

GLENCORE

Appendix A: Water Management Plan Longwalls 30 & LWW6-LWW8

Ulan Underground

Document Number: ULNCX-111515275-3575 Status: Approved Version: 3.0 Effective: 29/01/2021 Review: 3 years Owner: Environment and Community Manager

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1 Introduction

1.1 Extraction Plan Application Area

Ulan Coal Mines Pty Limited (UCMPL) has Extraction Plan approval for longwall (LW) panels LW30 & LWW6-LWW8, herewith referred to as the Application Area (**Figure 1**), for the Ulan Underground Mine (UUG).

The Application Area has been chosen to include any area that is likely to be perceptibly impacted by mining subsidence as well as the surrounding area within a distance equal to the overburden depth from the outermost goaf edges of the four longwall panels. Subsidence movements occur predominantly within the limits of the longwall panels. Subsidence impacts are generally within a distance of half depth of overburden cover from the longwall panels.

1.2 Purpose and Scope

The purpose of this Water Management Plan for Longwalls 30 & W6-W8 (WMP LW30 & LWW6-LWW8) is to outline the management strategies, controls and monitoring programs to be implemented for the management of groundwater and surface water regarding potential environmental impacts, as a result of secondary extraction within the Application Area.

This WMP LW30 & LWW6-LWW8 (this Plan) has been amended to incorporate the approved MOD4¹ mine plan which extend² the longwall panel lengths of LW30, LWW7 and LWW8. Amendments to this Plan are identified by red text. A summary of the predicted changes to potential subsidence effects, subsidence impacts and environmental consequences, as a result of the revised mine plan layout at UUG is provided in **Section 3.3**. There are no significant changes to the monitoring or management measures previously proposed, as a result of the revised layout of LW30, LWW7 and LWW8.

This Plan applies to surface water and groundwater resources potentially impacted as a result of mining within the Application Area (**Figure 1**).

UCMPL has a comprehensive Environmental Management Strategy (EMS) in place for its existing mining operations, which is consistent with PA 08_0184. Existing EMS plans, monitoring programs and procedures will be applied to environmental management of the Application Area. Plans and monitoring programs specific to the management of environmental and public safety impacts of secondary extraction within the Application Area will be developed and submitted for approval³ as part of this Extraction Plan.

The appointed team of suitably qualified and experienced experts which included representatives from Strata Control Technology (SCT), Mackie Environmental Research and Umwelt Australia relevant to this plan, was endorsed by the Secretary of NSW Department of Planning, Industry and Environment (DPIE) on 27 June 2016 (Attachment 2 of the Extraction Plan).

¹ Ulan Continued Operations Project - Modification 4 Longwall Optimisation Project Environmental Assessment (ELA, 2018)

² As a result of MOD4, length of approximate extensions for LW30, LWW7 and LWW8 are 195m, 220m, 155m respectively.

³ Extraction Plan to be submitted to and approved by DPIE prior to commencement of secondary extraction within the Application Area.



Figure 1 Extraction Plan LW30 & LWW6-LWW8 Application Area

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Figure 2 Water Courses and Surface Water Monitoring

Notes: Potential ponding and erosion sites - Indicative sites identified during EA (Umwelt 2009) sites for monitoring to be finalised during pre-mining inspections.

Status: Approved Version: 3.0

Effective: 29/01/2021 Review: 3 Years





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Figure 4 Groundwater Drawdown Model, Groundwater Monitoring Network and Private Bores

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1.3 Description of Water within the Application Area

1.3.1 Water Courses within the Application Area

The Project Area (**Figure 2**) is located within the headwaters of both the Goulburn River system and the Talbragar River system. The catchments for these river systems are separated by the Great Dividing Range with the Goulburn River system draining east into the Hunter River Catchment and the Talbragar River system draining west to the Macquarie River Catchment and eventually into the Murray River (**Figure 3**). The tributaries within the Project Area draining to the Goulburn River and Talbragar River are ephemeral by nature.

There are eight sub catchment areas of these river systems that lie partly within the Project Area, including Ulan Creek, Spring Gully, Bobadeen Creek, Curra Creek, Sportsmans Hollow Creek and Moolarben Creek catchments which flow into the Goulburn River system. The Mona Creek and Cockabutta Creek catchments flow into the Talbragar River system. The catchments relevant to the Application Area are displayed in **Figure 3**.

Mona Creek is the only named creek that exists within the Application Area, the other flow lines comprise of first, second and third order ephemeral flow lines (**Figure 2** & **Figure 3**). Mona Creek and its tributaries are ephemeral and only flow during and immediately after heavy rainfall events. Small ponds and groundwater seeps from sandstone strata are evident for some weeks to months after rain.

Mona Creek flows as a third order creek in the north-west corner of the Application Area, approximately 600m of the creek line will be undermined by LWW8 (**Figure 2 & Figure 3**). The overburden depth in this area is approximately 180 meters. Beyond the Application Area, Mona Creek becomes a fourth order creek before entering the Talbragar River to the north-west of the Application Area.

1.3.2 Groundwater within the Application Area

The regional groundwater systems were described in detail in the Groundwater Assessment prepared as part of the Project EA (Umwelt 2009). An overview of the regional groundwater systems is provided below. The regional groundwater system comprises two general aquifer types:

- Alluvial aquifers associated with major drainage lines; and
- Hardrock/coal aquifers associated with the coal measures

The properties of the two aquifer systems vary significantly. The alluvial aquifers within the region include alluvial deposits along the Goulburn River and Ulan Creek. These deposits are generally a mix of clayey silts and sands with occasional coarser gravel layers. The alluvial deposits within the region are considered shallow and of limited extent. The hardrock/coal aquifers comprise Jurassic sandstones and siltstones overlying Triassic sandstones with Permian coal measures underlying the Triassic layer. These geological units form relatively discrete layers dipping to the north-east at a shallow angle and overlie a relatively impermeable granite basement.

The Goulburn River and Talbragar River act as regional drainage sinks. Groundwater discharge into rivers is termed 'baseflow' and typically takes longer to reach a river than rainfall-runoff across the land surface. Flow analysis of the Goulburn River (MER, 2009) indicates that the upper reaches of the Goulburn River exhibit fast recession of stream flows with flows sustained only for short periods of time. This suggests that the upper reaches of the Goulburn River have modest to poor storage characteristics in the shallow aquifer systems which contribute to baseflow. MER (2009) stated that "Minor contributions of baseflows from slightly deeper hardrock systems (as upward leakage possibly via springs), are more likely to dominate the extended dry periods when flows are frequently less than 0.5 ML/day".

There are no identified groundwater dependant ecosystems (GDE) (for example no hanging swamps and limestone cave systems) or associated springs within the Project Area⁴. Potential examples of these ecosystems within the boundary of the Ulan Mine Complex are generally not well-defined and blend into adjacent drier communities (Project EA).

'The Drip' is an important natural feature which is sustained by a localised groundwater system. 'The Drip' is located on the Goulburn River approximately 3 km east of the Ulan Mine Complex and 6.7 km south-east of the Application Area. 'The Drip' is sustained by surficial and relatively shallow elevated groundwater storage which is governed mostly by short term rainfall events that surcharge the regolith, weathered rock and joints in the area. Rainfall recharge and downwards percolation is intercepted at horizontal bedding planes which then transmit the groundwater to the unconfined rock faces above the Goulburn River, where it emanates as seeps and drips. During dry periods some seeps cease to flow. Ulan Coal operations are moving northward and westward away from 'The Drip'.

1.4 Structure of the WMP LW30 & LWW6-LWW8

This Plan references key components of approved water management plans for the project area, as required by PA08_0184, including:

- Water Management Plan (WMP⁵);
- Surface Water Monitoring Program (SWMP⁶);
- Groundwater Monitoring Program (GWMP7); and
- Surface Water and Groundwater Response Plan (SWGWRP⁸).

Table 1 identifies where the requirements of Condition 2, Schedule 5 of PA 08_0184 are addressed in this Plan. The WMP, SWMP, GWMP and the SWGWRP are available on the Ulan Coal website at http://www.ulancoal.com.au/en/environment/Pages/environment-management-plan.aspx.

