Appendix M

Make good strategy

Make Good Strategy

Impacts in Landholder Bores | Hume Coal Project | Response to Submissions

Prepared for Hume Coal Pty Limited | 12 June 2018

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Make Good Strategy

Final report

Report J14136RP1_RTS_MG | Prepared for Hume Coal Pty Limited | 12 June 2018

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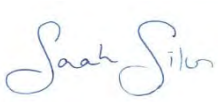
Signature		Signature	
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Table of contents

Table of contents

Appendices

Tables

Figures

1 Introduction

Hume Coal Pty Limited (Hume Coal) proposes to develop and operate an underground coal mine and associated mine infrastructure (the project) in the Southern Coalfield of NSW. The project has been developed following several years of technical investigations, which are compiled in the *Hume Coal Project Environmental Impact Statement* (EIS) (EMM 2017a).

The Hume Coal Project Water Impact Assessment Report (the water assessment) (EMM 2017b), Appendix E in the EIS, documents the groundwater and surface water assessment methods and results, and presents the initiatives to avoid and mitigate the predicted water associated impacts. A regional numerical groundwater flow model was developed for the water assessment (Coffey 2016b) to determine the effects of mining on the groundwater and surface water systems in the region and whether these effects complied with the Aquifer Interference Policy (AIP) (NOW 2012). In response to submissions received following public exhibition of the EIS, the numerical groundwater model has been revised, updated, and a detailed uncertainty analysis has been undertaken (HydroSimulations 2018). The revised model has identified and quantified the project's potential drawdown impacts on water resources and users (including environmental and landholder users) in the project area.

There are over 400 landholder bores registered within a 9 km radius of the proposed mine (WaterNSW 2018). The dominant licensed purpose of these bores is for domestic and stock use, but irrigation bores are also present. Unregistered and unlicensed bores, which are not included in the WaterNSW database, are unknown to Hume Coal and are not considered in this assessment.

The revised groundwater model predicts the drawdown in each registered landholder bore that have current Works and Use Approvals as provided by the WaterNSW on 27 April 2018. All bores within the model domain are considered for the full period of time that drawdown is predicted to occur as a result of the project activities and existing stresses are also incorporated. Drawdown is defined as the change in water level (pressure head) in a bore over a period of time. Drawdown can occur due to a combination of stresses on the groundwater system. Existing stresses on the groundwater system prior to the proposed project can include climatic changes, existing landholder pumping and/or ongoing take of water by Berrima Colliery. These stresses are considered part of the baseline conditions.

The AIP requires that the project considers its own effects on bores and whether the project will exceed the minimal impact criteria on landholder bores. The revised groundwater model predicts impacts, as a direct result of the proposed project activities, are to be greater than the AIP Level 2 impact criteria of 2 m drawdown in a porous rock water source (such as the Hawkesbury Sandstone) at 94 landholder bores on 72 properties. As such, these bores are subject to further investigations to demonstrate that the decline will not prevent long-term viability of the bores otherwise 'make good' provisions will be applied.

Definitive 'make good provisions' are not defined in the AIP or other NSW legislation. Guidance has been sought from an AIP Fact Sheets (DPI Water 2013) and, in the absence of NSW guidelines, the Project has looked further afield to other states for guidance. .

Landholder bore assessments and make good provisions were proposed as part of the Water Assessment in Appendix E of the EIS. This report refines the 'make good' strategies for the individual bores using the updated drawdown outputs from the revised groundwater model. By applying the concept of make good for landholder bores, the drawdown effects are mitigated, and a landholder's access to water for farming and other purposes are not compromised.

1.1 Overview of geology and hydrogeology

Reference to the Southern Coalfield 1:100,000 Geological Series Sheet (Moffit 1999) indicates the project area is in the Permo-Triassic Sydney Basin and Triassic sedimentary units.

The Ashfield Shale outcrops over much of the eastern part of project area while the Hawkesbury Sandstone is exposed over much of the western part (Moffit 1999). The Hawkesbury Sandstone has been incised by creek channels and, as a result, Permian coal outcrops next to drainage lines in the west. The hills to the immediate south of the project area comprise remnants of thick Tertiary Robertson Basalt flows that overly the Ashfield Shale (Moffit 1999).

The three primary groundwater systems within the project area are defined as:

- localised low permeability groundwater systems associated with the Robertson Basalt and the Wianamatta Group shales;
- regional porous fractured groundwater system associated with the Hawkesbury Sandstone; and
- localised water bearing zones associated with the Illawarra Coal Measures and the Shoalhaven Group.

Depressurisation of groundwater systems are predicted to occur during underground mining (Section 2). Dewatering of an unconfined or semi confined/confined groundwater system will result in water level drawdown of the water table, and a lowering of piezometric pressures.

The quality of groundwater in the mine site area varies depending on the lithology of the strata:

- Groundwater quality of the basalt is characterised by low salinity and a near neutral pH. It is likely to be suitable for a broad range of beneficial uses.
- The quality of the groundwater in the Wianamatta Group shales is typically characterised as being saline although the degree of salinity of the groundwater within the shales is relatively moderate. The yield of this aquifer is typically too low to support a range of beneficial uses.
- The Hawkesbury Sandstone is an important water supply resource in the region. It is used for domestic, stock and irrigation purposes. It is characterised with a low salinity and near neutral pH within in the project area.

1.2 Regulations, policies and strategies

1.2.1 Water Management Act 2000

The *Water Management Act 2000* (WMA 2000) is based on the principles of ecologically sustainable development, and the need to share and manage our water resources for future generations. The WMA 2000 recognises that water management decisions must consider economic, environmental, social, cultural and heritage aspects. In addition, the WMA 2000 recognises that using water sustainably and efficiently brings economic and social benefits to the state of NSW.

The WMA 2000 provides for water sharing between different water users, be they environmental, basic rights or existing water access licence holders. The core provisions of the WMA 2000, Section 23, that are relevant here are:

> The water use provisions of a management plan for a water management area must deal with the following matters:
>
> (a) the identification of existing and potential water use practices and related activities,
>
> (b) the identification of those uses and activities which have adverse impacts, including cumulative impact, on water sources or their dependent ecosystems or on other water users.
>
> (c) the identification of the occurrence of land degradation, including soil erosion, compaction, geomorphic instability, contamination, acidity, waterlogging, decline of native vegetation or, where appropriate, salinity within the area and any impacts on water sources.

The WMA 2000 refers to the term 'make good' but only in relation to protection of the environment in section 353B, where it states:

> The court may order the offender to take such steps as are specified in the order, within such time as is so specified (or such further time as the court on application may allow):
>
> (a) to prevent, control, abate or mitigate any harm to the environment caused by the commission of the offence, or
>
> (b) to make good any resulting environmental damage, or
>
> (c) to prevent the continuance or recurrence of the offence.

The WMA 2000 in section 364A considers penalties that can be applied regarding respect of impacting the rights of others. The WMA 2000 states:

> (1) In imposing a penalty on a person for an offence against this Act or the regulations, the court is to take into consideration the following (so far as they are relevant):
>
> (a) the impact of the offence on other persons' rights under this Act,
>
> (b) the market value of any water that has been lost, misused or unlawfully taken as a consequence of the commission of the offence,
>
> (c) the extent of the harm caused or likely to be caused to the environment (including, in particular, any water source or waterfront land) by the commission of the offence,
>
> (d) the practical measures that may be taken to prevent, control, abate or mitigate that harm,
>
> (e) the extent to which the person could reasonably have foreseen the harm caused or likely to be caused to the environment by the commission of the offence,
>
> (f) the extent to which the person had control over the causes that gave rise to the offence,
>
> (g) whether the offence was committed during a severe water shortage (that is, in contravention of an order in force under section 49A or 324),
>
> (h) the persons intentions in committing the offence,
>
> (i) whether, in committing the offence, the person was complying with orders from an employer or supervising employee,

(j) in the case of an offence of taking water in contravention of this Act, whether the water so taken had been released for environmental purposes and, if so, whether the person was aware of that fact,

(k) any civil penalty that has been imposed on the person under section 60G in relation to the conduct from which the offence arises.

The WMA 2000 does not define the term 'make good' in respect of existing extractive users. It also does not define what make good for the environment is.

1.2.2 Aquifer Interference Policy

The NSW Government released the Aquifer Interference Policy (AIP) in 2012 and has since been applied to the approval of multiple NSW major projects. The policy explains the role and requirements of the Minister for aquifer interference activities when administering the WMA 2000. The AIP essentially:

- clarifies the requirements for licensing of water intercepted during aquifer interference activities (such as mining, quarrying, dewatering for construction); and
- defines and establishes 'minimal impacts' for water related assets (such as existing bores and groundwater dependent ecosystems

The AIP defines water sources as being either ‘highly productive’ or ‘less productive’ based on levels of salinity and average yields from bores. The AIP then defines water sources by their geological providence, being either: alluvium, coastal sand, porous rock or fractured rock. Based on low average bore yields reported from bores within and around the project area, the Hume Coal project is considered to be in a highly productive porous rock system.

The AIP discusses the impact of an activity as either being ‘Level 1: minimal impact’ or ‘Level 2: exceeding minimal impact’. The definition of 'minimal impact' is outlined in a series of tables which demonstrate how the criteria are applied for different types of water sources and for different sensitive receptors (ie other users, and ecosystems).

If the impact of an activity is assessed as being Level 1: minimal impact then the project is considered to have impacts that are acceptable. Where the predicted impacts exceed the Level 1 thresholds by no more than the accuracy of the model, then this is considered as having impacts within the range of acceptability and extra monitoring or mitigation or remediation will be required during operations.

Where the predicted impacts an activity is assessed as being ‘Level 2’ or ‘greater than minimal impact’, additional studies are required to fully understand the predicted impacts. If the assessment shows that the predicted impacts, although greater than ’minimal’, do not prevent the long-term viability of the relevant water-dependent asset, then the impacts will be considered to be acceptable.

Where impacts are predicted to be ‘greater than minimal impact’ and the long-term viability of the water-dependent asset is compromised, then the impact is subject to make good provisions.

Table 1.1 presents the defined impacts for a ‘less productive’ porous rock or fractured rock aquifer, as is outlined in the AIP.

Table 1.1 Minimal impact consideration criteria for a 'less productive' groundwater source

	Water table	Water pressure	Water quality
	Porous and fractured rock water source		
Level 1	Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site listed in the schedule of the relevant water sharing plan. A maximum of a 2m decline cumulatively at any water supply work.	A cumulative pressure head decline of not more than a 2m decline, at any water supply work.	Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity.
Level 2	If more than 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan if appropriate studies demonstrate to the Minister's satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site. If more than a 2m decline cumulatively at any water supply work then make good provisions should apply.	If the predicted pressure head decline is greater than the **Level 1** requirement (above), then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply	If the **Level 1** requirement (above) is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.

The make good provisions that are referred to in the AIP are not defined in the AIP or in the WMA 2000.

1.2.3 The NSW Government AIP Fact Sheet 4

The NSW Government AIP Fact Sheet 4 (DPI Water 2013) visually outlines visually how a minimal impact is to be considered. Figure 1.1 (sourced from AIP Fact Sheet 4) depicts how the minimal impact criteria are applied to both a water supply work and a Groundwater Dependent Ecosystem (GDE) defined in a water sharing plan. This fact sheet also defines the term make good as:

> The requirement to ensure third parties have access to an equivalent supply of water through enhanced infrastructure or other means for example deepening an existing bore, funding extra pumping costs or constructing a new pipeline or bore (DPI Water 2013).

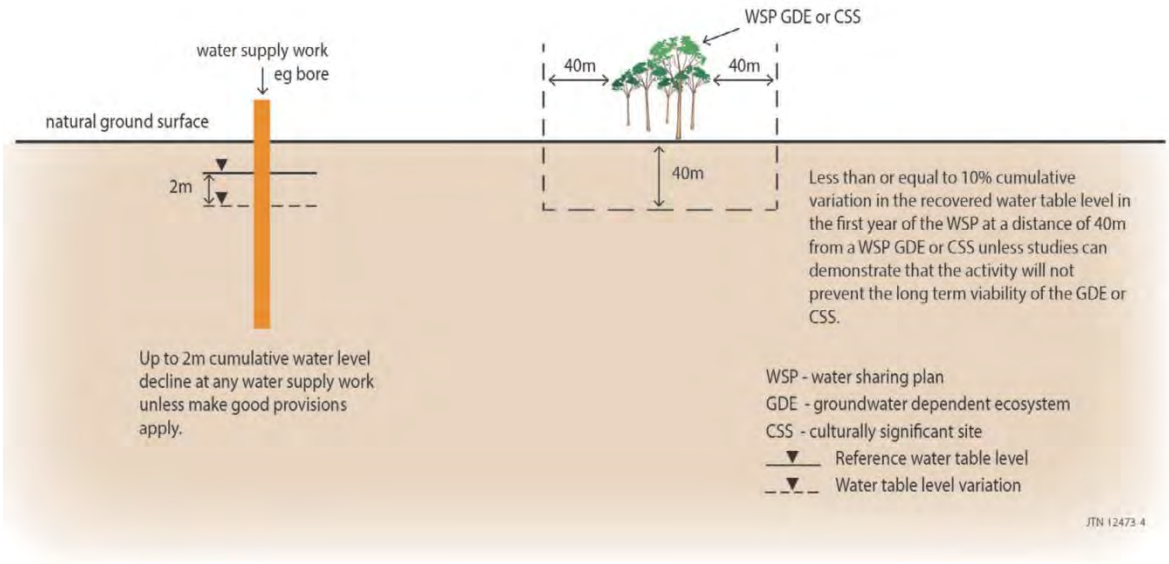


Figure 1.1 Porous or fractured rock groundwater source - minimal impact consideration (DPI Water 2013)

1.2.4 NSW make good guidelines (yet to be published)

DPI Water is drafting make good guidelines to define what strategies and approaches are acceptable for making good on impacts greater than the minimal impact criteria. The guidelines are likely to include both options the NSW Government considers acceptable on make good, and also define what impacted parties can expect, and what is expected to be offered by impacting proponents. The policy will also help define what is an unrealistic expectation of make good.

2 Predicted impacts

2.1 Groundwater modelling assessments

2.1.1 Groundwater model

A complex, regional numerical groundwater flow model was developed for the EIS to inform predicted groundwater level impacts. A substantial database of observations compiled from data provided by Hume Coal and obtained from published sources was analysed to build the numerical model, and then calibrate and refine the model. The model estimates mine inflows, depressurisation and drawdown at the water table associated with mine dewatering. This was used to simulate water level changes on the groundwater system and sensitive receptors (ie landholders and environmental users).

The model was developed in early 2015, and has undergone multiple refinements (Coffey 2016). Following submission of the EIS, and upon receipt of the submissions from the NSW Government, special interest groups and the local community, the model was revised and updated to address specific submissions. The revision of the model was completed using a later version of MODFLOW-SURFACT and USG with more sophisticated solver settings that reduced the mass balance errors in the EIS model. Additional model refinements are outlined in the model report (HydroSimulations 2018).

The original EIS model (Coffey 2016) and the revised groundwater model (HydroSimulations 2018) are both assessed as being a Class 2 confidence level, as per the criteria in the Australian groundwater modelling guidelines (Barnett et al 2012).

Further detail regarding the revised groundwater model method and results can be found in the Revised Water Assessment (EMM 2018).

2.1.2 Water quality model

A hydrogeochemical modelling assessment was conducted by RGS (2018) to predict the water quality evolution in the primary water dam and determine the groundwater response to underground placement of reject slurry into the mine voids. The models were constructed in Geochemist's Workbench (Bethke 2016) and PHREEQC (Parkhurst and Appello 1995) to estimate the range of water qualities likely to exist and determine the likely quality resulting from placement into the mined-out voids and subsequent rebound of groundwater.

2.2 Summary of results

2.2.1 Drawdown

Based on results of the revised groundwater model (HydroSimulations 2018), the AIP Level 2 drawdown is predicted to be exceeded in 94 landholder bores on 72 properties as a result of the project. The number of affected bores and their respective screened geology are presented in Table 2.1.

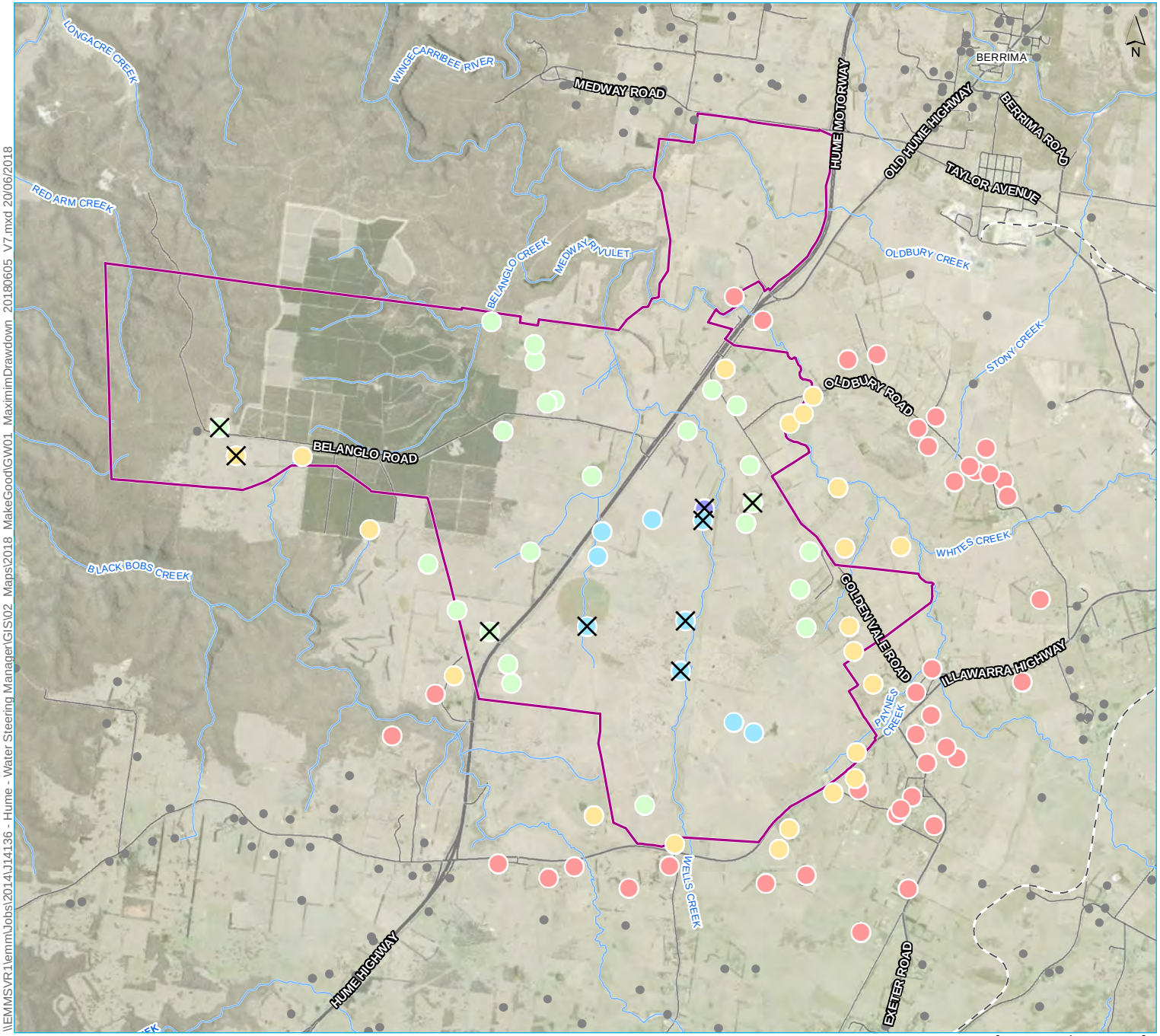
Figure 2.1 presents the distribution of modelled maximum drawdown at landholder bores. The area of greatest predicted drawdown migrates according to the areas active areas of mining over time. The greatest area of drawdown occurs approximately 18 to 20 years after mining begins.

Most of the impacted bores target the Hawkesbury Sandstone, which is the most productive formation in the region. Only six of the 94 bores do not fully or partially screen the Hawkesbury Sandstone (Table 2.1).

Table 2.1 Number of bores impacted per formation

Targeted formation	Number of Bores
Wianamatta Group	5
Wianamatta Group and Hawkesbury Sandstone	30
Hawkesbury Sandstone	52
Hawkesbury Sandstone and Illawarra Coal Measures	6
Illawarra Coal Measures	1

The project will not dewater the Hawkesbury Sandstone, rather the aquifer will undergo some degree of depressurisation depending on proximity to the mine workings desaturated zone. The groundwater supply potential of the Hawkesbury Sandstone will remain largely viable in the vicinity of the project.



KEY

- Project area

Maximum drawdown (m)

- 2 - 5
- 5 - 10
- 10 - 20
- 20 - 40
- 40+
- Bore to be intersected by mining
- Non-affected bores

Existing features

- Main road
- Local road
- Drainage line
- Rail line

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Source: EMM (2018); DFSI (2017); Hume Coal (2017)

Maximum drawdown

Make good strategy

Drawdown in landholder bores

Figure 2.1

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2.2.2 Water quality

The Level 1: minimal impact with regards to water quality is define as “any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity” (Table 1.1).

The project is within an upland recharge environment. Groundwater quality varies depending on lithology of the strata. The Wianamatta Group is typically too saline and is generally considered to have limited potential as a groundwater resource, whereas groundwater quality of the Hawkesbury Sandstone is considered ‘fresh’ and is suitable to support most beneficial uses, including irrigation and raw potable supply.

The hydrogeochemical assessment conducted by RGS (2018) concluded that the project would not result in significant changes to the groundwater chemistry and would thus not change the beneficial use class of the aquifers. The hydrogeochemistry study considered interaction of reject slurry with groundwater in the mined out voids. The modelling results, which incorporated significant conservatism, indicated that the leachate (from emplacement of the limestone amended reject slurry into the mine voids the quality would be nearly indistinguishable from ambient groundwater, and would maintain the same beneficial use status (RGS 2018).

While the assessments conclude there are no predicted chemistry changes to landholder bores from the project, Hume is committed to monitoring groundwater quality in various aquifers in the vicinity of the mine footprint as part of their Project’s ongoing monitoring program (Refer to Section 13 of the Revised Water Assessment (EMM 2018)).

2.2.3 Groundwater dependent ecosystems

There are no high priority groundwater dependent ecosystems within the predicted drawdown or depressurisation areas of the project (EMM 2017b).

3 Preliminary make good assessment

As stated in Section 1.2.2, the AIP specifies that where the predicted impacts of an activity are assessed as being 'Level 2' or 'greater than minimal impact', additional studies are required to fully understand the predicted impacts. If the assessment shows that although the predicted impacts are greater than minimal, the long-term viability of the relevant water-dependent asset is not compromised, then the impacts will be considered to be acceptable. Where impacts are predicted to be greater than minimal impact and the long-term viability of the water-dependent asset is compromised, then the impact is subject to make good provisions.

A desktop assessment was completed to provide a preliminary assessment of what make good provisions may be necessary on the 94 bores predicted to have impacts greater than minimal impact (ie greater than 2 m), due to the project.

Following the desktop assessment, field assessments on individual bores would be required to verify the results of the preliminary make good assessment. This is discussed in Section 4.3.

The desktop assessment referenced the component of predicted drawdown on landholder bores as a result of the project only, and does not include components of existing, pre-mining stresses, including landholder pumping and drainage from Berrima mine. Drawdown and a decline of water pressure in an aquifer can occur due to a combination of inputs such as increased landholder pumping and long term climatic changes. These additional inputs, above what is considered baseline or the existing situation, are not part of the preliminary make good assessment as the project specific impacts need to be determined and considered. In implementing make good for individual bores, consideration of other influences, including timing, will need to be considered.

3.1 Data used in desktop assessment

The desktop assessment was undertaken using the NSW government's groundwater bore database to identify registered bores with current/active approvals within an area approximately 81 km^2, centred at the project's centre. This area is larger than the area the revised groundwater model predicted to be impacted by the project. The database used for this assessment included the following information:

a) bore ID ('GW' number) and location coordinates;

b) Water Access Licence and Approvals numbers and purposes ; and

c) bore completion depth and open interval.

The revised groundwater modelling and uncertainty analysis was undertaken with reference to the groundwater bore database used in the EIS (DPI Water 2015). Subsequently, WaterNSW provided an up-to-date extraction from their water licence and approvals database to Hume Coal on 27 April 2018, which contained a list of all registered bores with currently active approvals and additional active approvals not associated with registered bores. This updated dataset was used to perform the make good desktop assessment in conjunction with the groundwater bore database used in the EIS.

Monitoring bores or bores located on Hume Coal owned properties are not subject to the make good assessment and, as such, have been filtered from the dataset subject to the desktop make good assessment.

The WaterNSW water licence and approvals database indicates that there are approximately 19 additional active (ie current) Water Supply Work and/or Use Approvals in the area predicted to potentially be affected by drawdown as a result of the project. These approvals do not have an associated groundwater bore works number (ie they are not listed in the groundwater bore database). Without information on the depth and construction of a bore (if present), these active approvals are unable to be included in the desktop make good assessment.

Physical bores associated with these active approvals can be included in an updated version of the make good assessment once physical bore details become available following field assessment and verification (refer to Section 4.3).

3.2 Make good options

The following sections provide details of the four preliminary options accepted by Hume as being appropriate make good provisions for the project.

3.2.1 Increased operational costs

The simplest of the proposed make good options involves making a financial contribution for increased operational costs associated with a lower groundwater level. While these costs could primarily be associated with increased power consumption, they could also include costs associated with a pump upgrade, bore servicing etc.

This option is assigned to bores where the maximum predicted drawdown results in less than 80% of the original hydraulic head and there is greater than 10 m of hydraulic head available above the pump, assuming the pump is originally installed at 75% of the total bore depth (Figure 3.1).

This option may require monetary contribution only, or provide minor technical and/or manual works at the bore.

Details as to the scale of financial contribution required would be unique to each bore. The approach would be assigned during the make good process, which is further discussed in Section 0.

3.2.2 Deepen pump

The second make good option involves deepening of the pump in the bore to allow for sufficient head above the pump and allow the bore to continue working efficiently. This option may result in increased operational costs, which would also be compensated.

This option is assigned to bores where:

- the maximum predicted drawdown is greater than 80% of the original hydraulic head and/or less than 10 m of hydraulic head is predicted to remain above the pump (assuming the pump is at 75% of the total bore depth), and
- when the pump is lowered to 90% of the total bore depth, there is greater than 10 m of hydraulic head above the pump (at the greater depth) when the maximum predicted drawdown is observed (Figure 3.2).

These bores are assumed to be fully functional provided the pump is lowered, and increased operational costs are compensated. This option may require minor technical and manual works at the bore.

Details and appropriateness of this make good option will be evaluated as part of the individual make good site assessment to be completed on each bore (Section 4.3). Following a field assessment, it may be acknowledged that the lowering of a pump as proposed will not be practical, or technical limitations for lowering pumps may occur when it is attempted. The plan for make good at each individual bore is subject to technical feasibility and consultation with the individual landholders, and other options may then need to be considered.

3.2.3 Replacement bore

The third make good option involves providing the landholder with a functional replacement bore, be it either by drilling a new bore to a new depth, re-lining the existing bore, or drilling out the existing bore to a deeper depth.

This third option is assigned to bores where the maximum predicted drawdown is greater than 80% of the available hydraulic head in the bore after considering the lowering of the pump, and less than 10 m of hydraulic head is predicted to remain above a pump, if lowered (Figure 3.3).

The 'replacement bore' option was also assigned to any bore in which Level 2 impacts (>2m) are predicted and the bores either intersect or terminate within 14 m of a proposed mine working (Figure 3.4). There are nine landholder bores that will potentially intercept (or be within 14 m of) the actual mine workings; it is required that these nine bores be replaced.

The replacement bores will target high yielding groundwater zones, either the deeper or shallower Hawkesbury Sandstone depending on the depth of the existing bore and the depressurisation predictions in that particular location. Depending on the depressurisation for individual properties multiple replacement bores may be considered if warranted to maintain supply.

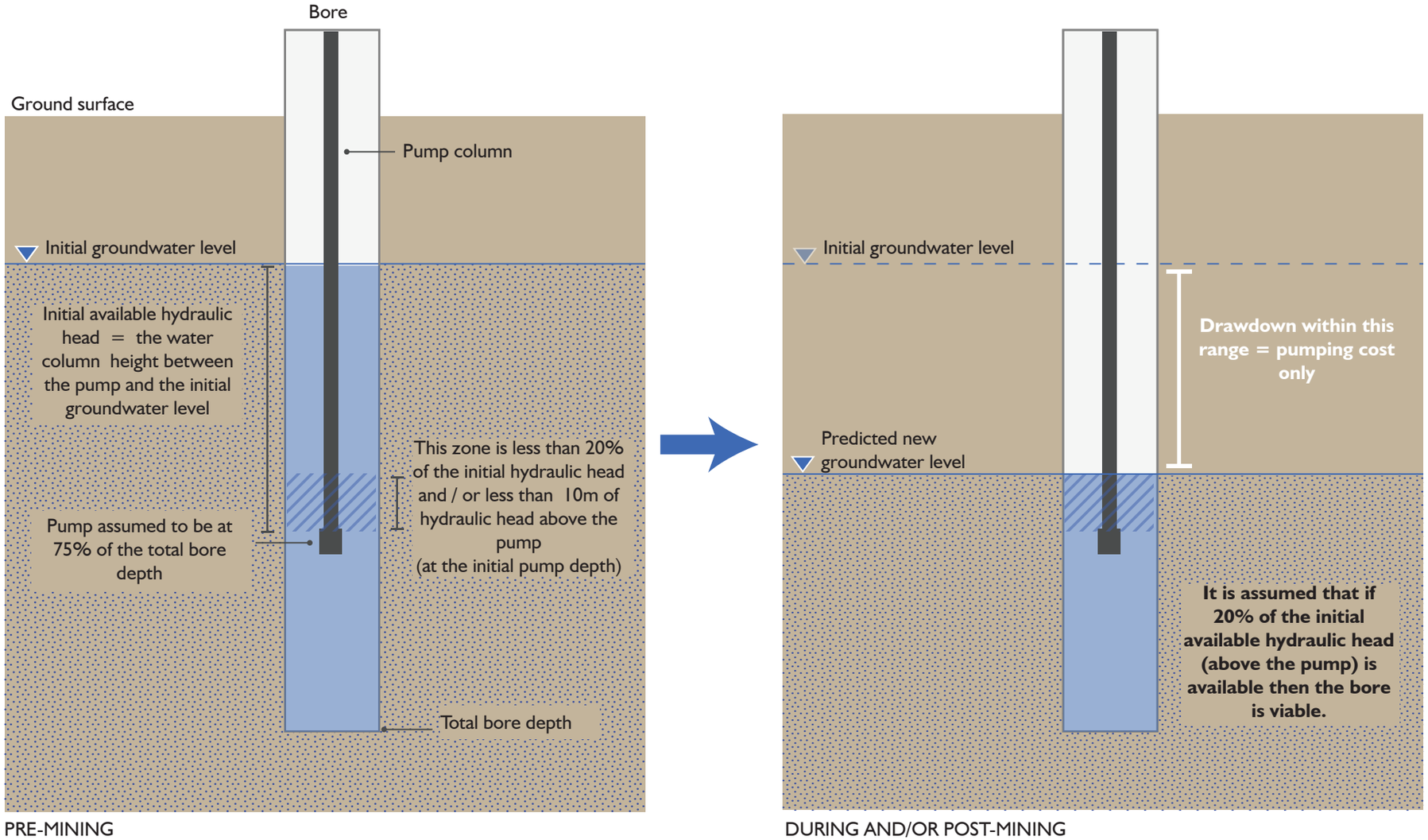
To gauge the appropriateness of a replacement bore location, the predicted groundwater drawdown, potential long term sustainable yields and possible interference with existing/replacement bores would need to be investigated within the numerical model. Consideration of surface infrastructure (ie tank locations pipe networks) will also be considered and included under the 'make good' works agreement.

