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GROUNDWATER MANAGEMENT PLAN

Tahmoor Coal Pty Ltd

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1 Introduction

1.1 Background

Tahmoor Coal Pty Ltd (Tahmoor Coal) owns and operates the Tahmoor Mine, an existing underground coal mine located approximately 80 kilometres (km) south-west of Sydney in the Southern Coalfields of New South Wales (NSW). Tahmoor Mine surface facilities are situated between the towns of Tahmoor and Bargo within the Wollondilly Local Government Area (LGA). The mine has previously extracted longwalls to the north and west of the surface facilities and has been operating continuously since 1979 when coal was first mined using bord and pillar mining methods, followed by longwall mining methods since 1987. Underground workings extend north under the town of Tahmoor and Picton with two ventilation shafts being located on the outskirts of town. The location of Tahmoor Mine in the regional context is shown in **Figure 1**.

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. Extracted coal is processed on site at the coal handling and preparation plant (CHPP) and coal clearance facilities prior to transportation via rail to Port Kembla and Newcastle for Australian domestic and export customers.

Tahmoor Mine surface facilities are situated in between the townships of Tahmoor and Bargo, and adjacent to Remembrance Drive on land owned by Tahmoor Coal with mining conducted under both crown and freehold property (see **Figure 1**). Surface facilities at Tahmoor Mine include administration buildings and offices, a materials store, diesel tanks, electrical workshop, mechanical workshop, bathhouse, water storage tanks, ventilation fan, CHPP, storage areas, run of mine (RoM) stockpile and product stockpiles. A third party owned power station is also located on-site and utilises methane from the mines' gas drainage system to produce electricity.

An Environmental Impact Statement (EIS) was exhibited in early 2019 to gain approval for the Tahmoor South Coal Project (the Project), which involves use of the existing surface infrastructure and the expansion of underground longwall mining to the south of the existing workings (referred to as the Tahmoor South Domain). Tahmoor Coal subsequently revised the proposed mine design and submitted amended development applications on two occasions (in February and August 2020). In April 2021, Tahmoor Coal received Development Application Approval (SSD 8445) for the extraction of up to 4 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal, with a total of up to around 35 Mt of ROM coal extracted up to 10 years from commencement of second workings (i.e. 18 October 2032).

Modification 1 to SSD 8445 (MOD 1), approved in July 2022, sought to extend the commissioning date of the Water Treatment Plant. Modification 2 to SSD 8445 (MOD 2), approved in June 2023, proposed the underground storage of brine in the historical Tahmoor North-Western Domain mining area and the temporary storage of excess mine water in the historical Tahmoor North mining area. Modification 3 to SSD 8445 (MOD 3), approved in 2024, proposed the extraction of an additional longwall (Longwall South 7A) within the approved Tahmoor South mining domain, requiring updates to the groundwater impact assessment and associated management measures.

1.2 Purpose

The purpose of this Groundwater Management Plan is to provide a framework for Tahmoor Coal personnel to ensure that compliance is achieved with relevant internal and external regulatory requirements related to groundwater management at Tahmoor Coal. The plan ensures that impacts on the community are minimised and managed within a structured framework.

This plan is to ensure compliance with Development Consent (SDD 8445) (the Consent) Condition B34, Schedule 2.

1.3 Scope

This Groundwater Management Plan includes management measures and monitoring requirements relating to:

a) Planning;
b) Stakeholder Consultation;
c) Environmental Management and Monitoring;
d) Implementation and Reporting;
e) Review and Improvement;
f) Document Information; and
g) Change Information.

The Groundwater Management Plan applies to all activities associated with Tahmoor Coal and forms part of the Environmental Management System (EMS).

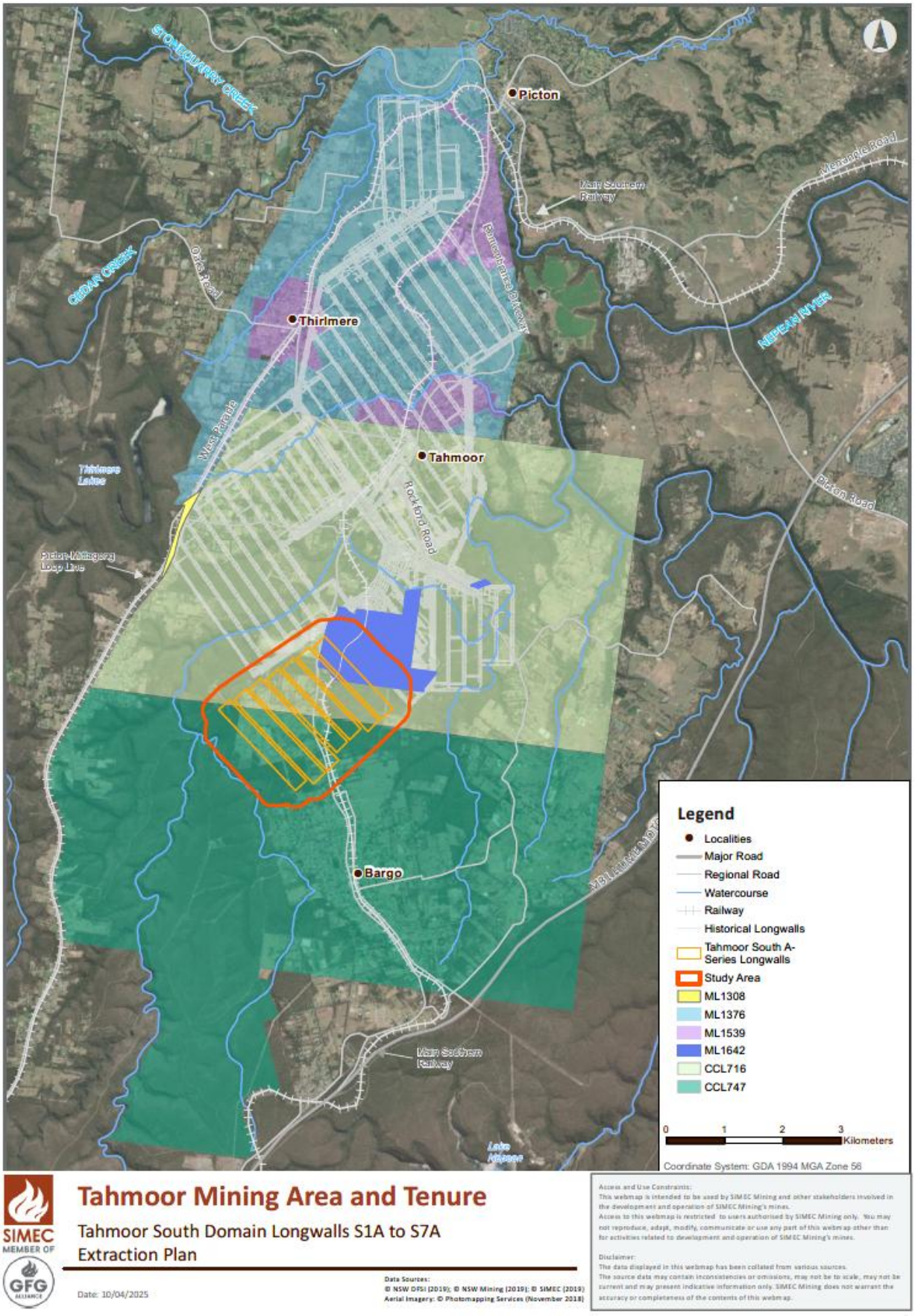

Figure 1 Tahmoor Coal Site Location

2 Planning

2.1 Statutory Requirements and Legislation

2.1.1 Relevant Legislation and Policy

2.1.1.1 Water Management Act 2000

The *Water Management Act 2000* is the regulatory framework for the management and control of water use within NSW. In conjunction with the *Water Act 1912*, it governs the licensing of water to users. In addition, the *Water Management Act 2000* allows for the development and implementation of Water Sharing Plans (WSPs). WSPs regulate the trade and sharing of surface and groundwaters between competing needs and users throughout NSW.

2.1.1.1.1 RELEVANT WATER SHARING PLANS AND GROUNDWATER MANAGEMENT AREAS

Tahmoor Mine currently extracts groundwater that drains into underground mine workings and pumps this water to the surface via three dewatering lines before treating the water and discharging it off site.

Tahmoor Mine falls within the '*Greater Metropolitan Region Groundwater Sources*' WSP (NOW, 2011b), which commenced in 2011. **Figure 2** indicates the extent of this WSP, along with the various groundwater sources in this region that are regulated by the WSP. A WSP is used to manage the average long-term annual volume of water extracted from a given groundwater source. The relevant Groundwater Source for the Tahmoor Mine is:

- Sydney Basin Nepean Sandstone.

Other relevant Groundwater Sources include:

- Sydney Basin – Central, located 10 km to the east and north-east.
- Sydney Basin – South, located 15-20 km east and south-east; and
- Goulburn GMA - located over 25 km to the west and south.

The Sydney Basin – Nepean Sandstone Groundwater Source is further subdivided into Management Zones (MZ), as shown using hatching on **Figure 2**. The Tahmoor South domain (CCL 747) is located within the *Nepean Management Zone 2*, while *Nepean Management Zone 1* covers the southern 'third' of the Groundwater Source as well as a smaller area to the west of Camden – these are both at least 10 km from the Tahmoor South Domain.

The Sydney Basin Nepean Groundwater Source has an annualised limit on entitlement (LTAAEL) of 99,568 ML (NOW, 2011a), while current entitlement is 31,446 ML (based on the WaterNSW Water Register 2023-24 water year).

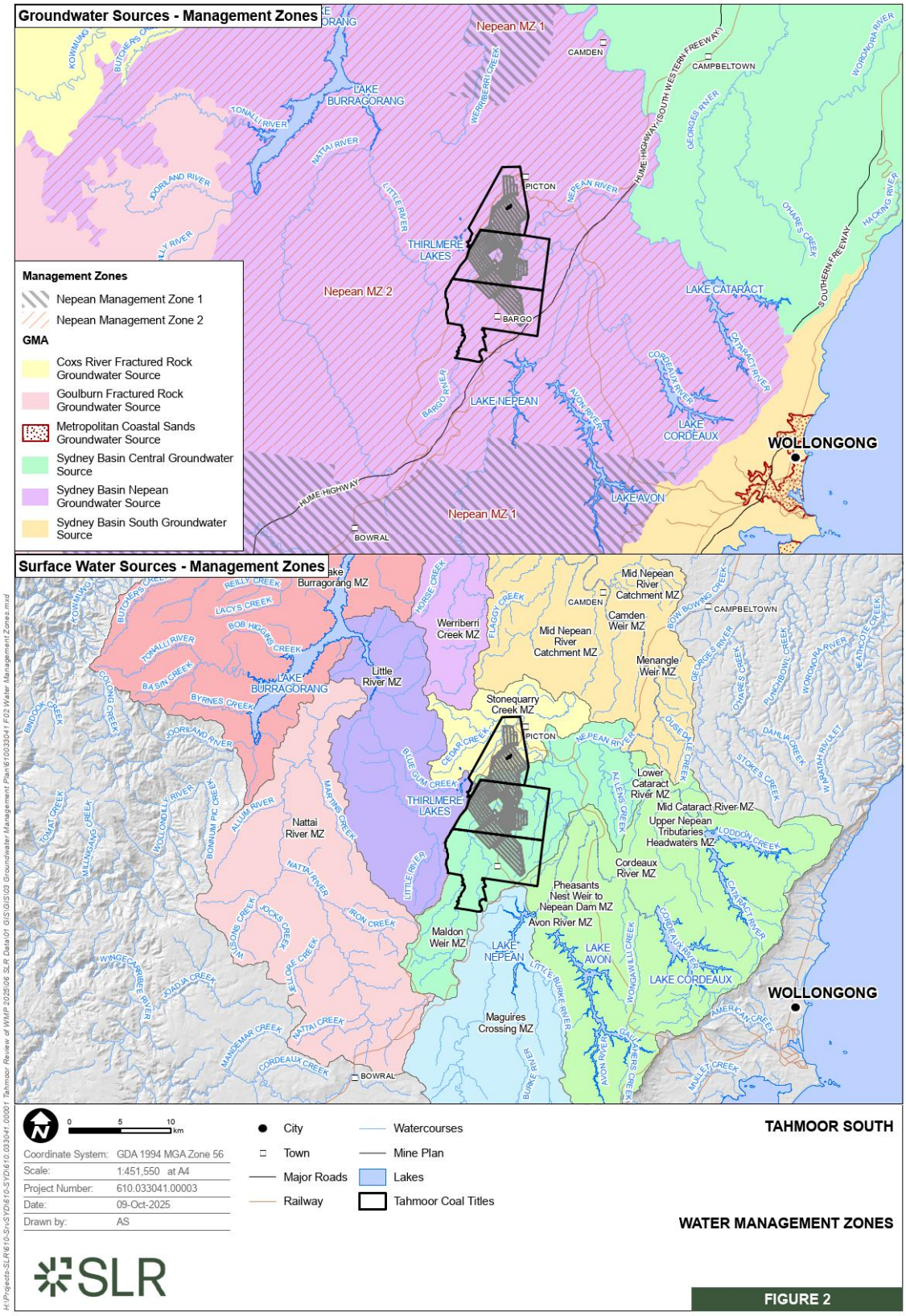

Figure 2 Relevant WSPs and Groundwater Management Areas

2.1.1.2 NSW Aquifer Interference Policy

The NSW Aquifer Interference Policy (AIP) was developed to provide a framework to guide the assessment of impacts that may result following the 'take' of water from an aquifer. It outlines the requirements for obtaining licences for approved aquifer interference activities, as well as considerations for the assessment of impacts (NSW Government, 2012).

Underground mining generally requires the dewatering of the geological strata. In accordance with the AIP, such activity is classified as an 'Aquifer Interference'. In order to meet the requirements of the 'minimal impact considerations' of the AIP, a groundwater assessment is conducted.

The AIP requires an estimation of "all quantities of water that are likely to be taken from any water source during and following cessation of the activity and all predicted impacts associated with that activity". Water take and impact estimation is to be based on a "complex modelling platform" for any mining activity not subject to the Gateway process, where the model makes use of the "available baseline data that has been collected at an appropriate frequency and scale and over a sufficient period of time to incorporate typical temporal variations".

The AIP specifies 'minimal harm considerations' for highly and less productive aquifers, while also defining thresholds for water table and groundwater pressure drawdown, and changes in groundwater and surface water quality. There are separate minimal impact considerations for:

- "Highly productive" groundwater;
- "Less productive" groundwater;
- "Water supply" works;
- "High Priority" Groundwater Dependent Ecosystems (GDEs); and
- "High Priority" Culturally significant sites.

The AIP categorises groundwater source productivity ('highly productive' or 'less productive') based on characteristics of salinity and aquifer yield. Tahmoor Mine is located within the 'Highly Productive' Hawkesbury Sandstone aquifer. The Hawkesbury Sandstone aquifer is the most utilised aquifer in this region. Water sourced from the underlying Narrabeen Group and Permian Coal Measures comprises the remaining portion of water sourced around Tahmoor Mine (HydroSimulations, 2018).

It should be noted that the categorisation of groundwater source productivity does not make any vertical distinction of aquifer productivity. This is relevant as the higher yielding Hawkesbury Sandstone aquifer overlies the lower-yielding Narrabeen Group/Permian Coal Measures groundwater systems which are at greater depths.

2.1.2 Development Consent Conditions

The requirement for this groundwater management plan is established by Condition B34 (v) under Schedule 1 of the Consent. **Table 1** outlines the requirements under this condition and identifies where these requirements have been addressed.

Table 1 Development Consent Conditions

Condition Reference	Condition	Where Addressed
B34	Prior to the commencement of construction activities, the Applicant must prepare a Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must: Groundwater Management Plan that includes:	
	• detailed baseline data regarding groundwater levels, yield and quality for privately-owned groundwater bores (as required under condition B25(a)) and the condition of GDEs (including Thirlmere Lakes) potentially impacted by the development;	**Section 4.1**
	• a program to periodically review and update data regarding groundwater levels, yield and quality at privately-owned groundwater bores in the vicinity of the development, including any bores potentially impacted by cumulative groundwater drawdown;	**Section 4.3.2**
	• a detailed description of the groundwater management system, including commitments to: ○ install an additional monitoring bore in the footprint of Tahmoor North to monitor post-mining groundwater level and quality; ○ install additional monitoring bores (minimum of four) at or near the Thirlmere Lakes; ○ install bores above the initial longwalls to define profile fracturing and depressurisation in the Hawkesbury Sandstone and Bulgo Sandstone; ○ monitor shallow groundwater within the Hawkesbury Sandstone; ○ monitor volumetric take (mine inflow), including inflows to the underground mine; and ○ regularly review the monitoring program to ensure robust and reliable monitoring is undertaken, including reviewing the performance of vibrating wire piezometers;	**Section 4.3 and Appendix B** **Section 4.3.3** **Section 4.3.6**
	• groundwater performance criteria, including trigger levels for identifying and investigating any potentially adverse groundwater impacts (or trends) associated with the development, on: ○ regional and local aquifers (alluvial and hard rock); and ○ groundwater supply for other users such as licensed privately-owned groundwater bores;	**Section 4.4.1, Appendix F**
	• uncertainty analysis of the potential impacts of mining the proposed longwalls on the water levels in Thirlmere Lakes, based upon results from the current Thirlmere Lakes Research Program and other ongoing monitoring and investigations;	**Section 4.2 and Appendix E, Appendix F**
	• a program to monitor and evaluate:	

	○ compliance with the relevant performance measures listed in Table 4 (of the commitments) and the performance criteria of this plan; ○ water loss/seepage from water storages into the groundwater system; ○ groundwater inflows, outflows and storage volumes, to inform the Site Water Balance; ○ impacts on water supply for other water users; ○ impacts on GDEs (including Thirlmere Lakes); ○ the hydrogeological setting of any nearby alluvial aquifers and the likelihood of any indirect impacts from the development; and ○ the effectiveness of the groundwater management system; • reporting procedures for the results of the monitoring program, including notifying other water users, the NSW Office of Environment and Heritage and Thirlmere Lakes Research Program of any elevated results; • a trigger action response plan to respond to any exceedances of the relevant performance measures and groundwater performance criteria, and repair, mitigate and/or offset any adverse groundwater impacts of the development, including impacts on Thirlmere Lakes; • a Groundwater Modelling Plan that: ○ provides details for the future groundwater model re-build and recalibration which must be completed within 2 years of the commencement of development under this consent; ○ is independently third-party reviewed; ○ provides for the incorporation of the outcomes of the findings of the Thirlmere Lakes Research Program and other relevant research on the Thirlmere Lakes; ○ considers field data and the outcomes of subsidence monitoring; ○ provides for periodic validation and where necessary recalibration, of the groundwater model for the development, including an independent review of the model every 3 years, and comparison of monitoring results with modelled predictions; and • a plan to respond to any exceedances of the performance measures in Table 4.	**Section 4.4.1** **Section 4.1.9 and Appendix D** **Appendix B and Appendix F** **Section 4.2** **Section 4.4.1 and Section 4.4.2** **Section 4.4.1 and Appendix F** **Section 4.2, Appendix E** **Section 4.4.1 and Appendix D**

2.1.3 Management Plan Requirements

Consent Condition E5 outlines the general requirements for all management plans. **Table 2** outlines the requirements under this condition and identifies where these requirements have been addressed.

Table 2 Management Plan Requirements

Condition Reference	Condition	Where Addressed
E5	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:	**NA**
(a)	a summary of relevant background or baseline data;	**Section 4.1**
(b)	details of:	**NA**
(b) (i)	the relevant statutory requirements (including any relevant approval, licence or lease conditions);	**Section 2.1**
(b) (ii)	any relevant limits or performance measures and criteria; and	**Section 4.4**
(b) (iii)	the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	**Section 4.4**
(c)	any relevant commitments or recommendations identified in the document/s listed in condition A2(c);	**Section 2.1.2**
(d)	a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	**Section 4.2**
(e)	a program to monitor and report on the:	**NA**
(e) (i)	impacts and environmental performance of the development; and	**Section 4.3**
(e) (ii)	effectiveness of the management measures set out pursuant to condition E5(d);	**Section 4.2.1**
(f)	a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	**Section 4.4**
(g)	a program to investigate and implement ways to improve the environmental performance of the development over time;	**Sections 4.5 and 6**
(h)	a protocol for managing and reporting any:	**NA**
(h) (i)	incident, non-compliance or exceedance of any impact assessment criterion or performance criterion;	**Sections 5.3, 5.4 and 5.5**
(h) (ii)	complaint; or	**Section 5.6**
(h) (iii)	failure to comply with other statutory requirements;	**Covered collectively within Sections 5.3, 5.4 and 5.5**
(i)	public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and	**Section 7.1**
(j)	a protocol for periodic review of the plan.	**Section 6**

2.2 EIS Commitments

Condition A2 (g) of the Consent states that the development may only be carried out generally in accordance with the EIS. The relevant EIS documents include:

a) Tahmoor South Project Environmental Impact Statement, Volumes 1 and 7, dated January 2019;
b) Tahmoor South Project Amendment Report, including Appendices A to R and response to submissions, dated February 2020;
c) Tahmoor South Project Second Amendment Report, Appendices A to O and response to submissions, dated August 2020; and
d) Additional information responses dated 14 September 2020 (including Appendices A to L), 23 October 2020 and 4 November 2020.

EIS commitments relevant to this management plan are outlined in **Table 3**.

Table 3 EIS Commitments

EIS Reference	Commitment		Where Addressed
HR-9	Potential impact: Variation in salinity or contaminants of concern in the REA runoff Management and mitigation: Conduct surface water and groundwater monitoring during active placement of coal handling and preparation plant rejects.		**Section 4.3.1.1, Appendix B and Appendix D**
GW-6	Groundwater The mitigation measures outlined in Section 11.3.5 and Appendix I of the EIS prepared for the Project remain applicable to the Amended Project. Although, the revised Groundwater Assessment provides further detail regarding monitoring of groundwater during operation of the project, such that monitoring would include: - A condition assessment of bores and monitoring equipment (VWPs) of new bores around Tahmoor South, with a specific update of the GWMP; - Re-install at least one bore in the footprint of a Tahmoor North longwall (eg at TNC029) to monitor post-mining groundwater level and groundwater quality; and - Monitoring in longwall centre-lines of pre- and post-mining conditions Tahmoor South. This would be undertaken for the longwall (LW101A), and then every two or three after that. Packer testing would also be undertaken, followed by installing VMPs at four elevations in the Hawkesbury Sandstone and then two in the Bulgo Sandstone to assist in defining a profile of fracturing and depressurisation above longwalls.		**4.1.5.1, Appendix B** **4.3.1, Appendix B** **4.3.1, Appendix B**
PAR	Groundwater In addition to these measures, since exhibition of the EIS, Tahmoor Coal has installed a number of piezometers in and around Longwalls 31-32 and the Western Domain longwalls (in Tahmoor North) at the northern edge of the mine. These have already, and will in future, provide useful information for conceptualisation and model calibration/verification.		**4.3.1, Appendix B, Appendix E and Appendix F**

2.3 Other Leases and Licences

All development consents, leases, licences, and other relevant approvals are stored in the Cority Compliance Management database and on Tahmoor Coal's storage drive, which is administered by both site and Liberty GFG Corporate. A summary of the relevant mining leases is provided in **Table 4**. A summary of other approvals and licences is provided in **Table 5**.

