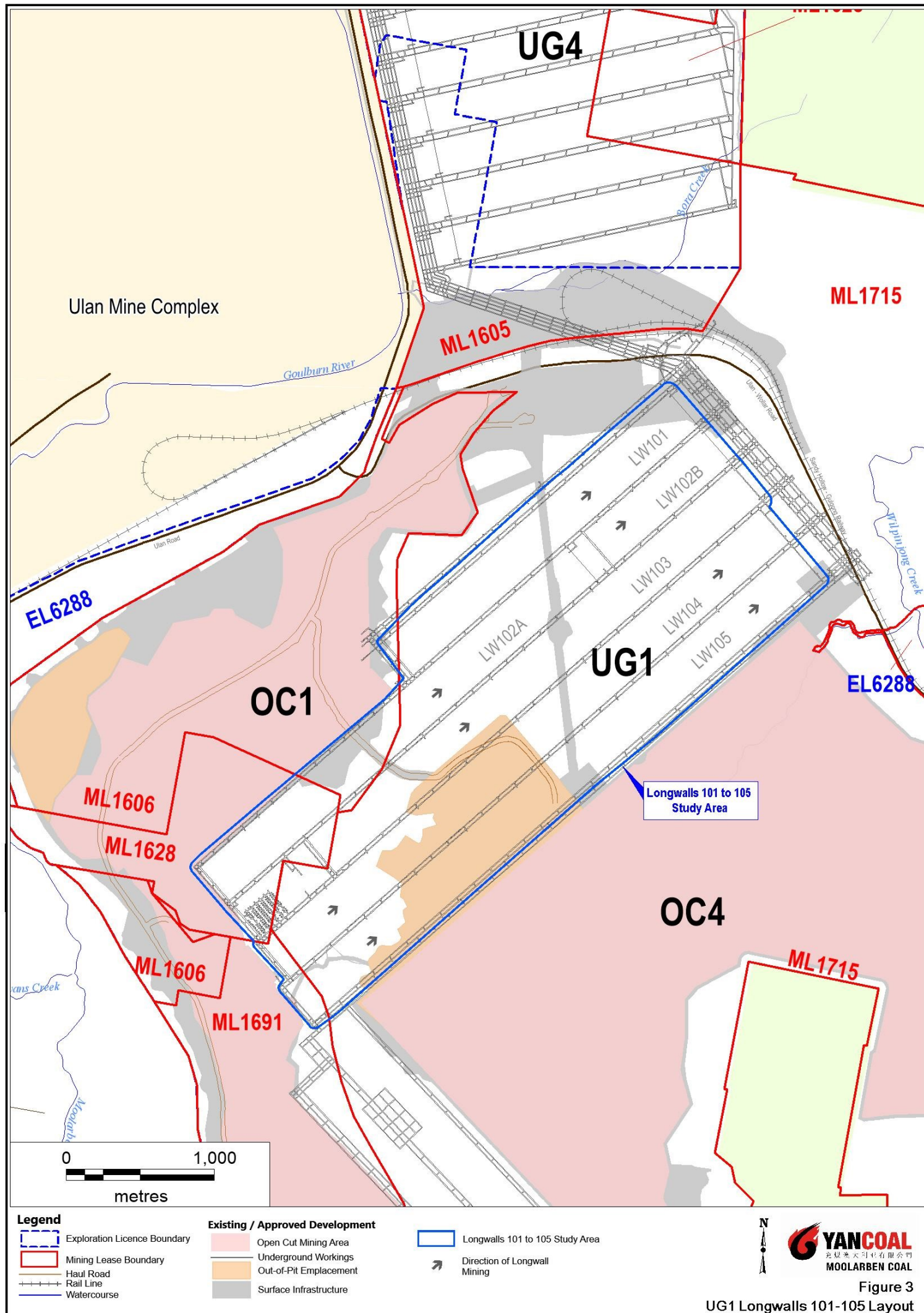
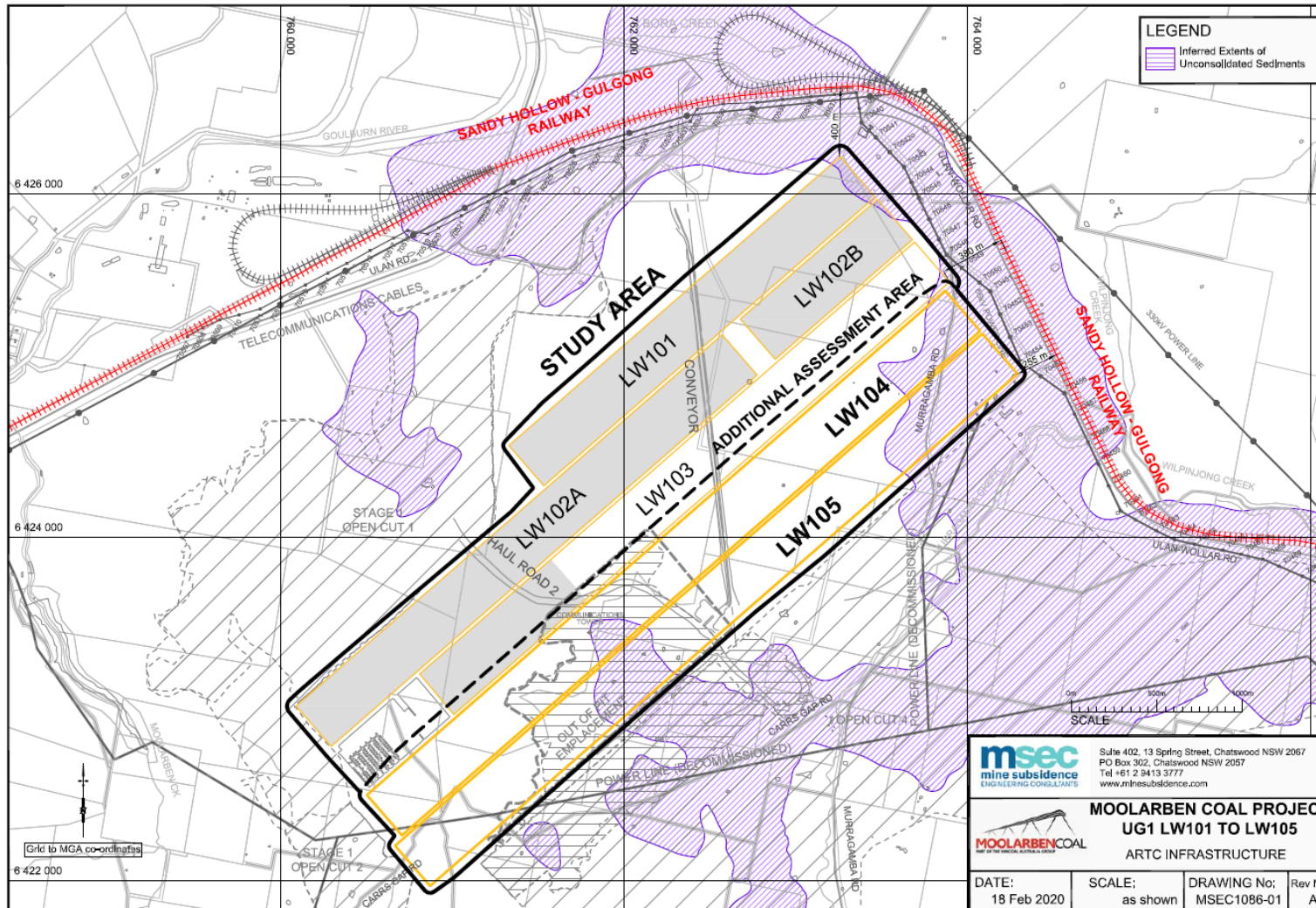


