MALABAR

MAXWELL UNDERGROUND MINE PROJECT

APPENDIX B

Groundwater Review

MAXWELL UNDERGROUND MINE PROJECT

Modification 2
Groundwater Review

Prepared for:

Malabar Resources
Thomas Mitchell Drive
Muswellbrook NSW 2333

SLR Ref: 665.10012-R01
Version No: -v3.00
June 2022

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Tenancy 202 Submarine School, Sub Base Platypus, 120 High Street
North Sydney NSW 2060 Australia

T: +61 2 9427 8100
E: sydney@slrconsulting.com   www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Malabar Resources (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
665.10012-R01-v1.0665.10012-R01-v3.0	14 June 2022	Maxime Philibert	Arash Mohajeri	Arash Mohajeri
665.10012-R01-v1.0665.10012-R01-v2.0	28 April 2022	Maxime Philibert	Arash Mohajeri	Arash Mohajeri
665.10012-R01-v1.0665.10012-R01-v1.0	11 November 2021	Maxime Philibert	Arash Mohajeri	Noel Merrick

CONTENTS

CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

1 Introduction

The Maxwell Underground Mine Project (the Project) is an approved underground coal mining operation owned by Maxwell Ventures (Management) Pty Ltd, a wholly owned subsidiary of Malabar Resources Limited (Malabar). The Project is in the Upper Hunter Valley of New South Wales (NSW), east-southeast of Denman and south-southwest of Muswellbrook (**Figure 1**).

Development Consent SSD 9526 for the Project was granted by the Independent Planning Commission (IPC) on 22 December 2020. The Project was subsequently approved under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 10 March 2021 (EPBC 2018/8287).

Malabar previously sought to modify Development Consent SSD 9526 under section 4.55(1A) of the E*nvironmental Planning and Assessment Act 1979* (EP&A Act) for a minor extension to the mine entry area (MEA) (Modification 1). Modification 1 was subsequently approved on 19 November 2021 and EPBC 2018/8287 was varied on 14 December 2021.

A proposed Modification is being sought under section 4.55(2) of the EP&A Act (the Modification). The Modification is located wholly within the approved Development Application Area and would comprise the following components (**Figure 2**):

- re-orientation of the longwall panels in the Woodlands Hill, Arrowfield and Bowfield Seams resulting in a minor increase in the approved underground mining extent;
- reduction in the width of some of the longwall panels in the Woodlands Hill Seam, which facilitates earlier commencement of longwall mining;
- repositioning of the upcast ventilation shaft site and associated infrastructure; and
- other minor works and ancillary infrastructure components (e.g. access road and ancillary water management infrastructure for the repositioned ventilation shaft site).

HydroSimulations (2019) completed the Groundwater Assessment for the Project Environmental Impact Statement (EIS) and has since been acquired by SLR Consulting Australia Pty Ltd (SLR). SLR was engaged by Malabar to prepare a Groundwater Review for the Modification.

Source: NSW Spatial Services (2022)

LEGEND

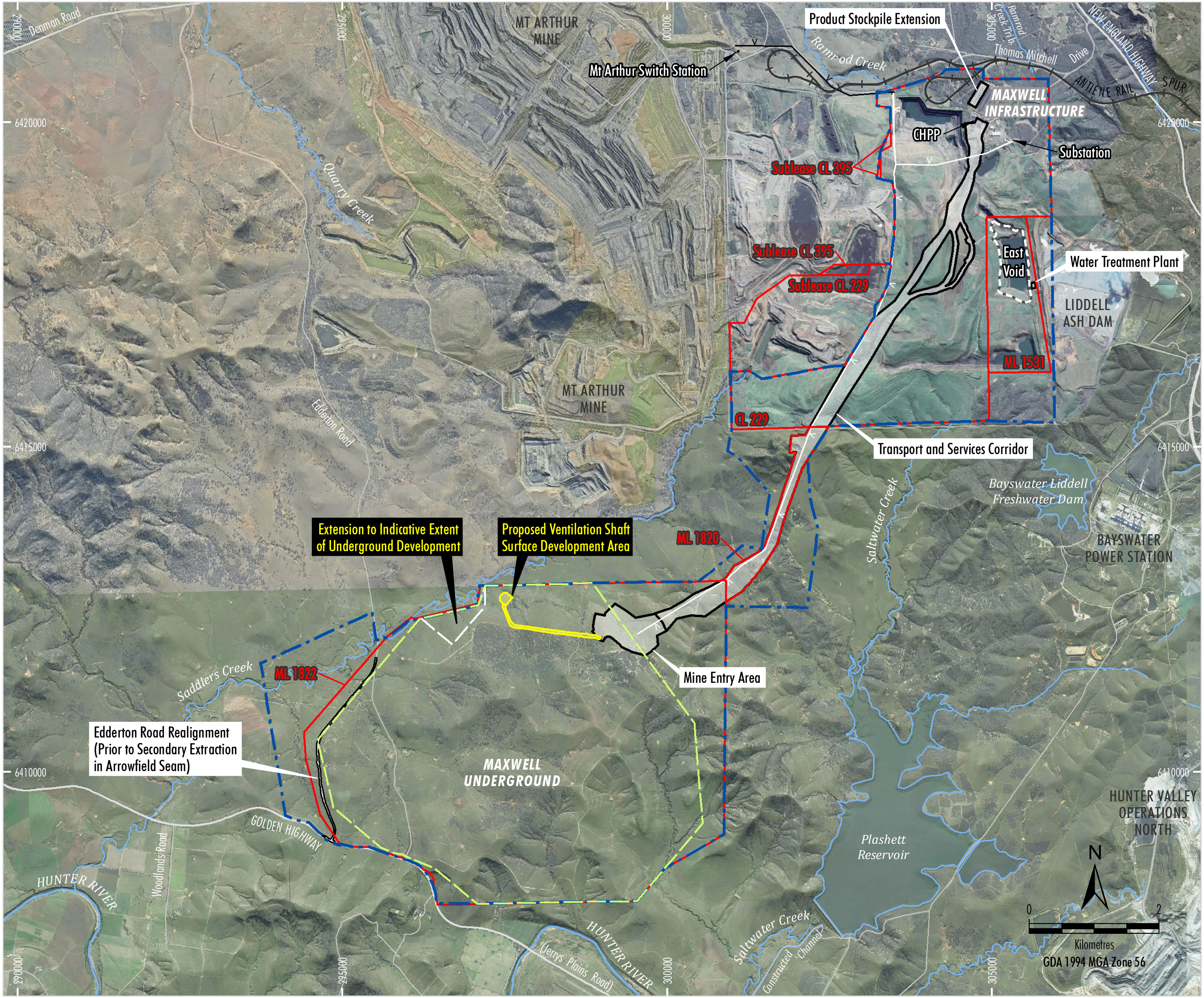
- Mining Operation
- Proposed Mining Operation
- Railway
- Local Government Boundary
- State Forest
- National Parks and Wildlife Service Estate
- Exploration Licence Boundary
- Mining and Coal Lease Boundary
- Indicative Extent of Underground Development

MALABAR

MAXWELL UNDERGROUND MINE PROJECT

Regional Location

Figure 1



LEGEND

- Mining and Coal Lease Boundary
- Proposed Ausgrid 66 kV Power Supply Extension #

Approved Maxwell Underground Mine

- Development Application Area
- Indicative Extent of Underground Development
- Indicative Surface Development Area
- CHPP Reject Emplacement Area
- 66 kV Power Supply

Proposed Modification

- Modified Indicative Extent of Underground Development
- Indicative Modification Surface Development Area

Subject to separate assessment and approval.

Source: NSW Spatial Services (2022); MSEC (2021)
Orthophoto Mosaic: 2020, 2019

MALABAR

MAXWELL UNDERGROUND MINE PROJECT

Modification General Arrangement

Figure 2

SHM-20-04 MOD LW_MP_Figure 2_Rev B

2 Objectives and Scope

The objectives of this Groundwater Review are to:

- Update the mining and goaf fracturing in the groundwater model based on the revised mine plan and assess the potential incremental groundwater impacts of the Modification.
- Present updated baseline data, including new groundwater level and quality data, from site monitoring bores and surface water flow/level data for Saddlers Creek.
- Verify that the Project groundwater model (HydroSimulations, 2019) continues to adequately calibrate to the updated baseline data.

3 Hydrogeological Setting

A comprehensive discussion of the Project area hydrogeology is presented in the EIS Groundwater Assessment (HydroSimulations, 2019). The following section presents a high-level summary of the hydrogeological setting in consideration of additional information collected since the submission of the EIS.

3.1 Hunter River Alluvium

3.1.1 Distribution and Flow

The Hunter River alluvium comprises surficial silts and clays overlying basal sands and gravels. Groundwater occurs within the alluvium at depths of approximately 5 meters (m) to 10 m below the ground surface and generally over 2 m below the base of the Hunter River (Figure 3). This indicates that the Hunter River generally has losing conditions, where surface water from the river seeps into the underlying alluvium. Flow levels in the Hunter River are sustained by regulated releases from Glenbawn Dam.

The cumulative departure from the mean (CDM) rainfall trend is presented on Figure 3, generated for the SILO Grid Point for data from 1900 to 2021. The area experienced a period of above average rainfall from 2007 to 2012, followed by a period of fluctuating rainfall until 2017. From 2017 to 2019, the area experienced below average rainfall, with extended dry conditions over eastern Australia (Bureau of Meteorology [BoM], 2021). Since early 2020, conditions have been wetter than average, including high rainfall totals in February and August 2020, and again in March 2021.

Figure 4 presents the location of the groundwater monitoring bores for the Project area. Recent groundwater levels show limited responses to the rainfall recession between 2017 and late 2019, with the Hunter River sustaining the alluvium aquifer throughout this period.

Regional groundwater flow within the alluvium is a subdued reflection of the topography, with groundwater flowing in a south-easterly direction consistent with the alignment of the Hunter River.

MB1-Alluvial and MB4-Alluvial, which are screened within the Hunter River Alluvium immediately south of the Project, water levels are mostly responsive to stream flow rather than rainfall recharge or periods of drier conditions (i.e. NSW drought 2017-2019). Groundwater levels in August 2021 are 0.5m to 0.9 m higher than water levels observed at the end of the drought (i.e. late 2019), reflective of higher stream levels in the Hunter River.

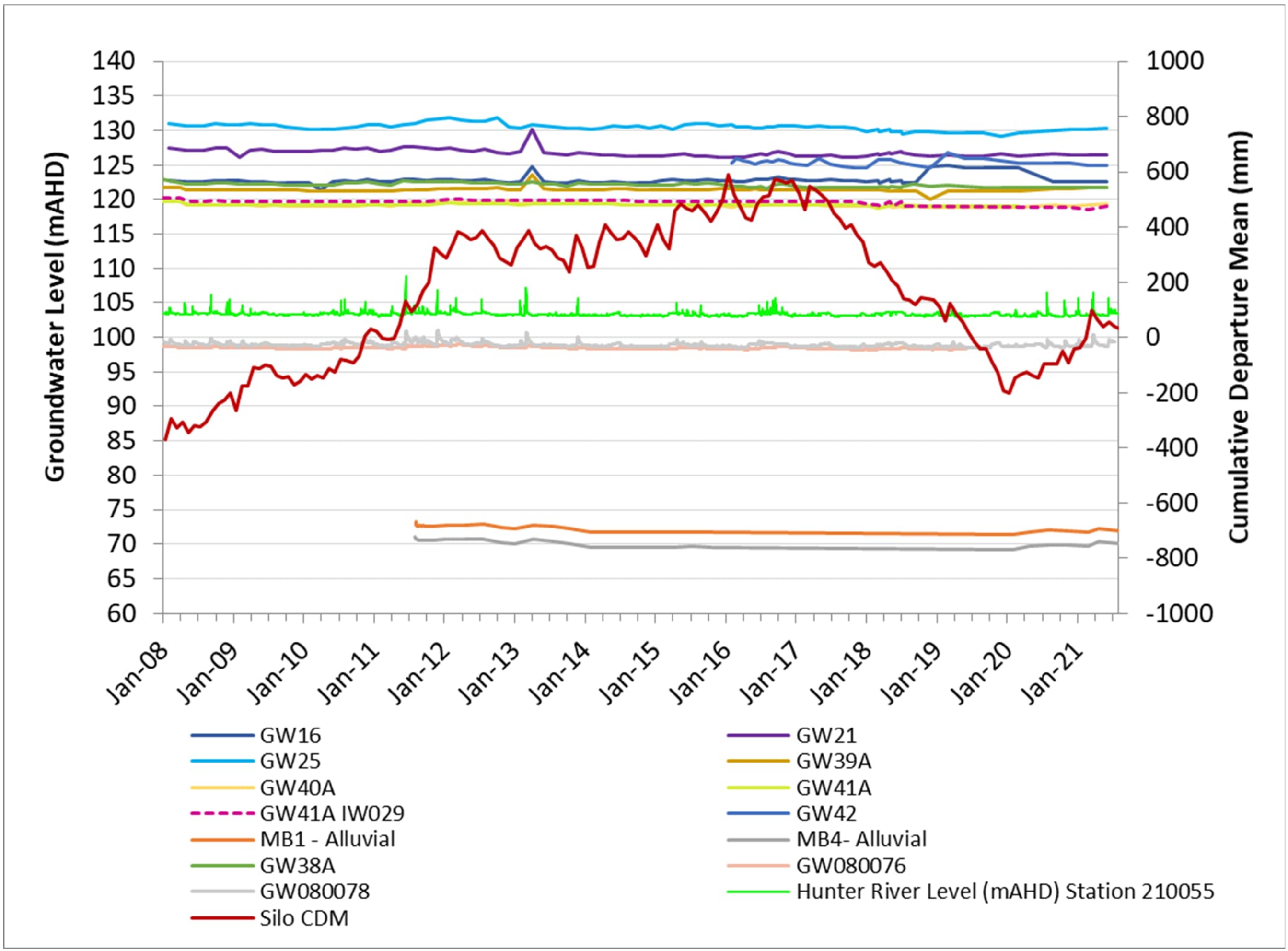
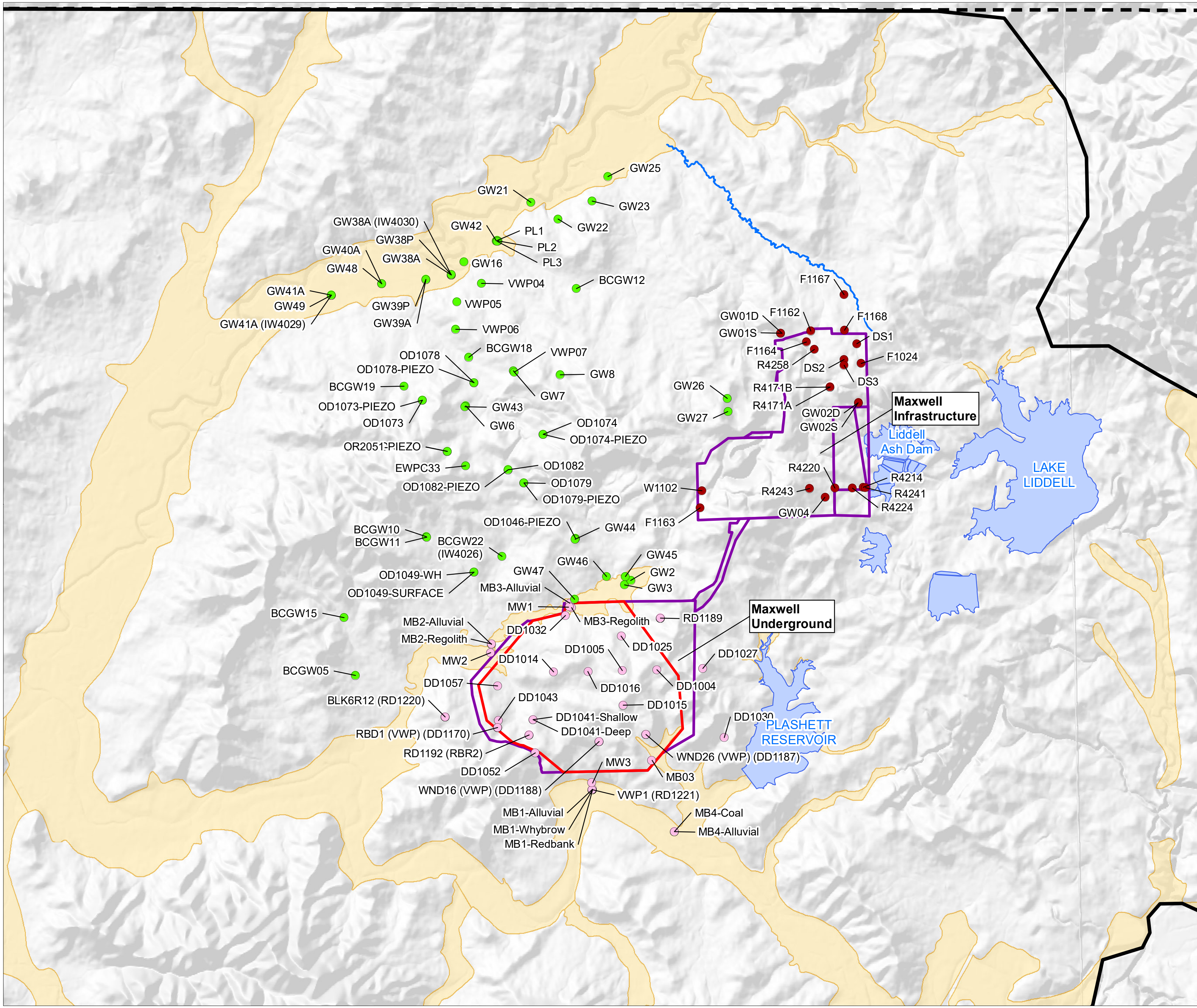


Figure 3 Hydrographs for bores in the Hunter River alluvium and Cumulative Departure from the Mean (CDM)

MAXWELL UNDERGROUND MINE PROJECT MODIFICATION 2 GROUNDWATER REVIEW

Groundwater Monitoring Network

FIGURE 4



Groundwater Monitoring Locations

- Maxwell Infrastructure
- Maxwell Underground
- Mt Arthur
- Active Model Boundary
- Model Extent
- Maxwell Project Coal and Mining Lease Boundaries
- Indicative Underground Mining Area
- Water Reservoirs
- Revised Extent of Alluvium (Hydrosimulations, 2018)

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:150,000 at A4
Project Number:	665.10012
Date:	14-Jun-2022
Drawn by:	JG

MALABAR

H:\Projects-SLR\620-BNE\665-WOL\665.10012 Maxwell Project GW RTS\ArcGIS\66510012 F04 Groundwater Monitoring Network.mxd

3.1.2 Recharge and Discharge

Recharge to the Hunter River Alluvium is mostly from regulated stream flow or flooding (losing streams), with direct infiltration of rainfall also occurring where there are no substantial clay barriers in the shallow sub-surface. There is also potential for discharge or vertical seepage to the underlying Permian Coal Measures.

3.2 Saddlers Creek Alluvium and Regolith

3.2.1 Distribution and Flow

The Saddlers Creek Alluvium presented in Figure 4 is comprised of surficial silts and clays overlying heterogenous interbedded clays, silts, sands and gravels. The occurrence of sands and gravels is predominantly within the lower reaches of Saddlers Creek, near the confluence with the Hunter River. The hydraulic properties of the alluvium near the confluence are expected to be similar to those of the Hunter River Alluvium, while the stratigraphy further upslope is expected to be lower yielding due to the increased presence of silts and clays. Spatially, the alluvium is variably saturated. Localised perched water tables are also evident where waterbodies continue to hold water throughout the dry period (e.g. pools along Saddlers Creek) occurring where clay layers slow the percolation of surface water (i.e. GW45).

Where groundwater is present, it occurs at depths of approximately 3 m to 10 m below the ground surface. Groundwater data collected between 2019 and 2021 is considered representative of local groundwater conditions and consistent with data presented in the groundwater impact assessment (HydroSimulations, 2019) to support the EIS. The water table within the alluvium is a subdued reflection of the topography with groundwater flowing in a general south-west direction toward the Hunter River.

Figure 5 shows groundwater levels in the Saddlers Creek Alluvium with responses to rainfall events by approximately 1 m at MB2-Alluvial and MB3-Alluvial, and occurrence of ephemeral streamflow events recharging the Saddlers Creek Alluvium. Saddlers Creek surface water levels increased in a range of 0.4 m to 1 m during high rainfall events in early 2020 and 2021 (Figure 5 B). At MB2-Regolith, groundwater levels are within baseline levels at 113 meters Australian Height Datum (mAHD) and still showing signs of an upward vertical gradient from regolith to the alluvium as of August 2021. An anomalous decline of approximately 5 m in April 2021 during exceptional rainfall events suggests a measurement error and is not considered representative of mining or climatic effects on water levels at this location.

Declining groundwater levels between 2 and 4 m at GW45 and GW47 since monitoring started in 2016 are attributed to low recharge due to the drought. This declining trend continued until late 2020, despite wetter conditions, before increasing by approximately 0.6 m (GW47) and 1.8 m (GW45) following above average conditions in early 2021.

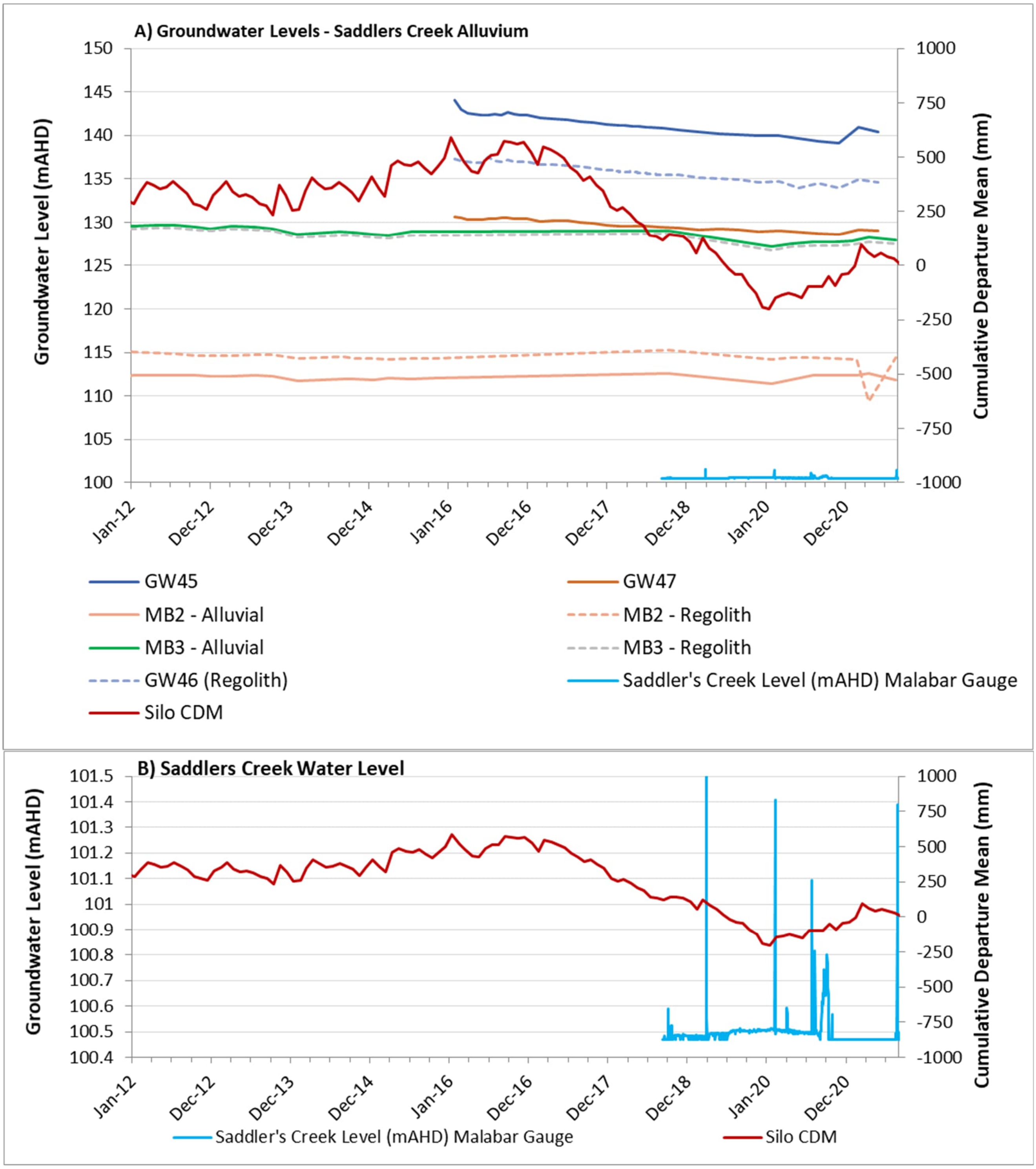


Figure 5 Hydrographs for bores in the Saddlers Creek Alluvium and Cumulative Departure from the Mean (CDM)

3.2.2 Recharge and Discharge

Saddlers Creek has intermittent flow, with flows occurring in response to rainfall events. When flowing, Saddlers Creek generally exhibits losing conditions, where surface water seeps into the underlying alluvium. Within the lower reaches of the creek there is also potential upward seepage from the underlying Permian Coal Measures.

There are possible minor short duration baseflow events after significant rainfall/flooding within the lower reaches of the creek.

3.3 Permian Coal Measures

3.3.1 Distribution and Flow

Groundwater within the Permian strata is encountered in the coal seams and in the sandstone/siltstone units of lower permeability. Recent groundwater levels and trends in the Permian Coal Measures (Figure 6) are consistent with the groundwater regime described in the EIS Groundwater Assessment. The coal seams are the primary groundwater bearing units in the Permian hydrostratigraphic sequence with low permeability interburden generally confining the individual seams. Additional observations to those previously reported in the EIS include the following:

- DD1032 is located to the south of Saddlers Creek Alluvium and monitors the Piercefield overburden. There was a rise in water levels in January 2020, followed by a decline in April 2020, stabilising throughout 2020-2021. A similar rise and decline in water levels early 2020 were also recorded in bore DD1043 despite above average rainfall in March 2020, however groundwater levels remain consistent with increasing rainfall from mid-2020 to mid-2021.
- The slight reduction in groundwater levels in monitoring bores DD1014, DD1005, DD1057, DD1030 and DD1025 between 2018 and 2020 is consistent with the trend observed for rainfall, suggesting the groundwater level declines were due to the drought. There was a groundwater response to rainfall recharge in DD1005 and DD1052 (approximately 2 m) in early 2021 while groundwater levels declined slightly throughout 2021 (approximately 0.5 m) at DD1004, DD1057 and DD1030 suggesting limited rainfall recharge at these sites.

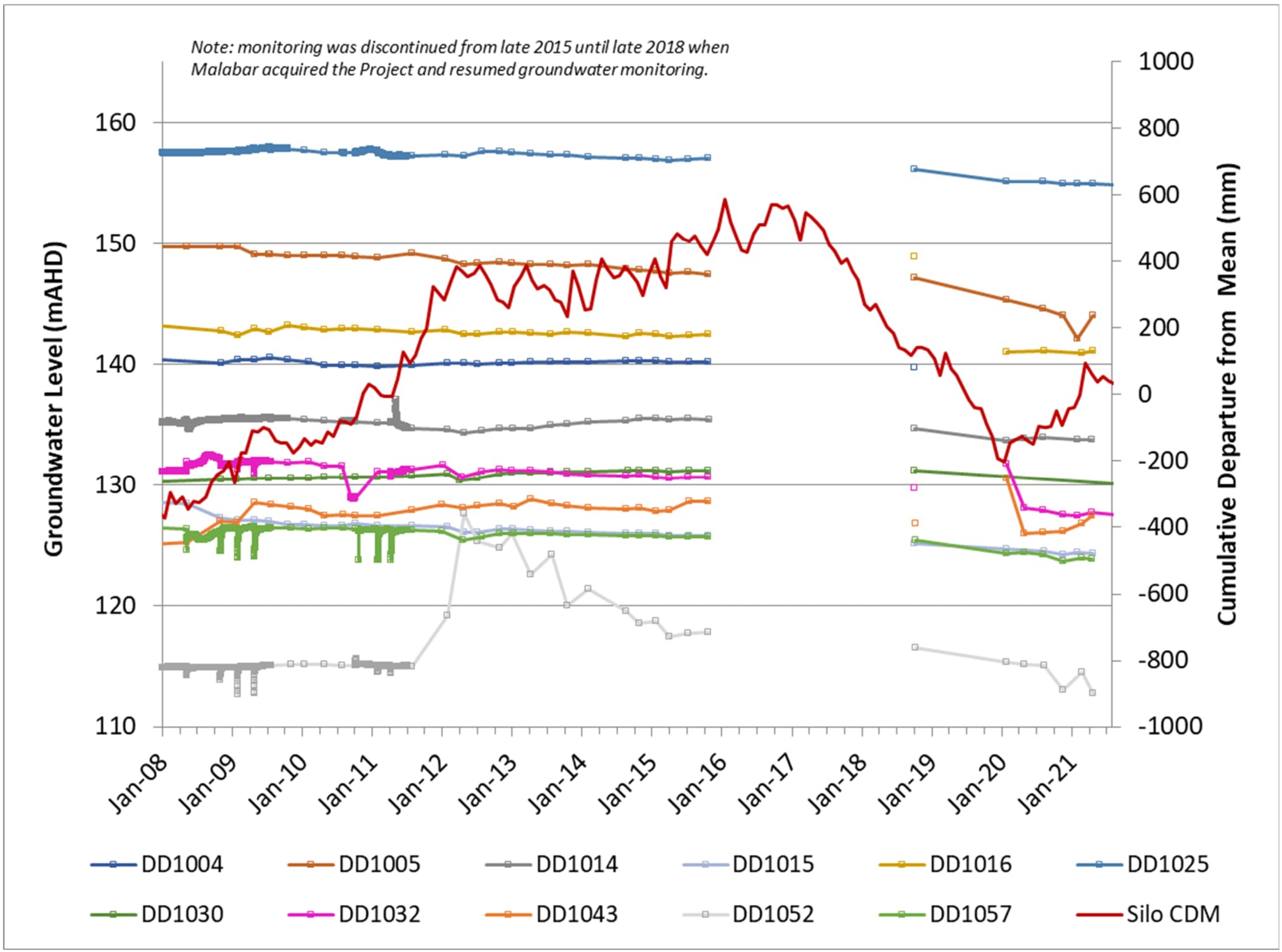


Figure 6 Hydrographs for bores in the Permian Coal Measures and Cumulative Departure from the Mean (CDM)

3.3.2 Recharge and Discharge

Vertical movement of groundwater (including recharge) is limited by the confining interburden layers, meaning that groundwater flow is primarily horizontal through the seams with recharge primarily occurring at sub-crop. Faults mapped within the region have been interpreted as exhibiting lower hydraulic conductivity compared to coal seams (AGE, 2012). Similarly, the presence of dyke intrusions localised along north-south trending faults within the Project area (MBGS, 2018) are not considered conduits to groundwater flow.

4 Water Quality

Water quality summary plots for pH, Electronic Conductivity (EC), Total Dissolved Solids (TDS) and major ions, for available sites and surrounding bores, are included in Appendix A. A comprehensive discussion of the Project groundwater quality is presented in Section 4.4.4 of the EIS Groundwater Impact Assessment (HydroSimulations, 2019).

Recent water quality results within the hydrostratigraphic units across the Project area and surrounds are representative and consistent with the water quality summary presented in the EIS Groundwater Assessment.

Additional observations to those previously reported in the EIS include the following:

- Recent water quality measurements show that the "highly productive" Hunter River Alluvium continues to be generally fresh.
- The "less productive" alluvium within the upper reaches of Saddlers Creek remains moderately saline, with an average TDS of 3,388 mg/L that is consistent with 3,408 mg/L reported in the EIS (i.e. a difference of approximately 0.5%).
- Metal concentrations measured since January 2019 are consistent with concentrations previously reported in the EIS Groundwater Assessment, with concentrations remaining below the laboratory limit of reporting.

5 Groundwater Modelling

5.1 Model Summary

The numerical groundwater model developed for the EIS Groundwater Assessment has been verified using additional data collected since that assessment was completed. The model development and conceptualisation are described in HydroSimulations (2019) and are briefly summarised below.

The model was developed to simulate groundwater conditions at the Project area and is designed for stresses (mining) to be simulated to predict potential impacts to the hydrogeological regime.

The model has been undertaken using Geographic Information Systems (GIS) in conjunction with MODFLOW-Un-Structured Grids (USG). A flexible mesh has been used to allow finer grid resolution in areas of the model that are sensitive. The model domain is discretised into 22 layers and a total of 875,182 Voronoi-shaped cells. The model domain has been designed to be large enough to prevent boundary effects on model outcomes associated with mining-related stress on the groundwater environment because of mining at the Project.

Model inputs include:

- Rainfall recharge.
- Regional groundwater inflows.
- Inflows from water courses.

Model outputs include:

- Evapotranspiration.
- Regional groundwater outflows.
- Pumping from bores.
- Water loss from mining (direct and indirect).

5.2 Calibration Results – Verification

5.2.1 Calibration Overview

The calibration data set for the groundwater model was updated with additional groundwater level data from the Project monitoring program as well as regional data available from other mining operations and government monitoring bores. The updated data set included water levels up to August 2021.

5.2.2 Transient Calibration Statistics

The transient calibration was conducted by matching the observed time series data to the simulated data. The new measurements recorded following the 2019 calibration have been included in the statistics to assess the continued reliability of the model. A total of 119 sites have been used to generate the transient calibration statistics. Groundwater levels recorded at the two monitoring bores RD1189m and RD1192m, equipped with vibrating wire piezometers (VWPs), were added to the observation target file for this study.

The industry standard method to evaluate the calibration of the model is to examine the statistical parameters associated with the calibration. This is achieved by assessing the difference between the modelled and observed (measured) water levels in terms of the scaled root mean square (SRMS).

The updated SRMS for the calibrated groundwater model is 5.5% which is slightly higher than the EIS model calibration. This indicates a good calibration and is within the 2012 Australian Groundwater Modelling Guidelines indicator of 10% SRMS (Barnett et al., 2012).

Table 1 shows a summary of the updated calibration statistics and the earlier modelling conducted for the EIS Groundwater Assessment (HydroSimulations, 2019).

Table 1 Transient Calibration Statistics for the Updated Model and EIS Groundwater Assessment

Statistical Parameters	Updated Statistics	EIS Groundwater Assessment)
Residual Mean	-2.7	-2.5
RMS error (m)	9.6	7.0
Scaled RMS error (%)	5.5	4.3

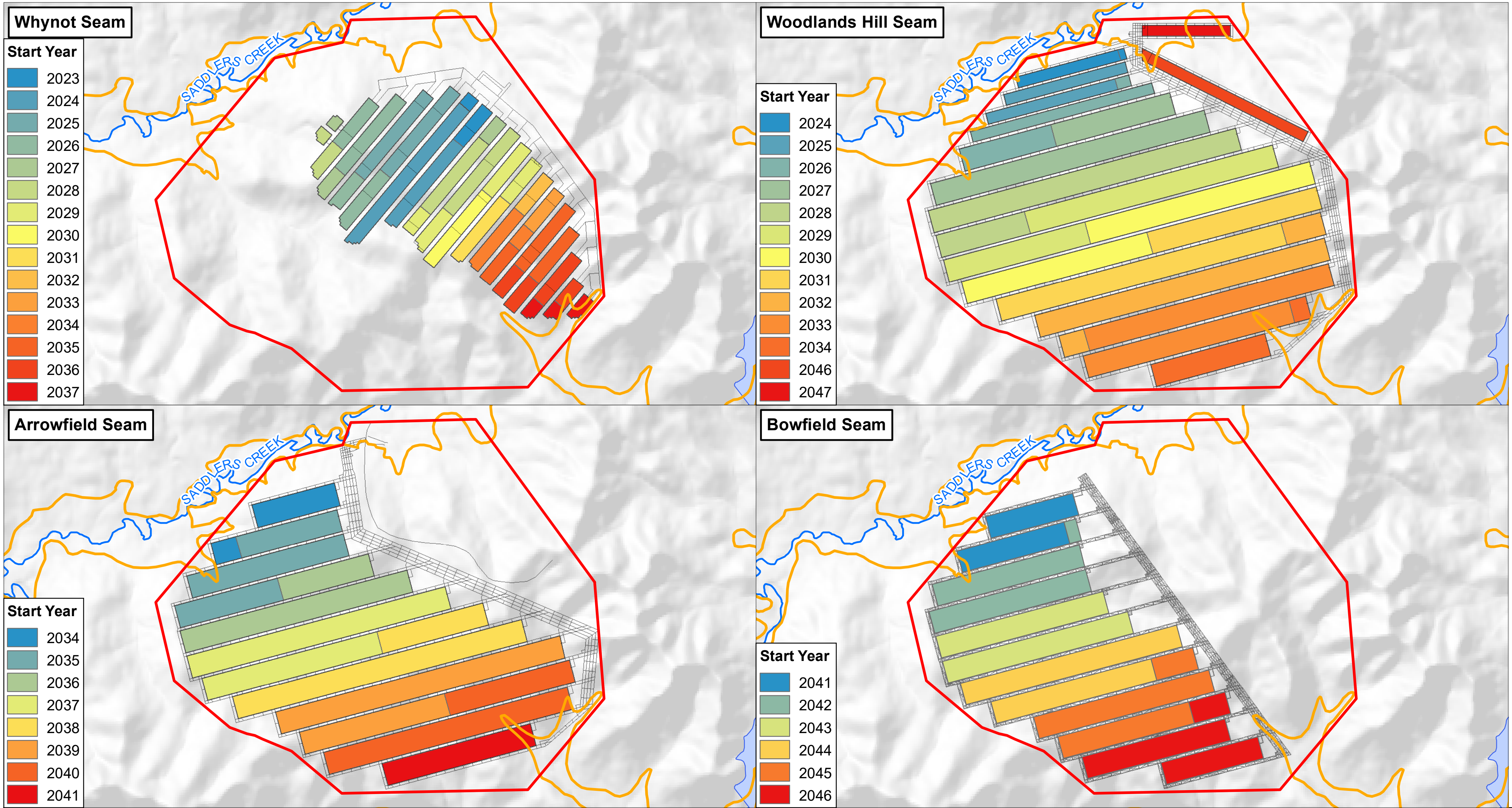
Appendix B presents simulated groundwater levels against the latest observed groundwater levels which remain consistent with hydrographs presented by HydroSimulations (2019). Bores equipped with VWPs at Spur Hill (i.e. SHD10, SHD17, SHD05 and SHD03) were excluded from the calibration datasets as the data appear unreliable (i.e. the observed declines at these bores do not accord with the conceptual understanding of the groundwater system).

Based on the above, the changes in the calibration performance due to the updated groundwater level dataset are considered negligible and, therefore, the groundwater model calibration remains valid and fit for purpose. Further details on calibration results are presented by HydroSimulations (2019) (refer to Section 5.3 of the EIS).

5.3 Predictive Model Update

Malabar has provided a revised mine plan (Modification Mine Plan) that included a slight change in the mine footprint and timing, as follows:

- Change in the mine schedule for Woodlands Hill, Arrowfield, and Bowfield Seams. Figure 7 presents the revised mine progression. The same mine layout and schedule were used for the Whynot panel (bord and pillar);
- Re-orientation of the longwalls in the Woodlands Hill, Arrowfield and Bowfield Seams;
- The longwall widths and cutting height were kept the same as in the EIS Project except for the four initial and two last panels in the Woodlands Seams (i.e. widths narrowed);
- The LW01 and LW02 layout in the Woodlands Hill seam slightly extends outside the approved Underground Indicative Mining Area (Figure 7); and
- Only the longwall panels were simulated in the model. The main headings, gate roads and the drifts were excluded (i.e. consistent with the EIS).