Table 4 Mining Lease

Lease	Title	Granted	Expires
CCL 716	Original Tahmoor Leases	15/06/1990 (Instrument of Renewal 16/8/2023)	13/03/2042
CCL 747	Bargo Mining Lease	23/05/1990 (Instrument of Renewal 21/11/2005)	06/11/2025 (renewal determination issued 16 May 2025 and effective 7 November 2025)
ML 1308	Small Western Lease to west of CCL 716	2/03/1993 (Instrument of Renewal 24/6/2014)	2/03/2035
ML 1376	Tahmoor North Lease	28/08/1995 (Instrument of Renewal 28/3/2023)	28/08/2043
ML 1539	Tahmoor North Extensions Lease	16/06/2003	16/06/2035
ML 1642	Pit-top and REA surface Mining Lease	27/08/2010 (Instrument of Renewal 17/10/2022)	27/08/2031

Table 5 Approvals/Licences

Approval Title / Description	Description	Date Granted	Expiry Date
Environmental Protection Licence 1389	Environmental Protection Licence	01/05/1994, latest variation 28/06/2024	No Expiry
WAL36442	Water Access Licence	06/12/2013	No Expiry
WAL25777	Water Access Licence	27/10/2014	No Expiry
WAL43656	Water Access Licence	01/8/2022	No Expiry
SWC871469 (Leased)	Water Access Licence (Lease)	11/07/2025	01/07/2026
SWC868868 (Leased)	Water Access Licence (Lease)	01/07/2024	30/06/2025*
WAL45204	Water Access Licence	07/08/2024	No Expiry
WAL43631	Licence to store explosives	08/03/2021	No Expiry
WAL43655	Water Access Licence	09/03/2021	No Expiry
WAL43657	Water Access Licence	09/03/2021	No Expiry
WAL43659	Water Access Licence	09/03/2021	No Expiry
XSTR200005 Dangerous Goods Licence	Licence to store explosives	02/02/2017	02/02/2027
5061521 Radiation Management Licence	Radiation Management Licence	29/10/2025	29/10/2026

*Lease in process of renewal for FY2026

3 Stakeholder Consultation

3.1 Internal Stakeholder Communication

Internal stakeholders include employees, contractors and visitors of Tahmoor Coal. The Communication and Engagement Procedure (TAH-HSEC-00119) has been developed to include the following:

a) Methods of communication between internal stakeholders;

b) Types of information that is communicated between internal stakeholders;

c) Responsibilities for communication of information to internal stakeholders; and

d) Review of communication methods, including the consideration of feedback to / from internal stakeholders.

3.2 External Stakeholder Communication

External stakeholders include neighbours and the local / regional community, local council, state and federal government agencies and regulators, and press / media. Any external communications relating to groundwater will be conducted in accordance with Tahmoor Coal's standard communications procedures. External stakeholders are identified within the following documents:

- *TAH-HSEC-00031- Community Development Plan; and*
- *TAH-HSEC-00039 – Stakeholder Engagement Plan*.

External stakeholder communication is undertaken in accordance with:

- *TAH-HSEC-00039– Stakeholder Engagement Plan*; and
- *TAH-HSEC-00119- Communication and Engagement Procedure*.

These documents include information on the following topics:

a) Methods of communication to external stakeholders.

b) Types of information that is communicated between external stakeholders.

c) Responsibilities for communication of information to external stakeholders.

d) Review of communication methods, including the consideration of feedback to / from external stakeholders.

A key objective of Communication and Engagement Procedure (TAH-HSEC-00119) is to maintain positive relationships established with the local community and other external stakeholders.

3.3 Consultation to Date

A draft version of this management plan was distributed to the following stakeholders for review and feedback:

a) Natural Resource Access Regulator (NRAR)
b) Department of Planning, Infrastructure and Environment (DPIE) Water
c) EPA

The feedback provided by stakeholders is summarised within **Table 6** below.

Table 6 Consultation to Date

Consulted Parties	Consultation Conducted	Outcomes of Consultation
EPA	Draft plan provided for comment on 16/11/2021. Feedback on draft plan received on 29/11/2021.	Comments reviewed and addressed in **Appendix E**.
DPIE Water	Draft plan provided for comment on 16/11/2021. No comments on the plan have been received as of 25/03/2022. Feedback provided by DPIE Water via email on 03/04/2022 stated that DPIE Water would prefer to review the plan once it is in final draft form, with all required elements and supporting work and documents (including modelling) complete and available.	No comments required to be addressed.
NRAR	Draft plan provided for comment on 16/11/2021. No feedback received as of 25/03/2022.	No comments required to be addressed.
DPE Water	Draft plan provided for comment on 13/9/2023. Feedback provided by DPE Water (now DCCEEW Water) on 22/12/2023, providing a number of recommendations. Responses to these recommendations was provided on 14/3/2023 and approval of the draft plan was received on 7/4/2024.	No comments required changes to the management plan.
DPHI	Draft plan provided for comment on 28/6/2024 to DPHI. Feedback provided by DPHI on 6/8/2024, with regards to a few recommendations provided by DPE Water on 22/12/2023. A discussion regarding this feedback was completed on 16/8/2024.	Clarification wording to address recommendations 2.4 and 2.6 from DPE Water (22/12/2023) have been included in this document (refer Sections 4.2 and 4.6). These amendments have been provided to DCCEEW Water for consultation.

4 Environmental Management and Monitoring

4.1 Baseline Data

4.1.1 Geology

The geology around Tahmoor Mine comprises interbedded sandstones, siltstones, shales of the Triassic Wianamatta Group, Hawkesbury Sandstone and Narrabeen Group, and the interbedded sandstones, siltstones, and coal seams of the Permian Illawarra Coal Measures, and the Shoalhaven Group. Sill and dyke intrusions have been identified from surface mapping and drilling records.

4.1.2 Hydrogeological Units

The major hydrostratigraphic units that characterise the area around Tahmoor Mine are the Sydney Basin Triassic and Permian rock units, with the Hawkesbury Sandstone being the primary aquifer. These aquifers fall within the *Nepean Sandstone Groundwater Source* and have been classified as being 'Highly Productive' by the NSW Government based on considerations of bore yield and groundwater quality. The Bulgo Sandstone of the Narrabeen Group and the underlying Illawarra Coal Measures supply additional water to this system; however, contributions are substantially lower.

The extent of surficial units around Tahmoor Mine are presented in **Figure 3**. Generally, there is limited extent of alluvium in this region. Surficial exposure is dominated by the Hawkesbury Sandstone, with some capping via overlying Wianamatta Formation. The major units are described in the following sub-sections.

Alluvium

The alluvium is composed of two main units – the Thirlmere Lakes alluvium and the Quaternary to modern alluvium (**Figure 3**):

- The Thirlmere Lakes alluvium is Cretaceous in age and are positioned within a thin valley that forms the upper reaches of Blue Gum Creek to the west of Tahmoor Mine. It has been described as 'laterised alluvium' (Moffit, 1999) and is characterised by clayey sands and sandy clays with maximum thicknesses of 40 m to 60 m.
- The modern to Quaternary aged alluvium typically exists within watercourses in the northern regions of the mine lease. The main body of alluvium is located near the Western Domain i.e. along Stonequarry Creek downstream (east) of the Western Domain, extending downgradient to Picton.

Groundwater conditions are likely to be unconfined. Recharge to the alluvium is expected to be predominantly from rainfall, rainfall runoff and peak streamflow events (SLR, 2021).

There is no mapped alluvium adjacent to or above the Tahmoor South mine footprint.

Wianamatta Formation

Shale formations that have been largely eroded and are present as hill cappings overlying the Hawkesbury Sandstone. The shales have poor permeability and water quality, however, can lead to the development of springs in areas in contact with the Hawkesbury Sandstone (HydroSimulations, 2018).

Hawkesbury Sandstone

This unit forms a porous rock aquifer of moderate resource potential, tending to higher resource potential in areas where secondary porosity (jointing and fracturing) is more developed, such as in structural zones like the Lapstone Monocline/Nepean Fault zones (HS/SLR, 2020).

In the area of Tahmoor Mine, groundwater in this aquifer generally flows in a south to north-easterly direction, although there is evidence of a weak groundwater divide roughly in line with the western edge of the mine lease. This runs from around Mittagong in the south, through the Thirlmere Lakes area and to the north-west of Tahmoor North. From this divide groundwater flows either to the east and north-east, generally towards the Nepean River, or to the west draining to the Blue Gum Creek/Little River/Nattai River catchment (HS/SLR, 2020).

Hawkesbury Sandstone exhibits a range of salinities (fresh to saline) with a median value of approximately 500 mg/L (GeoTerra, 2013). Publicly available data from AGL's Camden Gas Project indicated an average total dissolved solid (TDS) of about 380 mg/L for Hawkesbury Sandstone groundwater (Parsons Brinckerhoff, 2013). These values are supported by the data collected in the previous bore census for the Western Domain (GeoTerra, 2019), where three of the four samples of groundwater electrical conductivity (EC, which is a measure of salinity) were <1,700 µS/cm (approx. 1,000 mg/L).

Following the significant rainfall events in February to March during 2021, there was a gradual decline in water quality (fresher groundwater) within the Hawkesbury Sandstone across the Western Domain with EC ranging from 255 µS/cm to 70 µS/cm (SLR, 2021). Some significant freshening in groundwater (from 1500 µS/cm to approximately 100 µS/cm) occurred locally around the Western Domain due to rainfall recharge. The private bores show a stable salinity in 2021 with a slight freshening at GW105228 from 1270 µS/cm in late October 2020 to 1000 µS/cm in July 2021. The latest records in EC at other private bores are within baseline levels (SLR, 2021).

Illawarra Coal Measures

The Illawarra Coal Measures includes the Bulli Coal and Wongawilli Coal seams, which are the major economic coal seams in the Southern Coalfield (HS/SLR, 2020). Tahmoor Mine, including the Tahmoor South workings, targets the Bulli Coal seam. The Bulli Coal seam is typically 375 – 410 metres deep at Tahmoor South.

Groundwater levels in the Illawarra Coal Measures follows a regional south-to-north gradient. However, as this aquifer is targeted for coal extraction at Tahmoor and several other nearby coal mines this gradient is reversed in some areas indicating flow towards the relevant mine workings.

The radius of influence around the mine workings, in the Bulli seam, appears to be around 600-1,000 m. SCT (2013) also analysed groundwater pressures and observed pressure reduction at 700-1,200 m from the nearest longwall.

This aquifer is not targeted for use as the water quality is poor (HS/SLR, 2020). The Illawarra Coal Measures have an average TDS of 11,000 mg/L and a range 3,200-27,500 mg/L was reported for groundwater from the Illawarra Coal Measures.

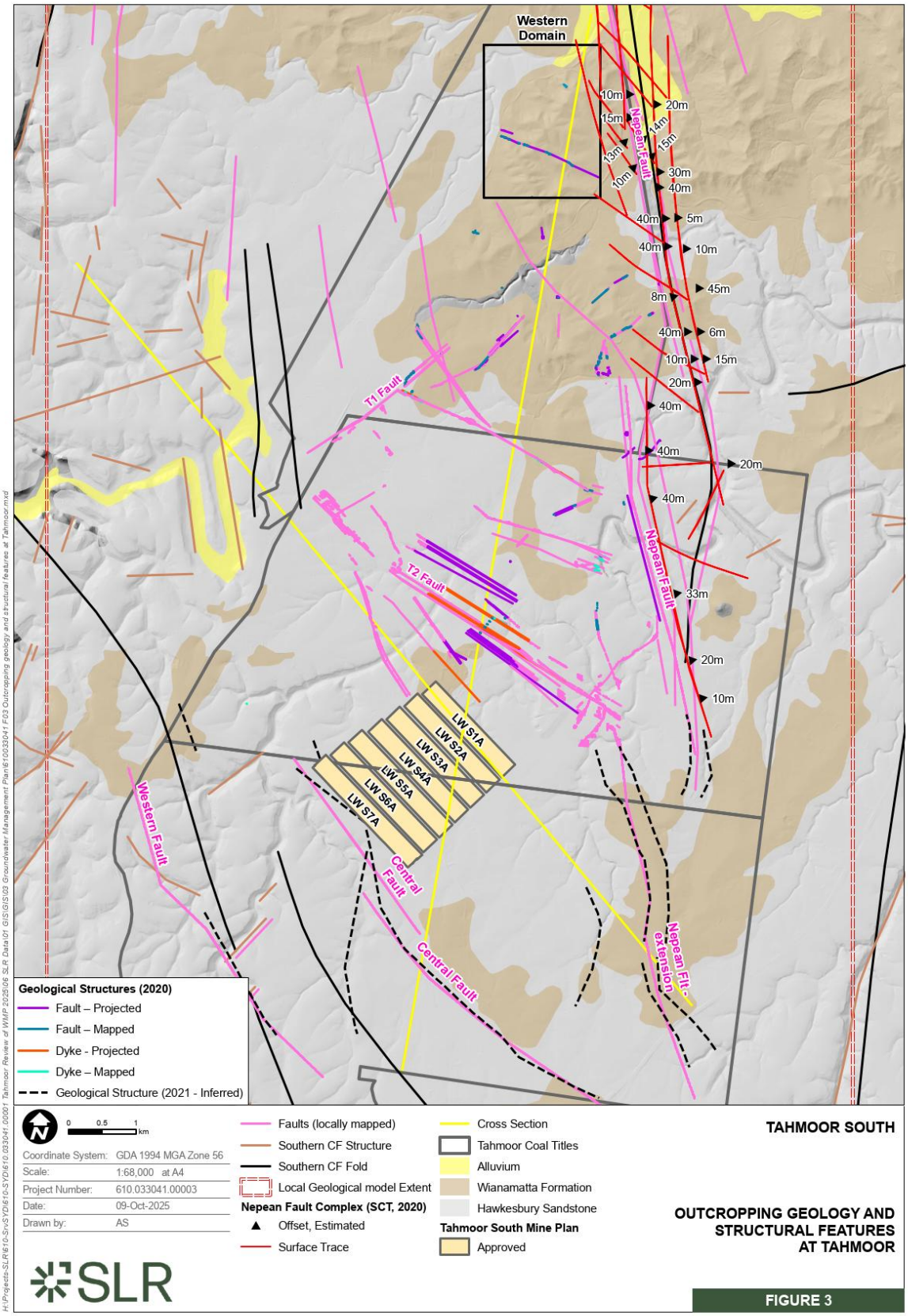

Figure 3 Surficial Geological Outcrop and major faults

4.1.3 Geological Structure

There are a number of geological structures mapped in the vicinity of Tahmoor Mine. The main ones are described as follows and shown on **Figure 3**. It is expected that as development occurs in the Tahmoor South area, additional structures will be identified and characterised.

4.1.3.1 Nepean Fault

The largest of these geological structures are the Nepean Fault (trending north-south) and several NW-SE trending features (faults and monoclines) near parts of the existing Tahmoor Mine and east of the Project. The Nepean Fault is known to have different properties to the host geological units. It could be either a hydraulic barrier or a conductive fault, as it is observed that there are large hydraulic gradients across the fault. Tahmoor Coal has observed water inflows to the mine to be higher than typical at a point where the mine workings intersected the fault zone, which indicates that the Nepean Fault is generally more permeable than the surrounding geology.
Further discussion of increased inflows during the intersection of Longwall 16 is presented in **Section 4.1.3.4**.

4.1.3.2 T1 and T2 Faults

The 'T1' and 'T2' faults which are present at the western edge of the previously extracted Tahmoor longwalls between the mine and the Thirlmere Lakes, lie essentially to the north of (and are not intersected by) the proposed Tahmoor South longwalls.

4.1.3.3 Other Structures

Other features of note are:

- *the Camden Syncline*, which plunges from south to north, and is located about 3.3 km east of the eastern-most Tahmoor South longwall panels, and more or less coincident with the Nepean River at this point;
- *Bargo Fault*, heading more or less west, which diverges from the Nepean Fault and crosses the mined area of Tahmoor North;
- *the Central and Western Faults*, which trend NW-SE, just outside the proposed southern limit of the Tahmoor South longwalls. The alignment of the Central Fault is essentially congruent with the course of Hornes Creek , suggesting that the creek might exist at this location due to the influence of this structural feature;
- *Victoria Park Fault*, lying near to the west of the Tahmoor North longwalls 26-31, and distant from Tahmoor South;
- There are other smaller faults mapped within the extent of the historical Tahmoor workings.

4.1.3.4 Water make associated with structures

As noted above, the Nepean Fault zone has been associated with greater water makes (inflow) than is typical. The intersection of other faults, such as the Bargo Fault and Victoria Park Faults, by mining has not produced notable additional water inflows. Investigative drilling into fault zones has also proved difficult. For this reason, it is believed that most of the faults in the area act as barriers to flow, possibly because of the presence of fines or mineralisation within the fault zone.

4.1.4 Historic Groundwater Inflow

Groundwater pumped from all sumps in the mine workings is currently, and will continue to be, monitored by means of flow meters fitted to pipelines recording pumping times and rates. This water reporting to the underground workings and sumps may include groundwater seepage inflows, supply inflows (potable supply and for operations), and some re-circulation.

Operational water balance reviews will continue to be performed monthly collating groundwater extractions, as well as imported water to inform on-site water management. Such a system has been in operation at Tahmoor since 2009 (15 years) and will continue for the life of Tahmoor South. Advice from SIMEC is that it is not possible to separately meter the volumes that enter the mine workings in the 'Drift' and in the workings (at seam level). The volumetric flux monitoring will therefore provide data on the total groundwater inflow to all workings, where inflow to Tahmoor South workings will be the primary component of groundwater inflow.

Since 2009, inflows to the Tahmoor Mine have typically ranged between 2 and 6 ML/day. The average inflow rate for the most recent water year (July 2023 to June 2024) was 3.6 ML/day. This compares to 2.9 ML/day in the previous water year (2022–2023), and 4.4 ML/day in 2021–2022 (SLR, 2021). These rates are based on calculated water balances, which may underestimate true inflows during temporary stoppages in pumping or overestimate inflows when pumping is intensified to recover accumulated water. Therefore, longer-term averages are considered more reliable than short-term estimates.

Between mid-2020 and April 2021, inflows increased beyond 5 ML/day during extraction of LW W1 and LW W2. Peak inflows of just over 6 ML/day were recorded in March and April 2021. Although these inflows were not metered in isolation, they were estimated to exceed 2.5 ML/day within the Western Domain during this period. No major geological structures, apart from a minor fault in the southern parts of LW W1 and W2, were observed intersecting the workings. **Figure 4** presents a history of the calculated inflows ('water make') at Tahmoor Mine between 2015 and 2024.

Groundwater inflows predicted for Tahmoor South under the revised numerical model (SLR, 2024) show a gradual increase over the first half of the operational life of LW S1A–S7A, reaching a peak of approximately 789.3 ML/year (average 2.16 ML/day) in water year 2024. Inflows are projected to decline gradually through to 2032. During extraction of the A-series longwalls, the model predicts inflows will reach a peak of 0.47 ML/day at the beginning of 2024 and gradually decrease to around 0.20 ML/day by the time mining concludes in October 2027. **Figure 5** shows the modelled inflows to Tahmoor South over the life of mine.

Tahmoor Coal currently holds 1,642 units of entitlement under WAL36442 and 1000 ML under SWC868868 (leased) from the Sydney Basin – Nepean Groundwater Source, in accordance with the Greater Metropolitan Region Groundwater Sources Water Sharing Plan 2023. Predicted operational groundwater inflows for the life of mine are within this entitlement volume.

In addition, revised modelling presented in the SLR (2024) Modification 3 report estimates long-term passive (or indirect) inflows to the historical workings post-mining, driven by aquifer recovery. During the active mining period (2024–2034), average daily passive take is predicted to decrease from around 6.2 ML/day to 4.0 ML/day, with a peak annual passive flux of 2,859 ML/year in 2033–2034. Over the post-mining period (2034–2068), inflows decline steadily to less than 0.1 ML/day by the late 2050s, and eventually approach negligible rates (<0.01 ML/day) by the late 2060s. These passive inflows represent indirect aquifer contributions to mine voids rather than active dewatering.

To manage these future passive inflows and account for water stored within the historical workings, Tahmoor Coal is seeking to obtain additional Water Access Licence (WAL) entitlements.

