



# UG1 LONGWALLS 101 TO 105 HERITAGE MANAGEMENT PLAN

Version	Issue Date	Section Revised	Description	Review Team
1	September 2017	All	Approved	MCO
2	March 2019	Sections 1, 4 and 13 and Figures	Amended 103 Layout	MCO
3	March 2020	All	Inclusion of LW 104-105	MCO

Approved: \_\_\_\_\_

Date: \_\_\_\_\_

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

## TABLE OF CONTENTS

<b>1.0 INTRODUCTION .....</b>	<b>1</b>
1.1 SCOPE AND PURPOSE .....	5
1.2 STRUCTURE OF THE HERITAGE MANAGEMENT PLAN .....	6
1.3 CONSULTATION FOR THE HERITAGE MANAGEMENT PLAN .....	6
<b>2.0 HERITAGE MANAGEMENT PLAN REVIEW AND UPDATE .....</b>	<b>8</b>
2.1 ACCESS TO INFORMATION .....	8
<b>3.0 STATUTORY REQUIREMENTS .....</b>	<b>9</b>
3.1 EP&A ACT PROJECT APPROVAL .....	9
3.2 OTHER LEGISLATION .....	10
<b>4.0 PREDICTED SUBSIDENCE IMPACTS AND ENVIRONMENTAL CONSEQUENCES .....</b>	<b>12</b>
4.1 LONGWALLS 101-105 EXTRACTION SCHEDULE .....	12
4.2 ENVIRONMENTAL RISK ASSESSMENT .....	13
4.3 ABORIGINAL HERITAGE SITES AND VALUES .....	14
4.4 HISTORIC HERITAGE SITES .....	20
<b>5.0 PERFORMANCE MEASURES AND PERFORMANCE INDICATORS .....</b>	<b>21</b>
<b>6.0 MONITORING AND MANAGEMENT .....</b>	<b>22</b>
6.1 BASELINE RECORDING .....	22
6.2 MONITORING OF ABORIGINAL HERITAGE SITES .....	22
6.3 MONITORING OF HISTORIC HERITAGE SITES .....	24
6.4 SUBSIDENCE PARAMETERS .....	24
6.5 SUBSIDENCE IMPACTS .....	24
<b>7.0 CONTINGENCY PLAN .....</b>	<b>27</b>
<b>8.0 REVIEW AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE ....</b>	<b>28</b>
8.1 ANNUAL REVIEW .....	28
8.2 AUDITS .....	28
8.3 FUTURE EXTRACTION PLANS .....	29
<b>9.0 INCIDENTS .....</b>	<b>30</b>
<b>10.0 COMPLAINTS .....</b>	<b>31</b>
<b>11.0 NON-COMPLIANCE WITH STATUTORY REQUIREMENTS .....</b>	<b>32</b>
<b>12.0 REFERENCES .....</b>	<b>33</b>

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

## **LIST OF TABLES**

Table 1	Heritage Management Plan Requirements
Table 2	Provisional Extraction Schedule
Table 3	Summary of the Known Aboriginal Heritage Sites within the Longwalls 101 to 105 Study Area
Table 4	Maximum Predicted Subsidence, Tilt and Curvature for the Aboriginal Heritage Sites within the Study Area due to the Extraction of Longwalls 101 to 105
Table 5	Predicted Strains for the Aboriginal Heritage Sites based on Conventional and Non-Conventional Anomalous Movements
Table 6	Maximum Predicted Total Conventional Subsidence, Tilt and Curvature for the Aboriginal Heritage Sites within the Study Area due to the Extraction of Longwalls 101 to 105
Table 7	Comparison of Maximum Predicted Conventional Subsidence Parameters for the Aboriginal Heritage Sites based on the Approved Layout and the Extraction Plan Layout
Table 8	Heritage Subsidence Impact Performance Measures

## **LIST OF FIGURES**

Figure 1	Regional Location
Figure 2	Moolarben Coal Complex Layout
Figure 3	Underground Mine 1 Longwalls 101 to 105 Layout
Figure 4	Heritage Sites in the Vicinity of Longwalls 101 to 105

## **LIST OF APPENDICES**

Appendix A	Conditions 41 to 46, Schedule 3 of Project Approval (08_0135)
------------	---

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	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 Moolarben Coal Complex comprises four approved open cut mining areas (OC1 to OC4), three approved underground mining areas (UG1, UG2 and UG4) and other mining related infrastructure (including coal processing and transport facilities) (Figure 2).

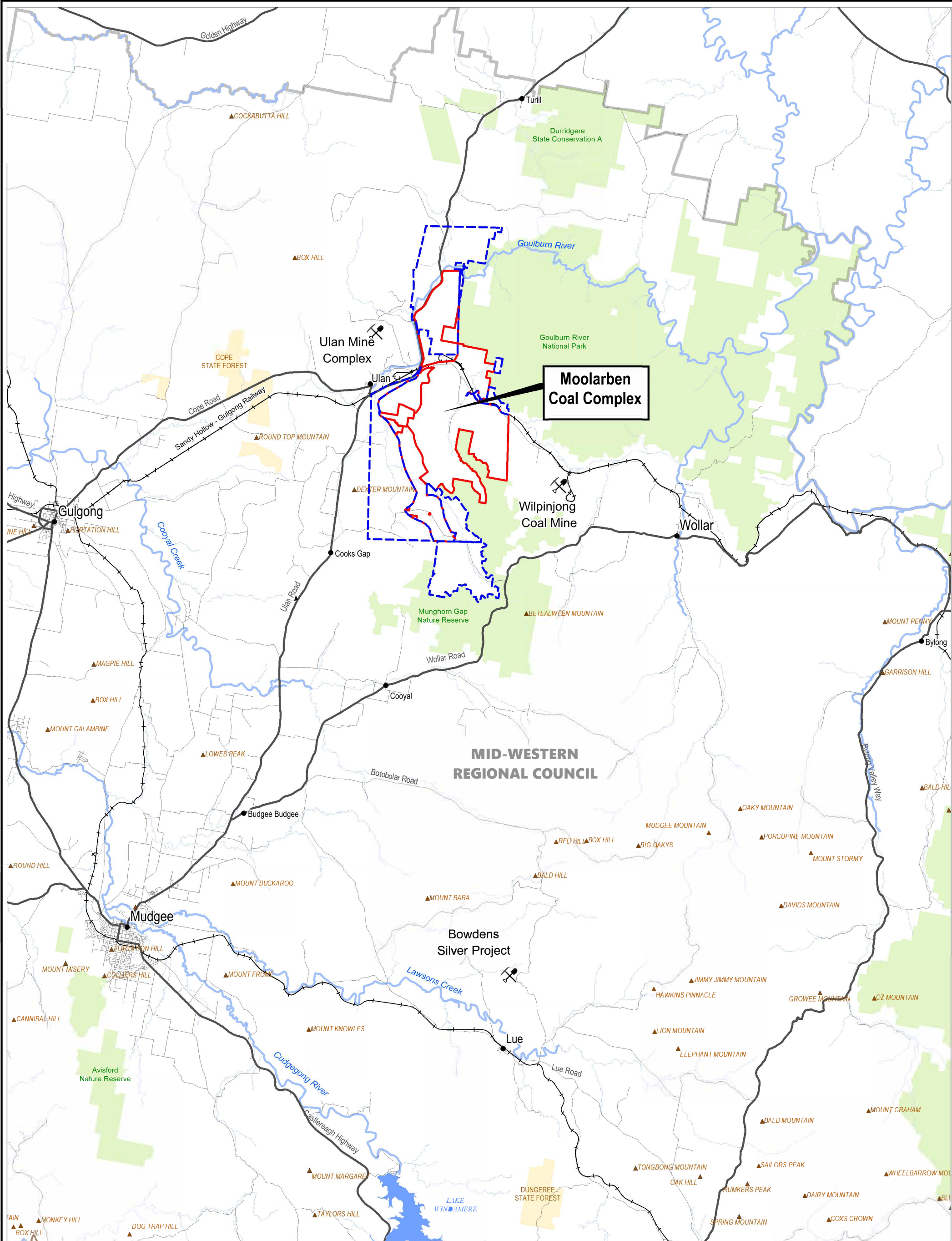
Since the commencement of coal mining operations in 2010, mining activities have occurred within OC1, OC2, OC4 and UG1 (Figure 2).

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).

