ULAN
UNDERGROUND

GLENCORE

Appendix G: Subsidence Monitoring Program Longwalls 30 & LWW6-LWW8

Ulan Underground

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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).

1.2 Purpose and Scope

The purpose and the scope of this Subsidence Monitoring Program for Longwalls 30 & LWW6-LWW8 (SMP LW30 & LWW6-LWW8) is to outline the subsidence effects monitoring program and the consolidated environmental, heritage, land management, built features and public safety monitoring programs implemented by UCMPL, to evaluate the impacts from subsidence within the Application Area.

This SMP LW30 & LWW6-LWW8 (this Plan) has been amended to incorporate the approved MOD4[1] mine plan which extend[2] 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 2.5 of the Extraction Plan. 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.

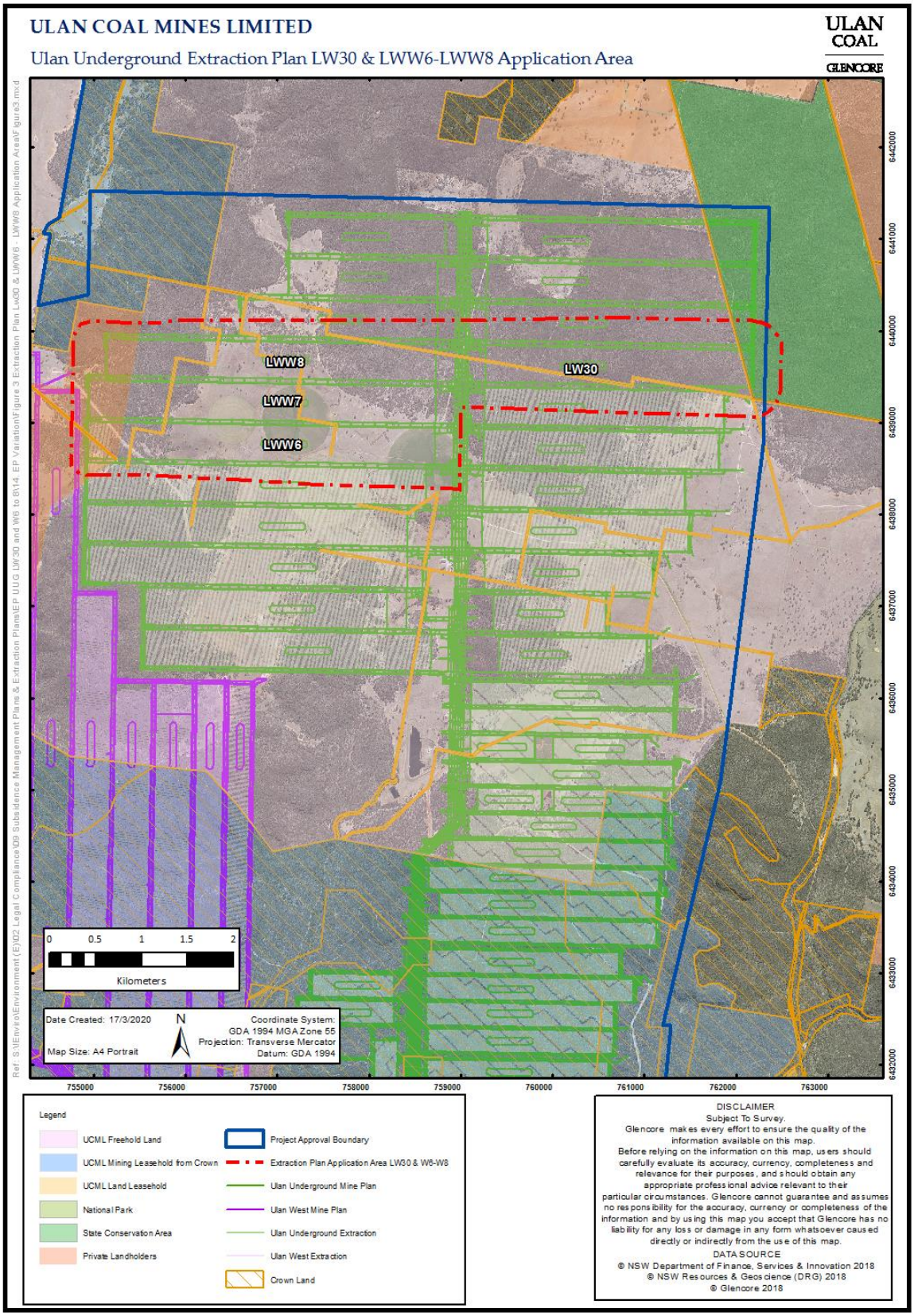
This scope of this Plan applies to the Application Area (**Figure 1**).

The appointed team of suitably qualified and experienced experts which included representatives from Strata Control Technology (SCT) 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.

Figure 1 Extraction Plan LW30 & LWW6-LWW8 Application Area



1.3 Description of the Application Area

The Application Area is a combination of undeveloped bushland, gently undulating open grazing and irrigation agricultural lands. The Application Area is split by the Great Dividing Range with land in the east in the Goulburn River Catchment, and land in the west in the Talbragar River catchment. Bushland in the east is gently undulating, bushland in the west is a little steeper dominated by sandstone outcrops and partially cleared valleys. Most of the land within the Application Area is owned by UCMPL, with the exception of one private property in the west of the Application Area and a small section of the Durridgere State Conservation Area (DSCA) in the east (**Figure1**). There are no privately owned dwellings within the Application Area.

The mining authorisations applicable to UUG include ML1468, ML1341, ML1511, ML1554, ML1656, ML 1365, ML 1366, ML1467 and CCL741 (**Figure 2**).

The depth of cover as measured from the top of seam varies from 165 meters to 335 meters. The depth of cover increases in northeast direction as the seam dips between 1 and 3 degrees along this orientation. Therefore the depth, in general terms, ranges from 165 meters to 270 meters for western panels (LWW6 to LWW8) and from 270 meters to 335 meters in the east (LW30).

Longwall mining at UUG targets the economic portion of the Ulan Coal Seam. The thickness of this section varies across the revised Application Area from approximately 2.5m to 3.3m with an average of 2.9m.

UCMPL owned and controlled land within the Application Area is used for mining related activities (e.g. underground mining and surface support infrastructure) and agricultural purposes (e.g. grazing and cropping) including the Bobadeen Irrigation Scheme (BIS). Privately owned land within the Application Area is used for cattle grazing. The DSCA is State-owned land controlled by the NSW National Parks and Wildlife Services (NPWS).

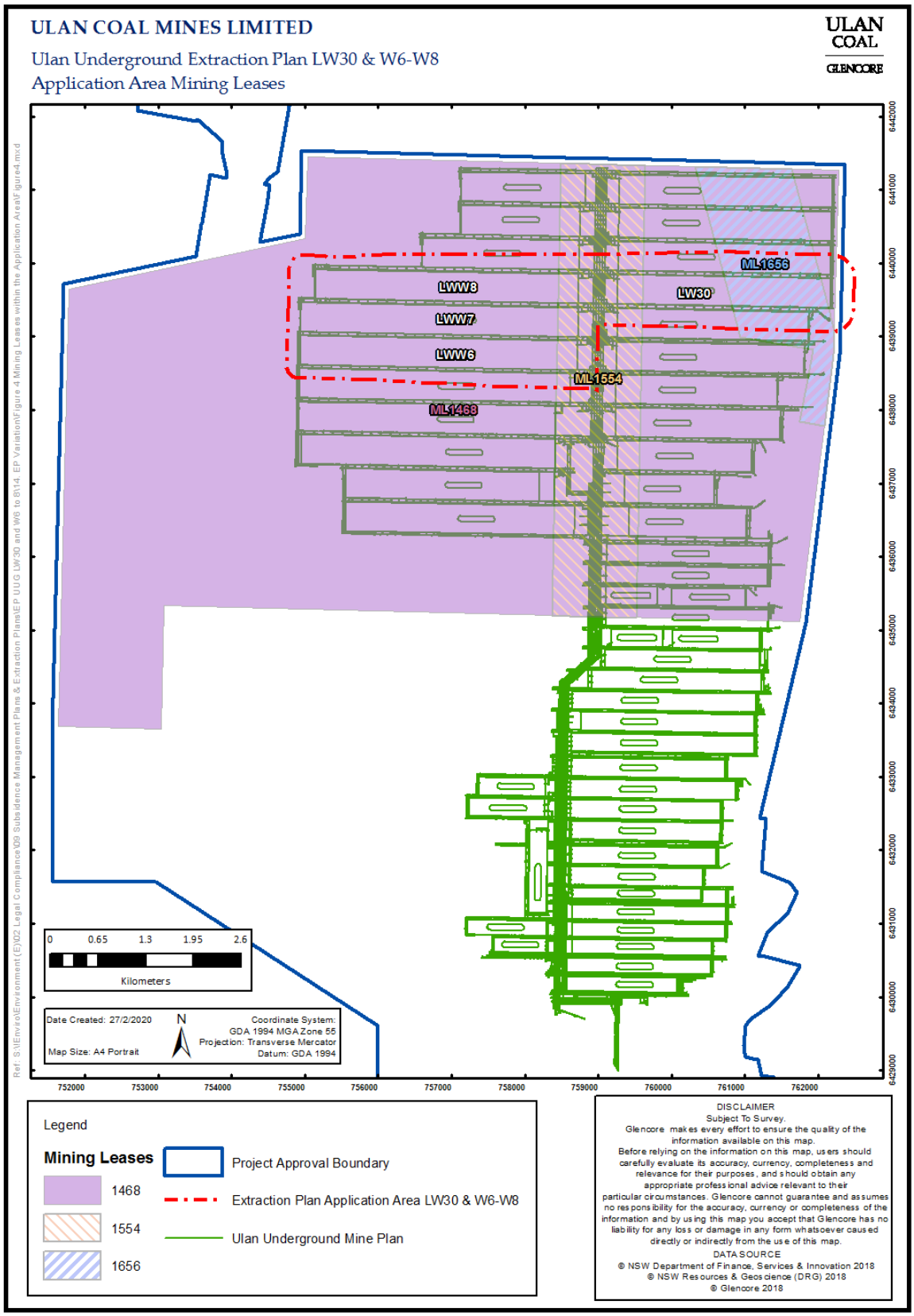
Non UCMPL owned built features within the Application Area include an overhead Essential Energy power line, permanent mark state survey stations, a small shelter, two farm dams and farm fences. The Essential Energy owned 12.7kV single wire earth return (SWER) type minor power line passes through the Application Area over the main headings and will not be undermined within the Application Area (**Figure 9**). There are no private bores within the Application Area, however a number of private bores could be affected by groundwater drawdown (**Figure 7**).

