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Tahmoor Coal Pty Ltd

PUBLIC SAFETY MANAGEMENT PLAN

Tahmoor North - Western Domain
Longwalls West 3 and West 4

May 2021

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Document Control

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1 Introduction

1.1 Background

The Tahmoor Coal Mine (Tahmoor Mine) is an underground coal mine located approximately 80 kilometres (km) south-west of Sydney between the towns of Tahmoor and Bargo, New South Wales (NSW) (refer to **Figure 1-1**). Tahmoor Mine produces up to three million tonnes of Run of Mine coal per annum from the Bulli Coal Seam. Tahmoor Mine produces a primary hard coking coal product and a secondary higher ash coking coal product that are used predominantly for coke manufacture for steel production. Product coal is transported via rail to Port Kembla and Newcastle for Australian domestic customers and export customers.

The Tahmoor Mine has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since Tahmoor Mine commenced in 1979 using bord and pillar mining methods, and via longwall mining methods since 1987. Tahmoor Coal is a wholly owned entity within the SIMEC Mining Division of the GFG Alliance group.

Tahmoor Coal has previously mined 33 longwalls to the north and west of Tahmoor Mine's current pit top location. The current mining area, the 'Western Domain', is located north-west of the Main Southern Rail between the townships of Thirlmere and Picton. The Western Domain is within the Tahmoor North mining area and is within Mining Lease (ML) 1376 and ML 1539.

The mine plan for the Western Domain includes four longwalls - Longwalls West 1 to West 4. An Extraction Plan for the first two longwalls in the Western Domain, Longwalls West 1 and West 2 (LW W1-W2), was approved by the NSW Department of Planning, Industry and Environment (DPIE) on 8 November 2019. Longwalls West 1 (LW W1) was the first longwall to be extracted in the Western Domain and was completed on 6 November 2020. The extraction of Longwalls West 2 (LW W2) commenced on 7 December 2020.

The proposed Longwalls West 3 and West 4 (LW W3-W4) are an extension of LW W1-W2 and will be the focus of the current Extraction Plan. LW W3-W4 are illustrated in **Figure 1-2**.

1.2 Purpose

This Public Safety Management Plan (PSMP) has been prepared to support an Extraction Plan for the secondary extraction of coal from LW W3-W4. This PSMP has been designed to provide the management strategies, controls and monitoring programs to be implemented for the management of potential safety hazards to the public by the secondary extraction of LW W3-W4.

The PSMP includes management of health and safety risk due to:

- Potential subsidence impacts on built features;
- Potential instability of cliffs or steep slopes caused by subsidence;
- Deformations or fracturing of any land caused by subsidence, and
- Any other impacts of subsidence.

1.3 Scope

The Study Area applicable to this PSMP consists of a combination of the Predicted 20 millimetres (mm) Total Subsidence Contour and the 35^{o} Angle of Draw Line, as shown on **Figure 1-2**.

This PSMP addresses management measures applicable to the Study Area, such as:

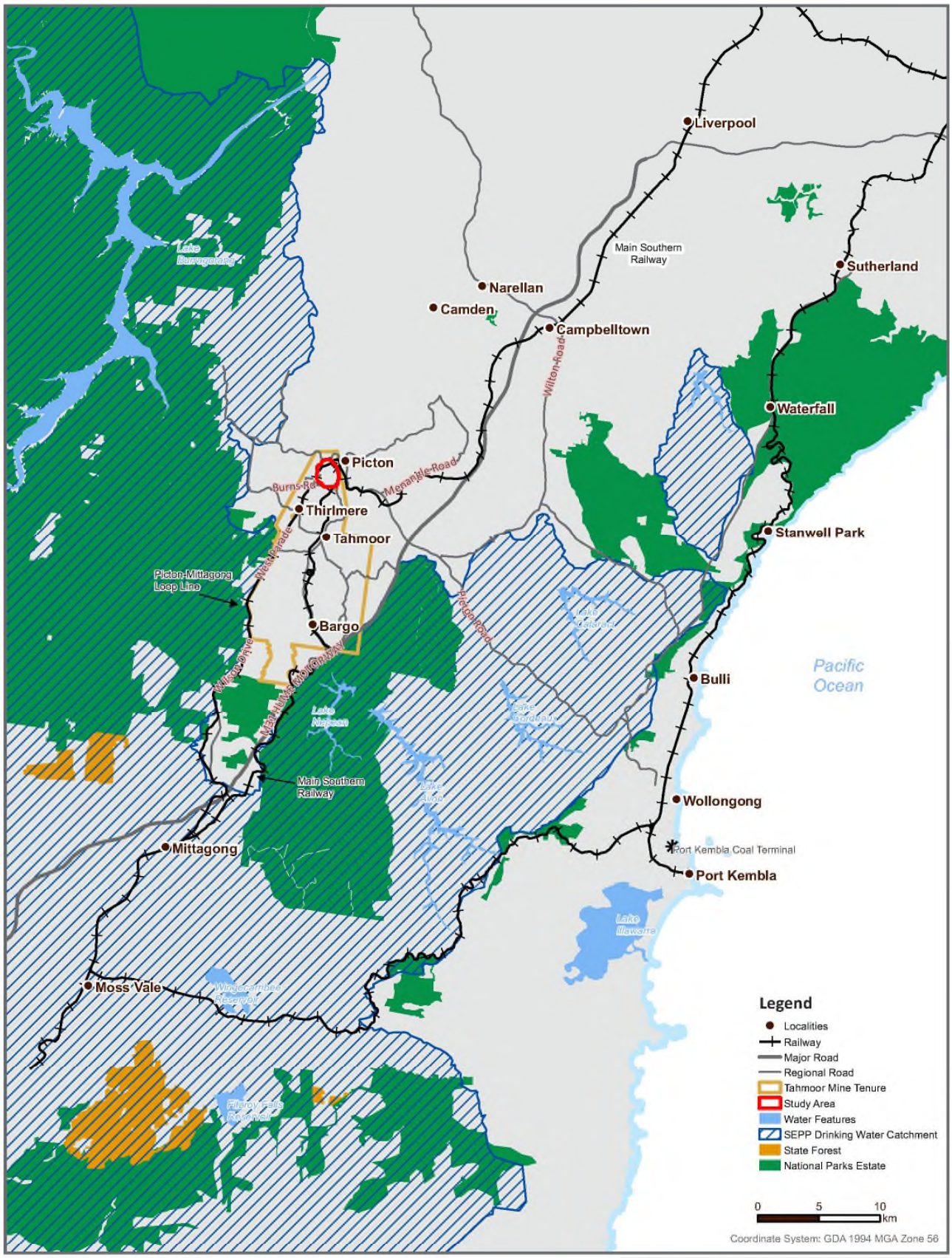
- Monitoring of areas posing safety risks;
- Erection of warning signs and possible entry or use restrictions;
- Backfilling of surface cracks and/or re-profiling of humps and swales on tracks and roads;
- Infilling of pot holes;
- Securing of potentially unstable structures and rock masses;
- Identification of potential flood-related impacts that may pose a risk to public safety; and
- Provision of regular updates regarding mining progress to the community where management of public safety is a significant issue.

Public safety management within the Study Area is managed by this PSMP and individual Infrastructure Management Plans.

This PSMP also:

- Addresses specific requirements set by DA 67/98 Condition 13H(vii)(g) (refer to **Section 2.1.1**);
- Addresses related regulatory requirements (refer to **Section 2.2**); and
- Addresses the monitoring and management of potential subsidence-related impacts to public safety (refer to **Section 4** and **Section 5**).

This PSMP has been prepared based on the contents of the Subsidence Predictions and Impact Assessment (MSEC, 2021) (**Volume 1**).



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REGIONAL CONTEXT

Tahmoor North Western Domain Longwalls West 3 and West 4 Extraction Plan

FIGURE 1-1

Date: 22/12/2020

Data Sources:
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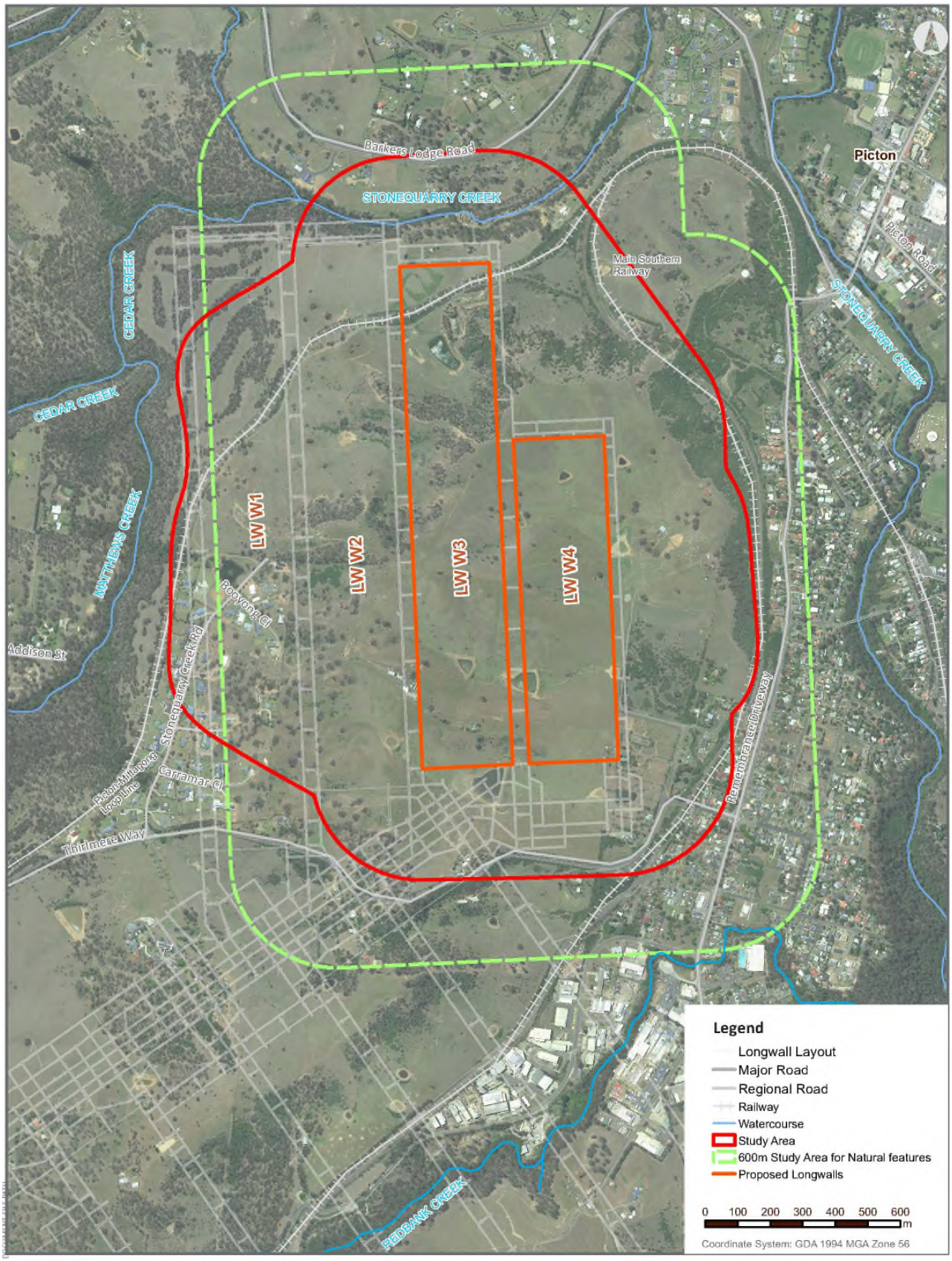

EXTRACTION PLAN STUDY AREA

Tahmoor North Western Domain Longwalls West 3 and West 4 Extraction Plan

FIGURE 1-2

Date: 10/05/2021

Data Sources:
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Aerial Imagery: © Photomapping Services (November 2018)

2 Regulatory Requirements

2.1 Project Approval

2.1.1 Development Consent

Tahmoor Coal's operations are conducted in accordance with applicable Commonwealth and State environmental, planning, mining safety, and natural resource legislation. A register of relevant environmental legislative and regulatory requirements is maintained by Tahmoor Coal in a compliance database.

The proposed LW W3-W4 will be extracted in the Tahmoor North mining area under Development Consents DA 57/93 and DA 67/93, as discussed further in **Section 3.2.1** of the Extraction Plan Main Document.

DA 67/98 provides the conditional planning approval framework for mining activities in the Western Domain to be addressed within an Extraction Plan and supporting management plans. Conditions relevant to this PSMP from DA 67/98 are detailed in **Table 2-1**.

Table 2-1 Key Conditions from DA 67/98 regarding Public Safety

<table>
<tr><th>Condition</th><th colspan="2">Condition Requirement</th><th>Section Addressed</th></tr>
<tr><td colspan="4">Performance Measures – Built Features</td></tr>
<tr><td>13E</td><td colspan="2">The Applicant must ensure that extraction of Longwall 33 and subsequent longwalls does not cause any exceedances of the performance measures in Table 2.
Notes
• The Applicant will be required to define more detailed performance measures in the Built Features Management Plans or Public Safety Management Plan.
• Requirements regarding safety or serviceability do not prevent 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 Coal Mine Subsidence Compensation Act 2017.</td><td rowspan="4">Section 3
Infrastructure Management Plans</td></tr>
<tr><td rowspan="3">Table 2</td><td>Feature</td><td>Performance Measure</td></tr>
<tr><td colspan="2">Key Public Infrastructure</td></tr>
<tr><td>• Main Southern Railway;
• Picton Tunnel;
• Picton-Mittagong Loop Line; and
• Electricity transmission lines and towers.</td><td>• Always safe and serviceable.
• Damage that does not affect safety or serviceability must be fully repairable, and must be fully repaired.</td></tr>
</table>

Condition	Condition Requirement		Section Addressed
	Other Infrastructure		
	• Electricity distribution lines, poles and associated towers; • Unsealed roads and road culverts, fire trails, fences and other built features; and • Other public infrastructure.	• Always safe. • Serviceability should be maintained wherever practicable. • Loss of serviceability must be fully compensated. • Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.	
	• Privately-owned residences.		
	• Other privately-owned built features and improvements, including farm dams, swimming pools, tennis courts, roads, tracks and fences		
	Public Safety		
	Public Safety	• Negligible additional risk.	
	Notes: • *The Applicant will be required to define more detailed performance measures in the Built Features Management Plans or Public Safety Management Plan.* • *Requirements regarding safety or serviceability do not prevent 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 Coal Mine Subsidence Compensation Act 2017.*		
13F	Any dispute between the Applicant and the owner of any built feature over the interpretation, application or implementation of the performance measures in Table 2 is to be settled by the Secretary, following consultation with the Resources Regulator. Any decision by the Secretary shall be final.		Noted.
Extraction Plan			
13H(vi)	describe in detail the performance indicators to be implemented to ensure compliance with the performance measures in Table 1 and Table 2, and manage or remediate any impacts and/or environmental consequences;		Section 3 Infrastructure Management Plans
13H(vii)(g)	Public Safety Management Plan which has been prepared in consultation with the Resources Regulator, which ensures public safety and manages access on the site;		This document Section 2.4
13H(vii)(h)	Trigger Action Response Plan/s addressing all features in Table 1 and Table 2, which contain:		Infrastructure Management Plans
	• appropriate triggers to warn of increased risk of exceedance of any performance measure; and		
	• specific actions to respond to high risk of exceedance of any performance measure to ensure that the measure is not exceeded;		

Condition	Condition Requirement	Section Addressed
	• an assessment of remediation measures that may be required if exceedances occur and the capacity to implement the measures; and	
	• adaptive management where monitoring indicates that there has been an exceedance of any performance measure in Table 1 or Table 2, or where any such exceedance appears likely; and	
13H(vii)(i)	Contingency Plan that expressly provides for:	Infrastructure Management Plans
	• adaptive management where monitoring indicates that there has been an exceedance of any performance measure in Table 1 and Table 2, or where any such exceedance appears likely; and	
	• an assessment of remediation measures that may be required if exceedances occur and the capacity to implement those measures; and	
	• includes a program to collect sufficient baseline data for future Extraction Plans.	

2.1.2 Extraction Plan Guidelines

The Extraction Plan and PSMP have been prepared in accordance with the DPIE *Draft Guidelines for the Preparation of Extraction Plans V5* (DPE, 2015), as illustrated in **Table 2-2**.

Table 2-2 Extraction Plan Guideline Requirements for Public Safety Management Plan

Extraction Plan Guideline Content Requirements	Section(s) Addressed
An overview of all landscape features, heritage sites, environmental values, built features or other values to be managed under the component plan.	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 2.1.1, Section 4.1
Setting out clear objectives to ensure the delivery of the performance measures and all other relevant statutory requirements (including relevant safety legislation).	Section 2, Section 3 Infrastructure Management Plans
Proposing performance indicators to establish compliance with these performance measures and statutory requirements.	Section 3.1 Infrastructure Management Plans
Describe the landscape features, heritage sites and environmental values to be managed under the component plan, and their significance.	Section 3 Infrastructure Management Plans
Describe all currently-predicted subsidence impacts and environmental consequences relevant to the features, sites and values to be managed under the component plan.	Section 3 Infrastructure Management Plans
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.	Infrastructure Management Plans
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 4.2 Infrastructure Management Plans

Extraction Plan Guideline Content Requirements	Section(s) Addressed
Fully describing the proposed monitoring of subsidence impacts and environmental consequences.	Section 4.2
Describe the proposed monitoring of the success of remediation measures following implementation.	Infrastructure Management Plans
Describe adaptive management proposed to avoid repetition of unpredicted subsidence impacts and/or environmental consequences.	Infrastructure Management Plans
Describe contingency plans proposed to prevent, mitigate or remediate subsidence impacts and/or environmental consequences which substantially exceed predictions or which exceed performance measures.	Infrastructure Management Plans
Listing responsibilities for implementation of the plan.	Section 6.3 Infrastructure Management Plans
An attached Trigger, Action, Response Plan (effectively a tabular summary of most of the above).	Infrastructure Management Plans
Management of health and safety risks due to potential subsidence impacts on built features	Section 2.4 Infrastructure Management Plans
Management of health and safety risks due to potential instability of cliff formations or steep slopes caused by subsidence	Section 3 Land Management Plan
Management of health and safety risks due to deformations or fracturing of any land caused by subsidence	Section 4
Management of health and safety risks due to any other impacts of subsidence	Section 5

2.2 Relevant Legislation

2.2.1 Work, Health and Safety Legislation

All persons conducting a business or undertaking (PCBUs), including mine operators and contractors, have a primary duty of care to ensure the health and safety of workers they engage, or whose work activities they influence or direct. The responsibilities are legislated in the *Work Health and Safety Act 2011* and the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and associated regulations (collectively referred to as the 'WHS laws').

As outlined in the Guide by the NSW Department of Trade & Investment Mine Safety:

"a PCBU must manage risks to health and safety associated with mining operations at the mine by:

- *complying with any specific requirements under the WHS laws;*
- *identifying reasonably foreseeable hazards that could give rise to health and safety risks;*
- *ensuring that a competent person assesses the risk;*
- *eliminating risks to health and safety so far as is reasonably practicable;*
- *minimising risks so far as is reasonably practicable by applying the hierarchy of control measures, any risks that are not reasonably practical to eliminate;*
- *maintaining control measures; and*
- *reviewing control measures.*

The mine operator's responsibilities include developing and implementing a safety management system that is used as the primary means of ensuring, so far as is reasonably practicable:

- *the health and safety of workers at the mine, and*
- *that the health and safety of other people is not put at risk from the mine or work carried out as part of mining operations."*

Detailed guidelines have also been released by the Department of Regional NSW - Resources Regulator (DPE, 2017).

2.2.2 Work Health and Safety (Mines and Petroleum Sites) Regulation 2014

The *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* commenced on 1 February 2015 and contains specific regulations in relation to mine subsidence. Clause 13 of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 requires the operator of a mine to establish a Safety Management System (SMS) for the mine.

A SMS for a mine is the primary means of ensuring the safe operation of a mine. It brings together a number of procedures and policies to enable a mine operator to follow a systematic approach to achieving and monitoring an effective level of health and safety.

The SMS is used as the primary means of ensuring the health and safety of workers at the mine.

Establishing an SMS requires a mine operator to:

- Identify all Principal Mining Hazards (PMH);
- Assess the risks;
- Prepare a Principal Hazard Management Plan (PHMP) for each PMH; and
- Prepare Principal Control Plans (PCP).

Division 2 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* requires the development of PHMP, which requires the mine operator to:

- Identify all principal hazards associated with mining operations or petroleum operations at the mine or petroleum site; and
- Conduct, in relation to each principal 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 hazard.

Under Schedule 1, subsidence is identified as a PMH requiring a PHMP.

2.2.3 Subsidence Principal Hazard Management Plan

Tahmoor Coal maintains a Subsidence Principal Hazard Management Plan that is reviewed, revised and updated prior to the commencement of each longwall.

The following factors should be considered when identifying, investigating and analysing subsidence hazards:

- The characteristics of all relevant surface and subsurface features, including any known future developments (e.g. sub-divisions or other improvements) within the area where risk management is required;
- The characteristics of the mining operation, including the rate, method, layout, schedule and sequence of mining operations, the thickness of the seam to be mined, extraction height and cover depth;
- The characteristics of any previously excavated or abandoned workings that may interact with any proposed or existing mine workings;
- 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;

- The characteristics of all relevant geological, hydrogeological, hydrological, geotechnical, topographical and climatic conditions of the area where risk management is required, including the structural, lithological and geotechnical characteristics of the overburden, inter-burden, floor and roof strata;
- The characteristics of any conditions that may cause elevated or abnormal subsidence or formation of sinkholes; and
- The predicted and actual nature, magnitude, location, distribution, timing and duration of subsidence.

2.3 Risk Management

2.3.1 Risk Management Process

At the core of an SMS is the process or processes for managing risks, in particular those posed by PMHs. Effectively controlling risks at Tahmoor Mine requires Tahmoor Coal to follow a risk management process, which involves the four steps:

- Identify hazards – find out what could cause harm;
- Assess risks if necessary – understand the nature of the harm that could be caused by the hazard, how serious the harm could be and the likelihood of it happening;
- Control risks – eliminate the risk or, if this is not possible, minimise the risk through risk control measures; and
- Review – review control measures to ensure they are working as planned.

The framework utilised for the risk assessment is the risk management process outlined within AS/NZS ISO 31000.

2.3.2 Subsidence Guidelines

The risk management process has been carried out in accordance with guidelines published by DPIE (2015). The following main steps of subsidence risk management have been and will be undertaken, in accordance with the guidelines:

- Identification and understanding of subsidence hazards;
- Assessment of risks of subsidence;
- Development and selection of risk control measures;
- Implementation and maintenance of risk control measures, and
- Continual improvement and change management.

Each of the above steps have been or will be conducted together with the following processes:

- Consultation, co-operation and co-ordination, and
- Monitoring and review.

The infrastructure management plans document the risk control measures that are planned to manage risks to health and safety associated with the mining of LW W3-W4 directly beneath or adjacent to built features in accordance with the WHS laws.

Tahmoor Coal has developed and acted in accordance with a risk management process to manage potential hazards due to mine subsidence on built features. The risk management strategy has been reviewed and updated based on experiences gained during the mining of Longwalls 22 to 32 and LW W1-W2, and the strategy for LW W3-W4 includes the following process:

- Regular consultation with owners and operators of built infrastructure before, during and after mining;
- Site-specific investigations;
- Implementation of mitigation measures following engineering inspections and assessments;
- Surveys and inspections during mining within the active subsidence area:
  - Detailed visual inspections of built features;
  - Ground surveys; and
  - Specific ground surveys and visual inspections, where recommended by an engineer based on the inspections and assessments.

2.3.3 Identification of Subsidence Hazards

Clause 34 of the *Work Health and Safety Regulation* (2017) requires that the duty holder (in this case Tahmoor Coal), in managing risks to health and safety, must identify reasonably foreseeable hazards that could give rise to risks to health and safety.

Mine subsidence hazards have been or will be identified, investigated and analysed in a systematic manner by examining each aspect of the built features. Each of the aspects below could potentially experience mine subsidence movements that give rise to risks to the health and safety of people:

- Railways;
- Local roads, bridges and culverts;
- Potable water infrastructure;
- Sewerage infrastructure;
- Gas infrastructure;
- Electrical infrastructure;
- Telecommunications infrastructure;
- Built heritage;
- Residential structures; and
- Farm dams.

A description of mine subsidence hazards identified that could give rise to risks to health and safety will be described in each of the individual Infrastructure Management Plans.

Tahmoor Coal has completed risk assessments for built features likely to be affected by subsidence from the extraction of LW W3-W4. A copy of the risk assessments is included in **Appendix A, Appendix B** and **Appendix C**.

