CENTENNIAL

Public Safety Management Plan

Longwalls 30 to 31

Mandalong Mine

MEMS-EP-9000-PMP-9060

June 2021

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1 BACKGROUND

1.1 Introduction

Mandalong Mine is an existing underground longwall coal mine located on the western side of Lake Macquarie near Morisset, approximately 35 km southwest of Newcastle. Centennial Mandalong Pty Ltd is the operator of the mine and is a wholly owned subsidiary of Centennial Coal Company Pty Limited.

Development Consent for Mandalong Mine (SSD-5144) was approved on 12 October 2015 and permits extraction of 6.5 million tonnes of run-of-mine (ROM) coal per calendar year until 31 December 2040.

An Extraction Plan is required to be developed and approved prior to undertaking secondary extraction. This Extraction Plan, prepared for Longwalls 30-31 (LW30-31), describes the applicable regulatory framework, mine planning, management and monitoring measures to be implemented to protect all surface/subsurface natural and built features in addition to administering public safety measures associated with secondary extraction.

This Public Safety Management Plan (in support of the LW30-31 Extraction Plan) has been developed in accordance with the current requirements of Condition 6, Schedule 4 of SSD-5144 for the extraction of LW30-31, and in accordance with Mining Leases (ML1722 and ML1744) requirements issued under the Mining Act 1992 to extract longwall panels within the West Wallarah Seam. The Extraction Plan and Public Safety Management Plan have been prepared generally in accordance with the Department of Planning & Environment, *Draft Guidelines for the Preparation of Extraction Plans V5* (2015) and the Department of Industry - Resources Regulator, *Managing Risks of Subsidence Guide: WHS (Mines and Petroleum Sites) Legislation* (2017).

Additionally, the Public Safety Management Plan has also been prepared to address the requirements of the Work Health and Safety legislation, including the Work Health and Safety Regulation 2017 and Work Health and Safety (Mines and Petroleum Sites) Regulation 2014. Regulatory requirements applicable to the development of the Public Safety Management Plan are outlined in **Section 5**.

The area applicable to this extraction plan is defined in detail in **Section 3.1**

1.2 Project Description

The Extraction Plan area comprises a surface area of approximately 209 hectares. Across the Extraction Plan area, the ground surface elevation ranges from 40 m to 240 m. Due to the elevated topography, alluvium is limited in this area. The depth of cover above the West Wallarah Seam in this area ranges from approximately 285 m to 500 m. The existing surface environment of the Extraction Plan area includes watercourses, native bushland, steep slopes and archaeological heritage items.

There are nine private properties, one property owned by Central Coast Council, one owned by Centennial Coal and one Crown Land lot. A small area of Olney State Forest is located at the southern extent of the Extraction Plan Area. Of the nine privately owned properties, four dwellings will be affected by subsidence. Local roads, power lines, telecommunication networks and other associated infrastructure are also included in the area of potential subsidence influence. This infrastructure is managed by the Built Features Management Plan and supporting individual

infrastructure management plans developed for Public Roads (Crown), Telstra Communications and Ausgrid Powerlines.

2 Purpose

The purpose of the Public Safety Management Plan is to provide the management strategies, controls and monitoring programs to be implemented for the management of potential risks from subsidence related impacts that may affect public safety, specifically from the secondary extraction of LW30-31.

3 Scope

3.1 Extraction Plan Area

The Public Safety Management Plan applies to the management of risks relating to the development of subsidence from the extraction of LW30-31, located within Centennial Mandalong Mining Leases (ML1722 and ML1744) and the SDD-5144 approved mining area. The Extraction Plan Area is defined by a minimum 26.5^{o} angle of draw or 20mm limit of subsidence at the Upper 95% Confidence Limits from the extents of proposed extraction of LW30-31 (**Figure 1**).

3.2 Work Health and Safety Legislation

The Public Safety Management Plan has also been prepared to address the requirements of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 (Clause 23 and 24) to manage subsidence as a principal mining hazard. Regulatory requirements applicable to the development of the Public Safety Management Plan to manage subsidence related risks to public safety, including to private property and public infrastructure are outlined in **Section 5.4**.

A Public Safety Management Plan is also necessary under the details required as part of a High Risk Activity Notification required under Clause 33 of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014. Under this legislation the Public Safety Management Plan covers all activities associated with the secondary extraction by longwall mining.

3.3 Key Features

The key features identified relevant to public safety within the Extraction Plan Area which are subject to this Public Safety Management Plan are detailed in **Table 1** along with their relevant management plan and monitoring programs.

Table 1 – Public Safety Feature within Extraction Plan Area and Relevant Management Plans

Feature	Identification and Assessment	Management and Monitoring
Public Roads **Crown Lands**	Subsidence Predictions and Impact Assessment for LW30-31 (Ditton Geotechnical Services, 2021)	**Public Roads Management Plan** Built Features Management Plan Subsidence Monitoring Program
Telstra Communication Network	Subsidence Predictions and Impact Assessment for LW30-31 (Ditton Geotechnical Services, 2021) Telstra Communications Assessment Report for Extraction Plan LW30-31 (Comms Network Solutions, 2020)	**Communication Management Plan** Built Features Management Plan Subsidence Monitoring Program
Ausgrid Powerlines	Subsidence Predictions and Impact Assessment for LW30-31 (Ditton Geotechnical Services, 2021) Ausgrid assessment	**Powerline Management Plan** Built Features Management Plan Subsidence Monitoring Program
Steep Slopes and Rock Outcrops on Private Property	Subsidence Predictions and Impact Assessment for LW30-31 (Ditton Geotechnical Services, 2021)	**Land Management Plan** Property Subsidence Management Plans (PSMP) Subsidence Monitoring Program
Private Dwellings	Subsidence Predictions and Impact Assessment for LW30-31 (Ditton Geotechnical Services, 2021) Pre-mining Dwelling Structural Assessments – Leigh Appleyard Charted Professional Engineer	**Property Subsidence Management Plans (PSMP)** Subsidence Monitoring Program

4 Consultation and Plan Development

During the development of the Extraction Plan and component plans, substantial consultation has been undertaken with key stakeholders as detailed in the overarching Extraction Plan. A brief summary is provided:

- Consultation with Infrastructure owners during development of infrastructure management plans:
    - Public Roads Management Plan – Lake Macquarie City Council, Central Coast Council and Crown Lands – DPIE;
    - Communications Management Plan – Telstra and Comms Network Solutions; and
    - Powerline Management Plan - Ausgrid
- Consultation with government departments during development of environmental management plans:
    - Cultural Heritage Management Plan - Biodiversity Conservation Division - DPIE (BCD) and Registered Aboriginal Parties;
    - Biodiversity Management Plan – BCD;
    - Water Management Plan - DPI-Water and EPA; and
    - Land Management Plan - Forestry Corporation NSW and Crown Lands - DPIE
- Consultation with private property owners for development of individual Property Subsidence Management Plans (PSMP)
- Consultation with Resource Regulator (RR) for preparation of the Extraction Plan, Built Features Management Plan, Public Safety Management Plan and Subsidence Monitoring Program.

A detailed summary and copy of the consultation is provided in the Extraction Plan (Section 2), Built Features Management Plan (Section 4) and supporting Infrastructure Management Plans (Section 4).

The process for consultation, communication and the provision of information pertaining to this management plan will be managed according to Centennial Mandalong's **HSMC-SC-Information and Communications Arrangements** and **HSMS-SE-6592-Consultation Arrangements**.

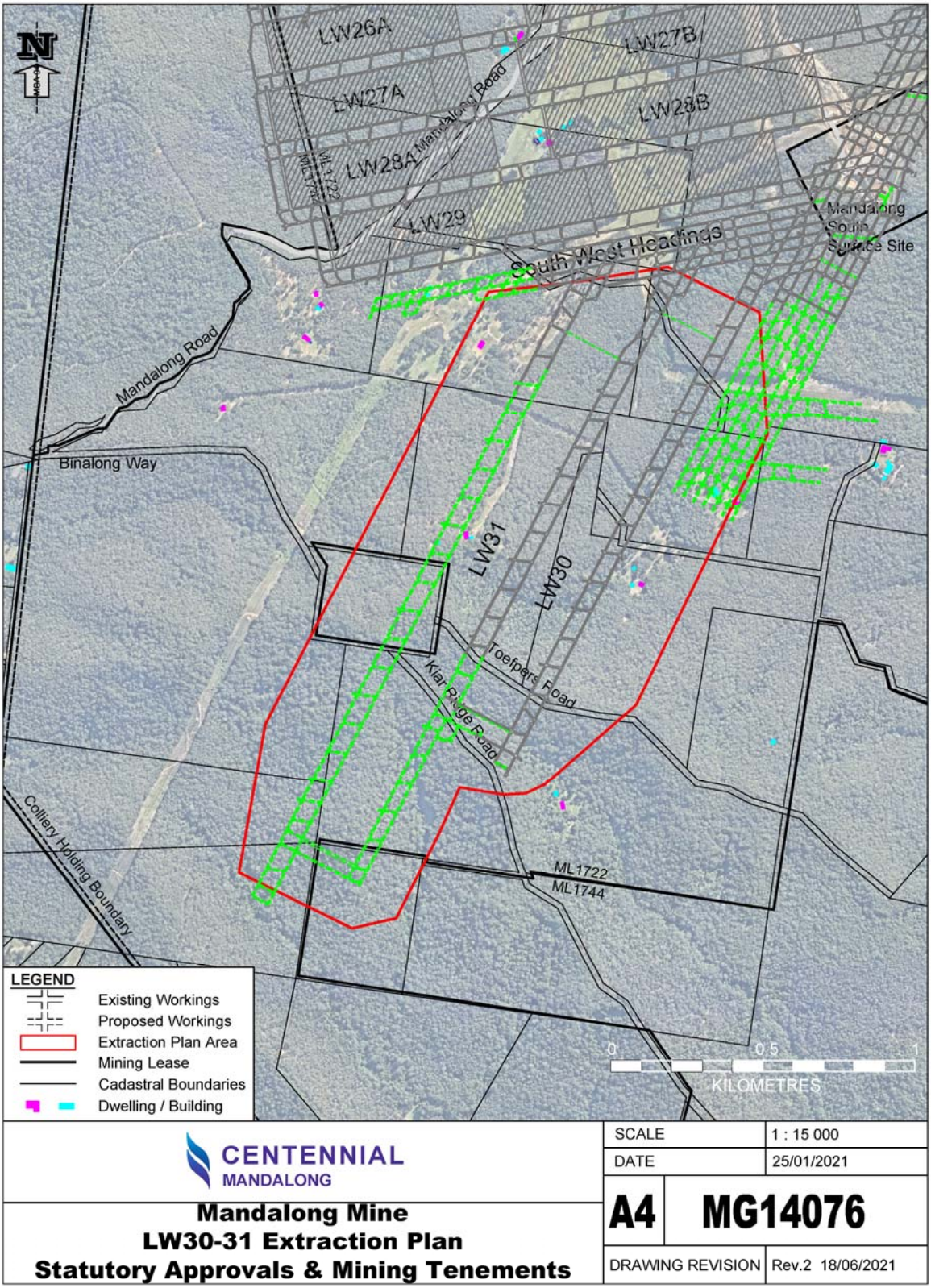

Figure 1 – Extraction Plan Area LW30-31

5 Regulatory Requirements

Centennial Mandalong operations are conducted in accordance with the relevant legislation and requirements of statutory authorities. Legislative and regulatory requirements are generally recognised through the imposition of conditions on the development consent, licences, mining approvals and Work, Health and Safety legislation.

5.1 Development Consent

Development Consent SSD-5144 provides a number of conditions relating to the preparation of the Public Safety Management Plan. These conditions are summarised in **Table 2** below, together with the notation of the section of this document in which each matter is addressed.

Table 2 - Development Consent Conditions SSD-5144

Condition	Development Consent Condition	Section Addressed
Schedule 4 Condition 4	**Performance Measures – Built Features** The Applicant shall ensure that the development does not cause any exceedances of the performance measures in Table 7, to the satisfaction of the Secretary.	Section 6 and Table 6
Schedule 4 Condition 5	**Performance Measures** Any dispute between the Applicant and the owner of any built feature over the interpretation, application or implementation of the performance measures in Table 7 is to be settled by the Secretary, following consultation with RR. Any decision by the Secretary shall be final and not subject to further dispute resolution under this consent.	Section 6
Schedule 4 Condition 6 (m)	(m) include a Public Safety Management Plan, which has been prepared in consultation with RR, to ensure that the proposed second workings do not impact on public safety;	Extraction Plan LW30-31 Public Safety Management Plan
Schedule 4 Condition 6 (o)	(o) Trigger Action Response Plan addressing all features in Tables 6 and 7 which contain: • appropriate triggers to warn of the development of an increasing risk of exceedance of any performance measures; • specific actions to respond to high risk exceedance of any performance measure to ensure that the measure is not exceeded; and • an assessment of remediation measures that may be required if exceedances occur and the capacity to implement the measures;	Section 12 Appendix 1
Schedule 4 Condition 6 (p)	(p) include a Contingency Plan that expressly provides for: • adaptive management where monitoring indicates that there has been an exceedance of any performance measure in Tables 6 and 7, or where any such exceedance appears likely; and an assessment of the remediation measures that may be required if exceedances occur and the capacity to implement the measures;	Section 12 Appendix 1
Statement of Commitments	**Subsidence Monitoring and Management** As part of the development of each Extraction Plan, Centennial Mandalong will update the Public Safety Management Plan and Built Features Management Plans in consultation with the relevant infrastructure owners.	This Plan and Built Features Management Plan

5.2 Mining Leases

The Extraction Plan Area for LW30-31 is associated with two mining leases held by Centennial Mandalong; ML1722 and ML1744. **Table 3** provides a summary of mining lease conditions that directly specify public safety requirements.

Table 3 – Summary of Mining Lease Conditions relating to Public Safety

	Mining Lease No. 1722 and 1744	Section Addressed
ML1722 Condition 6 ML1744 Condition 6	**Extraction Plan** (a) In this condition: (i) approved Extraction Plan means a plan, being: A. an extraction plan or subsidence management plan approved in accordance with the conditions of a relevant development consent and provided to the Secretary; or B. a subsidence management plan relating to the mining operations subject to this lease: I. submitted to the Secretary on or before 31 December 2014; and II. approved by the Secretary. (ii) relevant development consent means a development consent or project approval issued under the Environmental Planning & Assessment Act 1979 relating to the mining operations subject to this lease. (b) The lease holder must not undertake any underground mining operations that may cause subsidence except in accordance with an approved Extraction Plan. (a) The lease holder must ensure that the approved Extraction Plan provides for the effective management of risks associated with any subsidence resulting from mining operations carried out under this lease. (b) The lease holder must notify the Secretary within 48 hours of any: (i) incident caused by subsidence which has a potential to expose any person to health and safety risks; (ii) significant deviation from the predicted nature, magnitude, distribution, timing and duration of subsidence effects, and of the potential impacts and consequences of those deviations on built features and the health and safety of any person; or (iii) significant failure or malfunction of a monitoring device or risk control measure set out in the approved Extraction Plan addressing: A. built features; B. public safety; or C. subsidence monitoring	Extraction Plan LW30-31 Built Features Management Plan LW30-31 Public Safety Management Plan LW30-31 Subsidence Monitoring Program LW30-31

5.3 Extraction Plan Guidelines

The Extraction Plan and Public Safety Management Plan have been prepared generally in accordance with the Department of Planning & Environment, *Draft Guidelines for the Preparation of Extraction Plans V5* (2015). **Table 4** provides a summary of the guidelines requirements for key component plans together with the notation of the section of this document in which each matter is addressed.