The installation of replacement bores will be done in accordance with industry best practice and utilise local knowledge of drilling and geological conditions to ensure successful outcomes of replacement bores

Decommissioning of old bores may need to occur following landholder consent, in accordance with *Minimum Construction Requirements for Water Bores in Australia* (NUDLC 2012). Individual landholders may choose to retain the original bore and this will be part of the individual negotiations and agreements for each landholder.

Approval and registration of the replacement bores will occur in accordance with the Water Management Act 2000.

The increased operational costs associated with the new bore would be compensated. Conceptually, this could include the provision of new surface infrastructure if the bore is moved to a new location. Specific details are dependent on the outcome of the individual field-based assessment (Section 4.3).



Make good provision - increased pumping costs only

Hume Coal Project

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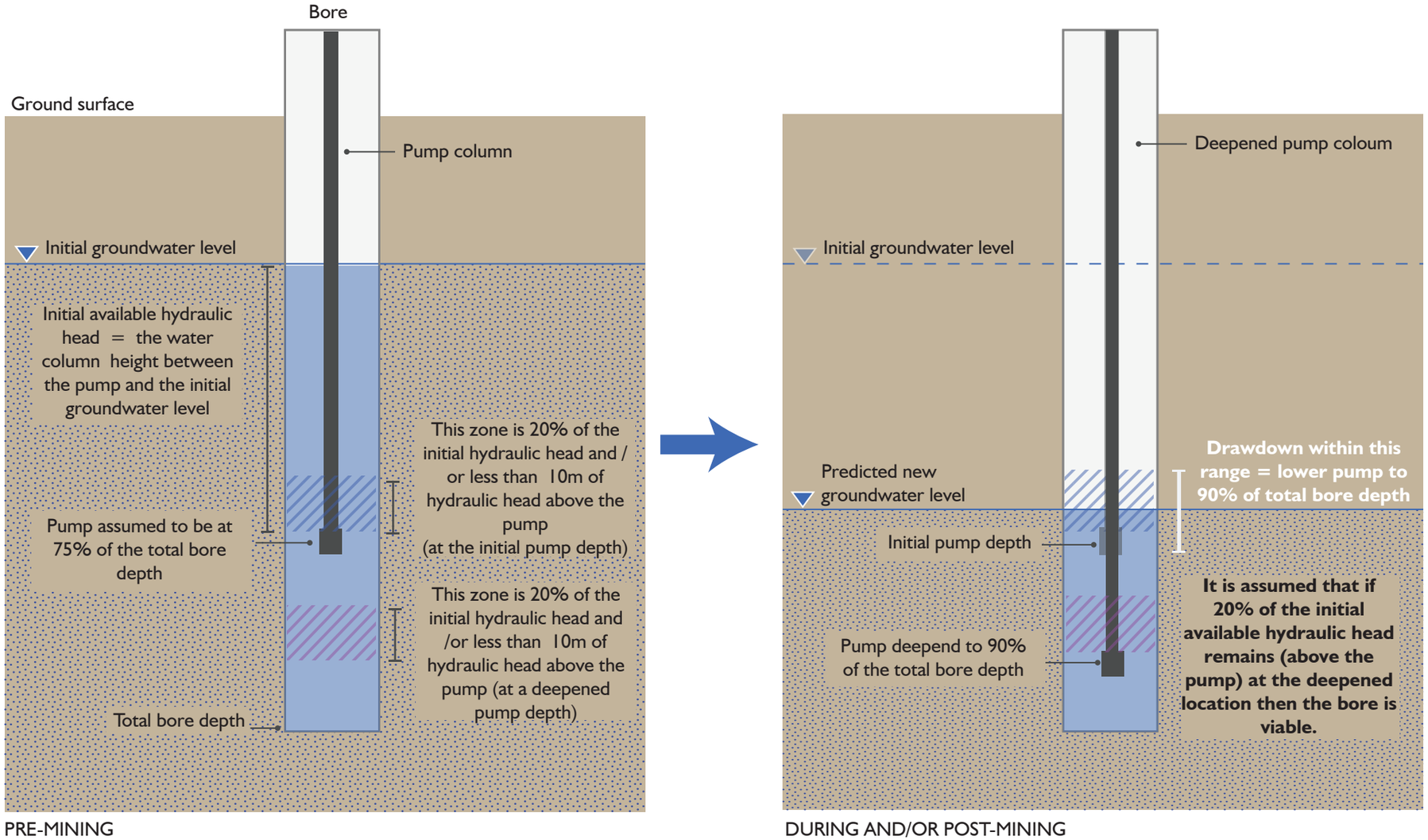
Figure 3.1



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Make good provision - deepen pump

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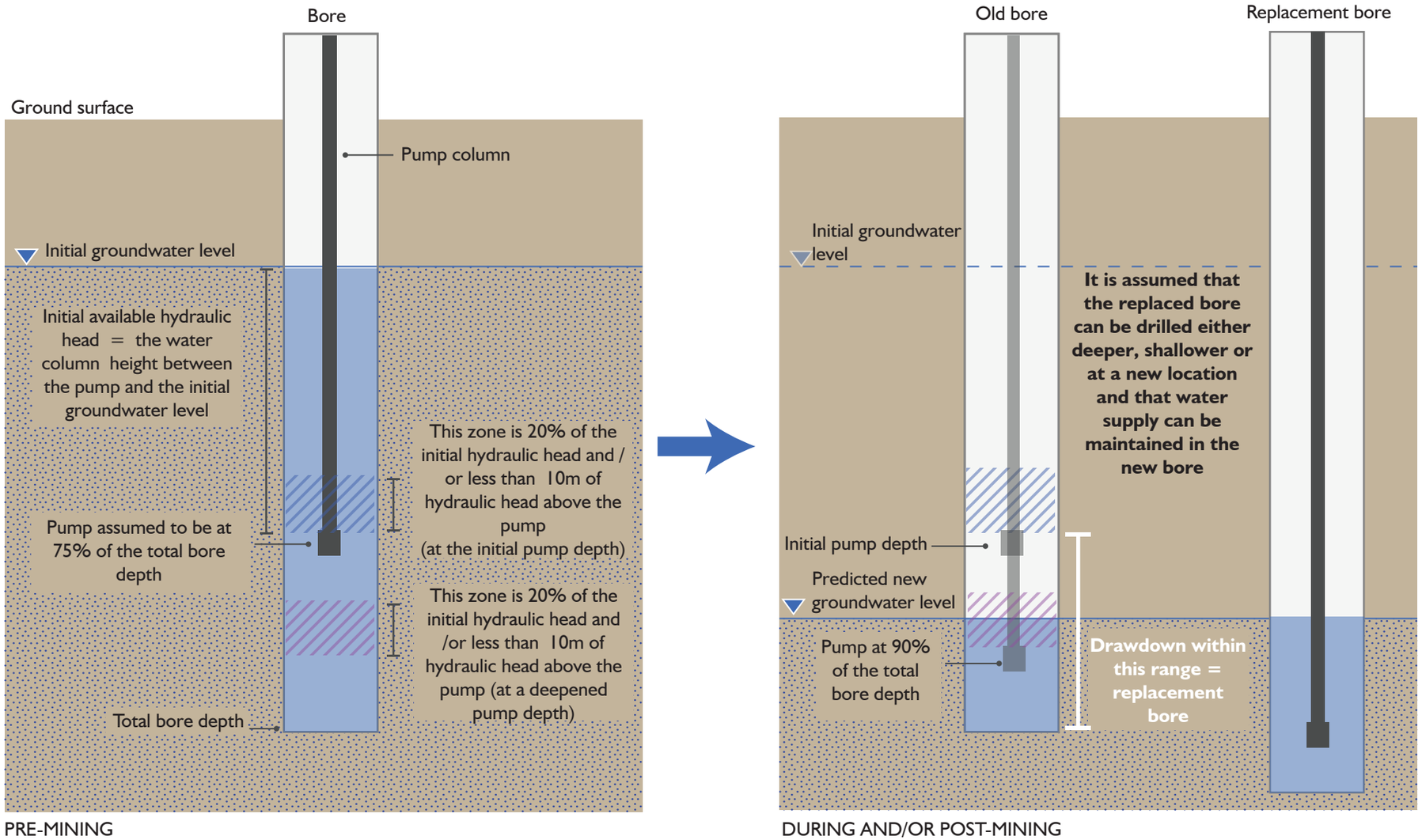
Figure 3.2



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Make good provision - replacement bore

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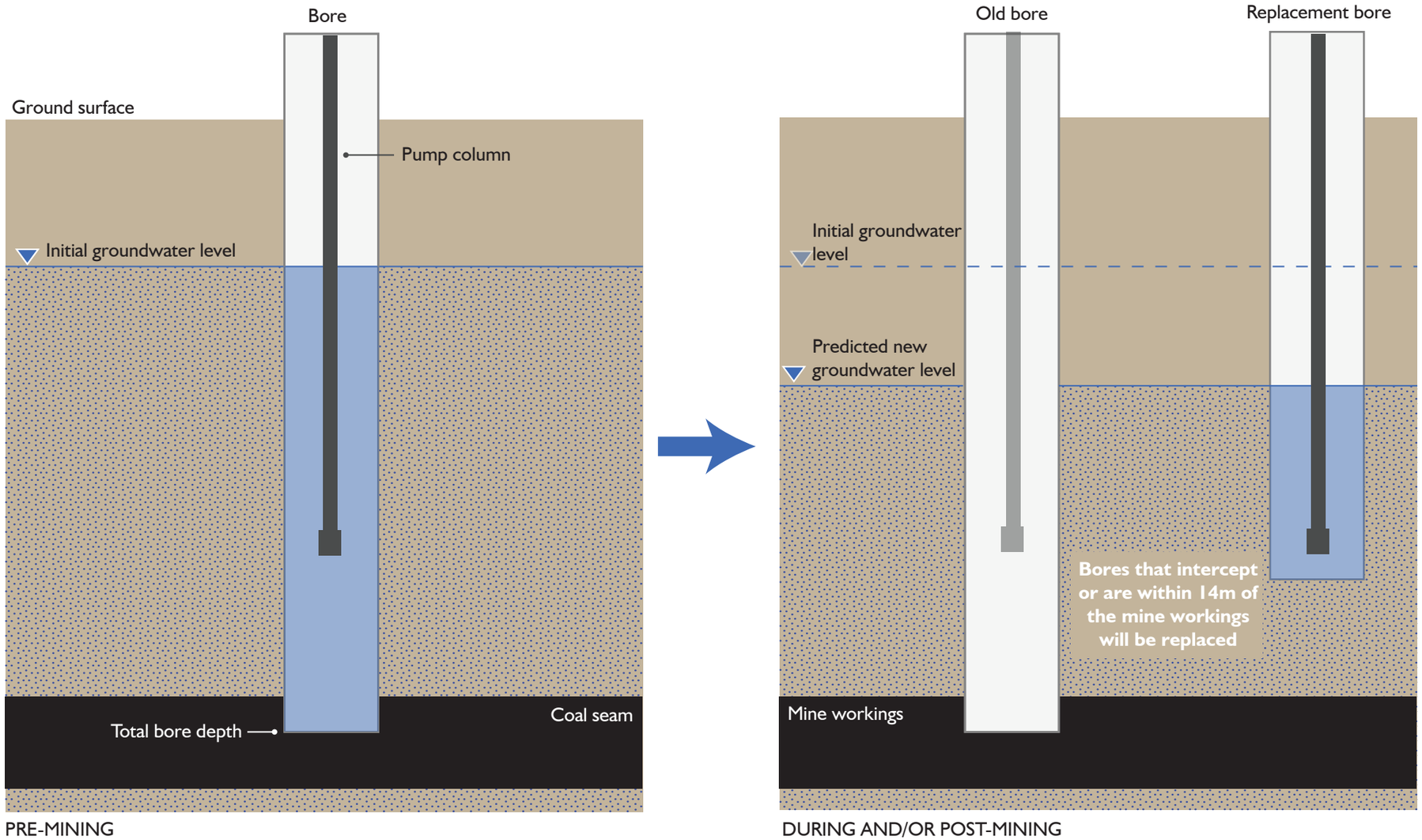
Figure 3.3



Make good provision - replacement bore, intercepted mine workings

Hume Coal Project
Make Good Strategy
Figure 3.4

3.2.4 Alternative water supply

At locations where an adequate replacement bore is not feasible, such as insufficient head in alternate aquifers or an alternative bore location cannot be agreed upon with the bore owner / landholder, an alternative water supply will be sourced for the landowner. This option may be assigned to bores that are completed within 14 m of the mine workings and significant drawdown is expected in the upper formations, hence a replacement bore may not be viable.

For this preliminary assessment, this option 4 was not required; all bores were able to be assigned to options 1, 2 or 3. Potential alternative water supply options include:

- enhancing surface water capture by enlarging a farm dam or constructing a new farm dam. Considerations for the property water demand, available harvestable rights and or ability for Hume to secure licences for additional surface water capture will need to be considered; and

- installing tank/s and/or infrastructure on/around existing buildings (eg sheds, houses) to better capture and store rainfall.

These options are reliant on rainfall and surface infrastructure to pump or pipe water around the property. It is noted that many properties surrounding the Hume project are small and therefore options for additional infrastructure needs to be carefully considered. Implementation of this strategy will depend on location, land access and the capability of the development of surface storage.

Details and appropriateness of this option will be evaluated as part of individual make good assessments (Section 4.3).

3.3 Assessment criteria

The criteria used to determine the respective preliminary make good provisions for impacted bores are summarised in a flowchart presented in Figure 3.5.

In general, the decision process considered the existing bore design, hydrogeological target and the modelled maximum drawdown in that bore. The dataset was collated and a series of steps were followed in the desktop assessment for each bore, as follows:

1. Extract registered bore data from the government's groundwater bore database incorporating an area larger than the total area of predicted impact of the mine. (Assess bores for relevance (monitoring bores and bores on Hume Coal land were removed from the dataset). Only bores with active (ie current) approvals were considered in the assessment.

2. Analyse construction details of each bore:

    a) if a construction log is available, then the screened interval, or area of open hole is documented;

    b) where no construction detail is available, the drillers log and/or the total depth of the hole was used to determine the likely screened/ open hole interval; and

    c) if the bore has no construction details, no log, and no total depth then it is assumed the bore screens the entire section of Hawkesbury Sandstone at that location.

3. Cross-reference the bore's screened area/open area with the respective model layer/s, notably the Wianamatta Group; upper, middle and lower Hawkesbury Sandstone, Wongawilli Coal Seam and Illawarra Coal Measures.

4. Cross-reference the bore depth with the target Wongawilli Coal Seam using the revised groundwater model (HydroSimulations 2018).

5. Run the groundwater model (HydroSimulations 2018). The output provided predicted drawdown for each bore over a 100 year period, time to 2 m drawdown and recovery, and the starting head pre mining (estimated using a nominal 32 year period of data) and at maximum drawdown. The project effects resulted in 94 bores, with an active water approval, having maximum drawdown (as a result of project activities) greater than 2 m over the 100 year simulation period.

6. Identify which of the 94 bores will be directly intersected by, or be within approximately 14 m of the mine workings. These bores will or will likely be eliminated as a result of the mine workings, regardless of the degree of drawdown predicted. The value of 14 m was derived as an appropriate distance to maintain bore integrity.

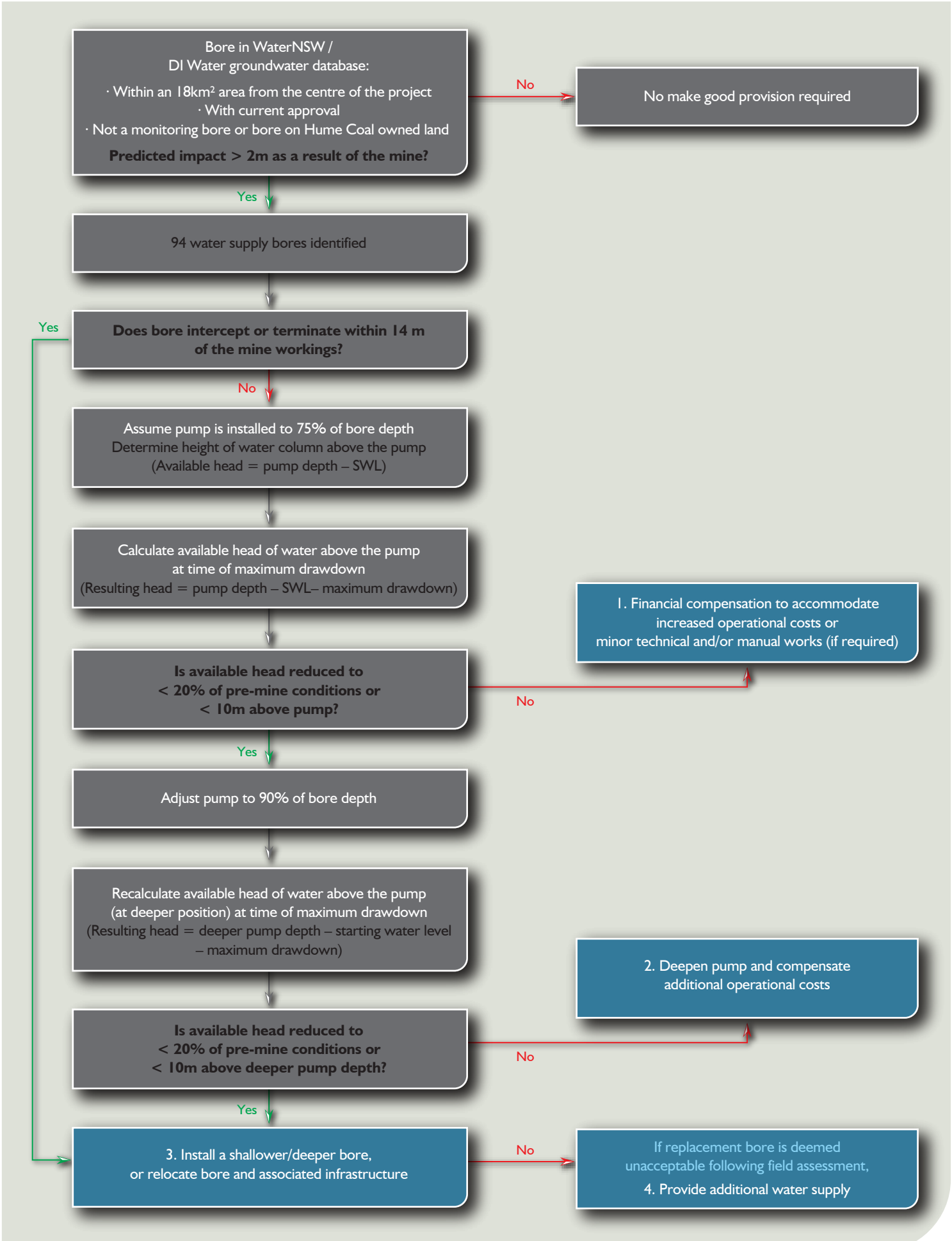
7. Assign an assumed pump depth to each bore. The depth of a bore's pump is not recorded in the government database. This desktop assessment assumed the installed pump depth to be 75% of the total bore depth.

8. Prepare hydrographs for a 60 year period presenting predicted project drawdown and the AIP 2 m drawdown threshold.

It should be noted that this desktop assessment relies on multiple data sources and assumptions. The make good actions proposed as a result of the assessment are preliminary and will be revisited following a field investigation and verification process ("ground truthing", Section 4.3).

This preliminary assessment was completed to provide a basis for the strategy which will be updated throughout the operation of the mine. It is acknowledged that the pre-mining starting water level at bores, prior to potential project impacts, is important in defining the make good option appropriate for each bore. The initial head (water level) used in the desktop assessment is derived from the uncertainty analysis of the revised groundwater model.

A measured initial head at individual landholder bores will be collected post EIS approval pending landholder engagement and mutual agreed access negotiations. Further details are outlined in Section 4.



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Flowchart of criteria and process for the make good assessment
Make Good Strategy
Hume Coal Project
Figure 3.5

3.4 Results of the preliminary make good assessment

A summary of the proposed make good options assigned to the 94 bores identified with Level 2 AIP impacts is presented in Table 3.1. Detail of the individual make good bores is tabulated in Appendix A. Individual hydrographs of the drawdown within each of these bores over a 60 period are provided in Appendix B.

Table 3.1 Summary of preliminary make good options

Make good option	Number of bores	%	Maximum drawdown predicted – average (m)	Average years where drawdown is >2m
1. increased pumping costs	31	33%	3	28
2. deepen pump and increased pumping costs	33	35%	11	48
3a.replace a stock and domestic bore and increased pumping costs	15	15%	11	43
3b. replace an irrigation bore and increased pumping costs	15	16%	18	51
All options (summary)	**94 (total)**		**10 (average)**	**41 (average)**

4 Make good process

Following the results of the preliminary make good assessment described in Section 3, a make good process will be implemented in stages, depending on the timing of predicted impact with elements of the first stage to be to be completed before mine operations start.

The following sections outline the proposed staged approach and outlines the steps in the process, which will ultimately lead to the landholder's water supplies to be 'made good' prior to and while impacts are occurring.

4.1 Staged approach

The timing of when the drawdown exceeds the AIP Level 2 at each of the 94 bores predicted to be directly impacted from project activities varies depending on the depth of the bore and its proximity to the mine area.

Table 4.1 presents the distribution of bores predicted to be impacted within 5-year interval stages. Bores identified in Stage 1 are bores predicted to be first affected by 2 m drawdown within the first 5 years of mining; Stage 2 bores are bores predicted to be first affected within 5-10 years of mining, and so on. The make good process will be implemented prior to the start of underground mine operations (time = 0 years) for Stage 1 bores. The make good process for each subsequent stage will be implemented every subsequent 5-year period in order for each bore to be incorporated into the make good process prior to the Level 2 impacts occurring. The spatial distribution of the make good bores within each stage is also shown on Figure 4.1 to Figure 4.4.

Table 4.1 Make good bores within individual stages

Stage	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
Time when bore first impacted by 2 drawdown	**0-5 yrs**	**5-10 yrs**	**10-15 yrs**	**15-20 yrs**	**20-25 yrs**	**+25 years**	
Make good provision							
1. increased pumping costs	-	3	7	9	5	7	31
2. deepen pump	6	9	13	3	2	-	33
3a. replace a stock / domestic bore	5	4	2	2	1	1	15
3b. replace an irrigation bore	5	8	1	1	-	-	15
	16	**24**	**23**	**15**	**8**	**8**	**94**

Each stage will involve the following steps:

1. During 3-5 years prior to the start of each stage:

    a) Update the groundwater model prior to the start of the next stage. Identify the registered bores with predicted impacts to exceed the AIP Level 2 drawdown within the upcoming 5-year stage;

    b) Notify relevant landholders and seek to obtain access to complete a field assessment.

c) Complete a field assessment of the identified bores. Ground-truth their location, accessibility, and condition. Collect a water level (non-pumping if possible) and water quality sample;

d) Update the desktop assessment with results of field assessment and identify an appropriate make good provision(s) to propose to landholder.

2. During 1-5 years prior to the start of each stage:

a) Establish a 'make good agreement' with the landholder (refer to Section 4.4) and implement the agreed make good provision.

3. During 1 year prior to the start of each stage:

a) Re-visit and monitor (water quality and water level) the make good bores. This may be done annually if it was negotiated with the landholder.

b) Prepare a make good status report, or earlier if calibration of the model was required during the stage and the drawdown predictions on the make bores were adjusted. A new make good strategy may be required (ie compare actual vs. predicted water level declines).

c) Update the list of predicted bores for the subsequent stage and confirm that the strategies already implemented (existing make good agreements) remain appropriate.

4. During each 5-year stage:

a) Continue to monitor Hume monitoring bores.

b) Monitor landholder bore(s), if negotiated within the make good agreement.

5. Annually during the (at least) the first 10 years of mining:

a) Verify the numerical groundwater model and recalibrate as required with monitoring data. The frequency of model verification is likely to be annual once mining commences and for the first 5 years, but the frequency may decrease as mining progresses and confidence in model results are confirmed. Recalibration is only required if the predictions of impact in the model vary significantly from the observed water level declines. If model recalibration is required, then updated predictions for inflow and drawdown in landholder bores will be re-forecasted at that time.

As the status and condition of each bore is different, the make good process for each bore will be unique. In some instances, more than one make good option may be proposed as different options may be suitable at different times over the life of the project.

4.2 Hume monitoring network

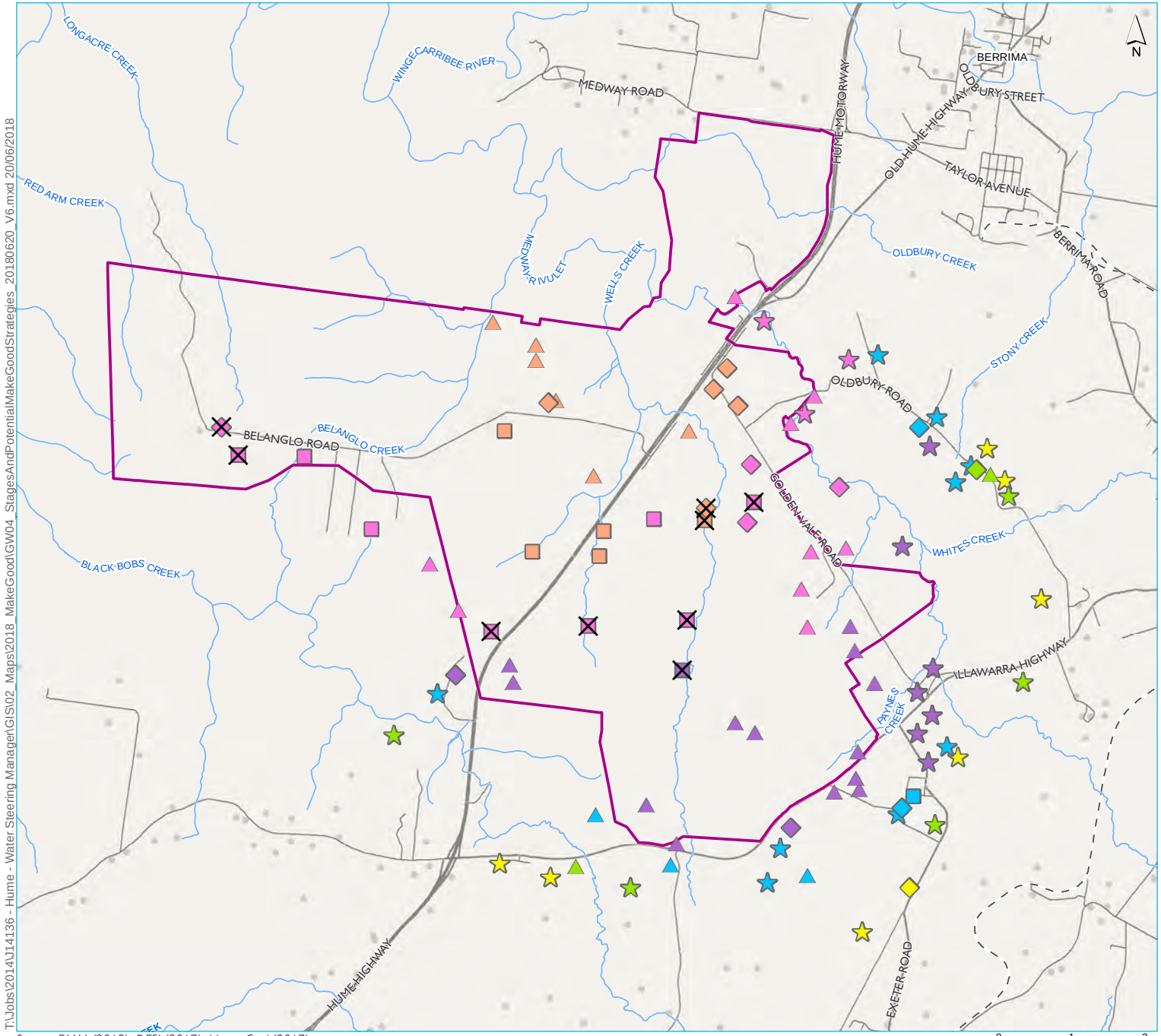
4.2.1 Current monitoring network

Hume established a comprehensive groundwater monitoring network to characterise the baseline, pre-mining hydrogeological environment of the project area. The program included baseline groundwater level and quality monitoring, collected from the various groundwater systems within and beyond the project area boundaries.

Monitoring and collection of data has continued since the submission of the EIS. The data will continue to be analysed to understand the groundwater flow paths, the connection or separation of groundwater bearing zones, groundwater–surface water connectivity, groundwater quality, and the likely changes of these characteristics over the long term.

The Hume groundwater monitoring and modelling plan (GMMP; EMM 2017d) is updated and periodically reviewed by DI Water with comments incorporated. This process will be ongoing and the details of the GMMP are incorporated into the overall water management and monitoring strategy for the project.

The existing Hume monitoring network for the project is shown on Figure 4.5.