Figure 1
Regional Location







Source; MSEC (2020)



Australian Rail Track Corporation Assets

Figure 4

1.2 SUITABLY QUALIFIED AND EXPERIENCED PERSONS

In accordance with Condition 5(a), Schedule 4 of Project Approval (08_0135), the suitably qualified and experienced persons that have prepared this LW101-105 BFMP-ARTC, namely representatives from Mine Subsidence Engineering Consultants (MSEC) and MCO were endorsed by the Secretary of the Department of Planning, Industry and Environment (DPIE).

This LW101-105 BFMP-ARTC has been prepared in consultation with the ARTC (Section 4.4).

A list of the key responsibilities of MCO personnel in relation to this LW101-105 BFMP-ARTC, and a list of key contacts is provided in Section 11.

1.3 STRUCTURE OF THE LONGWALLS 101-105 BFMP-ARTC

The remainder of the LW101-105 BFMP-ARTC is structured as follows:

- Section 2: Describes the review and update of the LW101-105 BFMP-ARTC.
- Section 3: Outlines the statutory requirements applicable to the LW101-105 BFMP-ARTC.
- Section 4: Provides baseline data, extraction schedule, revised assessment of the potential subsidence impacts and environmental consequences for Longwalls 101-105, as well as the outcomes of the risk assessment.
- Section 5: Details the performance measures relevant to ARTC assets.
- Section 6: Describes the monitoring program.
- Section 7: Describes the management measures that will be implemented.
- Section 8: Details the performance indicators that will be used to assess against the performance measures.
- Section 9: Provides a contingency plan to manage any unpredicted impacts and their consequences.
- Section 10: Describes the Trigger Action Response Plan (TARP) management tool.
- Section 11: Describes the roles and responsibilities for MCO personnel and key contacts.
- Section 12: Describes the program to collect sufficient baseline data for future Extraction Plans.
- Section 13: Describes the Annual Review, audits, regular reporting and improvement of environmental performance.
- Section 14: Outlines the management and reporting of incidents.
- Section 15: Outlines the management and reporting of complaints.
- Section 16: Outlines the management and reporting of non-compliances with statutory requirements.
- Section 17: Lists the references cited in this LW101-105 BFMP-ARTC.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

2.0 LONGWALLS 101 TO 105 BFMP-ARTC REVIEW AND UPDATE

In accordance with Condition 5, Schedule 6 of Project Approval (08_0135), this LW101-105 BFMP-ARTC will be reviewed as follows:

5. *Within 3 months of the submission of:*
 - (a) *the submission of annual review under condition 4 above;*
 - (b) *the submission of an incident report under condition 7 below;*
 - (c) *the submission of an audit under condition 9 below; or*
 - (d) *any modification to the conditions of this approval or MP 05_0117 (unless the conditions require otherwise),**the Proponent shall review and, if necessary, revise the strategies, plans, and programs required under this approval to the satisfaction of the Secretary. Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted to the Secretary for approval.*

2.1 ACCESS TO INFORMATION

In accordance with Condition 11, Schedule 6 of Project Approval (08_0135), MCO will make the approved LW101-105 BFMP-ARTC publicly available on the MCO website.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

3.0 STATUTORY REQUIREMENTS

MCO's statutory obligations are contained in:

- the conditions of the NSW Project Approval (05_0117) (as modified) and NSW Project Approval (08_0135) (as modified);
- the conditions of Commonwealth Approvals (EPBC 2007/3297, EPBC 2013/6926, EPBC 2008/4444 and EPBC 2017/7974);
- relevant licences and permits, including conditions attached to the Environment Protection Licence (EPL) No. 12932 and MLs (i.e. ML 1605, ML 1606, ML 1628, ML 1691 and ML 1715); and
- other relevant legislation.

Obligations relevant to this LW101-105 BFMP-ARTC are described below.

3.1 EP&A ACT PROJECT APPROVAL

Condition 5(g), Schedule 4 of Project Approval (08_0135) requires the preparation of a Built Features Management Plan as a component of the Extraction Plan. In addition, Conditions 3, 5(n), 5(p) and 6, Schedule 4 and Condition 3, Schedule 6 of Project Approval (08_0135) outline general management plan requirements that are applicable to the preparation of this LW101-105 BFMP-ARTC.

Table 1 presents these requirements and indicates where they are addressed within this LW101-105 BFMP-ARTC.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