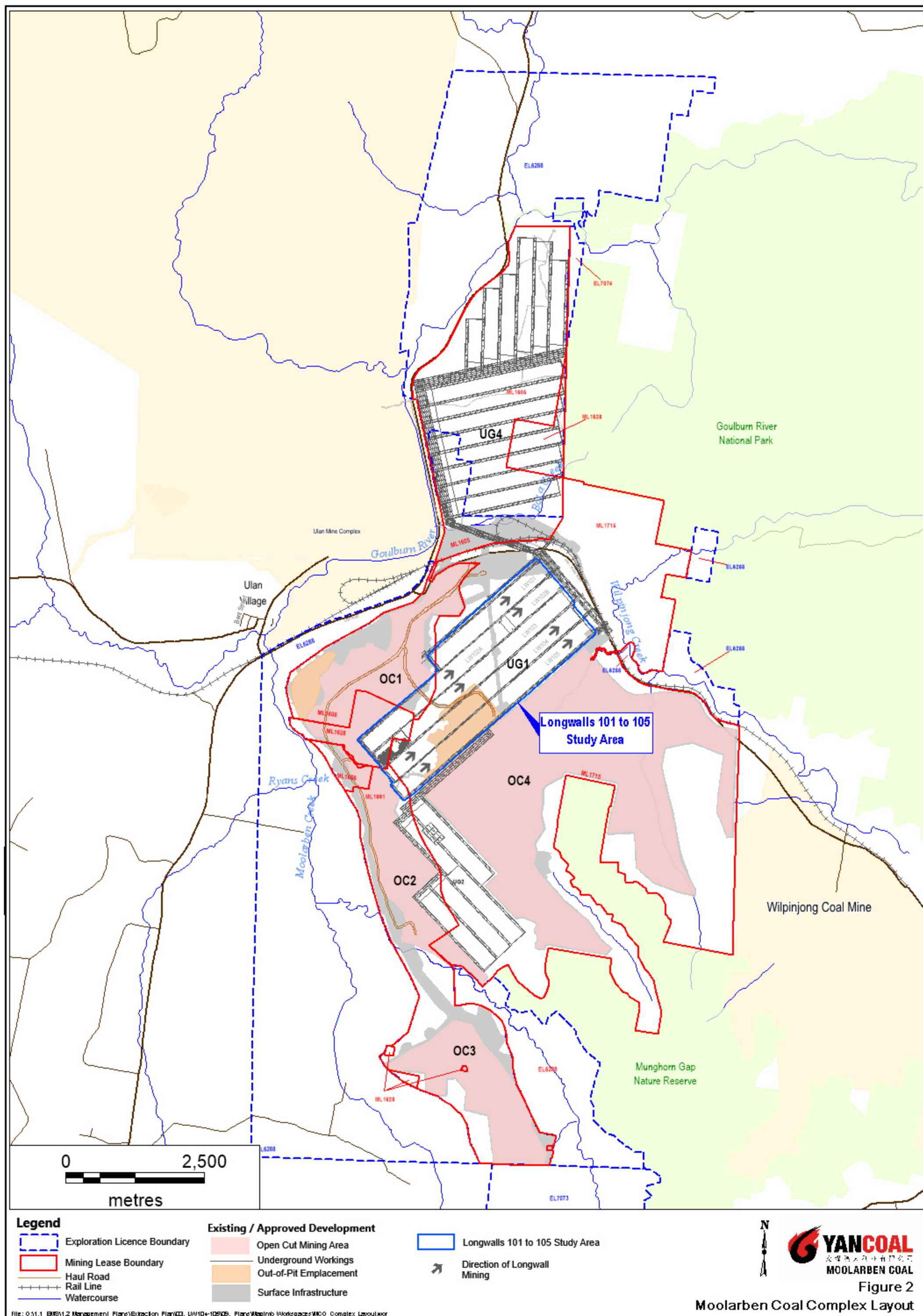
Mining operations at the Moolarben Coal Complex are currently approved until 31 December 2038 in accordance with Project Approval (05\_0117) (Moolarben Coal Project Stage 1) (as modified) and Project Approval (08\_0135) (Moolarben Coal Project Stage 2) (as modified).

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal









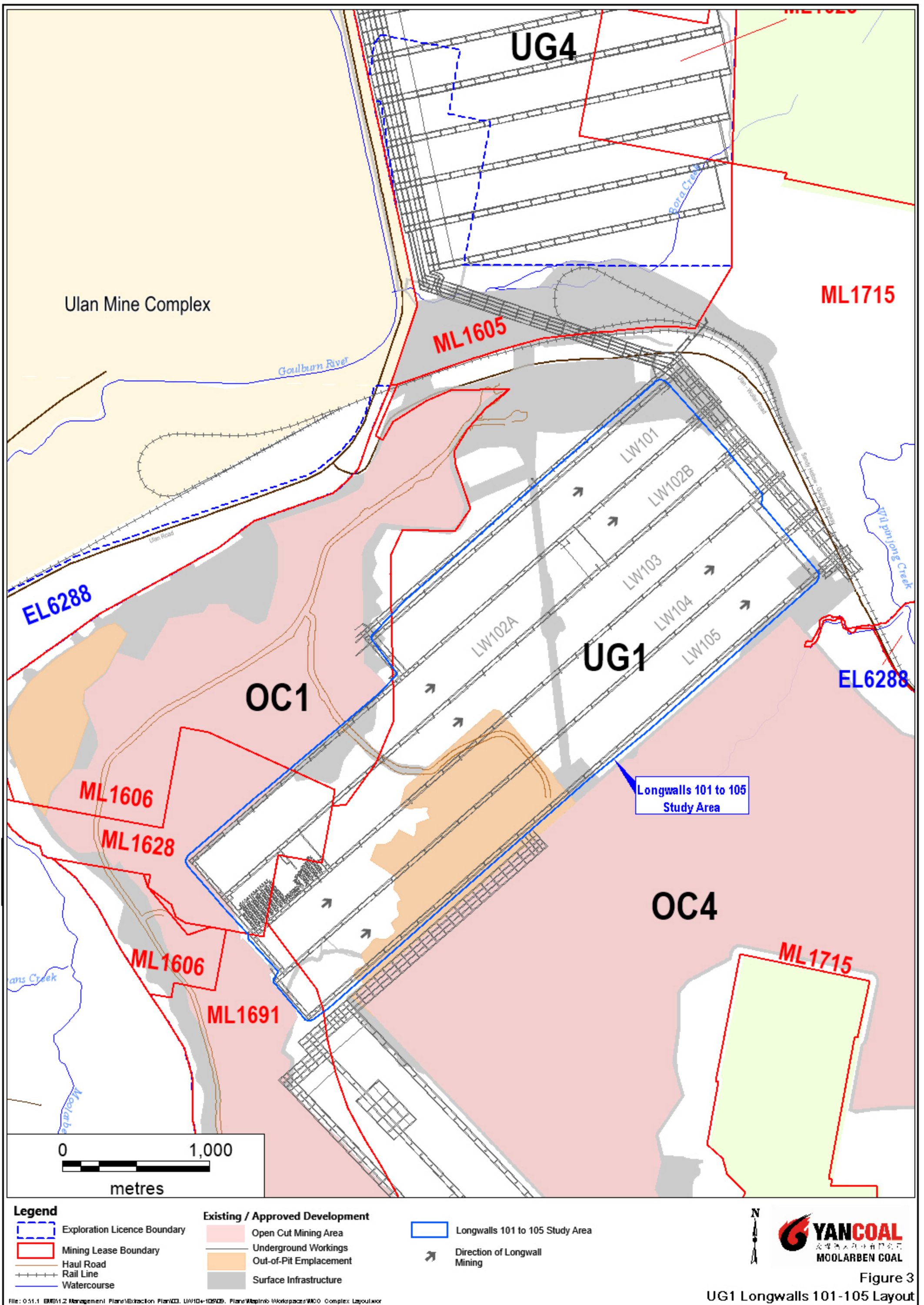


Figure 3  
UG1 Longwalls 101-105 Layout

## 1.1 SCOPE AND PURPOSE

This UG1 Longwalls 101 to 105 Heritage Management Plan (LW101-105 HMP) has been prepared by MCO with input from Jamie Reeves of Niche Environment and Heritage (Niche), and Peter De Bono of Mine Subsidence Engineering Consultants [MSEC] to satisfy the requirements of Project Approval (08\_0135) as modified and the NSW Department of Planning and Environment (DPI&E) and NSW Division of Resources and Energy (DRE) (2015) Draft *Guidelines for the Preparation of Extraction Plans*. The appointment of the team of suitably qualified and experienced persons (which includes representatives of MCO, Niche and MSEC) has been endorsed by the Secretary of the DPI&E.

**Scope:** This LW101-105 HMP considers Aboriginal and historic heritage within the Longwalls 101-105 Study Area<sup>1</sup> (Figure 4).

**Purpose:** This LW101-105 HMP describes the management of potential environmental consequences on Aboriginal and historic heritage resulting from the extraction of Longwalls 101-105.

Longwalls 101-105 form the UG1 Underground Mine at the Moolarben Coal Complex.

This amendment has been prepared to incorporate the final two longwall panels 104 and 105 of the UG1 mining area into the Extraction Plan. The only mine plan alteration from that approved under the Stage 2 Project Approval (08\_0135) is the shortening of the commencing end of LW104 by 70m, which was conducted to facilitate the installation of a rear panel ventilation shaft and associated roadway.