0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:70,000 at A4
Project Number:	665.10012
Date:	08-Jun-2022
Drawn by:	JG

MALABAR

Watercourses
Indicative Underground Mining Area
Revised Extent of Alluvium (HydroSimulations, 2018)

MAXWELL UNDERGROUND MINE PROJECT
MODIFICATION 2
GROUNDWATER REVIEW

Revised Mine Progression for the Modification

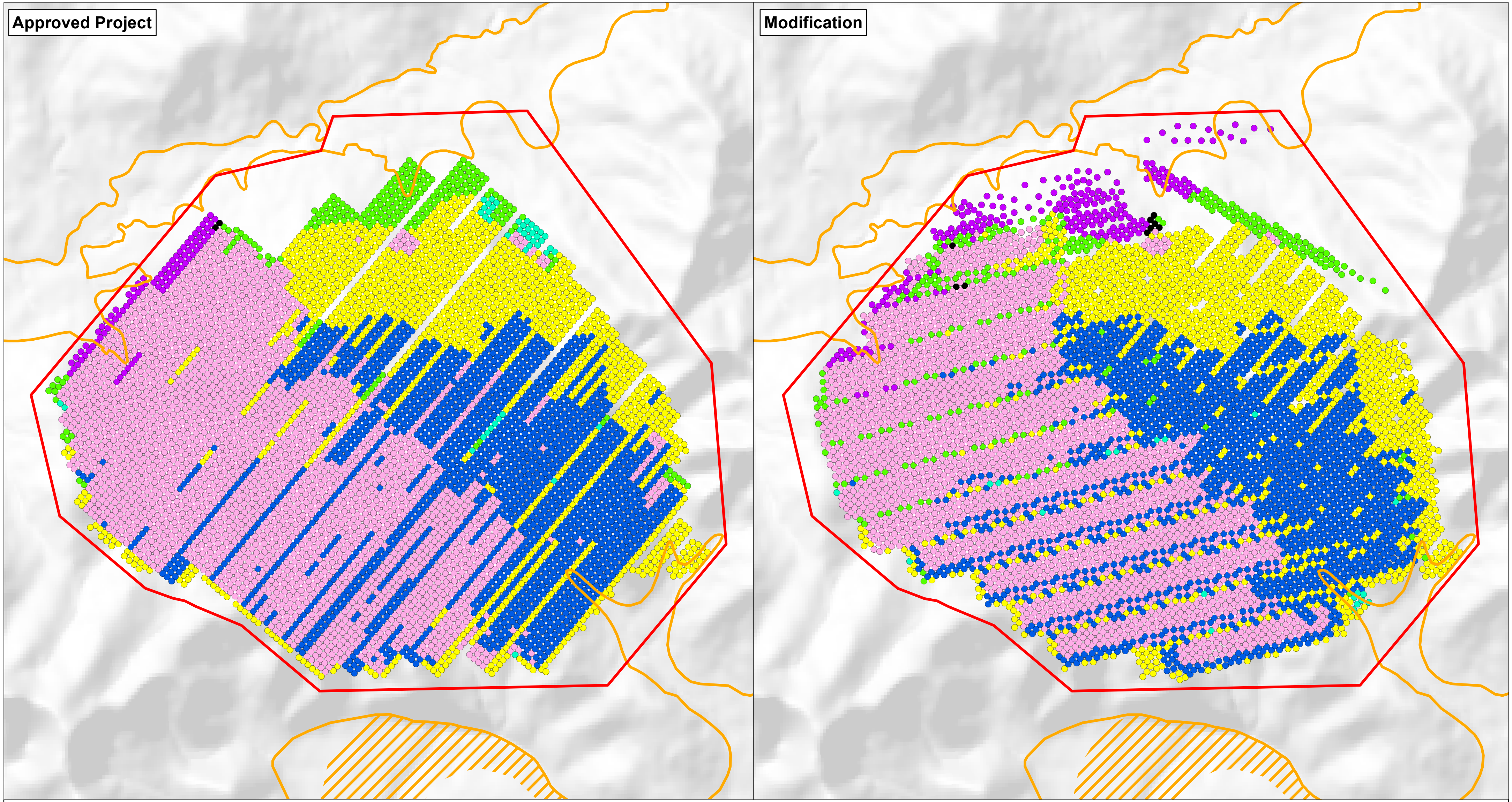
FIGURE 7

H:\Projects-SLR\620-BNE\665-WOL\665.10012 Maxwell Project GW RTS\ArcGIS\66510012 F07 Revised Mine Progression for the Modification.mxd

The Modification mine plan was incorporated into the model to assess the incremental impact compared to the approved Project mine plan. For the Modification model, the predictive model Drain (DRN) package was updated to include the re-orientated longwall panels in the Woodlands Hill, Arrowfield and Bowfield Seams. No change was made to the mine plan in the Whynot Seam in the model.

The height of fracture for the Modification mine plan layout design was then calculated using the methodology adopted in HydroSimulations (2019) to represent multi-seam fracturing. Figure 8 compares the fracture zone height between the Modification and the approved Project. It also indicates in which model layers the height of fracture is potentially extending across the Project area. The height of fracturing was added to the groundwater model using 'stacked drain' method, consistent with the method previously used in the EIS model. The DRN conductance was set to the same values as in the EIS model (HydroSimulations, 2019).

The Time Varying Material (TVM) package was updated to account for the updated fracture height. The enhanced equivalent porous medium hydraulic conductivities representing the collapsed strata and used in the EIS model were applied at the end of mining prior to the simulation of recovery. There were no updates made to any of the other model packages.



0 0.5 1 km

Coordinate System: GDA 1994 MGA Zone 56
Scale: 1:45,000 at A4
Project Number: 665.10012
Date: 08-Jun-2022
Drawn by: JG

MALABAR

- Watercourses
- Indicative Underground Mining Area
- Revised Extent of Alluvium (HydroSimulations, 2018)
- Proposed Highly Productive Alluvium Extent

Maxwell – Fracture Height Ditton A95

- Layer 1 - Regolith (Representative of fracturing of the surface)
- Layer 3 – Whybrow Overburden
- Layer 4 – Whybrow, Redbank and Wambo Seams, Interburden
- Layer 5 – Whynot Seam
- Layer 6 – Whynot-Blakefield Interburden
- Layer 7 – Blakefield Seam
- Layer 8 – Blakefield – GlenMunro Interburden

MAXWELL UNDERGROUND MINE PROJECT
MODIFICATION 2
GROUNDWATER REVIEW

Modelled Height of Fracture (Ditton A95) for the Approved Project and the Modification

FIGURE 8

5.3.1 Groundwater Model Runs

To understand the potential incremental impact due to the Modification, three model scenarios were run:

- Null Run: A baseline scenario with no Project and no Mt Arthur Mine (i.e. a 'no-mining' or 'null' run as per Barnett et al. (2012). This enables assessment of the cumulative effects of the Project along with those of the Mt Arthur Mine. The Null run from the EIS was used.
- Approved: A baseline scenario with the Mt Arthur Mine was applied. The approved run from the EIS Groundwater Assessment was used.
- Approved plus Modification: The approved scenario with the Modification mine plan.

The following section presents the results of the Modification modelling compared to the EIS Groundwater Assessment. A positive change value means greater impacts due to the Modification than the approved Project. A negative incremental change value means less impacts with the Modification than the approved Project.

5.4 Predictive Results

5.4.1 Mine Inflows

Figure 9 compares the predicted total inflows (megalitre [ML]/day) to the Maxwell Underground for the Modification and the approved Project. Overall, the predicted inflow between the Modification and the approved Project are generally consistent on an annual basis, with the Modification resulting in an overall reduction of approximately 500 ML in total groundwater inflows over the life of the Project.

The predicted peak inflow to the Maxwell Underground with the Modification is estimated to reach 3.2 ML/day in Year 11. This represents a slight increase to the peak inflow associated with the approved Project, due to a slight increase in the area mined by the Modification. Under the Modification scenario, a higher number of active drains result in a slightly higher inflow peak during mining at Woodlands Hill.

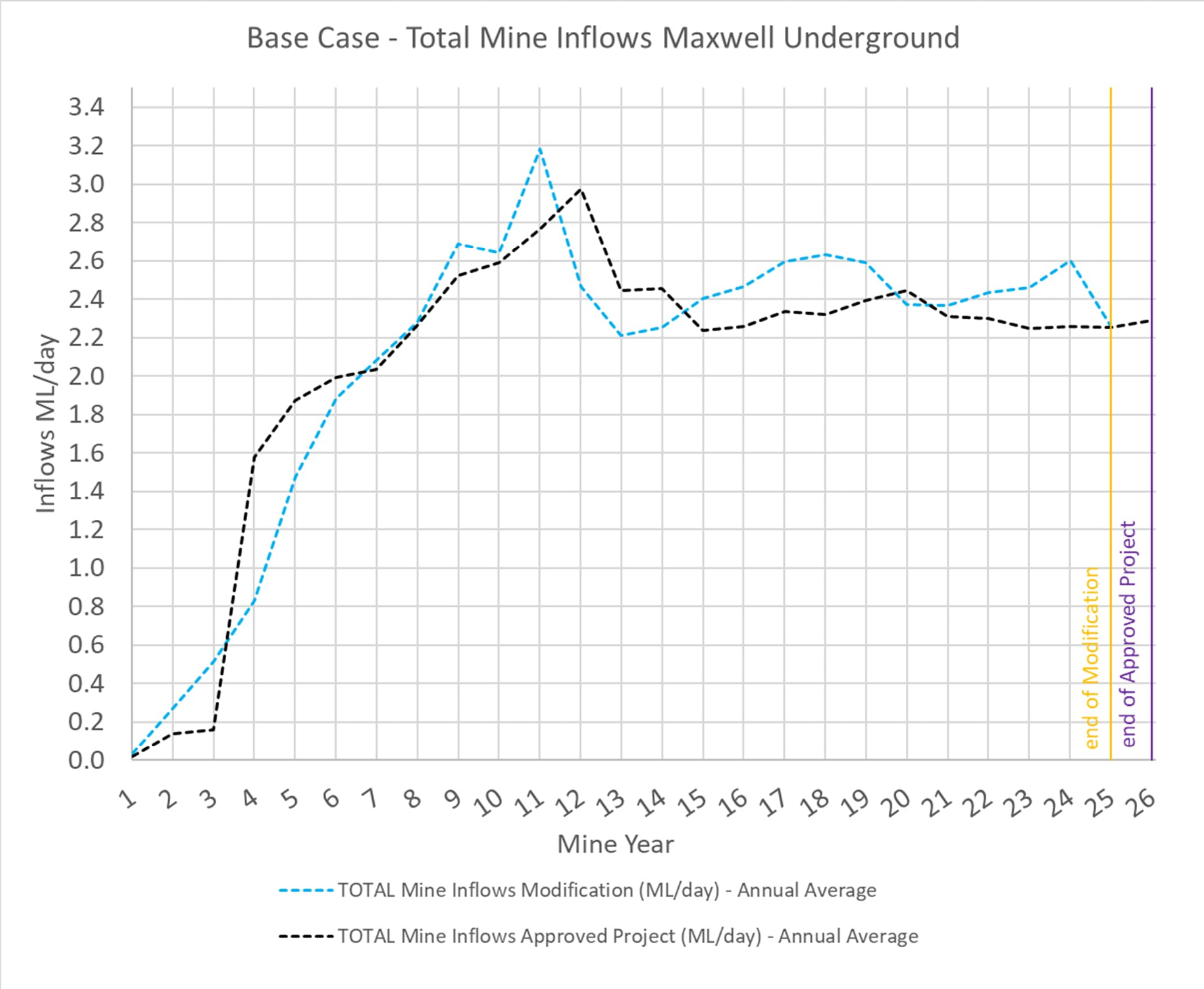


Figure 9 Predicted Inflows to Maxwell Underground – Base case for the Modification and Approved Project

5.4.2 Drawdown and Depressurisation

Mining results in depressurisation of the coal seams and fractured overburden/interburden within the immediate area of mining activities. Depressurisation, that is depression in the potentiometric surface, propagates away from the mining area based on the hydraulic properties of the surrounding strata. Depressurisation, or depression of the potentiometric surface, does not necessarily result in physical groundwater drawdown within constrained units (such as the deeper Permian groundwater system).

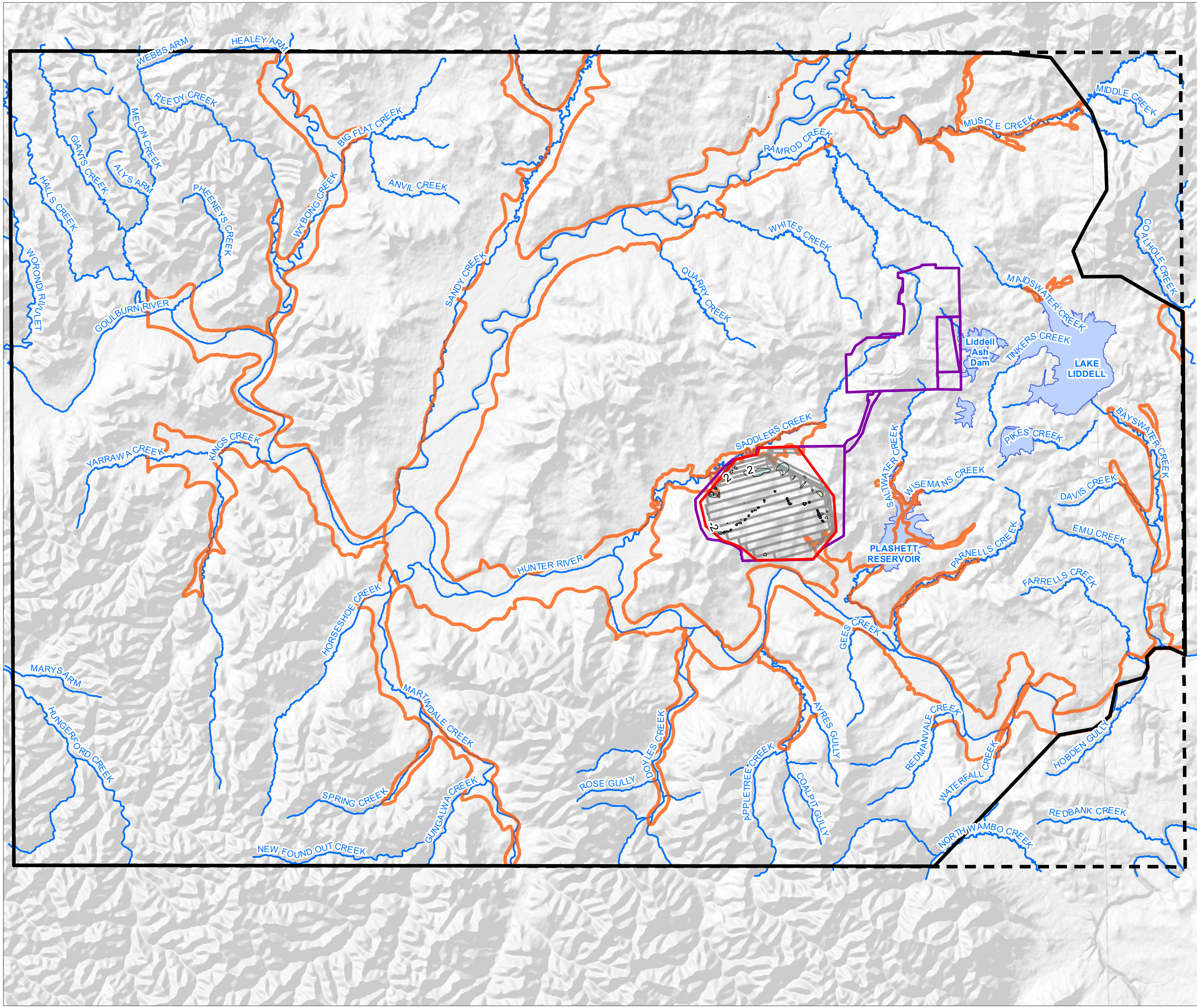
5.4.2.1 Drawdown and Depressurisation – Incremental Impact

Figure 10 to Figure 15A-B show the maximum incremental drawdown due to the Modification (brown shades) and areas where drawdown is reduced due to the Modification (blue shades). The results are presented for the water table (all layers), unconsolidated sediments (Layer 1), and depressurisation within the Whynot Seam (Layer 5), Woodlands Hill Seam (Layer 11), Arrowfield Seam (Layer 13) and Bowfield Seam (Layer 15).

Figure 10A-B shows maximum incremental water table drawdown for all layers constrained across the indicative underground mining area ranging from 2 m to 10 m and along the edge of the Saddlers Creek alluvium (i.e. mid reach) to the north-west. The increase in water table drawdown is located where the early Woodlands Hill longwall panels extend further than the approved mine plan. Less water table drawdown is predicted (1 m to 5 m) for the Modification in areas where longwalls in the Woodlands Hill are shorter and have a change in their orientation compared to the approved mine plan (i.e. including along the Saddlers Creel alluvium within the boundary of the Indicative Underground Mining Area).

Figure 11A-B shows a negligible change in maximum incremental drawdown in the unconsolidated material (Layer 1) (around 1 m localised across Saddlers Creek alluvium) due to the Modification. The negligible drawdown is largely a function of the current modelled unsaturated conditions in Layer 1.

Figure 12A-B to Figure 15A-B show that the Modification would result in depressurisation of the deeper strata propagating further to the north-west and south-east, but a reduction in the propagation of depressurisation to the north-east and south-west (i.e. the Modification would have less of an impact on deeper strata beneath the Hunter River relative to the approved Project). As described above, the increase in the depressurisation of deeper strata to the north-west and south-east of the Project is not expected to cause a material increase in drawdown in the Saddlers Creek and Saltwater Creek alluvium.



MAXWELL UNDERGROUND MINE PROJECT MODIFICATION 2 GROUNDWATER REVIEW

Maximum Incremental Water Table Drawdown (all layers) due to the Modification

FIGURE 10A

- Active Model Boundary
- Model Extent
- Watercourses
- Revised Extent of Alluvium (Hydrosimulations, 2018)
- Maxwell Project Coal and Mining Lease Boundaries
- Indicative Underground Mining Area
- Water Reservoirs
- Woodlands Hill – Revised Longwall Panels

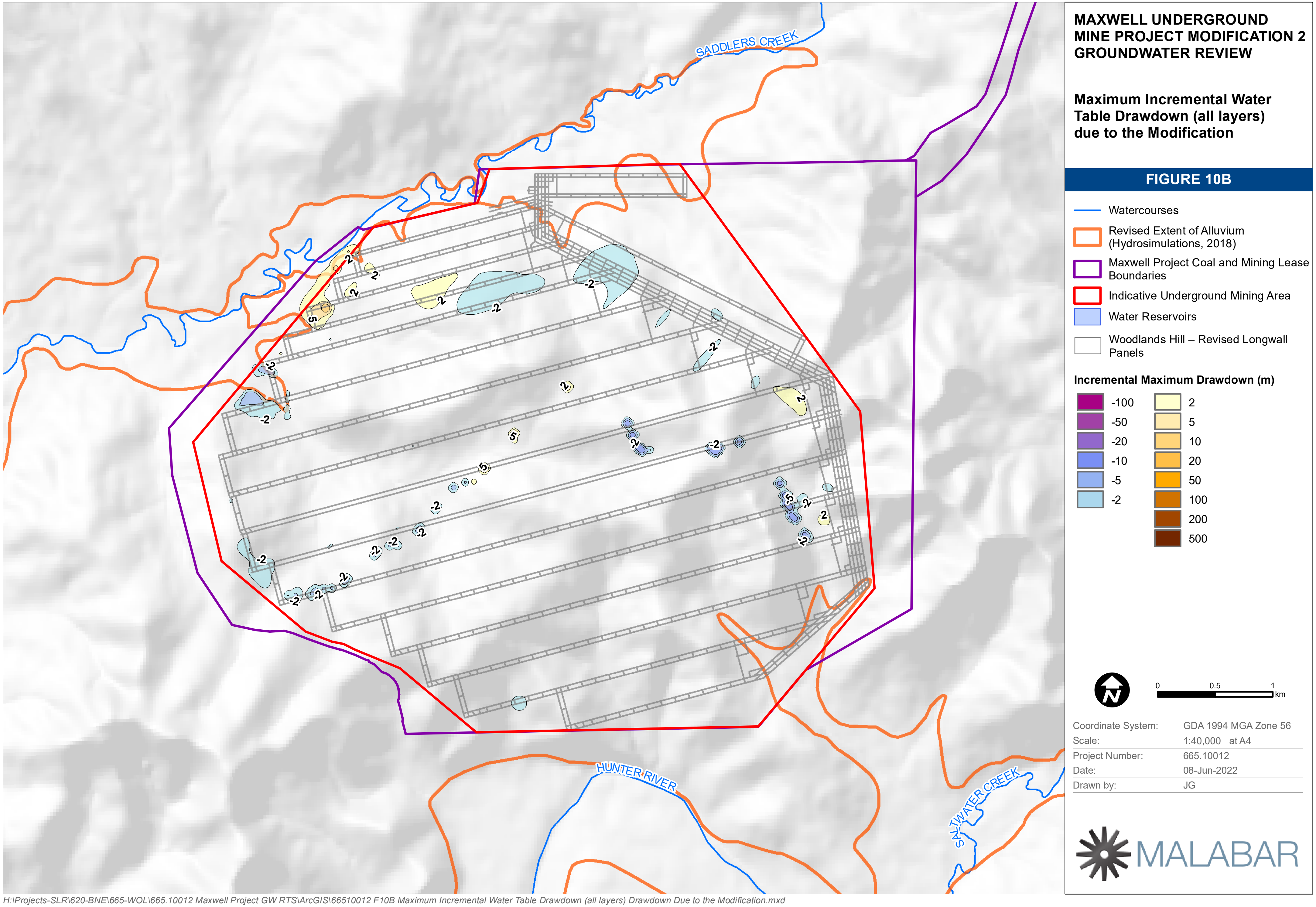
Incremental Maximum Drawdown (m)

-100	2
-50	5
-20	10
-10	20
-5	50
-2	100
	200
	500

0 2.5 5 km

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:225,000 at A4
Project Number:	665.10012
Date:	08-Jun-2022
Drawn by:	JG

MALABAR

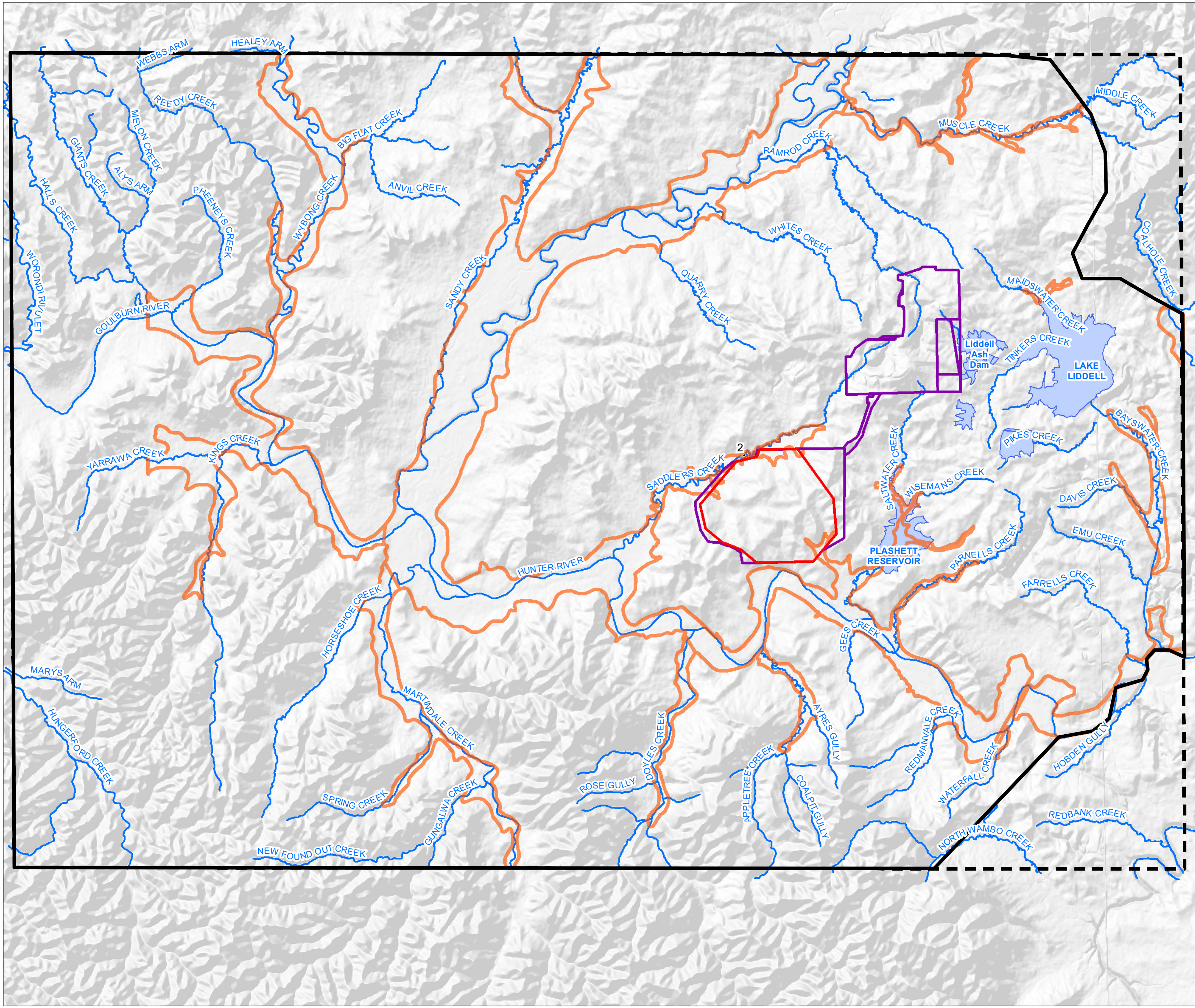


SADDLERS CREEK
HUNTER RIVER
SALTWATER CREEK
MAXWELL UNDERGROUND MINE PROJECT MODIFICATION 2 GROUNDWATER REVIEW
Maximum Incremental Water Table Drawdown (all layers) due to the Modification
FIGURE 10B
Watercourses
Revised Extent of Alluvium (Hydrosimulations, 2018)
Maxwell Project Coal and Mining Lease Boundaries
Indicative Underground Mining Area
Water Reservoirs
Woodlands Hill – Revised Longwall Panels
Incremental Maximum Drawdown (m)
-100
-50
-20
-10
-5
-2
2
5
10
20
50
100
200
500
0 0.5 1 km
Coordinate System: GDA 1994 MGA Zone 56
Scale: 1:40,000 at A4
Project Number: 665.10012
Date: 08-Jun-2022
Drawn by: JG
MALABAR
H:\Projects-SLR\620-BNE\665-WOL\665.10012 Maxwell Project GW RTS\ArcGIS\66510012 F10B Maximum Incremental Water Table Drawdown (all layers) Drawdown Due to the Modification.mxd

MAXWELL UNDERGROUND MINE PROJECT MODIFICATION 2 GROUNDWATER REVIEW

Maximum Incremental Drawdown due to the Modification, Unconsolidated Sediments (Layer 1)

FIGURE 11A



- Active Model Boundary
- Model Extent
- Watercourses
- Revised Extent of Alluvium (Hydrosimulations, 2018)
- Maxwell Project Coal and Mining Lease Boundaries
- Indicative Underground Mining Area
- Water Reservoirs

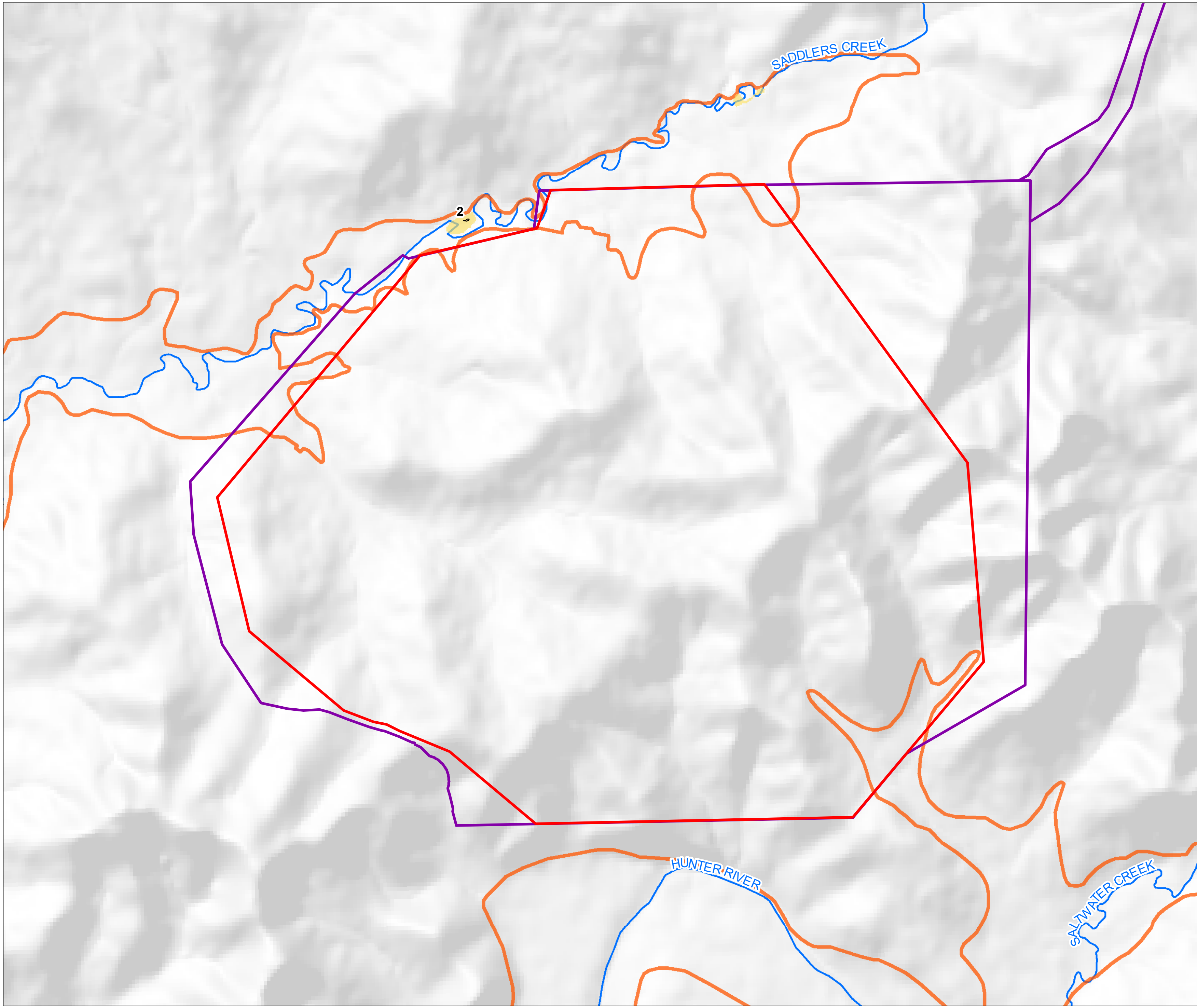
Incremental Maximum Drawdown (m)

- 1
- 2
- 5
- 10
- 20
- 50
- 100

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:225,000 at A4
Project Number:	665.10012
Date:	08-Jun-2022
Drawn by:	JG

MALABAR

H:\Projects-SLR\620-BNE\665-WOL\665.10012 Maxwell Project GW RTS\ArcGIS\66510012 F11A Maximum Incremental Drawdown due to the Modification, Unconsolidated Sediments (Layer 1).mxd



MAXWELL UNDERGROUND MINE PROJECT MODIFICATION 2 GROUNDWATER REVIEW

Maximum Incremental Drawdown due to the Modification, Unconsolidated Sediments (Layer 1)

FIGURE 11B

Watercourses
Revised Extent of Alluvium (Hydrosimulations, 2018)
Maxwell Project Coal and Mining Lease Boundaries
Indicative Underground Mining Area
Water Reservoirs

Incremental Maximum Drawdown (m)

1
2
5
10
20
50
100

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:40,000 at A4
Project Number:	665.10012
Date:	08-Jun-2022
Drawn by:	JG

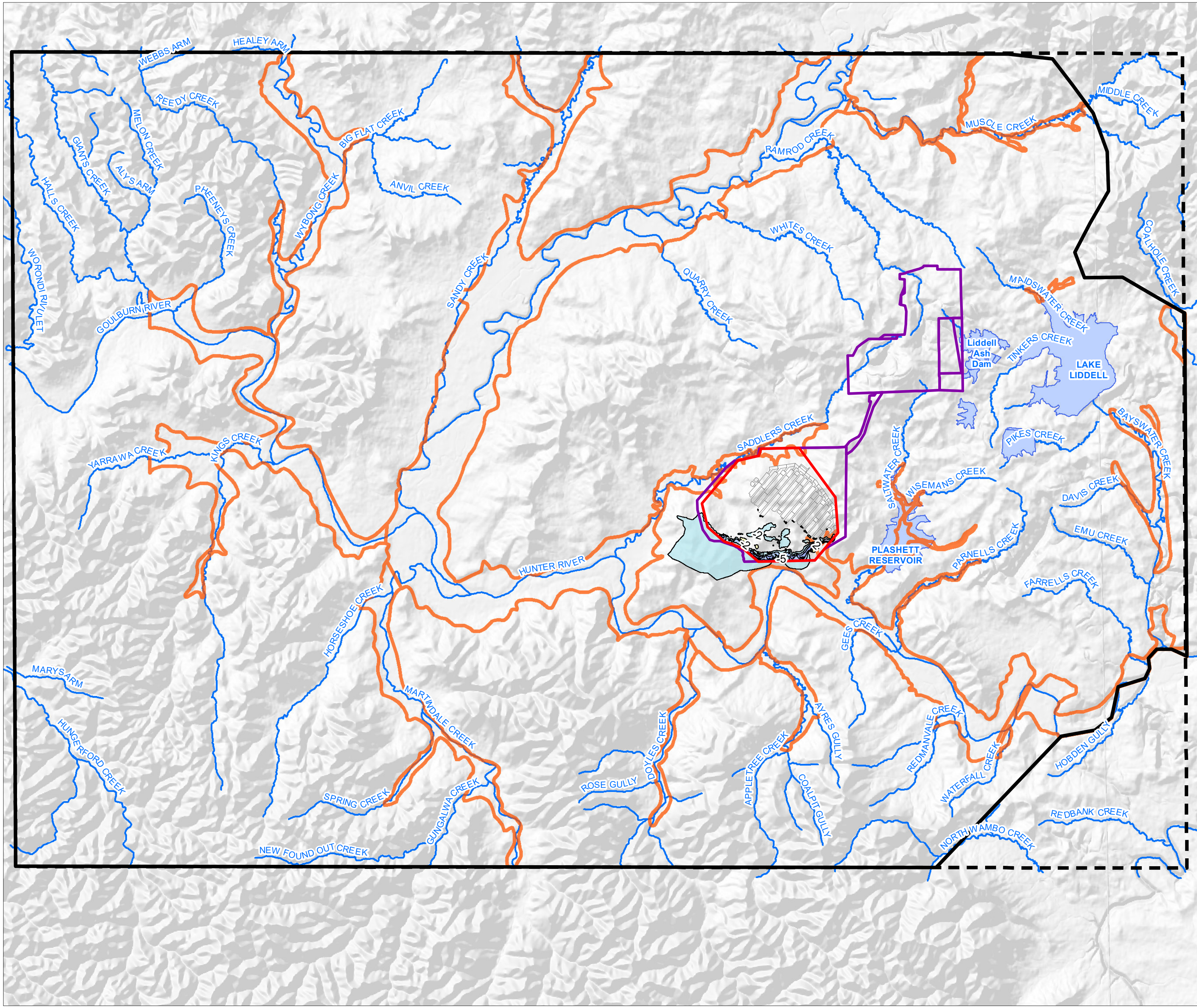
MALABAR

H:\Projects-SLR\620-BNE\665-WOL\665.10012 Maxwell Project GW RTS\ArcGIS\66510012 F11B Maximum Incremental Drawdown due to the Modification, Unconsolidated Sediments (Layer 1).mxd

MAXWELL UNDERGROUND MINE PROJECT MODIFICATION 2 GROUNDWATER REVIEW

Maximum Incremental Drawdown due to the Modification, Whynot seam (Layer 5)

FIGURE 12A



- Active Model Boundary
- Model Extent
- Watercourses
- Revised Extent of Alluvium (Hydrosimulations, 2018)
- Maxwell Project Coal and Mining Lease Boundaries
- Indicative Underground Mining Area
- Water Reservoirs
- Whynot Seam - Bord and Pillar

Incremental Maximum Drawdown (m)

-100	2
-50	5
-20	10
-10	20
-5	50
-2	100
	200
	500

0 2.5 5 km

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:225,000 at A4
Project Number:	665.10012
Date:	08-Jun-2022
Drawn by:	JG

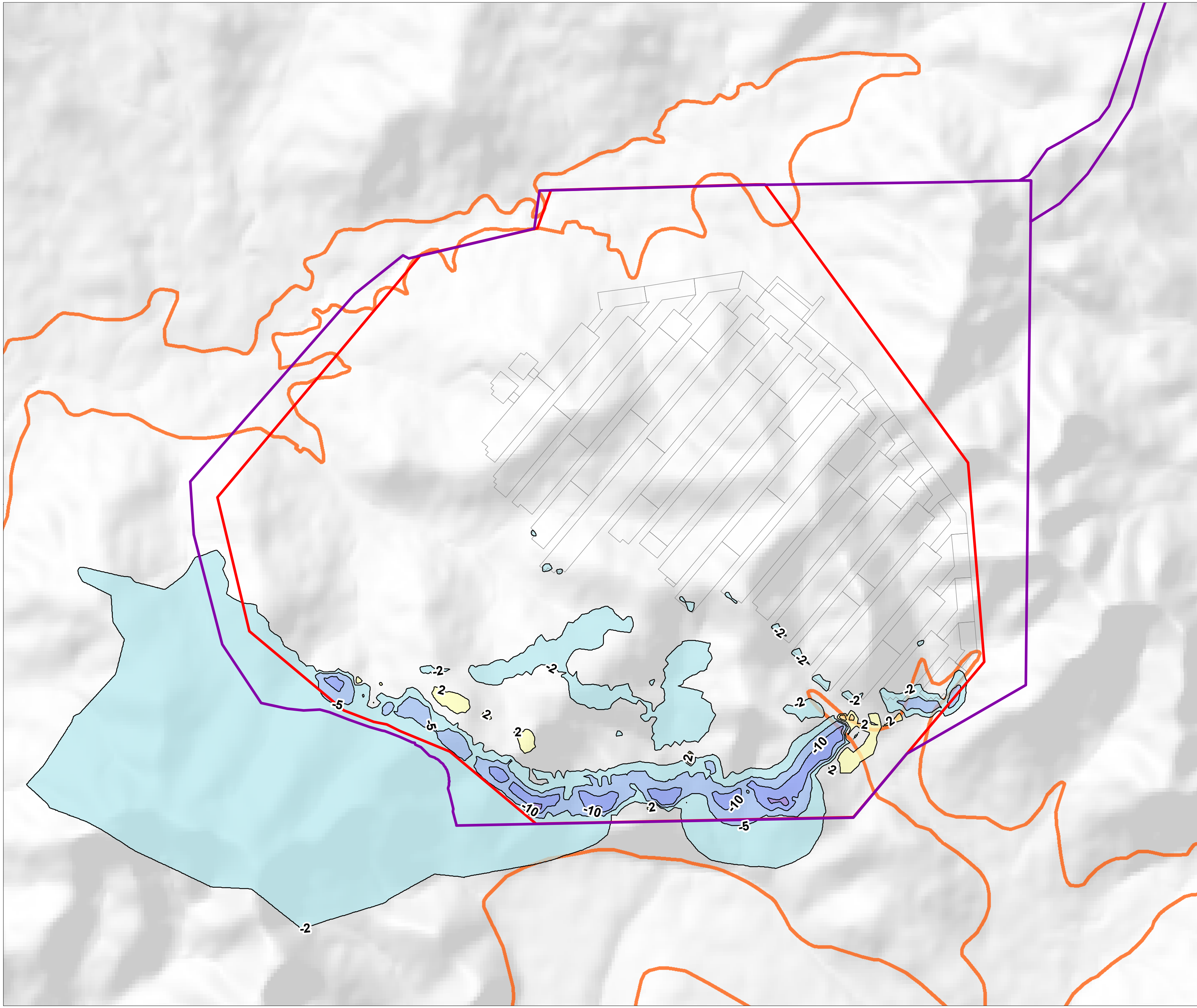
MALABAR

H:\Projects-SLR\620-BNE\665-WOL\665.10012 Maxwell Project GW RTS\ArcGIS\66510012 F12A Maximum Incremental Drawdown due to the Modification, Whynot seam (Layer 5).mxd

MAXWELL UNDERGROUND MINE PROJECT MODIFICATION 2 GROUNDWATER REVIEW

Maximum Incremental Drawdown due to the Modification, Whynot seam (Layer 5)

FIGURE 12B



- Watercourses
- Revised Extent of Alluvium (Hydrosimulations, 2018)
- Maxwell Project Coal and Mining Lease Boundaries
- Indicative Underground Mining Area
- Water Reservoirs
- Whynot Seam - Bord and Pillar

Incremental Maximum Drawdown (m)