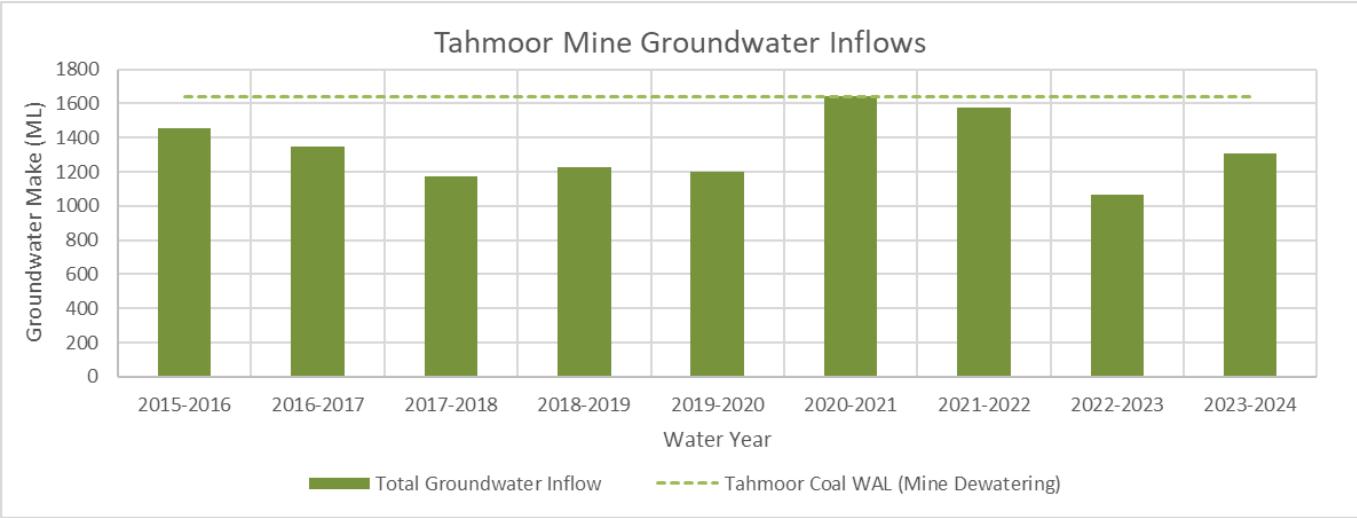

Figure 4 Calculated Groundwater Inflow to the Tahmoor Mine Workings

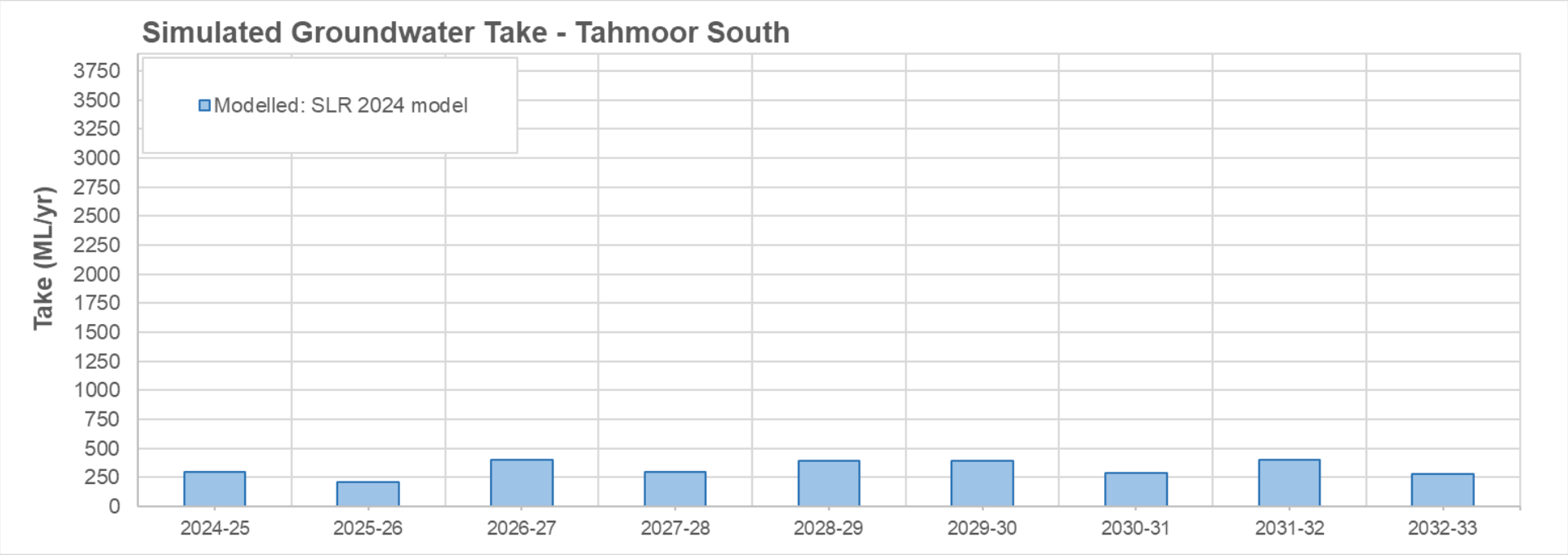

Figure 5 Simulated Groundwater Take

4.1.5 Groundwater Levels

4.1.5.1 Tahmoor South Monitoring Bores

Historically, thirteen bores exist that are equipped with Vibrating Wire Piezometers (VWPs) in the Tahmoor South monitoring network, and these are described in **Table 7** and shown on **Figure 6**. Telemetry has been installed providing continuous access to data.

As per commitments under the approved Development Consent SSD 8445 MOD 2 (determined 13 June 2023) and retained in the updated MOD 3 Water Management Plan, selected monitoring points from the historical workings (Western Domain) have been incorporated into the ongoing Tahmoor South monitoring regime. These include VWP sites WD02, TNC036, and TNC040, as listed in **Table 7**.

Table 7 Summary of existing VWPs in Tahmoor South

Bore ID	Easting	Northing	Status	Targeted Aquifer*	Type	Sensor Depths (m bns)
TBC009	278511	6202058	Existing	HBSS, BHCS, BGSS, WBCS, BUCO, WWCO	VWP	30, 75, 140, 182, 192, 322, 343, 357, 381, 391, 397m
TBC018	279645	6204509	Existing	HBSS, BHCS, BGSS, WBCS, BUCO, WWCO	VWP	70 (inactive), 11, 164, 179, 198, 282 (inactive), 366, 377, 404, 426, 432m (inactive)
TBC020	280909	6204059	Existing	HBSS, BHCS, BGSS, WBCS, BUCO, WWCO	VWP	70 (inactive), 105 (inactive), 141 (inactive), 194 (inactive), 211, 293, 375, 397 (inactive), 411, 434, 439m (inactive)
TBC024	274763	6204163	Existing	HBSS, BHCS, BGSS, WBCS, BUCO, WWCO	VWP	117, 139, 168, 185, 240, 295, 350, 371, 384, 391m
TBC026	281603	6207068	Existing	HBSS, BHCS, BGSS, WBCS, BUCO, LRSS, WWCO	VWP	95, 135, 176, 191, 211, 278, 344 (inactive), 409, 432, 440, 460m
TBC027	275708	6202210	Existing	HBSS, BHCS, BGSS, WBCS, BUCO, WWCO	VWP	95, 132, 169, 181, 198, 253, 306, 362, 384, 396, 400m
TBC032	277244	6204725	Existing	HBSS, BHCS, BGSS, WBCS, BUCO, WWCO	VWP	95, 131, 168, 181, 200, 237, 294, 371, 397, 437m
TBC034	272956	6205076	Existing	HBSS, BHCS, BGSS, WBCS, BUCO, WWCO	VWP	65 (inactive), 113 (inactive), 161(inactive), 176, 196, 245, 294, 343, 364, 382m
TBC039	273445	6207688	Existing	BGSS, BGSS, SBSS, BUSM, WWCO	VWP	243, 299, 354, 375, 402m
TBC19b	277200	6202080	Existing	HBSS, HBSS, HBSS	VWP	80, 109, 137m
TNC036	277268.6	6215382.0	Existing	HBSS, BGSS,BUCO	VWP	65, 97, 169, 214, 298, 412, 463m
TNC040	279003.6	6214520.9	Existing	WMFM, HBSS, BGSS,BUCO	VWP	27, 65, 131, 225, 252, 352, 452, 501m
WD02	278245.5	6215178.3	Existing	HBSS, BACS, BGSS	VWP	130, 200, 240, 280, 305, 330, 355, 410m

** WNFM – Wianamatta Group, HBSS – Hawkesbury Sandstone, BHCS – Bald Hill Claystone, BGSS – Bulgo Sandstone, SPCS – Stanwell Park Claystone, SCSS – Scarborough Sandstone, WBCS - Wombarra Claystone, CCSS – Coal Cliff Sandstone, BUCO– Bulli Coal Seam, WWCO – Wongawilli Coal Seam*

To complement the VWP network, 28 open standpipes (OSPs) have been constructed across the Tahmoor South area for ongoing water level and quality monitoring. This includes two OSPs (P14 and P16) retained from the Western Domain monitoring program and one OSP (REA4) previously associated with the Reject Emplacement Area (REA), which has now been integrated into the broader network.

In addition, 5 private and 4 NSW government bores have been incorporated into the monitoring program where access has been granted by landholders, with standpipes installed to facilitate regular level and quality sampling. Construction details are provided in **Table 8**.

Table 8 Summary of existing Open Standpipes in Tahmoor South

Bore ID	Easting	Northing	Target Aquifer	Depth (m)	Monitoring Regime
P50a	274203.785	6209099.692	HBSS	71	15 minute intervals
P50b	274191.154	6209101.903	HBSS	90	15 minute intervals
P50c	274181.203	6209095.28	HBSS	117	15 minute intervals
P51a	275623.00	6206431.71	HBSS	19.96	15 minute intervals
P51b	275620.60	6206419.68	HBSS	35.38	15 minute intervals
P57a	2754900	6207140	HBSS	92	15 minute intervals
P57b	2754900	6207140	HBSS	120	15 minute intervals
P57c	2754900	6207140	HBSS	150	15 minute intervals
P52	277649.84	6206848.30	HBSS	41.17	15 minute intervals
P53a	277649.91	6206496.48	HBSS	41	15 minute intervals
P53b	277658.61	6206492.50	HBSS	60.55	15 minute intervals
P53c	277665.80	6206489.23	HBSS	80.78	15 minute intervals
P54a	277809.68	6205951.98	HBSS	25	monthly
P54b	277806.92	6205944.68	HBSS	35.99	monthly
P55a	277297.77	6205283.12	HBSS	41.05	15 minute intervals
P55b	277303.32	6205270.96	HBSS	59.36	15 minute intervals
P55c	277296.45	6205262.51	HBSS	81.90	15 minute intervals
P56a	276645.55	6206175.36	HBSS	20.9	15 minute intervals
P56b	276639.18	6206166.92	HBSS	45.56	15 minute intervals
P56c	276637.06	6206154.37	HBSS	80.4	15 minute intervals
P14A	278398.4	6216535.9	Alluvium/colluvium	6	15 minute intervals
P14B	278392.6	6216534.3	HBSS	16.6	15 minute intervals
P14C	278397.2	6216541.8	HBSS	31.6	15 minute intervals
P14D	278391.4	6216540.0	HBSS	61.6	15 minute intervals
P16A	277350.5	6215146.7	HBSS	27.5	15 minute intervals
P16B	277349.9	6215140.4	HBSS	45.5	15 minute intervals
P16C	277347.3	6215135.3	HBSS	75.5	15 minute intervals
GW109257	276603.8	6205057	HBSS	120	monthly
GW104008	280359	6205978	HBSS	140	monthly
GW112473	276586	6202000	HBSS	138	monthly
GW104659	276616	6207392	HBSS	132	monthly
GW104323	276242	6206412	HBSS	79.8	monthly
REA4	277650.8	6206835.2	REA	57.5	monthly
GW075409-1	273774	6209555	Alluvium	*Public data not available*	monthly
GW075409-2	273774	6209555	HBSS		monthly
GW075410	273000	6210570	Alluvium/ HBSS		monthly
GW075411	274240	6211004	HBSS		monthly

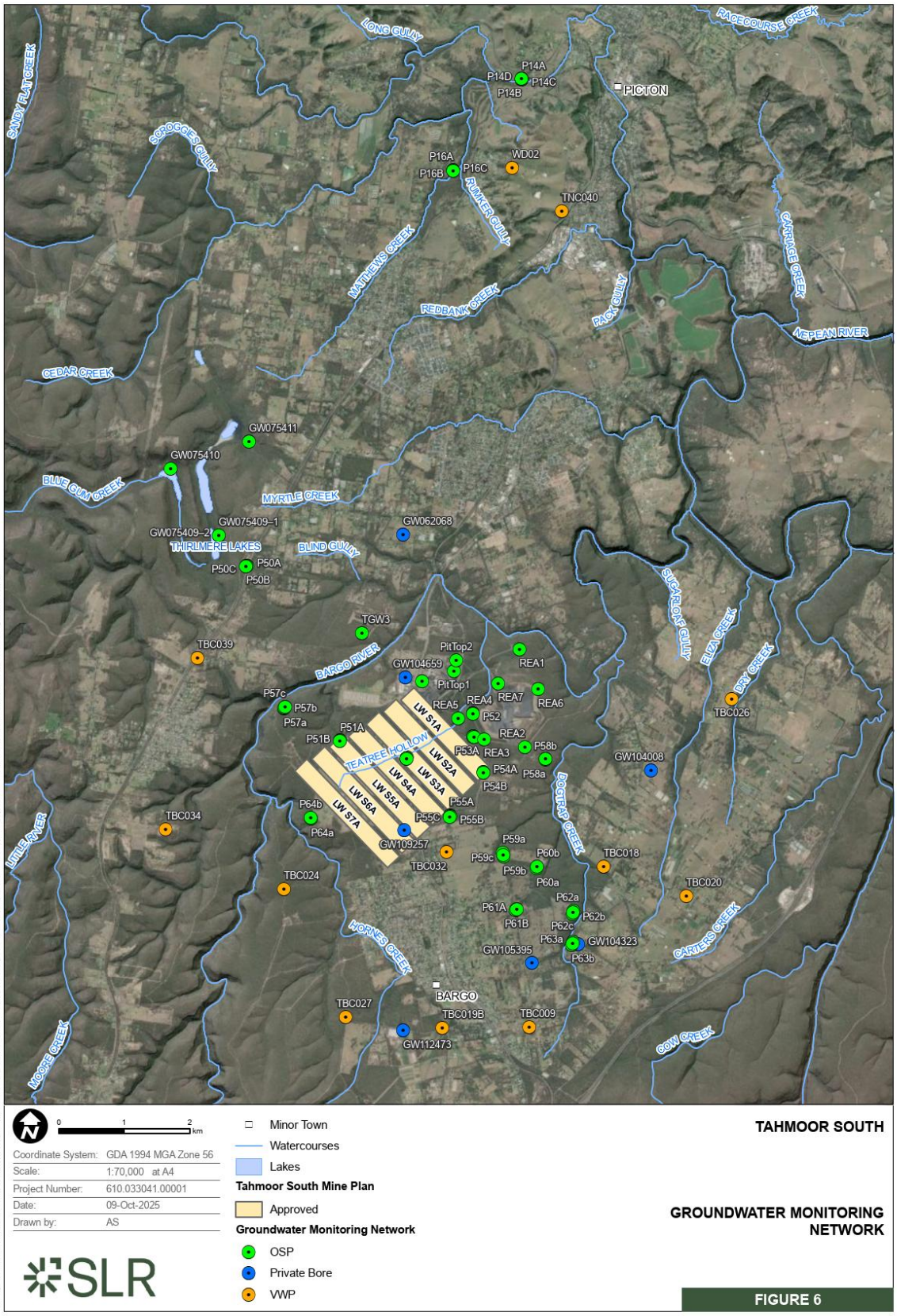

Figure 6 Existing Groundwater Monitoring Sites

4.1.5.2 Private Bores

The pre-mining private landholder bore survey commenced in January 2022 and was concluded by 15th March 2022, surveying a total of 40 bores. Water level data was captured for all bores where possible and summarised in **Table 9**. Five bores have been incorporated into the routine monitoring regime, with water levels manually recorded monthly.

Table 9 Groundwater Levels in Private Bores

Bore	Ongoing Monitoring	Current Use and Frequency	Aquifer	Bore Depth (m)	Groundwater Depth (metres below ground)
10CA119328	no	Irrigation, daily (when onsite dam is low)	HBSS	NR	54.4
115NTG	no	Not currently used, pump to be installed next month	HBSS	~160 - 170 m	41.67
GW032443	no	Not currently used	HBSS	10.71 (measured, likely blocked)	0.71
GW059618	no	No one onsite for comment, likely not in use as no infrastructure connected	HBSS	122.71	19.96
GW062068	yes	Not used due to "part cave-in" 11 years ago	HBSS	>100	21.93
GW102452	no	Formerly used for aquaculture (~50,000L/day)	HBSS	71.41	36.41
GW103023	no	No current use. Formerly used for water extraction to supply aquaculture enterprise	HBSS	51.43	17.68
GW103036	no	Daily, irrigation	HBSS	127.42	68.49
GW103615	no	Not currently used	HBSS	73.1	65.36
GW104008	yes	When required to fill the dam and irrigate lawns	HBSS	>100	46.84
GW104323	yes	Daily use (on timer) for crop irrigation	HBSS	79.8	68.6
GW104659	yes	To replenish adjacent dam, regulated by timer	HBSS	50.08	43.8
GW105395	yes	Not currently used	HBSS	53.1	0.5
GW105803	no	Not currently used	HBSS	80 (anecdotal, not measured)	17.05
GW106546	no	Once per week for stock watering	HBSS	63.63 (likely blockage as installed to 116 metres)	41.67
GW109257	yes	Not used for two years, previously used to fill site dam	HBSS	NR	37.06
GW111518	no	Frequent use when required, for crop irrigation	HBSS	28.3 (owner described depth of 28.3 so potential obstruction)	19.24
GW111828	no	Not currently used, previously used intermittently when water not available from GW115773 as irrigation back-up	HBSS	60.7 (likely blocked as install depth recorded as 205 m)	Dry or blocked

GW111842	no	Not currently used	HBSS	69.4 (likely blocked as install depth recorded as 240 m)	Dry or blocked
GW112415	no	Daily use to fill dam and irrigate lawn	HBSS	96.96	42.86
GW112473	yes	Daily use to fill dam	HBSS	NR	32.95
GW115773	no	Daily use for irrigation	HBSS	81.87	75.85
GW116897	no	Not currently used, waiting for pump install for future crop use	HBSS	51.2 (potential blockage as install recorded to 160m)	19.9
GW45404	no	Not used in years	HBSS	72.73 (could be blocked)	Dry
Heritage Well	no	Unused	HBSS	3.12	1.15

4.1.6 Hydraulic Conductivity

For the purpose of describing or quantifying how water flows through a porous or fractured medium, the term 'permeability' is used interchangeably with 'hydraulic conductivity' in this document. Data has been sourced from packer testing with some available from core testing, conducted at Tahmoor, Appin and Dendrobium Mines. Packer testing primarily tests horizontal hydraulic conductivity (Kh), but can also be useful in characterising the likely vertical hydraulic conductivity (Kv) in sedimentary units. Data indicated that there is large range of values among formations, however it should be noted that there is limited core testing data (Kv), particularly outside of the Hawkesbury Sandstone (HBSS).

Data suggests a decreasing permeability with depth of the rock mass as a whole; however, that trend is mainly evident for the non-coal units while the coal seams are key exceptions to this general trend:

- Decreasing from the Hawkesbury Sandstone down to the Wombarra Claystone, then a step up at the Bulli Coal seam due to the higher permeability of the coal material; and
- A further decreasing trend in the sandstone and siltstone units below the Bulli Coal Seam.
- Like the Bulli Coal, the Wongawilli Coal seam is more permeable than the surrounding sandstone and siltstone units.
- There is a weak trend of decreasing matrix permeability with depth observed in the core data (SLR, 2021).

The installation of three further Height-of-Fracturing (HoF) holes are proposed for investigating fracturing conditions, as per the Groundwater Monitoring Plan (SLR, 2021b), one more in the A-block, and two in the B-block. This follows the ongoing investigation in the Western Domain at bores WD01-WD02.

4.1.7 Groundwater Quality

Monitoring Bores

Water quality sampling is undertaken across the Tahmoor South mining domain to monitor groundwater chemistry and assess potential impacts associated with mine operations. The current monitoring network comprises 28 open standpipes, including REA4, and 5 private bores that provide coverage across the mining lease and surrounding areas. These locations are sampled in accordance with the site's monitoring schedule and are detailed in **Table 10**.

This network has evolved to include bores inherited from the historical mining domain, as required under Development Consent SSD 8445 MOD 2, providing continuity of groundwater quality records. The former pit-top bores and standpipes previously located at the Reject Emplacement Area (REA1–7) have since been decommissioned, with REA4 now retained as a standard open standpipe within the broader network.

Groundwater samples are submitted for comprehensive laboratory analysis on a quarterly or monthly basis, depending on the assigned monitoring regime. Parameters analysed include:

- Electrical conductivity (EC), Total Dissolved Solids (TDS), Dissolved Oxygen (DO)
- Nutrients: Total Nitrogen (Total N), Total Phosphorus (Total P)
- Major Ions: Calcium (Ca), Chloride (Cl), Potassium (K), Sodium (Na), Sulfate (SO_4), Bicarbonate (HCO_3), Fluoride (F)
- Alkalinity: Total, Bicarbonate, Carbonate, Hydroxide
- Metals (total and dissolved): Iron (Fe), Manganese (Mn), Copper (Cu), Lead (Pb), Zinc (Zn), Nickel (Ni), Aluminium (Al), Arsenic (As), Selenium (Se), Lithium (Li), Strontium (Sr), Cobalt (Co)

In addition, Electrical Conductivity (EC) has been recorded since 2012 at NSW Government monitoring bores located at Thirlmere Lakes, supporting regional hydrogeological assessments and trend comparisons.

Table 10 Groundwater Quality Monitoring Network

Bore	Easting	Northing	Bore Depth (m)	Monitoring Regime
REA4	277650.8	6206835.2	57.5	monthly
P50a	274203.8	6209099.7	71	monthly
P50b	274191.2	6209101.9	90	monthly
P50c	274181.2	6209095.3	117	monthly
P51a	275623.00	6206431.71	19.96	monthly
P51b	275620.60	6206419.68	35.38	monthly
P52	277649.84	6206848.30	41.17	monthly
P53a	277649.91	6206496.48	41	monthly
P53b	277658.61	6206492.50	60.55	monthly
P53c	277665.80	6206489.23	80.78	monthly
P54a	277809.68	6205951.98	25	monthly
P54b	277806.92	6205944.68	35.99	monthly
P55a	277297.77	6205283.12	41.05	monthly
P55b	277303.32	6205270.96	59.36	monthly
P55c	277296.45	6205262.51	81.90	monthly
P56a	276645.55	6206175.36	20.9	monthly
P56b	276639.18	6206166.92	45.56	monthly
P56c	276637.1	6206154.4	80.4	monthly
P57a	2754900.0	6207140.0	92	monthly
P57b	2754900.0	6207140.0	120	monthly
P57c	2754900.0	6207140.0	150	monthly
GW109257	276603.8	6205057	120	monthly
GW104008	280359	6205978	140	monthly
GW112473	276586	6202000	138	monthly
GW104659	276616	6207392	132	monthly
GW104323	276242	6206412	79.8	monthly
P14A	278398.4	6216535.9	6	quarterly

P14B	278392.6	6216534.3	16.6	quarterly
P14C	278397.2	6216541.8	31.6	quarterly
P14D	278391.4	6216540.0	61.6	quarterly
P16A	277350.5	6215146.7	27.5	quarterly
P16B	277349.9	6215140.4	45.5	quarterly
P16C	277347.3	6215135.3	75.5	quarterly
GW075409-1	273774.0	6209555.0	*Public data not available*	monthly
GW075409-2	273774.0	6209555.0		monthly
GW075410	273000.0	6210570.0		monthly
GW075411	274240.0	6211004.0		monthly

Field water quality has been undertaken for EC and pH on a monthly basis since August 2019. **Appendix C** presents the baseline data (EC and pH) for the Pit Top and REA bores, with the rainfall residual mass included for comparison to climatic trends.