KEY

- Project area

Make Good stage

- Stage 1 impact observed <5 years
- Stage 2 impact observed 5-10 years
- Stage 3 impact observed 10-15 years
- Stage 4 impact observed 15-20 years
- Stage 5 impact observed 20-25 years
- Stage 6 impact observed 25+ years

Make good provision

- 1. increased pumping costs only
- 2. deepen pump
- 3a. replacement bore (stock / domestic)
- 3b. replacement bore (irrigation)
- Bore to be intersected by mining
- Non-affected bores

Existing features

- Main road
- Local road
- Drainage line
- Rail line

Source: EMM (2018); DFSI (2017); Hume Coal (2017)

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Stages and potential make good strategies

Make good strategy
Drawdown in landholder bores
Figure 4.1

HUMECOAL PROJECT

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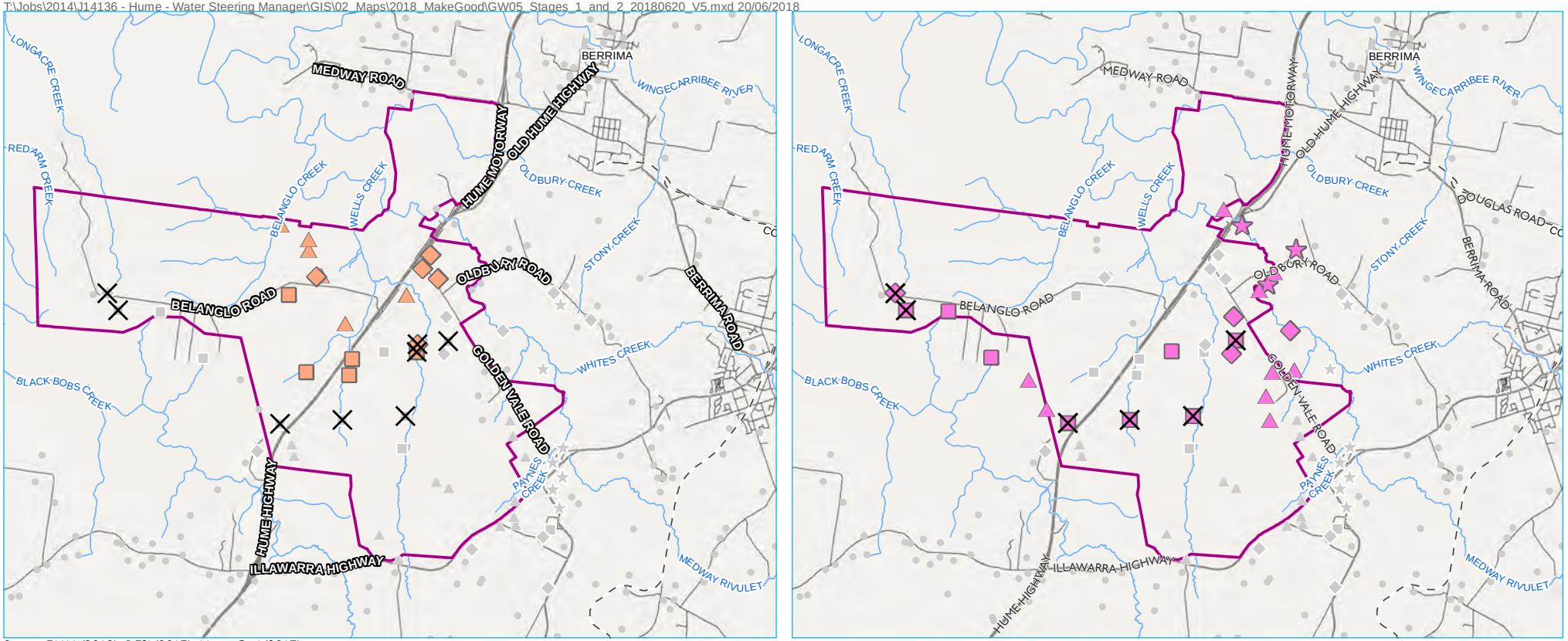

Source: EMM (2018); DFSI (2017); Hume Coal (2017)

KEY

Make Good stage

- Stage 1 impact observed <5 years
- Stage 2 impact observed 5-10 years
- Other make good bore

Make good provision

- 1. increased pumping costs only
- 2. deepen pump
- 3a. replacement bore (stock / domestic)
- 3b. replacement bore (irrigation)

- Project area
- Bore to be intersected by mining
- Non-affected bores

Existing features

- Main road
- Local road
- Drainage line
- Rail line

0 1 2 km
GDA 1994 MGA Zone 56
N

Stages 1 and 2 and potential make good strategies

Make good strategy
Drawdown in landholder bores
Figure 4.2

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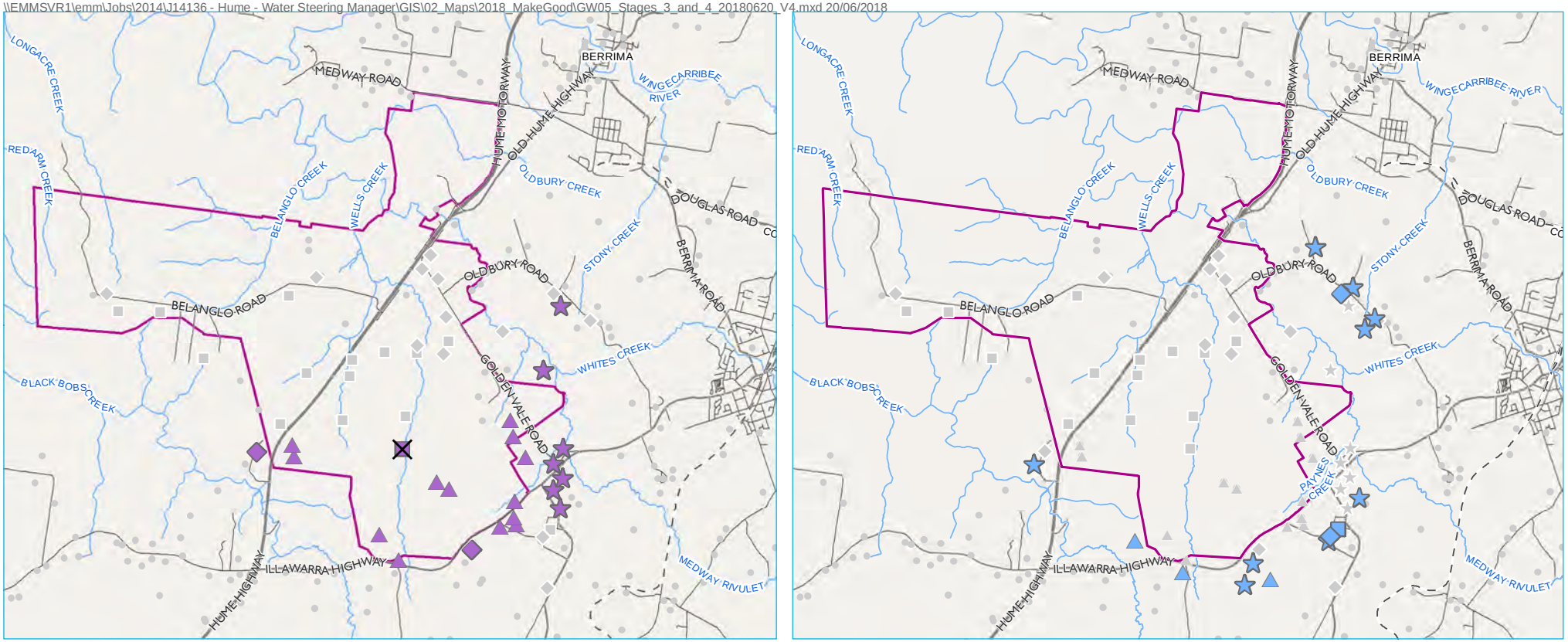

Source: EMM (2018); DFSI (2017); Hume Coal (2017)

KEY

Make Good stage

- Stage 3 impact observed 10-15 years
- Stage 4 impact observed 15-20 years
- Other make good bore

Make good provision

- 1. increased pumping costs only
- 2. deepen pump
- 3. replacement bore (S/D)
- 3. replacement bore (irr)

- Project area
- Bore to be intersected by mining
- Non-affected bores

Existing features

- Main road
- Local road
- Drainage line
- Rail line

0 1 2 km

GDA 1994 MGA Zone 56

N

Stages 3 and 4 and potential make good strategies

Make good strategy

Drawdown in landholder bores

Figure 4.3

HUMECOAL PROJECT

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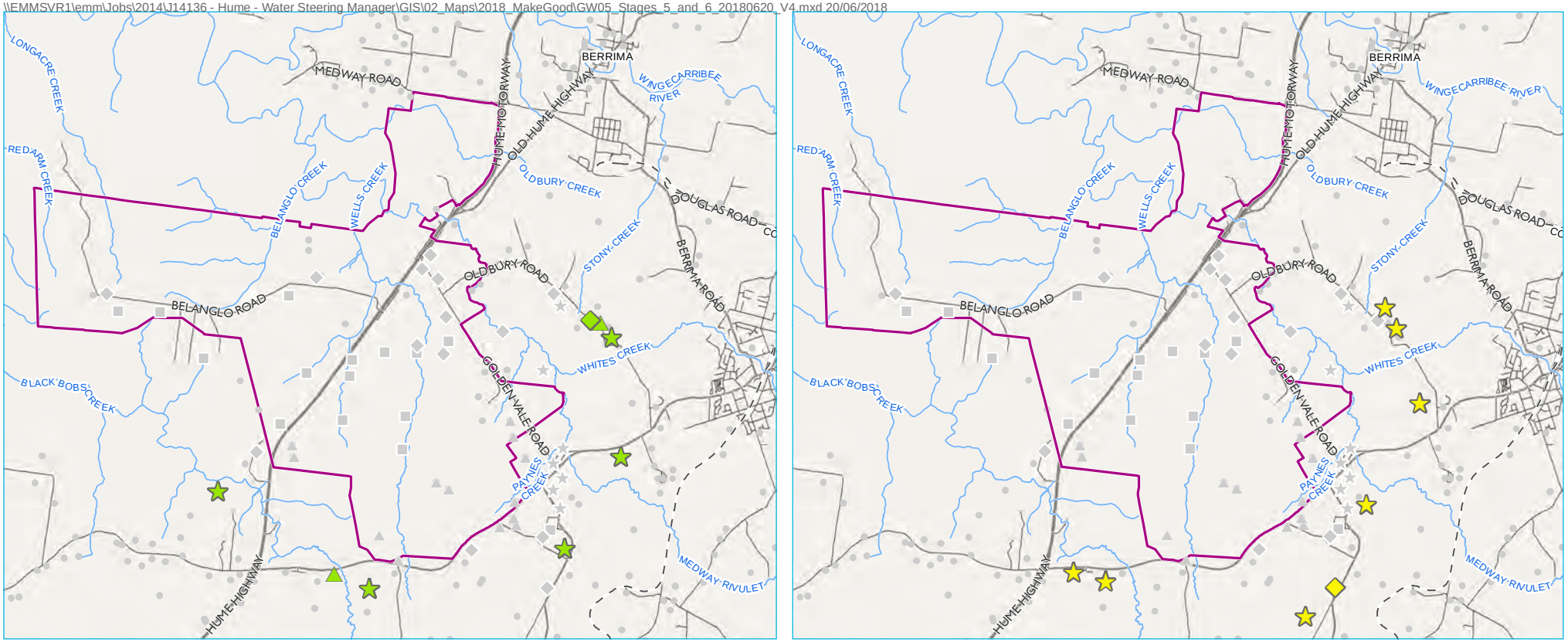

Source: EMM (2018); DFSI (2017); Hume Coal (2017)

KEY

Make Good stage

- Stage 5 impact observed 20-25 years
- Stage 6 impact observed 25+ years
- Other make good bore

Make good provision

- 1. increased pumping costs only
- 2. deepen pump
- 3. replacement bore (S/D)
- 3. replacement bore (irr)

- Project area
- Non-affected bores

Existing features

- Main road
- Local road
- Drainage line
- Rail line

0 1 2 km

GDA 1994 MGA Zone 56

N

Stages 5 and 6 and potential make good strategies

Make good strategy

Drawdown in landholder bores

Figure 4.4

HUMECOAL PROJECT

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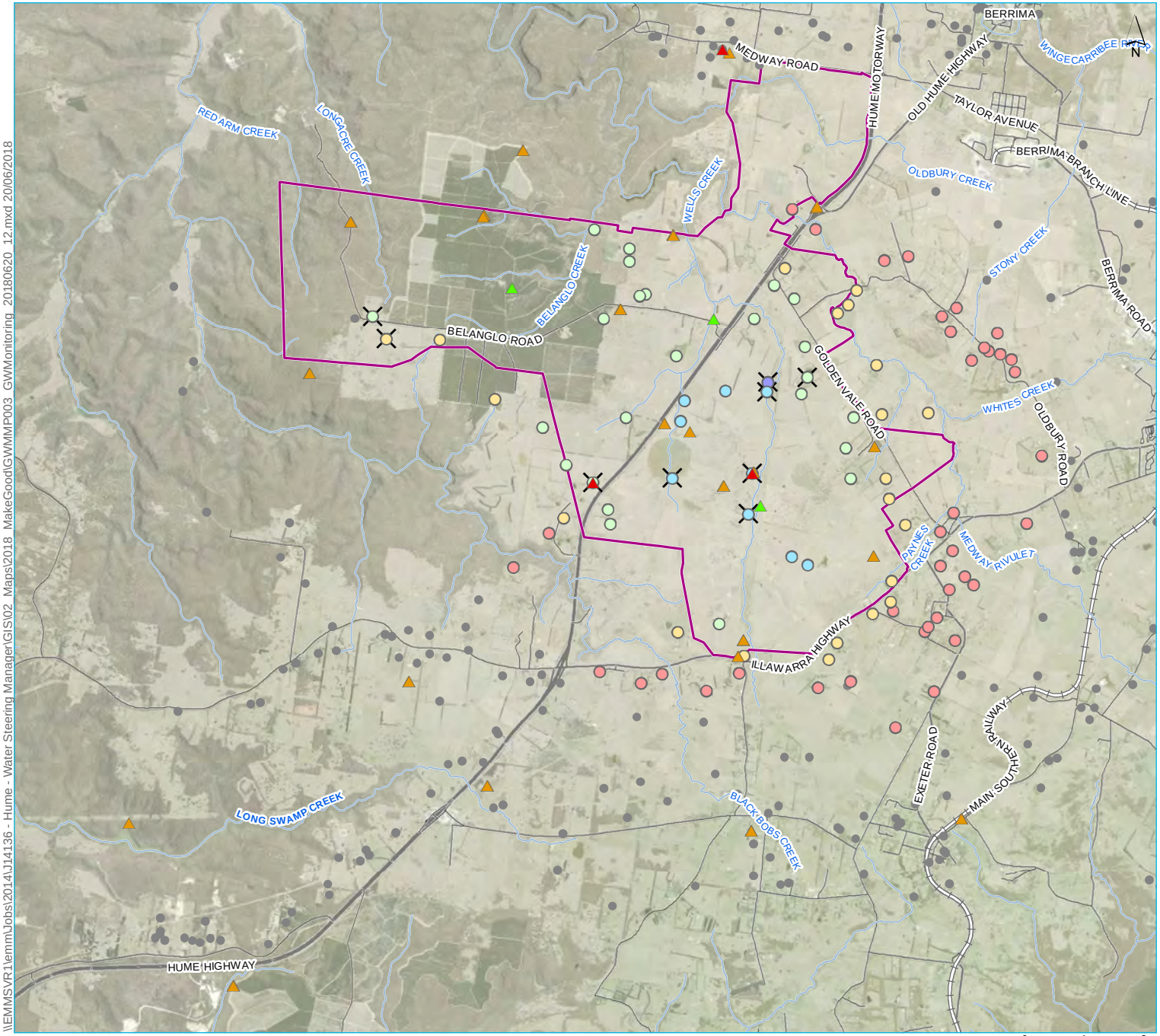

KEY

Groundwater monitoring network

- Vibrating wire piezometer
- Landholder bores utilised for monitoring
- Monitoring bore or bore nest

Maximum drawdown (m)

- 2 - 5
- 5 - 10
- 10 - 20
- 20 - 40
- 40+
- Project area
- Bore to be intersected by mining
- Non-affected bores

Existing features

- Main road
- Local road
- Drainage line
- Rail line

0 1 2 km

GDA 1994 MGA Zone 56

Source: EMM (2018); DFSI (2017); Hume Coal (2017)

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Groundwater monitoring network

Make good strategy

Drawdown in landholder bores

Figure 4.5

HUMECOAL PROJECT

EMM

4.2.2 Additional monitoring sites

The current monitoring network will be enhanced with strategically placed monitoring bores to improve model verification (ie comparison of model results to actual as mining progresses), and to assist with the early detection of the timing of impacts on landholder bores. Additional monitoring bore locations will be developed in consultation with the relevant NSW government agencies and details of changes to the monitoring network will be included in future revisions of the GMMP (EMM 2017d).

Ongoing or ad-hoc monitoring of individual landholder bores may also be undertaken as part of the make good agreements, if negotiated with the relevant landholders. Provision and installation of meters on impacted landholder bores may also be considered within the individual make good agreements.

4.3 Field assessments

Field assessments of the individual impacted bores are required to verify the results of the preliminary make good assessment presented in Chapter 3.

The individual field assessments are an important step to assess the current bore condition, confirm accuracy of the information in the database and to collect a water level and quality sample prior to potentially being impacted by the project. The inspection will record the total depth of the bore, a measurement of the standing water level or a pumping water level, coordinates, condition, use of the bore, and whether a pump is installed and to what depth, where possible. A field assessment template is included in Appendix C.

The collected information would be used as a measure of security for both bore owners and Hume Coal through understanding the current bore condition and providing a reference point for comparison with subsequent bore assessments. The verified bore data will also be included in re-calibration runs of the groundwater flow model.

Field assessments will be the basis of negotiations of make good agreements and will provide vital information if a compensation or impact dispute arises.

All landholders with bores that were deemed to experience a drawdown in excess of 2 m for the EIS were contacted via individual letters. Individuals were encouraged to provide information to Hume Coal on their bore, and also have their bore inspected. Reluctance for some landholders to engage directly with Hume Coal means that limited direct consultation and field inspection of bores has been able to be undertaken to date. However, Hume Coal is committed to their approach. Attempts to complete field inspections and one-on-one consultation with landholders will be adapted considering the results of this current assessment.

Prior to commencement of mining, Hume Coal will aim to complete a field inspection on all bores predicted to be impacted during Stage 1 (0-5 years of mining) (refer to Figure 4.2). Bores not predicted to be impacted in Stage 1 but are located on the same property as a Stage 1 bore can also have their field assessment completed earlier than their scheduled stage. Individual details related to the Stage 1 make good bores are provided in Appendix D.

Field assessments of the remaining make good bores (bores within Stages 2 – 6) will be completed 3-5 years prior to commencement of their relevant stage (Table 4.1). It is Hume Coal's intent that the field assessments are completed within the first three years of the previous stage to ensure the affected landholder has at least two years for the consultation (assessment, negotiation and agreement) process. As such, the list of bores for the subsequent stage will be reviewed and potentially updated if warranted following model verification (ie using actual data collected as mining progresses). Model verification is proposed to be completed at 12 monthly intervals for the first 10 years of mining, after which time, model verification is proposed to occur at 2 yearly intervals until mining ceases, with recalibration as required.

For example:

- Stage 1 bores will be scheduled to undergo field assessments prior to commencement of mining.
- Stage 2 bores will be scheduled to undergo field assessments after the first year or two of mining.
- Stage 3 bores will be scheduled to undergo field assessments around year six to year eight of mining.
- (and so on, for the remaining stages).

4.4 Consultation

4.4.1 Initial consultation

Consultation by Hume Coal to assess landholder bores commenced in late 2016 and is still in progress. To date, the make good consultation has comprised:

- 148 letters - two rounds of individual letters to all individuals identified as being impacted by more than 2m in the EIS model (January 2017 and May 2017), and additional ad hoc letters;
- 43 emails for various enquiries;
- 75 phone calls;
- 9 meetings;
- 2 media releases;
- summary project document releases;
- fact sheet releases;
- updates to the Hume coal website; and
- use of social network services (ie Facebook).

Recent modelling efforts, completed for the project's response to submissions, have identified 94 impacted bores, as opposed to 93 bores identified in the EIS. Thus, further consultation efforts are on-going, with the 20 new landholders that were not originally consulted.

The make good assessment considers the predicted drawdown at registered bores identified within the DPI Water database only. All bores drilled must be registered and approved as a legal requirement under the *NSW Water Act 1912*. Under the WMA 2000, to drill and use water supply bores requires a Water supply work and use approval and, depending on the intended use, may also require a Water Access Licence. Once a water supply bore is drilled (under both the *NSW Water Act 1912* and the WMA 2000) it is a requirement to submit the drilling details (via the driller's Form A) to DI Water so they can be registered.

It is possible bores may have been drilled without the correct water licence or approval, and/or without submitting the required Form A; any such unregistered and unapproved bores could not be considered in this assessment. Unregistered bores can be added to the make good assessment if requested by the landholder.

4.4.2 Current and ongoing consultation

As described above in section 2.1.1, the groundwater model reported in the EIS was later revised in response to submissions received during exhibition. As a result of these revisions, 21 additional bores were identified as being affected of 2m or greater, whilst 20 of the original bores identified in the EIS will no longer require 'make good' measures. For all landowners impacted, new and existing, Hume Coal will continue to work with each landowner for each of the predicted affected bores.

As a result of these model changes, there are now 94 bores predicted to be affected as opposed to 93 bores, across 72 properties as described in the EIS. Additionally, Hume Coal will be consulting with those new landholders of the 21 included affected bores that were not consulted during exhibition.

Prior to the release of the response to submission document, letters were sent to all landholders including those who were initially identified in the EIS, explaining that as part of the process of responding to submissions that revisions of the groundwater model were undertaken and that their bore(s) are predicted to be one of the following: the predicted affect is unchanged; no longer affected; or newly affected.

The letters also comprised the following, based on the type of impact, including:

- Factsheets on the updated groundwater modelling and groundwater take;
- Information on the proposed impacts to the licensed groundwater bore/s;
- Potential make good options;
- Sample bore baseline assessment form;
- Copy of the NSW Government's Aquifer Interference Policy; and
- Copies of the Aquifer Interference Policy fact sheets.

Offer of a meeting was detailed in each letter to discuss the project, impact on individual bore/s and make good options based on the impact. The option to contact Hume Coal was also offered, even if the landholder is no longer impacted. Contact details were included in the letter including contact phone number, office address, mailing address and email address.

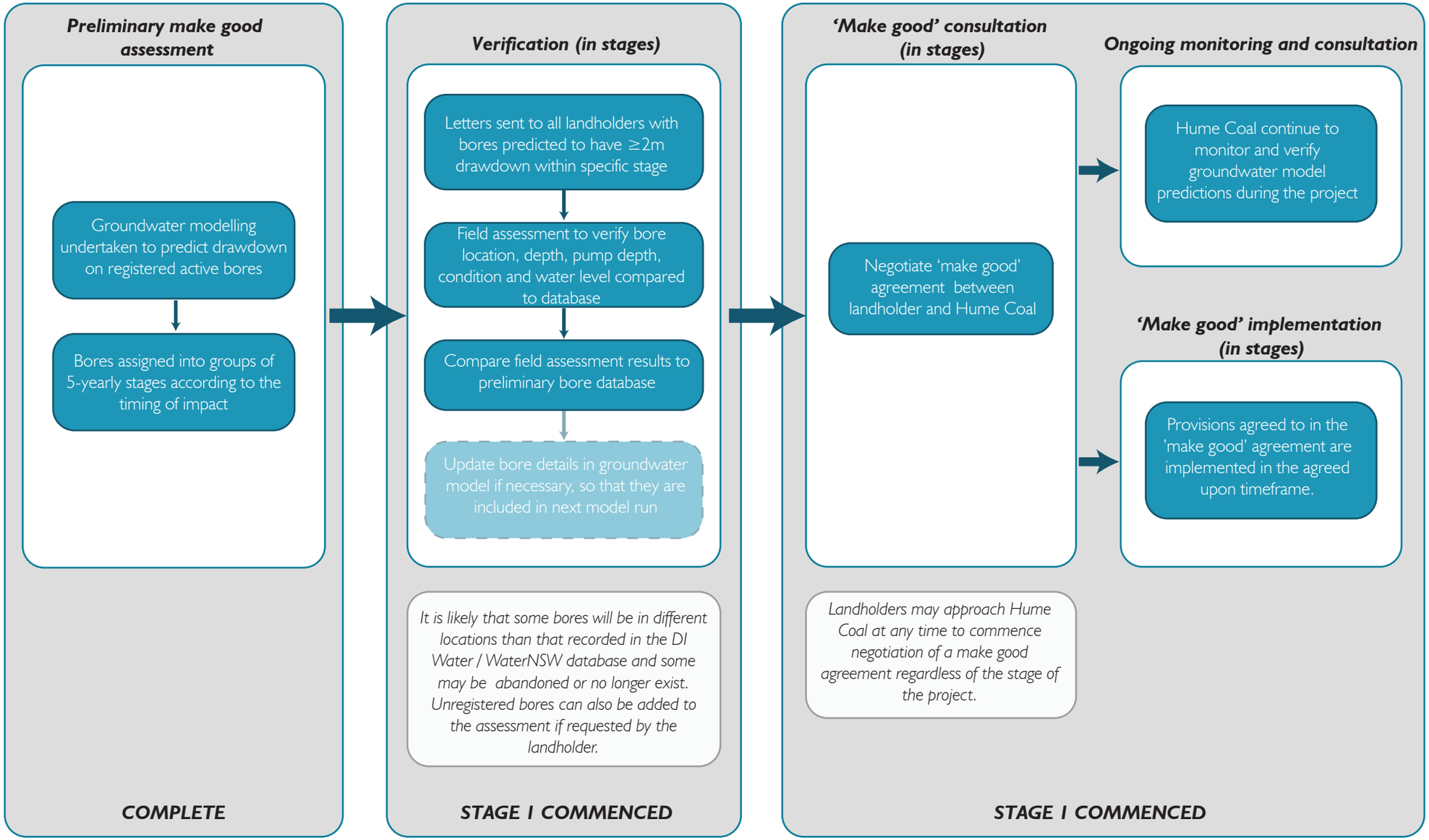
In order to better understand each individual bore, Hume Coal will continue to request access from the landholder's to undertake a baseline bore assessment.

As mentioned above, fact sheets have been produced addressing groundwater modelling and take and are available for the community to access via the Hume Coal website, via email, at the Berrima Community Shop and via post if requested.

Predicted impacts on landholder bores will be confirmed via monitoring of these individual bores, or, where not possible (ie permission not granted), via installation of dedicated monitoring bore(s) within proximity to landholder bores.

Hume Coal is open to consultation and negotiation of make good agreements with any landholder who owns a bore potentially affected by the project. This process can be initiated by any landowner at any time, regardless of when and in which stage their bore is predicted to be impacted.

Figure 4.6 outlines the proposed consultation process.



EMM HUMECOAL PROJECT

Make good consultation process

Hume Coal Project

Make Good Strategy - Response to Submissions

Figure 4.6

4.5 Make good agreements

It is anticipated that legally binding make good agreements will be negotiated between Hume Coal and all affected landholders. These agreements will include specific make good measures and outline a timeframe of commitments. Negotiations will be made on a case-by-case basis.

Hume Coal will continue to monitor groundwater levels in dedicated monitoring bores and verify the numerical groundwater model as mining progresses. This will allow the accuracy of drawdown predictions at landholder bores to be monitored and assessed over time.

If calibration of the model is required, and the drawdown predictions on the bores are revised, then a new make good strategy may be required and the make good agreements can be re-negotiated.

As previously addressed, the make good options proposed in the preliminary assessment may not be feasible following the results of the field assessment. For example, the pump may already be installed at maximum depth and cannot be lowered further to maintain supply, or the landholder may have a preference for an alternate supply of water as opposed to a replacement bore. In such cases, additional strategies are therefore available to be negotiated at the time of consultation with each landholder.

Flexibility in the make good process is required in order to achieve appropriate make good provisions (ie ongoing water supply for all landholders).

The following sections briefly discuss specific concerns that could be managed as part of the individual make good agreements consultation process.

4.5.1 Bore maintenance

It is acknowledged that physical adjustments to existing bores may require additional maintenance. For example, a higher rate of iron encrustation of bores may occur. Iron encrustation can occur due to naturally elevated iron levels in the groundwater system coming in contact with air inside a bore and can affect the yield and water quality of the bore. An increase of airspace within the bore, following drawdown of the water level, may result in additional iron encrustation within the bore.

Provisions for cleaning and managing encrustation in bores that are drawn down significantly and other additional maintenance activities, where applicable, will be outlined in the individual make good agreements.

4.5.2 Yield loss

Relocating a bore may incur changes to individual bore yield, which will be measured and considered during drilling. A possible strategy to manage lower bore yield observed during drilling of the replacement bore may be to construct a larger diameter bore, or to construct two bores to replace the original one.

4.5.3 Changes in water quality

Groundwater quality is typically uniform within the Hawkesbury Sandstone and the Wongawilli Coal seam and thus changes to groundwater quality in terms of applicable beneficial use are not envisaged either as a direct result of the project (refer to the Revised Water Assessment (EMM 2018) or as a result of make good provisions, such as replacing a bore. Should a bore be re-drilled and constructed into, or through, the deeper underlying Illawarra Coal Measures, then the groundwater quality will be tested. If the beneficial use class of the bore is not maintained, options for this to be rectified will be investigated (and may include dilution with other water supplies, or on-site treatment).

As discussed in Chapter 2.2.2, geochemical modelling completed for the project have predicted there will be no notable water quality changes to landholder bores from the mine's operation. Regardless, Hume Coal is committed to monitoring groundwater quality within various aquifers in the vicinity of the mine footprint (and outside) as part of the project's ongoing groundwater monitoring program.

If notable water quality changes are observed, in that the beneficial use in the aquifer or the bore is compromised, additional sampling and investigations will be conducted to determine the cause of the change and to confirm whether the change will prevent the long-term viability of the impacted aquifer and/or bore. If it is found the long-term viability of the water supply is compromised as a result of the project then make good obligations will be required to be negotiated and implemented.

4.5.4 Water storage

While it is not a preferred make good option (especially for large licence holders), the provision of additional water source may be negotiated in some landholder agreements. The preliminary make good assessment identified potentially suitable options that do not require importing surface water to individual properties.

However, if actioned, this option could include provision of the additional on-site storage and infrastructure.

4.5.5 Make good contracts

Specific details regarding contracts, logistics and timing of works and contracts will be discussed with individual landholders. This is to be negotiated as part of the make good agreement process and will incorporate the landholders' individual preferences.

4.5.6 Deepening of bores

The AIP Fact Sheet 4 (DPI Water 2013) suggests that a possible make good provision to be considered is the deepening of an existing bore.

Hume Coal acknowledges that it may not be physically possible to deepen (ie within the existing bore) for many bores for various reasons, such as the original hole not being straight/vertical, partial or full collapse of the bore, risks of losing the bore drill stem, or rusted casing at the surface. These reasons may not become apparent until deepening is attempted.

In these instances, Hume Coal's preference will be to provide a new, deeper bore adjacent to the existing bore, rather than attempt to deepen the existing bore. This alternative may provide a more pragmatic simple and more cost effective solution to deepening the existing bore.