The major natural features within the Application Area include sandstone formations, a number of ephemeral watercourses, a spring fed dam and the DSCA. The spring is located within a dam located on privately owned land. All water courses within the Application Area are ephemeral in nature comprising of drainage lines and occasional pools that form after rain. Flow lines in the east of the Application Area report to Curra Creek and Bobadeen Creek in the Goulburn River catchment. Flow lines in the west report to Mona Creek in the Talbragar River catchment (**Figure 4**).

Approximately 2.8ha of the DSCA is located directly above the eastern portion of LW30. The revised Application Area that extends over the DSCA is predominately undeveloped bushland. There are no features of specific conservation values known to exist within the Application Area over DSCA.

There are two cliff formations within the Application Area (**Figure 6**). The cliff line in the north-west corner of the Application Area across both UCMPL owned land and privately owned land and contains the Mona Creek Aboriginal rock shelter sites (Ulan ID#180 to 187) which are protected from subsidence impacts by an offset from mining. The cliff line over LWW7 is approximately 300m in length, is less than 20 meters high and has no recorded Aboriginal rock shelter sites. This cliff line extends from UCMPL owned land onto privately owned land.

Figure 2 Applicable Mining Authorisations



1.4 Structure of the SMP LW30 & LWW6-LWW8

An overview of the main text sections and attachments of this Plan are:

Section 1 Provides an introduction to this Plan, including the purpose and scope, relationship to the EMS and the document structure.

Section 2 Describes the regulatory requirements and provides a summary of relevant legislation and stakeholder consultation.

Section 3 Describes the subsidence monitoring to be undertaken and outlines the performance measures and performance indicators.

Section 4 Provides a description of the evaluation measures that will be implemented and how monitoring data will be used to assess the relevant subsidence predictions, performance indicators and performance measures.

Section 5 Provides a description of contingency measures if an exceedence of the subsidence predictions, performance indicators and performance measures has occurred.

Section 6 Provides a summary of the review and improvement process and reporting requirements.

Section 7 Outlines the roles and responsibilities for this Plan.

Section 8 Lists the documents referred to in **Sections 1 to 6** of this Plan.

Section 9 Provides a historical review reference of this Plan.

Attachment 1 Survey Methodology & Survey Accuracies

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)[3]. This Plan has been prepared specifically to address Condition 26(g) of Schedule 3 of PA08-0184 (**Table 1**).

Table 1 Project Approval Management Plan Requirements

Project Approval (PA 08_0184) Condition	Extraction Plan Reference
Condition 26 of Schedule 3 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: … g) include the following to the satisfaction of DRE: • a Subsidence Monitoring Program to: - Provide data to assist with the management of the risks associated with subsidence; - validate the subsidence predictions; and - analyse the relationship between the subsidence effects and impacts under the Extraction Plan and any environmental consequences.	This Plan is a component of the Extraction Plan **Section 3** **Section 4** **Section 4**

2.2 Performance Measures and Performance Indicators

In accordance with Condition 24 of Schedule 3 of the PA08_0184, UCMPL must ensure that there is no exceedance of the subsidence impact performance measures listed in Table 14. The performance measures specified in Table 14 of the PA08_0184 are outlined in **Table 2**. UCMPL have developed a number of performance indicators for the performance measures.

The sections within each relevant component management plan where the performance indicators are described in detail are referenced in **Table 2**.

The results from UCMPL subsidence effects monitoring, heritage and environmental monitoring (**Section 4**) will be analysed to inform the assessment during the extraction of LW30 & LWW6-LWW8, against the performance indicators for the performance measures listed in **Table 2**.

[3] PA08_0184, Schedule 3, Condition 26(h).

Table 2 Subsidence Performance Measures and Performance Indicators

Water [1]	Performance Measures	Performance Indicators
Ulan, Mona & Cockabutta Creeks	No greater environmental consequences than predicted in the EA	Section 4 WMP LW30 & LWW6-LWW8
Biodiversity[2]		
Threatened species, populations, habitat or ecological communities	Negligible impact	Section 4 BMP LW30 & & LWW6-LWW8
Land[3]		
Cliffs in the Brokenback Conservation Area	Nil environmental consequences	Section 4 LMP LW30 & & LWW6-LWW8
Other cliffs	Minor environmental consequences	
Heritage[4]		
Aboriginal sites	Nil impact in the Brokenback Conservation Area, Grinding Groove Conservation Areas; and on Mona Creek Rock Shelter Sites	Section 4 HMP LW30 & & LWW6-LWW8
Talbragar Fish Fossil Reserve	Negligible impact	
Other Heritage Sites	No greater impact than predicted in the EA	
Built Features[5]		
All built features	Safe, serviceable and repairable unless the owner agrees otherwise in writing	Section 4 BFMP LW30 & & LWW6-LWW8 Section 4 WMP LW30 & & LWW6-LWW8
Public Safety[6]		
Public Safety	No additional risk due to mining	Section 4 PSMP LW30 & & LWW6-LWW8

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 for Cockabutta Creek are not considered applicable. No flow lines report to Ulan Creek in the Application and therefore subsidence performance indicators are not considered applicable to this Plan.

[2] Within the Application Area, there are areas of CEEC/EEC consisting of Derived Native Grassland and Blakely's Red Gum Woodland. Threatened microbat and woodland bird species have been previously identified in the Application Area.

[3] The Brokenback Conservation Area contains those cliff lines afforded the greatest protection under Project Approval 08_0184 (performance criteria of Nil Environmental consequence). The Brokenback Conservation Area is located approximately 2km south-west of the Application Area. There is considered to be no potential for subsidence related ground movements at this site as a result of longwall mining within the Application Area (Technical Report 1). Management and monitoring of the Brokenback Conservation area is undertaken by the adjacent Ulan West Operations under the existing Extraction Plan for Longwalls 1 to 6.

[4] The Talbragar Fish Fossil Reserve is located approximately 1.6km south-west of the Application Area. There is considered to be no potential for subsidence related ground movements at this site as a result of longwall mining within the Application Area (Technical Report 1).

[5] Built features not owned by UCMPL within the Application Area include an overhead essential energy power line, state survey marks and a small shelter, farm dams and farm fences on an area of Private Property. There are several private bores outside the Application Area predicted to be impacted by groundwater drawdown.

[6] Public access to UCMPL and privately owned land is restricted within the Application Area, and is therefore nominally inaccessible to the public. Access to Durridgere State Conservation Area within the Application Area is limited to a single 4WD access track.

2.3 Relevant Legislation

2.3.1 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.

2.3.2 Environmental Planning and Assessment Act 1979

Project Approval 08_0184 (PA08_0184) under Part 3A of the *Environmental 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 Subsidence Monitoring Plan in accordance with Condition 26(g), Schedule 3 of PA08_0184.

2.4 Consultation

Consultation was undertaken during the Project EA[4]. Consultation specific to the Extraction Plan was undertaken with government agencies, asset owners, UCMPL Community Consultative Committee (CCC) and registered Aboriginal stakeholders. Further information regarding consultation is provided in Section 2.1 of the Extraction Plan.

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

3 Subsidence Monitoring Program

The purpose of this Plan is to:

- Outline the subsidence monitoring for subsidence effects (**Table 2**) as a result of secondary extraction of longwall panels within the Application Area, as described in the Extraction Plan (**Section 4.1**); and
- Outline the consolidated monitoring programs (**Table 3**) for water, heritage, land, biodiversity, built features and public safety management (**Section 4.2**).

All forms of subsidence monitoring will be undertaken by appropriately qualified and experienced personnel. The results from the subsidence monitoring program will be evaluated by appropriately qualified and experienced personnel (**Section 5**) against the performance measures and subsidence predictions. A summary of the performance measures and performance indicators are provided in **Section 3.2.**

UCMPL have prepared specific management plans as components of the Extraction Plan including management plans for water, land, biodiversity, built features, heritage, public safety and rehabilitation. Where required each management plan describes the relevant:

- Subsidence performance indicators;
- Subsidence predicted impacts and environmental consequences;
- Management measures implemented to ensure compliance with performance measures;
- Contingency plan;
- Reporting requirements; and
- Remediation measures.