-100	2
-50	5
-20	10
-10	20
-5	50
-2	100
	200
	500

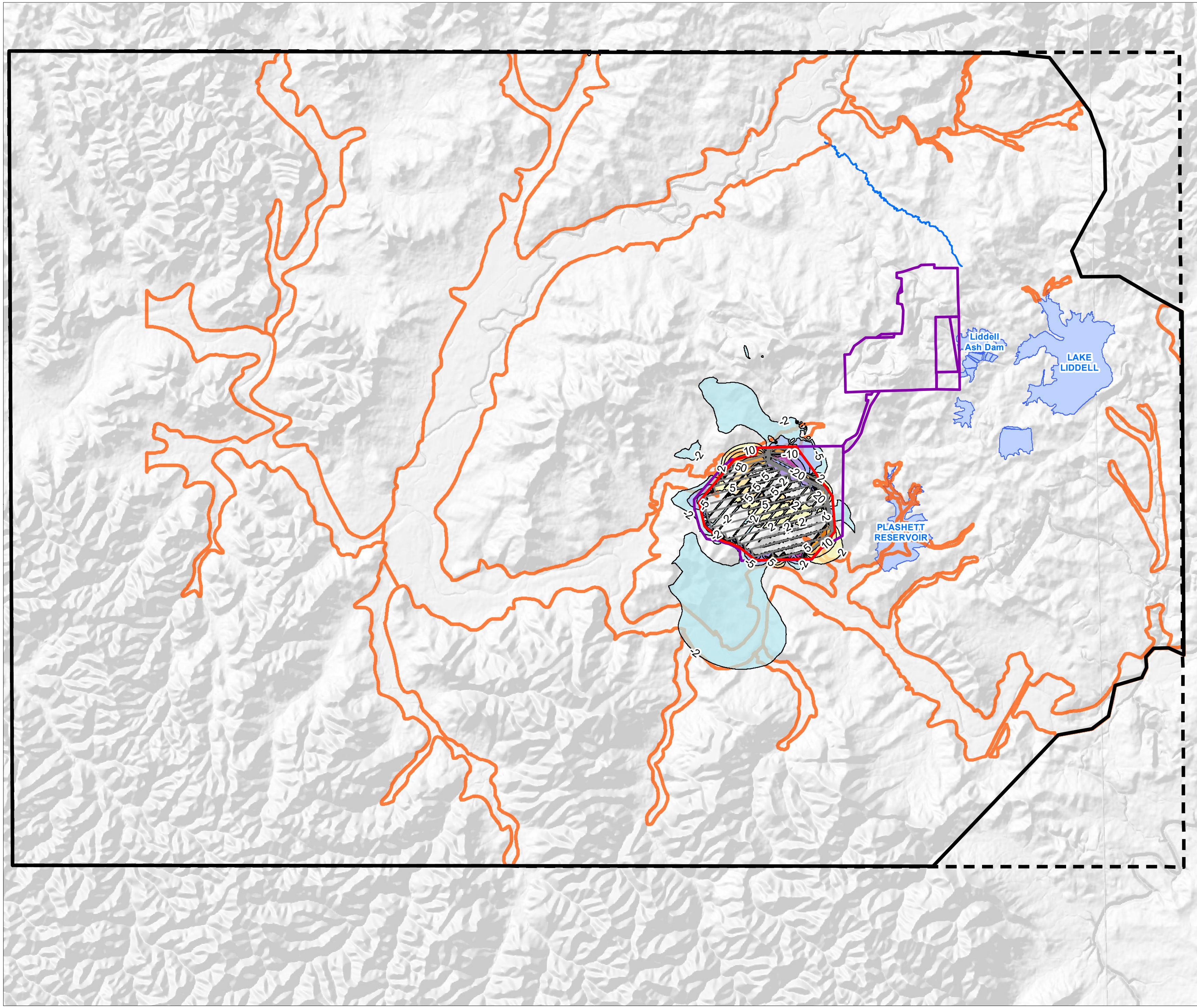
N

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:40,000 at A4
Project Number:	665.10012
Date:	08-Jun-2022
Drawn by:	JG

MALABAR

H:\Projects-SLR\620-BNE\665-WOL\665.10012 Maxwell Project GW RTS\ArcGIS\66510012 F12B Maximum Incremental Drawdown due to the Modification, Whynot seam (Layer 5).mxd.mxd



MAXWELL UNDERGROUND MINE PROJECT MODIFICATION 2 GROUNDWATER REVIEW

Maximum Incremental Drawdown due to the Modification, Woodlands Hill seam (Layer 11)

FIGURE 13A

- Active Model Boundary
- Model Extent
- Watercourses
- Revised Extent of Alluvium (Hydrosimulations, 2018)
- Maxwell Project Coal and Mining Lease Boundaries
- Indicative Underground Mining Area
- Water Reservoirs
- Woodlands Hill – Revised Longwall Panels

Incremental Maximum Drawdown (m)

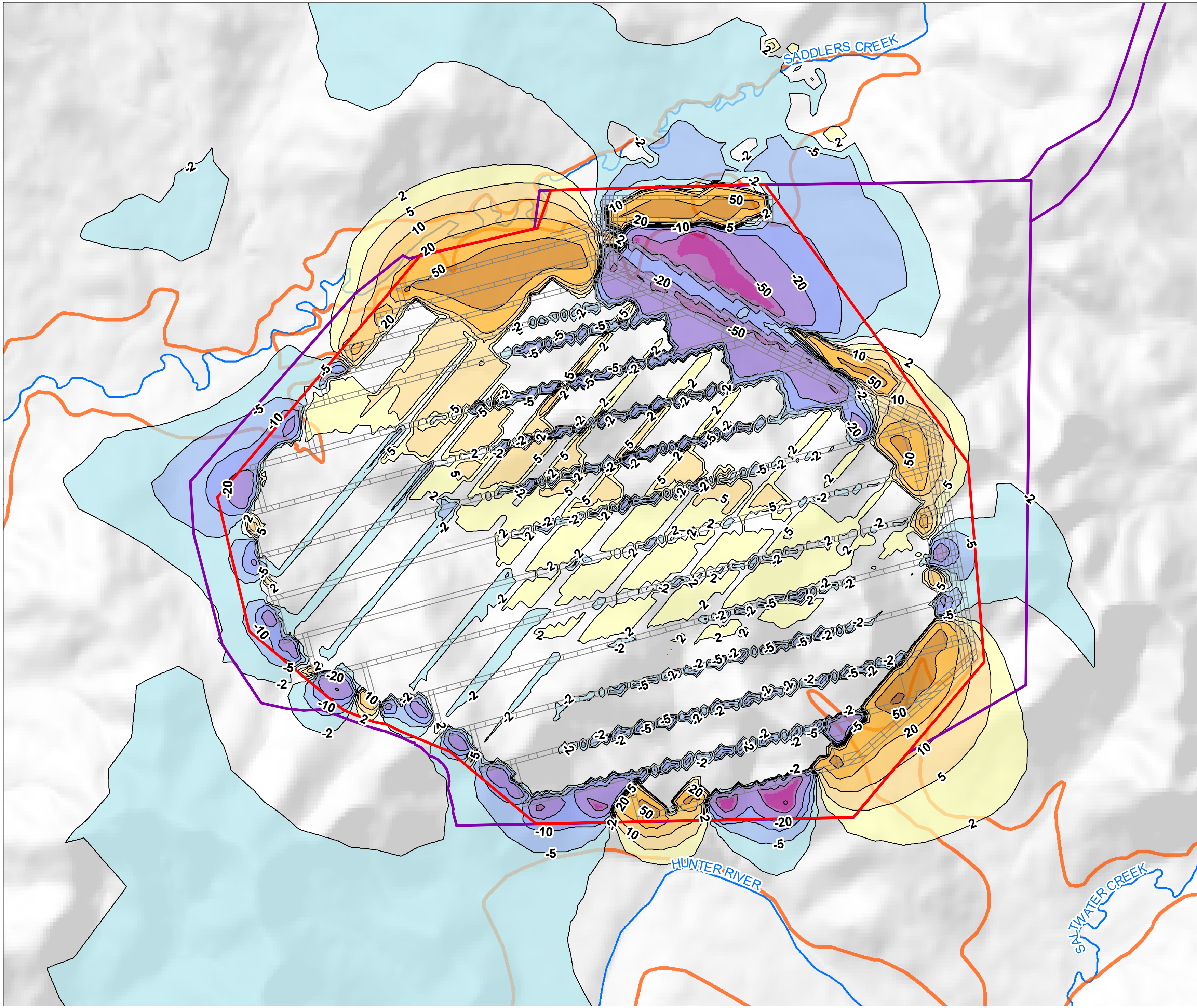
-100	2
-50	5
-20	10
-10	20
-5	50
-2	100
	200
	500

0 2.5 5 km

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:225,000 at A4
Project Number:	665.10012
Date:	08-Jun-2022
Drawn by:	JG

MALABAR

H:\Projects-SLR\620-BNE\665-WOL\665.10012 Maxwell Project GW RTS\ArcGIS\66510012 F13A Maximum Incremental Drawdown due to the Modification, Woodlands Hill seam (Layer 11).mxd



MAXWELL UNDERGROUND MINE PROJECT MODIFICATION 2 GROUNDWATER REVIEW

Maximum Incremental Drawdown due to the Modification, Woodlands Hill seam (Layer 11)

FIGURE 13B

- Watercourses
- Revised Extent of Alluvium (Hydrosimulations, 2018)
- Maxwell Project Coal and Mining Lease Boundaries
- Indicative Underground Mining Area
- Water Reservoirs
- Woodlands Hill – Revised Longwall Panels

Incremental Maximum Drawdown (m)

-100, -50, -20, -10, -5, -2, 2, 5, 10, 20, 50, 100, 200, 500

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:40,000 at A4
Project Number:	665.10012
Date:	08-Jun-2022
Drawn by:	JG

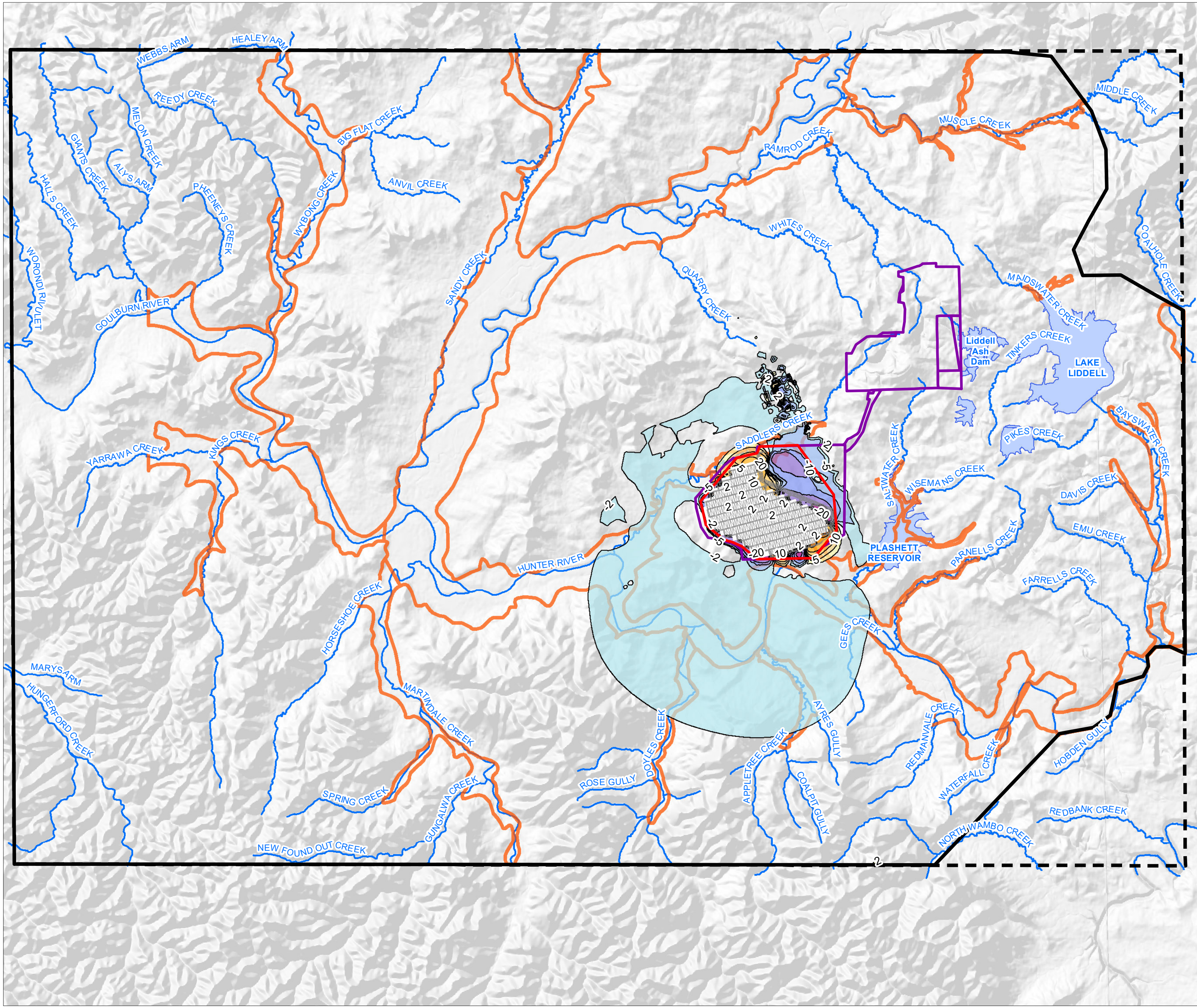
MALABAR

H:\Projects-SLR\620-BNE\665-WOL\665.10012 Maxwell Project GW RTS\ArcGIS\66510012 F13B Maximum Incremental Drawdown due to the Modification, Woodlands Hill seam (Layer 11).mxd

MAXWELL UNDERGROUND MINE PROJECT MODIFICATION 2 GROUNDWATER REVIEW

Maximum Incremental Drawdown due to the Modification, Arrowfield seam (Layer 13)

FIGURE 14A



- Active Model Boundary
- Model Extent
- Watercourses
- Revised Extent of Alluvium (Hydrosimulations, 2018)
- Maxwell Project Coal and Mining Lease Boundaries
- Indicative Underground Mining Area
- Water Reservoirs
- Arrowfield – Revised Longwall Panels

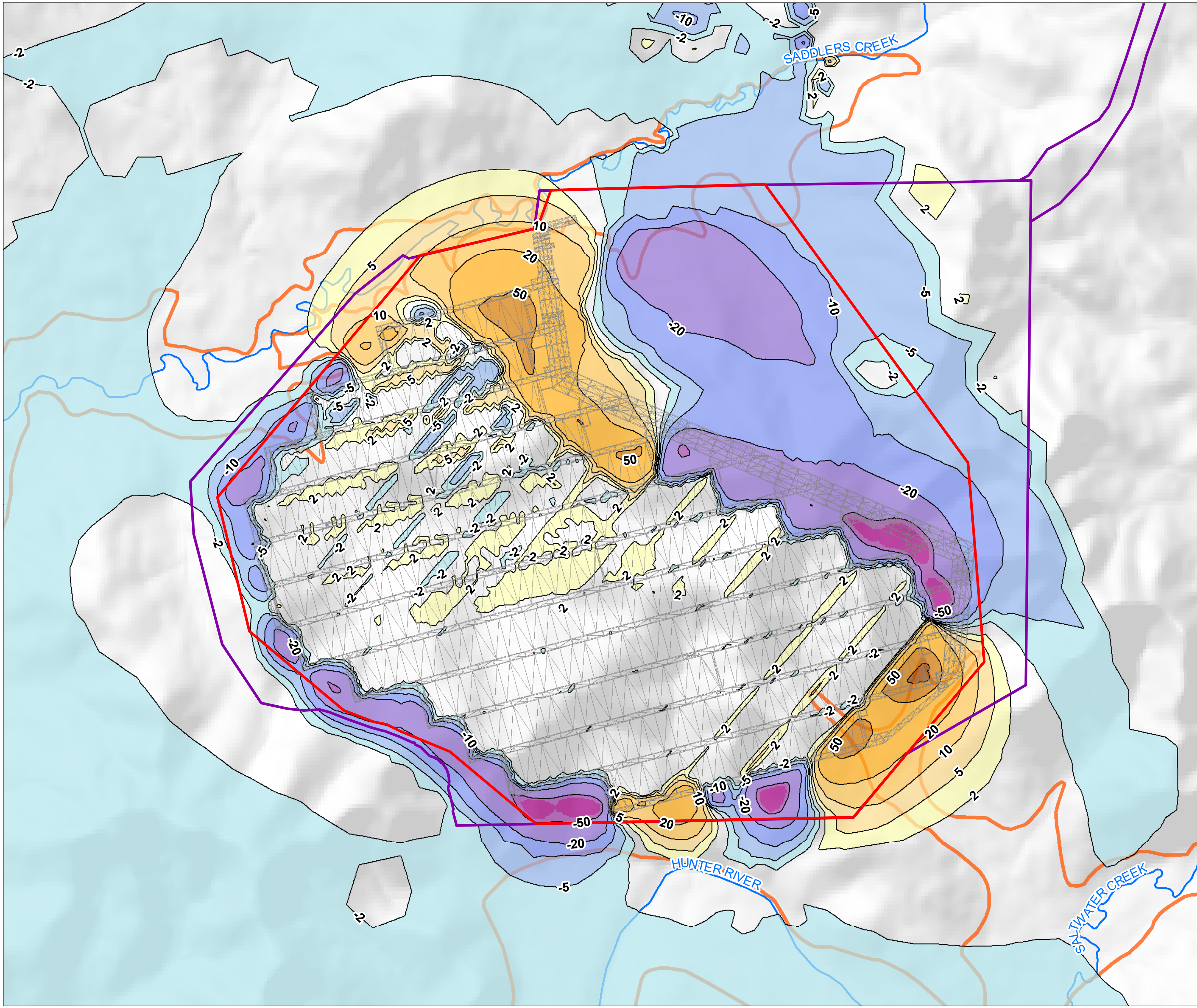
Incremental Maximum Drawdown (m)

-100	2
-50	5
-20	10
-10	20
-5	50
-2	100
	200
	500

0 2.5 5 km

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:225,000 at A4
Project Number:	665.10012
Date:	08-Jun-2022
Drawn by:	JG

MALABAR



MAXWELL UNDERGROUND MINE PROJECT MODIFICATION 2 GROUNDWATER REVIEW

Maximum Incremental Drawdown due to the Modification, Arrowfield seam (Layer 13)

FIGURE 14B

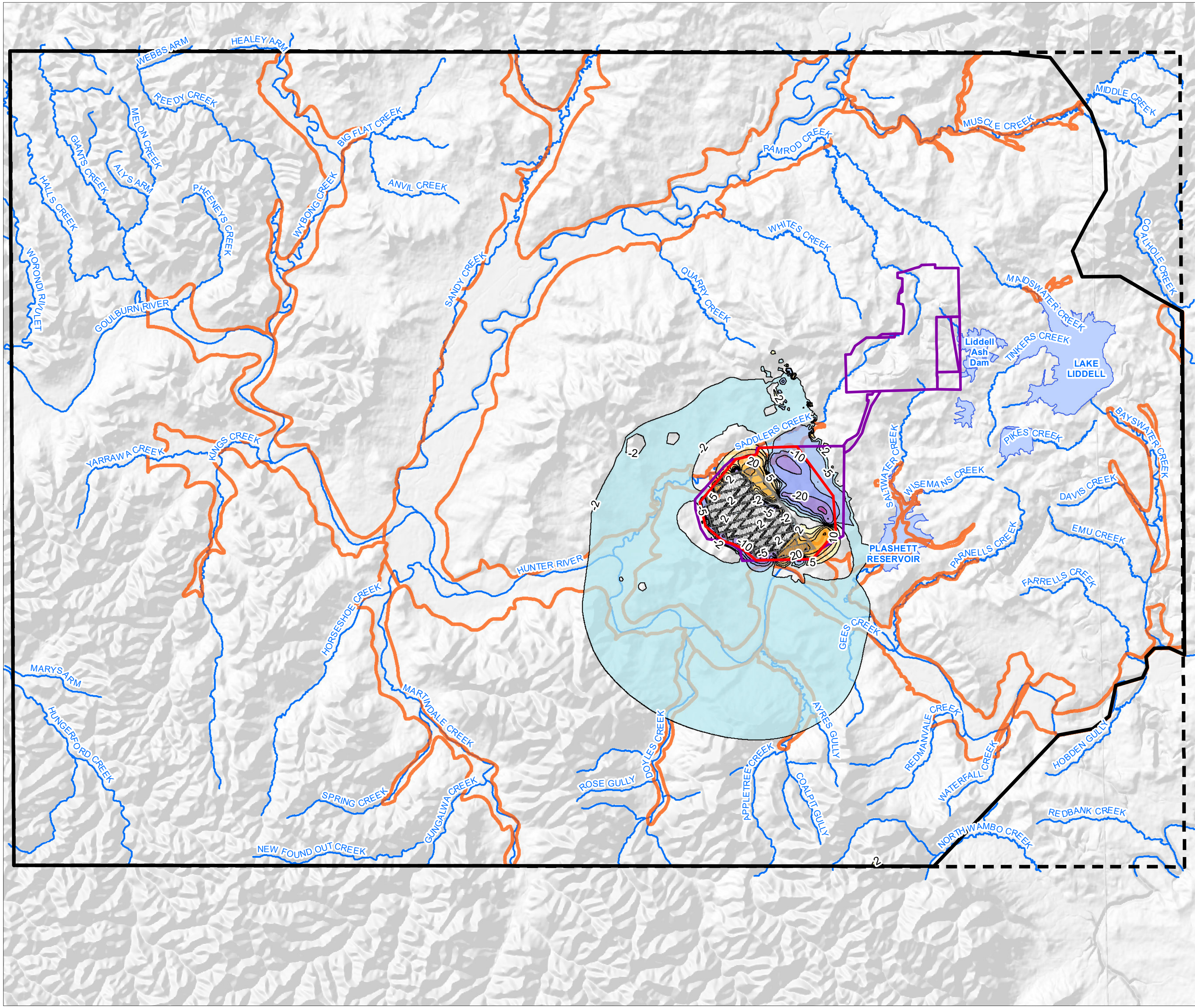
- Watercourses
- Revised Extent of Alluvium (Hydrosimulations, 2018)
- Maxwell Project Coal and Mining Lease Boundaries
- Indicative Underground Mining Area
- Water Reservoirs
- Arrowfield – Revised Longwall Panels

Incremental Maximum Drawdown (m)

-100	2
-50	5
-20	10
-10	20
-5	50
-2	100
	200
	500

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:40,000 at A4
Project Number:	665.10012
Date:	08-Jun-2022
Drawn by:	JG

MALABAR



MAXWELL UNDERGROUND MINE PROJECT MODIFICATION 2 GROUNDWATER REVIEW

Maximum Incremental Drawdown due to the Modification, Bowfield seam (Layer 15)

FIGURE 15A

- Active Model Boundary
- Model Extent
- Watercourses
- Revised Extent of Alluvium (Hydrosimulations, 2018)
- Maxwell Project Coal and Mining Lease Boundaries
- Indicative Underground Mining Area
- Water Reservoirs
- Bowfield – Revised Longwall Panels

Incremental Maximum Drawdown (m)

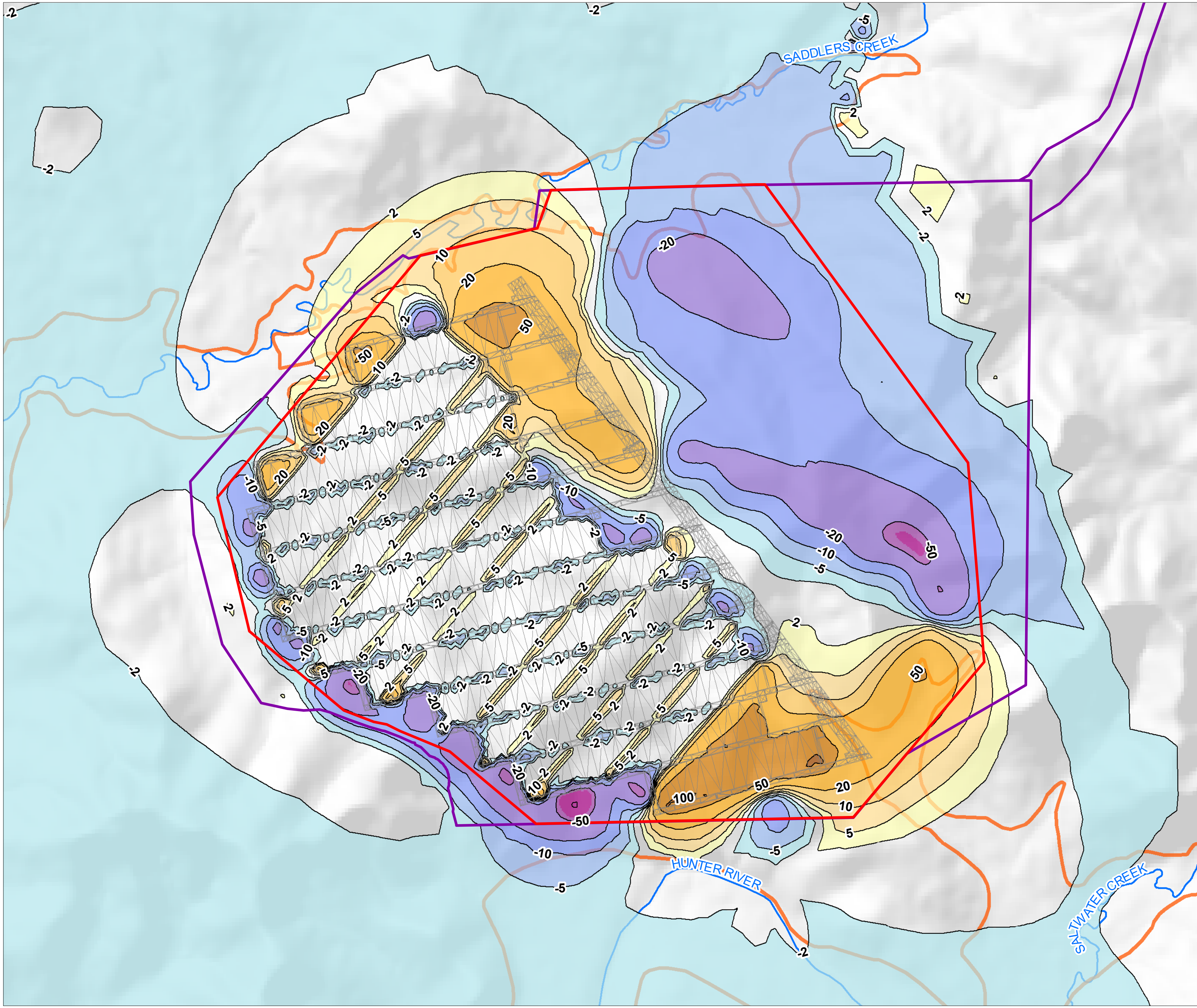
-100	2
-50	5
-20	10
-10	20
-5	50
-2	100
	200
	500

0 2.5 5 km

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:225,000 at A4
Project Number:	665.10012
Date:	08-Jun-2022
Drawn by:	JG

MALABAR

H:\Projects-SLR\620-BNE\665-WOL\665.10012 Maxwell Project GW RTS\ArcGIS\66510012 F15A Maximum Incremental Drawdown due to the Modification, Bowfield seam (Layer 15).mxd



MAXWELL UNDERGROUND MINE PROJECT MODIFICATION 2 GROUNDWATER REVIEW

Maximum Incremental Drawdown due to the Modification, Bowfield seam (Layer 15)

FIGURE 15B

- Watercourses
- Revised Extent of Alluvium (Hydrosimulations, 2018)
- Maxwell Project Coal and Mining Lease Boundaries
- Indicative Underground Mining Area
- Water Reservoirs
- Bowfield – Revised Longwall Panels

Incremental Maximum Drawdown (m)

-100	2
-50	5
-20	10
-10	20
-5	50
-2	100
	200
	500

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:40,000 at A4
Project Number:	665.10012
Date:	08-Jun-2022
Drawn by:	JG

MALABAR

H:\Projects-SLR\620-BNE\665-WOL\665.10012 Maxwell Project GW RTS\ArcGIS\66510012 F15B Maximum Incremental Drawdown due to the Modification, Bowfield seam (Layer 15) .mxd

5.4.3 Predicted Incidental Take of Water from the Alluvium

Figure 16 presents the predicted incidental take of water from the different alluvial water sources for the Modification compared to the approved Project. Overall, the change in flow between the alluvium and the Permian coal measures due to the Modification is consistent with the approved Project (i.e. incremental change of less than 1 ML/year). Accordingly, the potential incremental impacts of the Modification on the alluvial aquifers are considered negligible.

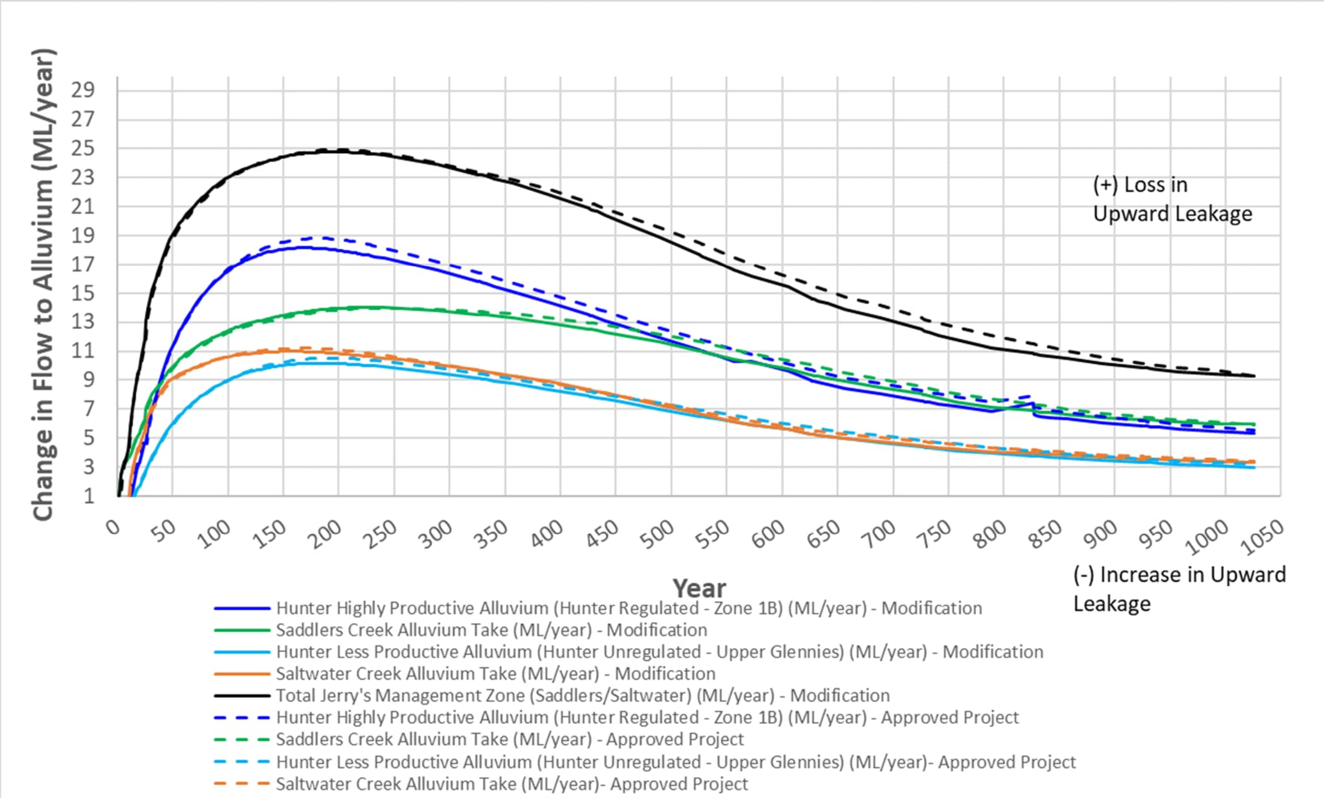


Figure 16 Predicted Incidental Take of Water from the Alluvium for the Modification and Approved Project

5.4.4 Predicted Stream Flow Effects

Predicted drawdown from the approved Project is predicted to extend toward the Hunter River, with the EIS groundwater model predicting increased leakage of up to 0.55 ML/year from the Hunter River to the underlying alluvium (HydroSimulations, 2019). This is considered negligible in comparison to the observed historical flow rates in the Hunter River and the regulation of its flow. For comparison, the median annual flow in the Hunter River at the Liddell Gauging Station (210083) is approximately 87,600 ML/year.

The change in baseflow for the Hunter River (ML/year) between the Modification and the approved Project during and post-mining is negligible.

The Modification would result in no change in river leakage for Saddlers Creek.

5.4.5 Drawdown at Privately Owned Water Supply Bores

The Modification will not result in impacts to any additional privately-owned or water supply bores.

Table 2 shows the privately-owned and mine-owned bores that were reported in the EIS Groundwater Assessment to experience drawdowns greater than the Aquifer Interference Policy minimal impact criteria (i.e. 2 m of drawdown). Table 2 demonstrates that, in all cases, the Modification results in less drawdown at privately-owned bores than the approved Project, including a reduction in impacts at the privately-owned bore to below the NSW Aquifer Interference Policy minimal impact criteria.

Table 2 Predicted Drawdown at Privately and Mine-owned Water Supply Bores

Bore ID	Use	Type	Bore Depth (m)	Water Column (m)	Geological Unit	Modification - Maximum Drawdown (m)	Approved Project - Maximum Drawdown (m)	Incremental Change (m)
GW029660	Stock	Privately-owned	74.7	39.6	Jerry's Plains Subgroup	1.8	2.3	-0.5
GW049223	Stock	Mine-owned	67.1	65.2	Jerry's Plains Subgroup	10.1	13.5	-3.4
GW031622	Stock	Mine-owned	91.4	60.9	Jerry's Plains Subgroup	2.4	3.9	-1.5
GW031859	Stock	Mine-owned	61	38.1	Jerry's Plains Subgroup	2.2	4.3	-2.1
GW032077	Stock	Mine-owned	53.3	13.9	Jerry's Plains Subgroup	1.9	3.1	-1.2

A negative incremental change in drawdown means a reduced drawdown with the Modification

A positive incremental change in drawdown means a greater drawdown with the Modification

6 Conclusions

The key conclusions from this Groundwater Review are summarised as follows:

- The updates to the baseline groundwater data set showed that the groundwater level trends and groundwater quality are generally consistent with the outcomes presented in the EIS Groundwater Assessment. Modest declines in groundwater levels and changes to groundwater quality have been attributed to the drought conditions (2017- 2019), with some subsequent recovery following a period of above average rainfall in 2020/2021.
- The model calibration was verified for the updated groundwater monitoring data. The updated data set, consisting of groundwater levels from 2018 to 2021 added to the calibration datasets, shows that the EIS groundwater model remains calibrated and is fit for purpose for prediction.
- The height of fracture was calculated for the Modification mine plan and showed a similar fracture zone as the approved Project design across the underground mining area.
- The predicted mine inflows to the Maxwell Underground workings during the life of the Project (incorporating the Modification) would be generally consistent with those predicted for the approved Project on an annual basis, with the Modification resulting in an overall reduction of approximately 500 ML in total groundwater inflows over the life of the Project.
- The Modification would result in depressurisation of the deeper strata propagating further to the north-west and south-east but a reduction in the propagation of depressurisation to the north-east and south-west (i.e. the Modification would have less of an impact on deeper strata beneath the Hunter River relative to the approved Project).
- The increase in the depressurisation of deeper strata to the north-west and south-east of the Project is not expected to cause a material increase in drawdown in the Saddlers Creek and Saltwater Creek Alluvium.
- There is a slight decrease in alluvial take due to the Modification(less than 1 ML/year).
- The maximum incremental change in baseflow to, or leakage from, the Hunter River and Saddlers Creek is negligible.
- The Modification will not result in impacts to any additional privately owned or water supply bores. In all cases, bores identified in the EIS as being impacted are now predicted to experience less drawdown due to the Modification.
- GW029660 and GW032077, which were previously predicted to experience greater than 2m drawdown due to the approved Project, are now predicted to experience less than 2 m of drawdown due to the Modification.

7 References

Australasian Groundwater and Environmental Consultants (AGE), 2012; Drayton South Coal Project. Groundwater Impact Assessment. Prepared for Anglo American Metallurgical Coal Pty Ltd. Project No G1544, dated October.

Barnett, B., Townley, L.R., Post, V., Evans, R.E., Hunt, R.J., Peeters, L., Richardson, S., Werner, A.D., Knapton, A. and Boronkay, A., 2012; *Australian Groundwater Modelling Guidelines*. Waterlines Report Series No. 82, June 2012.

BoM 2021; [Bureau of Meteorology] Climate data on line. Available at: http://www.bom.gov.au/climate/averages

Ditton, S. and Merrick, N, 2014; A New Subsurface Fracture Height Prediction Model for Longwall Mines in the NSW Coalfields. Geological Society of Australia, 2014 Australian Earth Sciences Convention (AESC), Sustainable Australia. Abstract No 03EGE-03 of the 22nd Australian Geological Convention, Newcastle City Hall and Civic Theatre, Newcastle, New South Wales. July 7 - 10. Page 136.

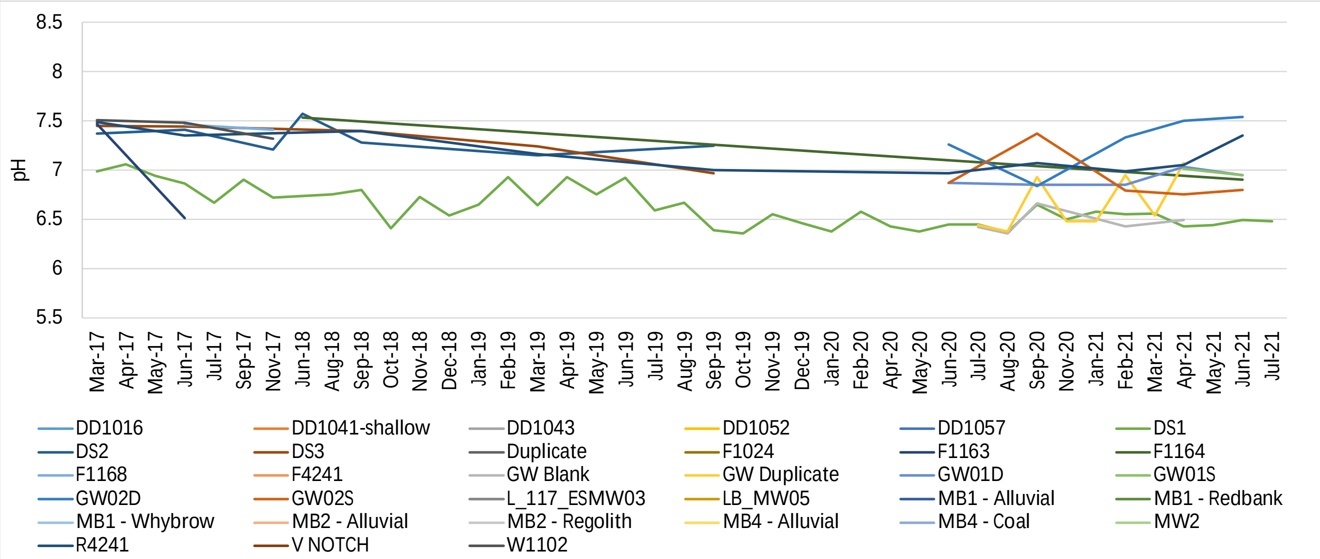
HydroSimulations; 2019; Maxwell Project: Groundwater Assessment, in support of an EIS. Prepared for Malabar Resources. Report. HS2018/44, dated July.

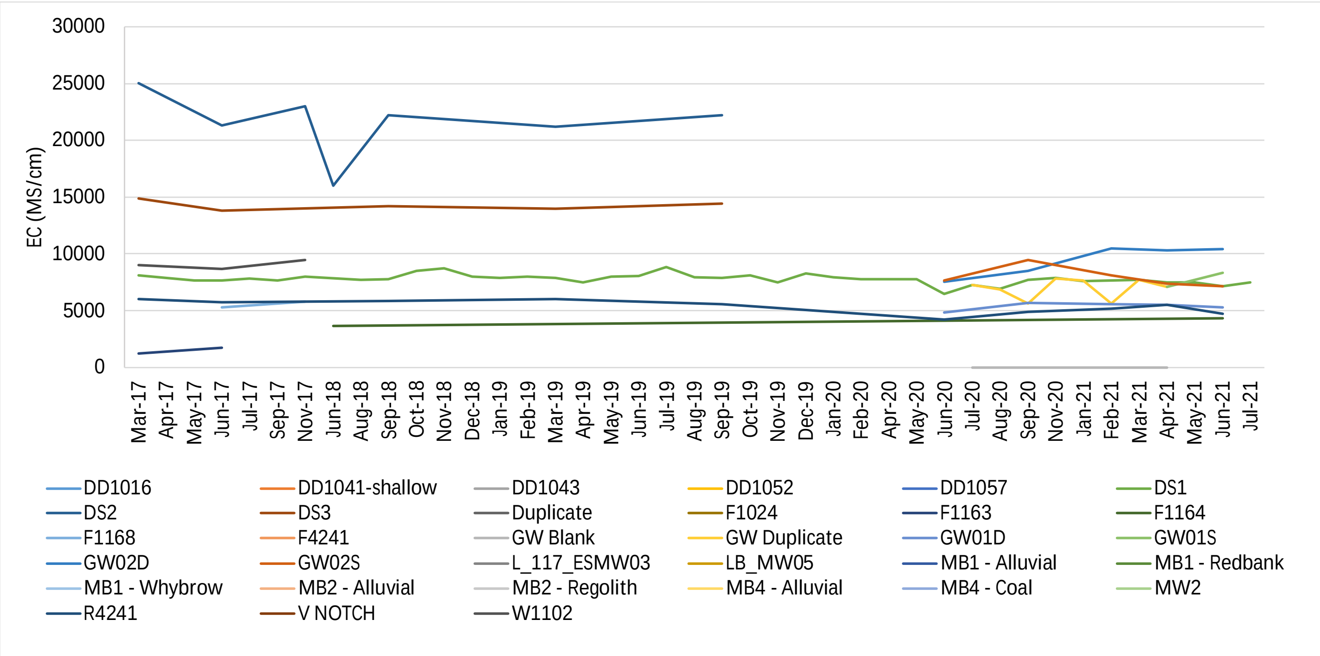
MBGS 2018; Structure Report, Maxwell Project, prepared for Malabar Resources. McElroy Bryan Geological Services Pty Ltd, dated August.

