



31 March 2020

James Wearne
Group Manager Approvals
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Our ref: 12528516-49422-2
Your ref:

Dear James,

Airly Mine SSD 5581 Modification 3 Response to DPIE Water Submission

1 Background

The Airly Mine Extension Project (SSD 5581) was submitted in September 2014, and approved in December 2016. State significant development SSD 5581 allows mining for a period of 20 years within the boundaries of the Project Application Area and will lapse on 31 January 2037. The Project Application Area boundary is shown in Figure 1.

Centennial Airly Pty Limited (Centennial Airly) now seek to modify SSD 5581 to increase the maximum production rate from 1.8 million tonnes per annum (Mtpa) of run of mine (ROM) coal to 3.0 Mtpa (Modification 3). Potential groundwater impacts from Modification 3 (the project) are assessed in the Groundwater Impact Assessment report (GHD, 2019).

1.1 DPIE Water submission

Following review of the Groundwater Impact Assessment report for the project, the Department of Planning, Industry and Environment (DPIE) Water have requested the following 'Pre-determination' items be addressed:

- Revise the Numerical Groundwater Model by incorporating all monitoring data up to the end of 2019 and the altered mining methods for the revised future mining plan and panels (i.e. post 2017) including, as a minimum fracturing patterns consistent with 'Scenario 2'.
- Prepare a comprehensive discussion of any variations noted compared to the outcomes for the 2018 model variant. The report should include a discussion of altered impacts arising from an increased presence of active subsidence fracturing with resulting hydraulic connection to shallow aquifers and surface water systems. A revised assessment of impacts against the criteria of the NSW Aquifer Interference Policy (2012) and an update on licensing requirements if required. Further analysis should be provided of the overlying 3rd order streams and how these are being considered within the groundwater model.

This letter outlines a response to the above items based on recent monitoring data and recommendations for future updates of the groundwater model for Airly Mine.

2 Groundwater model – calibration and predictions

The Groundwater Impact Assessment for the project is based on predictions from the groundwater model developed for the Airly Mine Extension Project (SSD 5581) and updated in 2018 with more recent monitoring data. The update in 2018 was undertaken for the following reasons:

- The original model was found to over-predict groundwater inflows into the mine workings between 2015 and 2017 and under-predict drawdown in the Lithgow Seam and Marrangaroo Formation at one monitoring location (ARP04).
- Incorporate data from groundwater monitoring locations installed in late 2016 and January 2017. These additional sites were installed throughout the eastern portion of the Project Application Area where monitoring had previously been limited.

The process of re-calibration of the groundwater model was reviewed independently by Dr Noel Merrick (HydroAlgorithmics).

Coal mining throughout the groundwater model calibration period was bord and pillar mining only within the Lithgow Seam since secondary extraction within the panel and pillar mining area did not commence until June 2019. Existing workings at Airly Mine are shown in Figure 1. As at the end of February 2020, mining had progressed to the extraction of the third panel within the panel and pillar mining area.

In accordance with the Airly Mine Water Management Plan (Centennial Coal, 2019), the groundwater model validation program compares actual and modelled groundwater inflows and monitored and modelled groundwater level predictions on an annual basis. Where the validation process identifies significant variances between monitored and predicted groundwater inflows or that the groundwater model is underestimating drawdown in groundwater level, then a recalibration process may be required to be undertaken in consultation with an independent reviewer. A summary of the relevant outcomes of the 2019 Annual Review is included in Section 3. Further, Centennial Airly intends to initiate a further re-calibration of the groundwater model (if required) once sufficient groundwater monitoring data are available to detect potential groundwater impacts from secondary extraction within the panel and pillar mining area.

The Groundwater Impact Assessment for the project presents groundwater model predictions under three conditions:

- Approved conditions (mining rate 1.8 Mtpa) with original model.
- Approved conditions (mining rate 1.8 Mtpa) with updated model.
- Proposed conditions (mining rate 3.0 Mtpa) with updated model.