Where relevant this Plan will reference the applicable sections from these component management plans throughout.

3.1 Subsidence Effects Monitoring Program

The following subsidence monitoring program for UUG has been developed by SCT in consultation with Ulan Coal. For justification of the subsidence monitoring locations and methodology, please refer to **Technical Report 1**.

The UUG Technical Services Manager is responsible for ensuring the implementation of the subsidence effects monitoring program as outlined in **Table 3**. The UUG Registered Mine Surveyor is responsible for ensuring the surveys of the ground transects are completed during each longwall and the data is verified, processed and maintained as outlined in **Table 3**.

UUG offers the opportunity to measure full subsidence movements via three subsidence monitoring lines within the Application Area, using a continuation of the high confidence subsidence monitoring now undertaken routinely at UUG. These measurements will not only provide confidence in the predictions but also help guide understanding of the mechanics of ground movements, stress relief phenomena, and potential high stress zones.

Subsidence effects monitoring for UUG includes two established ground transect lines and the proposed implementation of an additional ground transect line;

- F Line (established cross line eastern panels); and
- H Line (established cross line western panels).

The two established ground transect lines are currently monitored in accordance with approved Subsidence Monitoring Programs for UUG. Appendix I of the Extraction Plan provides the A0 size version of Extraction Plan showing the proposed and existing locations and layout of subsidence survey grids/marks for these transect lines.

Pegs on these subsidence lines will be installed at intervals of approximately 1/20th depth of cover across each longwall block or generally 10 m where 1/20th depth of cover is greater than 10 m. In non-rock areas galvanised steel star pickets driven to approximately 0.1 m above ground RL or refusal. In solid rock areas a hole is drilled to 0.2 m and brass or stainless steel threaded rod or bolt installed with approximately 0.01 m above ground RL.

The subsidence monitoring lines are surveyed in three dimensions using the survey control provided by the GNSS and/or total station survey control network to establish the distance and nature of ground movements, particularly horizontal movements. The survey methodology and accuracy for UUG related subsidence surveys is specified in **Attachment 1**. The subsidence monitoring lines will be surveyed upon installation of the line and within two weeks of the completion of secondary extraction of each longwall panel.

3.1.2 Alternate Subsidence Monitoring Methodology

UCMPL are investigating alternate survey methods including the use of Aerial Laser Scanning (ALS) / LiDAR and Unmanned Aerial Vehicles survey techniques to monitor subsidence of longwall panels. The LiDAR surveys would be linked into existing survey control marks and the observed subsidence calibrated against the subsidence data obtained using the conventional survey cross-lines and centrelines. Any changes to the approved subsidence methodology as outlined in **Section 4.1** will be in consultation with the DPIE.

Figure 3 *Subsidence Effects Monitoring Program*

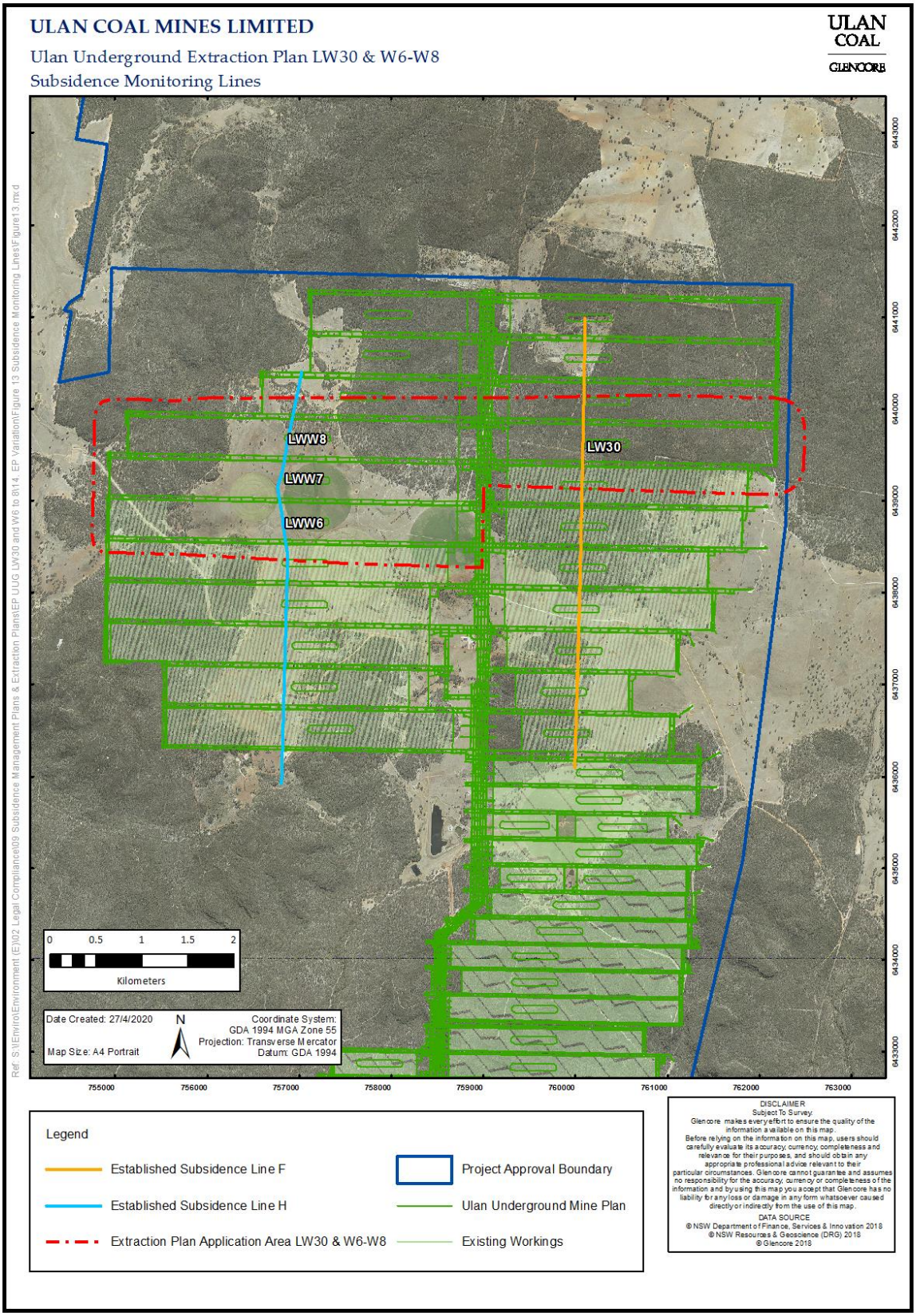


Table 3 Summary of Subsidence Effects Monitoring Program

Survey Line[1]	Data Type	Parameters	Accuracy of Survey[2]	Survey Frequency	Responsibilities & Reporting
F & H Lines	3D Position (X, Y, Z)	• Subsidence parameters to be measured on survey monitoring marks based on three dimensional position of each peg using far field GPS control network: - Vertical subsidence; - Cross Panel Horizontal Movement; - Tilt; & - Strain along Line.	• Class "D" or greater standard of accuracy as defined in ICSM (2007)	• Survey to be completed upon completion of the installation of the line. • Survey to be completed after secondary extraction of each longwall panel and before the commencement of the following longwall panel.	• Survey data recorded from the subsidence line survey program will be verified, processed and maintained by the UUG Mine Surveyor and the UUG Technical Services Manager. • Cliff line and internal road data recorded from the visual inspection program will be verified, processed and maintained by the Environment & Community Coordinator. • Incident and annual reporting requirements will be the responsibility of the Environment & Community Manager. • Reporting of subsidence monitoring program in accordance with **Section 7.26.4** to include: - Incident Reporting: Notification with 24hrs of becoming aware of the occurrence. - Annual Review (AR): Submitted before 31 March annually. Reporting period 01 January to 31 December. This document includes the Annual Report.
Layout of Monitoring Points		• **Layout of survey** lines and survey marks across the Application Area shown on Extraction Plan 7 (**Appendix G**). • **Survey marks** Pegs on these subsidence lines will be installed at intervals of approximately 1/20th depth of cover across each longwall block or generally 10m where 1/20th depth of cover is greater than 10m. In non-rock areas galvanised steel star pickets driven to approximately 0.1m above ground RL or refusal. In solid rock areas a hole is drilled to 0.2m and brass or stainless steel threaded rod or bolt installed with approximately 0.01m above ground RL.			
Visual Inspections: (Cliff Lines & Internal Roads)	X, Y Coordinates	• Parameters to be monitored for general surface and landscape features of internal access tracks and cliff lines include: - Length of rock falls (m) along cliff lines; - Perceptible cracking along cliff lines; - Surface cracking on access tracks; - Subsidence steps on access tracks; & - Fallen trees across access tracks.	• Equipment to record locations include: - Inspection Forms; - GPS digital camera; or - Camera and Handheld GPS accurate +/- 5m.	• Visual inspections of cliff lines and internal roads completed prior to commencement of each longwall. • Visual inspections to be completed monthly during each longwall for access tracks. • Visual inspections of cliff lines to be completed at the end of each longwall. • Pre and post mining inspections of cliff lines and access roads to be undertaken on private property. Landholder will contact UCMPL for inspection during mining if subsidence impacts of concern to the landholder are present.	

Notes: All surveys made must be calculated and plotted using **GDA 1994 MGA Zone 55**

1 Layout of survey lines and survey marks across the Application Area shown on Extraction Plan 7 in Appendix I of the Extraction Plan.