The main text sections of this Plan are:

- **Section 1** Introduction, purpose and scope, relationship to the EMS and the document structure.
- Section 2 Describes the regulatory requirements, and the subsidence performance measures relevant to this Plan. Provides a summary of relevant legislation and stakeholder consultation.
- **Section 3** Summarises the predicted subsidence impacts and environmental consequences resulting from the extraction of LW30 & LWW6-LWW8.
- **Section 4** Describes the management, monitoring and evaluation measures that will be implemented and how monitoring data will be used to assess the relevant performance indicators and performance measures.
- Section 5 Provides a Contingency Plan to manage any unpredicted impacts and their consequences. Provides a Trigger Action Response Plan (TARP) for this Plan which is a simple and transparent snapshot of the monitoring of environmental performance and where required the implementation of management and/or contingency measures.
- **Section 6** Provides a summary of the review and improvement process and reporting requirements.
- **Section 7** Outlines the roles and responsibilities.
- Section 8 Lists the documents referred to in Sections 1 to 6 and provides an historical review reference.

⁴ Ulan Coal - Continued Operations Environmental Assessment (Umwelt 2009).

⁵ Ulan Coal Document Number: ULNCX-111515275-99

⁶ Ulan Coal Document Number: ULNCX-111515275-1642

⁷ Ulan Coal Document Number: ULNCX-111515275-1643

⁸ Ulan Coal Document Number: ULNCX-111515275-1644

2 Regulatory Requirements

2.1 **Project Approval**

This Plan is a component of the Ulan Underground Extraction Plan Longwalls LW30 & LWW6-LWW8 (the Extraction Plan)⁹ and has been prepared specifically to address Condition 26 of Schedule 3 which states:

26. The Proponent shall prepare and implement an Extraction Plan for all second workings on site to the satisfaction of the Director-General. Each Extraction Plan must include:

- a revised Water Management Plan for the project, which specifically provide for the management
 of any potential subsidence impacts and/or environmental consequences of the proposed second
 workings; and
- a program to collect sufficient baseline data for Future Extraction Plans¹⁰.

The structure of this Plan also follows the draft *Guidelines for the Preparation of Extraction Plans* (the Guidelines) provided by the DPIE. **Table 1** identifies where the requirements of PA 08_0184 and the Guidelines are addressed in this WMP LW30 & W6-W8.

EP Guidelines for Extraction Plan Management Plans	PA 08_0184 Requirements for Management Plans Condition 2, Schedule 5	This Plan or WMP Reference	Section Description
Overview of landscape features, heritage sites and	Condition 2(a) <i>detailed</i> baseline data	Figure 1 & Figure 2 and Section 1.3 of	Section 1.3 of this Plan provides a summary description of surface water and groundwater.
environmental values to be managed under the		this Plan Section 2 of the WMP	Section 2 of the WMP provides summary of land use, soils and hydrology.
Component plan; and Description of landscape features, heritage sites and environmental values to be managed under the		Section 3 of the GWMP	Section 3 of the GWMP provides a detailed summary of the existing groundwater regime, predicted groundwater impacts, groundwater users, dependent ecosystems and baseline data.
component plan and their significance.		Section 3 of the SWMP	Section 3 of the SWMP provides a detailed summary of the existing surface water systems, baseline data, water quality, stream health and aquatic ecology.
	Condition 2(b) a description of: • the relevant statutory requirements (including	Section 2.3 of this Plan	Section 2.3 provides descriptions of project approval, subsidence performance measures and legislation applicable to this Plan.
	any relevant approval, licence or lease conditions);	Section 2 of the WMP, SWGWRP and GWMP	Section 2 of the WMP, SWGWRP and GWMP summarise conditions under PA08_0184 and identifies relevant Statement of Commitments and other approval requirements including existing SMP conditions.
			Section 2 of the WMP, SWGWRP and GWMP also provide an overview of the <i>Water Act 1912, Water Management Act 2000, Dams Safety Act 1978,</i> EPL 394, water licences and other relevant guidelines and standards.
Performance measures relevant to the landscape	Condition 2(b) a description of: • any relevant limits or	Section 2 of this Plan	Section 2 this Plan provides the subsidence performance measures for water.
features, heritage sites and environmental values to be managed under the	performance measures/ criteria;	Section 4 of the WMP	Section 4 of the WMP summarises the impact assessment criteria (trigger levels) for surface water monitoring undertaken by Ulan Coal.
component plan		Section 3 of the SWMP	Section 3 of the SWMP details the trigger values for surface waters. These trigger values

Table 1 Supporting Documents – Reference Summary

⁹ PA08_0184, Schedule 3, Condition 26(h).
 ¹⁰ UCML's program to collect baseline data for future Extraction Plans is provided in Attachment 3 of the Extraction Plan.

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EP Guidelines for Extraction Plan Management Plans	PA 08_0184 Requirements for Management Plans Condition 2, Schedule 5	This Plan or WMP Reference	Section Description
		Section 3 of the GWMP	have been adopted for assessing and responding to changes in stream health. Section 3 of the GWMP details the trigger values for groundwaters. These trigger values have been adopted for assessing and responding to predicted groundwater changes, including private bores to assist in determining when response mechanisms or remedial actions are required.
Performance indicators to establish compliance with these performance measures	 Condition 2(b) a description of: the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures; 	Section 4.3 of this Plan	Section 4.3 of this Plan outlines performance indicators to assess the subsidence performance measures for water.
	Condition 2(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	Section 3 of the WMP, SWMP and GWMP	Section 3 of the WMP, SWMP and GWMP describes the implementation of each respective management plan.
Currently predicted subsidence impacts and environmental consequences relevant to the features, sites and values to be managed.		Section 3 of this Plan	Section 3 of this Plan provides a summary of the approved subsidence impacts and revised impacts.
Measures planned to remediate these impacts and/or consequences		Section 4.1 of this Plan	Section 4.1 of this Plan provides a summary of the subsidence management measures for both groundwater and surface water.
Existing baseline monitoring network and baseline monitoring results. Proposed monitoring of subsidence impacts and environmental consequences.	 Condition 2(d) a program to monitor and report on the: impacts and environmental performance of the project; effectiveness of any management measures (see c above); 	Figure 2 & Figure 3 and Section 4.2 of this Plan Section 4 of the WMP Section 4 of the SWMP Section 4 of the SWMP	 Section 4.2 of this Plan describes the existing and proposed monitoring and evaluation program. Section 4 of the WMP summarises the surface water and ground water monitoring objectives of the SWMP and GWMP respectively. Section 4 of the SWMP provides details of Ulan Coal surface water monitoring program, monitoring standards in accordance with relevant Australian Standards, legislation and the OEH approved methods for sampling Section 4 details the surface water monitoring program including monitoring of the following elements of the Ulan Coal water management system and surrounding creeks: Surface water quality and flows in upstream and downstream watercourses; Base flow in the Goulburn and Talbragar Rivers; Channel stability in upstream and downstream watercourses; Stream health conditions in upstream and downstream watercourses; On-site water management; and
		Section 4 of the GWMP	Water quality and volume for off-site discharges.

