Appendix B – Letters of Consultation

7 September 2020

Stephen O'Donoghue
Director – Resource Assessments
NSW Department of Planning, Industry and Environment
Level 30, 320 Pitt Street
Sydney NSW 2001

Dear Stephen,

Re: LW W3-W4 Extraction Plan – Endorsement of Team

We refer to Condition 13H(i) of the Tahmoor North Development Consent DA 67/98, which states the following:

> *The Applicant must prepare an extraction Plan for all second workings in Longwall 33 and subsequent longwalls to the satisfaction of the Secretary. Each Extraction Plan must:*
> *(i) Be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Secretary;*

Tahmoor Coal has commenced preparation of the Extraction Plan for the next two (2) longwalls within the Western Domain – Longwalls West 3 and West 4 (LW W3-W4). Tahmoor Coal proposes that the following Tahmoor Coal staff and specialist consultants be appointed for the preparation of the Extraction Plan and supporting documents:

- Extraction Plan Key Documents:
  - Zina Ainsworth (Tahmoor Coal) – Environment & Community Manager;
  - April Hudson (Tahmoor Coal) – Approvals Specialist;
  - Ronald Mark Rundle (Tahmoor Coal) – Registered Surveyor;
- Subsidence documents:
  - Daryl Kay (Mine Subsidence Engineering Consultants) - Subsidence Specialist;
  - Kennith Mills (SCT)– Geotechnical Engineer;
  - Stephen Wilson (SCT) – Mine Planner;
- Water Management Plan supporting documents:
  - Anthony Marszalek (Hydro Engineering & Consulting) – Water Resources Engineer;
  - Camilla West (Hydro Engineering & Consulting) – Water Resources Scientist;
  - David Newton (WRM) – Engineer (flood modelling specialist);
  - Ruebin Nguon (WRM) – Engineer (flood modelling specialist);
  - Andrew Dawkins (GeoTerra) – Hydrogeologist / Geochemist;
  - Jackson Newton (SLR) – Hydrogeologist;
  - Maxime Philbert (SLR) – Hydrogeologist;
  - Will Minchin (Watershed Hydrogeo) – Hydrogeologist;
- Land Management Plan supporting documents:
  - Rod (Douglas Partners) – Geotechnical Engineer;
  - Fiona Henry (Douglas Partners) – Geotechnical Engineer;
  - Murray Fraser (SLR) – Agronomist;

SIMEC MINING
Tahmoor Coal Pty Limited ABN 97 076 663 968
PO Box 100, Tahmoor, NSW 2573, Australia
T: +61 (0) 2 46400100
E: zina.ainsworth@simecgfg.com
simec.com
MEMBER OF GFG ALLIANCE

- Biodiversity Management Plan supporting documents:
    - Matthew Russell (Niche) – Aquatic ecologist;
    - Luke Baker (Niche) – Ecologist, Accredited Assessor;
    - Alex Christie (Niche) – Ecologist, Accredited Assessor;
- Heritage Management Plan supporting documents:
    - Ryan Desic (EMM Consulting) – Archaeologist;
    - Pamela Chauvel (EMM Consulting) – Archaeologist; and
    - Pamela Kottaras (EMM Consulting) – Archaeologist.

A copy of the curriculum vitae for the above team members are attached to the end of this letter.

We seek endorsement of the Secretary of DPIE as required under Condition 13H(i) of DA 67/98 that the appointment of the proposed Extraction Plan Team is accepted for the preparation of the LW W3-W4 Extraction Plan for the Western Domain.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or zina.ainsworth@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coking Coal Operations
SIMEC Mining

Ms Zina Ainsworth
Manager Environment and Community
SIMEC Mining

By email: zina.ainsworth@simecgfg.com

14/09/2020

Dear Ms Ainsworth

Tahmoor North Mine (DA 67/98)
Extraction Plan Team

I refer to your letter dated 7 September 2020 seeking the Planning Secretary's approval of suitably qualified persons to prepare the Extraction Plan for Longwalls West 3 and West 4 at the Tahmoor North Mine.

The Department has reviewed the nominations and information you have provided and is satisfied that these experts are suitably qualified and experienced. Consequently, I can advise that the Planning Secretary approves the appointment of the following experts:

- Extraction Plan:
  - Zina Ainsworth, Environment & Community Manager, Tahmoor Coal;
  - April Hudson, Approvals Specialist, Tahmoor Coal;
  - Ronald Mark Rundle, Registered Surveyor, Tahmoor Coal;
- Subsidence:
  - Daryl Kay, Subsidence Specialist, Mine Subsidence Engineering Consultants;
  - Kennith Mills, Geotechnical Engineer, SCT;
  - Stephen Wilson, Mine Planner, SCT;
- Water Management Plan:
  - Anthony Marszalek, Water Resources Engineer, Hydro Engineering & Consulting;
  - Camilla West, Water Resources Scientist, Hydro Engineering & Consulting;
  - David Newton, Engineer (Flood Modelling Specialist), WRM;
  - Ruebin Nguon, Engineer (Flood Modelling Specialist), WRM;
  - Andrew Dawkins, Hydrogeologist / Geochemist, GeoTerra;
  - Jackson Newton, Hydrogeologist, SLR;
  - Maxime Philbert, Hydrogeologist, SLR;
  - Will Minchin, Hydrogeologist, Watershed Hydrogeo;
- Land Management Plan:

- Roderick Haselden, Geotechnical Engineer, Douglas Partners;
- Fiona Henry, Geotechnical Engineer, Douglas Partners;
- Murray Fraser, Agronomist, SLR;

- Biodiversity Management Plan:
  - Matthew Russell, Aquatic ecologist, Niche;
  - Luke Baker, Ecologist - Accredited Assessor, Niche;
  - Alex Christie, Ecologist - Accredited Assessor, Niche;
- Heritage Management Plan:
  - Ryan Desic, Archaeologist, EMM Consulting;
  - Pamela Chauvel, Archaeologist, EMM Consulting; and
  - Pamela Kottaras, Archaeologistm, EMM Consulting.

If you wish to discuss the matter further, please contact Gen Lucas on 9274 6489 or gen.lucas@planning.nsw.gov.au

Yours sincerely

Stephen O'Donoghue
Director
Resource Assessments
As nominee of the Planning Secretary

14 September 2020

Stephen O'Donoghue
Director – Resource Assessments
NSW Department of Planning, Industry and Environment
Level 30, 320 Pitt Street
Sydney NSW 2001

Dear Stephen,

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

Tahmoor Coal Mine (Tahmoor Mine) has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since the Mine commenced in 1979, and longwall mining methods have been used since 1987. Tahmoor Coal is a subsidiary within the SIMEC Mining Division (SIMEC) of the GFG Alliance (GFG).

Tahmoor Mine is located approximately 80 kilometres south-west of Sydney between the towns of Tahmoor and Bargo. Tahmoor Coal has previously mined 32 longwalls to the north and west of the Tahmoor Mine's current pit top location.

Tahmoor Coal extended its underground coal mining to the north-west of the Main Southern Railway referred to as the 'Western Domain', which are located in the Tahmoor North Mining Lease areas. The Western Domain includes Longwalls West 1 (LW W1) to West 4 (LW W4) at Picton and Thirlmere. Tahmoor Coal is currently mining LW W1 in accordance with the relevant Development Consents and Extraction Plan Approval. Longwall West 2 is scheduled to commence in November 2020.

Tahmoor Coal would like to consult with the Department of Planning, Industry and Environment (DPIE) regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

Under the conditions of Tahmoor Coal's Development Consent DA 67/98, an Extraction Plan is required for all second workings in the Western Domain. Tahmoor Coal is currently preparing an Extraction Plan for LW W3-W4. The Extraction Plan will be submitted to DPIE for approval.

The Extraction Plan will address the LW W3-W4 Study Area, which comprises the predicted 20 mm Subsidence Contour and the 35° Angle of Draw Line (refer to attached figure).

The Extraction Plan will provide an overview of the project, details of the development of the Extraction Plan, details on how subsidence impacts and environmental consequences will be monitored and managed during and after mining, and details on how the Extraction Plan will be implemented.

The Extraction Plan will be supported by the following key documents:

- Subsidence Prediction and Impact Assessment Report;
- Water Management Plan;
- Land Management Plan;
- Biodiversity Management Plan;
- Heritage Management Plan;
- Built Features Management Plan;
- Public Safety Management Plan;
- Subsidence Monitoring Program; and
- Graphical Plans.

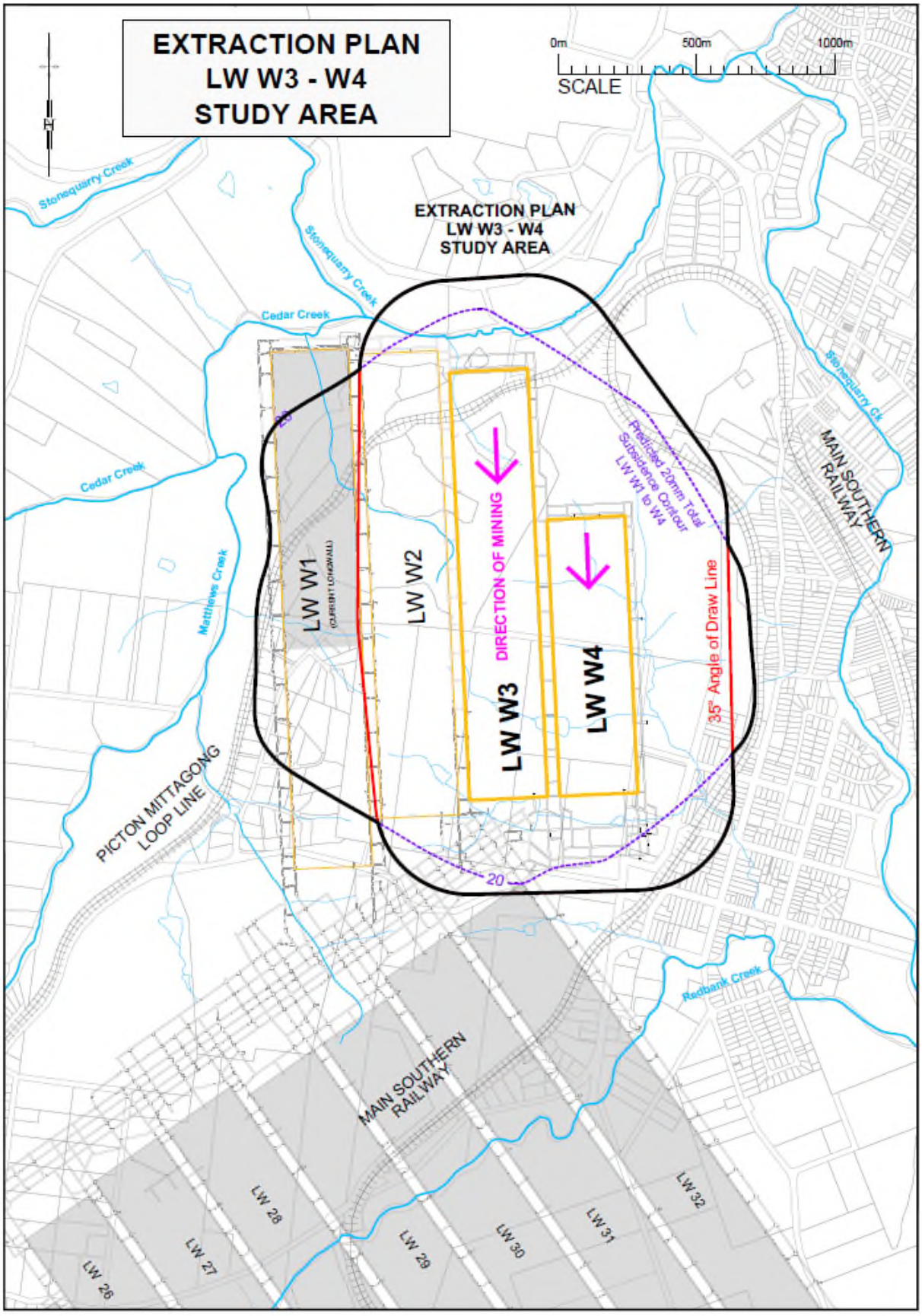
We would be pleased to discuss this with you at our upcoming meeting on Wednesday 23 September 2020 and would appreciate receiving any comments for the preparation of the Extraction Plan by **Friday 2 October 2020**.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

SIMEC

DEPARTMENT OF PLANNING, INDUSTRY & ENVIRONMENT

Western Domain – LW W3-W4 Extraction Plan

23 SEPTEMBER 2020

ENVIRONMENT AND COMMUNITY DEPARTMENT

Tahmoor Coal

SIMEC MINING

simecgfg.com

MEMBER OF GFG ALLIANCE

Contents

01
WESTERN DOMAIN OVERVIEW

Tahmoor Coal

SIMEC MINING

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Western Domain

Overview

Planned Longwalls:

- LW W1: 15 November 2019 - ~November 2020
  - 1640 m extracted as of 20 September 2020
- LW W2: ~December 2020 - ~August 2021
- LW W3: ~September 2021 - ~April 2022
- LW W4: ~May 2022 - ~September 2022

Approvals:

- LW W1-W2 Extraction Plan approval obtained.
- LW W2 start position approved subject to additional monitoring.
  - Surface Water Management Plan and Subsidence Monitoring Program to be updated.
- Awaiting Modification 5 DA 67/98 approval.
- Currently seeking LW W3-W4 Extraction Plan approval.
  - Proposed submission January 2021

02
LW W3-W4 EXTRACTION PLAN

Tahmoor Coal

SIMEC MINING

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LW W3-W4 Extraction Plan

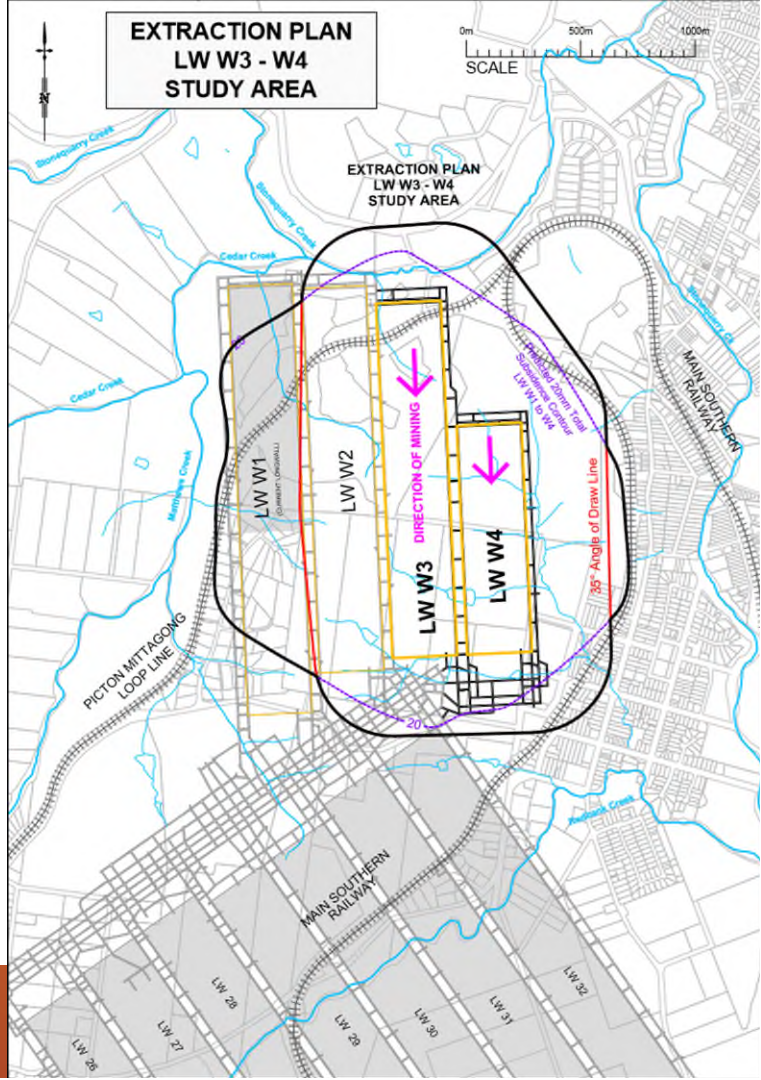
Key Features

Extraction Plan Study Area:

- Predicted 20 mm total subsidence
- 35° Angle of Draw Line

Key Features:

- Natural features:
  - Cedar Creek, Stonequarry Creek, Redbank Creek (tributaries)
  - Steep slopes
- Heritage items:
  - Aboriginal heritage archaeological sites
  - Weatherboard House
  - Picton-Mittagong Loop Line culverts
  - MSR Picton Mainline Railway Loop and Tunnel
- Built features:
  - Stonequarry Estate, scattered rural residential properties
  - Infrastructure and services
  - Dams



LW W3-W4 Extraction Plan

Documents for preparation

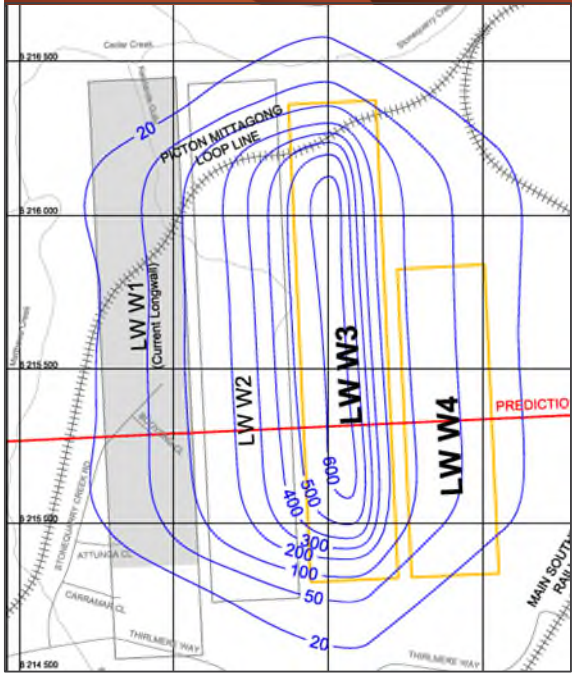
- Main Document
- Subsidence Predictions Report
- Water Management Plan
  - Surface Water Technical Report
  - Flood Impact Study
  - Groundwater Technical Report
  - Baseline Private Bore Assessment
- Land Management Plan
  - Land and Agricultural Resource Assessment
  - Geotechnical Assessment
- Biodiversity Management Plan
  - Aquatic Biodiversity Technical Report
  - Terrestrial Biodiversity Technical Report
- Heritage Management Plan
  - Aboriginal Heritage Technical Report
  - Historical Heritage Technical Report
- Built Features Management Plan
  - Infrastructure Management Plans
- Public Safety Management Plan
- Subsidence Monitoring Program
- Graphical Plans

LW W3-W4 Extraction Plan

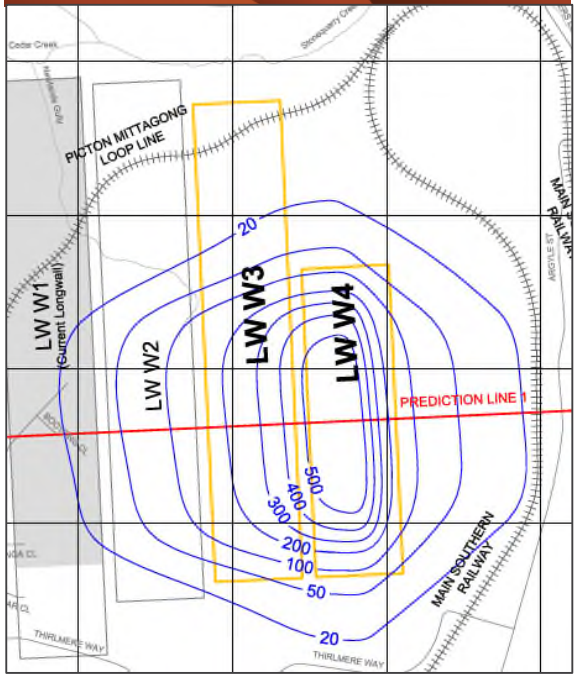
Infrastructure Management Plans

- Endeavour Energy Management Plan
- Sydney Water Potable Water Management Plan
- Stonequarry Creek Sewer Management Plan
- Jemena Management Plan
- Telstra Management Plan
- NBN Management Plan
- Wollondilly Shire Council Management Plan
- RMS Management Plan
- Main Southern Railway Management Plan
- Picton-Mittagong Railway Management Plan
- Built Structures Management Plan
- Weatherboard House Management Plan

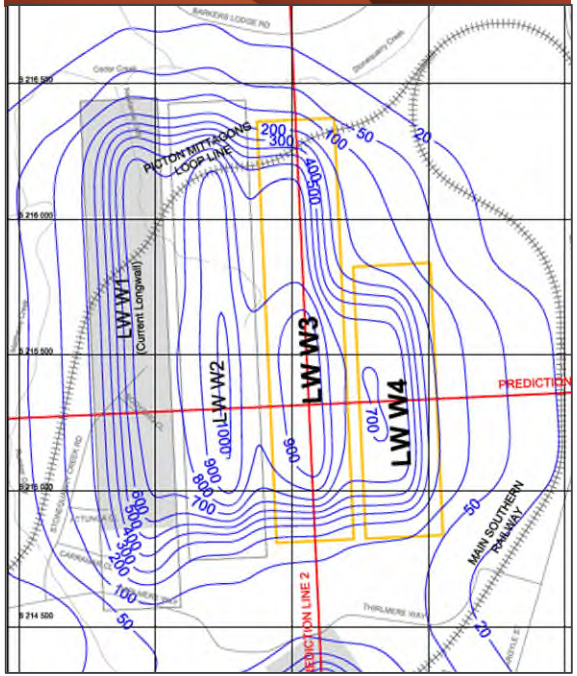
Predicted Incremental Subsidence Contours (LW W3)



Predicted Incremental Subsidence Contours (LW W4)



Predicted Total Subsidence Contours (after LW W4)



03
EXTRACTION PLAN CONSULTATION

Tahmoor Coal

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Consultation

Extraction Plan LW W3-W4

Department / Stakeholder	Consultation Record
NSW Department of Planning, Industry and Environment – Planning (DPIE)	Meeting 23/09/2020, letter of consultation 14/09/2020
NSW Department of Planning, Industry and Environment – Environment, Energy and Science (EES)	Letter of consultation 16/09/2020
NSW Department of Planning, Industry and Environment – Crown Lands Division	Letter of consultation 16/09/2020
NSW Department of Planning, Industry and Environment – Water	Letter of consultation 16/09/2020
Department of Regional NSW – Resources Regulator (Subsidence)	Letter of consultation 22/09/2020
Department of Regional NSW – Resources Regulator (Compliance)	Letter of consultation 16/09/2020
Department of Regional NSW – Mining Exploration and Geoscience	Letter of consultation 16/09/2020
NSW Infrastructure – Natural Resources Access Regulator (NRAR)	Letter of consultation 16/09/2020
NSW Department of Primary Industries – Agriculture	Letter of consultation 16/09/2020
Office of the National Rail Safety Regulator	Letter of consultation 22/09/2020

Consultation

Extraction Plan LW W3-W4

Department / Stakeholder	Consultation Record
Dam Safety Committee	Letter of consultation 16/09/2020
NSW Environment Protection Authority	Letter of consultation 16/09/2020
WaterNSW	Letter of consultation 16/09/2020
NSW Roads and Maritime Services	Letter of consultation 16/09/2020
NSW State Emergency Services	Letter of consultation 16/09/2020
Subsidence Advisory NSW	Letter of consultation 16/09/2020
Wollondilly Shire Council	Letter of consultation 16/09/2020
Tahmoor Colliery Community Consultative Committee	Briefed 3/09/2020
Registered Aboriginal Parties	To be consulted as part of reports and AHIP preparation
Private property landholders	Letter of consultation 15/09/2020

April Hudson

From: Zina Ainsworth
Sent: Thursday, 24 September 2020 5:49 PM
To: April Hudson
Subject: FW: Tahmoor Mine Western Domain_Extraction Plan LW W3-W4
Attachments: 20200923 DPIE Meeting LW W3-W4 Extraction Plan.pdf

Hi April
FYI and can you please file?
Thanks
Z

From: Zina Ainsworth
Sent: Thursday, 24 September 2020 5:49 PM
To: Steve O'Donoghue <Stephen.ODonoghue@planning.nsw.gov.au>; Gen Lucas <Gen.Lucas@planning.nsw.gov.au>
Cc: David Talbert <David.Talbert@simecgfg.com>
Subject: FYI: Tahmoor Mine Western Domain_Extraction Plan LW W3-W4

Hi Stephen and Gen
Thank you for your time yesterday to discuss the upcoming Extraction Plan for LW W3-W4.
Please find attached the presentation and data below regarding valley closure as requested.

Let me know if you have any questions,
Kind Regards
Zina

Maximum predicted incremental conventional subsidence, tilt and curvature for the proposed longwalls

Longwall	Maximum predicted incremental vertical subsidence (mm)	Maximum predicted incremental tilt (mm/m)	Maximum predicted incremental hogging curvature (km^{-1})	Maximum predicted incremental sagging curvature (km^{-1})
LW W3	650	4.5	0.05	0.09
LW W4	575	4.5	0.05	0.08

Maximum predicted total conventional subsidence, tilt and curvature for the proposed longwalls

Longwall	Maximum predicted total vertical subsidence (mm)	Maximum predicted total tilt (mm/m)	Maximum predicted total hogging curvature (km^{-1})	Maximum predicted total sagging curvature (km^{-1})
LW W3	950	5.0	0.06	0.10
LW W4	1000	5.0	0.06	0.10

Maximum predicted total vertical subsidence, upsidence and closure for Matthews Creek

Location	Longwall	Maximum predicted total vertical subsidence (mm)	Maximum predicted total upsidence (mm)	Maximum predicted total closure (mm)
Matthews Creek	After LW W2	90	90	170
	After LW W3	100	100	190
	After LW W4	100	100	200

Maximum predicted total vertical subsidence, upsidence and closure for Cedar Creek

Location	Longwall	Maximum predicted total vertical subsidence (mm)	Maximum predicted total upsidence (mm)	Maximum predicted total closure (mm)
Cedar Creek	After LW W2	60	160	180
	After LW W3	70	170	200
	After LW W4	70	170	200

Maximum predicted total vertical subsidence, upsidence and closure for Stonequarry Creek

Location	Longwall	Maximum predicted total vertical subsidence (mm)	Maximum predicted total upsidence (mm)	Maximum predicted total closure (mm)
Stonequarry Creek	After LW W2	50	90	60
	After LW W3	70	120	80
	After LW W4	70	120	80

14 August 2020

Mr Ray Ramage
Senior Mine Safety Officer – Subsidence
Resources Regulator
Department of Planning & Environment
8 Hartley Drive
Thornton NSW 2322

Dear Mr Ramage,

Tahmoor Coal
Development Consent DA67-98
Condition 13G

We refer to Development Consent 67-98, as modified, which provides planning consent for underground coal mining within our Tahmoor North mining domain.

Specifically, Condition 13G of DA67/98, conditions the following:

> *First Workings*
>
> *13G. The Applicant may carry out first workings within the underground mining area approved mine plan, other than in accordance with an approved Extraction Plan, provided that the Resources Regulator is satisfied that the first workings are designed to remain stable and non-subsiding in the long-term, except insofar as they may be impacted by approved second workings.*
>
> *Notes:*
>
> - *The intent of this condition is not to require an additional approval for first workings, but to ensure that first workings are built to geotechnical and engineering standards sufficient to ensure long term stability, with negligible resulting direct subsidence impacts.*
> - *DRG should be consulted when designing first workings in order to provide comment on matters relating to coal resource recovery.*

First Workings

The parameters used for first workings at Tahmoor Coal Mine are width of 5.2 metres and height of 2.7 metres.

The design parameters for first workings utilised at Tahmoor Coal Mine are below the criteria for a High Risk Activity notification, as outlined within Schedule 3, Part 2, Clause 12 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

First Workings – Western Domain

First workings in preparation for the extraction of our Longwalls West 3 and West 4 (LW W3-W4) are about to commence in the Western Domain. Tahmoor Coal is currently mining Longwall West 1 in the Western Domain, and has extracted 1224 meters as of 2 August 2020. Mining of Longwall West 3 is anticipated to commence during September 2021 following the completion of both Longwalls West 1 and West 2.

LW W3-W4 will be the subject of an Extraction Plan approval from the Department of Planning, Industry and Environment (DPIE). This Extraction Plan is currently being prepared, and it is anticipated that the document will be submitted to DPIE in January 2021. A copy of the submitted LW W3-W4 Extraction Plan will be provided to the Resources Regulator once submitted to DPIE.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or zina.ainsworth@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coking Coal Operations
SIMEC Mining

April Hudson

From: Resources Regulator <nswresourcesregulator@service-now.com>
Sent: Monday, 17 August 2020 2:39 PM
To: April Hudson
Cc: Gang Li; Ray Ramage
Subject: ASMT0012078 | First Workings for LW W3 and W4 under Development Consent DA67-98.

Dear April,

I wish to acknowledge receipt of your email and attached letter dated 14 August 2020 in relation to first workings for Longwalls W3 and W4 under Condition 13 of Development Consent DA67-98.

The content of the letter has been noted for our records.

Regards,

Raymond Ramage
Senior Mine Safety Officer Subsidence
Subsidence Engineering | Resources Regulator
M 0422 551 293

The Department of Regional New South Wales acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for Elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.

Ref:MSG0284872_21QW0dlV2d8bg1YodaiX

22 September 2020

Gang Li
Principal Inspector - Subsidence
Department of Regional NSW – Resources Regulator
PO Box 344
Hunter Region Mail Centre NSW 2310

Dear Gang,

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

Tahmoor Coal Mine (Tahmoor Mine) has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since the Mine commenced in 1979, and longwall mining methods have been used since 1987. Tahmoor Coal is a subsidiary within the SIMEC Mining Division (SIMEC) of the GFG Alliance (GFG).

Tahmoor Mine is located approximately 80 kilometres south-west of Sydney between the towns of Tahmoor and Bargo. Tahmoor Coal has previously mined 32 longwalls to the north and west of the Tahmoor Mine's current pit top location.

Tahmoor Coal extended its underground coal mining to the north-west of the Main Southern Railway referred to as the 'Western Domain', which are located in the Tahmoor North Mining Lease areas. The Western Domain includes Longwalls West 1 (LW W1) to West 4 (LW W4) at Picton and Thirlmere. Tahmoor Coal is currently mining LW W1 in accordance with the relevant Development Consents and Extraction Plan Approval. Longwall West 2 is scheduled to commence in December 2020.

Tahmoor Coal would like to consult with the Office of the National Rail Safety Regulator regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

Under the conditions of Tahmoor Coal's Development Consent DA 67/98, an Extraction Plan is required for all second workings in the Western Domain. Tahmoor Coal is currently preparing an Extraction Plan for LW W3-W4. The Extraction Plan will be submitted to Department of Planning, Industry and Environment (DPIE) for approval.

The Extraction Plan will address the LW W3-W4 Study Area, which comprises the predicted 20 mm Subsidence Contour and the 35° Angle of Draw Line (refer to attached figure).

The Extraction Plan will provide an overview of the project, details of the development of the Extraction Plan, details on how subsidence impacts and environmental consequences will be monitored and managed during and after mining, and details on how the Extraction Plan will be implemented.

The Extraction Plan will be supported by the following key documents:

- Subsidence Prediction and Impact Assessment Report;
- Water Management Plan;
- Land Management Plan;
- Biodiversity Management Plan;
- Heritage Management Plan;
- Built Features Management Plan;
- Public Safety Management Plan;
- Subsidence Monitoring Program; and

» Graphical Plans.

The Built Features Management Plan includes a requirement to prepare a Main Southern Rail Management Plan and a Picton to Mittagong Loop Line Management Plan.

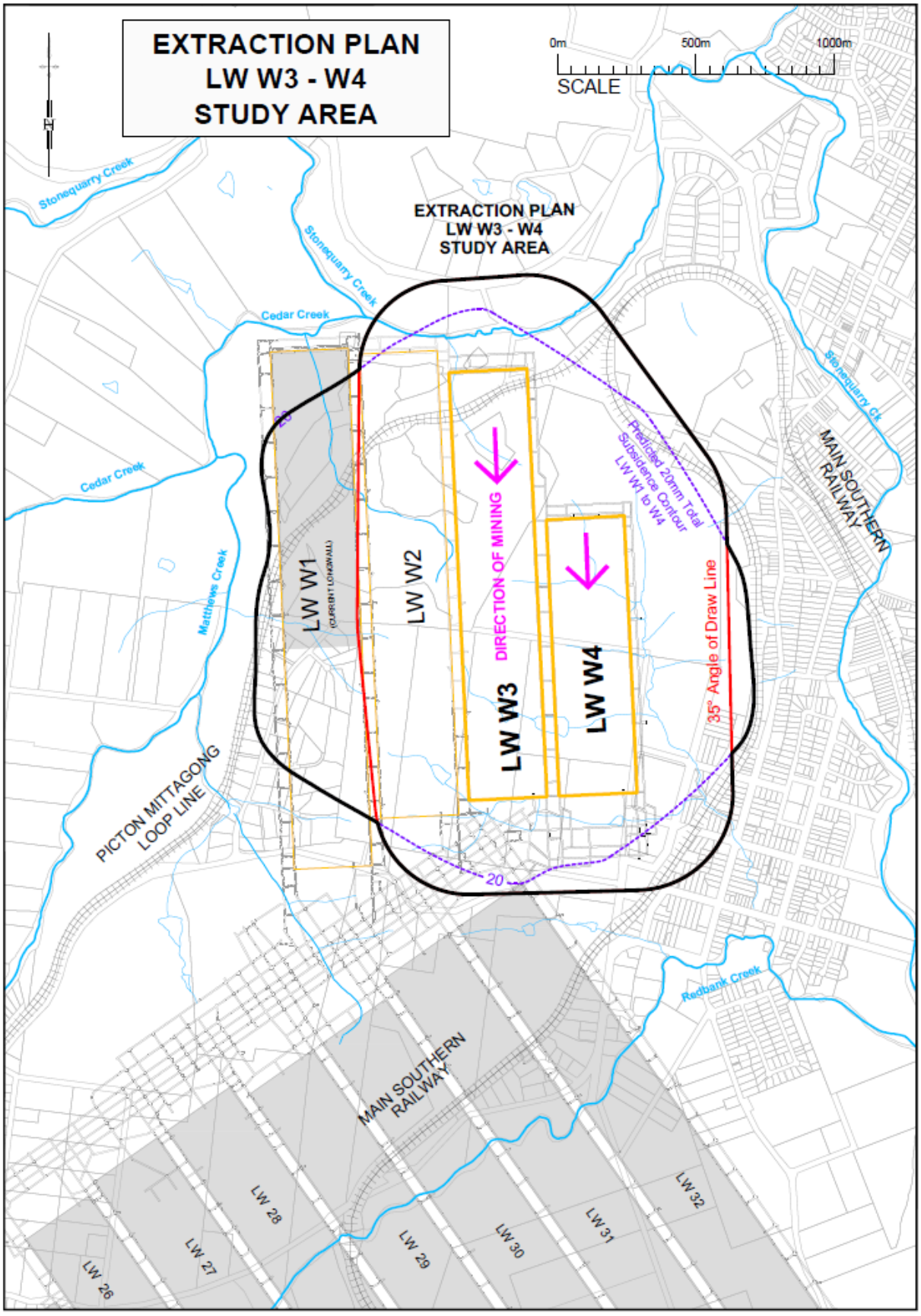
We would be pleased to incorporate any of your organisation's initial comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 9 October 2020**. If required, we are happy to arrange a teleconference and/or a site visit to discuss this matter further.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

April Hudson

From: Gang Li <gang.li@planning.nsw.gov.au>
Sent: Friday, 25 September 2020 9:50 AM
To: Amanda Francis
Subject: RE: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Dear Amanda'

Thanks, your letter received.

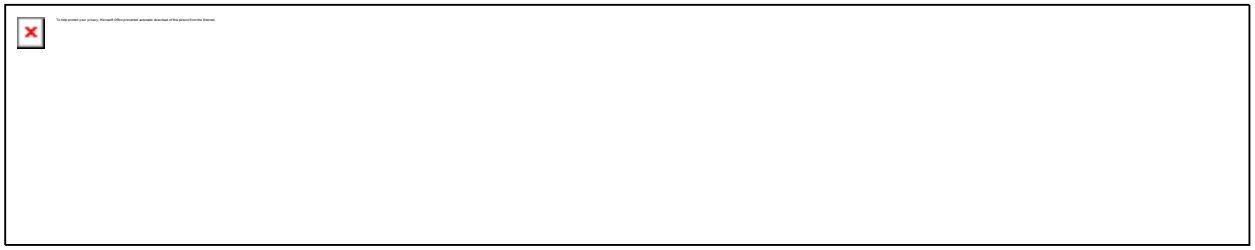
Kind Regards

Dr. Gang Li
Principal Subsidence Engineer

NSW Resources Regulator | Department of Regional NSW
T 02 4063 6429 | **M** 0409 227 986 | **E** gang.li@planning.nsw.gov.au
8 Hartley Drive, Thornton, NSW 2322
PO Box 343 HRMC NSW 2310

NSW GOVERNMENT | Regional NSW

The Department of Regional New South Wales acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for Elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.



From: Amanda Francis <Amanda.Francis@simecgfg.com>
Sent: Tuesday, 22 September 2020 12:21 PM
To: Gang Li <gang.li@planning.nsw.gov.au>; RRD OCI Subsidence Monitoring Mailbox <subsidence.monitoring@planning.nsw.gov.au>
Cc: Ray Ramage <ray.ramage@planning.nsw.gov.au>
Subject: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Dear Gang

Please see attached letter regarding consultation for Tahmoor Coal's Longwall West 3 and West 4 extraction plan.

Kind regards

Amanda Francis
Community Liaison Specialist
T: +61-2-4640-0025
F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

16 September 2020

Greg Kininmonth
Manager Environmental Operations
Department of Regional NSW – Resources Regulator
PO Box 674
Wollongong NSW 2520

Dear Greg,

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

Tahmoor Coal Mine (Tahmoor Mine) has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since the Mine commenced in 1979, and longwall mining methods have been used since 1987. Tahmoor Coal is a subsidiary within the SIMEC Mining Division (SIMEC) of the GFG Alliance (GFG).

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Tahmoor Coal would like to consult with the Department of Regional NSW – Resources Regulator regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

Under the conditions of Tahmoor Coal's Development Consent DA 67/98, an Extraction Plan is required for all second workings in the Western Domain. Tahmoor Coal is currently preparing an Extraction Plan for LW W3-W4. The Extraction Plan will be submitted to DPIE for approval.

The Extraction Plan will address the LW W3-W4 Study Area, which comprises the predicted 20 mm Subsidence Contour and the 35° Angle of Draw Line (refer to attached figure).

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- Heritage Management Plan;
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- Public Safety Management Plan;
- Subsidence Monitoring Program; and
- Graphical Plans.

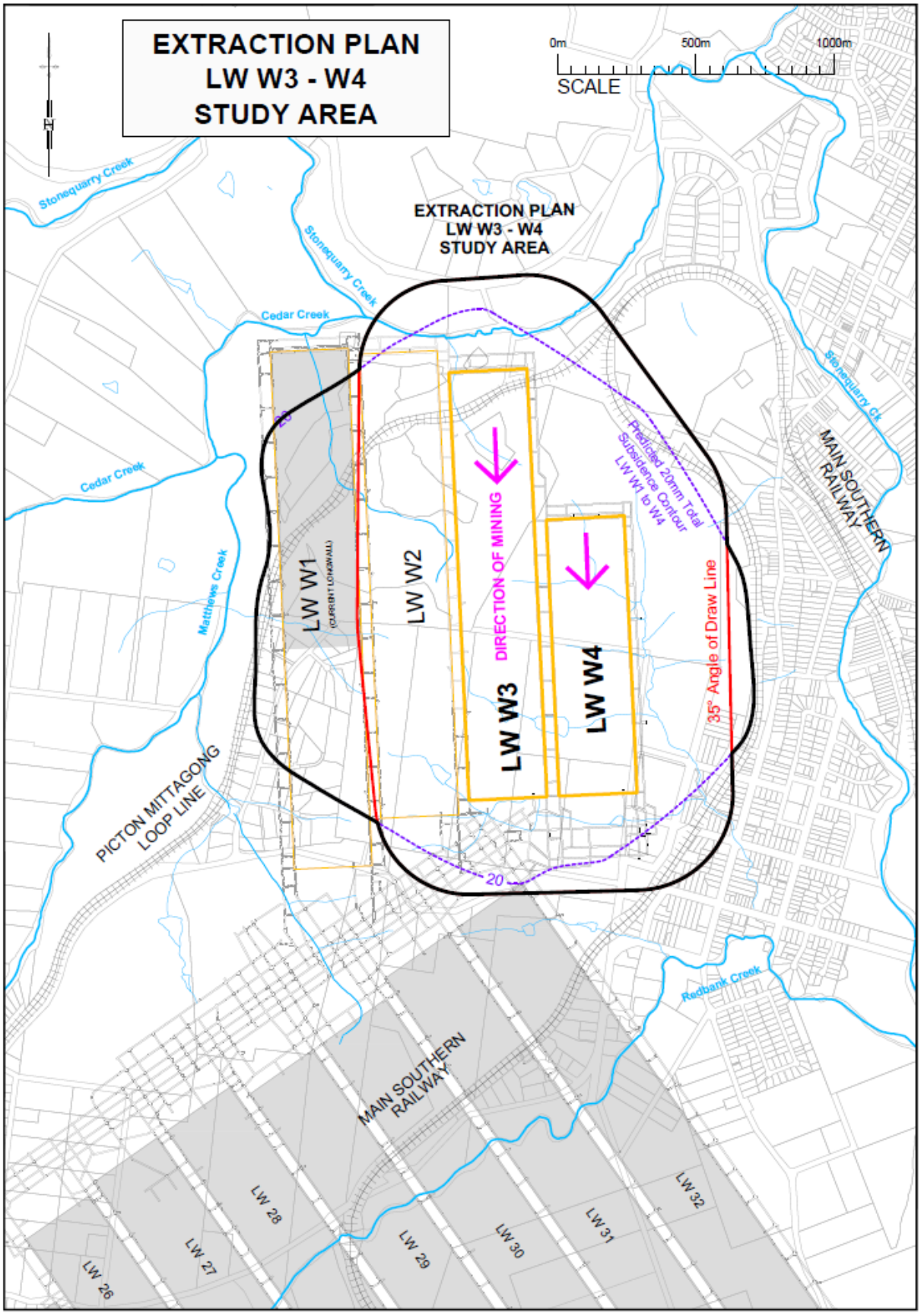
We would be pleased to incorporate any of your organisation's comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 9 October 2020**. If required, we are happy to arrange a teleconference to discuss this matter further.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

April Hudson

From: Greg Kininmonth <greg.kininmonth@planning.nsw.gov.au>
Sent: Friday, 20 November 2020 5:01 PM
To: Amanda Francis
Cc: Peter McMillan
Subject: RE: Follow up: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan

Hi Amanda

The Mining Act Inspectorate within the Resources Regulator has no specific comment to provide with regard to the preparation of this Extraction Plan.

The Mine Safety section of the Resources Regulator was forwarded the initial application and it is my understanding that they also no have no comments to provide.

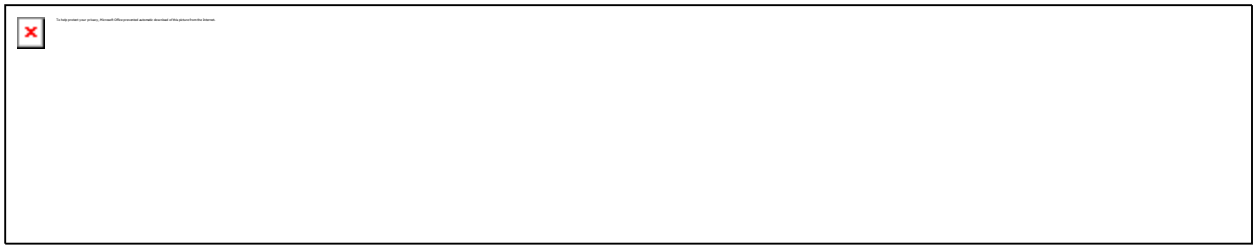
I apologise that no response was provide to your initial submission.

Regards

Greg Kininmonth
Manager Environmental Operations

NSW Resources Regulator | Department of Regional NSW
T 02 4276 7428 | **M** 0429 168 021 | **E** greg.kininmonth@planning.nsw.gov.au
Level 3, Block F | 84 Crown Street | Wollongong NSW 2500
PO Box 674 | Wollongong NSW 2500

The Department of Regional New South Wales acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for Elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.



From: Amanda Francis <Amanda.Francis@simecgfg.com>
Sent: Wednesday, 18 November 2020 4:38 PM
To: nswresourcesregulator@service-now.com; Greg Kininmonth <greg.kininmonth@planning.nsw.gov.au>
Subject: Follow up: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan

Dear Greg

Tahmoor Coal is following up if your organisation has any comments into the preparation of the Longwall West 3 and West 4 Extraction Plan.

We are seeking final comments by **Friday 4 November 2020**. If no response is received by this date, it will be assumed your organisation has no comments.

Kind regards

Amanda Francis
Community Liaison Specialist
T: +61-2-4640-0025
M: +61-0429-442-811
F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

From: Amanda Francis
Sent: Wednesday, 16 September 2020 4:51 PM
To: nswresourcesregulator@service-now.com; Greg Kininmonth
Subject: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan

Dear Greg

Please see attached letter regarding consultation for Tahmoor Coal's Longwall West 3 and West 4 extraction plan.

Kind regards

Amanda Francis
Community Liaison Specialist
T: +61-2-4640-0025
F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

16 September 2020

Brendan Killen
Manager Strategy and Policy
Subsidence Advisory NSW
PO Box 488G
Newcastle NSW 2300

Dear Brendan

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

Tahmoor Coal Mine (Tahmoor Mine) has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since the Mine commenced in 1979, and longwall mining methods have been used since 1987. Tahmoor Coal is a subsidiary within the SIMEC Mining Division (SIMEC) of the GFG Alliance (GFG).

Tahmoor Mine is located approximately 80 kilometres south-west of Sydney between the towns of Tahmoor and Bargo. Tahmoor Coal has previously mined 32 longwalls to the north and west of the Tahmoor Mine's current pit top location.

Tahmoor Coal extended its underground coal mining to the north-west of the Main Southern Railway referred to as the 'Western Domain', which are located in the Tahmoor North Mining Lease areas. The Western Domain includes Longwalls West 1 (LW W1) to West 4 (LW W4) at Picton and Thirlmere. Tahmoor Coal is currently mining LW W1 in accordance with the relevant Development Consents and Extraction Plan Approval. Longwall West 2 is scheduled to commence in November 2020.

Tahmoor Coal would like to consult with Subsidence Advisory NSW regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

Under the conditions of Tahmoor Coal's Development Consent DA 67/98, an Extraction Plan is required for all second workings in the Western Domain. Tahmoor Coal is currently preparing an Extraction Plan for LW W3-W4. The Extraction Plan will be submitted to DPIE for approval.