2 In accordance with *Survey Methodology* and *Subsidence Survey Accuracies* provided in **Attachment 1** of this Plan.

3.2 Consolidated Subsidence Monitoring Program

A summary of the consolidated environmental, heritage, land management, built features and public safety monitoring programs (**Figures 3-9**) implemented by UCMPL to evaluate the impacts from subsidence within the Application Area is provided in **Table 4** and displayed in **Figure 10.**

Monitoring and evaluation of subsidence performance measures and potential mining related impacts on groundwater, surface water, flora and fauna and surface features, built features, Aboriginal and European heritage and public safety are described in detail Section 4 of the Extraction Plan component management plans (Appendices A to F of the Extraction Plan).

The Environment and Community Coordinator is responsible for ensuring all monitoring, visual inspections and recording of data are carried out as outlined in **Table 4.**

The Environment and Community Manager is responsible for ensuring all incident and annual reporting requirements are undertaken as outlined in **Table 5**.

Table 4 Summary of the Consolidated Subsidence Monitoring Program

Management Plan	Monitoring Component	Parameters	Location/Network	Monitoring Frequency	Monitoring Type[5]
Water Management Plan LW30 & LWW6-LWW8	Surface Water Quality Monitoring	• TSS (mg/L)	• SW10, SW07, SW08. • Refer to **Figure 4.**	• 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 4.**	• 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 4** 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
	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) • Refer to **Figure 7.**	• 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 7** • Refer to GWMP for site coordinates of private bores.	• Annually	EMS

[5] EMS = Monitoring in accordance with PA_0184 Environmental Management Plans; (EP) - Monitoring specific this Extraction Plan

Management Plan	Monitoring Component	Parameters	Location/Network	Monitoring Frequency	Monitoring Type[5]
Land Management Plan LW30 & W6-W8 **and** **Public Safety Management Plan LW30 & LWW6-LWW8**	Surface cracking inspection of UCMPL owned land and Durridgere State Conservation Area (DSCA)	• Visual observation to monitor the condition of the ground surface; • Handheld GPS accurate +/- 5m or GPS equivalent camera to record subsidence impact to lands.	• Monitoring of UCMPL's internal access tracks within the active subsidence zones of LW30, LWW6 to LWW8. • Monitoring of the DSCA will be undertaken within the active subsidence zone of LW30. • Refer to **Figure 8**	• During mining: visual inspections to be completed monthly during the extraction of the longwall; and • Post-mining: visual inspections to be completed at the end of each longwall (at least 3 months after cessation of mining, within 12 months of cessation of mining).	EP
	Cliff formation inspection on UCMPL owned land	• Visual observations and photographic record to record signs of surface cracking and quantify length (m) of rock falls.	• Cliff formation located above LWW7. • Refer to **Figure 8**	• Pre-mining visual inspection. • Post-mining: visual inspection to be completed upon the completion of LWW7 secondary extraction (at least 3 months after cessation of mining, within 12 months of cessation of mining).	EP
	Surface cracking/cliff formation inspection of privately owned land	• Visual observation and photographic record to monitor the condition of the ground surface and access tracks; • Visual observations and photographic record to record signs of surface cracking and quantify length (m) of rock falls; and • Handheld GPS accurate +/- 5m or GPS equivalent camera to record subsidence impact to lands.	• Cliff formation located above LWW7. • Monitoring of landholders existing access tracks within subsidence zones of LWW6 to LWW8; • Monitoring of agricultural land within subsidence zones of LWW6 to LWW8; and • Monitoring of bushland within subsidence zones of LWW6 to LWW8. • Refer to **Figure 8** • **Notes:** Access to cliff line for monitoring on Private Property will be subject to approval by the landowner.	• Pre-mining visual inspection. • During mining: visual inspections to be completed monthly during the extraction of the longwall under the property. • Landholder to contact UCMPL immediately if surface cracking is observed. UCMPL will conduct visual verification inspections[6]; • Post-mining: visual inspections to be completed within one month of the longwall leaving the boundary of the property. • Private Property Condition Assessment Report to be completed at least 3 months after cessation of mining and no later than within 12 months of cessation of mining.	EP
Biodiversity Management Plan LW30 & LWW6-LWW8	Floristic Based Subsidence Monitoring	• Monitoring to identify any deterioration of the vegetation health that may be subsidence induced.	• Floristic Based Subsidence (FBS) sites as identified by **Figure 5**.	• In autumn and spring prior to longwall mining, during mining and at least two years post mining.	EMS
	Residual Vegetation Monitoring	• Monitoring as a control (analogue sites) to identify any deterioration of the vegetation health that may be subsidence induced.	• Floristic sites in residual vegetation areas as identified by **Figure 5**.	• Monitoring occurs annually, sites are generally monitored every 2 years (full floristic every 4 years and rapid assessment every 4 years).	EMS

[6] No Inspection of cliff line during mining, no persons (including landholder) to enter the vicinity of this area during active undermining.

Management Plan	Monitoring Component	Parameters	Location/Network	Monitoring Frequency	Monitoring Type[5]
	Microbat monitoring of cliff lines	• Monitoring to identify decreasing trends in threatened micro-bat species activity levels.	• Cliff line above LWW7 • Refer to **Figure 5** • **Notes:** The cliff line for monitoring on Private Property will be subject to approval by the landowner.	• Pre-mining between October to February and two years after longwall mining during the same period.	EMS
	Subsidence Area Microbat Habitat-usage Monitoring	• Monitoring to identify presence/absence of cave-dependent micro-bat species (i.e. Large-pied Ear Bat)	• Cliff line above LWW7 • Refer to **Figure 5** • **Notes:** The cliff line for monitoring on Private Property will be subject to approval by the landowner.	• Pre-mining at least two years prior to longwall mining between September and December. • Annually thereafter if monitoring establishes potential maternity roost sites.	EMS
	Monitoring to identify any deterioration of potential threatened species or associated habitat.	• Masked Owl: Monitoring to identify reduction in abundance and/or condition of HBTs; and • Regent Honeyeater and Swift Parrot: Monitoring to identify decline in canopy cover of key feed species.	• Floristic Based Subsidence (FBS) sites as identified by **Figure 5** • Floristic sites in residual vegetation areas as identified by **Figure 5**	• In autumn and spring prior to longwall mining, during mining and at least two years post mining.	EMS
Built Features Management Plan LW30 & LWW6-LWW8	UCMPL owned Built Features	• Visual inspections to record the general condition of UCMPL's assets including serviceability and safety.	• UCMPL owned built features within the Application Area • Refer to **Figure 9**	• Farm dams, roads, pivots will be inspected monthly during undermining to identify any subsidence impacts. • UCMPL owned power lines and pipelines are inspected and maintained in accordance with the UCMPL Maintenance Management System.	EP

Management Plan	Monitoring Component	Parameters	Location/Network	Monitoring Frequency	Monitoring Type[5]
	Built Features on Private Property	• Visual conditional assessment of Built Features including serviceability and safety.	• Non-UCMPL owned built features located on private property within the Application Area. • Refer to **Figure 9**	• Pre-mining visual inspection. • During mining: visual inspections to be completed monthly during the extraction of the longwall under the property. • Landholder to contact UCMPL immediately if damage to built feature is observed. UCMPL will conduct visual verification inspections[7]; • Post-mining: visual inspections to be completed within one month of the longwall leaving the boundary of the property. • Private Property Condition Assessment Report to be completed at least 3 months after cessation of mining and no later than within 12 months of cessation of mining.	EP
	Essential Energy Power Line	• Visual inspection by suitably qualified person to ensure integrity of the asset	• 5 poles located within the Application Area • Refer to **Figure 9**	• Prior to the commencement of each longwall extraction; • At a frequency of monthly during the extraction of each longwall; and • Inspected six monthly for at least 2 years (or until no further movement is recorded) after the extraction of each longwall.	EP
	State Survey Control Marks	• Ensure State Survey Control Marks within 2km radius of the goaf edge of active longwall are registered as 'Disturbed' through appropriate processes. • Reinstate and resurvey the Survey Control Mark after cessation of subsidence movements is evidenced by the Subsidence Monitoring Program.	• All State Survey Control Marks within 2km radius of longwall mining. • Refer to **Figure 9**	• Prior to the commencement of each longwall; and • Post mining to determine if there are any state survey marks which meet the criteria for recommissioning.	EP
Heritage Management Plan LW30 & LWW6-LWW8	Aboriginal Heritage Monitoring on UCMPL Land	• Visual inspections of selected rock shelters within the Application Area	• LWW6 – Rock shelter Ulan ID # 599 • LWW7-8 – Mona Creek Rock Shelter Sites Ulan ID # 185-187 (Site No. 28-30) • Application Area – Ulan ID#735[8] • LWW8 – Ulan ID#741 • LWW9 – Ulan ID#171 • Refer to **Figure 6**	• Pre mining of heritage sites prior to commencement of the relevant longwall panel. • Post mining, within six months of cessation of mining the relevant longwall panel.	EMS EP