Note there are no proposed changes to mining areas or the total mining footprint as part of this project.

For each condition, the predictive model has been run under two fracturing scenarios. These scenarios (1 and 2) are detailed in GHD (2019) and relate to the height of fracturing of the overburden above the 61 m width panels in the panel and pillar mining area. Scenario 2 predictions were adopted for the groundwater impact assessment because it is more conservative than Scenario 1, however likely overestimates actual groundwater inflow rates into the mine since it adopts a greater height of fracturing (75 m) than the 60 m reported in the subsidence assessment (Strata2, 2019).

Predicted groundwater inflows into the mine under each of the three conditions are shown in Figure 2. Groundwater inflows predicted using the original model and approved under SSD 5581 peak at 184 ML/day and are labelled in Figure 2 as GHD (2014). These inflows are substantially higher than inflows predicted using the updated model, for both approved and proposed conditions. Observed mine inflows have been low (not measureable) to date and therefore the lower inflows modelled by the updated model are considered to be more realistic (refer Section 3).

Under Scenario 2 and the 3 Mtpa mining rate (proposed conditions) the modelled groundwater inflow rate increases over time to a peak of 71 ML/year in 2027, before gradually decreasing to 69 ML/year in 2031. Under the proposed 3 Mtpa mining rate the peak inflow is predicted to occur earlier than for the approved 1.8 Mtpa mining rate, however the peak inflow is predicted to be slightly higher for the 1.8 Mtpa mining rate (76 ML/year). Mine inflows for both the 1.8 Mtpa mining rate and the 3 Mtpa mining rate are similar at the end of mining as the mine plan has the same footprint for both scenarios.

Centennial Airly's existing Water Access Licence (WAL) for groundwater take from the Sydney Basin North groundwater source (managed under the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources) is 278 ML/year. This covers the predicted groundwater inflow approved under SSD 5581 and therefore is a considerably greater volume than the predicted take under the project.

3 2019 Annual Review

The existing groundwater monitoring program at Airly Mine includes vibrating wire piezometers (VWPs), sampling of groundwater bores and flow monitoring of groundwater seepage. All VWPs and standpipe monitoring bores are continuously logged for piezometric head and groundwater levels.

Existing monitoring locations are shown in Figure 1. VWPs ARP01, ARP02A and ARP03 overlay or are in the vicinity of the panel and pillar mining area.

Hydrographs for ARP01, ARP02A and ARP03A, including data reported during 2019, are shown in Figure 3, Figure 4 and Figure 5 respectively. A data summary is provided in Table 1, including comparison of levels to trigger values from the Water Management Plan. These trigger values are based on baseline groundwater level data and groundwater drawdown predictions from the groundwater model. Data are not available for ARP01 since 2015 and for ARP03 (Lithgow Seam and Marrangaroo Formation VWPs) since early 2019 due to instrument malfunctioning.

Table 1 VWP data summary for panel and pillar mining area, 2019

Monitoring location	Strata	Trigger value (WMP, 2019) (m AHD)	Minimum observed level			
			Jan – Mar	Apr – Jun	Jul – Sept	Oct – Dec
			(m AHD)	(m AHD)	(m AHD)	(m AHD)
ARP01	Narrabeen Sandstone	-	NA	NA	NA	NA
	Irondale Seam	-	NA	NA	NA	NA
	Lithgow Seam	-	NA	NA	NA	NA

Monitoring location	Strata	Trigger value (WMP, 2019) (m AHD)	Minimum observed level			
			Jan – Mar	Apr – Jun	Jul – Sept	Oct – Dec
			(m AHD)	(m AHD)	(m AHD)	(m AHD)
	Marrangaroo Formation	-	NA	NA	NA	NA
ARP02A	Narrabeen Sandstone	-(a)	957.3	957.4	957.4	957.3
	Irondale Seam	-(b)	774.3	774.3	774.2	773.9
	Lithgow Seam	-(b)	752.1	738	752.3	752.3
	Marrangaroo Formation	753	754.6	754.7	754.6	754.6
ARP03	Narrabeen Sandstone	867	869.5	869.6	869.4	869.4
	Middle River Seam	-(b)	836.0	836.3	836.1	836.0
	Lithgow Seam	-(b)	748.3	NA	NA	NA
	Marrangaroo Formation	745	746.2	NA	NA	NA