Table 4 - Extraction Plan Guideline Requirements for Key Component Plans

Extraction Plan Guideline Requirement – Key Component Plans	Section Addressed
An overview of all landscape features, heritage sites, environmental values, built features or other values to be managed under the component plan	Section 1 Section 3
Setting out all performance measures included in the development consent relevant to the features or values to be managed under the component plan	Section 6
Setting out clear objectives to ensure the delivery of the performance measures and all other relevant statutory requirements (including relevant safety legislation)	Section 6
Proposing performance indicators to establish compliance with these performance measures and statutory requirements;	Section 6 TARPS
Describe the landscape features, heritage sites and environmental values to be managed under the component plan, and their significance. It should be noted that a full description of such features, sites and values would commonly have been provided and considered in a recent environmental impact assessment. Consequently, this section can be relatively brief, and focus on the presentation of appropriate figures and/or graphical plans;	Section 8
Describe all currently-predicted subsidence impacts and environmental consequences relevant to the features, sites and values to be managed under the component plan;	Section 8
Describe all measures planned to remediate these impacts and/or consequences, including any measures proposed to ensure that impacts and/or consequences comply with performance measures and/or the Applicant's commitments;	Section 9 Section 10.2 TARPS in Appendix 1
Describe the existing baseline monitoring network and the current baseline monitoring results, including pre-subsidence photographic surveys of key landscape features and key heritage sites which may be subject to significant subsidence impacts (such as significant watercourses, swamps and Aboriginal heritage sites);	Section 10.1
Fully describing the proposed monitoring of subsidence impacts and environmental consequences;	Section 10.2
Describe the proposed monitoring of the success of remediation measures following implementation;	Section 10.2
Describe adaptive management proposed to avoid repetition of unpredicted subsidence impacts and/or environmental consequences;	Section 11 And TARPS in Appendix 1
Describe contingency plans proposed to prevent, mitigate or remediate subsidence impacts and/or environmental consequences which substantially exceed predictions or which exceed performance measures;	Section 11 Section 12 TARPS in Appendix 1
Listing responsibilities for implementation of the plan; and	Section 13
An attached Trigger, Action, Response Plan (effectively a tabular summary of most of the above).	TARPS in Appendix 1

5.4 Work, Health and Safety Legislation

Mandalong Mine has developed a Safety Management System framework (MS-1001) that integrates plans, policies and procedures that enables a systematic approach to establishing and maintaining effective systems to manage health and safety consistent with WHS legislation and AS/NZS 4804:2001.

The following Work, Health and Safety (WHS) requirements have been considered for the Extraction Plan principally within the context of subsidence related risks to public safety, including to private property and public infrastructure and in reference to *Managing Risks of Subsidence Guide: WHS (Mines and Petroleum Sites) Legislation* (NSW Department of Industry - Resources Regulator, 2017).

Work Health and Safety legislation relating to the management of risk to health and safety from mine subsidence is addressed in **Table 5**.

Table 5 – Summary of WHS Legislation Relating to Mine Subsidence

Work Health and Safety Legislation Clause	Requirement	Section Addressed
WHS Regulation 2017 Clause 34	**Duty to identify hazards** A duty holder, in managing risks to health and safety, must identify reasonably foreseeable hazards that could give rise to risks to health and safety.	Section 7 Section 8 Extraction Plan Appendix 4 -Risk Assessments
WHS Regulation 2017 Clause 35	**Managing risks to health and safety** A duty holder, in managing risks to health and safety, must: (a) eliminate risks to health and safety so far as is reasonably practicable, and (b) if it is not reasonably practicable to eliminate risks to health and safety, minimise those risks so far as is reasonably practicable.	Section 6.1 Section 7 Section 9 Section 11
WHS Regulation 2017 Clause 36	**Hierarchy of control measures** (1) This clause applies if it is not reasonably practicable for a duty holder to eliminate risks to health and safety. (2) A duty holder, in minimising risks to health and safety, must implement risk control measures in accordance with this clause. (3) The duty holder must minimise risks, so far as is reasonably practicable, by doing 1 or more of the following: (a) substituting (wholly or partly) the hazard giving rise to the risk with something that gives rise to a lesser risk, (b) isolating the hazard from any person exposed to it, (c) implementing engineering controls. (4) If a risk then remains, the duty holder must minimise the remaining risk, so far as is reasonably practicable, by implementing administrative controls. (5) If a risk then remains, the duty holder must minimise the remaining risk, so far as is reasonably practicable, by ensuring the provision and use of suitable personal protective equipment. **Note.** A combination of the controls set out in this clause may be used to minimise risks, so far as is reasonably practicable, if a single control is not sufficient for the purpose.	Section 6.1 Section 7 Section 9 MS-1001
WHS Regulation 2017 Clause 37	**Maintenance of control measures** A duty holder who implements a control measure to eliminate or minimise risks to health and safety must ensure that the control measure is, and is maintained so that it remains, effective, including by ensuring that the control measure is and remains: (a) fit for purpose, and (b) suitable for the nature and duration of the work, and	Section 9 Section 10 Volume 3 of LW30-31 EP

Work Health and Safety Legislation Clause	Requirement	Section Addressed
	(c) installed, set up and used correctly.	
WHS Regulation 2017 Clause 38	**Review of control measures** (1) A duty holder must review and as necessary revise control measures implemented under this Regulation so as to maintain, so far as is reasonably practicable, a work environment that is without risks to health or safety. (2) Without limiting subclause (1), the duty holder must review and as necessary revise a control measure in the following circumstances: (a) the control measure does not control the risk it was implemented to control so far as is reasonably practicable, (b) before a change at the workplace that is likely to give rise to a new or different risk to health or safety that the measure may not effectively control, (c) a new relevant hazard or risk is identified, (d) the results of consultation by the duty holder under the Act or this Regulation indicate that a review is necessary, (e) a health and safety representative requests a review under subclause (4). (3) Without limiting subclause (2) (b), a change at the workplace includes: (a) a change to the workplace itself or any aspect of the work environment, or (b) a change to a system of work, a process or a procedure. (4) A health and safety representative for workers at a workplace may request a review of a control measure if the representative reasonably believes that: (a) a circumstance referred to in subclause (2) (a), (b), (c) or (d) affects or may affect the health and safety of a member of the work group represented by the health and safety representative, and (b) the duty holder has not adequately reviewed the control measure in response to the circumstance.	Section 11 Section 15 Extraction Plan Appendix 4 -Risk Assessments
WHS Regulation (Mines and Petroleum Sites) 2014 Clause 9	**Management of risks to health and safety** (cl 617 model WHS Regs) (1) A person conducting a business or undertaking at a mine must manage risks to health and safety associated with mining operations at the mine in accordance with Part 3.1 of the WHS Regulations. (2) A person conducting a business or undertaking at a mine must ensure that a risk assessment is conducted in accordance with this clause by a person who is competent to conduct the particular risk assessment having regard to the nature of the hazard. (3) In conducting a risk assessment, the person must have regard to: (a) the nature of the hazard, and (b) the likelihood of the hazard affecting the health or safety of a person, and (c) the severity of the potential health and safety consequences. (4) Nothing in subclause (3) limits the operation of any other requirement to conduct a risk assessment under this Regulation. (5) A person conducting a business or undertaking at a mine (who is the mine operator of the mine or who is a contractor) must keep a record of the following: (a) each risk assessment conducted under this clause and the name and competency of the person who conducted the risk assessment, (b) the control measures implemented to eliminate or minimise any risk that was identified through any such risk assessment. (6) A person conducting a business or undertaking at a mine is not required to keep a record of a risk assessment if: (a) the risk assessment is one that an individual worker is required to carry out before commencing a particular task, and (b) the person keeps a record of risk assessments that addresses the overall activity being undertaken (of which the task forms a part) such as risk assessments carried out in relation to the development of the safety management system for the mine or for a principal mining hazard management plan. (7) The record kept under subclause (5): (a) if kept by a mine operator—forms part of the safety management system of the mine and the records of the mine, or (b) if kept by a contractor who has prepared a contractor health and safety	Section 7 MS-1001

Work Health and Safety Legislation Clause	Requirement	Section Addressed
	management plan—forms part of the plan.	
WHS Regulation (Mines and Petroleum Sites) 2014 Clause 10	**Review of control measures** (cl 618 model WHS Regs) (1) A person conducting a business or undertaking at a mine must review and as necessary revise control measures implemented under clause 9 in the following circumstances: (a) an audit of the effectiveness of the safety management system for the mine indicates a deficiency in a control measure, (b) a worker is moved from a hazard or assigned to different work in response to a recommendation contained in a health monitoring report provided under Part 3, (c) an incident referred to in clause 128 occurs, (d) any other incident occurs that is required to be notified to the regulator under the WHS laws. (2) The mine operator of a mine must ensure that a control measure that is the subject of a request by a health and safety representative under clause 38 (4) of the WHS Regulations is reviewed and as necessary revised, whether the request is made to the mine operator or notified to the mine operator under subclause (3) by another person conducting a business or undertaking at the mine. (3) A person conducting a business or undertaking at the mine who is not the mine operator of the mine must immediately notify the mine operator of a request made to the person under clause 38 (4) of the WHS Regulations. (4) A health and safety representative for workers at the mine may request a review of a control measure under clause 38 (4) of the WHS Regulations as if the circumstances referred to in subclause (1) were included as a circumstance in clause 38 (4) (a) of the WHS Regulations.	Section 11 Section 14 Section 15 MS-1001
WHS Regulation (Mines and Petroleum Sites) 2014 Clause 23 Identification of principal mining hazard management plan	(1) The mine operator of a mine must identify all principal mining hazards associated with mining operations at the mine. (2) The mine operator must conduct, in relation to each principal mining hazard identified, a risk assessment that involves a comprehensive and systematic investigation and analysis of all aspects of risk to health and safety associated with the principal mining hazard. (3) The mine operator, in conducting a risk assessment under subclause (2), must: (a) use investigation and analysis methods that are appropriate to the principal mining hazard being considered, and (b) consider the principal mining hazard individually and also cumulatively with other hazards at the mine.	Centennial Risk Management System – consistent with AS/NZS ISO 31000:2009 Risk Assessments in Appendix 4 Extraction Plan Subsidence WHS No. 1001025001 Built Features LW30-31 No. 1001284061 Environment LW30-31 No. 1001284063 PSMPs LW30-31 No. 1001285007
WHS Regulation (Mines and Petroleum Sites) 2014 Clause 24 Preparation of principal mining	(1) The mine operator of a mine must consider the following when preparing a principal mining hazard management plan for a principal mining hazard at the mine in accordance with this clause and Schedule 1. (2) A principal mining hazard management plan must: (a) provide for the management of all aspects of risk control in relation to the principal mining hazard, and (b) so far as is reasonably practicable, be set out and expressed in a way that is readily understandable by persons who use it..	Extraction Plan LW30-31 and Public Safety Management Plan

Work Health and Safety Legislation Clause	Requirement	Section Addressed
hazard management plan	(3) A principal mining hazard management plan must: (a) describe the nature of the principal mining hazard to which the plan relates, and (b) describe how the principal mining hazard relates to other hazards associated with mining operations at the mine, and (c) describe the analysis methods used in identifying the principal mining hazard to which the plan relates, and (d) include a record of the most recent risk assessment conducted in relation to the principal mining hazard, and (e) describe the investigation and analysis methods used in determining the control measures to be implemented, and (f) describe all control measures to be implemented to manage risks to health and safety associated with the principal mining hazard, and (g) describe the arrangements in place for providing the information, training and instruction required by clause 39 of the WHS Regulations in relation to the principal mining hazard, and (h) refer to any design principles, engineering standards and technical standards relied on for control measures for the principal mining hazard, and (i) set out the reasons for adopting or rejecting each control measure considered. (4) The mine operator of a mine must consider the following when preparing a principal mining hazard management plan for a principal mining hazard at the mine: (a) the matters set out in Schedule 1 in respect of the principal mining hazard, and (b) any other matter relevant to managing the risks associated with the principal mining hazard at the mine.	
WHS Regulation (Mines and Petroleum Sites) 2014 Clause 67 Subsidence	(1) In complying with clause 9, the mine operator of an underground coal mine must manage risks to health and safety associated with subsidence at the mine. (2) Without limiting subclause (1), the mine operator must ensure that: (a) so far as is reasonably practicable, the rate, method, layout, schedule and sequence of mining operations do not put the health and safety of any person at risk from subsidence, and (b) monitoring of subsidence is conducted, including monitoring of its effects on relevant surface and subsurface features, and (c) any investigation of subsidence and any interpretation of subsidence information is carried out only by a competent person, and (d) all subsidence monitoring data is provided to the regulator in the form and at the times required by the regulator, and (e) so far as is reasonably practicable, procedures are implemented for the effective consultation, co-operation and co-ordination of action with respect to subsidence between the mine operator and relevant persons conducting any business or undertaking that is, or is likely to be, affected by subsidence	Section 6.1 Section 9 Section 10 Section 13 Section 14 TARPs Extraction Plan Appendix 4 - Risk Assessments
WHS Regulation (Mines and Petroleum Sites) 2014 Clause 128 Duty to notify regulator of certain incidents	(1) The operator of a mine or petroleum site must take all reasonable steps to ensure that the regulator is notified in accordance with this clause after becoming aware of an incident (other than a notifiable incident) arising out of the carrying out of mining operations or petroleum operations at the mine or petroleum site, but only if the incident: (a) results in illness or injury that requires medical treatment within the meaning of clause 13 of Schedule 9, or (b) is a high potential incident. (5) In this clause: *high potential incident* means any of the following: (m) any indication from monitoring data of the development of subsidence which may result in any incident referred to in clause 179 (a) (xvi) - a failure of ground, or of slope stability control measures, or	Appendix 1 TARPs Public Safety Management Plan

Work Health and Safety Legislation Clause	Requirement	Section Addressed
	179 (a) (xvii) - rock falls, instability of cliffs, steep slopes or natural dams, occurrence of sinkholes, development of surface cracking or deformations or release of gas at the surface, due to subsidence.	
WHS Regulation (Mines and Petroleum Sites) 2014 Schedule 1 Subsidence Clause 3C Principal hazard management plans – additional matters to be considered	**Subsidence** The following matters must be considered in developing the control measures to manage the risks of subsidence: (a) the characteristics of all relevant surface and subsurface features, (b) the characteristics of all relevant geological, hydrogeological, hydrological, geotechnical, topographic and climatic conditions, including any conditions that may cause elevated or abnormal subsidence or the formation of sinkholes, (c) the characteristics of any previously excavated or abandoned workings that may interact with any proposed or existing mine workings, (d) the existence, distribution, geometry and stability of significant voids, standing pillars or remnants within any old pillar workings that may interact with any proposed or existing mine workings, (e) the predicted and actual nature, magnitude, distribution, timing and duration of subsidence, (f) the rate, method, layout, schedule and sequence of mining operations.	Extraction Plan - Appendix 1 (Ditton Geotechnical Services, 2021) Extraction Plan and Volume 3 (Component Plans)
WHS Regulation (Mines and Petroleum Sites) 2014 Schedule 3 Clause 16 High Risk Activities	**Secondary extraction or pillar extraction, splitting or reduction** (1) The following are identified as high risk activities: (a) secondary extraction by longwall mining, shortwall mining or miniwall mining, (b) pillar extraction, (c) pillar splitting, (d) pillar reduction. (2) The waiting period for any such activity is 3 months. (3) The information and documents that must be provided in relation to any such activity are as follows: (a) details of the authoritative sources used in determining that the proposed method of work can be done safely, (b) engineering plans showing the manner and sequence of extraction, endorsed by the individual nominated to exercise the statutory function of mining engineering manager at the mine, (c) information about the land above or in the vicinity of the proposed activity including land use and details of who owns or occupies any land that may be affected by subsidence, (d) in the case of a pillar extraction, details of the procedures for the recovery of buried and immobile mining plant in or around a goaf, (e) details of how the risks to the health and safety of workers and other persons from subsidence caused by the activity will be managed.	Extraction Plan LW30-31 and High Risk Activity Notification for LW30-31

6 Performance Measures and Indicators

6.1 Mine Design

Mandalong Mine is designed to provide reduced levels of subsidence by using sub-critical longwall panels (180m to 200m) combined with 43m to 53m wide chain pillars that utilise the bridging effect of the overlying massive conglomerate and sandstone strata. This design is proven and provides subsidence impacts below safe, serviceable and repairable (SSR) criteria for dwellings and also minimises the impacts to the flood plain, natural features and built features managed by this plan.