A complex-wide Heritage Management Plan (complex-wide HMP) has been developed to manage Aboriginal and historic heritage across the Moolarben Coal Complex (including the Longwalls 101-105 Study Area [Figure 4] covered by this LW101-105 HMP). The approved complex-wide HMP is publicly available on MCO's website ([www.moolarbencoal.com.au](http://www.moolarbencoal.com.au)).

To avoid duplication of existing Environmental Management Plans, this LW101-105 HMP references components of the complex-wide HMP.

<sup>1</sup> Longwalls 101-105 and the area of land within the furthest extent of the 26.5 degree (°) angle of draw and 20 millimetre (mm) predicted subsidence contour.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal



## 1.2 STRUCTURE OF THE HERITAGE MANAGEMENT PLAN

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

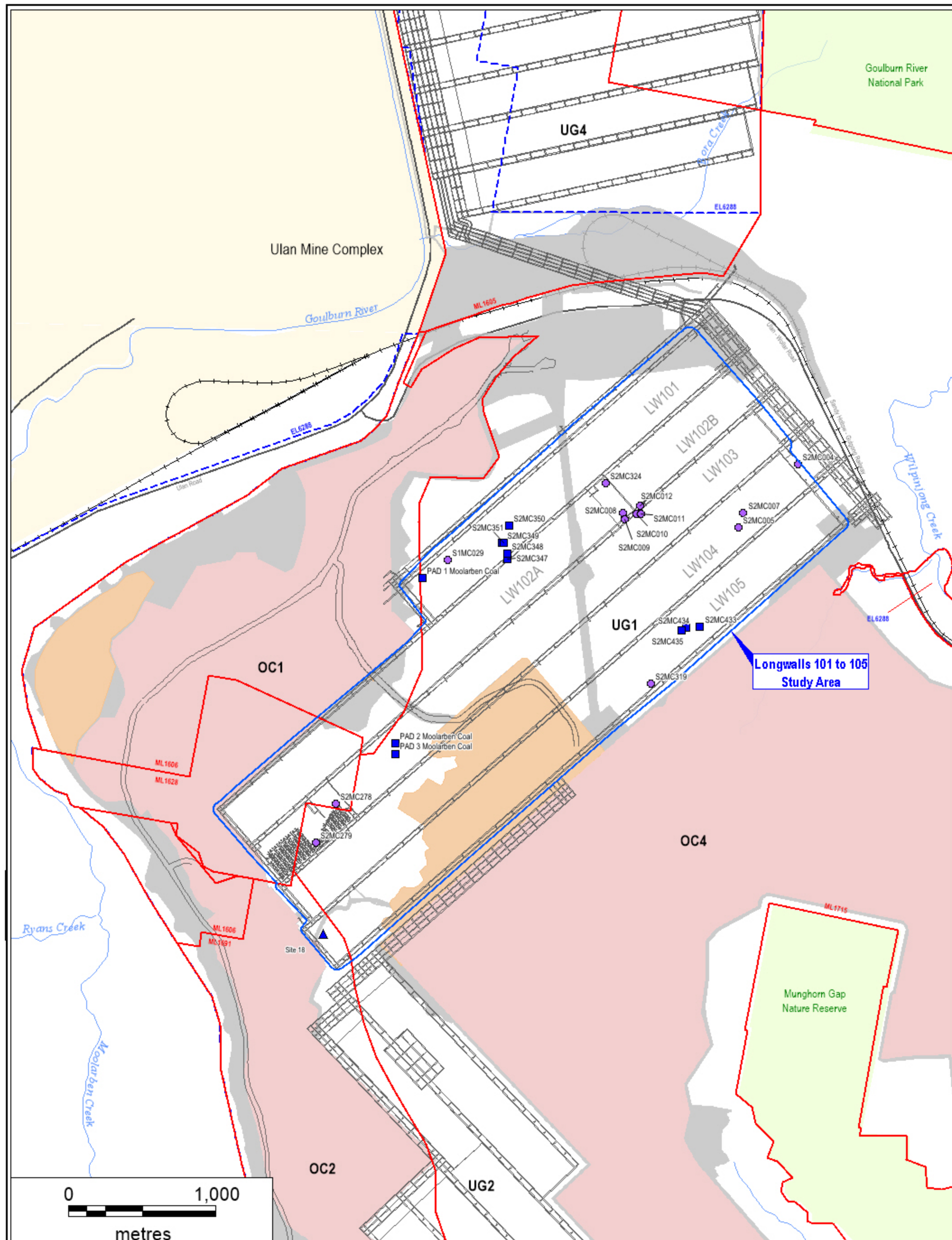
- Section 2** Describes the review and update of the LW101-105 HMP.
- Section 3** Outlines the statutory requirements applicable to the LW101-105 HMP.
- Section 4** Summarises the predicted subsidence impacts and environmental consequences resulting from the secondary extraction of Longwalls 101-105
- Section 5** Details the performance measures and indicators that will be used to assess environmental performance in relation to Aboriginal and historic heritage sites.
- Section 6** Describes the monitoring program and potential management measures that could be implemented to remediate any identified impacts to Aboriginal and historic heritage sites.
- Section 7** Provides a Contingency Plan to manage any unpredicted impacts and their consequences.
- Section 8** Describes the Annual Review requirements, audits, improvement of environmental performance and preparation for future Extraction Plans.
- Section 9** Outlines the management and reporting of incidents.
- Section 10** Outlines the management and reporting of complaints.
- Section 11** Outlines the management and reporting of any non-compliance with statutory requirements.
- Section 12** Lists the documents referred to in Sections 1 to 11 of this LW101-105 HMP.

## 1.3 CONSULTATION FOR THE HERITAGE MANAGEMENT PLAN

In accordance with Condition 5(k), Schedule 4 of Project Approval (08\_0135), this LW101-105 HMP has been provided to the DPI&E Biodiversity Conservation Division (formerly NSW Office of Environment and Heritage (OEH)) and the Registered Aboriginal Parties (RAPs) for their review and comment. Comments received will be considered before the LW101-105 HMP is finalised and lodged with the Secretary of the DPI&E for approval.

RAPs for the Moolarben Coal Complex have been identified through a comprehensive program of Aboriginal community consultation undertaken at the Moolarben Coal Complex.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal



#### Legend

- |  |   |  |
|--|---|--|
| <span style="border: 1px dashed blue; padding: 2px;"> </span> Exploration Licence Boundary           | <b>Existing / Approved Development</b>  | <span style="border: 2px solid blue; padding: 2px;"> </span> Longwalls 101 to 105 Study Area |
| <span style="border: 1px solid red; padding: 2px;"> </span> Mining Lease Boundary                    | <span style="background-color: #f8d7da; border: 1px solid #f5c6cb; padding: 2px;"> </span> Open Cut Mining Area   | <span style="color: blue;">▲</span> Historic Heritage Site                                   |
| <span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> Haul Road  | <span style="background-color: #fff3cd; border: 1px solid #ffeeba; padding: 2px;"> </span> Underground Workings   | <b>Aboriginal Heritage Sites</b>   |
| <span style="border-bottom: 1px dashed black; width: 20px; display: inline-block;"></span> Rail Line | <span style="background-color: #fff3cd; border: 1px solid #ffeeba; padding: 2px;"> </span> Out-of-Pit Emplacement | <span style="color: purple;">●</span> Open Artefact / Isolated Find                          |
| <span style="border-bottom: 1px solid blue; width: 20px; display: inline-block;"></span> Watercourse | <span style="background-color: #d6d8db; border: 1px solid #c6c8ca; padding: 2px;"> </span> Surface Infrastructure | <span style="color: blue;">■</span> PAD / Rock Shelter                                       |



Figure 4  
Heritage Sites in the Vicinity of Longwalls 101 to 105

## 2.0 HERITAGE MANAGEMENT PLAN REVIEW AND UPDATE

In accordance with Condition 5, Schedule 6 of Project Approval (08\_0135), and consistent with the complex-wide HMP, this LW101-105 HMP 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 HMP publicly available on the MCO website.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	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); and
- other relevant legislation.

#### 3.1 EP&A ACT PROJECT APPROVAL

Condition 5(k), Schedule 4 of Project Approval (08\_0135) requires the preparation of a Heritage Management Plan (i.e. this LW101-105 HMP) as a component of the Extraction Plan. In addition, Conditions 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 the LW101-105 HMP. Table 1 presents these requirements and indicates where they are addressed within this LW101-105 HMP.

Condition 5(k), Schedule 4 of Project Approval (08\_0135) requires that the LW101-105 HMP “*reflects all requirements under conditions 41-46 of Schedule 3*”. These requirements are addressed by the complex-wide HMP. Notwithstanding, Appendix A (of this LW101-105 HMP) indicates where each component of the conditions is addressed within the complex-wide HMP.