Private Bores

Historical groundwater quality data for the Study Area, in the form of EC, are summarised in **Figure 7**. These data were sourced from publicly available data from the NSW government Groundwater Works/Pinneena database, and from the bore census conducted by Geoterra (2013a). The information in the Groundwater Works database is a mix of qualitative (e.g. 'fresh', 'brackish') and quantitative (e.g. '500 ppm'). In order to convert or standardise these qualitative entries to an approximate quantitative measure some assumptions have been made. The resultant quantitative salinities were classified as shown on **Figure 7**, as well as assigning the various bores to layers using the geological model built for this study.

The data indicate that:

- Groundwater in the Alluvium and Wianamatta Formation are of mixed quality. It is likely that evaporative concentration of salts could occur in alluvial aquifers, especially in clayey facies. The marine origin and low permeability of the Wianamatta Shales tends to lead to higher salinities in this unit.
- There is little data for the Narrabeen Group or Illawarra Coal Measures. Older units such as the Shoalhaven Group exhibit a range of salinities from fresh to saline.

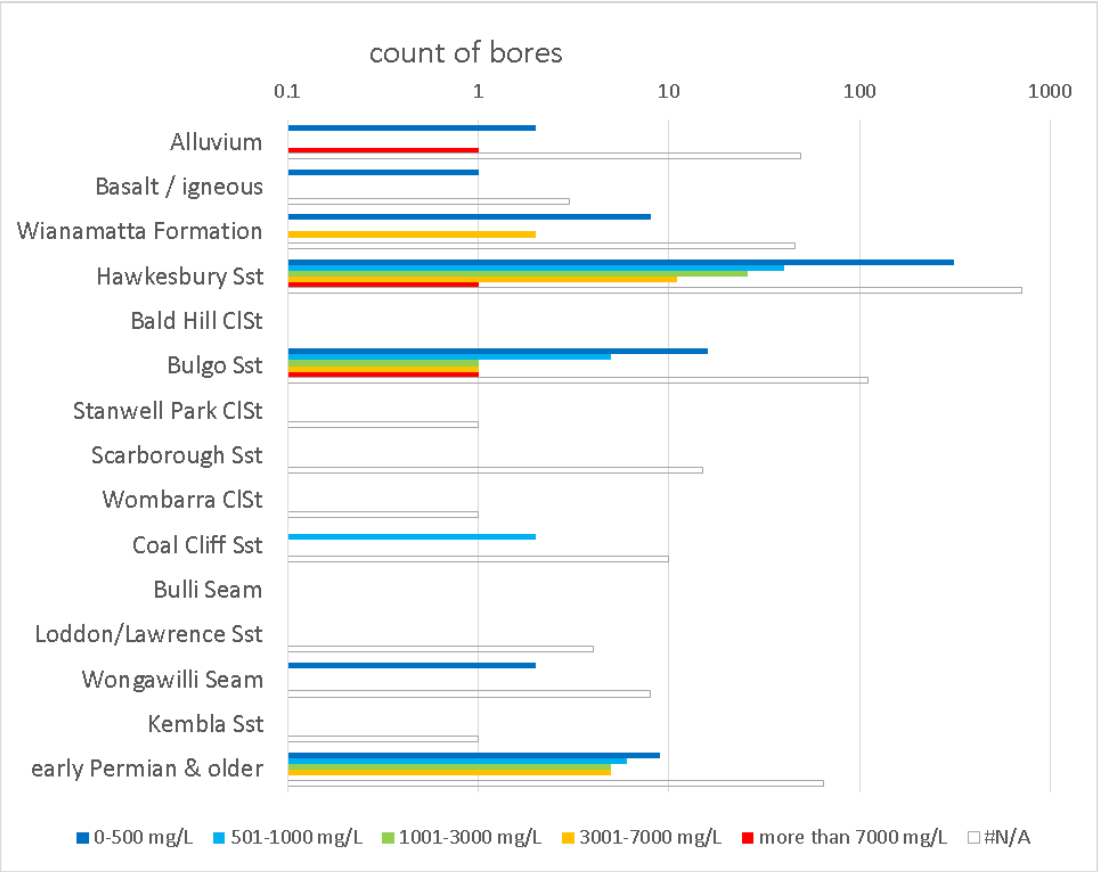

Figure 7 Summary of groundwater salinity data

In addition, **Table 11** presents the salinity (as EC) recorded during the 2022 Private Bore Survey (SLR, 2022c). The median groundwater salinity is 810 µS/cm, with a minimum of 165 µS/cm and a maximum of 3,378 µS/cm. There are no apparent trends with groundwater salinity and bore depth or location.

Table 11 Private Bore Survey Salinity Data

Bore	Ongoing Monitoring	Aquifer	Bore Depth (m)	Groundwater Salinity EC (µS/cm)
10CA119328	No	HBSS	NR	1472
115NTG	No	HBSS	~160 - 170 m	689
GW032443	No	HBSS	10.71 (measured, likely blocked)	226
GW059618	No	HBSS	122.71	2396
GW062068	Yes	HBSS	>100	165
GW070245	No	HBSS	NR	949
GW102179	No	HBSS	NR	1849
GW102344	No	HBSS	NR	801
GW102452	No	HBSS	71.41	371
GW103023	No	HBSS	51.43	3378
GW103036	No	HBSS	127.42	371

GW103559	No	HBSS	NR	487
GW104008	Yes	HBSS	>100	1323
GW104323	yes	HBSS	79.8	1025
GW104659	Yes	HBSS	50.08	539
GW105262	No	HBSS	NR	1828
GW105395	No	HBSS	53.1	3341
GW105803	No	HBSS	80 (anecdotal, not measured)	1108
GW105883	No	HBSS	NR	1686
GW110669	No	HBSS	NR, 111 metres install depth noted on bore	677
GW111518	No	HBSS	28.3	277
GW111669	No	HBSS	NR	481
GW111810	No	HBSS	NR	2058
GW112415	No	HBSS	96.96	1059
GW112473	Yes	HBSS	NR	515
GW115773	No	HBSS	81.87	820
GW116897	No	HBSS	51.2 (potential blockage as install recorded to 160m)	776
Heritage Well	No	HBSS	3.12	684
GW106590	No	HBSS	150 (Installed depth)	842

4.1.8 Groundwater Use

4.1.8.1 Groundwater Dependent Ecosystems

The Thirlmere Lakes are the closest 'High Priority' Groundwater Dependent Ecosystem to Tahmoor Mine, being 650-700 m from historical Tahmoor longwalls at their closest points, but at least 3,500 m from Tahmoor South longwalls.

Thirlmere Lakes are of high conservation importance, gazetted as a National Park in 1972, and providing habitat for dependent aquatic species (Schädler & Kingsford, 2016). The Lakes are a group of waterbodies in the Greater Blue Mountains World Heritage Area that includes Lake Gandangarra, Lake Werri Berri, Lake Couridjah, Lake Baraba and Lake Nerrigorang.

The water in Thirlmere Lakes is predominantly derived via rainfall. The Thirlmere Lakes Inquiry concluded that the Lakes appear to act as naturally losing system under both dry and wet conditions (Heritage Computing, 2012b; Schädler & Kingsford, 2016).

Findings by the NSW government Thirlmere Lakes Research Program (TLRP) indicate that historical effects of Tahmoor Mine on Thirlmere Lakes hydrology have likely been very small compared to climatic effects. The TLRP released the major findings report from the study, '*Thirlmere Lakes – A Synthesis of Current Research'*, on the 24th March 2022 (DPE, 2022). The field and modelling results suggest that the recent water level declines are primarily associated with climate variability versus the nearby longwall mining. However, this conclusion does not preclude the influence of the ongoing longwall mining and bore extraction in the future, and ongoing monitoring was recommended. The findings of this report are aligned with existing conceptualisation of the Lakes and are supported by the proposed monitoring program and groundwater modelling.

The numerical groundwater model (SLR, 2024) predicted minimal cumulative impacts to the Thirlmere Lakes. Predicted change in leakage ranged between negligible at Baraba Lake to the largest loss of leakage predicted for Lake Werri Berri at 0.07 ML/day. This predicted minimal impact is consistent with findings from the NSW Government Thirlmere Lakes Research Program (TLRP) that found that the historical mining at Tahmoor North had likely only a negligible to very minor effect on the lake water balance, and consistent with the conclusions of the Tahmoor South EIS.

A TARP has also been developed for Thirlmere Lakes to monitor for early warning signs of potential impacts and to initiate appropriate actions and responses.

Regional mapping of groundwater dependence of terrestrial ecology is shown on **Figure 8** (DPIE, 2018). Key areas as identified via this mapping include the Thirlmere Lakes and reaches of Dog Trap Creek and Teatree Hollow. This indicates a high probability of interaction of groundwater and surface water at these locations, in the form of riparian vegetation.

4.1.8.2 Springs

Relevant literature indicates that the Hawkesbury Sandstone may contain springs that have developed in saturated and perched aquifers of the formation (HydroSimulations, 2018). However, no significant springs or soaks have been mapped or located in the vicinity of the Project. Field investigations carried out by Brienen Environment & Safety (2022) supported this finding. This was further confirmed by site inspections undertaken in January 2024 by Niche Environment and Heritage, who found no evidence of springs (SLR, 2024).

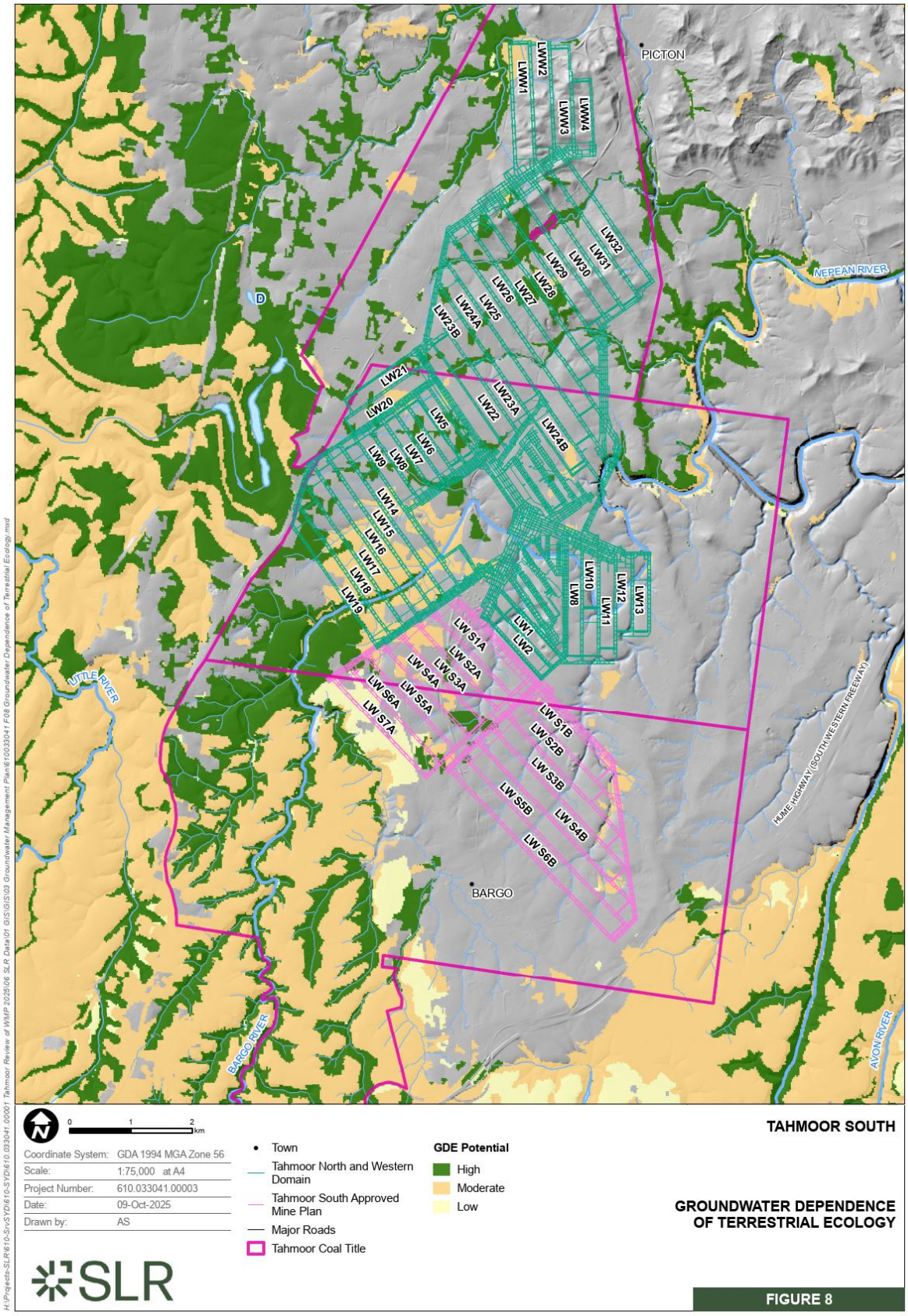

Figure 8 Groundwater Dependence of Terrestrial Ecology (DPIE, 2018)

4.1.8.3 Anthropogenic Use

As stated in the EIS Groundwater Assessment (HydroSimulations, 2020), there are 982 registered bores and an associated 791 WALs within the immediate vicinity of the Study Area. The Hawkesbury Sandstone, surficial alluvium and basalt aquifers were the predominant target aquifers (89% of the total) with approximately 10% targeting the Bulgo Sandstone.

A total of 52 registered bores which had the potential to incur a Project related groundwater drawdown of greater than 2 metres, as identified in the EIS, were incorporated into the Private Bore Baseline Survey in 2022 as per the requirements of the Aquifer Interference Policy. During the survey process an additional six bores were incorporated into the survey at the request of individual landholders. The "heritage well", previously identified in the Statement of Heritage Impact (SoHI) for the Wirrimbirra Sanctuary (EMM, 2020) was also incorporated. Subsequently, a total of 59 private bores were proposed to be assessed, however, only 40 of these bores were inspected due to access restrictions. The baseline survey commenced on 15 January 2022 and was concluded by 15 March 2022. SLR (2024) predicted that a total of 13 registered private bores were likely to experience greater than 2 metres of drawdown as a result of extraction from LW S1A to LW S7A extraction, while 27 private bores were predicted to experience greater than 2 metres of cumulative drawdown. Utilising the SLR (2024) updated groundwater model a summary of predicted drawdown resulting from this extraction is provided in **Table 12** indicating that there are 13 bores with potential drawdowns more than 2 m due to LW S1A to LW S7A extraction.

The field survey was conducted to establish baseline conditions of as many bores as possible, with seven selected for ongoing monitoring.

Table 12 Private Groundwater Users potentially impacted by Tahmoor South operations

Work Number	Easting	Northing	LW S1A-S7A Potential Impact (m)	Cumulative Mining Impact (m)
GW109257	276603.8	6205057.0	7.74	31.78
GW032443	276427.0	6206329.0	3.97	30.88
GW104323	276241.6	6206412.0	3.95	22.23
GW014262	276764.0	6204587.0	7.74	28.69
GW111810	277035.4	6204405.0	6.51	32.65
GW104659	276616.0	6207392.0	<2	26.77
GW007445	277437.0	6204264.0	5.38	33.10
GW103615	279634.6	6204110.0	3.17	23.25
GW110669	274570.4	6207928.0	2.88	25.74
GW058634	279446.1	6203408.0	3.08	24.09
GW111669	279262.7	6203321.0	3.16	24.21
GW102179	279262.7	6203321.0	3.01	36.13
GW105395	278546.8	6203033.0	3.90	25.52
GW111047	280015.0	6206037.0	<2	7.04
GW031294	279732.0	6205706.0	<2	6.78
GW070245	280043.3	6205645.0	<2	6.10
GW102344	280250.8	6206554.0	<2	6.36
GW053449	280369.0	6205813.0	<2	5.82
GW104008	280359.0	6205978.0	<2	5.90
GW106590	280442.0	6206344.0	<2	6.15

Work Number	Easting	Northing	LW S1A-S7A Potential Impact (m)	Cumulative Mining Impact (m)
GW054146	279879.6	6204679.0	<2	5.29
GW105577	280728.0	6207041.0	<2	4.25
GW108538	281155.0	6205941.0	<2	4.53
GW062068	276572.8	6209556.0	6.14	30.37
GW057969	281351.1	6206122.0	<2	4.24
GW051877	281673.0	6205875.0	<2	4.12
GW100455	281877.0	6207020.0	<2	3.16

4.1.9 On-site Water Storage

There are 20 earthen water storages and two water storage tanks across the Tahmoor Coal surficial workings area. Two investigations into the potential for seepage from these storages to groundwater have been completed including:

- Tahmoor South Surface Water Investigation, SLR 2022, which included a visual inspection and assessment, and
- Preliminary Surface Water and Groundwater Quality Investigation, SLR, 2022.

Both reports are included in **Appendix D**. Findings of both reports concluded minimal likelihood of any connectivity between surface water storages and groundwater systems. The need for ongoing monitoring specific to leakage is considered unnecessary based on these findings.

4.2 Management Measures

Management measures for groundwater impacts at Tahmoor South have included a comprehensive update to the numerical groundwater model, prepared by SLR in 2024, in support of the Tahmoor South MOD 3 – LW S7A Groundwater Impact Assessment. This model was developed to assess cumulative impacts associated with the entire approved mining layout and the proposed extraction of LW S7A.

The updated model incorporated substantial new data, including:

- Updated geological and structural interpretations;
- Revised hydraulic properties from updated literature and site-specific monitoring;
- Expanded calibration datasets, including additional VWP data and long-term groundwater level trends;
- Observed subsidence behaviour and associated height-of-fracturing investigations from Tahmoor North and South; and
- Outputs from the Thirlmere Lakes Research Program, which were not available at the time of earlier model development.

The SLR (2024) model addressed previous regulatory feedback regarding model limitations, particularly those related to cumulative impact assessment, treatment of the alluvium, calibration performance in the Western Domain, and the connection to Thirlmere Lakes. The model extended the spatial and temporal scope of simulation and presented revised impact predictions for all key receptors including licensed bores, groundwater dependent ecosystems, and surface water features.

The model update was submitted for independent third-party review in 2024. At the time of writing, the review process is ongoing, with responses to comments and clarifications under way

Ongoing management measures continue to include the periodic validation and where necessary recalibration, of the groundwater model for the development, including an independent review of the

model every 3 years, and comparison of monitoring results with modelled predictions. The groundwater model is currently undergoing independent peer review.

4.2.1 Management Measure Effectiveness

The groundwater model will be validated periodically via comparison of monitoring results with modelled predictions. Re-calibration will occur as necessary, and an independent review of the model will occur every three years. Groundwater monitoring results will be compared to groundwater model predictions on an annual basis to assess actual versus predicted groundwater levels and/or drawdown (i.e. height of depressurisation), and groundwater inflows to the mine. This analysis will be incorporated in regular groundwater compliance reporting, such as the Annual Review Review

Aligned with completion of model re-calibration the trigger levels dependent on modelling outputs will be reviewed and updated as necessary.

4.3 Monitoring

Groundwater monitoring will be undertaken in accordance with the relevant Australian Standards legislation and EPA approved methods for sampling, including (but not limited to):

- NSW DECC (2004) Approved Methods for Sampling and Analysis of Water Pollutants in New South Wales.
- AS/NZS 5667.1:1998 Water Quality – Sampling – Guidance on the Design of Sampling Programs, Sampling Techniques, and the Preservation and Handling of Samples.
- AS/NZS 5667.11:1998 Water Quality - Sampling - Guidance on Sampling of Groundwaters.

Groundwater monitoring has commenced across all Tahmoor South monitoring sites for both groundwater levels and groundwater quality.

4.3.1 Tahmoor South Monitoring Network

The Tahmoor South Monitoring Network currently consists of a series of multi-level Vibrating Wire Piezometers (VWPs), Open standpipes (OSPs) and private bores.

The standpipe piezometers can be used for monitoring water levels manually or with an automated datalogger (installed in 18 sites to date), as well as for collection of water samples for groundwater quality monitoring purposes. The VWPs are grouted and therefore can only be used for monitoring groundwater pressures, but do allow for multiple instruments to be installed at different depths within a single borehole.

The network answers to the requirement of the Consent Conditions and EIS Commitments in addition to the key receptors identified, as detailed in the Tahmoor South MOD 3 – LW S7A Groundwater Impact Assessment (SLR, 2024).

In addition to the proposed ‘Tahmoor South’ network, monitoring results associated with Tahmoor North and the Western Domain have been incorporated into the numerical groundwater modelling, and where purposeful, into the Tahmoor South network (i.e. in the footprint of a Tahmoor North longwall). Additionally, monitoring in longwall centrelines of pre- and post-mining conditions at Tahmoor South will be undertaken for the longwall (LW S1A), and then every two or three after that. Packer testing would also be undertaken, followed by installing VMPs at four elevations in the Hawkesbury Sandstone and then two in the Bulgo Sandstone to assist in defining a profile of fracturing and depressurisation above longwalls.

4.3.1.1 Groundwater Monitoring Regime

Pre-extraction monitoring regimes for both groundwater level and quality are described below. The frequency of monitoring and the parameters to be monitored may be varied in consultation with regulators, during extraction as per adaptive management strategies. It is proposed that quarterly

sampling may be suitable post-establishment of baseline conditions (24 months or more, at most sites, but 12 months of sampling at some sites near to LW S1A), with adjustments in frequency made as extraction progresses and based on proximity to the position of the active longwall.

4.3.1.1.1 GROUNDWATER LEVEL MONITORING

Prior to commencement of extraction groundwater level data have been collected on a monthly basis, or where loggers are installed, downloaded monthly. This is suitable to determine baseline aquifer conditions.

This monthly monitoring regime is continuing throughout extraction. However, during extraction in previous mining areas, Tahmoor Coal has demonstrated responsiveness to variability in groundwater levels that may be resultant of mining, via adaptive management practices. Consequently, the frequency of monitoring may be varied in consultation with DPHI or advisory panels (or similar) as required.

Post-mining monitoring will continue with continuous recording for loggers and quarterly manual measurements of water level for 12 months following completion of the longwalls or as required in accordance with the Rehabilitation Plan.

4.3.1.1.2 GROUNDWATER QUALITY MONITORING

Monthly sampling was undertaken prior to longwall extraction occurring near to the monitoring points. Ongoing monthly quality monitoring is currently underway. Frequency of monitoring may be reduced at some sites post collection of 24 baseline data points, dependent on intent and location (i.e. those more pertinent to the B-block, and not intended to be mined before 2024 may only require quarterly sampling).

Collection of field parameters will occur monthly, inclusive of:

- pH;
- Electrical Conductivity – EC (µS/cm);
- Total Dissolved Solids – TDS (mg/L).

A full suite of groundwater chemistry will be sampled monthly, inclusive of:

- Major ions: Ca, K, Na, Mg, F, Cl, SO4;
- Total phosphorus and total nitrogen;
- Total alkalinity as CaCO3, HCO3, CO3, DOC; and
- Total and dissolved metals: (Fe, Mn, Cu, Pb, Zn, Ni, Al, As, Se, Li, Sr, Co, Ba).