6.2 Subsidence Prediction

Subsidence predictions and potential impacts from the extraction of LW30-31 on surface and subsurface features present within the Extraction Plan Area has been prepared by Ditton Geotechnical Services (2021) based on the following methodology:

(i) The development of a geotechnical model of the overburden and immediate roof-pillar-floor system using available borehole log and testing data.

(ii) Prediction of maximum subsidence effect parameters for the proposed longwalls.

(iii) Review of Mandalong Mine's subsidence data and impacts associated with LWs 1 - 27.

(iv) Prediction of first and final subsidence effect profiles and final contours and assessment of the potential impacts to existing and proposed features or developments.

(v) Prediction of post-mining surface levels.

(vi) Potential surface cracking widths and their general location.

(vii) Prediction of sub-surface heights of continuous and discontinuous fracturing above the proposed longwall panels.

(viii) Potential ponding depth locations.

(ix) Potential surface gradient changes and erosion / slope stability impacts.

(x) Valley Closure and Uplift potential along watercourses.

(xi) Far-field horizontal displacements and strains.

(xii) Predicted impacts and management strategies required for the environment, developments and Aboriginal and European Heritage sites.

Two empirically based prediction models (**ACARP, 2003** and **SDPS®**) have been used to generate subsidence profiles and contours above the proposed longwall panels after mining is complete. **Surfer 8®** software has then been used to generate subsidence, tilt, horizontal displacement, and strain contours above the panels from the **SDPS®** output files.

The subsidence predictions models used in this study are summarised below:

- **ACARP, 2003** - An empirical model that was originally developed for predicting maximum single and multiple longwall panel subsidence, tilt, curvature and strain in the Newcastle Coalfield. The model database included measured subsidence parameters and overburden geology data, which have been back analysed to predict the subsidence reduction potential (SRP) of massive lithology in terms of 'Low', 'Moderate' and 'High' SRP categories.

The model database also includes chain pillar subsidence, inflexion point distance, goaf edge subsidence and angle of draw prediction models, which allow subsidence profiles to be generated for any number of panels and a range of appropriate confidence limits. The Upper 95% Confidence Limit (U95%CL) has been adopted in this study for predictions of the Credible Worst-Case values.

The model has been updated by Ditton Geotechnical Services (DgS) since 2007 to allow the original **ACARP, 2003** model to be applied to other Australian Coalfields and improve its robustness over a greater range of mining geometries and geologies.

- **SDPS®, 2007** - A US developed (Virginia Polytechnical Institute) influence function model for subsidence predictions above longwalls or pillar extraction panels. The model requires calibration to measured subsidence profiles to reliably predict the subsidence and differential subsidence profiles required to assess impacts on surface features.

  The model also includes a database of percentage of hard rock (i.e. massive sandstone / conglomerate) that effectively reduces subsidence above super-critical and sub-critical panels due to either bridging or bulking of collapsed material. This is consistent with the **ACARP, 2003** models prediction methodology.

Pre-feasibility studies of appropriate panel widths and set-back distances required to minimise or limit surface impacts to manageable levels have been undertaken by Centennial Mandalong and DgS prior to the preparation of the predictions. The outcomes of the preliminary analysis have resulted in the mining geometry and layout adopted.

Based on regression analysis techniques, curves of 'best fit' have been used to estimate Mean and Credible Worst-Case (Upper 95% Confidence Limits) for the subsidence effects due to the proposed longwalls. The curves are based on measured subsidence data in the NSW Coalfields and key mining geometry parameters (refer **ACARP, 2003**). The Mandalong mining experience to-date has also been reviewed against the database (LW1-27).

The prediction method allows specialist consultants to assess the potential range of impacts to a given feature in a probabilistic manner. Impact Management Plans and strategies can then be developed that allows appropriate Trigger Action Responses and mine planning adjustments or mitigation measures necessary to deliver satisfactory outcomes to stakeholders.

6.3 Performance Measures

As outlined in **Section 6.1**, the primary objective of the mine design is to prevent any significant mine induced risk to public safety by providing low levels of subsidence, that allow built features including private dwellings to remain safe, serviceable and repairable and negligible additional risk to public safety.

The Public Safety Management Plan together with the Built Features Management Plan and supporting infrastructure management plans aim to ensure the performance measures in SSD-5144 Schedule 4 Condition 4 Table 7 are not exceeded. The performance measures are shown in **Table 6**.

Table 6 - Subsidence Impact Performance Measures

Key Public Infrastructure	
M1 Motorway	Always safe and serviceable.
Main Northern Railway	
330 kV power supply infrastructure	Damage that does not affect safety or serviceability must be fully repairable, and must be fully repaired.
Other Built Infrastructure	
Power lines and power poles	Always safe.
Telecommunications infrastructure	Serviceability should be maintained wherever practicable.
Privately-owned residences	
Local Roads	Loss of serviceability must be fully compensated.
Other built features and improvements, (including access roads, farm dams, swimming pools, tracks and fences)	Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.
Public Safety	
Public Safety	Negligible additional risk.

Notes:

- *Key public infrastructure is shown in Figure 2 of Appendix 2 and in Figure 1 of Appendix 5*
- *Other built infrastructure is shown in Figure 1 of Appendix 5.*
- *The Applicant will be required to define more detailed performance indicators for each of these performance measures in the Built Features Management Plan, Property Subsidence Management Plans and Public Safety Management Plan (see condition 6 below).*
- *Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Secretary will be the final arbiter.*
- *Requirements regarding safety or serviceability do not preclude preventative or mitigatory actions being taken prior to or during mining in order to achieve or maintain these outcomes.*
- *Requirements under this condition may be met by measures undertaken in accordance with the Mine Subsidence Compensation Act 1961.*

6.4 Performance Indicators

To establish compliance with the performance measured outlined in **Section 6.3**, Centennial Mandalong has established a subsidence and environmental monitoring program developed in consultation with the built feature owners and RR. Trigger Action Response Plans (TARPs) have also been established and provided in **Appendix 1**.

These documents establish the appropriate subsidence monitoring, parameters and associated trigger levels to demonstrate that subsidence performance satisfies the Subsidence Performance Measures set in **Table 6** and infrastructure requirements.

The Performance Indicators have been established for each built feature. The TARPS provide the trigger values as outlined in **Table 7**.

Table 7 – Performance Indicators

Performance Indicator	Tigger	Action / Response
Level 1 Low	Operations within prediction and approved impact.	Continued operations and monitoring as normal.
Level 2 Medium	Operations within approved impacts but exceed or potentially exceed predictions.	Review and investigation processes are engaged, with adaptive management as required.
Level 3 High	Operations exceed approved impact. *The approved Performance Measures of Development Consent SSD-5144 and other relevant approvals and management plans.*	Adaptive Management measures are fully engaged as per TARPs and relevant sections for the Extraction Plan.

7 Risk Management

Centennial Mandalong has adopted the Stature Risk Assessment Program which was developed to ensure consistency in all risk assessments across the Centennial Coal operations. The Stature Risk Assessment Program sets out a consequences table and risk ranking matrix for managing identified risks consistent with AS/NZS ISO 31000:2009.

All operational processes undertaken at the Centennial Mandalong operations are subject to the risk assessment process prior to implementation. The process for risk and change management is undertaken according to the methodology and tools contained within **HSMS-SE-1024-Risk Management Arrangements** and **HSMS-SE-1082- Change Management System**.

Centennial Mandalong has completed a **WRAC Risk Assessment (No. 1001025001)** as required by the Work Health Safety (Mines and Petroleum Sites) Regulation 2014 to develop control measures to manage the risk to health and safety associated with subsidence. As outlined in WHS Regulation (Mines and Petroleum Sites) Schedule 1 Clause 3C, the following matters were considered in developing the control measures to manage the risks of subsidence:

(a) the characteristics of all relevant surface and subsurface features,
(b) the characteristics of all relevant geological, hydrogeological, hydrological, geotechnical, topographic and climatic conditions, including any conditions that may cause elevated or abnormal subsidence or the formation of sinkholes,
(c) the characteristics of any previously excavated or abandoned workings that may interact with any proposed or existing mine workings,
(d) the existence, distribution, geometry and stability of significant voids, standing pillars or remnants within any old pillar workings that may interact with any proposed or existing mine workings,
(e) the predicted and actual nature, magnitude, distribution, timing and duration of subsidence,
(f) the rate, method, layout, schedule and sequence of mining operations.

A copy of the risk assessment is included in Appendix 4 of the Extraction Plan LW30-31.

In addition, three separate risk assessments were undertaken, specifically for the LW30-31 Extraction Plan and associated management plans. The three risk assessments were:

- RA No. 1001284063 – Environmental Features
    - Surface water, ponding and flooding
    - Groundwater
    - Land – steep slopes, surface cracking, slope stability, rock rollout, landslip, agricultural land capability
    - Biodiversity – GDE's, wetlands, threatened flora and fauna
    - Heritage – Aboriginal and European
    - Public Safety

- RA No. 1001284061 – Built Features
    - Public Roads – Toefpers Road and Kiar Ridge Road (Crown roads)
    - Telstra Communications (aerial copper cables)
    - Ausgrid 11kV powerlines
    - State Survey Marks

- Public Safety

- RA No. 1001285007 – Property Subsidence Management Plans (private property)
  - Dwellings and buildings
  - Agricultural land capability
  - Dams, fences, access roads, bridges
  - Flooding (property, dwelling, access routes and land at 1 year and 100 year ARI storm events)
  - Creeks, drainage, remnant ponding
  - Steep slopes, surface cracking, slope stability, rock rollout, landslip.

7.1 Identified Risks

Mandalong Mine has well established Infrastructure Management Plans, which have been developed and refined since the commencement of longwall mining in 2005. The risks to features from the development of mine subsidence within the Extraction Plan area are detailed for each infrastructure item. Subsidence predictions and assessment was provided by Ditton Geotechnical Services (2021).

The risk assessment team also considered the tolerance of landscape features to subsidence impact. Two case studies were modelled:

1. Maximum Subsidence Prediction (mean); and
2. Credible Worst-Case Subsidence (Upper 95% Confidence Limits).

This enabled a form of sensitivity analysis of the subsidence predictions to be made as outlined in **Table 8**.

Table 8 – Subsidence Sensitivities

Prediction	Cause
Maximum Predicted Subsidence (Mean)	Expected geotechnical conditions
Maximum Predicted Subsidence (Credible Worst-Case, U95% CL)	Geotechnical conditions worse than anticipated

The predicted mean and U95%CL subsidence effect results for LW30 to 31 are summarised below:

- **First maximum panel subsidence** ranges from 0.55 m to 1.04 m (15% to 27% the mining height, T).
- **Final maximum panel subsidence** ranges from 0.98 m to 1.33 m (26% to 35%T).
- **First maximum chain pillar subsidence** ranges from 0.50 m to 0.97 m (13% to 27% of the mining height, T).
- **Final maximum chain pillar subsidence** ranges from 0.62 m to 1.12 m (17% to 31% of the mining height, T).
- **Maximum panel tilt** ranges from 6 to 15 mm/m (mean values) and 9 mm/m to 22 mm/m (U95%CL values).
- **Maximum panel concave curvatures** range from 0.30 km-1 to 0.59 km-1 (mean values) or radii of curvature of 3.4 km to 1.7 km. U95%CL values range between 0.45 km-1 and 0.88 km-1 or radii of curvature of 2.25 km to 1.14 km.

- **Maximum panel convex curvatures** range from 0.23 km-1 to 0.46 km-1 (mean values) or radii of curvature 4.3 km to 2.16 km. U95%CL values range between 0.35 km-1 and 0.69 km-1 or radii of curvature of 2.85 km to 1.44 km.
- **Maximum panel compressive strains** range from 3 to 6 mm/m (mean values) and from 5 to 9 mm/m (U95%CL values).
- **Maximum panel tensile strains** range from 3 to 5 mm/m (mean values) and from 4 to 7 mm/m (U95%CL values).

7.1.1 Public Roads

Potential hazards to public roads and public safety from the impact of mine subsidence can include:

- Potential for surface cracking - edges of extraction void and travelling abutments particularly in rock outcrop areas;
- Potential for surface humps (compression) - near centre of extracted panels and travelling abutment;
- Potential for step change in road pavement - associated with cracking;
- Potential reduced serviceability of drainage channels; and
- Potential for flooding hazards for roads and access tracks.

7.1.2 Ausgrid 11kV Power Lines

Potential hazards to the Ausgrid power supply network and public safety from the impact of mine subsidence on powerlines can include:

- Potential damage to poles, cross arms, insulators and conductors;
- Potential for tilting poles, increased/decreased conductor tension;
- Potential for reduced conductor ground clearance; and
- Potential interruption of power supply to customers.

7.1.3 Telstra Communication Network

Potential hazards to the Telstra communications network and public safety from the impact of mine subsidence on phone lines can include:

- Potential damage to direct buried copper cables and potential loss of service to customers;
- Potential damage to aerial copper cables and potential loss of service to customers; and
- Potential damage to conduit and pit network supporting communications cables.

7.1.4 Steep Slopes and Rock Outcrops

Potential hazards to steep slopes and rock outcrops and public safety from mine subsidence can include:

- Potential surface cracking;
- Potential rock fall, rock rollout, overhang collapse; and
- Potential landslide.

7.1.5 Private Properties and Dwellings

Potential hazards to private property, dwellings and public safety from the impact of mine subsidence can include:

- Potential damage to the dwellings and buildings, resulting in structural damage, being beyond safe, service and repairable.
- Potential increased flooding to land
- Potential to reduce dwelling freeboard below 100 year flood level
- Potential increased flood hazard at dwellings
- Potential increased flood hazard on property access routes

7.2 Risk Assessment Outcome

A risk ranking (low, moderate, significant, high or extreme) was assigned to each risk/hazard. The risk ranking for all features was assessed as **Low** to **Significant** at the maximum predicted subsidence.

The risk assessments undertaken for the extraction plan and subsequently identified control measures to ensure the potential for these risks to occur is appropriately controlled to ensure infrastructure is maintained as Safe, Serviceable and Repairable as a minimum and in many cases no significant impact at all was predicted. Refer to **Sections 8** and **Section 9** for details.

The four Risk Assessments are included in the Extraction Plan LW30-31 - Appendix 4.

8 Features and Predicted Impacts

8.1 Public Roads

The existing **Public Roads Management Plan** (MEMS-EP-9000-PRMP-9051) has been revised for LW30-31 and developed in consultation with LMCC, Central Coast Council, Crown Lands, Resource Regulator and landholders. The location of public roads and the Extraction Plan Area are shown in **Figure 2**.

There are two unsealed Crown Roads located within the EP area, Toefpers Road and Kiar Ridge Road. The two unsealed tracks are located within private property and extending between Crown Land (Yambo Trig Station) and Olney State Forest. Access along the two Crown Roads is limited to 4-wheel drive vehicles with locked gates at the Central Coast Council property and the boundary of Olney State Forest. **Table 9** provides the maximum subsidence predictions at the Worst-Case (Upper 95% Confidence Limits) for the Crown roads.