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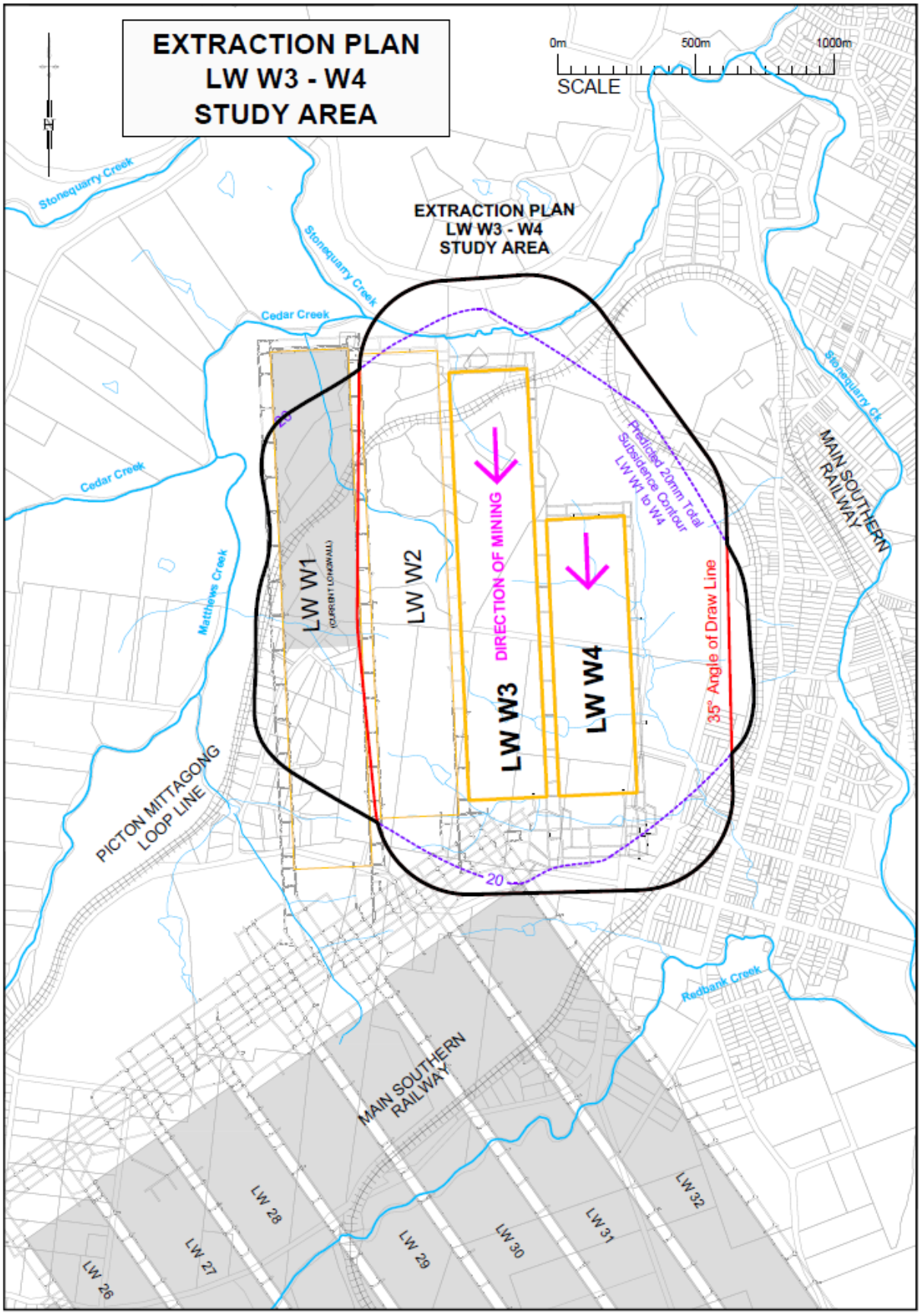
We would be pleased to incorporate any of your organisation's comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 9 October 2020**. If required, we are happy to arrange a teleconference to discuss this matter further.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

NSW GOVERNMENT

Subsidence Advisory

117 Bull Street, Newcastle West, NSW, 2302 | **T**: (02) 4908 4300
99 Menangle Street, Picton, NSW, 2571 | **T**: (02) 4677 6500
24 Hour Emergency Service: 1800 248 083 (Free Call)

Zina Ainsworth
Manager Environmental and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Via email: zina.ainsworth@simecgfg.com

Dear Zina

RE: Tahmoor North Longwalls W3-W4 Extraction Plan Letter of Consultation – EMIN20-00013

I refer to your letter dated 16 September 2020 inviting Subsidence Advisory NSW (SA NSW) to provide comment on SIMEC's secondary extraction plan for Longwalls W3-W4.

It is noted that SA NSW has not yet been provided with a draft or final Built Features Management Plan (BFMP) or an updated subsidence impact assessment for comment. SA NSW requires a BFMP to be provided prior to a complete assessment and response to the extraction plan to the DPIE.

Any BFMP provided for consultation and review by SA NSW should conform with the following requirements;

- The procedures and monitoring in the proposed BFMP will allow the performance criteria set out in the consolidated consent (DA67/98-Mod-5) for the Tahmoor North project to be met; and
- Procedures and monitoring in the BFMP should also meet any requirements by SA NSW as outlined in the *Coal Mine Subsidence Compensation Act 2017* and SA NSW process for managing claims.

Please contact me on (02) 4908 4353 or at subsidencedevelopment@customerservice.nsw.gov.au if you have any questions or wish to discuss.

Yours sincerely

Kieran Black, Technical Specialist

on behalf of John Johnston
Manager, Subsidence Risk Evaluation and Regulation, Subsidence Advisory NSW

8 December 2020

16 September 2020

Liza Schaeper
Senior Team Leader, Ecosystems and Threatened Species, Greater Sydney
Department of Planning, Industry & Environment – Environment, Energy & Science
Locked Bag 5022
Parramatta NSW 2124

Dear Liza

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

Tahmoor Coal Mine (Tahmoor Mine) has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since the Mine commenced in 1979, and longwall mining methods have been used since 1987. Tahmoor Coal is a subsidiary within the SIMEC Mining Division (SIMEC) of the GFG Alliance (GFG).

Tahmoor Mine is located approximately 80 kilometres south-west of Sydney between the towns of Tahmoor and Bargo. Tahmoor Coal has previously mined 32 longwalls to the north and west of the Tahmoor Mine's current pit top location.

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Tahmoor Coal would like to consult with the DPIE Environment, Energy and Science Group regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

Under the conditions of Tahmoor Coal's Development Consent DA 67/98, an Extraction Plan is required for all second workings in the Western Domain. Tahmoor Coal is currently preparing an Extraction Plan for LW W3-W4. The Extraction Plan will be submitted to DPIE for approval.

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- Graphical Plans.

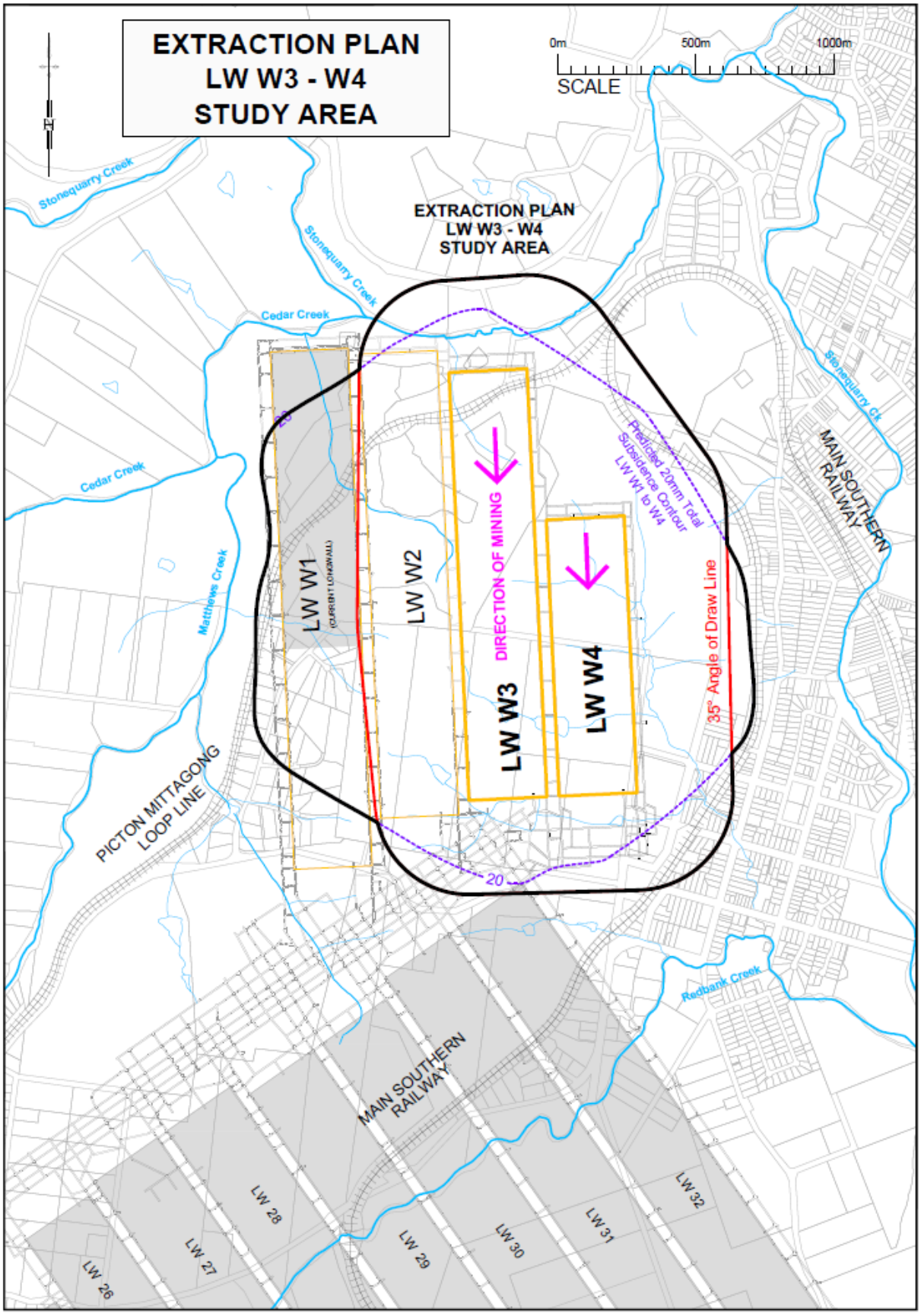
We would be pleased to incorporate any of your organisation's comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 9 October 2020**. If required, we are happy to arrange a teleconference to discuss this matter further.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

Amanda Francis

From: Liza Schaeper <Liza.Schaeper@environment.nsw.gov.au>
Sent: Monday, 21 September 2020 1:49 PM
To: Amanda Francis
Cc: Martin Krogh; Meagan Hinds
Subject: RE: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Dear Amanda,

Thank you for your email.

To assist us in our understanding, can you please supply the follow information:

1. Flow and level monitoring data for Cedar Ck, Matthews Ck and Stonequarry Ck (excel file preferred).
2. If you put a continuous level monitor in the large pool in Stonequarry Ck, can we have the data from it to see if it is providing the necessary monitoring for this major stream feature.
3. An updated plan of where LW W1 is currently at (as of mid September)
4. A draft of the subsidence prediction report (presumably done by MSEC – should already have been largely completed)
5. Groundwater monitoring data for the Tahmoor North area (excel file preferred).

As the time frame is quite short, timely supply of this information will be appreciated.

Kind regards,

Liza

From: Amanda Francis <Amanda.Francis@simecgfg.com>
Sent: Wednesday, 16 September 2020 4:57 PM
To: Liza Schaeper <Liza.Schaeper@environment.nsw.gov.au>
Cc: Martin Krogh <Martin.Krogh@environment.nsw.gov.au>; Meagan Hinds <Meagan.Hinds@environment.nsw.gov.au>
Subject: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Dear Liza

Please see attached letter regarding consultation for Tahmoor Coal's Longwall West 3 and West 4 extraction plan.

Kind regards

Amanda Francis
Community Liaison Specialist
T: +61-2-4640-0025
F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574

simec.com

Our ref: DOC21/50505

April Hudson
Approvals Specialists
SIMEC Mining
April.Hudson@simecgfg.com

Dear April

Subject: Extraction Plan Consultation longwall West 3 and West 4 Tahmoor Colliery, January 2021

I refer to your email dated 15 January 2021 providing the additional information as requested for Tahmoor Colliery Longwall West 3 and West 4 (LW W3-W4) Extraction Plan. I understand that this referral is to meet the consultation requirement with the Environment, Energy and Science Group for the proposed extraction plan for longwalls W3 & W4.

This information has been reviewed by the Group's Principal Scientist Martin Krogh. As in previous longwall approvals, our primary concern relates to subsidence impacts to watercourses including an appropriate water monitoring program and remediation plans that have appropriate measures and objectives to assess remediation success.

At present, the information provided is incomplete. The subsidence assessment provided is in a draft form and lacks detailed scientific methods or evidence to demonstrate remediation success to date for impacts to Myrtle and Redbank Creeks, or remediation plans for future potential impacts to Matthews, Cedar and Stonequarry Creeks (if they occur). In addition, two other reports are referenced, HEC 2020 and Geoterra 2020, which have not been made available for concurrent review. In addition, the MSEC report has a limited review of LW32 subsidence despite impacts significantly exceeding predictions. Suggestions are made that this may in part be due to the proximity of the Nepean fault. This report relies on updated mapping of the Nepean fault which runs just to the east of LW W4, apparently outlined in a SCT (2020) report.

To assist with resolving these issues it is recommended that:

- SIMEC provide the following reports: HEC (2020), Geoterra (2020) and SCT (2020); for our assessment; and
- Provide a presentation and report to EES that describes the remediation applied to Myrtle Ck and Redbank Ck and how/why it is deemed to have been a success.

It would be appreciated if these reports can be sent through to me via email and we can then arrange for a presentation. My contact details are liza.Schaeper@environment.nsw.gov.au and 9995 6753.

Yours sincerely

Liza Schaeper
Senior Team Leader, Ecosystems and Threatened Species, Greater Sydney
Environment, Energy and Science
29 January 2021

22 September 2020

Ian Cochran
Technical Specialist
Office of the National Rail Safety Regulator
Level 4, 309 Kent Street
Sydney NSW 2000

Dear Ian

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

Tahmoor Coal Mine (Tahmoor Mine) has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since the Mine commenced in 1979, and longwall mining methods have been used since 1987. Tahmoor Coal is a subsidiary within the SIMEC Mining Division (SIMEC) of the GFG Alliance (GFG).

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Tahmoor Coal would like to consult with the Office of the National Rail Safety Regulator regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

Under the conditions of Tahmoor Coal's Development Consent DA 67/98, an Extraction Plan is required for all second workings in the Western Domain. Tahmoor Coal is currently preparing an Extraction Plan for LW W3-W4. The Extraction Plan will be submitted to Department of Planning, Industry and Environment (DPIE) for approval.

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- Subsidence Monitoring Program; and

» Graphical Plans.

The Built Features Management Plan includes a requirement to prepare a Main Southern Rail Management Plan and a Picton to Mittagong Loop Line Management Plan.

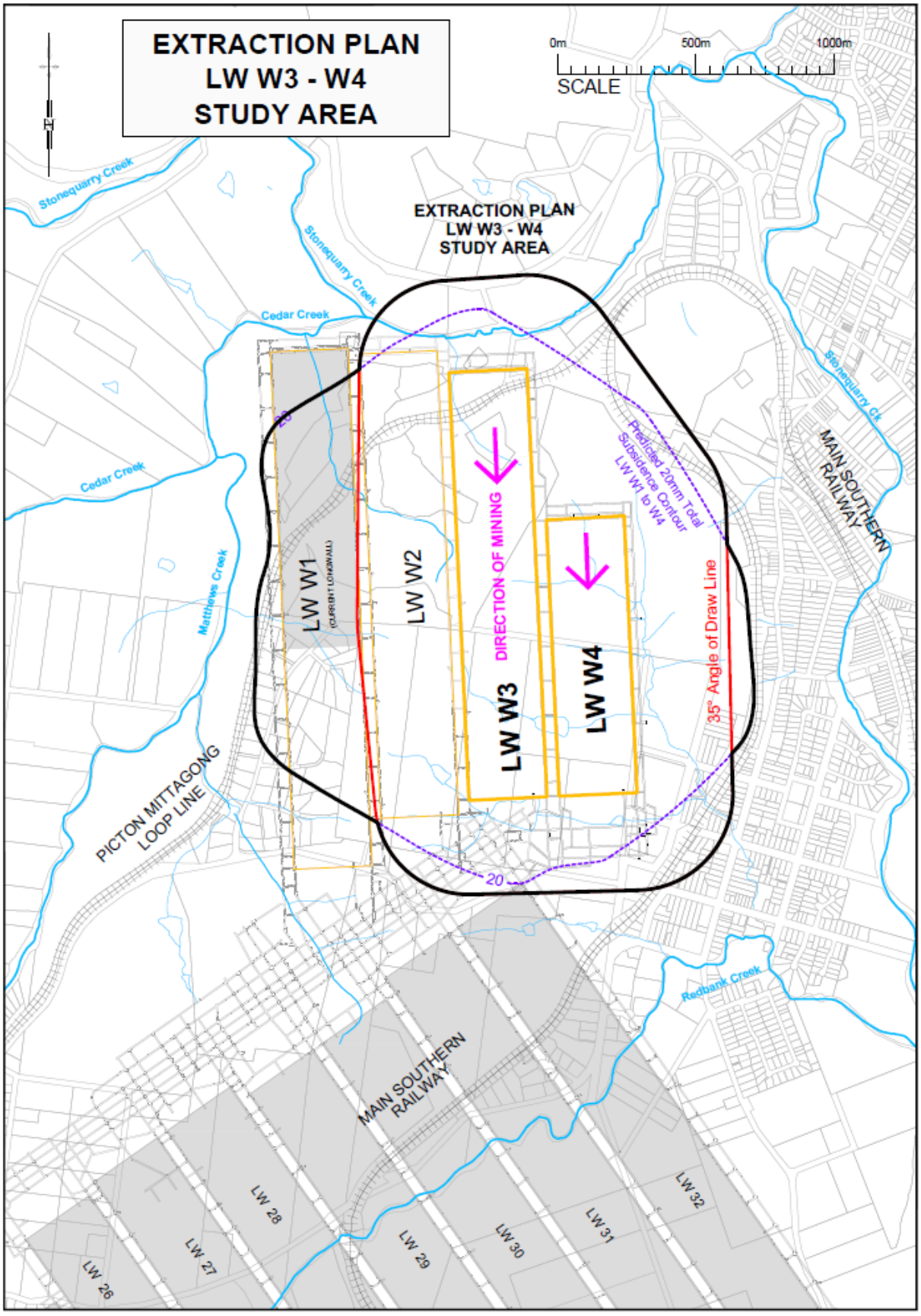
We would be pleased to incorporate any of your organisation's initial comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 9 October 2020**. If required, we are happy to arrange a teleconference and/or a site visit to discuss this matter further.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

April Hudson

From: David Talbert
Sent: Thursday, 3 December 2020 9:35 AM
To: April Hudson
Subject: FW: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

David Talbert
Project Manager

T: +61-2-4640-0028
M: +61 414 905 565
E: david.talbert@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

From: Ian Cochran <Ian.Cochran@onrsr.com.au>
Sent: Thursday, 3 December 2020 9:33 AM
To: Amanda Francis <Amanda.Francis@simecgfg.com>
Cc: David Talbert <David.Talbert@simecgfg.com>; Bruce Weston <Bruce.Weston@onrsr.com.au>; Colin Holmes <Colin.Holmes@onrsr.com.au>
Subject: RE: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Amanda and David,

ONRSR acknowledges receipt of your email dated 1 December 2020 containing the Letter of Consultation regarding preparation of the Extraction Plan for stage 2 coal extraction at Tahmoor North longwalls W3 and W4.

We look forward to opportunities to provide review and comments on relevant parts of the associated plans yet to be finalised, in particular the Built Features Management Plan, TARPs, and Heritage Management Plan (re Picton Viaduct).

Regards,

Ian Cochran
Technical Specialist - Bridges & Structures

Safe railways for Australia

Office of the National Rail Safety Regulator
Technical Division

Level 4, 309 Kent Steet, Sydney NSW 2000

PO Box 3461, Rundle Mall, Adelaide SA 5000

0414 840 400
ian.cochran@onrsr.com.au
www.onrsr.com.au

From: Amanda Francis <Amanda.Francis@simecgfg.com>
Sent: Tuesday, 1 December 2020 6:51 PM

To: Ian Cochran <Ian.Cochran@onrsr.com.au>
Cc: Bruce Weston <Bruce.Weston@onrsr.com.au>; David Talbert <David.Talbert@simecgfg.com>; April Hudson <April.Hudson@simecgfg.com>
Subject: FW: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Dear Ian

As discussed with David, please find attached.

Kind regards
Amanda Francis
Community Liaison Specialist
T: +61-2-4640-0025
M: +61-0429-442-811
F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

From: Amanda Francis
Sent: Tuesday, 22 September 2020 12:34 PM
To: ian.cochran@onrsr.com.au
Subject: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Dear Ian

Please see attached letter regarding consultation for Tahmoor Coal's Longwall West 3 and West 4 extraction plan.

Kind regards
Amanda Francis

Community Liaison Specialist
T: +61-2-4640-0025
F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

16 September 2020

Adam Bannister
Assessment Coordination Unit
Department of Regional NSW – Mining Exploration and Geoscience
PO Box 674
Wollongong NSW 2500

Dear Adam

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

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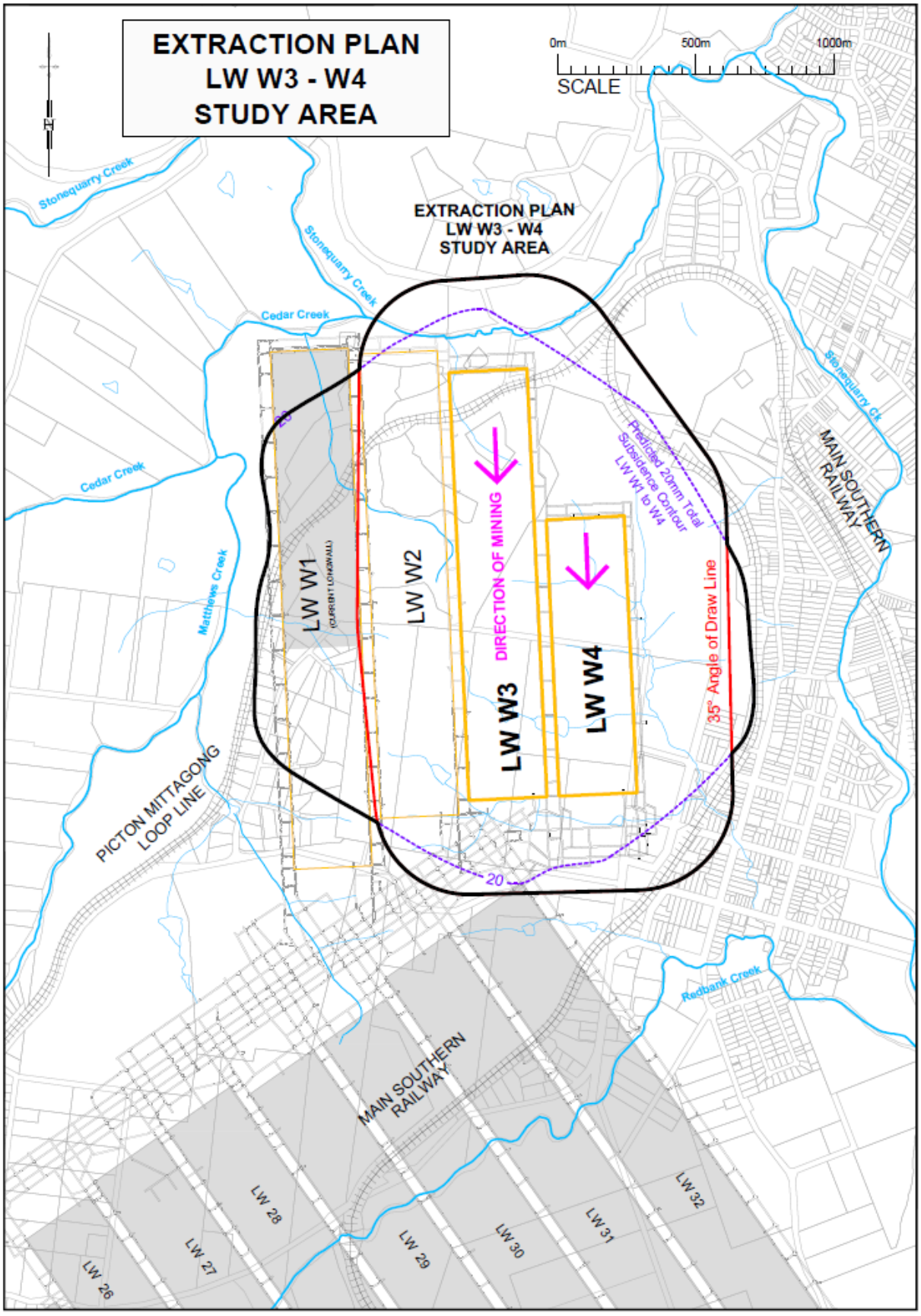
Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

April Hudson

From: Amanda Francis
Sent: Wednesday, 16 September 2020 5:14 PM
To: 'assessment.coordination@planning.nsw.gov.au'; 'resource.operations@planning.nsw.gov.au'
Subject: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation
Attachments: 20200916 Tahmoor Coal LW W3-W4 Extraction Plan.pdf

Dear Adam

Please see attached letter regarding consultation for Tahmoor Coal's Longwall West 3 and West 4 extraction plan.

Kind regards

Amanda Francis
Community Liaison Specialist
T: +61-2-4640-0025
F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

16 September 2020

Ellie Randall
Water Regulation Officer
NSW Infrastructure – Land & Water – Natural Resources Access Regulator
Locked Bag 5022
Parramatta NSW 2124

Dear Ellie

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

Tahmoor Coal Mine (Tahmoor Mine) has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since the Mine commenced in 1979, and longwall mining methods have been used since 1987. Tahmoor Coal is a subsidiary within the SIMEC Mining Division (SIMEC) of the GFG Alliance (GFG).

Tahmoor Mine is located approximately 80 kilometres south-west of Sydney between the towns of Tahmoor and Bargo. Tahmoor Coal has previously mined 32 longwalls to the north and west of the Tahmoor Mine's current pit top location.

Tahmoor Coal extended its underground coal mining to the north-west of the Main Southern Railway referred to as the 'Western Domain', which are located in the Tahmoor North Mining Lease areas. The Western Domain includes Longwalls West 1 (LW W1) to West 4 (LW W4) at Picton and Thirlmere. Tahmoor Coal is currently mining LW W1 in accordance with the relevant Development Consents and Extraction Plan Approval. Longwall West 2 is scheduled to commence in November 2020.

Tahmoor Coal would like to consult with the Natural Resources Access Regulator regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

Under the conditions of Tahmoor Coal's Development Consent DA 67/98, an Extraction Plan is required for all second workings in the Western Domain. Tahmoor Coal is currently preparing an Extraction Plan for LW W3-W4. The Extraction Plan will be submitted to DPIE for approval.

The Extraction Plan will address the LW W3-W4 Study Area, which comprises the predicted 20 mm Subsidence Contour and the 35° Angle of Draw Line (refer to attached figure).

The Extraction Plan will provide an overview of the project, details of the development of the Extraction Plan, details on how subsidence impacts and environmental consequences will be monitored and managed during and after mining, and details on how the Extraction Plan will be implemented.

The Extraction Plan will be supported by the following key documents:

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- Water Management Plan;
- Land Management Plan;
- Biodiversity Management Plan;
- Heritage Management Plan;
- Built Features Management Plan;
- Public Safety Management Plan;
- Subsidence Monitoring Program; and
- Graphical Plans.

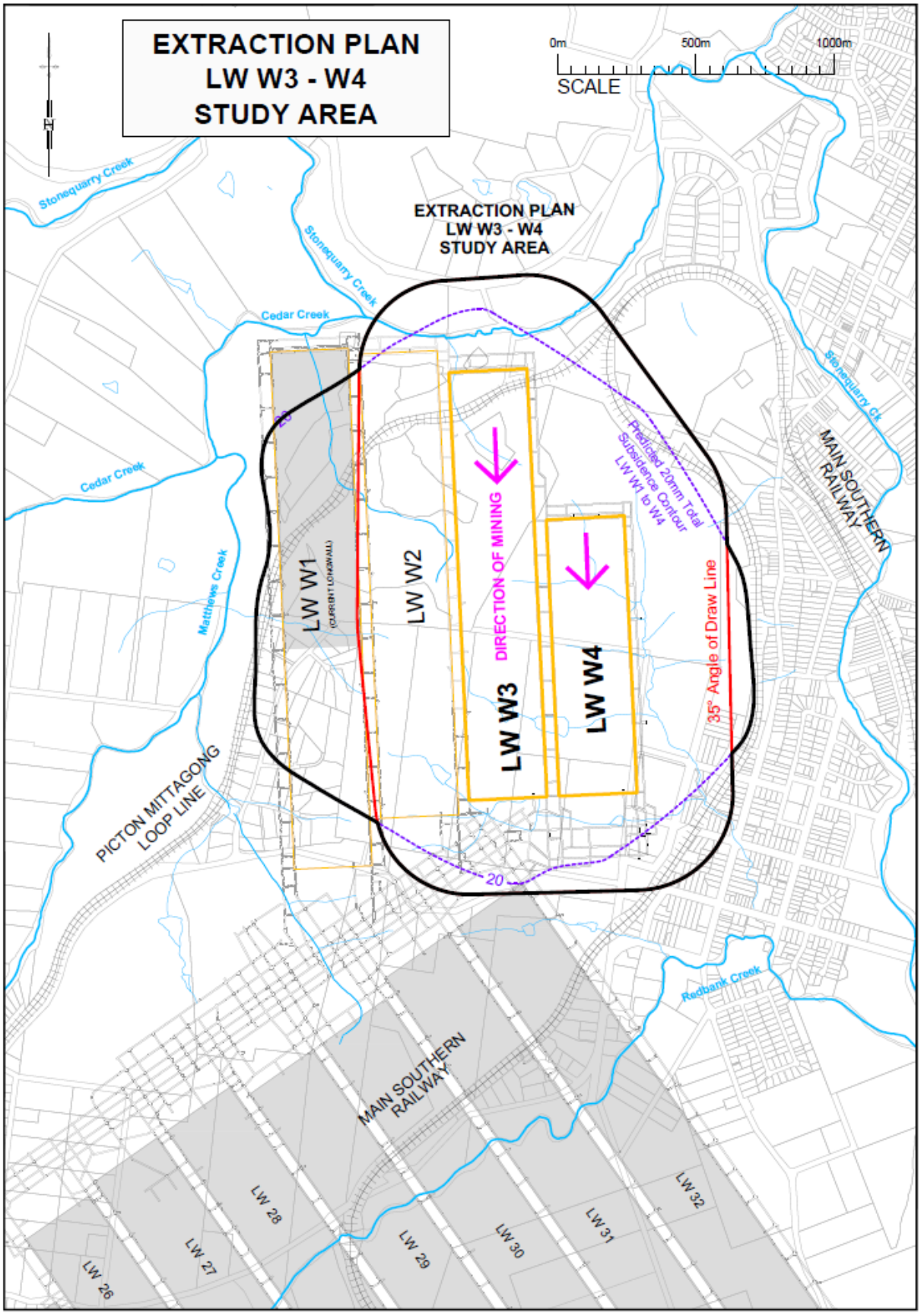
We would be pleased to incorporate any of your organisation's comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 9 October 2020**.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

April Hudson

From: Jane Curran <jane.curran@nrar.nsw.gov.au>
Sent: Friday, 20 November 2020 8:20 AM
To: April Hudson
Cc: Amanda Francis
Subject: RE: Follow up: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Hi April,

NRAR would be happy to review the Water Management Plan when it is prepared. At this stage I can only comment that NRAR would be keen to see details of water take and appropriate water licencing within the WMP.

Kind regards,

Jane Curran | Water Regulation Officer
Natural Resources Access Regulator | Water Regulation (East)
Level 0 | 84 Crown Street | Wollongong NSW 2500
PO Box 53 Wollongong NSW 2520
T: +61 2 *4275 9327* | F: +61 2 *4224 9740*
E: jane.curran@nrar.nsw.gov.au
W: www.industry.nsw.gov.au

From: April Hudson <April.Hudson@simecgfg.com>
Sent: Thursday, 19 November 2020 5:41 PM
To: Jane Curran <jane.curran@nrar.nsw.gov.au>
Cc: Amanda Francis <Amanda.Francis@simecgfg.com>
Subject: RE: Follow up: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Hi Jane,

Thanks for your email.

We are in the preparation stage of the Extraction Plan, and the documents will be submitted to DPIE early in the New Year. Once the Extraction Plan has been prepared, the documents will be sent out to all stakeholders for review and comment.

At this stage we are looking for any general comments regarding considerations that NRAR would like to be included in the Extraction Plan documentation, particularly in relation to the Water Management Plan.

A copy of our previous Water Management Plan (and all other documents) for Longwalls West 1 and West 2 can be found on our website:
http://www.simec.com/mining/tahmoor-coal-pty-ltd/publications/approvals/longwall-west-1-2/

Kind regards,

April Hudson
Approvals Specialist

T: +61 2 4640 0022
M: +61 466 380 992
F: +61 2 4640 0140
E: April.Hudson@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Tahmoor NSW 2574
simec.com

From: Jane Curran <jane.curran@nrar.nsw.gov.au>
Sent: Thursday, November 19, 2020 8:03:24 AM
To: Amanda Francis <Amanda.Francis@simecgfg.com>
Cc: Ellie Randall <ellie.randall@dpi.nsw.gov.au>
Subject: RE: Follow up: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Hi Amanda,

Can you please send the extraction plan for review once it has been collated?
Thank you

Kind regards,

Jane Curran | Water Regulation Officer
Natural Resources Access Regulator | Water Regulation (East)
Level 0 | 84 Crown Street | Wollongong NSW 2500
PO Box 53 Wollongong NSW 2520
T: +61 2 *4275 9327* | F: +61 2 *4224 9740*
E: jane.curran@nrar.nsw.gov.au
W: www.industry.nsw.gov.au

From: Ellie Randall <ellie.randall@dpi.nsw.gov.au>
Sent: Wednesday, 18 November 2020 6:04 PM
To: Jane Curran <jane.curran@nrar.nsw.gov.au>
Cc: Amanda Francis <Amanda.Francis@simecgfg.com>
Subject: Re: Follow up: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Hi Jane,

Do you know the status of the extraction plan?

Ellie Randall
Water Regulation Officer

Natural Resources Access Regulator | Department of Planning, Industry and Environment
P: 4275 9308 | **E** ellie.randall@nrar.nsw.gov.au

Level 0 | 84 Crown Street | Wollongong NSW 2500

PO Box 53 Wollongong NSW 2520

www.industry.nsw.gov.au/nrar

To contact the NRAR Hotline and make a report call: 1800 633 362

Read the NRAR Progress Report 2019-20

The Department of Planning, Industry and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

From: Amanda Francis <Amanda.Francis@simecgfg.com>
Sent: Wednesday, 18 November 2020 5:12 PM
To: NRAR Service Desk Mailbox <nrar.servicedesk@dpie.nsw.gov.au>; Ellie Randall <ellie.randall@dpi.nsw.gov.au>
Cc: Heather Dewson <heather.dewson@dpie.nsw.gov.au>
Subject: Follow up: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Dear Ellie

Tahmoor Coal is following up if your organisation has any comments into the preparation of the Longwall West 3 and West 4 Extraction Plan.

We are seeking final comments by **Friday 4 November 2020** please. If no response is received by this date, it will be assumed your organisation has no comments.

Kind regards

Amanda Francis
Community Liaison Specialist
T: +61-2-4640-0025
M: +61-0429-442-811
F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

From: Amanda Francis
Sent: Wednesday, 16 September 2020 5:16 PM
To: nrar.servicedesk@dpie.nsw.gov.au; ellie.randall@nrar.nsw.gov.au
Subject: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Dear Ellie

Please see attached letter regarding consultation for Tahmoor Coal's Longwall West 3 and West 4 extraction plan.

Kind regards

Amanda Francis
Community Liaison Specialist

T: +61-2-4640-0025
F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

16 September 2020

Fabienne Boudoux d'Hautefeuille
Manager – Water Assessments
NSW Department of Planning, Industry and Environment
Locked Bag 5022
Parramatta NSW 2124

Dear Fabienne,

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

Tahmoor Coal Mine (Tahmoor Mine) has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since the Mine commenced in 1979, and longwall mining methods have been used since 1987. Tahmoor Coal is a subsidiary within the SIMEC Mining Division (SIMEC) of the GFG Alliance (GFG).

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Tahmoor Coal would like to consult with the Department of Planning, Industry and Environment (DPIE) - Water regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

Under the conditions of Tahmoor Coal's Development Consent DA 67/98, an Extraction Plan is required for all second workings in the Western Domain. Tahmoor Coal is currently preparing an Extraction Plan for LW W3-W4. The Extraction Plan will be submitted to DPIE for approval.

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- Graphical Plans.

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Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

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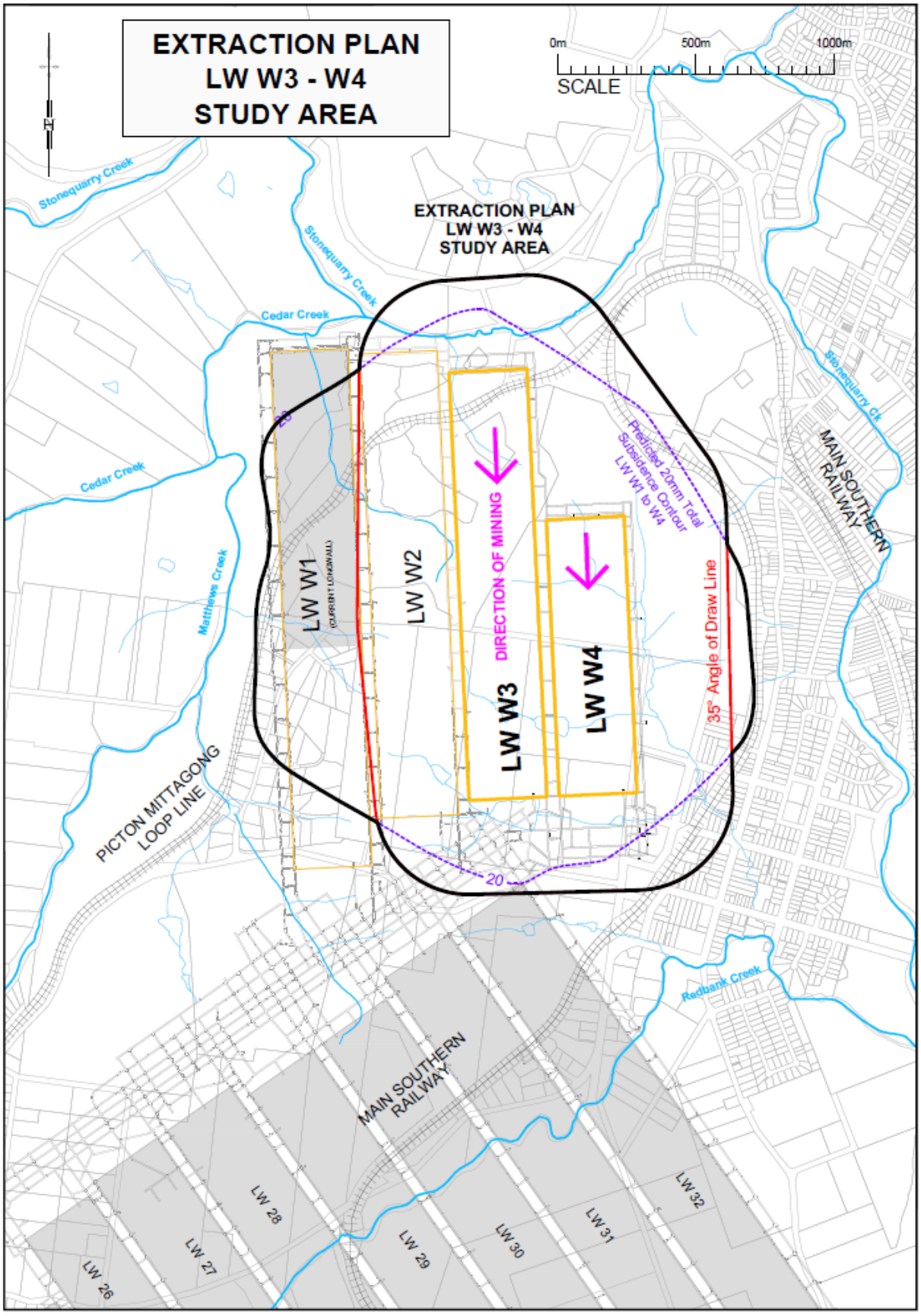

Extraction Plan LW W3-W4 Study Area

April Hudson

From: Fabienne Boudoux d'Hautefeuille <fabienne.d'hautefeuille@dpi.nsw.gov.au>
Sent: Thursday, 19 November 2020 8:53 AM
To: Amanda Francis; water.enquiries@industry.nsw.gov.au
Cc: Robert Brownbill; Alistair Drew; Simon Francis
Subject: Re: Follow up: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Hi Amanda,
I must apologise as I misunderstood the context of your query and realise this is a request ahead of lodging the extraction plan with DPIE P&A. If Tahmoor Coal believes there are matters to be clarified ahead of submission, then we can meet with you and/or the technical people preparing the extraction plan. Else, we would comment when it comes through Planning and is refered to us.

Regards

Fabienne

Fabienne d'Hautefeuille
Manager Water Assessments – Water Science

Water Division | Department of Planning, Industry and Environment
M 0447 432 816 | **E** fabienne.d'hautefeuille@dpie.nsw.gov.au
Level 30, 4 Parramatta Square, 12 Darcy Street, Parramatta NSW 2150
www.dpie.nsw.gov.au

Our Vision: Together, we create thriving environments, communities and economies.

From: Fabienne Boudoux d'Hautefeuille <fabienne.d'hautefeuille@dpi.nsw.gov.au>
Sent: Thursday, 19 November 2020 8:36 AM
To: Amanda Francis <Amanda.Francis@simecgfg.com>; water.enquiries@industry.nsw.gov.au <water.enquiries@industry.nsw.gov.au>
Cc: Robert Brownbill <rob.brownbill@dpie.nsw.gov.au>; Alistair Drew <alistair.drew@dpie.nsw.gov.au>; Simon Francis <simon.francis@dpie.nsw.gov.au>
Subject: Re: Follow up: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Hi Amanda,
we are likely to have comments. Our comments will go through NRAR and then to DPIE Planning&Assessment as it is post-determination. DPIE Planning and Assessments indicate the orders of priorities in the advice our agencies provide to them. We have a significant number of requests for advice and yours is yet to come. Please work with DPIE Planning& Assessment to manage the timeline.
Best regards,

Fabienne

Fabienne d'Hautefeuille
Manager Water Assessments – Water Science

Water Division | Department of Planning, Industry and Environment
M 0447 432 816 | **E** fabienne.d'hautefeuille@dpie.nsw.gov.au
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From: Amanda Francis <Amanda.Francis@simecgfg.com>
Sent: Wednesday, 18 November 2020 5:13 PM
To: Fabienne Boudoux d'Hautefeuille <fabienne.d'hautefeuille@dpi.nsw.gov.au>; water.enquiries@industry.nsw.gov.au <water.enquiries@industry.nsw.gov.au>
Cc: Robert Brownbill <rob.brownbill@dpie.nsw.gov.au>; Alistair Drew <alistair.drew@dpie.nsw.gov.au>; Simon Francis <simon.francis@dpie.nsw.gov.au>
Subject: Follow up: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

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We are seeking final comments by **Friday 4 November 2020** please. If no response is received by this date, it will be assumed your organisation has no comments.

Kind regards
Amanda Francis
Community Liaison Specialist
T: +61-2-4640-0025
M: +61-0429-442-811
F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

From: Fabienne Boudoux d'Hautefeuille <fabienne.d'hautefeuille@dpi.nsw.gov.au>
Sent: Wednesday, 30 September 2020 5:23 PM
To: Amanda Francis <Amanda.Francis@simecgfg.com>; water.enquiries@industry.nsw.gov.au
Cc: Robert Brownbill <rob.brownbill@dpie.nsw.gov.au>; Alistair Drew <alistair.drew@dpie.nsw.gov.au>; Simon Francis <simon.francis@dpie.nsw.gov.au>
Subject: Re: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

thank you Amanda. Just seeing your email. We will get back to you.
Regards
Fabienne

Fabienne d'Hautefeuille
Manager Water Assessments – Water Science

Water Division | Department of Planning, Industry and Environment
M 0447 432 816 | **E** fabienne.d'hautefeuille@dpie.nsw.gov.au
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From: Amanda Francis <Amanda.Francis@simecgfg.com>
Sent: Wednesday, 16 September 2020 5:18 PM
To: water.enquiries@industry.nsw.gov.au <water.enquiries@industry.nsw.gov.au>; Fabienne Boudoux d'Hautefeuille <fabienne.d'hautefeuille@dpi.nsw.gov.au>
Cc: Robert Brownbill <rob.brownbill@dpie.nsw.gov.au>; Alistair Drew <alistair.drew@dpie.nsw.gov.au>; Simon Francis <simon.francis@dpie.nsw.gov.au>
Subject: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Dear Fabienne

Please see attached letter regarding consultation for Tahmoor Coal's Longwall West 3 and West 4 extraction plan.

Kind regards
Amanda Francis
Community Liaison Specialist
T: +61-2-4640-0025

F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

16 September 2020

Clay Preshaw
Manager Catchment Protection
WaterNSW
PO box 398
Parramatta NSW 2124

Dear Clay,

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

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Tahmoor Coal would like to consult with WaterNSW regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

Under the conditions of Tahmoor Coal's Development Consent DA 67/98, an Extraction Plan is required for all second workings in the Western Domain. Tahmoor Coal is currently preparing an Extraction Plan for LW W3-W4. The Extraction Plan will be submitted to DPIE for approval.

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- Heritage Management Plan;
- Built Features Management Plan;
- Public Safety Management Plan;
- Subsidence Monitoring Program; and
- Graphical Plans.

Tahmoor Coal understand that the Study Area is not located within the Sydney Drinking Water Catchment (SDWC) area. The management and monitoring of surface water flow and water quality in the local waterways during mining will be considered in the Water Management Plan.