4.3.2 Private Bore Monitoring

The private landholder bores census was concluded in March 2022. The Tahmoor Coal Community Liaison Specialist attempted to contact all pertinent landholders, with a total of forty bores surveyed. Where possible, the following information was collected;

- Current bore status (operational, destroyed, etc);
- Bore location and top of casing (surveyed);
- Bore equipment;
- Current use regime;
- Groundwater level;
- Groundwater quality (as per the regime described above);
- Land access agreements and suitability for routine monitoring.

The OSP monitoring network was developed to capture suitable spatial representation of the Hawkesbury Sandstone to capture potential impact to private bores. Additionally, six bores have been selected for inclusion into the ongoing monitoring regime. This selection was made on the suitability of the bores, land access agreements and spatial distribution.

4.3.3 Groundwater Extraction Monitoring

Groundwater pumped from all sumps in the mine workings is currently, and will continue to be, monitored by means of flow meters fitted to pipelines recording pumping times and rates. This water reporting to the underground workings and sumps may include groundwater seepage inflows, supply inflows (potable supply and for operations), and some re-circulation.

Operational water balance reviews will continue to be performed monthly collating groundwater extractions, as well as imported water to inform on-site water management. The 'groundwater inflow' calculated from the water balance is a licensable 'groundwater take' as per the AIP and *Water Management Act 2000*.

4.3.4 Auxiliary Monitoring

Auxiliary monitoring includes climate monitoring, surface water monitoring and subsidence monitoring. Figure 11 shows the maximum predicted groundwater level drawdown and the subsidence monitoring points.

4.3.5 Post-mining groundwater Levels and Quality

Tahmoor Coal committed to establishing suitable post-mining groundwater monitoring within the footprint of the historical Tahmoor North workings, consistent with the Environmental Impact Statement (EIS) commitments for the project. A detailed review of the Western Domain groundwater monitoring network was undertaken in 2025 (SLR, 2025a) to confirm whether the existing infrastructure is sufficient to meet the post-mining monitoring requirements.

The 2025 review concluded that the current network provides appropriate spatial and hydrogeological coverage to assess long-term post-mining behaviour. Specifically:

WD02, TNC36, and TNC40 were identified as suitable for ongoing groundwater-level monitoring, representing key areas within and adjacent to the historical longwall footprint. These sites demonstrate stable and representative hydrographs consistent with expected post-mining recovery trends in the Hawkesbury Sandstone.

P14 and P16 were confirmed as appropriate for groundwater-quality monitoring, providing access to the key hydrostratigraphic units and a long-term record of both pre-mining and operational-phase water quality.

Re-installation of TNC029 was reassessed as part of the review and determined not to add further value to the network, given the availability of nearby monitoring bores with comparable geological settings and established time-series data. The existing monitoring points collectively provide sufficient information to characterise post-mining groundwater recovery and assess any potential long-term changes in water quality.

Monitoring at WD02, TNC36, TNC40, P14, and P16 will continue in accordance with the requirements of the Water Management Plan. Data from these locations will be used to assess post-mining groundwater trends, validate model predictions, and inform adaptive management of the Western Domain. The monitoring bores and Western Domain longwalls are illustrated in **Figure 9**.

4.3.6 Monitoring Equipment Effectiveness

Annual reviews of the monitoring network will be undertaken to assess the condition of the monitoring bores and associated equipment. Monitoring will be undertaken as per the standards described above, with equipment maintained to meet these standard **requirements.**

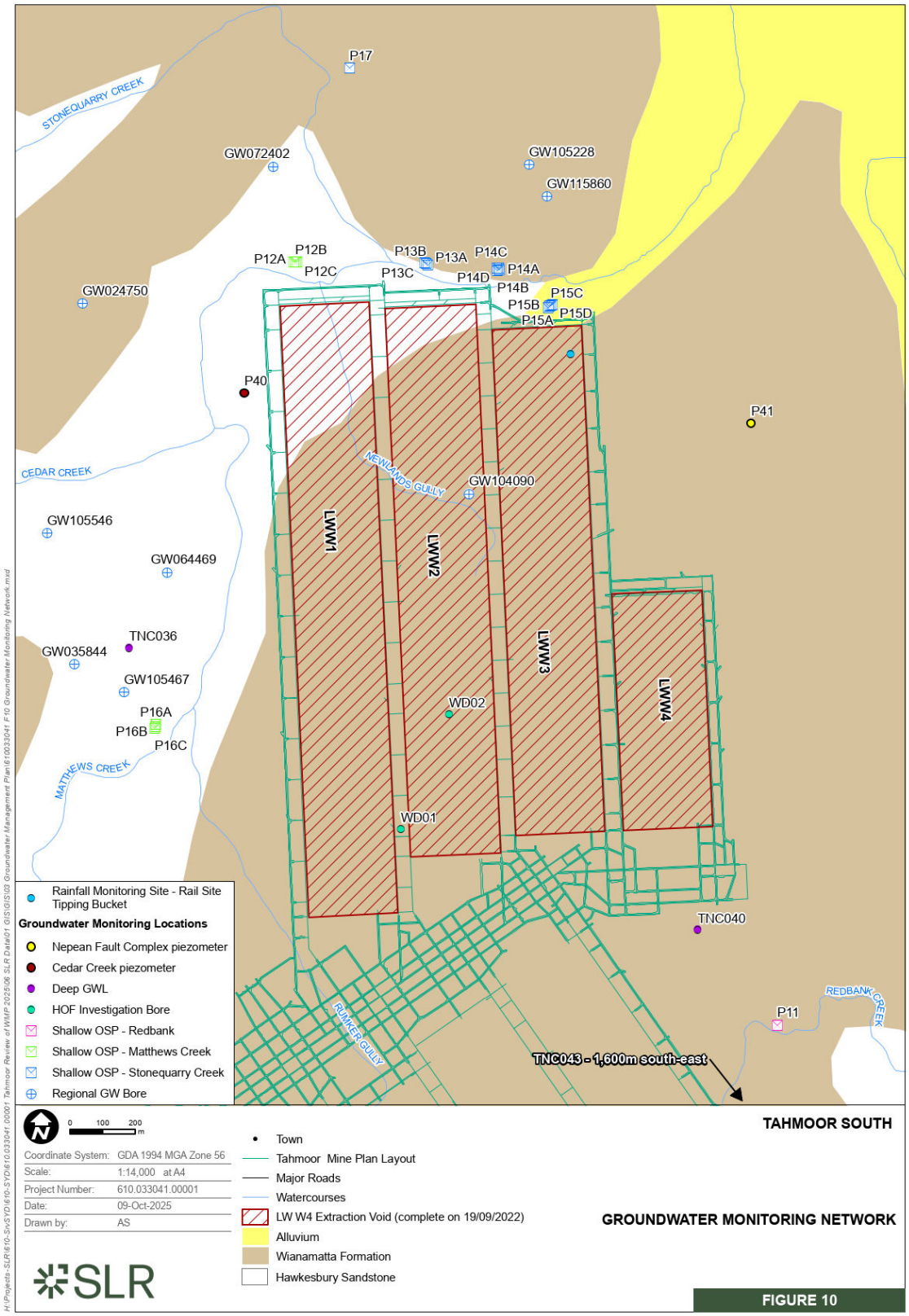

Figure 9: Post-mining groundwater monitoring locations

4.4 Contingency Plan

4.4.1 Trigger Action Response Plans

In accordance with Condition E5 (f) of the Consent, in the event that performance measures (in the form of pre-defined tiggers) are considered to have been exceeded or are likely to be exceeded, a response will be undertaken in accordance with the Trigger Action Response Plans (TARP) provided in **Appendix** .

The primary actions of the TARP are to:

- Define appropriate trigger levels for 'shallow' and 'deep' groundwater levels, groundwater quality (pH, EC and metals) at monitoring bores and private bores;
- Develop specific actions to respond to high risk of exceedance of any performance measure to ensure that the measure is not exceeded; and
- Present a plan in the event a performance measures are exceeded or are likely to be exceeded and describe the management / corrective actions to be implemented (i.e. notifications to relevant agencies, groundwater monthly/quarterly reviews, revision in any Corrective Action Management Plan and/or Annual Reviews).

It is important to note that the Conditions refer to compliance with the "relevant performance measures listed in Table 4 (of the commitments)", however Table 4 is only pertinent to Surface Water and not groundwater. The only exclusion to this is the Performance Measure referring to Groundwater Dependent Ecosystems (GDEs) including Thirlmere Lakes, for which the performance measure states;

- Negligible impacts including;
    - Negligible change in groundwater levels; and
    - Negligible change in groundwater quality.

This performance measure applies to the TARP titled "WMP13 - Groundwater Bores Monitoring for Thirlmere Lakes.

Each TARP has four levels of triggers – "Normal Conditions" - being where the environment is behaving or performing within normal or expected levels, through to Level 3 (L3) each with escalating risk to the environment via deviation from baseline or expected conditions.

The success of remediation measures that have been implemented for any TARP exceedance would be reviewed as part of any Corrective Action Management Plan and or Annual Review reporting, the latter which would provide an opportunity to review and update existing triggers if deemed necessary.

A total of six TARPS (TARP WMP8 to WMP13) are required to address various components of the groundwater system, including:

- WMP8 – Shallow Groundwater Levels (Open standpipes and private bores);
- WMP9 – Shallow Groundwater Pressures (VWP Sensors < 200 m depth);
- WMP10 – Groundwater Level / Pressure Deep VWPs (> 200 m depth excluding monitoring the Bulli Coal Seam);
- WMP11 – Groundwater Quality (Open standpipes and private bores);
- WMP12 – Groundwater – Surface-water interaction; and
- WMP13 – Groundwater Bores Monitoring for Thirlmere Lakes.

The TARPS are provided to work in conjunction with not only each other, but also other TARPS within the overarching Water Management Plan to provide a holistic approach to the overall management of the water system.

4.4.1.1 Methodology for Derivation of Triggers

Trigger levels have been developed utilising baseline data in conjunction with modelled drawdown predictions and climate data.

Historical data indicates that significant mining-related drawdown or depressurisation (tens to hundreds of metres) is typical in strata deeper than 200 metres below ground (mBG), and drawdown or depressurisation is less severe and less persistent in strata shallower than 200 mBG. Consequently, trigger levels have been set independently for these depth profiles.

4.4.1.1.1 GROUNDWATER LEVELS

Shallow monitoring (<200 metres)

In the Western Domain, climatic variations have not caused reductions in groundwater levels at shallow open-standpipe bores in excess of 2 m (SLR,2021). Differences at VWPs observed due to climatic variation, however, were observed to cause reductions in water levels of up to 5 m. Therefore, a water level reduction of greater than 2 m for shallow standpipe bores and 5 m for shallow VWP loggers for a period beyond 6 months was considered to be a possible indicator of greater than predicted impacts to groundwater (even if greater drawdown was predicted, the concept is to use this magnitude of drawdown as an early warning).

Shallow OSPs

The TARP Significance Levels (1, 2 and 3) will be assigned a trigger corresponding to a calculated groundwater elevation for each groundwater monitoring bores. For monitoring sites with short baseline periods (<6 months), the maximum groundwater level observed during pre-mining has been used as reference levels in the TARP level calculations. For bores with a longer baseline, the reference level has been defined following a review of the baseline data (refer to **Table 13)**.

Table 13 Shallow Monitoring Bore Trigger Levels

Bore ID	Groundwater Levels (mAHD)		
	TARP Level 2	TARP Level 3	TARP Level 4
Shallow OSP			
P51A	296.3	292.4	288.5
P51B	297.5	293.6	289.7
P52	246.7	244.6	242.5
P53A	255.8	253.7	251.6
P53B	255.8	253.7	251.6
P53C	253.6	251.4	249.1
P54A	260.7	259.0	257.4
P54B	259.9	258.2	256.6
P55A	271.1	269.7	268.2
P55B	266.0	264.4	262.9
P55C	259.7	258.2	256.6
P56A	288.2	284.8	281.4
P56B	278.9	275.5	272.1
P56C	257.4	254.1	250.7
REA4	248.3	246.2	244.1
Private Bores			

Bore ID	Groundwater Levels (mAHD)		
	TARP Level 2	TARP Level 3	TARP Level 4
GW062068	274.0	270.5	267.1
GW104008	234.7	234.0	233.2
GW104323	256.9	256.8	256.8
GW104659	249.8	243.6	237.4
GW105395	322.1	modelled DDN less than 1m	modelled DDN less than 1m
GW109257	280.9	278.9	276.9
GW112473	317.1	modelled DDN less than 1m	modelled DDN less than 1m

Shallow VWPs

Regionally, climatic variations have been observed to cause reductions in water levels of up to 5 m in shallow (< 200 m depth) VWPs. Therefore, a water level reduction of greater 5 m for shallow VWP loggers for a period beyond 6 months is considered to be a possible indicator of greater than predicted impacts to groundwater (even if greater drawdown was predicted, the concept is to use this magnitude of drawdown as an early warning).

A reference level has been generated for each VWP sensor, based on the average groundwater level observed prior to commencement of extraction.

At most sites the average groundwater levels sits at levels observed prior to the 2017-2019 NSW drought and in some cases to levels observed during the wetter conditions in 2021. This makes the groundwater level average a conservative reference level.

TARP Level 1 (L1) was then calculated as Reference level (mAHD) minus 5 m which is consistent with approaches adopted elsewhere at Tahmoor Mine (i.e. for the Western Domain).

Elsewhere at Tahmoor Mine, TARP Level 3 (L3) has been based on the maximum modelled drawdown and calculated as Reference Level minus maximum modelled drawdown. The maximum modelled drawdown at the reference sites ranges from 0 m to 3.3 m which is smaller than the adopted 5 m natural fluctuations to derive TARP L1. This results in some cases in the TARP L3 being higher than TARP L1.

Therefore, instead of calculating TARP L3 as “Reference Level minus maximum modelled drawdown”, TARP L3 is calculated as “TARP L1 minus the maximum modelled drawdown”. TARP L3 now lies below TARP L1.

TARP Level 2 (L2) is calculated as the average of L1 and L3.

Trigger levels for the shallow VWP sensors are provided in **Table 14**

Table 14 Shallow VWP Trigger Levels

Bore	Groundwater Trigger Level (mAHD)		
	TARP Level 1	TARP Level 2	TARP Level 3
TBC009 – HBSS 30m	321.8	321.6	321.5
TBC009 – HBSS 75m	304.4	304.2	304.1
TBC009 – BHCS 182m	288.0	287.4	286.8
TBC009 – BGSS 192m	285.4	285.2	285.0
TBC024 - HBSS 117m	282.6	-	-
TBC024 - HBSS 139m	282.0	281.5	281.0

Bore	Groundwater Trigger Level (mAHD)		
	TARP Level 1	TARP Level 2	TARP Level 3
TBC024 - BHCSS 168m	284.5	283.6	282.8
TBC024 - BGSS 185m	284.3	282.3	280.3
TBC027 - HBSS-95m	315.1	-	-
TBC027 - HBSS-132m	307.8	307.6	307.3
TBC027 - HBSS-169m	307.2	307.0	306.8
TBC027 - BHCS-181m	305.7	305.5	305.3
TBC027 - BGSS-198m	305.3	305.1	304.9
TBC034 - HBSS-65m	366.8	-	-
TBC034 - HBSS-113m	363.0	362.7	362.3
TBC034 - HBSS-161m	353.4	353.1	352.8
TBC034 - BHCS-176m	349.9	349.4	348.9
TBC034 - BGSS-196m	353.3	352.1	350.9
TBC09-HBSS-30m	321.8	321.6	321.5
TBC09-HBSS-75m	304.4	304.2	304.1
TBC09-BHCS-182m	288.0	287.4	286.8
TBC09-BGSS-192m	285.4	285.2	285.0
TBC018 - WWFM/HBSS-70m	245.5	245.2	244.8
TBC018 - WWFM/HBSS-117m	246.9	246.6	246.2
TBC018 - HBSS (lower)-164m	245.7	245.4	245.1
TBC018 - BHCS-179m	243.5	243.1	242.8
TBC018 - BGSS-198m	239.7	237.8	236.0
TBC032 - HBSS-95m	257.3	256.7	256.2
TBC032 - HBSS-131m	250.0	249.3	248.6
TBC032 - HBSS-168m^	261.9	261.1	260.4
TBC032 - BHCS-181m	237.8	228.7	219.5
TBC032 - BGSS-200m	238.8	208.7	178.7
TBC039 – HBSS 65m	308.7	-	-
TNC036 – HBSS 65m	204.5	-	-
TNC036 – HBSS 97m	191.3	185.7	180.0
TNC036 – BGSS 169m	192.5	135.7	79.0
TNC040 – WMFM 27m	203.3	198.2	198.2
TNC040 – HBSS 65m	182.1	175.8	169.5
TNC043 – HBSS 65m	153.7	152.5	151.3
TNC043 – HBSS 111.5m	150.6	148.5	146.5

* Data unavailable (tbc) = to be confirmed, ^potential issues with VWP stability but trigger levels still reported

Deep monitoring (> 200 metres)

For bores that monitor depths greater than 200 m groundwater level monitoring results will be compared to groundwater model predictions on an annual basis comparing actual groundwater levels with predictions. In the event that monitoring data suggests divergence from the predicted trends (i.e. from numerical groundwater modelling predictions), the TARP would be enacted.

Each trigger level is associated with level of deviation from modelled predicted drawdown and period of time for which this deviation is experienced:

- Normal Conditions – Observed drawdown does not exceed modelled impacts predicted drawdown by greater than 30 metres. Observed drawdown exceeds the modelled predicted drawdown by greater than 30 metres for less than three consecutive months;
- Level 1 (L1) – Observed drawdown exceeds the modelled predicted drawdown, by greater than 30 metres for greater than three consecutive months;
- Level 2 (L2) – Observed drawdown exceeds modelled predicted drawdown by more than 30 metres for a greater than 6 consecutive months; and
- Level 3 (L3) – Observed drawdown exceeds modelled predicted drawdown for 12 consecutive months or more.

Bores encompassed within this TARP, including the associated model layer, are provided in **Table 15**, with associated predicted drawdown hydrographs provided in the LW S1A – S7A Modification 3 Groundwater Technical Report (SLR, 2024).

Table 15 Deep VWP Sensors and associated model layers

Bore	Model Layer	Model Geology
TBC09_332	8	BUSS Mid
TBC09_343	8	BUSS Mid
TBC09_357	12	SBSS Lower
TBC09_391	15	Bulli Seam
TBC09_397	17	Wongawilli
TBC18_282	8	BUSS Mid
TBC18_366	8	BUSS Mid
TBC18_404	15	Bulli Seam
TBC18_426	17	Wongawilli
TBC18_432	17	Wongawilli
TBC20_211	8	BUSS Mid
TBC20_293	8	BUSS Mid
TBC20_375	8	BUSS Mid
TBC20_411	7	BUSS Upper
TBC20_434	17	Wongawilli
TBC26_211	8	BUSS Mid
TBC26_278	8	BUSS Mid
TBC26_344	8	BUSS Mid
TBC26_409	13	WBCS
TBC26_432	15	Bulli Seam
TBC26_440	16	Eckersley

TBC26_460	16	Eckersley
TBC32_200	8	BUSS Mid
TBC32_237	8	BUSS Mid
TBC32_294	8	BUSS Mid
TBC39_243	8	BUSS Mid
TBC39_299	8	BUSS Mid
TBC39_354	11	SBSS Upper
TBC39_375	16	Eckersley
TBC39_402	16	Eckersley

Bulli Coal Seam

It is expected that the TARP will exclude loggers located in the Bulli Coal Seam on the basis that as this is the target coal seam, significant depressurisation effects are expected due to dewatering of mine workings. Additionally, there are no other groundwater users of this aquifer (environmental or anthropogenic), other than mines, that warrant the need to investigate head changes in this unit. However, monitoring will be undertaken and undergo review alongside the loggers included in the TARP.

4.4.1.1.2 GROUNDWATER QUALITY

The proposed methodology for calculating trigger values for EC, pH and metals at Tahmoor South monitoring bores and private bores is presented here. The proposed TARP is provided in **Appendix F**.

EC

Electrical conductivity (EC) is a measure of salinity and is used for monitoring of changes to groundwater salinity. Baseline data has undergone review and data cleansing prior to derivation of triggers. A single trigger level will be established for each bore, as the maximum observed EC in the pre-mining/early mining record plus ten per cent of that value.

pH

Each bore has been assigned a lower and upper trigger level, to represent the natural fluctuations in pH and enable capture of groundwater changes to more basic or acidic conditions. Baseline data (pre-mining and early-mining) has undergone review and data cleansing. Triggers are based on the minimum and maximum pH values recorded in the available dataset minus/plus 1 pH unit if the max/min pH are within four pH units (otherwise, just max/min are utilised). Again, regional data will be taken into consideration.

Dissolved Metals

A single trigger level concentration for metals has been assigned to the Tahmoor South monitoring bores and the private bores. Triggers have been derived for dissolved metals and total iron (Fe).

The trigger has been set at the 95th percentile value of all available baseline data to date.

4.4.1.2 Adaptive Management via TARPs

Adaptive Management is the implementation of management strategies as required dependent on ongoing outcomes and impacts of mining. For example, if surface water losses are identified, additional management will be implemented to review this from a groundwater perspective (i.e. groundwater–surface water interaction study). Hence, adaptive management is responding to changing requirements for management based on ongoing review of data. Consequently, the two TARPs presented here have strong links to other primary TARPs and utilise the same network.

Groundwater – Surface Water Interaction

The Tahmoor South monitoring network has been developed to provide pertinent information on baseflow relationships with nested surface water and groundwater monitoring sites. Groundwater data would be reviewed alongside complementary monitoring.

This TARP defines levels of deviation in surface water - groundwater interactions from 'normal' conditions and the actions to be implemented in response to each level deviation. The instigation of this TARP will be dictated by triggers exceedances in pertinent groundwater or surface water sites requiring further investigation of groundwater – surface water interactions.

This TARP references Biodiversity Management Plan TARP – Riparian Vegetation (BMP3), which specifically defines levels of deviation in riparian vegetation condition from normal conditions and the actions required to be implemented in response to each level of deviation. The riparian vegetation can be considered a GDE with relevant Performance Measure, managed under the Riparian Vegetation TARP, supported by this TARP. TARP BMP3 will be enacted via this TARP as well as via its own specific criteria, to support investigations providing a holistic review of groundwater and surface water in relation to GDEs.