Tahmoor Coal, in consultation with infrastructure owners, will build upon the risk assessments to assess in detail the likelihood of the identified hazards affecting health and safety, and the severity of potential health and safety consequences during the risk assessment as a group. The results of the risk assessments will be included in each of the individual Infrastructure Management Plans.

The identification and risk assessment process will take into account the location of infrastructure relative to LW W3-W4 and the associated timing and duration of the subsidence event.

Whilst mine subsidence predictions and extensive past experiences from previous mining at Tahmoor Coal will be taken into account, the identification and risk assessment process recognises that there are uncertainties in relation to predicting subsidence movements, and uncertainties in how mine subsidence movements may adversely impact built features. This includes the presence and influence of geological structures and valleys.

Tahmoor Coal will consider the outcomes of the hazard identification and risk assessment process when developing measures to manage potential impacts on the health and safety of people, and potential impacts on built features in consultation with stakeholders.

2.3.4 Subsidence Risk Assessments

For each longwall or series of longwalls within the LW W3-W4 Extraction Plan, a series of management plans have been developed following risk assessments that include:

- Review of the potential issues likely to result from mine subsidence;
- Review of the potential likelihood and consequence of all identified potential issues;
- The consequent risk levels; and
- The existing and additional management measures and controls to be implemented to the risk, or to minimise the risks so far as is reasonably practicable.

For LW W3–W4, the following risk assessments have been undertaken:

- LW W3–W4 General Risk Assessment held on 23 September 2020;
- LW W3–W4 Main Southern Railway Risk Assessment held on 10 February 2021; and
- LW W3–W4 Picton-Mittagong Loop Line Risk Assessment held on 24 February 2021.

Copies of each of these risk assessments summary reports are provided in **Appendix A, Appendix B,** and **Appendix C**.

2.4 Consultation

Separate Infrastructure Management Plans will be developed in consultation with the relevant infrastructure owner(s) prior to the influence of subsidence on each relevant feature.

The following infrastructure owners will be consulted with regard to the infrastructure indicated and the relevant Infrastructure Management Plan:

- Endeavour Energy – Endeavour Energy Management Plan for electrical infrastructure;
- Jemena – Jemena Management Plan for gas infrastructure;
- Sydney Water:
  - Sydney Water Potable Water Management Plan for potable water infrastructure;
  - Sydney Water Sewer Management Plan for sewer infrastructure;
- Bradcorp – Stonequarry Sewer Management Plan for the Stonequarry Sewerage Treatment Plant.
- Telstra – Telstra Management Plan for telecommunications infrastructure managed by Telstra;
- NBNCo – NBN Management Plan for telecommunications infrastructure managed by NBN;
- Australian Rail Track Corporation (ARTC) (Main Southern Railway)– Main Southern Railway Management Plan for Main Southern Railway infrastructure;
- Railcorp and Transport Heritage NSW (Picton-Mittagong Loop Line) – Picton-Mittagong Railway Management Plan for Picton-Mittagong Loop Line infrastructure;

- Transport for NSW – Transport for NSW Management Plan for state roads and associated infrastructure;
- Wollondilly Shire Council:
  - Wollondilly Shire Council Management Plan for local roads, culverts and bridges; and
  - Weatherboard Cottage Management Plan for the heritage-listed Weatherboard Cottage.

3 Potential Public Safety Hazards

3.1 Built Features

The primary risk associated with mining beneath built features is public safety.

Tahmoor Coal has extensive experience directly mining beneath or adjacent to built features, including houses and civil structures, public infrastructure, commercial and retail properties, local roads and bridges, the Main Southern Railway, and the Picton-Mittagong Loop Line.

Tahmoor Coal has implemented extensive subsidence and mitigation measures prior to, during and after mining to ensure that the health and safety of people have not been put at risk due to mine subsidence. People have not been exposed to immediate and sudden safety hazards as a result of impacts that have occurred due to mine subsidence movements.

Built features identified within the LW W3-W4 Extraction Plan include:

- Electrical infrastructure;
- Gas infrastructure;
- Potable water infrastructure;
- Sewer infrastructure;
- Telecommunications infrastructure;
- Main Southern Railway;
- Picton-Mittagong Loop Line;
- State roads and infrastructure;
- Local roads, bridges and culverts;
- Structures, including houses, swimming pools and other structures;
- Built heritage Weatherboard Cottage;
- Farm Dams;
- Groundwater bores; and
- Permanent survey marks.

The subsidence impacts and management measures for all identified built features are outlined in detail within the following plan:

- Built Features Management Plan.

Detailed subsidence predictions are contained within the following report:

- MSEC (2021), Subsidence Predictions and Impact Assessments Report.

Monitoring requirements for each identified built feature are outlined with the following plan:

- Subsidence Monitoring Program.

The measures outlined within this plan for identified built features to specifically monitor safety risks include:

- Regular ground survey;
- Other electronic surveys;
- Site specific inspections of infrastructure items;
- Visual inspections; and
- Photo monitoring points.

Infrastructure Management Plans prepared for each identified built feature includes a detailed section on subsidence impact management measures, including:

- Risk assessment and hazard identification;
- Subsidence predictions and impact assessment;
- Management of public safety;
- Management controls;
- Risk control measures;
- Monitoring measures; and
- Trigger and responses.

3.2 Cliffs and Steep Slopes

The primary risk associated with mining beneath cliffs and steep slopes is public safety.

Tahmoor Coal has extensive experience directly mining beneath or adjacent to cliffs and steep slopes. Tahmoor Coal has implemented extensive subsidence and mitigation measures prior to, during and after mining to ensure that the health and safety of people have not been put at risk due to mine subsidence. People have not been exposed to immediate and sudden safety hazards as a result of impacts that have occurred due to mine subsidence movements.

Douglas Partners (2021) define cliffs and steep slopes as:

- Cliff – Slope appears vertical and ranges between 64° and 84°;
- Extreme Slope – need rope access to climb slope and ranges between 45° and 64°;
- Very Steep Slope – Can climb by clutching at vegetation and ranges between 27° and 45°;
- Steep Slope - Walkable with effort and ranges between 18° and 27°;
- Moderate Slope - Walkable and ranges between 10° and 18°; and
- Gentle Slope - Easy walking and ranges between 0° and 10°.

The major natural features with the study area are Cedar Creek and Stonequarry Creek, however the reaches of these creeks within the LW W3-W4 Study Area do not contain cliff features.

Subsidence can trigger slope failure in the form of local rock face instability due to tilting and bending of the rock mass beds. Overhangs and jointed planes are particularly susceptible to collapse leading to rock falls and toppling failures.

Steep slopes are defined as an area of land having natural slope ranging between 18.4° and 45° (Steep Slope to Very Steep Slope definitions). Numerous steep slopes with shallow residual soil cover underlain by Ashfield Shale exist above LW W3-W4. Steep slopes are also located along the banks of Stonequarry Creek and an unnamed tributary of Redbank Creek.

The subsidence impacts will take place over a broad area due to the depth of mining (greater than 470 m) and changes in relief across the Study Area will generally be minor. Slope instability incidents may occur in the areas where large subsidence gradients occur.

The geotechnical assessment has concluded that the risk of slope instability for the assessed hazards prior to mining is in the range of very low to moderate, and was unchanged during and following longwall mining of LW W3-W4 (Douglas Partners, 2021).

The subsidence impacts and management measures for all identified steep slopes are outlined in detail within the following plan:

- Land Management Plan.

The Land Management Plan is supported by the following specialist technical report, specifically considering subsidence risks and public safety considerations for steep slopes:

- Douglas Partners (2021), Geotechnical Assessment.

Detailed subsidence predictions are contained within the following report:

- MSEC (2021), Subsidence Predictions and Impact Assessments Report.

Monitoring requirements for steep slopes are outlined with the following plan:

- Subsidence Monitoring Program.

The measures outlined within this plan for steep slopes to specifically monitor safety risks include:

- Regular ground survey;
- Other electronic surveys;
- Visual inspections; and
- Photo monitoring points.

3.3 Subsidence Deformations

The management strategy for surface cracking within the LW W3-W4 Study Area is to identify any subsidence related impacts through monitoring prior to, during and post-secondary extraction.

The subsidence impacts and management measures for surface deformations are outlined in detail within the following plan:

- Land Management Plan.

Monitoring of surface deformations will be achieved by implementing the following measures:

- Visual inspections; and
- Photo monitoring.

In response to observed subsidence impacts causing surface deformations or surface cracking, Tahmoor Coal will implement the following management measures:

- Install warning signs in the immediate area if the cracking is considered a public safety risk;
- Install danger tape in the immediate area if the cracking is considered a public safety risk;
- Plan and undertake site rehabilitation as soon as practical to remove any ongoing public safety risks. Site rehabilitation measures could include:
  - Backfilling or grout filling of surface cracking;
  - Re-profiling of compression humps;
  - Infilling of pot holes or subsidence related undulations developed; and
  - Securing of unstable structures or natural features, such as rock masses.

3.4 Other Subsidence Impacts

Flood modelling has been undertaken by consultants, WRM, based on the existing topography as surveyed by LiDAR (Light Detection and Ranging) and predicted subsidence movements due to the extraction of the proposed longwalls WRM (2020).

The flood modelling determined that flows are generally contained within the channels of Cedar Creek and Stonequarry Creek within the Study Area. The crest of Barkers Lodge Road may be overtopped during a Probable Maximum Flood (PMF) event. The subsidence resulting from the mining of the proposed LW W3-W4 results in a negligible change in flood levels, flow velocities and flood extent within the Study Area (WRM, 2020)

The subsidence impact assessment and flood study contained within the Water Management Plan has concluded that subsidence impacts within the LW W3-W4 Study Area would not cause a significant increase in flood risk. Therefore, the potential public safety risk from increased flooding from subsidence impact is consider negligible.

The subsidence impacts and management measures for flooding are outlined in detail within the following plan:

- Water Management Plan.

The Water Management Plan is supported by the following specialist technical report, specifically considering subsidence risks and public safety considerations for flooding:

- WRM (2020), Flood Impact Study.

4 Subsidence Monitoring Program

4.1 Performance Measures

Performance measures for built features are provided in Table 2 of Condition 13E of DA 67/98 (refer to **Section 2.1.1**). It is anticipated that the performance measures will be not be exceeded during and after mining of LW W3-W4 through the implementation of the various Infrastructure Management Plans.

4.2 Monitoring Program

Tahmoor Coal has developed a Subsidence Monitoring Program, which is included in the Extraction Plan for LW W3-W4. The Subsidence Monitoring Program describes the inspection regimes, layout of monitoring points, parameters to be measured, monitoring methods and accuracy, timing and frequencies of surveys and inspections, and recording and reporting of monitoring results.

The Subsidence Monitoring Program is consistent with the monitoring commitments as described in the following plans, which are submitted as part of Tahmoor Coal's Extraction Plan for LW W3-W4:

- Tahmoor Coal – LW W3-W4 Water Management Plan, 2021;
- Tahmoor Coal – LW W3-W4 Land Management Plan, 2021;
- Tahmoor Coal – LW W3-W4 Biodiversity Management Plan, 2021;
- Tahmoor Coal – LW W3-W4 Heritage Management Plan, 2021;
- Tahmoor Coal – LW W3-W4 Built Features Management Plan, 2021; and
- Tahmoor Coal – LW W3-W4 Public Safety Management Plan, 2021.

The Subsidence Monitoring Program will be consistent with detailed Subsidence Management Plans, which will be developed by Tahmoor Coal in consultation with stakeholders prior to the influence of subsidence on each relevant feature. Each of these management plans will describe measures that will be undertaken to monitor subsidence movements and physical changes and/or impacts that occur during mining. The management plans will include:

- Tahmoor Coal - LW W3-W4 Management Plan for Potential Impacts to Endeavour Energy Infrastructure, Report No. MSEC1173-06, 2021.
- Tahmoor Coal – LW W3-W4 Management Plan for Potential Impacts to Jemena Gas Infrastructure, Report No. MSEC1173-05, 2021;
- Tahmoor Coal – LW W3-W4 Management Plan for Potential Impacts to Sydney Water Potable Water Infrastructure, Report No. MSEC1173-03, 2021;
- Tahmoor Coal – LW W3-W4 Management Plan for Potential Impacts to Sydney Water Sewerage Infrastructure, Report No. MSEC1173-09, 2021;
- Tahmoor Coal – LW W3-W4 Management Plan for Potential Impacts to Stonequarry Wastewater Treatment Plant, Report No. MSEC1173-04, 2021;
- Tahmoor Coal – LW W3-W4 Management Plan for Telstra Infrastructure, Comms Network Solutions, 2021;
- Tahmoor Coal – LW W3-W4 Management Plan for NBNCo Infrastructure, Comms Network Solutions, 2021;

- Tahmoor Coal – LW W3-W4 Management Plan for Potential Impacts to Main Southern Railway, Report No. MSEC1163, 2021;
- Tahmoor Coal – LW W3-W4 Management Plan for Potential Impacts to Picton-Mittagong Loop Line, Report No. MSEC1168, 2021;
- Tahmoor Coal – LW W3-W4 Management Plan for Potential Impacts to Wollondilly Shire Council Infrastructure, Report No. MSEC1173-02, 2021;
- Tahmoor Coal – LW W3-W4 Management Plan for Potential Impacts to TfNSW Infrastructure, Report No. MSEC1173-18, 2021;
- Tahmoor Coal – LW W3-W4 Management Plan for to No. 796-800 Thirlmere Way (Weatherboard Cottage), Report No. MSEC1173-13-03, 2021; and
- Tahmoor Coal – LW W3-W4 Management Plan for Potential Impacts to Built Structures, Report No. MSEC1173-12, 2021.

4.3 Baseline Monitoring for Future Extraction Plans.

To assist in the preparation of future Extraction Plans, monitoring of built features, cliffs and steep slopes, and surface deformations as outlined in the Subsidence Monitoring Program would provide sufficient baseline data. Monitoring data collected during the mining of LW W3-W4 would be used in the review of observed subsidence impacts for future Extraction Plans.

5 Subsidence Management Strategies

5.1 Public Safety Management

The primary risk associated with mining beneath structures is public safety. Historically, residents have not been exposed to immediate and sudden safety hazards as a result of impacts that occur due to mine subsidence movements in the NSW Coalfields, where the depths of cover were greater than 350 metres, such as the case above the proposed longwalls. This includes the recent experience at Tahmoor, which has affected more than 2,000 houses and civil structures.

Emphasis is placed on the words “immediate and sudden” as in rare cases, some structures have experienced severe impacts, but the impacts did not present an immediate risk to public safety as they developed gradually with ample time to relocate residents.

Tahmoor Coal proposes to continue its long established practice of ensuring that built structures and natural features remain safe and serviceable at all times during mining. Tahmoor Coal, in consultation with landowners, routinely studies the potential for impacts on built structures, other infrastructure and natural features to develop management and mitigation measures. These studies draw upon the subsidence management expertise within Tahmoor Coal and its consultant structural, geotechnical, rail and subsidence engineers.

The risk management process followed by Tahmoor Coal is implemented through a four-staged process, as described in **Section 5.1.1**.

5.1.1 Structures Risk Management Process

Stage One

Regular consultation, cooperation and coordination with the community before, during and after mining. This includes letters and door knocking to all residents of structures that will soon be affected by subsidence. The letters offer a free pre-mining inspection and hazard identification inspection by a structural engineer.

Stage Two

Site-specific investigations, where they are necessary and appropriate, into the conditions of buildings and associated structures and their surrounding environment (where access is allowed). The site-specific investigations have been and will continue to be undertaken early so that there is adequate time, if required, to arrange additional inspections and/or surveys and implement any mitigation measures before mining-induced impacts are experienced.

For properties located directly above the first 300 m of the commencing end of a longwall, the investigations are targeted to be undertaken prior to extraction or at the latest, they will be undertaken prior to the first 200 m of extraction of the longwall.

The site-specific investigations include the following:

- Identification of structures from aerial photographs and kerbside inspections;
- Front of house risk and visual screening inspections by Tahmoor Coal in company with a structural engineer for all properties that are predicted to experience more than 20 mm of incremental vertical subsidence due to the extraction of each upcoming longwall. The purpose of the inspections is to identify hazards where access has not been granted by the landowner. In some cases, particularly in semi-rural and rural areas, it is difficult to inspect a structure that is remote from the street front. Where these cases involve properties that are located directly above a longwall, Tahmoor Coal has requested access to conduct a pre-mining inspection and hazard identification inspection by a structural engineer;
- Tahmoor Coal will request access to conduct pre-mining geotechnical inspections of structures located on or immediately adjacent to steep slopes that are predicted to experience more than 20 mm of incremental vertical subsidence due to the extraction of each longwall;
- Tahmoor Coal will request access to conduct pre-mining hazard identification inspections by a structural engineer (where access is allowed by the landowner) to properties with structures that have been specifically targeted on the basis that may be more sensitive to mine subsidence movements. These include:
  - Commercial and business establishments, public amenities and public utilities;
  - Structures of heritage significance;
  - Structures that are located above hidden creeks;
  - Structures that are located above mapped geological structures;
  - Structures that are located on or adjacent to steep slopes or that have been recommended for structural inspection by the geotechnical engineer;
  - Structures that have been identified as being potentially unstable or unsafe by landowners (Stage One), or from the front of house inspections (Stage Two);
  - Houses and units located outside the declared Mine Subsidence Districts; and
  - Houses and units estimated to have been constructed prior to the declaration of the Picton Mine Subsidence District as originally declared in 1997 or if outside the original declared boundary, prior to the declaration of the current boundary in 2017.

Stage Three

Implementation of pre-mining mitigation measures following inspections by the geotechnical engineer and the structural engineer, in consultation and agreement with the landowner.

Stage Four

Surveys and inspections during mining within the active subsidence area:

- Detailed visual inspections and vehicle-based inspections along the streets;
- Ground surveys along the streets;
- Specific ground surveys for selected properties, where recommended by the geotechnical engineer or structural engineer due to their proximity to steep slopes or pre-existing condition;
- Visual inspections of residential structures that are:
  - Located on or adjacent to steep slopes;
  - Are in poor existing condition (based on the hazard identification inspections);
  - Have previously reported impacts; and/or
  - Where recommended by the Structures Response Group;

- Visual inspections of pool fences and gates; and
- Visual inspections of commercial, industrial and business establishments, public amenities and public utilities.

6 Review and Improvement

This section of the BFMP describes the key elements of implementation relevant to built features. A description of general reporting requirements, reviews and key responsibilities that are applicable to extraction of LW W3-W4 are discussed in the Extraction Plan Main Document.

6.1 Reporting Requirements

Generic reporting requirements for the LW W3-W4 Extraction Plan are discussed in **Section 6.1** of the Extraction Plan Main Document. Specific reporting requirements will be described in the individual infrastructure management plans.

6.2 Review and Auditing

This PSMP can be reviewed and updated to continually improve the risk management systems based on audit, review and learnings from the development of subsidence during mining and manage changes in the nature, likelihood and consequence of subsidence hazards.

6.3 Roles and Responsibilities

Generic roles and responsibilities applicable for the implementation of the LW W3-W4 Extraction Plan are discussed in **Section 6.3** of the Extraction Plan Main Document. There are no roles and responsibilities specific to the implementation of built features management measures identified for the extraction of LW W3-W4.

7 Document Information

This section provides a compiled list of references, terms, and abbreviations used in this document. In addition, this section provides the change information for this document.

7.1 References

Douglas Partners (2021), Report on Geotechnical Assessment, Extraction Plan Longwall West 3 and West 4, prepared for Tahmoor Coal, March 2021, document 89541.03.R.001.Rev1.

Mine Subsidence Engineering Consultants (2021), Tahmoor Coal – Longwalls W3 and W4, Subsidence Predictions and Impact Assessments for Natural and Built Features due to the Extraction of the Proposed Longwalls W3 and W4 in Support of the Extraction Plan Application. Prepared for Tahmoor Coal, March 2021, document MSEC1112.

NSW Department of Planning and Environment (DPE) (2015), Draft Guidelines for the Preparation of Extraction Plans V5.

NSW Department of Planning and Environment (2017), Resources Regulator, Mine Safety Operations.

WRM (2020), Matthew Creek Flood Impact Study for LW W1-W4, Prepared for Tahmoor Coking Coal Operations, January 2020, document 1072-06-B1.

7.2 Glossary of Terms

The Extraction Plan Main Document provides a compiles Glossary of Terms in **Section 8.3**.

7.3 Abbreviations

Abbreviations used in this document are provided below in **Table 7-1**.

Table 7-1 Abbreviations

Abbreviation	Definition
ARTC	Australian Rail Track Corporation
DPE	NSW Department of Planning and Environment (former) Now known as NSW Department of Planning, Industry and Environment (DPIE)
DPIE	NSW Department of Planning, Industry and Environment
km	Kilometre/s
LW	longwall
LW W1	Longwall West 1
LW W1-W2	Longwalls West 1 to West 2
LW W2	Longwall West 2
LW W3-W4	Longwalls West 3 to West 4
m	Metre/s
mm	Millimetre/s
ML	Mining Lease

Abbreviation	Definition
NSW	New South Wales
PCBU	Persons conducting a business or undertaking
PCP	Principal Control Plans
PHMP	Principal Hazard Management Plan
PMH	Principal Mining Hazards
PSMP	Public Safety Management Plan
SMP	Subsidence Management Plan
SMS	Safety Management System
Tahmoor Mine	Tahmoor Coal Mine
Tahmoor Coal	Tahmoor Coal Pty Ltd

7.4 Change Information

Table 7-2 provides the details of document history of this PSMP.

Table 7-2 Document History

Version	Date Reviewed	Reviewed By	Change Summary
1.0	May 2021	Zina Ainsworth, David Talbert, Malcolm Waterfall	New document

Appendix A – LW W3-W4 Risk Assessment Report for General Risks

SIMEC

MEMBER OF GFG ALLIANCE

Tahmoor Coal Pty Ltd

RISK ASSESSMENT REPORT

Tahmoor North – Western Domain
Longwalls West 3 and West 4

Date Held: 23 September 2020

October 2020

simecgfg.com

Document Control

DOCUMENT TITLE:	Tahmoor North – Western Domain LW W3-W4 Risk Assessment Report
PUBLICATION DATE:	1/10/2020
DOCUMENT STATUS:	Final (Version 1)
PREPARED BY:	April Hudson Approvals Specialist Tahmoor Coal – SIMEC Mining
APPROVED BY:	Zina Ainsworth Environment and Community Manager Tahmoor Coal – SIMEC Mining

simecgfg.com

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1 Introduction

1.1 Background

Tahmoor Coal Mine is located approximately 80 kilometres south-west of Sydney in the township of Tahmoor NSW. It is managed and operated by Tahmoor Coal Pty Ltd, which is a subsidiary of SIMEC Mining Division (SIMEC). Tahmoor Coal has previously mined 32 longwalls to the north and west of the mine's current pit top location.

Tahmoor Coal proposes to extend underground coal mining to the north-west of the Main Southern Railway in the area referred to as the 'Western Domain', which will include Longwalls West 1 to West 4 (LW W1-W4) at Picton (refer to **Figure 1-1**). Longwall West 1 is currently being mined accordance with current Development Consent (DA 67/98) and Extraction Plan Approval for the extraction of Longwalls West 1 and West 2. First workings of development headings for LW W3 are about to commence.

Under Condition 13H of the Development Consent (DA 67/98), as modified, an Extraction Plan is required for all second workings from LW W1 and subsequent longwalls. An extraction plan for Longwalls West 3 and West 4 (LW W3-W4) is currently being prepared. The Extraction Plan will be required to be approved by the NSW Department of Planning, Industry and Environment (DPIE), and Infrastructure Management Plans are required to be approved by the relevant infrastructure owners.

The Extraction Plan shall address the Study Area for LW W3-W4, which is comprised of both the predicted 20 mm Total Subsidence Contour and the 35° Angle of Draw Line (refer to **Figure 1-1**). The Extraction Plan will provide detailed information on how the risks associated with mining under the Study Area will be managed by Tahmoor Coal during and following the extraction of LW W3-W4.

A Risk Assessment Workshop was held at Tahmoor Mine on 23 September 2020 to determine the major risks relating to built infrastructure and environmental features associated with LW W3-W4. In addition, this assessment also identified other risks that may impact on achieving timely approval for the commencement of LW W3-W4 extraction, as well as the completion of extraction of LW W3-W4.