Kiar Ridge Fire Trail is located within the EP Area. The fire trail is gravel construction and is suitable for 4-wheel drive vehicles. The fire trail is located predominately outside the longwall void, with limited exposure to subsidence.

Two private access roads also traverse the EP area. The most southern single lane private access road services two properties and is partly sealed. The second single lane gravel access road services one private property.

Table 9 – Summary of Worst-Case Subsidence Predictions for Roads Above LW30-31

Road	LW#	Final Maximum Subsidence S_{max} (m)	Final Maximum Tilt T_{max} (mm/m)	Final Maximum Tensile Strain* (mm/m)	Final Maximum Compressive Strain* (mm/m)
Kiar Ridge	30-31	1.16	13	3	4
Toepfers	30-31	1.08	13	3	4

* - Tensile and compressive strains may increase 2 times occasionally due to crack development.

8.1.1 Predicted Subsidence Effects

The expected subsidence effect to the roads / tracks is assessed as **Low**. The impacts due to the predicted subsidence effects for proposed LW30 to 31 may include:

- Tensile crack widths of between 20 mm & 50 mm.
- Compressive shearing or heaving between 20 mm & 40 mm.
- Increase of super-elevation in the road of 1.0% to 1.3%.
- Cracking of culverts and fill embankments due to curvatures of +/- 0.3 to 0.5 km-1 (radius of curvature from 3.3 km to 2 km).
- Erosion and slope instability of fill embankments.

The subsidence impacts predicted for LW30 to 31 are consistent with observed impacts for the given tilt and strain at Mandalong to-date. The expected subsidence effect to the roads / tracks is assessed as **Low**.

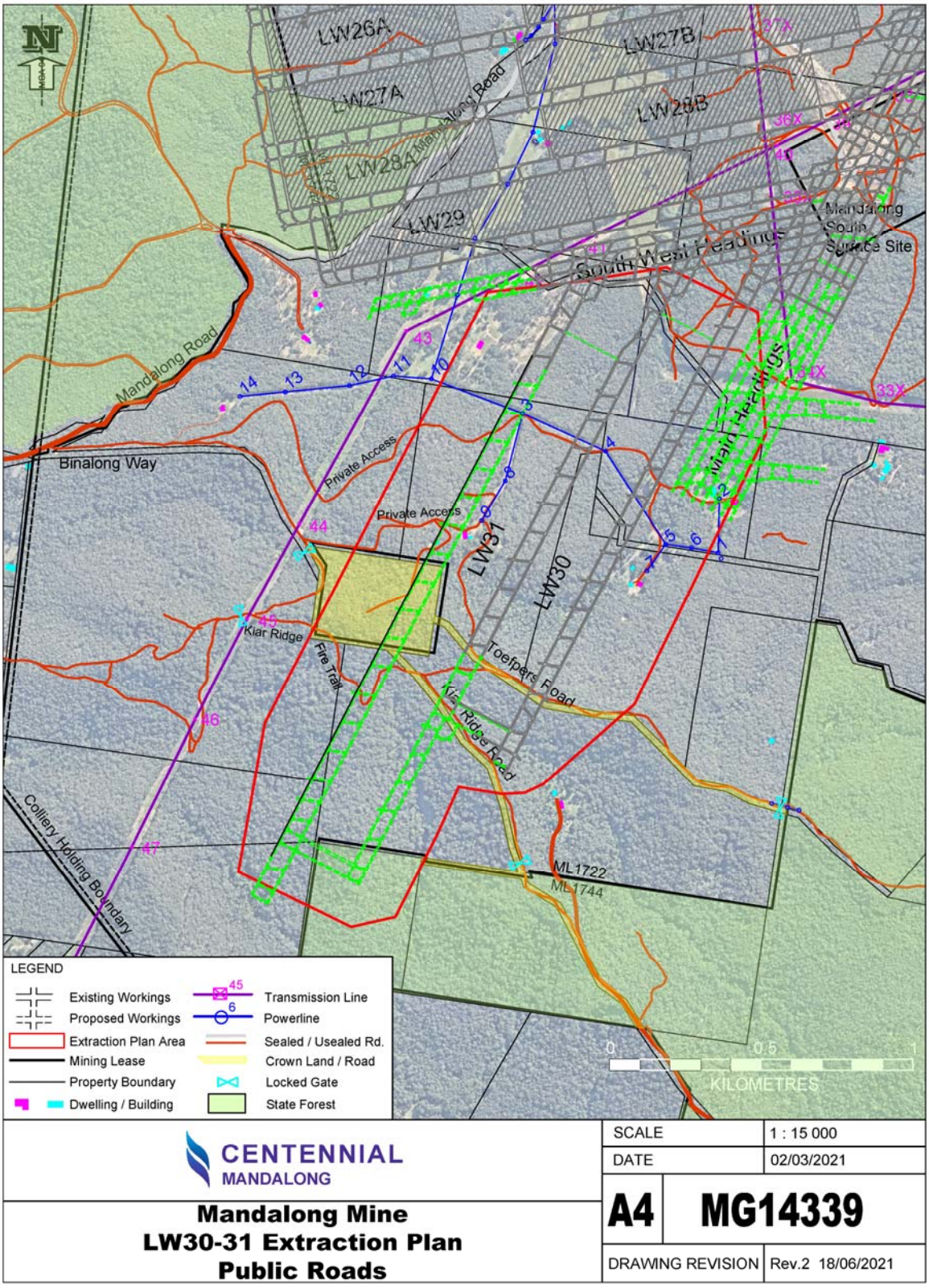

Figure 2 – Public Roads and Mine Workings within Extraction Plan Area

8.2 Telstra Communications

Telstra Network Integrity Services and their approved contractor Comms Network Solutions have been consulted on the development of the **Communications Management Plan for LW30-31** (MEMS-EP-9000-CMP-9052). The Telstra communications network in the EP area comprises of aerial cables suspended on 5m poles. The communication lines are generally located along a private access road and Ausgrid powerline easement as shown in **Figure 3**. Within the application area the communication network comprises:

Local Customer Access Network - Aerial Cables
The Aerial CAN copper cable extending from Binalong Way is fed from Dooralong Exchange Area by an aerial 100Pr cable feeding east along Mandalong Road via the Durren Durren area. The aerial cable is 10Pr/0.64 with poles at around 50-60m centres through a relatively narrow tree covered unsealed private access road and Ausgrid powerline easement over LW30-31.

Pits, Conduits and Elevated Joints
Associated pits, conduits and elevated joints support the cable network.

8.2.1 Predicted Subsidence Effects

Centennial Mandalong has a proven history of mining beneath the Telstra communications network. Communications Management Plans have been developed in consultation with Telstra for each of the previous 10 Extraction Plan areas. Similarly, a **Communications Management Plan** (MEMS-9000-CMP-9052) has been developed in consultation with Telstra for the Extraction Plan LW30-31, based on the Ditton Geotechnical Services subsidence predictions for LW30-33 Modification 9 (2020) and Extraction Plan LW30-31 (2021) and detailed in the Telstra Communications Assessment Report for Extraction Plan for LW30-33 (Comms Network Solutions, 2020).

There has been no recorded impact to the Telstra copper cable network during the development of subsidence over Longwalls 1 to 28 in the past 16 years.

The expected subsidence impact over the LW30-31 extraction plan area is **Low** to the aerial copper cables and the associated pits, joints and conduits. Serviceability of the network is not expected to be affected, therefore no additional risk to the health and safety of the public.

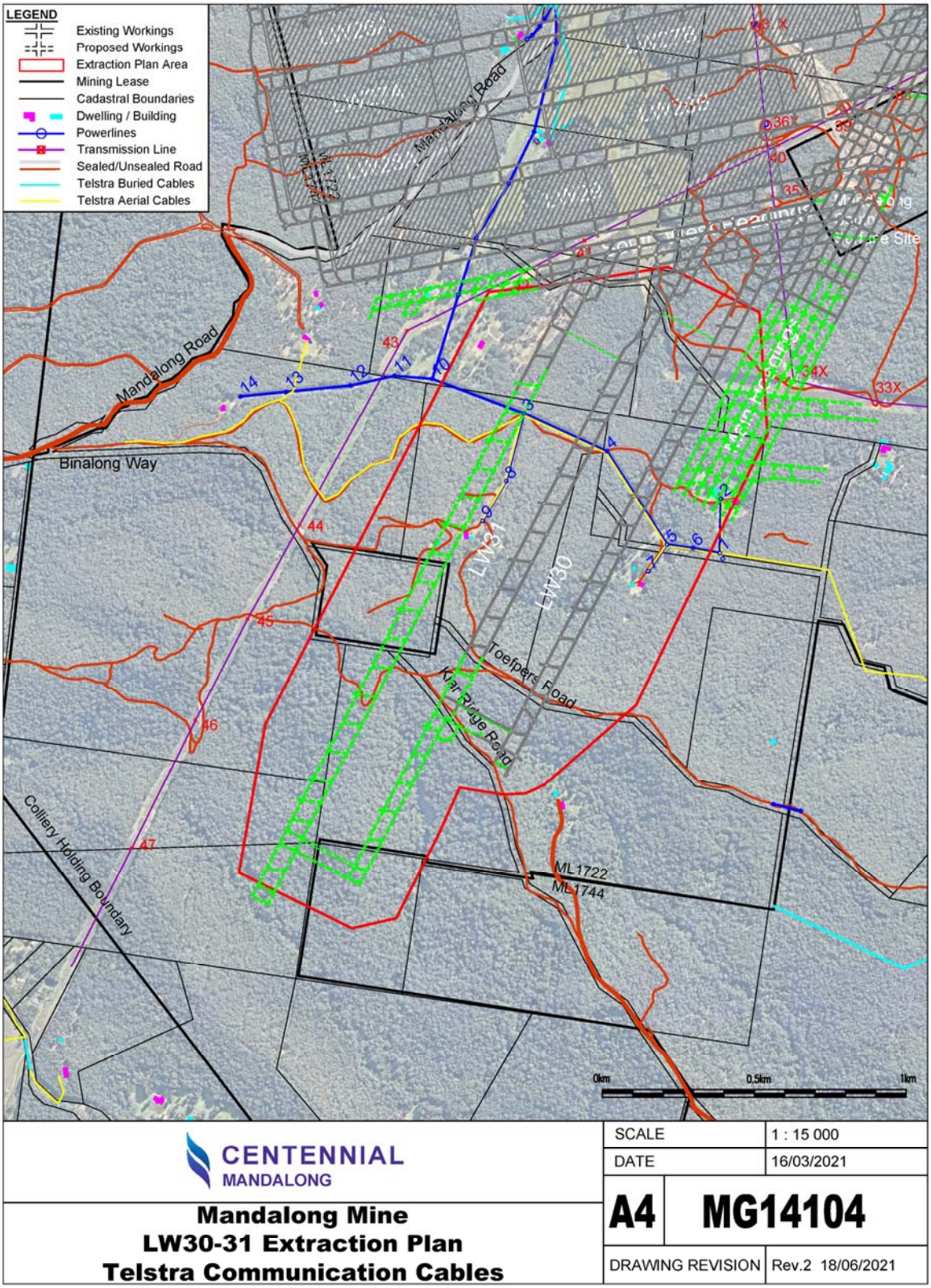

Figure 3 – Telstra Network within Extraction Plan Area LW30-31

8.3 Ausgrid Powerlines

Ausgrid 11kV powerlines supply a small number of properties within the Extraction Plan area. The powerlines and timber poles are located within private property as shown in **Figure 4**.

8.3.1 Predicted Subsidence Effects

Centennial Mandalong has successfully mined beneath the Ausgrid powerline network during the extraction of the 29 previous longwall panels with the Powerline Management Plan. The management plan was developed or revised for each of the previous 10 Extraction Plan areas. Similarly, a **Powerline Management Plan** (MEMS-9000-PLMP-9054) has been prepared in consultation with Ausgrid for the Extraction Plan for LW30-31, based on based on the Ditton Geotechnical Services subsidence predictions for LW30-33 Modification 9 (2020) and Extraction Plan LW30-31 (2021).

Ausgrid have carried out modelling using overhead line design software of the existing electrical overhead network in the vicinity of LW30-33 and identified minor mitigation works are required to be completed prior to the poles being impacted by subsidence. Ausgrid will conduct the mitigation works prior to subsidence affecting the powerline network, with typical works including installing rollers, replacing cross-arms, replacing poles and removing stays. Centennial will record the pre and post condition of Ausgrid power poles and provide the information to Ausgrid.

Table 10 – Worst-Case Final Subsidence Predictions for Ausgrid Power Poles over LW30-33

Pole No.	Easting (m)	Northing (m)	Final Subsidence (m)	Final Tilt (mm/m)	Final Ground Strain+ (mm/m)	Pole Base Displacement (mm)	Pole Movement Direction (o)
Proposed LW30 to 31 Effects (Extraction Plan)							
1 (MG-77016)	352108	6328379	0.00	0.2	0.1	4	296
2 (MG-77017)	352112	6328558	0.03	0.9	0.1	17	297
3 (MG-77014)	351463	6328840	**0.20**	**6.8**	3.2	**136**	280
4 (MG-77015)	351737	6328714	**1.20**	**11.3**	-5.5	**226**	118
5 (MG-77008)	351935	6328407	0.06	0.7	-0.2	13	295
6 (MG-77006)	352021	6328395	0.03	0.9	0.1	18	298
7 (MG-77007)	351873	6328319	**0.06**	0.3	0.0	5	324
8 (MG-71001)	351406	6328616	**0.55**	**10.6**	**-0.5**	**212**	122
9 (MG-71002)	351328	6328484	**0.47**	**9.0**	**0.5**	**180**	172
10 (MG-77013)	351162	6328954	**0.02**	**0.0**	***0.5***	***20***	**120**
11 (MG-77002)	351037	6328964	**0.00**	**0.0**	***0.5***	***20***	**120**
12 (MG-77003)	350892	6328932	**0.00**	**0.0**	***0.5***	***20***	**120**
13 (MG-77004)	350680	6328911	**0.00**	**0.0**	**0.0**	**0**	-
14 (MG-77005)	350531	6328896	**0.00**	**0.0**	**0.0**	**0**	-

+ - Tensile and compressive phases may occur during subsidence development. **Bold** - predictions different to Mod 9.
italics - far-field displacements & strains