Groundwater Bores Monitoring for Thirlmere Lakes

The Thirlmere Lakes have a specific series of bores aimed at monitoring potential impacts on the Lakes resulting from longwall extraction. The network is designed to provide an early warning system of changes in groundwater conditions that may indicate a potential impact to Thirlmere Lakes, via a cross section of data between mine operations and the Lake, including the following sites:

- "Early warning" bores: GW104659, TBC039 (sensor at 65 metres in Hawkesbury Sandstone (HBSS))
- "Thirlmere Lakes" bores: GW075409–1, GW075409–2, GW075410, GW075411 (paired with gauging station 212066) and P50a, P50b, P50c

Trigger levels are linked to the shallow water level and water quality triggers defined in their specific TARPs. Given the Thirlmere Lakes are considered GDEs, the relevant Performance Measure is incorporated, as follows;

- GDE Performance Measure: Negligible impacts including:
    - Negligible changes in groundwater levels; and
    - Negligible changes in groundwater quality.

4.4.2 Potential Ameliorative Actions – Private Bores

The monitoring network described above, provides water level and quality data at an adequate spatial and temporal scale to undertake investigations into potential impacts to existing groundwater users.

In accordance with Condition B26 – B29 of the Tahmoor South Domain Consent (SSD 8445), where a mining related impact has occurred at a private bore, Tahmoor Coal will implement a make good process. Tahmoor Coal commits to facilitation of "make good" provisions beyond the period of maximum drawdown and post-mining.

Tahmoor Coal has been implementing this process during the life of Tahmoor/Tahmoor North. The process allows for bore owners to apply to Tahmoor Coal if they believe their bore's level or water quality has declined triggering an assessment into the potential cause (i.e. mining related). If it is deemed that the mine is responsible, then remedial action would be implemented, potentially deepening and/or replacing bores and wells, and/or providing an alternative water source to affected users.

The make good process would be staged by Tahmoor Coal in accordance with the proposed mining schedule and the results of predictive groundwater modelling. Contact has been made with landholders whose registered bores are predicted to incur a drawdown of greater than 2 m, as per the NSW Aquifer Interference Policy (AIP) criterion, or whose bores are at risk of subsidence related impacts. Following this

initial contact with landholders, where access was granted a baseline field survey has been completed to verify bore details – location, depth, condition of bore and pump, standing water levels, groundwater quality and usage (where possible). Survey findings have been provided to the landholder so that they have the same baseline information as Tahmoor Coal. This information has provided both parties with a thorough understanding of the current bore condition and a reference point for comparison with subsequent bore assessments as mining progresses. The verified bore data has also been included in the recent update of the groundwater model.

In the event that a mining-related impact to a private bore has been confirmed and any further potential impacts are understood (based on groundwater modelling), the landholder and Tahmoor Coal would negotiate a make good agreement. This agreement would include specific make good mitigation measures and outline a potential timeframe for undertaking these measures, if required. The make good agreement would include and consider the conditions of any development consents, the provisions of the AIP and the NSW Coal Mine Subsidence Compensation Act 2017.

There are a number of make good options that may be adopted, based on the details and characteristics of an individual bore and the extent of mining-induced impacts. These mitigation measure options include:

- Bore maintenance where physical adjustments and regular maintenance of the bore(s) are required to return them to pre-mining conditions. This could include re-establishment of saturated thickness in the affected bore(s) through extending the depth of the pump, or deepening of the bore(s) to return yield to pre-mining conditions;
- Replacement of bore(s) to provide a yield at least equivalent to the yield of the affected bore prior to mining. This may be required where deepening of an existing bore is not possible (e.g. the bore has partially collapsed or the bore hole is not straight or vertical);
- Provision of access to an alternative source of water or compensatory water supply. This option may be offered while other measures are being undertaken and could include connection to the town water supply or the provision of on-site storage (e.g. dam or water tanks); or
- Compensation to reflect increased water extraction costs (e.g. due to lowering pumps or installation of additional or alternative pumping equipment).

Equivalent water supply should be provided (at least on an interim basis) as soon as practicable after the loss is identified, unless otherwise agreed with the landowner. The burden of proof that any loss of water supply is not due to mining impacts rests with Tahmoor Coal, in accordance with Condition B27 of SSD 8445.

If there is a dispute as to whether the loss of water is to be attributed to the development or the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution, in accordance with Condition B28 of SSD 8445. If Tahmoor Coal is unable to provide an alternative long-term supply of water, compensation will be provided to the affected landowner, to the satisfaction of the Planning Secretary.

4.5 Adaptive Management/Continuous Improvement

In accordance with Condition E4 of the Consent, where any exceedance of the criteria or performance measures outlined within this document has occurred, Tahmoor Colliery will:

a) take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action;
c) within 14 days of the exceedance occurring (or other timeframe agreed by the Planning Secretary), submit a report to the Planning Secretary describing these remediation options and any preferred remediation measures or other course of action; and
d) implement reasonable remediation measures as directed by the Planning Secretary

Tahmoor Coal have adopted the "Plan-Do-Check-Act" model as shown in **Figure 10**. This model will be applied to all aspects of Tahmoor Coal's environmental management and is utilised to embed the continuous improvement process in all system documents.

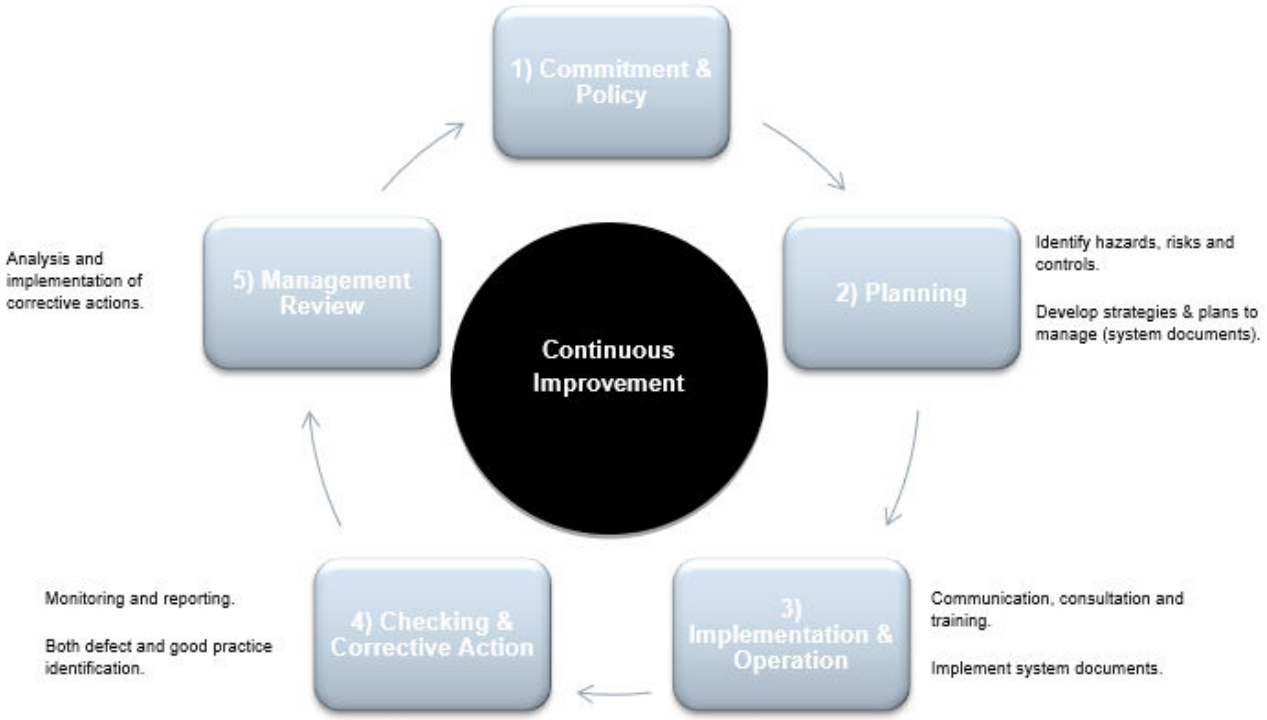

Figure 10: Continuous Improvement Model

4.6 Long-term Water Management Strategy

In accordance with Consent Conditions A29 to A31, the long-term water management strategy for Tahmoor Mine would be developed progressively as the Project development progresses.

Section 5.2 of the Water and Salt Balance report, an appendix to the WMP, states the following pertaining to the long-term water management strategy:

> *"Following commencement of operations and confirmation of the groundwater inflow rates to Tahmoor South underground, the existing numerical model would be updated and simulated for the post-mining recovery period. The model predictions would then be used to assist with decision-making and planning on the following aspects:*

- *Potential water related impacts associated with the post-mining recovery period; and*
- *Groundwater and surface water licencing for the post-recovery period.*

This will be undertaken by 31 December 2027. This timeframe will enable long term monitoring of groundwater flows to the Tahmoor South underground which would facilitate improved calibration and forecasting of the post-mining groundwater recovery rates. This would also provide sufficient lead time prior to closure to establish details of the closure plan including rehabilitation."

5 Implementation and Reporting

5.1 Tahmoor Environmental Management System (EMS) Framework

The Tahmoor Environmental Management System (EMS) Framework provides the strategic context for the environmental management of Tahmoor Coal and forms part of the broader Health, Safety, Environment and Community (HSEC) management systems at Tahmoor Coal. The EMS outlines how Tahmoor Coal manages environment and community (E&C) aspects, impacts and performance. It provides a framework for the standards, plans and procedures implemented to ensure operations are managed in accordance with the ISO:14001 principles.

The objectives of the EMS are:

a) To provide an overall framework for environmental management at Tahmoor utilising the principles of ISO:14001;

b) To ensure compliance with all development consent, licences and approvals at Tahmoor Coal;

c) To detail the relationship and interactions between various operational and environmental components at Tahmoor Coal;

d) To provide effective mechanisms for external communications, maintaining a relationship with the local community; and

e) To assist Tahmoor Coal employees and contractors in administering their responsibilities regarding environmental management.

This plan will be implemented in conjunction with the EMS framework.

5.2 General Reporting

General reporting requirements in accordance with Consent Condition E13 and E14, including submitting an Annual Review by the end of March each year (or other timeframe agreed by the Planning Secretary). The Annual Review will:

a) describe the development (including any rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;
b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the:
    i. relevant statutory requirements, limits or performance measures/criteria;
    ii. requirements of any plan or program required under this consent;
    iii. monitoring results of previous years; and
    iv. relevant predictions in the EIS (or updated and contemporary modelling, as required by agencies).
c) identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;
d) evaluate and report on:
    i. the effectiveness of the noise and air quality management systems; and
    ii. compliance with the performance measures, criteria and operating conditions of this consent;
e) identify any trends in the monitoring data over the life of the development and provide any raw monitoring data as requested by the Planning Secretary;
f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
g) describe what measures will be implemented over the next calendar year to improve the environmental performance of the development.

Copies of the Annual Review must be submitted to Council and relevant agencies and made available to the CCC and any interested person upon request.

5.3 Incidents

The Consent defines an incident as '*an occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance*'.

Material Harm is defined within the Consent as "harm to the environment that:

- involves actual or potential harm to the health or safety of human beings or to the environment that is not trivial, or results in actual or potential loss or property damage of an amount, or
- amounts in aggregate, exceeding $10,000, (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment)".

This definition excludes "harm" that is authorised under either this consent or any other statutory approval.'

Tahmoor Coal manages and responds to incidents in accordance with the following plans:

a) Emergency and Incident Manual (TAH-HSEC-232).
b) Pollution Incident Response Management Plan (TAH-HSEC-00155).
c) Notification of Environmental Pollution Incidents (TAH-HSEC-00224).

These plans have been developed to manage preparation, incident response and reporting requirements under the Protection of the Environment Operations Act 1997 (NSW).

The management plans provide roles and responsibilities, management strategies, action and response plans and record management protocols for incidents and emergencies.

A Written Incident Notification will be submitted to the Planning Secretary via the Major Projects website within seven days after Tahmoor Coal becomes aware of an incident.

Written Incident Notifications will include:

a) the development and application number;
b) details of the incident (date, time, location, a brief description of what occurred and why it is classified as an incident);
c) how the incident was detected;
d) when Tahmoor Coal became aware of the incident;
e) any actual or potential non-compliance with conditions of consent;
f) describe what immediate steps were taken in relation to the incident;
g) identify further action(s) that will be taken in relation to the incident; and
h) identify a project contact for further communication regarding the incident.

Within 30 days of the date on which the incident occurred or as otherwise agreed to by the Planning Secretary, Tahmoor Coal will provide the Planning Secretary and any relevant public authorities (as determined by the Planning Secretary) with a Detailed Incident Report.

Detailed Incident Reports will include:

a) a summary of the incident;
b) outcomes of an incident investigation, including identification of the cause of the incident;
c) details of the corrective and preventative actions that have been, or will be, implemented to address the incident and prevent recurrence; and
d) details of any communication with other stakeholders regarding the incident.

5.4 Non-Compliances

The Consent defines a non-compliance as ‘an occurrence, set of circumstances or development that is in breach of the consent’.

Non-compliances or system defects detected during monitoring, inspections and audits will be managed in accordance with the Tahmoor South Environmental Management Strategy (TAH-HSEC-00375), with corrective action plans developed and implemented to rectify any issues.

The Planning Secretary will be notified in writing via the Major Projects website within seven days after Tahmoor Colliery becomes aware of any non-compliance.

If a non-compliance is detected, the following steps will be followed:

a) Identify and confirm the non-compliance (i.e. review against approval criteria or condition and confirm that a non-compliance has occurred);
b) Complete internal environmental incident reporting documentation including an investigation to capture all relevant information;
c) In accordance with the relevant approval, determine what action (i.e. external reporting) is required. Specifically, determine if immediate reporting is required and to which stakeholders, or ensure that the event is captured for future reporting;
d) Following the incident investigation, develop a corrective action plan aimed at preventing future re-occurrence; and
e) Complete all required reporting and consult with relevant agencies on the corrective action plan to be implemented.

A non-compliance notification will identify the following:

a) the development and the application number,
b) the condition of consent that the development is non-compliant with
c) the way in which it does not comply and the reasons for the non-compliance (if known); and
d) any actions which have been, or will be, undertaken to address the non-compliance.

A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.

5.5 Exceedances

For the purposes of this plan, an exceedance is defined 'any instance where monitoring results show an exceedance of criterion outlined within the Consent or other regulatory instrument’.

Exceedances will be managed by Tahmoor Coal through the Contingency Plan and TARP process as outlined in **Section 4.4** and **Appendix F**.

Exceedance reporting will occur as per the response in the Trigger Actions Response Plans, with reporting to DPIE (and other relevant agencies) within 7 days of investigation completion where a TARP Level 4 has occurred.

5.6 Complaints and Disputes

Community Complaints at Tahmoor Coal are managed in accordance with Communication and Engagement (TAH-HSEC-00119) and Community Complaints & Enquiry Procedure (TAH-HSEC-00120). Tahmoor Coal operates a 24-hour complaints line (1800 154 415) for receiving community complaints and other stakeholder communications. The general process detailed in Community Complaints & Enquiry Procedure (TAH-HSEC-00120) for responding to complaints is:

a) Acknowledging all complaints and responding to the complainant within 24 hours where practicable;
b) Registering all complaint details in Cority;

c) Investigating complaints impartially considering the facts and the circumstances prevailing at the time;
d) Implementing corrective actions if required; and
e) Reporting to relevant stakeholders of investigation outcomes and corrective actions taken.

A record of all community complaints in relation to activities undertaken by the licensee must be kept in a legible form and be in accordance to Tahmoor Coal's Environmental Protection Licence (EPL) 1389.

The following information will also be kept in the event of a community complaint, as required by Section M4 in Tahmoor Coal's EPL 1389:

a) The date and time of the complaint;
b) The method by which the complaint was made;
c) Any personal details of the complainant which were provided by the complainant or a note to that effect;
d) The nature of the complaint;
e) The action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) If no action was taken by the licensee, the reasons why no action was taken.

These records must be kept for at least 4 years after the complaint was made and be able to be produced to any authorised officer who asks to see them.

In the event of a dispute or conflict between Tahmoor Coal personnel and a member of the community, the Tahmoor Coal E&C Manager will facilitate communication between both parties to reach a resolution, which may include a meeting with the complainant to discuss the issue.

Where relevant, negotiations will be initiated in accordance with any relevant Consent conditions. This general process is documented *in* Communication and Engagement (TAH-HSEC-00119). If a dispute cannot be resolved, the matter will be escalated to involve the site Operations Manager or General Manager as required and may involve consultation with the relevant government agency to assist in reaching a determination on the matter

5.7 Risk and Change Management

Aspects and impacts of environmental matters at Tahmoor Coal are considered for operational activities, legislative requirements and internal and external stakeholder views, in accordance with Condition E4 of the Consent. Key aspects and impacts, including noise management, are identified during the annual review of the Tahmoor Coal Environment and Community (E&C) Broad Brush Risk Assessment (BBRA) and the operational Life of Mine (LOM) Risk Assessment.

The purpose of the E&C BBRA is to identify significant E&C aspects and impacts across the site, the risk they pose and the controls necessary to effectively manage them. Management of potential impacts is prioritised according to the level of risk each aspect is assigned. Once all identified aspects, impacts, risks and management controls have been identified within the Annual E&C Risk Assessment, associated plans are updated accordingly.

The LOM Risk Assessment considers aspects and impacts of business activities at a strategic level. These risk assessments cover the life of mine risks associated with each operation. The outcomes of the LOM Risk Assessment are used in conjunction with the Tahmoor Coal E&C BBRA to develop the annual capital and operational budget and the associated work schedule. Existing or proposed management controls are identified to reduce the risk of impacts on the environment and community. The need for any new (or modifications to existing) approvals is also identified during this process.

In accordance with Tahmoor Coal's Health & Safety Management System, project and activity specific risk assessments are completed as required and include assessment of E&C risks.

5.8 Roles & Responsibilities

E&C management is regarded as part of the responsibilities of all employees and contractors at Tahmoor Coal. Specific information pertaining to the role, responsibility, authority and accountability of key personnel involved in environmental management at Tahmoor Coal is provided in **Table 16** below.

Table 16 Accountabilities

Role	Accountabilities for this document
Operations Manager	Provide adequate environmental personnel/resources for implementation of this plan and associated plans.
Environment & Community Manager	Facilitate a process of managing overall compliance with regulatory requirements and undertake external reporting for legislative non-compliances as required. Determine adequate resources and funds are available to ensure the effectiveness of this procedure; and certify compliance and adherence to this plan. Develop, implement and maintain this plan. Liaise with relevant government authorities in relation to regulatory conditions and compliance issue. Liaise with the community as required and as per the Stakeholder Engagement Strategy, including facilitation of Community Consultative Committee meetings.
All Managers	Activities under their control are to be undertaken in accordance with this plan and associated management plans and site procedures. Manage environmental controls within their jurisdiction are operated and maintained in a proper and efficient manner. Report all environmental incidents and complaints in a timely manner.

Role	Accountabilities for this document
Environmental Specialist	Responsible for coordinating environmental compliance on-site including timely completion of monitoring and reporting in accordance with internal and external requirements. Sign off on the accuracy of reports and the suitability of recommendations. Develop, implement, review and maintain this plan and system documents. Implement process for self-assessment audits. Assign persons responsible for completion of audit actions and set a due by date. Monitor that planned actions arising out of audits are implemented. Ensure all community complaints are addressed, investigated and appropriately managed as per site procedures, and reported internally as per internal requirements.
All Coordinators	Activities under their control are to be undertaken in accordance with this plan and associated management plans and site procedures. Manage environmental controls within their jurisdiction are operated and maintained in a proper and efficient manner. Report all environmental incidents and complaints in a timely manner.
All Persons	Activities under their control are to be undertaken in accordance with this plan and associated management plans and site procedures. Manage environmental controls within their jurisdiction are operated and maintained in a proper and efficient manner. Report all environmental incidents and complaints in a timely manner.

5.9 Internal Audits & Reviews

In accordance with internal company requirements, Tahmoor Coal has implemented a system for the monitoring and review of environmental and community performance at the site. Tahmoor Coal is to provide ongoing monitoring and regular management review of performance to:

a) Confirm the adequacy and effectiveness of management plans, procedures and standards;

b) Address any identified weaknesses;

c) Share good performance and lessons learnt with other sites; and

d) Ensure ongoing compliance with all leases, licences and approvals.

Process or area specific internal audits are also conducted periodically, generally administered by the General Manager E&C, focussing on the following areas:

a) Air quality;

b) Water management;

c) Noise;

d) Erosion and sediment control; and

e) Statutory approvals.

These audits may be conducted by consultants on behalf of Tahmoor Coal, by Liberty GFG employees or may be self-assessments conducted by Tahmoor Coal personnel. Audit results and corrective actions are recorded in Cority and assigned to responsible personnel for completion within appropriate timeframes.

5.10 Independent Environmental Audit

In accordance with Conditions E15 – E20 of the Consent, Tahmoor Coal will complete Independent Environmental Audits of the development at the frequencies determined within DPHI's Independent Audit Post Approval Requirements (2020), and outlined below in **Table 17**.

Table 17 Independent Audit Frequencies

Phase	Initial Independent Audit	Ongoing Independent Audit Intervals
Construction	Within 12 weeks of the commencement of construction	At intervals, no greater than 26 weeks from the date of the initial Independent Audit or as otherwise agreed by the Secretary.
Operation	Within 26 weeks of the commencement of operation	At intervals, no greater than 3 years or as otherwise agreed by the Secretary.
Closure /Rehabilitation	Within 52 weeks from notifying of suspension/ceasing of operations	At intervals no greater than 1 year or as otherwise agreed by the Secretary.

Tahmoor Coal will complete independent audits in accordance with the following Consent Conditions and in accordance with the requirements of the DPHI's *Independent Audit Post Approval Requirements (2020)*:

a) E15: Independent Audits of the development must be conducted and carried out in accordance with the Independent Audit Post Approval Requirements (2020).
b) E16: Proposed independent auditors must be agreed to in writing by the Planning Secretary prior to the commencement of an Independent Audit.
c) E17: Planning Secretary may require the initial and subsequent Independent Audits to be undertaken at different times to those specified in the Compliance Reporting Post Approval Requirements (2020), upon giving at least 4 weeks' notice (or timing) to Tahmoor Coal of the date upon which the audit must be commenced.
d) E18: In accordance with the specific requirements in the Independent Audit Post Approval Requirements (2020), Tahmoor Coal will:
    i. review and respond to each Independent Audit Report prepared under Condition C5 of the Development Consent, or Condition C6 where notice is given by the Planning Secretary;
    ii. submit the response to the Planning Secretary; and
    iii. make each Independent Audit Report, and response to it, publicly available within 60 days of submission to the Planning Secretary. unless otherwise agreed by the Planning Secretary.
e) E19: Independent Audit Reports and Tahmoor Coal's response to audit findings must be submitted to the Planning Secretary within 2 months of undertaking the independent audit site inspection as outlined in the Independent Audit Post Approvals Requirements (2020) unless otherwise agreed by the Planning Secretary.
f) E20: Notwithstanding the requirements of the Independent Audit Post Approvals Requirements (2020), the Planning Secretary may approve a request for ongoing independent operational audits to be ceased, where it has been demonstrated to the Planning Secretary's satisfaction that independent operational audits have demonstrated operational compliance.