Table 1: Management Plan Requirements

Project Approval (08_0135) Condition		LW101-105 BFMP-ARTC Section
Condition 3, Schedule 4		
Notes:		
...		
<ul style="list-style-type: none"> The Proponent will be required to define more detailed performance indicators for each of these performance measures in Built Features Management Plans or Public Safety Management Plan (see condition 5 below). 		Section 8
<ul style="list-style-type: none"> 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. 		Sections 5, 6 & 8
...		
<ul style="list-style-type: none"> Requirements under this condition may be met by measures undertaken in accordance with the Mine Subsidence Compensation Act 1961. 		Section 9
...		
Condition 5(g), Schedule 4		
(g) include a Built Features Management Plan, which has been prepared in consultation with DRE and the owners of affected public infrastructure, to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings, and which:		
<ul style="list-style-type: none"> addresses in appropriate detail all items of key public infrastructure and other public infrastructure and all classes of other built features; 		Section 4.1
<ul style="list-style-type: none"> has been prepared following appropriate consultation with the owner/s of potentially affected feature/s; 		Section 4.4
<ul style="list-style-type: none"> recommends appropriate remedial measures and includes commitments to mitigate, repair, replace or compensate all predicted impacts on potentially affected built features in a timely manner; and 		Sections 7 & 9
<ul style="list-style-type: none"> in the case of all key public infrastructure, and other public infrastructure except roads, trails and associated structures, reports external auditing for compliance with ISO 31000 (or alternative standard agreed with the infrastructure owner) and provides for annual auditing of compliance and effectiveness during extraction of longwalls which may impact the infrastructure; 		Section 13.1
Condition 5(n), Schedule 4		
(n) include a contingency plan that expressly provides for adaptive management where monitoring indicates that there has been an exceedance of any performance measure in Tables 18 and 19, or where any such exceedance appears likely;		Section 9
Condition 5(p), Schedule 4		
(p) include a program to collect sufficient baseline data for future Extraction Plans.		Section 12
Condition 6, Schedule 4		
6. The Proponent shall ensure that the management plans required under conditions 5(g)-(l) above include:		
(a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval; and		Section 4 and 6.3
(b) a detailed description of the measures that would be implemented to remediate predicted impacts.		Section 7

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

Table 1 (Continued): Management Plan Requirements

Project Approval (08_0135) Condition		LW101-105 BFMP-ARTC Section
Condition 3, Schedule 6		
3. The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:		Sections 3 and 4.4
(a) detailed baseline data;		Section 4.1
(b) a description of:		
<ul style="list-style-type: none"> the relevant statutory requirements (including any relevant approval, licence or lease conditions); 		Section 3
<ul style="list-style-type: none"> the relevant limits or performance measures/criteria; 		Section 5
<ul style="list-style-type: none"> the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures; 		Section 8
(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;		Sections 7 & 9
(d) a program to monitor and report on the:		Sections 6, 8 & 13
<ul style="list-style-type: none"> impacts and environmental performance of the project; 		
<ul style="list-style-type: none"> effectiveness of any management measures (see c above); 		
(e) a contingency plan to manage any unpredicted impacts and their consequences;		Section 9
(f) a program to investigate and implement ways to improve the environmental performance of the project over time;		Sections 6 & 13
(g) a protocol for managing and reporting any:		
<ul style="list-style-type: none"> incidents; 		Section 14
<ul style="list-style-type: none"> complaints; 		Section 15
<ul style="list-style-type: none"> non-compliances with statutory requirements; and 		Section 16
<ul style="list-style-type: none"> exceedances of the impact assessment criteria and/or performance criteria; and 		Section 9
(h) a protocol for periodic review of the plan.		Section 2

3.2 OTHER LEGISLATION

The Acts which may be applicable to the conduct of the Moolarben Coal Complex includes, but are not limited to, the:

- Crown Lands Act, 1989;
- Fisheries Management Act, 1994;
- Heritage Act, 1977;
- Coal Mine Subsidence Compensation Act, 2017;
- Mining Act, 1992;
- National Parks and Wildlife Act, 1974;

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

- *Biodiversity Conservation Act, 2016;*
- *Protection of the Environment Operations Act, 1997;*
- *Roads Act, 1993;*
- *Water Act, 1912;*
- *Water Management Act, 2000;*
- *Work Health and Safety Act, 2011; and*
- *Work Health and Safety (Mines and Petroleum Sites) Act, 2013.*

Relevant licences or approvals required under these Acts will be obtained as required.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

4.0 SANDY HOLLOW GULGONG RAILWAY

4.1 BASELINE DATA

The Sandy Hollow Gulgong Railway owned by ARTC runs adjacent to Ulan-Wollar Road and is shown on Figure 4. The Sandy Hollow Gulgong Railway is located to the north and east of the Study Area and the nearest edge of the Longwalls 101-105 vary from approximately 255 metres (m) (Longwall 105) to 400 m (Longwall 101) from the rail track.

Drainage culverts are located along the Sandy Hollow Gulgong Railway, the largest of which is at Murragamba Creek crossing.

At these locations, the rail track and culverts will not be subjected to measureable systematic mine subsidence ground movement; however they may experience small far-field horizontal movements (Section 4.3).

4.2 LONGWALLS 101-105 EXTRACTION SCHEDULE

The Sandy Hollow Gulgong Railway is located to the north and east of the Study Area for Longwalls 101-105 (Figure 4) and may be subject to subsidence effects (i.e. low level far-field horizontal movements) (MSEC, 2020).

Longwalls 101-105 and the area of land within the furthest extent of the 26.5° angle of draw and 20 mm predicted subsidence contour (i.e. the Longwalls 101-105 Study Area) are shown on Figures 3 and 4. Longwall extraction will occur from the west to the east. The longwall layout includes approximately 311 m panel widths (void) with 20 m pillars (solid).

The provisional extraction schedule for Longwalls 101-105 is provided in Table 2.

Table 2: Provisional Extraction Schedule

Longwall	Estimated Start Date	Estimated Duration	Estimated Completion Date
101	-	-	Complete
102 (A+B)	-	-	Complete
103	September 2019	9 months	June 2020
103 Plunge	-	-	Complete
104	July 2020	12 months	June 2021
105	July 2021	11 months	May 2022

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

Following approval of the UG1 Optimisation Modification in April 2016, MCO has delineated geological features in Longwall 102 and 103 that prevented economic mining of these sections, and has subsequently revised the longwall layout to avoid these features. The subsequent barrier pillar separating Longwalls 102A and 102B is approximately 140 m in length and the Longwall 103 commencing end was shorted by 660m and replaced by a first workings only production panel. Longwall 104 was also shortened by 70m at the commencing end to allow for a rear of panel shaft. In addition, following further detailed design, Longwalls 101-103 have been shortened by approximately 70 m to provide safe operational conveyor distance between the end of the longwalls and main headings. With the exception of these changes, the longwall geometry is the same as that for the approved UG1 Optimisation Modification, and MSEC (2017 and 2020) concludes that the overall impact assessments for the natural and built features are unchanged or reduced.

4.3 REVISED SUBSIDENCE AND IMPACT PREDICTIONS

Subsidence and impact predictions for Longwalls 101-105 in relation to the ARTC assets was conducted by MSEC (2015) as part of the Moolarben Coal Complex UG1 Optimisation Modification Environmental Assessment (EA) and was summarised as follows:

The longwalls at the MCC are not passing under the railway line.

...

At these distances between the panels and the railway track and based on these depths of cover, the rail track will not be subjected to measurable systematic mine subsidence ground movements; however, ... , the ground near the railway line may experience far field horizontal movements and possibly small valley upsidence and closure movements.