Notes:

NA - No available data

(a) Observed pressure consistently below the base of the VWP, therefore no trigger value adopted

(b) Drawdown predicted to be below the base of the seam, therefore no trigger value adopted

Piezometric pressure is generally low and stable at the existing VWP monitoring locations, generally ranging from 0 m to 10 m above the measuring point elevation, with little observable response to rainfall. The low piezometric pressure is considered to reflect the extensive groundwater seepage areas across the slopes of Mount Airly and Genowlan Mountain.

Groundwater levels reported in 2019 are generally similar to those reported between 2013 and 2018 (and reported in the EIS). All levels recorded for ARP02A and ARP03 during 2019 were above their respective trigger values and hence compliant. No groundwater drawdown is evident at these sites in 2019, which is consistent with model predictions.

Groundwater inflow to mine workings at Airly Mine has historically been reported as low and of negligible volume. There were no metered groundwater inflows into the mine in 2019. Centennial Airly reports that there has been no measureable groundwater in the panel and pillar mining area either on development or extraction (David King, pers comm). Based on metered data, 0.324 ML of water was transferred from the underground workings to the surface facilities area at Airly Mine during 2019, however this was excess surface water that was introduced to the underground mine for operational purposes.

The updated groundwater model predicted groundwater inflows into the mine of approximately 14.3 ML/year during 2019. These inflows would not be measureable and is generally consistent with, or exceeds, observed inflows.

4 Response to DPIE Water submission

Groundwater monitoring data reported in 2019 (both levels and inflows) have been reviewed and compared to model predictions (under Scenario 2). As outlined in Section 3, monitoring data is consistent with model predictions. On this basis, it is not considered that an update or re-calibration of the groundwater model is required at this stage. In fact, if a re-calibration were to be undertaken it would be necessary to reduce modelled inflows even further to match the absence of observed inflows into the panel and pillar mining area which would result in a reduced peak modelled groundwater inflow in the future.

As was noted in Section 2, groundwater inflows into the mine that were predicted using the original model and approved under SSD 5581 are substantially higher than inflows predicted using the updated model, for both approved and proposed conditions. The WAL volume held by Centennial Airly for the Sydney Basin North groundwater source is based on the predictions from the original model and therefore this WAL is considerably higher than the predicted groundwater inflows for the project. As such, it is very unlikely that the updated groundwater model will underestimate future groundwater inflows to the extent that the WAL volume is insufficient.

Finally, since groundwater level monitoring data reported at sites ARP02A and ARP03 in 2019 is consistent with groundwater model predictions, it is not considered to be necessary to reassess groundwater impacts attributable to mining within the panel and pillar mining area. Further, it is noted that 3rd order streams are not undermined at Airly Mine and there are no 3rd order streams in the vicinity of the panel and pillar mining area.

5 Limitations

This report has been prepared by GHD for Centennial Airly Pty Ltd and may only be used and relied on by Centennial Airly Pty Ltd for the purpose agreed between GHD and Centennial Airly Pty Ltd as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Centennial Airly Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

6 References

Centennial Coal (2019). *Airly Mine Water Management Plan*. Revision 4. October 2019.

GHD (2014) *Airly Mine Extension Project Hydrogeological Model Report*, prepared by GHD Pty Ltd for Centennial Airly Pty Ltd, document reference 22/16787.

GHD Pty Ltd (2019). *Airly Mine Mod 3: Groundwater Impact Assessment*

Strata2 (2019) *Airly Mine Panel and Pillar Mining Zone: Revised Subsidence Estimates and Impacts*, document reference AIR-006-Rev2.