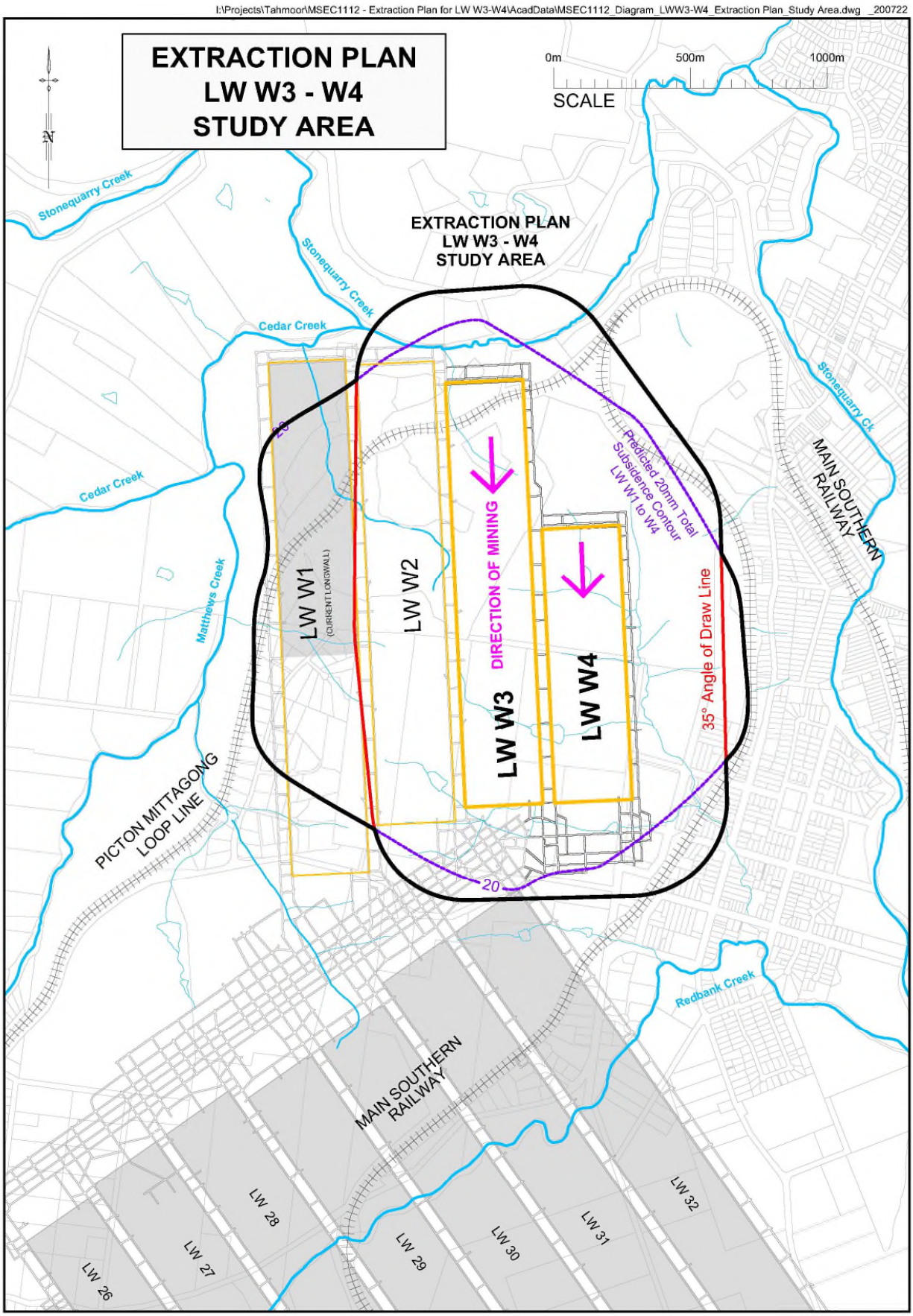


Figure 1-1 Study Area for LW W3-W4

1.2 Methodology

This risk assessment was completed using the Workplace Risk Assessment and Control methodology (WRAC).

It was compiled by a team of specialist personnel including:

- Diana Harris - Compliance Officer and Risk Assessment Facilitator, Tahmoor Coal;
- Zina Ainsworth - Environment and Community Manager, Tahmoor Coal;
- David Talbert - Project Manager – Environment and Community, Tahmoor Coal;
- April Hudson - Approvals Specialist, Tahmoor Coal;
- Amanda Francis - Community Engagement Specialist, Tahmoor Coal;
- Natalie Brumby - Environment and Community Graduate, Tahmoor Coal;
- Daryl Kay - Subsidence Engineer, MSEC;
- John Matheson - Structural Engineer, JMA Solutions;
- Adam Walker - Building Inspector, Building Inspection Services:
- Ken Mills - Geotechnical Engineer, Strata Control Technologies;
- Camilla West - Water Resources Scientist, Hydro Engineering Consultants;
- Andrew Dawkins – Hydrologist / Geochemist, GeoTerra;
- Roderick Haselden – Goetechnical Engineer, Douglas Partners;
- Matthew Russell - Aquatic Ecologist, Niche Environment and Heritage;
- Alex Christie – Ecologist / Accredited Assessor, Niche Environment and Heritage;
- Ryan Desic – Archaeologist, EMM Consulting; and
- Alex Parro - Environmental Scientist, Cardno.

The 12 step Risk Management process which forms part of the Tahmoor Coal Risk Management Standard has been adhered to in this risk assessment.

The risk matrix has been used to prioritise risk treatments.

Prior to this risk assessment any previous risk assessments, safety alerts and High Potential Risk incidents have been sourced and put forward for consideration within the risk assessment workshop.

1.3 Outcome

This risk assessment identified a total of 67 risks / hazards (refer to **Figure 1-2**), which included:

- One high risk, 14 medium risks and 52 low risks;
- Six risks that were satisfactory and did not require any further risk control, and 61 risks that required further improvement;
- Risk consequences included:
    - 28 risks with property damage consequences;
    - 13 risks with environmental impact consequences;
    - Nine risks with health and safety consequences;
    - Nine risks with financial consequences;
    - Six risks with legal and compliance consequences;
    - One risk with community / reputation consequences; and
    - One risk with investment return consequences.

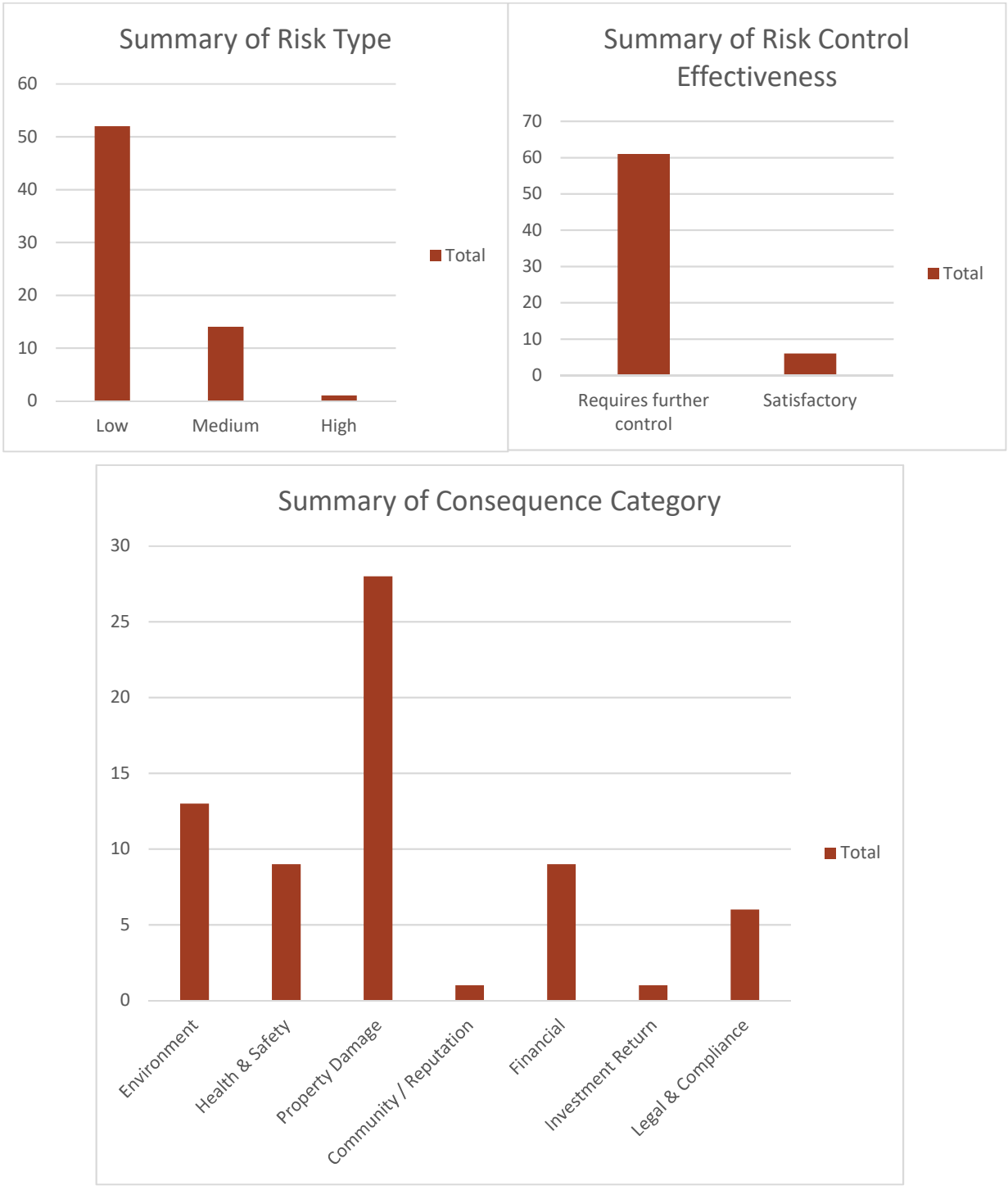


Figure 1-2 Graphs of Risk Type, Risk Control Effectiveness and Consequence Category

1.4 Further Actions

Further actions as identified in the Risk Assessment are identified in **Table 1-1**. Refer to **Appendix C** for figures showing the location of items discussed in the table below.

Table 1-1 Table of Further Actions

Treatment plans/tasks	Task Owner	Due Date
Adaptive management review following 800 m into LW W2 to review starting position for LW W3	April Hudson	01-Apr-21
Building Inspection Services to complete baseline tilt measurement of poles	April Hudson	01-Sep-21
Complete Stonequarry Creek Estate Water Management Plan including TARP	David Talbert	01-Sep-21
Complete Aboriginal Heritage Technical Report, and incorporate monitoring measures and TARP into Heritage Management Plan	April Hudson	30-Jan-21
Complete Aquatic Biodiversity Technical Report, and incorporate monitoring measures and TARP into Biodiversity Management Plan	April Hudson	30-Jan-21
Complete baseline gas detection survey (Macarthur Gas)	April Hudson	01-Sep-21
Complete Built Structures Management Plan including TARP for emergency evacuation procedures	April Hudson	01-Sep-21
Complete Endeavour Energy Management Plan including TARP	April Hudson	01-Sep-21
Complete Extraction Plan	April Hudson	30-Jan-21
Complete geotechnical assessment of Picton Tunnel	David Talbert	30-Dec-20
Complete geotechnical assessment of PMLL structures	David Talbert	01-Sep-21
Complete Geotechnical Report for landscape features (including steep slopes), and incorporate monitoring measures and TARP into Land Management Plan	April Hudson	30-Jan-21
Complete Groundwater Technical Report, and incorporate monitoring measures and TARP into Water Management Plan	April Hudson	30-Jan-21
Complete Historical Heritage Technical Report, and incorporate monitoring measures and TARP into Heritage Management Plan	April Hudson	30-Jan-21
Complete Jemena Management Plan including TARP and contact details for Jemena	April Hudson	01-Sep-21
Complete Land and Agricultural Resource Assessment, incorporate information into Land Management Plan, allocation of monitoring measures and TARP in Land Management Plan	April Hudson	30-Jan-21
Complete MSR Management Plan	David Talbert	01-Sep-21
Complete NBN Management Plan including TARP	April Hudson	01-Sep-21
Complete new PSMPs for other items for LW W3-W4	April Hudson	30-Jan-21
Complete PMLL Management Plan	David Talbert	01-Sep-21
Complete POSI application for W3 - W4.	April Hudson	01-Sep-21
Complete Public Safety Management plan to incorporate signage and communication regarding subsidence.	April Hudson	30-Jan-21
Complete structural assessment of Picton Tunnel	David Talbert	30-Dec-20
Complete structural assessment of PMLL structures	David Talbert	01-Sep-21

Complete structural assessment of Weatherboard Cottage	April Hudson	01-Sep-21
Complete structural engineering review of bridges	April Hudson	01-Sep-21
Complete Surface Water Technical Report, and incorporate monitoring measures and TARP into Water Management Plan	April Hudson	30-Jan-21
Complete Sydney Water Potable Water Management Plan including TARP	April Hudson	01-Sep-21
Complete Sydney Water Sewerage Management Plan including TARP	April Hudson	01-May-22
Complete Telstra Management Plan including TARP	April Hudson	01-Sep-21
Complete Terrestrial Biodiversity Technical Report, and incorporate monitoring measures and TARP into Biodiversity Management Plan	April Hudson	30-Jan-21
Complete Weatherboard Cottage Management Plan including TARP	April Hudson	01-Sep-21
Complete Wollondilly Shire Council Management Plan including TARP	April Hudson	01-Sep-21
Complete AHIP application and submission to DPIE	April Hudson	01-Mar-21
Conduct Dam Break study for the large dams	April Hudson	01-Sep-21
Consider completing a statement of heritage impacts for weatherboard cottage	April Hudson	01-Sep-21
Consider need for Heritage approval to install mitigation measures	April Hudson	01-Nov-20
Develop stakeholder engagement plans and implement	Amanda Francis	30-Dec-20
Endeavour Energy to complete Critical Poles Audit	April Hudson	01-Mar-21
Engagement with key stakeholders to be conducted.	David Talbert	30-Dec-20
Engineering assessment to be conducted	David Talbert	30-Dec-20
Engineering Review of Embankments, culverts, Picton Tunnel, Viaduct and other key infrastructure.	David Talbert	23-Dec-20
Finalise rail management plan and implement.	David Talbert	01-May-21
Implement monitoring from Infrastructure Management Plans.	Amanda Francis	02-Aug-21
Notify Spatial Services via POSI application of predicted subsidence movements of the permanent survey control marks	April Hudson	01-Sep-21
Obtain Environmental Approvals to complete engineering works on Picton Viaduct and Picton Tunnel	April Hudson	01-Nov-20
Prepare land access agreement plan and implement.	Amanda Francis	30-Dec-20
Review and update traffic control plan for emergency repairs	Amanda Fitzgerald	01-Sep-21
Risk review with rail regulators to be conducted	David Talbert	30-Dec-20
Separate risk assessment to be completed for rail infrastructure.	David Talbert	23-Dec-20
SMEC to complete survey of critical poles	April Hudson	01-Sep-21
Submission of Weatherboard Cottage Management Plan to Council.	April Hudson	01-May-22
Update Aboriginal Heritage Technical Report, and incorporate monitoring measures and TARP into Heritage Management Plan	April Hudson	30-Jan-21

2 Objective

The purpose of the Risk Assessment was to:

- Ensure the required approvals for the proposed longwalls are obtained in a timely manner to enable mining to commence;
- Ensure all environmental risks are appropriately eliminated or managed according to environmental legislation requirements;
- Ensure the safe and serviceable operation of all surface infrastructure and structures in the Study Area;
- Ensure that the health and safety of people who may be present in the Study Area are not put at risk due to mine subsidence;
- Assist in the establishment of procedures to measure, monitor, control, mitigate and repair infrastructure in the Study Area; and
- Ensure the required management plans for environmental features and built features are prepared and in place in a timely manner to manage potential impacts to environmental features or built features during mining.

The Risk Assessment will also be used to:

- Develop, review and improve the treatment plans / tasks identified as a result of the identified risks;
- Provide a basis to determine whether the identified risk management measures are sufficient to address the identified risks;
- Meet the statutory requirements of legislation and regulations that relate to impacts to environmental features and built features; and
- Identify those processes requiring a more detailed level of risk assessment due to the Potential Maximum Consequence (PMC) level of risk.

3 Context

3.1 Scope

The risk assessment considered the areas below:

- Obtaining LW W3-W4 Extraction Plan approval;
- Obtaining Aboriginal Heritage Impact Permit (AHIP) and/or Wollondilly Shire Council approval for proposed Weatherboard Cottage management;
- Impacts to utility infrastructure owned by Endeavour Energy (electrical), Sydney Water (potable water and sewer), Stonequarry Creek Estate Sewerage Plant (sewer), Jemena (gas), Telstra (telecommunications), NBN (telecommunications), Wollondilly Shire Council (roads, culverts and bridges), and Spatial services (survey marks);
- Impacts to rail infrastructure include the Main Southern Railway and Picton-Mittagong Loop Line;
- Impacts to rural properties and structures such as built structures, pools, septic tanks, and farm dams;
- Impacts to land owners and the community;

- Impacts to watercourses including pool water level, streamflow, water quality, and flood potential;
- Impacts to groundwater including groundwater level and water quality;
- Impacts to landscape features such as steep slopes and agricultural land capability;
- Impacts to aquatic ecology including aquatic habitat, macroinvertebrates, fish, and threatened aquatic species and habitat;
- Impact to terrestrial ecology including riparian vegetation, threatened ecological communities, threatened amphibians, threatened microbats, and groundwater dependent ecosystems;
- Impacts to Aboriginal heritage items including grinding groove sites, scarred trees, and surface scattered; and
- Impacts to historical heritage items including buildings of local heritage significance (Weatherboard Cottage, Picton Heritage Rail, Mushroom Tunnel) and sandstone and brick culverts associated with the Picton-Mittagong Loop Line.

Appendix C provides figures showing the locations of the above features that were discussed during the risk assessment.

3.2 Internal Context

This risk assessment was conducted for the Environment and Community Department of Tahmoor Coal to help identify the risks to environmental features associated with the extraction of LW W3-W4.

The risk assessment was conducted in accordance with the Risk Management Standard, utilising a cross-section of site personnel, relevant specialists and civil works experts, and an internal facilitator.

3.3 External Context

This risk assessment provides a process for ensuring that major risks to environmental features that may impact on approval by Government Agencies and stakeholders are identified and managed.

The external context for this Risk Management Process included consideration of:

- NSW DPIE as the approver of the Extraction Plan;
- NSW *Work Health and Safety (Mines and Petroleum Sites) Regulations 2014*;
- AS/NZS ISO 31000:2009 Risk Management - Principles and Guidelines; and
- Risk Management Handbook for the Mining Industry (MDG1010).

3.4 Exclusions / Assumptions

The participants in the risk assessment agreed to the following exclusions / assumptions:

- This risk assessment assumes that community effects will be managed as per Tahmoor Coal procedures (e.g. dust, lighting and noise).
- A risk assessment focusing in more detail on rail infrastructure likely to be impacted by LW W3-W4 will be completed separately.

4 Issue / Reason for Review

The risk assessment was completed to identify significant implications relating risks to approval, environmental features and built features, and to identify the controls necessary to effectively manage these risks.

5 Risk Analysis Method

5.1 Risk Management Standard

All risk assessments are conducted in accordance with Tahmoor Coal's Risk Management Standard.

The Tahmoor Coal Risk Management Standard is based on the ***ISO31000:2009 Risk Management – Principles and Guidelines International Standard.***

5.2 Risk Management Process

The risk management process is set out in the 12 Steps Risk Management Process (refer to **Figure 5-1**).

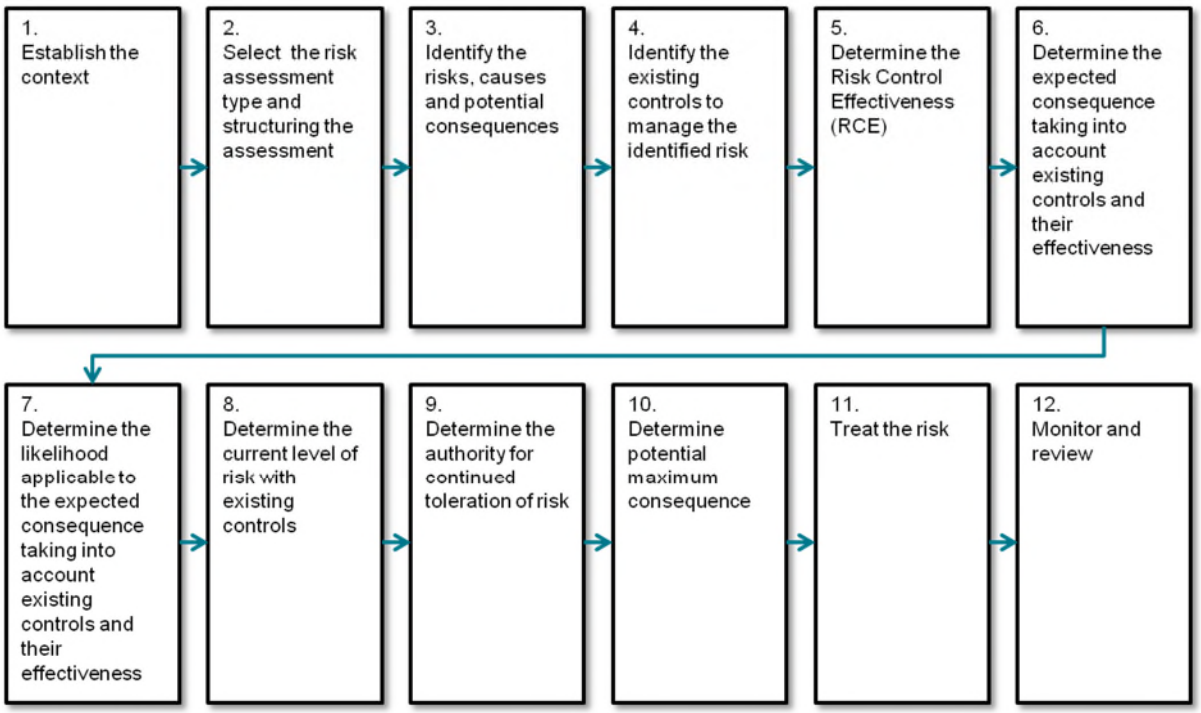


Figure 5-1 The 12 Steps Risk Management Process

5.3 Risk Matrix

The analyses of the risks identified in the workshop have undergone categorisation by the use of the risk matrix outlined within the Tahmoor Coal Risk Management Standard.

5.4 Hierarchy of Controls

During the risk management process additional treatments and controls have been categorised using the hierarchy of controls table (refer to **Figure 5-2**).

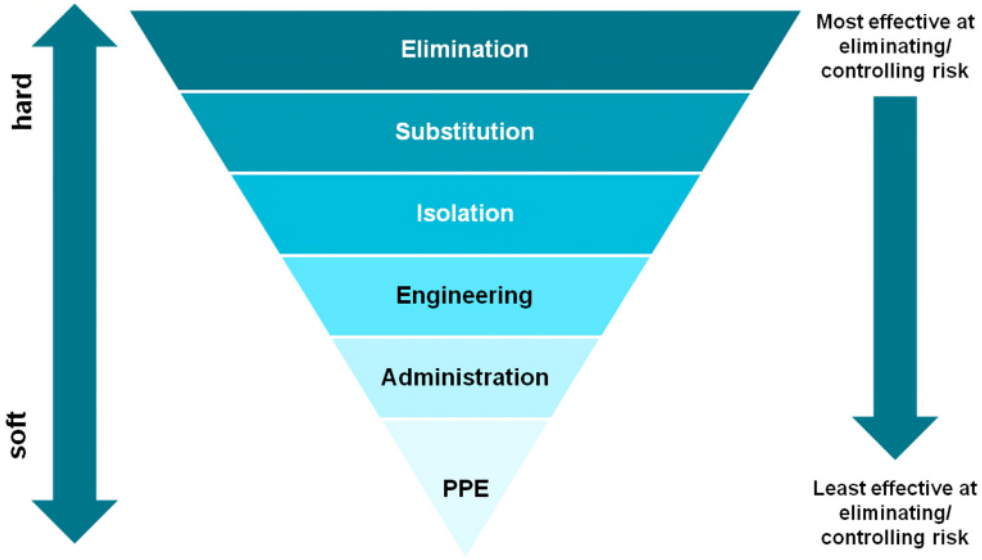


Figure 5-2 Hierarchy of Controls

5.5 Risk Assessment Team Members

Participating risk assessment team members are listed in **Table 5-1.**

Table 5-1 Participating Risk Assessment Team Members

Name	Position	Organisation
Diana Harris	Facilitator - Compliance Officer	Tahmoor Coal Pty Ltd
Zina Ainsworth	Environment and Community Manager	Tahmoor Coal Pty Ltd
David Talbert	Project Manager	Tahmoor Coal Pty Ltd
April Hudson	Approvals Specialist	Tahmoor Coal Pty Ltd
Amanda Francis	Community Engagement Specialist	Tahmoor Coal Pty Ltd
Natalie Brumby	Environment and Community Graduate	Tahmoor Coal Pty Ltd
Alex Parro	Environmental Scientist	Cardno
Daryl Kay	Subsidence Engineer	MSEC
John Matheson	Structural Engineer	JMA Solutions
Adam Walker	Building Inspector	Building Inspection Services
Ken Mills	Geotechnical Engineer	Strata Control Technologies
Camilla West	Water Resources Scientist	Hydro Engineering Consultants
Andrew Dawkins	Hydrologist / Geochemist	GeoTerra Pty Ltd
Roderick Haselden	Geotechnical Engineer	Douglas Partners
Matthew Russell	Senior Aquatic Ecologist	Niche Environment and Heritage
Alex Christie	Ecologist, Accredited Assessor	Niche Environment and Heritage
Ryan Desic	Archaeologist	EMM Consulting

Due to COVID-19 restrictions, team members attended via Skype conference call. A copy of the invitation to the conference call (as evidence of attendance) is attached in **Appendix A**.