...

These far-field horizontal movements generally do not result in impact at structures, except where they occur at large structures, such as railway lines, since these large structures can be very sensitive to differential horizontal movements. The predicted far-field horizontal movements of less than 70 mm at the railway track are expected to be bodily movements that are directed across the track towards the extracted goaf area and should be accompanied by very low levels of strain.

...

The effects of this subsidence and the differential far field movements due to the proposed extraction of the UG1 longwalls on the Gulgong to Sandy Hollow Railway are very small and are unlikely to adversely impact on the railway line.

Revised subsidence and impact predictions specifically for the extraction of Longwalls 101-105 on ARTC assets were conducted by MSEC and reported in MSEC (2020). Subsequent to the preparation of MSEC (2016), the longwall layout was revised to incorporate a reduced longwall length and shorter barrier pillar (Section 4.2). MSEC (2020) includes updated subsidence predictions for the revised layout. As the asset is located further from Longwalls 101-103, a reduced impact is predicted by MSEC (2017) compared to MSEC (2016).

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

In relation to subsidence predictions, MSEC (2016; 2017; 2020) makes the following conclusions:

- Longwall extraction will not occur directly below the Sandy Hollow Gulgong Railway.
- At its nearest point, the Sandy Hollow Gulgong Railway is located approximately 255m away from the end of the longwall panels.
- The railway line will not be subjected to measurable conventional vertical mine subsidence ground movements (i.e. less than survey accuracy limits).
- The railway line may be subject to low level far-field horizontal movements that are likely to be less than 70 mm.
- The existing open cut (OC1) will significantly reduce the potential for far-field movements.
- The presence of unconsolidated Tertiary sediments (in the north-east) should result in further reducing the potential for far-field movements to develop at the railway line.
- It is possible that a slight increase in compression could develop in the rail due to the curve near Longwall 101.
- It is recommended that a program of ground monitoring near the Sandy Hollow Gulgong Railway be implemented and monitoring and management strategies be developed.

The far-field horizontal movement of 70mm horizontal movement is expected to be bodily with very low levels of associated ground strain. The typical direction of measurable horizontal movements is towards the longwalls. This orientation is close to perpendicular to the railway and since the rail line is a straight section of line along the ends of 104 and 105, the resulting horizontal movement in the direction along the rail line should be negligible. The far-field horizontal movements are also based on a maximum observed value from observed data, including the southern coalfield, therefore these values tend to be conservative. The latest observed horizontal movements along the FF line adjacent to the railway were within survey accuracy and generally less than 10mm.

4.4 RISK ASSESSMENT MEETING

In accordance with the draft *Guidelines for the Preparation of Extraction Plans* (DP&E and DRE, 2015), potential risks and potential risk control measures and procedures have been considered at a risk assessment for the ARTC infrastructure in the vicinity of Longwalls 101-103, held on 23 March 2017. Attendees at the risk assessment meeting included representatives from MCO, ARTC, MSEC, Resource Strategies and a risk assessment facilitator (AXYS Consulting Pty Ltd [AXYS]). This was subsequently reviewed by MCO and MSEC representatives for Longwall 104 and 105 in January 2020.

The investigation and analysis methods used during the risk assessment review included (AXYS, 2020):

- Confirmation of relevant ARTC assets.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

- Review of the revised subsidence predictions and potential impacts on ARTC assets (including consideration of past experience in Longwall 101 and 102 and in the Western Coalfield).
- Consideration and discussion of the proposed monitoring program, management measures and contingency measures.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

The following potential risks were identified during the risk assessment (AXYS, 2020):

- Longwall mining causes impacts to Sandy Hollow Gulgong Railway Infrastructure and MCO are required to compensate ARTC to make repairs.
- Longwall mining causes impacts to Sandy Hollow Gulgong Railway Infrastructure causes impacts to other rail users' operations.

A number of risk control measures and procedures were identified prior to and during the risk assessment and are summarised as follows:

Baseline Data / Validation

1. Conduct a baseline survey and dilapidation audit of Sandy Hollow Gulgong Railway Infrastructure in the area that may be affected by the mining of Longwalls 101-105.
2. Installation of the subsidence monitoring program.

Management / Monitoring / Response Measures

3. Establish a key contacts list between MCO and ARTC to provide a regular update of status of mining activities, and for ongoing liaison.
4. Include in the LW101-105 BFMP-ARTC a schedule of times/frequency of communication with ARTC for the status of mining of Longwalls 101-105.
5. Develop a TARP and include triggers for conditions that may need to be actioned by MCO and/or ARTC.

MCO considers all risk control measures and procedures to be feasible to manage all identified risks.

The proposed risk control measures and procedures have been incorporated where relevant in this LW101-105 BFMP-ARTC and the program for implementation is summarised in Table 3.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

Table 3: Program for Implementation of Proposed Risk Control Measures and Procedures

Risk Control Measure / Procedure		LW101-105 BFMP-ARTC Section	Proposed Timing
Baseline Data / Validation			
1	Conduct a baseline survey and dilapidation audit of Sandy Hollow Gulgong Railway Infrastructure in the area that may be affected by the mining of Longwalls 101-105.	Section 6.2	Prior to Longwall 104 being within 400m
2	Extend the subsidence monitoring program for Longwalls 104 and 105.	Section 6.2	Prior to Longwall 104
Management / Monitoring / Response Measures			
3	Establish key contacts list in the LW101-105 BFMP-ARTC.	Section 11.1	Complete
4	Include in the LW101-105 BFMP-ARTC a schedule of times/frequency of communication with ARTC for the status of mining of Longwalls 101-105.	Section 7 and Table 6	Complete
5	Develop a TARP and include triggers for conditions that may need to be actioned by MCO and/or ARTC.	Section 10 and Attachment 1	Complete

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

5.0 PERFORMANCE MEASURES

The performance measures specified in Table 19, Schedule 4 of Project Approval (08_0135) relevant to the Sandy Hollow Gulgong Railway, as a built feature, are listed in Table 4.

Table 4: Built Features Subsidence Impact Performance Measures

Feature	Subsidence Impact Performance Measure
Key public infrastructure:	
Gulgong-Sandy Hollow Railway Line	Always safe and serviceable. Damage that does not affect safety or serviceability must be fully repairable, and must be fully repaired.

Source: Table 19 in Schedule 4 of Project Approval (08_0135).

In accordance with Condition 3, Schedule 4 of Project Approval (08_0135), MCO must ensure that there is no exceedance of the performance measures listed in Table 19, to the satisfaction of the Secretary of the DPIE.