**Table 1: Heritage Management Plan Requirements**

Project Approval (08_0135) Condition	LW101-105 HMP Section
<b>Condition 5, Schedule 4</b>	
5. The Proponent shall prepare and implement an Extraction Plan for all second workings on site to the satisfaction of the Secretary. Each extraction plan must:	
...	
(k) include a Heritage Management Plan, which has been prepared in consultation with OEH and relevant stakeholders for both Aboriginal and historic heritage, to manage the potential environmental consequences of the proposed second workings on both Aboriginal and non-Aboriginal heritage items, and reflects all requirements under conditions 41-46 of Schedule 3;	This document and complex-wide HMP
...	
(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 such exceedances seem likely;	Section 7
...	
(p) include a program to collect sufficient baseline data for future Extraction Plans.	Section 8.3

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

**Table 1 (Continued): Heritage Management Plan Requirements**

Project Approval (08_0135) Condition	LW101-105 HMP Section
<b>Condition 6, Schedule 4</b> 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 (b) a detailed description of the measures that would be implemented to remediate predicted impacts.	Sections 4  Section 6 and complex-wide HMP
<b>Condition 3, Schedule 6</b> 3. The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include: (a) detailed baseline data (b) a description of: <ul style="list-style-type: none"> <li>the relevant statutory requirements (including any relevant approval, licence or lease conditions);</li> <li>any relevant limits or performance measures/criteria;</li> <li>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;</li> </ul> (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria; (d) a program to monitor and report on the: <ul style="list-style-type: none"> <li>impacts and environmental performance of the project;</li> <li>effectiveness of any management measures (see c above)</li> </ul> (e) a contingency plan to manage any unpredicted impacts and their consequences; (f) a program to investigate and implement ways to improve the environmental performance of the project over time; (g) a protocol for managing and reporting any: <ul style="list-style-type: none"> <li>incidents;</li> <li>complaints;</li> <li>non-compliances with statutory requirements; and</li> <li>exceedances of the impact assessment criteria and/or performance criteria; and</li> </ul> (h) a protocol for periodic review of the plan.	Sections 4.3.2  Section 3  Section 5 Section 5  Sections 6, 7 and complex-wide HMP Sections 6, 8 and complex-wide HMP  Section 7 and complex-wide HMP Section 6 and 8  Section 9 Section 10 Section 11 Section 7 and complex-wide HMP Section 2

### 3.2 OTHER LEGISLATION

The Acts, Regulations and guidelines that may be applicable to the management of Aboriginal and historic heritage at the Moolarben Coal Complex include, but are not limited to, the:

- Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act, 1984*;
- Commonwealth *Australian Heritage Council Act, 2003*;
- Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*;

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

- Commonwealth Native Title Act, 1993;
- NSW Heritage Act, 1977;
- NSW National Parks and Wildlife Act, 1974;
- Aboriginal cultural heritage consultation requirements for proponents 2010 (NSW Department of Environment, Climate Change and Water [DECCW], 2010a);
- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010b); and
- Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011).

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal



## 4.0 PREDICTED SUBSIDENCE IMPACTS AND ENVIRONMENTAL CONSEQUENCES

### 4.1 LONGWALLS 101-105 EXTRACTION SCHEDULE

Longwalls 101-105, the 103 Plunge Panel 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 metre (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	July 2021
105	July 2021	12 months	July 2022

Following approval of the UG1 Optimisation Modification in April 2016, MCO delineated a geological feature in Longwall 102 that prevented economic mining of this section, and has subsequently revised the longwall layout to incorporate a barrier pillar around this feature. The barrier pillar separating Longwalls 102A and 102B is approximately 140 m in length. 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.

A second geological intrusion has been located at the commencing end of LW103 preventing viable extraction by longwall mining methods in this area. As a consequence, the LW103 commencing position has been moved outbye of the influence of this structure, and a first workings plunge panel has been established to partially extract the remanent coal that would otherwise become sterilised.

LW104 commencing end has also been shortened by 70m to facilitate the installation of a rear panel ventilation shaft and associated roadway.

With the exception of these changes, the longwall geometry is the same as that for the approved UG1 Optimisation Modification, and MSEC (2017; 2019 and 2020) conclude that the overall impact assessments for the natural and built features are unchanged or reduced.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

## 4.2 ENVIRONMENTAL RISK ASSESSMENT

Environmental Risk Assessments (ERA) have been conducted for four of the key component plans of the UG1 Longwalls 101-105 Extraction Plan<sup>2</sup> viz., Water Management Plan, Biodiversity Management Plan, Land Management Plan and Heritage Management Plan, to provide appropriate consideration to risk assessment and risk management in accordance with the Draft DPI&E and DRE (2015) *Guidelines for the Preparation of Extraction Plans*.

An ERA workshop for LW panels 101-103 was held on 8 December 2016 and reviewed in March 2019 to support the Longwalls 101-103 Extraction Plan Amendment and in consideration of the Revised Extraction Plan Layout. An ERA for LW panels 104-105 was held on 30 January 2020, facilitated by independent specialist, Risk Mentoring.

The suitably qualified and experienced experts endorsed by the Secretary of the DPI&E for the preparation of the UG1 Longwalls 101-105 Extraction Plan participated in the ERAs.

The ERA process involved the key steps described below.

### ***Review of Relevant Documentation***

In preparation for the ERA workshops, the ERA participants reviewed a number of documents relevant to the risk assessment. This included (but was not limited to):

- The Preliminary Risk Assessment conducted for the Stage 2 Environmental Assessment (EA) (MCO, 2009).
- The UG1 Optimisation Modification Subsidence Assessment (MSEC, 2015).
- Project Approval (08\_0135) (including subsidence impact performance measures).
- The approved UG1 Longwalls 101-to 103 Extraction Plan
- The revised longwall layout (i.e. incorporating a sterilised coal pillar around a geological feature in Longwall 102, the 103 Plunge Panel and shortening of LW104).

### ***Risk Identification***

The participants were asked to identify any additional (specific) issues or risks and/or changes to previously assessed levels of risk in preparation for the ERA workshops.

<sup>2</sup> Separate risk assessments have also been conducted for the built features in the vicinity of the UG1 Longwalls 101-105 Study Area and for public safety.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

### **ERA Workshop**

The ERAs took a comprehensive approach to identifying and ranking risks relevant to the Longwall panels 101-103 and 104-105. The following investigation and analysis methods were used during the risk assessment:

- Establishing the context, including identification of key assumptions and review of supporting information and objectives.
- Identifying risks via several risk management techniques, including:
  - brain storming;
  - modified hazard and operability analysis; and
  - gap analysis against approved subsidence impacts, the subsidence impact performance measures in Project Approval (08\_0135) and the features that may be affected by underground coal mining.
- Analysis of identified risks and nomination of key potential environmental issues.
- Ranking of the risks, including consideration of mitigation, management and/or control measures.

The ERAs indicated that risks relevant to Aboriginal and historic heritage sites in the Longwalls 101-103 and 104-105 panels were in the “Low” category, and it was expected that the risks could be managed with implementation of the appropriate mitigation, management and/or control measures.

## **4.3 ABORIGINAL HERITAGE SITES AND VALUES**

### **4.3.1 Aboriginal Cultural Heritage Values**

The RAPs for the Moolarben Coal Complex have been consulted on the nature and extent of Aboriginal cultural heritage at the Moolarben Coal Complex on a number of occasions, including during the community consultation processes undertaken for previous cultural heritage assessments and investigations (described in Appendix C of the complex-wide HMP).

Previous assessments have identified and documented the following general cultural heritage values for the Moolarben Coal Complex area, including the following:

- Archaeological sites having contemporary cultural value because they provide a tangible link to the traditional past (Kuskie, 2013).
- The presence of flora and fauna species with known traditional uses (Kuskie, 2013).

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal



- The area of Moolarben Ridge to the south of Carrs Gap having contemporary cultural value to the Wiradjuri community (Hamm, 2008 and Kuskie, 2013).
- The area along the Goulburn River known as “The Drip” is considered to have high cultural value as the sites in this area represent easily identified material remains and the area is ceremonially important (Hamm, 2006).

Consultation undertaken to date with the Aboriginal community indicates that all Aboriginal heritage sites at the Moolarben Coal Complex, known or otherwise, have high cultural significance.

#### 4.3.2 Baseline Data

A number of Aboriginal cultural surveys and assessments have previously been undertaken across the Moolarben Coal Complex and surrounding areas. A list of previous assessments is presented in Appendix C of the complex-wide HMP. Approximately 414 Aboriginal heritage sites have already been managed (e.g. salvaged) and/or require no further management, leaving approximately 423 known Aboriginal heritage sites remaining across the entire Moolarben Coal Complex (described in Appendix D of the complex-wide HMP). An additional 102 sites were identified on lands immediately adjacent to the Moolarben Coal Complex (described in Appendix H of the complex-wide HMP).