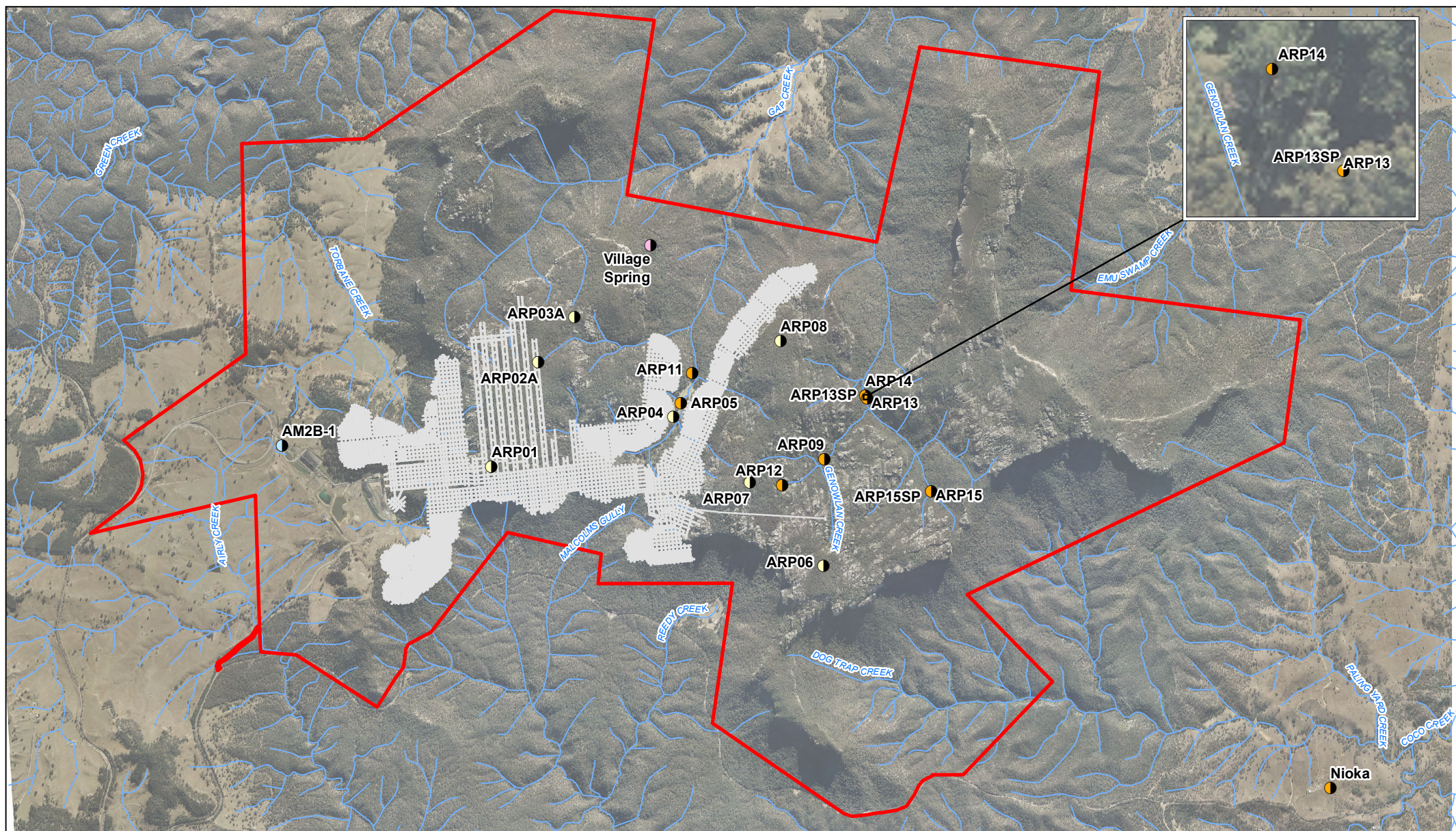
Sincerely

A handwritten signature in dark ink, appearing to read 'Stuart Gray', is positioned below the word 'Sincerely'.