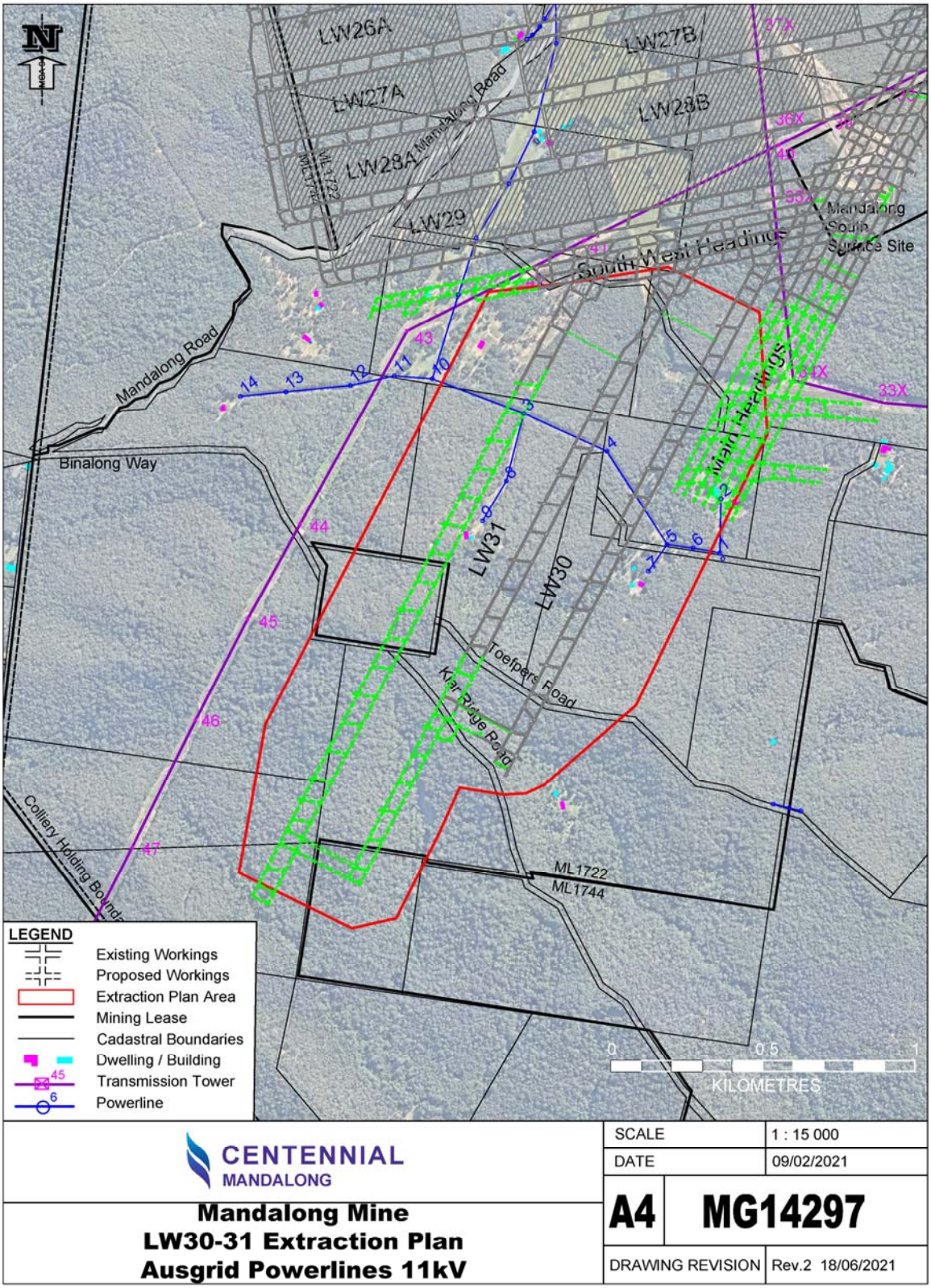

Figure 4 –Ausgrid Powerline Network and Mine Workings within Extraction Plan Area

8.4 Slope Instability and Erosion

The EP Area is typified by relatively elevated densely timbered ridgelines surrounded by flat, low lying areas. Elevations on these ridgelines reach up to 240 m Australian Height Datum (AHD). Limited relatively flat-lying areas have been cleared for property development.

Surface slopes range from 2° to 5° in the flat, low lying areas and from 5° to 35° on the ridges. There are several sandstone and pebbly sandstone rock outcrops/faces along the upper slopes of the ridges that typically range between 2 m and 5 m high with some between 5 m and 10 m high. Sandstone boulders from 1 m to 5 m high were noted on the slopes below the rock faces and on the ridge crests. Several caves and/or overhangs between 6 m and 14 m wide and 4 m to 15 m deep exist in the rock faces and boulders. The presence of mature trees on the steep slopes will provide significant natural reinforcement of the soils and reduce the likelihood of landslip development during and after mine subsidence. The location of the steep slopes (coloured green) are shown in **Figure 5**.

The lithology is interbedded sandstone, siltstone, mudstone, and pervasive conglomerate units (Munmorah Conglomerate). Sandstone, siltstone, carbonaceous mudstone and coal form the immediate roof, while the floor will consist of competent tuffaceous sandstone and siltstone. A detailed review of the geology and geomorphic features and potential subsidence effects has been assessed by Ditton Geotechnical Services (2021).

Potential impacts to land due to mine subsidence that could occur above the proposed longwalls includes:

- Cracking and tilting of steep slopes and/or road-side cuttings;
- General instability of steep slopes due to deep or shallow translational sliding along mudstone / claystone bedding planes.

8.4.1 Predicted Subsidence Effects

The proposed longwalls will cause subsidence, tilting and bending of the surface supporting the steep slopes and rock outcrops. Final worst-case subsidence predictions range from 0.98 m to 1.33 m above LW30 to 31.

The predicted post mining surface slope gradient changes for the proposed mining layout are presented in **Figure 5**. The predictions of maximum tilt and strain indicate the slopes may be subject to tilts of 6 to 22 mm/m and tensile strains of 3 to 7 mm/m.

8.4.1.1 Surface Cracking

The following surface impacts are predicted above relatively flat or mildly sloping terrain up to 18° due to the proposed LW30 and 31 and the predicted tensile strains of 3 mm/m to 7 mm/m and compressive strains from 3 mm/m to 9 mm/m:

- tensile crack widths of 20 mm to 70 mm
- compressive shearing or heaving between 30 mm to 90 mm

Tensile cracks of similar magnitudes to those mentioned above will probably develop up to 50 m behind the advancing goaf edge of the longwall panels. The majority of these cracks are likely to be transient, and some may partially close in the central areas of the panels where permanent compressive strains develop after mining is completed.

Cracks of up to 100 mm wide have been detected on the steep slopes and ridges above the longwall 25 and 26 to-date after subsidence of up to 1.2 m. Wider cracking may increase above the assessment area due to interaction of near surface topography and geology with differential subsidence profiles.

The predicted impacts to the steep slopes include:

- crack widths of 100 mm to 320 mm on steep slopes and ridges.
- uplift and closure of between 20 mm and 90 mm in the central limits of the proposed longwalls or along creek beds with shallow bedrock exposures.
- crack depths of between 5 m and 10 m in relatively flat terrain and up to 20 m on ridge crests in steep terrain.
- compressive strain peaks and resultant heaving / shearing is also likely to occur on the down-slope side of panels beneath steep slopes and of similar magnitude to the impacts in the tension zones.

Surface cracking is likely to be wider (and deeper) on the steep slopes above the proposed longwalls however, due to rigid-body rotation effects during subsidence development.

8.4.1.2 Cliff Lines

There are no cliff lines within or surrounding the EP Area.

8.4.1.3 Rock Fall and Rollouts

The predicted subsidence and associated tilt and strains could result in minor cracking along the existing rock faces or rock outcrops on steep slopes and along watercourses. It is considered that the release of sandstone boulders down slope and impact a residence or person is 'very unlikely' to occur due to the absence of overhangs and cliff lines in the EP Area.

Four houses located in the EP Area (No. 34, 35, 55 and 109) where identified and listed as potentially vulnerable to rock rollout in the EIS subsidence assessment (Ditton Geotechnical Services, 2013). Following site inspections and detailed analysis by Ditton Geotechnical Services (2021), it was assessed the potential for rock rollout impacting houses was 'very unlikely'.

- House No. 109 (MS0025) is located 350 m downslope of a 3 m to 5 m high rock face above LW31 rib side. The slope consists of a 150 m long steep rocky section of 35^{o} and a 150 m length firm soil slope of 10^{o}. Both slopes have a dense cover of mature trees. There is also a cleared 50 m section of firm soil slope (5^{o}) and farm dam between the house and the surrounding bushland.
- House No. 55 (MS0139) is located 150 m below an 80 m long steep rocky slope of 25^{o} with a dense cover of mature trees and a 70 m length section of firm soil slope of 10^{o} with a sparse tree cover.
- House No. 34 (MS0137) is located 388 m below a 3 m to 5 m high rockface and 200 m long rocky slope. An incised water course is located 260 m downslope of the rock face and is between the house and the steep slopes above LW30. The watercourse will protect the property from any rock rollout events.
- House No. 35 (MS01070) is not exposed to any rock faces or steep rocky slopes following inspection of the site.

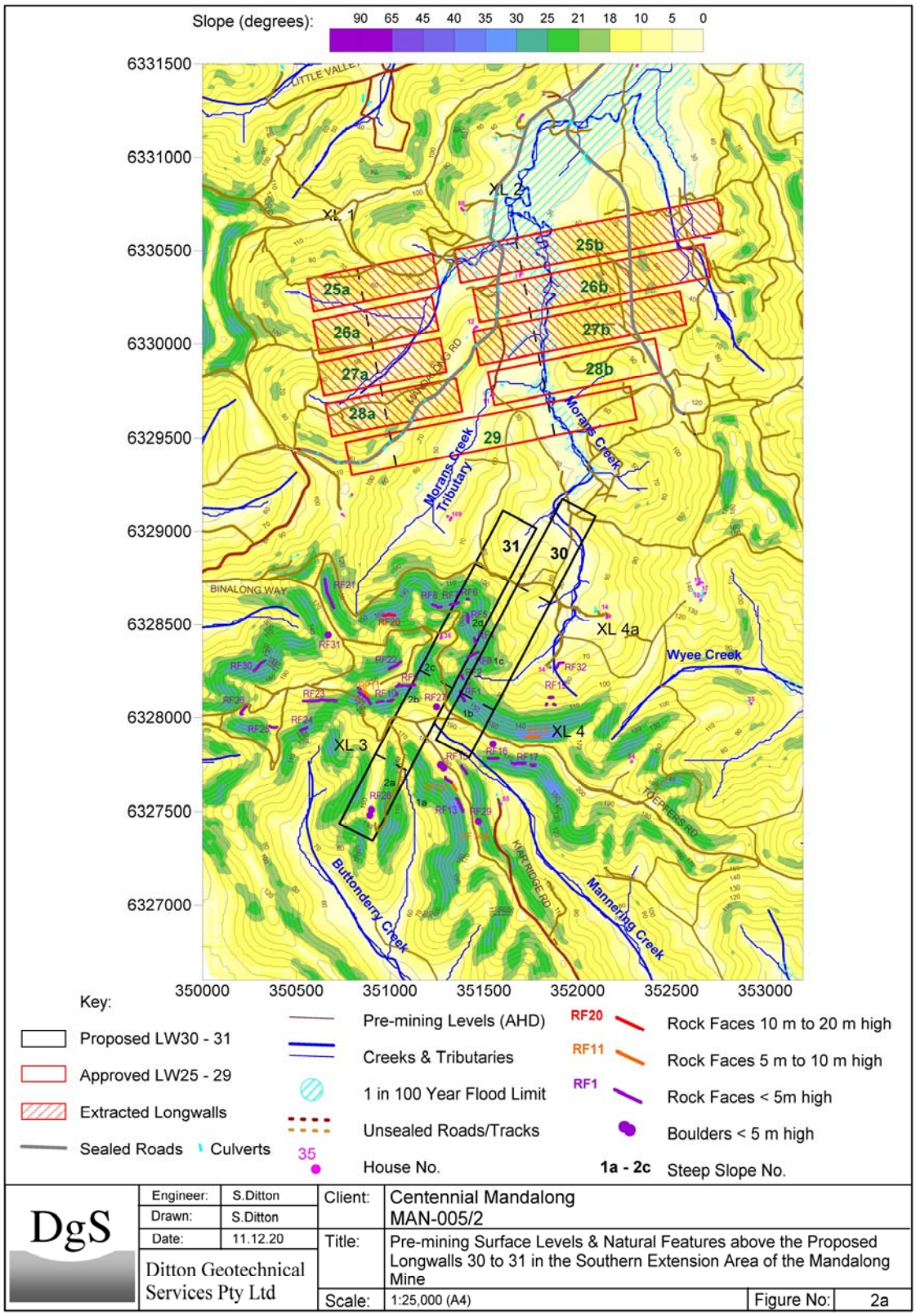

Figure 5 – Steep Slopes over LW30-31

8.4.1.4 Deep-seated Land Sliding

Ditton Geotechnical Services (2021) assessment of the likelihood of en-masse sliding (i.e. a deep landslip) on the ridges or hills over basal mudstone beds cracked and tilted by subsidence, have been assessed based on the Landslide Risk Assessment Guideline presented in AGS, 2007.

Ditton Geotechnical Services concluded that the steep slopes in their current, pre-mining condition have a 'Low' sliding potential over an extreme range of climatic conditions (i.e. dry to perched water tables) with an FoS ranging from 2.29 to 5. This is confirmed by the absence of slope features that are indicative of existing or past deep-seated slope instability.

The subsided slopes for the same climatic conditions and range of expected tilts and strains are also assessed to have 'Low' sliding potential (FoS ranges from 1.56 to 3.9) during worst-case conditions with unrepaired, water filled cracks.

Another important factor is the alignment of the tensile cracking in relation to the slope crests. Cracks that are sub-parallel to the slope crests will have a greater potential impact on slope instability than cracks which are perpendicular to the slope crests. The stability analysis has assumed that the cracks are longitudinal and continuous along the length of the northern and south facing slopes.

Based on the proposed north-south longwall orientation, it has been assumed that the transient cracking that occurs behind the longwall face will be perpendicular or at a high angle to the east and west facing slopes. The potential for slope instability or erosion to develop will be minimised if large cracks (> 100 mm wide) can be sealed in a reasonably timely manner to prevent water ingress and on-going erosion.

8.4.1.5 Erosion of Slopes and Creek Beds

The potential for terrain adjustment due to erosion and deposition of soils after subsidence has also been broadly assessed by Ditton Geotechnical Services (2021). The rate of soil erosion is expected to increase in areas with exposed dispersive/reactive soils and slopes > 18°, where these slopes are subjected to the estimated tilt increases of 1°. Areas with slopes < 18° are expected to have low erosion rate increases, except for the creek channels, which would be expected to re-adjust to any changes in gradient.

In general, head-cuts in creek channels with alluvial sediments would be expected to develop above chain pillars between the panels and on the side where gradients increase. Sediment would be expected to accumulate where gradients decrease.

8.5 Private Property and Dwellings

There are nine private properties, one property owned by Central Coast Council, one owned by Centennial Coal and one Crown Land lot. A small area of Olney State Forest is located at the southern extent of the Extraction Plan Area. Of the nine privately owned properties, four dwellings will be affected by subsidence as shown in **Figure 6.** The privately owned properties and four affected dwellings are managed by individual **Property Subsidence Management Plans** (PSMP) as required by SSD-5144 Schedule 4 Condition 6 (h).