6 Risk Assessment Register

The Risk Assessment Register is attached within **Appendix B**.

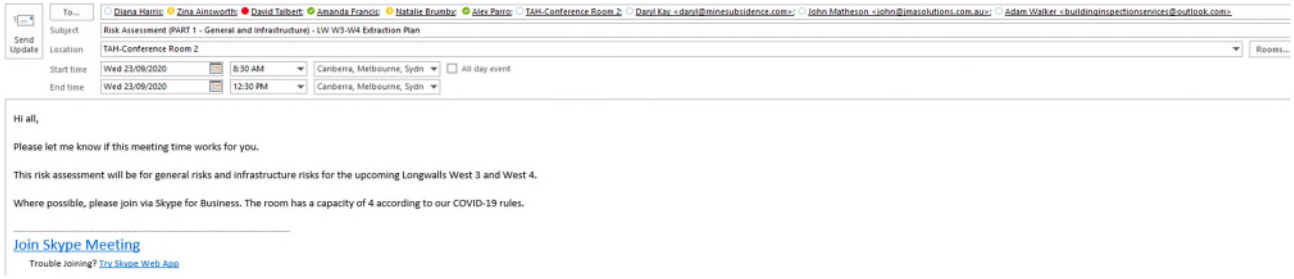
7 Treatment Plan

A treatment plan is provided in **Section 1.4.1**.

8 Risk Assessment Review Period

A review period for the risk assessment has not been identified.

Appendix A – Risk Assessment Attendance Sheet



Send Update | To... | Diana Harris; Zina Ainsworth; David Talbert; Amanda Francis; Natalie Brumby; Alex Parro; TAH-Conference Room 2; Daryl Kay <daryl@minesubsidence.com>; John Matheson <john@jmasolutions.com.au>; Adam Walker <buildinginspectionservices@outlook.com>

Subject: Risk Assessment (PART 1 - General and Infrastructure) - LW W3-W4 Extraction Plan

Location: TAH-Conference Room 2 | Rooms...

Start time: Wed 23/09/2020 | 8:30 AM | Canberra, Melbourne, Sydn | All day event

End time: Wed 23/09/2020 | 12:30 PM | Canberra, Melbourne, Sydn

Hi all,

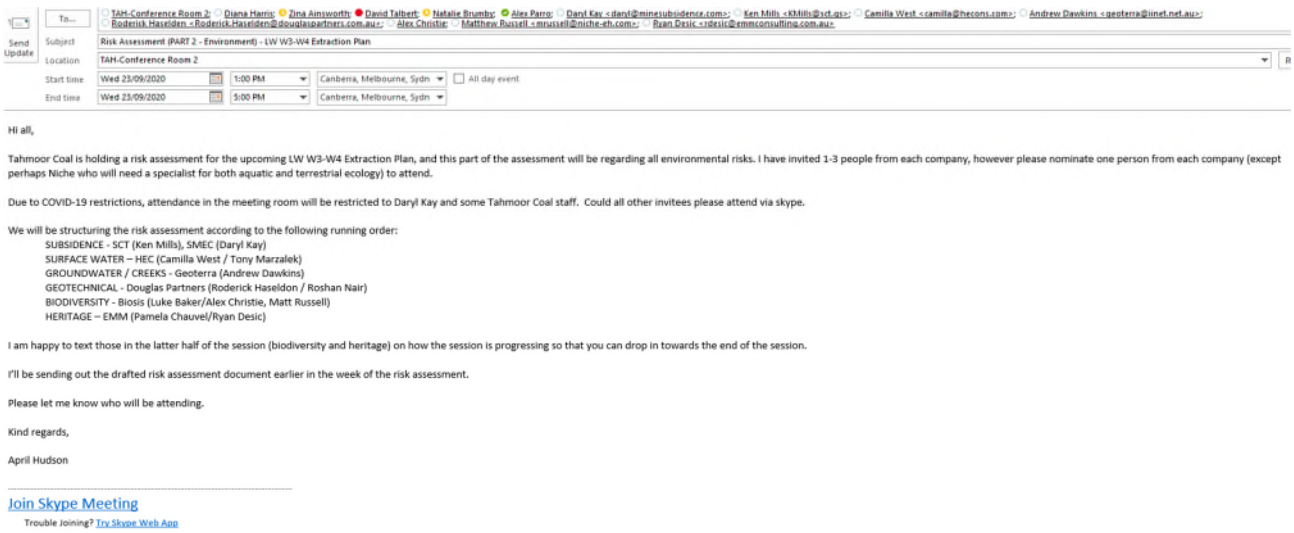
Please let me know if this meeting time works for you.

This risk assessment will be for general risks and infrastructure risks for the upcoming Longwalls West 3 and West 4.

Where possible, please join via Skype for Business. The room has a capacity of 4 according to our COVID-19 rules.

Join Skype Meeting

Trouble Joining? Try Skype Web App



Send Update | To... | TAH-Conference Room 2; Diana Harris; Zina Ainsworth; David Talbert; Natalie Brumby; Alex Parro; Daryl Kay <daryl@minesubsidence.com>; Ken Mills <KMills@sct.gs>; Camilla West <camilla@hecons.com>; Andrew Dawkins <geoterra@iinet.net.au>; Roderick Haselden <Roderick.Haselden@douglaspartners.com.au>; Alex Christie; Matthew Russell <mrussell@niche-eh.com>; Ryan Desic <rdesic@emmconsulting.com.au>

Subject: Risk Assessment (PART 2 - Environment) - LW W3-W4 Extraction Plan

Location: TAH-Conference Room 2

Start time: Wed 23/09/2020 | 1:00 PM | Canberra, Melbourne, Sydn | All day event

End time: Wed 23/09/2020 | 5:00 PM | Canberra, Melbourne, Sydn

Hi all,

Tahmoor Coal is holding a risk assessment for the upcoming LW W3-W4 Extraction Plan, and this part of the assessment will be regarding all environmental risks. I have invited 1-3 people from each company, however please nominate one person from each company (except perhaps Niche who will need a specialist for both aquatic and terrestrial ecology) to attend.

Due to COVID-19 restrictions, attendance in the meeting room will be restricted to Daryl Kay and some Tahmoor Coal staff. Could all other invitees please attend via skype.

We will be structuring the risk assessment according to the following running order:

SUBSIDENCE - SCT (Ken Mills), SMEC (Daryl Kay)
SURFACE WATER – HEC (Camilla West / Tony Marzalek)
GROUNDWATER / CREEKS - Geoterra (Andrew Dawkins)
GEOTECHNICAL - Douglas Partners (Roderick Haseldon / Roshan Nair)
BIODIVERSITY - Biosis (Luke Baker/Alex Christie, Matt Russell)
HERITAGE – EMM (Pamela Chauvel/Ryan Desic)

I am happy to text those in the latter half of the session (biodiversity and heritage) on how the session is progressing so that you can drop in towards the end of the session.

I'll be sending out the drafted risk assessment document earlier in the week of the risk assessment.

Please let me know who will be attending.

Kind regards,

April Hudson

Join Skype Meeting

Trouble Joining? Try Skype Web App

Appendix B – Risk Assessment Register

Major Project Risk Assessment: Tahmoor Underground - Extraction Plan LW W3-W4

	Step 2: Assess Type; Key Elements-These change depending on TYPE of Risk Assessment			Step 3: Identify the risks, causes and potential consequences			Step 4: Identify the existing controls to manage the identified risks	Step 5: Determine RCE	Steps 6, 7 & 8: Determine the Expected Consequence / Likelihood applicable to the Expected Consequence / Current level of risk				Step 10: PMC		Step 11: Treat the Risks			
Appendix B																		
Site	Type of Risk Assessment	Key Element (CURA Context/Category)	Sub Key Element (If applicable)	Risk Description - Something happens.....	Consequence - resulting in:	Causes - Caused by	Existing Control Description	Risk Control Effectiveness	Expected Consequence Category	Expected Risk Consequence	Risk Likelihood	Current Risk Rating	Potential Maximum Consequence	Potential Maximum Category	Treatment plans/tasks (Description)	Task Owner	Due Date	Comments
Tahmoor Underground	Major Project																	
Tahmoor Underground	Major Project	Approvals	Extraction Plan	Extraction Plan Approval not received and delay in LW start	Approval not achieved in time, delay to LW production	* Poor planning and management * DPIE delay in assessing application	* Extraction Plan for previous longwalls (LW W1-W2) approved and to be referenced as example (AC) * Approvals Specialist managing schedule and scope of works (AC) * Weekly Approvals Planning meeting to review schedule and tracking to meet timeframe (AC) * Consultation strategy implemented for Government Agencies (AC) * All specialist consultants engaged (AC) * Weekly GM meetings (AC)	2	Financial	4	D	14	4	Financial	Adaptive management review following 800 m into LW W2 to review starting position for LW W3	April Hudson	01-Apr-21	
Tahmoor Underground	Major Project	Approvals	Extraction Plan	Adequate baseline data not available	Approval not achieved in time, delay to LW production	Inadequate baseline data	* Sufficient baseline data gathered as part of LW W1-W2, currently being managed by Approvals Specialist (AC) * Consultation strategy implemented for Government Agencies (AC)	3	Financial	3	D	9	3	Financial				
Tahmoor Underground	Major Project	Approvals	Extraction Plan	DPIE requires changes to mine layout	Approval not achieved in time, delay to LW production	* Concerns regarding impacts to creeks and tunnel * Independent expert panel report on impacts to streams in catchment areas	* Adaptive management plan for LW W3 (EC) * Consultation strategy implemented for Government Agencies (AC) * Implementation of CMAP and proven remediation success and dedicated Environmental Projects Coordinator (AC) * Design of Mine Plan layout conducted in consultation with Subsidence and Geotechnical Consultants to minimise impacts to creeks (EC) * Avoidance of directly mining under creeks and tunnels (E)	2	Financial	4	C	18	4	Financial	Adaptive management review following 800 m into LW W2 to review starting position for LW W3	April Hudson	01-Apr-21	
Tahmoor Underground	Major Project	Approvals	Extraction Plan	DPIE does not accept proposed management actions as outlined in TARP for impacts to waterways	Delay in production	DPIE Policy position on mining impacts to creeks	* Prior consultation with DPIE (AC) * Implementation of CMAP and dedicated Environmental Projects Coordinator (AC) * Design of Mine Plan layout conducted in consultation with Subsidence and Geotechnical Consultants to minimise impacts to creeks (EC) * Avoidance of directly mining under creeks (E) * Adaptive management plan for Longwall W3 (EC)	2	Legal & Compliance	2	D	5	2	Legal & Compliance	Adaptive management review following 800 m into LW W2 to review starting position for LW W3	April Hudson	01-Apr-21	
Tahmoor Underground	Major Project	Approvals	Extraction Plan	Longwall West 2 completed earlier than scheduled	Approval not achieved in time, delay to LW production	LW W2 production exceeds budget production output (less time for approval)	* Regular tracking of LW W2 schedule to meet extraction plan submission (AC) * Target date for start of LW W3 known (AC) * Extraction plan approval process developed in accordance with LW W2 schedule (AC) * Weekly Approvals Planning meeting to review schedule and tracking to meet timeframe (AC) * Technical Services provide monthly forecast to Senior Management Team for tracking and review (AC)	3	Financial	3	D	9	3	Financial				
Tahmoor Underground	Major Project	Approvals	Aboriginal heritage	AHP approval not received and delay in LW start	Approval not achieved in time, delay to LW production	Quality of application DPIE processing delay Late submission of AHP	* Consultation with key government agencies to confirm documentation required for AHP (AC) * AHP prescriptive guidelines (AC) * Known process and previous history of receiving approvals (AC) * Engagement of experienced consultants (AC)	2	Legal & Compliance	2	D	5	2	Legal & Compliance	Completing of AHP application and submission to DPIE	April Hudson	01-Mar-21	
Tahmoor Underground	Major Project	Approvals	Historical Heritage	Weatherboard Cottage approval not received by Wollondilly Shire Council before mining impacts	Delay in production	* Inadequate consultation with Council prior to submitting documentation * Delay in Council approval	* Existing plan completed and approved by Council for other similar Heritage features (AC) * Mine Plan set well back from Weatherboard Cottage(EC) * Pre Mining Inspection completed prior to mining impacts (EC)	2	Legal & Compliance	1	E	1	1	Legal & Compliance	Submission of Weatherboard Cottage Management Plan to Council.	April Hudson	01-May-22	
Tahmoor Underground	Major Project	Subsidence Monitoring	Subsidence	Potential for greater than predicted subsidence over LW W3-W4 to cause greater subsidence than predicted	Impacts to surface and subsurface features	Geological movements due to subsidence	* Approvals Coordinator managing report delivery to schedule (AC) * Weekly Approvals Planning meeting to review schedule and tracking to meet timeframe (AC) * Learnings from mining previous Longwalls LW W1-W2 (AC) * Adaptive management plan for Longwall W3 (EC) * Existing subsidence monitoring (EC)	2	Legal & Compliance	2	D	5	2	Legal & Compliance	Complete Extraction Plan	April Hudson	30-Jan-21	Observed movements currently less than prediction
Tahmoor Underground	Major Project														Adaptive management review following 800 m into LW W2 to review starting position for LW W3	April Hudson	01-Apr-21	
Tahmoor Underground	Major Project	Subsidence Monitoring	Subsidence	Failure to implement management plan actions	Fines and prosecution	Poor planning and management	* Weekly subsidence meetings attended by Environmental and Community Team members and External Consultants (AC) * Subsidence Monitoring reports (EC) * Monthly Environmental Response Group Meeting attended by Environment and Community Team members and External Consultants (AC)	3	Legal & Compliance	2	D	5	2	Financial				
Tahmoor Underground	Major Project	Community Engagement	Land Owners	Stress to land owner/business owner from LW W3-W4	Health and Safety	* Impacts to business * Inconvenience to business * Concerns about mining * Previous relationships * Poor engagement * Mental health	* Mental health counselling services available to all stakeholders (AC) * Infrastructure Management Plan for selected properties in area (AC) * Stakeholder Engagement Plan (education of subsidence) (AC) * Information packs (AC) * Pre Mining Inspections and Hazard Inspections offered to all land owners (AC) * Monthly newsletter to all residents including email contact for community (AC) * SA NSW guidelines (AC) * 24 hour emergency contact line for community (AC) * Prepared LW W3-W4 Resident Information Pack and Frequently Asked Questions (AC)	3	Health & Safety	2	E	3	2	Health & Safety				
Tahmoor Underground	Major Project	Community Engagement	Land Owners	Community Action Group Forms	Community Reputation	* Impacts and inconvenience to business/property owners. * Concerns about mining * Previous relationships * Poor engagement * Mental health	* Mental health counselling services available to all stakeholders (AC) * Infrastructure Management Plan for selected properties in area (AC) * Stakeholder Engagement Plan (education of subsidence) (AC) * Information packs (AC) * Pre Mining Inspections and Hazard Inspections offered to all land owners (AC) * Monthly newsletter to all residents including email contact for community (AC) * SA NSW guidelines (AC) * 24 hour emergency contact line for community (AC) * Prepared LW W3-W4 Resident Information Pack and Frequently Asked Questions (AC)	2	Community / Reputation	1	D	2	2	Community / Reputation	Develop stakeholder engagement plans and implement	Amanda Francis	30-Dec-20	
Tahmoor Underground	Major Project	Community Engagement	Land Owners	Land Owners will not sign Land Access Licence to meet monitoring requirements	Approval not achieved	* Land owner not agreeing with access agreement conditions * Poor management and consultation	* Consultation with Landowner regarding monitoring and mining process ongoing (AC) * Previous history of stakeholder engagement plans and land access established procedures (AC) * A clear defined process for pre-mining inspections (AC) * Front of house pre mining inspections (EC) * Details list of ownership in area (AC) * Draft monitoring plan issued for discussion (AC)	2	Legal & Compliance	2	C	8	2	Legal & Compliance	Prepare land access agreement plan and implement.	Amanda Francis	30-Dec-20	
Tahmoor Underground	Major Project	Community Engagement	Rural residences	Damage to infrastructure or buildings	Health and Safety	Subsidence	* Infrastructure Management Plans (AC) * Previous history of managing properties (AC) * Consultation and engagement with residents (AC) * Weekly subsidence meetings attended by Environmental and Community Team members and External Consultants (AC) * Subsidence Monitoring reports (EC) * Pre Mining Inspections and Hazard Inspections offered to all land owners (AC) * Front of house pre mining inspections (EC) * Weekly visual inspections conducted by building inspector (AC) * Management Plans prepared for previous longwalls (AC)	2	Health & Safety	2	D	5	2	Health & Safety	Implement monitoring from Infrastructure Management Plans.	Amanda Francis	02-Aug-21	
Tahmoor Underground	Major Project	Built Infrastructure	Heritage Rail	Heritage Rail MP not completed prior to influence of Longwall mining	Delay in production	* Late submission by Tahmoor * Poor Project Management * Inadequate consultation with key stakeholders * Inadequate resources. * Access to complete investigative works.	* Previous survey and management completed successfully (AC) * Learnings from mining beneath Main southern railway (AC) * Consultation with Transport Heritage NSW and key stakeholders prior to mining (AC) * Regular Meetings with Transport Heritage Rail Management Group (AC) * Project Schedule in place (AC) * Approvals Coordinator managing schedule and scope of works (AC) * Weekly Approvals Planning meeting to review schedule and tracking to meet timeframe (AC)	2	Financial	2	D	5	2	Financial	Finalise rail management plan and implement.	David Talbert	01-May-21	
Tahmoor Underground	Major Project	Built Infrastructure	Main Southern Railway Infrastructure	* Rail Embankments/Culverts and other infrastructure. * Picton Viaduct and Picton Tunnel * Resources Regulator does not accept proposed Management Strategy	Financal Impact	* RR conservative interpretation of Engineering Reports. * Poor Project Management * Inadequate consultation.	* Learnings from mining beneath Main Southern Railway (AC) * Consultation with RR and key stakeholders (AC) * Regular Meetings with ARTC Rail Management Group (AC) * Project Schedule (AC)	2	Financial	3	C	13	3	Legal & Compliance	Engineering Review of Embankments, culverts, Picton Tunne, Viaduct and other key infrastructure.	David Talbert	23-Dec-20	
Tahmoor Underground	Major Project														Separate risk assessment to be completed for rail infrstructure.	David Talbert	23-Dec-20	
Tahmoor Underground	Major Project														Finalise rail management plan and implement.	David Talbert	01-Sep-21	
Tahmoor Underground	Major Project														Obtain Environmental Approvals to complete engineering works on Picton Viaduct and Picton Tunnel	April Hudson	01-Nov-20	

Major Project Risk Assessment: Tahmoor Underground - Extraction Plan LW W3-W4

	Step 2: Assess Type; Key Elements-These change depending on TYPE of Risk Assessment			Step 3: Identify the risks, causes and potential consequences			Step 4: Identify the existing controls to manage the identified risks	Step 5: Determine RCE	Steps 6, 7 & 8: Determine the Expected Consequence / Likelihood applicable to the Expected Consequence / Current level of risk				Step 10: PMC		Step 11: Treat the Risks			
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Site	Type of Risk Assessment	Key Element (CURA Context/Category)	Sub Key Element (If applicable)	Risk Description - Something happens.....	Consequence - resulting in:	Causes - Caused by	Existing Control Description	Risk Control Effectiveness	Expected Consequence Category	Expected Risk Consequence	Risk Likelihood	Current Risk Rating	Potential Maximum Consequence	Potential Maximum Category	Treatment plans/tasks (Description)	Task Owner	Due Date	Comments
Tahmoor Underground	Major Project	Built Infrastructure	Endeavour Energy Infrastructure	Adverse impacts to power poles	Reduction in clearance heights and / or excessive tilting of power poles	Subsidence	* Successful completion of management plan for LW 22-W2 (AC) * Previous ground survey, pole survey and visual inspection as part of LW 22 - W2 management (AC) * Previous consultation, coordination and cooperation with Endeavour Energy (AC)	2	Health & Safety	3	E	6	3	Health & Safety	Complete Endeavour Energy Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project														Endeavour Energy to complete Critical Poles audit	April Hudson	01-Mar-21	
Tahmoor Underground	Major Project														SMEC to complete survey of critical poles	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project														Building Inspection Services to complete baseline tilt measurement of poles	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Endeavour Energy Infrastructure	Adverse impacts to consumer cables to houses	Loss of serviceability, emergency repair of powerline	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey, pole survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with Endeavour Energy (AC)	2	Property Damage	1	E	1	1	Property Damage	Complete Endeavour Energy Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Sydney Water Potable Water Infrastructure	Leakage of the joints	Reduced water supply requiring emergency repair or replacement of pipework	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with Sydney Water (AC) * UPVC pipes reduces potential for breakage (EC)	2	Property Damage	1	D	2	1	Property Damage	Complete Sydney Water Potable Water Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project		Sydney Water Sewer Infrastructure	Leakage of the joints	Leakage of sewage requiring repair or replacement	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-32 management (AC) * Previous consultation, coordination and cooperation with Sydney Water (AC) * PVC pipes reduces potential for breakage (EC)	2	Property Damage	1	D	2	1	Property Damage	Complete Sydney Water Sewerage Management Plan including TARP	April Hudson	01-May-22	
Tahmoor Underground	Major Project	Built Infrastructure	Stonequarry Creek Estate Sewerage Plant	Reduction of grade below self-cleansing	Loss of serviceability, requiring emergency repair or replacement of pipework	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW W1-W2 management (AC) * Previous consultation, coordination and cooperation with Bradcorp (AC)	2	Property Damage	2	D	5	2	Property Damage	Complete Stonequarry Creek Estate Water Management Plan including TARP	David Talbert	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Stonequarry Creek Estate Sewerage Plant	Damage to pipeline	Loss of serviceability, requiring emergency repair or replacement of pipework	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW W1-W2 management (AC) * Previous consultation, coordination and cooperation with Bradcorp (AC)	2	Property Damage	2	D	5	2	Property Damage	Complete Stonequarry Creek Estate Water Management Plan including TARP	David Talbert	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Stonequarry Creek Estate Sewerage Plant	Damage to pipeline	Leakage of sewage into waterway	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW W1-W2 management (AC) * Previous consultation, coordination and cooperation with Bradcorp (AC)	2	Environment	2	D	5	2	Environment	Complete Stonequarry Creek Estate Water Management Plan including TARP	David Talbert	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Stonequarry Creek Estate Sewerage Plant	Damage to Wastewater Treatment Plant	Loss of serviceability, requiring emergency repair or replacement of pipework	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous consultation, coordination and cooperation with Bradcorp (AC)	2	Property Damage	2	D	5	2	Property Damage	Complete Stonequarry Creek Estate Water Management Plan including TARP	David Talbert	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Jemena gas infrastructure	Damage to gas infrastructure	Gas leak, emergency repair	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with Jemena (AC) * Design of gas line flexible pipework (EC) * Gas is odourous - community more likely to report gas leaks if they occur (EC)	2	Health & Safety	1	D	2	1	Health & Safety	Complete Jemena Management Plan including TARP and contact details for Jemena	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project														Complete baseline gas detection survey (Macarthur Gas)	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Telstra / NBN infrastructure	Damage to copper local cable	Loss of serviceability, emergency repair or replacement of cable	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with Telstra and NBN Co (AC)	2	Property Damage	1	E	1	1	Property Damage	Complete Telstra Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project														Complete NBN Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Telstra / NBN infrastructure	Damage to conduit, manhole, pit and pole network	Loss of serviceability, emergency repair or replacement of cable	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with Telstra and NBN Co (AC)	2	Property Damage	1	E	1	1	Property Damage	Complete Telstra Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project														Complete NBN Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Telstra / NBN infrastructure	Damage to optical fibre cables	Loss of serviceability, emergency repair or replacement of cable	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with Telstra and NBN Co (AC)	2	Property Damage	2	E	3	2	Property Damage	Complete Telstra Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project														Complete NBN Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Council Infrastructure	Minor cracking or heaving of pavement, kerbs and gutters	Slight damage to road, requiring repair. Reduced maintenance life	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with Wollondilly Shire Council (AC)	2	Property Damage	2	E	3	2	Property Damage	Complete Wollondilly Shire Council Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Council Infrastructure	Major cracking or heaving of pavement, kerbs and gutters	Extensive damage to road, requiring emergency repair and extension rehabilitation	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with Wollondilly Shire Council (AC)	2	Property Damage	3	E	6	3	Property Damage	Complete Wollondilly Shire Council Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Council Infrastructure	Slope instability causing loss of support to road	Tension cracking in road surface requiring repair or damage to roadway barriers (Tension to cables)	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 31-W2 management (AC) * Previous consultation, coordination and cooperation with Wollondilly Shire Council (AC) * Pre mining Geotechnical assessment conducted for LW 32 (EC) * Traffic management plan for any work on Thirlmere Way to satisfaction of WSC (AC)	2	Health & Safety	2	D	5	2	Health & Safety	Complete Wollondilly Shire Council Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project														Review and update traffic control plan for emergency repairs	Amanda Fitzgerald	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Council Infrastructure	Damage to bridges	Loss of serviceability	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW W1-W2 management (AC) * Previous consultation, coordination and cooperation with Wollondilly Shire Council (AC) * Surveys currently on bridges (AC)	2	Financial	2	E	3	2	Financial	Complete structural engineering review of bridges	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project														Complete Wollondilly Shire Council Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Council Infrastructure	Damage to culverts and stormwater infrastructure	Reduced maintenance life; sealing / localised repair or loss of serviceability requiring emergency repair and/or replacement of culverts	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with Wollondilly Shire Council (AC)	2	Property Damage	2	E	3	2	Property Damage	Complete Wollondilly Shire Council Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Survey Control Marks	Movement of survey control marks	Errors in measurements	Subsidence	* Preparation of POSI application of predicted subsidence movements of the permanent survey control marks (AC)	2	Property Damage	2	D	5	2	Property Damage	Notify Spatial Services via POSI application of predicted subsidence movements of the permanent survey control marks	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Survey Control Marks	Movement of PCTN Picton Station	Errors in measurements	Subsidence	* POSI application of predicted subsidence movements of the permanent survey control marks completed for LW 32 - W2 (AC) * Ongoing monitoring and review of far field monitoring network, including GNSS network (EC)	2	Property Damage	2	D	5	2	Property Damage	Complete POSI application for W3 - W4.	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Survey Control Marks	Use of survey control marks by general surveyors during and after mining, affecting results (prior to re-calibration)	Errors in measurements	Subsidence	* POSI application of predicted subsidence movements of the permanent survey control marks completed for LW 32 - W2 (AC) * Ongoing monitoring and review of far field monitoring network, including GNSS network (EC)	2	Property Damage	2	D	5	2	Property Damage	Complete POSI application for W3 - W4.	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Built Structures	Impact on health and safety of people	Injury to person	Subsidence resulting in failure of a structural element	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with residents (AC) * Completion of Pre-mining and subsidence hazard inspections (EC)	2	Health & Safety	3	E	6	3	Health & Safety	Complete Built Structures Management Plan including TARP for emergency evacuation procedures	April Hudson	01-Sep-21	