4.6 Status reports

Nearing the end of each Stage (during year 4), a make good status report will be prepared. The purpose of these reports will be to:

- summarise Hume Coal monitoring bore data and make good bore field assessment and monitoring results;
- compare actual (measured) and predicted water declines;
- present the most recent model results and drawdown predictions;

- comment on progress and success of make good arrangements (ie number of agreements; and
- update the list of predicted bores for the upcoming stages and proposed make good provisions.

Model verification is proposed annually for the first 10 years of mining (annually during Stage 1 and Stage 2). If calibration is required, and the drawdown predictions on the make good bores adjusted, then an alternative make good strategy may be required, which will be discussed and justified within the report. The make good status report will comment on the suitability of the strategies employed and whether they remain appropriate.

4.7 Dispute resolution

The make good agreements are a negotiated outcome between Hume Coal and the impacted bore owner. The potential areas of likely dispute include:

- landholder refusing access for initial or future assessment of bore condition (field investigation);
- landholder refusing to discuss options or to enter into an agreement;
- misaligned expectations of compensation or make good suggestions; and
- disagreement on results of the field investigation.

The AIP assumes that an outcome can be reached but it does not outline dispute resolution mechanisms. Hume Coal assumes that the process for resolving disputes will include negotiations to achieve a make good agreement that is satisfactory and agreed to by both parties.

The NSW Department of Planning and Environment (DRE 2018) maintain that the vast majority of relationships between explorers (ie resource companies) in NSW and landholders are positive, and that very few progress to mediation, arbitration and to the courts. However, should they arise, Hume Coal propose to follow the formal dispute resolution pathway outlined for the NSW Land Access Arbitration Framework (DRE 2018):

- notice of intent (as outlined in Chapter 4.4);
- negotiation (as outlined in Chapter 4.5);
- mediation (if no agreement was reached through negotiation);
- arbitration (if no agreement was reached through mediation); and
- the NSW Land and Environment Court (if the final arbitration determination is appealed).

As discussed in Chapter 4.4, Hume has been proactive in their efforts to notify landholders of the impacts predicted at their bores. There has been reluctance by some landholders to enter into make good negotiations with Hume Coal and this is likely be due to perceived project uncertainty in the minds of some community members.

Project approval will provide a higher level of certainty to the community, and therefore, it is assumed, an increased willingness from landholders to enter into make good contract agreements with Hume Coal will follow. Perceived uncertainty is a known reason for reluctance to make decisions or enter into negotiations with regard to decisions (Duncan et al. 2007).

Negotiation with landholders will be undertaken and options discussed in conjunction with the field assessments. This will then be followed by more formal contracts for make good agreements with financial and logistical details and timing for works identified. Hume Coal will aim to complete a field inspection on all bores predicted to be impacted during Stage 1 (0-5 years of mining) following the EIS approval and prior to commencement of mining. Negotiations and contract agreements will then follow, with the stage 1 landholder contacts to be formalised and agreed upon prior to mining commencing. Hume Coal consider that one project approval is imminent or granted, landholders will be more forthcoming without the need for lengthy dispute resolution processes.

The formal dispute resolution process may be required if no agreement between Hume and a landholder is in place, or if a dispute occurs following a make good agreement be made (ie a challenge to an existing agreement). These disputes will ideally be resolved through further negotiation, but if unsuccessful, then facilitated mediation.

If negotiation and facilitated mediation are unsuccessful then expert determination or arbitration may be used, in accordance with the NSW DPI Land access arbitration procedures under the Mining Act 1992 and the Petroleum (Onshore) Act 1991). Expert determination is a merit-based determination by an independent party who knows the subject matter. Arbitration is an assessment of the legal facts (ie contract determination) and would be most likely used once an existing contract is in place. The arbitration decision may be appealed in the Land and Environment Court.

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Appendix A

Make good assessment table

Table A.1 Make good assessment table

Make good option	Bore	Above mine or within 14 m?	Total depth (m)	Initial standing water level (m bgl)	Licensed purpose	Project only drawdown - max (m)	Project only time to max drawdown (yrs)	Project time to 2 m drawdown (yrs)	time to recovery (dd<2m) (yr)	Duration of time drawdown exceeds 2 m (yr)	STAGE 1 impact observed <5 years?
1. increased operational costs	GW102775		116	31.60	Domestic, Stock	4.3	22.5	12.5	57.5	45.0	3
	GW109323		132	68.58	Irrigation	5.2	28.0	15.0	71.6	56.5	4
	GW109039		120	46.77	Domestic, Stock	4.5	14.5	13.0	57.5	44.5	3
	GW028832		132	35.97	Irrigation	6.0	21.5	10.0	59.5	49.5	3
	GW102589		139	65.08	Domestic, Stock	2.1	30.5	25.0	35.0	10.0	6
	GW102705		150	44.54	Domestic, Stock	2.4	30.5	21.5	42.5	21.0	5
	GW113046		120	53.01	Domestic, Stock	2.1	30.5	24.5	36.5	12.0	5
	GW104684		156	67.08	Domestic, Stock	2.6	30.0	21.0	49.5	28.5	5
	GW106958		168	88.90	Domestic, Stock	3.0	25.0	15.0	47.5	32.5	4
	GW104728		79	26.85	Domestic, Stock	4.0	24.0	12.5	55.5	43.0	3
	GW104404		159	97.59	Domestic, Stock	3.1	24.5	14.0	45.5	31.5	3
	GW104213		144	40.57	Domestic, Stock	3.8	24.5	12.5	56.5	44.0	3
	GW102269		97	41.43	Domestic, Stock	2.1	31.5	25.0	38.0	13.0	6
	GW104110		140	65.92	Domestic, Stock	2.1	27.0	25.0	32.0	7.0	6
	GW102777		103	51.41	Domestic, Stock	3.5	32.0	16.5	65.5	49.0	4
	GW111795		156	59.21	Domestic, Stock	2.7	31.5	20.0	58.5	38.5	5
	GW102694		169	102.02	Irrigation	1.9	44.5	44.5	44.5	0.5	6
	GW104727		175	101.96	Domestic, Stock	3.3	34.0	18.5	65.5	47.0	4
	GW103326 *		90	30.96	Domestic, Stock	2.0	30.5	30.5	30.5	0.5	6
	GW106906		150	50.32	Irrigation	2.3	29.5	23.0	44.5	21.5	5
	GW060125		107	20.25	Domestic, Irrigation, Stock	8.1	19.5	7.0	51.5	44.5	2
	GW106855		146	41.74	Domestic, Stock	2.8	29.0	16.5	52.5	36.0	4
	GW047076		89.9	44.81	Domestic, Irrigation, Stock	2.2	29.5	27.0	37.5	10.5	6
	GW053801		99.1	45.40	Domestic, Irrigation, Stock	4.5	21.0	15.0	51.5	36.5	4
	GW057683		61	10.54	Domestic, Stock	4.2	19.0	6.5	30.5	24.0	2
	GW106589		120	49.04	Stock	2.4	22.5	15.0	29.5	14.5	4
	GW105989		150	64.51	Domestic, Stock	2.3	25.5	19.5	36.5	17.0	4
	GW106517		144	67.82	Irrigation	3.3	25.0	13.5	54.5	41.0	3
	GW102950 *		70	10.54	Domestic, Stock	4.2	19.0	6.5	30.5	24.0	2
	GW102371		162	82.84	Domestic, Irrigation, Stock	2.5	27.0	19.0	42.5	23.5	4
	GW047443		67.1	30.96	Domestic, Irrigation, Stock	2.0	30.5	30.5	30.5	0.5	6

Table A.1 Make good assessment table

Make good option	Bore	Above mine or within 14 m?	Total depth (m)	Initial standing water level (m bgl)	Licensed purpose	Project only drawdown - max (m)	Project only time to max drawdown (yrs)	Project time to 2 m drawdown (yrs)	time to recovery (dd<2m) (yr)	Duration of time drawdown exceeds 2 m (yr)	STAGE 1 impact observed <5 years?
2. deepen pump	GW105079		114	57.77	Domestic, Stock	6.4	18.5	11.5	61.5	50.0	3
	GW102916	yes	108	36.00	Domestic, Irrigation, Stock	12.2	18.5	8.5	63.5	55.0	2
	GW100147	yes	80	47.13	Domestic, Stock	8.3	16.5	10.5	63.5	53.0	3
	GW100153	yes	85	47.39	Domestic, Stock	8.7	18.5	10.0	63.5	53.5	3
	GW108825		79	26.29	Domestic, Stock	11.7	18.5	1.5	40.5	39.0	1
	GW105068		91	47.20	Domestic, Stock	5.6	20.5	14.0	65.5	51.5	3
	GW062326		94.5	67.38	Domestic, Irrigation	3.8	27.0	16.0	61.5	45.5	4
	GW108469		114	73.97	Domestic, Stock	2.2	28.5	22.5	37.5	15.0	5
	GW108833		85	45.37	Domestic, Stock	5.5	21.5	13.5	67.5	54.0	3
	GW106718		93	60.20	Domestic, Irrigation, Stock	11.8	22.0	5.0	61.5	56.5	2
	GW111395		121	78.19	Domestic	3.3	32.5	19.0	65.5	46.5	4
	GW111551		78	38.69	Domestic, Stock	8.8	19.5	9.0	61.5	52.5	2
	GW107807	yes	121	59.56	Domestic, Stock	32.4	14.0	11.0	75.6	64.5	3
	GW108004	yes	121	44.45	Domestic, Stock	33.3	14.0	11.5	73.6	62.0	3
	GW109084		139	63.58	Domestic, Stock	15.0	17.5	13.0	69.5	56.5	3
	GW104523		91	48.58	Domestic, Stock	4.9	22.5	14.0	67.5	53.5	3
	GW103597	yes	90	41.27	Domestic, Stock	5.9	19.0	13.5	63.5	50.0	3
	GW104526		61	33.78	Domestic, Stock	2.8	30.0	20.0	51.5	31.5	5
	GW103108		114	61.05	Irrigation	6.4	27.0	15.5	69.5	54.0	4
	GW011227		40.3	20.00	Domestic, Irrigation, Stock	6.1	19.5	7.5	45.5	38.0	2
	GW028687		51.8	19.64	Domestic, Irrigation, Stock	9.0	18.5	6.5	51.5	45.0	2
	GW102689	yes	84	46.06	Domestic, Irrigation, Stock	12.1	14.5	9.5	63.5	54.0	2
	GW105396		96	55.90	Domestic, Stock	8.9	17.5	13.5	65.5	52.0	3
	GW104468	yes	103	62.08	Domestic, Stock	12.7	18.5	9.0	63.5	54.5	2
	GW024688	yes	75.2	29.36	Irrigation, stock	16.5	18.5	1.5	52.5	51.0	1
	GW106711		145	84.69	Domestic, Irrigation, Stock	10.7	20.5	8.0	52.5	44.5	2
	GW102713	yes	60	24.07	Domestic, Stock	15.1	18.5	1.5	49.5	48.0	1
	GW049172	yes	70.1	33.74	Domestic, Stock	16.9	18.5	1.0	46.5	45.5	1
	GW071741	yes	85	51.17	Domestic, Stock	11.1	17.5	11.5	59.5	48.0	3
	GW112440	yes	91	47.30	Domestic, Stock	17.3	17.0	10.5	59.5	49.0	3
	GW037851	yes	78.6	41.87	Domestic, Irrigation, Stock	16.5	18.5	1.0	45.5	44.5	1
	GW109918		102	41.60	Domestic, Stock	13.5	18.5	1.0	42.5	41.5	1
	GW054137		46	21.44	Domestic, Stock	4.8	18.5	6.0	32.0	26.0	2

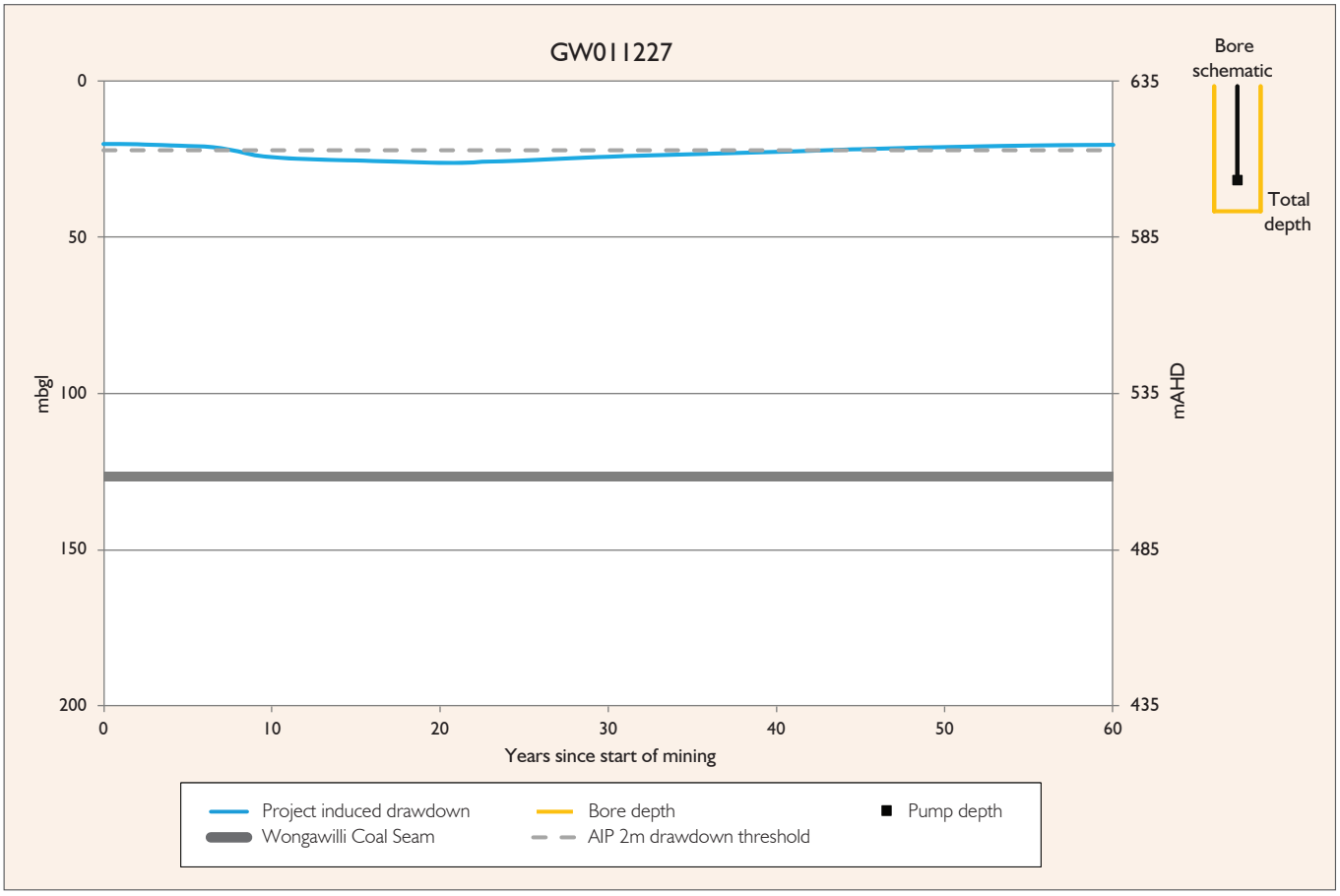
Table A.1 Make good assessment table

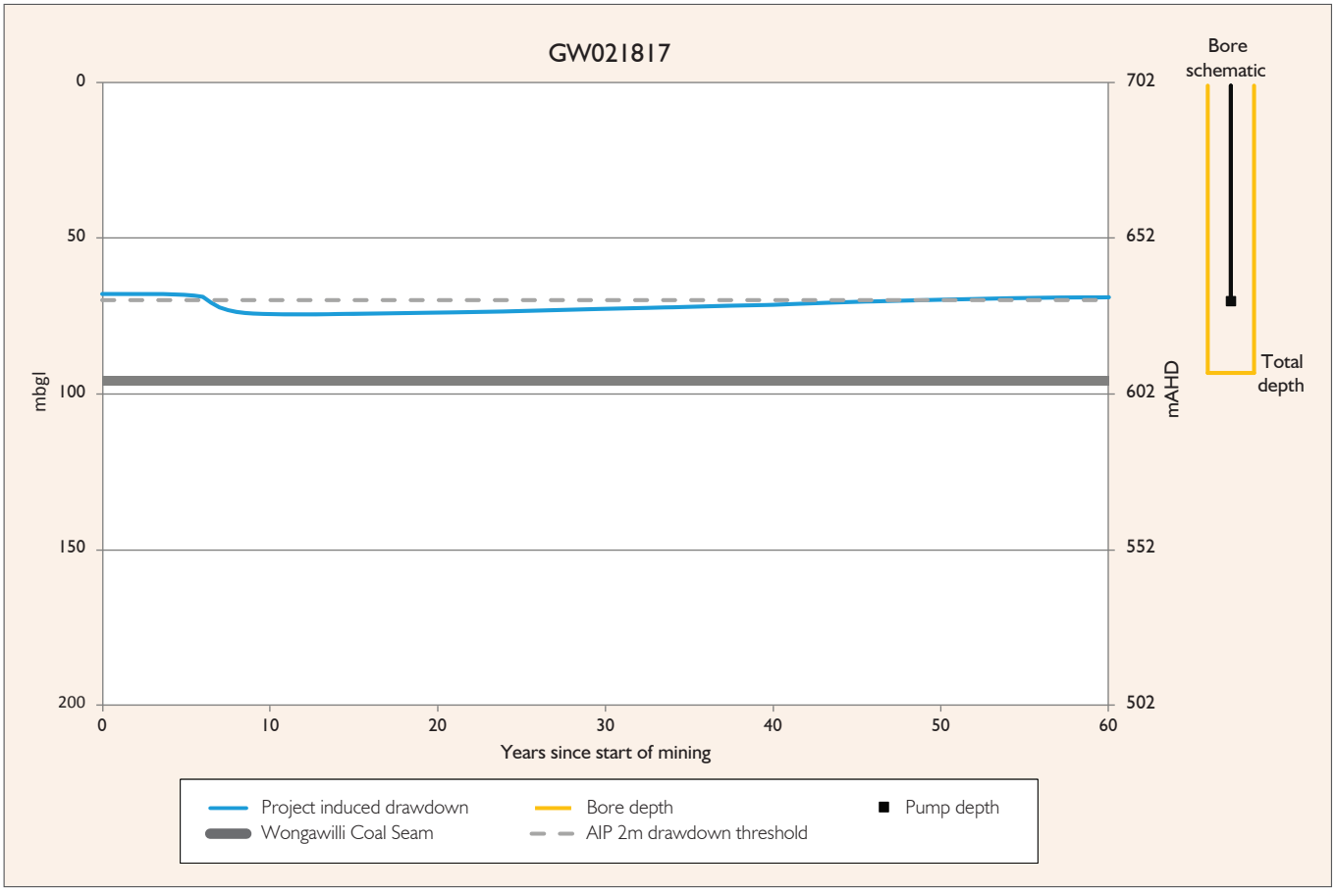
Make good option	Bore	Above mine or within 14 m?	Total depth (m)	Initial standing water level (m bgl)	Licensed purpose	Project only drawdown - max (m)	Project only time to max drawdown (yrs)	Project time to 2 m drawdown (yrs)	time to recovery (dd<2m) (yr)	Duration of time drawdown exceeds 2 m (yr)	STAGE 1 impact observed <5 years?
3a. Replace stock/domestic bore	GW032319		38.1	30.72	Domestic, Stock	10.9	8.5	2.5	44.5	42.0	1
	GW105744		67	52.35	Domestic, Stock	3.6	29.0	16.5	65.5	49.0	4
	GW104421	yes	42	27.01	Domestic, Stock	11.2	9.5	4.0	47.5	43.5	1
	GW057943		25.9	60.87	Domestic, Stock	5.9	23.5	14.5	73.6	59.0	3
	GW104745	yes	130	32.30	Domestic, Stock	46.8	8.5	2.5	51.5	49.0	1
	GW064613	yes	43	35.71	Domestic	17.2	18.5	1.0	46.5	45.5	1
	GW104486	yes	43	35.67	Domestic, Stock	15.5	18.5	7.0	59.5	52.5	2
	GW048345		38.1	29.42	Domestic, Stock	13.1	18.5	6.0	53.5	47.5	2
	GW060067		76	65.50	Domestic, Stock	2.6	39.5	25.5	67.5	42.0	6
	GW052538	yes	88	63.51	Domestic, Stock	13.1	6.5	6.0	43.5	37.5	2
	GW114544		36	73.99	Domestic, Stock	2.6	26.5	17.5	40.5	23.0	4
	GW035590		33.5	43.53	Domestic, Stock	6.6	20.5	12.5	56.5	44.0	3
	GW060199		37	19.13	Domestic, Stock	8.2	20.0	8.5	57.5	49.0	2
	GW107240	yes	42	24.08	Domestic, Stock	8.5	9.0	4.0	41.5	37.5	1
	GW034742		76.2	74.18	Stock	2.3	28.0	21.0	41.5	20.5	5
3b. Replace Irrigation bore	GW102588	yes	88	72.14	Domestic, Irrigation, Stock	5.4	7.5	6.0	31.5	25.5	2
	GW026805		82.9	60.65	Domestic, Irrigation, Stock	6.8	22.0	6.5	57.5	51.0	2
	GW023322	yes	44.8	34.30	Domestic, Irrigation, Stock	19.7	18.5	2.5	55.5	53.0	1
	GW026136	yes	52.7	51.86	Irrigation, stock	21.4	18.0	7.5	52.5	45.0	2
	GW110236	yes	108	36.00	Irrigation, stock	24.8	18.0	4.0	52.5	48.5	1
	GW047157	yes	67.1	48.09	Domestic, Irrigation, Stock	19.2	3.5	1.5	55.5	54.0	1
	GW108195	yes	126	44.90	Irrigation	21.1	18.5	10.5	69.5	59.0	3
	GW108194	yes	121.5	43.79	Irrigation	23.6	18.5	9.0	65.5	56.5	2
	GW072672	yes	122	36.20	Domestic, Irrigation, Stock	12.8	18.5	6.5	59.5	53.0	2
	GW107535	yes	114	51.17	Irrigation	29.1	17.5	7.5	54.5	47.0	2
	GW106710	yes	115	68.09	Domestic, Irrigation, Stock	14.3	18.0	8.0	56.5	48.5	2
	GW102309		67	51.10	Irrigation	3.9	28.0	16.0	67.5	51.5	4
	GW106489	yes	55	31.99	Irrigation	29.9	18.0	1.5	65.5	64.0	1
	GW106491	yes	60	40.20	Irrigation	26.2	18.0	2.0	57.5	55.5	1
	GW021817		92.9	68.50	Domestic, Irrigation, Stock	6.6	11.0	6.0	58.5	52.5	2

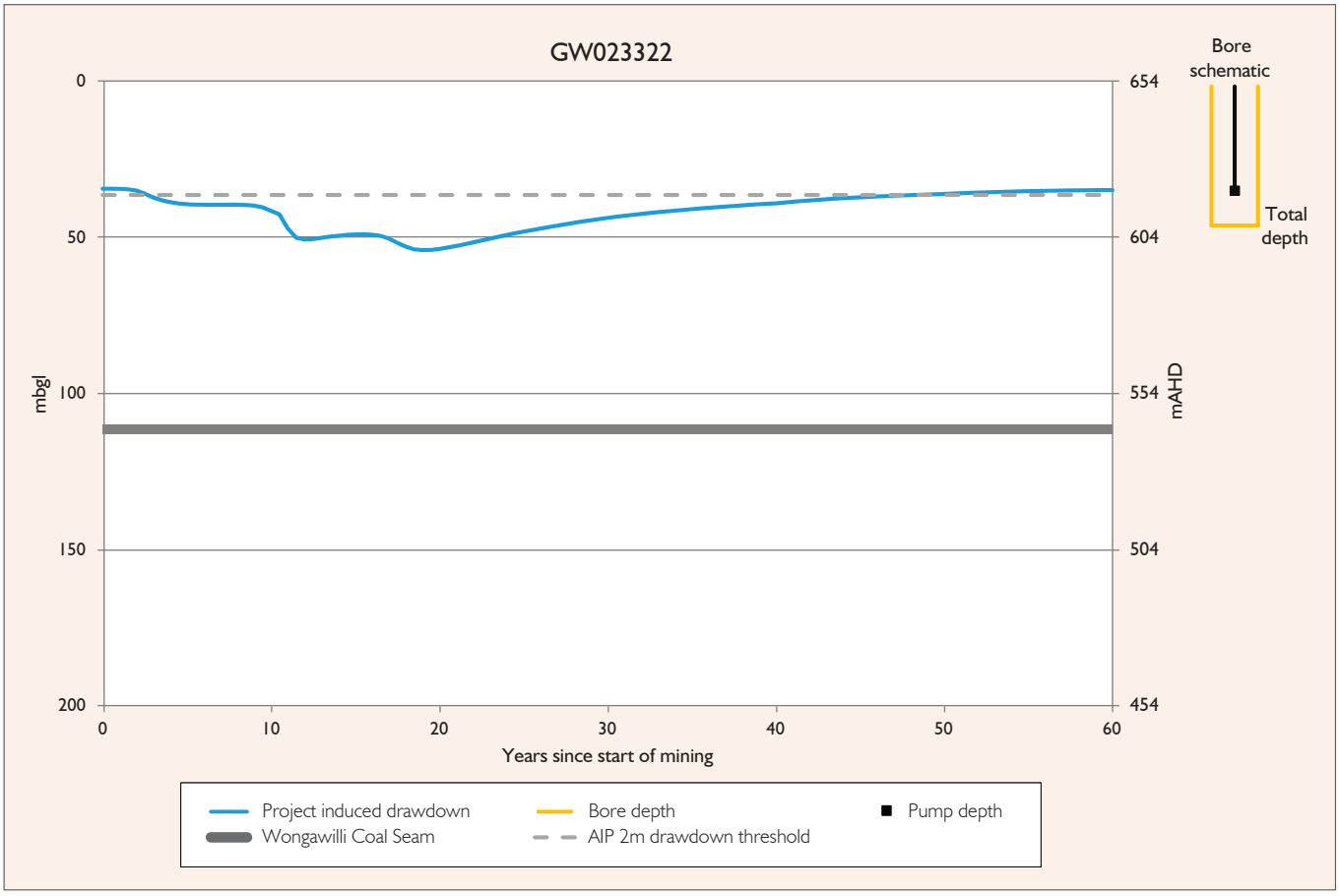
*Notes: * information on the existence of bore received after uncertainty analysis completed. Impacts from nearby similar bores have been used to include these in the make good assessment. (GW102950 – proxy bore GW057683;* GW103326 – proxy bore GW047443

Appendix B

Predicted drawdown hydrographs


GW011227
Bore schematic
Total depth
0
50
100
150
200
mbgl
635
585
535
485
435
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth


GW021817
Bore schematic
Total depth
0
50
100
150
200
mbgl
702
652
602
552
502
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth