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EP Guidelines for Extraction Plan Management Plans	PA 08_0184 Requirements for Management Plans Condition 2, Schedule 5	This Plan or WMP Reference	Section Description
		Section 4 of the GWMP	 Section 4 of the GWMP provides details of groundwater monitoring program, monitoring standards and a program to monitor private bores. Section 4 of the GWMP details an extensive groundwater monitoring program with a total of 87 groundwater piezometers located both within and outside the approved mining boundary and previously mined areas. This program addresses monitoring of the following elements of the alluvial and hardrock/coal aquifers underlying the UUG mining area: groundwater inflows to open cut pit and underground mine workings; groundwater levels and water quality; seepage/leachate from UCMPL's mine water management system; baseflows in watercourses; impacts on 'The Drip'; and
Proposed monitoring of the success of remediation measures following		Section 4.1 and Section 4.2 of this Plan	 riparian vegetation monitoring Section 4.1 and Section 4.2 of this Plan provide a summary of the subsidence management measures and responses for both groupdurate and outfoce wroter
Adaptive management proposed to avoid repetition of unpredicted subsidence impacts and/ or environmental consequences Contingency plans proposed to remediate unpredicted subsidence impacts and/or environmental consequences Trigger, Action, Response Plan	(e) a contingency plan to manage any unpredicted impacts and their consequences;	Section 5.1 of this Plan Section 5 of this Plan Section 3 of the SWGWRP	 Section 5.1 of this Plan provides a summary of the adaptive management approach in the event performance measures are exceeded, higher than predicted subsidence or subsidence related incident has occurred. The Contingency Plan outlines UUG's requirement to develop the appropriate course of actions, including corrective and preventative actions. Section 5.2 of this Plan provides a TARP for to identify the appropriate response measures and responsibilities. Section 3 of the SWGWRP outlines a number of Trigger Action Response Plans (TARPS) that outline the responses required in the event that operations result in adverse impacts to the surrounding surface water and/or groundwater environment.
Responsibilities for implementation of the component plan		Section 7 of this Plan	Responsibilities for implementation of this Plan is listed.
	(f) a program to investigate and implement ways to improve the environmental performance of the project over time;	Section 6.1 of this Plan Section 5.0 of the WMP, SWMP and GWMP	Section 6.1 of this Plan describes the review mechanism for improvement. Section 5 of the WMP, SWMP and GWMP outlines UUG's approach for improvement.
	 (g) a protocol for managing and reporting any: incidents; complaints; non-compliances with statutory requirements; and 	Section 6.2 of this Plan Section 4 of the WMP, SWMP and GWMP	Section 6.2 of this Plan describes the reporting and community response process. Section 4 of the WMP, SWMP and GWMP outlines the details of reporting incidents, non- compliances, community complaints in relation to surface water and groundwater.

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EP Guidelines for Extraction Plan Management Plans	PA 08_0184 Requirements for Management Plans Condition 2, Schedule 5	This Plan or WMP Reference	Section Description
	exceedances of the impact assessment criteria and/or performance criteria; and		
	(h) a protocol for periodic review of the plan.	Section 6.1 of this Plan Section 5 of the WMP, SWMP and GWMP	Section 6.1 of this Plan describes the review process of the plan. Section 5 of the WMP, SWMP and GWMP outlines UUG's approach for review of management plans.

2.2 Subsidence Performance Measures

This WMP LW30 & LWW6-LWW8 outlines the management strategies, controls and monitoring programs to be implemented for the management of surface water and groundwater regarding potential environmental impacts from secondary extraction within the Application Area¹¹ as described in the Extraction Plan.

UCMPL must ensure that there is no exceedance of the subsidence impact performance measures¹² for water as provided in **Table 2**.

Table 2 Water Performance Measures

Water	Subsidence Impact Performance Measures
Ulan, Mona & Cockabutta Creeks	No greater environmental consequences than predicted in the EA

2.3 Relevant Legislation

2.3.1 Water Management Act 2000

The Water Management Act 2000 (WM Act) regulates the use and interference with surface water and groundwater sources which are governed by operational water sharing plans (WSP) in NSW.

Baseflow losses are compensated by:

- The *Hunter Unregulated and Alluvial Water Sources WSP 2009* applies in the vicinity of LW30. The losses of baseflows from this system are compensated as required by the Project Approval 08_0184¹³ by the discharge of water to the Goulburn River and are covered under WAL19047, which has 600 units of allocation in the Upper Goulburn River water source.
- The Macquarie Bogan Unregulated and Alluvial Water Sources WSP 2012 applies in the vicinity of LWW6-W8. The losses of baseflows from this system will be compensated as required by the Project Approval 08_0184¹⁴ through WAL 34921 (Obtained Dec 2018), which provides 30 units of allocation from Talbragar Alluvial GW sources and WAL 41817 (Obtained Feb 2019), which provides 50 units of allocation from the Upper Talbragar River Water Source.

Dewatering extraction is provided for by:

- The WSP North Coast Fractured and Porous Rock Groundwater Sources 2016 applies in the vicinity of LW30. UCML holds WAL41492 which provides 7060 units of allocation in the Oxley Basin Coast Groundwater Source.
- The WSP for NSW Murray Darling Basin (MDB) Porous Rock Groundwater Sources 2011: applies in the vicinity of LWW6-W8. UCML holds WALs within the Sydney Basin of the MDB Groundwater Source as follows: WAL 37192, 704 units and WAL 41906, 2215 units. UCML secured a further 4031 units in the 2018 gazetted water allocation.

2.3.2 Environmental Planning and Assessment Act 1979

Project Approval 08_0184 (PA08_0184) under Part 3A of the *Environmental Extraction Planning and Assessment Act 1979* (EP&A Act) was granted on 15 November 2010. As required by PA08_0184 UCMPL are required to prepare an Extraction Plan, to the satisfaction of the Secretary of DPIE. A component of the Extraction Plan is the preparation of a Water Management Plan in accordance with Condition 26(h), Schedule 3 of PA08_0184.

¹¹ PA08_0184, Schedule 3, Condition 26(h).

¹² PA08_0184, Schedule 3, Condition 24, Table 14.

^{**}Extraction of water allocated to Wallerawang Collieries Limited by WAL27887 will be undertaken by UCML, facilitated under the NSW Office of Water 'Application to change water access licence' process

¹³ PA08_0184, Schedule 3, Condition 29.

¹⁴ PA08_0184, Schedule 3, Condition 29.

2.3.3 Mining Act 1992

The NSW *Mining Act 1992* (Mining Act) places controls on methods of exploration and mining, the disposal of mining waste, land rehabilitation, and environmental management activities. The extraction of coal using the mining methods described in the Extraction Plan occurs within the subsurface Mining Lease (ML) ML1468, granted approval under the Mining Act on the 18 May 2000.

2.3.4 Environmental Protection Licence 394

Environment Protection Licence 394 (EPL 394) currently contains licensed discharge points (LDP's) in relation to water management [refer to SWMP (ULN SD PLN 0055)]. EPL 394 was issued to UCMPL in accordance with the *Protection of the Environment Operations Act 1997* (POEO Act).

2.4 Consultation

Consultation was undertaken during the Project EA¹⁵ and in preparation of the WMP. Consultation specific to the Extraction Plan was undertaken with government agencies, asset owners, UCMPL's Community Consultative Committee (CCC) and registered Aboriginal stakeholders. Further information regarding consultation is provided in Section 2.1 of the Extraction Plan.

2.4.1 Private Bore Consultation

There are a number of private landowners who participate in UCMPL's private bore monitoring program (**Figure 4**). These landowners are regularly consulted annually through the Private Bore Survey program in accordance with the GWMP. This also provides an opportunity for general consultation with private land owners in regards to UCMPL's operation.

There are a number of private bores that may be impacted by drawdown associated with mining within the Project Area (**Figure 4 & Table 3**). Consultation has commenced with several landholders to establish alternative water supply agreements in advance of impact occurring.

2.4.2 Private Property Consultation

The landholder of Private Property located in the west of the Application Area (**Figure 1 & Figure 2**) has been consulted during the preparation of this Extraction Plan. There are several farm dams which could potentially be impacted by subsidence, and a private bore predicted to be impacted by groundwater drawdown.

A Private Property Subsidence Management Plan (PPSMP) will be prepared in consultation with the landholder for each longwall panel, prior to the commencement of mining for the monitoring and management of property features potentially impacted by subsidence.

¹⁵ Ulan Coal - Continued Operations Environmental Assessment (Umwelt 2009)

3

Predicted Subsidence Impacts & Environmental Consequences

The approved subsidence impacts and environmental consequences relating to surface water and groundwater are described in the Project EA and subsequent modifications.

Section 3.1.1 provides a summary of approved subsidence impacts from the Project EA and subsequent modifications describing Mona Creek and ephemeral drainage lines within the Project Area, relevant to this Plan.

Section 3.1.2 provides a summary of revised subsidence impacts to surface waters from the SCT report (**Technical Report 1**) and a review of surface water impacts by Umwelt Australia (Umwelt) from the recent secondary extraction of previous UUG longwall panels (**Technical Report 4**).

Section 3.2.1 provides a summary of approved subsidence impacts from the Project EA and subsequent modifications describing groundwater within the Project Area, relevant to this Plan.

Section 3.2.2 provides a summary of the groundwater impacts (including private bore impacts) completed by Mackie Environmental Research (MER) in August 2016 (**Technical Report 3**).