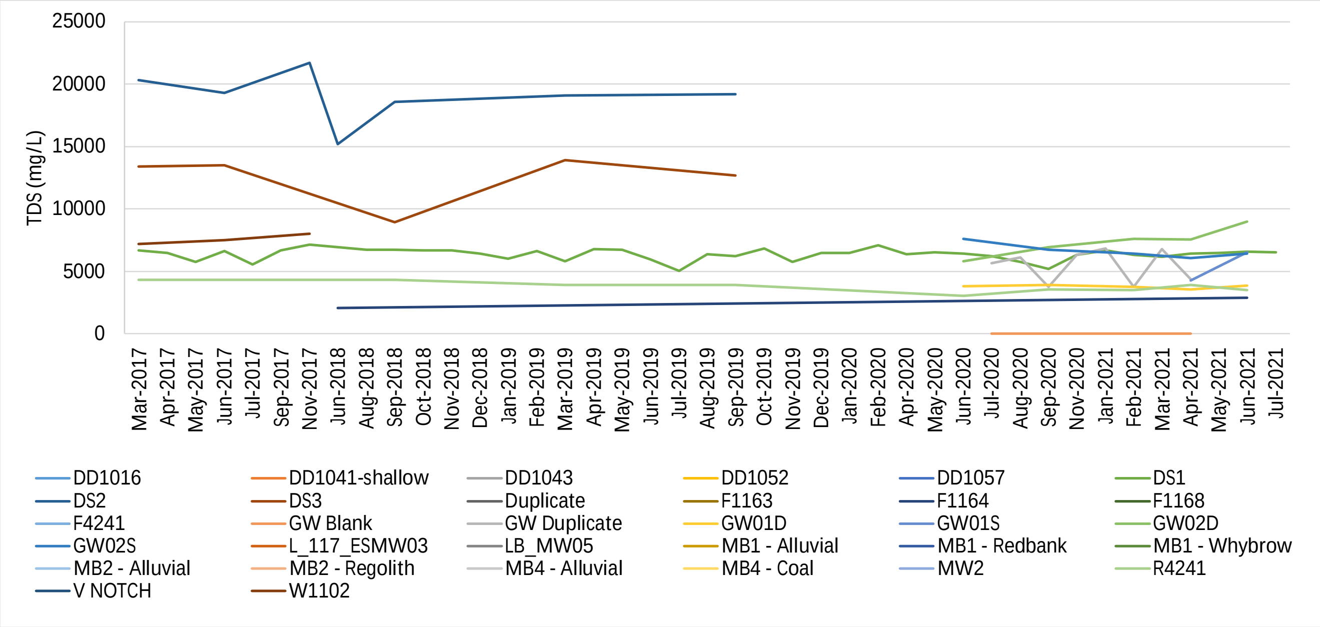
Malabar Resources, 2019; Maxwell Project. Environmental Impact Assessment. Application No SSD-9526

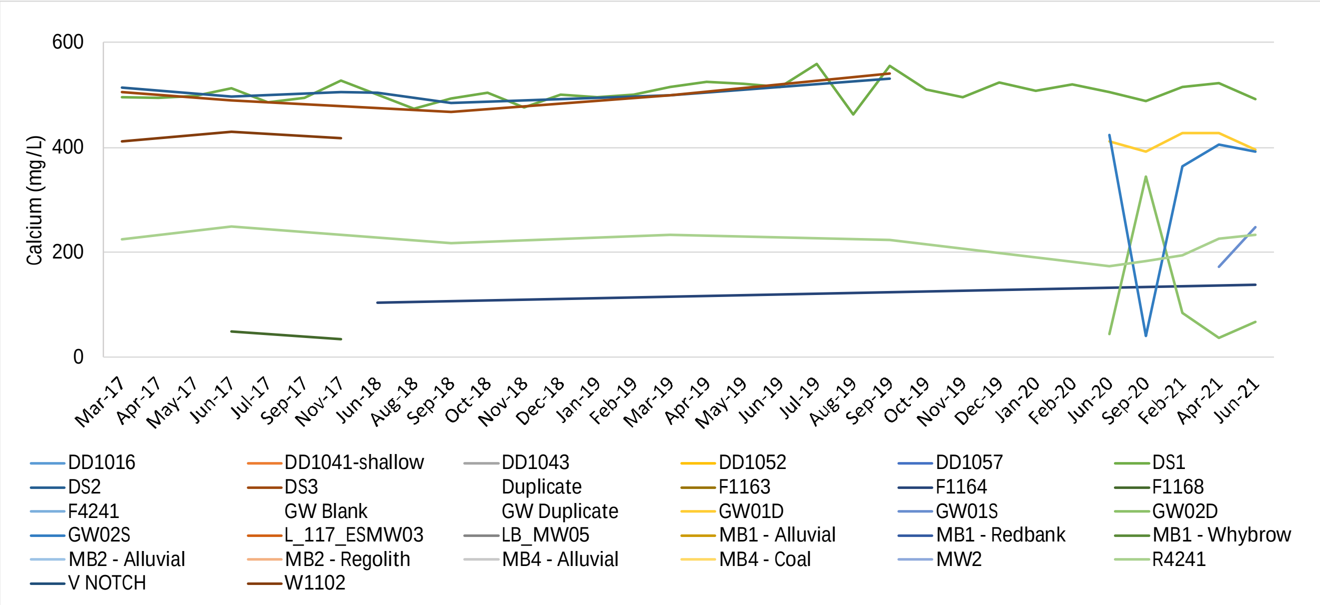
APPENDIX A

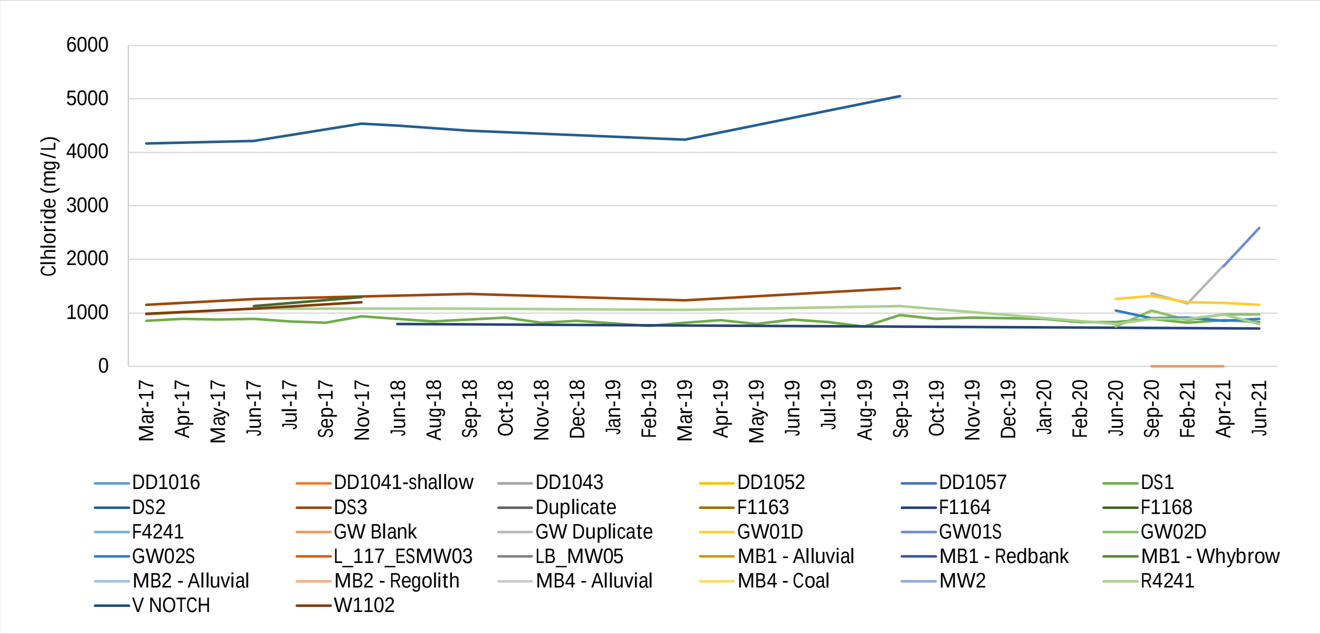
Existing Groundwater Quality

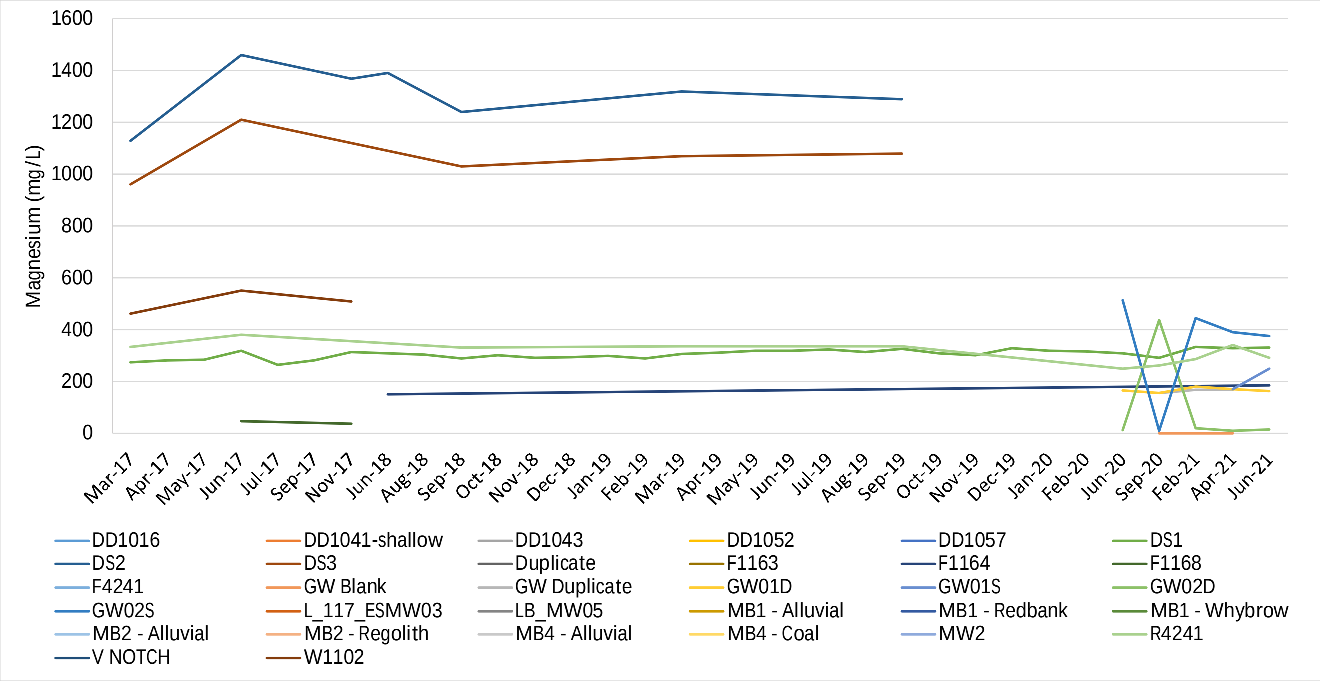


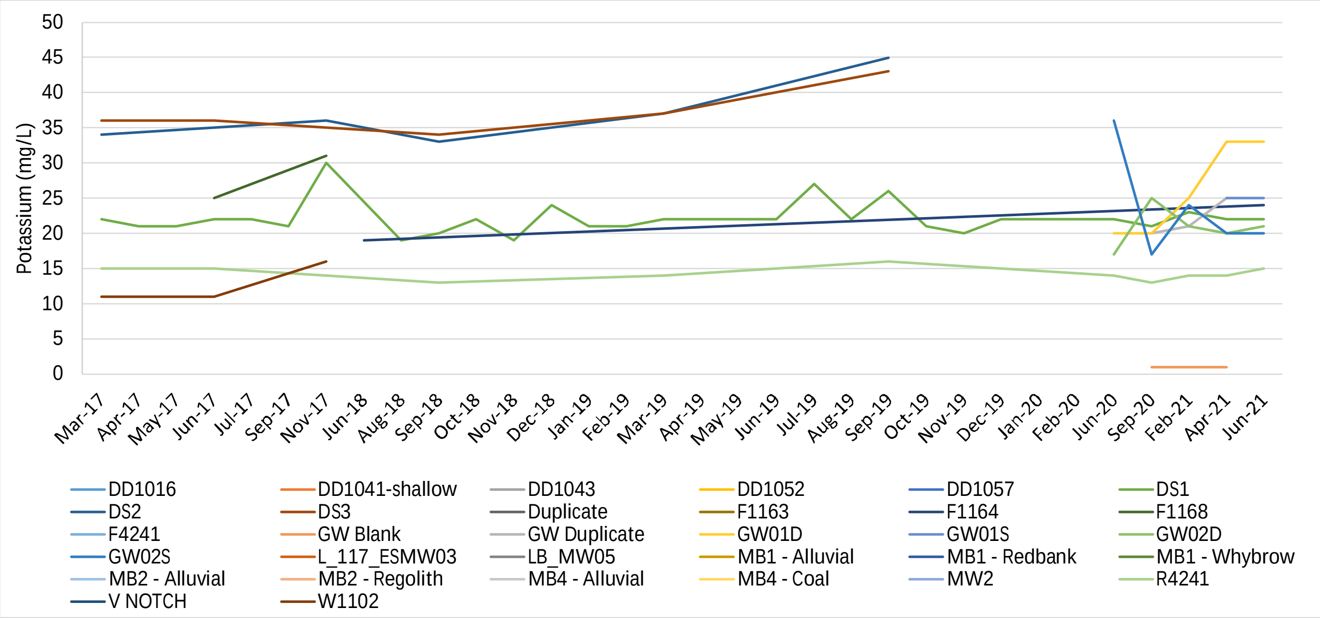



TDS (mg/L)
25000
20000
15000
10000
5000
0
Mar-2017
Apr-2017
May-2017
Jun-2017
Jul-2017
Sep-2017
Nov-2017
Jun-2018
Aug-2018
Sep-2018
Oct-2018
Nov-2018
Dec-2018
Jan-2019
Feb-2019
Mar-2019
Apr-2019
May-2019
Jun-2019
Jul-2019
Aug-2019
Sep-2019
Oct-2019
Nov-2019
Dec-2019
Jan-2020
Feb-2020
Apr-2020
May-2020
Jun-2020
Jul-2020
Aug-2020
Sep-2020
Nov-2020
Jan-2021
Feb-2021
Mar-2021
Apr-2021
May-2021
Jun-2021
Jul-2021
DD1016
DD1041-shallow
DD1043
DD1052
DD1057
DS1
DS2
DS3
Duplicate
F1163
F1164
F1168
F4241
GW Blank
GW Duplicate
GW01D
GW01S
GW02D
GW02S
L_117_ESMW03
LB_MW05
MB1 - Alluvial
MB1 - Redbank
MB1 - Whybrow
MB2 - Alluvial
MB2 - Regolith
MB4 - Alluvial
MB4 - Coal
MW2
R4241
V NOTCH
W1102

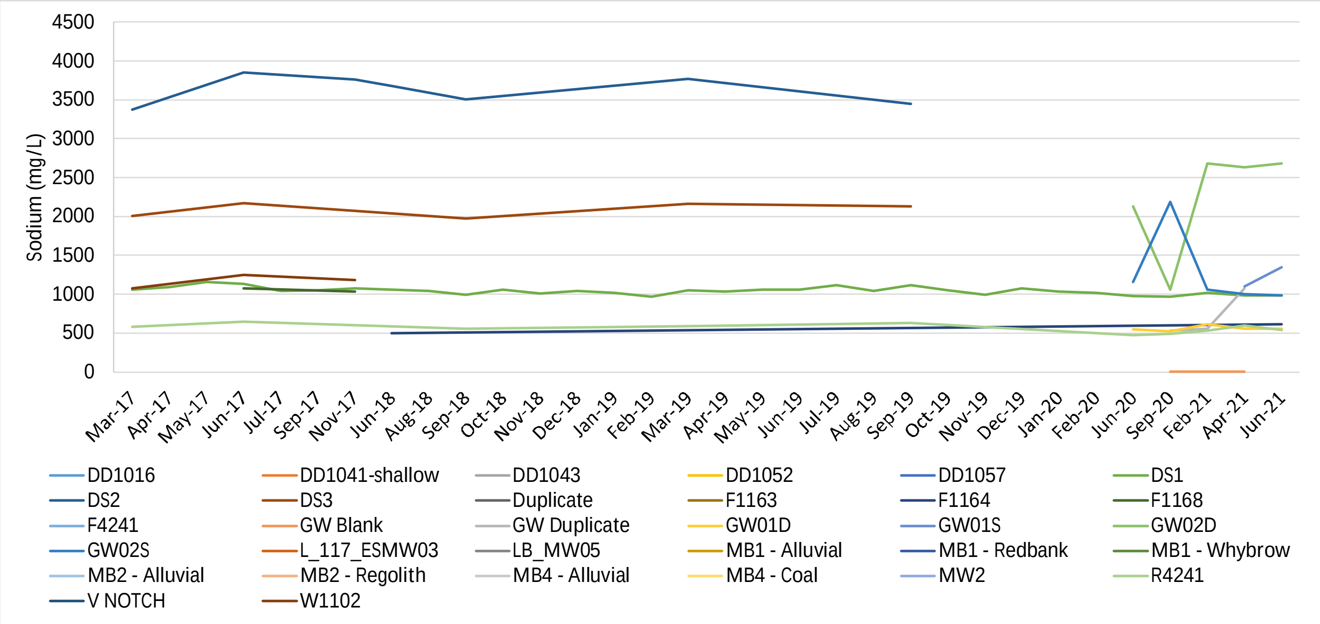

Calcium (mg/L)
600
400
200
0
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Sep-17
Nov-17
Jun-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Apr-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Jun-20
Sep-20
Feb-21
Apr-21
Jun-21
DD1016
DD1041-shallow
DD1043
DD1052
DD1057
DS1
DS2
DS3
Duplicate
F1163
F1164
F1168
F4241
GW Blank
GW Duplicate
GW01D
GW01S
GW02D
GW02S
L_117_ESMW03
LB_MW05
MB1 - Alluvial
MB1 - Redbank
MB1 - Whybrow
MB2 - Alluvial
MB2 - Regolith
MB4 - Alluvial
MB4 - Coal
MW2
R4241
V NOTCH
W1102


Clhloride (mg/L)
6000
5000
4000
3000
2000
1000
0
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Sep-17
Nov-17
Jun-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Apr-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Jun-20
Sep-20
Feb-21
Apr-21
Jun-21
DD1016
DD1041-shallow
DD1043
DD1052
DD1057
DS1
DS2
DS3
Duplicate
F1163
F1164
F1168
F4241
GW Blank
GW Duplicate
GW01D
GW01S
GW02D
GW02S
L_117_ESMW03
LB_MW05
MB1 - Alluvial
MB1 - Redbank
MB1 - Whybrow
MB2 - Alluvial
MB2 - Regolith
MB4 - Alluvial
MB4 - Coal
MW2
R4241
V NOTCH
W1102

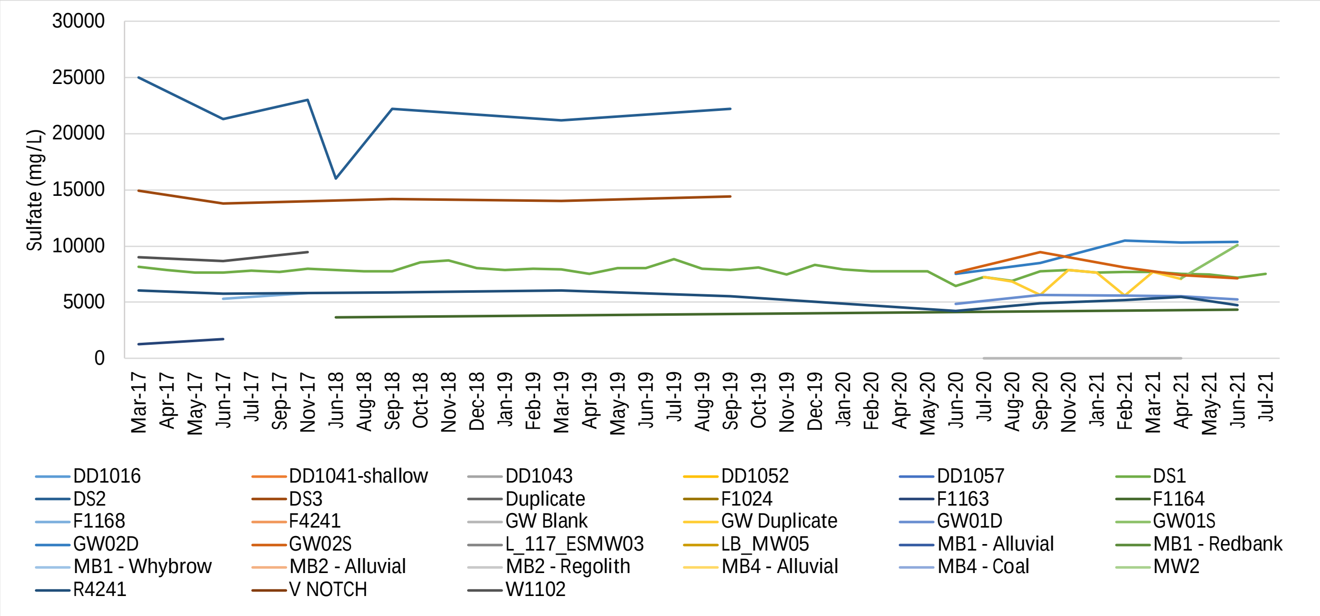

Magnesium (mg/L)
1600
1400
1200
1000
800
600
400
200
0
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Sep-17
Nov-17
Jun-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Apr-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Jun-20
Sep-20
Feb-21
Apr-21
Jun-21
DD1016
DD1041-shallow
DD1043
DD1052
DD1057
DS1
DS2
DS3
Duplicate
F1163
F1164
F1168
F4241
GW Blank
GW Duplicate
GW01D
GW01S
GW02D
GW02S
L_117_ESMW03
LB_MW05
MB1 - Alluvial
MB1 - Redbank
MB1 - Whybrow
MB2 - Alluvial
MB2 - Regolith
MB4 - Alluvial
MB4 - Coal
MW2
R4241
V NOTCH
W1102



Potassium (mg/L)
50
45
40
35
30
25
20
15
10
5
0
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Sep-17
Nov-17
Jun-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Apr-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Jun-20
Sep-20
Feb-21
Apr-21
Jun-21
DD1016
DD1041-shallow
DD1043
DD1052
DD1057
DS1
DS2
DS3
Duplicate
F1163
F1164
F1168
F4241
GW Blank
GW Duplicate
GW01D
GW01S
GW02D
GW02S
L_117_ESMW03
LB_MW05
MB1 - Alluvial
MB1 - Redbank
MB1 - Whybrow
MB2 - Alluvial
MB2 - Regolith
MB4 - Alluvial
MB4 - Coal
MW2
R4241
V NOTCH
W1102



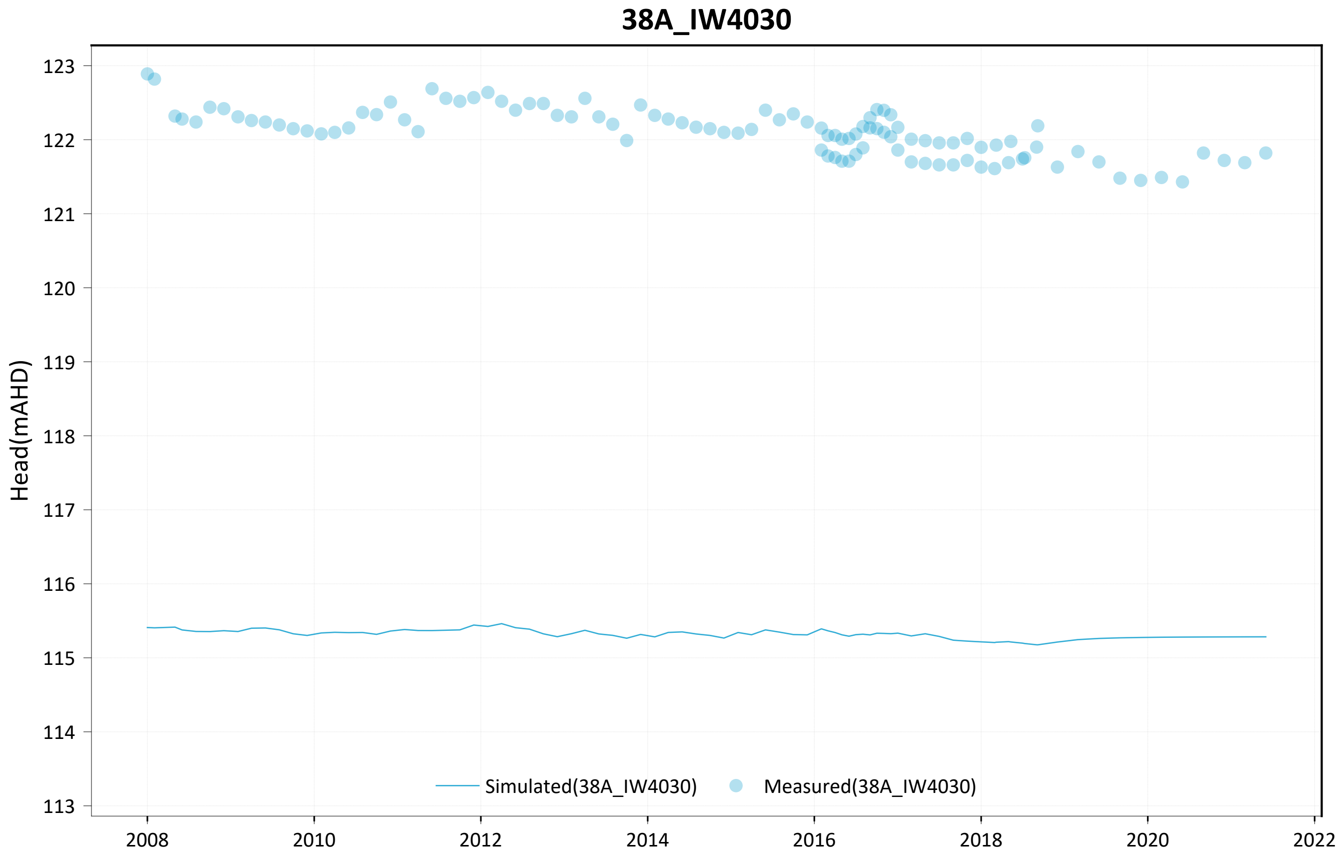
Sodium (mg/L)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Sep-17
Nov-17
Jun-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Apr-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Jun-20
Sep-20
Feb-21
Apr-21
Jun-21
DD1016
DD1041-shallow
DD1043
DD1052
DD1057
DS1
DS2
DS3
Duplicate
F1163
F1164
F1168
F4241
GW Blank
GW Duplicate
GW01D
GW01S
GW02D
GW02S
L_117_ESMW03
LB_MW05
MB1 - Alluvial
MB1 - Redbank
MB1 - Whybrow
MB2 - Alluvial
MB2 - Regolith
MB4 - Alluvial
MB4 - Coal
MW2
R4241
V NOTCH
W1102

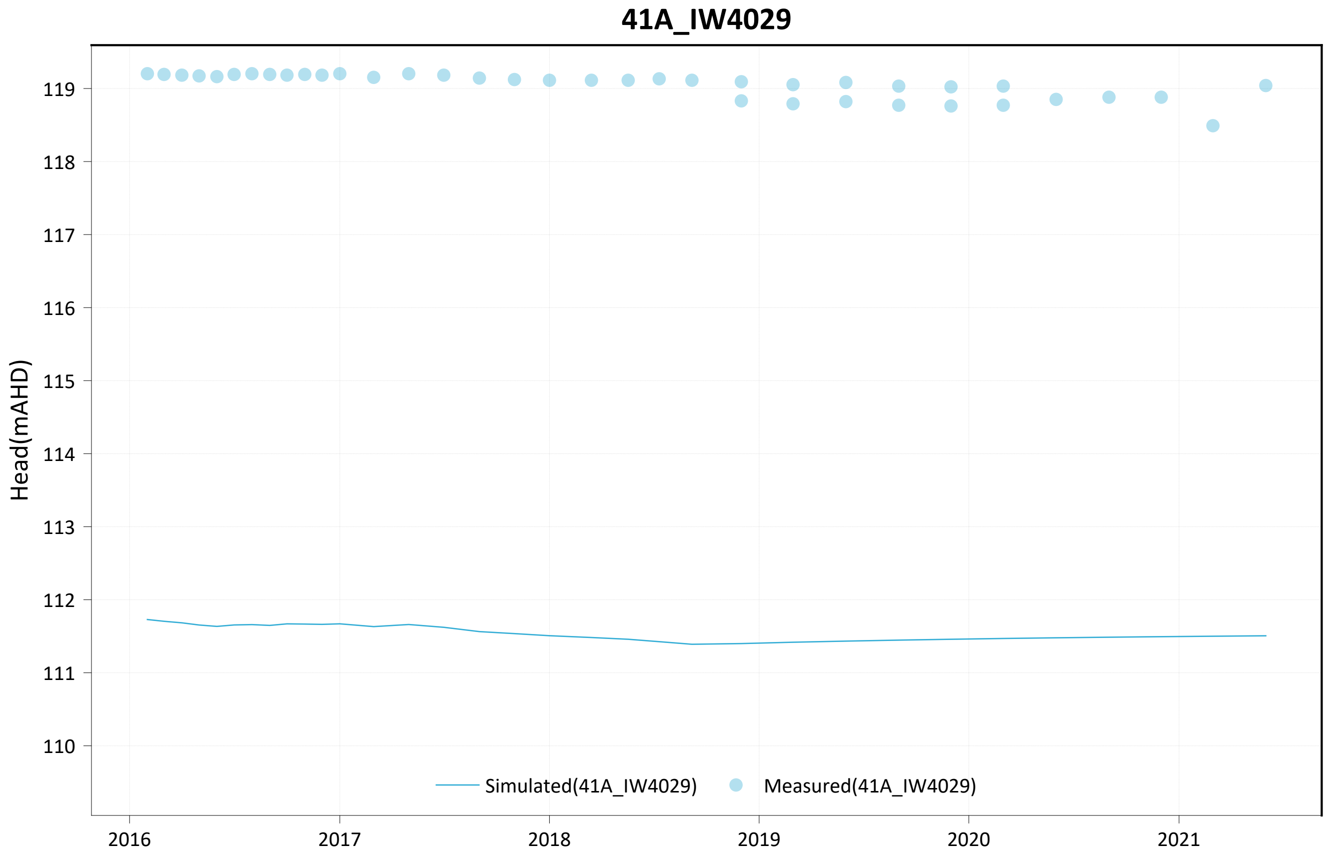


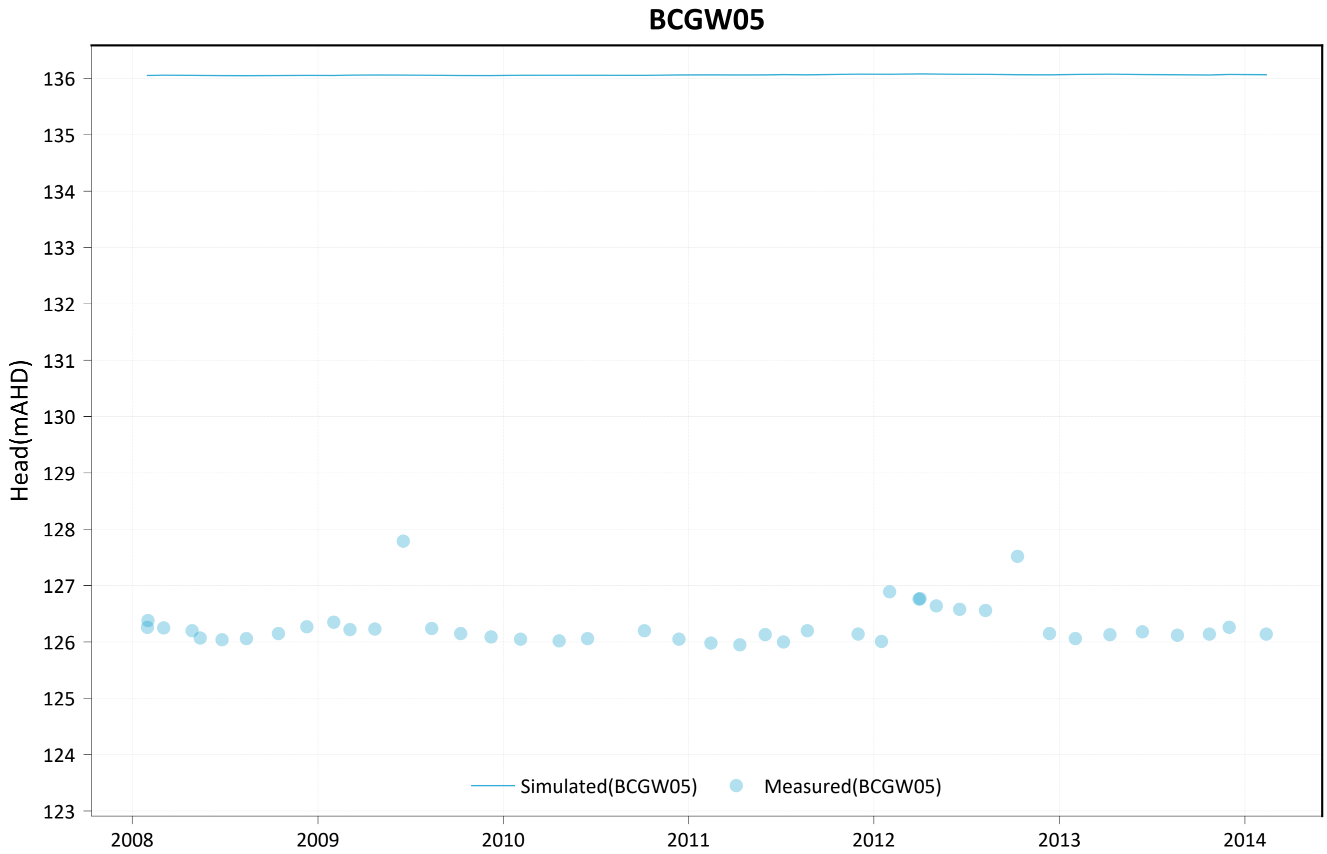
Sulfate (mg/L)
30000
25000
20000
15000
10000
5000
0
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Sep-17
Nov-17
Jun-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Apr-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Apr-20
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Nov-20
Jan-21
Feb-21
Mar-21
Apr-21
May-21
Jun-21
Jul-21
DD1016
DD1041-shallow
DD1043
DD1052
DD1057
DS1
DS2
DS3
Duplicate
F1024
F1163
F1164
F1168
F4241
GW Blank
GW Duplicate
GW01D
GW01S
GW02D
GW02S
L_117_ESMW03
LB_MW05
MB1 - Alluvial
MB1 - Redbank
MB1 - Whybrow
MB2 - Alluvial
MB2 - Regolith
MB4 - Alluvial
MB4 - Coal
MW2
R4241
V NOTCH
W1102

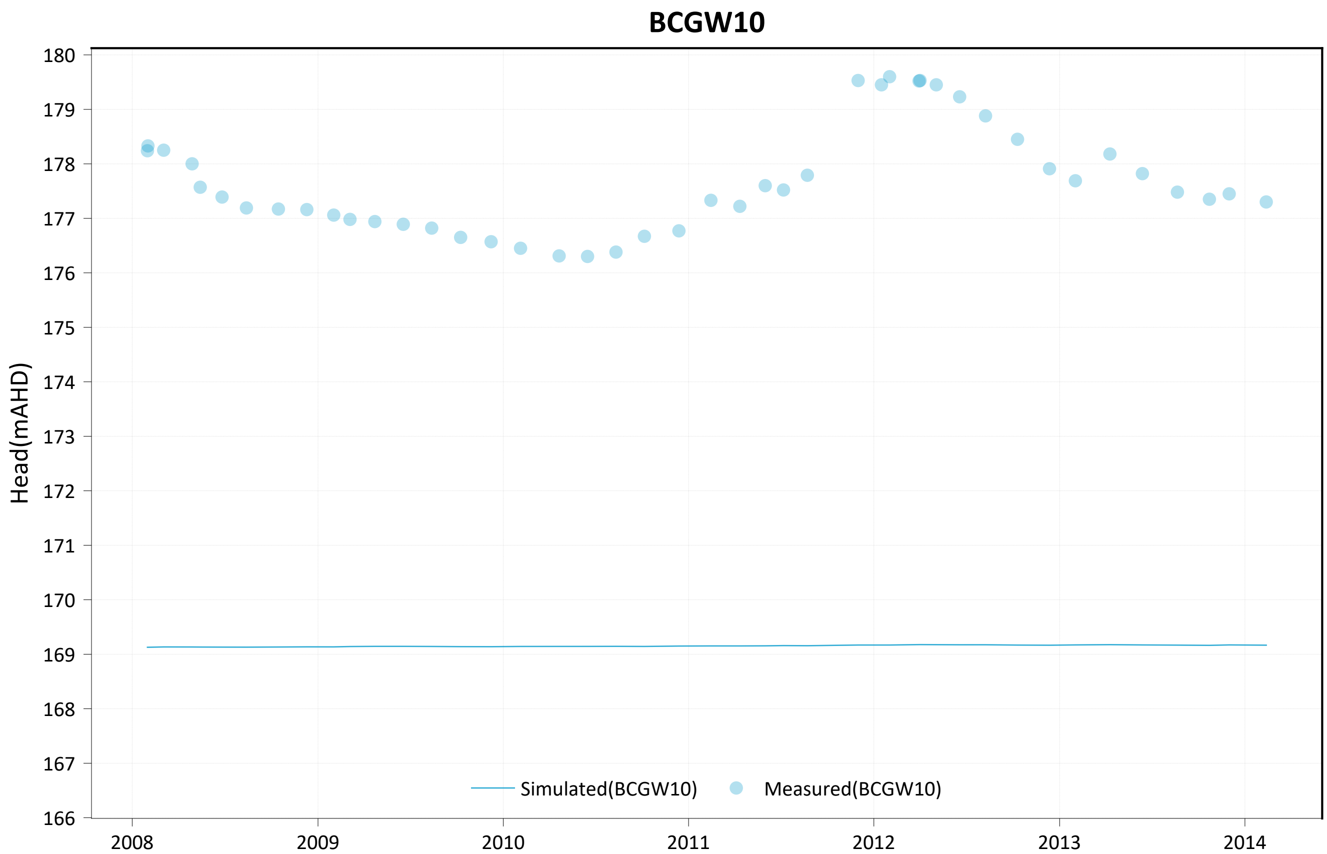
APPENDIX B

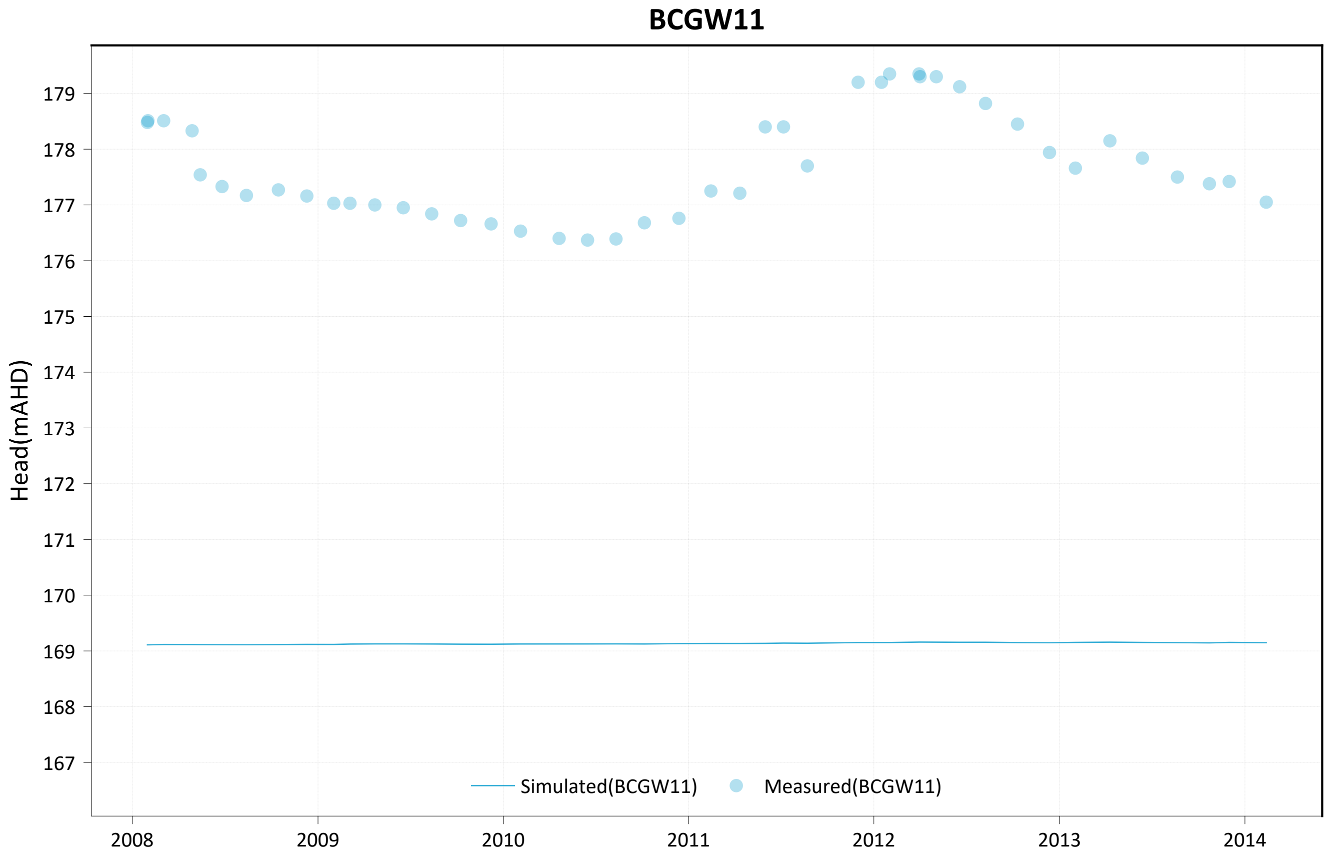
Calibration Hydrographs

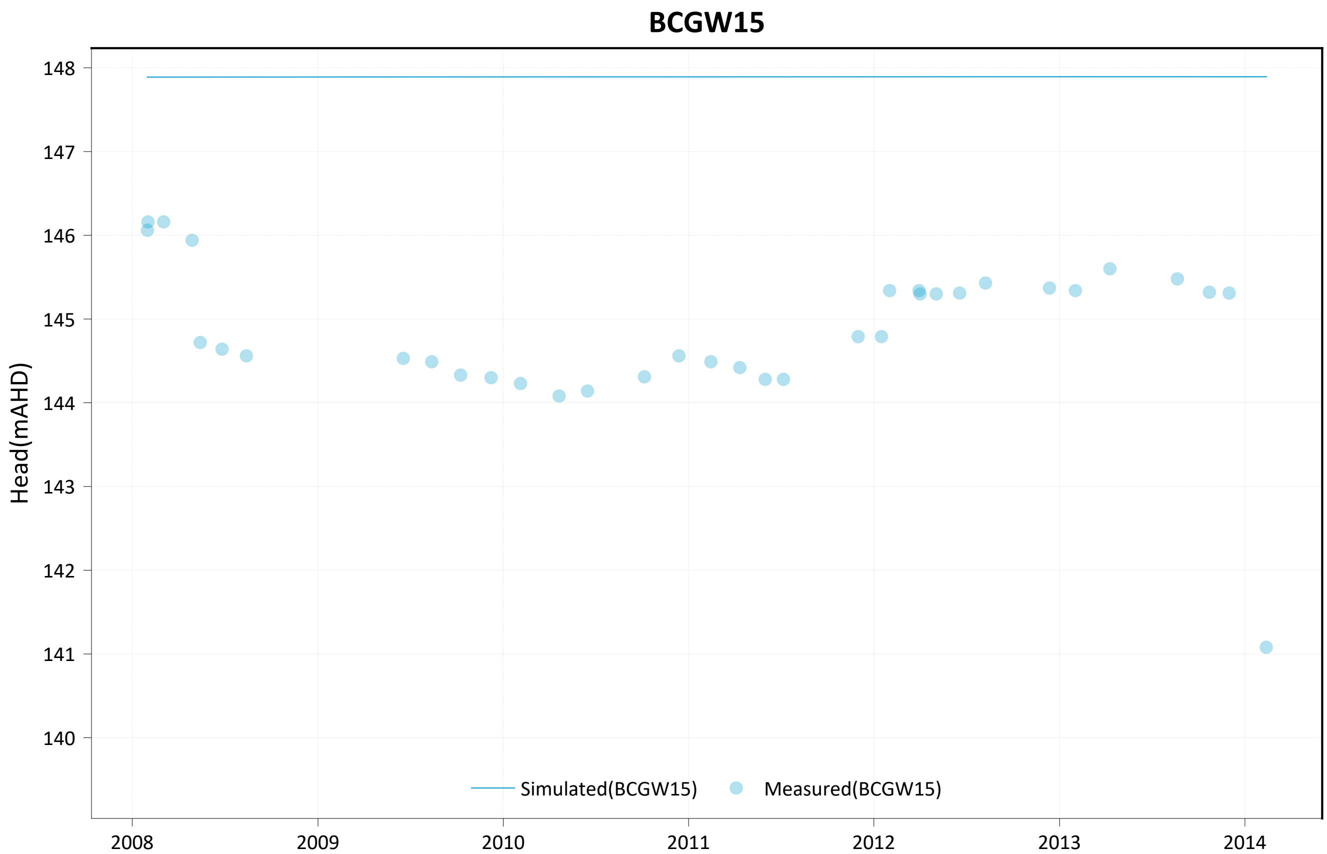

38A_IW4030
Head(mAHD)
123
122
121
120
119
118
117
116
115
114
113
2008
2010
2012
2014
2016
2018
2020
2022
Simulated(38A_IW4030)
Measured(38A_IW4030)