A total of 17 Aboriginal heritage sites have been identified within the Longwalls 101-103 Study Area (Niche, 2017; 2020). An inspection was conducted by Niche in December 2016 to confirm the nature of three sites previously recorded as PADs (i.e. PAD 1 Moolarben Coal, PAD 2 Moolarben Coal and PAD 3 Moolarben Coal) within the Longwalls 101-103 Study Area. Following review of the Moolarben Aboriginal Sites Database and Aboriginal Heritage Information Management System, these sites were considered unlikely to be open PADs and more likely to be associated with rock shelters. All three sites were confirmed to be associated with rock shelters during the inspection (Niche, 2017).

There are 19 previously recorded Aboriginal Heritage sites within Longwall 104-105. Of these sites, 14 have been managed under existing approvals and are no longer *in situ*. An inspection was conducted by Niche and RAPs in December 2019 over longwall panels 104-105. An additional 3 heritage sites were identified as part of this survey. A total of 8 Aboriginal Heritage sites remain over longwall panels 104-105.

These sites are shown on Figure 4 and summarised in Table 3, and include isolated finds, artefact scatters, potential archaeological deposits (PADs) and/or rock shelters.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

**Table 3: Summary of the Known Aboriginal Heritage Sites within the Longwalls 101 to 105 Study Area**

AHIMS ID	Site Name	Site Type	Archaeological Significance <sup>1</sup>
36-3-0837	PAD 1 Moolarben Coal	Rock Shelter with PAD	Low
36-3-0838	PAD 2 Moolarben Coal	Rock Shelter with PAD	Low
36-3-0839	PAD 3 Moolarben Coal	Rock Shelter with Artefacts (1 artefact) and PAD	Low
36-3-0826	S1MC029	Isolated Find	Low
36-3-1157	S2MC008	Isolated Find	Low
36-3-1158	S2MC009	Isolated Find	Low
36-3-1159	S2MC010	Artefact Scatter (3 artefacts)	Low
36-3-1160	S2MC011	Isolated Find	Low
36-3-1161	S2MC012	Isolated Find	Low
36-3-3266	S2MC278	Artefact Scatter (3 artefacts)	Low
36-3-3267	S2MC279	Artefact Scatter (3 artefacts)	Low
36-3-3041	S2MC324	Isolated Find	Low
36-3-3027	S2MC347	Rock Shelter with Artefacts Scatter and PAD	Low
36-3-3028	S2MC348	Rock Shelter with PAD	Low
36-3-3029	S2MC349	Rock Shelter with PAD	Low
36-3-3030	S2MC350	Rock Shelter with PAD	Low
36-3-3031	S2MC351	Rock Shelter with Artefacts (1 artefact)	Low
36-3-1153	S2MC004	Isolated Find	Low
36-3-1154	S2MC005	Artefact Scatter	Low
36-3-1156	S2MC007	Isolated Find	Low
36-3-3058	S2MC319	Isolated find	Low
36-3-TBA	S2MC433	Shelter with PAD	Low
36-3-TBA	S2MC434	Shelter with Artefact	Low
36-3-TBA	S2MC435	Shelter with Artefacts	Moderate

Source: Niche (2017; 2020).

<sup>1</sup> Consultation undertaken to date with the Aboriginal community indicates that all Aboriginal heritage sites at the Moolarben Coal Complex, known or otherwise, have high cultural significance

#### 4.3.3 Predicted Subsidence Impacts and Environmental Consequences

Subsidence impact predictions for Aboriginal heritage sites in the Longwalls 101-103 Study Area were prepared in 2015 for the UG1 Optimisation Modification (the Approved Layout) and have been revised to reflect the latest longwall layout (the Extraction Plan Layout) (MSEC, 2017 and 2020).

The maximum predicted total conventional subsidence, tilt and curvatures for the Aboriginal heritage sites in the Longwalls 101-105 Study Area are provided in Table 4 with the maximum predicted strains

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

provided in Table 5. A summary of the maximum predicted values of total conventional subsidence, tilt and curvature for each site type is provided in Table 6.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

**Table 4: Maximum Predicted Subsidence, Tilt and Curvature for Aboriginal Heritage Sites within the Study Area due to the Extraction of Longwalls 101 to 105**

Site Name	Maximum Predicted Subsidence <sup>1, 2</sup> (mm)	Maximum Predicted Tilt <sup>3</sup> (mm/m)	Maximum Predicted Hogging Curvature <sup>4</sup> (km <sup>-1</sup> )	Maximum Predicted Sagging Curvature <sup>4</sup> (km <sup>-1</sup> )
PAD 1 Moolarben Coal	1800	65.0	> 3	> 3
PAD 2 Moolarben Coal	2250	3.0	> 3	> 3
PAD 3 Moolarben Coal	2300	1.0	> 3	> 3
S1MC029	1950	50.0	> 3	> 3
S2MC008	< 20	0.5	< 0.01	< 0.01
S2MC009	125	5.0	0.15	0.15
S2MC010	350	14.0	0.55	0.50
S2MC011	1000	40.0	1.60	1.50
S2MC012	250	6.0	0.40	0.35
S2MC278	<20	<0.5	<0.01	< 0.01
S2MC279	<20	<0.5	<.09	0.07
S2MC324	50	2.0	0.09	0.08
S2MC347	225	5.0	0.40	0.35
S2MC348	600	30.0	1.00	0.95
S2MC349	2300	12.0	> 3	> 3
S2MC350	2300	1.0	> 3	> 3
S2MC351	2250	14.0	> 3	> 3
S2MC004	<20	<0.5	<0.01	0.04
S2MC005	2200	6.0	>3	>3
S2MC007	2200	0.5	>3	>3
S2MC319	775	55.0	>3	2.60
S2MC433	2200	8.0	>3	>3
S2MC434	2200	<0.5	>3	>3
S2MC435	2200	1.0	>3	>3

Source: MSEC (2017; 2020).

mm/m = millimetres per metre, km<sup>-1</sup> = 1/kilometres.

<sup>1</sup> Subsidence refers to vertical displacements of the ground.

<sup>2</sup> Maximum Predicted Total Conventional Subsidence for Longwalls 101-105 based on the Maximum Subsidence due to the Extraction Plan Layout after Longwall 105.

<sup>3</sup> Tilt is the change in the slope of the ground as a result of differential subsidence, and is calculated as the change in subsidence between two points divided by the distance between those two points.

<sup>4</sup> Curvature is the second derivative of subsidence, the rate of change of tilt, and is calculated as the change in tilt between two adjacent sections of the tilt profile divided by the average length of those sections.

**Table 5: Predicted Strains for the Aboriginal Heritage Sites based on Conventional and Non-Conventional Anomalous Movements**

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal



Type	Conventional based on 10 times Curvature (mm/m)	Non-Conventional based on the 95% Confidence Level (mm/m)	Non-Conventional based on the 99% Confidence Level (mm/m)
Tension	> 30	10	22
Compression	> 30	13	31

Source: MSEC (2017; 2020).

% = percent.

**Table 6: Maximum Predicted Total Conventional Subsidence, Tilt and Curvature for the Aboriginal Heritage Sites within the Study Area due to the Extraction of Longwalls 101 to 105**

Site Type	Maximum Predicted Total Conventional Subsidence (mm)	Maximum Predicted Total Conventional Tilt (mm/m)	Maximum Predicted Total Conventional Hogging Curvature (km <sup>-1</sup> )	Maximum Predicted Total Conventional Sagging Curvature (km <sup>-1</sup> )
Rock Shelter with Artefacts and/or PAD	2300	65	> 3	> 3
Isolated Find	2200	55	> 3	> 3
Artefact Scatter	2200	14	> 3	> 3

Source: MSEC (2017; 2020).

MSEC (2020) compared the maximum predicted subsidence impacts on Aboriginal heritage sites due to the extraction of Longwalls 101-105 based on the Extraction Plan Layout with the maximum predictions due to the extraction of Longwalls 101-105 based on the Approved Layout. This comparison is provided in Table 7.

**Table 7: Comparison of Maximum Predicted Conventional Subsidence Parameters for Aboriginal Heritage Sites based on the Approved Layout and the Extraction Plan Layout**

Layout	Maximum Predicted Total Conventional Subsidence (mm)	Maximum Predicted Total Conventional Tilt (mm/m)	Maximum Predicted Total Conventional Hogging Curvature (km <sup>-1</sup> )	Maximum Predicted Total Conventional Sagging Curvature (km <sup>-1</sup> )
Approved Layout (LW101-103) (Report No. MSEC1084)	2300	65	> 3	> 3
Extraction Plan Layout (Report No. MSEC1084)	2300	65	> 3	> 3

Source: MSEC (2020).