Major Project Risk Assessment: Tahmoor Underground - Extraction Plan LW W3-W4

	Step 2: Assess Type; Key Elements-These change depending on TYPE of Risk Assessment			Step 3: Identify the risks, causes and potential consequences			Step 4: Identify the existing controls to manage the identified risks	Step 5: Determine RCE	Steps 6, 7 & 8: Determine the Expected Consequence / Likelihood applicable to the Expected Consequence / Current level of risk				Step 10: PMC		Step 11: Treat the Risks			
Appendix B																		
Site	Type of Risk Assessment	Key Element (CURA Context/Category)	Sub Key Element (If applicable)	Risk Description - Something happens.....	Consequence - resulting in:	Causes - Caused by	Existing Control Description	Risk Control Effectiveness	Expected Consequence Category	Expected Risk Consequence	Risk Likelihood	Current Risk Rating	Potential Maximum Consequence	Potential Maximum Category	Treatment plans/tasks (Description)	Task Owner	Due Date	Comments
Tahmoor Underground	Major Project	Built Infrastructure	Built Structures	Damage to structures	Repair of structures	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with residents (AC) * Completion of Pre-mining and subsidence hazard inspections (EC)	2	Property Damage	2	D	5	2	Property Damage	Complete Built Structures Management Plan including TARP for emergency evacuation procedures	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Pools	Impact on health and safety of people	Injury to person / single fatality	Subsidence causing damage to pool gate or fence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with residents (AC) * Completion of Pre-mining and subsidence hazard inspections (EC)	2	Health & Safety	4	E	10	4	Health & Safety	Complete Built Structures Management Plan including TARP for emergency evacuation procedures	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Pools	Damage to pools	Repair of pools or plant	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with residents (AC) * Completion of Pre-mining and subsidence hazard inspections (EC)	2	Property Damage	2	D	5	2	Property Damage	Complete Built Structures Management Plan including TARP for emergency evacuation procedures	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Septic tanks	Damage to septic tanks	Repair of tanks	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with residents (AC) * Completion of Pre-mining and subsidence hazard inspections (EC)	2	Property Damage	2	D	5	2	Property Damage	Complete Built Structures Management Plan including TARP for emergency evacuation procedures	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Built Infrastructure	Weatherboard Cottage	Damage to Weatherboard Cottage structures	Damage to Weatherboard Cottage structures, impacts to heritage significance of property	Subsidence	* Management Plans prepared for previous longwalls for similar structures (AC)	2	Property Damage	2	E	3	2	Property Damage	Complete Weatherboard Cottage Management Plan including TARP	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project														Complete structural assessment of Weatherboard Cottage	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project														Consider completing a statement of heritage impacts for weatherboard cottage	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project	Surface Water	Pool water level and streamflow	Fracturing of creek beds Stonequarry Creek	Reduction in pool holding capacity, water level, connective streamflow; Changes in natural drainage behaviour; Reduction in channel bank stability	Subsidence	* Mine design (EC) * Adaptive management (AC) * Management Plans prepared for previous longwalls (AC) * Previous monitoring completed for previous longwalls (AC)	2	Environment	3	C	13	3	Environment	Complete Surface Water Technical Report, and incorporate monitoring measures and TARP into Water Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Environmental														Adaptive management review following 800 m into LW W2 to review starting position for LW W3	April Hudson	01-Apr-21	
Tahmoor Underground	Major Project	Surface Water	Water quality	Fracturing of creek beds Stonequarry creek, gas emissions occur	Decrease in water quality in creeks (pH, EC, heavy metals)	Subsidence	* Mine design (EC) * Adaptive management (AC) * Management Plans prepared for previous longwalls (AC) * Previous monitoring completed for previous longwalls (AC)	2	Environment	3	C	13	3	Environment	Complete Surface Water Technical Report, and incorporate monitoring measures and TARP into Water Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Major Project														Adaptive management review following 800 m into LW W2 to review starting position for LW W3	April Hudson	01-Apr-21	
Tahmoor Underground	Environmental	Surface Water	Flood potential	Alteration of topography, vertical subsidence	Increase in flood levels	Subsidence	* Mine design (EC) * Management Plans prepared for previous longwalls (AC) * Completed flood modelling for LW W1 - W4 confirms level of impact and rates of change (AC)	2	Environment	1	D	2	1	Environment	Complete Surface Water Technical Report, and incorporate monitoring measures and TARP into Water Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Environmental	Groundwater	Groundwater level	Fracturing of geological strata	Adverse effects to private bore	Subsidence	* Make good procedure (AC) * Pre existing bore water census (EC) * Management Plans prepared for previous longwalls (AC) * Previous monitoring completed for previous longwalls (AC)	2	Property Damage	1	D	2	1	Environment	Complete Groundwater Technical Report, and incorporate monitoring measures and TARP into Water Management Plan	April Hudson	30-Jan-21	Confirm Bradcorp bore is decommissioned. If bore is in use the likelihood will be Almost Certain due to LW W2.
Tahmoor Underground	Environmental	Groundwater	Water quality	Adverse impact to groundwater aquifers	Adverse effects to private bores	Subsidence	* Make good procedure (AC) * Pre existing bore water senses (EC) * Management Plans prepared for previous longwalls (AC) * Previous monitoring completed for previous longwalls (AC)	2	Investment Return	1	D	2	1	Environment	Complete Groundwater Technical Report, and incorporate monitoring measures and TARP into Water Management Plan	April Hudson	30-Jan-21	Confirm Bradcorp bore is decommissioned. If bore is in use the likelihood will be Almost Certain due to LW W2.
Tahmoor Underground	Environmental	Landscape features	Steep slopes	Tension cracks, compression ridges	Failure of steep slopes, slope slippage	Subsidence	* Geotechnical Engineer assessment and report where the slopes are near surface features or buildings (PM) * Management Plans prepared for previous longwalls (AC) * Previous monitoring completed for previous longwalls (AC) * Previous consultation, coordination and cooperation with landowners / residents (AC) * Visual inspections during mining (AC)	2	Property Damage	2	E	3	2	Property Damage	Complete Geotechnical Report for landscape features (including steep slopes), and incorporate monitoring measures and TARP into Land Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Major Project							2	Health & Safety	1	E	1	1	Health & Safety	Complete Public Safety Management plan to incorporate signage and communication regarding subsidence	April Hudson	30-Jan-21	
Tahmoor Underground	Major Project	Landscape features	Farm dams	Damage to farm dams	Leak of dam water	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with residents * Completion of Pre-mining inspections (EC)	2	Property Damage	2	D	5	2	Property Damage	Complete Geotechnical Report for landscape features (including steep slopes), and incorporate monitoring measures and TARP into Land Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Major Project														Conduct Dam Break study for the large dams	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project			Damage to farm dams	Personnel injury	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW 22-W2 management (AC) * Previous consultation, coordination and cooperation with residents * Completion of Pre-mining inspections (EC)	2	Health & Safety	4	E	10	4	Health & Safety	Complete Geotechnical Report for landscape features (including steep slopes), and incorporate monitoring measures and TARP into Land Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Major Project														Conduct Dam Break study for the large dams	April Hudson	01-Sep-21	
Tahmoor Underground	Major Project			Change in catchment run off characteristics	Localised ponding, reduction in water level	Subsidence	* Undulating terrain incised valleys * Natural grades are substantially greater than predicted tilts * Surface flow modelling completed for previous management plans (EC) * Changes in freeboard modelling conducted (EC)	3	Financial	1	E	1	1					
Tahmoor Underground	Environmental	Landscape features	Agricultural land capability	Alteration of landscape	Decrease in land and soil capability	Subsidence	Not deemed a risk by the group.	2	Property Damage	1	E	1	1	Property Damage	Complete Land and Agricultural Resource Assessment, incorporate information into Land Management Plan, allocation of monitoring measures and TARP in Land Management Plan	April Hudson	30-Jan-21	Plans to develop a majority of agriculture land for residential housing
Tahmoor Underground	Environmental	Aquatic ecology	Aquatic habitat / Macroinvertebrates / fish	Fracturing of creek beds Stonequarry Creek	Reduction in pool connectivity / holding capacity / flow, change in water quality resulting in change in-stream vegetation and aquatic habitat.	Subsidence	* Mine design (EC) * Management Plans prepared for previous longwalls (AC) * Previous monitoring completed for previous longwalls (AC)	2	Environment	2	C	8	2	Environment	Complete Aquatic Biodiversity Technical Report, and incorporate monitoring measures and TARP into Biodiversity Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Environmental	Aquatic ecology	Threatened aquatic species and habitat	Fracturing of creek beds	Reduction in pool holding capacity / flow resulting in decreased in threatened aquatic species	Subsidence	No threatened aquatic species have been observed in the Study Area to date (baseline monitoring).	2	Environment	1	E	1	1	Environment	Continue and update of Aquatic Biodiversity Technical Report, and incorporate monitoring measures and TARP into Biodiversity Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Environmental	Terrestrial ecology	Riparian vegetation	Fracturing of creek beds, emissions of gas	Riparian vegetation die-back, tree fall	Subsidence	* Mine design (EC) * Management Plans prepared for previous longwalls (AC) * Previous monitoring completed for previous longwalls (AC)	2	Environment	1	D	2	1	Environment	Complete Terrestrial Biodiversity Technical Report, and incorporate monitoring measures and TARP into Biodiversity Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Environmental	Terrestrial ecology	Threatened ecological communities	Fracturing of creek beds, emissions of gas	Riparian vegetation die-back, tree fall	Subsidence	* Mine design (EC) * Management Plans prepared for previous longwalls (AC) * Previous monitoring completed for previous longwalls (AC)	2	Environment	1	D	2	1	Environment	Complete Terrestrial Biodiversity Technical Report, and incorporate monitoring measures and TARP into Biodiversity Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Major Project	Terrestrial ecology	Threatened Amphibians	Decline in pool holding capacity	Impacts to amphibian habitat	Subsidence	No threatened amphibians in the baseline studies recorded and no significant impacts predicted in the impact assessment.	2	Environment	1	E	1	1	Environment	Complete Terrestrial Biodiversity Technical Report, and incorporate monitoring measures and TARP into Biodiversity Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Environmental	Terrestrial ecology	Groundwater dependent ecosystems	Fracturing of geological strata	Reduction of groundwater level resulting in impact to groundwater dependent ecosystems	Subsidence	No groundwater dependent ecosystems in or near the Study Area - not deemed a risk by the group.	3	Environment	1	E	1	1	Environment				

Major Project Risk Assessment: Tahmoor Underground - Extraction Plan LW W3-W4

	Step 2: Assess Type; Key Elements-These change depending on TYPE of Risk Assessment		Step 3: Identify the risks, causes and potential consequences			Step 4: Identify the existing controls to manage the identified risks	Step 5: Determine RCE	Steps 6, 7 & 8: Determine the Expected Consequence / Likelihood applicable to the Expected Consequence / Current level of risk				Step 10: PMC		Step 11: Treat the Risks			

Appendix B

Site	Type of Risk Assessment	Key Element (CURA Context/Category)	Sub Key Element (If applicable)	Risk Description - Something happens.....	Consequence - resulting in:	Causes - Caused by	Existing Control Description	Risk Control Effectiveness	Expected Consequence Category	Expected Risk Consequence	Risk Likelihood	Current Risk Rating	Potential Maximum Consequence	Potential Maximum Category	Treatment plans/tasks (Description)	Task Owner	Due Date	Comments
Tahmoor Underground	Environmental	Aboriginal heritage	Grinding groove sites	Fracturing of Stonequarry Creek beds	Loss of heritage values	Subsidence	* Mine design (EC) * Adaptive management (AC) * Management Plans prepared for previous longwalls (AC) * Previous monitoring completed for previous longwalls (AC)	2	Environment	3	D	9	1	Environment	Complete Aboriginal Heritage Technical Report, and incorporate monitoring measures and TARP into Heritage Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Major Project														Completing of AHIP application and submission to DPIE	April Hudson	01-Mar-21	
Tahmoor Underground	Major Project	Aboriginal heritage	Scarred tree	Tree tilts and falls over	Loss of heritage values	Subsidence	* Visual inspections conducted (AC) * Management Plans for previous Longwall W1 - W2 (AC)	2	Environment	1	E	1	1	Environment	Update Aboriginal Heritage Technical Report, and incorporate monitoring measures and TARP into Heritage Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Major Project	Aboriginal heritage	Surface scatters	Disturbance of scatters	Loss of heritage values	Subsidence	* Visual inspections conducted (AC) * Management Plans for previous Longwall W1 - W2 (AC)	2	Environment	1	E	1	1	Environment	Update Aboriginal Heritage Technical Report, and incorporate monitoring measures and TARP into Heritage Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Environmental	Historical heritage	Local and State heritage items (Weatherboard Cottage, Picton Heritage Rail)	Cracking of heritage buildings, impacts to archaeological site, impacts to rural landscape	Loss of heritage value	Subsidence	* Management Plans prepared for previous longwalls for similar structures (AC)	2	Property Damage	2	D	5	2	Property Damage	Complete Historical Heritage Technical Report, and incorporate monitoring measures and TARP into Heritage Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Major Project														Complete new PSMPs for other items for LW W3-W4	April Hudson	30-Jan-21	
Tahmoor Underground	Environmental	Historical heritage	PMLL Railway culverts	Cracking of heritage culverts along Picton-Mittagong Loop Line	Loss of heritage values	Subsidence	* Concrete sleeves inserted into culverts for LW W1-W2 (EC) * Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW W1-W2 management (AC) * Previous consultation, coordination and cooperation with Transport Heritage (AC) * Existing surveys conducted (AC)	2	Property Damage	2	C	8	2	Property Damage	Complete Historical Heritage Technical Report, and incorporate monitoring measures and TARP into Heritage Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Major Project														Complete PMLL Management Plan	David Talbert	01-Sep-21	
Tahmoor Underground	Major Project														Complete structural assessment of PMLL structures	David Talbert	01-Sep-21	
Tahmoor Underground	Major Project														Complete geotechnical assessment of PMLL structures	David Talbert	01-Sep-21	
Tahmoor Underground	Major Project	Historical heritage	MSR Picton Tunnel	Minor cracking to MSR Picton Tunnel	Loss of heritage values	Subsidence	* Preliminary engineering reviews (AC) * Preliminary heritage reviews (AC)	2	Property Damage	2	C	8	2	Property Damage	Complete Historical Heritage Technical Report, and incorporate monitoring measures and TARP into Heritage Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Major Project														Complete MSR Management Plan	David Talbert	01-Sep-21	
Tahmoor Underground	Major Project														Complete structural assessment of Picton Tunnel	David Talbert	30-Dec-20	
Tahmoor Underground	Major Project														Complete geotechnical assessment of Picton Tunnel	David Talbert	30-Dec-20	
Tahmoor Underground	Major Project														Consider need for Heritage approval to install mitigation measures	April Hudson	01-Nov-20	
Tahmoor Underground	Major Project			Minor cracking to MSR Picton Tunnel	Property Damage	Subsidence	* Preliminary engineering reviews (AC) * Preliminary heritage reviews (AC)	2	Financial	3	C	13	3		Engineering assessment to be conducted	David Talbert	30-Dec-20	
Tahmoor Underground	Major Project														Engagement with key stakeholders to be conducted	David Talbert	30-Dec-20	
Tahmoor Underground	Major Project														Risk review with rail regulators to be conducted	David Talbert	30-Dec-20	
Tahmoor Underground	Major Project	Historical heritage	Mushroom Tunnel	Cracking of Mushroom Tunnel	Loss of heritage values	Subsidence	* Management Plans prepared for previous longwalls (AC) * Previous ground survey and visual inspection as part of LW W1-W2 management (AC) * Previous consultation, coordination and cooperation with Council * Existing surveyes conducted (AC)	2	Property Damage	3	E	6	3	Property Damage	Complete Historical Heritage Technical Report, and incorporate monitoring measures and TARP into Heritage Management Plan	April Hudson	30-Jan-21	
Tahmoor Underground	Major Project	Historical heritage	MSR Railway culverts	Cracking of heritage culverts along Main Southern Railway	Loss of heritage values	Subsidence	* Management Plans prepared for previous longwalls (AC)	2	Property Damage	3	E	6	3	Property Damage	Complete Historical Heritage Technical Report, and incorporate monitoring measures and TARP into Heritage Management Plan	April Hudson	30-Jan-21	
	98	62		66	66	Subtotal CountA (ignoring hidden values)		67				98	97					

Tahmoor Underground	Broad Brush											#N/A						
Tahmoor Underground	Life of Mine											#N/A						
Tahmoor Underground	Business											#N/A						
Tahmoor Underground	Major Project											#N/A						
Tahmoor Underground	Environmental/Health/Process											#N/A						
Tahmoor Underground	Equipment											#N/A						

Appendix C – Figures Reviewed During Risk Assessment

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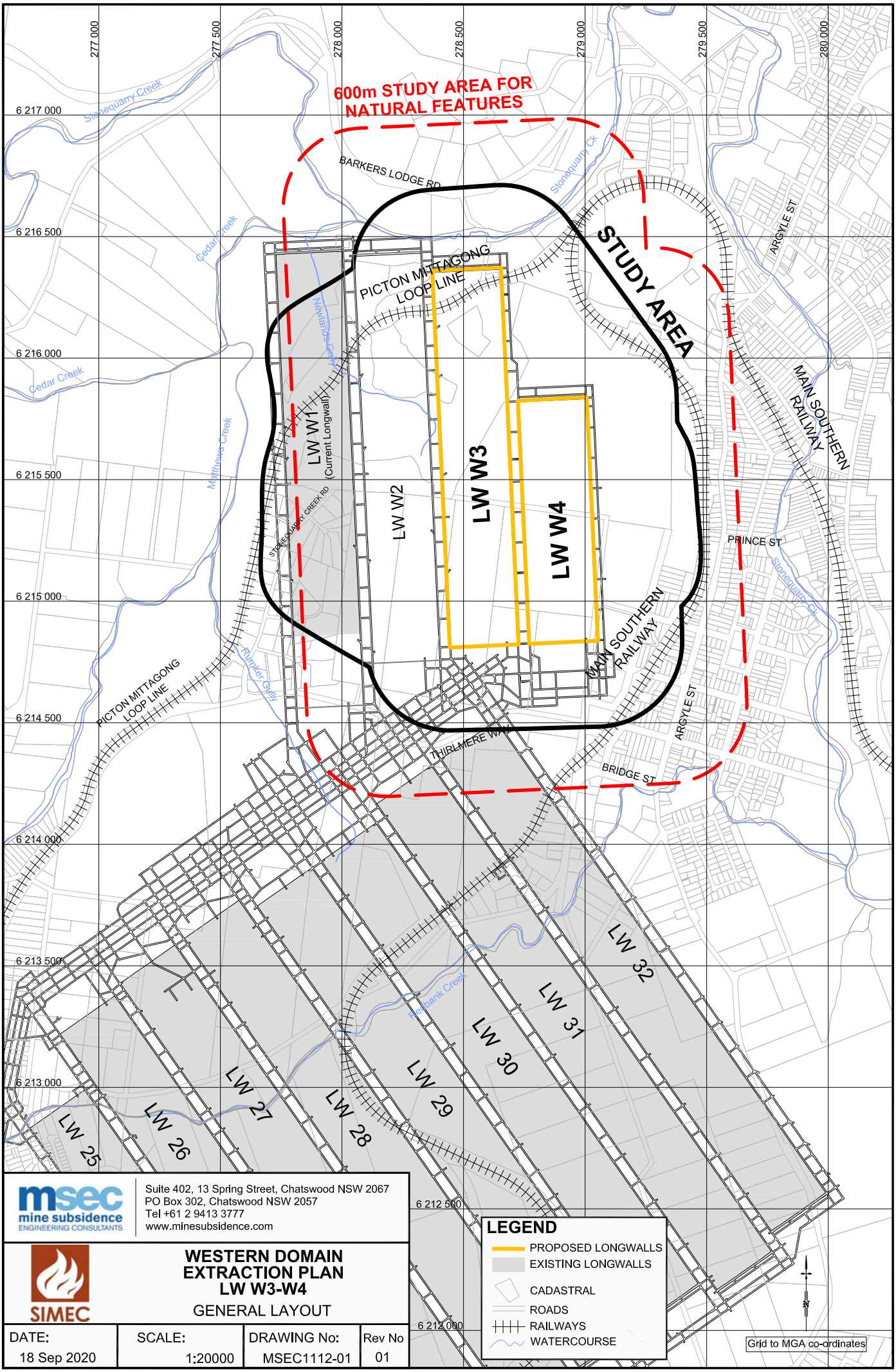

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4

GENERAL LAYOUT

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18 Sep 2020	1:20000	MSEC1112-01	01