Stuart Gray

Technical Director - Hydrogeology

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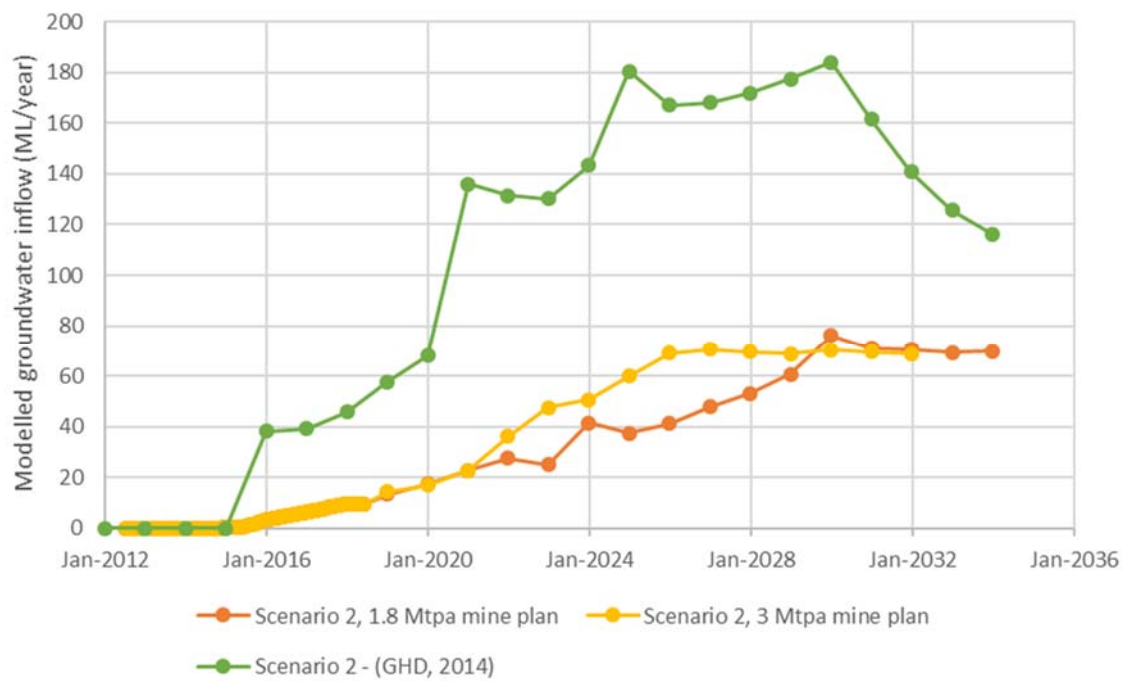