This comparison shows that the maximum predicted total conventional subsidence, tilt and curvature for the Aboriginal heritage sites, based on the Extraction Plan Layout, are similar to or less than the predicted maxima for the Approved Layout.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

MSEC (2017 and 2020) concluded that Aboriginal heritage impacts associated with the Extraction Plan Layout would be similar to the predicted impacts of the Approved Layout. In summary:

- Open sites containing artefact scatters and isolated finds could potentially be affected by cracking of surface soils as a result of mine subsidence movements, however it is unlikely that the scattered artefacts or isolated finds themselves would be impacted by surface cracking (MSEC, 2020).
- Subsidence impacts on scattered artefacts or isolated finds are unlikely; however, potential impacts on archaeological sites due to post-mining remediation works to surface areas are possible (MSEC, 2020).
- Sites located within rock shelters or overhangs will be subjected to similar impacts described for rock ledges. That is, there is a potential for fracturing of sandstone and subsequent rockfalls, which could potentially affect artefact scatters, isolated finds or PADs associated with the relevant rock shelter (MSEC, 2020).
- Sites PAD 2 Moolarben Coal and PAD 3 Moolarben Coal are isolated rock outcrops, which are generally considered to be at lower risk of impact than continuous lengths of rock outcrop. PAD 3 Moolarben Coal is considered to have a higher risk of impact resulting from the extraction of Longwalls 101-103, due to the structure/nature of this site (MSEC, 2017).
- Site PAD 1 Moolarben Coal is a small isolated feature and subsidence impacts are considered to be unlikely (MSEC, 2017).

#### 4.4 HISTORIC HERITAGE SITES

One historic heritage site of moderate local significance, European Heritage Site 18 (Site 18), is located above Longwall Panel 105; a dry stone wall that formed part of the Mudgee to Wollar road that ran via Moolarben. Site 18 has been subject to historical research archival recording in September 2009 (Stedinger Associates, 2009).

The maximum predicted subsidence at the heritage site after extraction is 2250mm. The maximum predicted systematic tilt is 2 mm/m (i.e. 0.2%), or a change in grade of 1 in 500. The maximum predicted systematic tensile and compressive strains at the site are >50mm/m (MSEC, 2015).

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

## 5.0 PERFORMANCE MEASURES AND PERFORMANCE INDICATORS

This LW101-105 HMP has been developed to manage the potential environmental consequences of the secondary extraction of Longwalls 101-105 on Aboriginal and historic heritage in accordance with Condition 5(k), Schedule 4 of Project Approval (08\_0135). In accordance with Condition 1, Schedule 4 of Project Approval (08\_0135), MCO must ensure that there is no exceedance of the subsidence impact performance measures listed in Table 18 of Condition 1, Schedule 4 and Table 19 of Condition 3, Schedule 4 of Project Approval (08\_0135). Subsidence impact performance measures relevant to Aboriginal and historic heritage sites in the Longwalls 101-105 Study Area are listed in Table 8.

**Table 8: Heritage Subsidence Impact Performance Measures**

Feature	Subsidence Impact Performance Measure
Aboriginal heritage site S2MC236 (AHIMS 36-3-0016 and 36-3-0134)	Negligible subsidence impacts or environmental consequences
Historic heritage sites	No greater subsidence impacts or environmental consequences than predicted in the EA

Source: Table 18 of Condition 1, Schedule 4 of Project Approval (08\_0135).

The Aboriginal heritage sites listed in Table 8 are not within the boundary of the Longwalls 101-105 Study Area and as a result the relevant subsidence impact performance measures will not be exceeded due to the secondary extraction of Longwalls 101-105.

The performance measure for historic heritage sites requiring '*No greater subsidence impact or environmental consequences than predicted in the EA*' is considered to reflect the predictions by MSEC's subsidence reports prepared for the Stage 2 EA, Preferred Project Report and UG1 Optimisation Modification EA. Potential impacts to Historic Heritage Site 18 (Carr's Gap Road Stone Wall), located at the south-western end of Longwall 105, could include cracking and loose stones that may become dislodged during mining (MSEC, 2015). The site has been subject to historical research and archival recording.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

## 6.0 MONITORING AND MANAGEMENT

### 6.1 BASELINE RECORDING

Detailed baseline record has been obtained for Aboriginal heritage sites PAD 1 Moolarben Coal, PAD 2 Moolarben Coal and PAD 3 Moolarben Coal. A detailed baseline record will be obtained for Aboriginal Heritage Site S2MC435 prior to the commencement of secondary extraction beneath the site. All other Aboriginal heritage rock shelter sites (and other known Aboriginal heritage sites) within the Longwalls 101-105 Study Area are considered to have been sufficiently recorded.

Where required, the baseline recording would include, at a minimum:

- a photographic record of the site;
- a detailed scaled plan of the site including physical characteristics and features; and
- detailed information regarding the dimensions, composition and features of the site.

### 6.2 MONITORING OF ABORIGINAL HERITAGE SITES

Aboriginal heritage sites such as scattered artefacts or isolated finds within the Longwalls 101-105 Study Area could potentially be affected by cracking of surface soils as a result of mine subsidence movements, however it is unlikely that the scattered artefacts or isolated finds themselves would be impacted. PAD 3, S2MC434 and S2MC435 (rock shelters with artefact(s)) are considered to have the highest risk of impact, with potential for fracturing of sandstone and subsequent rockfalls.

In this regard, MCO will undertake subsidence monitoring of site PAD 3, S2 MC434 and S2MC435 unless salvaged prior to undermining. In order to identify and document whether any subsidence impacts have arisen from mining activities at these sites, the monitoring requirements described in section 5.9.1 of the complex-wide HMP will be implemented for this site. Monitoring will involve the following:

- *MCO will engage an appropriately qualified expert to monitor the Aboriginal archaeological sites described as requiring monitoring. This may include the establishment of a percentage estimate of the likelihood of subsidence occurring in sensitive areas.*
- *Where insufficient pre-existing information is available for any of the specific Aboriginal archaeological sites to permit comparison with the condition post-mining, more detailed recording will occur prior to undermining.*
- *Monitoring will involve inspecting and recording the condition of these specific Aboriginal archaeological sites within three to six months after undermining has occurred. Each inspection will involve recording of data on environmental conditions, pre-existing human and natural impacts, heritage evidence present and any identified changes to these environmental and heritage*

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

*conditions compared with previous inspections. The potential cause (subsidence or other impacts) of changes to the condition of individual sites will be assessed.*

- *Monitoring will be focussed on the features of the site that make it significant (e.g. grooves, art, artefacts and/or PAD).*
- *A report documenting the results of monitoring will be prepared that details the methodology of the inspections, conditions of the environment and Aboriginal heritage evidence at the relevant sites, comparisons with previously reported conditions at each site, identification of any natural and/or human impacts during the intervening period, identification of any implications for the ongoing management and protection of Aboriginal heritage evidence at the Moolarben Coal Complex, and documentation of the actual impacts of operations on the Aboriginal archaeological sites.*
- *Copies of this report will be distributed to the RAPs, OEH and the DPI&E and a summary included in the Annual Review.*

Monitoring for subsidence related impacts will occur at PAD 3, S2 MC434 and S2MC435 within three to six months of undermining (unless salvaged). If, during the above monitoring, significant subsidence impacts are identified, then the salvage and excavation procedures outlined in Section 6.4 will be considered.

Monitoring and/or salvage and/or excavation would only occur where safe to do so, as determined in consultation with relevant MCO safety personnel.

For the purpose of determining what constitutes a significant subsidence impact on Aboriginal heritage sites, a site is considered to be “affected by significant subsidence impacts” if it exhibits one or more of the following consequences that cannot be attributed to natural weathering or deterioration:

- overhang collapse;
- cracking of sandstone that coincides with the feature(s) of the site that make it significant; and
- rock fall that damages the feature(s) of the site that make it significant.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal



### 6.3 MONITORING OF HISTORIC HERITAGE SITES

Historic Heritage Site 18 (Carrs Gap Road Stone Wall) has been subject to historical research and archival recording. No further monitoring is required.

### 6.4 SUBSIDENCE PARAMETERS

Subsidence parameters will be measured in accordance with the UG1 Longwalls 101-105 Subsidence Monitoring Program.

In summary, surveys will be conducted to measure subsidence movements in three dimensions using a total station survey instrument. Subsidence movements will be measured along subsidence lines that have been positioned across the general landscape.