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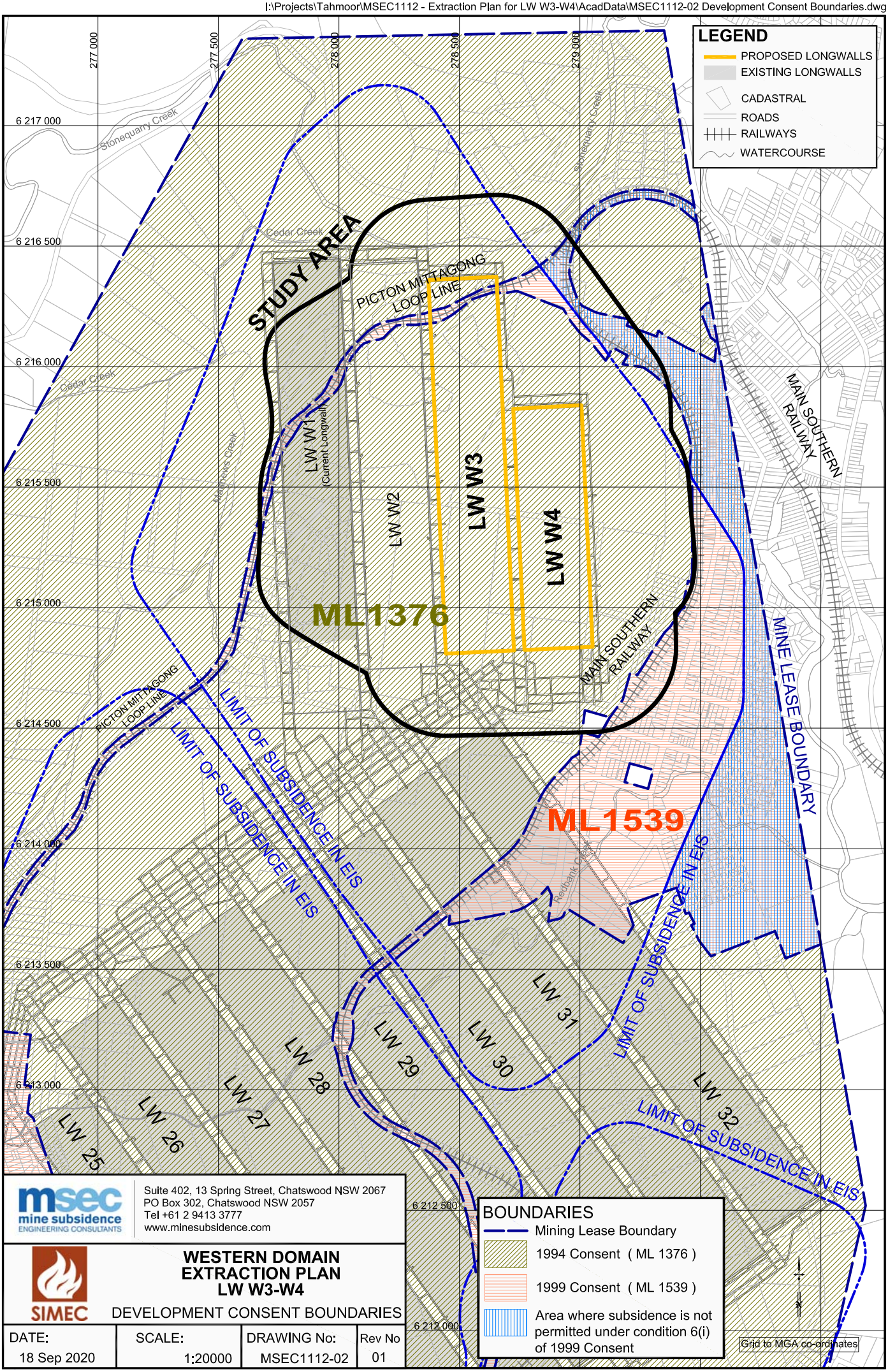

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4

DEVELOPMENT CONSENT BOUNDARIES

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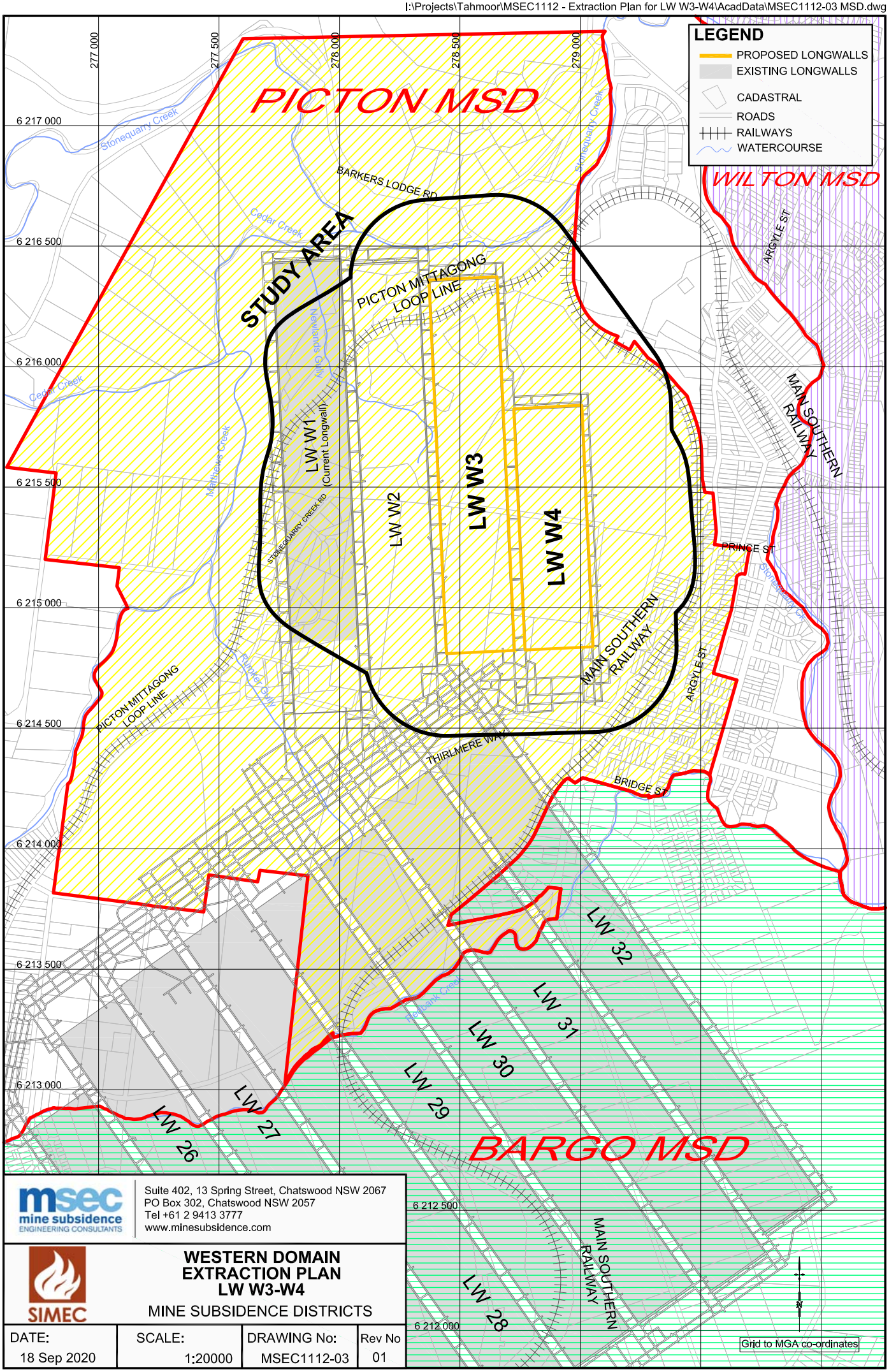

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MINE SUBSIDENCE DISTRICTS

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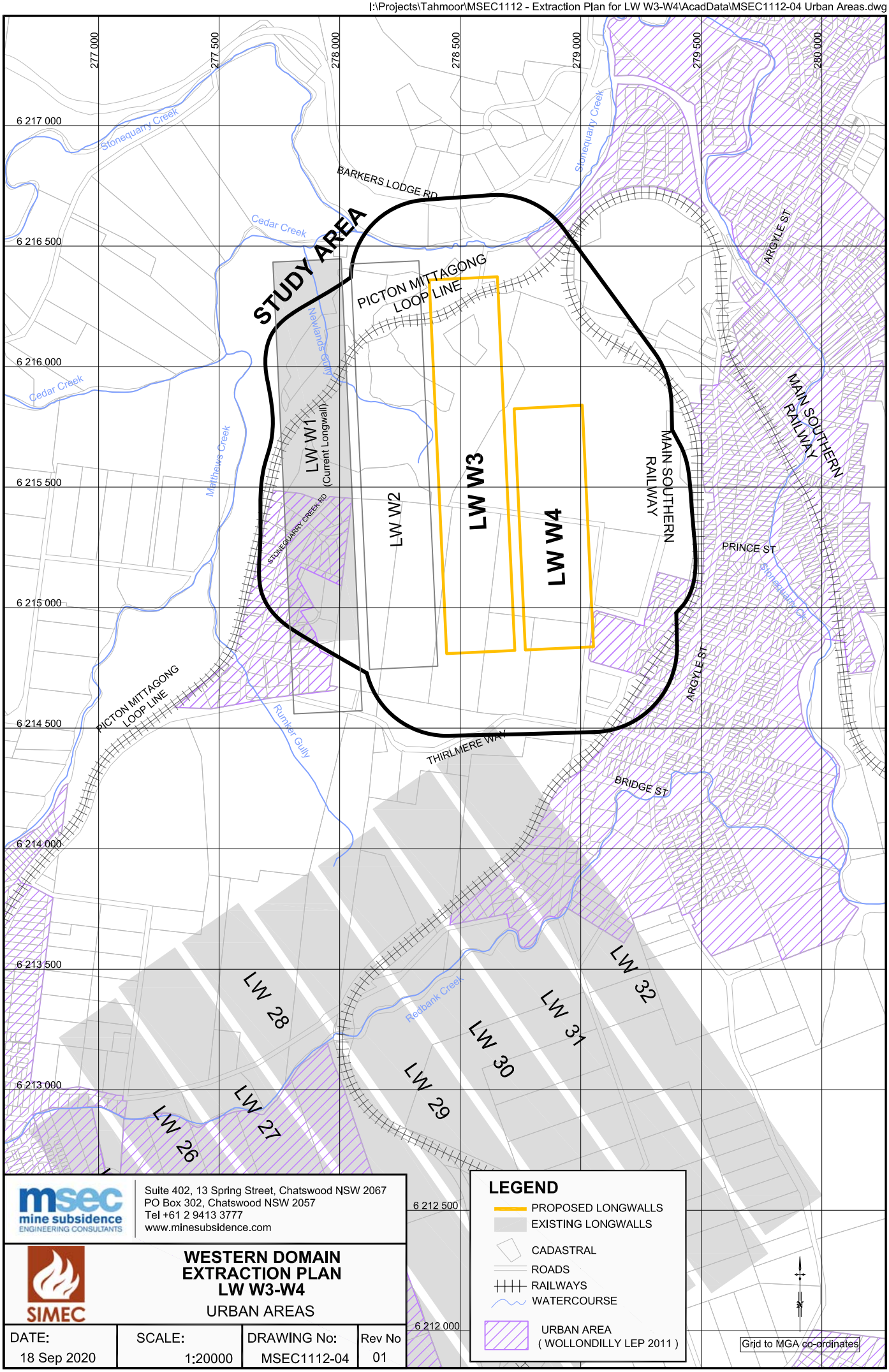

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4

URBAN AREAS

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LEGEND

- PROPOSED LONGWALLS
- EXISTING LONGWALLS
- CADASTRAL
- ROADS
- RAILWAYS
- WATERCOURSE
- URBAN AREA (WOLLONDILLY LEP 2011)

Grid to MGA co-ordinates

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4

SURFACE LEVEL CONTOURS

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Grid is MGA co-ordinates

STUDY AREA

LW W1 (Current Longwall)

LW W2

LW W3

LW W4

CROSS-SECTION A

LONG-SECTION B

LW 32

LW 31

PICTON MITTAGONG LOOP LINE

MAIN SOUTHERN RAILWAY

BARKERS LODGE RD

THIRLMERE WAY

STONEQUARRY CREEK RD

Cedar Creek

Stonequarry Creek

Newlands Gully

Matthews Creek

Bunker Gully

6 217 000

6 216 500

6 216 000

6 215 500

6 215 000

6 214 500

279 000

278 000

277 500

LEGEND

- PROPOSED LONGWALLS
- EXISTING LONGWALLS
- CADASTRAL
- ROADS
- RAILWAYS
- WATERCOURSE
- 2m SURFACE LEVEL CONTOURS ARE IN m AHD

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4

BULLI SEAM FLOOR CONTOURS

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LEGEND
- PROPOSED LONGWALLS
- EXISTING LONGWALLS
- ROADS
- RAILWAYS
- WATERCOURSE
- 5m SEAM FLOOR CONTOURS ARE IN m AHD

Grid to MGA co-ordinates

277 500 278 000 278 500 279 000 279 500

6 217 000 6 216 500 6 216 000 6 215 500 6 215 000 6 214 500 6 214 000

STUDY AREA

BARKERS LODGE RD

Cedar Creek

Stonequarry Creek

PICTON MITTAGONG LOOP LINE

Newlands Gully

LW W1 (Current Longwall)

LW W2

LW W3

LW W4

LW 31

LW 32

CROSS-SECTION A

LONG-SECTION B

STONEQUARRY CREEK RD

Matthews Creek

Rumker Gully

MAIN SOUTHERN RAILWAY

-240 -245 -250 -255 -260 -265 -270 -275 -280 -285 -290 -295 -300 -305 -310 -315 -320 -325

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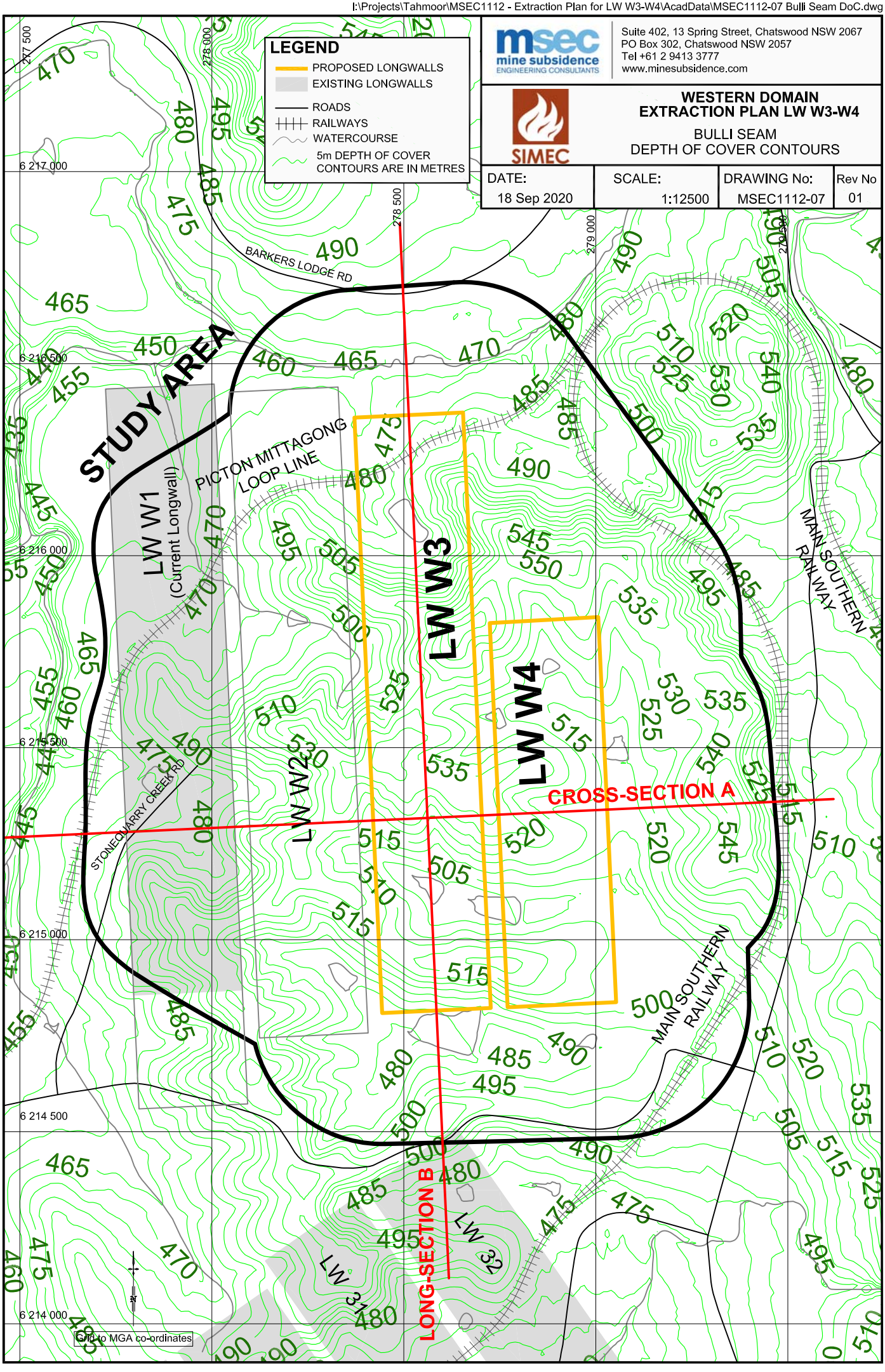

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4

BULLI SEAM DEPTH OF COVER CONTOURS

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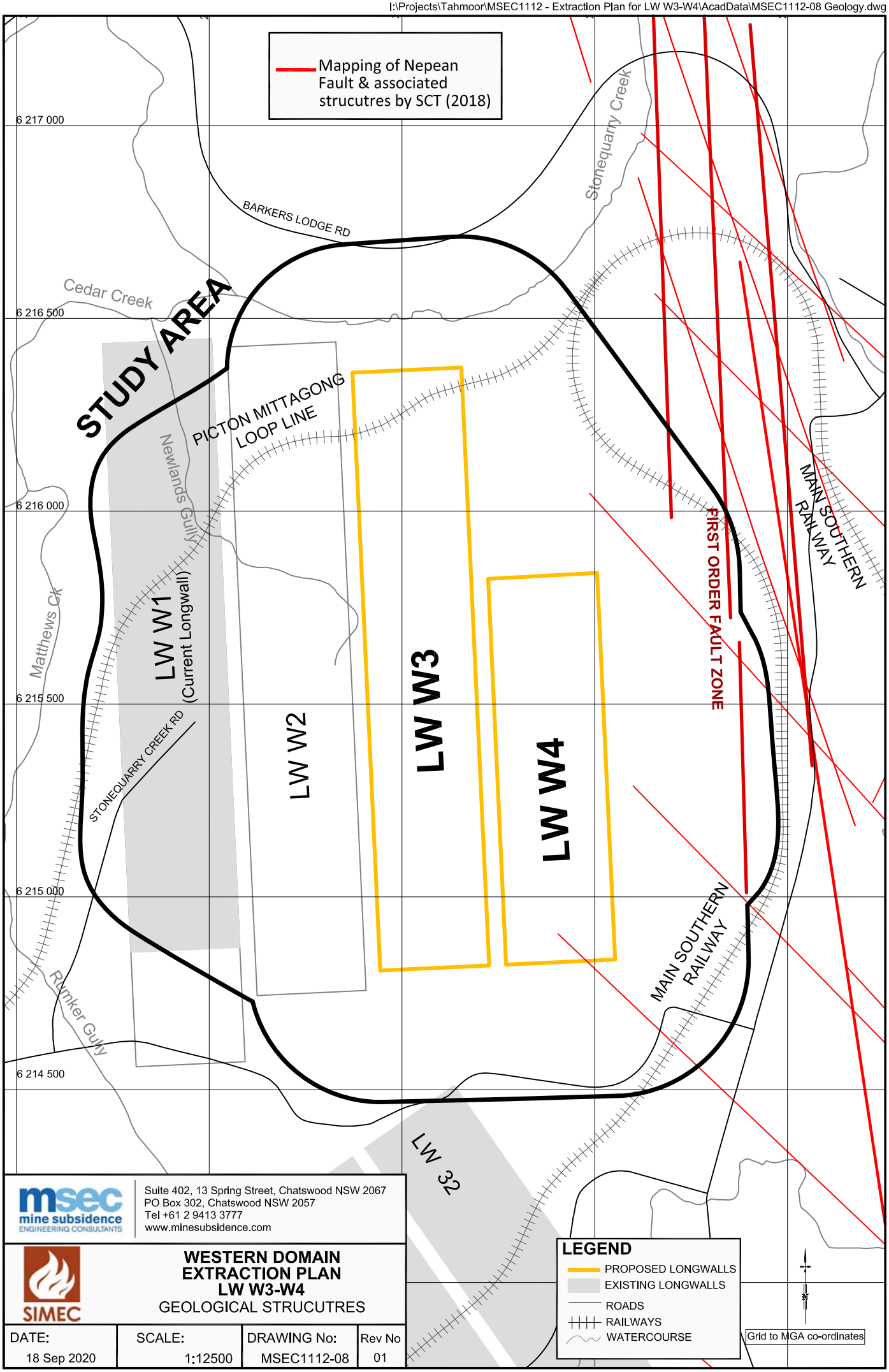

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GEOLOGICAL STRUCUTRES

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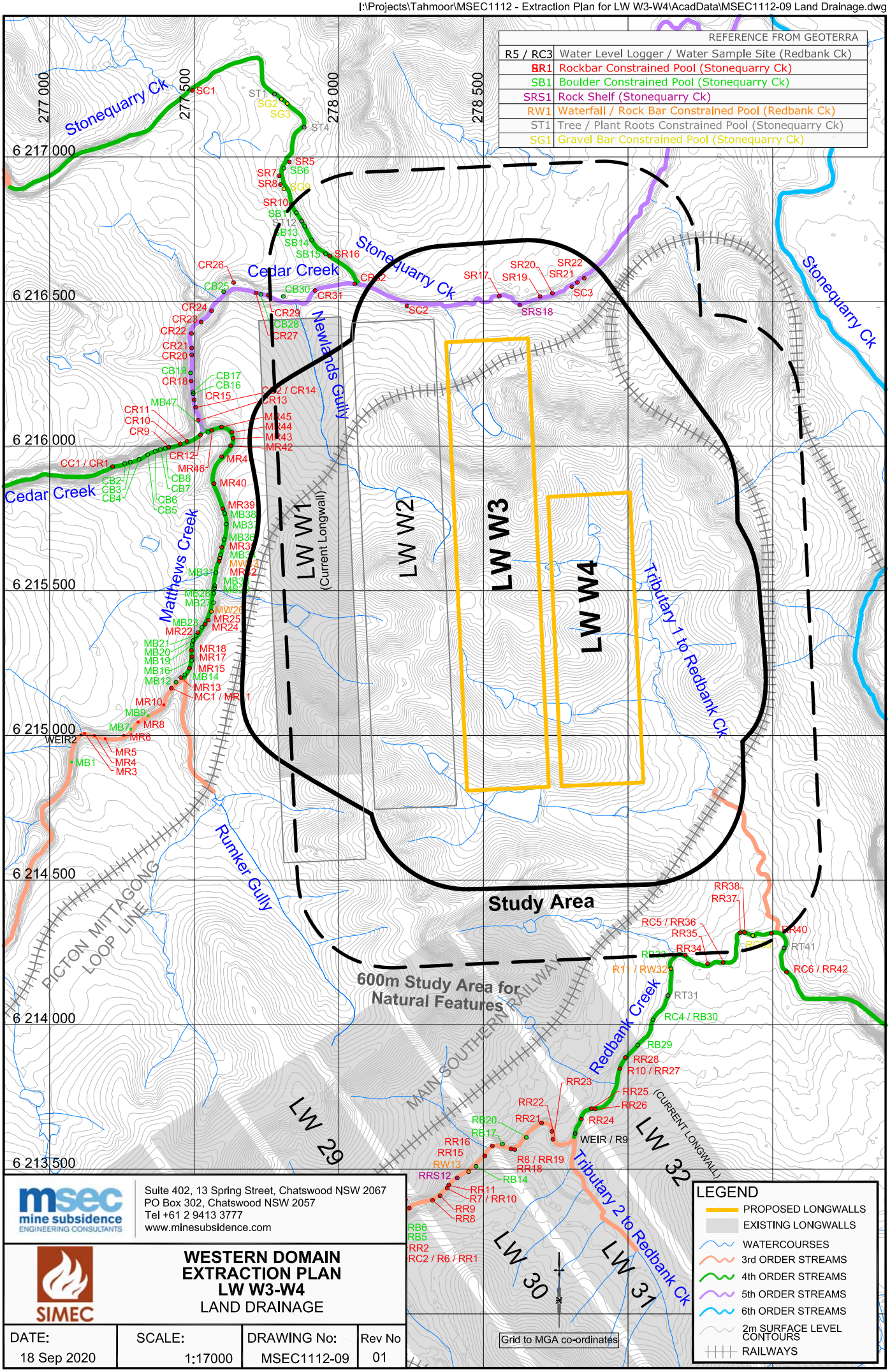