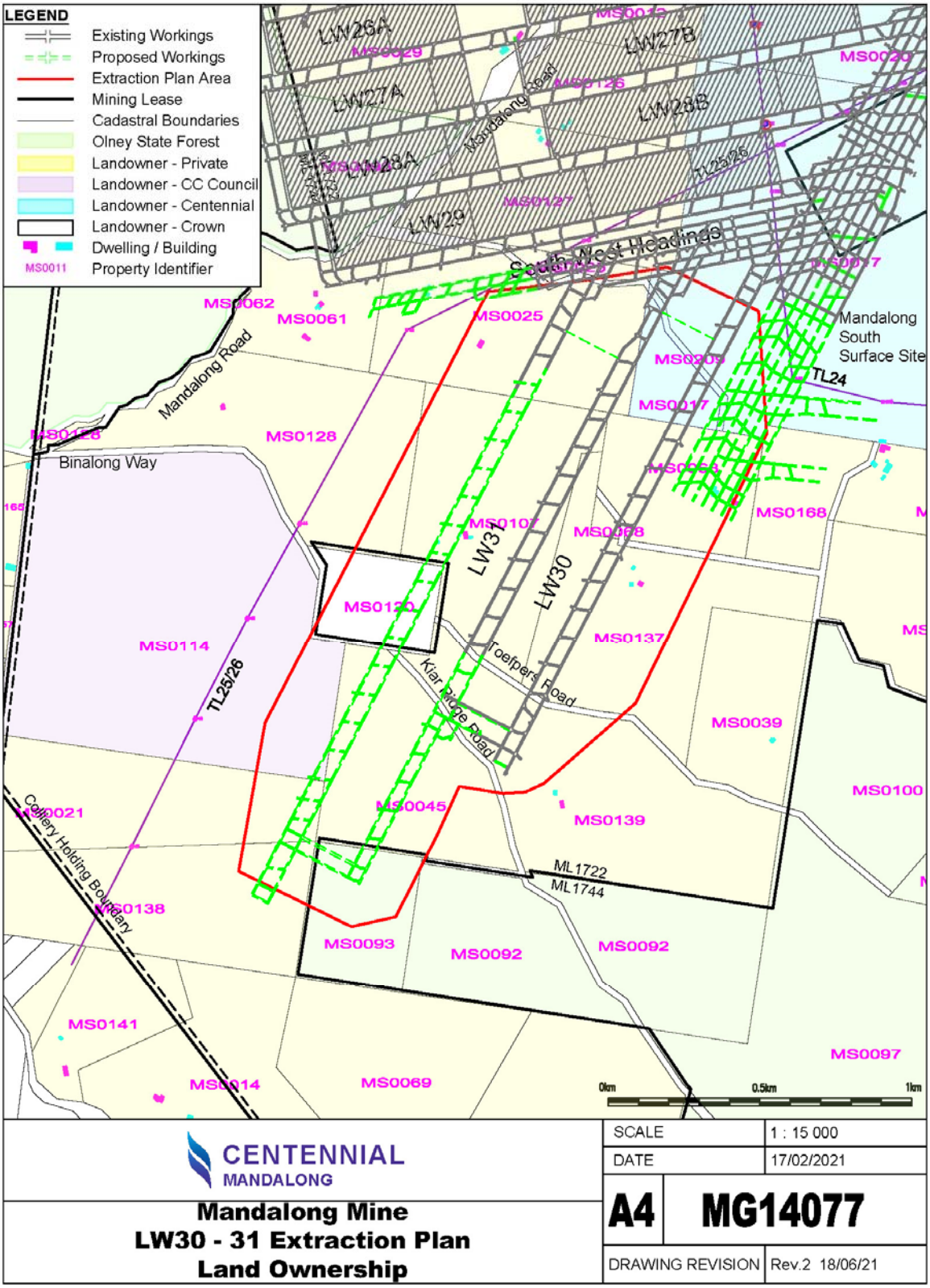

Figure 6 – Land Ownership within Extraction Plan Area

8.5.1 Predicted Subsidence Effects

8.5.1.1 Dwelling - Structural

Subsidence impacts to the four private dwellings is expected to be similar to approximately 70 dwellings previously affected by subsidence from Longwalls 1-28. All dwellings have remained safe, serviceable and repairable.

All four private dwellings are expected to remain Safe, Serviceable and Repairable at maximum predicted subsidence values. One dwelling is located over LW31 and will be directly mined beneath, while the three other dwellings are all located near the 20mm limit of subsidence.

Pre-mining structural assessments of the dwellings planned to be directly undermined have been conducted by Leigh Appleyard – Chartered Professional Engineer, confirming the design and form of all the structures would adequately tolerate the predicted level of subsidence. Additionally, no hazards were identified that would cause additional risk to health and safety of the occupants or public. Individual PSMPs document the predicted impacts and any mitigation or potential remediation measures required. **Table 11** provides a summary of the dwellings, structural assessment and PSMP development.

8.5.1.2 Dwelling - Flood

The Flood Modelling and Assessment for LW1-33 was prepared by Umwelt (2020) for the subsidence impact from mining. The Extraction Plan Area for LW30-31 is located outside the extents of the 100 year flood model, comprising third order streams.

All dwellings and property access routes are located outside the 100 year flood plain.

Additional modelling by Umwelt confirmed that there are negligible changes to the catchment and dwellings located within previously approved Extraction Plan areas including one dwelling located on a second order stream located over LW28.

Table 11 - Dwelling Subsidence Impact Assessment Summary

Centennial Property Reference	Owner Lot & DP	Address	Property and Building Description	Dwelling	Dwelling Potentially Affected by LW30-31 Subsidence	Dwelling / Building Structural Inspection Completed	Dwelling / Building Hazards Identified	Steep Slopes (>1:3) on Property	PSMP Prepared in Consultation with Landowner
MS0021	Privately Owned Lot 186 DP 755271	893 Dickson Road Durren Durren	Rural property. Dwelling located outside EP Area.	Yes	No Located outside EP Area	NA	No	Yes	Yes
MS0025	Privately Owned Lot 140 DP 755238	1033 Mandalong Rd Wyee	Rural residential property with single storey dwelling	Yes	Yes Located at 20mm limit of subsidence	Yes	No	Yes	Yes
MS0045	Privately Owned Lot 114 DP 755238	497 Toepfers Road Wyee	Rural property. Planned Eco Tourism Business (camping)	No	NA	NA	NA	Yes	Yes
MS0068	Privately Owned Lot 1 DP 805044	253 Binalong Way Wyee	Rural residential property. Single story dwelling.	Yes	No Located outside 20mm limit subsidence	NA	No	Yes	Yes
MS00107	Privately Owned Lot 3 DP 805044	44 Binalong Way Wyee	Rural residential property with steel frame shed on concrete slab used as dwelling.	Yes	Yes	Yes	No	Yes	Yes
MS0128	Privately Owned Lot 4 DP 805044	39 Binalong Way Wyee	Rural residential property with two storey steel shed on concrete slab converted to dwelling.	Yes	No Located outside EP Area	NA	No	Yes	Yes
MS0137	Privately Owned Lot 2 DP 805044	256 Binalong Way Wyee	Rural residential property with single storey dwelling	Yes	Yes Located at 20mm limit of subsidence	No	No	Yes	Yes

Centennial Property Reference	Owner Lot & DP	Address	Property and Building Description	Dwelling	Dwelling Potentially Affected by LW30-31 Subsidence	Dwelling / Building Structural Inspection Completed	Dwelling / Building Hazards Identified	Steep Slopes (>1:3) on Property	PSMP Prepared in Consultation with Landowner
MS0138	Privately Owned Lot 1871 DP 1075680	873 Dickson Road Durren Durren	Rural residential property. Dwelling located outside EP Area.	Yes	No Located outside EP Area	No	No	Yes	Yes
MS0139	Privately Owned Lot 145 DP 755238	195 Woods Road Wyee	Rural residential property. Single story steel shed converted to dwelling.	Yes	Yes Located at 20mm limit of subsidence	No	No	Yes	Yes

9 Management Measures

The primary management strategy being implemented is impact avoidance through the sub-critical longwall design and bridging overburden to provide reduced levels of subsidence. Monitoring will be undertaken to confirm that mine design measures to prevent impact are adequate and will provide data for trend analysis to enable adaptive management if required. Mitigation measures have been required to ensure the serviceability of Ausgrid powerlines.

9.1 Ausgrid Powerlines

Ausgrid have identified the following mitigation work is required on a number of poles prior to the powerlines being impacted by subsidence from LW30-31.

The management measures are:

- Ausgrid has completed modelling of subsidence effects on the powerline network;
- Ausgrid has identified mitigation works are required to be completed prior to power poles being impacted by subsidence;
- Ausgrid will conduct the mitigation works prior to subsidence affecting the powerline network (typical works include installing rollers, replacing cross-arms and removing stays);
- Centennial to record the pre and post condition of Ausgrid power poles using Centennial's 3D scanning theodolite (Trimble SX10);
- Centennial to provide Ausgrid with the pre and post 3D scanning results for evaluation;
- Centennial to monitor subsidence line Crossline 23, 24 and 25 and conduct visual inspections of the affected section of the powerline; and
- Centennial to conduct weekly inspections of powerlines and private access road when the infrastructure is within the Active Longwall Subsidence Zone.

The mitigation works, including modelling and any necessary subsidence remediation works will be conducted by Ausgrid. Centennial Mandalong will reimburse Ausgrid for the cost of conducting these works.

The management strategy also includes Centennial Mandalong monitoring subsidence and conducting visual inspections of the affected sections of the powerline. Subsidence monitoring will coincide with Telstra Communications due to their location and as detailed in **Section 10**. Weekly and monthly visual inspections will record the condition of the powerline infrastructure.

9.2 Public Roads

Access to the two crown roads, Toefpers Road and Kiar Ridge Road as well as Kiar Ridge fire trail are limited by:

- Locked gates at private property and Olney State Forest;
- 4 wheel drive access; and
- Located within private property boundaries.

Subsidence warning signs will be installed at road access points and mining notifications will be provided to landowners and agencies.

10 Monitoring Program

The Mandalong Mine Subsidence Monitoring Program consists of conventional subsidence monitoring, visual inspections and aerial LIDAR surveys, developed in order to:

- Demonstrate mine development and extraction is undertaken as per approved designs;
- Provide information to demonstrate statutory compliance and obligations are satisfied;
- Targeted monitoring of sensitive surface and built features;
- Meet stakeholder monitoring requirements to minimise impact to infrastructure;
- Provide data to manage the risk associated with both conventional and non-conventional subsidence;
- Provide appropriate and timely subsidence information to assess against triggers established in the TARPs.
- To provide data for future monitoring systems for ongoing mining within Mandalong mining leases.

The Subsidence Monitoring Program is scheduled in the Centennial Compliance Database. The compliance database allows for surveys, inspections and notifications to be scheduled on either time or productions schedule (longwall face position). The required actions are assigned to the relevant role to ensure the subsidence monitoring program is achieved.

10.1 Baseline Monitoring

10.1.1 Detail Aerial Mapping

An aerial LIDAR survey was undertaken in April 2020, providing the pre-mining landform for the Extraction Plan area and post mining landform for Longwalls 1 to 25. Aerial LIDAR surveys of the whole mining area are conducted approximately every three years.

10.1.2 Conventional Subsidence Monitoring

Centennial Mandalong has a well-established conventional subsidence line monitoring program, with currently over 80km of crosslines and centrelines established over the whole mining area and including LW30-31. The monitoring lines typically consist of star pickets or buried star pickets with cast iron covers, nominally spaced at 10m intervals.

Within the Extraction Plan area, three crosslines will be established:

- Crossline 23 Centennial Property over LW28-30
- Crossline 24 Toefpers Road (Crown Rd easement) over LW30-33; and
- Crossline 25 Private access road over LW31.

The monitoring point spacing, survey methods and scheduled visual inspections allow for the detection of both conventional and non-conventional subsidence movements due to any potential changes in geological conditions and mining within steep slope areas within the Extraction Plan Area.

10.1.3 Telstra Phone Lines

The Telstra aerial communication line is located adjacent to a private access road and powerline easement. A pre-mining visual inspection will be conducted.

10.1.4 Dwellings and Property Features

In consultation with each affected landowner, Centennial Mandalong will establish subsidence monitoring on the dwellings, dams and surface improvements to record their pre-mining condition.

SA NSW will also conduct a pre-mining inspection of the dwellings and improvements. SA NSW will provide a copy of the pre-mining condition report to the landowner and Centennial. A pre-mining structural inspection and assessment has also been completed on dwellings and buildings affected by subsidence from LW30-31.

10.1.5 Ausgrid Powerlines

Centennial will record the pre and post condition of Ausgrid power poles using Centennial's 3D scanning theodolite (Trimble SX10) and provide Ausgrid with the pre and post 3D scanning results for evaluation.

10.2 Subsidence Monitoring

10.2.1 Subsidence Monitoring Zones

Mandalong Mine has developed three subsidence monitoring zones to accommodate the development of subsidence from the narrow longwall panels and the bridging effect of the overlying massive strata that provides the reduced levels of subsidence. Unique to Mandalong Mine and as a result of the bridging massive strata, subsidence develops later than in typical longwall operations, with the majority of subsidence realised after the longwall face has retreated approximately 500m.

Additional subsidence also develops over the longwall panel following the extraction of the next adjacent longwall panel. This is due to the compression of the intervening chain pillar and strata. The additional subsidence contributed is typically in the order of 0.30m and is dependent on the geotechnical conditions and the depth of cover. Tilts and strains typically remain unchanged and may be reduced as a result of the decreased vertical subsidence differential between the maingate chain pillar and the centre of the longwall panel. In areas with higher depth of cover over 300m some additional minor settlement may occur following the extraction of the adjacent two to three longwall panels.

Accordingly, with 29 longwall panels now completed, Mandalong has developed three subsidence monitoring zones which define required monitoring activities in actively subsiding and stable areas of the mine as follows below. Full details of proposed monitoring activities within each zone are described within the Subsidence Monitoring Program for each Extraction Plan progressively approved by the mine.

10.2.1.1 Active Subsidence Zone for Visual Monitoring

The "Active Subsidence Zone" for visual monitoring inspections is defined as:

- 100m in advance of the current longwall face position; and
- the following 500m of longwall extraction (i.e. 500m behind the face position).

10.2.1.2 Active Longwall Zone for Crossline Monitoring

The "Active Longwall Subsidence Zone" includes the nominated crosslines for the current longwall panel and the three previous longwall panels.

10.2.1.3 Stable Longwall Subsidence Zone for Crossline Monitoring

The "Stable Longwall Subsidence Zone" represents the stable non-subsiding areas beyond the three previous longwall panels, defined as being from the start of the nominated crosslines up to the Active Longwall Subsidence Zone.

10.2.2 Public Roads

Subsidence monitoring will be conducted pre and post-secondary extraction as detailed in the **Public Roads Management Plan**.

Weekly visual inspections will be undertaken while Crown and private access roads are located within the active subsidence zone (refer **Section 10.2.1**). A monthly visual inspection will then continue on the roads for the following six months or until the weekly visual inspections recommence for the next longwall panel.

The monitoring program is summarised in **Table 12** and detailed in the **Public Roads Management Plan** and **Subsidence Monitoring Program**.

10.2.3 Telstra Communications

Subsidence is not expected to impact the serviceability of the aerial copper cables, pits, conduits and elevated Joints. The management strategy for the Telstra communication network is to monitor subsidence similar to the monitoring for Powerlines as outlined above in **Section 10.2.2**. Any damage to the network will be rectified in accordance with the **Communications Management Plan**.

The monitoring program is summarised in **Table 12** and detailed in the **Communications Management Plan** and **Subsidence Monitoring Program**.

10.2.4 Ausgrid Power Lines

The Ausgrid 11kV powerlines and timber poles supply a limited number of properties within the Extraction Plan Area. The management strategy as outlined in the **Powerline Management Plan** is to monitor subsidence and conduct visual inspections of the affected section of the powerline. Subsidence monitoring will be consistent with Public Roads and Telstra Communications as detailed in **Section 10.2.2.** Weekly and monthly visual inspections will record the condition of the powerline infrastructure.

10.2.5 Steep Slopes

Weekly inspection will be conducted along public and private access roads when steep slopes are located within the active subsidence zone. Post-mining visual inspections will be conducted over the steep slope areas on private property, Centennial property and within Olney State Forest. The monitoring program is summarised in **Table 12** and detailed in the **Land Management Plan** and **Subsidence Monitoring Program**.

10.2.6 Property and Dwellings

The proposed management measures for each property are documented in each of the landowner's PSMP. Copies of the nine PSMPs are included in the Extraction Plan LW30-31 (Volume 3).