### 6.5 SUBSIDENCE IMPACTS

In the event that significant subsidence impacts due to the secondary extraction of Longwalls 101-105 are identified or deemed likely at PAD 3, S2MC434 and S2MC435 during monitoring, then salvage and/or excavation will be considered in consultation with a suitably qualified archaeologist. Salvage and test excavation of S2MC005 will be undertaken prior to extraction in consultation with a suitably qualified archaeologist. Monitoring and/or salvage and/or excavation would only occur where safe to do so, as determined in consultation with relevant MCO safety personnel. Protocols for the salvage and excavation of Aboriginal heritage sites are detailed in sections 5.6.1 and 5.6.2 of the complex-wide HMP as follows:

*Aboriginal archaeological sites that are considered to hold research potential and are scheduled to be impacted will undergo a two-phase program of archaeological excavation. This program will include an initial exploratory phase followed, when warranted, by a more targeted investigation of the site's research potential as follows:*

- 1. initial subsurface testing using one or more linear transects of hand excavated, regularly-spaced shovel test pits (Section 5.6.1); and*
- 2. controlled salvage excavation of areas with high research potential as identified through Phase 1 (the initial subsurface testing) (Section 5.6.2).*

*If the initial program of shovel test pits determines that the site does not hold high scientific significance in accordance with the Burra Charter (Australia ICOMOS 1999) and the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011), then the second phase of investigation (i.e. open area excavation) will not be undertaken. For instance, if initial subsurface testing revealed evidence of poor spatial integrity at the site (e.g. ground disturbance, sheet erosion) or few subsurface artefacts, there will remain little value in a more detailed scientific investigation of the site through controlled salvage excavation.*

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

### 5.6.1 Initial Subsurface Testing

*The objective of the initial phase of the archaeological excavation program is to determine the nature, extent and composition of each site. Data collected during this phase will be used to inform the need for a further controlled salvage excavation phase (where required), which is designed to target in situ concentrations of sub-surface cultural deposits.*

*Following the initial subsurface testing (shovel test pits), any sites that reveal poor spatial integrity, significant ground disturbance, shallow soil profiles and/or few subsurface cultural material, will not be subject to further subsurface investigation (i.e. the second phase of more detailed investigation and controlled salvage excavation will not occur).*

*Initial subsurface testing will be undertaken as follows:*

- One or more transects of shovel test pits spaced no more than 20 m apart will be excavated along the length and/or width of the site (as determined from surface expression of artefacts). Areas of grossly modified terrain (e.g. dams) will be excluded from the sampling process.*
- Approximately 0.5 m x 0.5 m (0.25 square metres [m<sup>2</sup>]) test pits will be dug by hand (shovel) at each designated shovel test pit point (approximately 20 m apart along the length of the transect).*
- For the initial subsurface testing, all excavated material will be sieved through 5 millimetre (mm) aperture screens.*
- The number of transects and shovel test pits may be reduced depending on the nature and scale of the site being assessed, subject to advice from a suitably qualified and experienced archaeologist and in consultation with the attending RAPs.*
- The spacing of transects and shovel test pits may be reduced depending on the nature and scale of the site being assessed, subject to advice from a suitably qualified and experienced archaeologist and in consultation with the attending RAPs. For example, when undertaking test pits within a rockshelter, testing will be undertaken in closer proximity.*

### 5.6.2 Controlled Salvage Excavation

*Where controlled salvage excavation is determined to be warranted in consultation with a suitably qualified and experienced archaeologist and the attending RAPs, the following process will be generally implemented at a level appropriate to the extent and nature of the site:*

- Controlled salvage excavation will be undertaken by a suitably qualified archaeologist(s), with assistance provided by the RAPs.*
- All excavation will be carried out manually using trowels, shovels and mattocks (where appropriate).*
- Open area excavation will proceed in 1 m<sup>2</sup> units.*

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

- *All excavation units (i.e. shovel test pits and open area 1 x 1 m<sup>2</sup> squares) will be assigned an alpha-numeric identifier.*
- *The first excavation unit will be excavated and documented in 5 cm spits at each area – either PAD or site – being investigated. Based on the evidence of the first excavation unit, 10 cm spits or sediment profile/stratigraphic excavation (whichever is smaller) may then be implemented.*
- *Excavation will cease at culturally sterile units or bedrock in all instances – the identification of sterile stratigraphic units will draw upon a geomorphological understanding of the wider Moolarben Coal Complex.*
- *Photographic and/or scale-drawn records of exposed soil profiles in open area excavations will be made.*
- *If specific archaeological features (e.g. hearths) are identified, the entire feature will be excavated and recorded prior to the continuation of excavation. Features will be photographed and scale plans drawn.*

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

## 7.0 CONTINGENCY PLAN

In the event a performance measure detailed in Section 5 is considered to have been exceeded, MCO will implement the following Contingency Plan (detailed in section 9.0 of the complex-wide HMP):

- The Environmental and Community Manager will report the exceedance to the General Manager within 24 hours of assessment completion.
- In the event that the incident has caused, or threatens to cause, material harm to the environment, MCO will report the exceedance of the performance to the DPI&E and DPI&E Biodiversity Conservation Division immediately. All other incidents will be reported to the DPI&E and DPI&E Biodiversity Conservation Division as soon as practicable after MCO becomes aware of the incident.
- MCO will identify an appropriate course of action with respect to the identified impact(s), in consultation with specialists, RAPs (in relation to Aboriginal archaeological sites) and relevant agencies, as necessary. For example, identification of proposed contingency measure(s) and a program to review the effectiveness of the contingency measures. Contingency measures will be developed in consideration of the specific circumstances of the exceedance and the assessment of environmental consequences.
- MCO will, on request, submit the proposed course of action to the DPI&E for approval.
- MCO will implement the approved course of action to the satisfaction of the DPI&E.
- MCO will provide a detailed report on the exceedance of the performance measures to the DPI&E and DPI&E Biodiversity Conservation Division within 7 days of the date of becoming aware of the exceedance.
- MCO will report the exceedance of the performance measure and the success of the approved course of action as a component of the Annual Review (detailed in section 10 of the complex-wide HMP).

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

## 8.0 REVIEW AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE

### 8.1 ANNUAL REVIEW

In accordance with Condition 4, Schedule 6 of Project Approval (08\_0135), MCO will conduct an Annual Review of operations conducted at the Moolarben Coal Complex (including the performance of this LW101-105 HMP) prior to 31 March for the preceding calendar year.

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 publicly available on the MCO website.

As described in Section 2, this LW101-105 HMP will be reviewed within three months of the submission of an Annual Review, and, if necessary, revised to ensure the plan is updated on a regular basis and to incorporate any recommended measures to improve environmental performance.

### 8.2 AUDITS

In accordance with Condition 9, Schedule 6 of Project Approval (08\_0135), an independent environmental audit was conducted in 2018, and will be undertaken every three years thereafter. A copy of the independent environmental audit report will be submitted to the Secretary of the DPI&E and made publicly available on the MCO website.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal



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 DPI&E.

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.

As described in Section 2, this LW101-105 HMP will be reviewed within three months of the submission of an independent environmental audit, and, if necessary, revised to ensure the plan is updated on a regular basis and to incorporate any recommended measures to improve environmental performance.

### 8.3 FUTURE EXTRACTION PLANS

In accordance with Condition 5(p), Schedule 4 of Project Approval (08\_0135), MCO will collect baseline data for future Extraction Plans (e.g. for the next underground mining domain).

Consideration of environmental performance and management measures, in accordance with the review(s) conducted as part of this LW101-105 HMP, will inform the appropriate type and frequency of monitoring and management/mitigation for future Extraction Plans.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

## 9.0 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 DPI&E and any other relevant agencies of any incident associated with the UG1 Underground Mine which causes or threatens to cause material harm to the environment immediately after MCO confirms that an incident has occurred. For any other incident associated with the UG1, 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 the DPI&E 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_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

## 10.0 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_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

## 11.0 NON-COMPLIANCE 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 9, MCO will notify the Secretary of the DPI&E, and any other relevant agencies, of any incident associated with MCO immediately after MCO becomes aware of the incident. Within seven days of the date of the incident, MCO will provide the Secretary of the DPI&E, and any relevant agencies, with a detailed report on the incident.

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 8.2, an independent environmental audit was conducted by the end of December 2015, and will be undertaken every three years thereafter. A copy of the independent environmental audit report will be submitted to the Secretary of the DPI&E and made publicly available on the MCO website.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

## 12.0 REFERENCES

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.

Hamm, G (2006) *Moolarben Coal Project - Aboriginal Cultural Heritage Assessment Report*. Report to Moolarben Coal Mines Pty Ltd.

Hamm, G (2008) *Aboriginal Heritage Plan for MCP Stage 1 Development Areas: Open Cut 1 and Main Infrastructure Area*. Report Prepared for Moolarben Coal Mine.

Kuskie, P (2013) *Moolarben Coal Project – Stage 1 Optimisation Modification, Near Ulan, Central Tablelands of New South Wales: Aboriginal Cultural Heritage Assessment*. Report to Moolarben Coal.

Mine Advice (2019), *Geotechnical Evaluation of Proposed Taking of Unsupported Plunges in LW103A Block*

Mine Subsidence Engineering Consultants (2008) *Subsidence Assessment*, Appendix 8 in Moolarben Coal Mines Pty Limited (2009) *Moolarben Coal Project Stage 2 Environmental Assessment Report*.