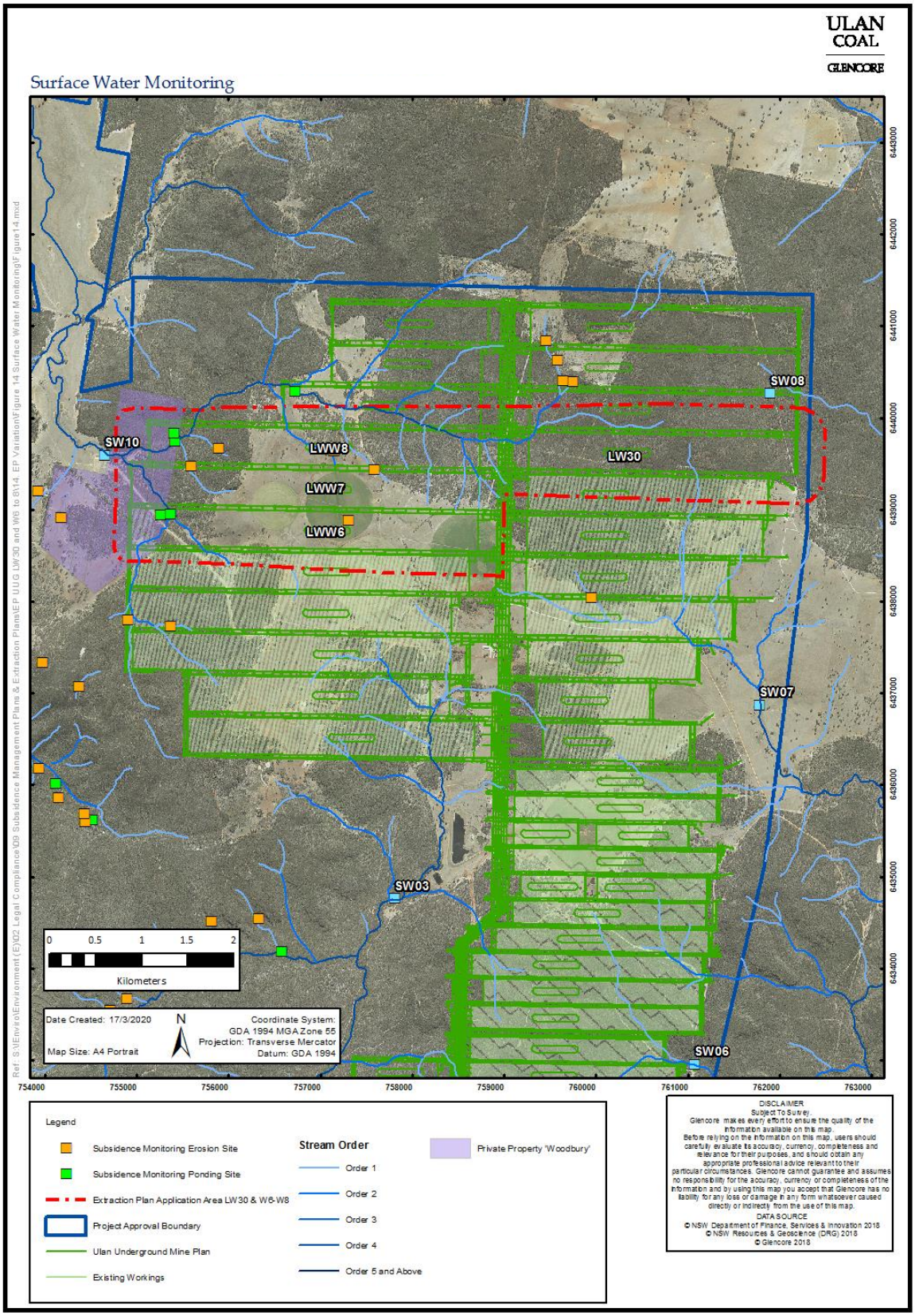
[7] No Inspection of cliff line during mining, no persons (including landholder) to enter the vicinity of this area during active undermining..

[8] Rock Shelters sites Ulan ID #171 & 735 are monitored as control sites to measure the accuracy of subsidence predictions for the secondary extraction of LWW8. ID#735 is not expected to experience subsidence impacts (5%) and ID#171 is predicted to have a 50% subsidence risk of perceptible impact during the extraction of LWW8.

Management Plan	Monitoring Component	Parameters	Location/Network	Monitoring Frequency	Monitoring Type[5]
	Aboriginal Heritage Monitoring on Private Property[9]	• Visual inspections of selected rock shelters within the Application Area	• LWW7-8 – Mona Creek Rock Shelter Sites Ulan ID # 180-184 (Site No. 23-27) • Refer to **Figure 6**	• Pre mining of heritage sites prior to commencement of the relevant longwall panel. • Post mining, within six months of cessation of mining the relevant longwall panel.	EMS EP
	European Heritage	• Visual inspection and photo record	• LWW8 – European Heritage Site CC6 • Refer to **Figure 6**	• Pre-mining inspection • Post mining inspection to document any subsidence impacts to the site (at least 3 months after undermining, within 12 months of undermining).	EP

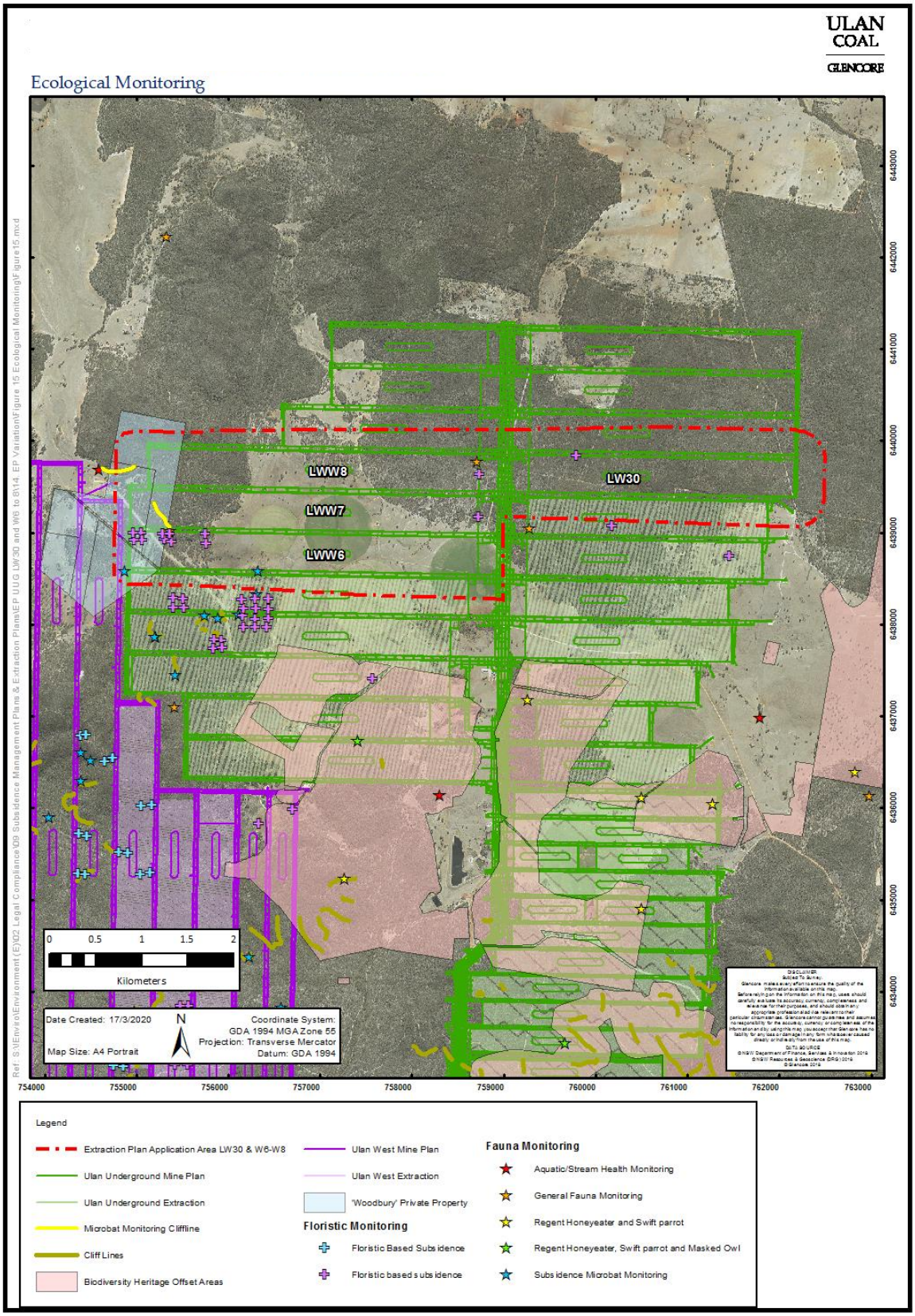
[9] Access to Aboriginal heritage monitoring sites subject to agreement by the Private Landholder.

Figure 4 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.

Figure 5 Ecological Monitoring



Notes: Access to the cliff line for microbat monitoring on Private Property will be subject to approval by the landowner as required in the PPSMP. Additional FBS sites may be established during this Extraction Plan in consultation with UCMPL's ecologist.