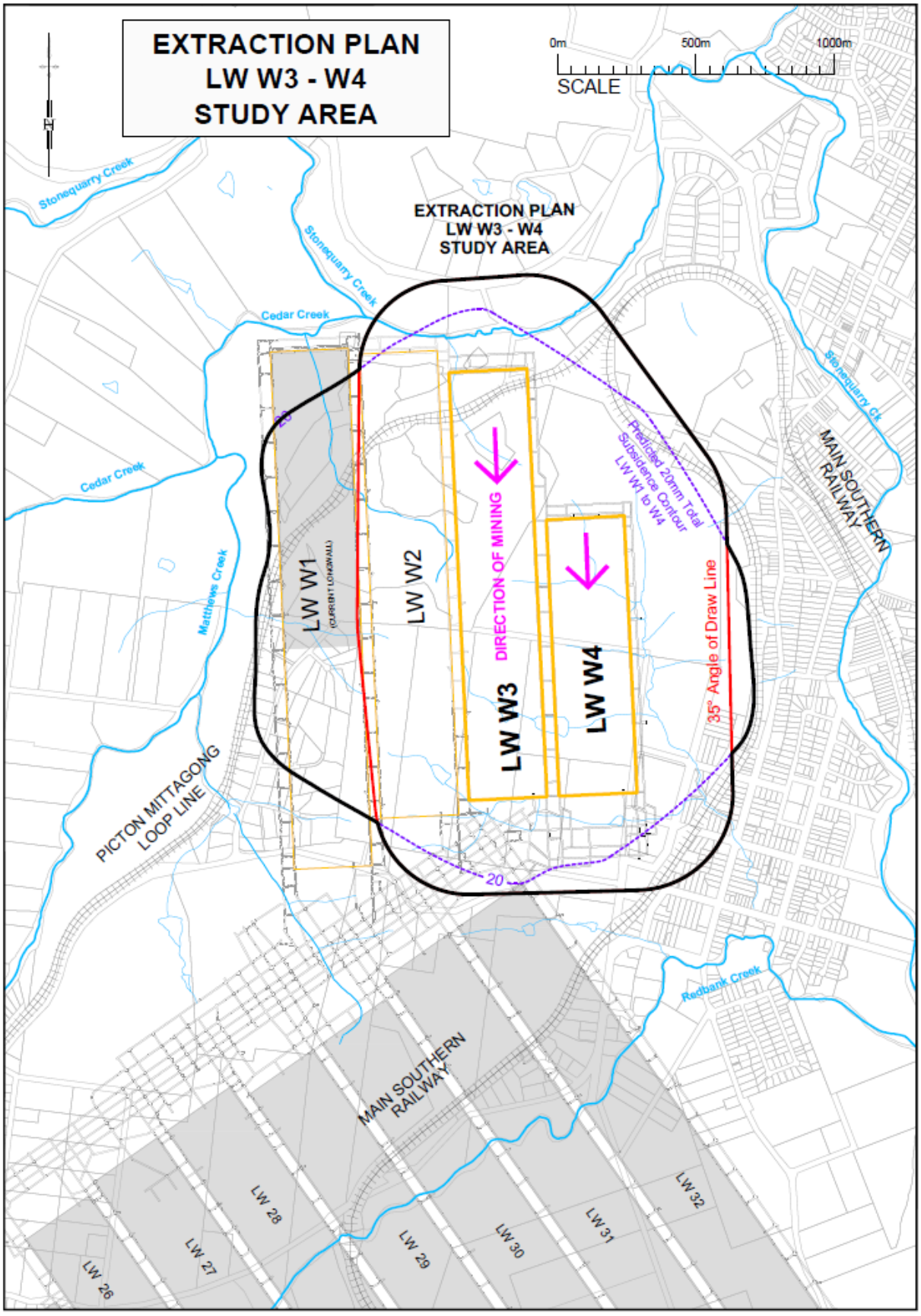
We would be pleased to incorporate any of your organisation's comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by Friday 9 October 2020.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

April Hudson

From: Amanda Francis
Sent: Tuesday, 3 November 2020 12:49 PM
To: April Hudson
Subject: Fwd: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation
Attachments: 20200916 Tahmoor Coal LW W3-W4 Extraction Plan.pdf

Hi April

Please see response from WaterNSW.

Thanks
Amanda

Get Outlook for Android

From: Jessie Evans <Jessie.Evans@waternsw.com.au>
Sent: Tuesday, 3 November 2020, 12:46
To: Amanda Francis
Subject: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Hi Amanda,

Apologies for the delay in getting back to you on this one. WaterNSW has no comments on the Extraction Plan as it falls outside the Sydney Drinking Water Catchment.

Thanks
Jessie

From: Amanda Francis <Amanda.Francis@simecgfg.com>
Sent: Wednesday, 16 September 2020 5:24 PM
To: Environmental Assessments <Environmental.Assessments@waternsw.com.au>; Clay Preshaw <Clay.Preshaw@waternsw.com.au>
Cc: Peter Dupen <Peter.Dupen@waternsw.com.au>; Ravi Sundaram <ravi.sundaram@waternsw.com.au>
Subject: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Dear Clay

Please see attached letter regarding consultation for Tahmoor Coal's Longwall West 3 and West 4 extraction plan.

Kind regards

Amanda Francis
Community Liaison Specialist
T: +61-2-4640-0025
F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

17 September 2020

Chris Salkovic
Executive Engineer
Dam Safety Committee
10 Valentine Ave
Parramatta NSW 2150

Dear Chris

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

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Tahmoor Coal would like to consult with the Dam Safety Committee regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

Under the conditions of Tahmoor Coal's Development Consent DA 67/98, an Extraction Plan is required for all second workings in the Western Domain. Tahmoor Coal is currently preparing an Extraction Plan for LW W3-W4. The Extraction Plan will be submitted to DPIE for approval.

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SIMEC MINING
Tahmoor Coal Pty Limited ABN 97 076 663 968
PO Box 100, Tahmoor, NSW 2573, Australia

T: +61 (02) 46 400 100
E: contact@simecgfg.com
simecgfg.com

A number of small to medium sized dams are located within the Study Area and are used for rural farming purposes. A geotechnical assessment of these dams will be completed, and the management of potential impacts to these dams will be included in the Land Management Plan. In addition, an assessment of the risk of dam failure and monitoring and management of these dams will be included in the Land Management Plan.

We would be pleased to incorporate any of your organisation's comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 9 October 2020**.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

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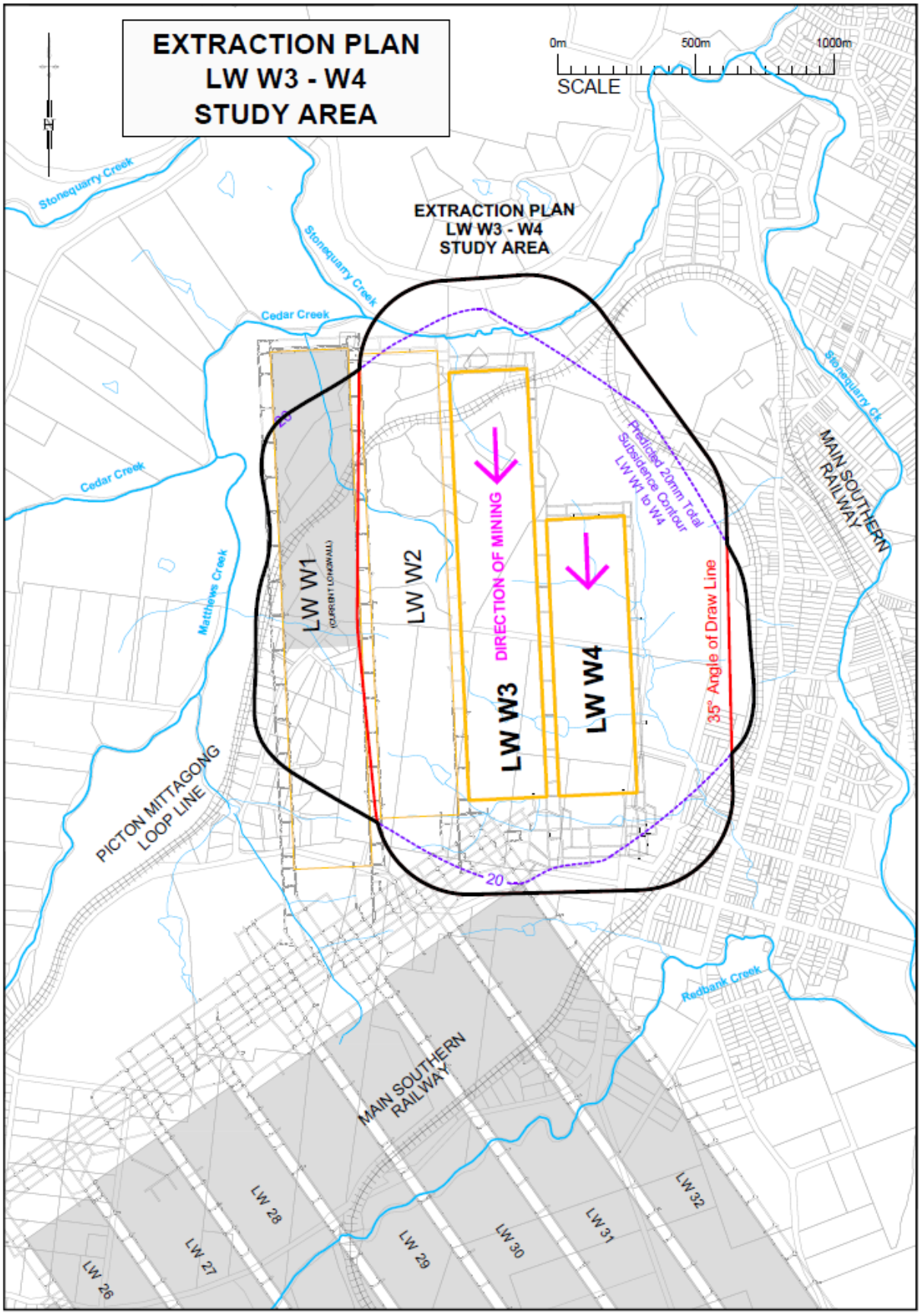

Extraction Plan LW W3-W4 Study Area

April Hudson

From: Bill Ziegler <bill.ziegler@damsafety.nsw.gov.au>
Sent: Thursday, 19 November 2020 10:16 AM
To: Amanda Francis
Subject: Follow up: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Morning Amanda
I have had a look at the plan you provided and can inform you that Dams Safety NSW has no comment about extraction of Longwalls West 3 and West 4 as there are no Declared Dams in the area of disturbance.

Later

Bill Ziegler
Manager Mining Impacts

Dams Safety NSW | Department of Planning, Industry and Environment
T 02 9842 8077 | **E** bill.ziegler@damsafety.nsw.gov.au
4 Parramatta Square
12 Darcy St., Parramatta, NSW 2150.
Locked Bag 5022, Parramatta NSW 2124
www.damsafety.nsw.gov.au

The Department of Planning, Industry and Environment acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.

17 September 2020

Andrew Couldridge
Senior Operations Officer – Metropolitan Illawarra
NSW Environment Protection Authority
PO Box 513
Wollongong NSW 2520

Dear Andrew

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

Tahmoor Coal Mine (Tahmoor Mine) has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since the Mine commenced in 1979, and longwall mining methods have been used since 1987. Tahmoor Coal is a subsidiary within the SIMEC Mining Division (SIMEC) of the GFG Alliance (GFG).

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Tahmoor Coal would like to consult with the NSW Environment Protection Authority regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

Under the conditions of Tahmoor Coal's Development Consent DA 67/98, an Extraction Plan is required for all second workings in the Western Domain. Tahmoor Coal is currently preparing an Extraction Plan for LW W3-W4. The Extraction Plan will be submitted to DPIE for approval.

The Extraction Plan will address the LW W3-W4 Study Area, which comprises the predicted 20 mm Subsidence Contour and the 35° Angle of Draw Line (refer to attached figure).

The Extraction Plan will provide an overview of the project, details of the development of the Extraction Plan, details on how subsidence impacts and environmental consequences will be monitored and managed during and after mining, and details on how the Extraction Plan will be implemented.

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- Subsidence Prediction and Impact Assessment Report;
- Water Management Plan;
- Land Management Plan;
- Biodiversity Management Plan;
- Heritage Management Plan;
- Built Features Management Plan;
- Public Safety Management Plan;
- Subsidence Monitoring Program; and
- Graphical Plans.

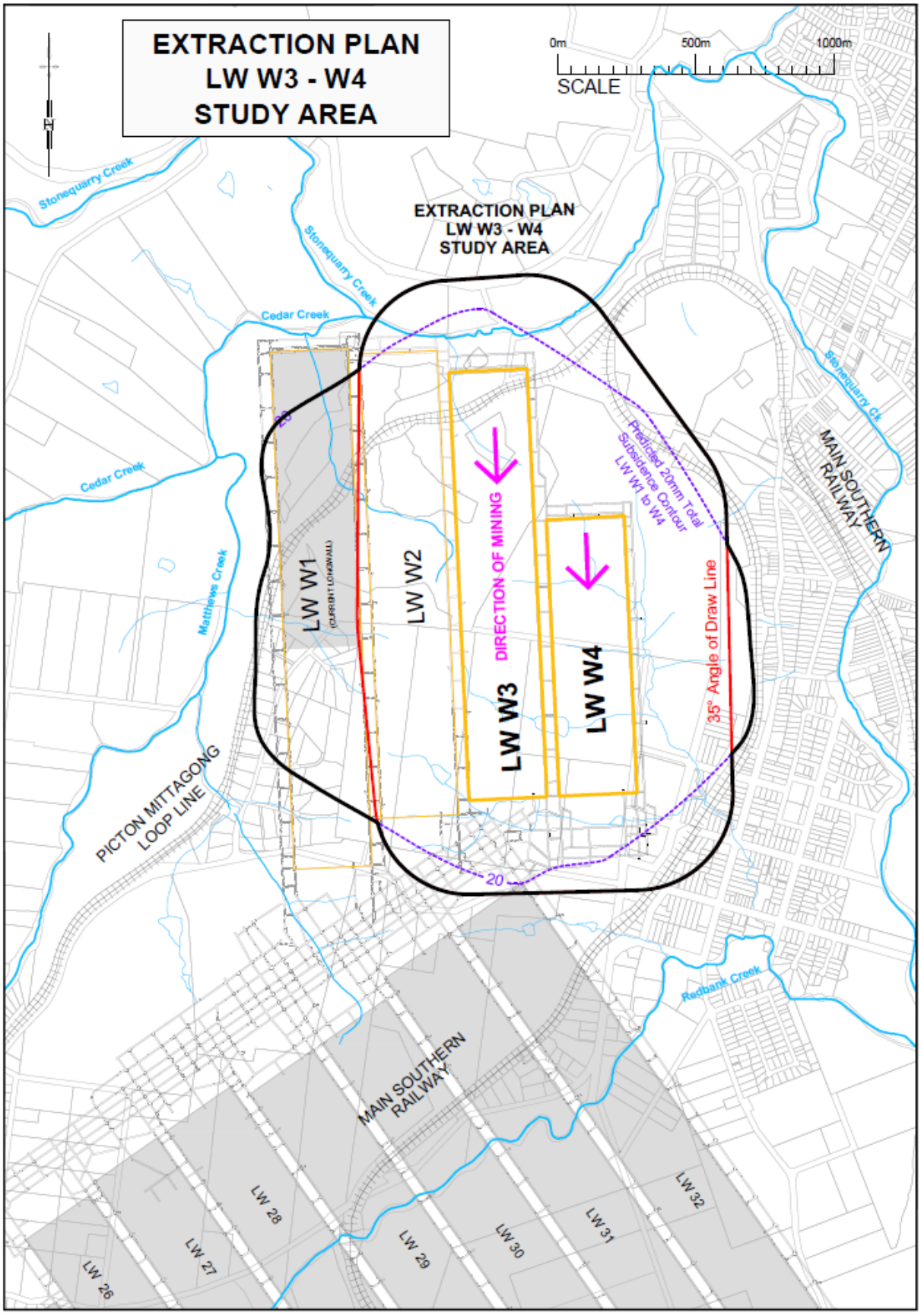
We would be pleased to incorporate any of your organisation's comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 9 October 2020**.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

April Hudson

From: Amanda Francis
Sent: Tuesday, 22 September 2020 10:15 AM
To: April Hudson
Subject: FW: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

FYI

From: Andrew Couldridge <Andrew.Couldridge@epa.nsw.gov.au>
Sent: Tuesday, 22 September 2020 10:14 AM
To: Amanda Francis <Amanda.Francis@simecgfg.com>; EPA RSD Illawarra Mailbox <epa.illawarra@epa.nsw.gov.au>
Subject: RE: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Hi Amanda,

Thank you for your email below requesting input to the LW 3 & 4 Extraction Plan.

We do not have any comments to provide on preparation of the plan.

Regards Andrew.

Mr Andrew Couldridge
Senior Operations Officer – Metro South
Regulatory Services Division, NSW Environment Protection Authority
+61 2 4224 4106 +61 439 706 236
andew.couldridge@epa.nsw.gov.au www.epa.nsw.gov.au @EPA_NSW

From: Amanda Francis <Amanda.Francis@simecgfg.com>
Sent: Thursday, 17 September 2020 4:20 PM

To: Andrew Couldridge <Andrew.Couldridge@epa.nsw.gov.au>; EPA RSD Illawarra Mailbox <epa.illawarra@epa.nsw.gov.au>
Subject: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation

Dear Andrew

Please see attached letter regarding consultation for Tahmoor Coal's Longwall West 3 and West 4 extraction plan.

Kind regards

Amanda Francis
Community Liaison Specialist
T: +61-2-4640-0025
F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

17 September 2020

Wendy Goodburn
Agriculture Land Use Planner
NSW Department of Primary Industries - Agriculture
Locked Bag 21
Orange NSW 2800

Dear Wendy

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

Tahmoor Coal Mine (Tahmoor Mine) has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since the Mine commenced in 1979, and longwall mining methods have been used since 1987. Tahmoor Coal is a subsidiary within the SIMEC Mining Division (SIMEC) of the GFG Alliance (GFG).

Tahmoor Mine is located approximately 80 kilometres south-west of Sydney between the towns of Tahmoor and Bargo. Tahmoor Coal has previously mined 32 longwalls to the north and west of the Tahmoor Mine's current pit top location.

Tahmoor Coal extended its underground coal mining to the north-west of the Main Southern Railway referred to as the 'Western Domain', which are located in the Tahmoor North Mining Lease areas. The Western Domain includes Longwalls West 1 (LW W1) to West 4 (LW W4) at Picton and Thirlmere. Tahmoor Coal is currently mining LW W1 in accordance with the relevant Development Consents and Extraction Plan Approval. Longwall West 2 is scheduled to commence in November 2020.

Tahmoor Coal would like to consult with the NSW Department of Primary Industries – Agriculture regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

Under the conditions of Tahmoor Coal's Development Consent DA 67/98, an Extraction Plan is required for all second workings in the Western Domain. Tahmoor Coal is currently preparing an Extraction Plan for LW W3-W4. The Extraction Plan will be submitted to DPIE for approval.

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- Public Safety Management Plan;
- Subsidence Monitoring Program; and
- Graphical Plans.

A Land and Agricultural Resource Assessment will be prepared and will provide an overview of the agricultural enterprises in the Study Area and the proposed management of any potential impacts as a result of mining. The key findings and management of potential impacts to agricultural enterprises will be summarised in the Land Management Plan.

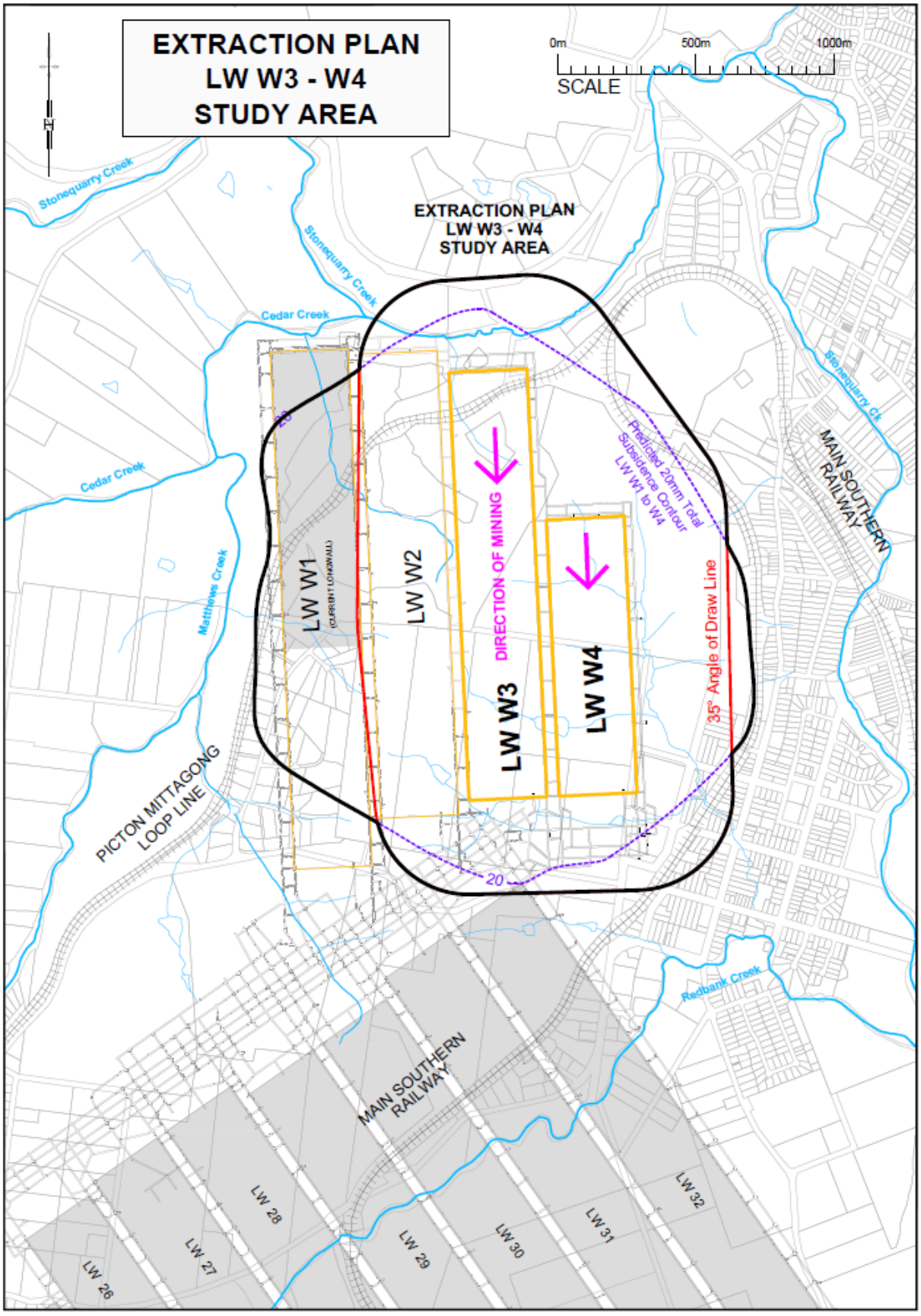
We would be pleased to incorporate any of your organisation's comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 9 October 2020**.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

NSW GOVERNMENT | Department of Primary Industries

OUT20/12137

7 October 2020

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Email: zina.ainsworth@simecgfg.com

Dear Zina

Response to consultation – Tahmoor North Longwalls W3-W4 Extraction plan

Thank you for the opportunity to provide any comment into the Land and Agricultural Resource Assessment that will help inform on issues on the Extraction Plan, as outlined in your letter dated 24 September 2020.

The NSW Department of Primary Industries (NSW DPI) Agriculture is committed to the protection and growth of agricultural industries, and the land and resources upon which these industries depend. Important issues are the potential impact on limited agricultural resources and the ability to rehabilitate the land to enable continued agricultural investment.

In response to your letter I have used the Tahmoor Coal Pty Ltd Extraction Plan – Tahmoor North Western Domain Longwalls West 1 and West 2 Volume 1 dated July 2019 as a basis to providing comments to the area that is adjacent to this previous study area.

The following may provide a guide to the inclusions that will assist in informing the extraction plan through the development of a Land and Agricultural Resource Assessment;

- Describe the current *Important Agriculture Land* on the proposed development site and surrounding locality including the land capability, and soil landscapes. We note that the site verification in previous work indicates no presence of biophysical strategic agricultural land. This work provides a baseline evaluation of the current land resource for any impact assessment.
- A description of the agricultural landuses in the area and associated enterprises and agricultural productivity of these again to provide a current status of agriculture in the area.
- Detail the expected life span of the proposed development.
- Consider possible cumulative effects to agricultural enterprises and landholders from subsidence/ other impacting events.
- An assessment of the monitoring regime that will identify any changes as a result of the effects of the long wall mining, especially subsidence. This may include impacts of farm

infrastructure i.e. buildings, fences, water supply infrastructure. (This may overlap with the other informing plans).

- Consult with the owners / managers of affected and adjoining neighbours and agricultural operations in a timely and appropriate manner about; the proposal, the likely impacts and suitable mitigation measures or compensation.
- Establish a complaints register that includes reporting and investigating procedures and timelines, and liaison with local government in relation to complaint issues involving agriculture.

Should you require clarification on the information contained in this response, please contact myself on 68811250 or mobile 0427949987. Please note that Wendy Goodburn who is the incumbent officer for your area is available when back from leave next week. Her contact is on mobile 0402069605.

Yours sincerely

Mary Kovac
Agricultural Landuse Planning Officer
Central and Far West
Agricultural Land Use Planning Unit

17 September 2020

Chris Millet
Manager Land Use – Southern Region
NSW Roads and Maritime Services
PO Box 477
Wollongong NSW 2500

Dear Chris

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

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Tahmoor Coal would like to consult with the NSW Roads and Maritime Services regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

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- Graphical Plans.

SIMEC MINING
Tahmoor Coal Pty Limited ABN 97 076 663 968
PO Box 100, Tahmoor, NSW 2573, Australia

T: +61 (02) 46 400 100
E: contact@simecgfg.com
simecgfg.com

No State roads managed by the RMS are located within the Study Area. The Study Area includes local roads that are managed by Wollondilly Shire Council. Tahmoor Coal will consult with Wollondilly Shire Council regarding local roads, and the management of roads, bridges and culvert infrastructure during mining will be included in the Wollondilly Shire Council Management Plan.

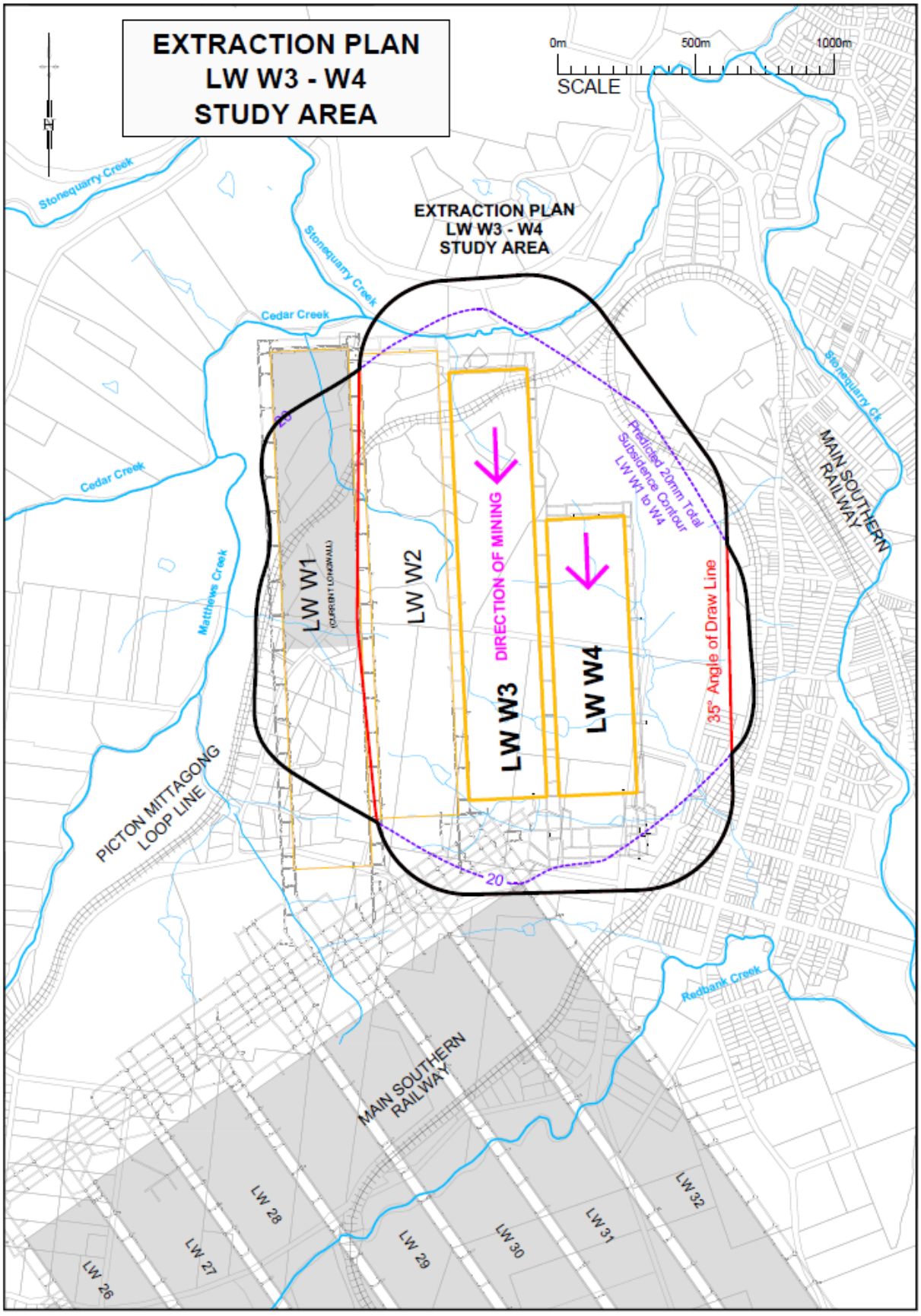
We would be pleased to incorporate any of your organisation's comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 9 October 2020**.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

April Hudson

From: April Hudson
Sent: Tuesday, 20 April 2021 4:15 PM
To: 'Martin.Cocca@rms.nsw.gov.au'; 'Cyril.Gunaratne@transport.nsw.gov.au'; 'Dony.D.Castro@transport.nsw.gov.au'
Cc: Amanda Francis
Subject: Tahmoor Coal - Longwall West 3 and West 4 Extraction Plan Consultation
Attachments: 20200917 Tahmoor Coal LW W3-W4 Extraction Plan.pdf

Dear Martin, Cyril and Dony,

Please see attached letter regarding consultation for Tahmoor Coal's Longwall West 3 and West 4 Extraction Plan.

Apologies, this letter of consultation was originally sent to development.southern@rms.nsw.gov.au on 17 September 2020 and again on 18 November 2020, with no response received. Could you please let us know if you have any comments for inclusion in the Extraction Plan. We intend to submit the Extraction Plan in the next few weeks.

Tahmoor Coal will update the Longwall West 1 and West 2 Roads and Maritime Services Management Plan (which includes management of Victoria Bridge over Stonequarry Creek and Menangle Street – Picton Road) for the upcoming longwalls West 3 and West 4 (and rename to Transport for NSW). During this update, Transport for NSW will be consulted and Tahmoor Coal will seek your authorisation of this management plan.

Kind regards,

April Hudson
Approvals Specialist

T: +61 2 4640 0022
M: +61 466 380 992
F: +61 2 4640 0140
E: April.Hudson@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Tahmoor NSW 2574
simec.com

18 September 2020

Chris Reynolds
Executive Director
NSW Department of Planning, Industry and Environment - Crown Lands Division
PO Box 2155
Dangar NSW 2309

Dear Chris

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

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Tahmoor Coal would like to consult with Crown Lands Division regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

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- Graphical Plans.

SIMEC MINING
Tahmoor Coal Pty Limited ABN 97 076 663 968
PO Box 100, Tahmoor, NSW 2573, Australia

T: +61 (02) 46 400 100
E: contact@simecgfg.com
simecgfg.com

Crown Lands in the Study Area include waterways (Matthews Creek, Cedar Creek, Redbank Creek, and Stonequarry Creek) and road reserves. Consideration of the management of potential impacts to Crown Land with waterways and road reserves will be included in the Water Management Plan and the Land Management Plan.

We would be pleased to incorporate any of your organisation's comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 9 October 2020**.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

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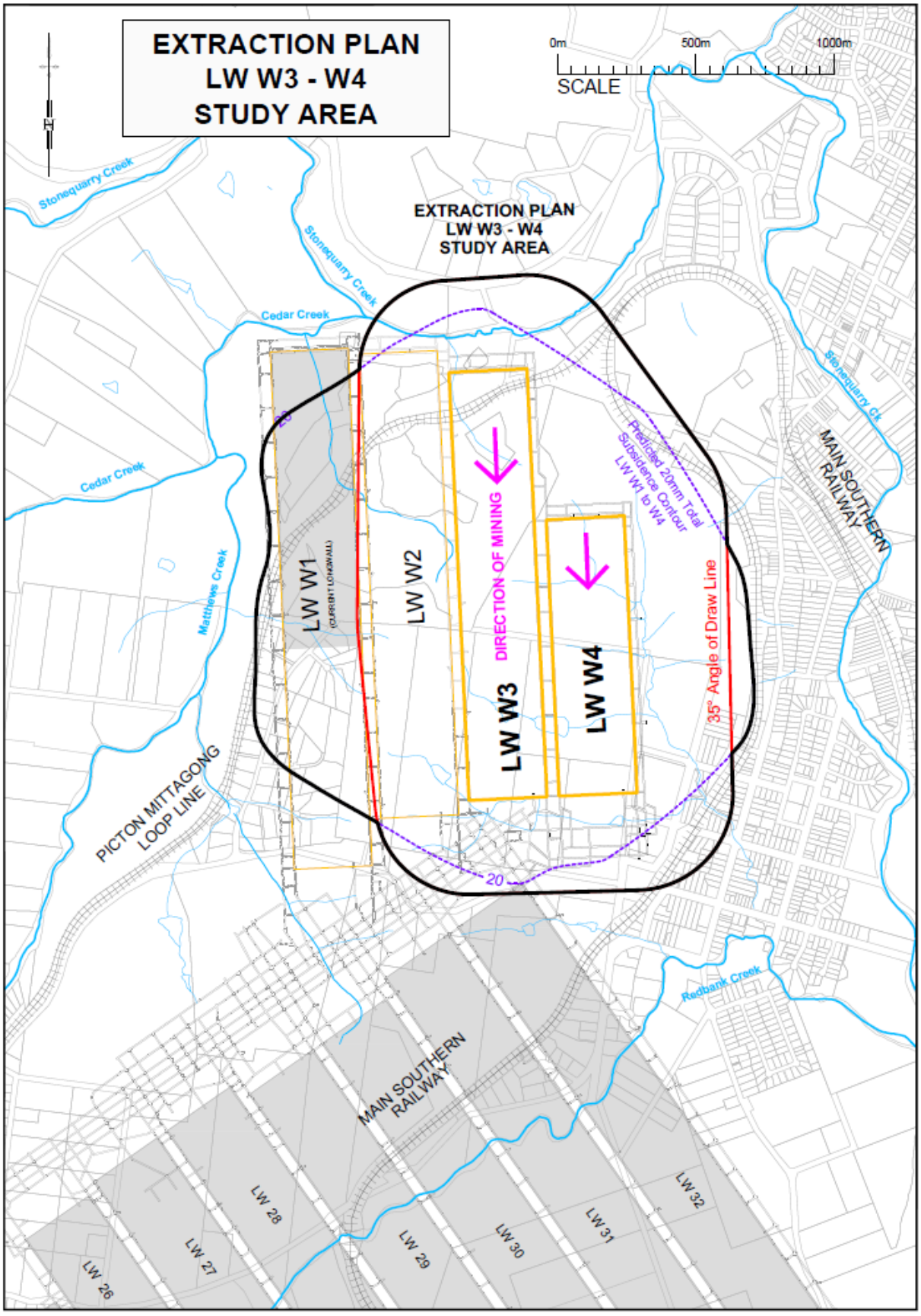

Extraction Plan LW W3-W4 Study Area

April Hudson

From: Amanda Francis
Sent: Friday, 18 September 2020 9:42 AM
To: 'cl.enquiries@crownland.nsw.gov.au'
Cc: 'daniel.summerhayes@crownland.nsw.gov.au'
Subject: Tahmoor Coal - Longwall West 3 & West 4 Extraction Plan consultation
Attachments: 20200918 Tahmoor Coal LW W3-W4 Extraction Plan.pdf

Dear Chris

Please see attached letter regarding consultation for Tahmoor Coal's Longwall West 3 and West 4 extraction plan.

Kind regards

Amanda Francis
Community Liaison Specialist
T: +61-2-4640-0025
F: +61-2-4640-0140
E: Amanda.francis@simecgfg.com

SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574
simec.com

18 September 2020

Alexandra Stengl
Manager Environmental Outcomes
Wollondilly Shire Council
PO Box 21
Picton NSW 2571

Dear Alexandra

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

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Tahmoor Coal would like to consult with Wollondilly Shire Council regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

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- Graphical Plans.

We would be pleased to incorporate any of your organisation's comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 9 October 2020**. If required, we are happy to arrange a teleconference to discuss this matter further.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

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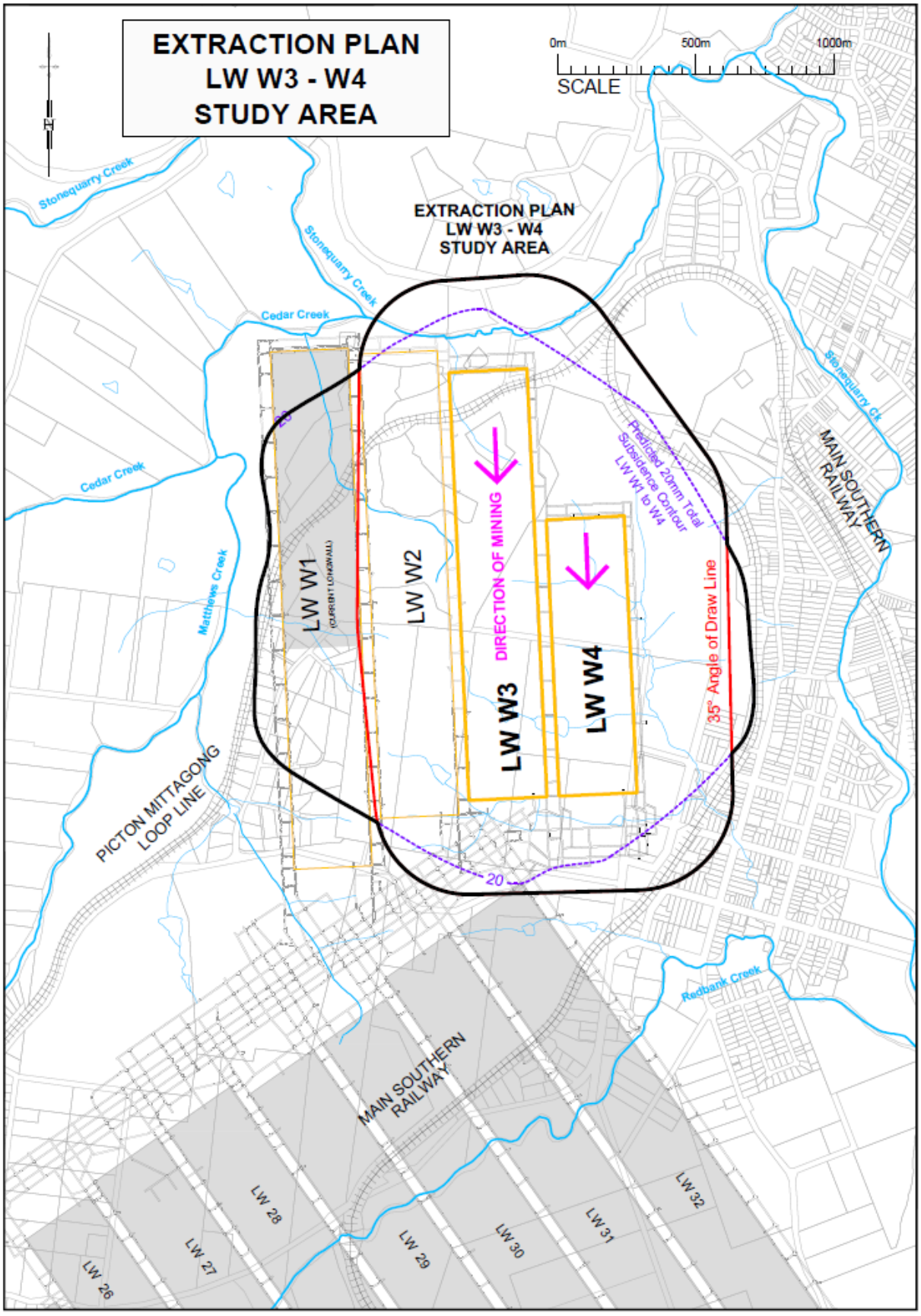

Extraction Plan LW W3-W4 Study Area

Wollondilly Shire Council

Frank McKay Building 62-64 Menangle Street Picton NSW 2571
All Correspondence to PO Box 21 Picton NSW 2571
Telephone: 02 4677 1100 Fax: 02 4677 2339
Email: council@wollondilly.nsw.gov.au Web: www.wollondilly.nsw.gov.au
ABN: 93 723 245 808

RURAL LIVING

Our Reference: 1148-3#1439

Ms Z Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
PO Box 100
TAHMOOR NSW 2573

13TH October 2020

Dear Ms Ainsworth

Thank you for your correspondence date 18th September providing Council with the opportunity to provide comment during the preparation of the Extraction Plan for Longwalls 3 and 4.

The Study Area and predicted areas to experience subsidence from Longwalls 3 and 4 are noted to be largely similar to the adjoining approved Longwalls 1 and 2 with a slight increase in number of potentially affected houses and local roads. Council provided a submission on the draft Extraction Plan submission, which amongst other matters, outlined considered deficiencies in the scientific basis in the approach adopted in identifying, assessing and responding to subsidence related impacts to waterways. Council also subsequently provided a submission on a Water Management Plan, which was welcomed as a condition of consent by the approval of this Extraction Plan.

The requested issues to be addressed based on issues raised in the above previous submissions by the Extraction Plan for Longwalls 3 and 4 for key components of the Extraction Plan is detailed in Table 1 (attached). In addition, Council would expect that the Extraction Plan for these longwalls involve:

- Additional consultation with landowners of potentially affected dwellings and full compensation of any impacts attributable to subsidence.
- Ongoing consultation regarding the management of impacts to local roads**.**

The ongoing consultation and collaboration by SIMEC as part of the Tahmoor North Colliery operations including presentations to Councillors and staff is welcomed. The holding of discussions during the preparation and implementation of the Extraction Plan as part of this collaborative approach would be appreciated.

Please contact Council's Team Leader Environmental Services, Bianca Klein, on (02) 4677 9610 or via e-mail Bianca.Klein@wollondilly.nsw.gov.au for any enquiries regarding this correspondence.

Yours faithfully

Alexandra Stengl
Manager Environmental Outcomes

Table 1: Recommendations regarding key components of the Extraction Plan

Plan component	Recommendation
Water Management Strategy	Modelling and data analysis to obtain an accurate scientific based assessment of the setbacks required for the longwalls to avoid impacts to third order water streams or above (in a catchment context).
	A detailed assessment of potential impacts mining operations on the ecological health of waterways in a catchment context that includes aquatic ecology.
	A detailed groundwater and geological model that would allow for an accurate scientific based understanding of identification of potential impacts associated with the proposal on both surface and groundwaters.
	A Water Management Plan detailing intended water quality monitoring that includes triggers based on ecological health parameters and monitoring for the presence of any re-emergence of water to the surface from mine induced fractures
	Any first or second other order watercourse be subject to a detailed assessment of likely subsidence induced impacts prior to the commencement of any extraction activity.
Biodiversity Management Plan	An accurate assessment of the extent and nature of impact of LW 3 and LW 4 on aquatic ecology (including downstream waterways).
	The terrestrial assessment be based on the most up to date vegetation mapping and the implementation of the Plan involve targeted surveys for flora and fauna species identified as being likely to occur on the site prior to the commencement of works.
Subsidence impacts to local roads	The updated Risk Management Plan to apply to Longwalls 3 and 4 be agreed upon by both parties prior to the commencement of any activity management of repair works due to subsidence impacts be the responsibility of Tahmoor Colliery.

1 December 2020

Michael Irons
Property Manager Wagga Wagga
Australian Rail Track Corporation
PO Box 2150
Wagga Wagga NSW 2650

By email: mirons@ARTC.com.au

Dear Michael,

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

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Tahmoor Coal would like to consult with ARTC regarding the Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) being prepared.

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The Extraction Plan will be supported by the following key documents:

- Subsidence Prediction and Impact Assessment Report;
- Water Management Plan;
- Land Management Plan;
- Biodiversity Management Plan;
- Heritage Management Plan;

- Built Features Management Plan;
- Public Safety Management Plan;
- Subsidence Monitoring Program; and
- Graphical Plans.

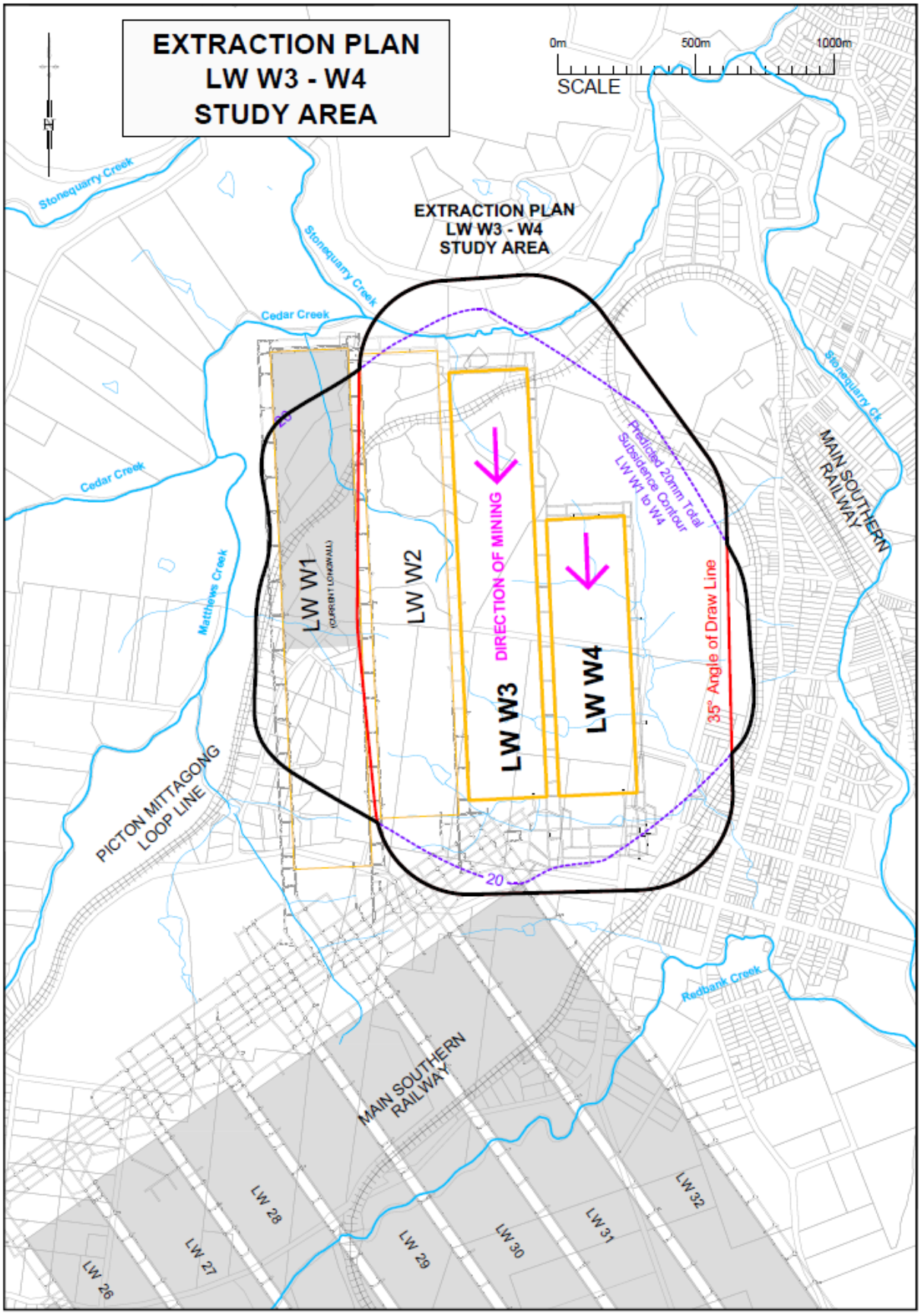
We would be pleased to incorporate any of your organisation's comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 11 December 2020**.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

April Hudson

From: David Talbert
Sent: Tuesday, 1 December 2020 2:52 PM
To: Michael Irons
Cc: Amanda Francis; April Hudson
Subject: Tahmoor Coal LW W3 - W4 Consultation
Attachments: 20201201 Tahmoor Coal LW W3-W4 Extraction Plan.pdf

Hi Michael,

Please find attached our letter detailing Tahmoor Coals request for comment in relation to preparation of the Extraction Pan for LW's W3- W4. Tahmoor Coal would appreciate if you have any comments that these be provided by no later than Friday 11 December 2020.