GW023322
Bore schematic
Total depth
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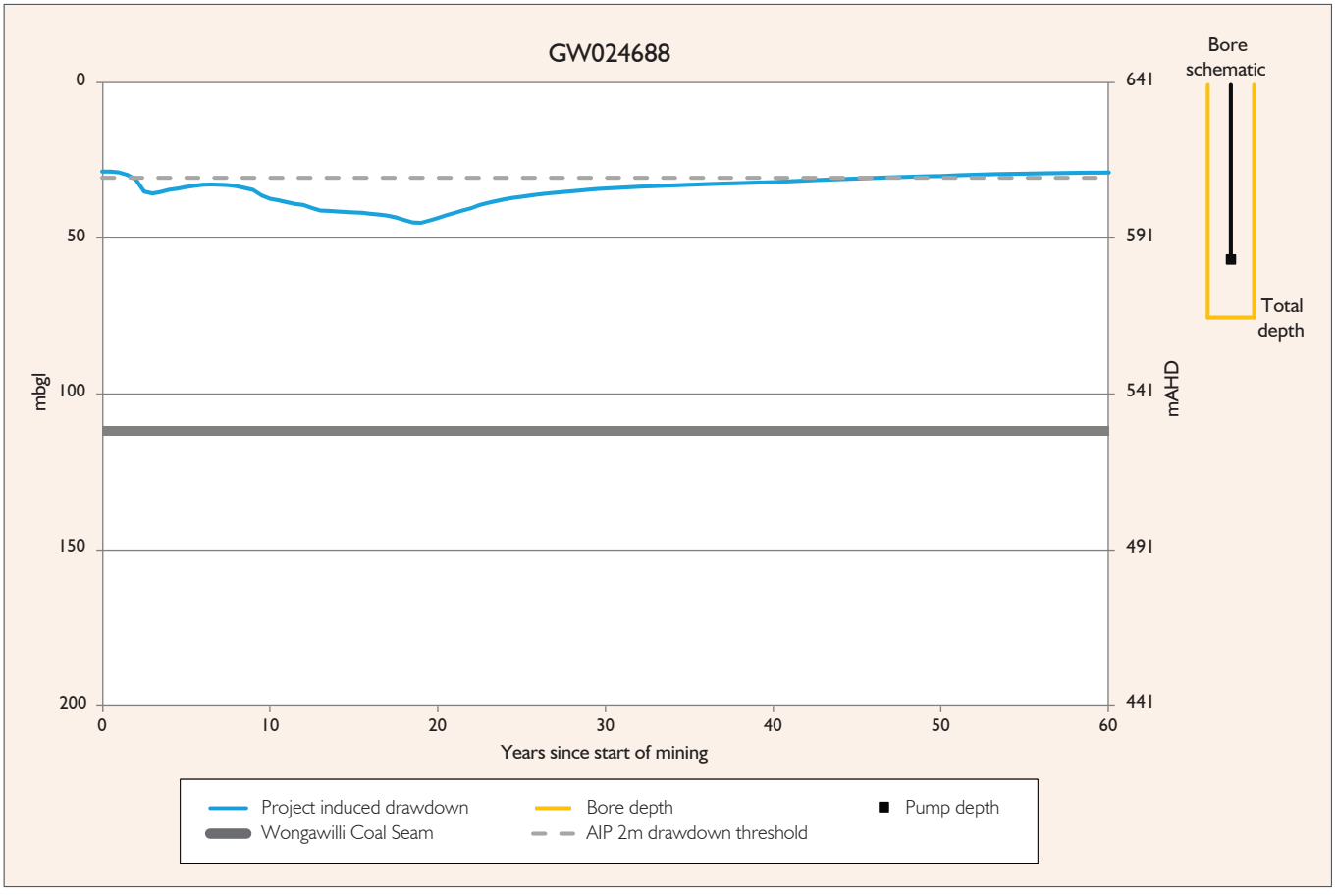
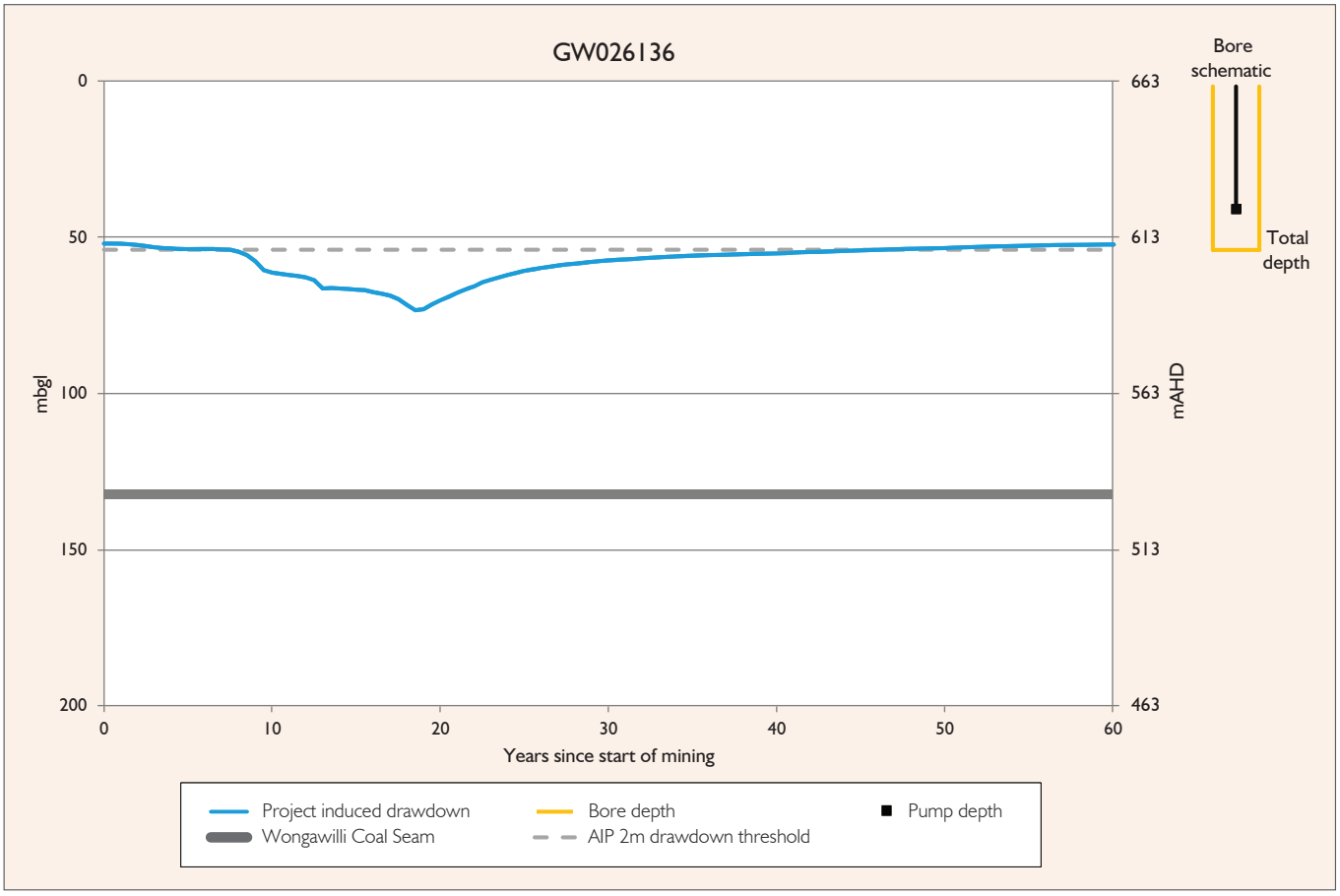
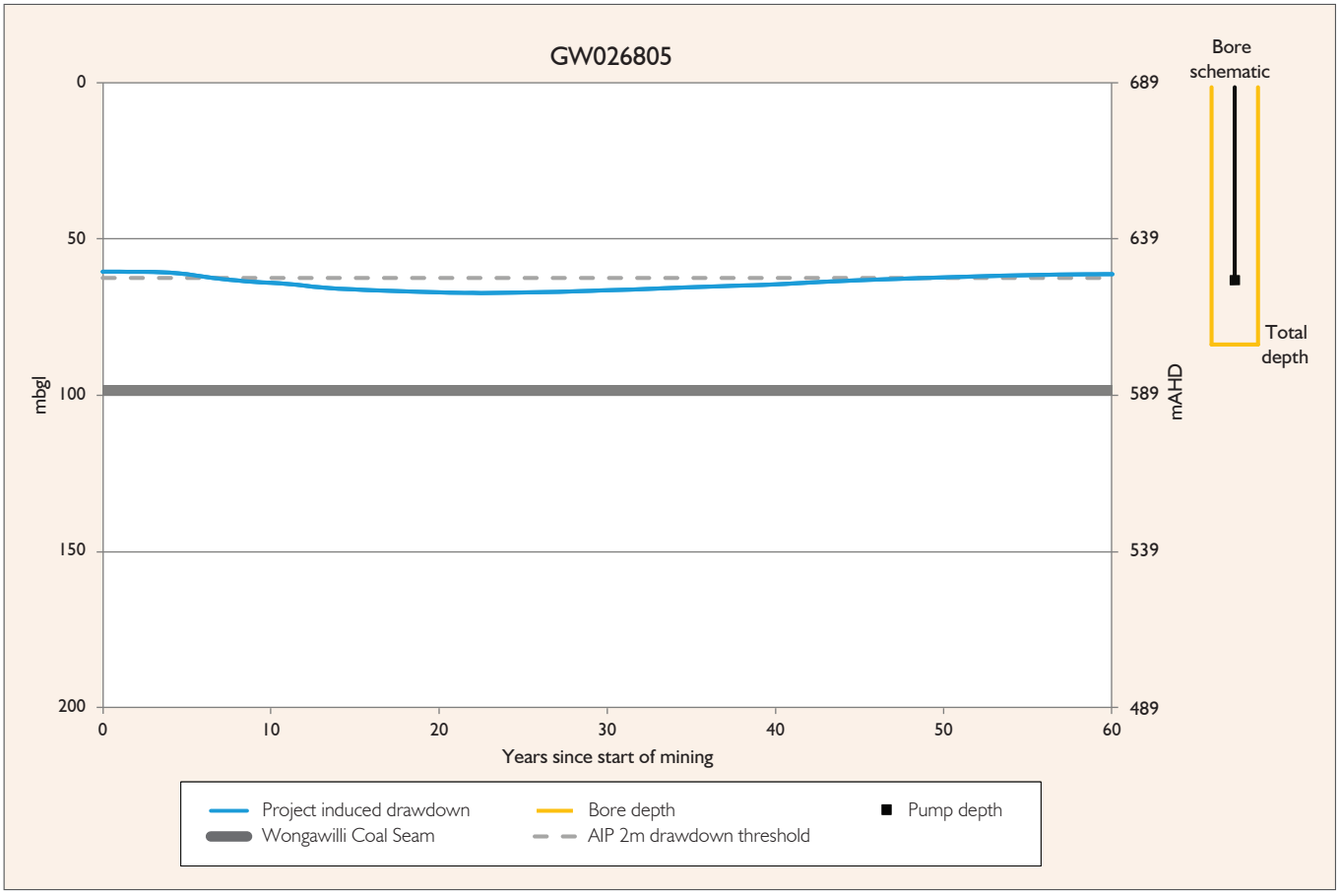
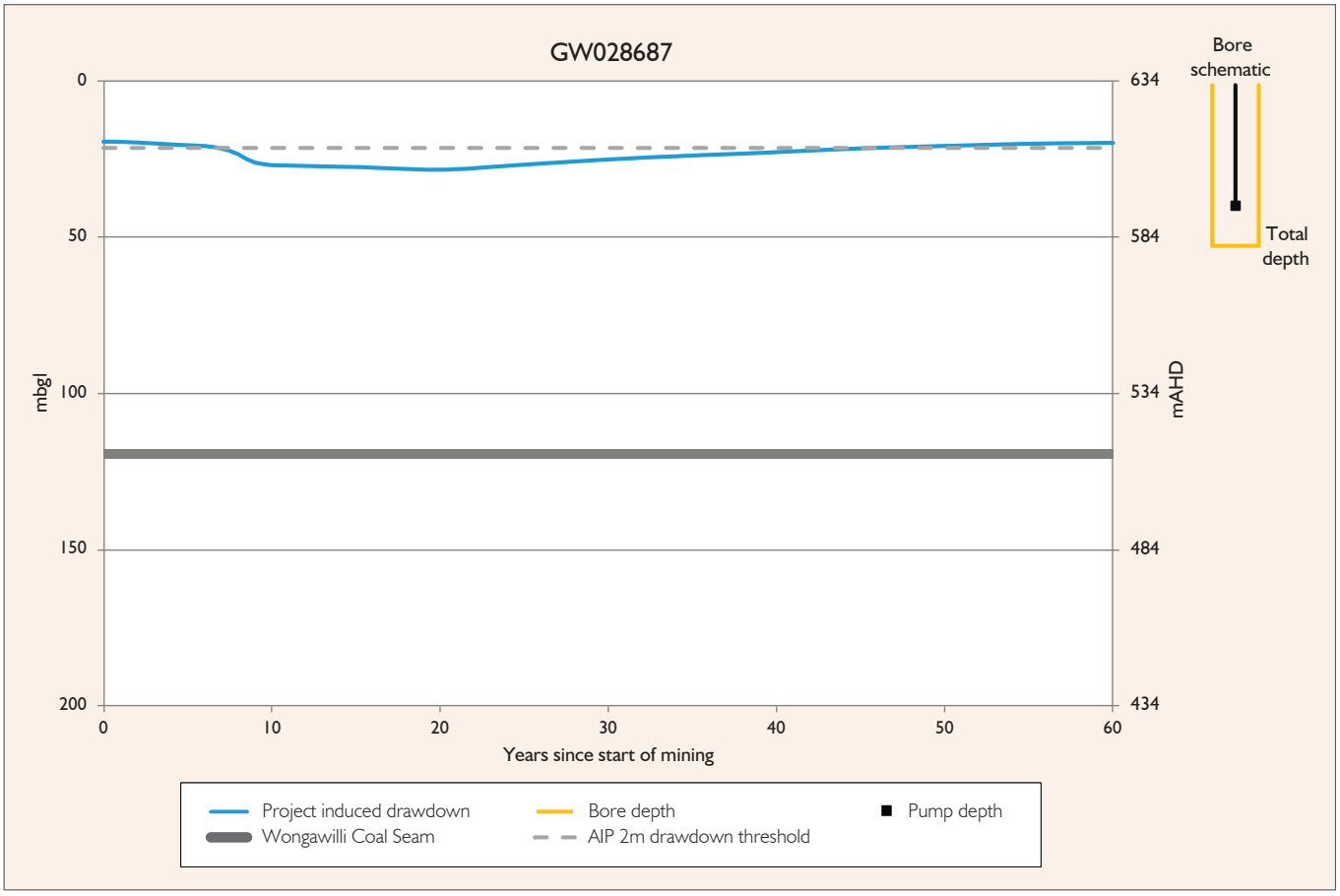
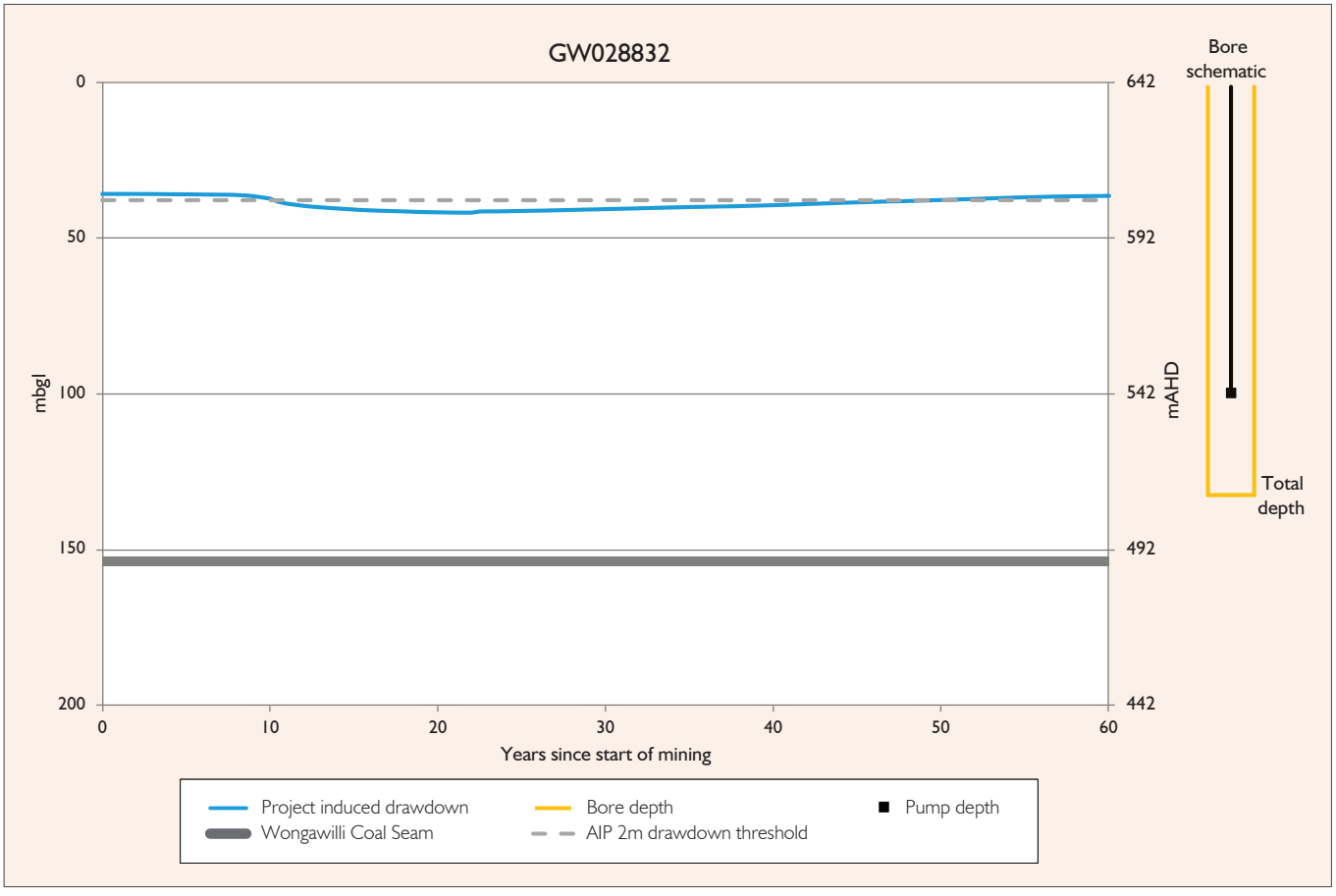
50
100
150
200
654
604
554
504
454
mbgl
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

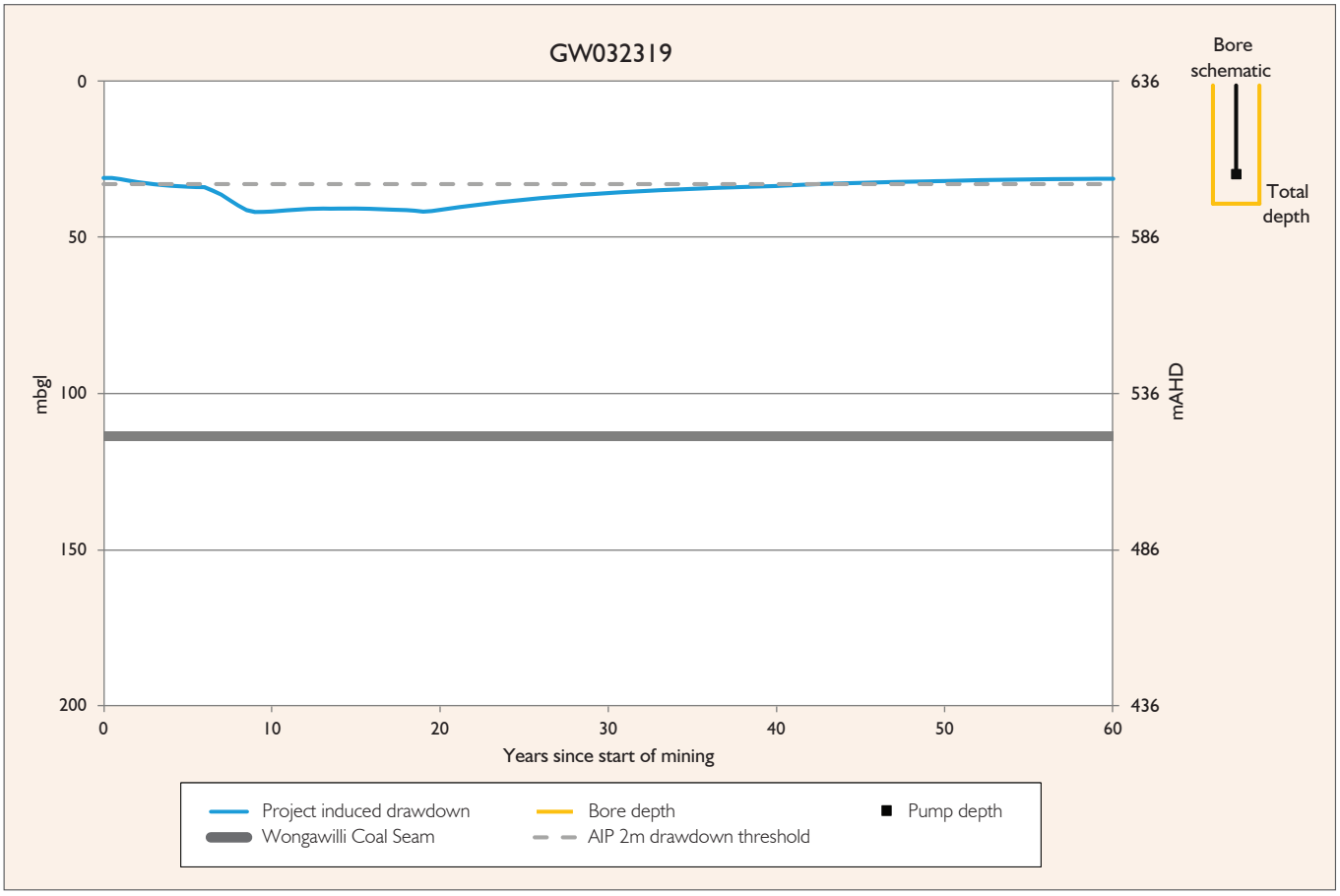

GW024688
Bore schematic
Total depth
0
50
100
150
200
641
591
541
491
441
mbgl
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

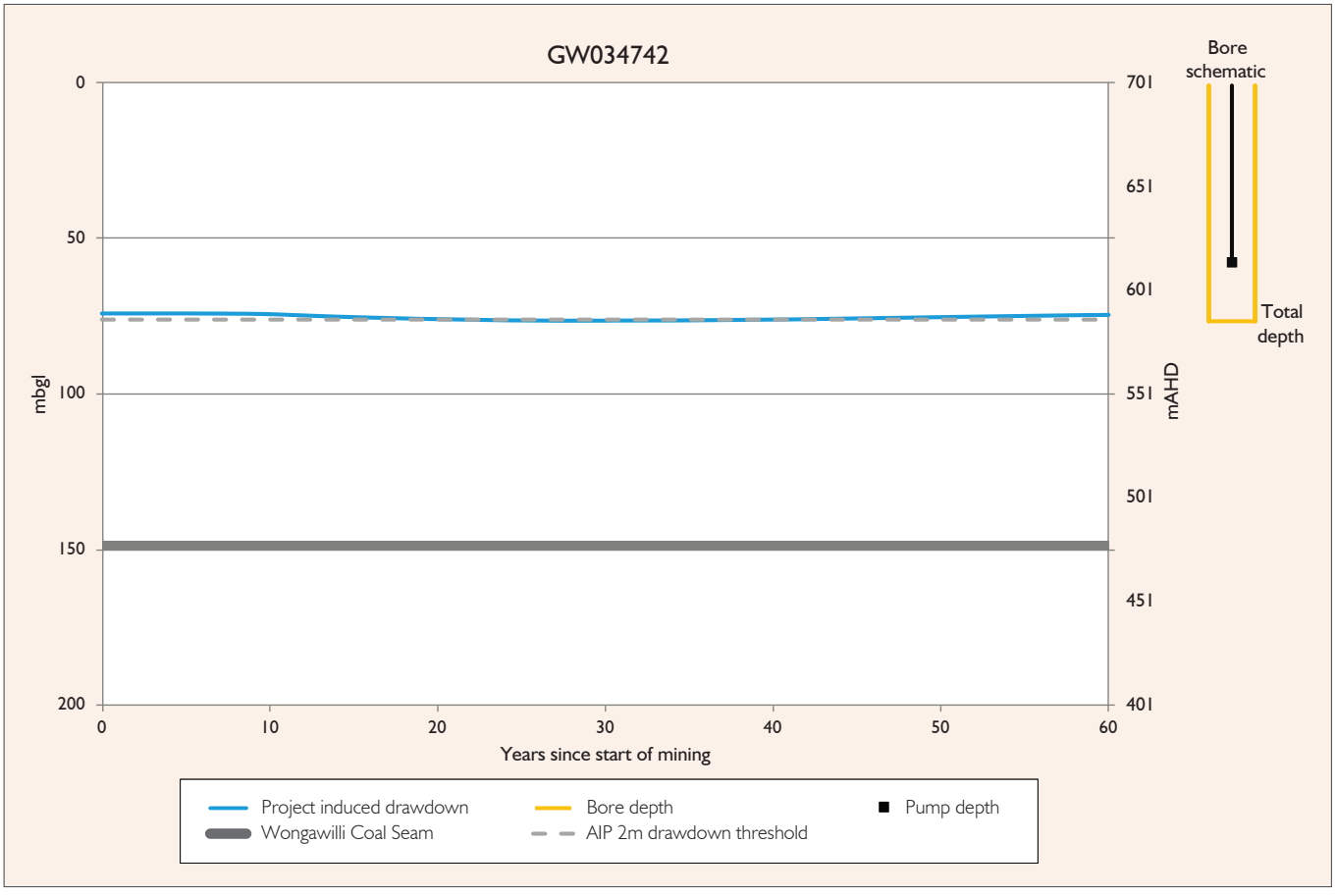

GW026136
Bore schematic
Total depth
0
50
100
150
200
mbgl
663
613
563
513
463
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

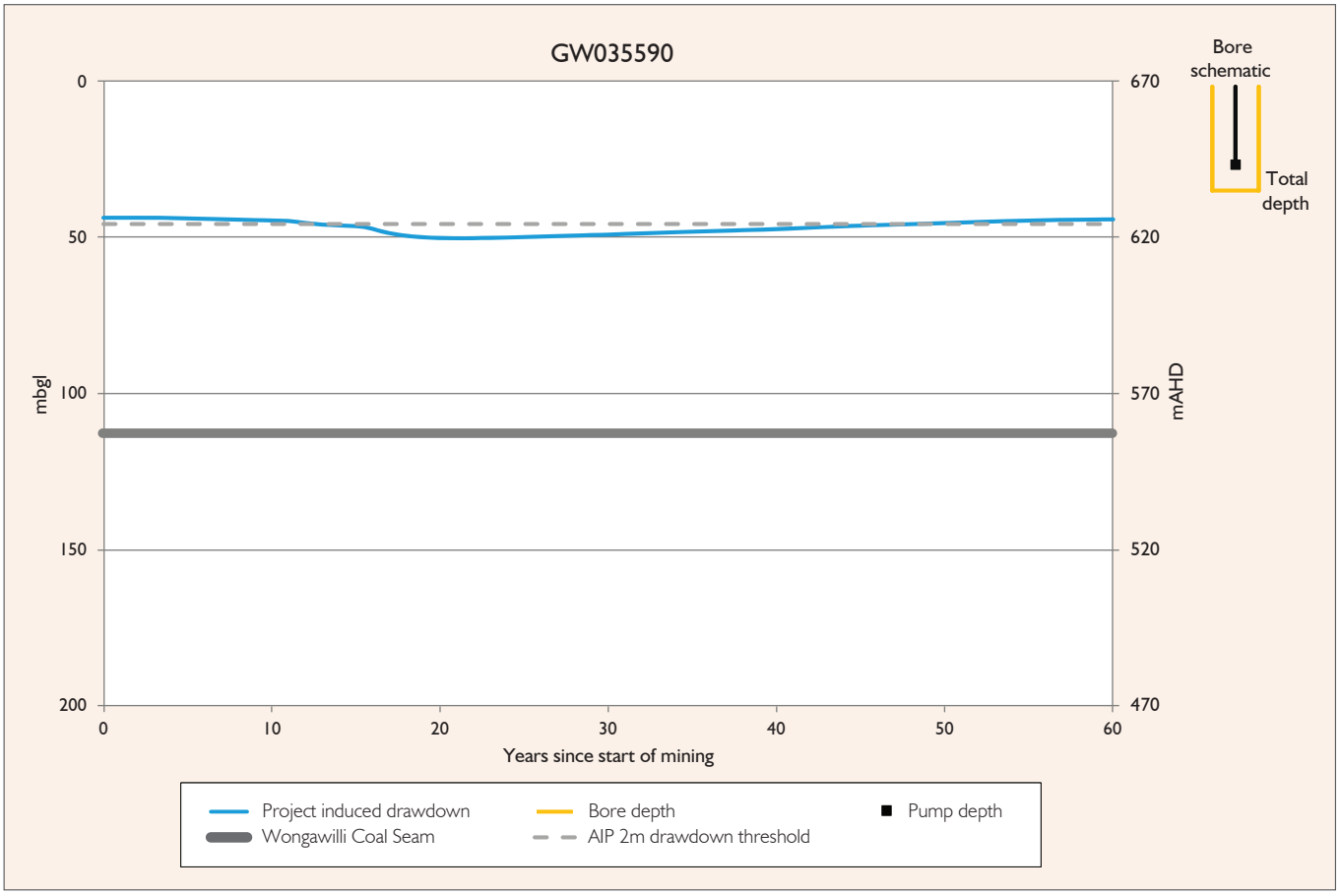

GW026805
Bore schematic
Total depth
0
50
100
150
200
mbgl
689
639
589
539
489
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

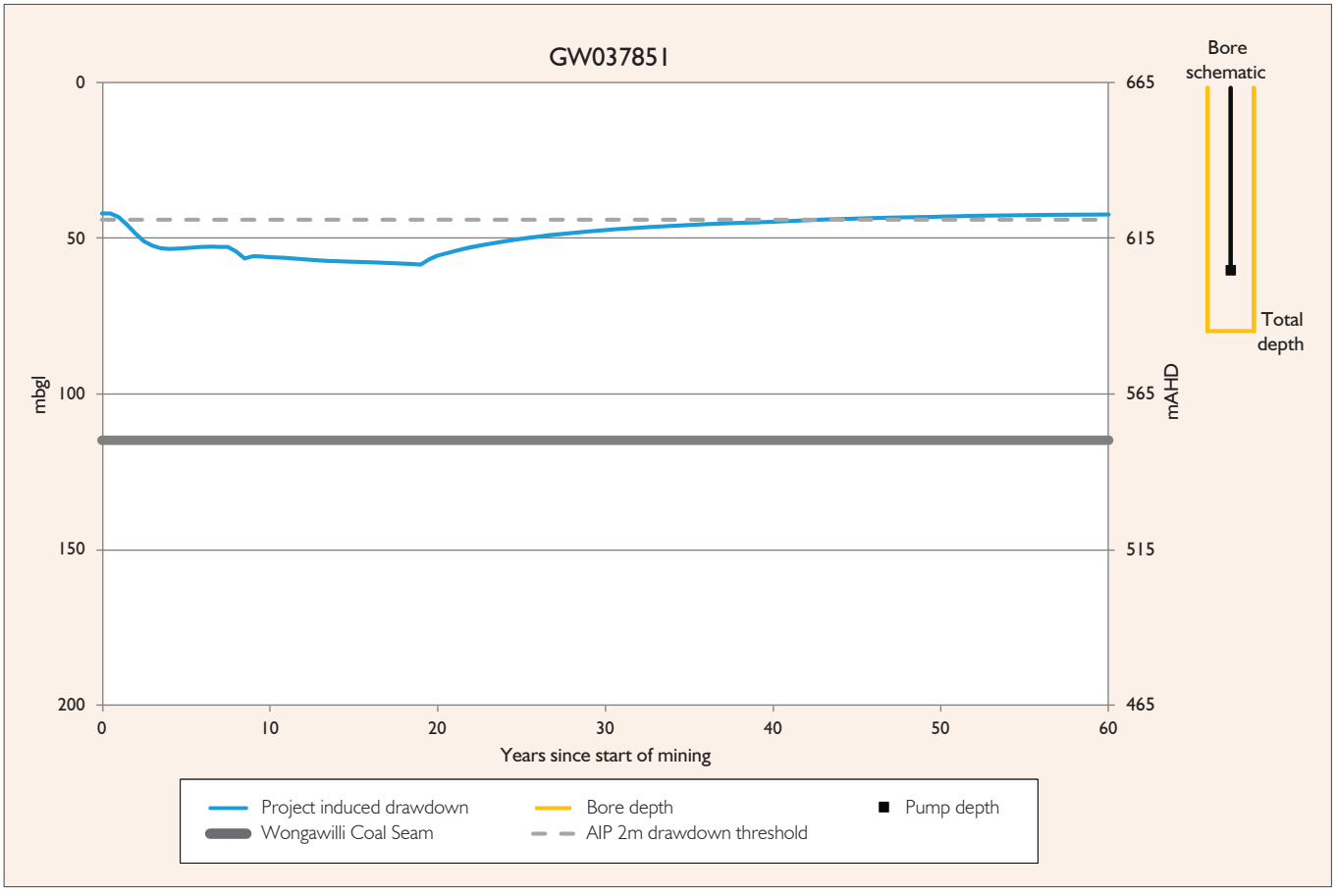

GW028687
Bore schematic
Total depth
mbgl
mAHD
0
50
100
150
200
634
584
534
484
434
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