Section 6 outlines the monitoring that will be undertaken to assess the impact of Longwalls 101-105 against the performance measures in relation to the Sandy Hollow Gulgong Railway. Management measures for the Sandy Hollow Gulgong Railway are outlined in Section 7 and performance indicators for the performance measures are summarised in Section 8.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

6.0 MONITORING

A monitoring program will be developed in order to monitor the impacts of the extraction of Longwalls 101-105 on the Sandy Hollow Gulgong Railway to identify unsafe conditions or loss of serviceability during or after mining. Key components of the monitoring program are summarised in Table 5.

Table 5: Sandy Hollow Gulgong Railway Monitoring Program Overview

Monitoring Component	Parameter	Timing/Frequency	Responsibility
Pre-mining			
UG1 subsidence monitoring lines, as described in the UG1 Longwalls 101 to 105 Subsidence Monitoring Program (LW101-105 SMP).	Installation of survey monitoring program and initial ground survey (including 'FF Line'). Monitoring parameters include: <ul style="list-style-type: none"> • subsidence; • tilt; • tensile strain; • compressive strain; and • absolute horizontal translation. 	Prior to commencement of Longwall 101 extraction and extend prior Longwall 104 extraction.	Underground Technical Manager / Registered Mine Surveyor
Maintenance inspections.	Alignment and condition of rail infrastructure.	Routinely as per ARTC inspections.	ARTC
During Mining			
Sandy Hollow Gulgong Railway – Baseline survey and visual inspection (i.e. dilapidation audit).	Alignment and condition of rail infrastructure.	Prior to secondary extraction within 400 m of the Longwall 104 take-off position.	Underground Technical Manager / Registered Mine Surveyor
UG1 subsidence monitoring lines, as described in the LW101-105 SMP.	Ground survey (including 'FF Line') and comparison against baseline. Monitoring parameters include: <ul style="list-style-type: none"> • subsidence; • tilt; • tensile strain; • compressive strain; and • absolute horizontal translation. 	<p>Prior to secondary extraction within 400 m of the longwall take-off position (i.e. the existing longwall mining limits).</p> <p>At 100 m intervals (determined by the longwall chainage marks) while the active mining face is within 400 m of the longwall take-off position. <i>[Inspection sheets to be provided to ARTC if/when movement detected]</i></p> <p>Opportunistic visual observations during routine works by MCO and its contractors.</p>	Underground Technical Manager / Registered Mine Surveyor

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

Table 5 (Continued): Sandy Hollow Gulgong Railway Monitoring Program Overview

Monitoring Component	Parameter	Timing/Frequency	Responsibility
During Mining (continued)			
Sandy Hollow Gulgong Railway – Subsidence impact inspection.	Subsidence impact inspections will target the identification of: <ul style="list-style-type: none">any defects or deformation of the rail line and associated infrastructure; andchanges to the visible surfaces of the culverts including cracking, buckling, shearing, and collapse.	If/when ground movement (in excess of survey accuracy) is detected during monitoring of the FF Line. At any time in case of fault or emergency and where requested by ARTC.	Underground Technical Manager
		Routinely as per ARTC inspections.	ARTC
Post-mining			
UG1 subsidence monitoring lines, as described in the LW101-105 SMP.	Ground survey (including ‘FF Line’). Monitoring parameters include: <ul style="list-style-type: none">subsidence;tilt;tensile strain;compressive strain; andabsolute horizontal translation.	Within three months of longwall completion (e.g. longwall has been relocated from the final end of block mining position). Provide a copy of the results of this final survey to ARTC.	Underground Technical Manager / Registered Mine Surveyor

The frequency of monitoring will be reviewed either:

- in accordance with the Annual Review; or
- if triggered as a component of the Contingency Plan as outlined in Section 9 of this LW101-105 BFMP-ARTC.

6.1 SUBSIDENCE PARAMETERS

Subsidence parameters (i.e. subsidence, tilt, tensile strain, compressive strain and absolute horizontal translation) associated with mining will be measured in accordance with the LW101-105 SMP.

In summary, surveys will be conducted to measure subsidence movements in three dimensions using a total station survey instrument. Subsidence movements (i.e. subsidence, tilt, tensile strain and compressive strain) will be measured along subsidence lines that have been positioned across the general landscape.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

Monitoring of subsidence parameters specific to the Sandy Hollow Gulgong Railway will be measured by a survey line ('FF Line') along Ulan-Wollar Road. As agreed with ARTC, in the event the subsidence monitoring program identifies ground movements (in excess of survey accuracy), inspection sheets detailing the results of the subsidence monitoring program will be provided to ARTC, following confirmation of the results.

6.2 SUBSIDENCE IMPACTS

A baseline inspection (including visual inspection and dilapidation audit) of the Sandy Hollow Gulgong Railway in the vicinity of Longwalls 101-105 will be conducted prior to mining within 400 m of the Longwall 104 take-off position.

A survey along the FF Line will be undertaken prior to secondary extraction within 400 m of the Longwall 104 take-off point. Additional surveys along the FF Line will be undertaken by MCO while mining is within 400 m of the longwall take-off position (i.e. at 100 m intervals as determined by the longwall chainage marks).

In the event monitoring identifies ground movement (in excess of survey accuracy) MCO will undertake an inspection of the rail line for any impacts caused by subsidence movements. Opportunistic observations of subsidence impacts will be conducted during routine works by MCO and its contractors.

It is understood that ARTC also conducts routine inspections (including fault and emergency patrols) which would be used for monitoring of the impacts of subsidence if conducted during the course of mining Longwalls 101-105.

Information will be recorded in the LW101-105 BFMP-ARTC Subsidence Impact Register (Attachment 2) and reported in accordance with Project Approval (08_0135) (Section 13).

6.3 ENVIRONMENTAL CONSEQUENCES

MCO and ARTC will compare the results of the subsidence impact monitoring against the built features performance measure and indicators (Sections 5 and 8). In the event the observed subsidence impacts from the Moolarben Coal Complex exceed the performance measure or indicators, MCO and ARTC will assess the consequences of the exceedance in accordance with the Contingency Plan described in Section 9.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

7.0 MANAGEMENT MEASURES

A number of potential management measures in relation to the rail line are considered to be applicable, if required. These may include:

- speed restriction of trains; and
- minor repair of track.

A number of potential management measures in relation to culverts are also considered to be applicable, if required. These include:

- point repairs;
- lining;
- grouting; and
- culvert replacement.

Follow-up inspections will be conducted to assess the effectiveness of the management measures implemented and the requirement for any additional management measures.