Our current schedule for longwalls is as follows;

	Start	Finish
LWW02	5/12/2020	11/07/2021
LWW03	8/08/2021	10/03/2022
LWW04	7/04/2022	19/08/2022

Regards

David Talbert
Project Manager

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M: +61 414 905 565
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SIMEC Mining
2975 Remembrance Driveway
Bargo NSW 2574


SIMEC


MEMBER OF
GFG
ALLIANCE

28 January 2021

Heritage NSW
Department of Premier and Cabinet
Locked Bag 5020
Parramatta 2124

To Heritage NSW

Tahmoor North Longwalls W3-W4 Extraction Plan
Letter of Consultation

Tahmoor Coal Mine (Tahmoor Mine) has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since the Mine commenced in 1979, and longwall mining methods have been used since 1987. Tahmoor Coal is a subsidiary within the SIMEC Mining Division (SIMEC) of the GFG Alliance (GFG) group.

Tahmoor Mine is located approximately 80 kilometres south-west of Sydney between the towns of Tahmoor and Bargo. Tahmoor Coal has previously mined 33 longwalls to the north and west of the Tahmoor Mine's current pit top location.

Tahmoor Coal extended its underground coal mining to the north-west of the Main Southern Railway referred to as the 'Western Domain', which is located in the Tahmoor North Mining Lease areas. The Western Domain includes Longwalls West 1 (LW W1) to West 4 (LW W4) at Picton and Thirlmere.

An Extraction Plan for the first two longwalls in the Western Domain, LW W1 and Longwall West 2 (LW W2), was approved by the NSW Department of Planning, Industry and Environment (DPIE) on 8 November 2019. Extraction of LW W1 was completed on 6 November 2020, and the extraction of LW W2 commenced on 7 December 2020.

Tahmoor Coal are currently preparing an Extraction Plan for Longwalls West 3 and West 4 (LW W3-W4) in accordance with the conditions of Development Consent DA 67/98. The Extraction Plan will address the LW W3-W4 Study Area, which comprises the predicted 20 mm Subsidence Contour and the 35° Angle of Draw Line (refer to attached figure).

The Extraction Plan will provide an overview of the project, details of the development of the Extraction Plan, details on how subsidence impacts and environmental consequences will be monitored and managed during and after mining, and details on how the Extraction Plan will be implemented.

The Extraction Plan will be supported by the following key documents:

- Subsidence Prediction and Impact Assessment Report;
- Water Management Plan;
- Land Management Plan;
- Biodiversity Management Plan;
- Heritage Management Plan;
- Built Features Management Plan;
- Public Safety Management Plan;
- Subsidence Monitoring Program; and
- Graphical Plans.

Tahmoor Coal would like to consult with Heritage NSW regarding the LW W3-W4 Extraction Plan currently in preparation. In particular, Tahmoor Coal are seeking comments from Heritage NSW regarding the management of heritage items in the Study Area, which would be considered in the LW W3-W4 Heritage Management Plan.

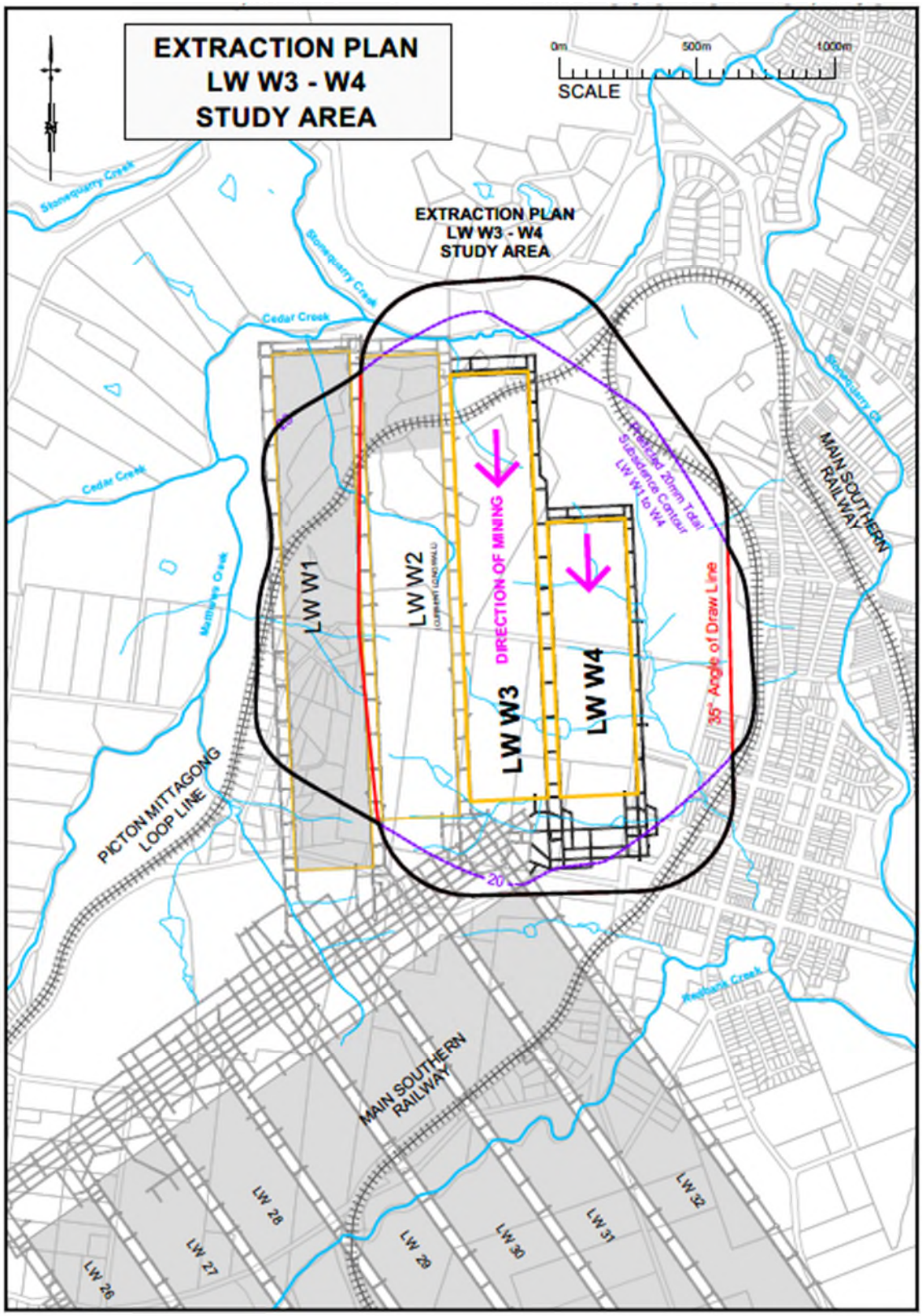
We would be pleased to incorporate any of your organisation's comments into the preparation of the Extraction Plan and to facilitate this, we would appreciate receiving any comments by **Friday 12 February 2021**. If required, we are happy to arrange a teleconference to discuss this matter further.

Please do not hesitate to contact me if you have any questions or concerns regarding the above on 0438 284 106 or at zina.ainsworth@simecgfg.com or contact April Hudson, Approvals Specialist, on 0466 380 992 or at april.hudson@simecgfg.com.

Yours sincerely,

Zina Ainsworth
Manager Environment and Community
Tahmoor Coal Pty Ltd
SIMEC Mining

Attachment: Extraction Plan LW W3-W4 Study Area



Extraction Plan LW W3-W4 Study Area

Appendix C – Coal Resource Recovery Plan

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Tahmoor Coal Pty Ltd

COAL RESOURCE RECOVERY PLAN

Tahmoor North - Western Domain
Longwalls West 3 and West 4

May 2021

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Document Control

APPLICANT:	Tahmoor Coal Pty Ltd
MINE:	Tahmoor Coal Mine
DEVELOPMENT APPROVAL:	DA 57/93 (as modified) and DA 67/98 (as modified)
MINING LEASES:	ML 1376 and ML 1539
DOCUMENT TITLE:	Tahmoor North - Western Domain Longwalls West 3 and West 4 Coal Resource Recovery Plan
DOCUMENT NUMBER:	TAH-HSEC-327
PUBLICATION DATE:	May 2021
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 Signature: Zina Ainsworth Date: 10 May 2021
	Malcolm Waterfall Mining Engineering Manager Tahmoor Coal – SIMEC Mining Signature: Malcolm Waterfall Date: 10.05.2021
	Peter Vale Head of Coal Mines Tahmoor Coal – SIMEC Mining Signature: Peter Vale Date: 10-5-21

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1 Introduction

1.1 Background

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.

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.

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

1.2 Purpose

This Coal Resource Recovery Plan (CRRP) has been prepared to support an Extraction Plan for the secondary extraction of coal from LW W3-W4. This CRRP has been prepared to demonstrate the efficient recovery of the available resource by secondary extraction of LW W3-W4 from the Bulli Coal Seam with ML 1376 and ML 1539 using conventional longwall retreat mining methods.

1.3 Scope

The Study Area applicable to this CRRP is defined as the surface area that is likely to be affected by the extraction of LW W3-W4 from the Bulli Coal Seam. This Study Area has been calculated by combining the areas bound by the following limits:

- The predicted limit of vertical subsidence, taken as the 20 millimetre (mm) subsidence contour resulting from the extraction of LW W3-W4; and
- A 35^{o} angle of draw line from the limit of proposed extraction for LW W3-W4.

The Study Area is illustrated in **Figure 1-2**.

The scope of this CRRP includes description of the following:

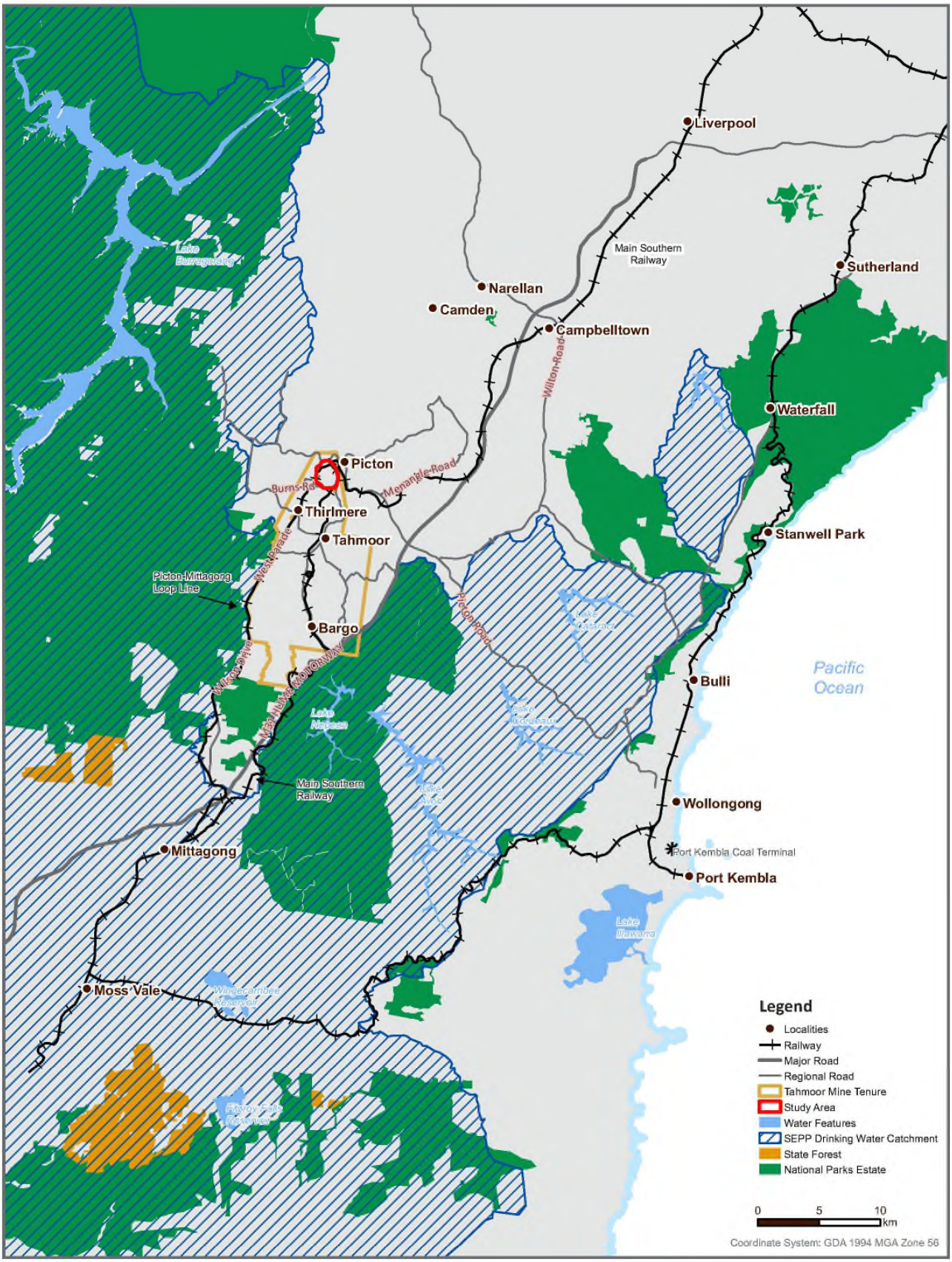
- Coal resources available within the Bulli Coal Seam;
- Proposed mining method, schedule and mine plan;
- Resource recovery and effects on future mining;
- Outline of proposed geological and geotechnical hazards; and
- Justification for the mine plan.

This CRRP has been prepared based on the contents of the following technical reports:

- 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 (MSEC, 2021).

The CRRP has been prepared in accordance with Section 8 of the DPIE *Draft Guidelines for the Preparation of Extraction Plans – Draft V5* (Department of Planning and Environment (DPE), 2015).

Graphical Plans (included as **Volume 3** of the Extraction Plan) provide details of the coal resources, existing and proposed workings, predicted impacts to surface features and additional supporting information.



SIMEC

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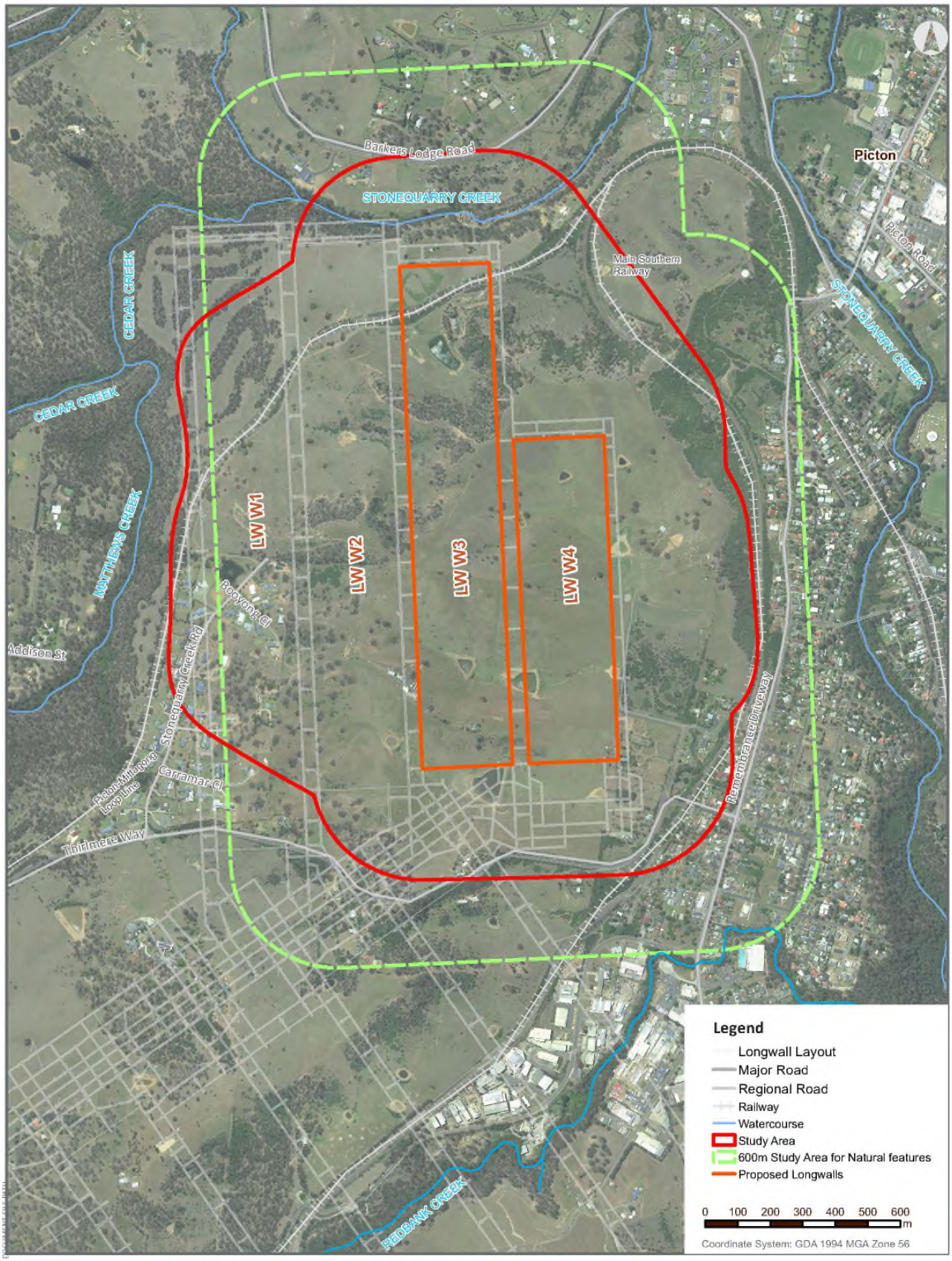
REGIONAL CONTEXT

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

FIGURE 1-1

Date: 22/12/2020

Data Sources:
© NSW DFSI (2019); © NSW Mining (2019); © SIMEC (2019)



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:
© NSW DFSI (2019); © NSW Mining (2019); © SIMEC (2019)
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 operating in the Tahmoor North mining area under Development Consents DA 57/93 and DA 67/98, as discussed further in **Section 3.2.1** of the Extraction Plan Main Document. DA 57/93 was originally granted covering development within ML 1376 and DA 67/98 was subsequently granted to include areas excluded from DA 57/93 including areas under the Main Southern Rail Line and the Picton–Mittagong Loop Line, which are covered by ML 1539.

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 CRRP from DA 67/98 are detailed in **Table 2-1**.

Table 2-1 Key Conditions from DA 67/98 regarding Coal Resource Recovery

Condition	Condition Requirement		Section(s) Addressed
Performance Measures – Natural and Heritage Features			
13A	The Applicant must ensure that extraction of Longwall 33 and subsequent longwalls does not cause any exceedances of the performance measures in Table 1. *Note: The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) for each of these performance measures in the various management plans that are required under this consent.*		Section 4 and Section 7
Excerpt from Table 1	Feature	Performance Measure	
	Mine workings		
	First workings	• To remain long term stable and non-subsiding	
	Second workings	• To be carried out only within the approved mine plan, in accordance with an approved Extraction Plan	
First Workings			
13G	The Applicant may carry out first workings within the underground mining area approved mine plan, other than in accordance with an approved Extraction Plan, provided that the Resources Regulator is satisfied that the first workings are designed to remain stable and non-subsiding in the long – term, except insofar as they may be impacted by approved second workings.		Section 4 and Section 7

Condition	Condition Requirement	Section(s) Addressed
	Notes: • *The intent of this condition is not to require an additional approval for first workings, but to ensure that first workings are built to geotechnical and engineering standards sufficient to ensure long term stability, with negligible resulting direct subsidence impacts.* • *Resources Regulator should be consulted when designing first workings in order to provide comment on matters relating to coal resource recovery.*	
Extraction Plan		
13H	The Applicant must prepare an Extraction Plan for all second workings in Longwall 33 and subsequent longwalls to the satisfaction of the Secretary. Each Extraction Plan must:	Extraction Plan Main Document
13H(iii)	include detailed plans of existing and proposed first and second workings and overlying surface features, including any applicable adaptive management measures;	Graphical Plans in Volume 3 of Extraction Plan
13H(iv)	include adequate consideration of mine roof and floor conditions, pillar width to height ratio, final pillar design dimensions and the long-term stability of pillars which has been undertaken in consultation with the Resources Regulator;	Section 4 and Section 7
13I	The Applicant must not undertake second workings following the extraction of Longwall 32 except in accordance with an Extraction Plan approved by the Secretary and must implement Extraction Plans as approved by the Secretary. • Notes: • *The preparation and implementation of Extraction Plans may be staged, with each plan covering a defined area of underground workings. In addition, these plans are only required to contain management plans that are relevant to the specific underground workings that are being carried out.* • *The burden of proof that any declines in performance of privately-owned registered bores and wells were not due to mining impacts rests with the Applicant.*	Section 4 and Section 7

2.1.2 Extraction Plan Guideline

This CRRP has 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 Key Component Plans

Extraction Plan Guideline Content	Section(s) Addressed
Any required Coal Resource Recovery Plan should also be included as an attachment.	This Coal Resource Recovery Plan

2.2 Relevant Legislation

The relevant Acts and regulations governing mining and resource extraction in New South Wales are detailed in the sections below.

2.2.1 Mining Act 1992

The overarching objective of the *Mining Act 1992* (Mining Act) is to encourage and facilitate the discovery and development of mineral resources in NSW, having regard to the need to encourage ecologically sustainable development. The Mining Act controls the granting of exploration and mining titles and, amongst other legislative instruments, places controls on methods of exploration and extraction, the disposal of mining waste, and rehabilitation and environmental management activities.

The objects of the Mining Act are to encourage and facilitate the discovery and efficient development of mineral resources of the State. Part1, Clause 3A of the Mining Act outlines the objectives of the Act, which are:

> *3A Objects*
>
> *The objects of this Act are to encourage and facilitate the discovery and development of mineral resources in New South Wales, having regard to the need to encourage ecologically sustainable development, and in particular:*
>
> *(a) to recognise and foster the significant social and economic benefits to New South Wales that result from the efficient development of mineral resources, and*
>
> *(b) to provide an integrated framework for the effective regulation of authorisations for prospecting and mining operations, and*
>
> *I to provide a framework for compensation to landholders for loss or damage resulting from such operations, and*
>
> *(d) to ensure an appropriate return to the State from mineral resources, and*
>
> *I to require the payment of security to provide for the rehabilitation of mine sites, and*
>
> *(f) to ensure effective rehabilitation of disturbed land and water, and*
>
> *(g) to ensure mineral resources are identified and developed in ways that minimise impacts on the environment.*

This CRRP demonstrates that the LW W3-W4 Extraction Plan meets the Clause 3A objectives of the Mining Act to be an efficient development and utilisation of coal resources. This CRRP outlines the mine design and mining method that adequately recovers coal resources and provides an appropriate return to the State and fosters significant social and economic benefits.

2.2.2 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) consolidates and contains specific planning provisions related to mining, petroleum production and extractive industries, and is the principal environmental planning instrument that governs the carrying out of the proposed development.

The Mining SEPP recognises the importance of mining, petroleum production, and extractive industries within the State. Part 1, Clause 2 of the Mining SEPP sets out the aims of the policy, which are:

11 *Aims of Policy*

The aims of this Policy are, in recognition of the importance to New South Wales of mining, petroleum production and extractive industries:

(a) to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and

(b) to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and

(b1) to promote the development of significant mineral resources, and

I to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources, and

(d) to establish a gateway assessment process for certain mining and petroleum (oil and gas) development:

(i) to recognise the importance of agricultural resources, and

(ii) to ensure protection of strategic agricultural land and water resources, and

(iii) to ensure a balanced use of land by potentially competing industries, and

(iv) to provide for the sustainable growth of mining, petroleum and agricultural industries.

Part 3, Clause 15 of the Mining SEPP deals with resource recovery and requires that resource recovery is efficient, optimised and minimises waste, which states:

15 Resource recovery

(1) Before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider the efficiency or otherwise of the development in terms of resource recovery.

(2) Before granting consent for the development, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at optimising the efficiency of resource recovery and the reuse or recycling of material.

(3) The consent authority may refuse to grant consent to development if it is not satisfied that the development will be carried out in such a way as to optimise the efficiency of recovery of minerals, petroleum or extractive materials and to minimise the creation of waste in association with the extraction, recovery or processing of minerals, petroleum or extractive materials.

2.2.3 Mining Lease Condition

Coal mining leases typically contain conditions of the grant of lease that require efficient coal resource recovery and that the lease holder must optimise recovery of the minerals that are the subject of this mining lease to the extent economically feasible.

The proposed longwalls (LW W3-W4) will extract coal within two mining leases – ML 1376 and ML 1539. The Mining Lease for the rural areas is ML 1376. The Mining Lease for railway corridors and certain urban areas is ML 1539.

Condition 1 of both ML 1376 and ML 1539 state the following:

> *The lease holder shall extract as large a percentage of the coal in the subject area as is possible consistent with the provisions of the Mining Act and regulations thereunder and shall comply with any direction given or which may be given in this regard by the Minister.*

2.3 Consultation

2.3.1 Consultation with Division of Resources and Geosciences

A letter was sent to the Department of Regional NSW – Resources Regulator (addressed to Ray Ramage) on 14 August 2020 with information on the first workings of Tahmoor Coal Mine for LW W3-W4 as required under Condition 13G(4) of DA 67/98. The Resources Regulator noted the contents of this letter on 17 August 2020.

A letter was sent to Department of Regional NSW – Resources Regulator (addressed to Dr Gang Li) and to the Department of Regional NSW – Mining Exploration and Geoscience (MEG) (addressed to Adam Bannister) to introduce the Extraction Plan for LW W3-W4. Tahmoor Coal provided a figure of the Extraction Plan Study Area, and an overview of the longwalls.

Dr Gang Li acknowledged the receipt of this letter on 25 September 2020, however no comments have been received as of 30 April 2021. No response from MEG has been received as of 30 April 2021.

3 Geology

3.1 Regional Geology

3.1.1 Sydney Basin

The Sydney Basin is a large sedimentary basin on the east coast of Australia covering almost 50,000 km^2, whereby approximately 44,000 km^2 is located onshore and another 5,000 km^2 located offshore extending to the edge of the continental shelf. The basin forms part of the larger Sydney Gunnedah-Bowen Basin system, as outlined on **Figure 3-1**, which extends 1,700 km north from coastal southern NSW to Townsville.

The Sydney Basin is sedimentary in origin, with deposition of sediments occurring from the early Permian (290 million years ago) through to the latter part of the Triassic (200 million years ago). The Sydney Basin on-laps the Lachlan Fold Belt to the west and south, with basin depth increasing to the north and east.

The geological strata of the Sydney Basin can be summarised (from youngest to oldest) as following:

- Unconsolidated alluvial deposits along the major rivers and dune/beach deposits along the coast (Tertiary and Quaternary in age);
- Fractured volcanic intrusive and flows (and associate dyke swarms and occasional sills) within the Sydney Basin (Jurassic and Tertiary in age);
- Sedimentary rocks (including substantial coal measures at depth) of the Sydney Basin (Permian and Triassic age); and
- Fractured basement rocks below the Sydney Basin (Palaeozoic age).

3.1.2 Southern Coalfield

The Southern Coalfield comprises the southern portion of the Sydney Basin, as outlined on **Figure 3-1**, covering an area south of Sydney almost to Batemans Bay, bounded in the west by the towns of Camden and Mittagong, and Helensburgh and Wollongong in the east.

The geology of the Southern Coalfield consists of the basal Permian Talaterang and Shoalhaven groups, overlain by the Permian Illawarra Coal Measures, and the Triassic Narrabeen Group.

These are overlain by the Hawkesbury Sandstone, Mittagong Formation and Wianamatta Group, as shown on **Figure 3-2**. The principal coal resource is situated within the Illawarra Coal Measures, with additional coal-bearing sequences also occur in the Clyde Coal Measures in the Talaterang Group.

Coal in the Southern Coalfield is extracted via underground mining methods and has been utilised as a resource for Coal Seam Gas (CSG) operations, with gas from coal being extracted within the underground mines in addition to above ground CSG operations. The coal in the Southern Coalfield differs in rank from the other coalfields of the Sydney Basin. It is generally low to high volatility bituminous coal, in contrast to the medium to high volatility bituminous coal which predominates in other regions. The coal is buried at depths of greater than 300 m.

The Sydney Subgroup contains all of the economic coal reserves of the Illawarra Coal Measures within the Southern Coalfield. It is composed of conglomerate, sandstone, conglomeratic sandstone, coal, claystone, siltstone and some tuff.

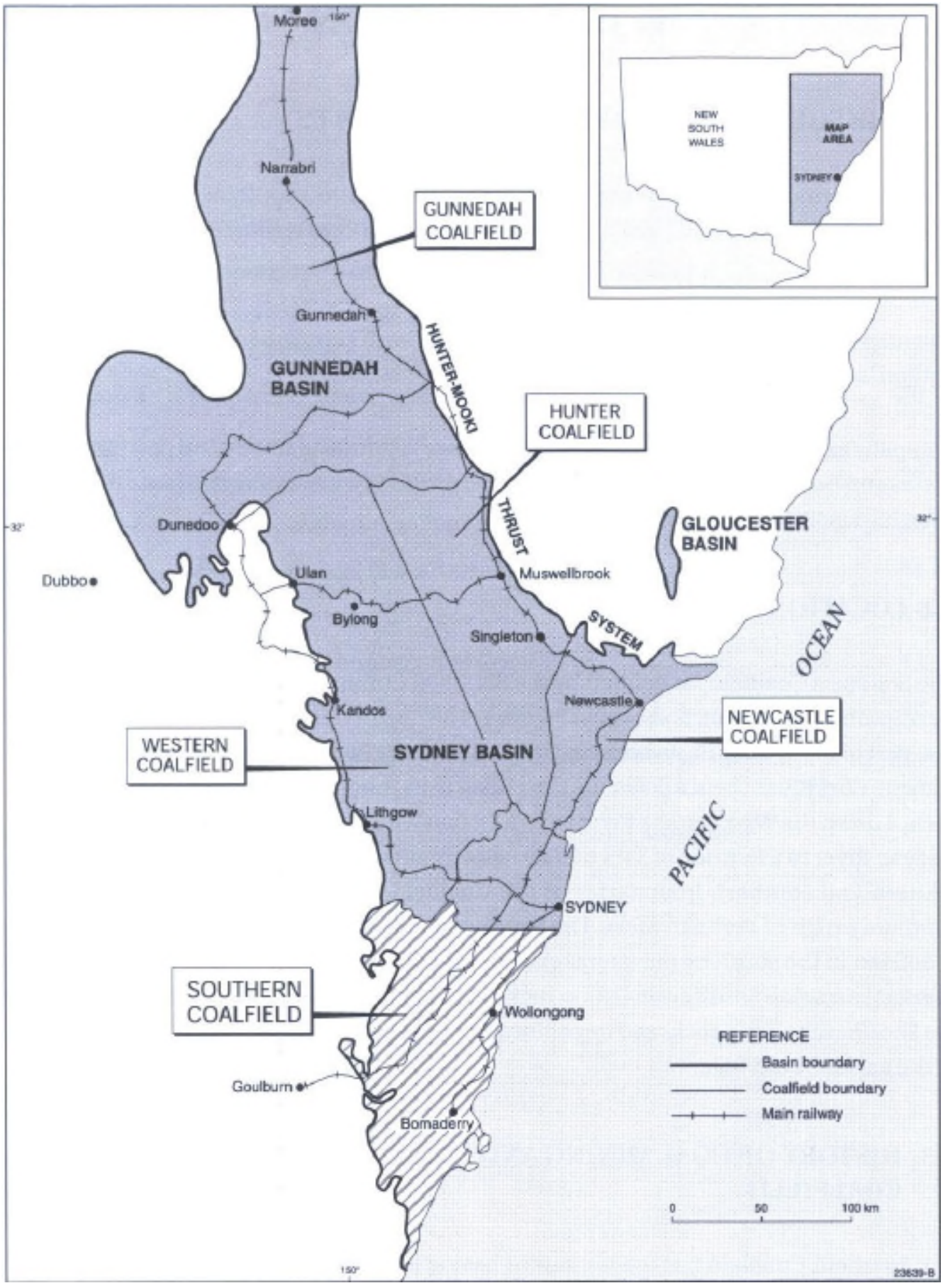


Figure 3-1 Sydney Basin and the Southern Coalfields

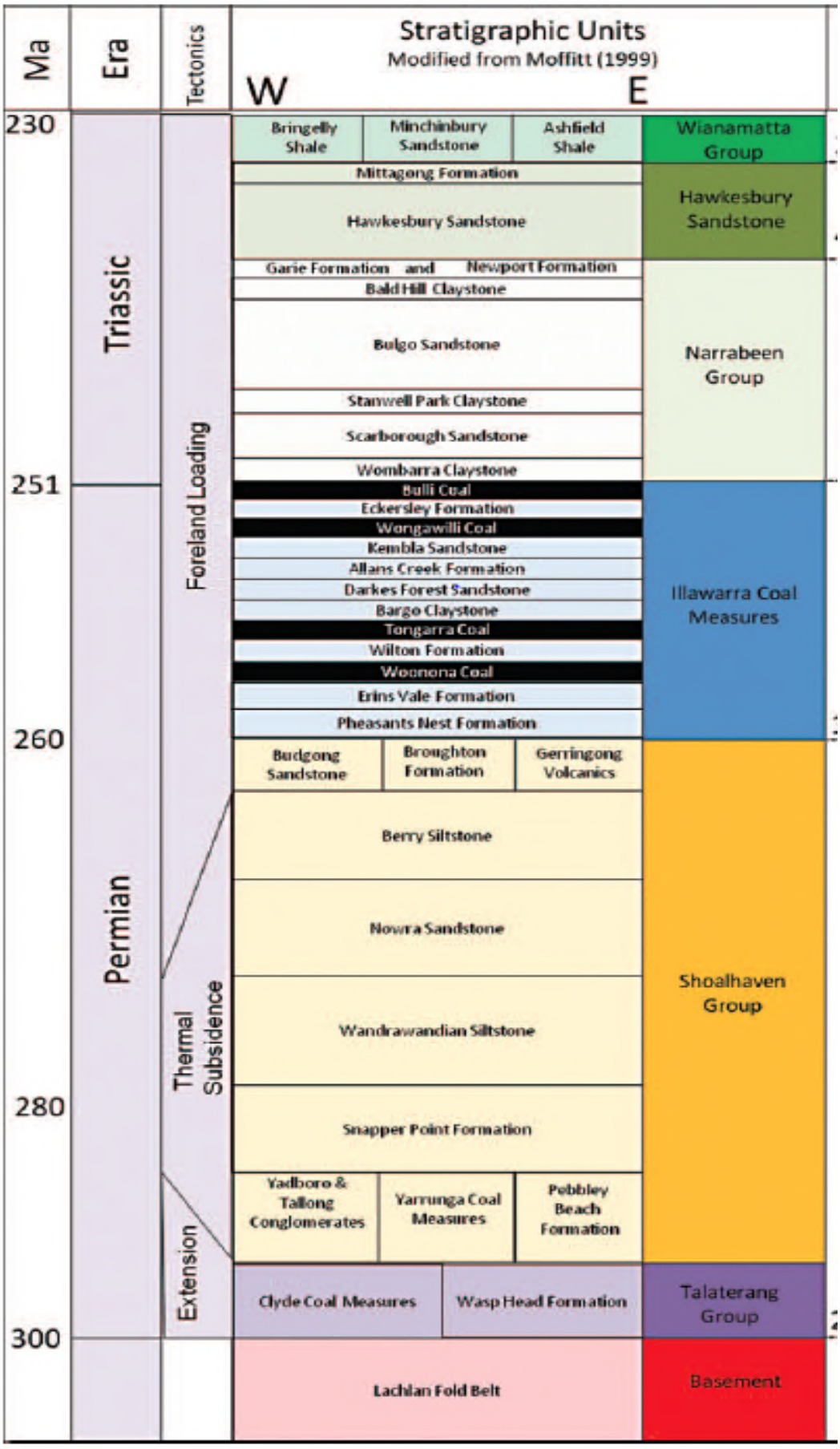


Figure 3-2 Southern Coalfield Stratigraphy

3.2 Local Geology

3.2.1 Wianamatta Group

The Wianamatta Group is the youngest geological layer member of the Sydney Basin, and lies at the highest layer member. It was deposited in connection with a large river delta, which shifted over time from west to east. This is evidenced by the sequence of strata, which clearly show the transition from marine deposits in front of the delta to deposits on land.

The Ashfield Shale was formed from clayey marine sediments. The subsequent Minchinbury Sandstone emerged from beach and the Bringelly Shale became alluvial in a marshy plain deposited on the delta.

The shales generally comprise fine grained sedimentary rocks such as shales and laminites with less common sandstone units. Weathering of the shale units produces a rich clayey soil, often with poor drainage. These clay soils are recognised as being reactive with considerable shrink-swell capacity.

3.2.2 Hawkesbury Sandstone

The Hawkesbury Sandstone is a quartz sandstone unit composed of very thick beds of heavily compacted sand, with a small quantity (about 5%) of shale in discontinuous beds one to three metres (m) thick. The thickness of the Hawkesbury Sandstone in the Southern Coalfield varies depending on the amount of erosion, but is typically 100-200 m thick, with some sections up to 300 m thick.

The individual sandstone beds are generally 1-10 m thick, but continue laterally for only 100-300 m. For this reason, the sandstone beds are described as being ‘lenticular’. The joints in the Hawkesbury Sandstone are sub-vertical and normally spaced slightly wider than the bedding planes.

The surface and regional geology in the Tahmoor Mine locality is outlined on **Figure 3-3**.

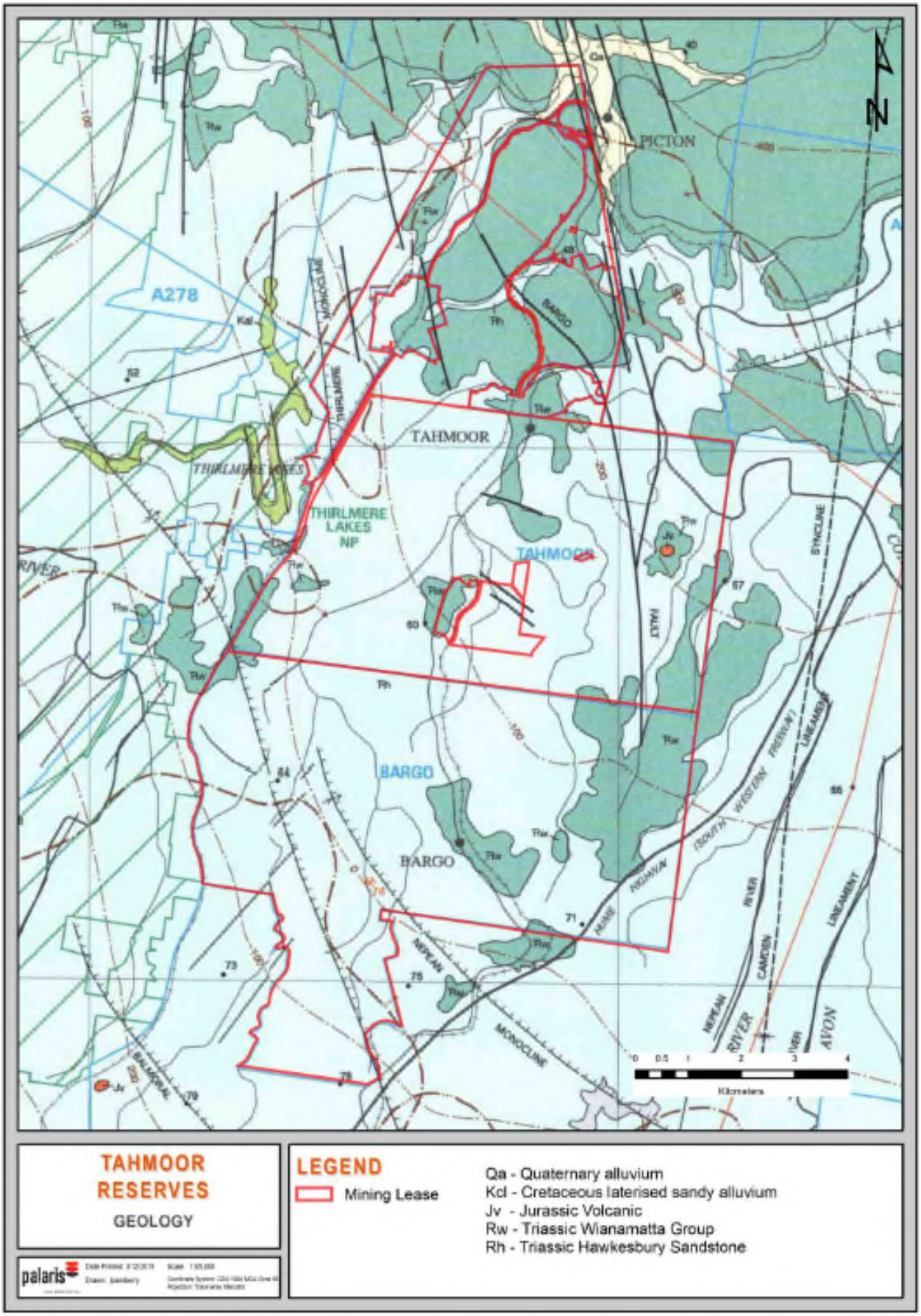


Figure 3-3 Surface and Regional Geology (Palaris, 2019)

3.2.3 Narrabeen Group

The overall thickness of the Narrabeen Group in the Southern Coalfield is approximately 300 m, of which 200 m is the Bulgo Sandstone and 24 m is the overlying Bald Hill Claystone. The Bald Hill Claystone is generally thought to act as a confining or sealing layer (aquitard) between the Bulgo and overlying Hawkesbury Sandstone.

The Narrabeen Group is also characterised by its petrological features:

- Grains of the sandstones are a mix of quartz and lithic fragments, rather than quartz. The sand-sized lithic fragments make up 20-30% of the clastic part of the unit, and are not as well sorted as in the Hawkesbury Sandstone; and
- Unweathered sandstones are typically more cemented, denser and less porous than those of the Hawkesbury Sandstone, and the cement is principally carbonate (more siderite than calcite).

Unweathered rocks are light to dark grey in colour due to a fine siderite cement and can be found 1-2 m below the surface. Hawkesbury Sandstone is by contrast often weathered and orange-brown to depths of 30 m and greater.

3.2.4 Illawarra Coal Measures

The geological units of major economic significance in the Southern Coalfield are the late Permian Illawarra Coal Measures, a 240 m thick deltaic sequence that occurs above the Shoalhaven Group and beneath the Hawkesbury Sandstone and Narrabeen Group. The Illawarra Coal Measures are divided into two subgroups, the basal Cumberland Subgroup, containing both the Pheasants Nest Formation and Erins Vale Formation, and the Sydney Subgroup which contains the economic coal seams (Bulli, Balgownie, Wongawilli, and Tongarra seams).

The coal measures outcrop above sea level approximately 20 km to the north of Wollongong. The Illawarra Coal Measures dip at approximately four degrees to the north-west in the Illawarra that creates the outcrop pattern that extends from sea level about 20 km north of Wollongong before turning westward to track the northern side of the Shoalhaven River valleys.

3.3 Coal Resource

3.3.1 Coals Seams

The principal coal-bearing units of the Illawarra Coal Measures are the Bulli, Balgownie, Wongawilli and Tongarra coal units, of which the Bulli Coal Seam and the Wongawilli Coal Seam have the largest resources, as shown on **Figure 3-4**.

Other coal members include the Cape Horn, Hargrave, Woronora, American Creek and Woonona. The other coal seams are uneconomic due to the high ash content, low thickness and thin coal intervals in addition to being laterally discontinuous.

3.3.2 Bulli Coal Seam

The Bulli Coal Seam is present throughout most of the Southern Coalfield, but its absence has been documented at the southernmost region of the coalfield and basin. It is considered to contain the bulk of the Southern Coalfield's reserves.

The Bulli Coal Seam is stratigraphically the top seam in the Illawarra Coal Measures and represents the majority of the coal reserves. The seam is generally 2-3 m thick, apart from the northern section of the coalfield where it increases to 5 m. It comprises interbanded dull and bright coal plies, with sub-bands of siderite and claystone. The seam is medium ash (8-9% in the east, and increasing westward), medium volatile matter (21.5-27.5%, air dry) and has a relatively low sulphur content.

Underground mining is used to extract the Bulli Coal Seam. The Bulli Coal Seam reaches depths of up to 800 m in the central north of the coalfield and is situated at more than 850 m below the surface in the north-west. To the north of the coalfield, the Bulli Coal Seam is 5 m at its thickest and in other regions varies in thickness between 2 and 3 m. The thicker sections of the Bulli Coal Seam occur in synclines and down-thrown fault blocks.

The Bulli Coal Seam consists of interbanded coal seams, composed of dull and bright plies. In addition to the coal, minor claystone and siderite is present in the seam. The Bulli Coal Seam contains 8-9% ash, 21.5-27.5% volatile matter, 30-55% vitrinite and a high inertinite percentage, up to 55%.

The Bulli Coal Seam is a prime quality coking coal with medium to high ash and low to medium volatiles, with an average raw yield ranging from 70-85% and average of approximately 76%. The regional dip of the Bulli Coal Seam towards the north-west is about 2.5 degrees. Where igneous intrusive bodies occur near the Bulli Coal Seam, the economic potential has been decreased due to thermal alteration of the coal.