Figure 2 Predicted mine inflows under approved and proposed conditions

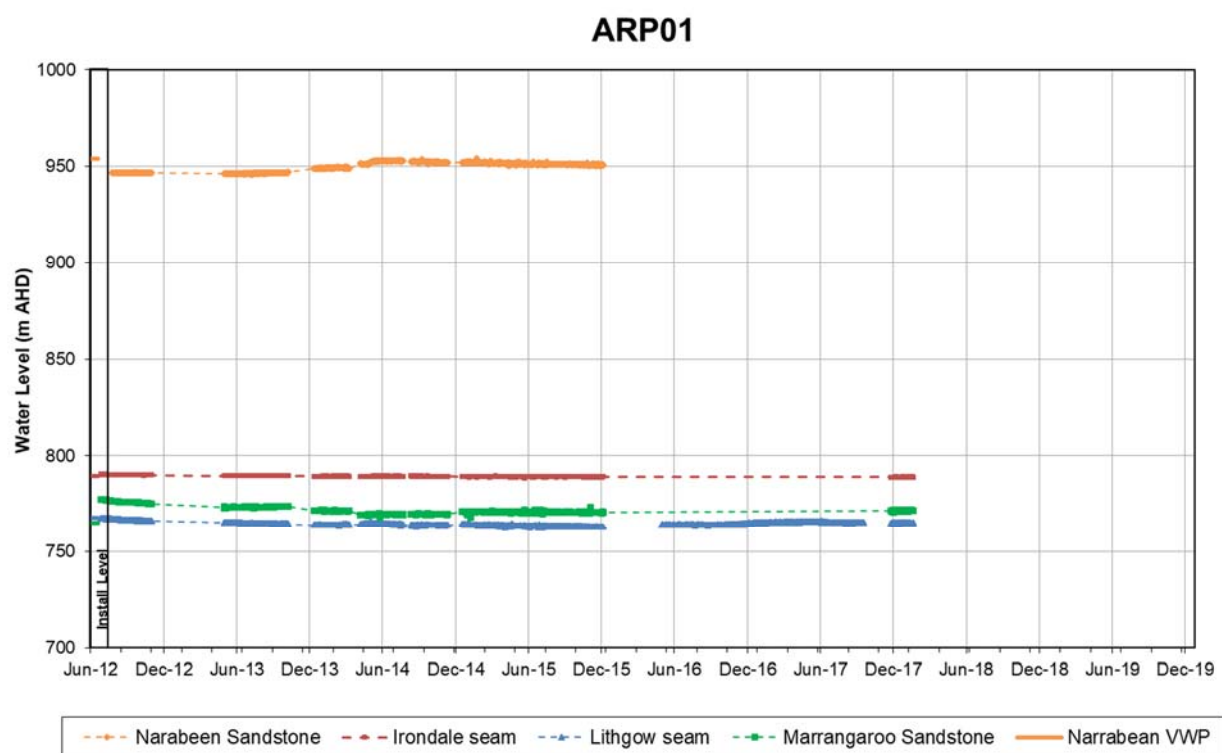


Figure 3 ARP01 hydrograph