Section 3.3 provides a summary of the revised subsidence impacts as they relate to MOD4 from the Ulan Continued Operations Project - Modification 4 Longwall Optimisation Project Environmental Assessment 2018 (ELA, 2018) and Subsidence Assessment for Amendment to LW30 and LWW6 - LWW8 Extraction Plan (SCT, 2019).

3.1 Surface Water

3.1.1 Approved Subsidence Impacts and Environmental Consequences

The following summary of subsidence related impacts to Mona Creek, other waterways and ephemeral drainage lines, were described in the Project EA, which stated:

Predicted subsidence impacts resulting from the proposed underground mining operations of Ulan No. 3 and Ulan West may potentially affect Ulan Creek, Bobadeen Creek, Curra Creek, Mona Creek and Cockabutta Creek catchments.

The subsidence affectation area includes numerous ephemeral drainage lines. As discussed in Section 5.2, the mine plan has been configured to avoid subsidence impacts on the main channel of Ulan Creek. Detailed terrain analysis to compare pre and post mining topography has confirmed that the predicted subsidence impacts will not result in any substantial ponding or drainage realignment within the project area.

There are numerous ephemeral watercourses located within the project area. Mining below ephemeral creeks is considered to have potential to reduce surface flows and the duration that pools retain water following a rainfall event. Over time, fine grained material is expected to gradually fill surface cracks and reduce the hydraulic conductivity of the immediate surface strata as observed in Ulan Creek over the medium term.

Water bores and groundwater seeps are likely to be impacted by mining subsidence movements. Water bores and natural springs located directly over the mining area are expected to dry up as a result of mining. Alternative arrangements may also be required to supplement any water supplies that rely on bores within the general vicinity of the project area. A detailed assessment of groundwater impacts has been conducted by Mackie Environmental Research (2009).

The revised subsidence related impacts to Ulan Creek and other waterways as a result of modifying the Ulan West Mine Plan were described in the Environmental Assessment Modification (MOD2) of Ulan Coal - Continued Operations (Umwelt 2012), which stated:

The proposed amendments will result in minor localised changes to subsidence predictions made as a part of the Ulan Coal – Continued Operations Environmental Assessment (Umwelt 2009). These changes however, will not significantly change the subsidence impacts previously described in the Ulan Coal – Continued Operations Environmental Assessment (Umwelt 2009) or the Modification of Ulan Coal Continued Operations (Umwelt 2011).

The following summary of revised subsidence related impacts as a result of modifying the Ulan Continued Operation Mine Plan within the Interaction Zone were described in the Environmental Assessment Modification (MOD3) of Ulan Coal - Continued Operations (Umwelt 2012), which stated:

The environmental impacts within the Interaction Zone were assessed as part of the UCCO Project EA and subsequently approved within PA 08_0184. The potential environmental impacts associated with the proposed modification within the Interaction Zone are consistent with the approved operations.

3.1.2 Revised Subsidence Impacts and Environmental Consequences

A summary of the revised subsidence assessment relevant to this Plan and the Application Area by SCT (**Technical Report 1**) is provided below. The revised subsidence assessment by SCT concluded:

Horizontal fracturing and upsidence is expected in topographic low points where the stream bed is comprised of sandstone rock strata. There is also potential for open tension cracks to occur along drainage channels located directly over and around the edges of longwall panels. The effect of any cracks in a drainage channel would be similar to that of other compression cracking and would tend to divert surface water downward into the overburden strata.

The main surface impacts are considered to be that ephemeral streams and pools located directly above longwall panels are not likely to hold water for as long after rain as they did prior to mining.

The longwall panels are located on both sides of the Great Dividing Range so there is potential for surface water to be diverted from the Mona Creek catchment downward into the mine and thereby through the mine pump out system into the Goulburn River Catchment.

Subsidence impacts are expected to be consistent with those described in the UCCO Project EA. For Mona Creek, the EA predicts a significant loss of base flow when creeks are directly mined under. The experience from Longwall 26 mining under Bobadeen Creek provides a guide as to the likely impacts that can be expected.

The dam located over Longwall W6 is fed from a spring located directly below it. Fracturing of the overburden strata during the start of mining Longwall W6 is expected to disrupt the spring that feeds the dam. It is considered unlikely that this spring fed system could be repaired or re-established.

A review of surface water impacts (**Technical Report 4**) in previous UUG mining areas was completed by Umwelt. Based on review of the available monitoring results there have been no greater environmental consequences than predicted in the EA to the surface waters of Ulan Creek, Curra Creek, Bobadeen Creek or Mona Creek. Monitoring indicates that minimal changes have occurred in these creeks in the last five years and that the changes that have occurred are not considered to have occurred due to subsidence impacts (**Technical Report 4**).

3.2 Groundwater

3.2.1 Approved Subsidence Impacts and Environmental Consequences

The following summary from Project EA in relation to groundwater impacts from underground mining relevant to this Plan concluded:

Generally, as underground mining progresses, subsidence and cracking of the overlying strata can result in the depressurisation of the strata above and below the mined section resulting in the inflow of groundwater into the mining area. This can result in potential impacts on regional groundwater systems.

An evaluation of the likely impacts of UCML's mining operations on the regional groundwater system was undertaken by Mackie Environmental Research (MER) as part of the EA for the Ulan Coal - Continued Operations Project (MER, 2009). This evaluation included computerised groundwater modelling based on predicted subsidence effects, extensive groundwater monitoring data and historical groundwater seepage estimates to the Ulan underground operations.

The groundwater assessment indicated that the total cumulative groundwater seepage to mine workings from underground operations is predicted to rise from the current rate of approximately 9.2 ML/day to approximately 24.0 ML/day in 2018. After 2018, the seepage rate is predicted to decline.

At the close of mining it is predicted that baseflow losses from the hardrock aquifers to the Goulburn River catchment arising from the proposed mining, may be of the order of 0.05 ML/day (MER, 2010).

Depressurisation and drawdown of the groundwater table as a result of mining activities has the potential to affect five privately owned bores as defined by the predicted 5 metre drawdown contour. Four of these five privately owned bores are located within the predicted 10 metre drawdown contour and are likely to experience yield reductions or complete loss of yield. Of these bores, only one is operable however it is currently not in use. The remaining bores are either inoperable or unable to be located (MER, 2009).

The revised subsidence related impacts to groundwater as a result of the proposed Ulan West Mine Plan Modification¹⁶ were described as:

The revised mine plan results in a minor reduction to the underground mining footprint and an alteration to the mining schedule during the early years of mining. These changes while minor, result in slight changes to the groundwater influx due to the altered mining schedule during the early years. Overall however, the groundwater impact (i.e. extent of depressurisation) of UCML's operations is unchanged, as the mine life and mining footprint from that used to assess UCML's groundwater impacts in the 2011 EA is unchanged.

The following summary of revised subsidence related impacts as a result of modifying the Ulan Continued Operation Mine Plan within the Interaction Zone were described in the Environmental Assessment Modification (MOD3) of Ulan Coal - Continued Operations (Umwelt 2012), which stated:

The environmental impacts within the Interaction Zone were assessed as part of the UCCO Project EA and subsequently approved within PA 08_0184. The potential environmental impacts associated with the proposed modification within the Interaction Zone are consistent with the approved operations.

¹⁶ Mackie Environmental Research Pty Ltd (MER) in Environmental Assessment Modification (MOD2) of Ulan Coal – Continued Operations (Umwelt 2012).

3.2.2 Revised Subsidence Impacts and Environmental Consequences

A review of the potential groundwater impacts arising from mining within the Application Area was completed by MER (**Technical Report 3**). The review by MER concluded:

Within the constraints and limitations imposed by numerical modelling, the potential impacts on regional groundwater systems include:

- complete depressurisation of Triassic and Permian strata within the footprint of mined panels;
- regional drawdown impacts, extending some 10 to 20 km at the end of mining in the Ulan seam;
- regional drawdown impacts, extending some 3 to 5 km beyond the mine footprint in Triassic strata;
- groundwater inflows to UG3 operations being sustained at 18 to 20 ML/day during extraction of longwall panels W6 to W11 and LW30;
- base flow losses of about 0.16 ML/day to the Talbragar River system and about 0.07 ML/day to the Goulburn River system for the period from 2009-2010 to the completion of mining.