Mine Subsidence Engineering Consultants (2011) *Subsidence Impact Assessment*, Appendix I in Hansen Bailey (2012) *Moolarben Coal Project Stage 2 Preferred Project Report*. Prepared for Moolarben Coal Mines Pty Limited.

Mine Subsidence Engineering Consultants (2015) *Subsidence Assessment (MSEC Report MSEC731 Revision A, June 2015)*, Appendix A in Moolarben Coal Operations Pty Ltd (2015) *Moolarben Coal Complex UG1 Optimisation Modification Environmental Assessment*.

Mine Subsidence Engineering Consultants (2017) *Subsidence Predictions and Impact Assessments for the Natural and Built Features in Support of the Extraction Plan*. Report number MSEC867.

Mine Subsidence Engineering Consultants (2019) *Modified Commencing End of LW103 and Proposed 103A Workings*. Report number MSEC103.

Mine Subsidence Engineering Consultants (2020) *Moolarben Project Stage 2 – Longwalls 101 to 105. Subsidence Predictions and Impact Assessments for the Natural and Built Features in Support of the Extraction Plan*.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal



Moolarben Coal Operations Pty Ltd (2009) *Moolarben Coal Project - Stage 2 Environmental Assessment*. March 2009.

Niche Environment and Heritage (2017) *Moolarben Coal UG1 Longwalls 101-103 Extraction Plan – Aboriginal Cultural Heritage Technical Report*.

Niche Environment and Heritage (2020) *Moolarben Coal UG1 Longwalls 104-105 Extraction Plan Aboriginal Cultural Heritage Technical Report*.

Stedinger Associates (2009) *A Photographic Archival Recording of Rural Heritage in the Moolarben Coal Operations Area, NSW, Volume 1: Report*.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

**APPENDIX A**

**CONDITIONS 41 TO 46, SCHEDULE 3 OF PROJECT APPROVAL (08\_0135)**

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 2020		Mar 2021	MCO	S. Archinal

Condition 5(k), Schedule 4 of Project Approval (08\_0135) requires that the UG1 Longwalls 101 to 103 Heritage Management Plan “reflects all requirements under conditions 41-46 of Schedule 3”. These requirements are covered by the complex-wide Heritage Management Plan (complex-wide HMP). Table A-1 indicates where each component of the conditions is addressed within the complex-wide HMP.

**Table A-1: Project Approval (08-0135) Requirements**

New South Wales Project Approval Condition		Complex-wide HMP Section												
<b>Protection of Aboriginal Heritage Items</b>  41. Unless otherwise authorised under the NP&W Act, the Proponent shall ensure that the project does not cause any direct or indirect impact on the identified Aboriginal heritage items located outside the approved disturbance area of the project.  <i>Note: Identified Aboriginal heritage items are listed in Appendix 8.</i>		Section 5												
<b>Additional Survey</b>  42. Prior to carrying out any development on site, unless the Secretary agrees otherwise, the Proponent shall:  (a) carry out additional archaeological survey work in the vicinity of the proposed Stage 2 ROM Coal Facilities and the northern section of the proposed Haul Road, in consultation with OEH and Aboriginal stakeholders;  (b) undertake a detailed analysis of the significance of the heritage items that are identified during the survey; and  (c) recommend measures to avoid and/or mitigate the impacts of the project on these heritage items, to the satisfaction of the Secretary.  43. Within 12 months of the date of this approval, unless the Secretary agrees otherwise, the Proponent shall carry out a detailed investigation into the Aboriginal cultural heritage values of the southern portion of the Dun Dun East biodiversity offset area (Lot 79, DP 704159), in the vicinity of Pyramul Creek, in consultation with OEH and Aboriginal stakeholders, and to the satisfaction of the Secretary.		Appendix C  N/A (no sites identified during survey)  N/A (no sites identified during survey)  Section 5.2.2												
<b>Heritage Conservation Areas</b>  44. The Proponent shall implement the heritage conservation strategy described in the EA, summarised in Table 16 and shown conceptually in Appendix 8, to the satisfaction of the Secretary.  Table 16: Summary of the Heritage Conservation Strategy		Section 5.2.1												
<table><tr><th>Area</th><th>Sites</th><th>Minimum Site Hectares (ha)</th></tr><tr><td>Murrumbidgee Creek Management Area</td><td>40 sites - 5 of high significance, 6 of medium and 29 of low</td><td>154</td></tr><tr><td>Powers Conservation Area</td><td>10 sites – 1 of high significance, 2 of medium and 7 of low significance</td><td>63</td></tr><tr><td>Red Hills Conservation Area</td><td>42 sites – 2 of high significance, 9 of medium and 31 of low significance</td><td>107</td></tr></table>			Area	Sites	Minimum Site Hectares (ha)	Murrumbidgee Creek Management Area	40 sites - 5 of high significance, 6 of medium and 29 of low	154	Powers Conservation Area	10 sites – 1 of high significance, 2 of medium and 7 of low significance	63	Red Hills Conservation Area	42 sites – 2 of high significance, 9 of medium and 31 of low significance	107
Area	Sites		Minimum Site Hectares (ha)											
Murrumbidgee Creek Management Area	40 sites - 5 of high significance, 6 of medium and 29 of low		154											
Powers Conservation Area	10 sites – 1 of high significance, 2 of medium and 7 of low significance		63											
Red Hills Conservation Area	42 sites – 2 of high significance, 9 of medium and 31 of low significance	107												
<i>Note: To identify the areas referred to in Table 16, see the applicable figures in Appendix 8.</i>														

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal

**Table A-1: Project Approval (08-0135) Requirements (Continued)**

NSW Project Approval Condition	Complex-wide HMP Section
<p><b>Long Term Security of the Heritage Conservation Areas</b></p> <p>45. Within 18 months of approval of the Heritage Management Plan, unless the Secretary agrees otherwise, the Proponent shall make suitable arrangements to protect the heritage conservation areas in Table 16 in perpetuity to the satisfaction of the Secretary.</p> <p>Notes:</p> <ul style="list-style-type: none"> <li>The location of the conservation areas are shown in the figure in Appendix 8.</li> <li>The protection of the Aboriginal heritage conservation area/s may be combined with the protection of the biodiversity offset areas required under condition 30 of this approval.</li> </ul>	Section 5.2.1
<p><b>Heritage Management Plan</b></p> <p>46. The Proponent shall prepare and implement a Heritage Management Plan for the project to the satisfaction of the Secretary. This plan must:</p> <p>(a) be prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Secretary;</p> <p>(b) be prepared in consultation with OEH and the Aboriginal stakeholders (in relation to the management of Aboriginal heritage values);</p> <p>(c) be submitted to and approved by the Secretary prior to construction, unless the Secretary agrees otherwise;</p> <p>(d) include a description of the measures that would be implemented for:</p> <ul style="list-style-type: none"> <li>managing the discovery of human remains or previously unidentified heritage items on site; and</li> <li>ensuring any workers on site receive suitable heritage inductions prior to carrying out any development on site, and that suitable records are kept of these inductions;</li> </ul> <p>(e) include the following for the management of Aboriginal Heritage:</p> <ul style="list-style-type: none"> <li>a detailed plan of management for the Murragamba Creek, Red Hills and Powers conservation areas;</li> <li>a description of the measures that would be implemented for: <ul style="list-style-type: none"> <li>protecting, monitoring and/or managing (including any proposed archaeological investigations and/or salvage measures) the heritage items identified in the tables in Appendix 8;</li> <li>managing the discovery of previously unidentified Aboriginal items on site;</li> <li>conserving the sites outside the surface disturbance area (see Appendix 8), including measures that would be implemented to secure, analyse and record the sites at risk of subsidence;</li> <li>maintaining and managing reasonable access for Aboriginal stakeholders to heritage items on site and within any Aboriginal heritage conservation areas;</li> <li>ongoing consultation with the Aboriginal stakeholders in the conservation and management of Aboriginal cultural heritage both on site and within any Aboriginal heritage conservation areas; and</li> </ul> </li> <li>a strategy for the storage of any heritage items salvaged on site, both during the project and in the long term;</li> </ul> <p>(f) include a detailed plan for the implementation of the mitigation and management measures outlined for the specified heritage items in Appendix 9, including archival recording, historical research and archaeological assessment prior to any disturbance.</p>	<p>Section 1.3</p> <p>Section 1.5</p> <p>Section 1.5</p> <p>Section 5.10 and 5.11</p> <p>Section 6</p> <p>Section 5.2.1</p> <p>Section 5 and Appendix D</p> <p>Section 5.10</p> <p>Section 5 and Appendix D</p> <p>Section 5.16</p> <p>Section 1.4 and 5.1</p> <p>Section 5.13</p> <p>Section 6</p>

Document	Version	Issue	Effective	Review	Author	Approved
MCO_UG1_LW101-105_HMP	3	Mar 20		Mar 21	MCO	S. Archinal