The management measures for properties affected by LW30-31 typically consist of monitoring subsidence on the dwellings, dams, surface improvements and drainage channels. A pre-mining inspection will also be conducted by SA NSW to record the pre-mining condition of the dwellings and

improvements. Any necessary remediation works will be undertaken when required or following the completion of subsidence and in consultation with the landowner and SA NSW. The monitoring for private dwellings is summarised in **Table 12, PSMPs** and the **Subsidence Monitoring Program.**

Table 12 –Public Safety Subsidence Effects Monitoring Program Summary

Feature	Location	Monitoring Method	Parameter	Monitoring Frequency and Duration
Crown Roads Public Roads Management Plan **Private Access Roads** PSMP **Telstra Communications Network** Communications Management Plan **Ausgrid Powerlines** Powerline Management Plan	**Crown Roads** Toefpers Rd Kiar Ridge Rd **Private Access Roads** Private properties **Powerline easements** 11kV powerline **Fire Trails and unsealed tracks**	**Crossline 23** Star posts on Centennial property at 10m spacing **Crossline 24 and Crossline 25** Star posts adjacent to road at 10m spacing	Vertical subsidence, tilt and strain.	<u>Baseline</u> Prior to mining LW30 and LW31. <u>Post Mining</u> 2 months after mining LW30 and LW31. <u>Stable Zone</u> 2 yearly.
		Visual Inspection	Presence of mine-induced damage: • surface tensile cracking in pavement • surface compressive shearing in pavement • surface cracking in fill embankments • erosion of local slope stability for fill embankment if cracking occurs • cracking to culverts and under-road pipes • road drainage Risk to public safety Powerline –tilting pole, damage cross arms, insulators; change in conductor sag/tension; ground clearance. Communications - aerial cable, tilting pole; change in conductor sag/tension; ground clearance; damage to connections.	<u>Active Zone</u> Weekly visual inspection while road and adjacent powerlines and communications are within the active subsidence zone. <u>Post Mining</u> Monthly visual inspection for the following six months or until the commencement of weekly inspections for the next longwall panel.
		Telstra Visual inspection of infrastructure conducted by Comms Network Solutions.	Inspection of aerial cables, poles, pits, cables, joints and conduits.	<u>Baseline</u> Prior to mining LW30-31 <u>Post Mining</u> 2 months after mining LW30-31

Feature	Location	Monitoring Method	Parameter	Monitoring Frequency and Duration
		3D Scanning Trimble SX10 Scanning Total Station of each power pole affected by subsidence.	3D scan of power pole, High resolution photograph of pole, Vertical subsidence at pole Tilt of pole, Change in distance between poles.	Baseline Prior to mining impacting poles from the extraction of LW30-31. Post Mining 2 months after mining LW30-LW31.
		Ausgrid	Overhead powerline modelling using LIDAR data.	Baseline Prior to mining LW30 and 31 2015 LIDAR information. Post mining After the completion of mining LW30-31.
Steep Slopes Land Management Plan	Private properties Centennial Olney State Forest	Visual Inspection	Presence of mine-induced damage – surface cracking and rock falls, damage to tracks and drainage	Post Mining Visual inspection following completion of each LW panel.
Private Dwellings PSMP LW30-31	Centennial Ref. MS0025 MS0107 MS0137 MS0139	Monitoring points installed as agreed in consultation with each landowner: • Four points in ground surrounding dwelling • Pins installed at dwelling corners • Points on dams and other structures • As agreed in PSMP	Vertical subsidence, tilt and strain	Baseline Prior to being affected by mining LW30-31 Post Mining 2 months after mining LW30-31

Feature	Location	Monitoring Method	Parameter	Monitoring Frequency and Duration
		Visual Inspection	Pre-mining Structural Assessment by civil/structural engineer SA NSW Pre-mining Inspection and report Centennial Mandalong Inspection	<u>Baseline</u> Prior to being affected by mining LW30-31
			Post-mining SA NSW Inspection (where claim is lodged for subsidence damage) Centennial Mandalong	<u>Post Mining</u> Following completion of subsidence or request by landowner

11 Adaptive Management

In addition to the sub-critical longwall panel design specifically designed to provide reduced levels of subsidence and impact, Centennial Mandalong developed an adaptive management approach designed to avoid repetition of any unpredicted subsidence and or environmental consequences. This system involves the monitoring and evaluation of impacts to built and natural features against the performance indicators defined in **Section 6.4** and contingency plan (TARP) in the event that a performance indicator is exceeded.

12 Contingency Plans

Trigger Action Response Plans (TARP) have been developed using performance indicators for built features. In the event that subsidence monitoring and or visual inspections identify that a performance indicator has been exceeded, Centennial Mandalong will implement the contingency measures as detailed in the TARP for the specific built feature (refer **Appendix 1**).

13 Roles and Responsibilities

The responsibility for implementation, monitoring and review of the Public Safety Management Plan lies with the Mining Approvals Coordinator. The roles and responsibilities for the Public Safety Management Plan are outline in **Table 13**.

Table 13 – Public Safety Management Plan Roles and Responsibilities

Position	Responsibility
Mine Manager	• Authorisation of the Public Safety Management Plan • Ensuring that sufficient resources are available to implement this plan. • Notifying Regulator of Incidents
Mining Approvals Coordinator	Implementation, monitoring and review of this plan, including: • Ensure that the Subsidence Monitoring Program, required inspections, mining notifications are scheduled into the Centennial Compliance Database prior to the commencement of each longwall panel. • Ensuring subsidence monitoring and inspections are conducted at the required schedule and persons conducting monitoring/inspections are trained in the requirements of this plan. • Consulting with the landowners, infrastructure owners and relevant government departments including Ausgrid, Telstra, DPIE, RR and SA NSW. • Review and assess the subsidence monitoring results against the performance measures. • Notification of any exceedance of performance indicators in accordance with the TARPs and management plan. • Coordinating any remedial work as required. • Preparation and submission of formal reporting requirements outlined in this plan. • Review and audit the Public Safety Management Plan.
Subsidence Surveyor	• Establishment of subsidence monitoring in accordance with the Subsidence Monitoring Program. • Ensure all subsidence surveys are conducted in accordance with the approved Subsidence Monitoring Program. • Review and assess subsidence monitoring results. • Notify the Mining Approvals Coordinator of any identified public safety issues. • Provide the monitoring results to the Mining Approvals Coordinator, RR, Ditton Geotechnical Services, Ausgrid, Telstra and SA NSW.
Survey Department	• When required, conduct inspections within the applicable subsidence zone to the standard required, using the subsidence inspection checklist. • Promptly notify the Mining Approvals Coordinator of any issue identified during a subsidence inspection.

14 Reporting

Reporting will be completed in accordance with the Guidelines for the Preparation of Extraction Plans (NSW Department of Planning & Environment, 2015) and WHS (Mines and Petroleum Sites) Regulation requirements, as summarised in **Table 14**.

Table 14 - Reporting Requirements

Report	Trigger	Requirements	Stakeholders
Incident Reporting	Any occasion or incident in accordance with consent condition, WHS Regulations or TARP.	In accordance with requirements of: • Development Consent Schedule 6 Condition 10; or • WHS Regulation (Mines and Petroleum Sites) Clause 128; or • TARP.	RR DPIE Telstra Ausgrid Ditton Geotechnical Services SA NSW CCC
Bi-Monthly Subsidence Impact Reporting	If a new impact is identified, compile after monthly subsidence.	Distinguish impact: • within predictions; • those which exceed predictions but remain within performance measures and/or performance indicators; and • those which exceed performance measures and/or performance indicators. Report to include: • full description; • location identification using aerial photos with longwall layout superimposed; • photos of the impact; and • preliminary characterisation of the impact in accordance with the relevant TARP(s).	
Annual Review	Annual Report required under development consent SSD-5144.	Report to include: • six-monthly reports of impacts and environmental monitoring results; • monitoring results; and • summary of subsidence impacts.	RR DPIE CCC Govt. Agencies Local Councils
Community Consultative Committee (CCC)	CCC meetings are typically held three times per year.	Subsidence and environmental performance are included as an agenda item at each meeting.	CCC
Mining Notifications	One month prior to mining beneath property or built feature.	Scheduled date that the property or built feature will be affected by subsidence and within the Active Subsidence Zone.	Local Councils Telstra, Comms Network Solutions, Ausgrid, Private Landowners

15 Audit and Review

Audit and review procedures are outlined in Centennial Mandalong's Safety Management System that comply with the NSW Work Health and Safety (Mines and Petroleum Sites) Regulations. These procedures are utilised to manage audit and review functions of the Public Safety Management Plan. Refer Document **HSMS-SE-1028- System Evaluation**.

15.1 Audit

The requirements of the Public Safety Management Plan are to be audited annually for compliance and effectiveness during the extraction of LW25-31.

Any non-conformances or deficiencies found during the audit are to be brought to the attention of the System Coordinator so that corrective actions can be outlined. These corrective actions are to be allocated and carried out accordance with **HSMS-SE-1029 - Corrective Action Procedure**.

15.2 Review

The Public Safety Management Plan will be reviewed every three years or in the event that one of the following occurs:

- Stakeholders raise issues that necessitates a review;
- Where unpredicted impacts or consequences have required implementation of contingency actions under this plan;
- Monitoring, incident or audit processes demonstrate a review is required;
- Where triggered by a TARP;
- Where triggered by circumstances in either Clause 10 or Clause 128 of WHS (Mines and Petroleum Sites) Regulation or Clause 38 WHS Regulation;
- Each new Extraction Plan; and
- Change in mine design or layout.

16 Document Control

An integrated Document Control Procedure is incorporated into Centennial Mandalong's Safety Management System. Documents, data and records pertaining to this plan will be managed according to **HSMS-SE-1025-Information Control**.

17 BIBLIOGRAPHY

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APPENDIX 1 – Trigger Action Response Plans

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APPENDIX 1 – Trigger Action Response Plans

Monitoring and Controls	Trigger	Action
Public Roads – LW30 -31		
• **Centennial** to establish subsidence monitoring / inspection sites for public roads prior to mining. • **Centennial** to mark the centreline and edges of current longwall panel one month prior to public road being affected by subsidence. • **Centennial** to notify Crown Lands one month prior to public road affected by subsidence from each longwall panel. • **Centennial** to conduct weekly visual inspections of public roads when located within Active Subsidence Zone. Record results on the Subsidence Inspection Checklist. • **Centennial** to conduct post-mining surveys following the development of subsidence (majority of subsidence developed when LW is completed or LW face is 800m past feature). • **Centennial** to provide pre and post mining subsidence monitoring results to stakeholders. **CONTROLS** Flood Modelling and Assessment LW30-31 (Umwelt 2020) determined that there was no predicted increase in flood hazard category on the access road at both the 1 year and 100 year ARI Storm Events.	**LEVEL 1 – LOW** **Operations within prediction and approved impact** • Development of subsidence and impact as expected. • Subsidence within predicted range (U95% CL). • Negligible visible impact on gravel access roads. • Possible minor tensile and compressive cracking to pavement not requiring immediate repairs.	• **Centennial** to conduct post mining inspection and subsidence monitoring and provide results to the **Landowner, RR** and **Crown Lands.**
	LEVEL 2 – MEDIUM **Operations within approved impact but exceed or potentially exceed predictions** • Development of subsidence exceeding or potentially exceeding prediction (Upper 95% Confidence Limits). • Tensile and compressive strains may increase 2 times predicted values due to crack development. • Vertical subsidence greater than predicted. • Typically minor impact to gravel access roads. • Cracking may be visible on roads – development of minor compression hump near centre of longwall and minor tensile cracking to pavement at edges. • Repairs to pavement may be required to reseal pavement.	• **Centennial** to advise **Landowner** and **Crown Lands** of observed damage to the public road. • **Centennial** to erect warning signs near affected area of road if necessary. • **Centennial** to conduct post mining inspection and subsidence monitoring and provide results to the **Landowner, RR** and **Crown Lands.** • **Centennial** to conduct repairs to damaged pavement.
	LEVEL 3 – HIGH **Operations exceed approved impact** • Development of subsidence and impact greater than expected (Upper 95% Confidence Limits). • Cracking to road pavement requiring immediate repairs to ensure public safety. • Repairs required, reshaping road, restoring drainage and resealing pavement.	• **Centennial** to immediately advise **Landowner** and **Crown Lands** of observed damage to the public road. • **Centennial** to erect warning signs near affected area of road. • **Centennial** to conduct post mining inspection and subsidence monitoring and provide results to **Landowner, RR** and **Crown Lands.** • **Centennial** to conduct repairs to damaged pavement. • **Centennial** to review results and predictions as per Extraction Plan. • **Centennial** to notify external stakeholders including relevant government agencies in accordance with **Incident Reporting** S6 Condition 10 and WHS Regulations.

Monitoring and Controls	Trigger	Action / Response
Powerlines – LW30-31		
• **Centennial** to establish subsidence monitoring and inspection sites for public / private roads and adjacent powerlines prior to mining. • **Centennial** to conduct pre and post mining 3D scanning and survey of power poles. • **Ausgrid** to model and install mitigation works on affected section of the powerline. • **Centennial** to mark the centreline and edges of current longwall panel on public/private road pavement one month prior to public road and powerlines being affected by subsidence. • **Centennial** to notify Ausgrid one month prior to powerline being affected by subsidence from each longwall panel. • **Centennial** to conduct weekly visual inspections of public/private roads and powerlines located along road easement when influenced by subsidence within the Active Longwall Subsidence Zone. Record results on the Subsidence Inspection Checklist. • **Centennial** to conduct monthly visual inspections for the following six months and record results on the Subsidence Inspection Checklist. • **Centennial** to be in regular contact with private property owner during the development of subsidence. • **Centennial** to conduct post-mining surveys following the development of subsidence (majority of subsidence developed when LW is completed or LW face is 800m past feature). • **Centennial** to provide pre and post mining subsidence monitoring results to Ausgrid, RR and SANSW.	**LEVEL 1 – LOW** **Operations within prediction and approved impact** • Development of subsidence and impact as expected. • Subsidence within predicted range (Upper 95% CL). • No noticeable impact to the surface or powerline network. • Damage powerlines unlikely.	• **Centennial** to conduct post mining inspection and subsidence monitoring and provide results to the Ausgrid, RR and SA NSW**.**
	LEVEL 2 – MEDIUM **Operations within approved impact but exceed or potentially exceed predictions** • Development of subsidence exceeding or potentially exceeding prediction (greater than Upper 95% CL). • Minor impact to powerline network • No immediate mitigation / remediation works on poles, insulators and conductors is considered necessary.	• **Centennial** to inspect powerlines. • **Centennial** to notify **Ausgrid** and **RR** of increased subsidence and any observed impact to powerline network. • **Ausgrid** to conduct inspection and investigate the impact of increased subsidence on powerline network. • **Ausgrid** to conduct repairs if considered necessary. • **Centennial** to advise **SA NSW** of potential repairs. • **Centennial** to review results and predictions as per Extraction Plan LW30-31.
	LEVEL 3 – HIGH **Operations exceed approved impact** • Development of subsidence and impact greater than expected. • Damage to powerline network that causes loss or potential loss of service.	• **Centennial** to immediately advise **Ausgrid** of observed damage to the powerline network. • **Ausgrid Emergency Service -** 1800 627 005 • **Ausgrid** to inspect any damage to powerline network and arrange repairs. • **Centennial** to promptly notify **RR** and **SA NSW** of increased subsidence and observed impact to powerlines. • **Centennial** to conduct post mining inspection and subsidence monitoring and provide results to **Ausgrid, RR** and the **SANSW.** • **Centennial** to review results and predictions as per Extraction Plan LW30-31. • **Centennial** to notify external stakeholders and government agencies in accordance with **Incident Reporting** requirements DC S6 Condition 10 and WHS Regulations.