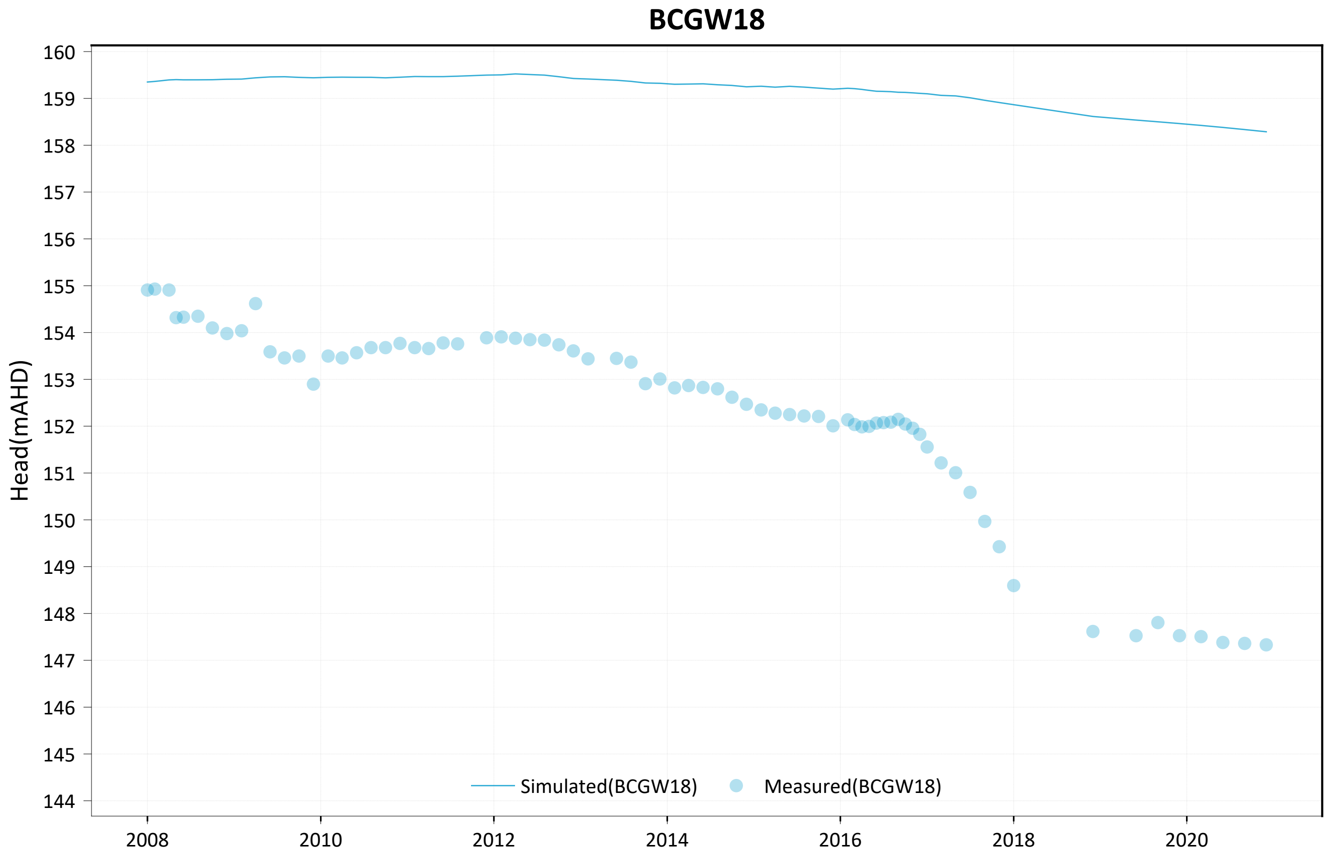

41A_IW4029
Head(mAHD)
119
118
117
116
115
114
113
112
111
110
2016
2017
2018
2019
2020
2021
Simulated(41A_IW4029)
Measured(41A_IW4029)

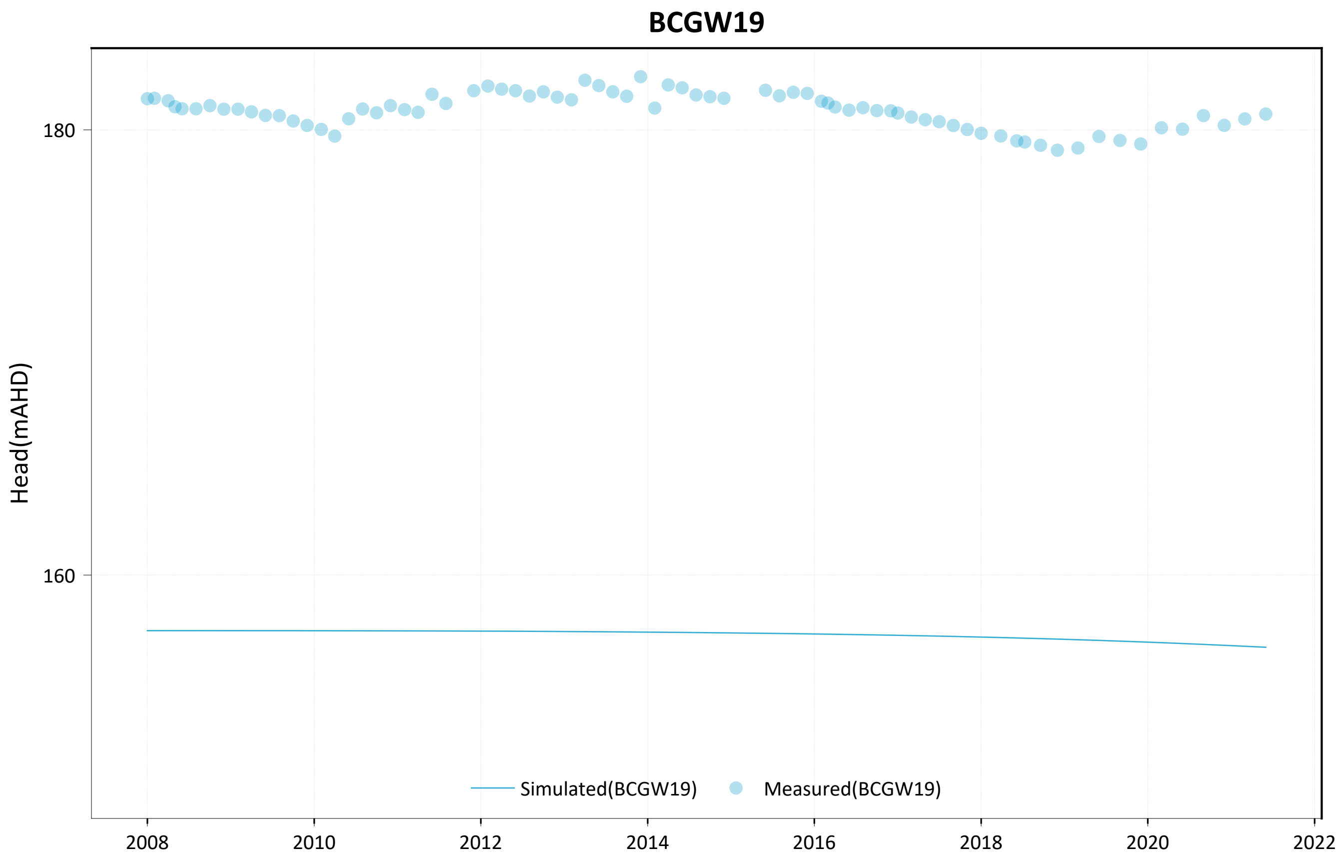

BCGW05
Head(mAHD)
136
135
134
133
132
131
130
129
128
127
126
125
124
123
2008
2009
2010
2011
2012
2013
2014
Simulated(BCGW05)
Measured(BCGW05)

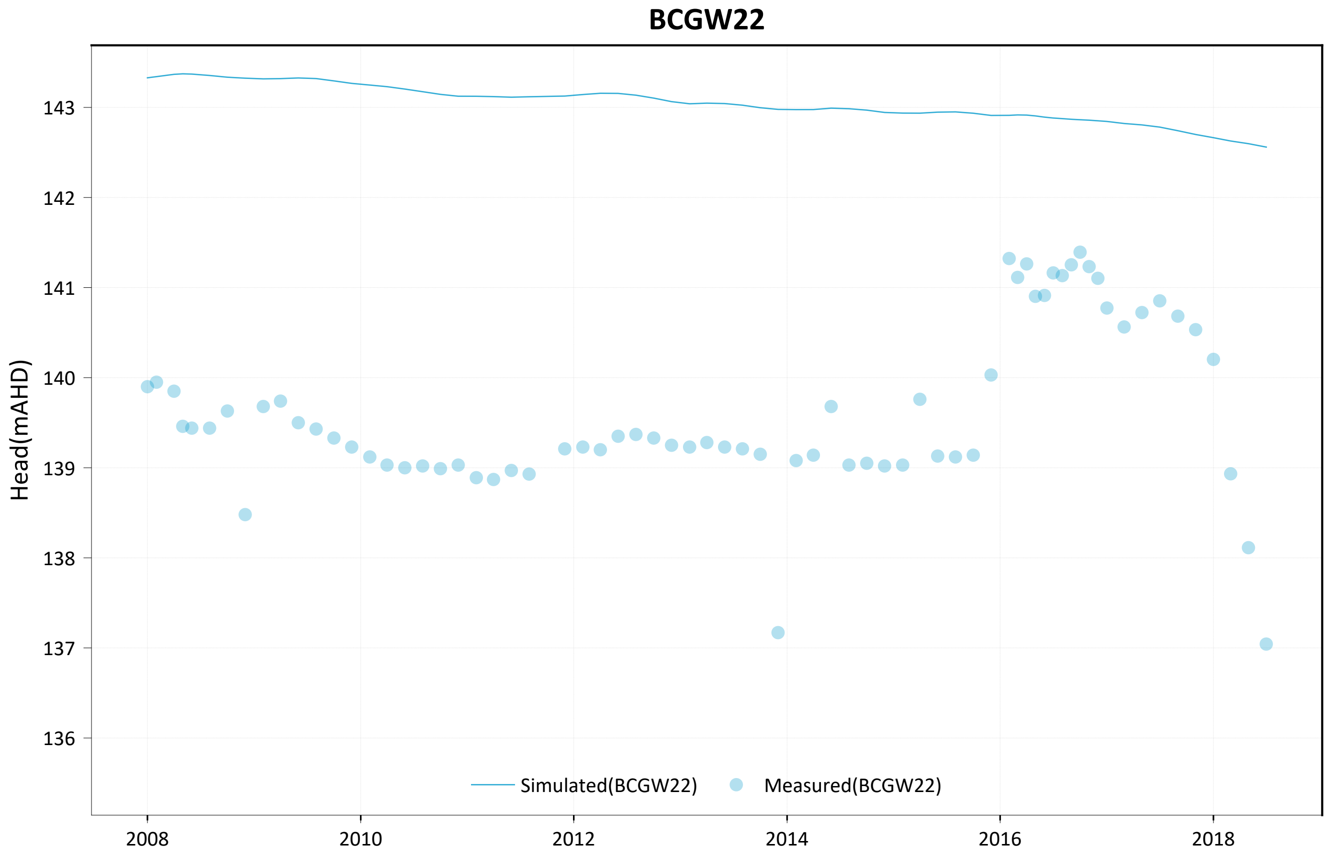

BCGW10
Head(mAHD)
180
179
178
177
176
175
174
173
172
171
170
169
168
167
166
2008
2009
2010
2011
2012
2013
2014
Simulated(BCGW10)
Measured(BCGW10)

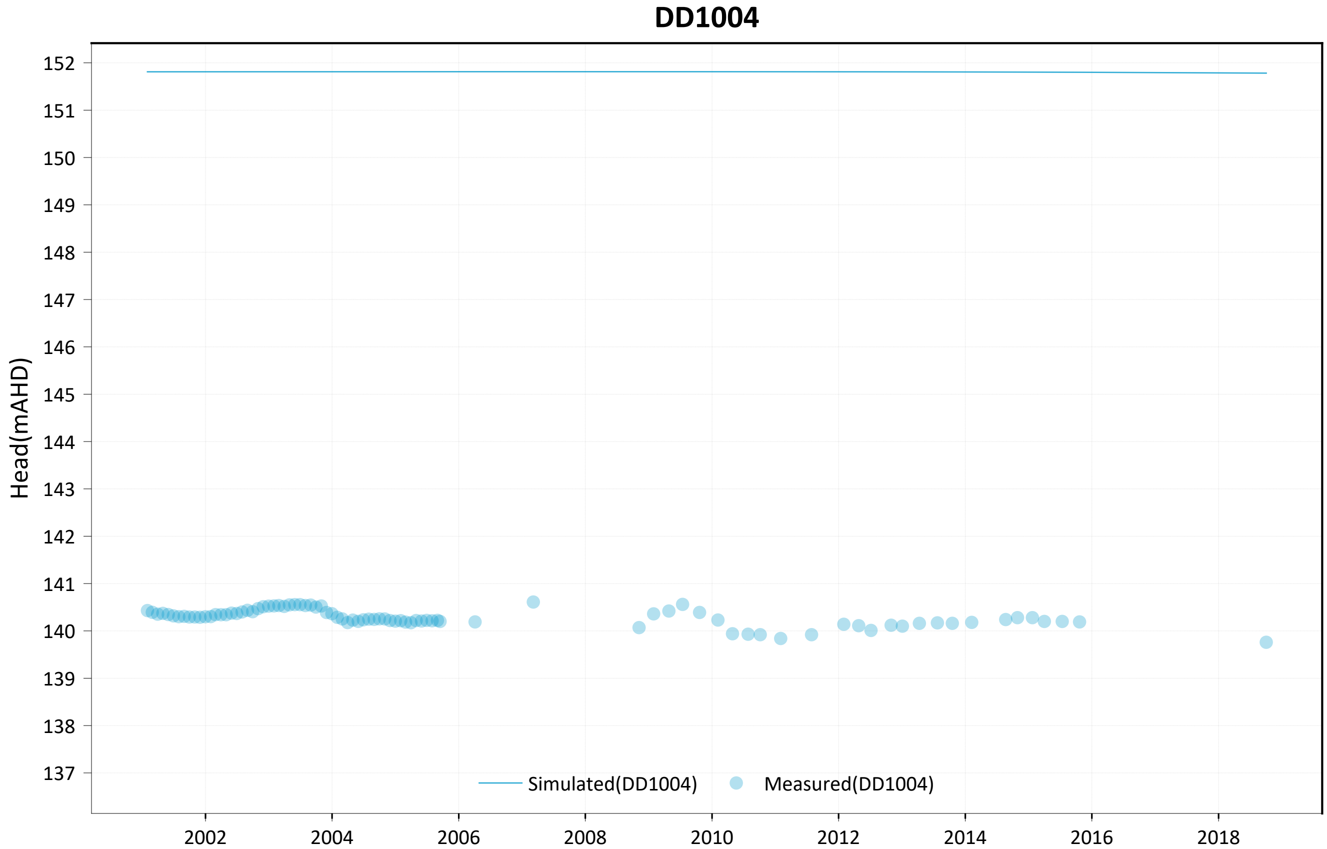

BCGW11
Head(mAHD)
179
178
177
176
175
174
173
172
171
170
169
168
167
Simulated(BCGW11)
Measured(BCGW11)
2008
2009
2010
2011
2012
2013
2014

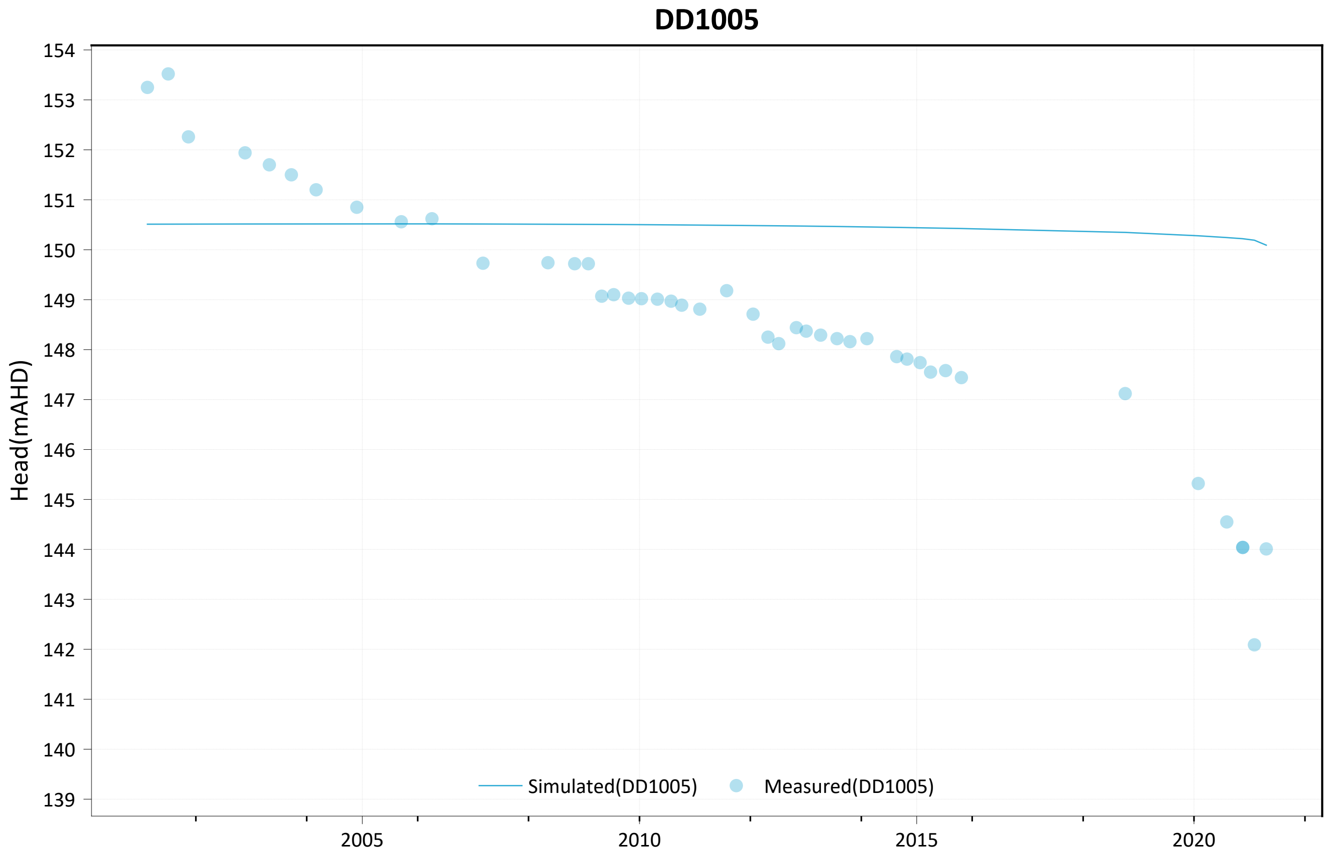

BCGW15
Head(mAHD)
148
147
146
145
144
143
142
141
140
Simulated(BCGW15)
Measured(BCGW15)
2008
2009
2010
2011
2012
2013
2014

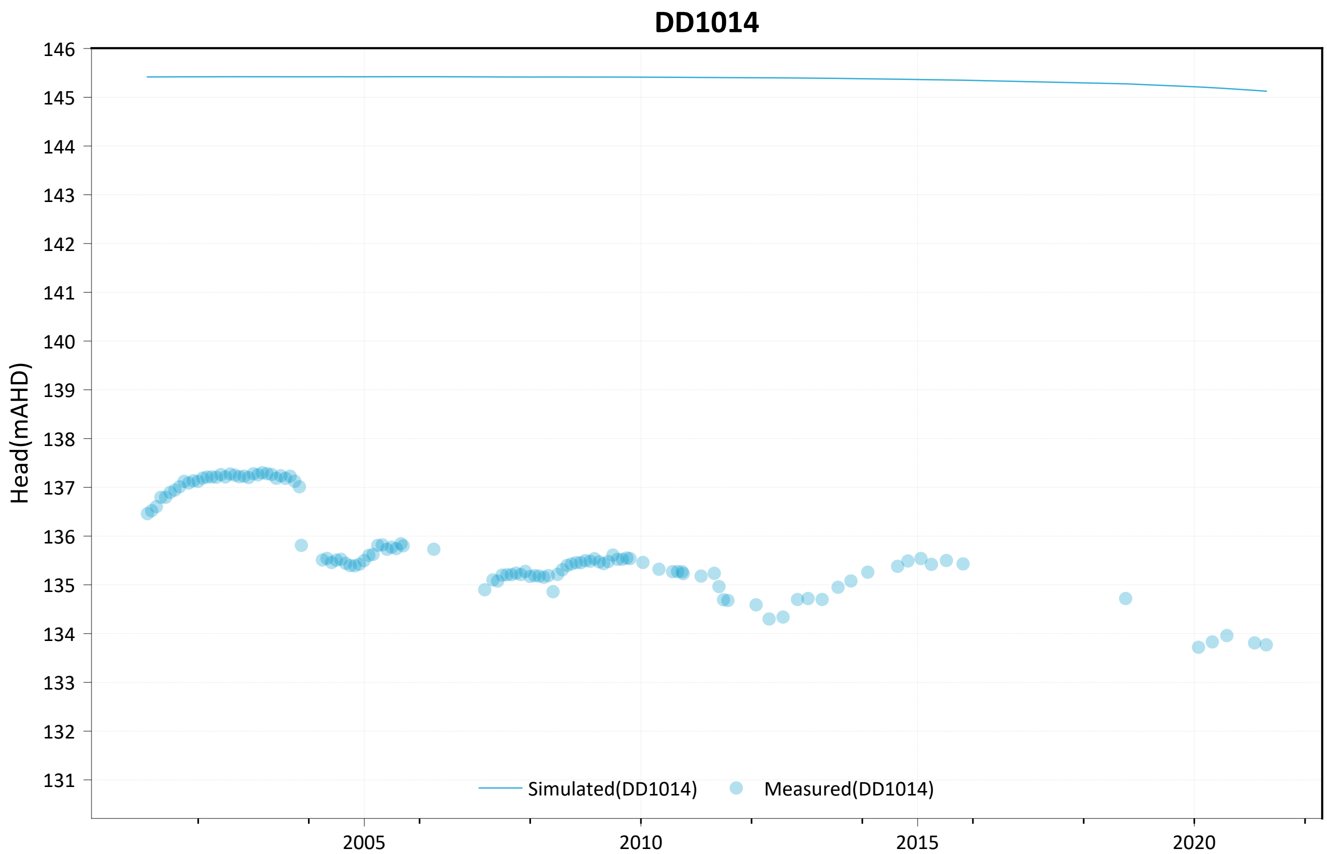

BCGW18
Head(mAHD)
160
159
158
157
156
155
154
153
152
151
150
149
148
147
146
145
144
2008
2010
2012
2014
2016
2018
2020
Simulated(BCGW18)
Measured(BCGW18)

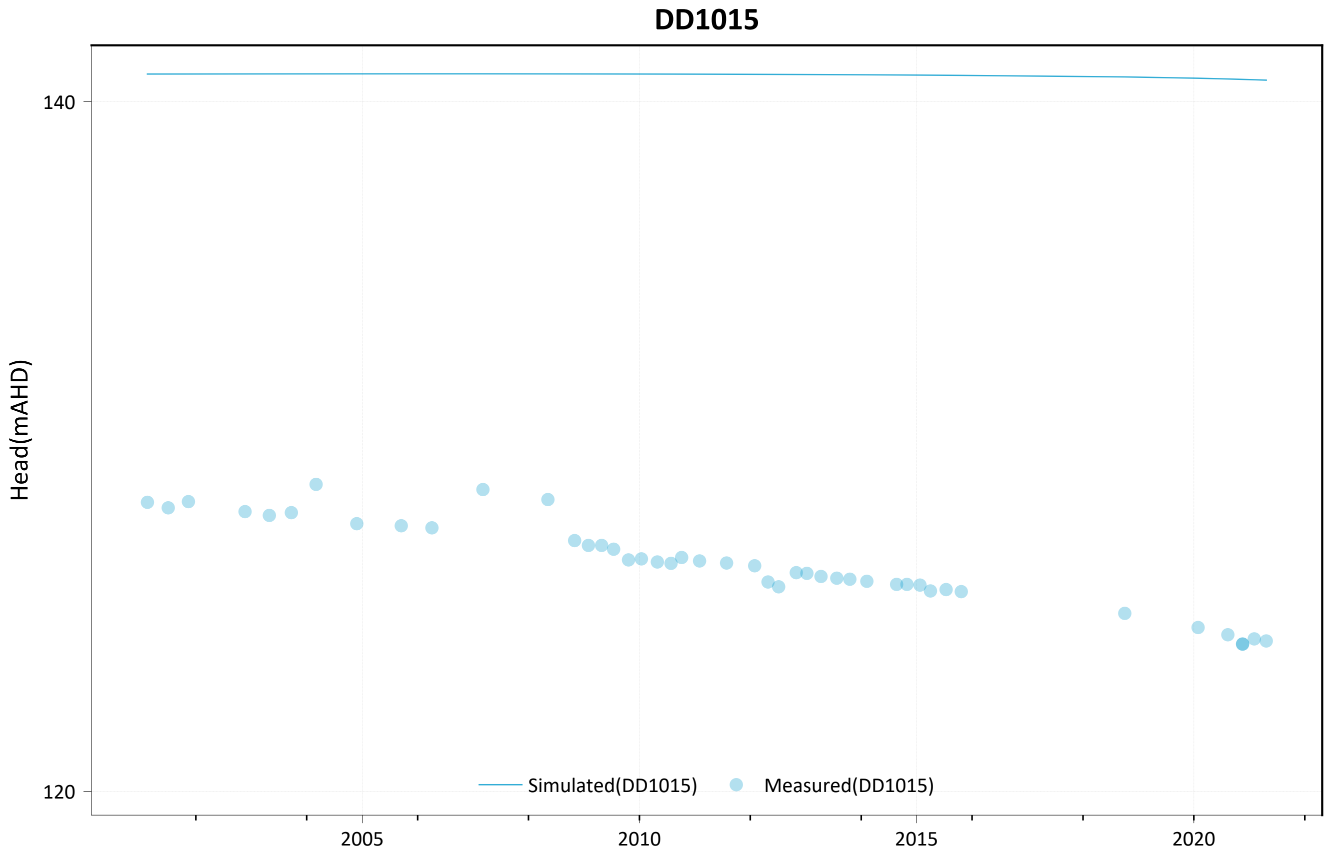

BCGW19
Head(mAHD)
180
160
2008
2010
2012
2014
2016
2018
2020
2022
Simulated(BCGW19)
Measured(BCGW19)

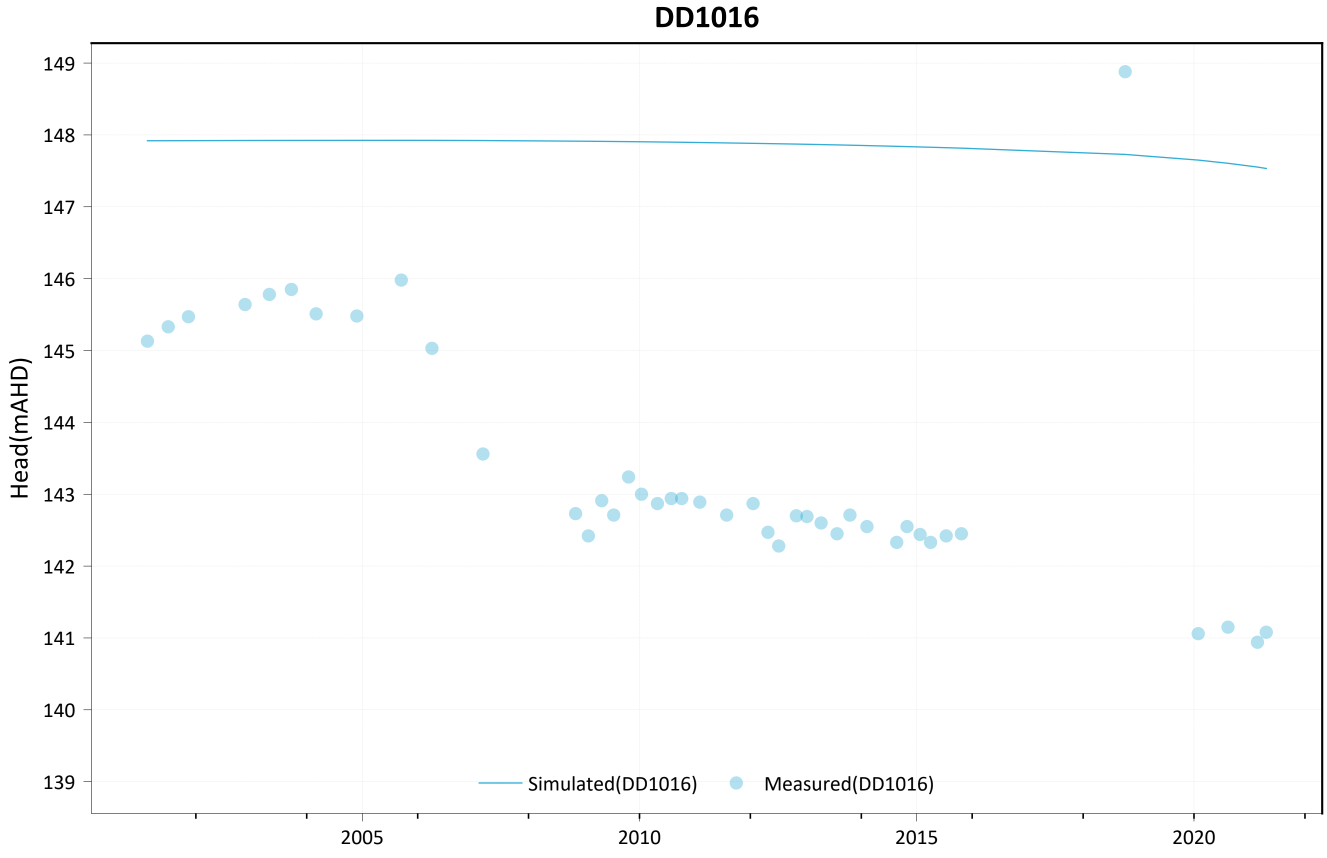

BCGW22
Head(mAHD)
143
142
141
140
139
138
137
136
Simulated(BCGW22)
Measured(BCGW22)
2008
2010
2012
2014
2016
2018

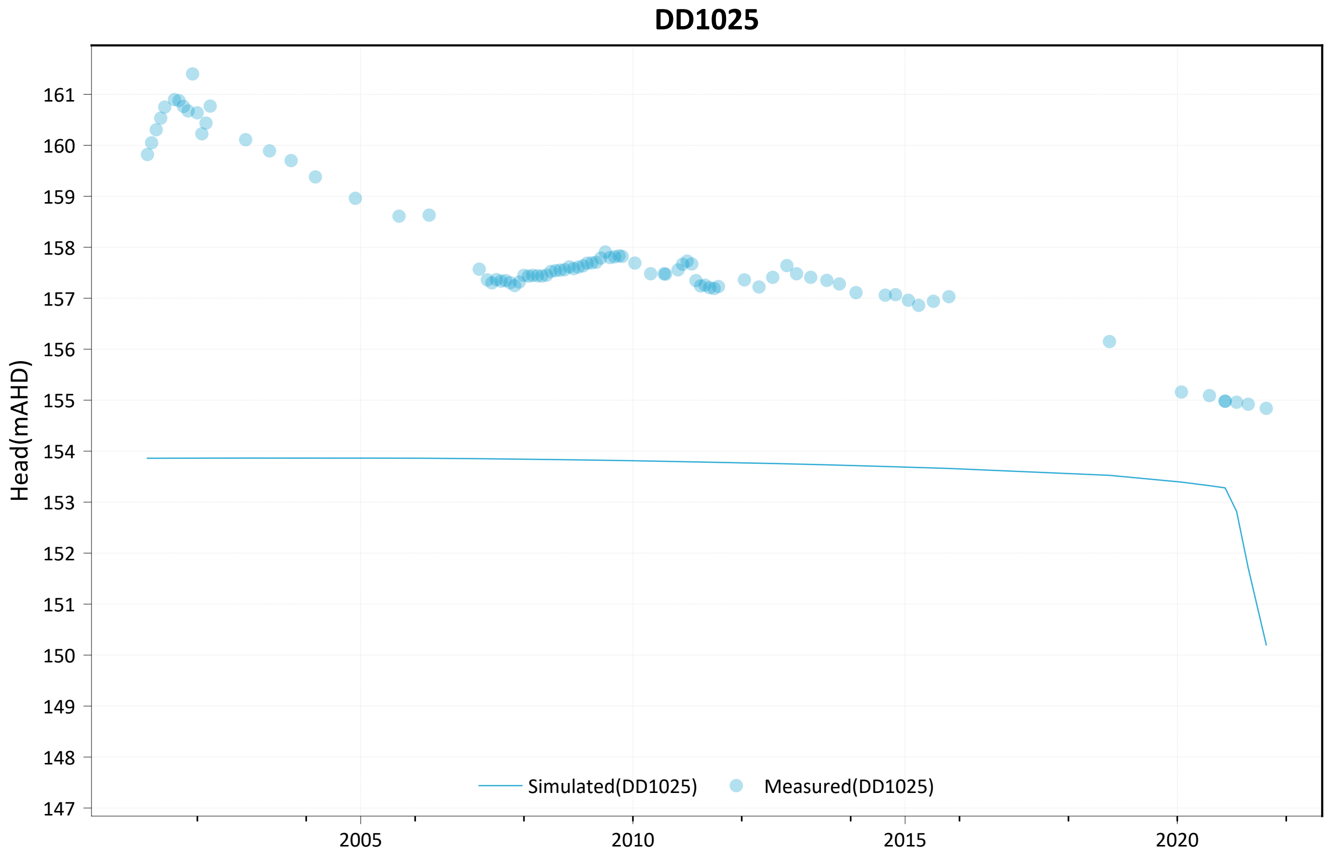

DD1004
Head(mAHD)
152
151
150
149
148
147
146
145
144
143
142
141
140
139
138
137
Simulated(DD1004)
Measured(DD1004)
2002
2004
2006
2008
2010
2012
2014
2016
2018

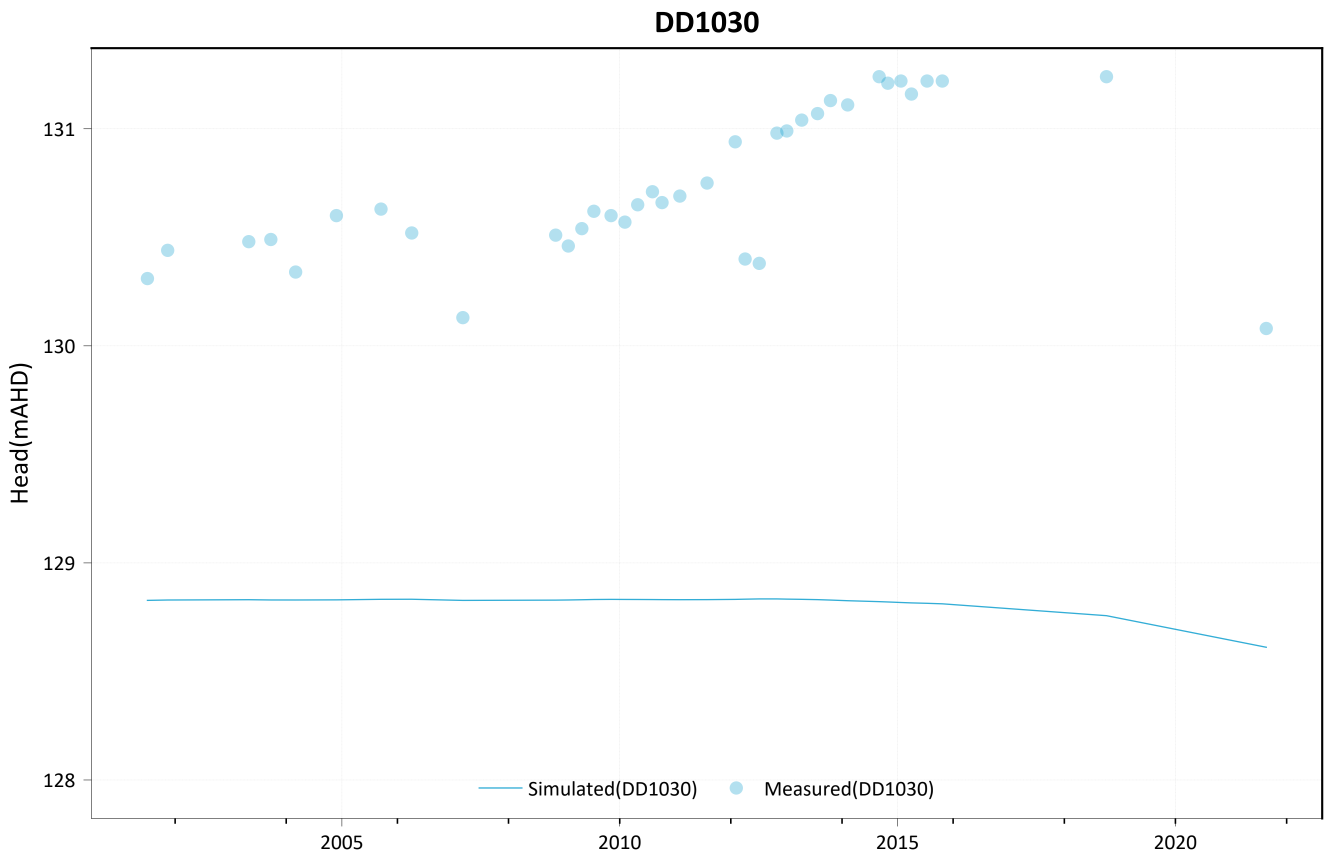

DD1005
Head(mAHD)
154
153
152
151
150
149
148
147
146
145
144
143
142
141
140
139
Simulated(DD1005)
Measured(DD1005)
2005
2010
2015
2020