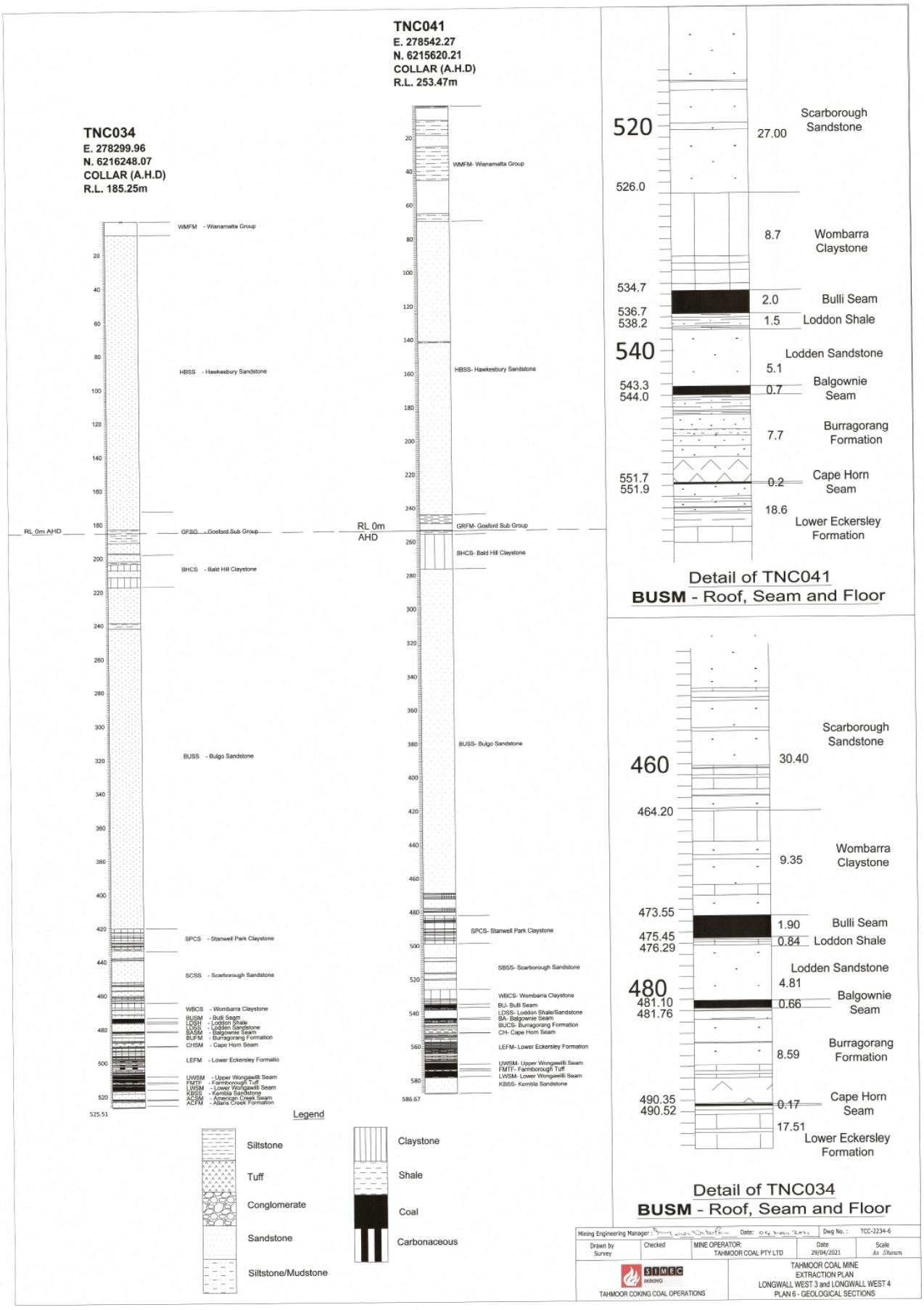


Figure 3-4 Tahmoor Mine – Typical Stratigraphy in the Western Domain (TNC034 and TNC041)

3.4 Overburden Stratigraphy

Locally the stratigraphy of the area (from youngest to oldest) can be summarised as:

- Alluvial sediments – sediments consisting of sand, gravel, silt and clay overlie the Wianamatta Shales and Hawkesbury Sandstone along the major rivers and creeks. These sediments are rarely more than 20 m thick;
- Wianamatta Group – the Triassic Wianamatta Group comprises the surficial geology over most of the area. It can be very thin to more than 100m thick in some of the more elevated areas. The Wianamatta Group primarily comprises shales, with occasional calcareous claystone, laminate and coal. The Ashfield Shale is the most widespread rock type, at surface, across the area;
- Mittagong Formation – separates the Ashfield Shale from the underlying Hawkesbury Sandstone. It is a thin layer (generally less than 10 m thick) comprising dark grey to grey alternating beds of shale laminate, siltstone and quartzose sandstone;
- Hawkesbury Sandstone – alluvial in origin, with a thickness of approximately 170 m in the region. Sandstone thicknesses increase to the north. The Triassic Hawkesbury Sandstone is generally medium to coarse grained quartz sandstone, with interbedded siltstone, finer grained sandstone and shale lenses. Shale lenses are common within this formation;
- Narrabeen Group – the total thickness of these Triassic rocks is approximately 450 m across the area and consists of the following subgroups:
    - Gosford Sub-group:
        - Newport Formation – medium grained, light to dark grey, quartzose sandstone interbedded with siltstone;
        - Garie Formation – a thin, cream kaolinite claystone, which grades upwards to grey;
    - Clifton Sub-group:
        - Bald Hill Claystone – grey to red/brown claystones and mudstones, occasional siderite nodules and generally softer than the overlying Garie Formation;
        - Bulgo Sandstone – white to grey coarse grained sandstone, fining upwards to coarse pebbly sandstone, with interbedded siltstone;
        - Stanwell Park Claystone – alternating light grey/green to brown sandstone and claystone intervals, with minor conglomerate;
        - Scarborough Sandstone – fine to very coarse grained, white to grey sandstone, with occasional siltstone and conglomerate laminae;
        - Wombarra Claystone – light grey/green to dark grey claystone, siltstone, mudstone with minor quartz lithic sandstone and conglomerate;
- Illawarra Coal Measures – the sedimentary thickness is approximately 300 m in the central area of the Southern Coalfield. The upper sections of the Permian Illawarra Coal Measures (Sydney Sub-group) contain the major coal seams including the Bulli, Balgownie and Wongawilli Coal seams. The underlying Cumberland Sub-group generally contains thin coal seam development;
- Shoalhaven Group – The Permian Budgong Sandstone is shallow marine to littoral, typically comprising fine and course grained sandstone; and

- Basement geology – The Southern Sydney Basin Permian and Triassic rocks have been deposited upon early to middle Palaeozoic basement rocks of the Lachlan Fold Belt. These rocks consist of intensely folded and faulted slates, phyllites, quartzite sandstones and minor limestones of Ordovician to Silurian age.

3.5 Structural Geology

3.5.1 Sydney Basin

The Sydney Basin formed as part of the regionally extensive Early Permian East Australian Rift System through northeast to southwest directed extensional stresses during the Late Carboniferous to Early Permian. Subsequently during the Mid-Permian to Late Triassic, a foreland basin system developed in front of the accreting New England Fold Belt.

The rift and foreland basin system that includes the Sydney, Gunnedah and Bowen basins, extended from south eastern Queensland to south-central New South Wales. Sediment thickness within the basins reach a thickness of about 5,500 m and thin significantly to the north and west.

Figure 3-5 outlines the structure of the Sydney Basin.

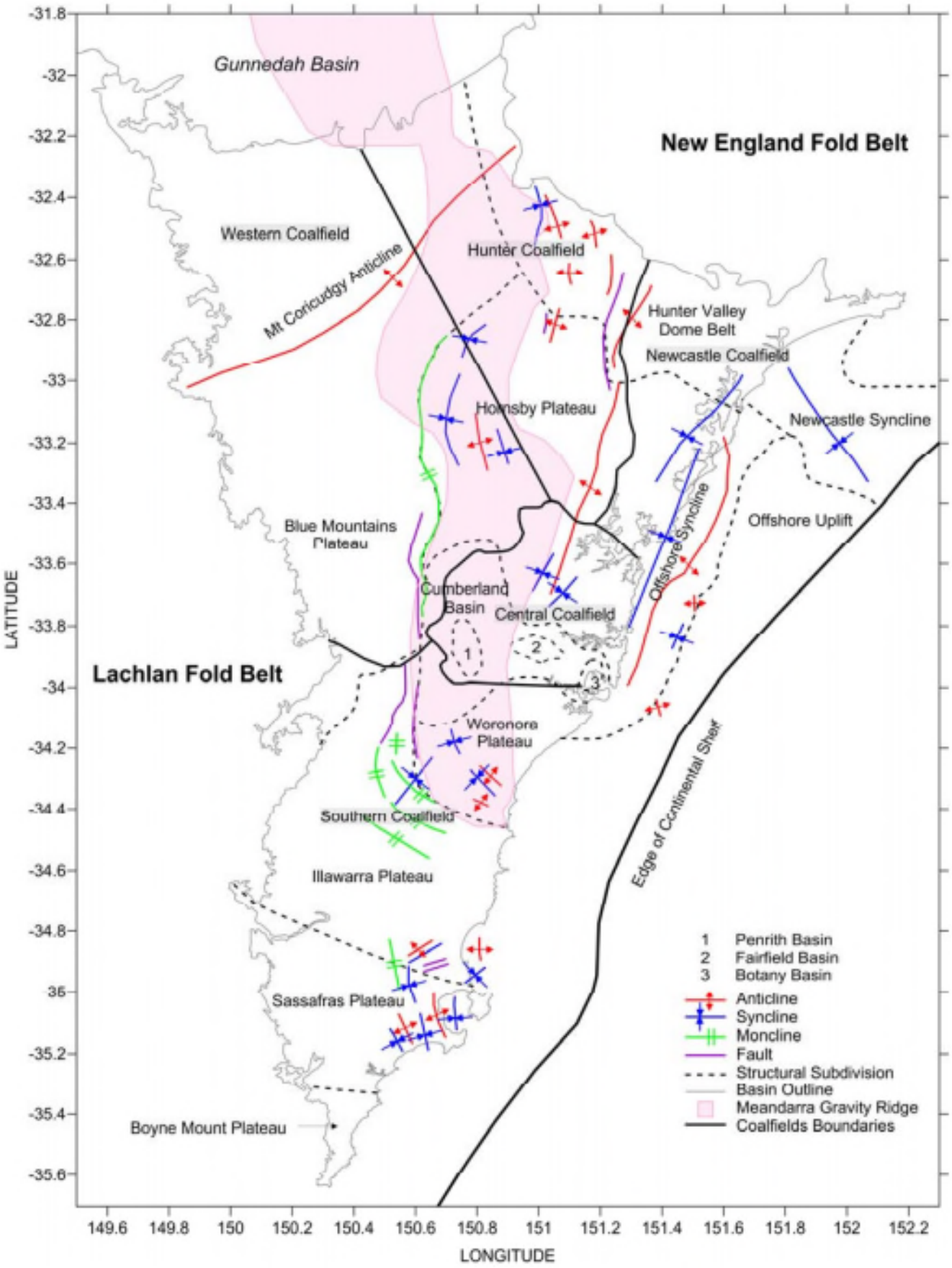


Figure 3-5 Structure and Tectonic Map of the Sydney Basin

3.5.2 Southern Coalfields

Structurally, the Southern Coalfields is dominated by the north, north-east plunging Camden Syncline, which is a broad and gentle warp structure. The Camden Syncline is bounded in the west and truncated in the south-west by the north-south trending Nepean Structural Zone, part of the Lapstone Structural Complex.

The normal and strike slip faults encountered at Tahmoor Mine have a distinct north-west trend, as opposed to the north-east trend of the reverse faults. The throw on all faults is typically <0.5 m. The north-west trending faults may also be associated with dykes. North-west trending dykes, normal faults and strike-slip faults have been negotiated in a number of longwall panels at Tahmoor Mine.

The structural geology of the Southern Coalfields is shown on **Figure 3-6** and the Tahmoor Mine on **Figure 3-7**.

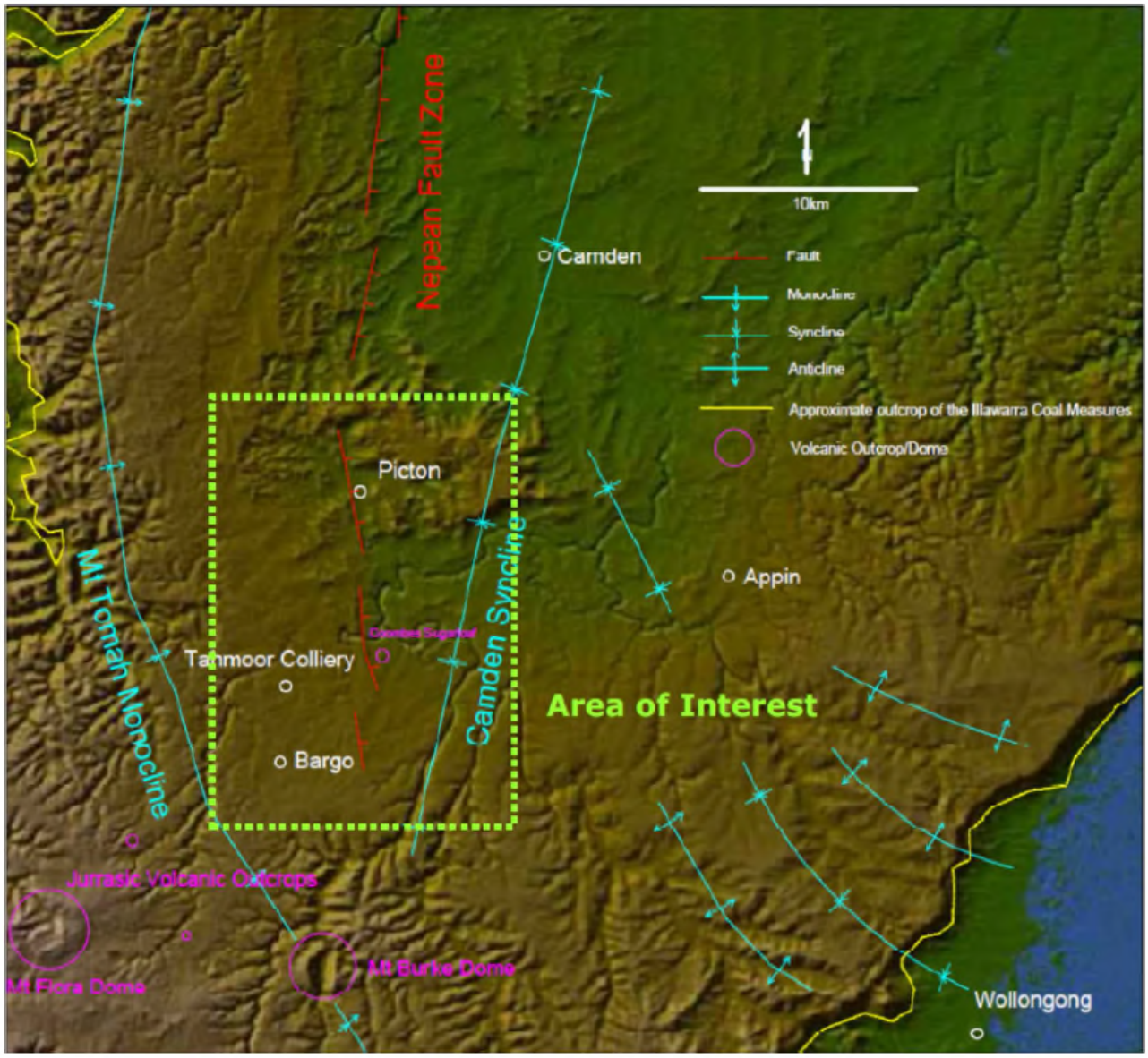


Figure 3-6 Structural Geology of the Southern Coalfields

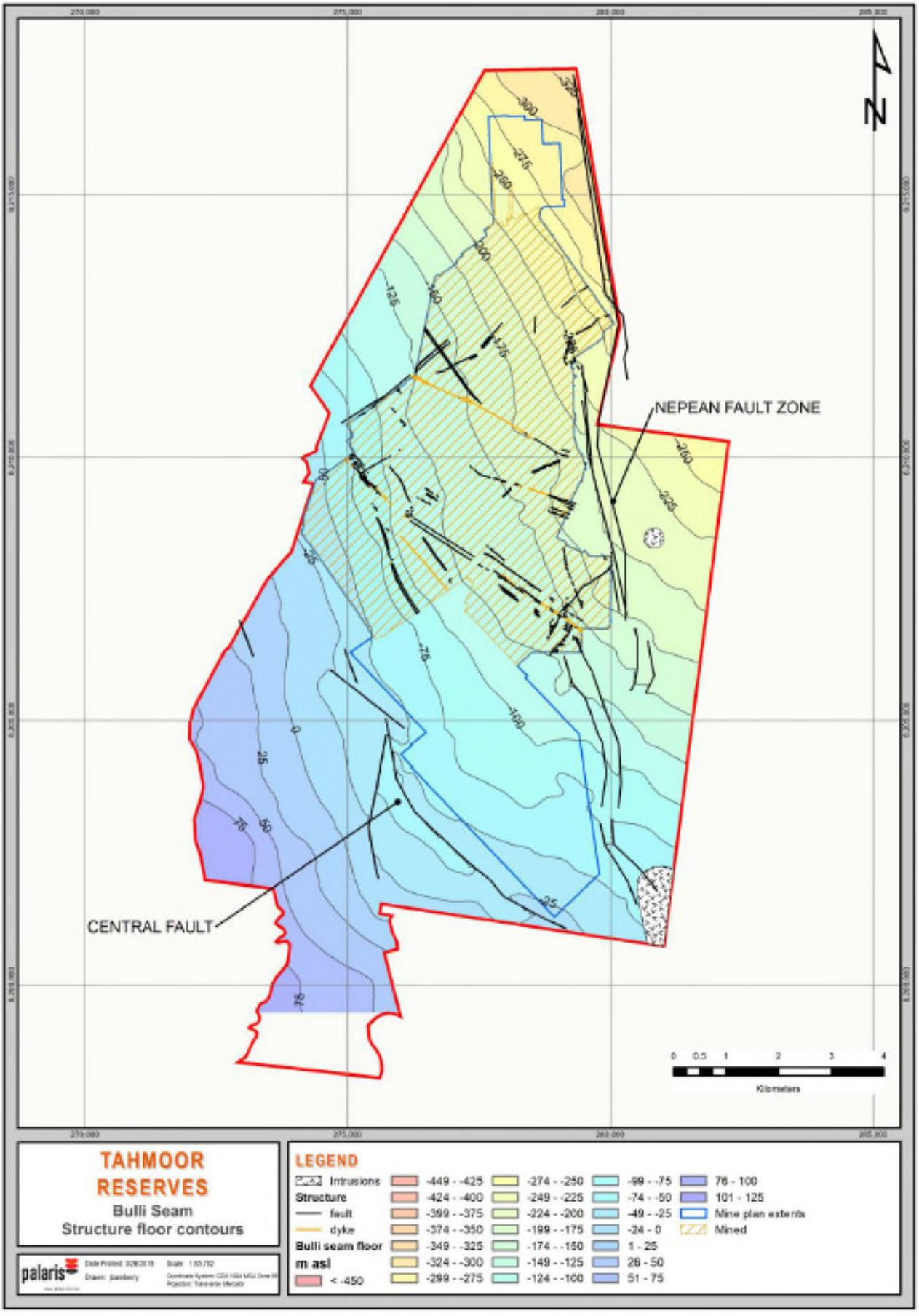


Figure 3-7 Structure of the Bulli Coal Seam (Palaris, 2019)

4 Mine Geotechnical Overview

4.1 Depth of Cover

The depth of cover over LW W3-W4 ranges from between a minimum of 480 m above the commencing end of LW W3 and a maximum of 540 m in the middle of LW W3 and on the northern edge of LW W4.

The changes in depth of cover relates to the seam dip and changes in surface topography.

4.2 Roof Stata Characteristics

The immediate Bulli Coal Seam roof consists of an interbedded sandstone, siltstone and mudstone sequence of varying thickness, stratigraphically named the Wombarra Claystone. This sequence is overlain by the more thickly bedded Scarborough Sandstone.

Generally, the overburden for the 50 m of roof above the Bulli Coal Seam averages 60-80 Mpa. Roof strengths range typically 40-80 Mpa. The immediate 0.5 m roof strength is typically in the range 40-70 Mpa. The average strength of the 0-2 m horizon is generally stronger, ranging between 50-80 Mpa. The 2-8 m roof horizon ranges in strength from 60-90 Mpa.

Roof conditions vary with both the roof lithology and local stress conditions. Tahmoor Coal undertakes extensive roof monitoring, including roof sampling at specified locations.

4.3 Floor Strata Characteristics

The Bulli Coal Seam floor typically consists of carbonaceous mudstone grading into the coarser Loddon Sandstone sediments below.

Floor strengths range typically 40-70 Mpa. In the current Tahmoor mining area, the immediate floor 0.2-0.5 m below the Bulli Coal Seam averages 50-80 Mpa.

Floor heave is commonly observed during development at Tahmoor. Floor brushing is carried out, usually at least once, to provide adequate clearance within the first two weeks of mining. Typically, 0.5 m of floor is brushed in development roadways.

A laboratory strength range for the coal of the Bulli Coal Seam is about 15-20 Mpa.

4.4 Seam Dip

The Bulli Coal Seam has a gentle dip to the northeast, averaging 1.7°, although can range with dips up to 3.6° being recorded. This northeast dip is consistent to being positioned on the western arm of the Camden Syncline and western edge of the Sydney Basin.

The Bulli Coal Seam average gradient is 3-5% (i.e. 1 in 20) or from 9-15 m across the proposed longwall face width within the mining area of LW W3-W4.

4.5 Seam Thickness and Working Section

The main part of the Bulli Coal Seam at Tahmoor Mine is a consistent seam of bright and dull coal. The thickness of the Bulli Coal Seam section ranges from 1.8-2.4 m in Tahmoor North and is mainly in the 2.0-2.2 m range, however in the LW W3 and LW W4 the seam is typically between 2.00–2.10 m thick.

The Bulli Coal Seam is currently mined on a full seam working section. Within the Tahmoor North domain, the seam profile is devoid of any significant stone bands and consists solely of coal of varying degrees of brightness and inherent mineral matter (ash). As such, dilution within the product is generally a function of longwall cutting heights and profiles and the product yield is primarily determined by seam thickness and inherent mineral matter.

4.6 Faulting

Faults and seam continuity have been interpreted from exploration drilling, extensive seismic surveys and underground mapping.

No significant geological structures have been identified within the LW W3 and W4 from underground workings by Tahmoor Coal. Two small faults have been encountered to date in the roadway development for LW W1 and LW W2, with approximate displacement of <0.05 m.

The Nepean Fault encountered at Tahmoor Mine is part of the regional Nepean Fault system. The Nepean Fault is located east of the LW W3-W4 mining area, approximately 500 m from the edge of LW W4.

This system is the southern extension of the Lapstone Monocline, and at Tahmoor, it consists of closely spaced sub-vertical en-echelon faults in a zone up to 400 m wide. The net displacement of the faults is approximately 30 m at Picton, diminishing to 10 m at Tahmoor North, and 3 m in Tahmoor South. The Nepean Fault Zone is the only hydraulically charged geological structure encountered during mining to date.

4.7 Igneous Intrusions

No igneous intrusions have been identified within the LWW3-W4 in underground workings by Tahmoor Coal.

To the southeast of the Tahmoor Mine leases, the Bulli Coal Seam is extensively intruded and/or cindered to the east of Bargo. The north-western limits of this intrusion partly encroach on the south-eastern part of Tahmoor South.

These intrusions typically have North-west to south-east orientated and have been intersected in workings in Tahmoor in southern regions. These bodies have presented as dykes with associated sill material, ranging from very strong fresh material to weak highly altered rock.

In the eastern part of the mining leasehold, a plug, which is exposed at the surface, is considered to be present at Bulli Coal Seam level. This feature is external to current mine plans.

4.8 Seam Splitting

The Bulli Coal Seam is represented by a single, thick uniform seam. In parts of the central and southern parts of Tahmoor Mine, a basal stone band is developed and below this, a localised split of the Bulli Coal Seam is developed.

Within the LW W3-W4 mining area, no seam splitting has been observed within exploration drilling, gas drainage drilling and roadway development so only the full seam is relevant.

4.9 Geotechnical Design Parameters

Chain pillars at Tahmoor Mine mostly range between 35-40 m. The use of 44 m wide double abutments chain pillars is relatively standard in the local mining district. Narrower chain pillars down to 25 m have been adopted where single sided abutment is planned.

4.10 Stability of Underground Workings

The Coal Mine Roof Rating (CMRR) is routinely measured at Tahmoor Mine to characterise the immediate roof strata. The CMRR throughout Tahmoor North ranges between 40-55.

Due to the laminated immediate roof, goafing is typically directly behind the shields and large en-masse roof falls are not a feature of longwalling in the Bulli Coal Seam at Tahmoor Mine.

The Tahmoor Mine Hazard Plan summarises the main features affecting the longwall stability as:

- Roadway stability due to stress notching;
- Cross grades across the face; and
- Minor strike slip faulting.

5 Coal Quality

Tahmoor Mine is a well-established and consistent metallurgical coal brand in the global marketplace that borders on being a hard coking coal. The Tahmoor Mine sells coking coal products to steel producers in Australian domestic market and export markets to European, Indian and Asian customers.

High quality coking coal is the primary product of the Tahmoor Mine. This product has a target ash of an average 9.3% with 9% product moisture. A higher ash coal is produced as a secondary product, which is washed to a target ash of 22% with a product moisture of 9%.

Cold and hot coke strength limit the classification and value of this coal to a premium semi-hard or a discounted hard coking coal generally trading at a slight discount to the Platts Low Vol Hard Coking Coal price.

Shipping results indicate coal quality parameters such as rank, ash, sulphur to be consistent with fluidity generally 2,000-4,000 ddpm, as outlined in **Table 5-1**. Volatile matter and dilatation vary slightly across the mining area.

Table 5-1 Tahmoor Coking Coal – Typical Specifications

Analysis	Units	Tahmoor Coking Coal
GCV	(ad)	7,610
Total Moisture	%ar	9.0
Volatile Matter	%ad	28.0
Ash	%ad	9.5
Sulphur	%ad	0.40
Phosphorus (in coal)	%ad	0.065
Vitrinite	%	53
HGI (ASTM)		65
CSN		7
RoMax	Rank	1.02
Grey King		G4
Average Max. Fluidity	ddpm	3,500
Total Dilatation	%	120
G / Y	% / mm	85/15
CSR	%	59
MMR	%	1.04
Loadport		PKCT or Newcastle

6 Mine Subsidence

The predicted incremental vertical subsidence contours resulting from the extraction of the proposed longwalls are outlined within **Table 6-1**. The incremental parameters represent the additional movements due to the extraction of each of the proposed longwalls.

Table 6-1 Maximum Predicted Incremental Conventional Subsidence, Tilt and Curvature

Longwall	Maximum predicted incremental vertical subsidence (mm)	Maximum predicted incremental tilt (mm/m)	Maximum predicted incremental hogging curvature (km^{-1})	Maximum predicted incremental sagging curvature (km^{-1})
LW W3	650	4.5	0.05	0.09
LW W4	600	4.5	0.05	0.08

The predicted total vertical subsidence contours resulting from the extraction of the proposed longwalls are outlined within **Table 6-2**. The predicted total parameters represent the accumulated movements due to the extraction of all proposed longwalls within each of the mining areas.

Table 6-2 Maximum Predicted Total Conventional Subsidence, Tilt and Curvature

Longwall	Maximum predicted incremental vertical subsidence (mm)	Maximum predicted incremental tilt (mm/m)	Maximum predicted incremental hogging curvature (km^{-1})	Maximum predicted incremental sagging curvature (km^{-1})
LW W3	950	5.0	0.06	0.10
LW W4	1025	5.0	0.06	0.10

7 Mining System

7.1 Mining Method

First workings (primary extraction / development mining) for LW W3-W4 utilise continuous miners and shuttle cars to develop roadways which form the longwall panels. The two heading development roadways for LW W3-W4 are typically 5.2 m wide and 2.7 m high by single pass continuous miners.

Development mining equipment required for first workings includes, but is not limited to:

- Continuous miners;
- Shuttle cars;
- Breaker feeders;
- Auxiliary fans;
- Graders;
- Underground personnel transporters; and
- Underground load haul dumps.

Second workings (secondary extraction / longwall mining) for LW W3-W4 will utilise longwall retreat method of mining to extract coal from the Bulli Coal Seam. Longwall mining is supported by continuous miner development operations. Each panel will progress in a direction towards the main headings, working north to south.

Longwall mining equipment required for second workings includes, but is not limited to:

- Longwall shearer – to cut coal from the face of the seam;
- Face conveyor – to collect sheared coal and carry it to a coal sizer and stage loader;
- Panel conveyor – to transfer the coal to a trunk conveyor in one of the main headings; and
- Hydraulic roof supports – to temporarily hold up the roof strata to provide a working space for the shearing machinery and face conveyor. After each slice of coal is removed, the hydraulic roof supports, face conveyor and shearing machinery are moved forward and the roof immediately above the seam is allowed to collapse into the void that is left as the face retreats (the goaf).

ROM coal from Tahmoor Mine is conveyed to the surface via a series of conveyor belts and discharged to the ROM Stockpile area, where the coal is reclaimed and transferred to the Coal Handling Preparation Plant (CHPP). At the CHPP, the ROM coal is processed by crushing, washing, sizing and dewatered and then transferred to the product coal stockpile by conveyor. Product Coal is reclaimed and transferred by conveyors to the Rail Load Out Bin, and then loaded into rail coal wagons for transport to either Port Kembla or the Port of Newcastle by rail.

Coal is mined from within the Bulli Coal Seam, producing hard coking coal for steel production. Product coal is marketed to Australian domestic customers and export customers.

7.2 Mine Design

The underground mine designs take the following criteria into account:

- Seam access;
- Pit bottom location with respect to geological structure;
- Access to shaft locations;
- Seam dip;
- Alignment with geological structure;
- Major horizontal stress;
- Depth of cover;
- Subsidence limits;
- Ventilation and gas drainage; and
- Timing of government approvals.

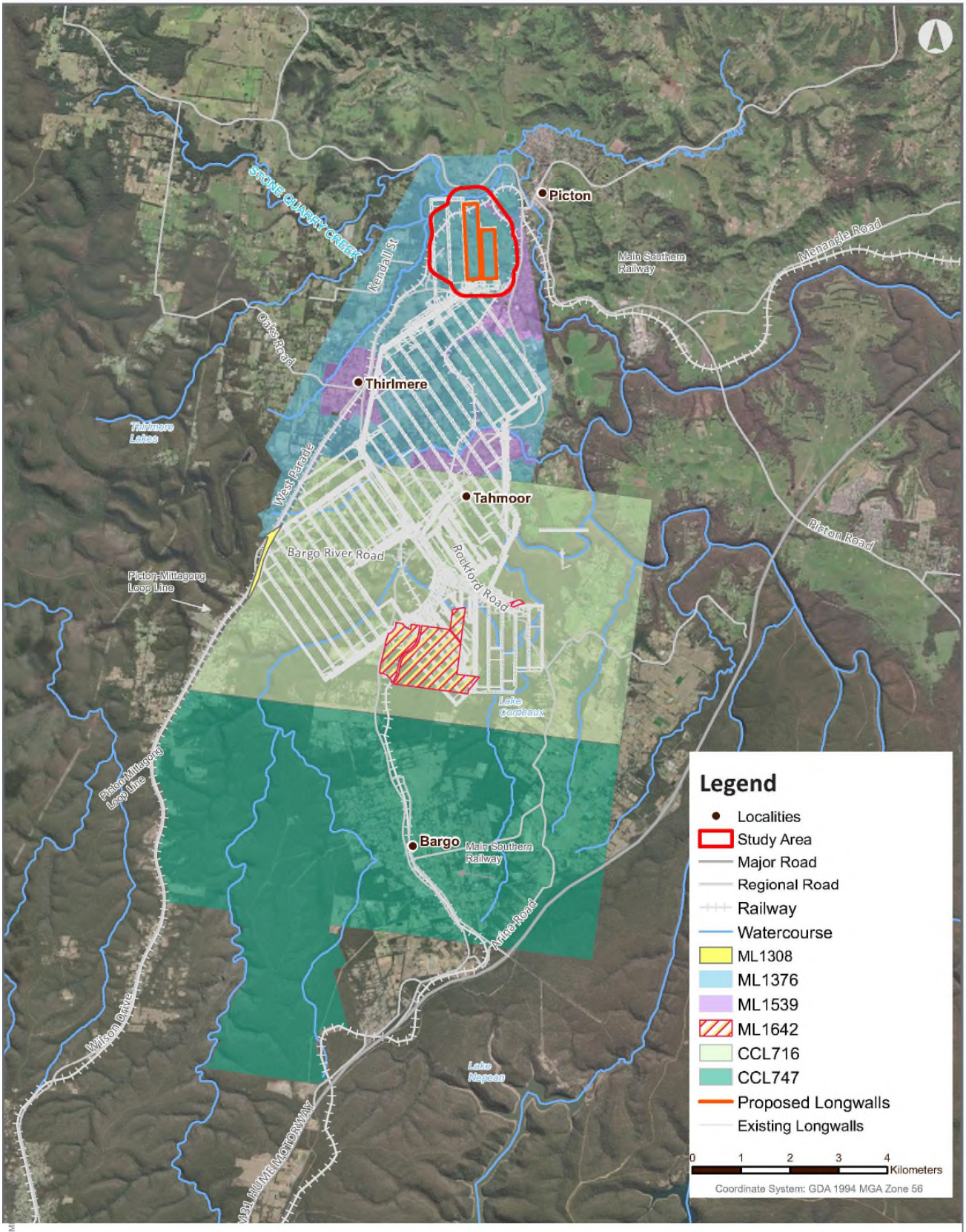
The mine plan for the Western Domain and the extracted longwalls within the Tahmoor North mining domain are shown on **Figure 7-1**.

The Western Domain mine plan has been refined over time since the approved 1993 EIS (Kembla Coal and Coke, 1993) and the approved 1998 EIS (Olsen Environmental Consulting, 1998). The mine plan for the Western Domain presented within the 2014 LW 31-37 SMP Application (Glencore, 2014) was further reviewed and refined during 2017. This mine design review resulted in reorientation of longwalls in the Western Domain from a north-west to south-east orientation to a north to south orientation to avoid mining directly under streams of third order or above.

These design changes were implemented to reduce subsidence-related impacts to Matthews Creek, Cedar Creek and Stonequarry Creek, which are located along the western and northern areas of the Western Domain. According to the current mine plan, Stonequarry Creek is located approximately 120 m north of the commencing end of LW W3, and Cedar Creek is located approximately 350 m north west of the commencing end of LW W4. Matthews Creek is not located within 600 m of LW W3-W4. The mine plan design minimises subsidence impact risks to surface water, aquatic habitat, and Aboriginal heritage sites located along these creeks.

LW W3-W4 are positioned with enough set back from the boundary of ML1376 to provide an adequate (in excess of 20 m) external barrier around the edge of the mining lease extent. Both ML 1376 and ML 1539 contain barrier conditions related to the Main Southern Rail Line and the Picton – Mittagong Loop Line. However, DA 67/98 was granted to include extraction of areas under the Main Southern Rail Line and the Picton – Mittagong Loop Line, which are covered by ML 1539.

First workings at Tahmoor Mine are typically 5.2 m wide resulting in stable first workings with minimal mine subsidence risk. The first working design at Tahmoor Mine does not trigger the requirement for a High-Risk Activity application for driving an underground roadway, which is triggered if first workings are greater than 5.5 m wide.



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Tahmoor Mining Area and Tenure

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

FIGURE 7-1

Date: 7/04/2021

Data Sources:
© NSW DFSI (2019); © NSW Mining (2019); © SIMEC (2019)
Aerial Imagery: © Photomapping Services (November 2018)

7.3 Mining Geometry

LW W3-W4 are to be developed north of the main headings in the Western Domain, will be orientated in a north to south direction, and will be mined from north to south as illustrated in **Figure 8-1**. LW W3 will be mined first, followed by LW W4.

The LW W3-W4 panels will be 283 m (LW W3) and 285 m (LW W4) in width (272.6 m (LW W3) and 274.6 m (LW W4) excluding first workings). The length of the longwalls will be 1,544 m for LW W3 and 996 m for LW W4 (excluding first workings). The overall void length is approximately 8 m greater than the lengths of longwall extraction, owing to the installation headings.

The mining height of the longwalls is anticipated to be a continuous 2.15 m and will be kept constant for the length of the longwall.

A summary of the dimensions of the longwalls is provided in **Table 7-1**.

Table 7-1 LW W3-W4 Design Parameters

Longwall Panel Parameters	Units	LW W3	LW W4
ROM Coal Extracted	tonnes	1,568,548	993,760
Gate Road Width	m	5.2	5.2
Gate Road Height	m	2.7	2.7
Maingate (MG) Chain Pillar Width	m	44 (1 to 12) 37 (12 to 13) 30 (13 to 18)	25
Tailgate (TG) Chain Pillar Width	m	39	44
Pillar Width/Height Ratio		14.4	9.5
Tailgate (TG) Chain Pillar Length	m	101	105
Longwall Void Width (Goaf)	m	283	285
Longwall Extraction Width	m	272.6	274.6
Longwall Void Length	m	1,552	1,004
Longwall Extraction Length	m	1,544	996
Longwall Extraction Height	m	2.15	2.15
Coal Seam thickness	m	2.00	2.10
Minimum Depth of Cover	m	480	500
Maximum Depth of Cover	m	540	540

7.4 Mining Hazards

A number of potential mining hazards for LW W3-W4 were identified and reviewed as part of the mine planning process and design considerations.

In summary, the more significant mining and general mine operating issues identified include:

- Longwall panel length being shorter than recent Tahmoor Mine longwalls;
- Ventilation of panels;
- Number of development units required to support a highly productive longwall;
- Mains development requirement;
- Scoping accurate productivity levels;
- Frequency of longwall and development relocations due to shorter longwall lengths;
- Resourcing with ramp up of Tahmoor South pre-approval development labour requirements;
- Geological information and level of certainty; and
- Mine planning effectiveness.

Tahmoor Mine prepares mining and geotechnical hazard plan for each longwall in advance of mining.

8 Resource Recovery

8.1 Coal Reserves

The geological definition of Tahmoor North has primarily been determined by the TNC series of boreholes which was undertaken in two separate programs, being TNC1 to TNC26 in the early 1990's and TNC27 to TNC46 from 2008-2010. Near term geological data is gained by a longwall block strip sampling regime and selective input of inseam exploration/gas drainage drill holes.

Coal Reserve for the Tahmoor North Western Domain mining area has been reported in accordance with the JORC Code, 2012. The reserves are estimated as at 31 December 2019 and generally reflect the mine design currently used for the Tahmoor North underground life of mine plan and are outlined within **Table 8-1**.

Table 8-1 Tahmoor North – Western Domain – Coal Reserve Estimate

Domain	Proved (Mt)
ROM Reserve	
Tahmoor North – Western Domain – LW W1-W4 Bulli Coal Seam (5% M_{ROM})	8.6
Marketable Reserve	
Coking Coal (8% M_{Prod}, 9.3% Ash)	5.8
Secondary Coking Coal (10% M_{Prod}, 17% Ash)	0.8
Total Product	6.5
Yield	
Product Yield (%)	76

The estimated coal resource recovery tonnages are outlined within **Table 8-2**.

Table 8-2 Estimated Coal Resource Recovery

Longwall	ROM tonnes (t)	Coking Coal Product tonnes (t)	High Ash Secondary product tonnes (t)	Reject tonnes (t)	Yield (%)
LW W3	1,568,549	1,063,993	19,831	501,143	69.1
LW W4	993,760	725,472	12,344	266,381	74.2

8.2 Mining Schedule

Mining of LW W3-W4 is scheduled to commence in September 2021. The two panels are anticipated to be extracted within one year and one month, and each panel is anticipated to be extracted over a four-month (LW W3) to seven-month (LW W4) period, as outlined within **Table 8-3**.

The rate of longwall retreat is anticipated to range from 50-60 m per week, depending on geological conditions and support regime.

Tahmoor Coal operates seven days a week, 24 hours a day on a roster basis.

Table 8-3 Mine Schedule for LW W3-W4

Longwall Panel	Estimated Start Date	Estimated Duration	Estimated Completion Date
Longwall West 3	5/9/2021	201 (7 months)	25/3/2022
Longwall West 4	22/4/2022	133 (4 months)	2/9/2022

8.3 Future Mining Proposed

There are no further longwalls planned in the Western Domain.

9 Justification Statement

The mine plan for LW W3-W4 has been developed based upon the following factors:

- Risk assessments for both natural environmental features and built infrastructure;
- Exploration drilling;
- Geological model and resource recovery parameters;
- Mining parameters;
- Economic feasibility parameters;
- Environment investigation and assessment, particularly in consideration for impacts associated with mining directly under 3rd Order or greater streams;
- Technical mining impact parameters, such as impacts of subsidence; and
- Consultation with the relevant Government authorities.

The mine layout and mining method provides an extraction layout that maximises the efficient use and management of resources through maximising resource utilisation.

There are no significant environmental impacts anticipated, given the mine plan avoidance of sensitive areas and the ability for ongoing adaptive management, which will preclude longwall mining within the Extraction Plan Study Area.

There are no significant subsidence impacts anticipated to surface infrastructure that cannot be mitigated prior to mining that will preclude longwall mining within the Extraction Plan Study Area.

The subsidence monitoring program forming part of the Extraction Plan summaries the overall monitoring of mining impacts on both the natural environment and built infrastructure, with management actions and controls detailed within the relevant key component plans and infrastructure management plans.

Using the proposed longwall mining method, the ROM recovery yield from the Bulli Coal Seam in is estimated to be 69% for LW W3 and 74% for LW W4. The total amount of ROM coal anticipated to be extracted from LW W3-W4 is approximately 2.562 million tonnes.

Tahmoor Coal considers that the mine layout of LW W3-W4 provides the most efficient resource recovery given the environmental and surface infrastructure constraints to mining.

10 Review and Improvement

This section describes the key elements of implementation relevant to the management of coal resource recovery. 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.

10.1 Reporting Requirements

Generic reporting requirements for the LW W3-W4 Extraction Plan are discussed in **Section 6.1** of the Extraction Plan Main Document. There are no reporting requirements specific to the management of coal resource recovery identified for the extraction of LW W3-W4.

10.2 Review and Auditing

Generic review and auditing requirements for the LW W3-W4 Extraction Plan are discussed in **Section 6.2** of the Extraction Plan Main Document. There are no review or auditing requirements specific to the management of coal resource recovery identified for the extraction of LW W3-W4.

10.3 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 coal resource recovery management measures identified for the extraction of LW W3-W4.

11 Document Information

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

11.1 References

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

Glencore (2014), Tahmoor Colliery Development and Extraction of Longwalls 31 to 37 – Subsidence management Plan Application.

Kembla Coal and Coke (1993), Tahmoor North Coal Project, an Extension of Current Operations, Environmental Impact Statement, prepared for Novacoal Australia.

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Palaris (2019), Tahmoor Coal Mine – Resource and Reserve Statement.

11.2 Glossary of Terms

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

11.3 Abbreviations

Abbreviations used in this document are provided below in **Table 11-1**.

Table 11-1 Abbreviations

Abbreviation	Definition
CMRR	Coal Mine Roof Rating
CRRP	Coal Resource Recovery Plan
CSG	Coal Seam Gas
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
JORC	Joint Ore Reserves Committee
km	Kilometre/s
LW	Longwall
LW W1	Longwall West 1

Abbreviation	Definition
LW W1-W2	Longwalls West 1 to West 2
LW W2	Longwall West 2
LW W3	Longwall West 3
LW W3-W4	Longwalls West 3 to West 4
LW W4	Longwall West 4
m	Metre/s
MG	Main Gate
Mining Act	NSW *Mining Act 1992*
Mining SEPP	*State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*
mm	Millimetre/s
ML	Mining Lease
ROM	Run of Mine
SMP Application	Subsidence Management Plan Application
T	Tonnes
Tahmoor Coal	Tahmoor Coal Pty Ltd
Tahmoor Mine	Tahmoor Coal Mine
TG	Tailgate

11.4 Change Information

Table 11-2 provides the details of document history of this Extraction Plan.

Table 11-2 Document History

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

Appendix D – Master Trigger Action Response Plan

Master Trigger Action Response Plan

Trigger Action Response Plan - Water Management Plan

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Downstream reduction in catchment flow rate in Stonequarry Creek at Picton Gauging Station (GS212053)	RAINFALL **Locations** • WaterNSW stations 568296 (Thurns Road) and 212063 (Lake Nerrigorang at Thirlmere Lakes) • Automatic rainfall stations at the Rail Site and Whiteys Site **Frequency** Pre-mining – Data recorded daily and downloaded monthly. During mining - Data recorded daily and downloaded monthly. Post mining - Data recorded daily and downloaded monthly for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details). STREAMFLOW[†] **Locations** Baseline / Impact site – WaterNSW gauging station GS212053 (Stonequarry Creek at Picton) Reference / Control sites - Bargo River (Site 300061) and Hornes Creek (Site 300062) **Frequency** Pre-mining – Continuous record, data downloaded monthly. During mining - Continuous record, data downloaded monthly. Post mining - Continuous record, data downloaded monthly for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details).	Level 1		
		• The median of the ratios does not fall below the 40th percentile* of the baseline data at GS212053 (refer to Table 1 for baseline ratios).	• Continue monitoring as per monitoring program. • Six monthly review and assessment of data.	• No response required.
		Level 2		
		• The median of the ratios falls below the 40th percentile but does not fall below the 20th percentile* of the baseline data at GS212053	• Continue monitoring as per monitoring program. • Six monthly review and assessment of data. • Convene Tahmoor Coal Environmental Response Group to review possible cause and response.	• As defined by Environmental Response Group.
		Level 3		
		• The median of the ratios falls below the 20th percentile* of the baseline data at GS212053 (refer to Table 1 for baseline ratios). AND • A similar trend has occurred at the control sites[†].	• Continue monitoring as per monitoring program. • Six monthly review and assessment of data. • Convene Tahmoor Coal Environmental Response Group to review possible cause and response.	• As defined by Environmental Response Group. • Consider increasing review and assessment of data frequency to monthly. • Check veracity/accuracy of recorded streamflow data at GS 212053. • Undertake the analysis of monitored flow rate versus modelled flow in control catchments. Filtered monitored flows at the control sites will be summed to give 14 day totals for comparison with corresponding 14 day totals of predicted flow from catchment models for these sites (calibrated for the baseline data period).
		Level 4		
		• The median of the ratios falls below the 20th percentile* of the baseline data at GS212053 AND • A similar trend has not occurred at the control sites. AND • Pool water level impacts have been recorded.	• Continue monitoring as per monitoring program. • Increase review and assessment of data frequency to monthly. • Convene Tahmoor Coal Environmental Response Group to undertake an investigation to assess if the change in behaviour is related to LW W3-W4 mining effects, other catchment changes or the prevailing climate.	• Continue monitoring and monthly assessment (until assessment indicates that the trigger is no longer occurring or it can be established whether the effect is mining related). • Report to DPIE and relevant government agencies within 7 days of investigation completion (according to Table 6-1 of the Extraction Plan Main Document). • Conduct detailed investigation of streamflow decline. • If it is concluded that there has been a mining-related impact then implement a corrective action management plan in accordance with a timeframe as recommended by the Environmental Response Group in consultation with the Resources Regulator (refer to Section 6.2.2 of the WMP).

Footnotes:

* The 40th and 20th percentiles of the baseline data have been adopted for each trigger level. The 20th percentile is an accepted metric of a significant variation from 'normal' conditions while the 40th percentile represents a slight deviation from the median or 'normal' conditions. As such, the range between the 40th percentile and the 20th percentile represents a slight deviation from 'normal' conditions to a significant variation from 'normal' conditions.

[†] Refer Section 5.2 of the Surface Water Technical Report.