Figure 6 Heritage Monitoring

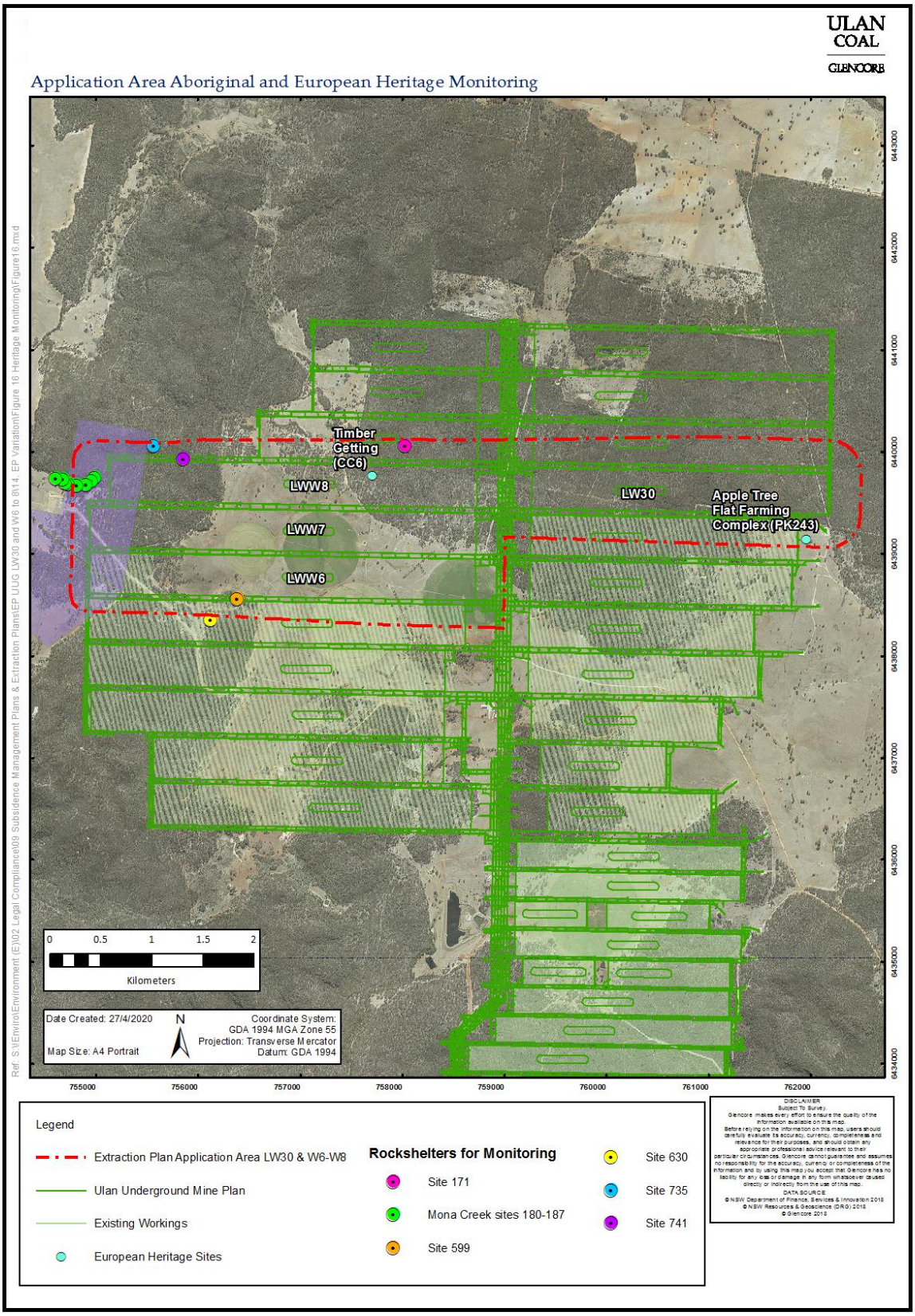


Figure 7 Private Bore and Groundwater Monitoring

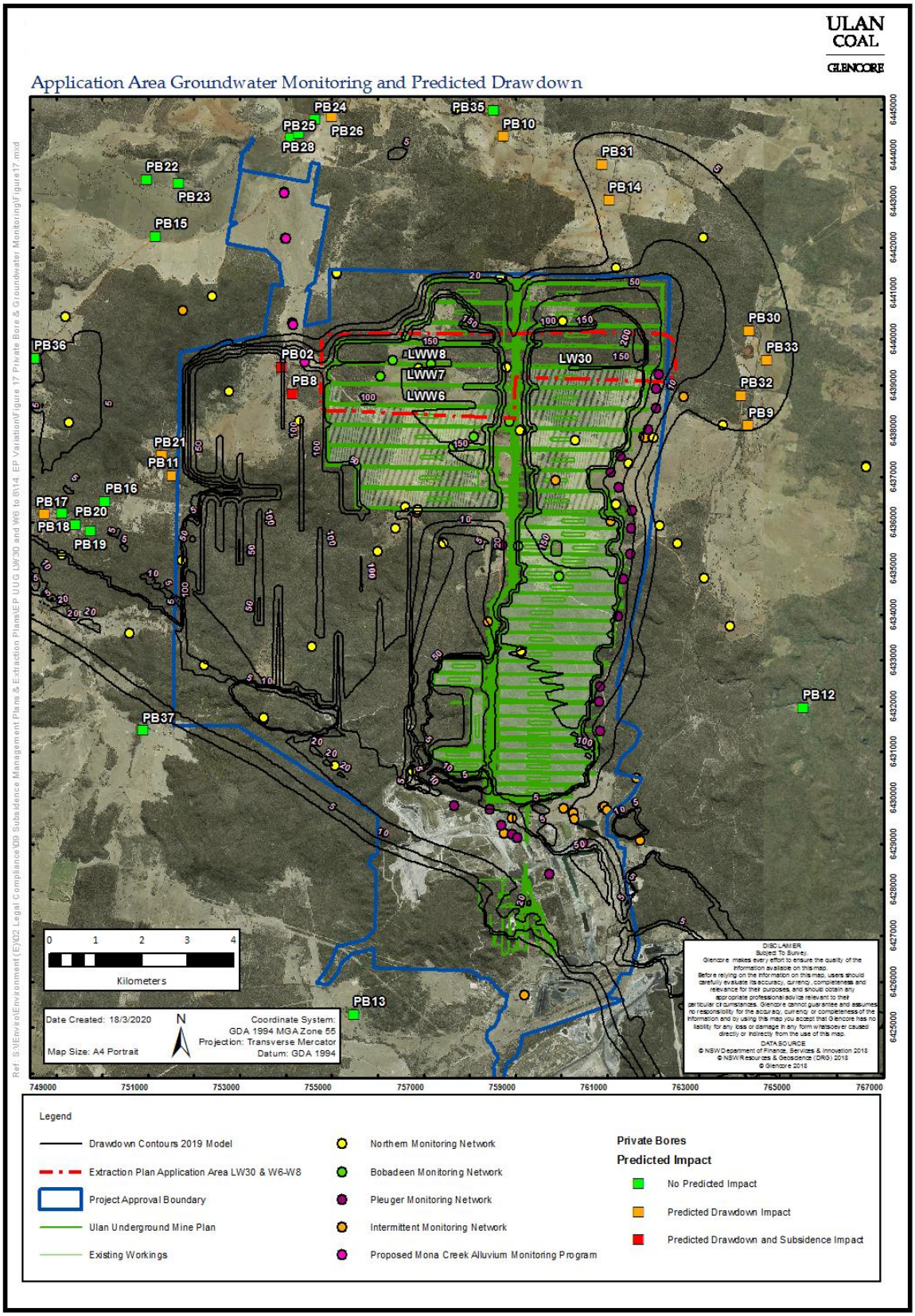


Figure 8 Land and Public Safety Feature Monitoring

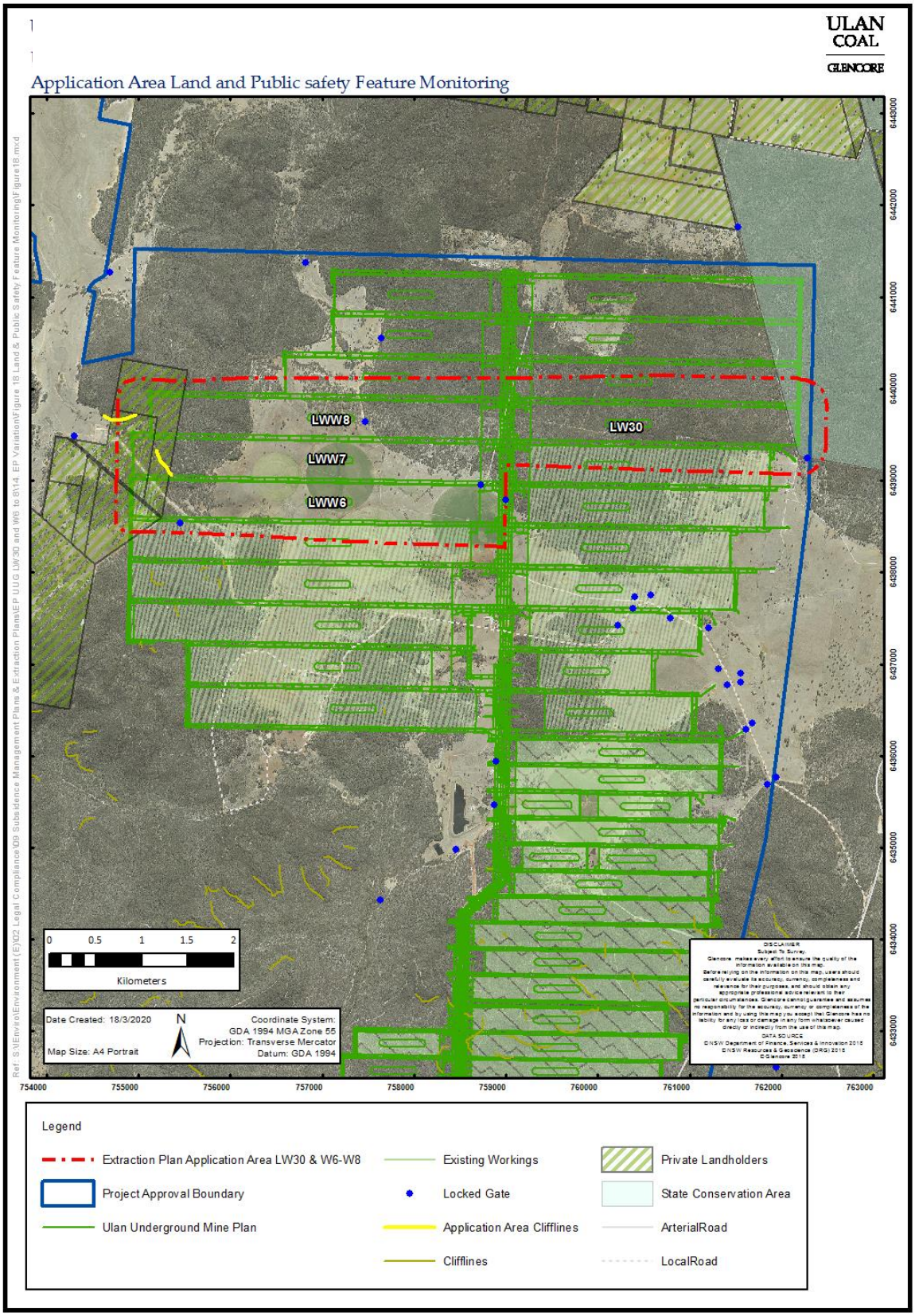


Figure 9 Built Features Monitoring

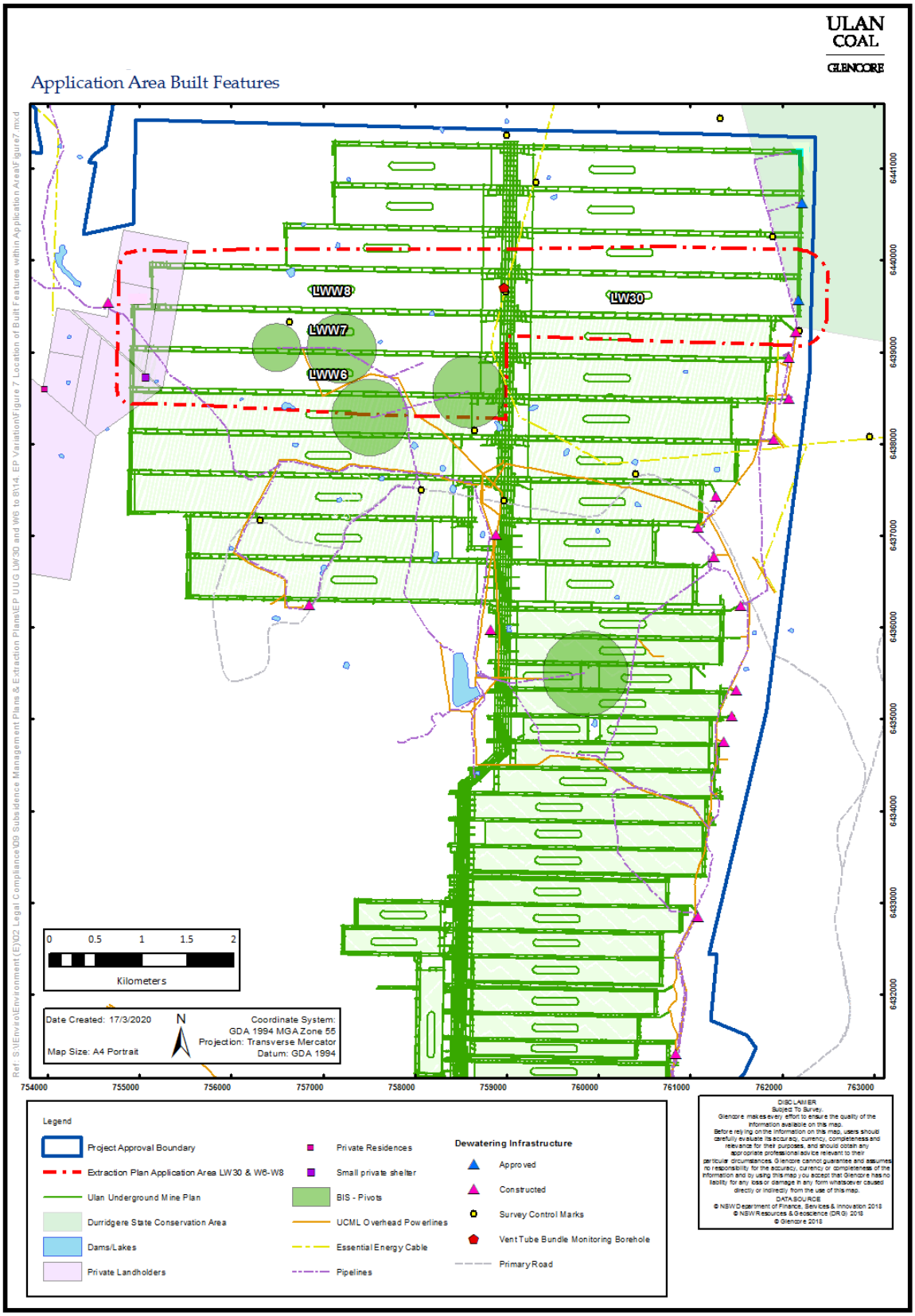