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4 LAND DRAINAGE

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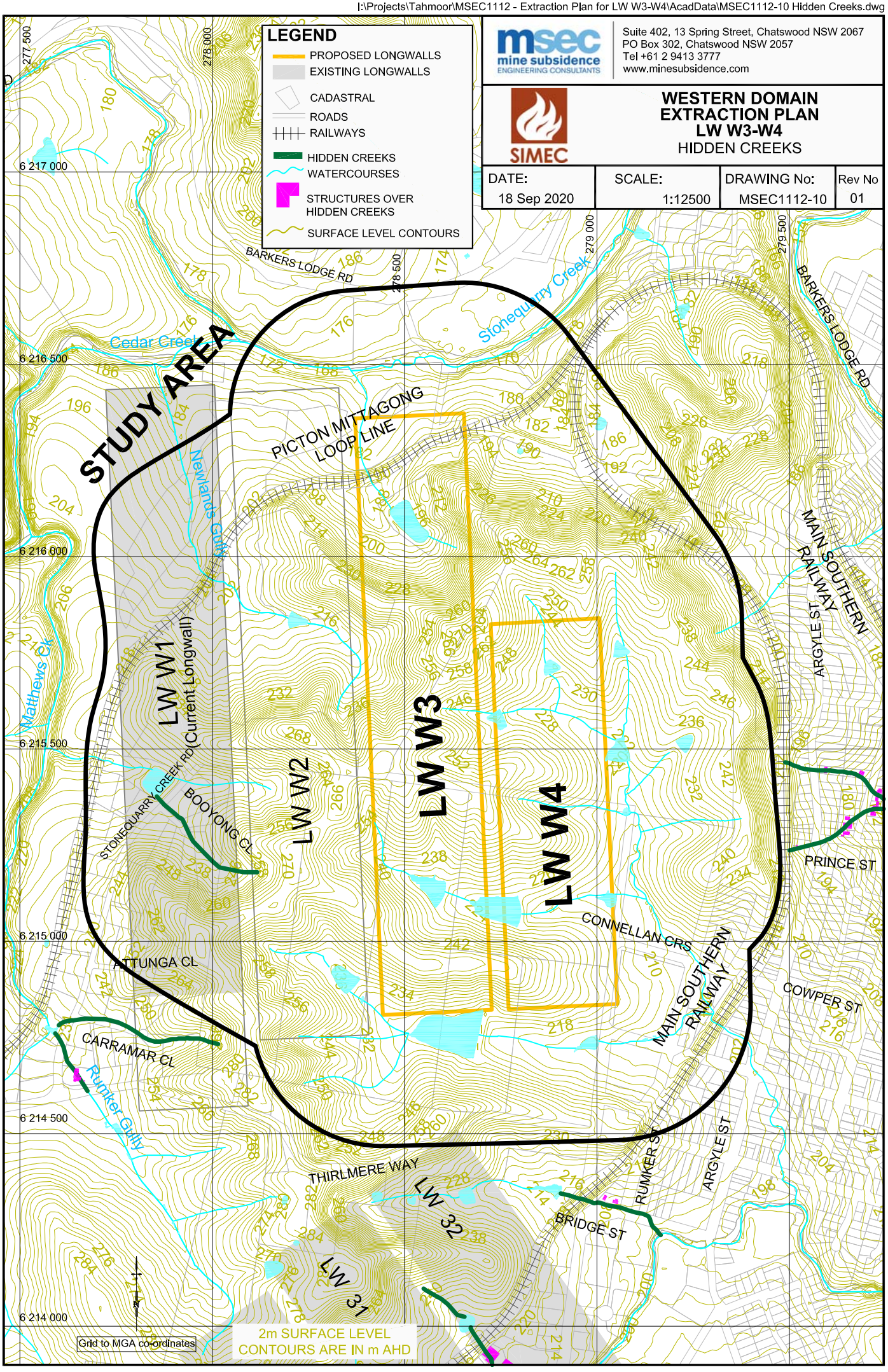

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4

HIDDEN CREEKS

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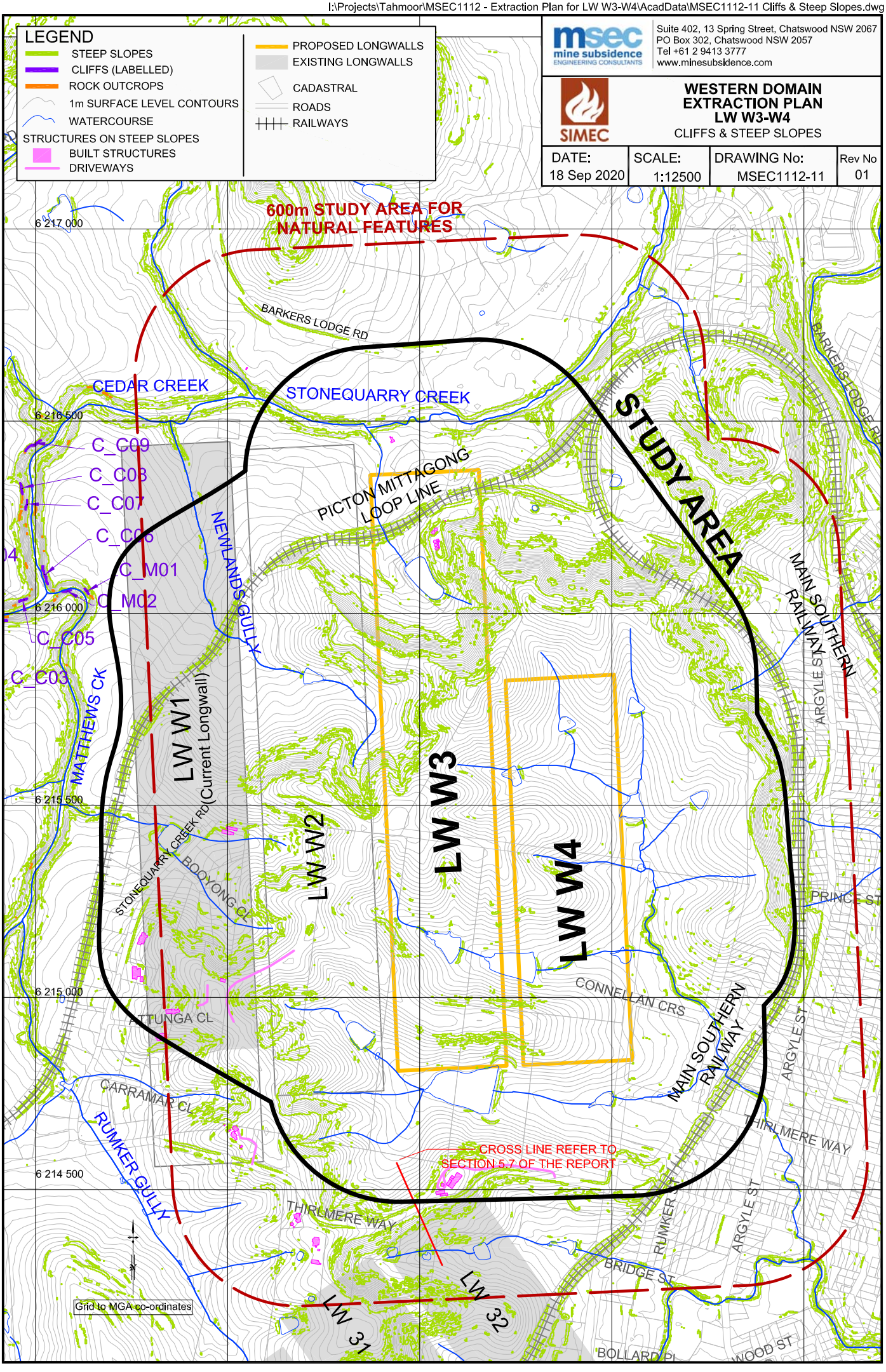

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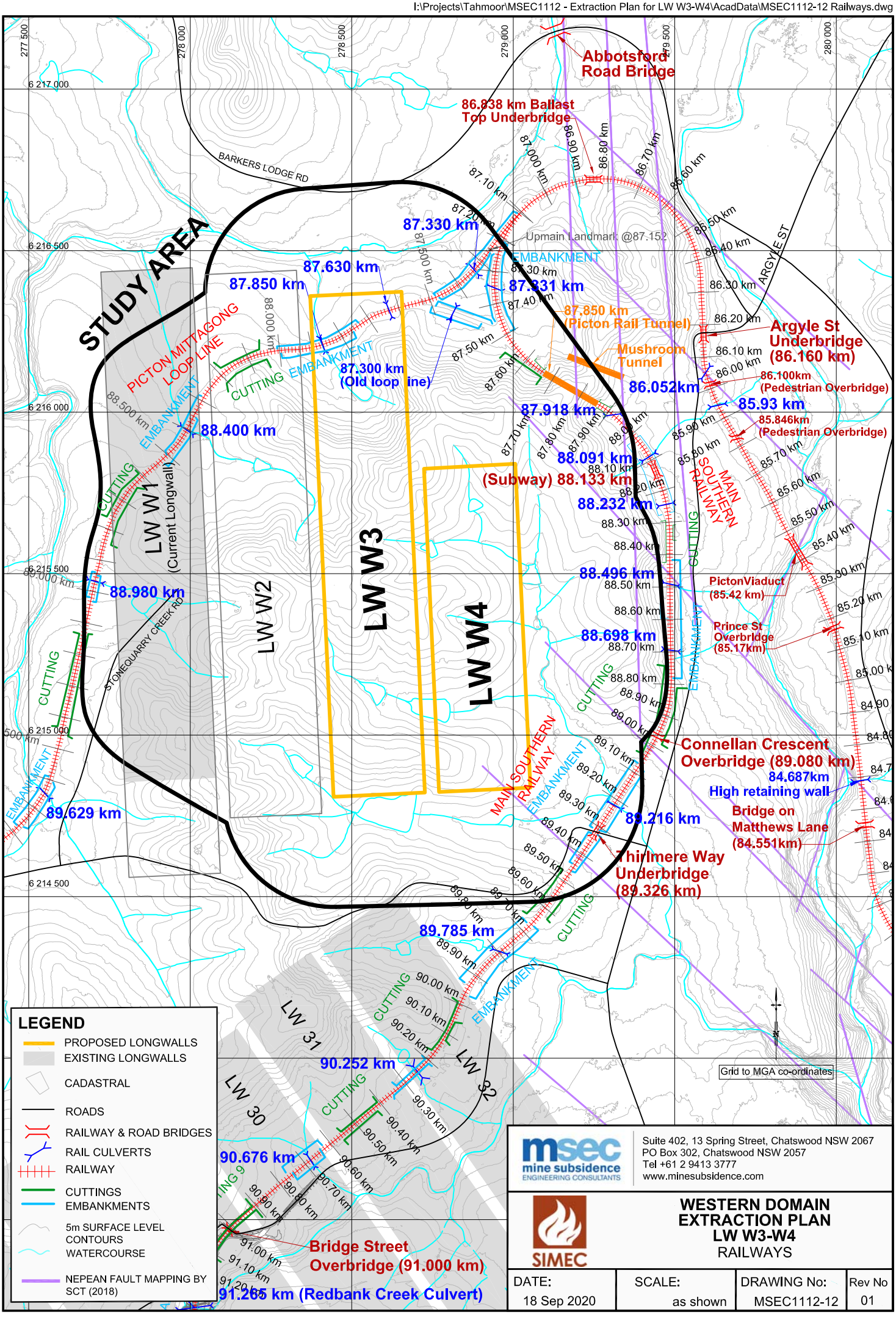

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4 RAILWAYS

DATE:	SCALE:	DRAWING No:	Rev No
18 Sep 2020	as shown	MSEC1112-12	01

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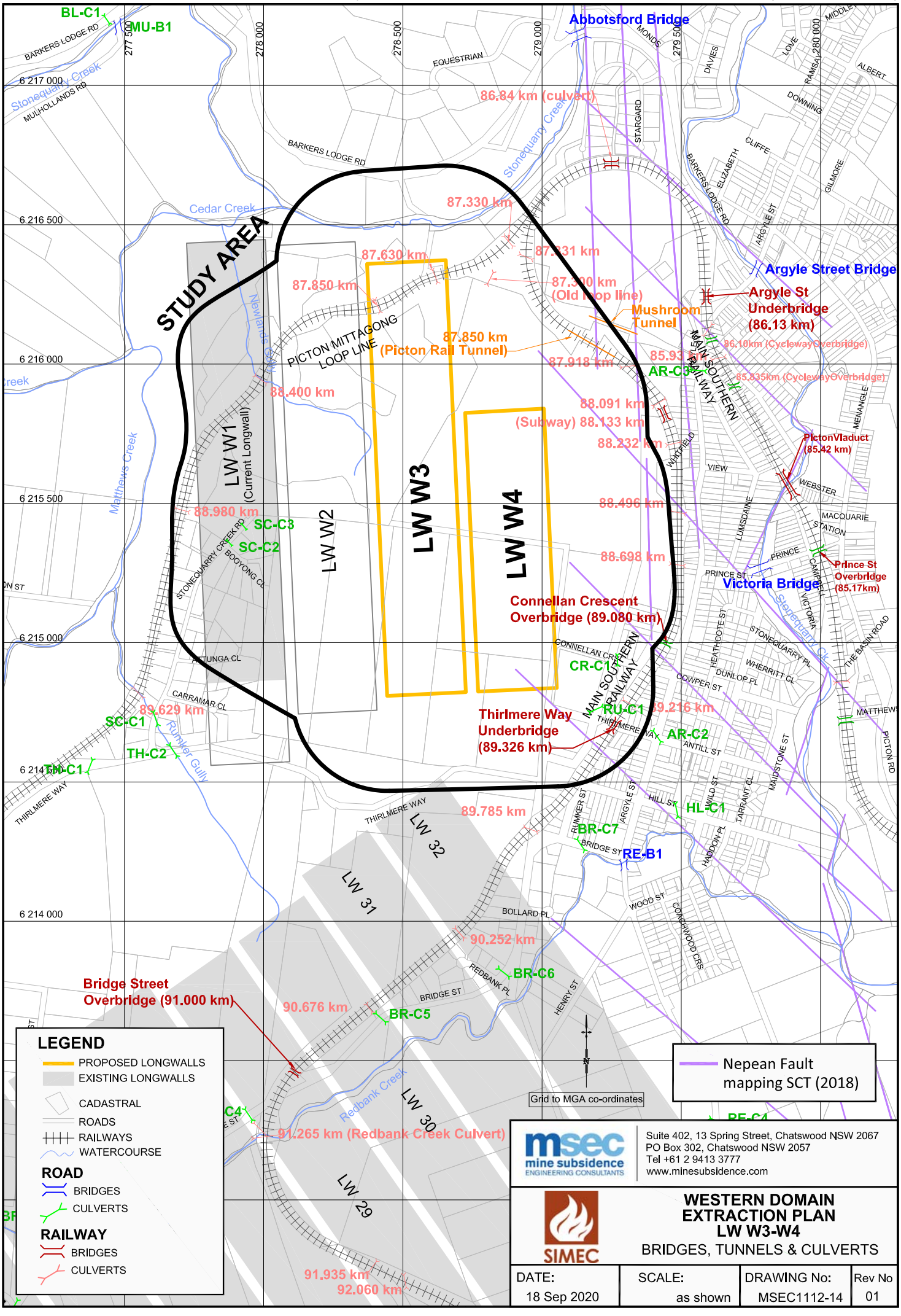
WESTERN DOMAIN EXTRACTION PLAN LW W3-W4
LOCAL ROADS

DATE:	SCALE:	DRAWING No:	Rev No
18 Sep 2020	1:12500	MSEC1112-13	01

LEGEND
- PROPOSED LONGWALLS
- EXISTING LONGWALLS
- CADASTRAL
- ROADS
- RAILWAYS
- WATERCOURSE

STUDY AREA
LW W1 (Current Longwall)
LW W2
LW W3
LW W4
LW 31
LW 32
PICTON MITTAGONG LOOP LINE
MAIN SOUTHERN RAILWAY
BARKERS LODGE RD
THIRLMERE WAY
CONNELLAN CRS
STONEQUARRY CREEK RD
BOOYONG CL
ATTUNGA CL
CARRAMAR CL
BRIDGE ST
BOLLARD PL
ARGYLE ST
HILL ST
ANTILL ST
COWPER ST
PRINCE ST
STAR ST
WHITFIELD
LUMSDAINE
HEATHCOTE ST
DUNLOP
WILD ST
HADDON PL
TARRANT
RUMKER ST
COACHWOOD
ELIZABETH
VIEW
Cedar Creek
Stonequarry Creek
Newlands Gully
Matthews Creek
Bunker Gully
278 000
278 500
6 217 000
6 216 500
6 216 000
6 215 500
6 215 000
6 214 500
6 214 000
Grid to MGA co-ordinates

I:\Projects\Tahmoor\MSEC1112 - Extraction Plan for LW W3-W4\AcadData\MSEC1112-14 Bridges Tunnels & Culverts.dwg



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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4

BRIDGES, TUNNELS & CULVERTS

DATE:	SCALE:	DRAWING No:	Rev No
18 Sep 2020	as shown	MSEC1112-14	01

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4

SYDNEY WATER
POTABLE WATER & SEWERAGE INFRASTRUCTURE

DATE:	SCALE:	DRAWING No:	Rev No
18 Sep 2020	1:12500	MSEC1112-15	01

LEGEND
- PROPOSED LONGWALLS
- EXISTING LONGWALLS
- CADASTRAL
- ROADS
- RAILWAYS
- WATERCOURSE

277 500 278 000 278 500
6 217 000 6 216 500 6 216 000 6 215 500 6 215 000 6 214 500 6 214 000

BARKERS LODGE RD
Stonequarry Creek
Cedar Creek
Stonequarry Ck
BARKERS LODGE RD
BARKERS LODGE RD
STUDY AREA
PICTON MITTAGONG LOOP LINE
Newlands Gully
Pressure Reducing Valve
Wastewater Treatment Plant
MAIN SOUTHERN RAILWAY
ARGYLE ST
LW W1 (Current Longwall)
LW W2
LW W3
LW W4
Type: uPVC Size: 180mmØ
Type: uPVC Size: 100mmØ
Type: uPVC Size: 100mmØ
Type: uPVC Size: 100mmØ
Matthews Creek
BOOYONG CL
STONEQUARRY CREEK RD
ATTUNGA CL
CARRAMAR CL
Rumker Gully
STAR ST
CONNELLAN CRS
PRINCE ST
COWPER ST
THIRLMERE WAY
LW 32
LW 31
MAIN SOUTHERN RAILWAY
RUMKER ST
ARGYLE ST
BRIDGE ST
BRIDGE ST
Redbank Creek
Grid to MGA co-ordinates

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4
GAS INFRASTRUCTURE

DATE:	SCALE:	DRAWING No:	Rev No
18 Sep 2020	1:12500	MSEC1112-16	01

LEGEND

- PROPOSED LONGWALLS
- EXISTING LONGWALLS
- CADASTRAL
- ROADS
- RAILWAYS
- WATERCOURSE

GAS PIPELINES
- Ø 32mm NY
- Ø 50mm NY
- Ø 63mm NY
- Ø 75mm NY
- Ø 160mm PE

278 000 278 500 279 000 279 500
277 500
6 217 000
6 216 500
6 216 000
6 215 500
6 215 000
6 214 500
6 214 000

BARKERS LODGE RD
Cedar Creek
Stonequarry Creek
STUDY AREA
PICTON MITTAGONG LOOP LINE
Newlands Gully
Matthews Ck
LW W1 (Current Longwall)
LW W2
LW W3
LW W4
LW 31
LW 32
STONEQUARRY CREEK RD
BOOYONG CL
ATTUNGA CL
CARRAMAR CL
Rumker Gully
THIRLMERE WAY
CONNELLAN CRS
MAIN SOUTHERN RAILWAY
ARGYLE ST
PRINCE ST
COWPER ST
RUMKER ST
BRIDGE ST
(CURRENT LONGWALL)

N

Grid to MGA co-ordinates

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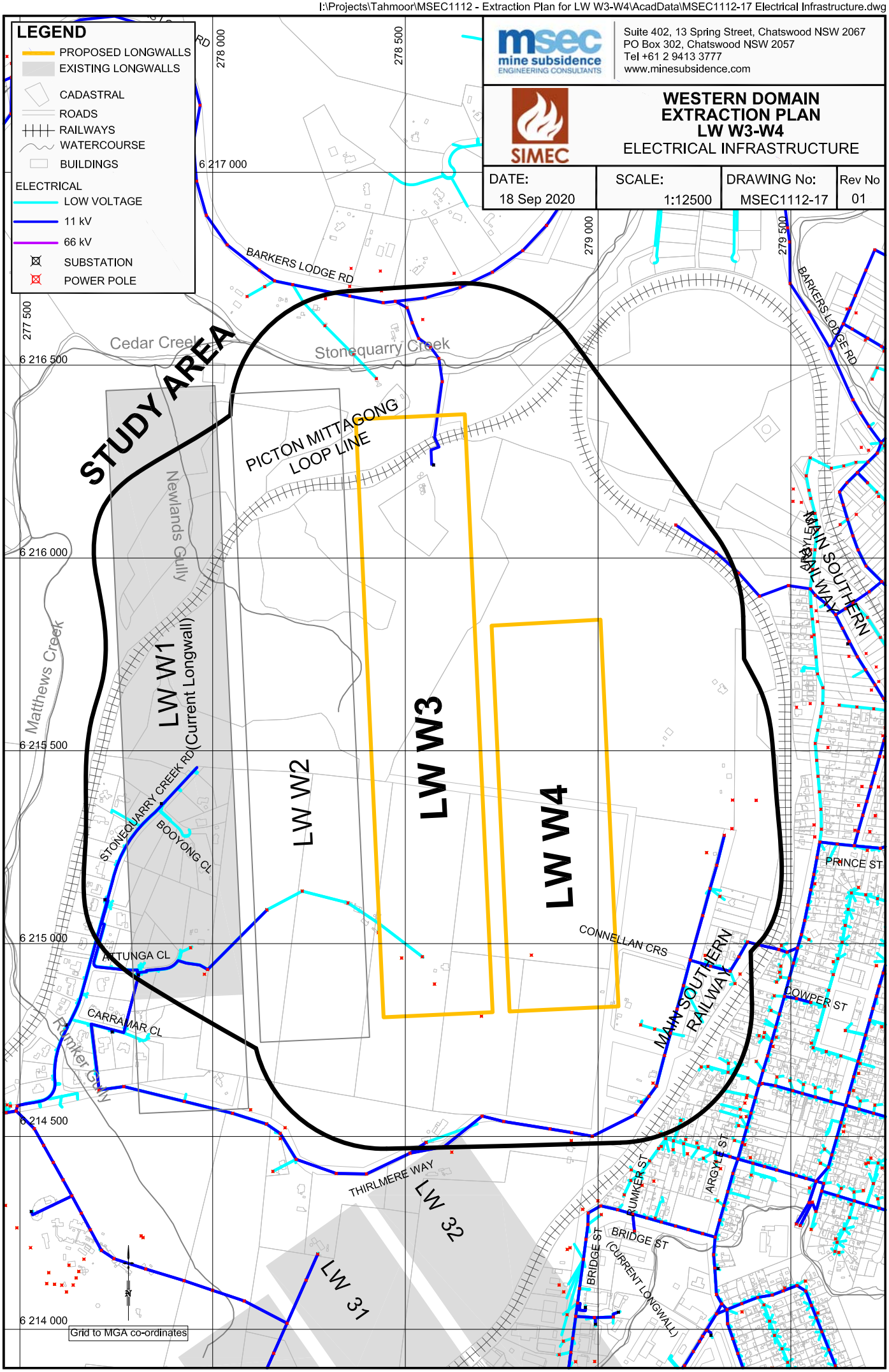

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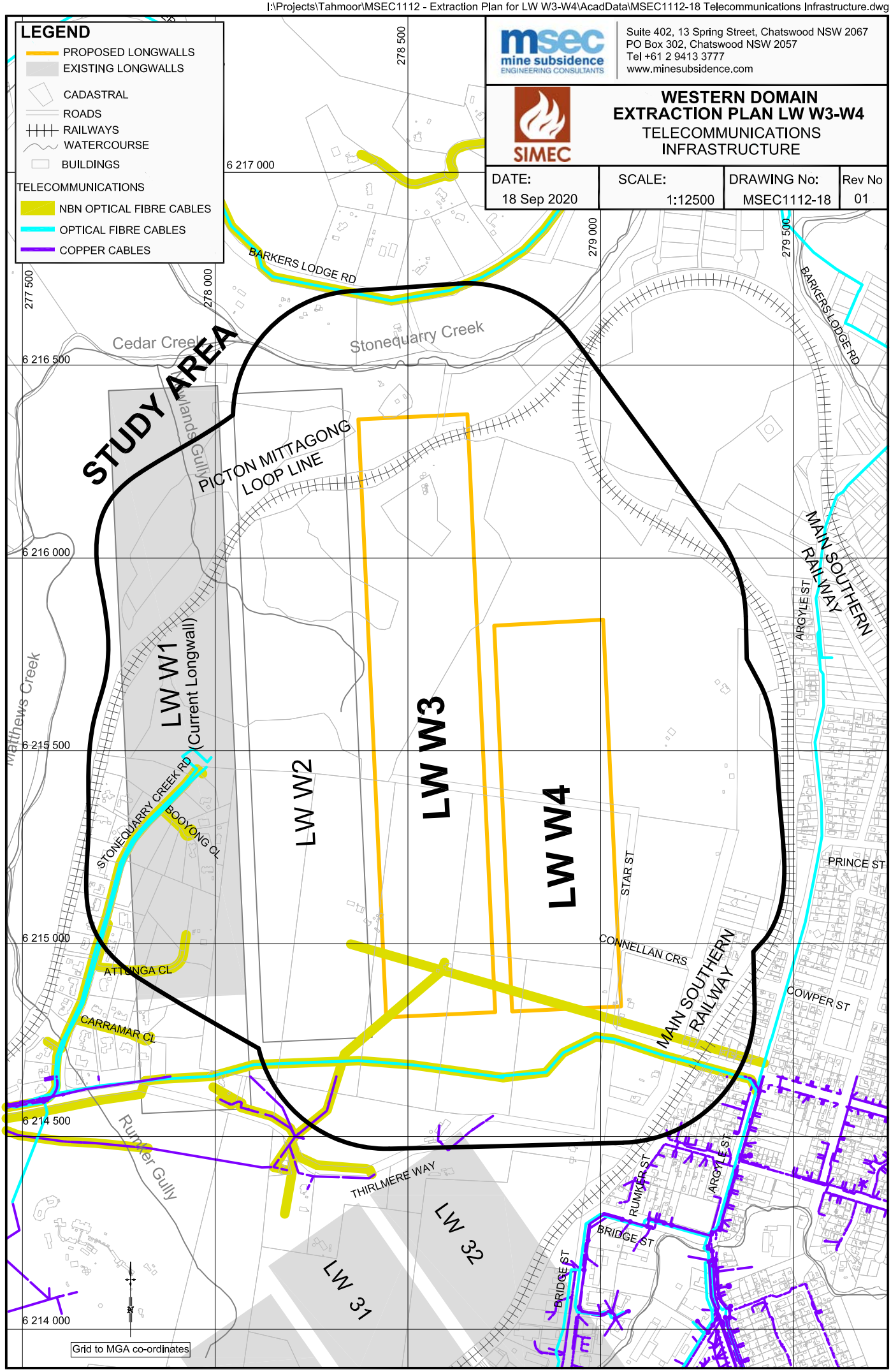