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Impact to pool water level	AUTOMATED POOL WATER LEVEL **Locations** (refer to Figure 5-2) Impact sites: • Cedar Creek (CA, CB, CD, CE and CG) • Matthews Creek (ME, MG) • Stonequarry Creek (SA, SB, SC2, SD, SF) Control sites: • Cedar Creek (Cedar US, CCR, CC1A) • Matthews Creek (MB) • Stonequarry Creek (SE, SG) **Frequency** Pre-mining – Continuous record, data downloaded monthly. Baseline data recorded since October 2018 in the Western Domain at the majority of Western Domain sites. During mining - Continuous record, data downloaded monthly. Post mining - Continuous record, data downloaded monthly for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details). MANUAL POOL WATER LEVEL **Locations** Impact sites: • Cedar Creek (CC, CF) • Matthews Creek (MC, MD U/S (upstream), MF) Control sites: • Matthews Creek (MA) • Stonequarry Creek (SC) **Frequency** Pre-mining - Monthly manual level reading. Visual inspection of natural drainage behaviour using photo points. Baseline data recorded since October 2018 in the Western Domain. During mining - Monthly manual level reading. Visual inspection of natural drainage behaviour using photo points. Post mining - Monthly manual level reading and visual inspection of natural drainage behaviour using photo points for 12 months following the completion of LW W2. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details).	Level 1		
		• The recorded water level has not declined below the recorded baseline minimum level (in one 24 hour period for automated pool water level). OR • The recorded water level has declined below the recorded baseline minimum level (for more than one 24 hour period for automated pool water level) but the decline is due to a monitoring or sensor error or the magnitude of the decline (below the recorded baseline minimum level) is within the range of sensor accuracy.	• Continue monitoring as per monitoring program. • Continue monthly review of data.	• No response required.
		Level 2		
		• The recorded water level has declined below the recorded baseline minimum level (for more than one 24 hour period for automated pool water level). AND • The above has occurred at one of the upstream pools (beyond mining effects).	• Continue monitoring as per monitoring program. • Continue monthly review of data. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by Environmental Response Group.
		Level 3		
		• The recorded water level has declined, although not atypically^, below the recorded baseline minimum level (for more than one 24 hour period for automated pool water level). AND • The above has not occurred at one of the upstream pools (beyond mining effects).	• Continue monitoring as per monitoring program. • Continue monthly review of data. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by Environmental Response Group. • Consider increasing download and review of data frequency to fortnightly for sites where Level 3 has been reached. • Review manual water level measurements for additional monitoring sites to identify potential spatial trends in water level decline.
		Level 4		
		• The recorded water level has declined atypically^ below the previously recorded minimum level (for more than one 24 hour period for automated pool water level). AND • Similar behaviour has not occurred at one of the upstream pools (beyond mining effects).	• Increase download and review of data frequency to fortnightly for sites where Level 4 has been reached. • Continue monthly download and review of data for all other sites. • Convene Tahmoor Coal Environmental Response Group to undertake an investigation to assess if the change in behaviour is related to LW W3-W4 mining effects, other catchment changes or the prevailing climate.	• Report to DPIE and relevant government agencies within 7 days of investigation completion (according to Table 6-1 of the Extraction Plan Main Document). • Conduct detailed investigation of surface water level decline. • Review manual water level measurements for additional monitoring sites to identify potential spatial tends in water level decline. • If it is concluded that there has been a mining-related impact then implement a corrective management action plan in accordance with a timeframe as recommended by the Environmental Response Group in consultation with the Resources Regulator (refer to Section 6.2.2 of the WMP).

Footnotes:

^ 'Atypical' surface water characteristics relate to a notable and / or rapid water level decline or change in the slope of the falling limb of the hydrograph or the water level recessionary behaviour below the CTF level which is inconsistent with baseline conditions and cannot be attributed to climatic conditions.

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Impact to physical features and natural behaviour of pools	VISUAL INSPECTIONS **Locations** Baseline / Impact sites - Stream reaches of Cedar Creek, Matthews Creek and Stonequarry Creek within the Study Area (refer to Figure 5-1 in the Water Management Plan). Reference / Control sites - Stream reaches of Cedar Creek, Matthews Creek and Stonequarry Creek outside of the Study Area (refer to Figure 5-1 in the Water Management Plan). **Frequency** Pre-mining- Observations prior to mining using fixed location photo points. Baseline data first recorded in 2014, and in November 2019 prior to mining. During mining – Observations every month during active subsidence period (after 200 m of secondary extraction of LW W3-W4), for sites within and adjacent to active subsidence zone*, by Tahmoor Coal using fixed location photo points. Reduce frequency of observations to 2-monthly after 1,000 m of extraction of LW W3-W4 for sections of valleys that are located behind the active subsidence zone unless continuing adverse changes are observed. Post mining - Observations using fixed location photo points on a 3-monthly basis for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details).	Level 1		
		• No observed impacts to pool level, drainage or overland connected flow.	• Continue monthly monitoring. • Continue monthly review of data.	• No response required.
		Level 2		
		• Visually observed reduction in pool level, drainage or overland connected flow. AND • The above has occurred at one of the upstream pools (beyond mining effects). OR • Visual monitoring of pools has not noted any mining related impacts¥.	• Continue monitoring as per monitoring program. • Continue monthly review of data. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by Environmental Response Group.
		Level 3		
		• Rock bar and/or stream base cracking, gas release, or iron precipitation noted during visual inspection (in excess of baseline conditions). AND • No reduction in pool water level, drainage or overland connected flow, taking into account climatic conditions and observations during baseline monitoring period.	• Continue monitoring as per monitoring program. • Continue monthly review of data. • Convene Tahmoor Coal Environmental Response Group to undertake an investigation to assess if the change in behaviour is related to LW W3-W4 mining effects, other catchment changes or the prevailing climate.	• As defined by Environmental Response Group. • Consider increasing inspection and review of data frequency to fortnightly for sites where Level 3 has been reached.
		Level 4		
		• Visually observed reduction in pool water level, drainage or overland connected flow, taking into account climatic conditions and observations during baseline monitoring period. AND • The above change has not occurred at one of the upstream pools (beyond mining effects).	• Increase inspection and review of data frequency to fortnightly for sites where Level 4 has been reached. • Continue monthly download and review of data for all other sites. • Convene Tahmoor Coal Environmental Response Group to undertake an investigation to assess if the change in behaviour is related to LW W1-W2 mining effects, other catchment changes or the prevailing climate. • Conduct visual inspection of downstream reaches beyond mining effects to identify if flow re-emergence is occurring. • If flow re-emergence sites are located, implement water quality monitoring at these location(s).	• Report to DPIE and relevant agencies within 7 days of investigation completion (according to Table 6-1 of the Extraction Plan Main Document). • If it is concluded that there has been a mining-related impact then implement a corrective action management plan in accordance with a timeframe as recommended by the Environmental Response Group in consultation with the Resources Regulator (refer to Section 6.2.2 of the WMP).

Footnotes:

* Survey area to include upstream pools (beyond mining effects) where a potential Level 4 TARP trigger has occurred at an impact site(s).

¥ Rockbar and/or stream base cracking, or gas release, iron precipitation in excess of baseline conditions.

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Impact to flood levels	FLOOD LEVELS **Locations** All dwellings within the 1% AEP flood extent **Frequency** Pre-mining – Pre-mine modelling (using surveyed pre-mine topography) to estimate 1% AEP flood levels and extents in areas potentially impacted by subsidence. Pre-mining modelling was completed in May 2019. Post mining and subsidence - Post-mine modelling (using surveyed post-mine topography) to estimate 1% AEP flood levels and extents in areas potentially impacted by subsidence.	Level 1		
		• No dwellings that were outside the pre-mine 1% AEP flood extent are within the post-mine 1% AEP flood extent.	• No action required.	• No response required.
		Level 4		
		• Subsidence results in the post-mining 1% AEP flood level being above the floor level of one or more dwellings.	• Provide up-to-date predicted flood information (including actual subsidence and flooding predictions) to the State Emergency Service, Wollondilly Shire Council and landowners.	• Negotiate remediation or compensation with landowners.

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Impacts to dams	PRIVATE DAMS **Locations** Identified farm dams within the Study Area **Frequency** Pre-mining - Dam embankment integrity and water level observation by a geotechnical consultant every month for at least two months immediately prior to undermining using fixed location photo points. During mining - Dam embankment integrity and water level observation every week during active subsidence period using fixed location photo points by Tahmoor Coal; and every month during the active subsidence period using fixed photo points by a geotechnical consultant. Post mining - Dam embankment integrity and water level observation using fixed location photo points on a 3-monthly basis for 12 months following the completion of LW W2. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details).	Level 1		
		• No cracks develop within dam wall (i.e. other than natural desiccation cracking).	• Continue monitoring in accordance with the monitoring program. • Continue monthly review of data.	• No response required.
		Level 2		
		• Development of isolated cracks (<10 mm wide) within dam wall (i.e. other than natural desiccation cracking).	• Continue monitoring in accordance with the monitoring program. • Continue monthly review of data.	• No response required.
		Level 3		
		• Development of isolated cracks (> 10 mm wide) within the dam wall (i.e. other than natural desiccation cracking); AND / OR • Development of isolated seepage from the face or toe of the farm dam embankment.	• Increase frequency of monitoring of geotechnical consultant to weekly during active subsidence period. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by Environmental Response Group.
		Level 4		
		• Development of persistent longitudinal or arcuate cracking within dam wall > 10 mm; AND / OR • Development of seepage from the face or toe of the farm dam embankment.	• Increase frequency of monitoring of geotechnical consultant to weekly during active subsidence period. • Convene Tahmoor Coal Environmental Response Group to review response. • Erect warning signs where necessary. • Reduce dam water level as recommended by Geotechnical Consultant. • Geotechnical consultant inspection to determine need for further action / investigation.	• Notify relevant Government Agencies and other stakeholders. • Repair cracks and embankment instability at the completion of the active subsidence period by excavation, grouting and re-compaction where practical.

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Stream water quality impact	STREAM WATER QUALITY **Locations** (refer to Figure 5-2) Impact sites: • Cedar Creek (CA, CB, CC, CD, CE, CF, CG) • Matthews Creek (MC1, MG) • Stonequarry Creek (SC2, SC, SD SF) Control sites: • Cedar Creek (Cedar US, CC1) • Matthews Creek (MB) • Stonequarry Creek (SC1, SE, SG) **Frequency** Pre-mining- Monthly sampling for 12 months prior to secondary extraction. Baseline data was recorded at some site during 2014 and all sites since January 2019. During mining - Monthly sampling and analysis. Post mining - Monthly sampling and analysis for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details).	Level 1		
		• The triggers for pH, EC and dissolved metals defined below do not occur, and there is no visual evidence of an increase in iron precipitation that was not observed in the baseline period.	• Continue monitoring as per monitoring program. • Continue monthly review of data.	• No response required.
		Level 2		
		• The trigger for pH, EC or dissolved metals defined below occurs in one month, and there is no visual evidence of an increase in iron precipitation that was not observed in the baseline period.	• Continue monitoring as per monitoring program. • Continue monthly review of data including analysis of water quality trend along creek (upstream to downstream) to identify spatial changes. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by Environmental Response Group.
		Level 3		
		• The trigger for pH, EC or dissolved metals defined below occurs in one month, and there is visual evidence of an increase in iron precipitation that was not observed in the baseline period.	• Continue monitoring as per monitoring program. • Continue monthly review of data to assess if the trigger was exceeded during the baseline period prior to commencement of mining and undertake analysis of water quality trend along creek (upstream to downstream) to identify spatial changes. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by Environmental Response Group. • Consider increasing monitoring and review of data frequency to fortnightly at sites where Level 3 has been reached.
		Level 4		
		Any of the following: • pH: the value* falls below a corresponding control (upstream) site(s) mean minus two standard deviations or the site-specific baseline mean minus two standard deviations (i.e. the sample becomes more acidic) for more than two consecutive months OR the value rises above the corresponding control (upstream) site(s) mean plus two standard deviations or the site-specific baseline mean plus two standard deviations (i.e. the sample becomes more alkaline) for more than two consecutive months. • EC: the value* rises above corresponding control (upstream) site(s) mean plus two standard deviations or the site-specific baseline mean plus two standard deviations for more than two consecutive months. • Dissolved metals: a specific metal or metals laboratory value/s rises above corresponding control (upstream) site(s) mean plus two standard deviations or the site-specific baseline mean plus two standard deviations for more than two consecutive months.	• Increase monitoring and review of data frequency to fortnightly for sites where Level 4 has been reached. • Continue monthly monitoring and review of data for all other sites. • Convene Tahmoor Coal Environmental Response Group to undertake an investigation to assess if the change in behaviour is related to LW W3-W4 mining effects, other catchment changes or the prevailing climate. • Immediately undertake additional water quality sampling and analysis of the site where the trigger has occurred and relevant control sites to confirm results and that the trigger exceedance is continuing. • Undertake an investigation to assess if the change in behaviour is related to LW W3-W4 mining effects (e.g. whether there has been subsidence induced cracking upstream), other catchment changes, unrelated pollution or the prevailing climate.	• Report to DPIE and relevant government agencies within 7 days of investigation completion (according to Table 6-1 of the Extraction Plan Main Document). • Conduct detailed investigation of water quality changes. • If it is concluded that there has been a mining-related impact then implement a corrective action management plan in accordance with a timeframe as recommended by the Environmental Response Group in consultation with the Resources Regulator (refer to Section 6.2.2 of the WMP).

Footnote:

* Field and laboratory records of pH and EC are collected for quality assurance purposes. The field values will be used in the TARP assessment unless erroneous values are identified in which the laboratory values will be adopted in the assessment.

‡ Log transformations (i.e. base 10 logs of the water quality concentrations) will be used to calculate the arithmetic means and standard deviations. Log transformations are commonly applied to concentrations as part of statistical analyses in water resources studies as is evidenced by the following statement from a US Geological Survey publication regarding such analyses: “In order to make an asymmetric distribution become more symmetric, the data can be transformed or re-expressed into new units. These new units alter the distances between observations on a line plot. The effect is to either expand or contract the distances to extreme observations on one side of the median, making it look more like the other side. The most commonly-used transformation in water resources is the logarithm. Logs of water discharge, hydraulic conductivity, or concentration are often taken before statistical analyses are performed.” (Helsel and Hirsch, 2002).

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Groundwater Quality at monitoring bores and private groundwater bores.	GROUNDWATER QUALITY – Monitoring bores **Locations** (refer to Figure 3-3) Impact sites – P12, P13, P14, P15, P16, and any additional bore(s) (to be drilled) Control sites – P17 **Frequency** Pre-mining - Field water quality and laboratory analysis monthly (refer to Section 5.2.1 for parameters). During mining - Field water quality and laboratory analysis monthly (refer to Section 5.2.1 for parameters). Post mining - Field water quality and laboratory analysis monthly (refer to Section 5.2.1 for parameters) for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details). GROUNDWATER QUALITY – Private groundwater bores **Locations** (refer to Figure 3-3) Control sites - GW72402, GW105228, GW105467, GW115860 and GW105546 and any other private bores where access is negotiated with landholder. **Frequency** Pre-mining - Field water quality (EC, pH) and iron staining. Pre-mining testing completed during bore census (GeoTerra, 2019). During mining - Field water quality and laboratory analysis on a 3-monthly basis (refer to Section 5.2.1 for parameters). Post mining - Field water quality and laboratory analysis on a 3-monthly basis (refer to Section 5.2.1 for parameters) for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details).	Level 1		
		• No observable change in salinity, pH or metals outside of the baseline variability.	• Continue monitoring program. • Ongoing review of water quality data.	• No response required.
		Level 2		
		• Short term increase (< 3 months) in salinity and/or metals, or change in pH outside of baseline variability*. The effect does not persist after a significant rainfall recharge event. AND/OR • A similar trend or response has been noted at other monitored bores or private groundwater bores.	• Continue monitoring program. • Ongoing review of water quality data. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 3		
		• Short term increase (< 3 months) in salinity and/or metals or change in pH outside of baseline variability*. The effect persists after a significant rainfall recharge event. AND/OR • The change in water quality is determined not to be controlled by climatic or anthropogenic factors.	• Continue monitoring program. • Ongoing review of water quality data and consideration of mining and external stresses (in groundwater monthly report). • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 4		
		• Medium to long term increase in salinity and / or metals or a change in pH outside of baseline variability* with the effect persisting for greater than 3 months or after a significant rainfall recharge event. AND • The reduction in water quality is determined not to be controlled by climatic or anthropogenic factors.	• Continue monitoring and review as per monitoring program. • Continue review of water quality data and consideration of mining and external stresses (in groundwater monthly report). • Convene Tahmoor Coal Environmental Response Group to review response.	• Report to DPIE and relevant government agencies within 7 days of investigation completion (according to Table 6-1 of the Extraction Plan Main Document). • For monitoring bores: If it is concluded that there has been a mining-related impact, then implement an investigation report. • For private groundwater bores: If it is concluded that there has been a mining-related impact, then implement actions in accordance with the make good provisions (Section 6.2.4 of the Water Management Plan) in consultation with the affected landholder.

Footnote:

* The baseline variability was estimated using available data and refers to the proposed trigger levels (refer to Section 6.2.2 and Table 6.2 of the Groundwater Technical Report.

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Groundwater Levels at monitoring bores and private groundwater bores.	GROUNDWATER LEVEL – Monitoring bores **Locations** (refer to Figure 3-3) Impact sites – P12, P13, P14, P15, P16, and any additional bore(s) (to be drilled) Control sites – P17, and possibly P11 **Frequency** Pre-mining - Minimum continuous 24-hourly readings with monthly logger download and dip meter. Baseline data available since May 2019. During mining - Minimum continuous 24-hourly readings with monthly logger download and dip meter. Post mining - Minimum continuous 24-hourly readings with monthly logger download and dip meter for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details). GROUNDWATER LEVEL – Private groundwater bores **Locations** (refer to Figure 3-3) Control sites - GW72402, GW105228, GW105467, GW115860 and GW105546 and any other private bores where access is negotiated with landholder. **Frequency** Pre-mining - Standing Water Level (where available) and yield data. Pre-mining testing completed in bore census (GeoTerra, 2019). During mining - Manual monitoring (flow rate and, where available, standing water level) on a 3-monthly basis. Post mining - Manual monitoring (flow rate and, where available, standing water level) on a 3-monthly basis for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details).	Level 1		
		• Groundwater level remains consistent within baseline variability and/or pre-mining trends, with reductions in groundwater level less than two metres and does not trigger Level 2 to Level 4 Significance Levels (refer to Table 6-2).	• Continue monitoring program. • Ongoing review of water level data.	• No response required.
		Level 2		
		• Greater than 2 m water level reduction following the commencement of extraction at LW W1 (and LW W2, W3, W4) (refer to Table 6-2 for TARP Significance Level 2). AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	• Continue monitoring program. • Ongoing review of water level data. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 3		
		• Water level declines below the water level of TARP Significance Level 3 (refer Table 6-2, calculated as the average of TARP Significance Level 2 and Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	• Continue monitoring program. • Ongoing review of water level data and consideration of mining and external stresses (in groundwater monthly report). • Compare against base case and deterministic model scenarios. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 4		
		• Water level reduction greater than the maximum modelled drawdown (refer to Table 6-1 for TARP Significance Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	• Continue monitoring and review as per monitoring program. • Ongoing review of water level data and consideration of mining and external stresses (in groundwater monthly report). • Convene Tahmoor Coal Environmental Response Group to review response. • Compare against base case and deterministic model scenarios.	• Report to DPIE and relevant government agencies within 7 days of investigation completion (according to Table 6-1 of the Extraction Plan Main Document). • For monitoring bores: If it is concluded that there has been a mining-related impact, then implement an investigation report. • For private groundwater bores: If it is concluded that there has been a mining-related impact, then implement actions in accordance with the make good provisions (Section 6.2.4 of the Water Management Plan) in consultation with DPIE and the affected landholder.

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Shallow Groundwater Pressures at VWPs TNC036, TNC040, WD01 and WD02 (once installed).	GROUNDWATER PRESSURE **Locations** Impact sites – TNC36, WD01 and WD02 (once installed) (refer to Section 5.2.2). Control sites - Groundwater bores/VWPs TNC40 (refer to Figure 3-3). **Frequency** Pre-mining - Minimum continuous 24-hourly readings with monthly logger download. During mining - Minimum continuous 24-hourly readings with monthly logger download. Post mining - Minimum continuous 24-hourly readings with monthly logger download for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details).	Level 1		
		• No observable mining induced change at VWP intakes located at or above (i.e. shallower than) 200 m depth.	• Continue monitoring program. • Ongoing review of water level data.	• No response required.
		Level 2		
		• Greater than 5 m water level reduction in VWP intakes located at or above (i.e. shallower than) 200 m depth following the commencement of extraction at LW W1 (and LW W2, W3 and W4) (refer to Table 6-2 for TARP Significance Level 2). AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	• Continue monitoring program. • Ongoing review of water level data. • Convene with Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 3		
		• Water level declines below the water level of TARP Significance Level 3 (refer Table 6-2, calculated as the average of TARP Significance Level 2 and Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	• Continue monitoring program • Ongoing review of water level data and consideration of mining and external stresses (in groundwater monthly report). • Compare against base case and deterministic model scenarios. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 4		
		• Water level reduction greater than the maximum modelled drawdown (refer to Table 6-2 for TARP Significance Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND • The reduction in water level is determined not to be controlled by climatic or anthropogenic factors.	• Continue monitoring and review as per monitoring program. • Ongoing review of water level data and consideration of mining and external stresses (in groundwater monthly report). • Convene Tahmoor Coal Environmental Response Group to review response. • Compare against base case and deterministic model scenarios.	• Report to DPIE and relevant government agencies within 7 days of investigation completion (according to Table 6-1 of the Extraction Plan Main Document). • If it is concluded that there has been a mining-related impact, implement an investigation report.

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Deep Groundwater Pressures at VWPs TNC036.	GROUNDWATER PRESSURE **Locations** Impact site – TNC36 (refer to Figure 3-3). Control site - Groundwater bores/VWPs TNC40 (refer to Figure 3-3). **Frequency** Pre-mining - Minimum continuous 24-hourly readings with monthly logger download. During mining - Minimum continuous 24-hourly readings with monthly logger download. Post mining - Minimum continuous 24-hourly readings for 12 months after LW W4 completed. Monthly logger downloaded for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details).	Level 1		
		• Observed data does not exceed predicted (modelled) impacts at VWP intakes located below (i.e. deeper than) 200 m depth (excluding those monitoring the Bulli Coal Seam).	• Continue monitoring program. • Ongoing review of water level data.	• No response required.
		Level 2		
		• Calculated or observed drawdown (based on 2009-2015 baseline data) for VWP intakes below 200 m depth (excluding those within the Bulli Coal Seam) is within 30 m of predicted (modelled) drawdown.	• Continue monitoring program. • Ongoing review of water level data. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 3		
		• Calculated or observed drawdown (based on 2009-2015 baseline data) for VWP intakes below 200 m depth (excluding those within the Bulli Coal Seam) exceeds predicted (modelled) drawdown by 30 m for a period of 6 months or more.	• Continue monitoring program. • Ongoing review of water level data. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group. • Consider increasing download frequency at groundwater bores where Level 3 has been reached to a fortnightly basis. Consider increasing review frequency to fortnightly.
		Level 4		
		• Calculated or observed drawdown (based on 2009-2015 baseline data) for VWP intakes below 200 m depth (excluding those within the Bulli Coal Seam) exceeds predicted (modelled) drawdown by 30 m for a period of 12 months or more.	• Continue monitoring and review as per monitoring program. • Convene Tahmoor Coal Environmental Response Group to undertake an investigation to assess whether change in behaviour is related to LW W1-W2 mining effects.	• Report to DPIE and relevant government agencies within 7 days of investigation completion (according to Table 6-1 of the Extraction Plan Main Document). • If it is concluded that there has been a mining-related impact, implement an investigation report.

Trigger Action Response Plan – Land Management Plan

Feature	Management		
	Trigger	Action	Response
Steep slope damage or instability	Level 1		
	• Surface cracking < 10 mm wide on slope	• Continue monitoring in accordance with the monitoring program.	• No response required.
	Level 2		
	• Surface cracking 10 – 20 mm wide on slope	• Continue monitoring in accordance with the monitoring program. • Convene Tahmoor Coal Environmental Response Group to review response. • Erect warning signs and restrict access to areas where necessary.	• As defined by the Tahmoor Coal Environmental Response Group. • Repair cracks at the completion of the active subsidence period.
	Level 3		
	• Surface cracking > 20 mm wide, tree fall.	• Increase frequency of monitoring by geotechnical consultant to weekly during active subsidence period. • Convene Tahmoor Coal Environmental Response Group to review response. • Erect warning signs and restrict access to areas where necessary. • Geotechnical engineer inspection to determine need for further action/investigation.	• Notify relevant Government Agencies and other stakeholders. • Repair cracks at the completion of the active subsidence period.

Feature	Management		
	Trigger	Action	Response
Surface cracking of landform	Level 1		
	• Surface cracking < 10 mm wide.	• Continue monitoring in accordance with the monitoring program.	• No response required.
	Level 2		
	• Surface cracking 10 – 20 mm wide.	• Continue monitoring in accordance with the monitoring program. • Convene Tahmoor Coal Environmental Response Group to review response. • Erect warning signs and restrict access to areas where necessary.	• As defined by Tahmoor Coal Environmental Response Group. • Repair cracks at the completion of the active subsidence period.
	Level 3		
	• Surface cracking > 20 mm wide.	• Increase frequency of monitoring by geotechnical engineer to weekly during active subsidence period. • Convene Tahmoor Coal Environmental Response Group to review response. • Erect warning signs and restrict access to areas where necessary. • Geotechnical engineer inspection to determine need for further action/investigation.	• Notify relevant Government Agencies and other stakeholders. • Repair cracks > 20 mm in width with excavation, grouting and re-compaction where practical.

Feature	Management		
	Trigger	Action	Response
Agricultural land	Level 1		
	• Vertical subsidence within predicted range. • Negligible impact to agricultural productivity or use of the land. • Negligible change to ponding. • No or minor impact to buildings or improvements. • Negligible increase in soil or tunnel erosion.	• Continue monitoring in accordance with the monitoring program.	• No response required.
	Level 2		
	• Impact to agricultural land from subsidence or increased flooding or ponding within predicted impacts. • Minor increase in ponding or changes to drainage systems that can be remediated.	• Continue monitoring in accordance with the monitoring program. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by Tahmoor Coal Environmental Response Group. • Repair any subsidence impacts at the completion of the active subsidence period.
	Level 3		
	• Significant impact and change to agricultural land functionality or agricultural productivity greater than predicted.	• Increase frequency of monitoring to weekly during active subsidence period. • Convene Tahmoor Coal Environmental Response Group to review response. • Erect warning signs and restrict access to areas where necessary.	• Notify relevant Government Agencies and other stakeholders. • Repair any subsidence impacts at the completion of the active subsidence period with excavation, re-levelling and re-compaction where required.

Trigger Action Response Plan – Biodiversity Management Plan

Feature	Management		
	Trigger	Action	Response
Decline or significant negative change in macroinvertebrate indicators. These indicators include: • Density • Family richness • Community assemblages • EPT index • SIGNAL score • AUSRIVAS score	**Level 1**		
	• Monitoring macroinvertebrate indicators are within range of baseline data as supported by statistical analysis.	• Continue monitoring as per monitoring program.	• No action required.
	Level 2		
	• One or more macroinvertebrate indicators are not within range of baseline data as supported by statistical analysis. AND ONE OR BOTH OF THE FOLLOWING: • Subsidence monitoring program identifies potential for impact to watercourse parameters associated with aquatic habitat areas compared to baseline (e.g. cracking). • Surface monitoring program identifies potential impacts to hydrology/water quality parameters compared to baseline.	• Continue monitoring as per monitoring program. • Convene Tahmoor Coal Environmental Response Group to review possible cause and response. • Review and confirm monitoring data, cross check aquatic biodiversity monitoring data against other related environmental data (e.g. control sites and benchmark data) and subsidence monitoring upon identification of the potential trigger. • Undertake further investigations as appropriate to confirm the potential issue and analyse data with the aim of determining whether the exceedance is likely to be mining related.	• As defined by Environmental Response Group. • Assess need for any increase to monitoring frequency or additional monitoring where relevant.
	Level 3		
	• Monitoring indicates that three or more macroinvertebrate indicators are not within range of baseline data as supported by statistical analysis. AND ONE OR BOTH OF THE FOLLOWING: • Subsidence monitoring identifies mining induced impacts compared to baseline watercourse parameters associated with aquatic habitat (e.g. cracking). • Subsidence monitoring identifies significant impacts to hydrology/water quality that exceed predictions compared to baseline.	• Continue monitoring as per monitoring program. • Convene Tahmoor Coal Environmental Response Group to review possible cause and response. • Review and confirm monitoring data, cross check aquatic biodiversity monitoring data against other related environmental data (e.g. control sites and benchmark data) and subsidence monitoring upon identification of the potential trigger. • Undertake further investigations as appropriate to confirm the potential issue and analyse data with the aim of determining whether the exceedance is likely to be mining related.	• Notify DPIE and relevant stakeholders within 7 days of investigation completion. • Investigate and implement any additional management measures as recommended and contingency plan as required in consultation with DPIE.

Feature	Management		
	Trigger	Action	Response
Reduction in aquatic habitat though loss of pools or associated reduction in water quality (AUSRIVAS habitat assessment).	Level 1		
	• Visual monitoring indicates aquatic habitat parameters are similar to baseline observations at aquatic ecology monitoring sites.	• Continue monitoring as per monitoring program.	• No action required.
	Level 2		
	• Visual monitoring indicates potential change in aquatic habitat compared to baseline observations at aquatic ecology monitoring sites. AND ONE OR BOTH OF THE FOLLOWING: • Subsidence monitoring identifies potential for impact to watercourse parameters associated with macroinvertebrate indicators compared to baseline. • Surface monitoring program identifies potential for impact to hydrology/water quality parameters compared to baseline.	• Continue monitoring as per monitoring program. • Convene Tahmoor Coal Environmental Response Group to review possible cause and response. • Review and confirm monitoring data, cross check aquatic biodiversity monitoring data against other related environmental data (e.g. control sites and benchmark data) and subsidence monitoring upon identification of the potential trigger. • Undertake further investigations as appropriate to confirm the potential issue and analyse data with the aim of determining whether the exceedance is likely to be mining related.	• As defined by Environmental Response Group. • Assess need for any increase to monitoring frequency or additional monitoring where relevant.
	Level 3		
	• Visual monitoring indicates a significance change in aquatic habitat compared to baseline observations at aquatic ecology monitoring sites. AND ONE OR BOTH OF THE FOLLOWING: • Subsidence monitoring identifies potential for impact to watercourse parameters associated with macroinvertebrate indicators compared to baseline. • Subsidence monitoring identifies significant impacts to hydrology/water quality that exceed predictions.	• Continue monitoring as per monitoring program. • Convene Tahmoor Coal Environmental Response Group to review possible cause and response. • Review and confirm monitoring data, cross check aquatic biodiversity monitoring data against other related environmental data (e.g. control sites and benchmark data) and subsidence monitoring upon identification of the potential trigger. • Undertake further investigations as appropriate to confirm the potential issue and analyse data with the aim of determining whether the exceedance is likely to be mining related.	• Notify DPIE and relevant stakeholders within 7 days of investigation completion. • Investigate and implement any additional management measures as recommended and contingency plan as required in consultation with DPIE.

Feature	Management		
	Trigger	Action	Response
Decline in amphibian populations within watercourses of the Study Area	Level 1		
	• Monitoring indicates amphibian population parameters are predominantly within a reasonable range of baseline data as supported by statistical analysis.	• Continue monitoring as per monitoring program.	• No response required.
	Level 2		
	• Monitoring indicates amphibian population parameters are predominantly not within a reasonable range of baseline data as supported by statistical analysis. AND • Subsidence monitoring program identifies potential for impact of watercourse parameters associated with sensitive amphibian habitat areas (within prediction compared to baseline).	• Continue monitoring as per monitoring program. • Convene Tahmoor Coal Environmental Response Group to review possible cause and response. • Review and confirm monitoring data, cross check biodiversity monitoring data against other related environmental data (e.g. control sites and benchmark data) and subsidence monitoring upon identification of the potential trigger. • Undertake further investigations as appropriate to confirm the potential issue and analyse data with the aim of determining whether the exceedance is likely to be mining related.	• As defined by Environmental Response Group. • Consider increasing monitoring frequency or additional monitoring where relevant.
	Level 3		
	• Monitoring indicates amphibian population parameters are significantly not within a reasonable range of baseline data as supported by statistical analysis. AND • Mining induced impacts (exceeds predicted compared to baseline) for watercourse parameters associated with sensitive amphibian habitat are identified by environmental monitoring.	• Continue monitoring as per monitoring program. • Convene Tahmoor Coal Environmental Response Group to review possible cause and response. • Review and confirm monitoring data, cross check biodiversity monitoring data against other related environmental data (e.g. control sites and benchmark data) and subsidence monitoring upon identification of the potential trigger. • Undertake further investigations as appropriate to confirm the potential issue and analyse data with the aim of determining whether the exceedance is likely to be mining related.	• Notify DPIE and relevant stakeholders within 7 days of investigation completion. • Investigate and implement any additional management measures as recommended and contingency plan as required in consultation with DPIE.

Feature	Management		
	Trigger	Action	Response
Dieback of riparian vegetation within watercourses of the Study Area	Level 1		
	• Monitoring indicates riparian vegetation parameters are predominantly within a reasonable range of baseline data as supported by statistical analysis.	• Continue monitoring as per monitoring program.	• No response required.
	Level 2		
	• Monitoring indicates riparian vegetation parameters are predominantly not within a reasonable range of baseline data as supported by statistical analysis. AND • Subsidence monitoring program identifies potential for impact of watercourse parameters associated with sensitive riparian habitat areas (within prediction compared to baseline).	• Continue monitoring as per monitoring program. • Convene Tahmoor Coal Environmental Response Group to review cause and response. • Review and confirm monitoring data, cross check Biodiversity monitoring data against other related environmental data (e.g. control sites and benchmark data) and subsidence monitoring upon identification of the potential trigger. • Undertake further investigations as appropriate to confirm the potential issue and analyse data with the aim of determining whether the exceedance is likely to be mining related.	• As defined by Environmental Response Group. • Consider increasing monitoring frequency or additional monitoring where relevant.
	Level 3		
	• Monitoring indicates riparian vegetation parameters are significantly not within a reasonable range of baseline data as supported by statistical analysis. AND • Mining induced impacts (exceeds predication compared to baseline) for watercourse parameters associated with riparian vegetation are identified by environmental monitoring.	• Continue monitoring as per monitoring program. • Convene Tahmoor Coal Environmental Response Group to review cause and response. • Review and confirm monitoring data, cross check biodiversity monitoring data against other related environmental data (e.g. control sites and benchmark data) and subsidence monitoring upon identification of the potential trigger. • Undertake further investigations as appropriate to confirm the potential issue and analyse data with the aim of determining whether the exceedance is likely to be mining related.	• Notify DPIE and relevant stakeholders within 7 days of investigation completion. • Investigate and implement any additional management measures as recommended and contingency plan as required in consultation with DPIE.

Trigger Action Response Plan – Heritage Management Plan

Feature	Management		
	Trigger	Action	Response
Aboriginal Heritage items*	Level 1		
	• Aboriginal heritage site monitoring indicates no detectable environmental consequences.	• Continue monitoring as per monitoring program.	• No response required.
	Level 2		
	• Aboriginal heritage site monitoring indicates potential detectable environmental consequences.	• Continue monitoring as per monitoring program. • Convene Tahmoor Coal Environmental Response Group to review response. • An archaeologist to inspect the relevant site(s) within the area of potential impact. • Review monitoring program and modify if necessary.	• If impacts to heritage sites are observed, notify DPIE and Heritage NSW within one week of the event. • Notify RAPs within on week of the event and co-ordinate a site inspection with RAPs. • Investigate and implement any additional management measures as required in consultation with RAPs, Heritage NSW and DPIE.
	Level 3		
	• Aboriginal heritage site monitoring indicates environmental consequences to heritage site(s).	• Continue monitoring as per monitoring program. • Convene Tahmoor Coal Environmental Response Group to review response. • Investigate exceedance of subsidence prediction. • Review mine design/predictions against mine criteria. • Review monitoring program and modify if necessary.	• Notify RAPs within 1 week of the event and co-ordinate a site inspection with RAPs. • Notify DPIE and Heritage NSW within one week of the event. • Investigate and implement any additional management measures as required in consultation with RAPs, Heritage NSW and DPIE.

*This TARP outlines performance indicators to be implemented to ensure compliance with negligible subsidence impacts or environmental consequences to the Aboriginal modified tree within the Study Area, Clearview (#52-2-2100) and considers the management or remediation of any impacts and/or environmental consequences relating to this Aboriginal heritage site. A site-specific TARP for Stonequarry Creek 1 is included in the SCRMP.

Feature	Management		
	Trigger	Action	Response
Historical Heritage	Level 1		
	• Historical heritage site monitoring indicates no detectable environmental consequences.	• Continue monitoring as per monitoring program.	• No response required.
	Level 2		
	• Historical heritage site monitoring indicates potential detectable environmental consequences but with negligible impacts to heritage site(s).	• Continue monitoring as per monitoring program.	• No response required.
	Level 3		
	• Historical heritage site monitoring indicates environmental consequences to heritage site(s).	• Continue monitoring as per monitoring program. • Convene Tahmoor Coal Environmental Response Group to review response. • Co-ordinate a site inspection with a structural engineer and qualified archaeologist or heritage architect. • Investigate exceedance of subsidence prediction. • Review mine design/predictions against mine criteria. • Review monitoring program and modify if necessary.	• Notify DPIE and Heritage NSW within one week of the event. • Investigate and implement any additional management measures as recommended and contingency plan as required in consultation with Heritage NSW and DPIE.

GENERAL TRIGGER LEVELS

Trigger Level	Description
GREEN	Observations within survey tolerance and environmental effects.
BLUE	Repeatable measurable differential movements consistent with low level mining influence.
YELLOW	Increased differential movements indicating increasing potential for greater than negligible subsidence impacts, environmental consequences or loss of heritage value of the AHIMS site.
RED	Differential movements indicating imminent potential for greater than negligible subsidence impacts, environmental consequences or loss of heritage value of the AHIMS site.
GREY	Loss of Monitoring Control.

ABBREVIATIONS WITHIN THESE TABLES:

DPIE = Department of Planning, Industry & Environment

EMM = EMM Consulting (heritage consultants)

MSEC = Mine Subsidence Engineering Consultants

MNC = MNC Consulting (high resolution surveys)

RAP = Registered Aboriginal Party

SCT = SCT Operations

SMEC = SMEC (ground surveys)

TC = Tahmoor Coal

RISK ISSUE	TRIGGER	CONTROL PROCEDURES	TIMING & FREQUENCY	BY WHOM?
General Procedures				
	GREEN	**GNSS MONITORING**		
		Install Goaf GNSS unit 23 (located approximately 100 m inside the commencing end of LW W3)	Install GNSS unit 23 above LW W3 prior to commencement of LW W3 Continuous readings, with data averaged over 24 hours and recorded once per day until end of LW W3-W4	MNC
		Continuous, automated GNSS units 12A and 13 across Rockbar SR17	Continuous readings, with data averaged over 24 hours and recorded once per day until end of LW W3-W4	MNC
		Continuous, automated GNSS units across Tahmoor Western Domain Network as per MSEC Drawing No. MSEC1173-00-01	Continuous readings, with data averaged over 24 hours and recorded once per day until end of LW W3-W4	MNC
		HIGH RESOLUTION SURVEYS ACROSS ROCKBAR SR17		
		Seven (7) High resolution closure lines HRC-A to HRC-G inclusive *Note: Frequency will be increased if recommended by the Technical Committee if adverse changes are observed, as described later in the TARP*	Install and baseline survey prior to LW W3 Weekly after start of LW W3 Twice weekly after 20 mm of vertical subsidence is measured by the Initial Goaf GNSS unit 23, or the length of the extraction of LW W3 exceeds 150 metres, whichever occurs first Continue until agreed to reduce by Technical Committee	MNC
		GROUND SURVEYS ACROSS STONEQUARRY CREEK AND ROCKBAR SR17		
		Absolute 3D and relative 3D Rockbar SR17 surveys *Note: Frequency will be increased if recommended by the Technical Committee if adverse changes are observed, as described later in the TARP*	Absolute 3D monthly from start of LW W3 Relative 3D weekly after start of LW W3 Continue until agreed to reduce by Technical Committee	SMEC
		Valley closure monitoring lines across Stonequarry Creek (SQ104 to SQ120) and Cedar Creek (C102 to C106), as shown in Drawing No. MSEC1173 00-01. *Note: Frequency will be increased if recommended by the Technical Committee if adverse changes are observed, as described later in the TARP*	Weekly after 20 mm of vertical subsidence is measured by the Initial Goaf GNSS unit 23, or the length of the extraction of LW W3 exceeds 150 metres, whichever occurs first Continue until agreed to reduce by Technical Committee	SMEC
		Rockbar / Valley floor closure lines across Stonequarry Creek (SQ01 to SQ13, as shown in Drawing No. MSEC1173 00-01. *Note: Frequency will be increased if recommended by the Technical Committee if adverse changes are observed, as described later in the TARP*	Weekly after 20 mm of vertical subsidence is measured by the Initial Goaf GNSS unit 23, or the length of the extraction of LW W3 exceeds 150 metres, whichever occurs first Continue until agreed to reduce by Technical Committee	SMEC
		2D survey along LW W3 Centreline above commencing end of LW W3 from Peg CLW3-1 (Northernmost peg) to Peg CLW3-14 (Stonequarry WTP dam)	Weekly after 20 mm of vertical subsidence is measured by the Initial Goaf GNSS unit 23, or the length of the extraction of LW W3 exceeds 150 metres, whichever occurs first Continue until agreed to reduce by Technical Committee	SMEC
		VISUAL INSPECTIONS		
		Aboriginal heritage recording and visual inspection *Note: Frequency will be increased if recommended by the Technical Committee if adverse changes are observed, as described later in the TARP*	Baseline inspection complete End of LW W1 and W2 complete End of LW W3 and W4	EMM
		Detailed visual inspections, including measurement of existing joints and fractures and water level of pool upstream of Rockbar SR17	As per timing and frequency for High Resolution Surveys	MNC

RISK ISSUE	TRIGGER	CONTROL PROCEDURES	TIMING & FREQUENCY	BY WHOM?
	GREEN	Baseline photographs of 10 key joints plus additional baseline photograph of secondary joints *Note: Frequency will be increased if recommended by the Technical Committee if adverse changes are observed, as described later in the TARP*		
		3D photogrammetric survey at Rockbar SR17 *Note: Frequency will be increased if recommended by the Technical Committee if adverse changes are observed, as described later in the TARP*	Baseline inspection completed End of LW W1 and W2 complete End of LW W3 and W4	MNC
		GEOTECHNICAL MONITORING		
		Inclinometer monitoring of borehole adjacent to Rockbar SR17	Install and baseline survey subject to granting of approvals Weekly after installation Continue until agreed to reduce by Technical Committee	TC / SCT
		In situ stress measurement and continuous, automated stress change monitoring of borehole adjacent to Rockbar SR17	Install and in-situ stress measurement subject to granting of approvals Download weekly stress change measurements after installation Continue until agreed to reduce by Technical Committee	TC / SCT
		SURFACE AND GROUNDWATER MONITORING		
		Continuous surface water level monitoring of pool behind Rockbar SR17 (as part of Water Management Plan)	Downloaded and reported monthly	HCS /HEC
		Groundwater level monitoring along Stonequarry Creek (as part of Water Management Plan)	Downloaded and reported monthly	SLR
		Visual inspection of Stonequarry Creek upstream and downstream of Rockbar SR17	Monthly	Geoterra
		ASSESSMENT OF MONITORING RESULTS		
		Analyse and report results to Technical Committee	Weekly after start of LW W3	Refer Table 7.1
		Technical Committee discuss results, **consider whether any additional management measures are required and make recommendations** to Tahmoor Coal Steering Committee *Note: Frequency will be increased if recommended by the Technical Committee if adverse changes are observed, as described later in the TARP*	Weekly after start of LW W3 Continue until agreed to reduce by Technical Committee	Technical Committee

<table>
<tr><th>RISK ISSUE</th><th>TRIGGER</th><th>CONTROL PROCEDURES</th><th>TIMING & FREQ</th><th>BY WHOM?</th></tr>
<tr><td rowspan="11">Aboriginal grinding site experiences greater than negligible subsidence impacts, environmental consequences or loss of negligible value, as defined below:

Table A1: Definition of negligible loss of heritage value
<table><tr><th>Type of value</th><th>Subsidence effects within threshold of negligible loss of heritage value</th><th>Subsidence effects exceeding threshold of negligible loss of heritage value</th></tr><tr><td>Values of primary significance:

Aboriginal grinding groove features</td><td>No visually perceptible subsidence impacts such as cracking through grinding groove features.</td><td>Visually perceptible subsidence impacts such as cracking through grinding groove features.</td></tr><tr><td>Values of contributory significance:

Sandstone rockbar feature</td><td>Visually perceptible cracking of rockbar feature to a level comparable to existing naturally caused examples on rockbar</td><td>Visually perceptible cracking of rockbar feature to a level distinctly more severe than existing naturally caused examples on rockbar</td></tr></table><table><tr><th>Monitoring</th><th>Accuracy</th><th>Blue</th><th>Yellow</th><th>Red</th></tr><tr><td>HRC closure lines</td><td>+/- 0.5 mm</td><td>C, D, E, F or G > 2 mm</td><td>D or E > 10 mm</td><td>D or E > 15 mm</td></tr><tr><td>Visual inspections</td><td>-</td><td>N/A</td><td>New crack identified</td><td>Refer to trigger for HRC lines</td></tr><tr><td>Joint measurements</td><td>Photograph with measurement card +/- 0.5 mm</td><td>Baseline joint movement > +/- 0.5 mm</td><td>Baseline joint movement > +/- 1.0 mm</td><td>Refer to trigger for HRC lines</td></tr><tr><td>Strain across the grinding groove sites (3D array)</td><td>+/- 0.2 mm/m</td><td>Repeatable at 0.5 mm/m</td><td>Repeatable at 1.0 mm/m</td><td>Refer to trigger for HRC lines</td></tr><tr><td>GNSS closure SR17N-SR17S</td><td>+/- 3 mm</td><td>> 10 mm</td><td>Refer to trigger for HRC lines</td><td>Refer to trigger for HRC lines</td></tr><tr><td>GNSS 3D ground movements Site 23 (above Longwall W3)</td><td>+/- 5 mm</td><td colspan="3">Trending information only</td></tr><tr><td>Surface and Ground Water level monitoring</td><td>Variable</td><td colspan="3">Refer to Water Management Plan</td></tr><tr><td>3D survey marks at Rockbar SR17</td><td>+/- 3 mm</td><td colspan="3">Trending information only</td></tr><tr><td>4 x GNSS units at Stonequarry Creek - 3D ground movements</td><td>+/- 5 mm</td><td colspan="3">Trending information only</td></tr><tr><td>Valley closure lines upstream and downstream of Rockbar SR17</td><td>+/- 3 mm</td><td colspan="3">Trending information only</td></tr><tr><td>Stress cell (dependent on approval)</td><td>+/- 1 MPa</td><td colspan="3">Trending information only</td></tr><tr><td>Inclinometer (dependent on approval)</td><td>+/- 3 mm deflection</td><td colspan="3">Trending information only</td></tr><tr><td colspan="5">Note: The Technical Committee will assess information from all relevant monitoring devices into consideration when making recommendations.</td></tr></table>KEY ASSESSMENT CRITERIA
• The current length of extraction and rate of longwall retreat;
• Current and forecast weather conditions, particularly at times of survey;
• Development of conventional subsidence directly above and beyond the commencing end of LW W3;
• The current magnitudes and rates of change in mine subsidence movements along and across Stonequarry Creek. This includes absolute horizontal movements, closure or ground extension movements across Rockbar SR17;
• Indications of where valley closure might be concentrating within the valley – that is, whether it is concentrating at the interface between the Wianamatta Shale and Hawkesbury Sandstone above the horizon of the rockbar, or whether it is concentrating at particular joints or bedding planes within Rockbar SR17, or whether it is distributing uniformly across the width of Rockbar SR17.</td><td>GREEN</td><td>Follow general procedures (as listed above)</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">BLUE</td><td>Contact Technical Committee and arrange teleconference</td><td>Within 24 hours</td><td>TC</td></tr>
<tr><td>Technical Committee undertake following action(s) in consideration of Key Assessment Criteria:
o increase survey frequencies
o increase visual inspections of rockbar
o increase frequency of Technical Committee assessments and meetings
o conduct additional monitoring and inspections as required
o consider whether any other additional management measures are required
o assess all available monitoring data for trends and forecast if and/or when the YELLOW trigger levels might be exceeded</td><td>Technical Committee meet via teleconference within 24 hours</td><td>Technical Committee</td></tr>
<tr><td rowspan="4">YELLOW</td><td>Report details of exceedance of trigger level and actions undertaken</td><td>Within one week</td><td>TC</td></tr>
<tr><td>Stop the progress of longwall</td><td>Immediately (subject to mine safety requirements)</td><td>TC</td></tr>
<tr><td>Contact Technical Committee and arrange teleconference</td><td>Technical Committee meet via teleconference ASAP (no later than 24 hours)</td><td>TC</td></tr>
<tr><td>Technical Committee to review potential of exceedance of performance measures (refer to Table A1) in consideration of Key Assessment Criteria and provide a formal Report to the Steering Committee recommending either continued Longwall operations or cessation and relocation of longwall equipment

Review all available monitoring data for trends including:
o arrange visual inspection by Technical Committee member(s) as appropriate
o arrange visual inspection by Aboriginal heritage consultant and RAP representative(s)
o increase survey and/or inspection frequencies as appropriate
o increase frequency of Technical Committee assessments as required
o conduct additional monitoring and inspections as required
o implement additional management measures as required
o forecast if and/or when the RED trigger level might be exceeded
o consider reducing longwall retreat rate
Make recommendation to Steering Committee</td><td>Within 24 hours

Within one week</td><td>TC

Technical Committee</td></tr>
<tr><td rowspan="4">RED</td><td>Stop Longwall operations</td><td>Immediately</td><td>TC</td></tr>
<tr><td>Contact Technical Committee and arrange teleconference</td><td>Technical Committee meet via teleconference asap (no later than 24 hours)</td><td>TC</td></tr>
<tr><td>Technical Committee meet to determine new start location for Longwall Operations based on all available monitoring data for trends and consideration of Key Assessment Criteria.
Additional actions include:
o arrange visual inspection by Technical Committee member(s) as appropriate
o arrange visual inspection by Aboriginal heritage consultant and RAP representative(s)
o increase survey and/or inspection frequencies as appropriate
o increase frequency of Technical Committee assessments as required
o conduct additional monitoring and inspections as required
o implement additional management measures as required
Make recommendation to Steering Committee</td><td>Technical Committee meet via teleconference asap (no later than 24 hours)</td><td>Technical Committee</td></tr>
<tr><td>Cease Longwall operations and safely relocate to new start position defined by the Technical Committee</td><td>Within 24 hours</td><td>TC</td></tr>
<tr><td>Loss of monitoring measures due to damage, vandalism or flooding</td><td>GREEN</td><td>Follow general procedures (including multiple redundancies in monitoring system including backup prism for HRC-E, GNSS units 12A and 13, SMEC Rockbar SR17 survey)</td><td>-</td><td>-</td></tr>
</table>

RISK ISSUE	TRIGGER	CONTROL PROCEDURES	TIMING & FREQ	BY WHOM?
	Loss of Monitoring Control	Expert Technical Committee meet and consider whether any additional management measures are required, including: o reinstate monitoring controls (e.g. HRC-E Line) o apply trigger levels to other HRC Lines o increase monitoring and reporting procedures	As required	Expert Technical Committee
		Report details of exceedance of trigger level and actions undertaken	Within 24 hours	TC
	Forecast of extreme wet weather	Expert Technical Committee meet and consider whether any additional management measures are required, including: o bring forward ground surveys and other monitoring activities ahead of the forecast wet weather event o additional inspections or monitoring before or after the weather event o consider actions if monitoring and visual inspections of the rockbar is not possible for an extended period of time after the wet weather event	As required	Expert Technical Committee
		Report details of weather event and actions undertaken	Within one week	TC

Appendix E – Myrtle Creek Rehabilitation Report

17 November 2020

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TAH5179A_Rev1

Dear Andrew

UPDATE OF REMEDIATION OUTCOMES AT POOL 23 ON MYRTLE CREEK

Please find herein an update of remediation outcomes at Pool 23 on Myrtle Creek following Stage 1 of the Corrective Management Action Plan (CMAP) for Myrtle Creek.