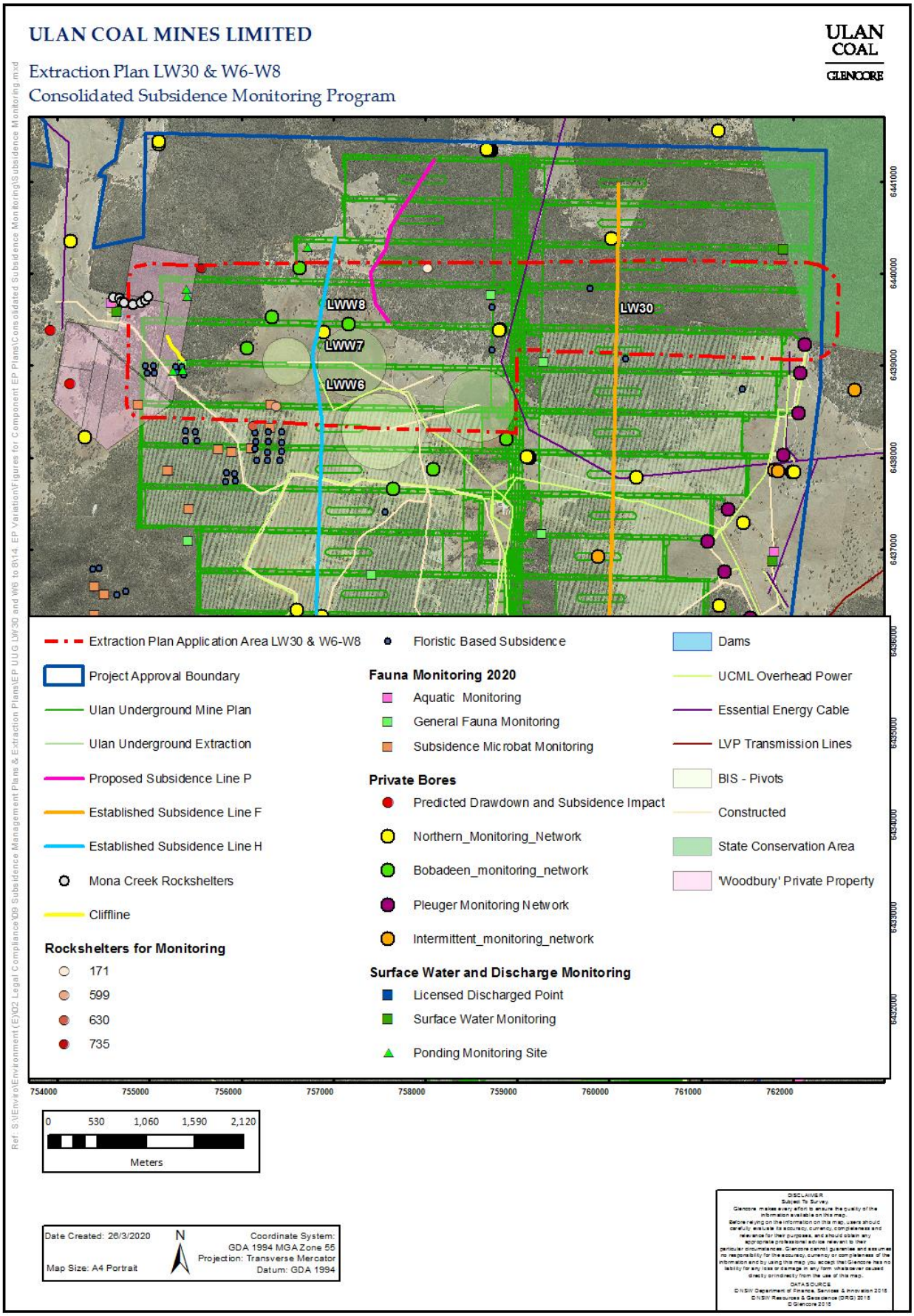


Figure 10 Consolidated Monitoring Program



4 Evaluation of Monitoring Results

As outlined in Section 4.2 of the Extraction Plan, UCMPL will take an adaptive management approach that will involve regular reviewing and evaluating the effectiveness of the management strategies.