A summary of management measures will be reported in the Annual Review.

Key management actions and timing is summarised in Table 6.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

Table 6: Sandy Hollow Gulgong Railway Key Management Actions

Management Measure	Timing/Frequency	Responsibility
Pre-mining		
Notification to ARTC prior to commencement of secondary extraction.	Prior to secondary extraction of Longwall 101 and 104.	Underground Technical Manager
Baseline survey and visual inspection (e.g. dilapidation audit) of Sandy Hollow Gulgong Railway Infrastructure.	Prior to secondary extraction of Longwall 101 and 104.	Underground Technical Manager
During Mining		
Notification to ARTC prior to subsidence effects on the Sandy Hollow Gulgong Railway.	Prior to secondary extraction within 400 m of the longwall take-off positions.	Underground Technical Manager
Provision of inspection sheets detailing the outcome of the subsidence impact monitoring program to ARTC (unless otherwise agreed by ARTC).	If/when ground survey identifies movement (in excess of survey accuracy).	Underground Technical Manager
Ensure safe access to Sandy Hollow Gulgong Railway is available such that routine inspections and maintenance and remediation works are able to be undertaken.	During Longwalls 101-105 extraction.	Underground Technical Manager
Implement TARP (Attachment 1).	During Longwall 101-105 extraction.	Underground Technical Manager
Post-mining		
Visual inspection of Sandy Hollow Gulgong Railway to identify any post-mining remediation works required.	Following completion of active mining at UG1.	Underground Technical Manager

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

8.0 ASSESSMENT OF PERFORMANCE INDICATORS AND MEASURES

In accordance with Condition 5(d), Schedule 4 of Project Approval (08_0135), performance indicators have been developed for the performance measures listed in Table 4 (Section 5).

The performance indicators proposed to ensure that the performance measures for the Sandy Hollow Gulgong Railway are achieved include:

- no defects or deformation of the rail track and associated infrastructure due to mining; and
- no visual displacement at joints or cracks in culverts.

Monitoring conducted to inform the assessment of secondary extraction of Longwalls 101-105 against the performance indicators for the performance measures relevant to the Sandy Hollow Gulgong Railway as a built feature is outlined in Section 6.

If a performance measure is considered to have been exceeded, the Contingency Plan outlined in Section 9 of this LW101-105 BFMP-ARTC will be implemented.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

9.0 CONTINGENCY PLAN

In the event the performance measures relevant to the Sandy Hollow Gulgong Railway as a built feature, summarised in Table 4, are considered to have been exceeded or are likely to be exceeded, MCO will implement the following Contingency Plan:

- The observation will be reported to the Underground Technical Manager or the Environmental and Community Manager within 24 hours.
- The observation will be recorded in the Subsidence Impact Register (Attachment 2).
- The likely exceedance will be reported in an Incident Report (refer to the Extraction Plan).
- MCO will provide the Incident Report to relevant stakeholders (i.e. DPIE, DRE and ARTC).
- MCO will conduct an investigation to identify and evaluate contributing factors to the exceedance, including re-survey of the relevant subsidence monitoring lines, analysis of predicted versus observed subsidence parameters and a review of the subsidence monitoring program with updates to the program where appropriate.
- An appropriate course of action will be developed in consultation with relevant stakeholders and government agencies including proposed contingency measures (Section 9.1), and a program to review the effectiveness of the contingency measures.
- The course of action will be approved by, and implemented to the satisfaction of, ARTC and DRE.
- This LW101-105 BFMP-ARTC and the performance indicators will be reviewed to adequately manage future potential impacts within the limits of Project Approval (08_0135).

MCO will comply with the *NSW Coal Mine Subsidence Compensation Act, 2017 (formerly Mine Subsidence Compensation Act, 1961)* in the event that property damages occur as a result of mining Longwalls 101-105.

9.1 CONTINGENCY MEASURES

Contingency measures will be developed in consideration of the specific circumstances of the feature (e.g. the location, nature and extent of the impact, and the assessment of environmental consequences).

Potential contingency measures that could be considered in the event the performance measure for the Sandy Hollow Gulgong Railway is exceeded are summarised in Table 7.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

Table 7: Potential Contingency Measures

Environmental Consequence	Potential Contingency Measures	
	Measure	Description
Impact on:		
Rail Track	Replace length of track	Temporary suspension of rail traffic and replacement of affected tracks.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

10.0 TRIGGER ACTION RESPONSE PLAN – MANAGEMENT TOOL

The framework for the various components of this LW101-105 BFMP-ARTC are summarised in the TARP shown in Attachment 1. The TARP illustrates how the various predicted subsidence impacts, monitoring components, performance measures, and responsibilities are structured to achieve compliance with the relevant statutory requirements, and the framework for management and contingency actions.

The TARP comprises:

- baseline conditions;
- predicted subsidence impacts;
- trigger levels from monitoring to assess performance; and
- triggers that flag implementation of contingency measures.

The TARP system provides a simple and transparent snapshot of the monitoring of environmental performance and the implementation of management and/or contingency measures.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

11.0 ROLES AND RESPONSIBILITIES

Key responsibilities of MCO personnel in relation to this LW101-105 BFMP-ARTC are summarised in Table 8. Responsibilities may be delegated as required.

Table 8: Longwalls 101 to 105 Built Features Management Plan – Australian Rail Track Corporation Responsibility Summary

Responsibility	Task
General Manager	<ul style="list-style-type: none"> Ensure resources are available to MCO personnel to facilitate the completion of responsibilities under this LW101-105 BFMP-ARTC.
Underground Technical Manager	<ul style="list-style-type: none"> Ensure the LW101-105 SMP is implemented. Ensure monitoring required under this LW101-105 BFMP-ARTC is carried out within specified timeframes, adequately checked and processed and prepared to the required standard. Undertake relevant monitoring and implementation of management measures summarised in Tables 5 and 6 respectively.
Environmental and Community Manager	<ul style="list-style-type: none"> Liaise with relevant stakeholders regarding subsidence impact management and related environmental consequences.
Registered Mine Surveyor	<ul style="list-style-type: none"> Undertake all subsidence monitoring to the required standard within the specified timeframes and ensure data are adequately checked, processed and recorded.

11.1 KEY CONTACTS

The details of key contacts and phone numbers in relation to this LW101-105 BFMP-ARTC are summarised in Table 9.