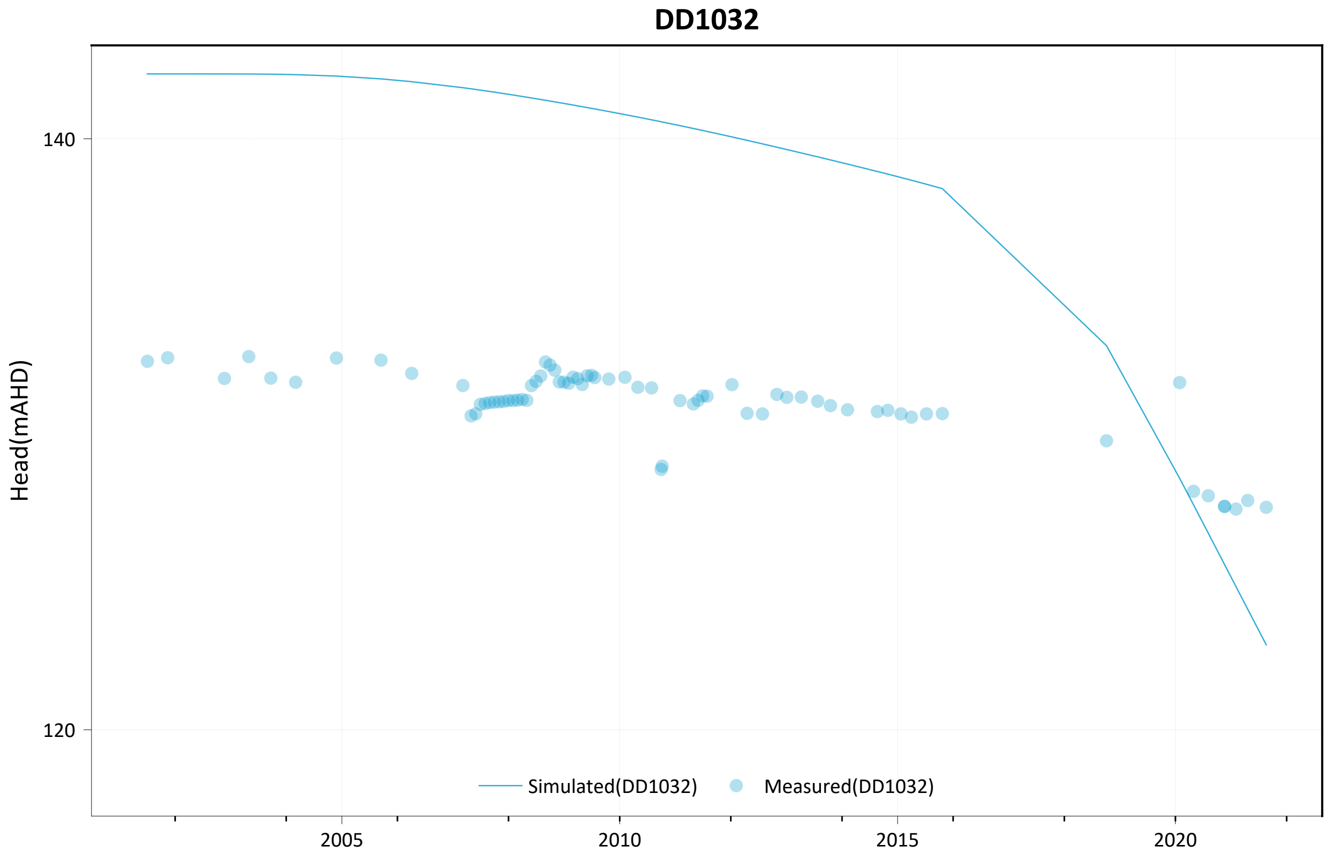

DD1014
Head(mAHD)
146
145
144
143
142
141
140
139
138
137
136
135
134
133
132
131
Simulated(DD1014)
Measured(DD1014)
2005
2010
2015
2020

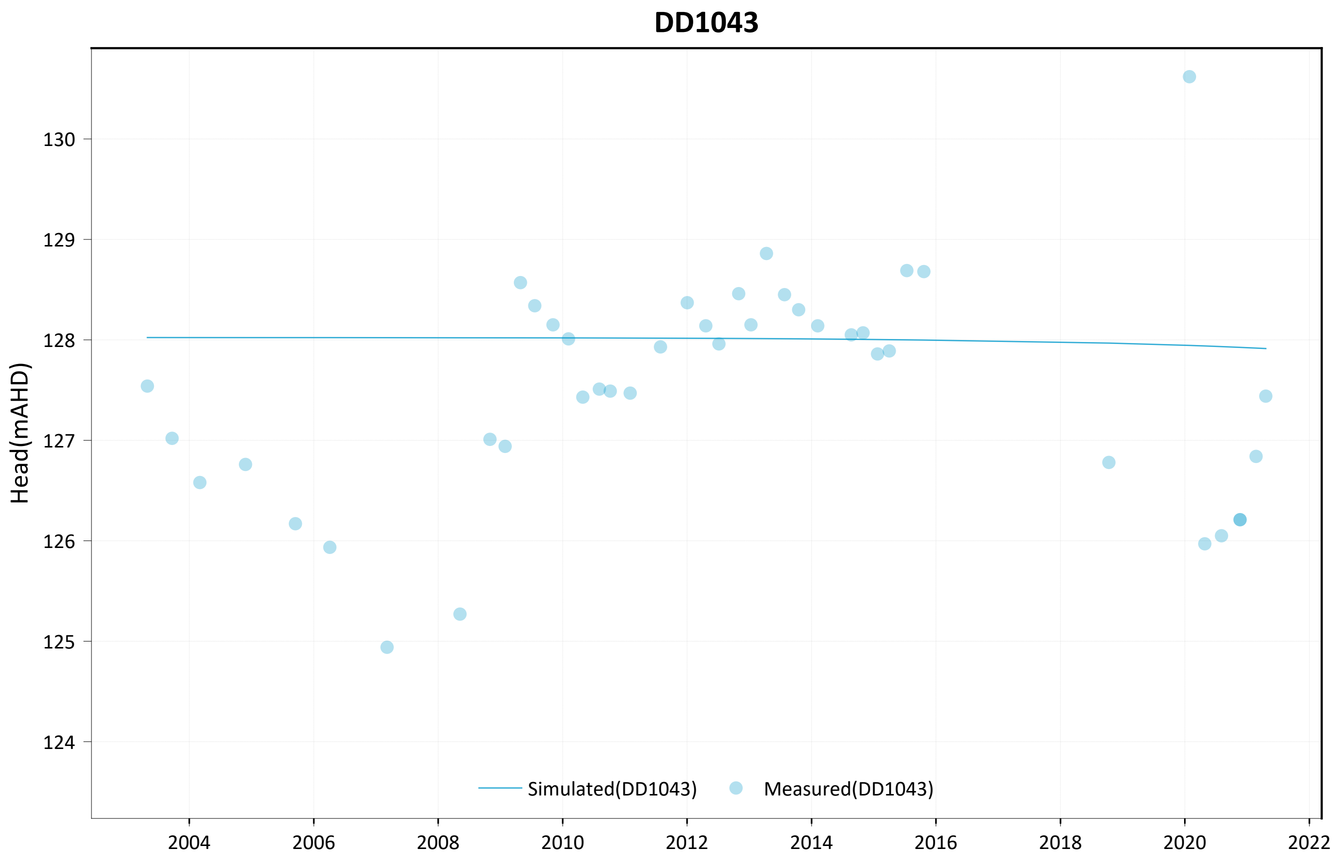

DD1015
Head(mAHD)
140
120
Simulated(DD1015)
Measured(DD1015)
2005
2010
2015
2020

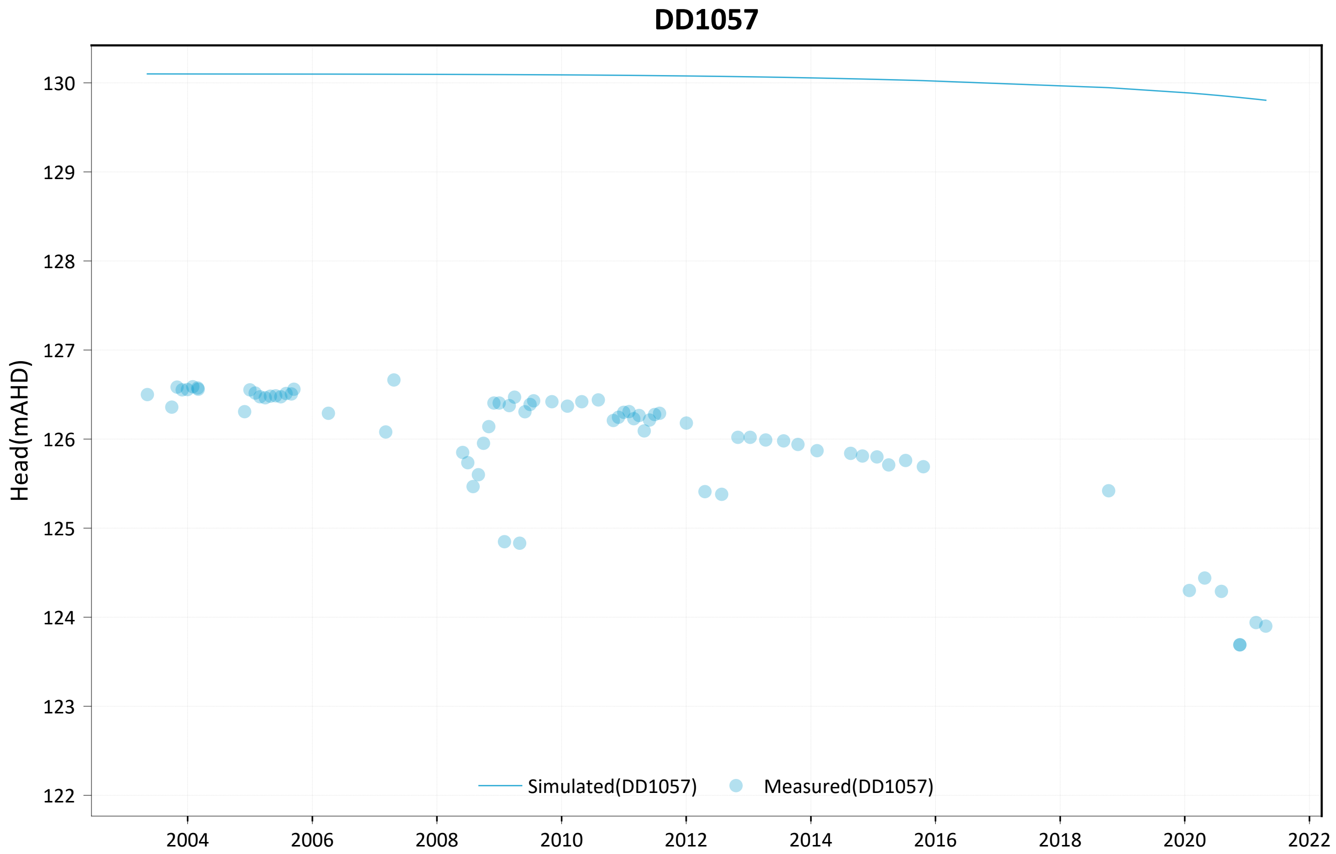

DD1016
Head(mAHD)
149
148
147
146
145
144
143
142
141
140
139
Simulated(DD1016)
Measured(DD1016)
2005
2010
2015
2020

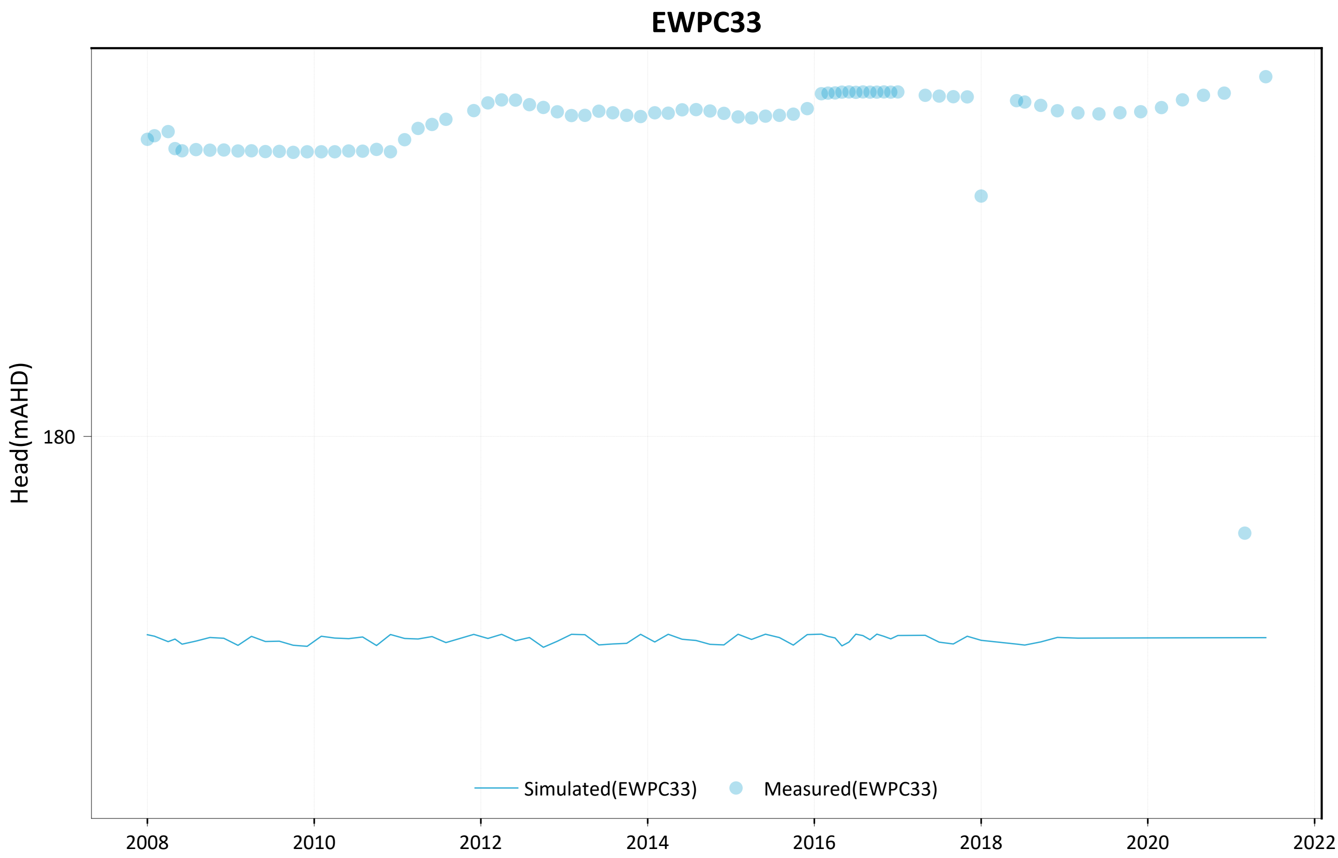

DD1025
Head(mAHD)
161
160
159
158
157
156
155
154
153
152
151
150
149
148
147
2005
2010
2015
2020
Simulated(DD1025)
Measured(DD1025)

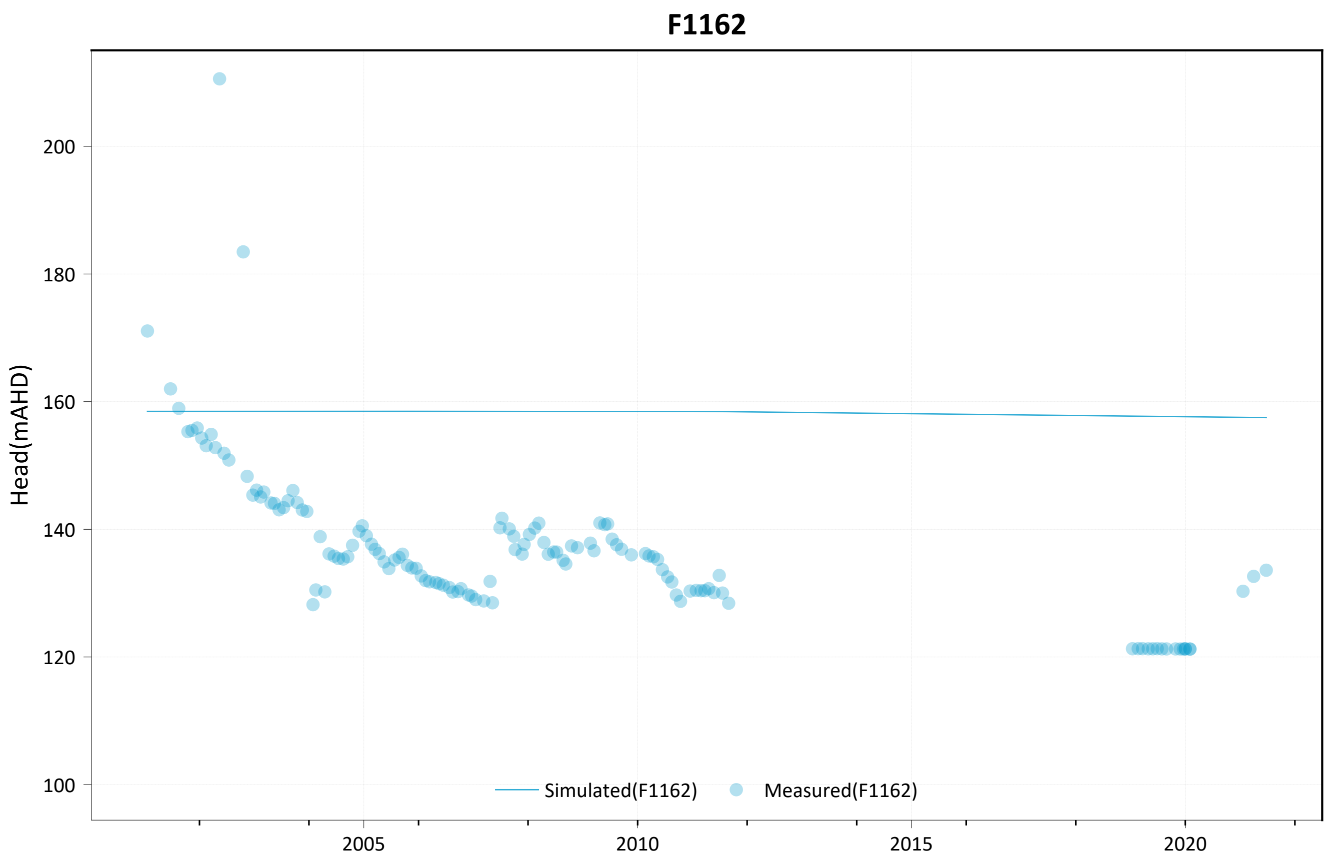

DD1030
Head(mAHD)
131
130
129
128
2005
2010
2015
2020
Simulated(DD1030)
Measured(DD1030)

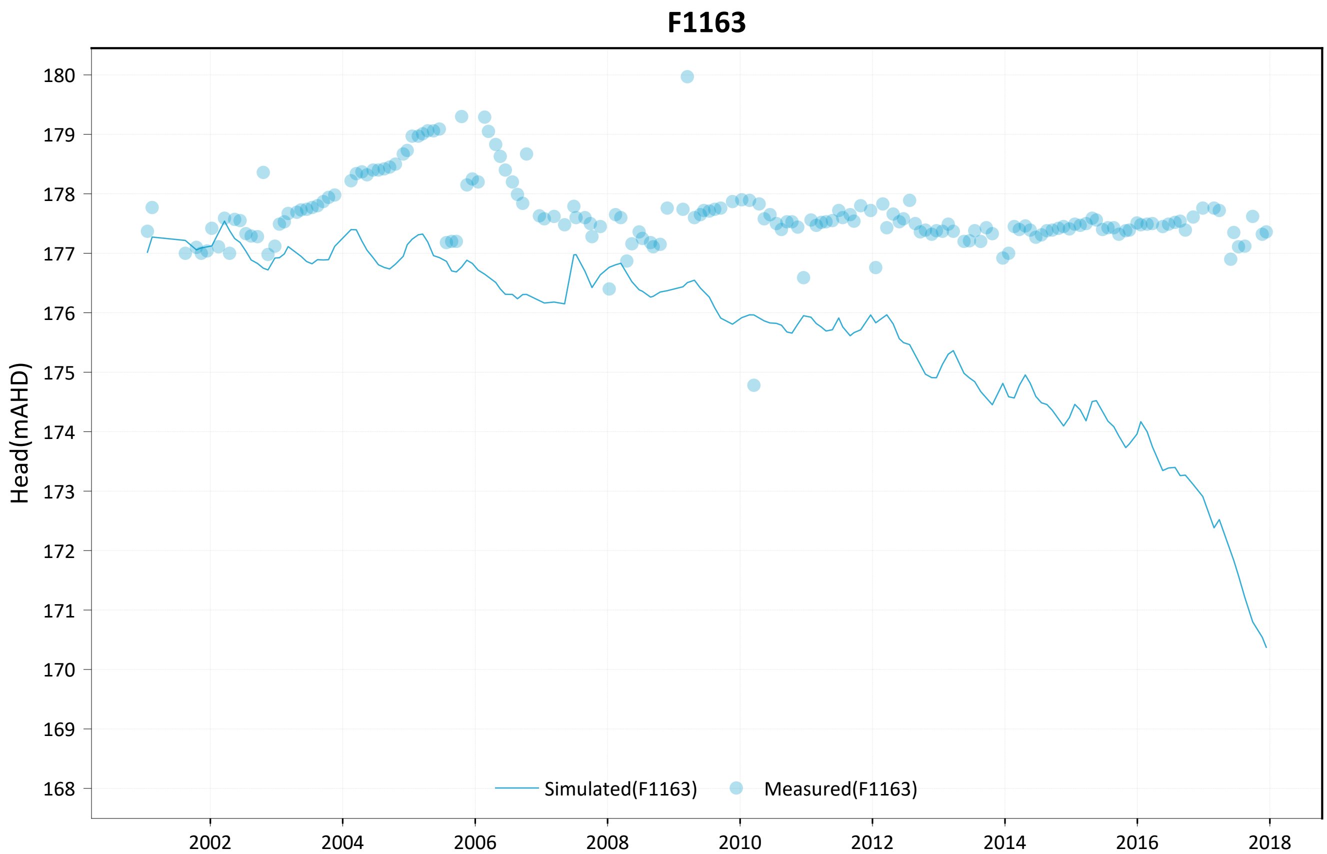

DD1032
Head(mAHD)
140
120
Simulated(DD1032)
Measured(DD1032)
2005
2010
2015
2020


DD1043
Head(mAHD)
130
129
128
127
126
125
124
Simulated(DD1043)
Measured(DD1043)
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022

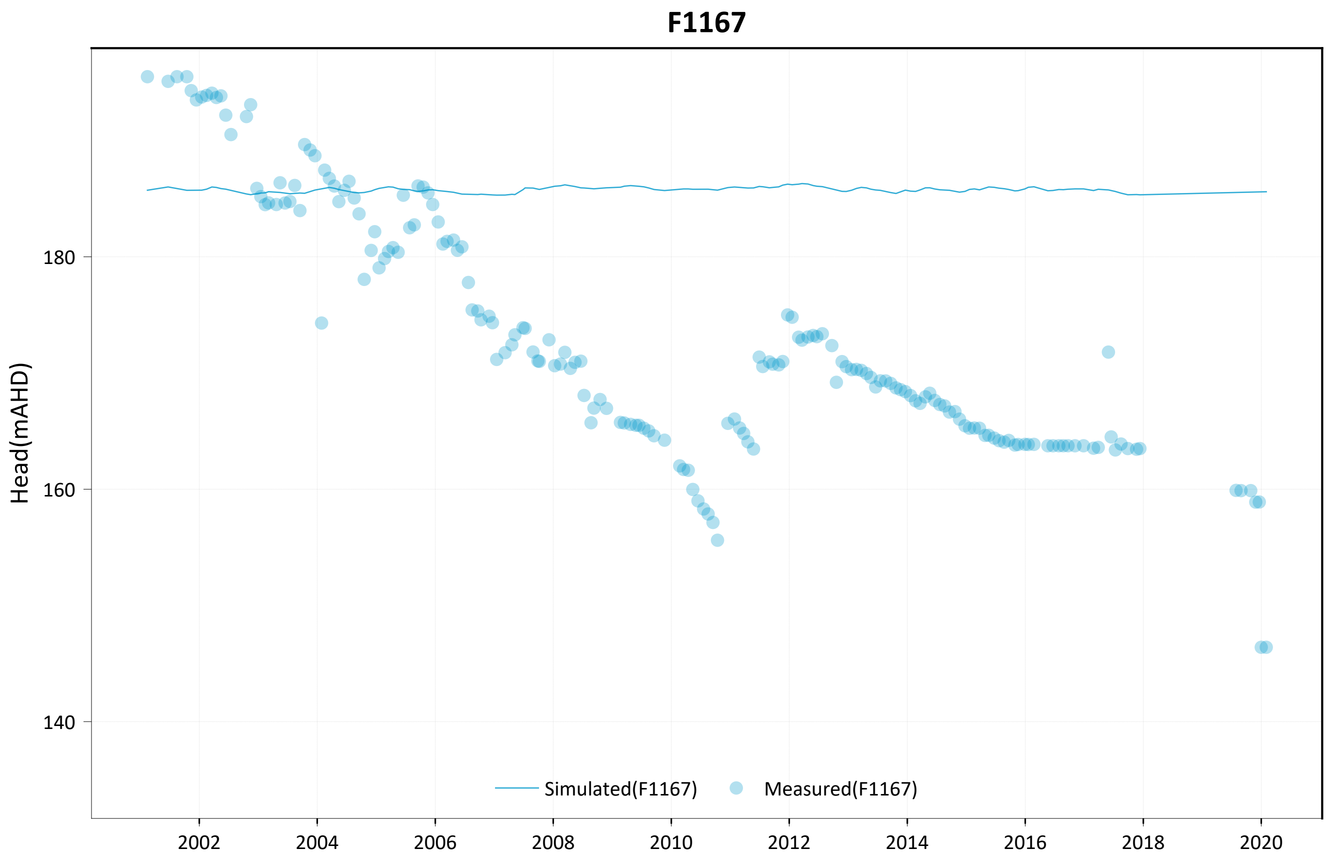

DD1057
Head(mAHD)
130
129
128
127
126
125
124
123
122
Simulated(DD1057)
Measured(DD1057)
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022


EWPC33
Head(mAHD)
180
Simulated(EWPC33)
Measured(EWPC33)
2008
2010
2012
2014
2016
2018
2020
2022


F1162
Head(mAHD)
200
180
160
140
120
100
2005
2010
2015
2020
Simulated(F1162)
Measured(F1162)


F1163
Head(mAHD)
180
179
178
177
176
175
174
173
172
171
170
169
168
2002
2004
2006
2008
2010
2012
2014
2016
2018
Simulated(F1163)
Measured(F1163)

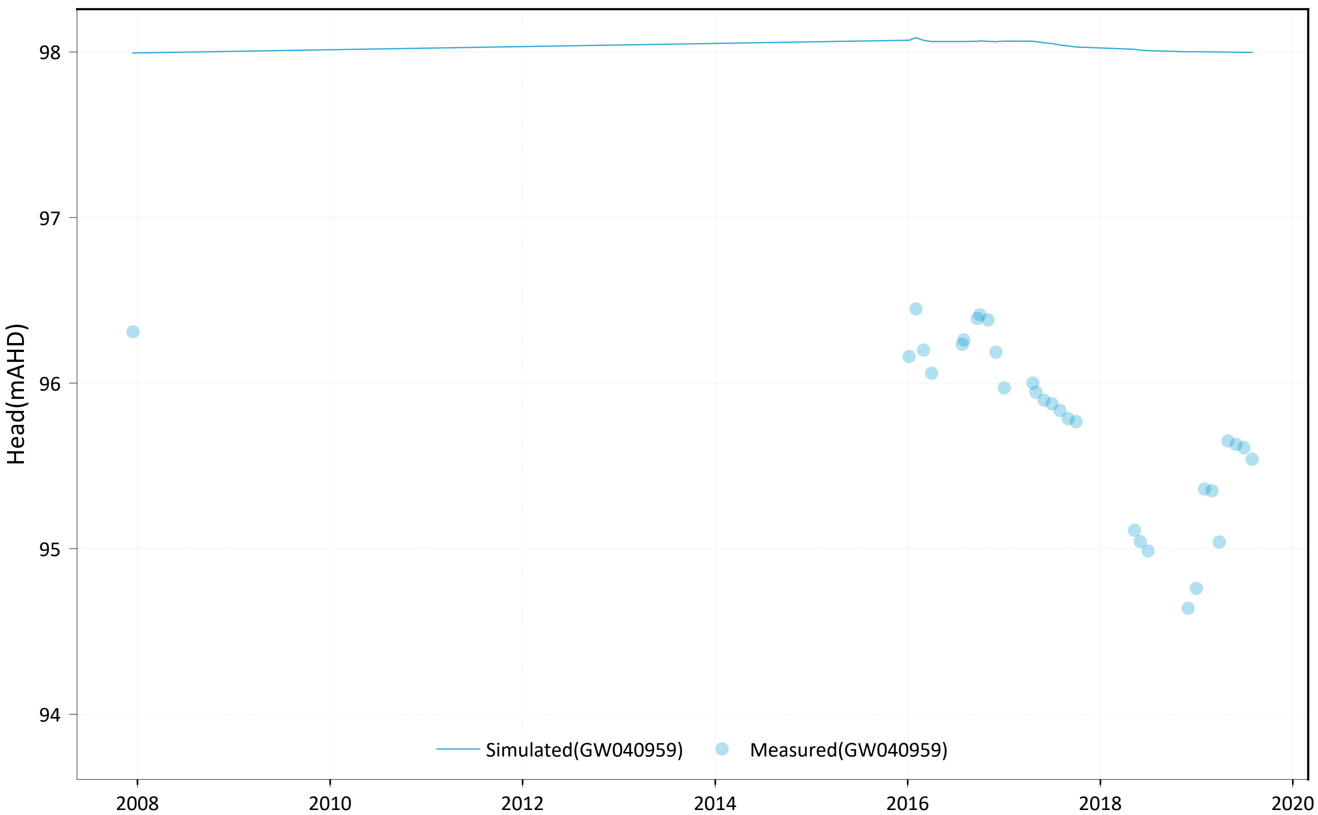
F1164
Head(mAHD)
180
160
140
120
100
2005
2010
2015
2020
Simulated(F1164)
Measured(F1164)

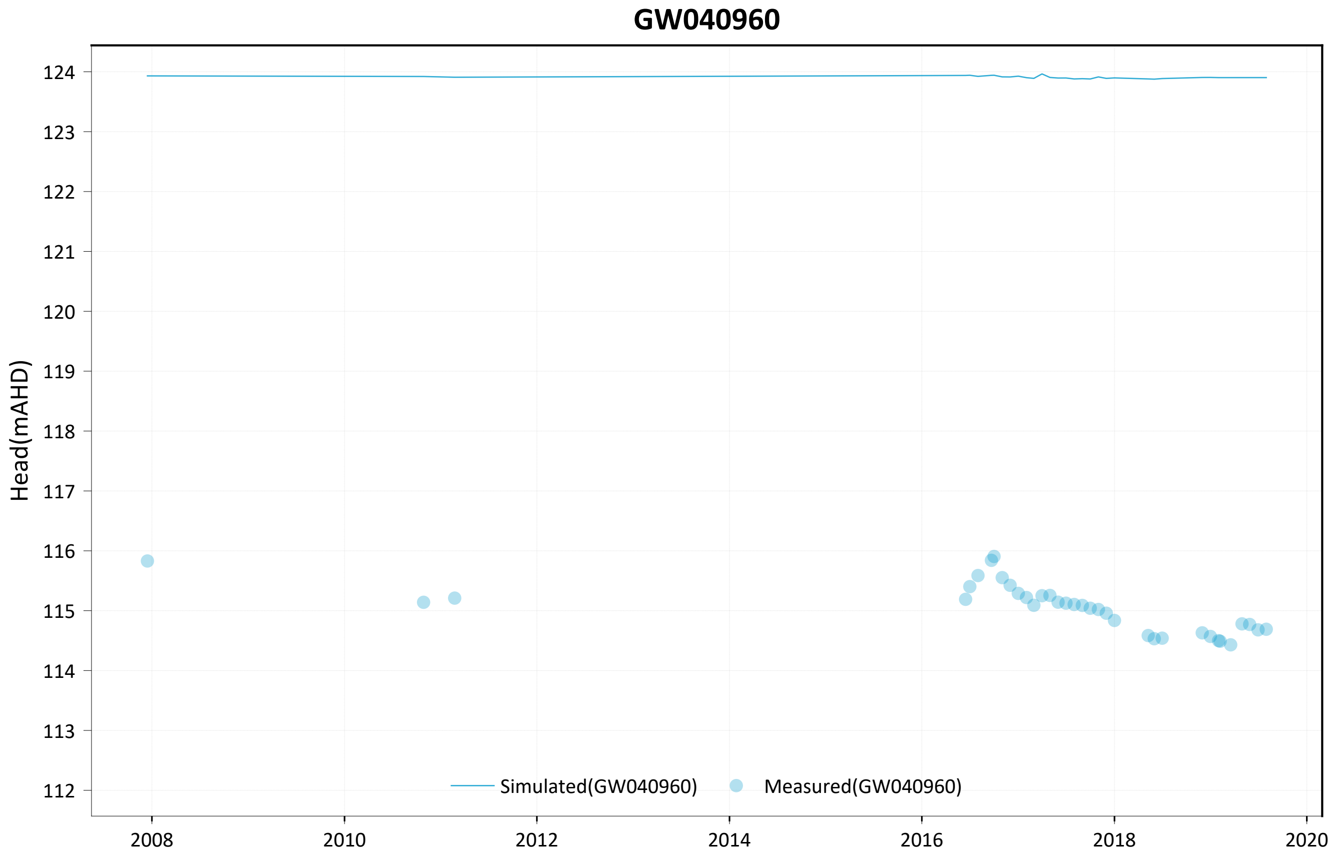


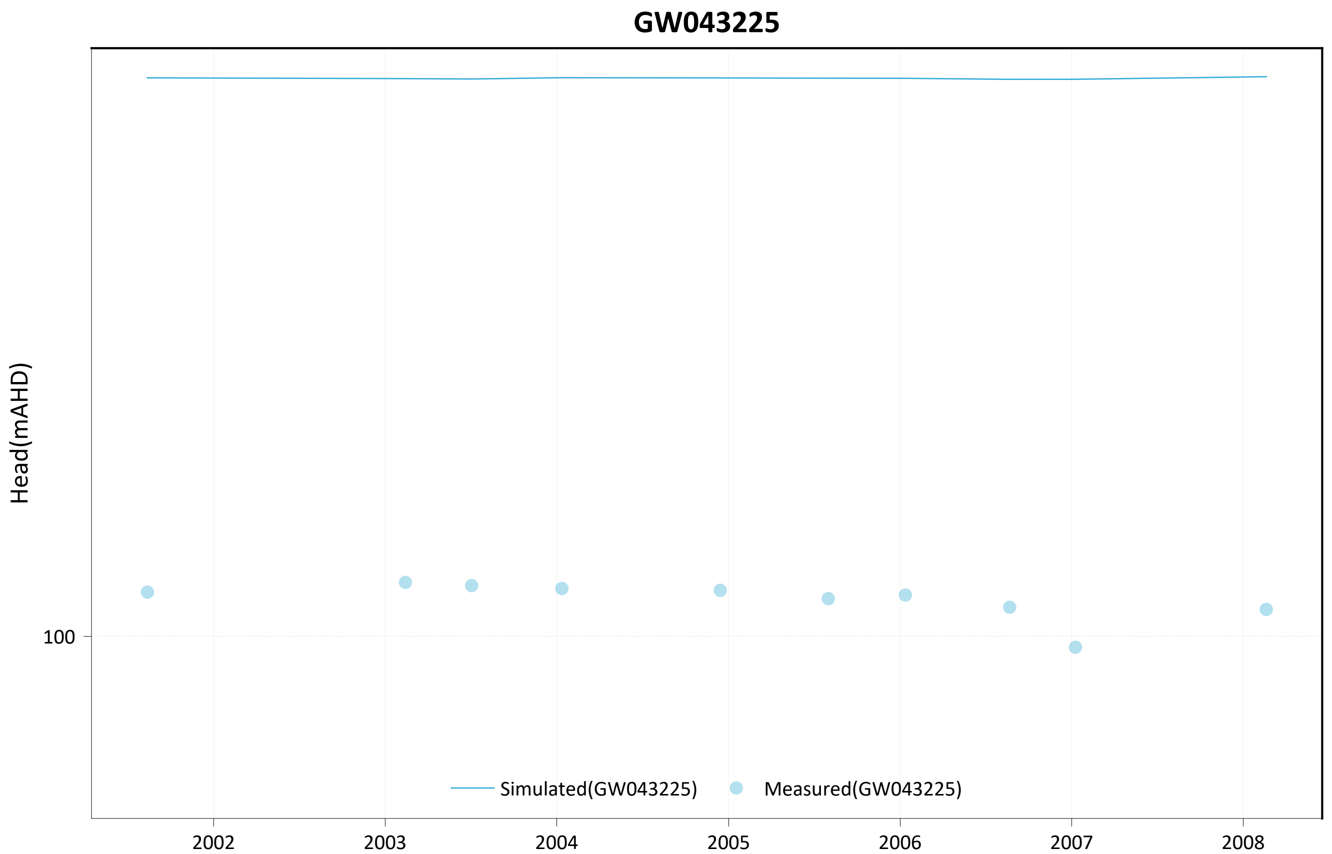
F1167
Head(mAHD)
180
160
140
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Simulated(F1167)
Measured(F1167)