The audit will recommend appropriate measures and corrective actions to improve environmental performance at Tahmoor Coal. Audit results and corrective actions are recorded in Cority and assigned to responsible personnel for completion within appropriate timeframes.

5.11 Employee & Contractor Training

Environmental training for Tahmoor Coal employees and contractors is conducted in accordance with the Environment & Community Training Needs Analysis, which Tahmoor Coal manages through the Scenario Training Database. General environmental awareness training is provided to all employees and contractors annually through a generic visitor induction and the SafeCoal training session scheduled by the Tahmoor Coal Health, Safety & Training Department.

6 Review and Improvement

6.1 Plan Audit

Audits of the Groundwater Management Plan are to be conducted in consultation with the Plan owner and nominated individuals and shall focus on the content and implementation.

Audits on the content shall consist of a determination of understanding of the Groundwater Management Plan by the individual's allocated responsibility under this plan.

Audits on the implementation shall consist of reviews of the safe working procedures and risk assessments developed to ensure safe operation of this Groundwater Management Plan, they may also involve discussions with personnel involved in the management plan to determine understanding and compliance.

Should an audit of this Groundwater Management Plan determine that a deficiency is evident in the content or implementation; a corrective action must be developed and implemented. Actions will be assigned to a nominated individual and tracked in Cority.

Tahmoor Coal is responsible to verify that the nominated corrective action has been implemented by way of a follow up audit.

Any changes to the Groundwater Management Plan are to be managed and communicated to all personnel in line with the Change Management Process.

6.2 Plan Review

This ***Groundwater Management Plan*** will be reviewed:

Event based: in accordance with Condition E7 (a) of the Consent, a review will be required within 3 months of any incident, event or finding that identifies an inadequacy in the Groundwater Management Plan risk assessment or associated documents to continue to effectively manage the identified hazard; a change to the workplace itself or any aspect of the work environment, a change to a system of work, a process or a procedure; or

If necessary, to either improve the environmental performance of the development, cater for a modification or comply with a direction, the strategies, plans and programs required under condition E8 of the development consent must be revised, to the satisfaction of the Planning Secretary. Where revisions are required, the revised document will be submitted to the Planning Secretary for approval within six weeks of the review; or

Time based: in the absence of regular event-based reviews and in accordance with Condition E7 (b-e) of the Consent, this plan will be reviewed within three months of:

b) the submission of an Annual Review under Condition E13;
c) the submission of an Independent Environmental Audit under Condition E15;
d) (the approval of any modification of the conditions of this consent (unless the conditions require otherwise); or
e) notification of a change in development phase under Condition A19;

If deemed appropriate, external service providers may be included in the review process. All reviews are to be documented.

7 Document Information

Relevant legislation, standards and other reference information will be regularly reviewed and monitored for updates and will be included in the site management system. Related documents and reference information in this section provides the linkage and source to develop and maintain site compliance information.

7.1 Access to Information

Information pertaining to Tahmoor Coal's general environmental performance against internal targets and external approvals criteria is reported to the community via the mine website and Tahmoor Coal's Community Consultative Committee (TCCCC). Examples of reports to government agencies include:

a) Environmental Protection Licence Annual Return (submitted to Environment Protection Authority);

b) Annual Review (submitted to Department of Planning & Infrastructure, Council, TCCCC etc.); and

c) Independent Environmental Audit (submitted to Department of Planning & Infrastructure).

These reports are prepared in accordance with relevant guidelines and Communication and Engagement (TAH-HSEC-00119) and are published on Tahmoor Coal's website in accordance with Website Management Procedure (TAH-HSEC-00221).

7.2 Related Documents

Related documents, listed in the below table, are internal documents directly related to or referenced from this document.

Table 18 Related Documents

Number	Title
TAH-HSEC-00375	Tahmoor Coal Environmental Management Strategy
TAH-HSEC-00119	Communication and Engagement
TAH-HSEC-00120	Community Complaints & Enquiry Procedure
TAH-HSEC-00221	Website Management Procedure
TAH-HSEC-00031	Community Development Plan
TAH-HSEC-00381	Social Impact Management Plan
TAH-HSEC-00039	Stakeholder Engagement Plan
TAH-HSEC-00232	Emergency and Incident Manual

7.3 Reference Information

Reference information, listed in the below table, is information that is directly related to the development of this document or referenced from within this document.

Table 19 Reference Information

Title
Barnett, B, Townley, L.R., Post, V., Evans, R.E., Hunt, R.J., Peeters, L., Richardson, S., Werner, A.D., Knapton, A. and Boronkay, A., 2012, Australian Groundwater Modelling Guidelines. Waterlines report 82, National Water Commission, Canberra.

DPIE, 2018. Spatial Layer of HEVAE Vegetation Groundwater Dependent Ecosystems Value in NSW. Department of Planning, Industry and Environment.
https://datasets.seed.nsw.gov.au/dataset/c2aa2b9e-3f9a-40ab-a21f-ed4eb14d99ee

GeoTerra (2019), Longwalls West 1 and West 2 - Baseline Private Bore Assessment, prepared for Tahmoor Coal, document TA36-R1A.

Geoterra, 2013. Tahmoor South - Shallow groundwater baseline monitoring. Report for Tahmoor Coal, document BAR3 - R1A.

Geoterra, 2013a. Tahmoor South - Shallow groundwater baseline monitoring. Report for
Tahmoor Coal, document BAR3 - R1A.

Heritage Computing, 2012b. An Appraisal of Groundwater Conditions in the Vicinity of Thirlmere Lakes, NSW. Report for Tahmoor Coal, doc HC2012/3. March 2012.

HydroSimulations, 2018. Tahmoor South Project EIS: Groundwater Assessment. Report HS2018/52 for Tahmoor Coal Pty. Ltd., December 2018.

HydroSimulations/SLR, 2019. Tahmoor LW W1-W2 Extraction Plan: Groundwater Technical Report. Report HS2019/14c for Tahmoor Coal Pty. Ltd., July 2019.

HydroSimulations/SLR, 2020. Tahmoor South Project – Amended Project Report: Groundwater Assessment. Report HS2019/42a_v4.0 for Tahmoor Coal Pty. Ltd., August 2020. IEPMC 2018. *Initial report on specific mining activities at the Metropolitan and Dendrobium coal mines.* 12 November 2018. Available via https://www.chiefscientist.nsw.gov.au/independent-reports/mining-in-the-sydney-drinking-water-catchment

Moffit R.S., 1999, Southern Coalfield Regional Geology 1:100 000, 1st edition. Geological Survey of New South Wales, Sydney.

Niche, 2018. Tahmoor South Project – Biodiversity Assessment. Report for Tahmoor Coal.

NSW DECC,2004. Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales. Department of Environment and Conservation (NSW).
Approved methods for the sampling and analysis of water (nsw.gov.au)

NSW Office of Water (NOW), 2011a. Report Card for the Nepean Sandstone Groundwater
Source.

NSW Office of Water (NOW), 2011b. Water Sharing Plan – Greater Metropolitan Regional
Groundwater Sources: Background Document.
http://www.water.nsw.gov.au/__data/assets/pdf_file/0005/548105/wsp_metro_groundwater_background.pdf

NSW Government, 2012. Aquifer Interference Policy. September 2012.

Parsons Brinckerhoff, 2013. Water Quality Investigation Camden Gas Project. Report for AGL
Upstream Investments, July 2013.

Schädler, S. and Kingsford, R.T. (2016). Long-term changes to water levels in Thirlmere Lakes – drivers and consequences. Centre for Ecosystem Science, UNSW, Australia

SCT, 2013. Review of Hydraulic Conductivity and Geotechnical Characteristics of the Overburden at Tahmoor South. SCT Report for Tahmoor Coal, Report TAH4083 Rev1.

SLR, 2021, Tahmoor Coal LW W3 – W4, Extraction Plan, Groundwater Technical Report, prepared for Tahmoor Coal Pty Ltd, May 2021

SLR, 2021f, Groundwater Modelling Plan, prepared for Tahmoor Coal, September 2021.

SLR, 2021h, Tahmoor South, Groundwater Monitoring Plan, prepared for Tahmoor Coal, October 2021

SLR, 2022, Tahmoor South Private bore Survey, prepared for Tahmoor Coal, April 2022

SLR, 2022b, Groundwater Technical Report, LW S1A – S6A Extraction Plan, prepared for Tahmoor Coal, October 2022

SLR, 2024. Tahmoor South Mod 3 – LW S7A Groundwater Impact Assessment. Prepared for Tahmoor Coal, May 2024.

SLR, 2025. Tahmoor Western Domain Groundwater Monitoring Review, prepared for Tahmoor Coal, September 2025

Thomann, J.A., Werner, A. D., Irvine, D.J, and Currell, M. J., 2020, Adaptive management in groundwater planning and development: A review of theory and applications, Journal of Hydrology, Vol. 586, July 2020

8 Change Information

Table 20 Full details of the document history are recorded in the document control register, by version

Version	Date Reviewed	Review team (Consultation)	Change Summary
1.0	02/11/2021	Michelle Grierson, Natalie Brumby, Thomas O'Brien, April Hudson	New Document
2.0	17/06/2022	Natalie Brumby	Reviewed in accordance with Condition E7(b) of SSD 8445 following submission of the 2021 Annual Review to DPE. Reviewed in accordance with condition E7(e) of SSD 8445 following change in development phase under condition A9 (construction commencement on 16th May 2022).
3.0	18/10/2022	Sharon Hulbert (SLR Consulting), Natalie Brumby	Reviewed in accordance with Condition E7(c), (d) and (e) following an Independent Environmental Audit (10th August 2022), following the approval of any modification (Mod 1 approved 19th July 2022) and following the commencement of first and second workings (18th Oct 2022) of the Consent SSD 8445.
4.0	30/06/2023	Sharon Hulbert (SLR Consulting), Natalie Brumby	Reviewed in accordance with Condition E7(b) following the submission of an Annual Review (31st March 2023) and Condition E7(c) following the submission of an Independent Environmental Audit (2nd June 2023).
5.0	13/09/2023	Sharon Hulbert (SLR Consulting), Natalie Brumby	Reviewed in accordance with Condition E7(d) following the approval of any modification (MOD 2 - 13th June 2023) of the Consent SSD 8445 and to incorporate recommendations from approved MOD 2 Development Consent. Section 4, Figures 6, 7 and 11, Tables 5, 7, 8, 11 and 14 updated.
6.0	30/6/2024	Sharon Hulbert (SLR Consulting), Natalie Brumby	Reviewed and updated in accordance with Condition E7(b) following the submission of an Annual Review (28th March 2024). Inclusion of additional text in Section 4.2 and Section 4.6 in response to DCCEEW Water recommendations from 22/12/2023.
7.0	08/10/2025	Raymond Minnaar (SLR Consulting), Natalie Brumby	Reviewed and updated in accordance with Condition E7(b) following approval of Modification 3 (SSD 8445 MOD 3),Condition E7(b) following the submission of an annual review 30 September 2025).and consideration of the DCCEEW Water Group recommendations (correspondence dated 2025). Updates include alignment of Section 4.2 and associated groundwater impact discussions with the SLR (2024) MOD 3 Groundwater Model Update, revision of terminology to reflect LW S1A–LW 7A, and confirmation of monitoring and management measures consistent with the updated Water Management Plan (2025) and regulator feedback.

APPENDIX A – Experts Endorsement

APPENDIX B – Tahmoor South Groundwater Monitoring Plan

APPENDIX C – Baseline data for the REA and Pit-top Bores

APPENDIX D – On-site Storages – Groundwater Interaction Studies

APPENDIX E – Groundwater Modelling Technical Report

APPENDIX F –Trigger Action Response Plans (TARP)

WATER MANAGEMENT PLAN TARP – WMP8 SHALLOW GROUNDWATER LEVELS (OPEN STANDPIPES AND PRIVATE BORES)

Performance Measure and Indicator, TARP Objective and Assessment Criteria	Monitoring Program	Management		
		Trigger	**Action**	**Response**
Performance Measure Feature No performance measure relevant. **TARP Objective** This TARP defines levels of deviation in groundwater level from 'normal' or baseline conditions and the actions to be implemented in response to each level deviation. This TARP supports TARP WMP13, where groundwater levels as they pertain to groundwater dependent ecosystems (GDEs) (Thirlmere Lakes) are covered. **Assessment Criteria** Bore specific trigger values based on baselines data for each reporting level.	**Locations** **Open standpipes** Existing sites: P51a, P51b, P52, REA4, P53a, P53b, P53c, P54a, P54b, P54c, P55a, P55b, P55c, P56a, P56b, P56c P50a, P50b, P50c, P57a, P57b, P57c[3] **Private bores** GW109257, GW104008, GW112473, GW104659, GW104323 All monitoring locations are shown in Figure 324 of the Water Management Plan. **Monitoring Frequency** **Pre-mining** Continuous logger (hourly intervals) and monthly manual measurements of water level. **During Mining** Continuous logger (hourly intervals) and monthly manual measurements of water level. **Post-mining** Continuous record (where loggers installed) and quarterly manual measurements of water level for a minimum of 12 months following the completion of active dewatering or as deemed necessary in consideration to the status of aquifer recovery or as required for future extraction activities.	**Normal Condition**		
		Groundwater level remains consistent with baseline variability and pre-mining trends with reductions in groundwater level less than two meters.	Continue monitoring and review of data as per monitoring program.	No response required.
		Level 1		
		Greater than 2 m water level reduction[1] for a period of greater than 6 months following the commencement of extraction.	For Private Bores and Open Standpipe Monitoring Bores *Actions as required for Normal Condition.* Undertake an investigation to assess cause and determine if mining related. Undertake investigation to demonstrate if the decline will impact the long-term viability of the affected water supply works. Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level results). The investigation will be commenced/completed as efficiently as practicable. If the changes have been confirmed to be related to mining effects: For Private Bores: Where impact is deemed attributable to mining, initiate negotiations with impacts landowners as soon as practicable. Consider all reasonable and feasible options for remediation as relevant (e.g. extending the depth of the bore, establishment of additional bores, etc - as per Section 6.2.1.4 of the Water Management Plan). For Open Standpipe Monitoring Bores For monitoring sites relevant to Thirlmere Lakes or associated with surface water monitoring sites, initiate groundwater – surface water interaction TARP.	For Private Bores and Open Standpipe Monitoring Bores: Report trigger exceedance to DPHI and key stakeholders. Report trigger exceedance and investigation outcomes in Annual Review. If the changes have been confirmed to be related to mining effects: For Private Bores: Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. extending the depth of the bore, establishment of additional bores, compensation to affected landowners as detailed in Section 6.2.1.4 of the Water Management Plan). Implement CMAs, subject to land access (finalise negotiations and implement the agreed "make-good" arrangements) Monitor and report on success of CMAs in Annual Review.
		Level 2		
		Water level declines below the average between the 'maximum modelled drawdown' (Level 3 trigger) and the '2 m drawdown' (Level 1 trigger)[1] for a period of greater than 6 months following the commencement of extraction. AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	For Private Bores and Open Standpipe Monitoring Bores: *Actions as stated in Level 1.* Consider increasing frequency of monitoring and review of data frequency at sites where Level 2 has been reached or at other relevant sites, subject to land access., as follows: Fortnightly, for sites within the active subsidence zone. Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact). Increased monitoring could be beneficial where commensurate responses in paired surface water monitoring locations have been observed. Compare against base case and deterministic model scenarios[2]. Review Water Management Plan and modify if necessary. For Private Bores: Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.	For Private Bores and Open Standpipe Monitoring Bores: *Responses as stated in Level 1.* Advise DPHI and key stakeholders of any required amendments to Water Management Plan. For Private Bores: Provide findings of CMA review to DPHI and key stakeholders for consultation. Implement additional CMAs, subject to land access.
		Level 3		

Performance Measure and Indicator, TARP Objective and Assessment Criteria	Monitoring Program	Management		
		Trigger	**Action**	**Response**
		Water level reduction greater than the maximum modelled drawdown[1] for a period of greater than 6 months following the commencement of extraction. AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	For Private Bores and Open Standpipe Monitoring Bores: *Actions as stated in Level 2.* Increase monitoring and review of data frequency for sites where Level 3 has been reached, and cause is unknown, Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate).	For Private Bores and Open Standpipe Monitoring Bores: *Responses as stated in Level 2.* For Private Bores: Develop a Rehabilitation Management Plan in consultation with DPHI and key stakeholders. Implement Rehabilitation Management Plan, subject to land access.

Notes:
[1] Level 1, 2 and 3 triggers for water level reduction is provided in Table 6-3 in Appendix E of the LW S1A-S7A Water Management Plan.
[2] "Deterministic" model scenario refers to the predictive scenario modelling utilised to determine the trigger level.
[3] Trigger levels to be defined for P50 and P57 bores when suitable baseline data available

WATER MANAGEMENT PLAN TARP – WMP9 SHALLOW GROUNDWATER PRESSURE (VWP SENSORS < 200 m DEPTH)

Performance Measure and Indicator, TARP Objective and Assessment Criteria	Monitoring Program	Management		
		Trigger	**Action**	**Response**
Performance Measure Feature No performance measure relevant. **TARP Objective** This TARP defines levels of deviation in groundwater level from 'normal' or baseline conditions and the actions to be implemented in response to each level deviation. **Assessment Criteria** Bore specific trigger values based on baselines data for each reporting level.	**Locations** TBC032, TBC033, TBC009, TBC018, TBC0039 Monitoring of all VWP < 200 m depth intakes. Reference Sites: TBC027, TBC034, TBC038 All monitoring locations are shown in Figure 23 of the Water Management Plan. **Monitoring Frequency** **Pre-mining** VWPs recording pressure readings hourly. The system is telemetered so that data is transmitted continuously and can be accessed at any point in time. **During Mining** VWPs recording pressure readings hourly. The system is telemetered so that data is transmitted continuously and can be accessed at any point in time. **Post-mining** Continuous record of water level/pressure for a minimum of 12 months following the completion of active dewatering or as deemed necessary in consideration to the status of aquifer recovery or as required for future extraction activities.	**Normal Condition**		
		No observable mining induced change at VWP intakes. Up to 5 m water level reduction in VWP intakes[1] following the commencement of extraction for a period of less than six months.	Continue monitoring and review of data as per monitoring program.	No response required.
		Level 1		
		Greater than 5 m water level reduction in VWP intakes[1] following the commencement of extraction for a period of greater than six months.	*Actions as required for Normal Condition.* Undertake an investigation to assess cause and determine if mining related, commence/complete as soon as practicable. Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level results).	Report trigger exceedance to DPHI and key stakeholders. Report trigger exceedance and investigation outcomes in Annual Review.
		Level 2		
		Water level declines below the calculated Level 2 trigger – being the average of Level 1 (the '5 m drawdown'[1]) and Level 3 (the 'maximum modelled drawdown') – following the commencement of extraction for a period of greater than six months. AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	*Actions as stated in Level 1.* Review deeper VWP data at monitored sites. Determine whether additional review of data is required. Determine if review of additional existing VWP sites is required. Consider increasing frequency of data review at sites where Level 2 has been reached or at other relevant sites. Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact). Increased monitoring could be beneficial where commensurate responses in paired surface water monitoring locations have been observed. Compare against base case and deterministic model scenarios[2]. Review Water Management Plan and modify if necessary.	*Responses as stated in Level 1.* Advise DPHI and key stakeholders of any required amendments to Water Management Plan.
		Level 3		
		Water level reduction greater than the maximum modelled drawdown[1] following the commencement of extraction for a period of greater than six months. AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	*Actions as stated in Level 2.* Increase review of data frequency for sites where Level 3 has been reached and the cause is unknown. Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate). Commence/complete as soon as practicable Undertake investigative to review model results in conjunction with field data.	*Responses as stated in Level 2.*

Notes:
[1] Level 1, 2 and 3 triggers for water level reduction is provided in Table 6-4 in Appendix E of the LW S1A-S7A Water Management Plan).
[2] "Deterministic" model scenario refers to the predictive scenario modelling utilised to determine the trigger level.

WATER MANAGEMENT PLAN TARP – WMP10 GROUNDWATER LEVEL / PRESSURE DEEP VWPS (> 200 m DEPTH EXCLUDING MONITORING THE BULLI COAL SEAM)

Performance Measure and Indicator, TARP Objective and Assessment Criteria	Monitoring Program	Management		
		Trigger	**Action**	**Response**
Performance Measure Feature No performance measure relevant. **TARP Objective** This TARP defines levels of deviation in groundwater level from 'normal' or baseline conditions and the actions to be implemented in response to each level deviation. **Assessment Criteria** Bore specific trigger values based on modelled data for each reporting level. Model layers utilised to define predicted drawdown for each VWP logger provided in Table below.	**Locations** TBC009, TBC0018, TBC020, TBC026, TBC032, TBC033, TBC039 Reference sites: TBC027, TBC034, TBC038 Monitoring of all VWP > 200 m depth intakes excluding those monitoring the Bulli Coal Seam. All monitoring locations are shown in Figure 23 of the Water Management Plan. **Monitoring Frequency** **Pre-mining** VWPs recording pressure readings hourly. The system is telemetered so that data is transmitted continuously and can be accessed at any point in time. **During Mining** VWPs recording pressure readings hourly. The system is telemetered so that data is transmitted continuously and can be accessed at any point in time. **Post-mining** Continuous record of water level/pressure for a minimum of 12 months following the completion of active dewatering or as deemed necessary in consideration to the status of aquifer recovery or as required for future extraction activities.	**Normal Condition**		
		Observed data does not exceed modelled impacts predicted drawdown by greater than 30 metres[1]. Observed drawdown exceeds the modelled predicted drawdown[1], by greater than 30 metres for less than three consecutive months	Continue monitoring and review of data as per monitoring program.	No response required.
		Level 1		
		Observed drawdown exceeds the modelled predicted drawdown[1], by greater than 30 metres for greater than three consecutive months.	*Actions as required for Normal Condition.* Undertake an investigation to assess cause and determine if mining related to be commenced/completed as soon as practicable. Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level monitoring results).	Report trigger exceedance to DPHI and key stakeholders. Report trigger exceedance and investigation outcomes in Annual Review.
		Level 2		
		Observed drawdown exceeds modelled predicted drawdown[1] by more than 30 metres greater than 6 consecutive months.	*Actions as stated in Level 1.* Consider increasing frequency of data review at sites where Level 2 has been reached or at other relevant sites. Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact). Increased monitoring could be beneficial where commensurate responses in paired surface water monitoring locations have been observed. Consider review data in conjunction with VWP data from additional existing VWP sites. Compare against base case and deterministic model scenarios[2]. Review Water Management Plan and modify if necessary.	*Responses as stated in Level 1.* Inclusion of more regional VWPs into data review to determine likely extent and depth of depressurisation. Advise DPHI and key stakeholders of any required amendments to Water Management Plan.
		Level 3		
		Observed drawdown exceeds modelled predicted drawdown[1] by 30 metres, for 12 consecutive months or more.	*Actions as stated in Level 2.* Increase review of data frequency for sites where Level 3 has been reached if the cause is unknown Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate). To be commenced/completed as soon as practicable. Review base case and deterministic model scenarios[2] in conjunction with water pressure data and report findings.	*Responses as stated in Level 2.*

Notes:
[1] Predicted drawdown refers to the drawdown as generated by the groundwater model and varies over time as extraction progresses. Observed drawdown will be plotted on a monthly basis against the predicted drawdown to determine if a trigger has occurred. Therefore, as the predicted drawdown will be constantly changing according to extraction progression, it is not possible to set a specific trigger limit.
[2] "Deterministic" model scenario refers to the predictive scenario modelling utilised to assess the trigger level.