1. INTRODUCTION

Myrtle Creek, a tributary to the Nepean River, defines the northern boundary of the township of Tahmoor in the Southern Highlands of New South Wales. The creek was incrementally impacted by the subsidence associated with longwall mining at Tahmoor Coal Mine leading to cracking of rock in the creek bed and loss of surface water from the creek. Tahmoor Coal Pty Ltd (Tahmoor Coal), the owner of the mine, completed Stage 1 of the CMAP at Pool 23 in February 2020. Tahmoor Coal commissioned SCT Operations Pty Ltd (SCT) to prepare this report updating the remediation outcomes at Pool 23 to mid-September 2020.

Figure 1 shows comparative photographs of Pool 23 before and after remediation.

The remediation trial at the Pool 23 rock bar on Myrtle Creek has shown a pattern of polyurethane injection into the fracture network to be effective as a strategy to maintain water in a subsidence impacted pool for an extended period. Aesthetic values have improved since remediation was completed and the pool returned to overflow level. SCT understands that the boreholes used for the remediation have been filled with textured concrete blend to reduce any signs of the work having taken place.

Monitoring indicates that the water level in Pool 23 has remained full or close to full since the work was completed and a heavy rainfall event on 6 February 2020 filled the pool. A grout curtain wall in a similar arrangement however with less emphasis on characterisation is likely to be effective at other sites where remedial action may be required.

a) 15 February 2019.

b) 20 August 2020.

Figure 1: Comparative photographs of Pool 23 before and after remediation.

This report is structured to present:

- a description of the Pool 23 site and a summary of the remediation work that was undertaken
- a review of the monitoring undertaken since the completion of remediation works
- recommended improvements to simplify the completion criteria and make them more relevant at other sites
- next steps for monitoring Pool 23.

2. SITE DESCRIPTION AND REMEDIATION

Figure 2 shows a plan of Myrtle Creek and the location of Pool 23 superimposed onto a 1:25,000 topographic series map of the area. The catchment upstream of the site is approximately 7km^2 in area. Average rainfall between 2004 and 2016 is approximately 760mm/yr.

There is a flow station known as M7 located approximately 520m downstream of Remembrance Drive at CH1909m. This station has been in operation since 2010 and provides a near continuous record of the flow in the creek at this point. The catchment area above M7 is approximately 8km^2 in area. Figure 3 shows the time weighted stream discharge duration curve for Myrtle Creek. This plot shows that natural flow in Myrtle Creek averages approximately 1Ml/day but is less than 0.1Ml/day for approximately 15% of the time.

Pool 23 was incrementally impacted by the subsidence associated with longwall mining at Tahmoor Coal Mine from Longwall 26 to Longwall 28 leading to cracking of rock in the creek bed and loss of surface water from the creek so that Pool 23 was mostly dry. Myrtle Creek was undermined by Longwall 26 during mid – end August 2011, Longwall 27 early – late March 2013, and Longwall 28 mid-May – early June 2014.

A Section 240 Notice was issued by the Division of Resources and Geoscience on 5 December 2016 (Tahmoor Coal 2019) leading to the development of the Myrtle Creek Plan (CMAP). Myrtle Creek CMAP was approved by the NSW Resources Regulator on 11 October 2018.Tahmoor Coal, the owner of the mine, contracted Pointe Engineering Pty Ltd (Pointe) to undertake a remediation trial at Pool 23 using polyurethane filler. Characterisation work was undertaken between 23 September 2019 and 11 November 2019. Remediation works began in early October 2019 and were completed in early-February 2020.

Remediation works involved filling mining induced fractures in the rock retaining Pool 23 and in the bed of Myrtle Creek immediately upstream with a hydrophobic polyurethane resin (PUR) called Spetec H100). Details of the work are described in Pointe Engineering (2020) from which the following summary is drawn.

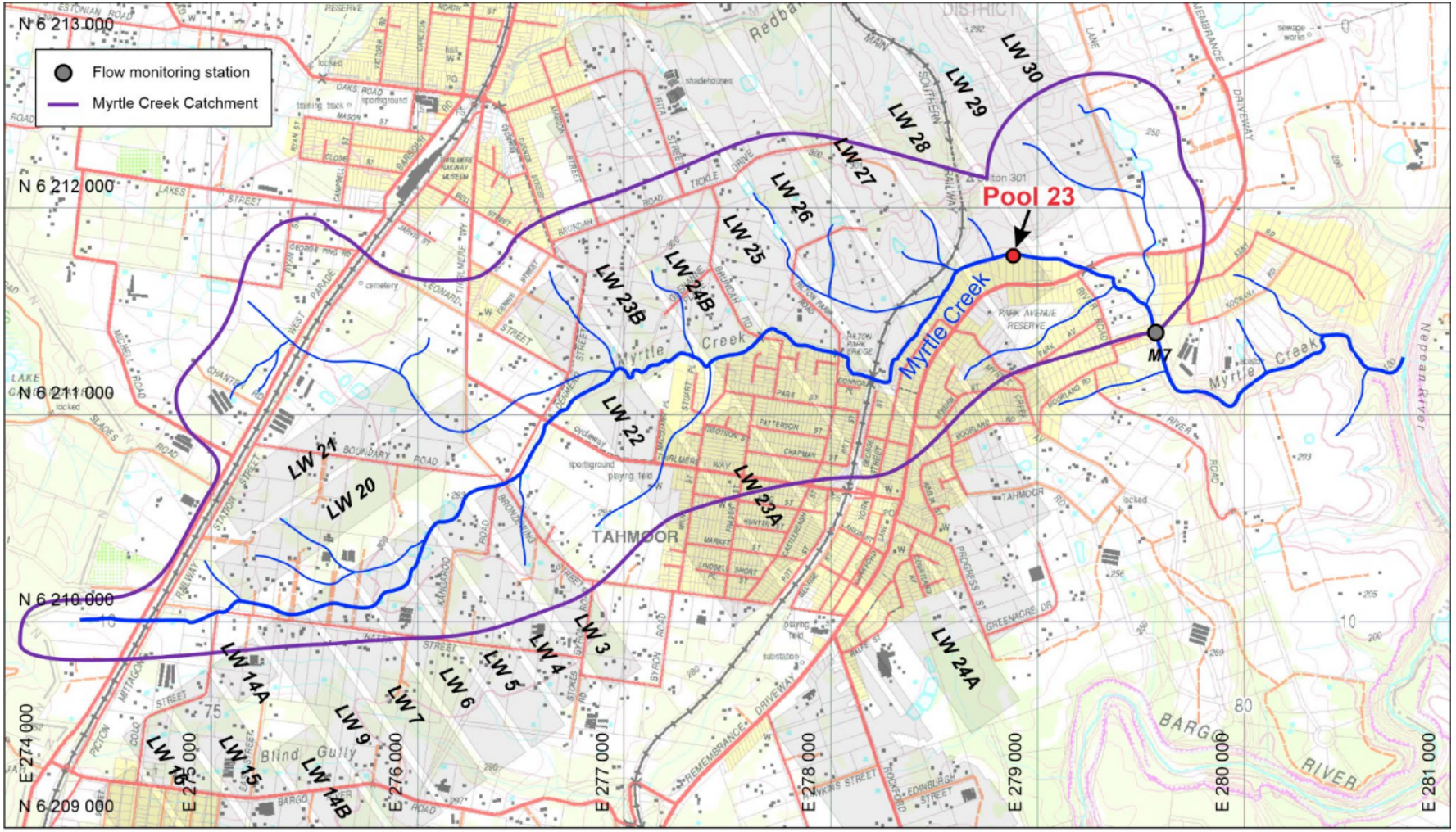


Figure 2: Site plan showing Myrtle Creek catchment and location of Pool 23 relative to longwall panels superimposed on a 1:25,000 topographic series base.

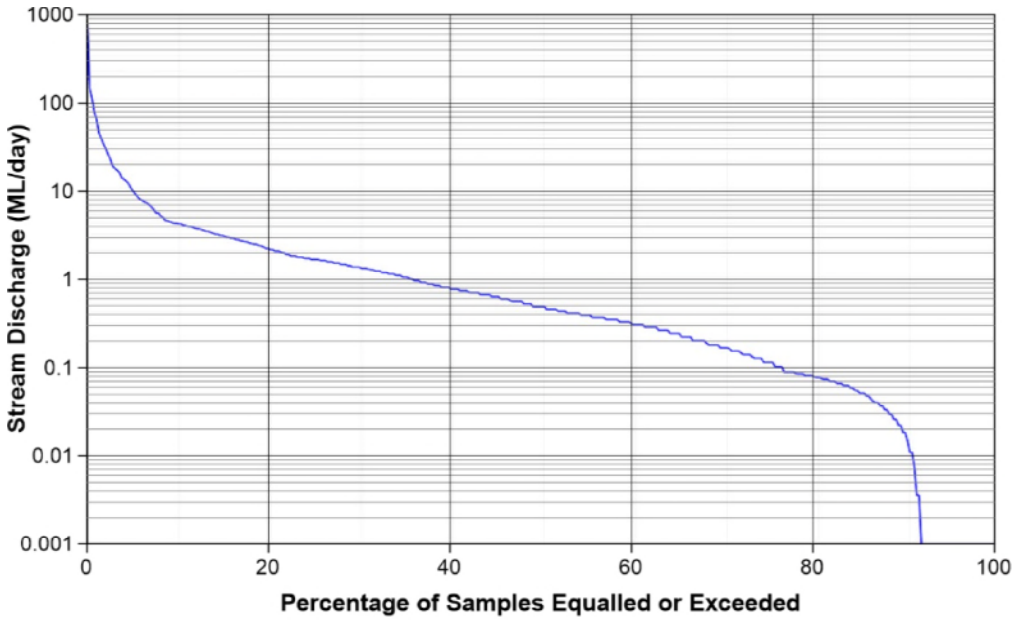


Figure 3: Time weighted stream discharge duration curve (after Hydrometric Consulting Services 2020).

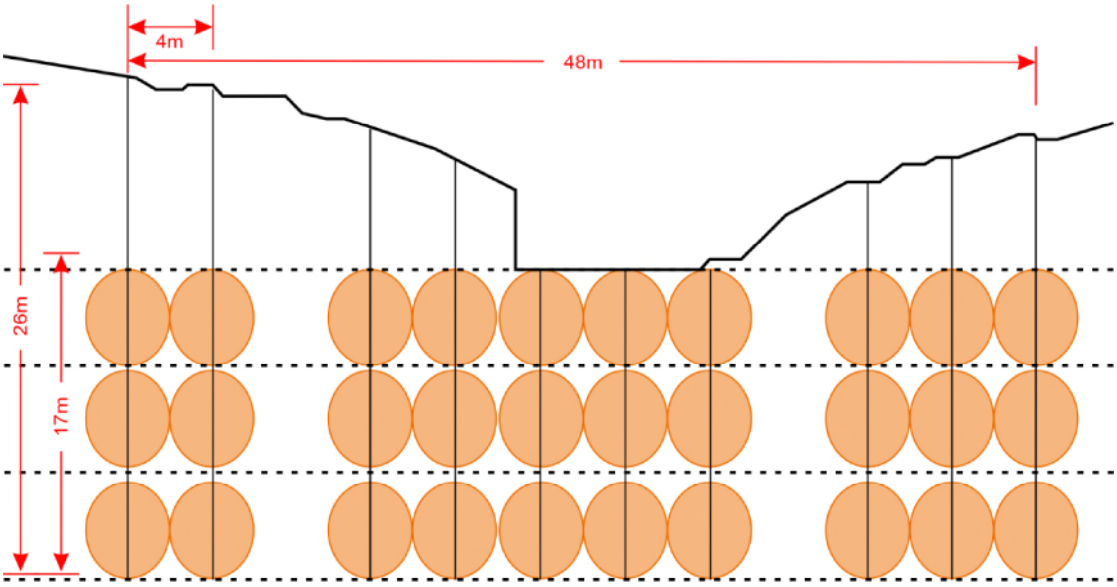
PUR filling was undertaken in four stages:

1. a curtain wall to 17m below rock bar taking 1200 litres of PUR
2. a curtain infill to 2m below the rock bar taking 400 litres of PUR
3. a grid pattern to 1m in the floor of Pool 23 taking 420 litres of PUR
4. a curtain infill to 7m below the rock bar taking 1500 litres of PUR.

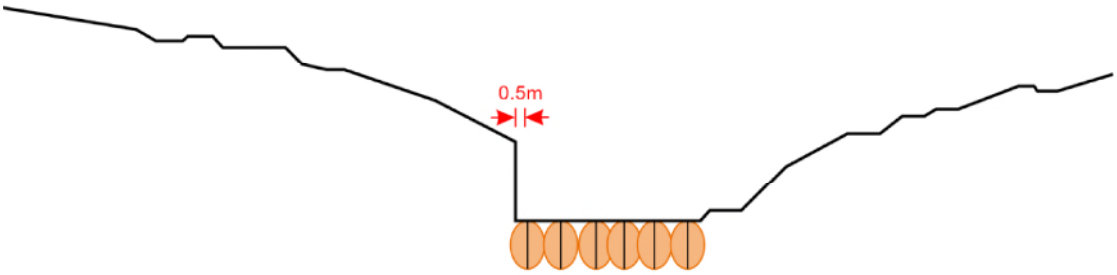
The approximate fill patterns from these four stages are shown in Figure 4.

The remediation works began as ten characterisation boreholes drilled across the site between 23 September 2019 and 11 November 2019. These boreholes were nominally 4m apart with two left out because of surface constraints. The boreholes were drilled in a line stretching 44m across the rock bar downstream of Pool 23 perpendicular to the creek flow. The boreholes were drilled vertically to a depth 17m below the rock bar overflow. Fractures were characterised along the full length of each borehole using a borehole camera, calliper log and packer testing. The core was also inspected and logged.

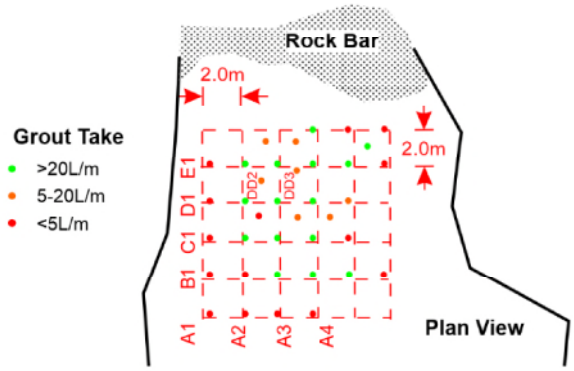
A baseline pool recession rate (PRR) test was undertaken on 3 October 2019. Approximately 13,000 litres of water were pumped into Pool 23 and the rate of lowering of the water level was monitored. The water level dropped to empty in a few hours.



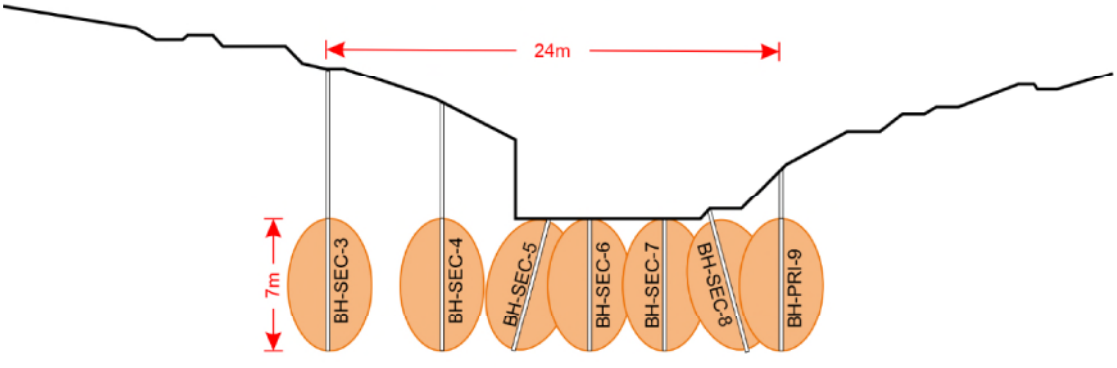
a) Stage 1.



b) Stage 2.



c) Stage 3.



d) Stage 4.

Figure 4: Stages of PUR Grouting at Pool 23.

Stage 1 grouting involved injection into the characterisation boreholes in three intervals from the bottom up. Although 1200 litres of PUR were injected, the cross flow between holes limited the effectiveness of this initial treatment. No change in PRR was observed.

Stage 2 grouting involved injecting 400 litres of PUR into twenty, 38mm diameter holes drilled to 2m below surface of the rock bar using a pneumatic hammer. The initial line of holes across the rock bar was split and secondary, tertiary, and quaternary holes drilled and injected at a final spacing of approximately 0.5 m. A reduction in PRR was observed with the water level taking 20 hours to drop to empty.

Stage 3 grouting involved injecting 450 litres of PUR into 37, 1m deep holes drilled into the floor of Pool 23 on an approximately 2m grid extending 12m by 14m with some infill holes. A further reduction in PRR was observed with the water level taking approximately 100 hours to drop to a residual level.

Initial characterisation drilling confirmed the presence of a significant fracture system at approximately 6m below the surface of the rock bar. Stage 4 grouting targeted this fracture system. Seven, 76mm diameter boreholes were drilled to a depth of 7m below the rock bar along a 24m section along the alignment of the Stage 1 grouting. The holes were drilled using a portable drill rig and mud flush system. In total, approximately 1500 litres of PUR in total were injected into these holes.

A heavy rainfall event commencing 7 February 2020 that continued for nearly a fortnight coincided with the end of the Stage 4 injection. Pool 23 filled during that event and has remained full since.

3. MONITORING OF POOL 23

The intent of the remediation is to return water to surface pools for extended periods consistent with the pre-mining state of Myrtle Creek.

Figure 5 shows the water level measured in Pool 23 since 2010 and the rainfall residual over the same period. Prior to mining beneath Myrtle Creek, Pool 23 remained substantially full, even during extended periods without rain. The progressive impacts of mining Longwalls 26, 27 and 28 are apparent in the water level of Pool 23. Between September 2011 and completion of remediation in February 2020, increasingly rapid drops in pool level following flow events associated with heavy rainfall and extended periods when the pool was empty are evidence of the increased fracturing associated with mining each successive longwall panel.

Remediation activities in late 2019 and early 2020 show an increase in pool level back to slightly above pre-mining levels. The discrepancy between pre and post mining levels is most likely a result of subsidence movements and re-establishment of the flow level monitoring device.

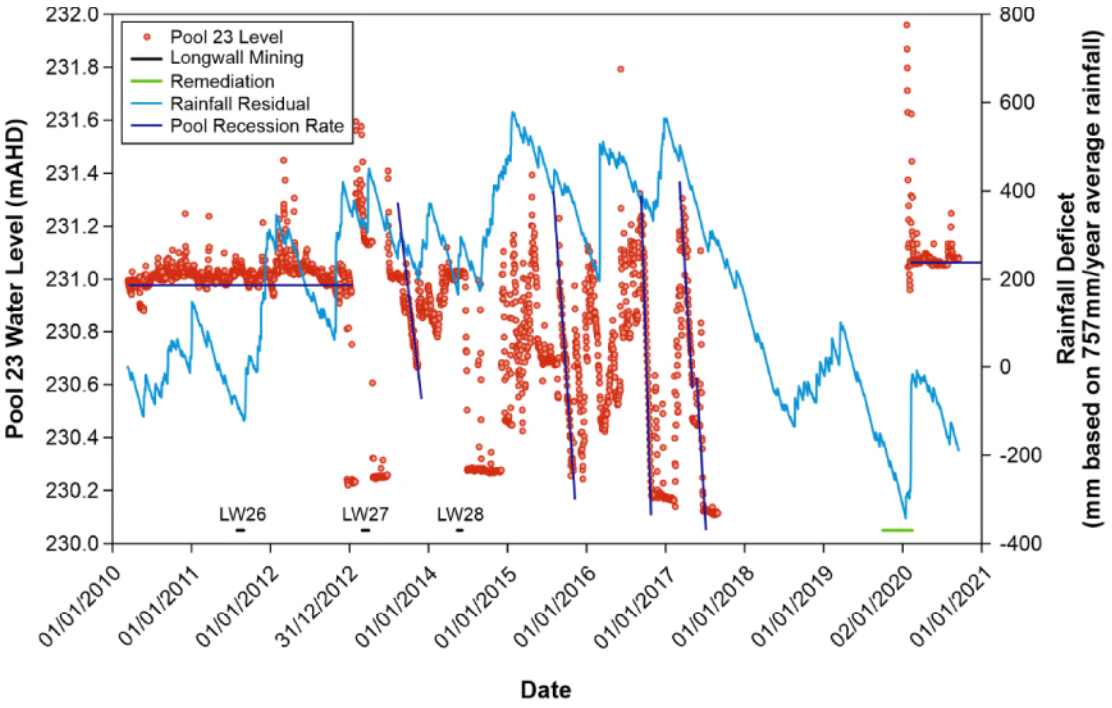


Figure 5: Water level in Pool 23 observed since 2010 and rainfall deficit over the same period.

Long term rainfall trends are apparent as the running difference between a long-term average and the cumulative rainfall that is measured to any given point in time. This difference is referred to as rainfall residual or rainfall deficit. Heavy rainfall events are evident as sharply increasing values of rainfall residual. Decreasing rainfall residual indicates extended periods of below average rainfall.

Since the beginning of 2017, there has been an ongoing trend of below average rainfall. Lower rainfall residual is expected to result in lower flows in Myrtle Creek and increased potential for Pool 23 to fall below full. However, since the remediation was completed in early 2020, there is no evidence of Pool 23 dropping below full even though the rainfall residual remains low and cumulative rainfall below long-term average.

Experience in the Bargo River and at other sites indicates that when a pool remains substantially full, biological activity and sediment trapped within the pool will gradually seal any remaining leakage paths. Visual observations suggest that these natural processes are taking place at Pool 23.

The flow regime in Myrtle Creek is such that there are times when there is very low flow and under these conditions evaporation rates are recognised as sufficient to reduce pool levels. The challenge for assessing remediation effectiveness is finding a completion criterion that achieves the intent of maintaining Pool 23 full for extended periods of no rain.

Pool 23 has remained full and overflowing for the eight months since remediation activities were completed in early February 2020. It appears likely that Pool 23 has been successfully remediated, but ongoing monitoring over an extended period is recommended to confirm this success.

4. Implications for Completion Criteria at Other Sites

The intent of the remediation is to return water to surface pools for extended periods consistent with the pre-mining state of Myrtle Creek. The flow regime in Myrtle Creek is such that there are times when there is very low flow and under these conditions evaporation rates may reduce water levels in some pools as it did prior to mining. The challenge for determining remediation effectiveness is finding a completion criterion that achieves the intent of the remediation.

Learnings from Myrtle Creek CMAP demonstrated that indirect methods based on hydraulic conductivity measurements or percentage fracture filling are not able to be measured reliably and do not directly indicate successful remediation. We recommend that indirect criteria based on borehole testing should not be used as a measure of remediation success.

We recommend instead to determine remediation effectiveness using pool recession rate (PRR) as the criteria because this rate directly measures whether the intent of the remediation has been met. PRR testing involves part filling the pool with a large volume of water, nominally 10,000 litres and measuring the rate at which the water level recedes. When the recession rate is low enough that water is retained within the pool for extended periods without the level dropping significantly, the remediation can be considered effective.

PRR testing is complicated by the background flow in the creek. If the flowrate is high, even pools that have not been remediated run full. However, when the flowrate drops, leakage through subsurface fracture networks accounts for a larger proportion of total flow and eventually all flow is accommodated within the fracture network and surface pools no longer contain water.

Reducing the PRR of a pool to a level where the pool remains full most of the time provides a good environmental outcome. To confirm this success over a longer term, we recommend remediated pool levels are monitored for approximately two years. Experience in the Bargo River and at other sites indicates that pools that hold water for extended periods tend to self-seal. If a pool can be remediated to the extent that it holds water most of the time over two years, its ability to hold water is likely to improve further with time.

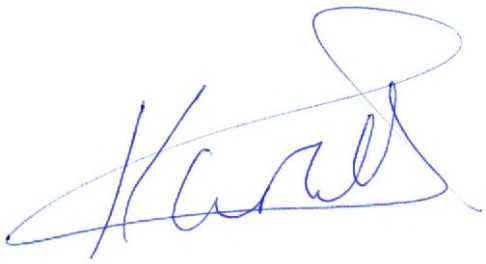
For future sites, the PRR test appears likely to provide the most relevant method for determining remediation effectiveness during the period of treatment. Monitoring pool levels and natural recession rates over an extended period of time provides a method of confirming overall remediation success. Indirect methods based on hydraulic conductivity measurements or percentage fracture filling are not able to be measured reliably and do not directly indicate successful remediation.

5. FURTHER MONITORING AT POOL 23

The existing monitoring of water levels at Pool 23 appears to provide convincing evidence of remediation success at this site. After a period of 8 months remaining full, it is very likely that Pool 23 will continue to remain full as natural remediation processes take over. If a continuation of this monitoring until the end of 2021, a period of two years since remediation, shows Pool 23 remains full, it would be reasonable to contend that the completion criteria has been met.

If you have any queries or require further clarification of any of the issues raised, please do not hesitate to contact me.

Yours sincerely



Ken Mills
Principal Geotechnical Engineer

REFERENCES

Hydrometric Consulting Services 2020, Time Weighted Stream Discharge Duration Curve, Output 16 November 2020.

Appendix F – Nepean Fault and SR17 Report

Strata Control Technology

TAHMOOR COAL PTY LTD

Assessment of Rockbar SR17 and Nepean Fault Complex to Support LW W3 and W4 Extraction Plan

TAH5229

Mining Research and Consulting Group

SCT Operations Pty Ltd PO Box 824 Wollongong NSW 2520 Australia
Phone: +61 2 4222 2777 Email: sctnsw@sct.gs Website: www.sct.gs
ABN 23 078 328 953

REPORT TO April Hudson
Approvals Specialist
Tahmoor Coal Pty Ltd
2975 Remembrance Drive
TAHMOOR NSW 2574

TITLE Assessment of Rockbar SR17 and Nepean Fault Complex to Support LW W3 and W4 Extraction Plan

REPORT NO TAH5229

PREPARED BY Ken Mills

DATE 1 February 2021

Report No	Version	Date
TAH5229	Draft	25 January 2021
TAH5229 Rev 1	Draft	29 January 2021
TAH5229 Rev 2	Draft	1 February 2021
TAH5229	Final	1 February 2021

Ken Mills
Principal Geotechnical Engineer

SUMMARY

Tahmoor Coal Pty Ltd (TC) owns and operates Tahmoor Coal Mine (Tahmoor Mine), an underground coal mine located approximately 80km south west of Sydney. TC is currently preparing an Extraction Plan (EP) for Longwalls West 3 and West 4 (LW W3-W4) that will start near Rockbar SR17 on Stonequarry Creek and mine sub-parallel to the Nepean Fault Complex (NFC) located to the east. TC commissioned SCT Operations Pty Ltd (SCT) to assess potential impacts of the proposed mining on Rockbar SR17 (SR17) and the potential for the NFC to influence subsidence behaviour in the subject area. This report presents our assessment of these two issues.

Valley closure movements at SR17 are expected to be small. SR17 is located at the start of LW W3. In this location, the three processes that are recognised to cause horizontal movements are expected to cancel each other out. The low levels of ground movement observed along Stonequarry Creek to date support this expectation but monitoring from LW W2 will be more informative because of the closer proximity of mining. Predicted valley closure movements are not expected to cause significant impacts at SR17 or cause any loss of water from the pool retained by SR17. Some opening of existing joints and the formation of some small fractures is considered possible as minor readjustments occur in the ground around the rockbar. However, these impacts are expected to be minor in the context of the existing joints and the general character of the site.

Mining LW W3-W4 is expected to cause an increase in maximum subsidence over extracted longwall panels close to the NFC similar to the increased subsidence observed over the starts of LW 24A, 25 and 32. The magnitude of maximum subsidence is expected to be higher than is typically observed in the Southern Coalfield for similar geometries and up to 50% higher over LW W4. The increased subsidence is expected to be manageable under existing TC subsidence management plans and of no particular significance.

Additional mechanisms associated with mining close to the NFC were investigated in the context of potential as principal hazards under *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*. These included:

1. The potential for greater than predicted subsidence beyond the panel edges.

2. The potential for unconventional subsidence movements occurring over the panels and beyond the footprint of mining.

3. The potential for movements that might occur more quickly than conventional subsidence and increase micro-seismic activity.

None of these mechanisms are considered likely to have potential to contribute to outcomes with potential to be principal subsidence hazards.

TABLE OF CONTENTS

PAGE NO

1. INTRODUCTION

Tahmoor Coal Pty Ltd (TC) owns and operates Tahmoor Coal Mine (Tahmoor Mine), an underground coal mine located approximately 80km south west of Sydney. TC is a wholly owned entity within the SIMEC Mining Division of the GFG Alliance Group. TC is currently preparing an Extraction Plan (EP) for LW W3-W4 that will start near Rockbar SR17 on Stonequarry Creek and mine sub-parallel to the Nepean Fault Complex (NFC) located to the east. SIMEC commissioned SCT Operations Pty Ltd (SCT) to assess potential impacts of the proposed mining on Rockbar SR17 (SR17) and the potential for the NFC to influence subsidence behaviour in the subject area. This report presents our assessment of these two issues.

The report is structured as:

- Section 2 presents the conclusions of our assessment.
- Section 3 presents a description of the site.
- Section 4 presents an assessment of the potential impacts of proposed mining on SR17.
- Section 5 presents an assessment of the potential influence on the NFC on subsidence associated with the project.

SR17 was inspected on 23 September 2020 but our assessment is predominantly a desktop assessment. Further detail and context of these sites and subsidence monitoring more generally can be found in MSEC (2021). It is not intended to reproduce that detail here.

Figure 1 presents an overview of the site and the relationship of previous and proposed longwall panels to SR17 and the NFC.

2. CONCLUSIONS

The main findings of our investigation are presented in this section. More detail is provided in subsequent sections.

2.1 Impacts to Rockbar SR17

Subsidence effects in the form of valley closure movements at SR17 are expected to be small because of the location of SR17 at the start of LW W3. In this location, the three processes recognised to cause horizontal movements are expected to cancel each other out. The low levels of ground movement observed to date along creeks adjacent to LW W1 support this expectation. Valley closure after mining LW W3-W4 is expected to be less than 70mm and, considering the mechanics of horizontal movements about longwall panels, much less. This closure is not expected to be large enough to cause significant impacts at SR17. Monitoring results from mining LW W2 will become available to provide further detail of the magnitude of valley closure along Stonequarry Creek and the valley closure that can be expected at SR17.

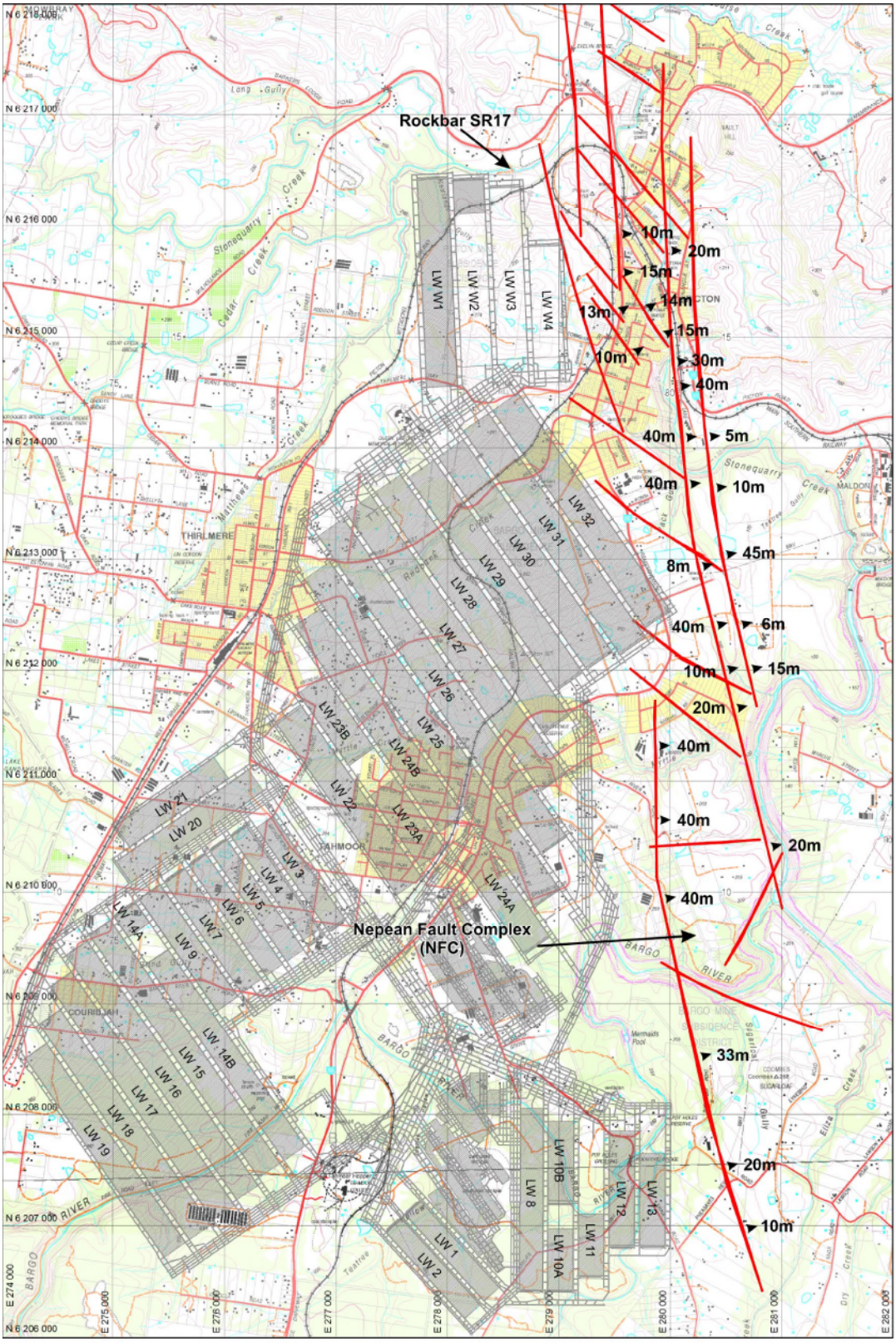


Figure 1: Tahmoor Mine, Rockbar SR17 and Nepean Fault Complex superimposed on 1:25,000 topographic map.

MSEC (2021) estimates valley closure at SR17 of 70mm from mining LW W3-W4 based on a comprehensive empirical dataset of measured valley closure. This dataset is general in nature and is not intended to account for the mechanics of the processes that cause horizontal subsidence movements. For instance, no differentiation is made between valley closure at the start and end of longwall panels. When allowance is made for the processes that cause horizontal movements, valley closure at SR17 at the start of LW W3 is expected to be much less than 70mm.

Some opening of existing joints and the formation of some small fractures is considered possible as minor readjustments occur in the ground around the rockbar. However, these impacts are expected to be minor in the context of the existing joints and the general character of the site.

Barbato et al (2014) report that 70mm of valley closure is unlikely to cause loss of water from the pool retained by SR17.

2.2 Influence of Nepean Fault

The shear stiffness of the overburden strata is expected to be reduced close to the NFC because of previous movements over geological time on the fault structures within this complex. A reduction in the shear stiffness of the overburden strata associated with strata weathering caused by proximity to the Bargo River Gorge was observed to cause an increase in subsidence over LW 24A and LW 25. Mining LW W3-W4 is expected to cause a similar increase in maximum subsidence over extracted longwall panels close to the NFC similar to that observed at the start of LW 32.

The magnitude of maximum subsidence is expected to be higher than is typically observed in the Southern Coalfield for similar panel geometries and overburden depths. Maximum subsidence may be up to 50% higher over LW W4 than is typical for this geometry and overburden depth. The increased subsidence is expected to be manageable under existing TC subsidence management plans and of no particular significance.

Additional mechanisms associated with mining close to the NFC are investigated in this report to provide a thorough and systematic review of all the subsidence outcomes that could reasonably be considered to have potential to be significant. None of these mechanisms is likely to cause outcomes with potential to be principal hazards under *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

The following potential subsidence outcomes were investigated:

1. The potential for greater than predicted subsidence beyond the panel edges.

2. The potential for unconventional subsidence movements occurring over the panels and beyond the footprint of mining including at or across the Nepean Fault because of mining close to the NFC.

3. The potential for movements that might occur more quickly than conventional subsidence because of the presence of the fault and increase normal mining related micro-seismic activity due to the isolating effect of the fault.

Our investigations indicate that none of these mechanisms is likely to be a principal subsidence hazard.

The only subsidence monitoring at Tahmoor Mine that extends across the Nepean Fault is monitoring associated with LW 13; a panel mined in the southeast part of the mine in the early 1990's (see Figure 1). This monitoring extended partly across the projected fault outcrop. No unusual or unconventional subsidence behaviour was observed at the projected fault outcrop.

Abnormal subsidence causing greater than predicted subsidence is observed near the south-eastern ends of the longwall panels from LW 24A, LW 25 and LW 32, but this greater than predicted subsidence over the panel is not associated with significantly greater than predicted subsidence beyond the panel edges. If greater than predicted subsidence occurs over LW W3-W4, subsidence outside the panel footprint is expected to be less than predicted because of the lower overburden shear stiffness.

Unconventional subsidence movements are possible within the subject area unrelated to the presence of the NFC. Step changes at the fault are not expected but would be of small magnitude, less than a few tens of millimetres, if they were to occur. Unconventional subsidence movements observed at Tahmoor previously were identified early and successfully managed with the existing subsidence management plans. This approach is expected to be effective above LW W3-W4 as well.

Mining induced micro-seismicity occurs routinely as the overburden strata fractures and moves downward toward the void created by longwall mining. The high stresses and absence of massive strata in the Southern Coalfield of NSW mean that fracturing and downward movement occurs gradually and incrementally as the longwall retreats. The micro-seismic activity associated with this ground movement occurs regularly and so has low magnitude. Disturbance of the ground around the NFC is expected to reduce the strength of the ground, increase the frequency of micro-seismic events, and reduce their magnitude.

3. SITE DESCRIPTION

Figure 2 shows a plan of the site, LW W3-W4, SR17 and traces of the NFC based on surface mapping (SCT 2018 and 2020) and in-seam drilling.

TC is planning to mine a 2.1m thick section of Bulli Seam with LW W3-W4 forming voids that are 283m and 285m wide respectively including gateroads. The seam dips to the northeast at approximately 1 in 20. The overburden depth is approximately 470m at the start of LW W3 and approximately 550m at the start of LW W4. The overburden section comprises approximately 310m of Narrabeen Group sandstones and siltstones, up to 185m of Hawkesbury Sandstone, and a cap of Wianamatta Shale at the surface.

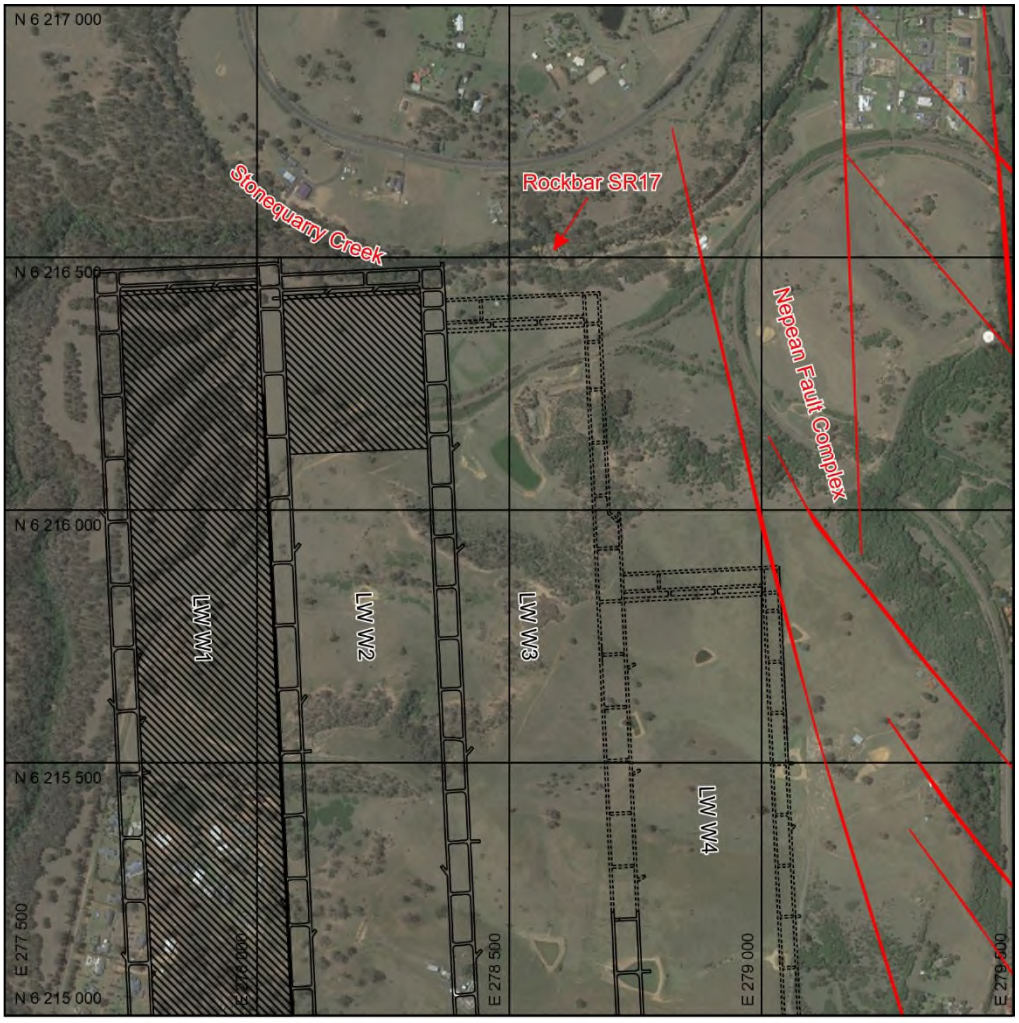


Figure 2: Site plan showing LW W3 - W4 relative to Rockbar SR17, Stonequarry Creek and the Nepean Fault Complex.

SR17 is a broad flat area of exposed rock located on Stonequarry Creek. SR17 is formed within the upper part of the Hawkesbury Sandstone outcrop. The rockbar extends between 100m and 160m north of the start line of LW W3. The rockbar is approximately 40m wide and 70m long. The rockbar is accessible by road and used as a ford; part of which is concreted. Endeavour Energy has installed a power pole on the rockbar to provided 11kV power to private properties on the south side of Stonequarry Creek including Stonequarry Wastewater Treatment Plant. There are up to 120 Aboriginal heritage grinding groove sites located on the rockbar. The site is assessed as having high significance as a heritage site (EMM 2020).

The NFC is located to the east of LW W3-W4 with one branch expected to come close to the northeast corner of LW W4. The NFC is a geological structure that trends for over 85km starting north of Richmond and extending south to south of Bargo. The structure is commonly described as a monocline in the north.

Mapping of surface outcrop indicates a series of en-echelon faults with multiple conjugate fault segments and splays (SCT 2018 and SCT 2020). A complex of ramping strata between fault segments form monoclinal sections.

Fault segments show variable vertical displacement as fault throws reduce towards the terminal ends of each fault segment. This style of faulting strata deformation results in the terrain and the rock type present at the surface reflecting the geometry of the faults.