Table 9: Longwalls 101 to 105 Built Features Management Plan – Australian Rail Track Corporation Key Personnel Contact Details

Organisation	Position	Contact Name	Phone Number
MCO	Underground Technical Manager	Mr Liam Mildon	02 6376 1614
	Environmental and Community Manager	Mr Graham Chase	02 6376 1407
	Moolarben Coal Hotline		1800 556 484
ARTC	External Works Manager	Mr Mark Robinson	0448 870 613
	Area Manager Muswellbrook	Mr David Green	0427 463 709
	Upper Hunter (3) Network Control (24 hour contact)		02 4902 7905

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

12.0 FUTURE EXTRACTION PLANS

In accordance with Condition 5(p), Schedule 4 of Project Approval (08_0135), MCO will collect baseline data for the future Extraction Plan (e.g. for the next Underground Mine). However, for the Sandy Hollow Gulgong Railway, the baseline (and post-mining) data collected for Longwalls 101-103 will be used as baseline for Longwalls 104-105 as longwall mining progressively moves further south of the ARTC assets.

In addition to the baseline data collection, consideration of the environmental performance and management measures, in accordance with the review(s) conducted as part of this LW101-105 BFMP-ARTC, will inform the appropriate type and frequency of monitoring of the assets relevant to the next Extraction Plan.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

13.0 ANNUAL REVIEW, REGULAR REPORTING AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE

In accordance with Condition 4, Schedule 6 of Project Approval (08_0135), MCO will conduct an Annual Review of the environmental performance of the Project by the end of March each year, or as otherwise agreed by the Secretary of the DPIE.

The Annual Review will:

- describe the works carried out in the previous calendar year, and the development proposed to be carried out over the current calendar year;
- include a comprehensive review of the monitoring results and complaints records of the Project over the previous calendar year, including a comparison of these results against the:
 - relevant statutory requirements, limits or performance measures/criteria;
 - monitoring results of previous years; and
 - relevant predictions in the EA;
- identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the monitoring data over the life of the Project;
- identify any discrepancies between the predicted and actual impacts of the Project, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the next year to improve the environmental performance of the Project.

In accordance with Condition 11, Schedule 6 of Project Approval (08_0135), the Annual Review will be made available on the MCO website.

As described in Section 2, this LW101-105 BFMP-ARTC will be reviewed within three months of the submission of an Annual Review, and revised where appropriate.

In accordance with Condition 8, Schedule 6 of Project Approval (08_0135), MCO will also provide regular reporting on the environmental performance of the Project on the MCO website.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

13.1 AUDITS

In accordance with Condition 9, Schedule 6 of Project Approval (08_0135), an independent environmental audit was conducted by the end of December 2015 and again in 2018, and will be undertaken every three years thereafter. A copy of the independent environmental audit will be provided to the Secretary of the DPIE and made available on the MCO website.

The independent environmental audit will be conducted by suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary of the DPIE.

The independent environmental audit will assess the environmental performance of the Project and assess whether it is complying with the requirements of Project Approval (08_0135), and any other relevant approvals, and recommend measures or actions to improve the environmental performance of the Project.

Further to the above, audits to ISO 31000 Risk Management standard are conducted on elements of the Moolarben UG Safety Management System annually, with internal and external audits being undertaken on alternate years. Additionally, an annual auditing of compliance and effectiveness on built features is captured as part of the Annual Review process.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

14.0 INCIDENTS

An incident is defined in Project Approval (08_0135) as a set of circumstances that:

- causes or threatens to cause material harm to the environment; and/or
- breaches or exceeds the limits or performance measures/criteria in Project Approval (08_0135).

In the event that an incident which causes, or threatens to cause, material harm to the environment occurs, the incident will be managed in accordance with the Pollution Incident Response Management Plan.

The reporting of incidents will be conducted in accordance with Condition 7, Schedule 6 of Project Approval (08_0135).

MCO will notify the Secretary of the DPIE, and any other relevant agencies immediately after MCO becomes aware of the incident which causes or threatens to cause material harm to the environment. For any other incident associated with the project, MCO will notify the Secretary and any other relevant agencies as soon as practicable after becoming aware of the incident. Within seven days of the date of the incident, MCO will provide the Secretary of DPIE and any relevant agencies with a detailed report on the incident. The report will:

- describe the date, time and nature of the exceedance/incident;
- identify the cause (or likely cause) of the exceedance/incident;
- describe what action has been taken to date; and
- describe the proposed measures to address the exceedance/incident.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

15.0 COMPLAINTS

MCO maintains a Community Complaints Line (Phone Number: 1800 556 484) that is dedicated to the receipt of community complaints. The Community Complaints Line is publicly advertised and operates 24 hours per day, seven days a week, to receive any complaints from neighbouring residents or other stakeholders.

MCO has developed a Community Complaints Procedure which details the process to be followed when receiving, responding to and recording community complaints. The Community Complaints Procedure is supported by a Complaints Database.

The Community Complaints Procedure is a component of the MCO Environmental Management Strategy which requires the recording of relevant information including:

- the nature of complaint;
- method of the complaint;
- relevant monitoring results and meteorological data at the time of the complaint;
- site investigation outcomes;
- any necessary site activity and activity changes;
- any necessary actions assigned; and
- communication of the investigation outcome(s) to the complainant.

In accordance with Condition 11, Schedule 6 of Project Approval (08_0135), the complaints register will be updated monthly and made available on the MCO website.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

16.0 NON-COMPLIANCES WITH STATUTORY REQUIREMENTS

A protocol for the managing and reporting of non-compliances with statutory requirements has been developed as a component of MCO's Environmental Management Strategy and is described below.

Compliance with all approvals, plans and procedures will be the responsibility of all personnel (staff and contractors) employed on or in association with the Moolarben Coal Complex.

The Environmental and Community Manager (or delegate) will undertake regular inspections, internal audits and initiate directions identifying any remediation/rectification work required, and areas of actual or potential non-compliance.

As described in Section 14, MCO will notify the Secretary of the DPIE, and any other relevant agencies, of any incident associated with MCO.

A review of MCO's compliance with all conditions of Project Approval (08_0135), mining leases and all other approvals and licenses will be undertaken prior to (and included within) each Annual Review. The Annual Review will be made publicly available on the MCO website.

As described in Section 13.1, an independent environmental audit was conducted by the end of December 2015 and again in 2018, and will be undertaken every three years thereafter. A copy of the audit report will be submitted to the Secretary of the DPIE and made publicly available on the MCO website.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

17.0 REFERENCES

AXYS Consulting Pty Ltd (2017) *Potential Impact of Longwall 101 to 103 on Australian Rail Track Corporation Infrastructure – Risk Assessment Report*.