Monitoring and Controls	Trigger	Action
Built Feature – Telstra Communications Network **CAN Local Aerial copper cable 10/0.64**		
• **Centennial** established subsidence monitoring / inspection sites for private access roads and adjacent communications lines • **Centennial** to mark the centreline and edges of current longwall panel on road pavement one month prior to private access roads and communications being affected by subsidence. • **Centennial** to notify Telstra one month prior to communications being affected by subsidence from each longwall panel. • **Centennial** to conduct weekly visual inspections of private roads and communications located along road and powerline easement when influenced by subsidence within the Active Subsidence Zone. Record results on the Subsidence Inspection Checklist. • **Centennial** to conduct monthly visual inspections for the following six months or until next longwall, and record results on the Subsidence Inspection Checklist. • **Comms Network Solutions** to inspect cable after completion of longwall panel. • **Centennial** to conduct post-mining surveys following the development of subsidence (majority of subsidence developed after 2 months) when LW is completed. • **Centennial** to provide pre and post mining subsidence monitoring results to Telstra, RR and SA NSW.	**LEVEL 1 – LOW** **Operations within predicted subsidence and impact.** • Development of subsidence and impact as expected. • Subsidence prediction – tilt and strains within Upper 95% Confidence Limits • No interruption of service. • Continue operations and monitoring program • Unlikely remedial work will be required.	• **Centennial** to conduct post mining inspection and provide subsidence monitoring results to **Telstra, RR and SA NSW.**
	LEVEL 2 – MEDIUM **Operations within approved impacts but exceed or potentially exceed predictions** • Development of subsidence exceeding or potentially exceeding subsidence prediction (Upper 95% Confidence Limits). • Tensile and compressive strains may increase 2 to 3 times predicted values due to crack development. • No or minor impact to communication network. • No interruption of service. • Continue operations and monitoring program	• **Centennia**l to notify **Telstra Integrity Services** and **Comms Network Solutions** that subsidence predictions have exceeded or potentially exceeded predictions. • **Comms Network Solutions** to inspect Telstra network for any damage and provide report to **Centennial** and **Telstra**. • **Centennial** to conduct post mining inspection and provide subsidence monitoring results to **Telstra, RR** and **SA NSW.**
	LEVEL 3 – HIGH **Operations exceed approved impact** • Development of subsidence and impact greater than expected (Upper 95% Confidence Limits). • Damage to aerial copper cable phone line causing interruption to Telstra communications service.	• **Centennial** to notify **Telstra Integrity Services** and **Comms Network Solutions** that subsidence predictions have exceeded. • **Centennial** to provide notification to **RR** and **SA NSW** • **Centennial** to arrange a Review Meeting to review survey results, cable inspections and proposed action to remediate damage to communication network. • **Centennial** to notify external stakeholders including relevant government agencies in accordance with **Incident Reporting** S6 Condition 10 and WHS Regulations. • **Centennial** to conduct review and predictions as per adaptive management process as detailed in the Extraction Plan LW25-31.

Monitoring and Controls	Trigger	Action
Property Access Roads		
• **Centennial** to conduct flood modelling and assessment to identify potential changes to flooding as per DC Schedule 4 Condition 6(h). • **Centennial** to conduct property inventory and detail predicted impacts from subsidence in PSMP. • **Centennial** to arrange **SA NSW** pre-mining inspection of property and improvements to detail pre-mining condition. • **Centennial** to establish subsidence monitoring / inspection sites on property access if an increase in flood hazard is predicted. To be arranged in consultation with **Landowner**. • **Centennial** to conduct post-mining surveys following the development of subsidence (majority of subsidence developed when LW is completed or LW face is 800m past feature). • **Centennial** to provide pre and post mining subsidence monitoring results to **Landowner**, **RR** and **SA NSW**. **CONTROLS** **Flood Modelling and Assessment LW30-31 (Umwelt 2020)** determined that there was no predicted increase in flood hazard category on the access road at both the 1 year and 100 year ARI Storm Events.	**LEVEL 1 – LOW** **Operation within prediction and approved impact** • Development of subsidence and impact as expected. • Subsidence within predicted range (U95% CL). • Negligible visible impact on gravel access roads. • Possible hairline cracking on sealed roads. • No change to flood hazard category.	• **Centennial** to conduct post mining inspection and subsidence monitoring and provide results to the **Landowner, RR** and **SA NSW**. • **Centennial** to assist landowner with any SA NSW claim for damage to property. • **SA NSW** to conduct post mining inspections and arrange any necessary repairs in consultation with **Landowner**.
	LEVEL 2 – MEDIUM **Operations within approved impact but exceed or potentially exceed predictions** • Development of subsidence exceeding or potentially exceeding prediction (Upper 95% Confidence Limits). • Minor cracking to gravel access roads, but remaining safe, serviceable and repairable. • Tensile cracking or minor compression humps may develop on sealed roads. Repairs may be required to reseal pavement. • No change to flood hazard category.	• **Centennial** to conduct post mining inspection and subsidence monitoring and provide results to the **Landowner, RR** and **SA NSW**. • **Centennial** to assist landowner with any SA NSW claim for damage to access road. • **Centennial** to arrange prompt repairs to access roads to make safe and allow access to the property. • **SA NSW** to conduct post mining inspections and arrange any necessary repairs in consultation with the **Landowner**.
	LEVEL 3 – HIGH **Operations exceed approved impact** • Development of subsidence and impact greater than predicted • Tensile cracks and/or compression humps develop on access roads that need repairing to ensure public safety. • Tensile cracks and/or compression humps develop on sealed roads. • Repairs required, reshaping road, restoring drainage and resealing pavement.	• **Centennial** to conduct post mining inspection and subsidence monitoring and provide results to the **Landowner, RR** and **SA NSW.** • **Centennial** to arrange prompt temporary repairs to make road safe and allow access to property. • **Centennial** to assist landowner with any SA NSW claim for damage to property. • **SA NSW** to conduct post mining inspections and arrange any necessary repairs in consultation with the **Landowner**. • **Centennial** to reassess flood hazard using actual subsidence data to determine if there is an increase in flood hazard at 1 year and 100 year ARI Storm Events. • If flood modelling indicates an increase in flood hazard, **Centennial** to commence negotiations and carry out works as agreed by **Landowner** to provide suitable access to the property. • **Centennial** to notify **external stakeholders including government agencies** in accordance with Incident Reporting S6 Condition 10. • **Centennial** to review results and predictions as per Extraction Plan.

Monitoring and Controls	Trigger	Action
Steep Slopes		
• **Centennial** to conduct pre mining steep slope inspection and assessment by Geotechnical Engineer. • **Centennial** to conduct subsidence monitoring and inspections as per the Public Safety Management Plan and Subsidence Monitoring Program. • **Centennial** to conduct weekly visual inspections when steep slopes are within active subsidence zone. • **Centennial** to provide pre and post mining subsidence monitoring results to **RR** and **Landowners**.	**LEVEL 1 – LOW** **Operation within prediction and approved impact** • Development of subsidence and impact as expected. • Subsidence within predicted range (Upper 95% Confidence Limits). • Negligible visible impact on gravel access roads. • Negligible impact to steep slopes. • Negligible indications down slope rock or bolder movements. • No rock mass instability. • Minor opening of rock joints that does not cause dislodgement of rocks.	• **Centennial** to conduct weekly visual inspections of land when steep slope zones are located in active subsidence zone and along pubic access roads. • **Centennial** to conduct post mining inspection and subsidence monitoring and provide results to the **RR** and **Landowner**.
	LEVEL 2 – MEDIUM **Operations within approved impact but exceed or potentially exceed predictions** • Development of subsidence exceeding or potentially exceeding prediction (Upper 95% Confidence Limits). • Cracking to gravel access roads, but remaining safe, serviceable and repairable. • Cracking to surface not requiring major repairs or posing further risk to public safety. • Opening of rock joints not likely to cause dislodgement of rocks.	• **Centennial** to conduct post mining inspection and subsidence monitoring and provide results to the **RR** and **Landowner**. • **Centennial** to inspect and erect warnings signs or barricades as per Public Safety Management Plan. • **Centennial** to notify Landowner • **Centennial** to arrange repairs to access roads or areas of potential rock instability in consultation with landowner. • **Centennial** to notify Principal Subsidence Engineer of higher than expected subsidence. • **Centennial** to arrange a Geotechnical Engineer to inspect any areas of suspected rock mass instability in consultation with **Landowner**. • **Centennial** to review results and predictions as per Extraction Plan.
	LEVEL 3 – HIGH **Operations exceed approved impact** • Development of subsidence and impact greater than expected. • Surface cracking visible that may be dangerous to public safety. • Opening of rock joints that may cause dislodgement of rocks. • Rock fall and rollouts • Overhang collapse • Landslide • Risks to public safety	• **Centennial** to conduct post mining inspection and subsidence monitoring and provide results to the **RR** and **Landowner**. • **Centennial** to inspect and erect warnings signs or barricades as per Public Safety Management Plan. • **Centennial** to notify **Landowner**. • **Centennial** to notify Principal Subsidence Engineer of higher than expected subsidence and impact. • **Centennial** to notify **DPIE** as per S4 Condition 2 SSD-5144. • **Centennial** to arrange immediate repairs to dangerous surface cracking (eg backfilling) any necessary repairs in consultation with the **Landowner** and **RR**. • **Centennial** to arrange a Geotechnical Engineer to inspect any areas of suspected rock mass instability. • **Centennial** to notify **external stakeholders including government agencies** in accordance with Incident Reporting S6 Condition 10. • **Centennial** to review results and predictions as per Extraction Plan.

Monitoring	Trigger	Action
Dwelling Strain		
• **Centennial** to conduct property inventory and detail predicted impacts from subsidence in PSMP as per DC Schedule 4 Condition 6(h). • **Centennial** to arrange pre-mining structural inspection of dwellings and buildings as per DC Schedule 4 Condition 6(h). Assessment includes structural integrity and any potential risks to health and safety. • **Centennial** to arrange SA NSW pre-mining inspection of dwelling and improvements. • **Centennial** to establish subsidence monitoring on dwelling and improvements in consultation with **Landowner.** • **Centennial** to conduct post-mining surveys following the development of subsidence (majority of subsidence developed when LW face is 800m past dwelling). • **Centennial** to provide subsidence monitoring results to **Landowner**, **RR** and **SA NSW**.	**LEVEL 1 – LOW** **Operation within prediction and approved impact** • Development of subsidence (U95% CL) and impact as expected. • Strain < 5mm/m Strain Category 0-2 (AS2870-2011). • No noticeable impact to dwelling. • Possible hairline to fine cracks noticeable that can be easily filled. • Possible slightly sticking doors or windows.	• **Centennial** to conduct subsidence monitoring on dwelling to determine strains and provide results to the **Landowner, RR** and **SA NSW.** • **Centennial** to assist landowner with any claim for damage to property. • **SA NSW** to conduct post mining inspections and arrange any necessary repairs in consultation with **Landowner**.
	LEVEL 2 – MEDIUM **Operations within approved impact but exceed or potentially exceed predictions** • Development of subsidence greater than predicted (U95% CL), but impact as expected • Strains approaching 5 mm/m Strain Category 0-2 (AS2870-2011). • Minor impact to dwelling. • Possible hairline to fine cracks noticeable that can be easily filled. • Possible slightly sticking doors or windows.	• **Centennial** to conduct subsidence monitoring on dwelling to determine strains and provide results to the **Landowner, RR** and **SA NSW.** • **Centennial** to assist landowner with any SA NSW claim for damage to property. • **Centennial / SA NSW** to arrange a structural inspection of the dwelling to insure that dwelling does not pose a risk to health and safety of occupants. • **SA NSW** to conduct post mining inspections and arrange any necessary repairs in consultation with Landowner. • **Centennial** to review results and predictions as per Extraction Plan.
	LEVEL 3 – HIGH **Operations exceed approved impact** • Development of subsidence and impact greater than expected and beyond SSR • Strain >5mm/m Beyond SSR Strain Category 3 to 5 (AS2870-2011) • Crack width > 5mm/to 25mm o Windows and door frames distorting o Service pipes disrupted o Roof and floor beams lose bearing o Windows broken o Severe buckling and bulging of roof and walls o Will require partial or complete rebuild.	• **Centennial** to conduct subsidence monitoring on dwelling to determine tilt and provide results to the **Landowner, RR** and **SA NSW**. • **Centennial** to commence negotiations with **Landowner** as per the Acquisition and Compensation process consistent with DC Schedule 5 Conditions 3 and 4. • **Centennial / SA NSW** to arrange structural inspection to assess if dwelling is repairable. • **Centennial** to arrange alternate temporary accommodation for occupants if necessary. • **Centennial** to notify **external stakeholders including government agencies** in accordance with Incident Reporting S6 Condition 10. • **Centennial** to review results and predictions as per Extraction Plan.

Monitoring	Trigger	Action
Dwelling Tilt		
• **Centennial** to conduct property inventory and detail predicted impacts from subsidence in PSMP as per DC Schedule 4 Condition 6(h). • **Centennial** to arrange pre-mining structural inspection of dwellings and buildings as per DC Schedule 4 Condition 6(h).). Assessment includes structural integrity and any potential risks to health and safety. • **Centennial** to arrange **SA NSW** pre-mining inspection of dwelling and improvements. • **Centennial** to establish subsidence monitoring on dwelling and improvements in consultation with **Landowner** • **Centennial** to conduct post-mining surveys following the development of subsidence (majority of subsidence developed when LW face is 800m past dwelling). • **Centennial** to provide pre and post mining subsidence monitoring results to **Landowner**, **RR** and **SA NSW**.	**LEVEL 1 – LOW** **Operation within prediction and approved impact** • Development of subsidence (U95% CL) and impact as expected • Tilt < 5mm/m Tilt Category A (AS2870-2011) • No noticeable impact to dwelling. • Possible sticking doors or windows • Unlikely remedial work will be required	• **Centennial** to conduct subsidence monitoring on dwelling to determine tilt and provide results to the **Landowner**, **RR** and **SA NSW**. • **Centennial** to assist landowner with any claim for damage to property. • **SA NSW** to conduct post mining inspections and arrange any necessary repairs in consultation with **Landowner**.
	LEVEL 2 – MEDIUM **Operations within approved impact but exceed or potentially exceed predictions** • Development of subsidence greater than predicted (U95% CL), but impact as expected • Tilt 5 to 7mm/m Tilt Category B (AS2870-2011) • Roof drainage overflowing or wet areas not draining effectively • Adjustment of roof drainage or wet areas might be required	• **Centennial** to conduct subsidence monitoring on dwelling to determine tilt and provide results to the **Landowner, RR** and **SA NSW**. • **Centennial** to assist landowner with any claim for damage to property. • **Centennial / SA NSW** to arrange a structural inspection of the dwelling to insure that dwelling does not pose a risk to health and safety of occupants. • **SA NSW** to conduct post mining inspections and arrange any necessary repairs in consultation with **Landowner** and **Centennial** • **Centennial** to provide alternate water supply if required.
	LEVEL 3 – HIGH **Operations exceed approved impact** • Development of subsidence and impact greater than expected and beyond Safe, Serviceable and Repairable (SSR). • Tilt >7mm/m Beyond SSR. Tilt Category C & D (AS2870-2011). • Tilt on dwelling may be noticeable. • Minor structural work might be required to rectify tilt. • Considerable structural work may be required to rectify tilt >10mm/m.	• **Centennial** to conduct subsidence monitoring on dwelling to determine tilt and provide results to the **Landowner, RR** and **SA NSW**. • **Centennial / SA NSW** to arrange structural inspection to assess if the dwelling is safe, serviceable and repairable. • **Centennial** to commence negotiations with **Landowner** as per the Acquisition and Compensation process consistent with DC Schedule 5 Conditions 3 and 4. • **Centennial** to arrange alternate temporary accommodation for occupants if necessary. • **Centennial** to notify **external stakeholders including government agencies** in accordance with Incident Reporting S6 Condition 10. • **Centennial** to provide alternate water supply if required. • **Centennial** to review results and predictions as per Extraction Plan.

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