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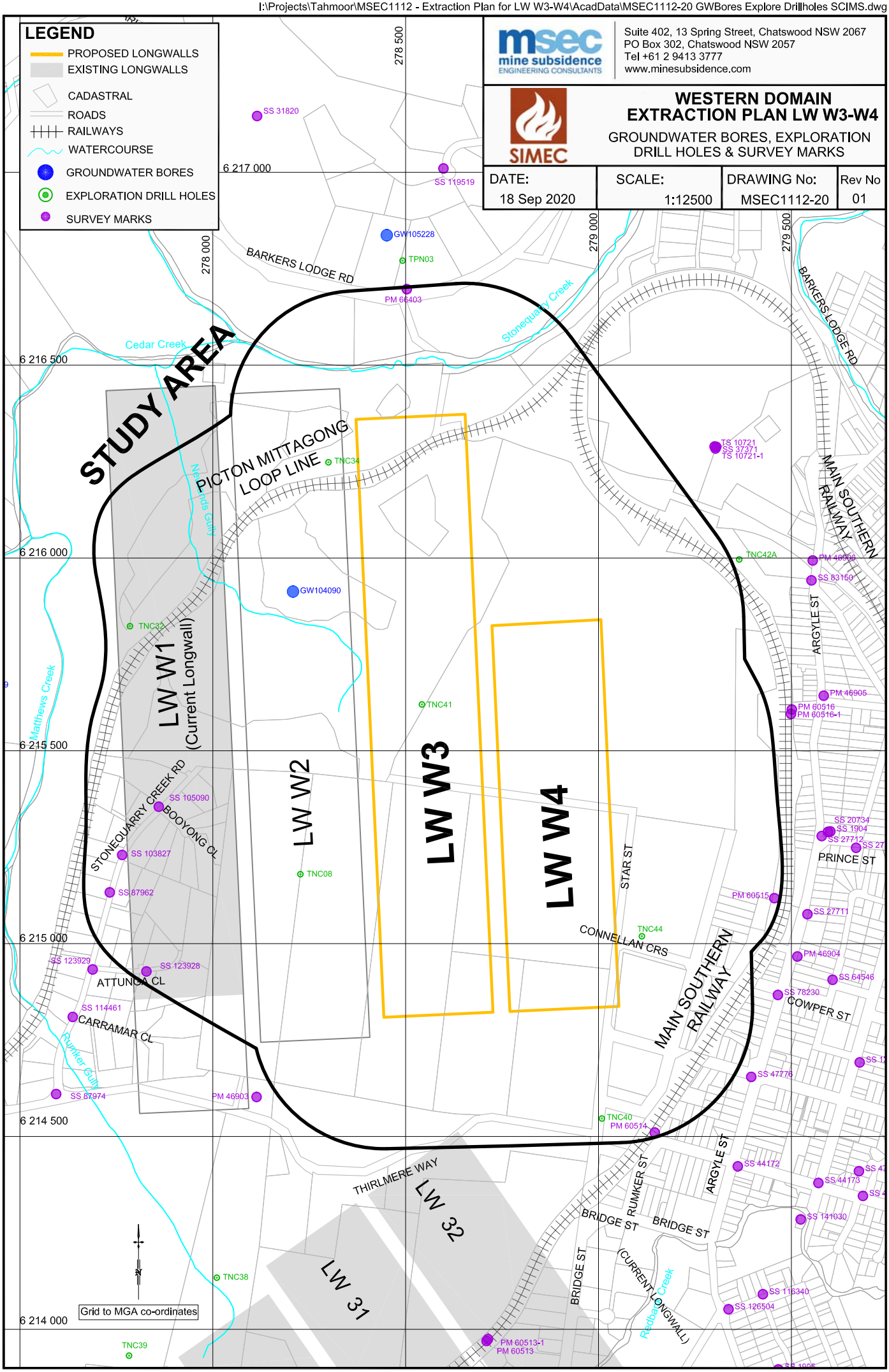

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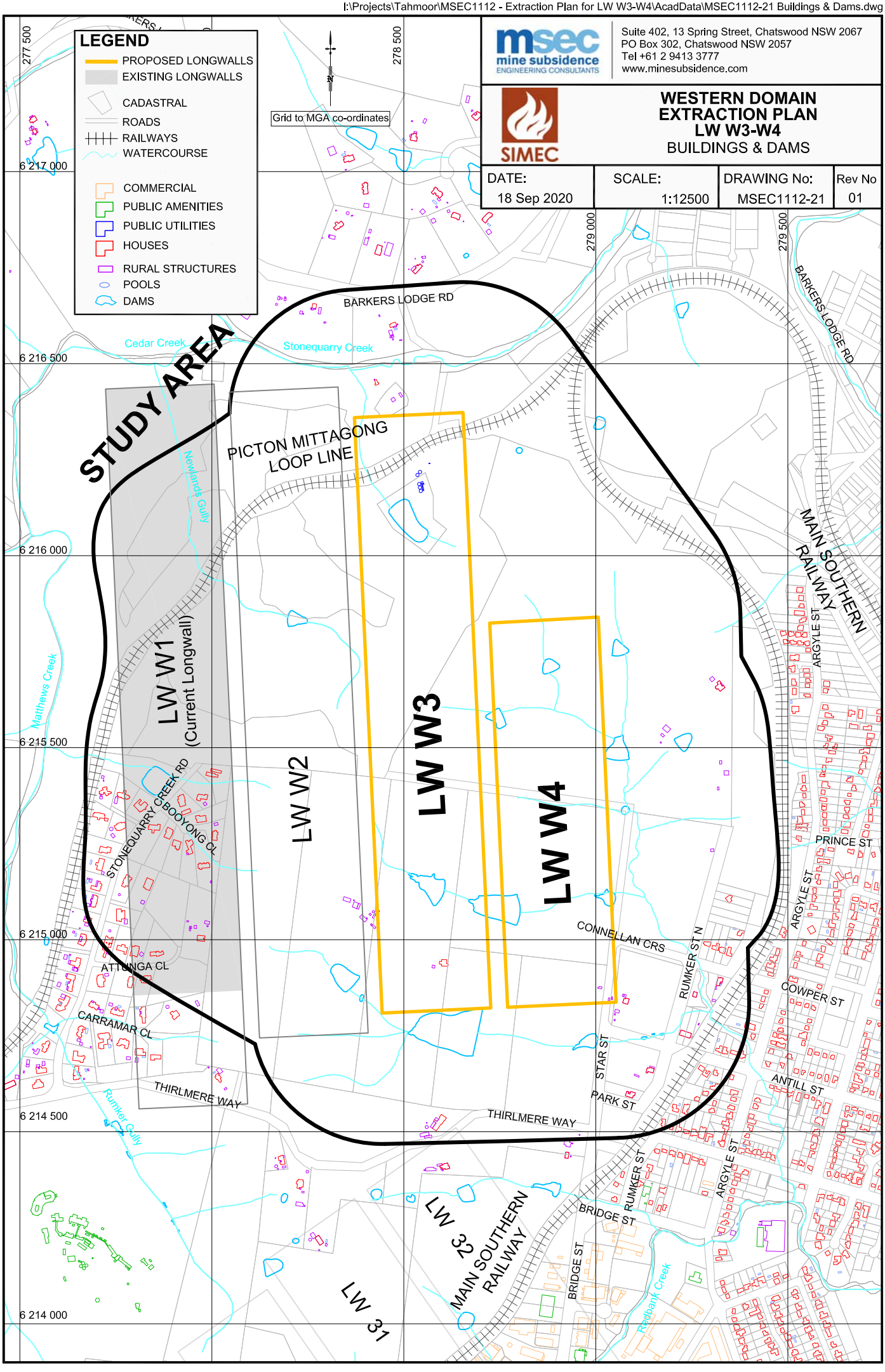

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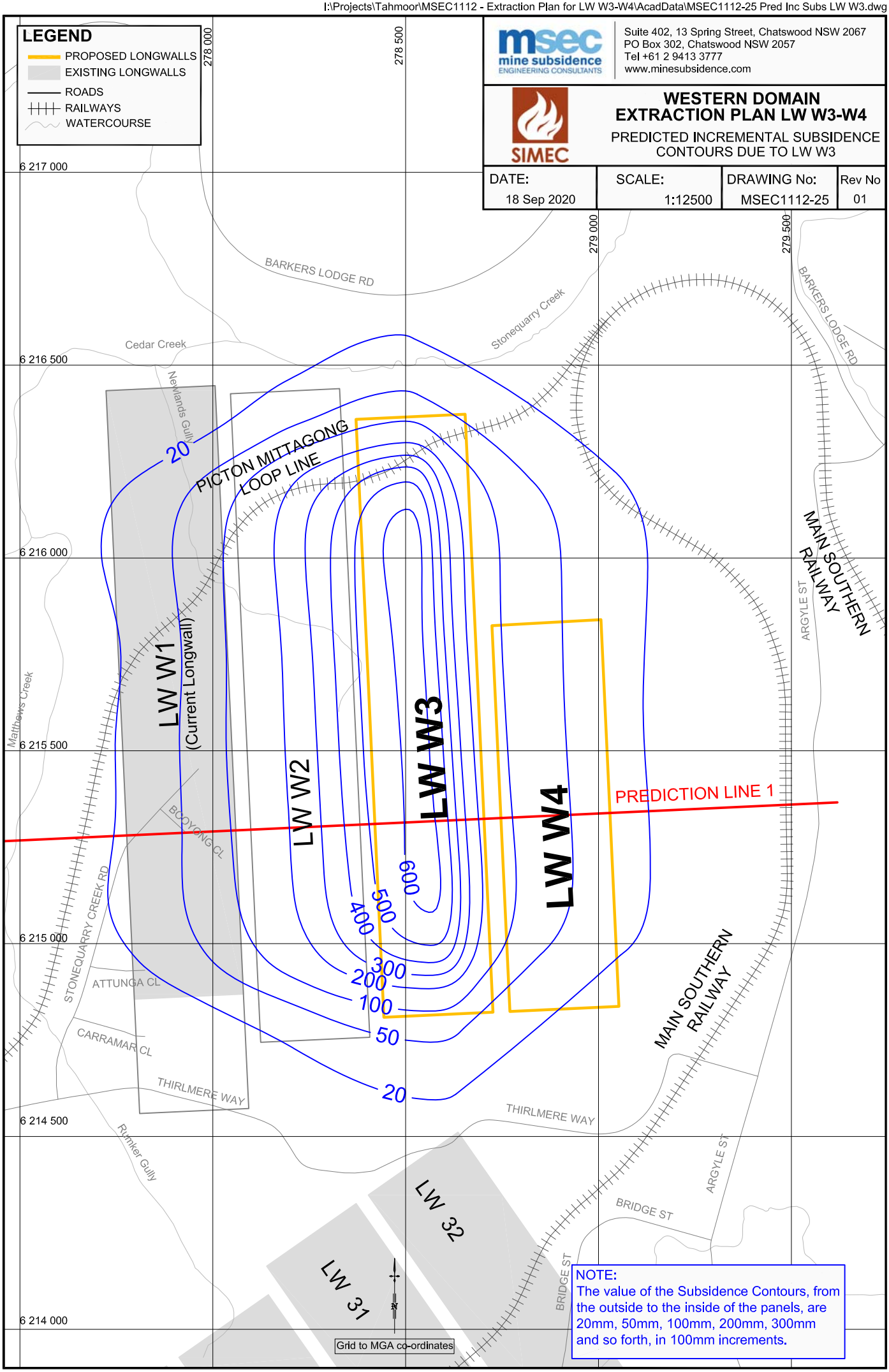

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4

PREDICTED INCREMENTAL SUBSIDENCE CONTOURS DUE TO LW W4

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LEGEND
- PROPOSED LONGWALLS
- EXISTING LONGWALLS
- ROADS
- RAILWAYS
- WATERCOURSE

278 000 278 500 279 000 279 500

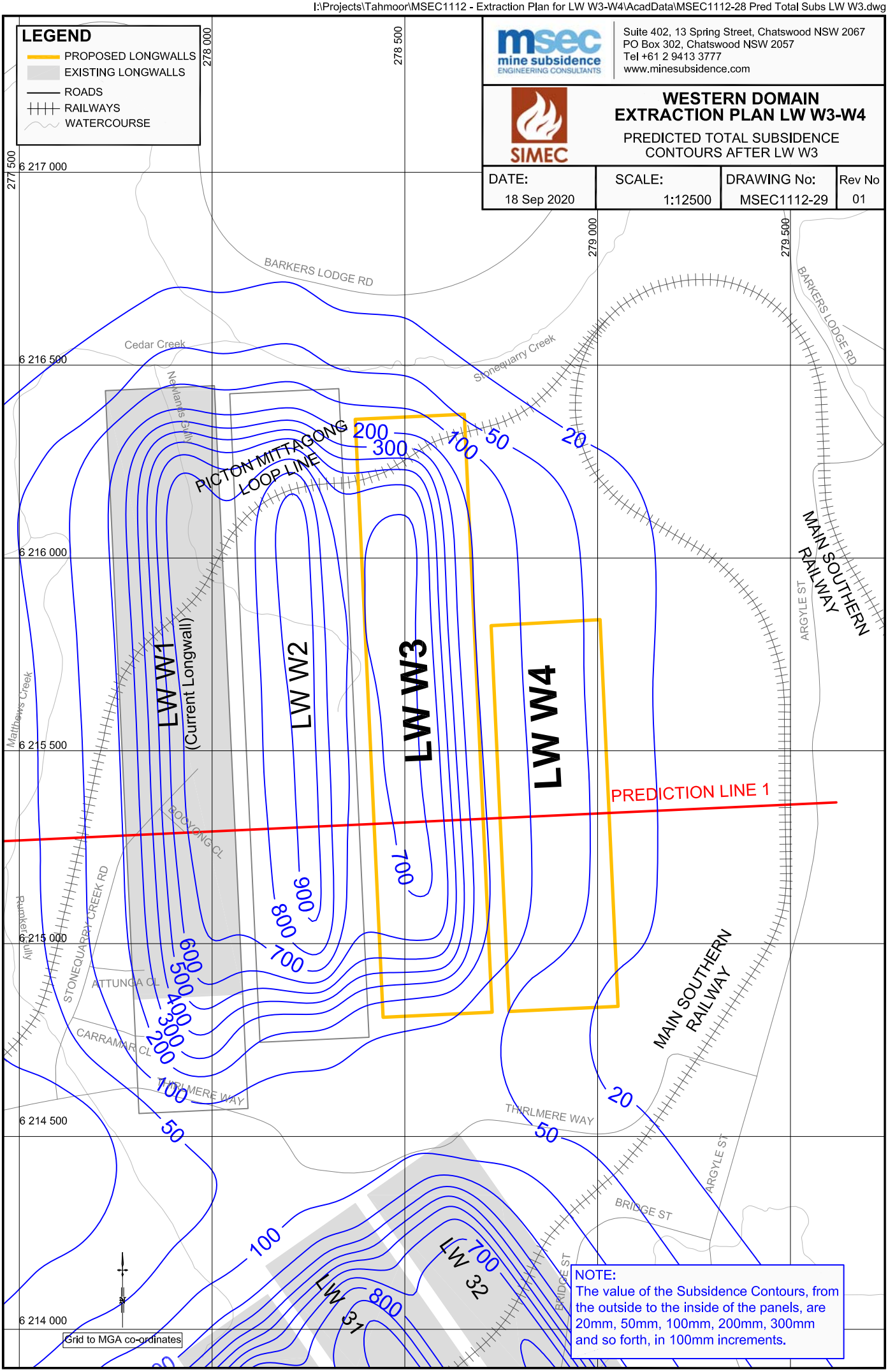
6 217 000 6 216 500 6 216 000 6 215 500 6 215 000 6 214 500 6 214 000

BARKERS LODGE RD
Cedar Creek
Stonequarry Creek
Newlands Gully
PICTON MITTAGONG LOOP LINE
MAIN SOUTHERN RAILWAY
ARGYLE ST
Matthews Creek
LW W1 (Current Longwall)
LW W2
LW W3
LW W4
20
500
400
300
200
100
50
PREDICTION LINE 1
BOOTONG CL
STONEQUARRY CREEK RD
ATTUNGA CL
CARRAMAR CL
THIRLMERE WAY
Rumker Gully
LW 32
LW 31
BRIDGE ST

NOTE:
The value of the Subsidence Contours, from the outside to the inside of the panels, are 20mm, 50mm, 100mm, 200mm, 300mm and so forth, in 100mm increments.

Grid to MGA co-ordinates

I:\Projects\Tahmoor\MSEC1112 - Extraction Plan for LW W3-W4\AcadData\MSEC1112-28 Pred Total Subs LW W3.dwg



I:\Projects\Tahmoor\MSEC1112 - Extraction Plan for LW W3-W4\AcadData\MSEC1112-29 Pred Total Subs LW W4.dwg

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4

PREDICTED TOTAL SUBSIDENCE CONTOURS AFTER LW W4

DATE:	SCALE:	DRAWING No:	Rev No
18 Sep 2020	1:12500	MSEC1112-29	01

LEGEND
- PROPOSED LONGWALLS
- EXISTING LONGWALLS
- ROADS
- RAILWAYS
- WATERCOURSE

277 500 | 278 000 | 278 500 | 279 000 | 279 500

6 217 000
6 216 500
6 216 000
6 215 500
6 215 000
6 214 500
6 214 000

BARKERS LODGE RD
Cedar Creek
Stonequarry Creek
Nepean River
Matthews Creek
Rumker Gully
STONEQUARRY CREEK RD
SOOYONG CL
ATTUNGA CL
CARRAMAR CL
THIRLMERE WAY
ARGYLE ST
BRIDGE ST
MAIN SOUTHERN RAILWAY
PICTON MITTAGONG LOOP LINE

LW W1 (Current Longwall)
LW W2
LW W3
LW W4
LW 31
LW 32

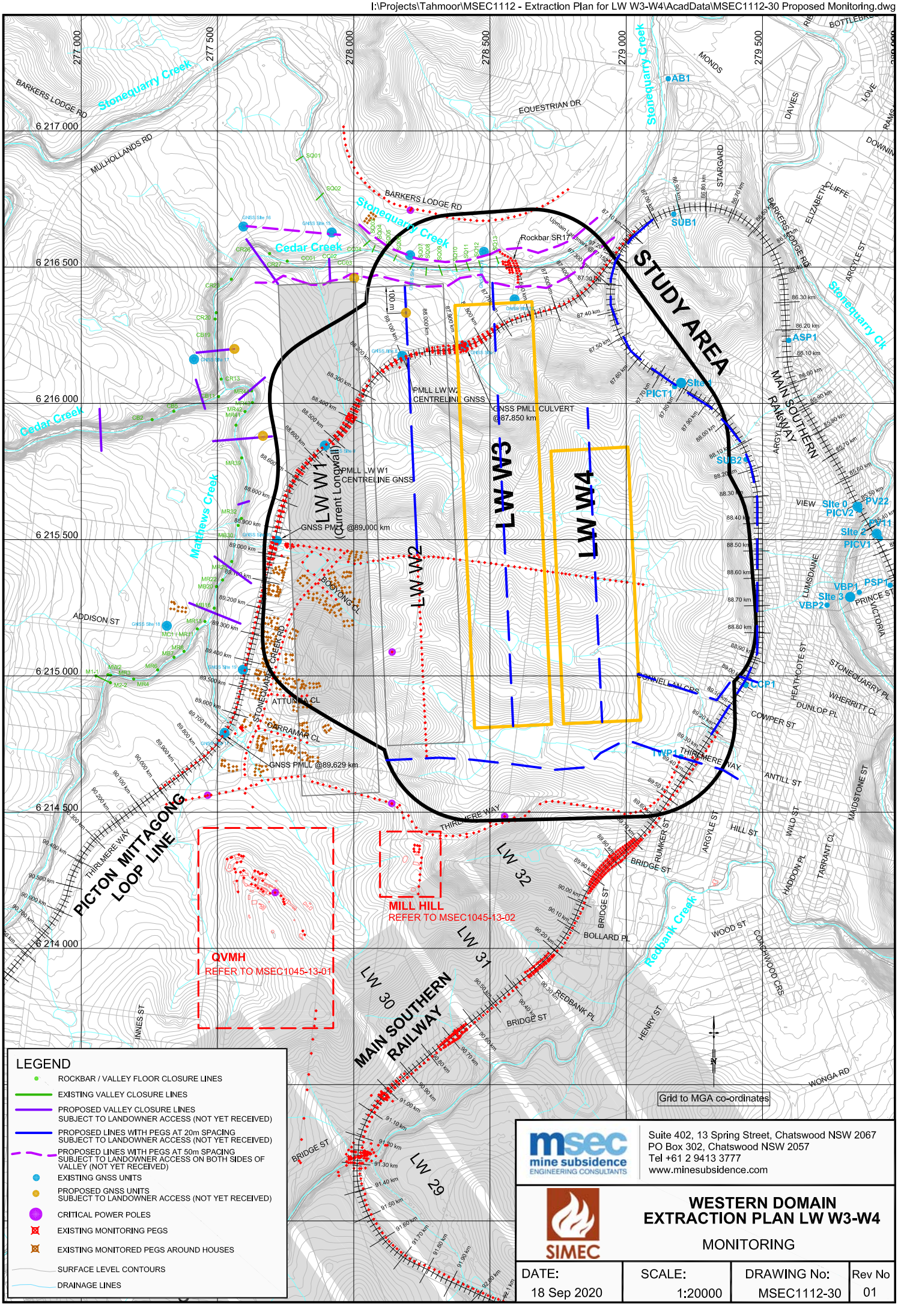
PREDICTION LINE 1
PREDICTION LINE 2

20 50 100 200 300 400 500 700 800 900 1000

Grid to MGA co-ordinates

NOTE:
The value of the Subsidence Contours, from the outside to the inside of the panels, are 20mm, 50mm, 100mm, 200mm, 300mm and so forth, in 100mm increments.

I:\Projects\Tahmoor\MSEC1112 - Extraction Plan for LW W3-W4\AcadData\MSEC1112-30 Proposed Monitoring.dwg



LEGEND

- ROCKBAR / VALLEY FLOOR CLOSURE LINES
- EXISTING VALLEY CLOSURE LINES
- PROPOSED VALLEY CLOSURE LINES SUBJECT TO LANDOWNER ACCESS (NOT YET RECEIVED)
- PROPOSED LINES WITH PEGS AT 20m SPACING SUBJECT TO LANDOWNER ACCESS (NOT YET RECEIVED)
- PROPOSED LINES WITH PEGS AT 50m SPACING SUBJECT TO LANDOWNER ACCESS ON BOTH SIDES OF VALLEY (NOT YET RECEIVED)
- EXISTING GNSS UNITS
- PROPOSED GNSS UNITS SUBJECT TO LANDOWNER ACCESS (NOT YET RECEIVED)
- CRITICAL POWER POLES
- EXISTING MONITORING PEGS
- EXISTING MONITORED PEGS AROUND HOUSES
- SURFACE LEVEL CONTOURS
- DRAINAGE LINES

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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4

MONITORING

DATE:	SCALE:	DRAWING No:	Rev No
18 Sep 2020	1:20000	MSEC1112-30	01

Appendix B – LW W3-W4 Potential Subsidence Impacts on the Main Southern Railway Line Infrastructure Risk Assessment

This information has been retracted
- For more information contact Tahmoor Coal

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Appendix C – LW W3-W4 Risk Assessment Report for Picton Mittagong Loop Line

This information has been retracted
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