To date the drawdowns in UCML piezometers distributed across the region have generally been lower than the 2009 model predictions. We note that the estimated drawdowns are conservative since there are only a small number of piezometers beyond the longwall panel footprint that have actually registered drawdowns in the water table.

We have reviewed the predicted drawdown impacts on private water supply boreholes throughout the region. As noted in the 2009 EIS, boreholes within the footprint of longwall panels are expected to fail when undermined. Most of these boreholes have been acquired by Ulan Coal Mines Limited (UCML) with two locations (PB2 and PB8) located within the Ulan West footprint, remaining. The current bore census indicates 6 boreholes close to, but not within the mine panel footprint, are likely to be impacted by more than 2 m drawdown (as defined by the Aquifer Interference Policy) during the course of mining. These boreholes are identified as PB9, PB11, PB14, PB21, PB30 and PB32. Annual measurement of standing water levels at these locations indicates observable impacts have not occurred to date.

3.3 Revised Impacts (MOD4)

A summary of the revised subsidence assessment relevant to this Plan and the Application Area by SCT in 2019 (**Technical Report 1a**) is provided below. The revised subsidence assessment by SCT concluded [extract]:

The proposed extensions to LWW7 and LWW8 below the Woodbury Property would mine under longer sections of the third order main channel of Mona Creek and a third order tributary of this creek. There are no significant drainage lines in the DSCA within the extended Extraction Plan Application Area.

Impacts to the sections of Mona Creek above the proposed extension areas are expected to be consistent with those assessed in SCT (2016) and SCT (2018a) for MOD4.

A review of the potential groundwater impacts was provided in the MOD4 Environmental Assessment (EA) (ELA, 2018). The EA concluded [extract]:

The 5m drawdown contour is predicted to extend a further 1 km at the north eastern corner of the operations as a result of the proposed modification, though this is not predicted to change the number of private bores impacted in this area.

The additional baseflow reduction from the mine plan associated with the proposed Modification over the MOD3 mine plan is 0.001 ML/day for the Goulburn River and 0.003 ML/day for the Talbragar River. These changes are very low to the overall baseflow likely to occur in those rivers and the changes are not practically measurable. Therefore, there will be no discernible change in the flow, and the predicted changes are within the within the accuracy of predictions.

The groundwater assessment undertaken shows that there are no additional private bores that are likely be impacted by the proposed Modification. The proposed modification is predicted to increase drawdown by 1.37m in PB30 and by >1m in 10 other private bores.

A review of the potential surface water impacts was provided in the MOD4 Environmental Assessment (ELA, 2018). The MOD4 EA concluded [extract]:

Overall, the proposed modification is not expected to cause changes to creek erosion or scouring. Monitoring for subsidence related impacts and watercourse stability will continue in association with the SWMP.

The proposed Modification is not predicted to have adverse cumulative impacts on water use, flows or qualities of the surrounding surface water systems.

4 Management, Monitoring & Evaluation

4.1 Subsidence Management Measures

4.1.1 Surface Water

The following summary from the Project EA, in relation to remediation measures for potential subsidence induced impacts on drainage lines, stated:

Any remediation works required to rectify surface cracking, surface ponding or out of channel flows are not expected to be substantial based on previous experience at UCML. Due to the limited remediation works undertaken as part of the existing operations any future remediation works are expected to also be limited in extent and be able to be undertaken either by hand or small earthmoving equipment, e.g. bobcat.

Management measures of potential subsidence related impacts on drainage lines are provided in the SWGWRP. As outlined in the SWGWRP details of surface water management measures and responses as a result of subsidence related impacts are provided.

4.1.2 Groundwater

The following summary from the Project EA, in relation to mitigation measures for potential subsidence induced impacts on groundwater, stated:

Mitigative measures for any identified negative impacts beyond those predicted may include replacement of water supply or relinquishment of groundwater or surface water allocations as an offset to monitored leakage in excess of predictions.

Management of potential subsidence related impacts on groundwater are detailed in the GWMP and SWGWRP. As described in **Table 1**, Section 4.2 of the GWMP and Section 3.1 of the SWGWRP provide details of groundwater management measures and responses as a result of subsidence related impacts on private bores.

4.1.2.1 **Private Bores**

As required by the GWMP, UCMPL conduct annual surveys of private bores within the vicinity of the Project Approval boundary (**Figure 4**). Private landowners participating in the bore monitoring program are contacted on an annual basis to monitor their water levels and water quality (electrical conductivity and pH).

This program is typically completed over a number of days, due to the spatial distribution of private bores around the Project Approval boundary. The electrical conductivity (EC) and pH results from the annual private bore survey are assessed against triggers levels outlined in the GWMP. The water level results from the annual private bore survey are assessed against triggers levels outlined in the GWMP.

UCMPL have developed a Trigger Action Response Plan (TARP) for privately owned bores within the SWGWRP, in response to exceedances of either water quality or water level triggers. The TARP within Section 3.2.1 of the SWGWRP provides approved actions and responses to be undertaken UCMPL receive:

- Notification or complaint from landowner regarding groundwater bore;
- Monitoring data shows an adverse impact from previous monitoring or groundwater model predictions; and
- Monitoring results outside the trigger values in the GWMP.

Private bores and the revised predicted level of drawdown for MOD4 are shown in Table 3.

Table 3: Revised Predicted Level of Drawdown for Private Bores

Private Bore Site ID#	MOD3 Predicted Drawdown (m)	MOD4 Predicted Drawdown **(m)
PB08	137.17	137.17
PB02*	64.24	93.34
PB21	49.64	49.57
PB17	12.43	12.43
PB30	6.07	7.44
PB32	5.80	6.36
PB33	5.47	6.11
PB14	5.15	5.55
PB31	5.04	5.25
PB10	4.47	4.52
PB05	4.02	4.39
PB09	4.06	4.21
PB26	2.70	2.72
PB11	2.12	2.14

Notes: *PB02 is no longer a private bore as UCMPL purchased this property. **MOD4 is predicted to increase drawdown by 1.37m in PB30 and by >1m in 10 other private bores.

4.2 Subsidence Monitoring

4.2.1 Surface Water Monitoring Program

The components of the SWMP for the Project Area include:

- Surface water quality and flows in upstream and downstream watercourses;
- Baseflow in the Goulburn and Talbragar Rivers;
- Channel stability in watercourses (proposed to be directly undermined);
- Stream health conditions in upstream and downstream watercourses;
- On-site water management; and
- Water quality and volume for off-site discharges.

The complete description of surface water monitoring locations, frequency and parameters measured for each of these components of the monitoring program are provided in the SWMP.

4.2.2 Surface Water Monitoring Program within Application Area

Monitoring and evaluation of potential mining related impacts on drainage lines and creeks specific to the Application Area are displayed in (**Figure 2**). In summary the locations, frequency and parameters measures specific for monitoring impacts on surface waters during longwall mining activities within the Application Area (from the SWMP) are provided in **Table 4**.

Monitoring Component	Parameters	Location/Network	Monitoring Frequency	Monitoring Type ¹⁷
Surface Water Quality Monitoring	• TSS (mg/L)	 SW10, SW07, SW08 Refer to Figure 2 	Monthly grab sample during creek flow events.	EMS
Channel Stability Monitoring	 Document any significant erosive or depositional features for quantitative evaluation. Recording of any visible subsidence impacts. 	 Along the section of Mona Creek above LWW8; and 2nd and 3rd order drainage Lines of Mona Creek within 0.2m subsidence contours of LW30, LWW6 to LWW8. Refer to Figure 2, Figure 3 and Figure 14 of the Extraction Plan. 	 Pre-mining; Post mining (at least 3 months after cessation of mining, within 12 months of cessation of mining). Annually for two years post mining. 	EMS EP
Ponding and Erosion Monitoring	 Presence of surface cracking and changes in erosion, surface ponding or out of channel flows. 	 Potential ponding and erosion sites (Indicative sites identified during EA (Umwelt 2009) sites for monitoring to be finalised during pre-mining inspection. Refer to Figure 2 for indicative potential ponding and erosion sites. 	 Pre-mining; Post mining (at least 3 months after cessation of mining, within 12 months of cessation of mining). Annually for two years post mining. 	EP
Stream Health Monitoring	 Monitoring aquatic macro invertebrate assemblages and riparian vegetation/health. 	 Ulan Creek, Mona Creek and Bobadeen Creek. Refer to SWMP for monitoring locations. 	Annually	EMS

Table 4 Surface Water Monitoring within Application Area

¹⁷ EMS = Monitoring in accordance with PA_0184 Environmental Management Plans; (EP) - Monitoring specific this Extraction Plan.