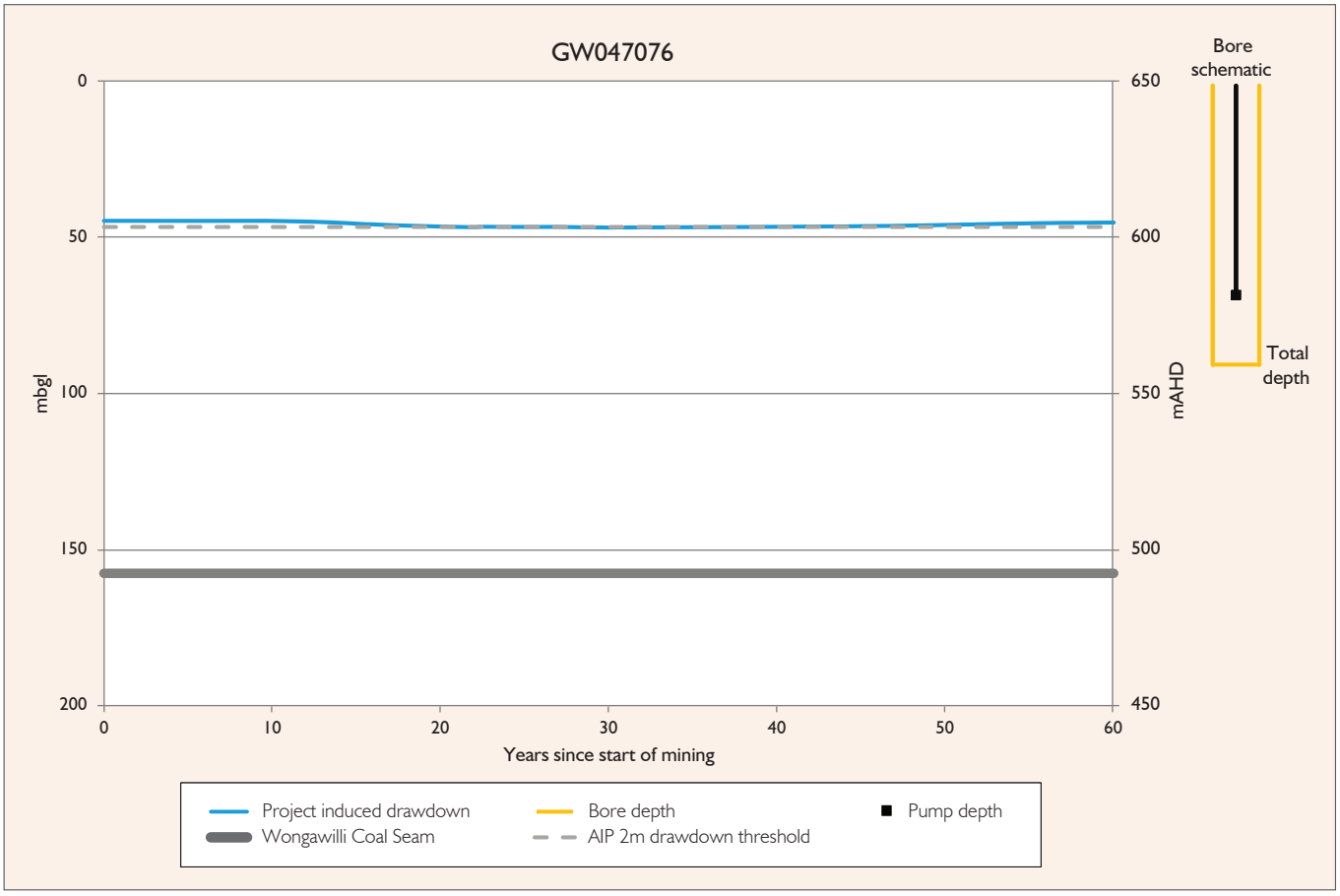

GW028832
Bore schematic
Total depth
mbgl
mAHD
0
50
100
150
200
642
592
542
492
442
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

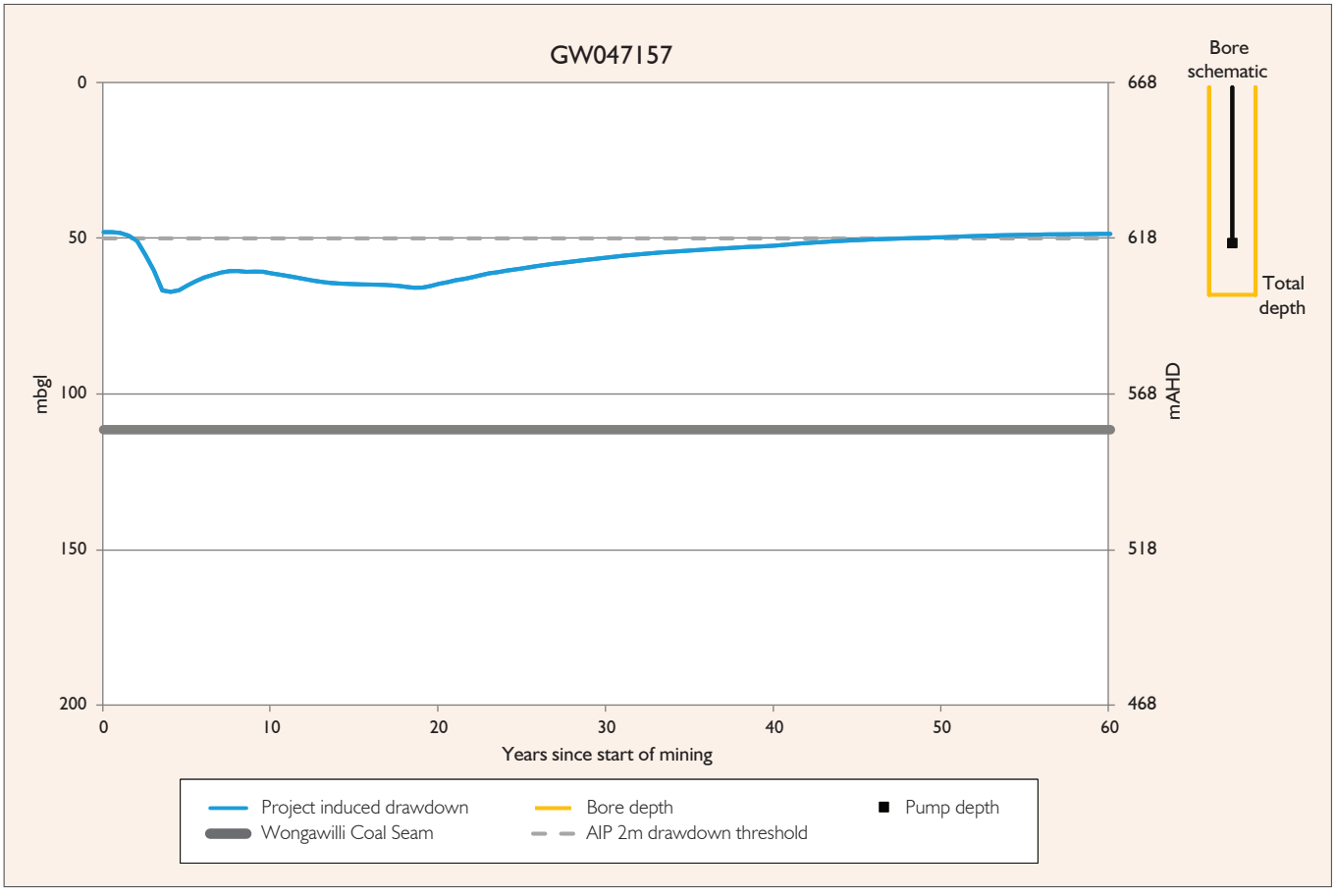

GW032319
Bore schematic
Total depth
0
50
100
150
200
mbgl
636
586
536
486
436
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

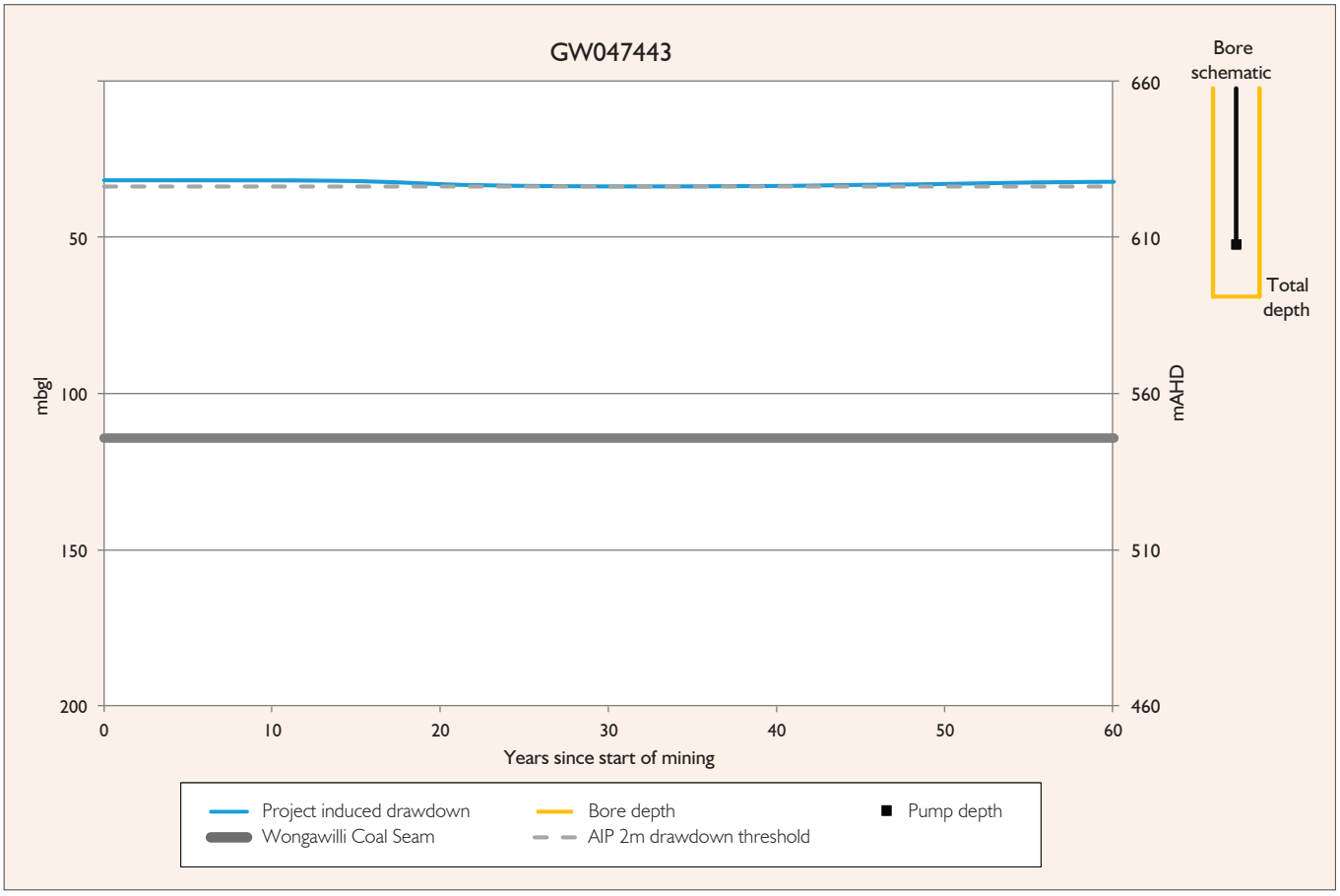

GW034742
Bore schematic
Total depth
0
50
100
150
200
mbgl
701
651
601
551
501
451
401
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

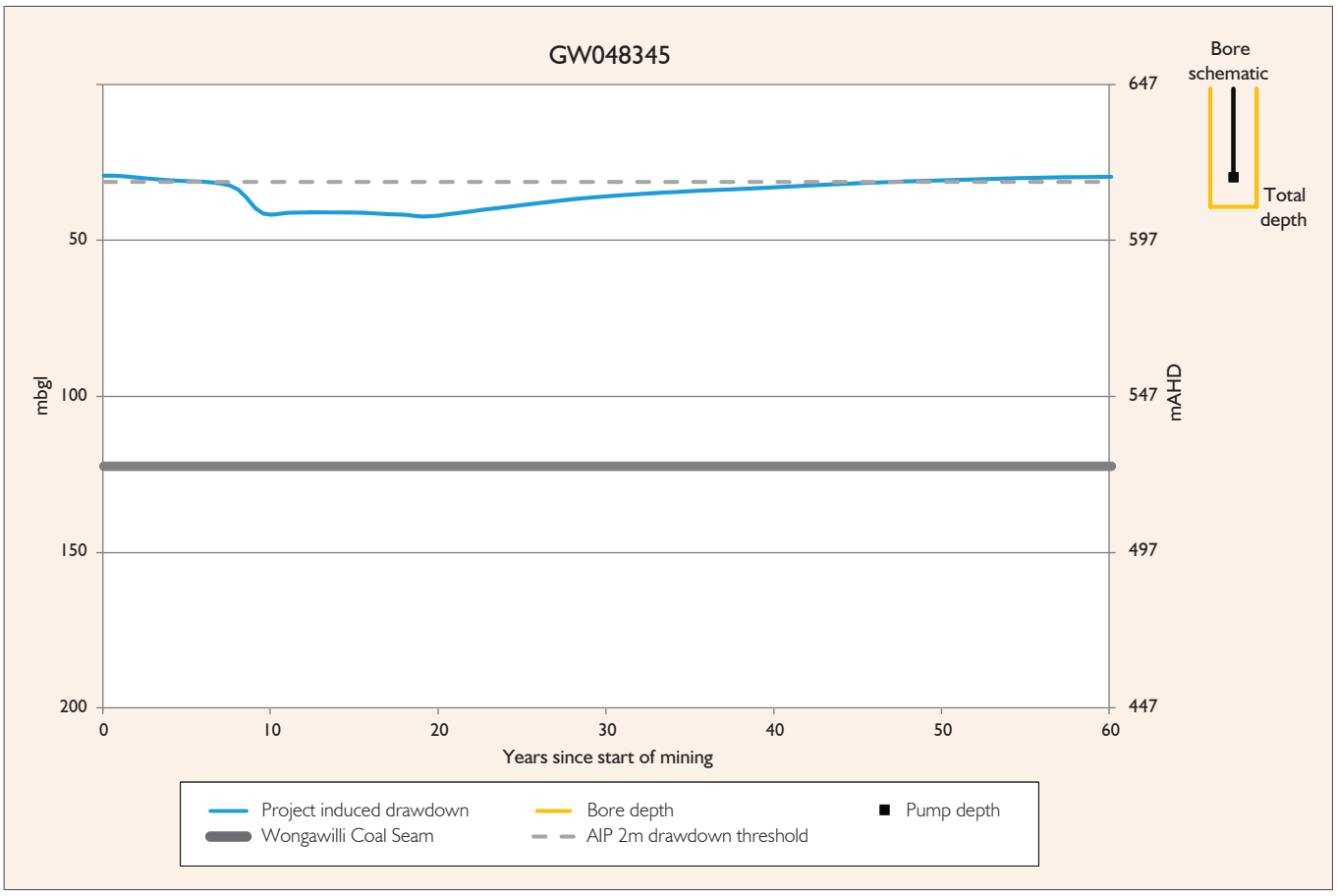

GW035590
Bore schematic
Total depth
0
50
100
150
200
mbgl
670
620
570
520
470
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

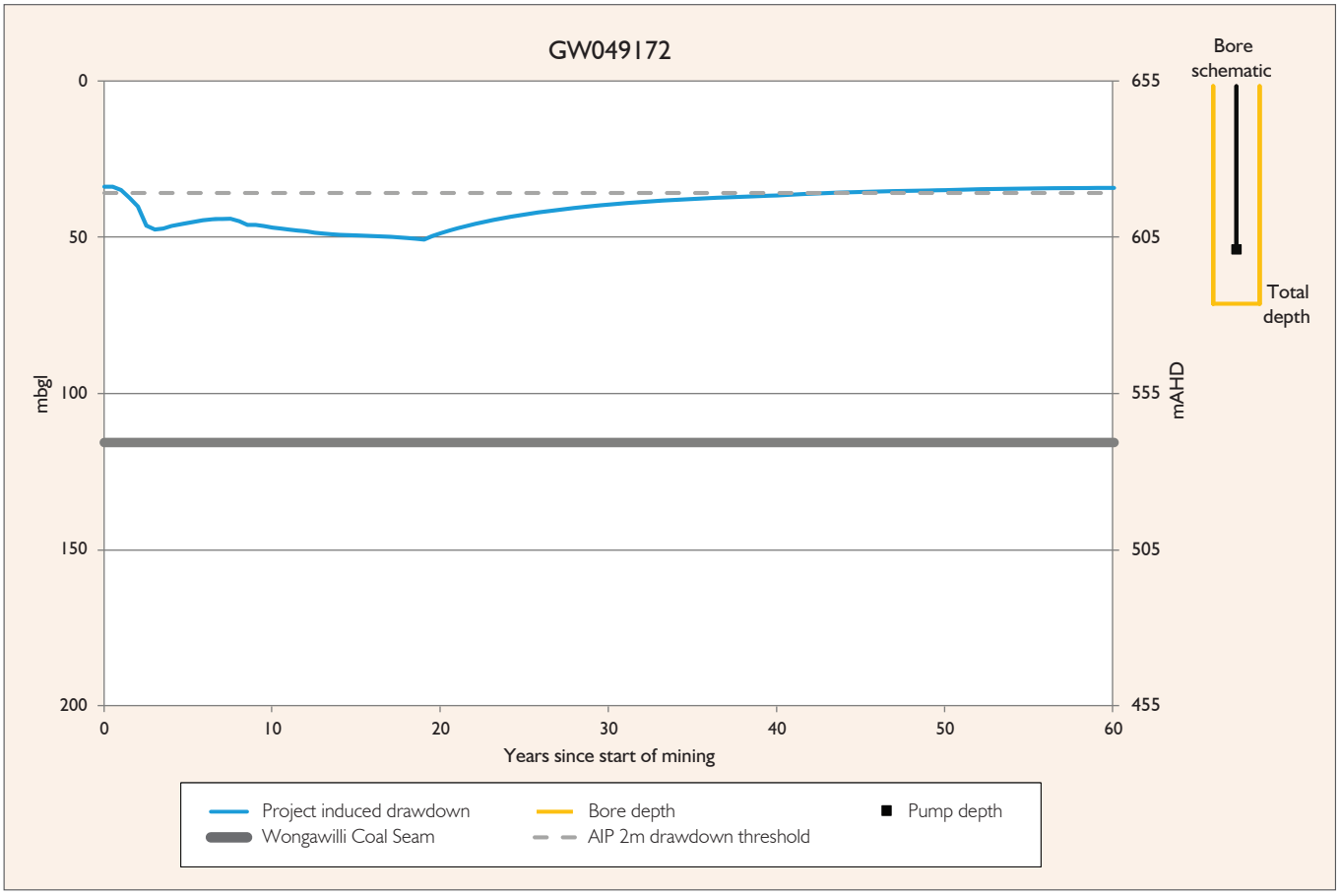

GW037851
Bore schematic
Total depth
0
50
100
150
200
mbgl
665
615
565
515
465
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

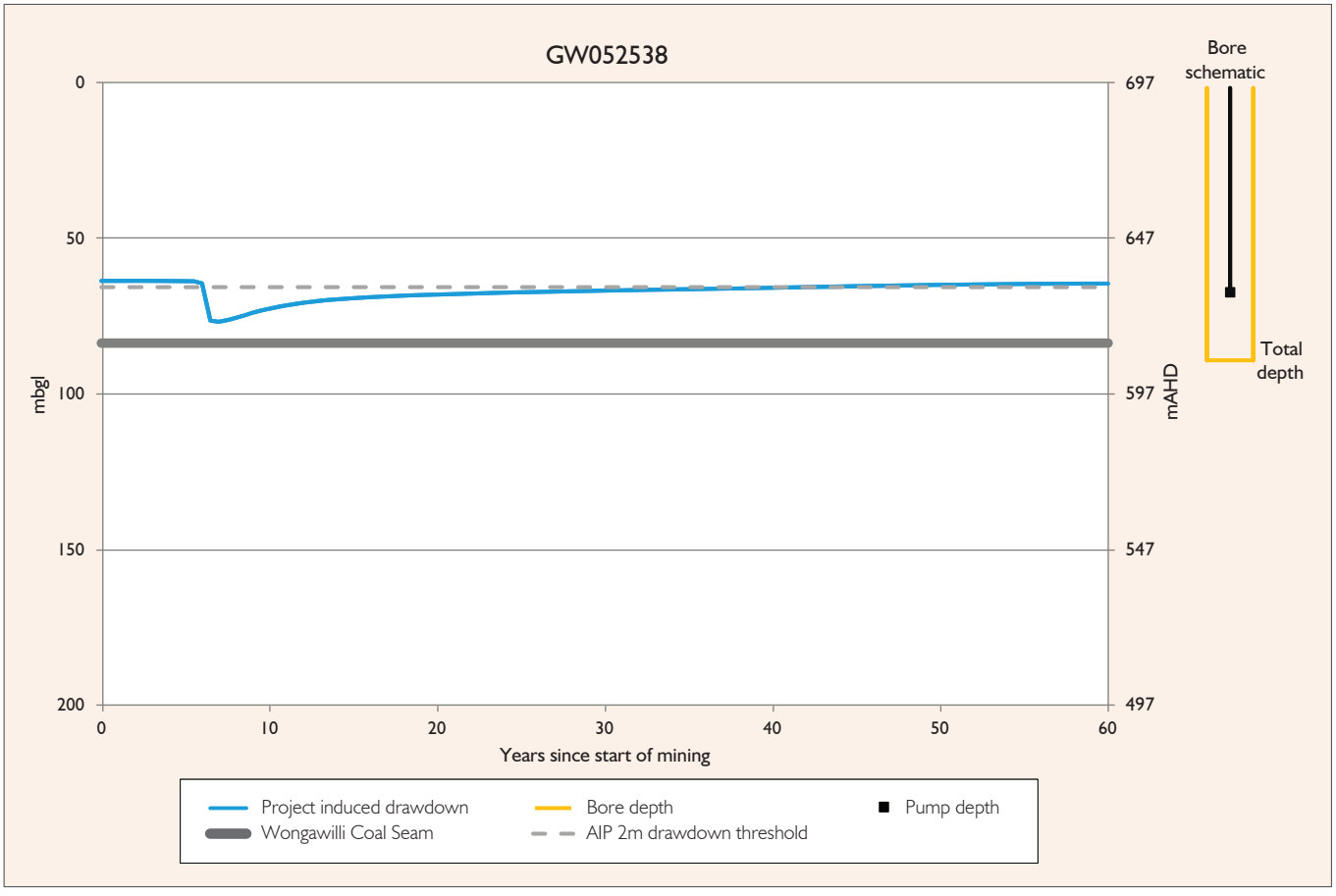

GW047076
Bore schematic
Total depth
mbgl
mAHD
0
50
100
150
200
650
600
550
500
450
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

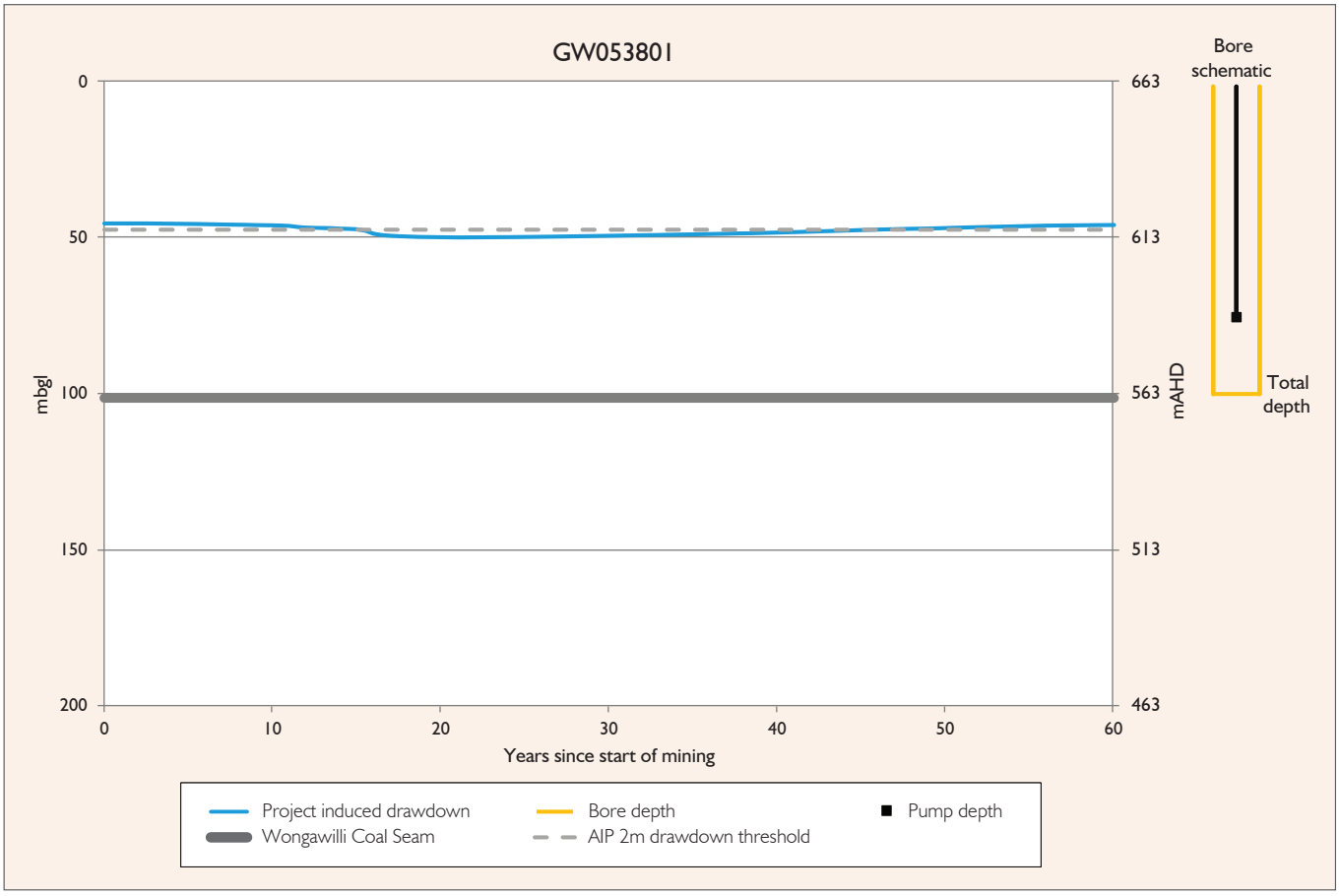

GW047157
Bore schematic
Total depth
mbgl
mAHD
0
50
100
150
200
668
618
568
518
468
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

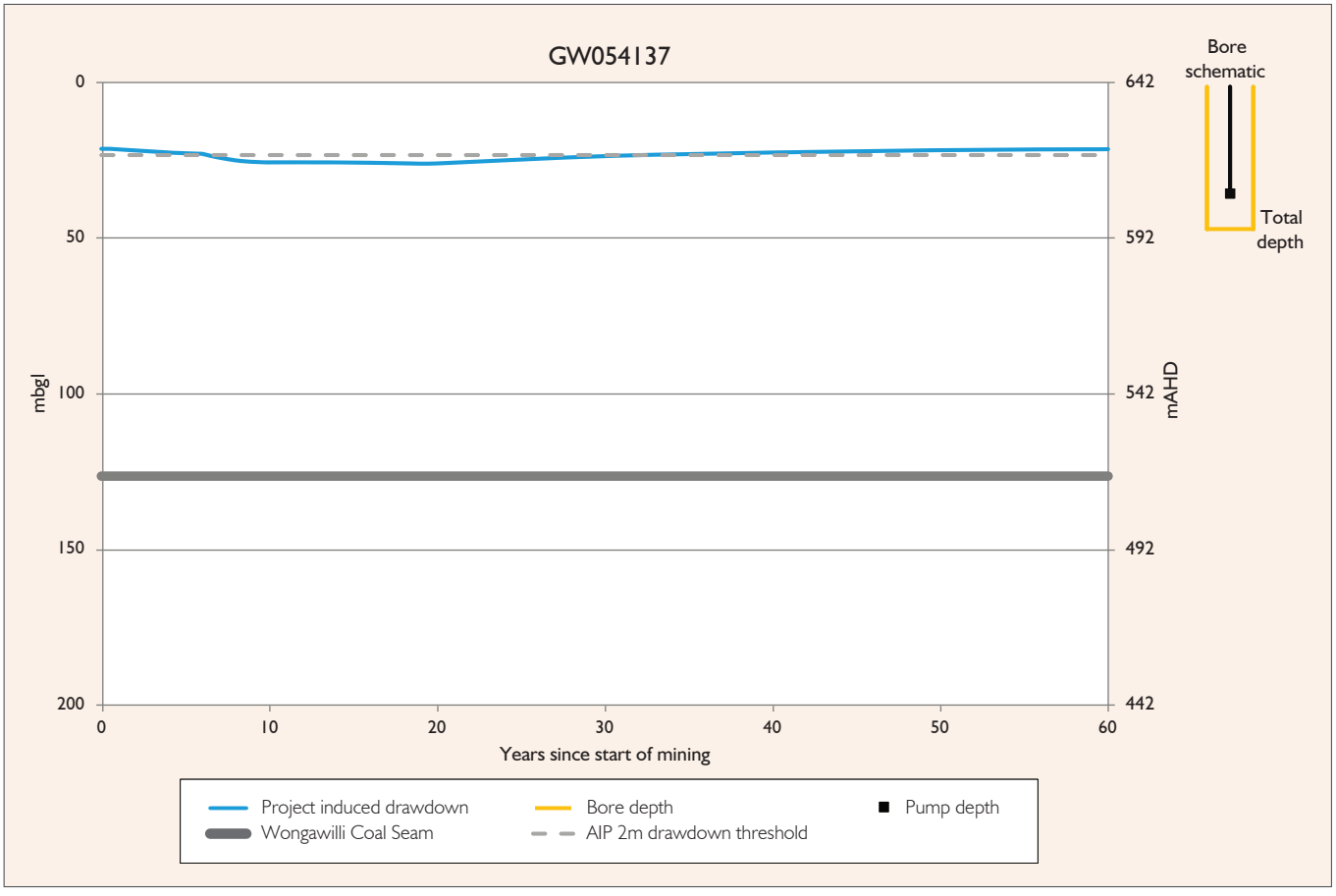

GW047443
Bore schematic
Total depth
mbgl
mAHD
50
100
150
200
660
610
560
510
460
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