4. POTENTIAL SUBSIDENCE IMPACTS AT SR17

This section presents the subsidence movements and impacts expected at SR17 from mining LW W3-W4. Valley closure movements at SR17 are expected to be small because of the location of SR17 at the start of LW W3 where the three recognised processes that cause horizontal movements tend to cancel each other out. Valley closure movements of less than a few tens of millimetres are expected when LW W3 is mined. These movements are not expected to be large enough to cause significant impacts at SR17. Monitoring results from mining LW W2 will become available to provide further detail of the magnitude of valley closure along Stonequarry Creek.

4.1 Mechanics of Horizontal Movements

There are three main processes recognised to contribute to horizontal subsidence movements observed on the surface, systematic, stress relief and topographic movements. An overview of these processes is presented in this section to show how they combine to reduce ground movements at the start of each longwall panel. More detail and discussion of these three components is presented in Mills (2014).

Systematic or conventional horizontal movements occur wherever there is active subsidence. The surface moves initially toward the freshly created void and subsequently in the direction of mining. Systematic movements typically have a magnitude of less than about 200-300mm and are largest over the start line of each longwall panel where movement toward the freshly created void and the direction of movement are additive.

Stress relief movements occur when tectonic energy stored as horizontal stress within the overburden strata is released by mining subsidence. When the horizontal stresses are high, the magnitude of this horizontal stress relief movement is typically less than 200mm at the goaf edge but continues gradually away from the panel and may be measurable for some kilometres from active mining. Stress relief movements cause only small differential movements and are generally imperceptible.

Topographic or dilational movements occur in sloping terrain. When the overburden subsides incrementally, fractures are formed within the rock causing the overall volume of the rock to increase by the volume of the fractures. The topographic component occurs in a downslope direction and depending on the terrain may have a magnitude much larger than the other two components, typically in the range 0.3-0.5 times vertical subsidence (300-500mm) and sometimes more than the magnitude of vertical subsidence in steep terrain. This movement typically occurs on bedding planes and is commonly referred to as valley closure because the horizontal movement in a downslope direction causes the sides of valleys to move together.

When mining away from a river valley or other topographic low point, systematic movements and stress relief movements occur in a direction toward the longwall panel and downslope movement associated with topography occurs in the opposite direction toward the river. In this situation, the three components of horizontal movement tend to cancel each other out and valley closure movements are significantly reduced as a result.

4.2 Predicted Movements

MSEC (2021) predicts subsidence movements at Rockbar SR17 from mining LW W3-W4 of 40mm vertical and 70mm horizontal valley closure. Allowing for significantly lower levels of valley closure expected at the start of longwalls mining away from creeks, rock fracturing at SR17 is expected to be slight. No loss of surface water is expected over SR17.

The methodology used by MSEC to estimate valley closure uses a comprehensive empirical data set of valley closure, but one that does not differentiate closure movements based on location relative to a panel. Valley closure movements near the start of a panel are not recognised in the database as being different from valley closure movements along the side of a panel or those near the end of a panel. Using this approach, valley closure movements at the start of a panel are expected to be much less than movements at other locations around an extracted longwall panel because the components contributing to horizontal movement, described in the previous section, act in opposite directions and tend to cancel out. The magnitude of horizontal closure at SR17 is expected to be much less than 70mm given the geometry of SR17 relative to the start of LW W3.

TC measured the closure along Stonequarry Creek during the period of mining LW W1 using survey marks and GNSS units. The only significant movements were apparent during a period of heavy flooding that occurred soon after the LW W1 commenced and may have continued for a period afterwards while the pegs were reinstated. The changes are thought likely to be caused by survey peg disturbance rather than real ground movements. It is possible that some valley closure was missed during the period before monitoring pegs were reinstated. The absence of any further significant closure along Stonequarry Creek during mining of LW W2 would indicate that closure movements at the start of LW W1 and LW W2 remained small and less than the survey tolerance of ±5mm.

Survey measurements of multiple pegs across SR17 indicate horizontal strains measured to date from mining LW W1 are less than survey tolerance of ±0.25mm/m. Strains of this magnitude would be too small to be perceptible as impacts to the rockbar. The corners of LW W1 and W2 are 560m and 260m respectively from SR17.

The start of LW W3 is 100m from SR17 at its closest point. The experience to date of low ground movements at SR17 is encouraging. Further movements are expected to remain small when LW W2 and LW W3 are mined and monitoring will provide the opportunity to confirm this expectation.

4.3 Impact Assessment

Valley closure movements are not expected to be large enough at SR17 to cause significant impacts to the rockbar. Monitoring results from mining LW W2 will become available as further confirmation of the magnitude of valley closure along Stonequarry Creek.

Some opening of existing joints and the formation of some small fractures is considered possible as minor readjustments occur in the ground around the rockbar in response to subsidence from longwall mining. However, these impacts are expected to be minor in the context of the existing joints and the general character of the site.

Barbato et al (2014) report 70mm of valley closure is unlikely to cause Type 3 impacts. Type 3 impacts include fracturing of the rockbar causing a reduction in standing water based on average rainfall and background surface water flow. These observations would indicate that water is unlikely to be lost from the pool retained by SR17.

5. SUBSIDENCE ASSOCIATED WITH PROXIMITY TO NFC

The start of LW W4 is approximately 4km from the Nepean River Gorge and 700m from Stonequarry Creek. The Nepean River Gorge is deeply incised into the surrounding plateau with potential to significantly draw down the groundwater system. Stonequarry Creek is generally less than 10m below the surrounding countryside and much less likely to significantly modify the groundwater system. Changes to the shear stiffness of the overburden strata in the vicinity of LW W4 are, however, likely to be caused by proximity to the NFC.

5.1 Investigation Approach

The approach to investigate the potential impacts of the Nepean Fault on the subsidence associated with mining LW W3-W4 was to examine the potential for subsidence impacts in the context of hazards that would be of significance in the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*. This information is intended to assist in:

- Improving co-operation and co-ordination of action, with respect to subsidence between the mine operator and relevant persons conducting any business or undertaking that is, or is likely to be, affected by subsidence.

- Detailing the site characteristics, including relevant mining geometries, geological, hydrogeological or geotechnical conditions and potential impacts on relevant surface and subsurface features.

- Managing the risks to the health and safety of workers and other persons from subsidence.

At the commencement of the investigation, SCT identified the following potential subsidence outcomes in the subject area that might conceivably be a consequence of proximity to the NFC:

1. The potential for greater than predicted subsidence within the footprint of LW W3-W4 to cause greater subsidence beyond the panel edges.

2. The potential for unconventional subsidence movements occurring beyond the edge of LW W4, including at or across the NFC.

3. The potential for mining induced stress changes near the NFC to cause fault structures to be mobilised.

4. The potential for movements that might occur more quickly than conventional subsidence, because of the presence of the fault and increase normal mining induced micro-seismic activity, due to the isolating effect of the fault.

Our investigation indicates that none of these potential outcomes is likely to occur and none are considered to have potential to be principal hazards. Nevertheless, they are investigated in the following sections, in the context of providing a thorough and systematic review of all the subsidence outcomes that could reasonably be considered to have potential to be significant.

5.2 Potential for Subsidence Greater than Predicted

Previous subsidence behaviour at Tahmoor is reviewed in this section to provide a basis to assess the potential for greater than predicted subsidence in the subject area. Possible reasons for increased subsidence observed at the south-eastern ends of the longwall panels are explored.

MSEC analysed the extensive subsidence monitoring network developed at Tahmoor above LW 24-32. A review of subsidence monitoring indicates that subsidence above the start of each of these longwall panels is:

- slightly greater over LW 28-31

- significantly greater over for LW 24-27 and 32

than observed more generally across the longwall panels at Tahmoor and elsewhere in the Southern Coalfield of NSW for similar geometries. This increased subsidence is termed "abnormal" because of its unusual character and localised nature.

Gale and Sheppard (2011) reported that numerical modelling showed that this abnormal subsidence is consistent with localised weathering of joint bedding planes above a depressed water table adjacent to an incised gorge. This localised weathering is thought to have contributed to lower shear stiffness of the overburden strata and greater magnitudes of surface subsidence.

As longwall mining moved to the north, the start of each panel moved away from the Bargo Gorge and gradually closer to the NFC. From LW 29 onward, maximum subsidence near the start of each panel once more increased above predictions. Subsidence over the start of LW 32 is approximately 50% higher than predicted and approaches the levels observed over LW 24A and LW 25. Subsidence along most of LW 32 is slightly greater than predicted.

The shear stiffness of the overburden strata is likely to decrease close to the NFC. The increased subsidence associated with proximity to the NFC is considered likely to be a result of this reduction. Over LW 24A and LW 25, proximity to the Bargo Gorge is likely to have been the main cause of the reduced shear stiffness inferred by Gale and Sheppard. Over LW 29-32, proximity to the NFC is likely to be the cause of the reduced shear stiffness. In both cases, the outcome is subsidence greater than predicted based on general experience in the Southern Coalfield.

On this basis, subsidence over LW W3 and LW W4 especially is expected to be greater than the subsidence that would be indicated by general experience elsewhere in the Southern Coalfield. This extra subsidence is of no particular significance and has been managed without incident throughout the period of mining at Tahmoor Mine.

5.3 Potential for Unconventional Subsidence Movements Associated with the NFC

The term "unconventional subsidence movement" is used here to describe ripples and sharp, localised changes in level associated with bedding plane shear. SCT is not aware of any evidence from previous mining at Tahmoor Mine of significant unconventional subsidence movements outside of the mining footprint, but such movements have been observed at other sites.

On this basis, there is some potential for low level unconventional subsidence movements to develop outside the footprint of mining and there may be some greater potential for such low-level movements due to the ground disturbance caused by the NFC.

However, notwithstanding the possibility of unconventional subsidence movements occurring to the east of LW W4 above the NFC, much greater levels of ground movement have been successfully managed previously at Tahmoor Mine using the proposed management strategies. SCT anticipates that these management strategies would again prove suitable to manage any unconventional movements that may develop in the subject area.

5.4 Monitoring Experience

Four subsidence lines at Tahmoor extend partly or fully across the NFC. The first of these, 900 Line, is a cross line located above LW 13 close to and partly over the NFC. The location of LW 13 is shown in the bottom right of Figure 1. Three recent subsidence lines were placed across the NFC adjacent to the starting corner of LW 32. The detailed monitoring results from these lines are presented in MSEC (2021) and are not repeated in this report, but the findings are considered here.

Figure 3 shows the subsidence measured on 900 Line above LW 13. Greater than predicted subsidence was observed near where the NFC is immediately adjacent to LW 13 and coincidentally where the Bargo River crosses the panel. LW 13 void is 235m wide and the depth below surface of the mining horizon is approximately 420m.

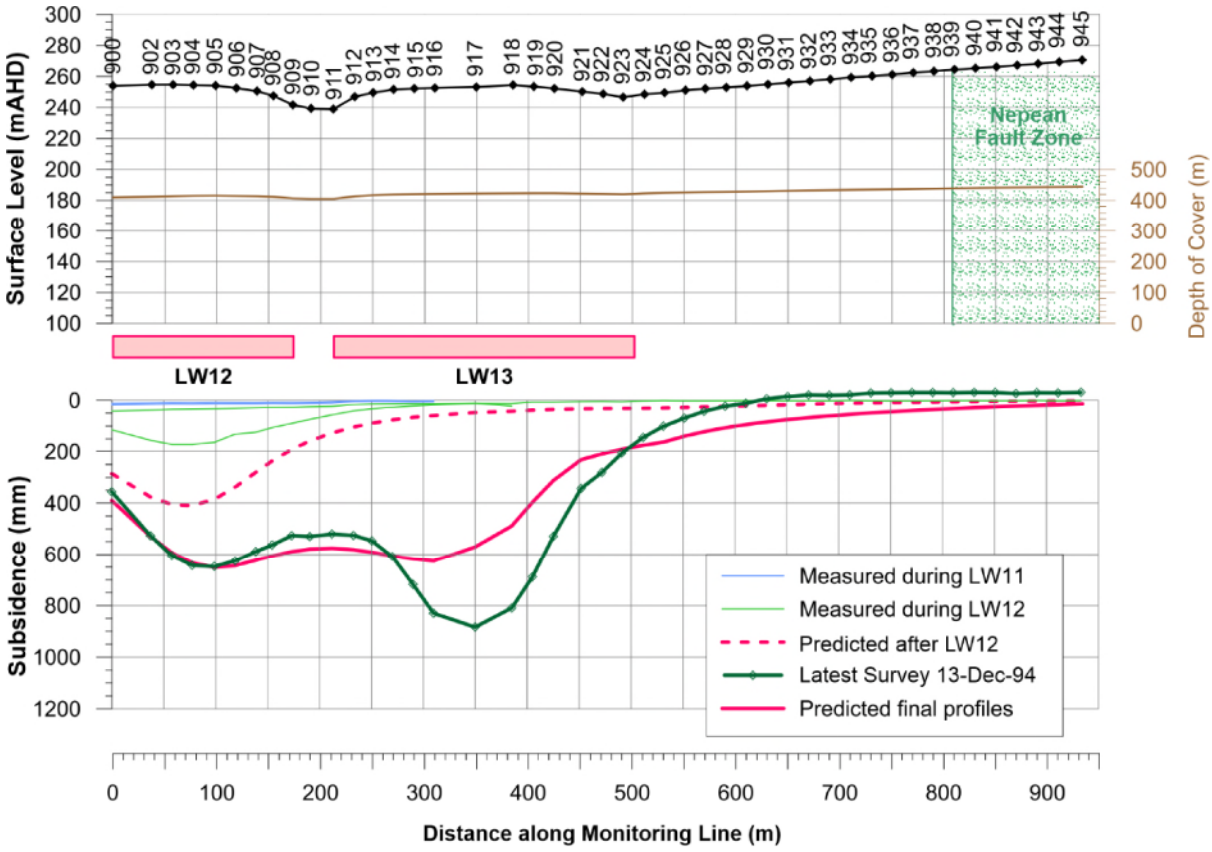


Figure 3: Predicted and observed profile of total subsidence along the 900-Line over Longwall 13 extending above the Nepean Fault Complex (MSEC).

Monitoring across the NFC adjacent to LW 13 and LW 32 indicates no unconventional subsidence occurred in the profile near to the NFC. Subsidence over each panel was greater than predicted, consistent with proximity to the NFC, but the subsidence profiles over the goaf edge are smooth and consistent in character with the subsidence profiles observed elsewhere at the mine where the NFC is not present.

There is no evidence in the subsidence profile over the solid abutment at LW 13 or LW 32 of any differential subsidence movements associated with mining near the NFC.

5.5 Unconventional Subsidence Generally

Although unlikely, it is possible that unconventional subsidence unrelated to the NFC may occur within the subject area during mining of LW W3-W4. Unconventional subsidence movements are observed above TCM from time to time and therefore, may occur above LW W3-W4. The management strategies that have been in place previously are expected to be effective for managing any unconventional subsidence movements that may develop.

The mechanics of the process causing unconventional subsidence movements involve lateral dilation of the subsiding strata that generate relative movement as shear on bedding planes similar in character to valley closure movements. In general, unconventional movements occur within the longwall footprint where subsidence and therefore, lateral dilation forces are greatest. Occasionally, first movements are apparent ahead of mining and then develop further as mining approaches.

5.6 Step Changes at the Fault Outcrops

Individual geological structures within the NFC are mapped as being sub-vertical. Unconventional subsidence movements typically occur on sub-horizontal geological structures such as bedding planes.

The potential for the Nepean Fault itself to cause a step change in the surface is considered small. Expressions of the NFC come closest to longwall panels near the start corner of LW W4. At this location, vertical subsidence is expected to be a few tens of millimetres in magnitude. Any differential vertical movement that may occur at the surface expression of geological structures within the NFC, beyond the panel edge, would be limited to less than this maximum vertical subsidence.

Mills and O'Grady (1998) measured the overburden movements above extracted longwall panels. The three-dimensional geometry of the bridging overburden strata around the start corner of LW W4 limits the potential for differential subsidence movements. Although the overburden strata on the panel side of any geological fault structure may not be able to transfer full load to the other side of the structure, the overburden strata on the panel side of the fault is likely to bridge and limit subsidence to low levels. Along the line of the fault, the effective panel width is small close to the fault because the longwall panel does not mine through the fault. The overburden strata is able to bridge across narrow panels at depth to limit surface subsidence to low levels.

5.7 Potential Increased Micro-Seismic Activity and Rapid Movements

Events that lead to seismic energy being released require the sudden failure of rock strata, most commonly with some component of tensile or shear failure. In the Southern Coalfield, the deformations of the overburden strata directly over the goaf occur as an upward progression of a series of shear and tensile failures involving individual strata units. There are many individual units and the horizontal stresses are large enough, that the failure processes tend to occur incrementally in small steps.

From time to time, failure of some of the thicker units produces enough energy to register as a small seismic event that can sometimes be heard, but even these larger events are seldom large enough to be felt directly. These micro-seismic events can be detected by geophones and their source located by triangulation by comparing arrival times of the seismic energy.

The presence of previously activated shear planes close to the NFC increases the degrees of freedom within the overburden strata for shear movement. The increased flexibility of strata softened by previous shear plane development is expected to reduce the magnitude of any seismic events that might occur from mining.

The gradual progress of longwall mining means that the upward progress of caving tends to develop gradually. Longwall retreat of 10m per day is expected to cause an average upward progression of the zone of large downward movement, using the terminology of Mills and O'Grady (1998), of approximately 10m per day.

It is possible that some stronger, more massive units bridge more effectively. The upward progression of caving may be delayed for a day or two until these units fail. However, the horizontal stresses in the Southern Coalfield are typically so large compared to the strength of the rock subject to the action of gravity in the third dimension that, the upward progress of rock failure inevitably occurs in small steps and is, therefore, gradual at the scale of interest.

In the Southern Coalfield, surface subsidence effects tend to develop gradually because of the gradual nature of the upward progression of caving. By comparison, the presence of massive conglomerate beds and a low horizontal stress environment in the Newcastle Coalfield, particularly near the coast, can lead to the development of sudden tensile failures of large volumes of rock with consequent release of higher levels of seismic energy and sudden movements. Such events are typically not observed on the Southern Coalfield except in a few special circumstances associated with valley closure and initial formation of large goaf areas leading to widespread stress relief. Neither of these special circumstances are relevant to the subject area.

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SCT 2020 "Structure Determinations of the Nepean Fault Adjacent to the Picton Rail Tunnel", SCT Report No TAH5262 22 December 2020.

Appendix G – Picton Rail Tunnel Report

Strata Control Technology

TAHMOOR MINE

Structure Determinations of the Nepean Fault Adjacent to the Picton Rail Tunnel

TAH5262

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TITLE Structure Determinations of the Nepean Fault Adjacent to the Picton Rail Tunnel

REPORT NO TAH5262

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DATE 22 December 2020

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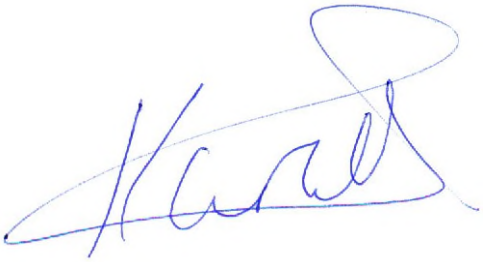
Report No	Version	Date
TAH5262	DRAFT	14 December 2020
TAH5262	FINAL	22 December 2020



Ken Mills
Principal Geotechnical Engineer

SUMMARY

SIMEC Mining (SIMEC) operates Tahmoor Coal Mine in an area approximately 70km southwest of Sydney. SIMEC requested SCT Operations Pty Ltd (SCT) to comment on potential impact of Nepean Fault Complex projections interpreted to pass through the Picton Rail Tunnel (PRT) area. The tunnel is excavated through the basal Wianamatta Group member the Ashfield Shale, the floor of the tunnel sits very close to the upper contact of the Hawkesbury Sandstone. Subsidence is anticipated to impact the area as far field effects from planned longwall panels located approximately 250 to 500m to the west of the fault projection intersecting the PRT.

The investigation found no direct impact on the PRT from previous subsidence movements on interpreted faulting. Analysis found an additional NFC segment adjacent the tunnel. The faulting in this area is interpreted to represent a zone of small offsets distributed over numerous small faults, splays, and strata ramps. Nearby mining in LW3 is further than 500m from the PRT, and LW4 is 250m from the PRT both are still expected to cause far field subsidence effects that will extend to the PRT. These effects are anticipated to be small, general body movements, distributed and dispersed over the numerous NFC defect planes. Minor strata shears are anticipated. Stress relief associated with mining is expected to increase hydraulic conductivity in the vicinity of the NFC. The changes in hydraulic conductivity are expected to be generally small, with relative position and direction of subsidence and orientation of the NFC segments influencing the magnitude of any change.

SCT has previously completed an investigation of the Nepean Fault Complex (NFC) in 2018, the NFC is a structure that trends for over 85kms starting north of Richmond to south of Bargo. Described often as a monocline in the north, the complex is from this work defined as a series of en-echelon faults with multiple conjugate fault segments and splays, with a complex of ramping strata between fault segments forming sections that form monoclines. Fault segments show highly variable vertical displacement as these offsets rapidly reduce in throw towards the terminal ends of each fault segment, this style of faulting strata deformation resulted in terrain highly influenced by the geometry of the faults and the rock type present at the surface.

In the PRT area and adjoining area over the active mining, the topography is dominated by a plateau surrounded by deep incised gorges and river valleys representing fault boundaries. At the PRT, the NFC is present as the terminating ends of several north-south trending faults segments, no measurable offsets were determined for the sections passing through or adjacent the PRT, faulting further to the east and south east demonstrate fault ramping and large measurable offsets dominate as does a shift in geography from gentle rolling hills and plateaus to steep sided gorges.

This investigation found the following:

- Nepean Fault Complex segments projected through the Picton Rail Tunnel area are mainly terminal ends of north-south trending faults with minimal offsets distributed among the fault planes present.

- No impact from faulting was observed during inspection of the tunnel.

- Review of geotechnical coring investigations recently completed in the tunnel showed no obvious strata change intersected that would indicate any large fault offset or deformation.

- The tunnel is formed on or above the upper contact of the Hawkesbury Sandstone in the overlying Wianamatta Group shales.

- Observation of microstructure has determined listric faulting forms part of the Nepean Fault Complex at this location, taking high angle faulting into curved planes dispersing the displacement into the bedding then re-emerging as multiple faults with smaller displacements.

- Observed microstructure indicates a listric faulting style for the NFC at the PRT consistent with extensional movements transitioning into multiple faults which further disperse and reduce offset displacements. This is a significant determination on fault behaviour at this location and impacts understanding of the faulting distribution.

- Review of the 2018 NFC analysis and analysis of latest imagery found an additional fault projection located immediately west of the PRT.

- The additional fault identified trend north-northwest to south-southeast and abuts the northeast corner of LW4.

- Subsidence movements at the PRT from mining of LW3 are further than 500m away and are anticipated to be slight and of a general body nature affecting the PRT evenly. Mining of LW4 is approximately 250m away but because of the smaller subsidence footprint is also anticipated to be slight impact on the PRT.

- Far field subsidence movements at the PRT are expected to be slight with movement potentially concentrated on strata boundaries and other low strength horizons.

- Subsidence movements on geological fault structures intersecting the PRT area are expected to be distributed over the numerous defect planes found in the terminating fault segments and fault ramps.

- Hydraulic conductivity of the strata around the PRT is expected to increase slightly as stress is relieved on pre-existing joints.

SIMEC has a regular program of inspection and monitoring of the PRT is underway, there is an inclinometer installed adjacent the tunnel, detailed surveys through the tunnel have been completed, distometers are installed throughout the tunnel and regular geotechnical inspections are planned during mining to monitor for any movement and potential damage.

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1. INTRODUCTION

SIMEC Mining (SIMEC) operates Tahmoor Coal Mine in an area approximately 70km southwest of Sydney. SIMEC requested SCT Operations Pty Ltd (SCT) to comment on potential impact of Nepean Fault projections interpreted to pass through the Picton Rail Tunnel (PRT) area. SCT was commissioned to help define the Nepean Fault Complex (NFC) near LW32 in 2018. That report presented a 12km section of the NFC to characterise the nature of the faulting and best determine the location of the fault planes and their surface expression. The NFC is a structure that trends for over 85kms starting north of Richmond to south of Bargo. Described often as a monocline in the north, the complex is from this work defined as a series of en-echelon faults with multiple conjugate fault segments and splays, with a complex of ramping strata between fault segments forming sections that form monoclines through to steep sided fault bounded gorges.

This report describes an inspection of the PRT, adjacent outcroppings, an updated review of the NFC interpretation and analysis of the fault offsets, and a discussion on the potential impacts on the interpreted faults adjacent the PRT from nearby mining activity.

The findings in this report are based on review of the previously completed mapping, inspection of outcrops at the PRT, further analysis of the mapping completed, and review of recent geotechnical investigations of the tunnel.

In the 2018 investigation, field mapping, data compilation, desktop analysis of aerial imagery and geographic features was completed to define the NFC adjacent the Tahmoor Mine between Picton and Tahmoor. Faulting was found to be dominated by sub-vertical, north-south first order faults typically 2-5 km long, set in an en-echelon distribution. Second order, conjugate, strike slip faults are evident in the space between the first order faults. Additional lesser order splays and low angle faults are anticipated but require direct observation to locate.

The surface geology consists of exposures to the Wianamatta Group and Hawkesbury Sandstone, the contact between these geological formations dominates the terrain. The Wianamatta Group form low rounded hills, slopes, and plateaus while the Hawkesbury Sandstone forms steep sided gorges and cliffs. The contact between the two is very distinct and forms a readily identifiable stratigraphic marker used to determine fault offsets.

Using topographic maps, the relative position of the marker indicated the relative vertical offsets across sections of the NPF. The first order faults were shown to have variable offset that quickly diminished as they terminate and the intervening terrain forms monoclines and fault ramps with vertical offsets ranging up to 60m in the Picton to Tahmoor area.

Mapping and ground truthing was able to delineate and define the nature of the fault complex with first order and second order fault determinations well established. First order faults trend north-south set in an en-echelon pattern dominating the terrain with second order conjugate strike slip faults evident between these. The resultant geography bordered by the faulting is the formation of plateaus, steep sided gorges, and alluvial filled plains.

In 2018, mining at Tahmoor Mine was mining LW32. This panel commenced adjacent a section of the NFC characterised by high-angle, north-south fault sections with large vertical offsets. The majority of LW32 retreated from the faults through a transition zone of fault ramps and into a zone of minimal fault disturbance. The current mine position is a group of four short longwall panels located to the north. These panels run from the north and retreat to the south. The north-south orientation runs sub parallel to where the NFC is located west of Picton and the Picton Rail loop and tunnel.

These four short panels are located beneath an area of plateau characterised by Wianamatta Group shales, numerous dams and low hummocky hills dominate the geography. The interpreted expression of the NFC commences approximately 200m to the east where short terminating portions of the fault complex form a ramp complex. The NPF transitions from high displacement offset areas in the south to more numerous smaller offset faults and ramping adjacent the village of Picton (Figure 1). The area around the PRT shows minimal fault plane offset as most of the first and second order faults are near their terminal ends. Faults trending north from here extend under an alluvial plain and interpretation of offset and location becomes difficult, however the fault offsets are anticipated to increase moving further to the north.

Field observation of the PRT, where a portion of the NFC projects, found no indication of disturbance of the strata immediately surrounding the tunnel. Microstructures observed indicate listric faulting is a mechanism of deformation were mapped within outcrop exposure (Figure 2) of the Ashfield Shale at the tunnel entrance. These mimic the interpreted multi fault plane nature of the NPC structure zone and the dispersed nature of the faults as both smaller offsets and strata ramping. The tunnel appears to be wholly within the Ashfield Shale of the Wianamatta Group and possibly using the upper contact of the Hawkesbury Sandstone as the base. SIMEC has asked what potential impacts their nearby longwall panel mining subsidence may be anticipated on the NFC at the PRT.

Direct mine subsidence event is located approximately 500m west of any faults intersecting the PRT in LW3 and 250m southwest in LW4, the effects on the PRT are considered far field impacts because of the distance from the main predicted event. These impacts will occur as the ambient stress and strain in the rock mass adjusts with the subsidence. The new longwall panels run parallel to the predicted mainly north-south trending NFC, movement from the subsidence will mainly exert a tension de-stressing event or relief of the stress acting on the faults near the surface and at depth. This effect may allow minor settling of these features, small differential movement may occur between the major strata units such as the base of the Wianamatta Shale and top of the Hawkesbury Sandstone, between the Hawkesbury Sandstone and the Bald Hill Claystone, and the underlying Bulga Sandstone. The underlying units and coal seams may also experience minor bedding parallel shear at this location. Structural disturbance may be considered minimal, potential for increased fracture permeability may be locally anticipated but diminish quickly away from the subsidence event.

Distribution of the NFC into several smaller defect planes, fault ramps, splays and conjugate fault planes lessens the potential for subsidence to impact the PRT. Monitoring of the tunnel for displacement is already well established and potential for permeability changes is monitored by existing vibrating wire piezometers.

2. OUTCOMES OF THE INVESTIGATION

Figure 1 shows the latest revised distribution of faults mapped and interpreted from the study. An additional north-south trending segment of the NFC was identified immediately west of the PRT, located approximately 200m east of the new longwall panel LW3 and abuts the north east corner of LW4 outer gateroads, the feature is likely to run mainly towards the north-northwest. Examination of outcrops at the PRT found microstructure in Wianamatta Group shales above the PRT northern portal.

Figure 2 shows a photograph of a vertical defect plane that then curves into the bedding, the movement on the planes then transitions into three curved defect planes that then become vertical. Microstructure are considered to mimic the large scale and are used in mapping to demonstrate the style and geometry of structures present. Here the fault splays from a single fracture into multiple fractures via a listric splaying of the fault surface, the relative larger offset on the singe fracture is dispersed onto the splay and multiple fractures transition from the splay. Listric faulting is indicative of extensional geological conditions which correlates well with fault ramping and stepped fault offsets and normal fault offsets locally observed in the NFC.

Regionally, the NFC is a well-known extension of the Lapstone Monocline; and is usually described as a high angle reverse fault complex with complicated displacement distribution. The NFC exhibits an en-echelon distribution of first order fault segments with major offsets. Ramping between individual fault segments is well developed in the NFC between the numerous en-echelon fault surfaces. First order north-south fault segments, each of limited extent, step across the area investigated. These display a distinct left lateral character. Second order faults are abundant and trend mainly northwest to southeast but can vary significantly. These are mainly conjugate sets of strike slip faults and splay faults located between the en-echelon first order faults, they tend to mimic the dominant joint set present in the Hawkesbury Sandstone. Massive sandstone units are usually characterised by dominant joint sets that will influence the distribution of subsequent occurring structures.

The terrain is heavily influenced by both the position of all these faults and the contact between the erosion resistant, quartz sandstone of the Triassic aged Hawkesbury Sandstone and the overlying Ashfield Shale of the Wianamatta Group. The terrain along the length of the fault forms a disrupted terraced plateau in the north and is deeply incised by gorges towards the south. Outcrops are limited to creek channels and gorges in the drainage system and along road, rail cuttings, and quarry pits.

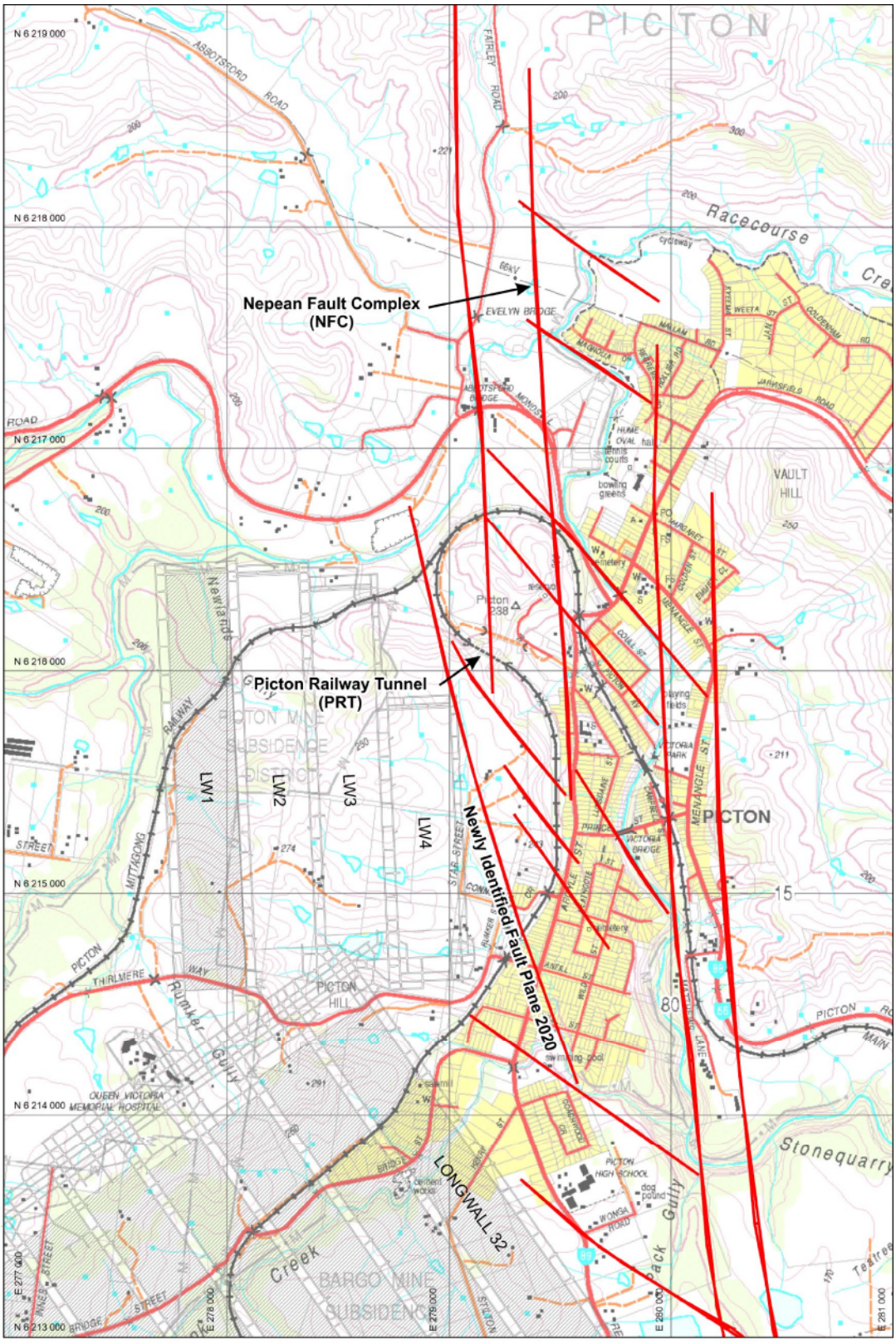

Figure 1: Nepean Fault mapping superimposed on 1:25,000 topographic map.

Figure 2: Picton Rail Tunnel Microstructure detail and listric faulting.

Offset on the faults is dominated by apparent normal throws of several tens of metres. These offsets are easily discerned in the landscape by the relative position of the contact between the Hawkesbury Sandstone and the Wianamatta Group. The offset can be observed where gorges have followed the fault and deeply eroded the surface. Comparison of the elevation of the sedimentary contact on each side of the drainage provides a relative displacement (Figure 3).

The terrain investigation shows the displacement rapidly diminishes laterally, borehole contouring of the Bulli Seam demonstrates the same en-echelon first order faults with ramps. The offset nature of the first order faults indicates the presences of a left lateral shear. Second order strike-slip, conjugate faults are consistent with this observation.

The area of greatest interest in this study is where the PRT is located relative to the NFC and the area of far field subsidence impacts from the nearby longwall mining. At this location, surface mapping shows the fault can be clearly seen expressed as distinct fault segment terminating in the adjoining landscape. The PRT is located adjacent to where the NFC then transitions across fault ramps and then becomes a series of large offset fault segments further to the south east. Subsidence impacts from the new longwall panels may occur from the seam level to the surface.

At the mining horizon, geological conditions adjacent to the first order faulting may include intensified and changed stress condition. Redirection of stress orientation adjacent to faulting is a common occurrence. Stress conditions along the fault ramp should be less intense as offset of the Nepean Fault into conjugate faults helps dissipate the effects of the faulting by redistribution of ground movement into multiple planes rather than focused on a single feature. Fault ramps may be characterised by a greater frequency of jointing and localised low angle faulting which all provide additional features for movement to be dispersed into. The greater the distance from the subsidence event, the less the impact will occur.

Based on the observed distribution of the NPF at the PRT, the impact from the nearby subsidence on the segment of NPF interpreted to pass through the PRT is expected to be minimal. Increased fracture permeability may occur as shifting of the stress orientations may allow NPF defect planes to open especially in strata units which have higher densities of pre-existing fractures.

3. FIELD WORK

The author, a senior engineering geologist, inspected the site on 14 November 2020. Geological structure present in the PRT area was mapped and described. The PRT was inspected for any previous impact on the tunnel from the projected NFC intersection. No direct impacts were observed in the brick and concrete lined tunnel.

Limited outcrop is present at the tunnel, at the northern end portal a steep cutting is present in the railway cutting and also an exposure above the portal. The rock type present is the Ashfield Shale, the basal member of the Wianamatta Group. Approximately 450m to the east, the Hawkesbury Sandstone is exposed in the road cutting at the overpass leading into Picton.

In the exposure above the northern portal of the PRT, minor joint sets are observed, and a small micro-structure was recorded that is interpreted to represent the NFC geometry at this location (Figure 2). A subvertical defect plan, becomes listric and diverges into the bedding planes but then transitions out from the same plane as three spaced subvertical defect planes.

4. FRACTURE ANALYSIS AND TERRAIN OBSERVATION

The fracture analysis and terrain observations previously completed (2018) was reviewed and the latest available imagery was re-analysed with the PRT and new mining area being the focus of this study.

The positioning of the original analysis of NFC segments was adjusted and a new first order north-south trending fault segment, immediately west of the PRT was interpreted. The revised map (Figure 1) plots the interpreted positions of the fault segments of the NFC in the Picton to Tahmoor area. In the current investigation, outcrop investigation was limited to the exposures at the northern portal of the PRT. Micro-structure observed at the tunnel (Figure 2) provided potential detail of the nature of the NFC at this location. A listric transition from a single fault to multiple faults via splayed fault surfaces redistribute below a horizontal plane into several new fault surfaces, this formed a potential décollement horizontal slip which would have dispersed much of the vertical displacement as horizontal bedding parallel shear. Listric faulting is a strong indicator that the NFC formed in an extensional environment, this is also indicated by the presence of fault ramping, stepped faults, splays, and normal fault offsets.

The boundary between the Wianamatta Group and the Hawkesbury Sandstone is distinct and is used in this analysis as a marker to determine the fault displacement along each fault segment where the intersection between this marker and the elevation contour can be determined. Figure 3 shows the interpreted fault throws along the length of the NFC between Picton and Tahmoor. High offset fault segments in the terrain form deep gorges with abutting plateaus, terminal end zones of fault segments tend to transition through a gentler topography of ramping and transition to plateaus, as seen in the area of the PRT.

Fault displacements were not readily observed in the area of the PRT, the interpreted transition of individual fault segments into multiple segments disperse these and result in less disturbed more stable strata. Exposure of Wianamatta Group shales and the Hawkesbury Sandstone dominate the terrain. At the PRT the area at the tunnel and west over the new mining area forms a plateau, this is surrounded by deeply incised gorges and river valleys. The plateau has formed over an area where the NFC is mainly terminal ends of fault segments and fault ramps. These disperse the high offsets observed further to the south east into gentler deformed terrain of the plateau hosting the PRT.

5. FAR FIELD SUBSIDENCE IMPACT ON FRACTURES AND HYDROLOGY

Horizontal subsidence movements at the surface and within the overburden strata can extend laterally for significant distances from longwall mining activity. These far field effects decrease quickly away from the directly subsided strata. Geological features such as faults, strata contrasts such as clay bands, thick sandstone units, coal seams and thick sandstone/conglomerate channels, igneous intrusives such as plugs, dykes and sills can focus far field effects.

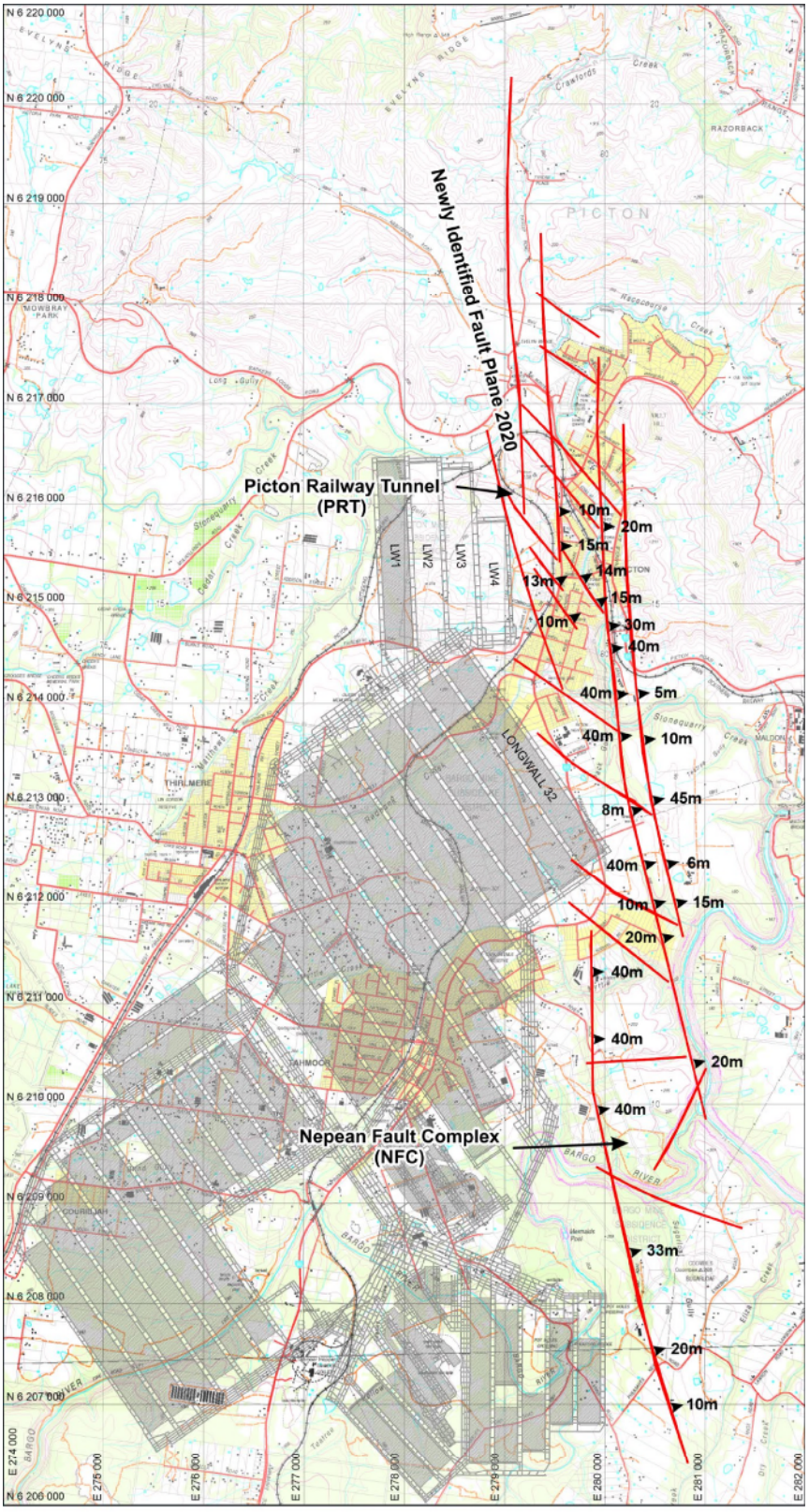

Figure 3: Nepean Fault mapping superimposed on 1:25,000 topographic map.

Concentrated movements may manifest as bedding parallel shear (decollement) where distinct block tilting of the strata results in differential slip especially where the contrast in rock types is greatest. At the PRT the greatest potential for such a surface to occur is the basal contact of the Wianamatta Group and the underlying massive sandstones of the Hawkesbury Sandstone.

The potential for far field subsidence related movement to impact the immediate PRT area must be considered low as the amount of movement predicted at such a distance from the subsidence event will be small. Movement that may occur would likely have its displacement focused along the multiple subvertical NFC fault segments, fault splays and ramps and also any potential tilting would focus potential horizontal shear along the contact between the Wianamatta Group and the Hawkesbury Sandstone.

Far-field subsidence movements affect the entire rock mass from surface to seam level. The distal effects may be described as mainly tensional strains, tilting and horizontal shearing. These effects are expected to impact the hydrology of the surrounding rock mass by causing an increase in hydraulic conductivity of the rock mass and fractures within it. Increase in fracture permeability is influenced by rock type, its geotechnical characteristics, and its ambient distribution of fracturing. The strata surrounding the PRT (Wianamatta Group and Hawkesbury Sandstone) is composed of massive geological units with well-spaced joints, faults, shears, and bedding planes. The far field subsidence impact on the PRT hydrology is expected to be generally small.

At depth, greater fracture density occurs in the coal seams, greater frequency of bedding partings in the surrounding strata and greater potential for horizontal shearing could result in greater rates of pore pressure drawdown through the rock mass closer to mining activity. The presence of the NFC may result in greater fracture permeability, but it may also serve to create offsets of the hydrological strata units and may increase or limit recharge based on structural and strata geometry.

6. CONCLUSION

These results of the investigations are summarised as:

- The Nepean Fault Complex (NFC) projected through the Picton Rail Tunnel (PRT) area mainly comprises the terminal ends of north-south trending fault segments with minimal offsets distributed among the fault planes present.

- No existing impact from the predicted fault intersections was observed during inspection of the tunnel.

- Review of geotechnical coring investigations recently completed in the tunnel showed no obvious strata change intersected that would indicate any large fault offset or deformation.

- The tunnel is formed directly on, or just above the upper contact of the Hawkesbury Sandstone in the overlying Wianamatta Group shales.

- Observation of microstructure has determined listric faulting forms part of the Nepean Fault Complex at this location, taking high angle faulting into a curved plane dispersing the displacement into the bedding then re-emerging as multiple faults with smaller displacements.

- Observed microstructure indicates a listric faulting style for the NFC at the PRT consistent with extensional movements transitioning into multiple faults which further disperse and reduce offset displacements. This is a significant determination on fault behaviour at this location and impacts understanding of the faulting distribution.

- Review of the 2018 NFC analysis found an additional interpreted fault projection located immediately west of the PRT.

- The additional fault identified trend north-northwest to south-southeast and abuts the northeast corner of LW4.

- Subsidence movements at the PRT from mining of LW3 are further than 500m away are anticipated to be slight and of a general body nature affecting the PRT evenly. Mining of LW4 is approximately 250m away but because of the smaller subsidence footprint is also anticipated to be slight impact on the PRT.

- Movements on geological faults intersecting the PRT area are expected to be distributed over numerous defect planes found in the terminating fault segments and fault ramps. Any movements on these structures are expected to be dispersed across multiple structures.

- A slight increase in hydraulic conductivity is expected from stress relief movements associated with nearby longwall mining. The hydraulic conductivity of pre-existing joints and any fresh fractures are expected to slightly increase the hydraulic conductivity of strata around the PRT.

SIMEC has a regular program of inspection and monitoring of the PRT underway, there is an inclinometer installed adjacent the tunnel, detailed surveys through the tunnel have been completed, distometers are installed throughout the tunnel and regular geotechnical inspections are planned during mining to monitor for any movement and potential damage. Regular geotechnical meetings are planned to be held during mining to review the data and determine if any actions are required.