Sensor	Model Layer	Model Geology		Sensor	Model Layer	Model Geology
TBC09_322	8	BUSS Mid		TBC26_344	8	BUSS Mid
TBC09_343	8	BUSS Mid		TBC26_409	13	WBCS
TBC09_357	12	SBSS Lower		TBC26_432	15	Bulli Seam
TBC09_381	10	SPCS		TBC26_440	16	Eckersley
TBC09_391	15	Bulli Seam		TBC26_460	16	Eckersley
TBC09_397	17	Wongawilli		TBC32_200	8	BUSS Mid
TBC18_282	8	BUSS Mid		TBC32_237	8	BUSS Mid
TBC18_366	80..0	BUSS Mid		TBC32_257	8	BUSS Mid
TBC18_377	13	WBCS		TBC32_294	8	BUSS Mid
TBC18_404	15	Bulli Seam		TBC32_314	8	BUSS Mid
TBC18_426	17	Wongawilli		TBC33_247	8	BUSS Mid

Performance Measure and Indicator, TARP Objective and Assessment Criteria			Monitoring Program			Management		
						Trigger	Action	Response
TBC18_432	17	Wongawilli		TBC33_306	8	BUSS Mid		
TBC20_211	8	BUSS Mid		TBC33_363	11	SBSS Upper		
TBC20_293	8	BUSS Mid		TBC33_384	16	Eckersley		
TBC20_375	8	BUSS Mid		TBC33_408	16	Eckersley		
TBC20_397	13	WBCS		TBC39_243	8	BUSS Mid		
TBC20_411	7	BUSS Upper		TBC39_299	8	BUSS Mid		
TBC20_434	17	Wongawilli		TBC39_354	11	SBSS Upper		
TBC20_439	4	HBSS Mid		TBC39_375	16	Eckersley		
TBC26_211	8	BUSS Mid		TBC39_402	16	Eckersley		
TBC26_278	8	BUSS Mid						

WATER MANAGEMENT PLAN TARP – WMP11 GROUNDWATER QUALITY (OPEN STANDPIPES AND PRIVATE BORES)

<table>
<tr><th rowspan="2">Performance Measure and Indicator, TARP Objective and Assessment Criteria</th><th rowspan="2">Monitoring Program</th><th colspan="3">Management</th></tr>
<tr><th>Trigger</th><th>Action</th><th>Response</th></tr>
<tr><td rowspan="8"><u>Performance Measure Feature</u>
No performance measure relevant.

<u>TARP Objective</u>
This TARP defines levels of deviation in groundwater level from ‘normal’ or baseline conditions and the actions to be implemented in response to each level deviation.
This TARP supports TARP WMP13, where groundwater quality as it pertains to groundwater dependent ecosystems (GDEs) (Thirlmere Lakes) is covered.

<u>Assessment Criteria</u>
Bore specific trigger values based on baselines data for each reporting level.</td><td rowspan="8"><u>Locations</u>
Open standpipes
Existing sites:
P51a, P51b, P52, REA4, P53a, P53b, P53c, P54a, P54b, P55a, P55b, P55c, P56a, P56b, P56c, P50a, P50b, P50c, P57a, P57b, P57c[2]

Private bores
GW109257, GW104008, GW112473, GW104659, GW104323

All monitoring locations are shown in Figure 23 of the Water Management Plan.

<u>Monitoring Frequency</u>
Pre-mining
Monthly water quality sampling.

During Mining
Monthly water quality sampling

Post-mining
Quarterly sampling and analysis for a minimum of 12 months following the completion of active dewatering or as deemed necessary in consideration to the status of aquifer recovery or as required for future extraction activities.

Water Quality sample parameters:
Field Parameters
PH
EC
TDS
DO

Laboratory Analysis
Total alkalinity as CaCO3, HCO3, CO3, DOC
Dissolved Major Cations (Ca, K, Na, Mg, F, Cl, SO4)
Dissolved Metals (Al, As, Ba, Co, Cu, Pb, Li, Mn, Ni, Se, Sr, Zn, Fe)
Total Metals (Al, As, Ba, Co, Cu, Pb, Li, Mn, Ni, Se, Sr, Zn, Fe)
Total Nitrogen
Total Phosphorus
Ionic Balance (Total Anions and Total Cations)</td><td>Normal Condition</td><td></td><td></td></tr>
<tr><td>No observable changes in salinity, pH or metals outside of the baseline variability.</td><td>Continue monitoring and review of data as per monitoring program.</td><td>No response required.</td></tr>
<tr><td>Level 1</td><td></td><td></td></tr>
<tr><td>Observed salinity and/or metals or pH outside of defined trigger levels[1] for 3 consecutive months or more. The effect does not persist after a significant rainfall recharge event.
AND
A similar trend or response is noted at other monitored bores or private groundwater bores.</td><td>For Private Bores and Open Standpipe Monitoring Bores
Actions as required for Normal Condition.
Undertake an investigation to assess cause and determine if mining related.
Undertake investigation to demonstrate if the change in quality will impact the long-term viability of the affected water supply works.
Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level results).
If the changes have been confirmed to be related to mining effects:
For Private Bores:
Initiate negotiations with impacted landholders as soon as practicable. Consider all reasonable and feasible options for remediation as relevant. This could include potential for implementation of make-good provisions as per Section 6.2.1.4 of the Water Management Plan for affected private bore owners (e.g. provision of access to an alternative source of water).
For Open Standpipe Monitoring Bores
For monitoring sites relevant to Thirlmere Lakes or associated with surface water monitoring sites, initiate groundwater – surface water interaction TARP.</td><td>For Private Bores and Open Standpipe Monitoring Bores
Report trigger exceedance to DPHI and key stakeholders.
Report trigger exceedance and investigation outcomes in Annual Review.
If the changes have been confirmed to be related to mining effects:
For Private Bores:
Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. provision of access to an alternative source of water as detailed in Section 6.2.1.4 of the Water Management Plan).
Implement CMAs, subject to land access.
Monitor and report on success of CMAs in Annual Review.</td></tr>
<tr><td>Level 2</td><td></td><td></td></tr>
<tr><td>Observed salinity and/or metals or pH outside of defined trigger levels[1], for 3 consecutive months or more. The effect persists after a significant rainfall recharge event.
AND
The change in water quality is determined not to be controlled by climatic or external anthropogenic factors.</td><td>For Private Bores and Open Standpipe Monitoring Bores
Actions as stated in Level 1.
Consider increasing frequency of monitoring and review of data at sites where Level 2 has been reached or at other relevant sites, subject to land access and feasibility.
Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact). Increased monitoring could be beneficial where commensurate responses in paired surface water monitoring locations have been observed
Review Water Management Plan and modify if necessary.
For Private Bores:
Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.</td><td>For Private Bores and Open Standpipe Monitoring Bores
Responses as stated in Level 1.
Advise DPHI and key stakeholders of any required amendments to Water Management Plan.
For Private Bores:
Provide findings of CMA review to DPHI and key stakeholders for consultation.
Implement additional CMAs, subject to land access.</td></tr>
<tr><td>Level 3</td><td></td><td></td></tr>
<tr><td>Observed salinity and/or metals or pH outside of defined trigger levels[1], for greater than 6 consecutive months.
AND
The change in water quality is determined not to be controlled by climatic or external anthropogenic factors.</td><td>For Private Bores and Open Standpipe Monitoring Bores
Actions as stated in Level 2.
Increase monitoring and review of data frequency for sites where Level 3 has been reached, and cause is unknown, subject to land access.
Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate).
Undertake investigative report to demonstrate if the water quality change will impact the long-term viability of any affected water supply works.</td><td>For Private Bores and Open Standpipe Monitoring Bores
Responses as stated in Level 2.
For Private Bores:
If ascertained impact is due to mining activities and has potential to impact long-term viability of supply for private groundwater bores:
Develop a Rehabilitation Management Plan in consultation with DPHI and landowner.
Implement Rehabilitation Management Plan, subject to land access.</td></tr>
<tr><td colspan="5">Notes:
1 Defined trigger levels for groundwater quality are listed in Table 6-5 of Appendix E of the LW S1A-S7A Water Management Plan.
2 Trigger levels to be defined for P50 and P57 bores when suitable baseline data available</td></tr>
</table>

WATER MANAGEMENT PLAN TARP – WMP12 GROUNDWATER - SURFACE WATER INTERACTION

Performance Measure and Indicator, TARP Objective and Assessment Criteria	Monitoring Program	Management		
		Trigger	**Action**	**Response**
Performance Measure Feature No performance measure relevant. **TARP Objective** This TARP defines levels of deviation in surface water - groundwater interactions from 'normal' conditions and the actions to be implemented in response to each level deviation. The instigation of this TARP will be dictated by triggers exceedances in pertinent groundwater or surface water sites requiring further investigation of groundwater – surface water interactions. Where groundwater – surface water connectivity indicates in a gaining stream, there is potential for groundwater supporting riparian vegetation. Consequently, Riparian vegetation in these situations could be a Groundwater Dependent Ecosystem (GDE), and the pertinent Performance Measure applicable: Negligible impacts including: • Negligible change in groundwater levels; and • Negligible change in groundwater quality. Riparian GDEs are addressed through the Riparian Vegetation TARP (BMP3). Consultation through the ERG will link this TARP (WMP12) to BMP3 via actions in BMP3 to consider groundwater – surface water relationships when pertinent. **Assessment Criteria** Bore specific trigger values based on baselines data for each reporting level. For this TARP, the aligned groundwater and surface water sites would be considered collectively to interpret potential changes/impacts to groundwater – surface water interaction.	**Locations** **Open standpipes** P51a, P51b, P52, REA4, P53a, P53b, P53c P54a, P54b, P54c, P55a, P55b, P55c The aligned surface water and groundwater sites are as follows: • P51a, P51b with surface water site BR2-Qla • P52, REA4 with surface water site-TT14-QLa • P53a, P53b, P53c with surface water site-TT14-Qla • P54a, P54b, P54c with surface water site TT3-QLa • P55a, P55b, P55c with surface water site TT1-QLa All monitoring locations are shown in Figure 23 of the Water Management Plan. **Monitoring Frequency** **Pre-mining** Monthly manual measurements of water level and water quality. **During Mining** Monthly manual measurements of water level and water quality. **Post-mining** Continuous record (where loggers installed) and quarterly manual measurements of water level for a minimum of 12 months following the completion of active dewatering or as deemed necessary in consideration to the status of aquifer recovery or as required for future extraction activities.	**Normal Condition**		
		Observed (or inferred where not immediately neighbouring a surface water site) groundwater and surface water interaction remains consistent with baseline variability and/pre-mining trends, and decrease in groundwater inflow not persisting after significant rainfall recharge events.	Continue monitoring and review of data as per monitoring program.	No response required.
		Level 1		
		Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 1 (in TARP WMP8) following the commencement of extraction.	*Actions as required for Normal Condition.* Undertake an investigation to assess cause and determine if mining related. Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level results).	Report trigger exceedance to DPHI and key stakeholders. Report trigger exceedance and investigation outcomes in Annual Review. If the changes have been confirmed to be related to mining effects: Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. extending the depth of the bore, establishment of additional bores, compensation to affected landowners as detailed in Section 6.2.1.4 of the Water Management Plan). Implement CMAs, subject to land access. Monitor and report on success of CMAs in Annual Review.
		Level 2		
		Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at aligned surface water monitoring site decline below Level 2 (in TARP WMP8) following the commencement of extraction. AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factor.	*Actions as stated in Level 1.* Consider increasing frequency of monitoring and review of data at sites where Level 2 has been reached or at other relevant sites, subject to land access and feasibility. Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact). Compare against base case and deterministic model scenarios[1]. Review manual water level measurements for additional monitoring sites to identify potential spatial trends in water level decline. Review surface water data to assess for surface water level decline at relevant site. Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options. Review Water Management Plan and modify if necessary.	*Responses as stated in Level 1.* Provide findings of CMA review to DPHI and key stakeholders for consultation. Implement additional CMAs, subject to land access. Advise DPHI and key stakeholders of any required amendments to Water Management Plan, including reporting on relationship of observations to baseline and deterministic model scenarios, as necessary.
		Level 3		
		Inferred groundwater levels at surface water monitoring site decline below Level 3 (in TARP WMP8) following the commencement of extraction. AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factor.	*Actions as stated in Level 2.* Increase frequency of data review for sites where Level 3 has been reached and cause is unknown, subject to land access. Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate). Report to be commenced and completed as soon as practicable.	*Responses as stated in Level 2.* Develop a Rehabilitation Management Plan in consultation with DPHI and key stakeholders. Implement Rehabilitation Management Plan, subject to land access.

Notes:
1 [1]"Deterministic" model scenario refers to the predictive scenario modelling utilised to determine the trigger level.

WATER MANAGEMENT PLAN TARP – WMP13 GROUNDWATER BORES MONITORING FOR THIRLMERE LAKES

<table>
<tr><th rowspan="2">Performance Measure and Indicator, TARP Objective and Assessment Criteria</th><th rowspan="2">Monitoring Program</th><th colspan="3">Management</th></tr>
<tr><th>Trigger</th><th>Action</th><th>Response</th></tr>
<tr><td rowspan="8"><u>Performance Measure Feature</u>
GDEs including Thirlmere Lakes[1].

<u>Performance Measure</u>
Negligible impacts including:
• Negligible change in groundwater levels; and
• Negligible change in groundwater quality.

<u>Performance Indicator</u>
The performance measure will be considered to be exceeded if the groundwater levels or groundwater quality decline below Level 3 (in the relevant groundwater TARP triggers for water level and water quality – TARP WMP8 or WMP11) following the commencement of extraction, and the investigation outcomes indicate a mining related impact based on monitoring data for the Thirlmere Lakes.

<u>TARP Objective</u>
This TARP defines levels of deviation at Thirlmere Lakes from ‘normal’ conditions and the actions to be implemented in response to each level deviation.

<u>Assessment Criteria</u>
Bore specific trigger values based on baselines data for each reporting level.</td><td rowspan="8"><u>Locations</u>
“Early warning” bores
Existing sites:
GW104659, TBC039 (sensor at 65 metres in Hawkesbury Sandstone (HBSS)), P50a, P50b, P50c[2]
Thirlmere Lakes bores (not trigger bores)
Existing sites:
GW075409–1, GW075409–2, GW075410, GW075411 (paired with gauging station 212066)

All monitoring locations are shown in Figure 23 of the Water Management Plan.

<u>Monitoring Frequency (for “early warning” bores)</u>
Pre-mining
Monthly manual measurements of water level and water quality.

During Mining
Monthly manual measurements of water level and water quality.

Post-mining
Continuous record (where loggers installed) and quarterly manual measurements of water level for a minimum of 12 months following the completion of active dewatering or as deemed necessary in consideration to the status of aquifer recovery or as required for future extraction activities.

Water Quality sample parameters:
<table><tr><th>Field Parameters</th></tr><tr><td>PH
EC
TDS
DO</td></tr><tr><th>Laboratory Analysis</th></tr><tr><td>Total alkalinity as CaCO3, HCO3, CO3, DOC
Dissolved Major Cations (Ca, K, Na, Mg, F, Cl, SO4)
Dissolved Metals (Al, As, Ba, Co, Cu, Pb, Li, Mn, Ni, Se, Sr, Zn, Fe)
Total Metals (Al, As, Ba, Co, Cu, Pb, Li, Mn, Ni, Se, Sr, Zn, Fe)
Total Nitrogen
Total Phosphorus
Ionic Balance (Total Anions and Total Cations)</td></tr></table></td><td>Normal Condition</td><td></td><td></td></tr>
<tr><td>Groundwater levels and quality remain consistent with baseline variability and/pre-mining trends, and changes in groundwater levels/quality not persisting after significant rainfall recharge events.</td><td>Continue monitoring and review of data as per monitoring program.</td><td>No response required.</td></tr>
<tr><td>Level 1</td><td></td><td></td></tr>
<tr><td>Level 1 trigger of TARP WMP8 for a minimum of two “early warning” bores.
OR
Level 1 trigger of TARP WMP11 for a minimum of two “early warning” bores.</td><td>Actions as required for Normal Condition.
Undertake an investigation to assess cause and determine if mining related.
Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level results).
If the changes have been confirmed to be related to mining effects:
Consider all reasonable and feasible options for remediation as relevant (e.g. extending the depth of the bore, establishment of additional bores). This could include potential for implementation of make-good provisions as per Section 6.2.1.4 of the Water Management Plan for affected private bore owners.
For monitoring sites relevant to Thirlmere Lakes or associated with surface water monitoring sites, initiate groundwater – surface water interaction TARP.</td><td>Report trigger exceedance to DPHI and key stakeholders.
Report trigger exceedance and investigation outcomes Annual Review.
If the changes have been confirmed to be related to mining effects:
Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. extending the depth of the bore, establishment of additional bores, compensation to affected landowners as detailed in Section 6.2.1.4 of the Water Management Plan).
Implement CMAs, subject to land access.
Monitor and report on success of CMAs in Annual Review.</td></tr>
<tr><td>Level 2</td><td></td><td></td></tr>
<tr><td>Level 2 trigger of TARP WMP8 for a minimum of three bores “early warning” bores
OR
Level 2 trigger of TARP WMP11 for a minimum of three bores (“early warning” bores and Thirlmere Lakes bores).</td><td>Actions as stated in Level 1.
Consider increasing frequency of monitoring and review of data at sites where Level 2 has been reached or at other relevant sites, subject to land access and feasibility.
Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact). Increased monitoring could be beneficial where commensurate responses in paired surface water monitoring locations have been observed
Review Thirlmere Lakes monitoring bore data
Compare against base case and deterministic model scenarios[2].
Review manual water level measurements for additional monitoring sites to identify potential spatial trends in water level decline.
Review surface water data to assess for surface water level decline at relevant site.
Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.
Review Water Management Plan and modify if necessary.
Undertake an investigation to determine if an exceedance of the performance measure is likely. To be commenced/completed as soon as practicable.</td><td>Responses as stated in Level 1.
Provide findings of CMA review to DPHI and key stakeholders for consultation.
Implement additional CMAs, subject to land access.
Advise DPHI and key stakeholders of any required amendments to Water Management Plan.
If relevant, notify Commonwealth DCCEEW of any predictions of an exceedance of a performance measure within two business days.</td></tr>
<tr><td>Exceeds Performance Measure</td><td></td><td></td></tr>
<tr><td>Level 3 trigger of TARPs WMP8 for a minimum of four bores “early warning” bores)
OR
Level 3 trigger of TARPs WMP11 for a minimum of four bores (“early warning” bores and Thirlmere Lakes bores).
AND
Review of Thirlmere Lakes bores indicated potential impacts resulting from extraction</td><td>Actions as stated in Level 2.
If the changes have been confirmed to be related to mining effects:
Investigate reasons for the performance measure exceedance. To be commenced/completed as soon as practicable.
Review predictions of subsidence impacts and environmental consequences associated with further longwall extraction based on the outcomes of the investigation.
Consider modifying mine plan.</td><td>Responses as stated in Level 2.
Submit a report to DPHI (in accordance with Condition E4 of SSD 8445) within 14 days of the exceedance occurring (or other timeframe agreed by DPHI) describing remediation options and any preferred remediation measures or other course of action.
Implement any reasonable remediation measures as directed by DPHI, subject to land access.
Notify Commonwealth DCCEEW of any detection or predictions of an exceedance of a performance measure within two business days.
Submit an Impact Response Plan to Commonwealth DCCEEW (in accordance with Condition 11 of the DAWE (now Commonwealth DCCEEW) Consent for the Tahmoor South Project).</td></tr>
</table>

Performance Measure and Indicator, TARP Objective and Assessment Criteria	Monitoring Program	Management		
		Trigger	Action	Response
				Update numerical groundwater model and re-run predictive scenarios to determine the likely extent and depth of depressurisation in the vicinity of Thirlmere Lakes, and to determine whether any additional management actions are required such as modifying the mine plan

Notes:
[1] It is noted that the only Groundwater Dependent Ecosystem (GDE) pertinent to the Tahmoor South Project is that of Thirlmere Lakes[2] "Deterministic" model scenario refers to the predictive scenario modelling utilised to determine the trigger level.
[2] Trigger levels for P50 bores to be developed when suitable baseline data available.

APPENDIX G – Response from Agencies

Agency	Date Response Received	Comments	Response
EPA	29-11-2021	The EPA has reviewed the plan and notes that the groundwater monitoring sub-plan (Appendix C) has not been attached to the main document.	Appendix C appended
		The EPA recommends that a map showing the locations of the groundwater monitoring bores around the pit top and Reject emplacement Area be included in section 4.1.5.1.	Additional figure (Figure 8) included in Section 4.1.5.1, showing locations of REA and pit-top piezometers.

APPENDIX H – Approval letter

Department of Planning, Housing and Infrastructure

Our ref: SSD-8445-PA-172

Amanda Bateman
Environmental and Community Manager
Tahmoor Coal Pty Ltd

14/08/2026

Subject: Tahmoor South Project (SSD-8445) - Groundwater Management Plan

Dear Ms. Bateman,

I refer to your request for review and approval of the revised Groundwater Management Plan following the approval of Modification 3 (26 May 2025) and following the submission of an annual review (30 September 2025) for the Tahmoor South Project (SSD-8445).

The Department has carefully reviewed the document and is satisfied that it generally meets the requirements of the relevant conditions of consent. Accordingly, as nominee of the Planning Secretary, I approve the Groundwater Management Plan (Rev 7.0, dated 9 October 2025) under Schedule 2, Condition B34(e)(v).

You are reminded that if there are any inconsistencies between the Groundwater Management Plan and the conditions of consent, the conditions prevail. Please ensure you make the document publicly available on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact Scotney Moore, on 02 9274 6342.

Yours sincerely

Jessie Evans
Director, Resource Assessments
Resource Assessments

As nominee of the Planning Secretary