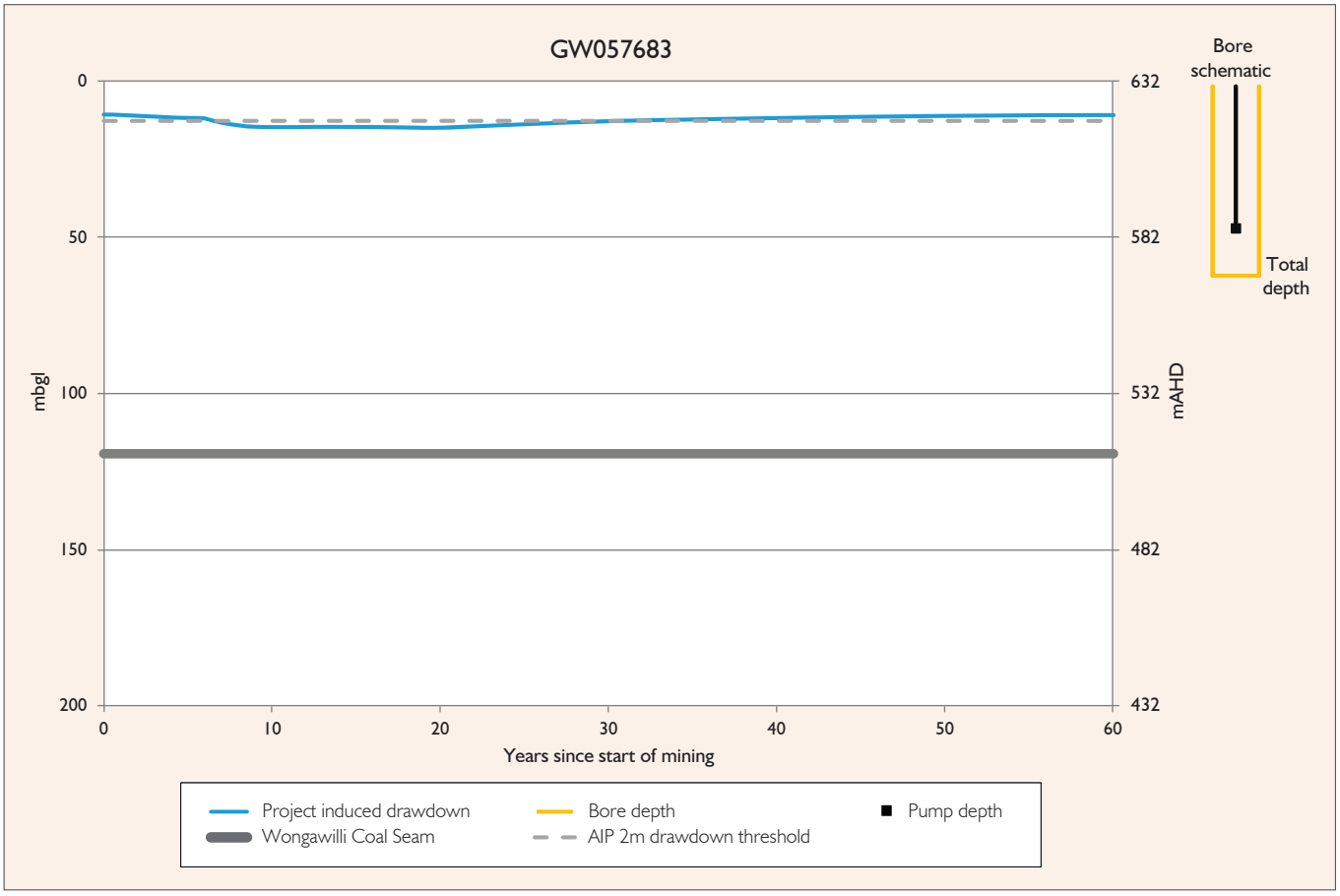

GW048345
Bore schematic
Total depth
mbgl
mAHD
50
100
150
200
647
597
547
497
447
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

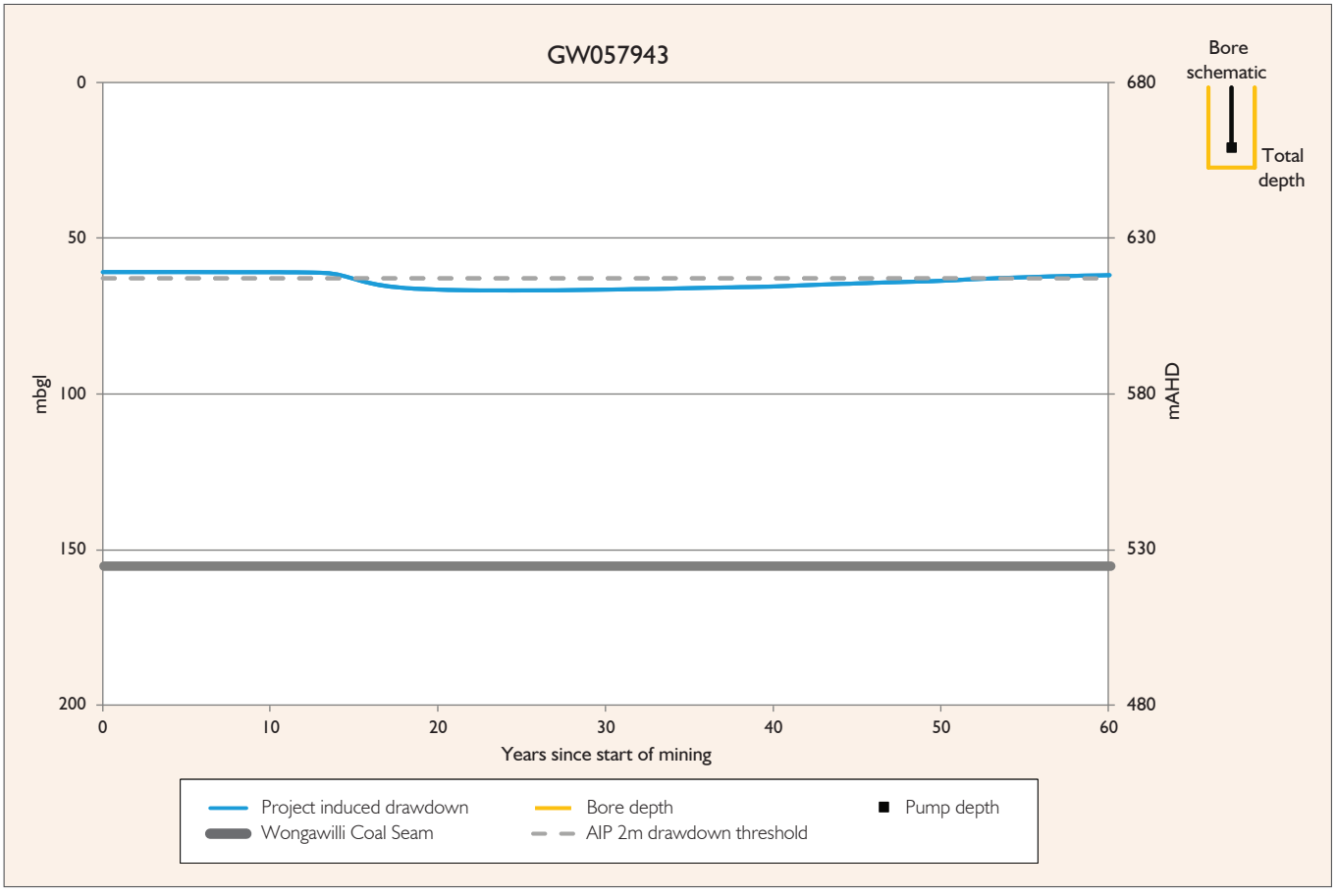

GW049172
Bore schematic
Total depth
mbgl
mAHD
0
50
100
150
200
655
605
555
505
455
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

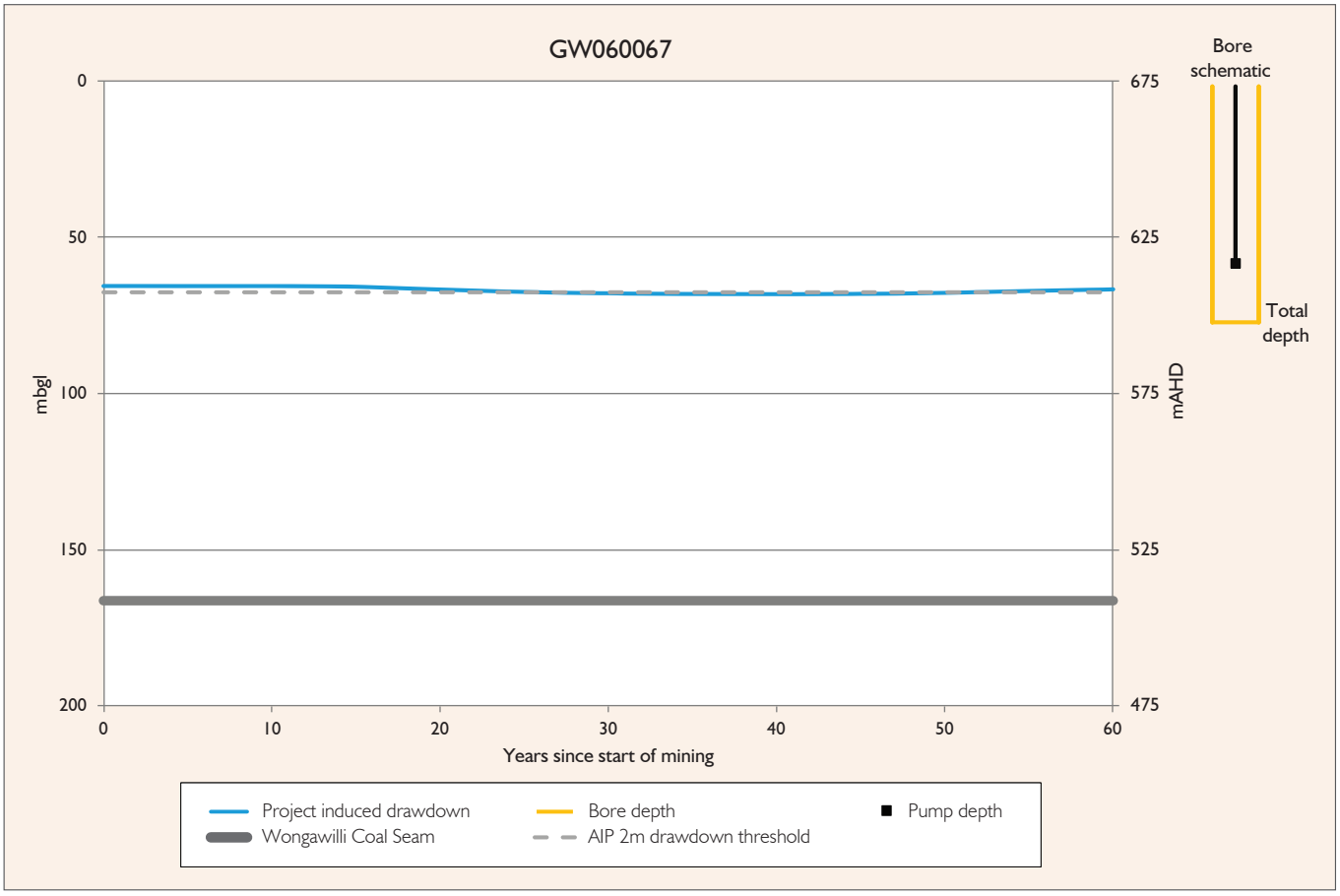

GW052538
Bore schematic
Total depth
mbgl
mAHD
0
50
100
150
200
697
647
597
547
497
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

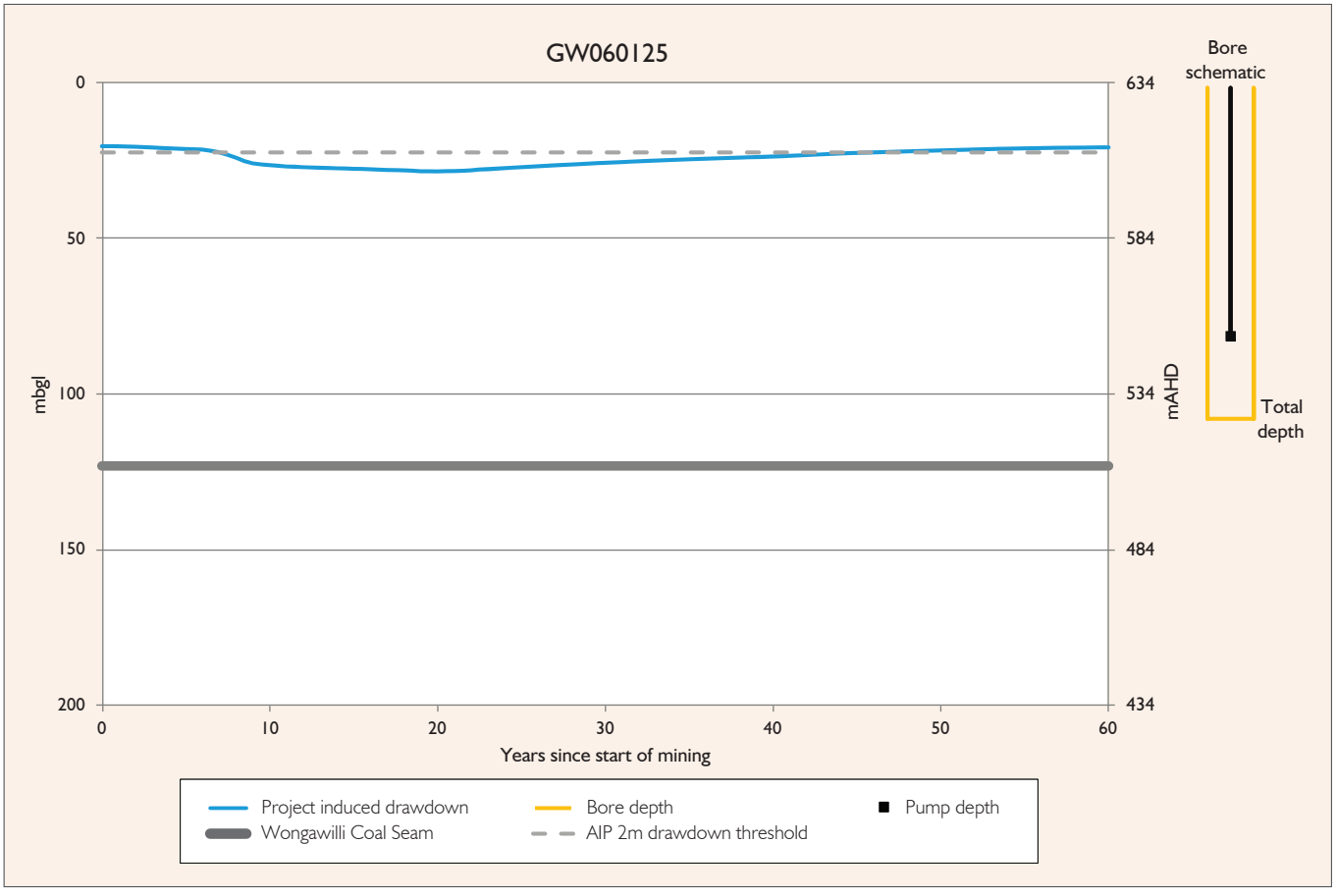

GW053801
Bore schematic
Total depth
mbgl
mAHD
0
50
100
150
200
663
613
563
513
463
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

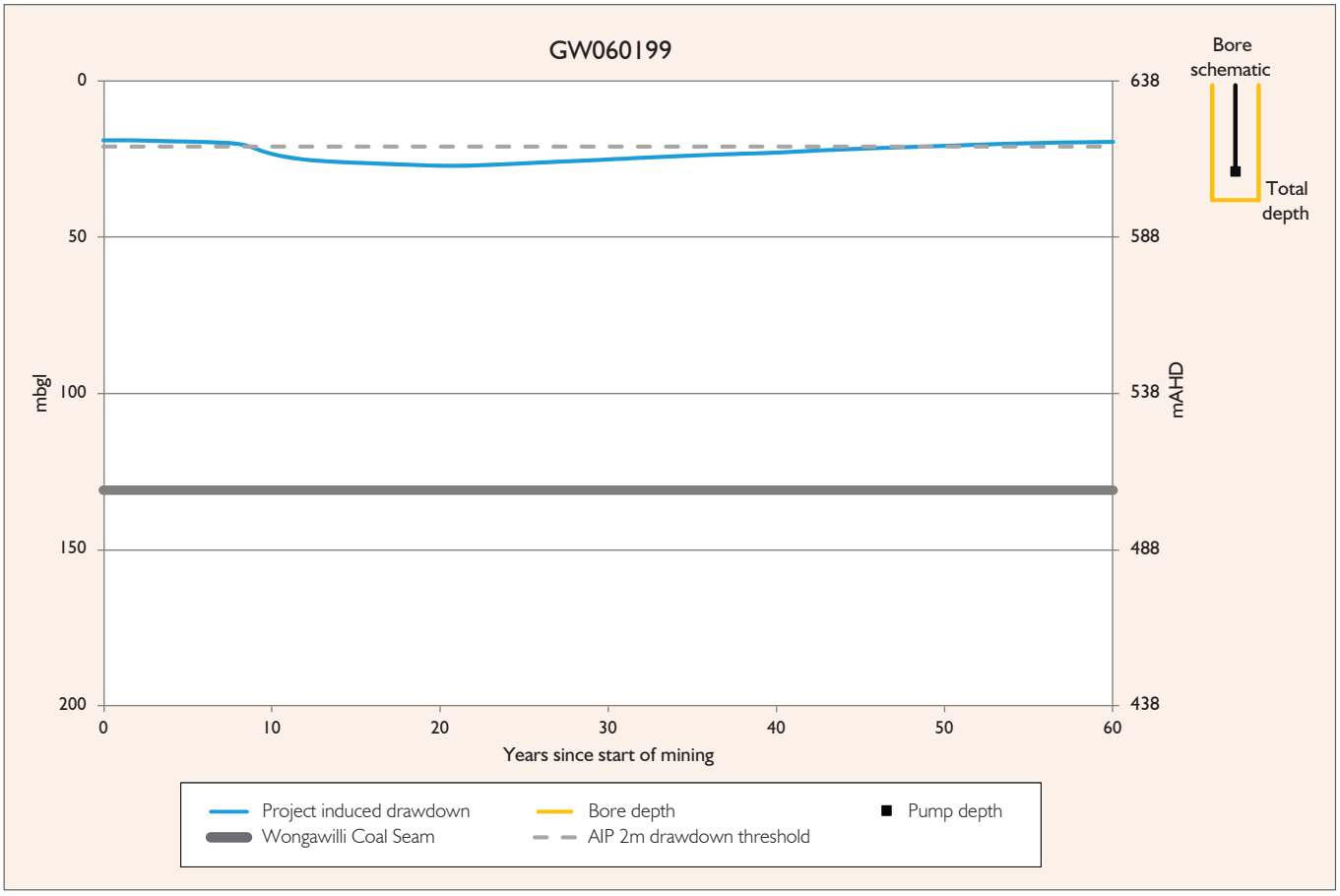

GW054137
Bore schematic
Total depth
mbgl
mAHD
0
50
100
150
200
642
592
542
492
442
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

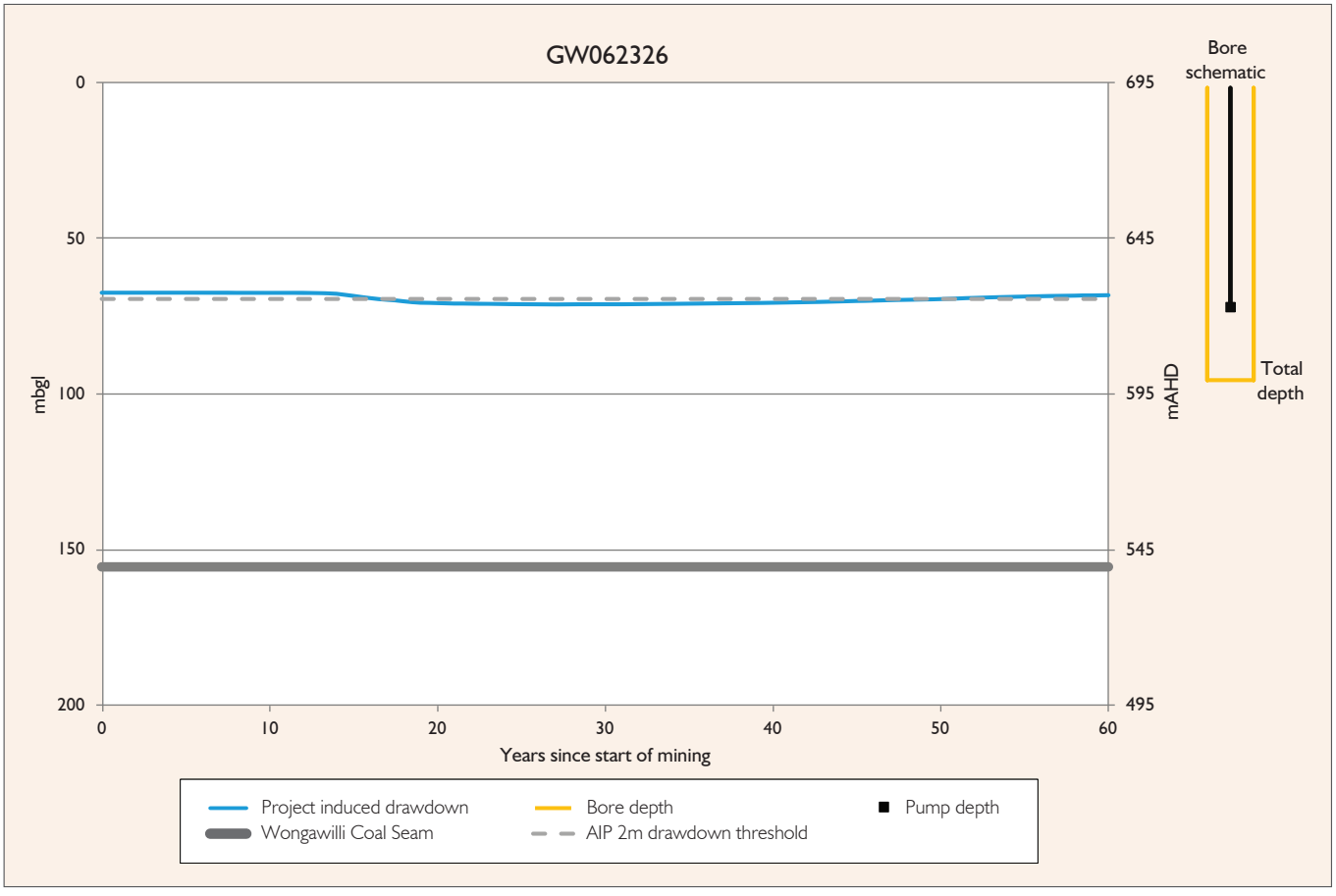

GW057683
Bore schematic
Total depth
0
50
100
150
200
mbgl
632
582
532
482
432
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

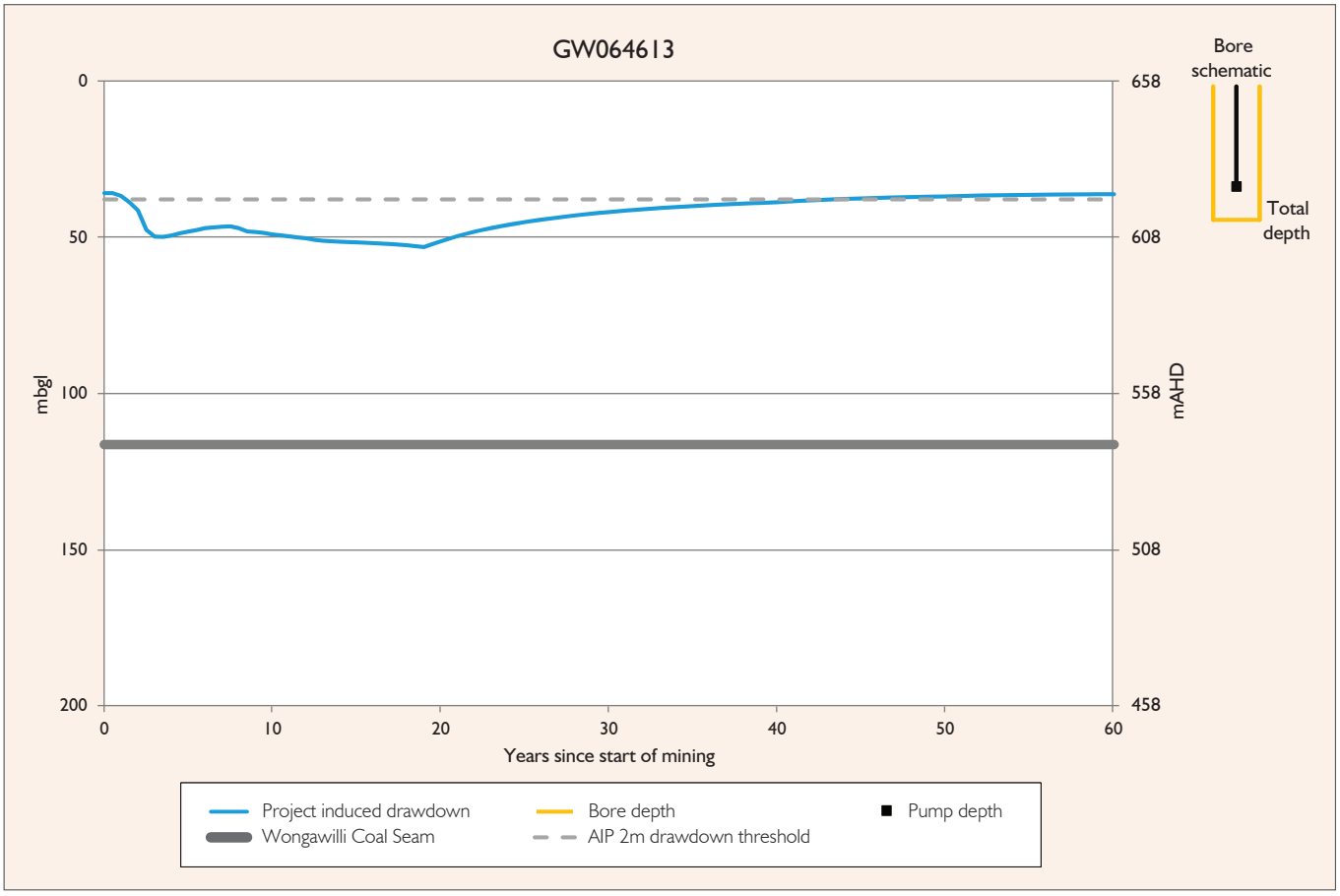

GW057943
Bore schematic
Total depth
0
50
100
150
200
mbgl
680
630
580
530
480
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

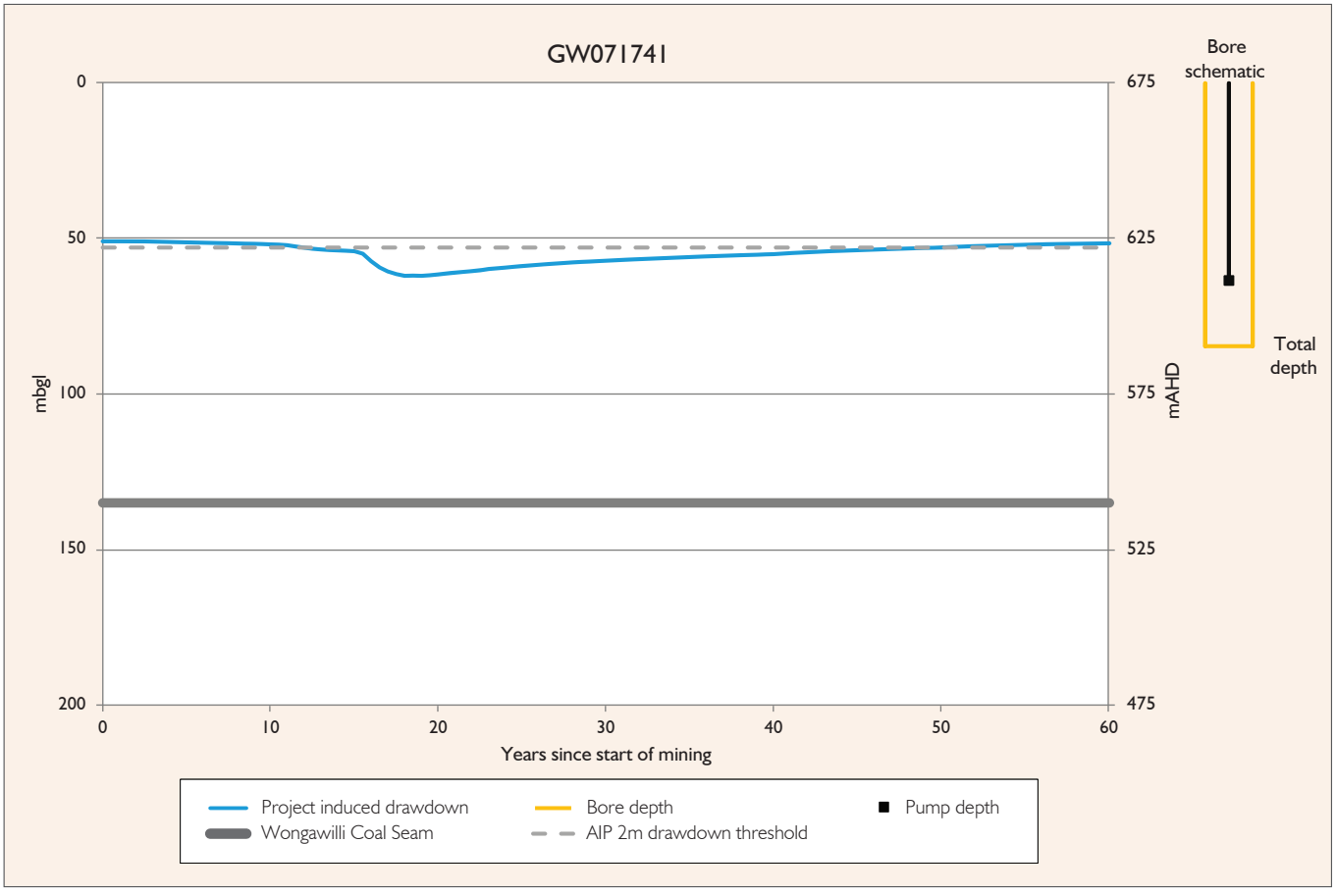

GW060067
Bore schematic
Total depth
mbgl
mAHD
0
50
100
150
200
675
625
575
525
475
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