4.2.3 Groundwater Monitoring Program

The existing groundwater monitoring program includes six groundwater monitoring networks located within and outside the Project Area. Relevant to the Application Area, the North Monitoring Network (NMN) is the primary groundwater monitoring networks utilised. The groundwater program provides monitoring of alluvial and hardrock/coal aquifers underlying the mining area including:

- Groundwater inflows to open cut pit and underground mine workings, including recirculation from water in previously mined areas;
- Groundwater levels and water quality; and
- Riparian vegetation¹⁸.

The Bobadeen Monitoring Network includes a group of 9 piezometers at shallow depths providing monitoring for the Bobadeen Irrigation Scheme (BIS).

Monitoring of groundwater levels and water quality for privately owned bores within and outside the Project Area is undertaken annually (refer to Sections 3.1.2 and 4.1.4 and of the GWMP). This monitoring program extends to approximately 12 kilometres away from the approved mine footprint.

The location of relevant groundwater monitoring bores, piezometers and privately owned bores within the groundwater monitoring program are displayed in (**Figure 4**).

The complete description of the groundwater monitoring locations, frequency and parameters measured for each of these components of the groundwater monitoring program are provided in Section 4 of the GWMP.

UCMPL currently maintains daily records of water in flows pumped from the mine for each pump. The data collected is incorporated into a detailed water balance model, consistent with the WAF.¹⁹ UCMPL currently maintains daily records of water in flows pumped from the mine for each pump. The data collected is incorporated into a detailed water balance model, consistent with the WAF.

Figure 5 below provides the 2018 Water Balance as an example, which includes the estimated groundwater volume component included in the stated water sources to assist in the assessment of the suitability of the water licence. It provides a water balance document, which details the volume of groundwater take in total, from each groundwater source.

4.2.3.1 Visual Monitoring of The Drip

In consultation with NRAR during the preparation of the amended Extraction Plan, UCMPL will commence regular visual inspections and qualitative assessments of the 'The Drip' flows utilising photographic monitoring during the collection of Drip water samples every two months. This will be in addition to the current pore pressure monitoring program which commenced in 2015 and water quality monitoring program which commenced in 2012. The purpose of the photographic monitoring is for determining any impacts possibly due to mining activities. For further information, refer to Section 4.2 of the GWMP which will be updated accordingly to reflect this additional monitoring requirement.

 ¹⁸ Monitoring for the potential groundwater impacts on riparian vegetation are considered in the BMP LW30 & W6-W8 (Appendix C of the Extraction Plan) and Biodiversity Management Plan (ULNCX-111515275-225) and Surface Water Monitoring Program (ULN SD PLN 0055).
 ¹⁹ The Minerals Council of Australia in conjunction with the Sustainable Minerals Institute of the University of Queensland, Water Accounting Framework (WAF) 1.2, 2012) for the Minerals Industry.

Figure 5 2018 Water Management Schematic



4.2.4 Groundwater Monitoring Program within Application Area

Monitoring and evaluation of potential mining related impacts on groundwater specific to the Application Area are displayed in (**Figure 4**). The applicable groundwater monitoring network and privately owned bores, frequency and parameters to be measured specific for monitoring impacts on groundwater during longwall mining activities within the Application Area (from the GWMP) are provided in **Table 5**.

Mining activities will depressurise the strata overlying the longwalls. Groundwater monitoring bores within the mine footprint will become obsolete. There are currently water monitoring bores in the northern monitoring network within the application area, which are considered adequate.

Monitoring Component	Parameters	Location/Network	Monitoring Frequency	Monitoring Type ²⁰
Groundwater Monitoring	 Standing water levels (m). Groundwater quality: EC (μS/cm) & pH; and Full chemical analysis. Piezometric head pressures. 	 North Monitoring Network (NMN) Intermittent Monitoring Network (IMN) Mona Creek Alluvium Monitoring (MCAM)² Refer to Figure 4. 	 NMN quarterly monitoring water levels and download VW data loggers; NMN EC and pH (Biannually); and NMN full chemical analysis (Annually). IMN water levels, chemistry and data download as required. MCAM quarterly monitoring water levels and download VW data loggers. 	EMS EP
Private Bores (Groundwater)	 Standing water levels (m). Water quality: pH; and EC (µS/cm) 	 Private Bore Monitoring Network Refer to Figure 4 Refer to GWMP for site coordinates of private bores. 	Annually	EMS

Table 5 Groundwater Monitoring Applicable to Application Area

Notes: ¹ Continuous monitoring at a number of groundwater monitoring bores is also undertaken. ² Mona Creek Alluvium Monitoring (MCAM) added to the groundwater monitoring program as required by MOD4.

4.2.5 Compensatory Water Supply

UCMPL shall provide a compensatory water supply to any owner of privately-owned land whose supply is adversely impacted (other than an impact that is negligible) as a result of the project, in consultation with the NSW Department of Industry-Water (DOI Water), and to the satisfaction of the Secretary.

The compensatory water supply measures must provide an alternative long-term supply of water that is equivalent to the loss attributed to the project. Equivalent water supply must be provided (at least on an interim basis) within 24 hours of the loss being identified.

If the Proponent and the landowner cannot agree on 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 Secretary for resolution.

If UCMPL is unable to provide an alternative long-term supply of water, then UCMPL shall provide alternative compensation to the satisfaction of the Secretary.

²⁰ (EMS) – Ulan Coal Mine Complex Monitoring Program undertaken in accordance with Environmental Management Strategy including DPIE Approved Environmental Management Plans, (EP) - Monitoring Program specific to the Application Area and requirements of this Extraction Plan.

4.3 Assessment of Subsidence Performance Measures

Subsidence impact performance measures listed in Table 14 of the Project Approval²¹ relevant to water are provided in **Table 2**. UCMPL have developed a range of performance indicators (**Table 6**) to inform if the performance measures are likely to be exceeded during the secondary extraction within the Application Area.

Table 7 provides a summary of the analysis of the monitoring data that will be undertaken to evaluate the potential impacts using the performance indicators against the performance measures.

Water	Subsidence Performance Measures	Performance Indicators
Ulan, Mona & Cockabutta Creeks ¹	No greater environmental consequences than predicted in the EA	 Performance indicators will be considered to have been triggered if: Surface water flow Total Suspended Solids (TSS) samples at SW07, SW08 and SW10 are greater than 50 mg/L for 3 or more consecutive samples³ and investigation reveals subsidence impact as a contributing cause; or Monitoring results from the stream health program, identify a deteriorating trend in water quality and stream health; or Monitoring results from the channel stability monitoring program within Mona Creek and 2nd and 3rd tributaries of Mona Creek identify a deteriorating trend in channel stability; or If the measured and projected decline in piezometric heads (assessed quarterly) exceeds the model predicted trends.
All Built Features	Safe, serviceable and repairable unless the owner agrees otherwise in writing ²	 This performance indicator will be triggered if: UCMPL receive a complaint from a private bore owner in regards to water supply from their bore/s which is not predicted to be impacted by groundwater drawdown; and/or Analysis of the Private Bore monitoring data indicates drawdown impacts have or likely to have exceeded groundwater model predictions.

Table 6 Water Performance Measures and Performance Indicators

Notes:

¹ The main channel of Cockabutta Creek is remote from the Application Area, approximately 2.4km to the south-west. There is not expected to be any impact to Cockabutta Creek as a result of ground movements associated with mining longwalls in the Application Area, therefore subsidence performance indicators are not considered applicable for this Plan.

² This Built Features subsidence performance measure is relevant to the integrity of Private Bores impacted by groundwater drawdown as a result of secondary extraction within the Application Area.

³ Performance indicator is based on exiting investigation level in the SWGRP. This indicator may be revised during revision of the SWGRP as interim trigger investigation levels are replaced by baseline data trigger levels for the relevant creeks.

⁴ Insufficient permanent or semi-permanent pools of water within Curra Creek prevent inclusion of this creekline in the stream health monitoring program.