Department of Planning and Environment and NSW Trade & Investment – Division of Resources and Energy (2015) *Guidelines for the Preparation of Extraction Plans Required under Conditions of Development Consents, Project Approvals and Mining Lease Conditions for Underground Coal Mining*. Version 5. Draft.

Mine Subsidence Engineering Consultants (2015) *Moolarben Coal Complex: Revised Predictions of Subsidence Parameters and Revised Assessments of Subsidence Impacts resulting from the Proposed UG1 Mine Layout Optimisation Modification*.

Mine Subsidence Engineering Consultants (2016) *Moolarben Coal Operations: Longwalls 101 to 103 - Subsidence Predictions and Impact Assessments for the ARTC Infrastructure*.

Mine Subsidence Engineering Consultants (2017) *Moolarben Coal Complex: Moolarben Project Stage 2 – Longwalls 101 to 103 – Subsidence Predictions and Impact Assessments for the Natural and Built Features in Support of the Extraction Plan*. Report number MSEC867.

Mine Subsidence Engineering Consultants (2020) *Moolarben Project Stage 2- Longwalls 104 to 105 Subsidence Predictions and Impacts Assessments for the Natural and Built Features In Support of the Extraction Plan*

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

ATTACHMENT 1

**UG1 LONGWALLS 101 TO 105
BUILT FEATURES MANAGEMENT PLAN – AUSTRALIAN RAIL TRACK CORPORATION
TRIGGER ACTION RESPONSE PLAN**

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Mar 20		Mar 23	MCO	S. Archinal

Condition	Normal		Level 1	Level 2
	Baseline Conditions	Predicted Impacts	Implement Management Measures	Restoration/Contingency Phase
Trigger	Rail track and associated infrastructure is safe, serviceable and repairable or as otherwise identified by pre-mining inspection.	Subsidence effects on the Sandy Hollow Gulgong Railway (i.e. small far field horizontal movements). Impacts are considered to be within acceptable limits if monitoring identifies (limits as advised by ARTC): <ul style="list-style-type: none"> Less than 40 mm of horizontal movement at line FF 	Monitoring identifies impacts that are greater than predicted, but the performance measure has not been exceeded and is not likely to be exceeded. Management measures are considered to be required if monitoring identifies (limits as advised by ARTC): <ul style="list-style-type: none"> Between 40 and 70 mm of horizontal movement at line FF 	If the Performance Measure relevant to the Sandy Hollow Gulgong Railway has been exceeded, or is likely to be exceeded (i.e. unsafe or loss of serviceability). Contingency measures are considered to be required if monitoring identifies (limits as advised by ARTC): <ul style="list-style-type: none"> Greater than 70 mm of horizontal movement at line FF.
Action	Establish baseline data, including: <ul style="list-style-type: none"> Maintenance inspections (as per ARTC inspections). Pre-extraction subsidence survey as per the UG1 Longwalls 101 to 105 Subsidence Monitoring Program. 	Conduct monitoring as described in Section 6 , including: <ul style="list-style-type: none"> Ground survey. Rail survey and visual inspection of the alignment and condition of rail infrastructure. Subsidence impact inspections, targeting the identification of: <ul style="list-style-type: none"> any defects or deformation of the rail line and associated infrastructure; and changes to the visible surfaces of the culverts (550m from LW105 on Murragamba Creek) including cracking, buckling, shearing and collapse. 	Management measures implemented as described in Section 7 (with regard to the specific circumstances of the subsidence impact [e.g. the nature and extent of the impact]). Follow-up inspections will be conducted to assess the effectiveness of the management measures implemented and the requirement for any additional management measures. In the event survey of the FF Line identifies ground movements (in excess of survey accuracy), ARTC will be notified as soon as the results have been confirmed.	Contingency Plan implemented (with regard to the specific circumstances of the subsidence impact). In summary: <ul style="list-style-type: none"> The observation will be reported to the Underground Technical Manager or the Environmental and Community Manager within 24 hours. The observation will be recorded in the Subsidence Impact Register. The exceedance or likely exceedance will be reported in an incident report. An investigation will be conducted to identify and evaluate contributing factors to the exceedance. An appropriate course of action will be developed in consultation with relevant stakeholders and government agencies. The course of action will be approved by, and implemented to the satisfaction of, relevant stakeholders and government agencies. The Built Features Management Plan – Australian Rail Track Corporation and the performance indicators will be reviewed to adequately manage future potential impacts.
Frequency	Prior to commencement of extraction of Longwall 101 and 104.	<ul style="list-style-type: none"> Ground survey: <ul style="list-style-type: none"> Prior to secondary extraction within 400 m of the Longwall 101 take-off position. At 100 m intervals (determined by the longwall chainage marks) while the active mining face is within 400 m of the longwall take-off position. Within three months of longwall completion (e.g. longwall has been relocated from the final end of block mining position). Rail survey and visual inspection: <ul style="list-style-type: none"> Prior to secondary extraction within 400 m of the Longwall 101 and 104 take-off position. Subsidence impact inspection: <ul style="list-style-type: none"> If/when ground movement (in excess of survey accuracy) is detected during monitoring of the FF Line. At any time in case of fault or emergency and where requested by ARTC. 	To be implemented as required (i.e. if monitoring identifies impacts that are greater than predicted, but the performance measure has not been exceeded and is not likely to be exceeded).	To be implemented following identification of an exceedance of the performance measure, or if the performance measure is likely to be exceeded (i.e. unsafe or loss of serviceability).
Position of Decision Making	<ul style="list-style-type: none"> Underground Technical Manager. Australian Rail Track Corporation – External Works Manager. 	<ul style="list-style-type: none"> Underground Technical Manager. Australian Rail Track Corporation –External Works Manager. 	<ul style="list-style-type: none"> Underground Technical Manager. Australian Rail Track Corporation – External Works Manager 	<ul style="list-style-type: none"> Underground Technical Manager. Australian Rail Track Corporation –External Works Manager, Area Manager and Network Control.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

ATTACHMENT 2

**UG1 LONGWALLS 101 TO 105
BUILT FEATURES MANAGEMENT PLAN – AUSTRALIAN RAIL TRACK CORPORATION
SUBSIDENCE IMPACT REGISTER**

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MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal

UG1 Longwalls 101 to 105 Built Features Management Plan – Australian Rail Track Corporation
Subsidence Impact Register

Impact Register Number	Built Feature	Impact Description	Does Impact Exceed the Built Feature Performance Measure/Indicators? (Yes/No)	Management Measures Implemented	Were Management Measures Effective? (Yes/No)

Document	Version	Issue	Effective	Review	Author	Approved
MCO_BFMP_ARTC	2	Jun 20		Jun 23	MCO	S. Archinal