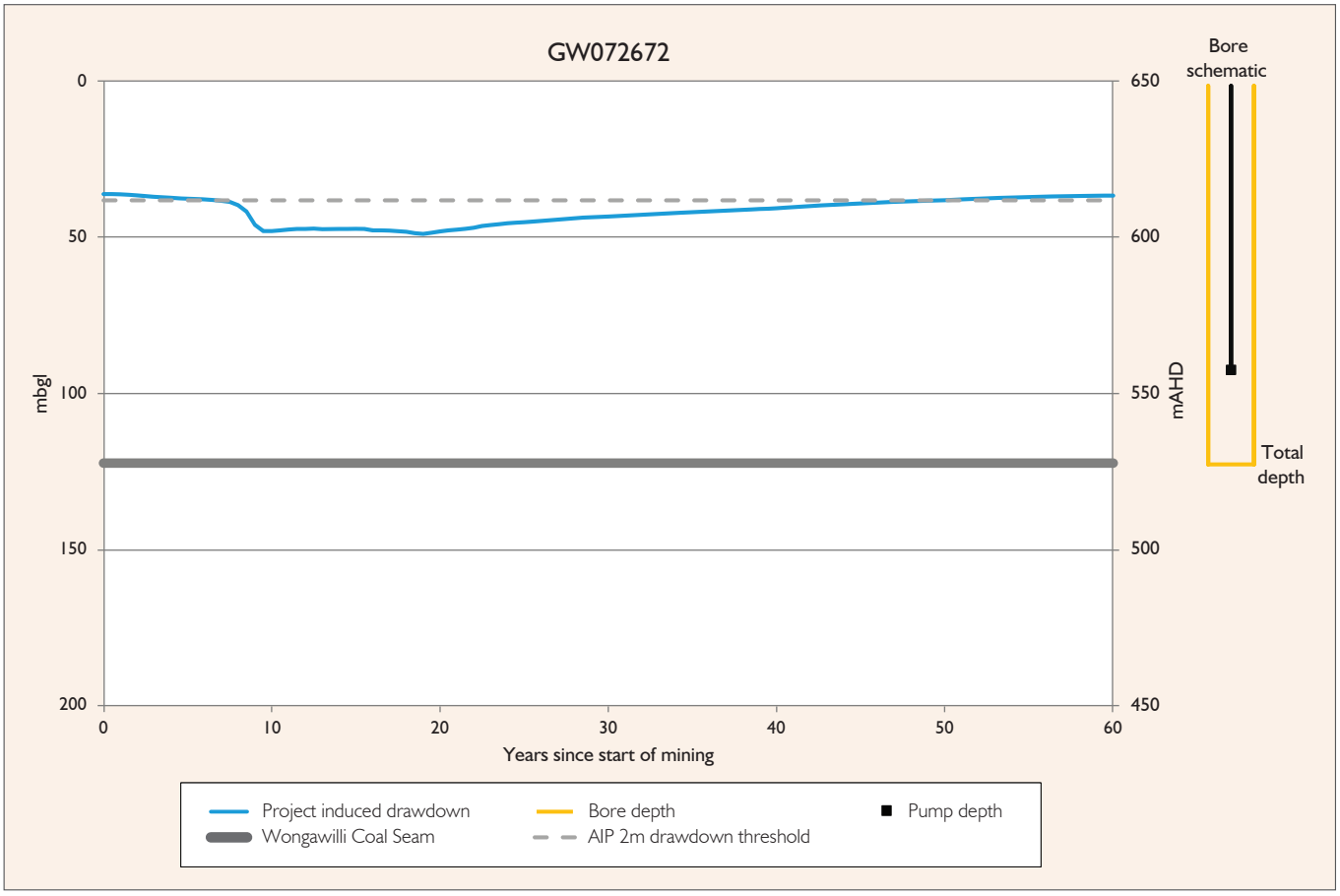

GW060125
Bore schematic
Total depth
mbgl
mAHD
0
50
100
150
200
634
584
534
484
434
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

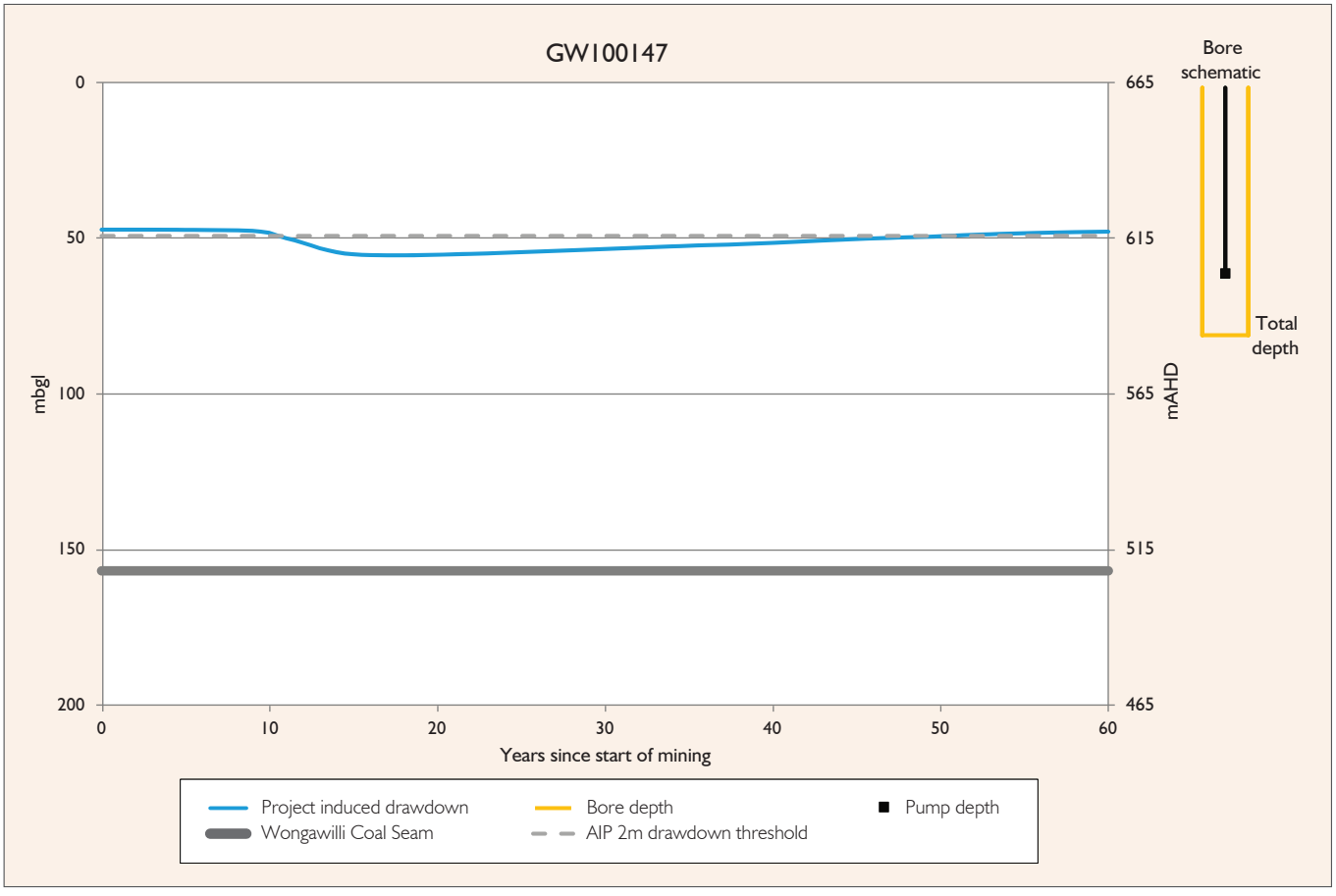

GW060199
Bore schematic
Total depth
0
50
100
150
200
mbgl
638
588
538
488
438
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth

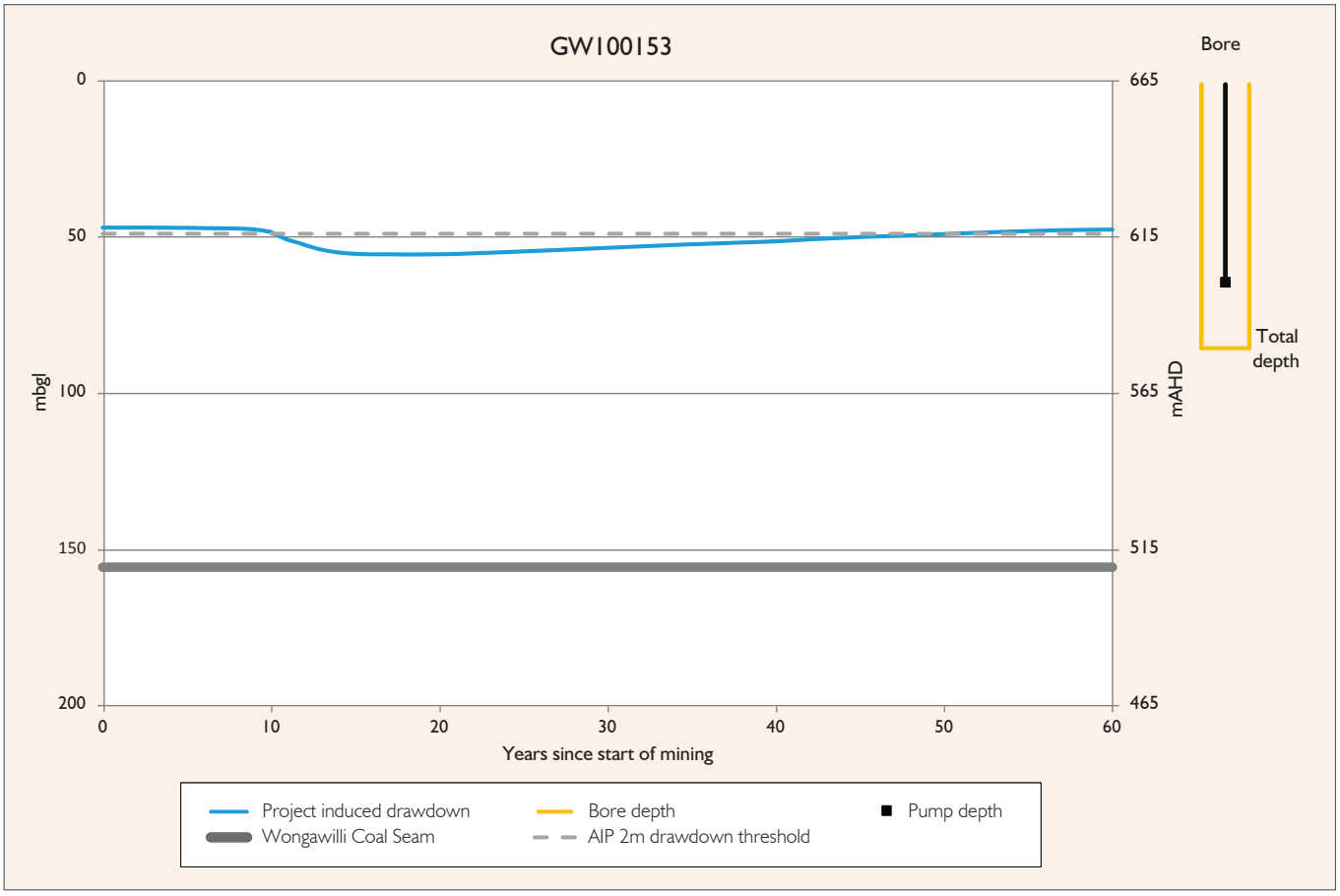

GW062326
Bore schematic
Total depth
0
50
100
150
200
mbgl
695
645
595
545
495
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth


GW064613
Bore schematic
Total depth
0
50
100
150
200
mbgl
658
608
558
508
458
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth


GW071741
Bore schematic
Total depth
0
50
100
150
200
mbgl
675
625
575
525
475
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth


GW072672
Bore schematic
0
50
100
150
200
mbgl
650
600
550
500
450
mAHD
Total depth
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth


GW100147
Bore schematic
0
50
100
150
200
mbgl
665
615
565
515
465
mAHD
Total depth
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth


GW100153
Bore
Total depth
mbgl
mAHD
0
50
100
150
200
665
615
565
515
465
0
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20
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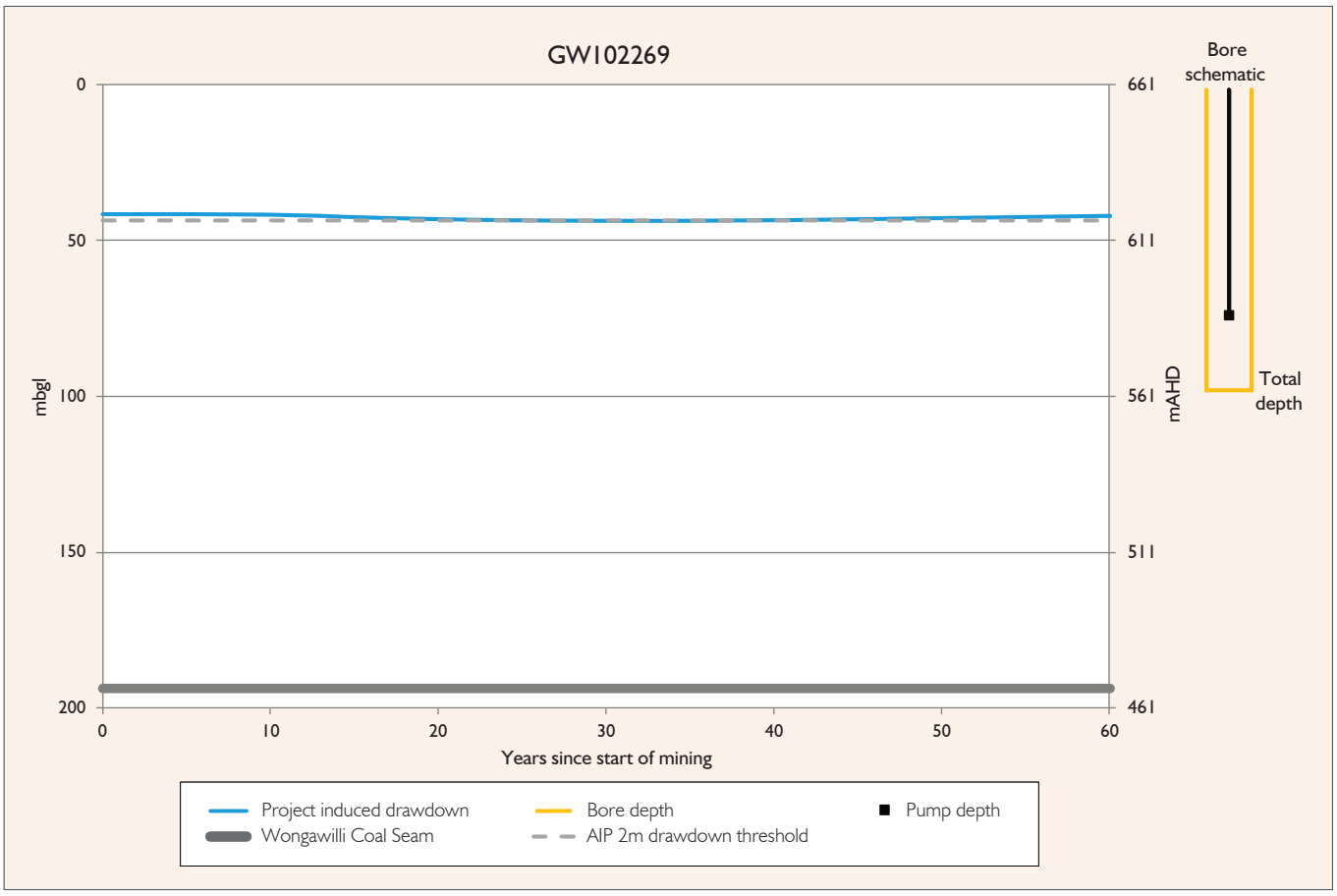
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth


GW102269
Bore schematic
Total depth
mbgl
mAHD
0
50
100
150
200
661
611
561
511
461
0
10
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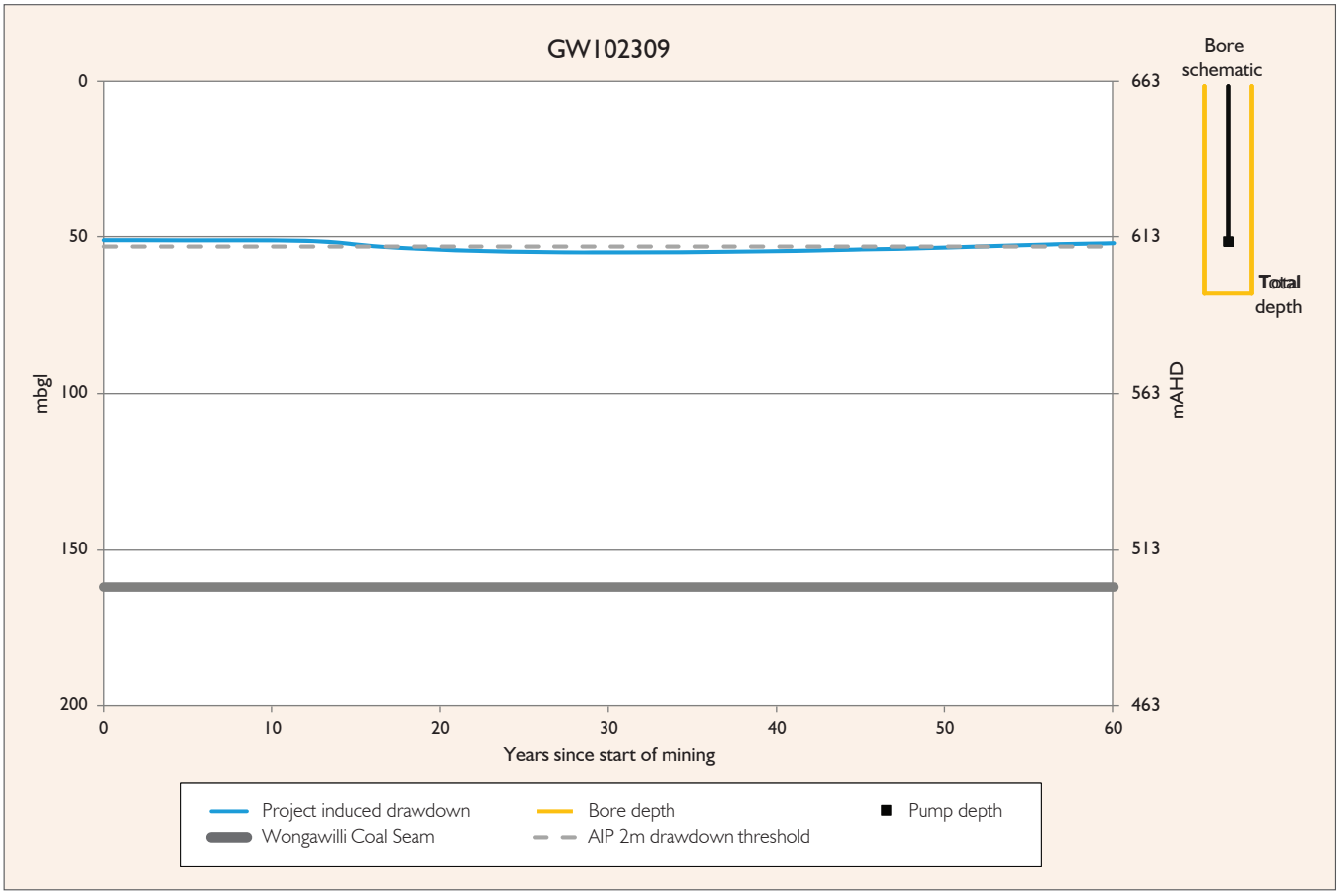
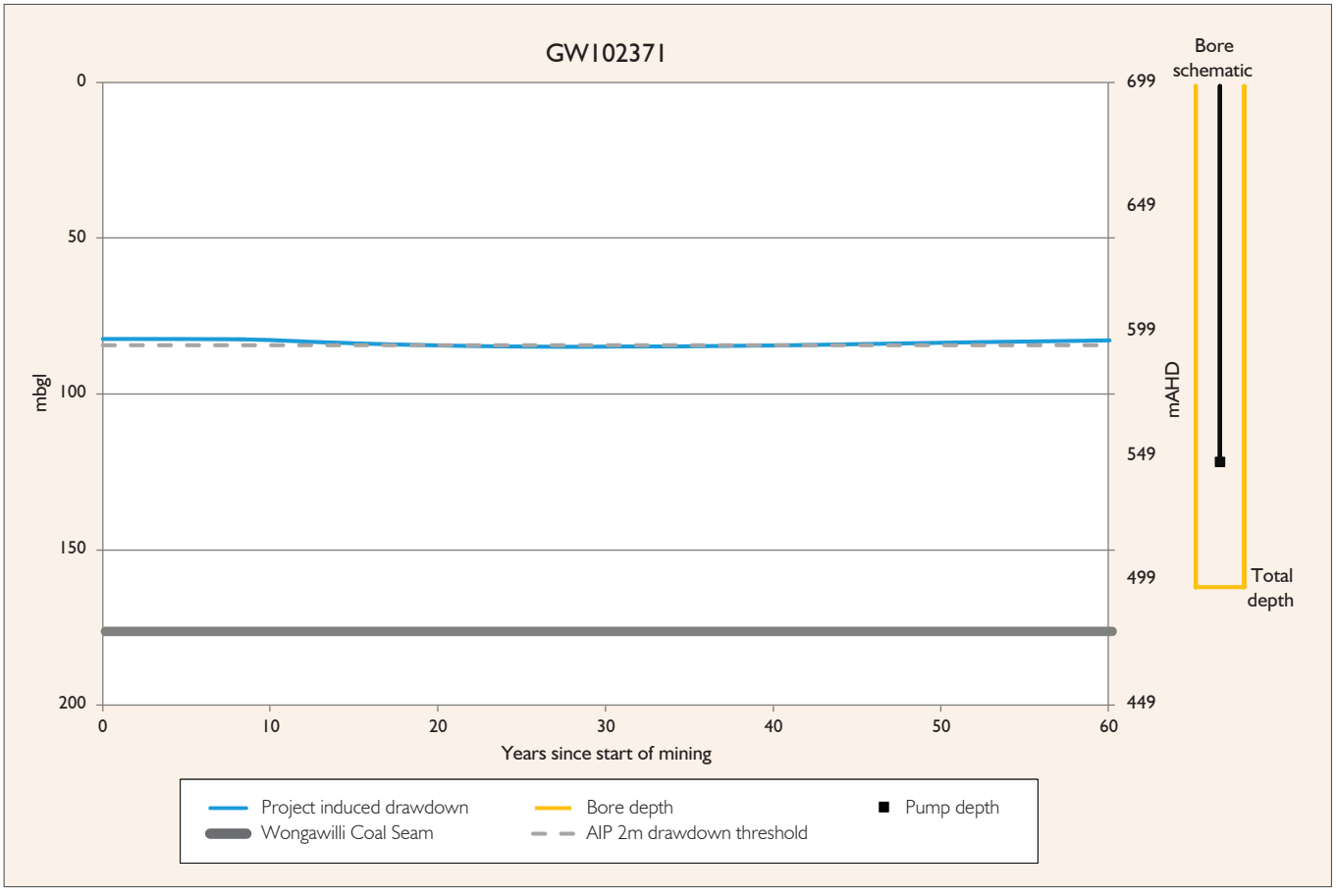
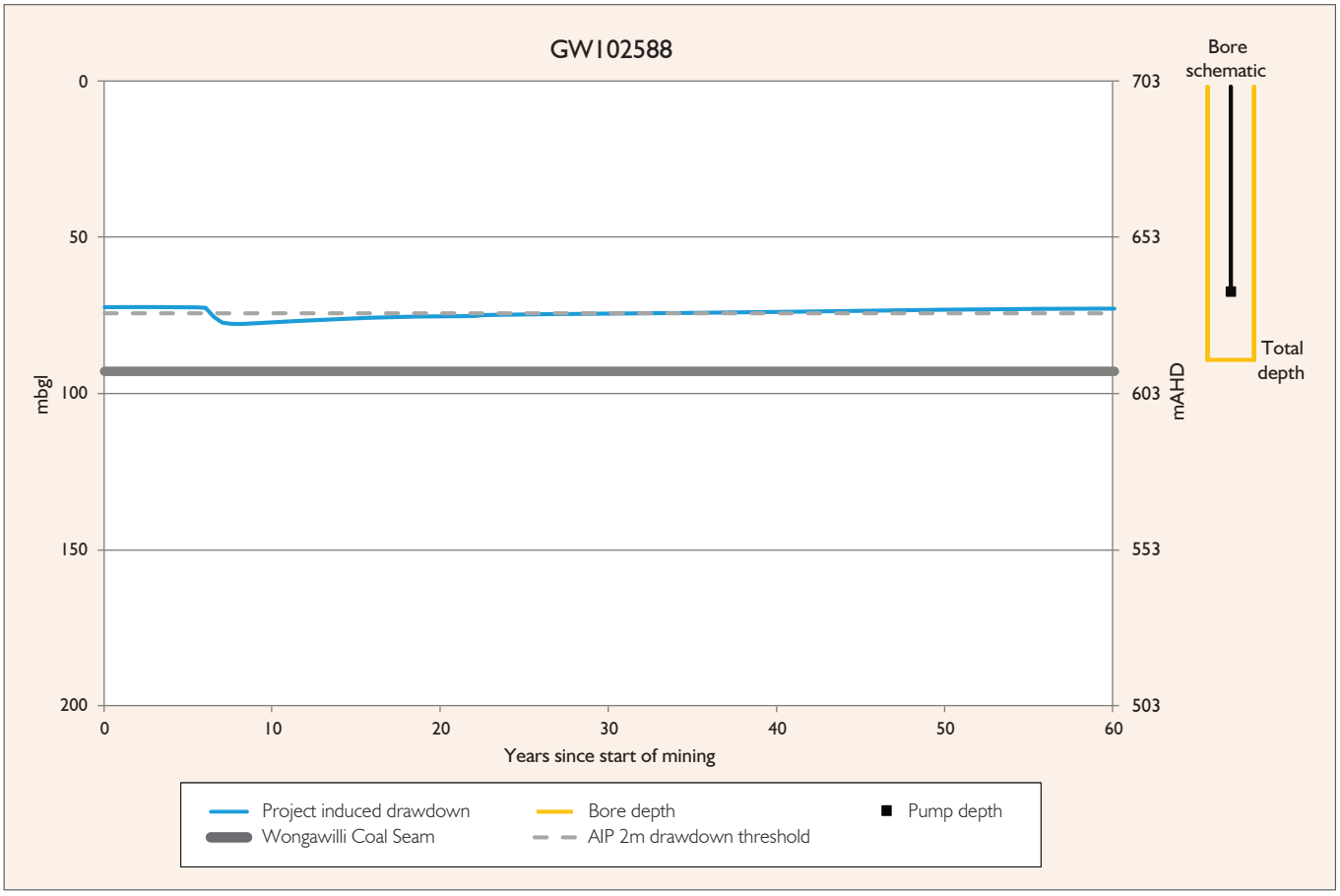
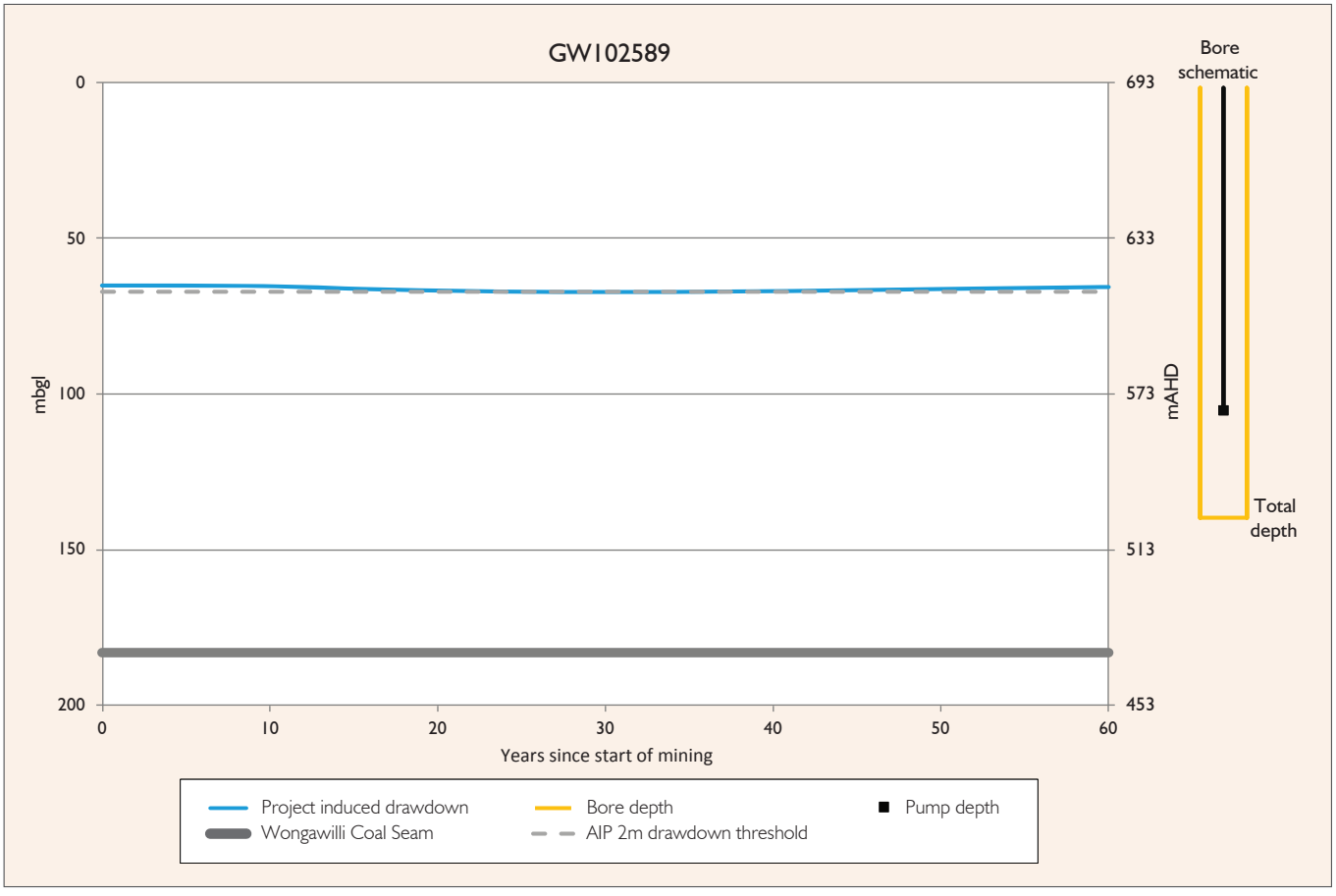
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth


GW102309
Bore schematic
Total depth
0
50
100
150
200
mbgl
663
613
563
513
463
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth


GW102371
Bore schematic
Total depth
0
50
100
150
200
mbgl
699
649
599
549
499
449
mAHD
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth


GW102588
Bore schematic
0
50
100
150
200
703
653
603
553
503
mbgl
mAHD
Total depth
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth


GW102589
Bore schematic
0
50
100
150
200
693
633
573
513
453
mbgl
mAHD
Total depth
0
10
20
30
40
50
60
Years since start of mining
Project induced drawdown
Wongawilli Coal Seam
Bore depth
AIP 2m drawdown threshold
Pump depth