Table	7 Monitorina	of Environmental	Consequences	against Performan	ce Indicators an	d Measures
				- J		

Performance Measure	Moni	toring of Enviro Consequenc	onmental e	Data Analysis to Assess against Performance	Performance Indicator(s)	Assessment of Performance Indicator(s)	Assessment of Performance Measure	Relevant Management and Contingency Measure
	Site	Parameter	Frequency	Indicator(s)				
No greater environmental consequences than predicted in the EA	Mona Creek (SW10) Bobadeen Creek (SW07) Curra Creek (SW08)	TSS	Monthly and/or Rainfall event >30mm in a 24hr period	Analysis of TSS surface water monitoring results from sites SW10, SW07 andSW08.	The surface water quality in the Creek does not exceed the surface water quality criteria of 50mg/L for TSS for 3 or more consecutive samples ³	Performance indicators will be considered to have been triggered if: Surface water flow Total Suspended Solids (TSS) sample within Mona Creek at SW10, Bobadeen Creek at SW07, Curra Creek at SW08 is greater than 50 mg/L for 3 or more consecutive samples ³ and investigation reveals subsidence impacts as a contributing cause. If data analysis indicates the performance indicators have been triggered, an assessment will be made against the performance measures that will consider if the exceedance is due to natural causes, water discharges or subsidence related impacts.	The performance measure is exceeded if the assessment of performance indicators indicates that the exceedance is due to subsidence related impacts within the Application Area. and Have resulted in greater environmental consequences than predicted in the Project EA has occurred.	If the assessment of performance indicators determine an exceedance of the performance measures is due to subsidence related impacts as a result of mining within the Application Area, the Contingency Plan would include: • Notify relevant government agencies; • Conduct investigations; • Implementation of remediation works (Section 4.2 of the SWMP and Section 3.1 of the SWGWRP); and • Reassess subsidence impacts.
	Mona Creek & 2 nd , 3 rd tributaries of Mona Creek ¹	Channel Stability	Pre-mining; Post mining (at least 3 months after cessation of mining, within 12 months of cessation of mining). Annually for two years post mining.	Monitoring to distinguish between natural erosion and erosion from mine subsidence instability.	A deteriorating trend (outside of natural events and climatic conditions) in channel stability as a direct result of mining in the Application Area.	Performance indicators will be considered to have been triggered if: Monitoring results from the channel stability monitoring program within Mona Creek and 2nd and 3rd tributaries of Mona Creek identify a deteriorating trend (outside of natural events and climatic conditions) in channel stability. The assessment of the performance indicators will		

Number:	ULNCX-111515275-3575
Owner:	Environment and Community Manager

Status: Approved Version: 2.0

Performance Measure	Monitoring of Environmental Consequence			Data Analysis to Assess against Performance Performance Indicator(s)	Assessment of Performance	Assessment of Performance Measure	Relevant Management and Contingency Measure	
measure	Site	Parameter	Frequency	Indicator(s)				
						consider other factors that might influence stream stability such as rainfall events and natural processes etc. in considering whether the exceedance is subsidence related.		
	Ulan Creek Mona Creek Bobadeen Creek	Stream Health Monitoring	Annually	Monitoring for aquatic macro invertebrates to detect potential changes in water quality.	A deteriorating trend (outside of natural events and climatic conditions) in water quality and stream health as a result of mining in the Application Area.	Performance indicators will be considered to have been triggered if: Monitoring results from the stream health program within Ulan, Mona or Bobadeen Creeks ⁴ identify a deteriorating trend (outside of natural events and climatic conditions) in water quality and stream health.		
	North Monitoring Network (NMN)	Baseflows associated with hardrock strata (indirect assessment from piezometric monitoring).	Continuous (daily) monitoring of piezometric heads in relevant piezometers.	Review of piezometric heads in relevant piezometers.	Piezometric heads to be checked against trends predicted by the regional groundwater model on a quarterly basis.	Performance indicators will be considered to have been triggered if: The measured and projected decline in piezometric heads exceeds the groundwater model predicted trends.	The performance measure is exceeded if the assessment of the performance indicators indicates the measured and projected decline in piezometric heads exceeds the model predicted trends due to UCMPL underground mining activities.	If the assessment of performance indicators determine an exceedance of the performance measures is due to groundwater drawdown impacts as a result of mining within the Application Area, the Contingency Plan to include: Notify relevant government agencies; Conduct investigations; Review adequacy of existing monitoring, water licencing and baseflow offsets; Complete follow up report to relevant

Plan

Appendix A: Water Management Plan

Longwalls 30 & LWW6-LWW8

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Effective: 19/08/2019

Review: 3 Years

Ulan	Und	lergr	ound
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Plan

Appendix A: Water Management Plan

Longwalls 30 & LWW6-LWW8

Performance Measure	Moni Site	toring of Enviro Consequenc Parameter	onmental e Frequency	Data Analysis to Assess against Performance Indicator(s)	Performance Indicator(s)	Assessment of Performance Indicator(s)	Assessment of Performance Measure	Relevant Management and Contingency Measure
								 government agencies; and Refer to TARP action and response measures in Table 8 of the SWGWRP for the Groundwater Model.
Safe, serviceable and repairable unless the owner agrees otherwise in writing	Private Bores	Water quality including EC, pH and water levels	Annually	 Analysis of: Community complaints; Data obtained from Private Bore Survey; and Data obtained from monitoring wells and piezometers 	Secondary extraction within the Project Area is predicted to cause drawdown impacts in Triassic strata, 3 to 5 kms beyond the mine footprint at the end of mining. Drawdown impacts in the Ulan seam are predicted to extend some 10 to 20 kms, though the Ulan Permian aquifer is not subject to beneficial use as a water resource.	 This performance indicator will be triggered if: UCMPL receive a complaint from a private bore owner in regards to water supply from their bore/s; and/or Analysis of the Private Bore monitoring data indicates a reduction in water levels: more than the 20% considered reflective of natural variability; or reducing trend amounting to more than 20% over 3 surveys Observed drawdown levels of proximate monitoring well or piezometer within the representative area indicates predicted impacts may be evident. 	The performance measure will have considered to be exceeded if monitoring for Private Bores indicates a drawdown impact greater than predicted in the Project EA and/or UCMPL receive a compliant from a Private Bore owner.	If the assessment of performance indicators determine an exceedance of the performance measures is due to subsidence related impacts as a result of mining within the Application Area, the Contingency Plan to include: • Notify relevant government agencies; • Conduct investigations; • Undertake consultation with affected built feature owners; • Respond to community complaint in accordance with Section 6.3 ; and • Refer to TARP action and response measures in Table 3.5 of the SWGWRP for private bores.

Notes: ¹ Refer to **Figure 2** for surface water monitoring locations. ² Refer to **Figure 4** for groundwater monitoring locations. ³ Performance indicator is based on exiting investigation level in the SWGRP (ULN SD PLN 0057). This indicator may be revised during revision of the SWGRP as interim trigger investigation levels are replaced by baseline data trigger levels for the relevant creeks. ⁴ Insufficient permanent or semi-permanent pools of water within Curra Creek prevent inclusion of this creekline in the stream health monitoring program

5 Contingency Plan

5.1 Adaptive Management

In the event the subsidence performance measures for water as summarised in **Table 7** are considered to have been exceeded or are likely to be exceeded, response and management will be undertaken in accordance with protocols for incident reporting as identified in Section 4.3 of the Extraction Plan (**Section 6.2**) and Section 4.5 of the WMP.

Section 4.3 of the Extraction Plan describes the process for handling and investigating nonconformances, including allocation of responsibility, external and internal reporting requirements, and initiating and completing corrective and preventative actions.

Figure 6 displays the Contingency Plan to be implemented in the event the water performance measures are exceeded, higher than predicted subsidence or environmental consequence has occurred or in the event of a subsidence related incident.



Figure 6 Contingency Plan

5.2 Trigger Action Response Plan

Trigger action response plans or TARPs identify appropriate response measures for unpredicted subsidence impacts on surface and groundwater and are outlined in Section 3.1 of the SWGWRP. **Table 8** displays how the various predicted subsidence impacts, monitoring components, performance measures and responsibilities are structured to achieve compliance with the relevant statutory requirements and the framework for management and contingency actions.