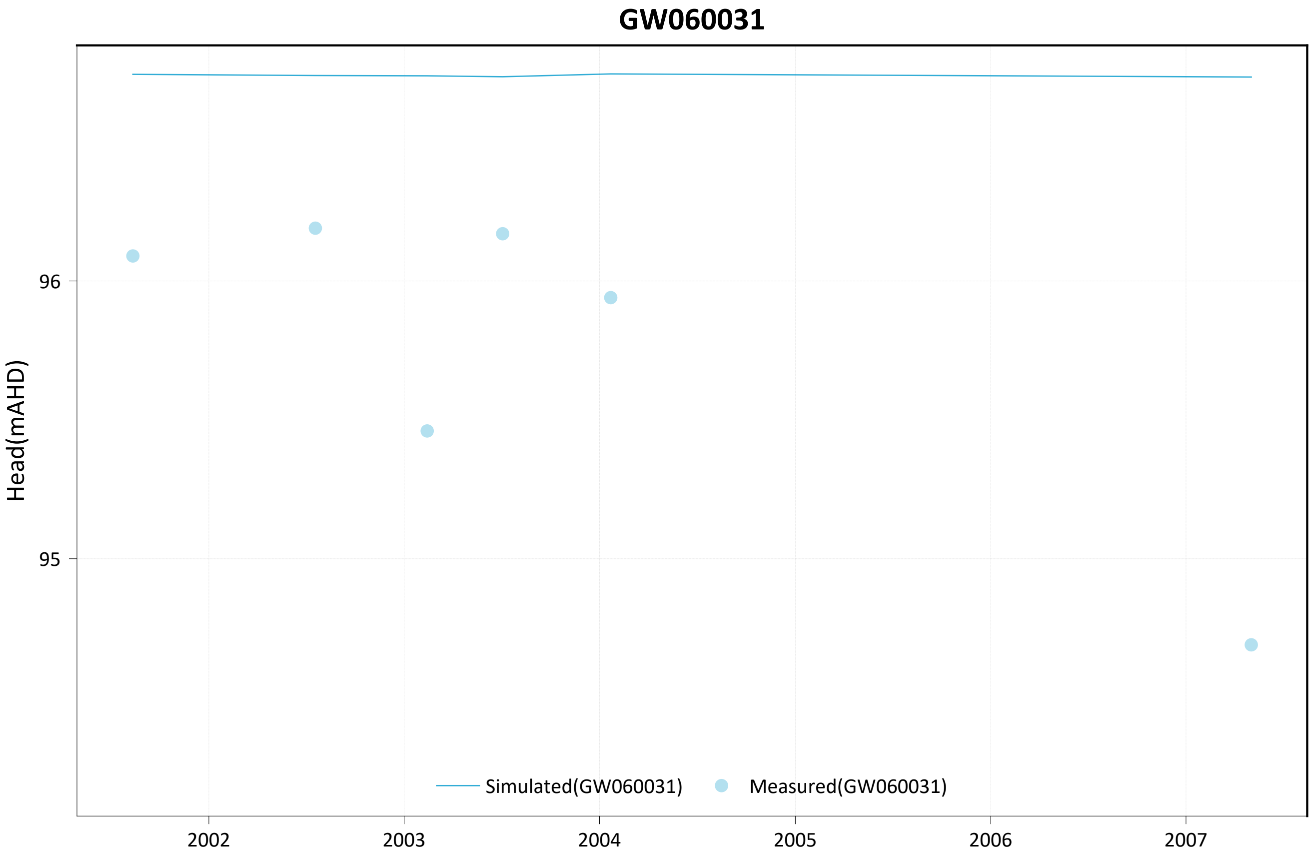
F1168

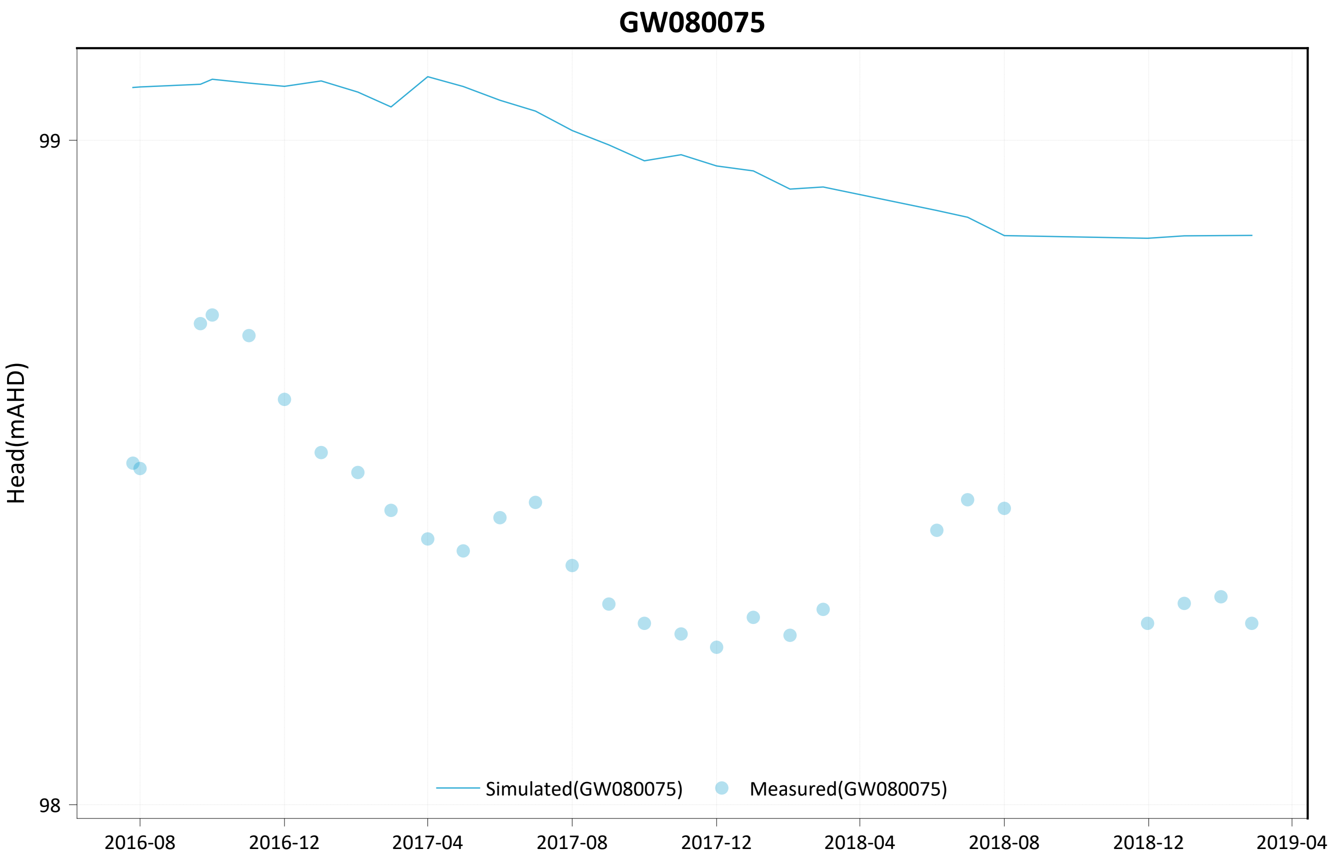
GW040959

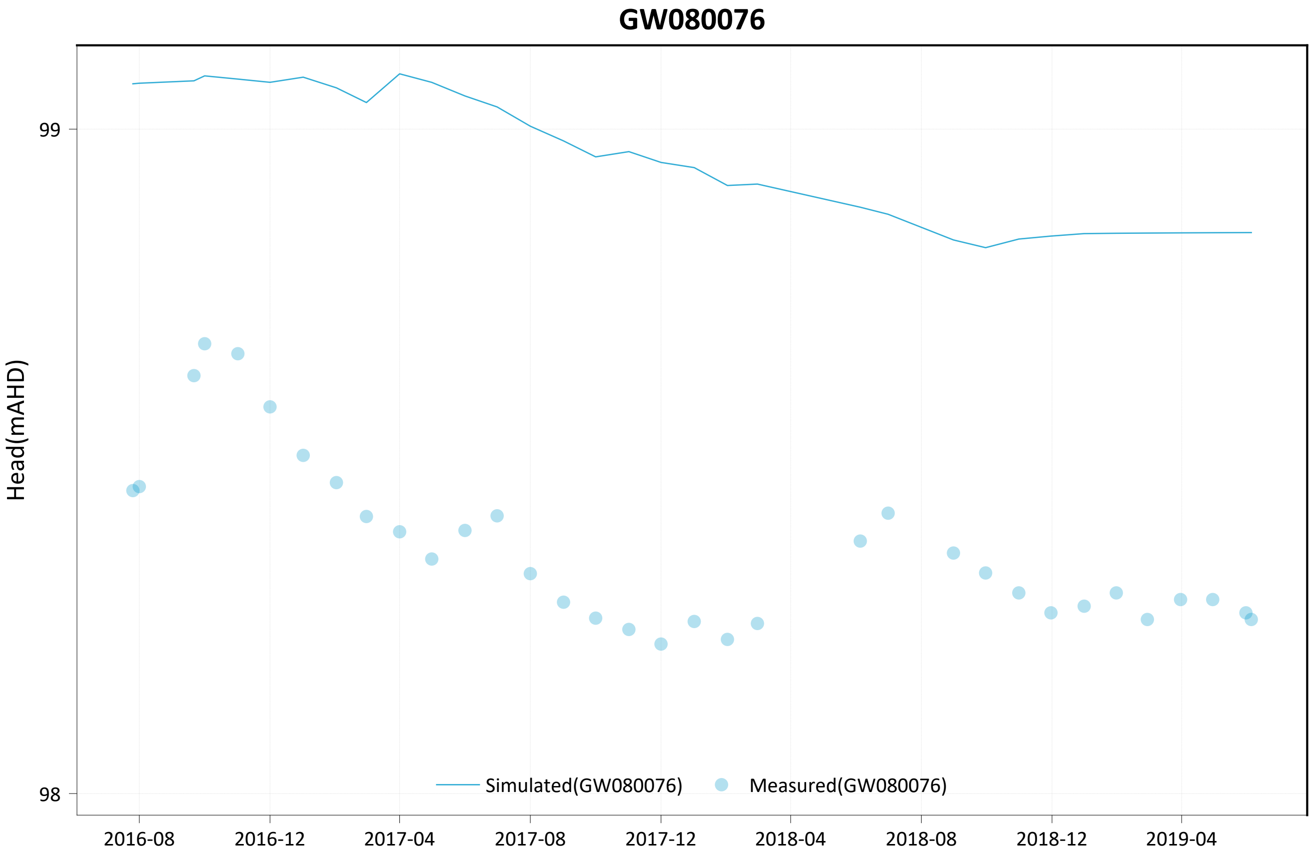


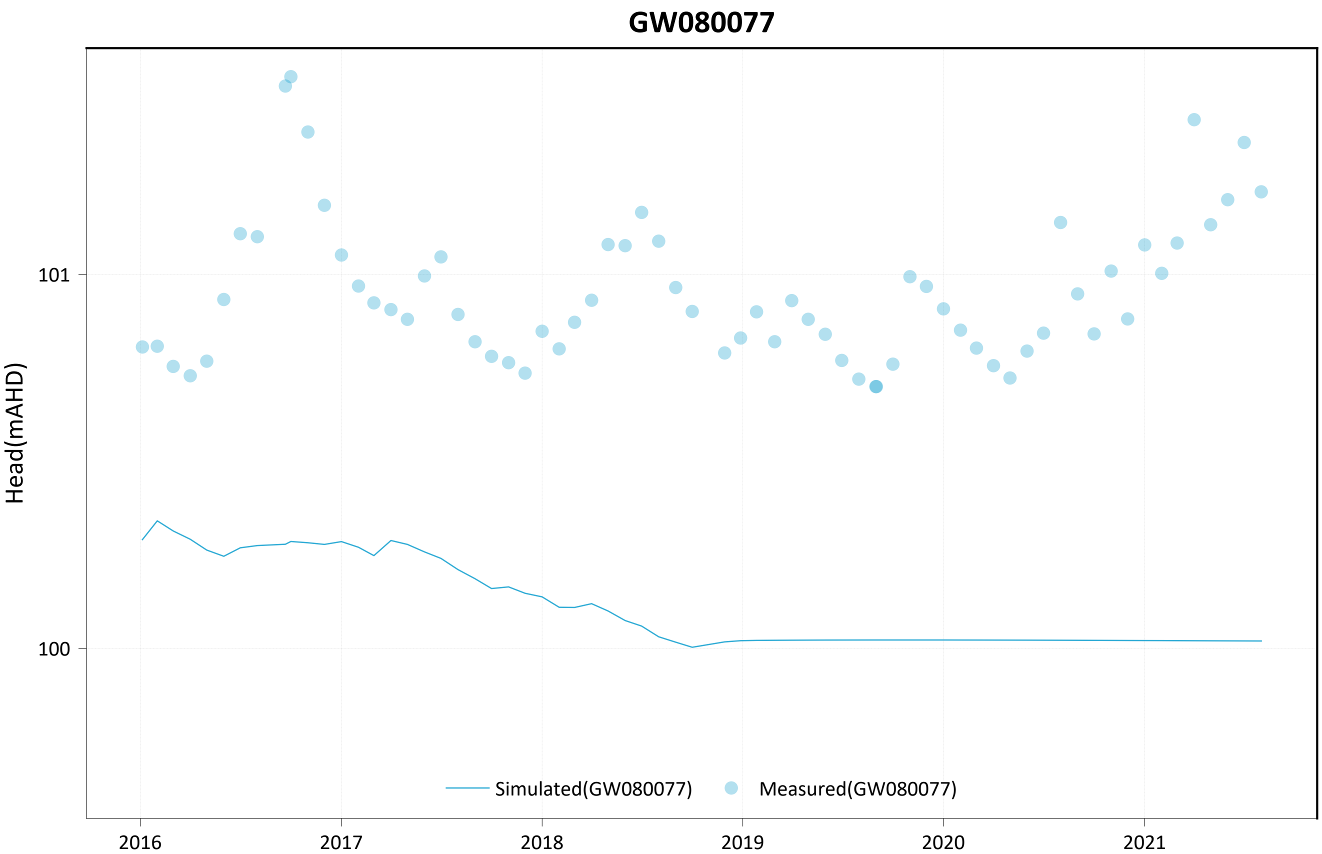

GW040960
Head(mAHD)
124
123
122
121
120
119
118
117
116
115
114
113
112
2008
2010
2012
2014
2016
2018
2020
Simulated(GW040960)
Measured(GW040960)

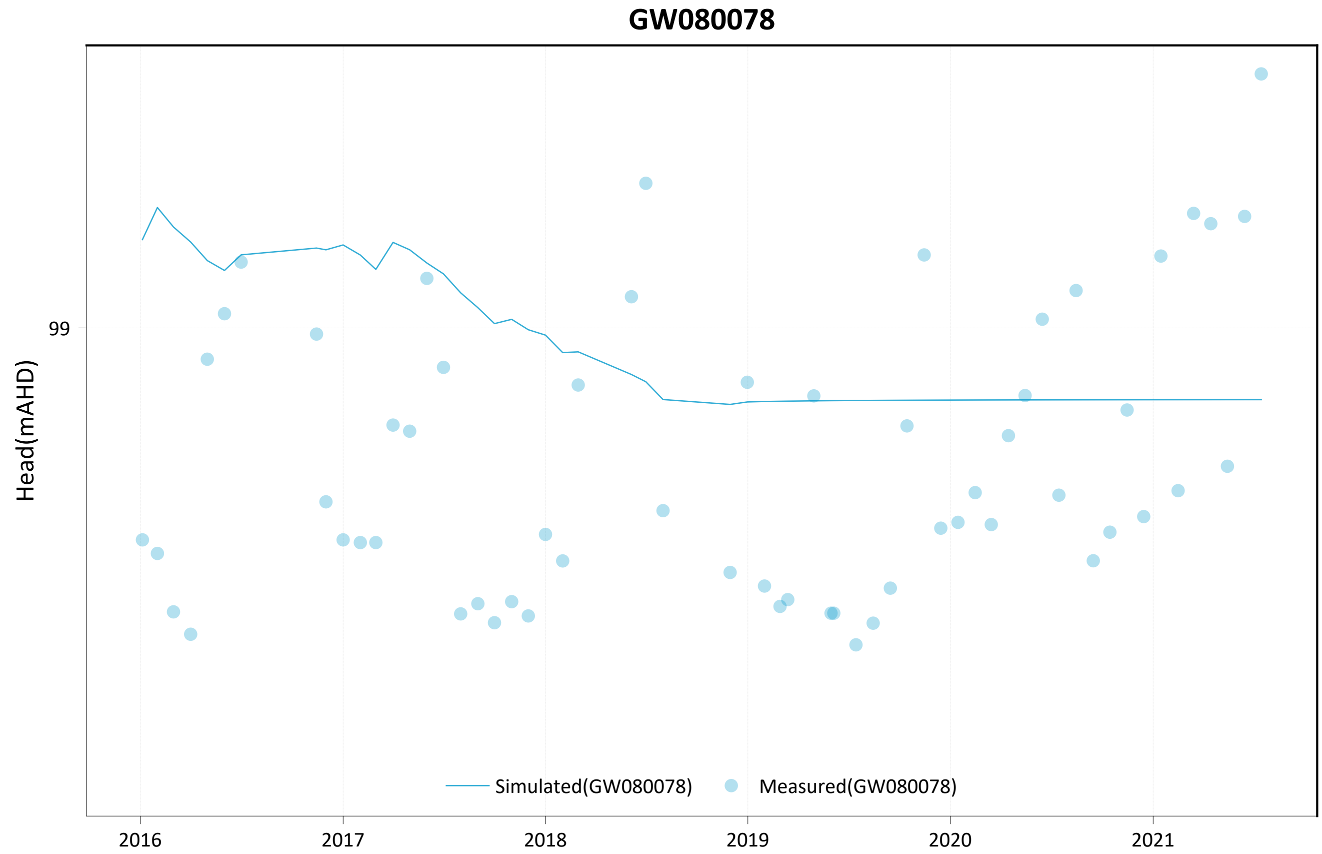

GW043225
Head(mAHD)
100
2002
2003
2004
2005
2006
2007
2008
Simulated(GW043225)
Measured(GW043225)

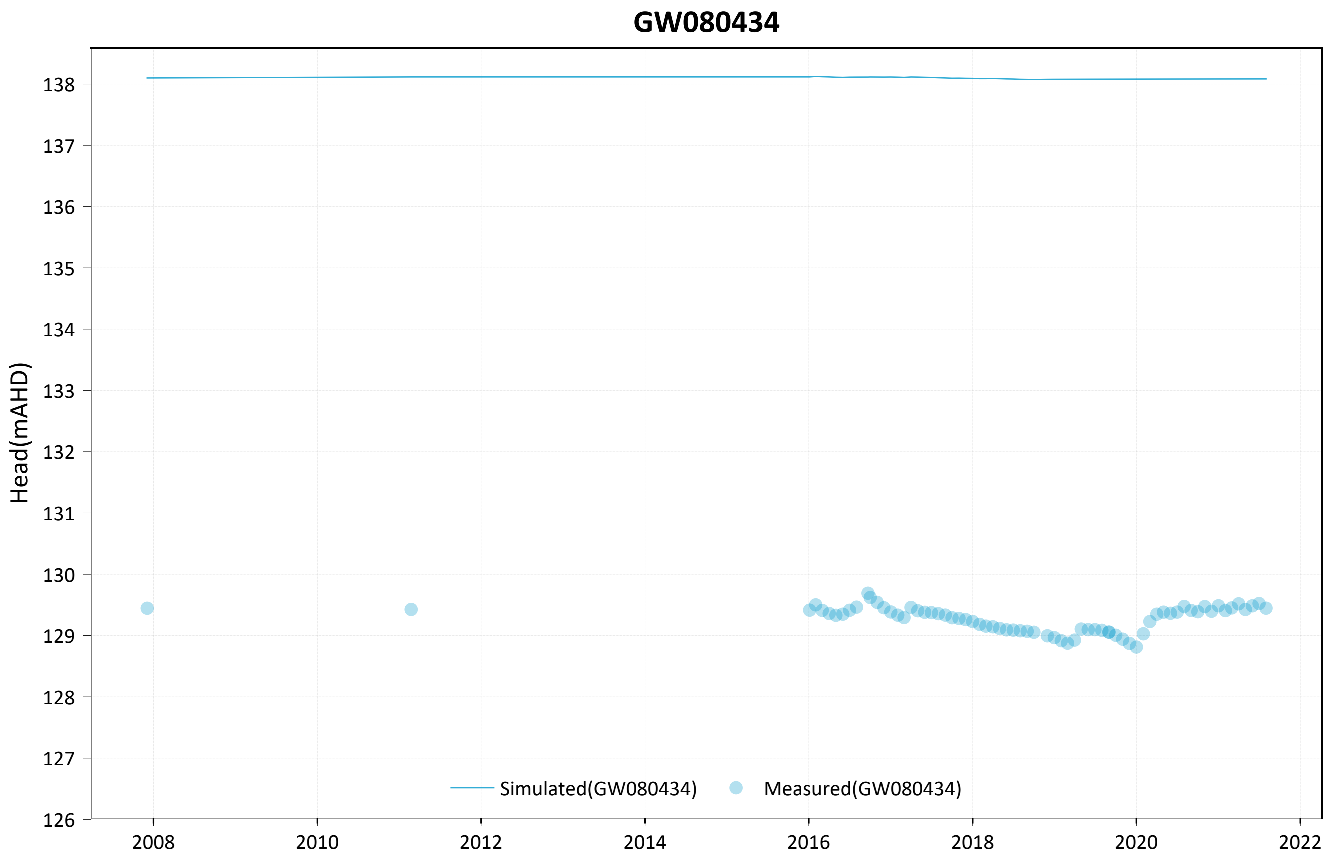

GW060031
Head(mAHD)
96
95
2002
2003
2004
2005
2006
2007
Simulated(GW060031)
Measured(GW060031)

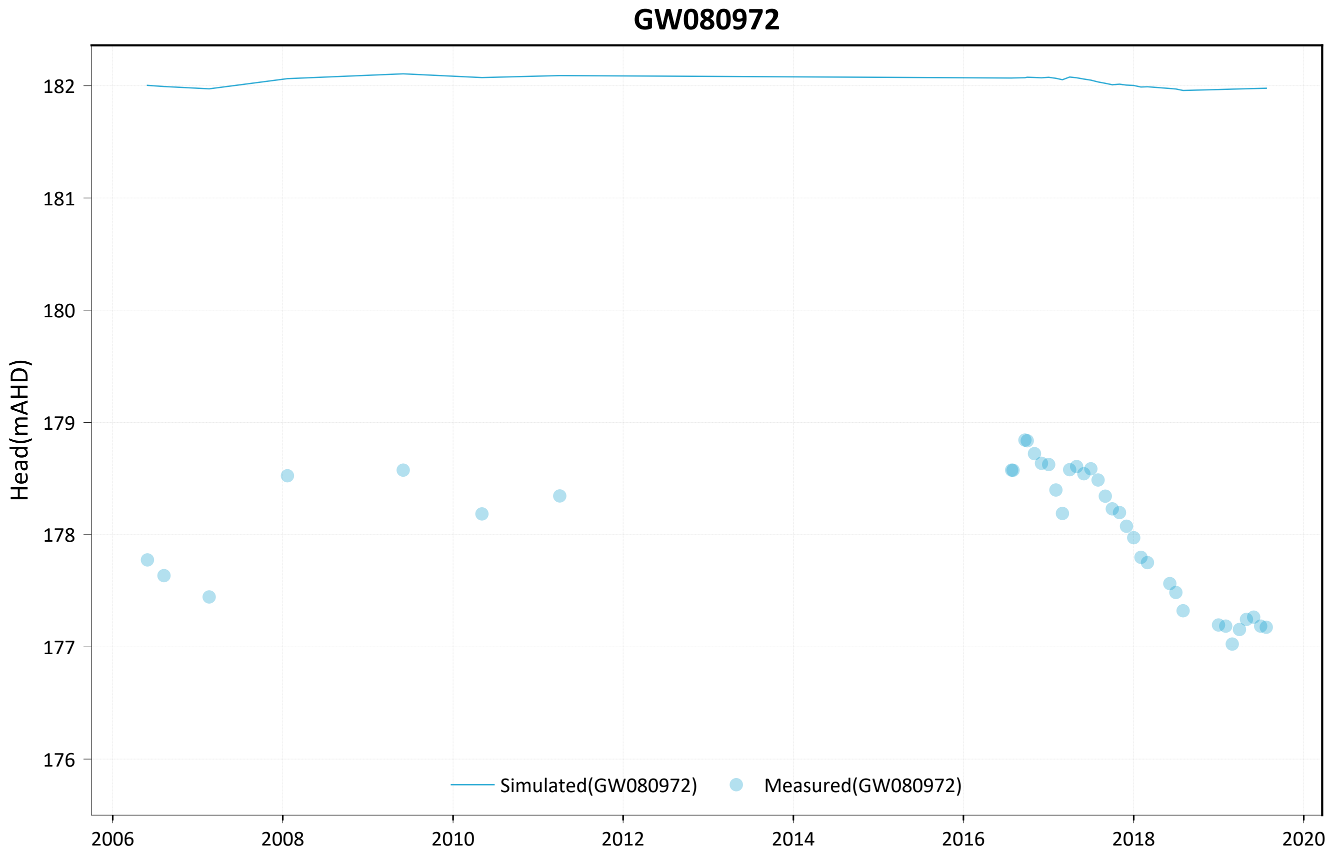

GW080075
Head(mAHD)
99
98
2016-08
2016-12
2017-04
2017-08
2017-12
2018-04
2018-08
2018-12
2019-04
Simulated(GW080075)
Measured(GW080075)

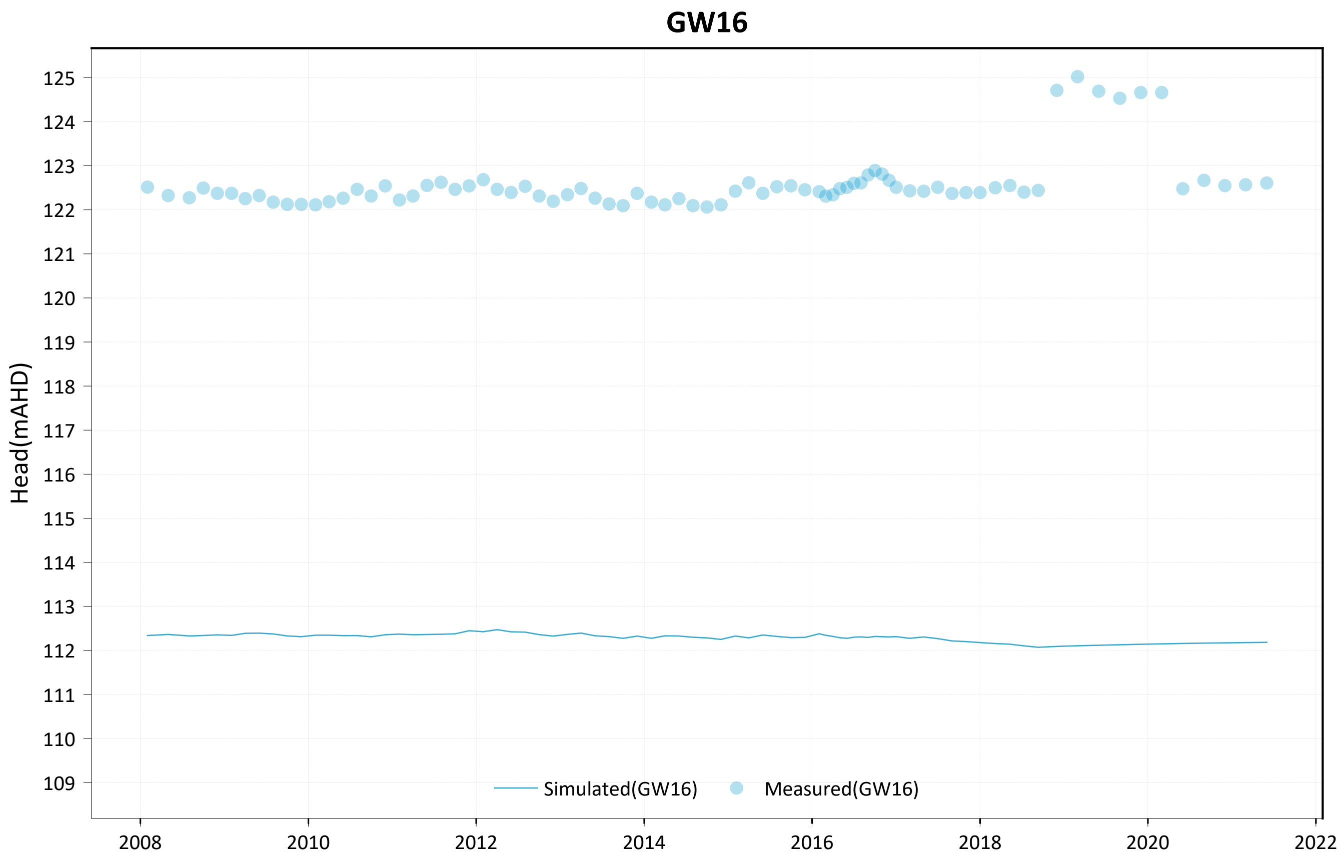

GW080076
Head(mAHD)
99
98
Simulated(GW080076)
Measured(GW080076)
2016-08
2016-12
2017-04
2017-08
2017-12
2018-04
2018-08
2018-12
2019-04

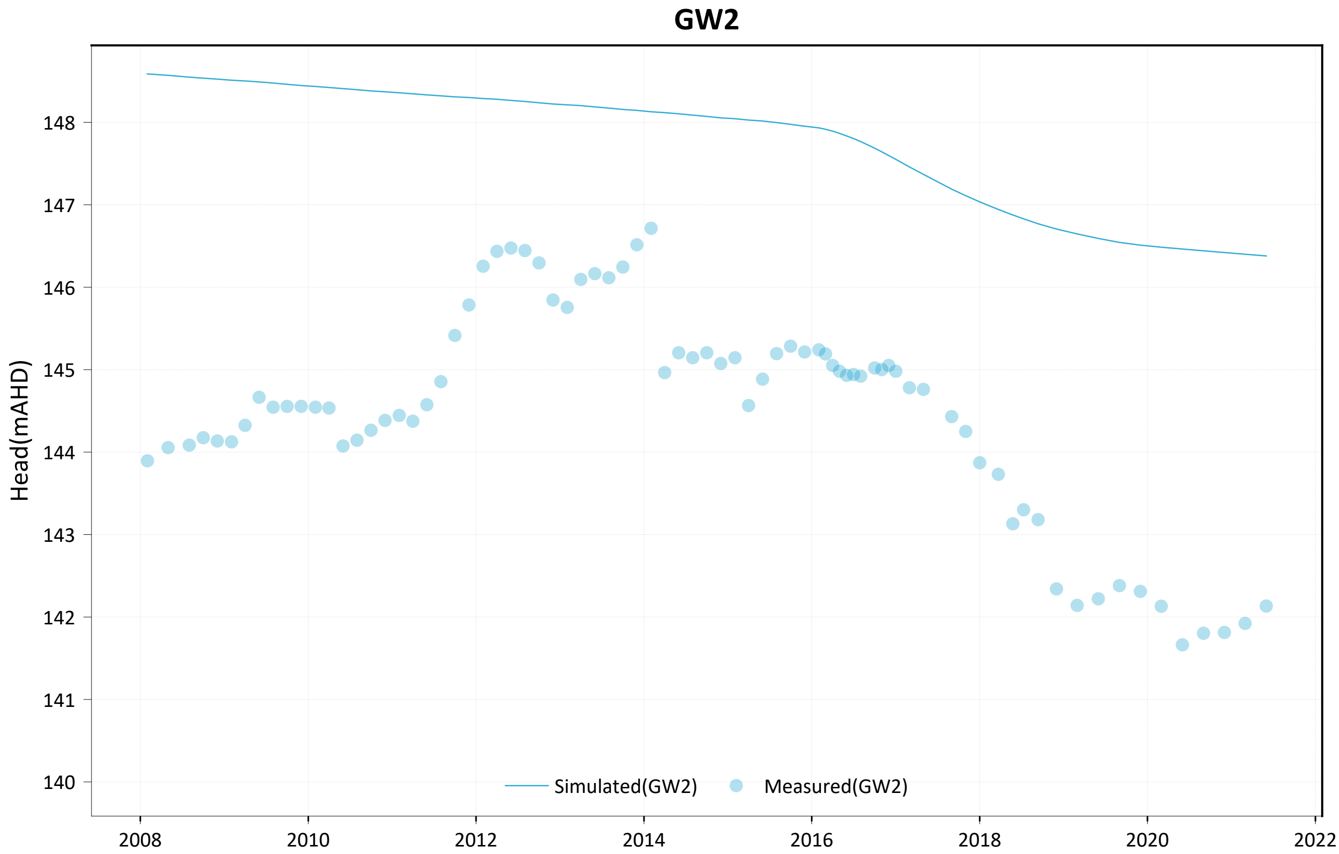

GW080077
Head(mAHD)
101
100
Simulated(GW080077)
Measured(GW080077)
2016
2017
2018
2019
2020
2021

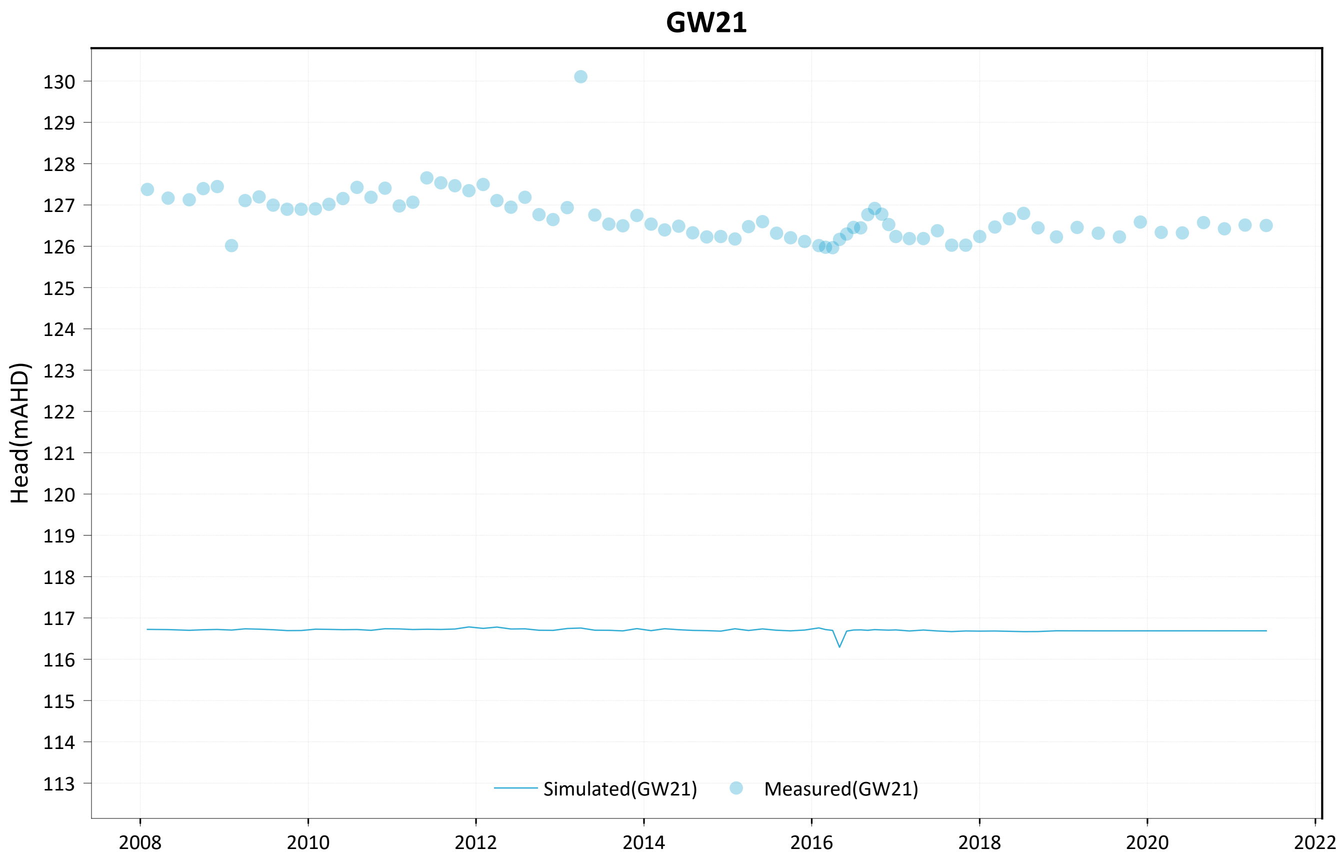

GW080078
Head(mAHD)
99
Simulated(GW080078)
Measured(GW080078)
2016
2017
2018
2019
2020
2021

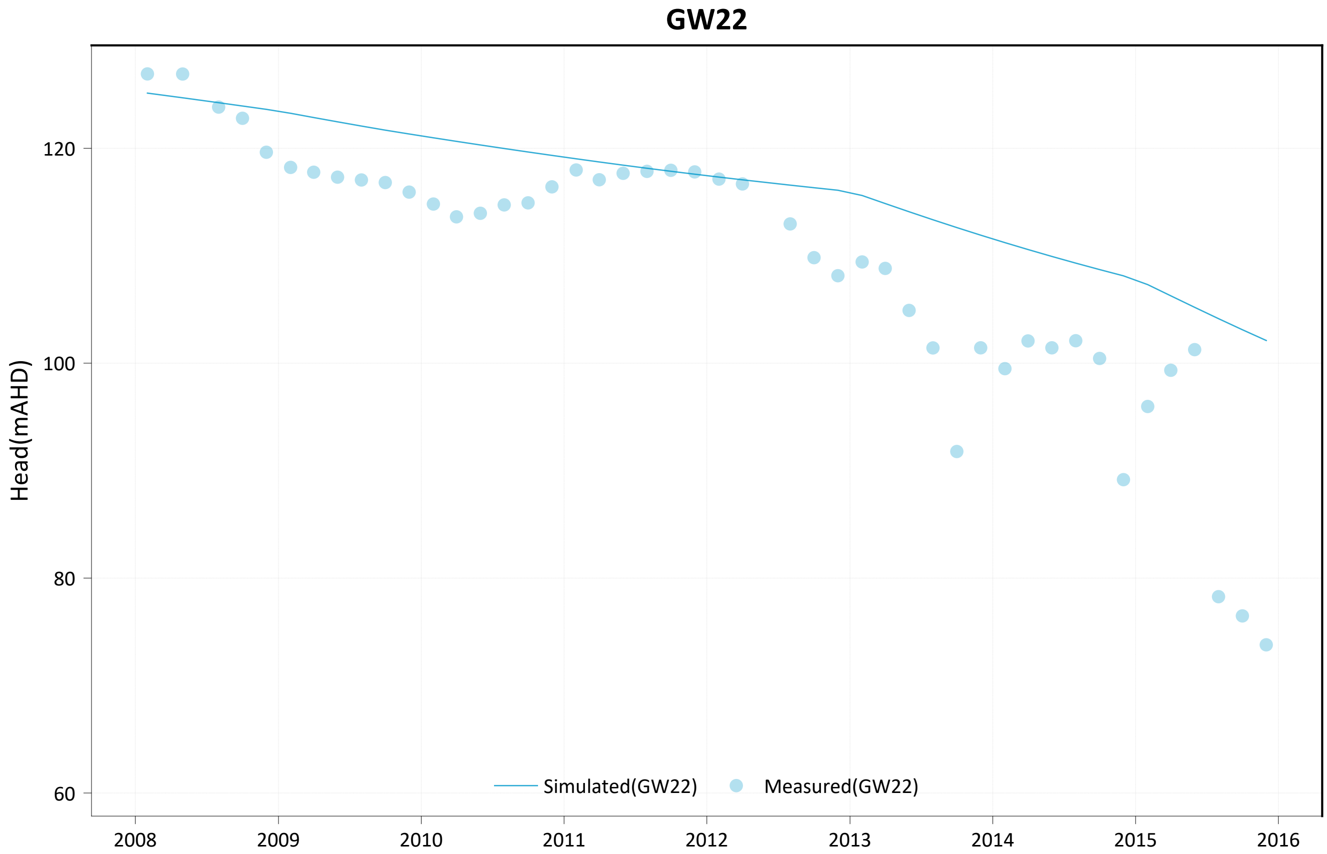

GW080434
Head(mAHD)
138
137
136
135
134
133
132
131
130
129
128
127
126
Simulated(GW080434)
Measured(GW080434)
2008
2010
2012
2014
2016
2018
2020
2022

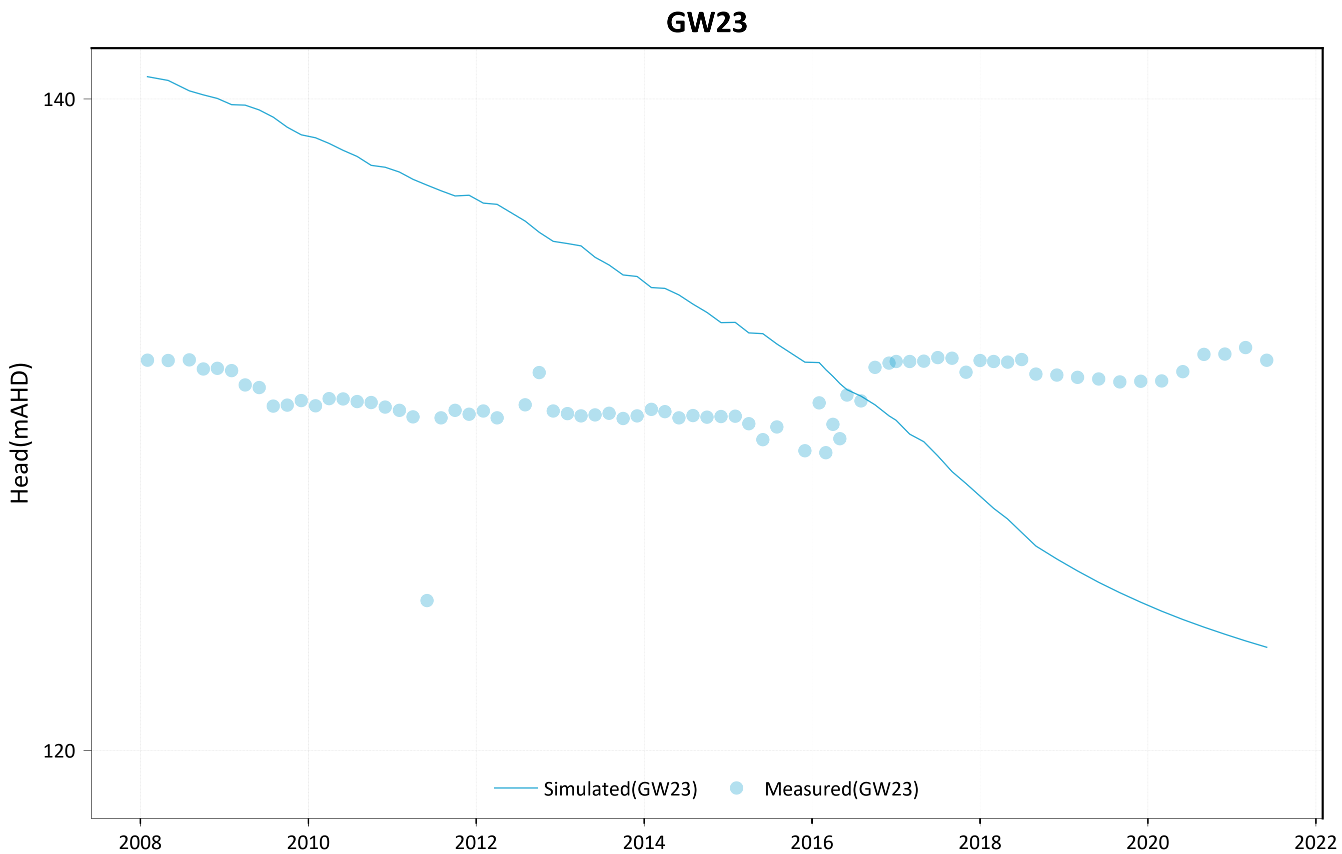

GW080972
Head(mAHD)
182
181
180
179
178
177
176
Simulated(GW080972)
Measured(GW080972)
2006
2008
2010
2012
2014
2016
2018
2020