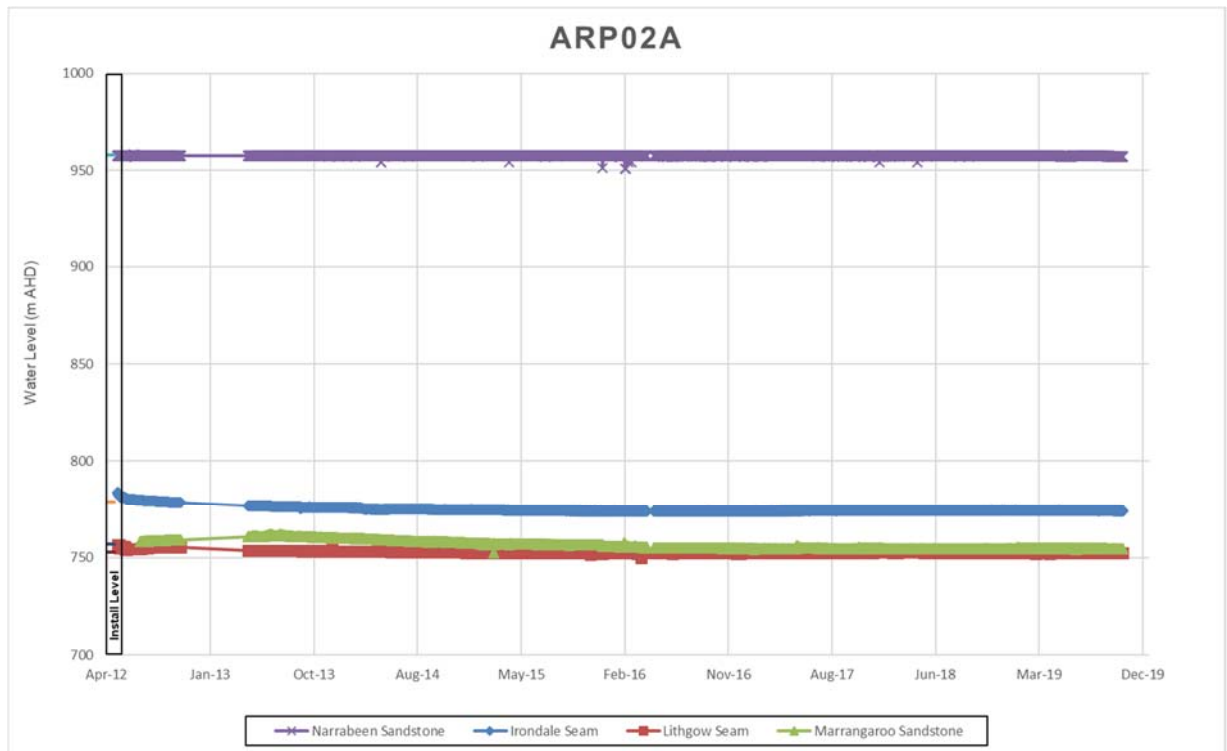


Figure 4 ARP02A hydrograph

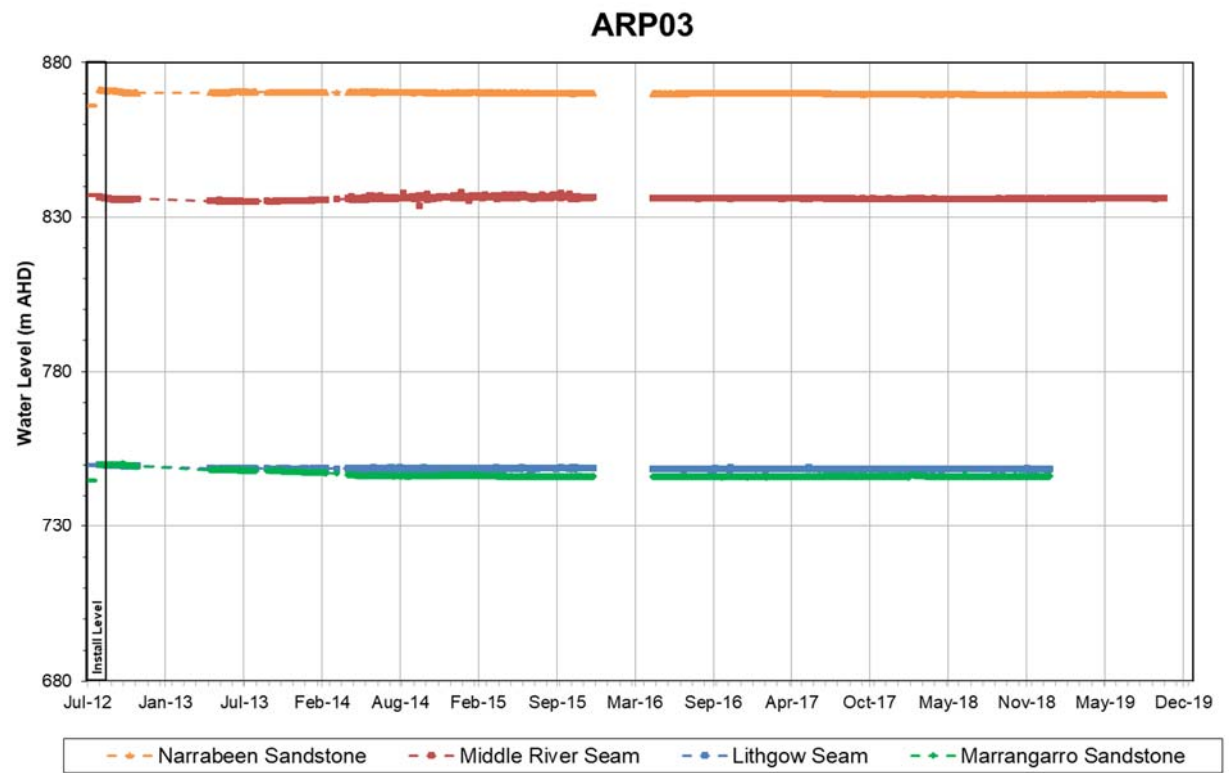


Figure 5 ARP03A hydrograph