Table 8 Trigger Action Response Plan

	Normal State Predicted Impacts	Level 1 Response Management Measures	Level 2 Response Contingency Phase
	Predicted impacts on surface water and groundwater as described in Section 3 .	• Surface water flow Total Suspended Solids sample within Mona Creek at SW10, Bobadeen Creek at SW07, Curra Creek at SW08 is greater than 50 mg/L for 3 or more consecutive samples and investigation reveals subsidence impact as a contributing cause; or	If investigations and management measures identify the cause of performance measures exceedances are related to mining activities within the Application Area.
		 Monitoring results from the stream health program with Ulan, Mona and Bobadeen Creeks identify a deteriorating trend (outside of natural events and climatic conditions) in water quality and stream health; or 	
Trigger		• Performance indicators will be considered to have been triggered if monitoring results from the stability monitoring program within Mona Creek and 2nd and 3rd tributaries of Mona Creek identify a deteriorating trend (outside of natural events and climatic conditions) in channel stability; or	
		 If the measured and projected decline in piezometric heads (assessed quarterly) exceeds the model predicted trends; or 	
		 UCMPL receive a complaint from a private bore owner in regards to water supply from their bore/s; or 	
		 Analysis of the Private Bore monitoring data indicates drawdown impacts have or likely to have exceeded groundwater model predictions. 	
	Continue monitoring in accordance with Section 4.2 of this Plan	• Implementation of management actions to assess if exceedances are due to mining related activities within the Application Area as identified Section 3.1 of the SWGWRP and as described in Section 4.1 of this Plan.	 Implementation of management responses as identified in Section 3.1 of the SWGWRP and as described in Section 4.1 of this Plan.
Action		• Management community complaints in accordance with Section 6.3 of this Plan.	Implement Contingency Plan.Review this Plan.
			 Notification to relevant government regulators (including DPI-water). Notification to include proposed remediation and make good measure/s to be implemented.
Frequency	In accordance with Table 6 and Subsidence Monitoring Program (Appendix G of the Plan).	 In accordance with Table 6 and Subsidence Monitoring Program (Appendix G of the Plan). 	Review monitoring methodology and frequency for this Plan in accordance with Contingency Plan.
Responsibility	Environment and Community Manager	Environment and Community ManagerUUG Technical Services Manager	 Environment and Community Manager UUG Technical Services Manager UUG Operations Manager

Number: ULNCX-111515275-3575 Owner: Environment and Community Manager Status: Approved Version: 3.0

Effective: 29/01/2021 Review: 3 Years

6 Review & Improvement

6.1 Review

Ongoing monitoring and review on the performance and implementation of this Plan will be undertaken in accordance with Section 4.6 of the Extraction Plan and Section 5 of the WMP. Any changes made to this Plan will be made in consultation with DPIE. A copy of the revised management plan will be supplied to the Secretary of the DPIE for approval.

6.2 **Reporting Requirements**

External reporting requirements, including incident and annual reporting, for this Plan will be in accordance with Section 4.3 of the Extraction Plan and Section 4.5 of the WMP.

In the event of an incident, UCMPL will notify the government agencies as identified in Section 4.3 of the Extraction Plan within 24 hours of becoming aware of the incident. Within seven days of the date of the incident, a detailed report of the incident will be provided and include, but not limited to, the following details:

- The date, time and nature of the exceedance/incident;
- The process to identify and investigate the likely cause of the exceedance/incident;
- Description of the response action undertaken to date; and
- Description of the proposed measures to address the exceedance/incident.

6.3 **Community Complaints**

Community complaints are managed in accordance with Section 4.4 of the Extraction Plan and Section 4.6 of the WMP, including receipt of complaints, investigation, implementation of appropriate remedial action, and feedback to the complainant, communication to site management or personnel and notification to government agencies where necessary.

7

Roles and Responsibilities

The key responsibilities of personnel in relation to this Plan are summarised in **Table 9**. Responsibilities may be delegated as required.

Table 9 Key Responsibilities

Responsibility	Accountabilities					
Operations Manager	Authorise the Extraction Plan and approve appropriate resources for the implementation of this Plan; and					
(Ulan Underground)	 Authorise internal and external reporting requirements of this Plan. 					
Technical Services Manager (Ulan Underground)	 Ensure the Subsidence Monitoring Program are implemented; Ensure monitoring and required under the Subsidence Effects Monitoring Program are carried out within specified timeframes, are adequately checked and processed and are prepared to the required standard; Ensure appropriate controls are in place to manage subsidence impacts upon surface operational infrastructure; and 					
	Poview this Plan in accordance with Section 4.5 and Section 4.6 and other legal					
Environment and Community Manager	 Review this Plan in accordance with Section 4.5 and Section 4.6 and other legal requirements and operation standards; Ensure the effective implementation of strategies designed to reduce impacts from the operation; 					
	 Ensure any potential or actual issue is reported in accordance with the Plan and other legal requirements and corporate standards; 					
	• Review and prepare internal and external reports as identified in the reporting framework;					
	 Approve subsequent revisions of this Plan; Instigate response in the event the performance indicators, TARP and/or Contingency Plan are triggered; and 					
	 Allocate resources for monitoring and review of subsidence monitoring survey results. Implement monitoring programs as required by this Plan and conduct analysis of results. 					
Environment and Community Coordinator	 against performance indicators as described in this Extraction Plan; Prepare this Plan and subsequent revisions for approval by the Environment and 					
	Community Manager; Assist in the propagation of reports as identified in reporting framework; and					
	 Assist in the preparation of reports as identified in reporting framework, and Assess any triggers as described in performance indicators and provide advice to implementation of TARPS and the Contingency Extraction Plan. 					
Environment and Community Officer	 Assist the Environment and Community Coordinator in the implementation of monitoring programs and analysis of results against performance indicators as described in this Plan; Assist in the preparation of reports as identified in reporting framework; and Assist the Environment and Community Coordinator in the assessment of triggers as described in performance indicators and provide advice to implementation of TARPS and 					
	the Contingency Plan.					
Mine Surveyor (Ulan Underground)	 Ondertake subsidence enects monitoring as required by this man and to the required survey standard within the specified timeframes and ensure data are adequately checked, processed and recorded. 					
All employees and contractors	 Comply with all requirements of this Plan; Undertake all works in accordance with this Plan and Programs and all other Ulan Coal Mine Complex systems; Report all potential environmental incidents to their supervisor immediately; and Seek Ground Disturbance Permits (GDP) approval from the Environment and Community Manager prior to any surface disturbance activities. 					

8 **Document Information**

Relevant legislation, standards and other reference information must be regularly reviewed and monitored for updates and should 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.

8.1 **Definitions**

Definitions as provided in Section 5.1 of the Extraction Plan.

8.2 Accountabilities

Accountabilities are described in Section 7 of this Plan.

8.3 References

References as provided in Section 5.2 of the Extraction Plan

8.4 Change Information

Full details of the document history are recorded in the document control register, by version. A summary of the current change is provided in **Table 10** below.

Version	Date	Review Team (consultation)	Change Summary
0.1	October 2016	Tara Stokes, Robyn Stoney, Ben Anderson	Document Development
0.2	October 2017	Jessica Southgate	Document formatting updated in accordance with Dept. of Planning feedback.
0.3	April 2018	Rebecca Croake	Figure 3 updated to include private bore labels, Table 3 updated to include private bores and predicted level of drawdown, Table 4 adjusted for ponding and erosion monitoring to occur annually and stream health assessments to occur annually, Section 2.3 updated to include water licences relevant to extraction of LW30 & W6-W8, Section 2.3.2.1 updated to include consultation with DPI— Water,
0.4	January 19	Lucy Stuart	Updated with comments received from Dol – Water and EPA in October 2018
1.0	August 2019	Tara Stokes	DPIE approved Extraction Plan LW30 & W6-W8 on 19/08/2019.
2.0	April 2020	Stephen Bragg, Lucy Stuart	This EP was amended regarding extension of longwall panels to align with the approved MOD 4.
3.0	December 2020	Robyn Stoney, Lucy Stuart, Stephen Bragg	This EP was resubmitted on the 21/12/2020 to address the requirements from the DPIE Water feeback

Table 10 Change Information