All subsidence effects monitoring results from the subsidence monitoring described in **Section 4.1** and **Table 3**, will be subject to a comparison against subsidence predictions for the relevant extraction area. This comparison will be undertaken by a suitably qualified subsidence consultant and if required the subsidence model for UUG will be updated to provide revised predictions for consecutive longwall panels.

All subsidence monitoring results from the subsidence monitoring described in **Section 4.2** and **Table 4** will be subject to a comparison against subsidence predictions for the relevant extraction area and assessment against the performance measures as provided in **Table 2**. The assessment of the performance measures will also include analysis of the monitoring data to determine if the performance indicators have been exceeded.

The results from UCMPL subsidence monitoring program for environment and heritage aspects will be evaluated by appropriately qualified and experienced specialist, and if required the subsidence model for UUG will be updated to provide revised predictions and/or revised performance indicators for consecutive longwall panels.

In the event that subsidence predictions and performance indicators are revised, the affected management plans (e.g. heritage, water, biodiversity etc) will be updated accordingly and submitted to relevant government agencies and the approved management placed on the UCMPL website www.ulancoal.com.au

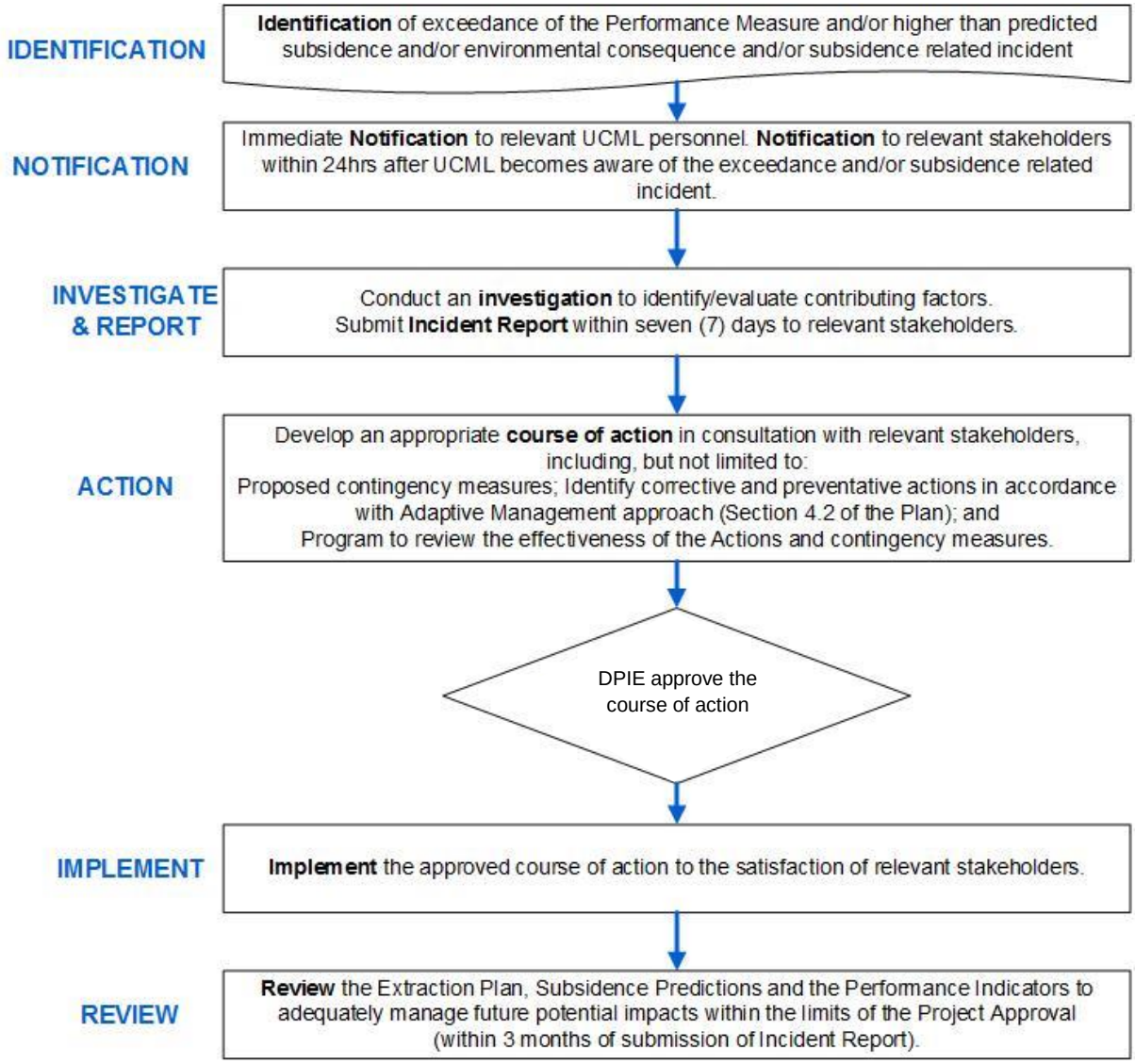
5 Contingency Plans

In the event the subsidence performance measures as summarised in **Table 2** 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 4.3 of the Extraction Plan describes the process for handling and investigating non-conformances, including allocation of responsibility, external and internal reporting requirements, and initiating and completing corrective and preventative actions.

Figure 11 displays the Contingency Plan to be implemented in the event the performance measures are exceeded, higher than predicted subsidence or environmental consequence has occurred or in the event of a subsidence related incident.

Figure 11 Contingency Plan



6 Review and 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. 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 Requirement

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

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 (**Figure 11**). 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
- Description of the proposed measures to address the exceedance/incident

Table 5 provides a summary of the reporting framework, including which stakeholders will receive copies of each report and the distribution method. Section 4.3 of the Plan provides further details on each reporting mechanism. Attachment 4 of the Extraction Plan provides a list of the key government departments and their contact details.

6.3 Community Complaints

Community complaints are managed in accordance with Section 4.4 of the Extraction Plan, 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.

6.4 Reporting Framework

This section of the Extraction Plan describes the external reporting framework for the secondary extraction within the Application Area. The key elements of the reporting framework, as required by the *Draft Extraction Plan Guidelines*, include:

- Incident Reporting;
- Annual Reporting[10]; and
- Annual Review.

Table 5 provides the detailed reporting framework[11], including which government stakeholders will receive copies of each report and the method of distribution.

[10] *Draft Extraction Plan Guidelines* outline requirement for six-monthly reporting, however a lesser frequency can be negotiated with DPIE where subsidence impacts and environmental consequences at the mine are relatively rare and benign in character. UCMPL propose to conduct annual reporting which will align with the due date for the Annual Review 31st march each year.

[11] The reporting frequency proposed by the Extraction Plan is consistent with the current reporting requirements approved under the Extraction Plan Approval for Ulan West Longwalls LW1 – LW6

Table 5 Summary of Reporting Framework

Report	Frequency	Distribution	Distribution Method	Responsibility
Incident Reporting (Letter report)	As Required (see **Section 4.3.1** of the Extraction Plan)	• DPIE (Manager – Mining Projects) • DPIE-RR (Subsidence Executive Officer) • MSA (District Manager) • DPIE-Water (Senior Water Regulation Officer)	Electronic copy sent by email	General Manager
Annual Review **(incorporating the Annual Report)**	Annually (For the period 01 January to 31 December) Submitted by the 31 March each year.	• DPIE (Manager – Mining Projects) • DPIE-RR (Principal Subsidence Engineer) • DPIE-Water (Senior Water Regulation Officer) • EPA (Ulan Coal general contact) • OEH (Ulan Coal general contact) • Mid-Western Regional Council (General Manager) • CCC Members	Electronic copy sent to each department and CCC member by email unless otherwise requested.	Environment and Community Manager

7 Roles and Responsibilities

The key responsibilities in relation to this Plan are summarised in **Table 6**. Please note that responsibilities may be delegated as required.

Table 6 Subsidence Monitoring Program Roles and Responsibilities

Responsibility	Accountabilities
Operations Manager **(Ulan Underground)**	• Authorise this Plan and approve appropriate resources for the implementation of this Plan; and • Authorise internal and external reporting requirements of this Plan.
Technical Services Manager **(Ulan Underground)**	• Ensure the Subsidence Monitoring Program and this Plan are implemented; • Ensure monitoring and required under the Subsidence Effects Monitoring Program this Plan 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.
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 this 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.
Environment and Community Coordinator	• Implement monitoring programs as required by this Plan and conduct analysis of results against performance indicators as described in this Plan; • Prepare this Plan and subsequent revisions for approval by the Environment and Community Manager; • 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 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)**	• Undertake subsidence effects monitoring as required by this Plan 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, the attached Management Plans and Programs and all other UCMPL 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

Refer to Section 7 of this Plan.

8.3 References

References as provided in Section 5.2 of the Extraction Plan.

8.4 Attachments

Attachment 1 Survey Methodology & Accuracies

8.5 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 7** below.

Table 7 Change Information

Version	Date	Review team (consultation)	Change Summary
0.1	October 2016	Tara Stokes, Robyn Stoney, Ben Anderson	Document Development
1.0	October 2017	Jessica Southgate	Document formatting updated in accordance with Dept. of Planning feedback.
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

Attachment 1 – Survey Methodology & Accuracies