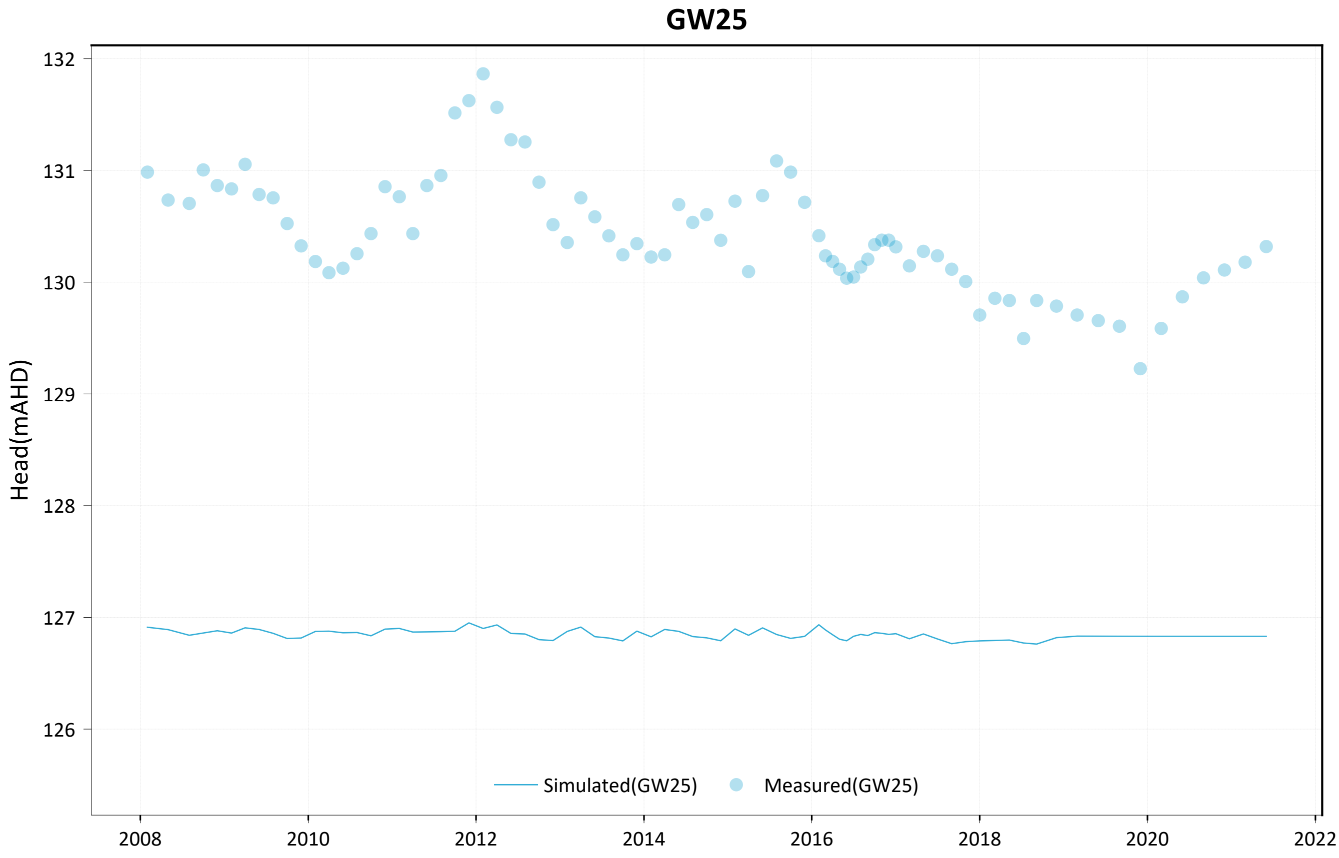

GW16
Head(mAHD)
125
124
123
122
121
120
119
118
117
116
115
114
113
112
111
110
109
Simulated(GW16)
Measured(GW16)
2008
2010
2012
2014
2016
2018
2020
2022

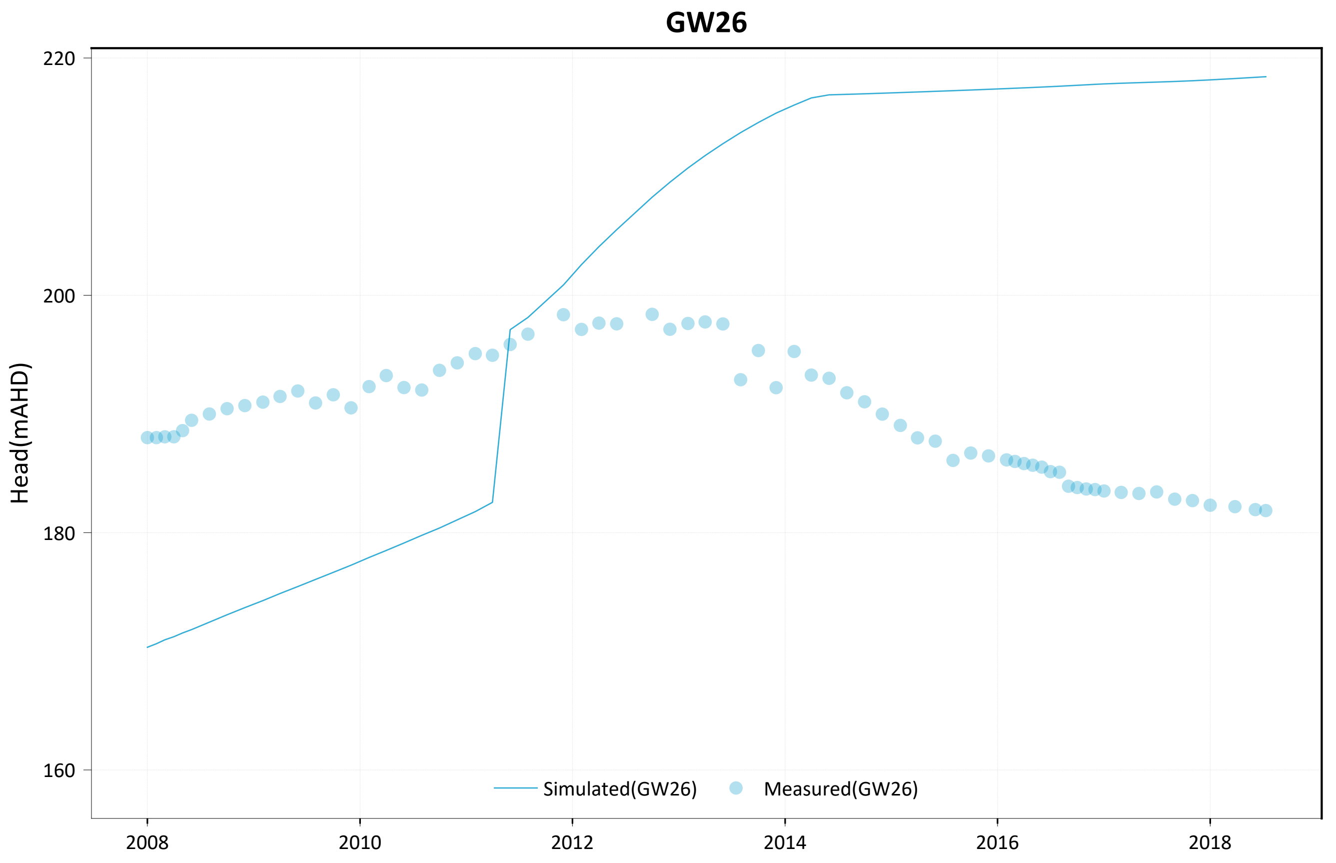

GW2
Head(mAHD)
148
147
146
145
144
143
142
141
140
Simulated(GW2)
Measured(GW2)
2008
2010
2012
2014
2016
2018
2020
2022

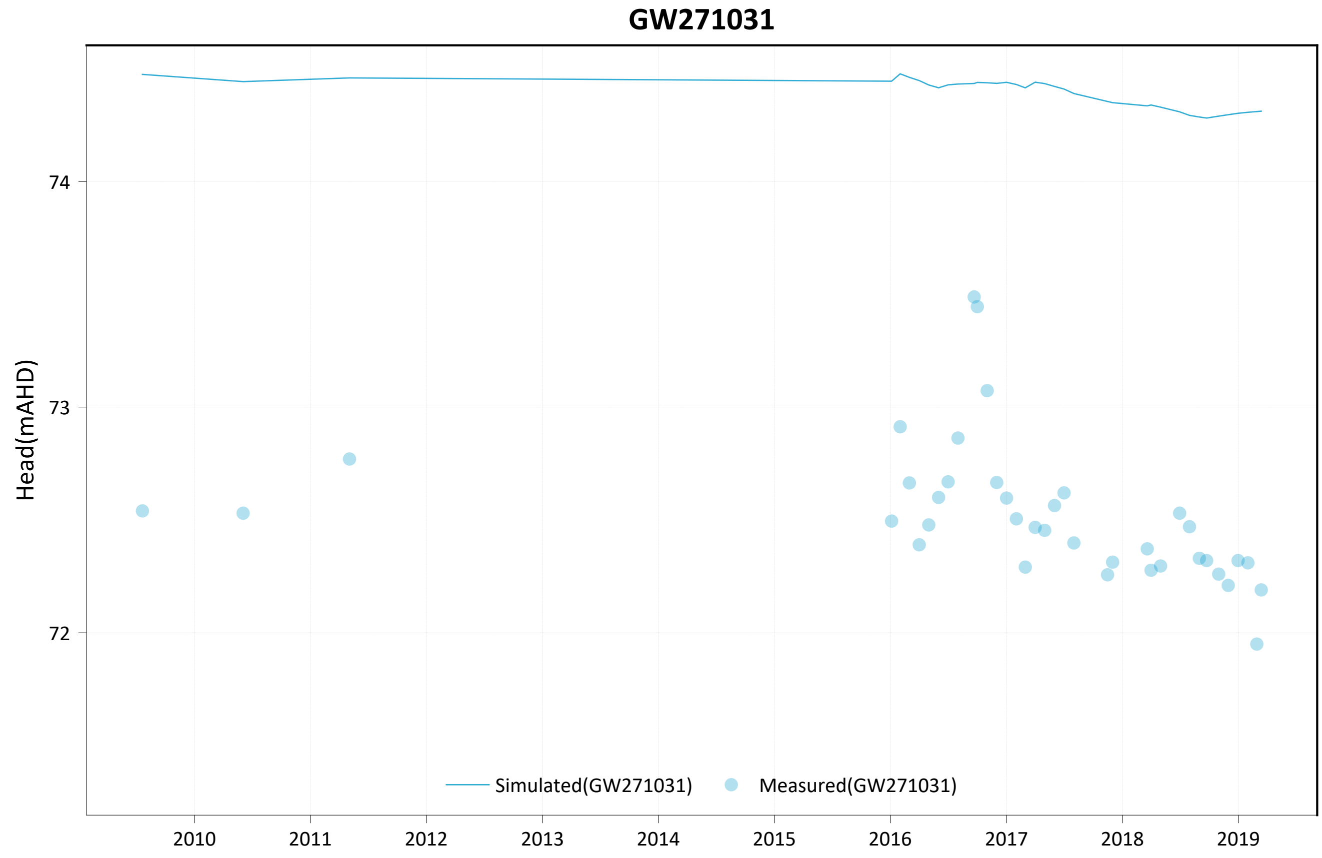

GW21
Head(mAHD)
130
129
128
127
126
125
124
123
122
121
120
119
118
117
116
115
114
113
Simulated(GW21)
Measured(GW21)
2008
2010
2012
2014
2016
2018
2020
2022

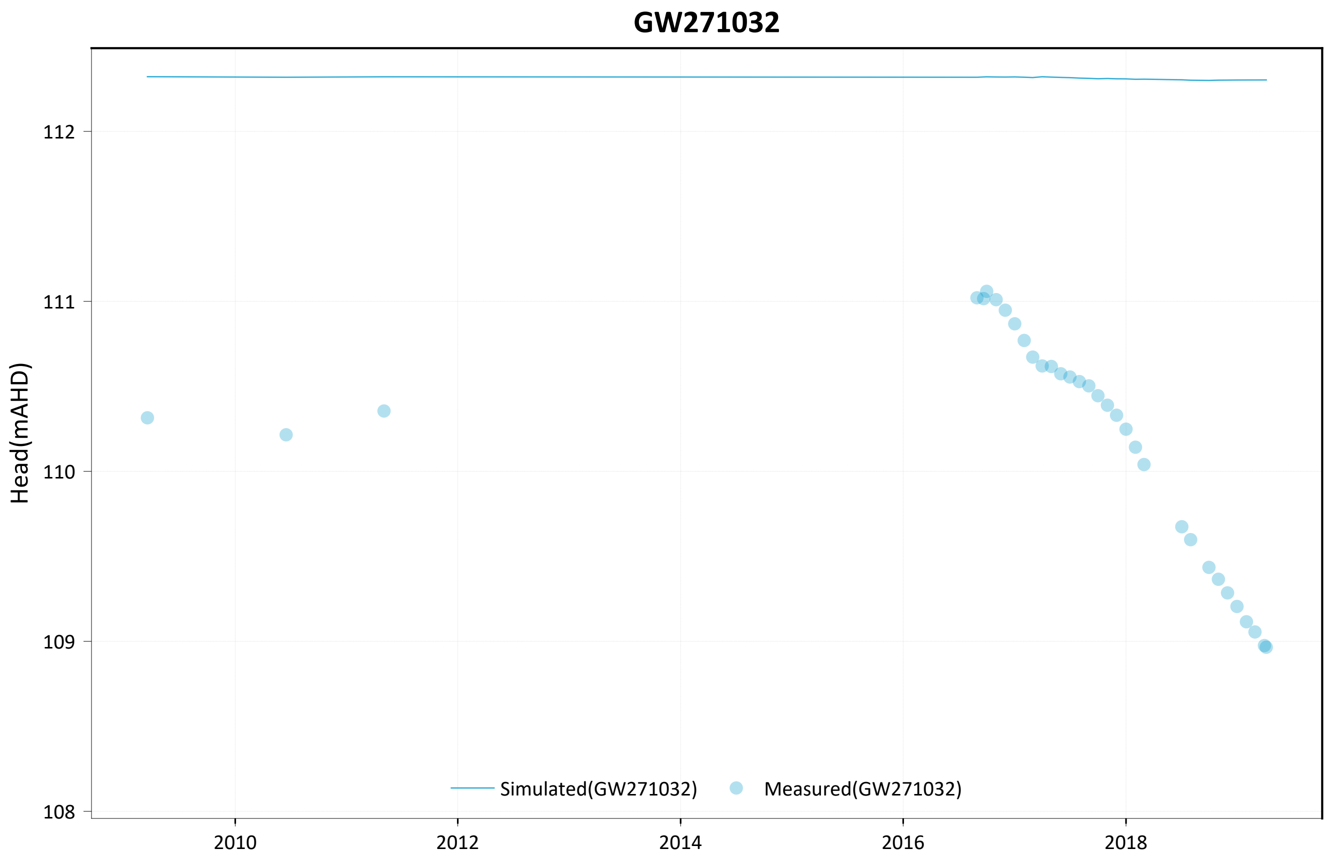

GW22
Head(mAHD)
120
100
80
60
2008
2009
2010
2011
2012
2013
2014
2015
2016
Simulated(GW22)
Measured(GW22)


GW23
Head(mAHD)
140
120
2008
2010
2012
2014
2016
2018
2020
2022
Simulated(GW23)
Measured(GW23)

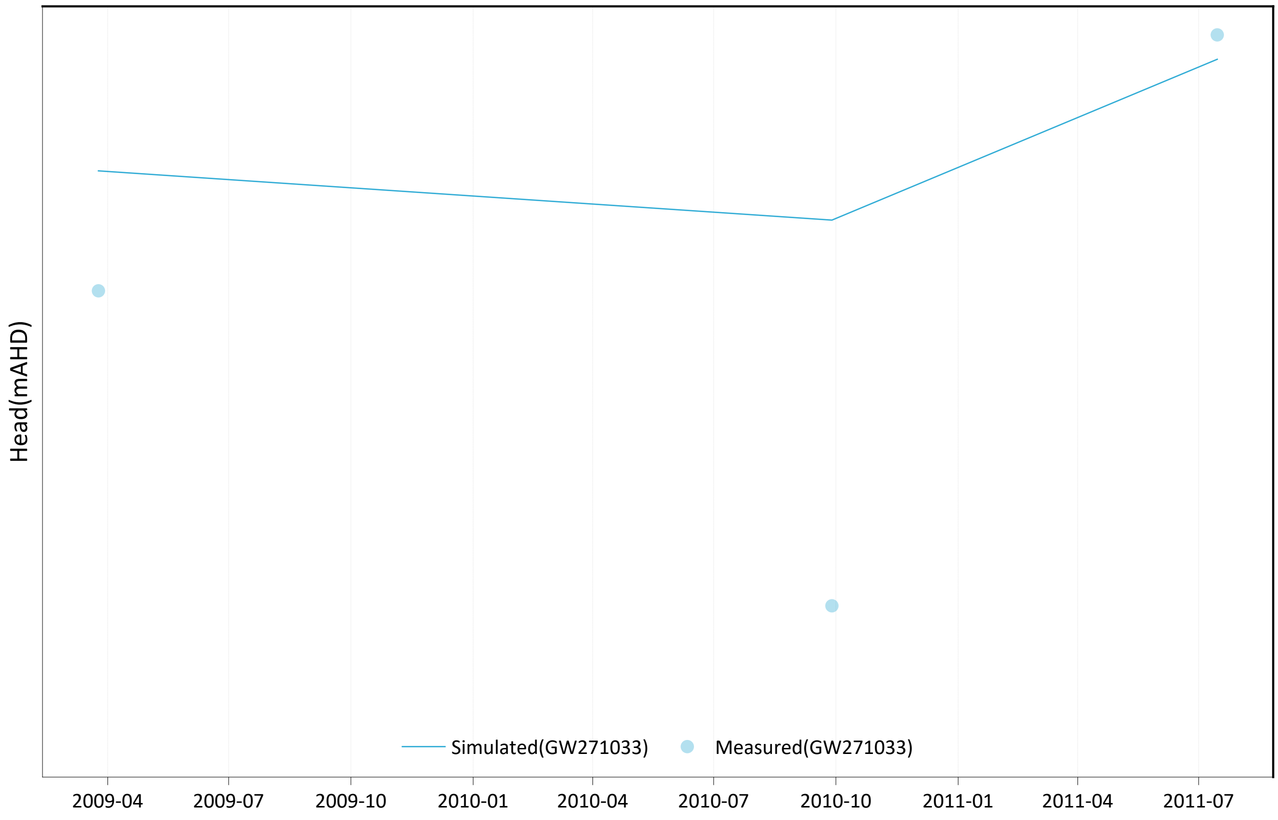

GW25
132
131
130
129
128
127
126
Head(mAHD)
Simulated(GW25)
Measured(GW25)
2008
2010
2012
2014
2016
2018
2020
2022


GW26
220
200
180
160
Head(mAHD)
Simulated(GW26)
Measured(GW26)
2008
2010
2012
2014
2016
2018

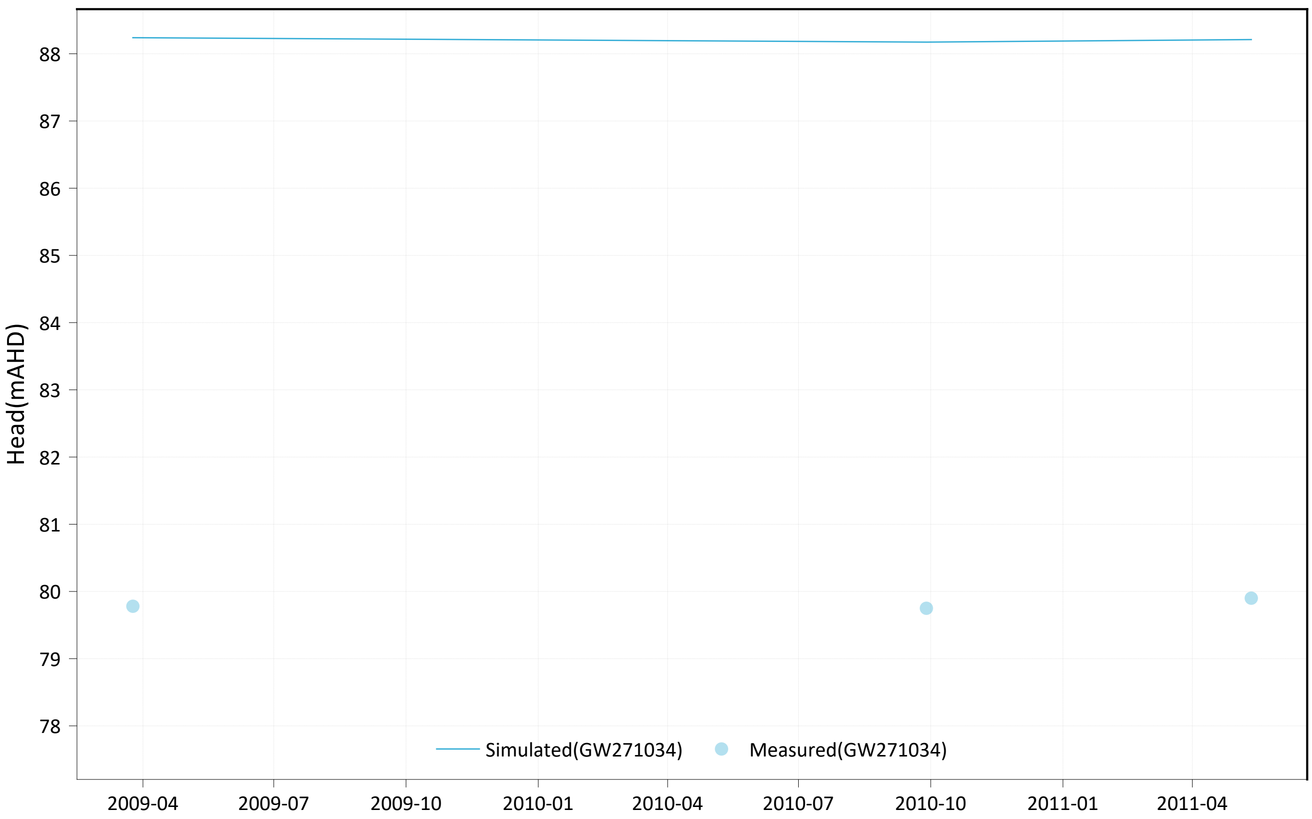

GW271031
Head(mAHD)
74
73
72
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Simulated(GW271031)
Measured(GW271031)

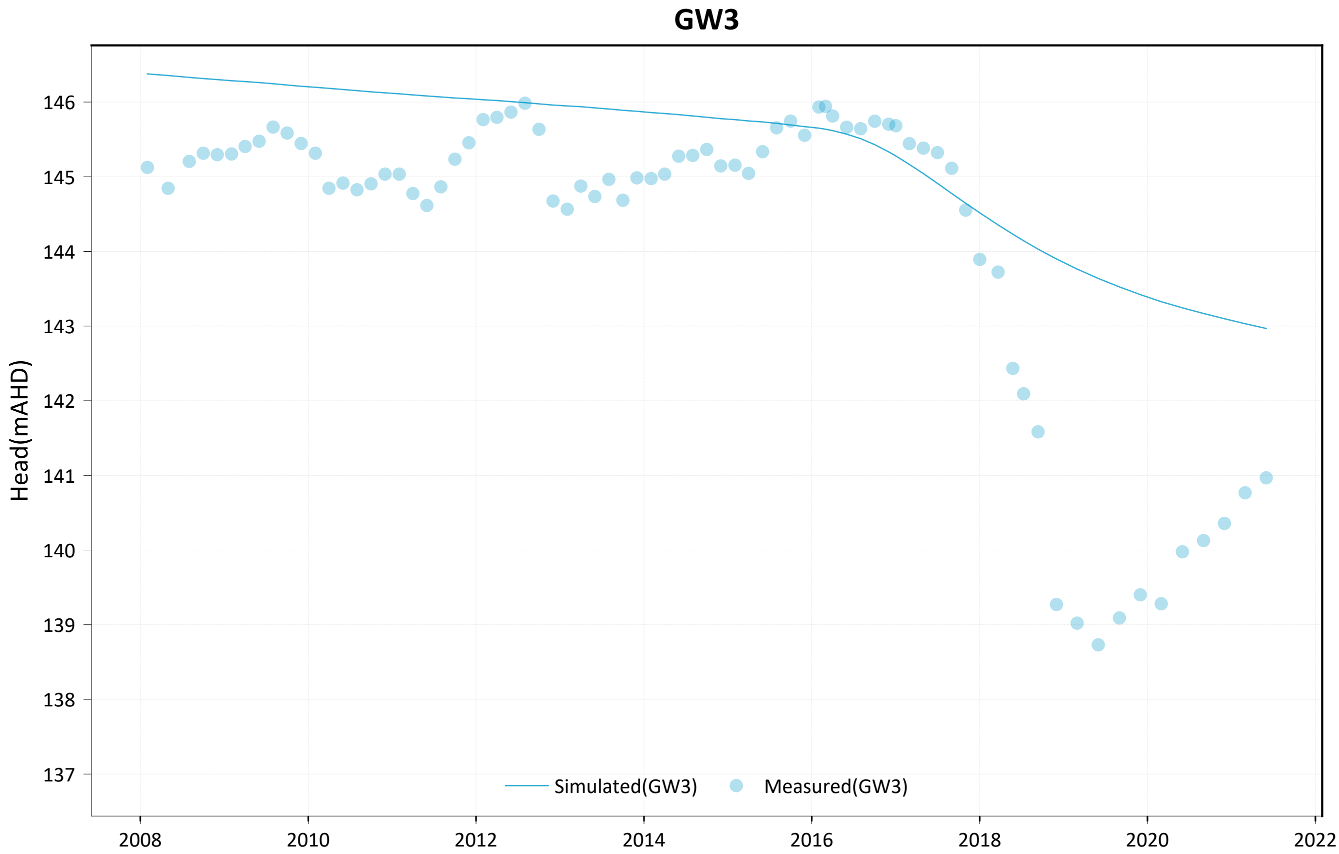

GW271032
Head(mAHD)
112
111
110
109
108
2010
2012
2014
2016
2018
Simulated(GW271032)
Measured(GW271032)

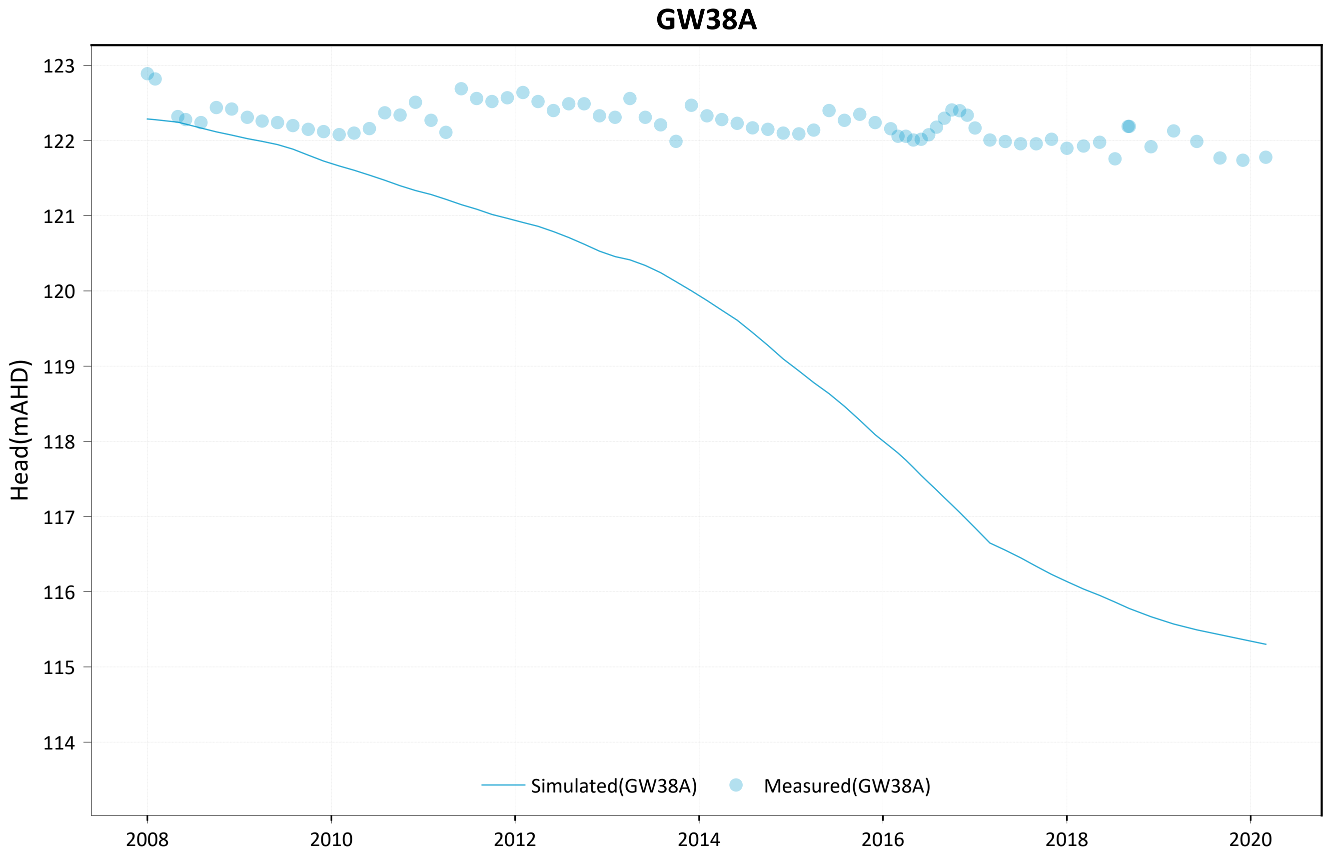
GW271033

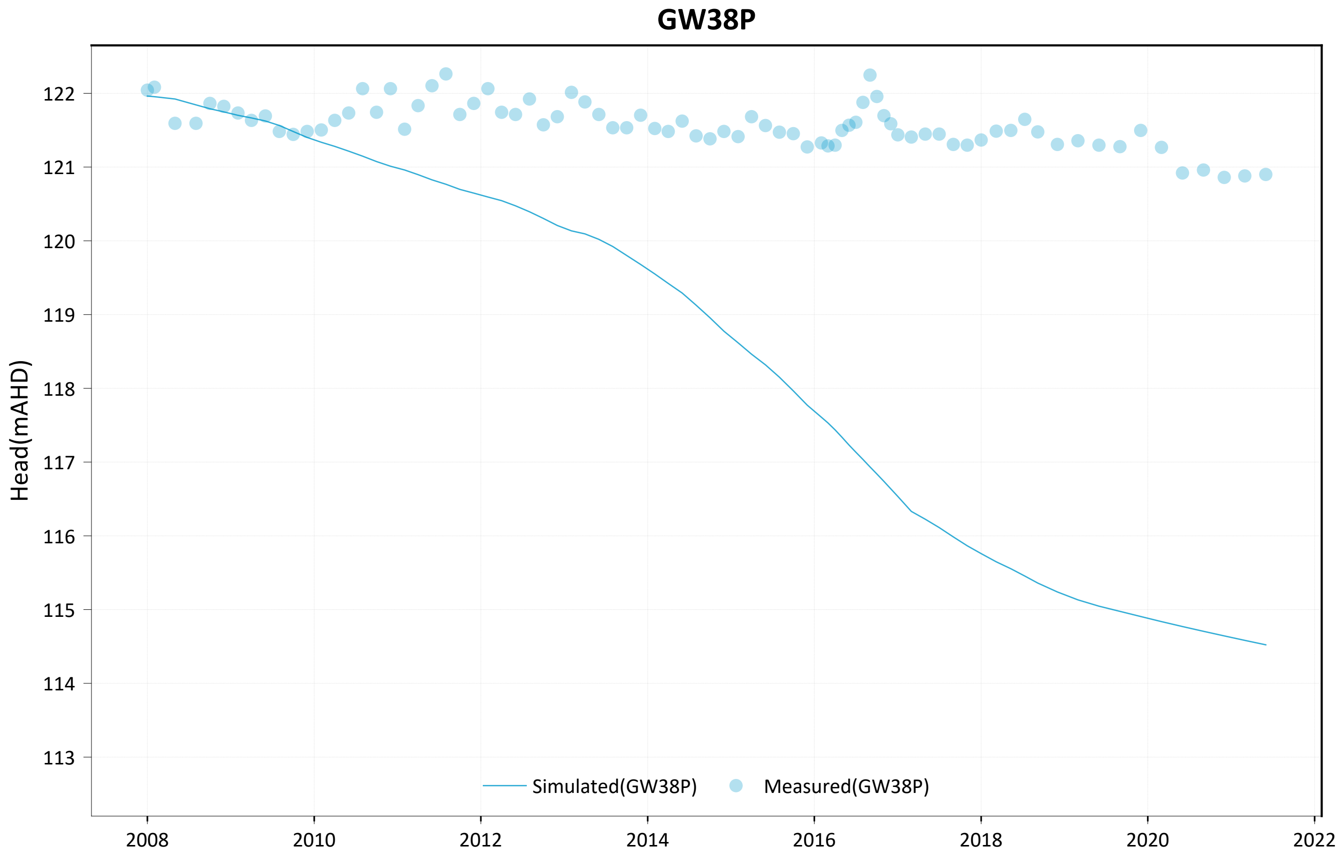


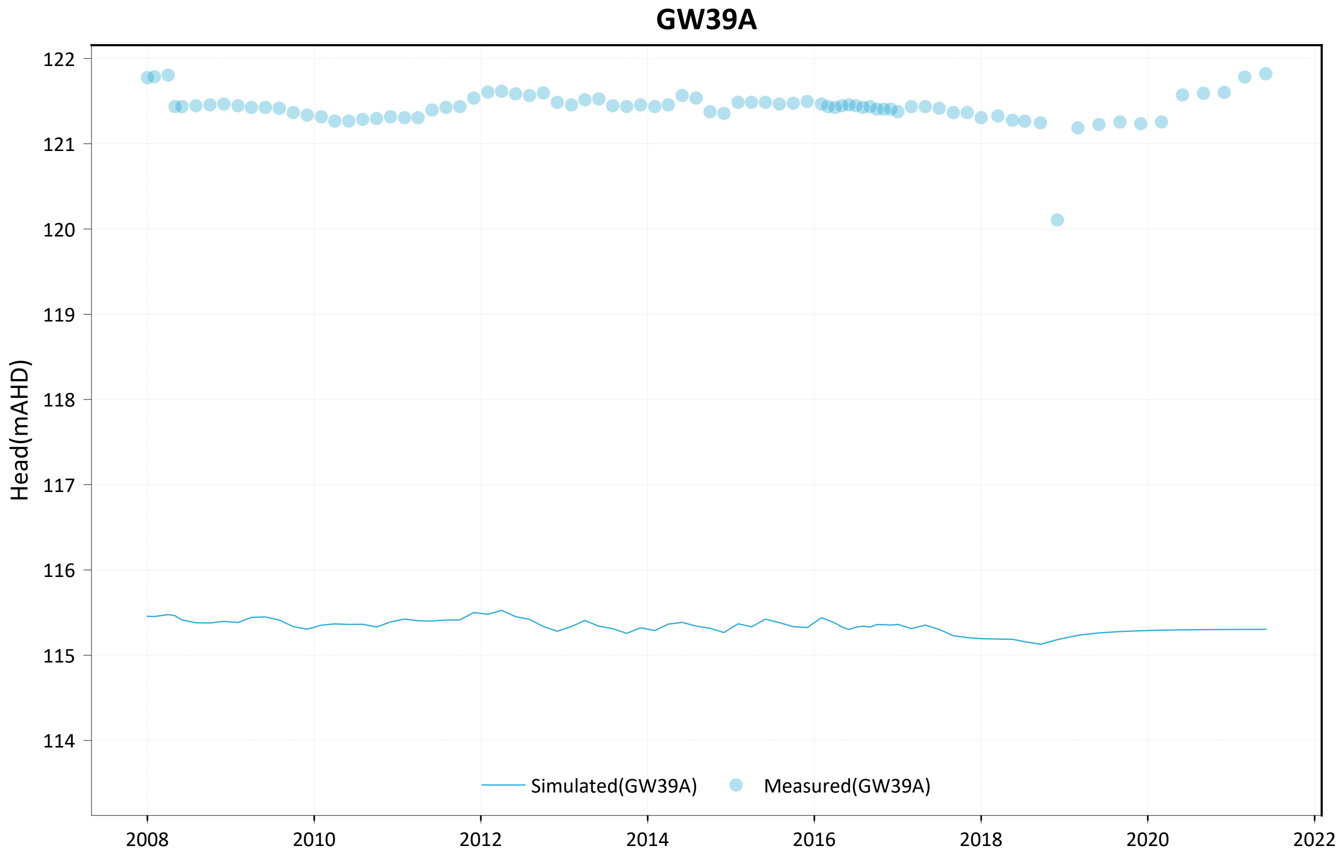
GW271034

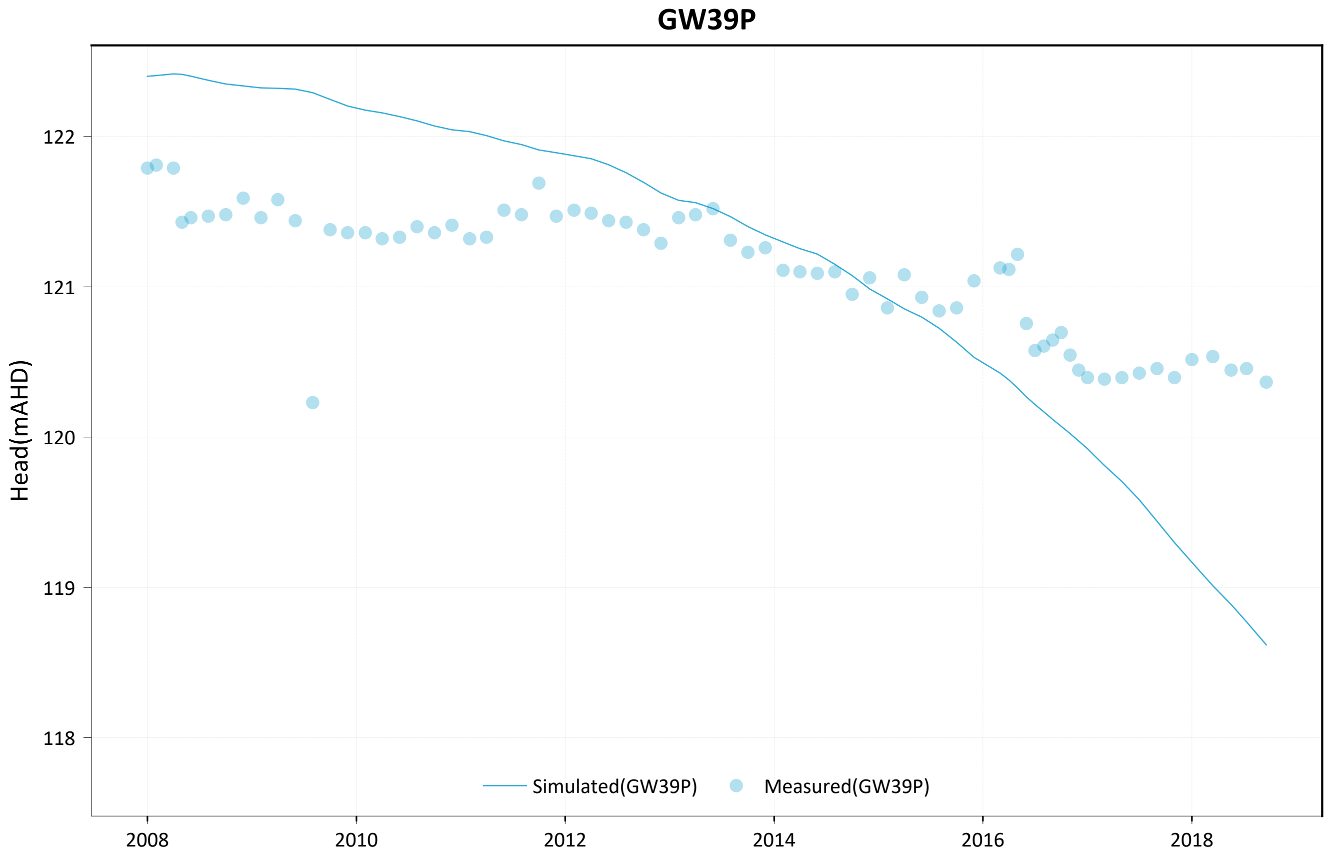


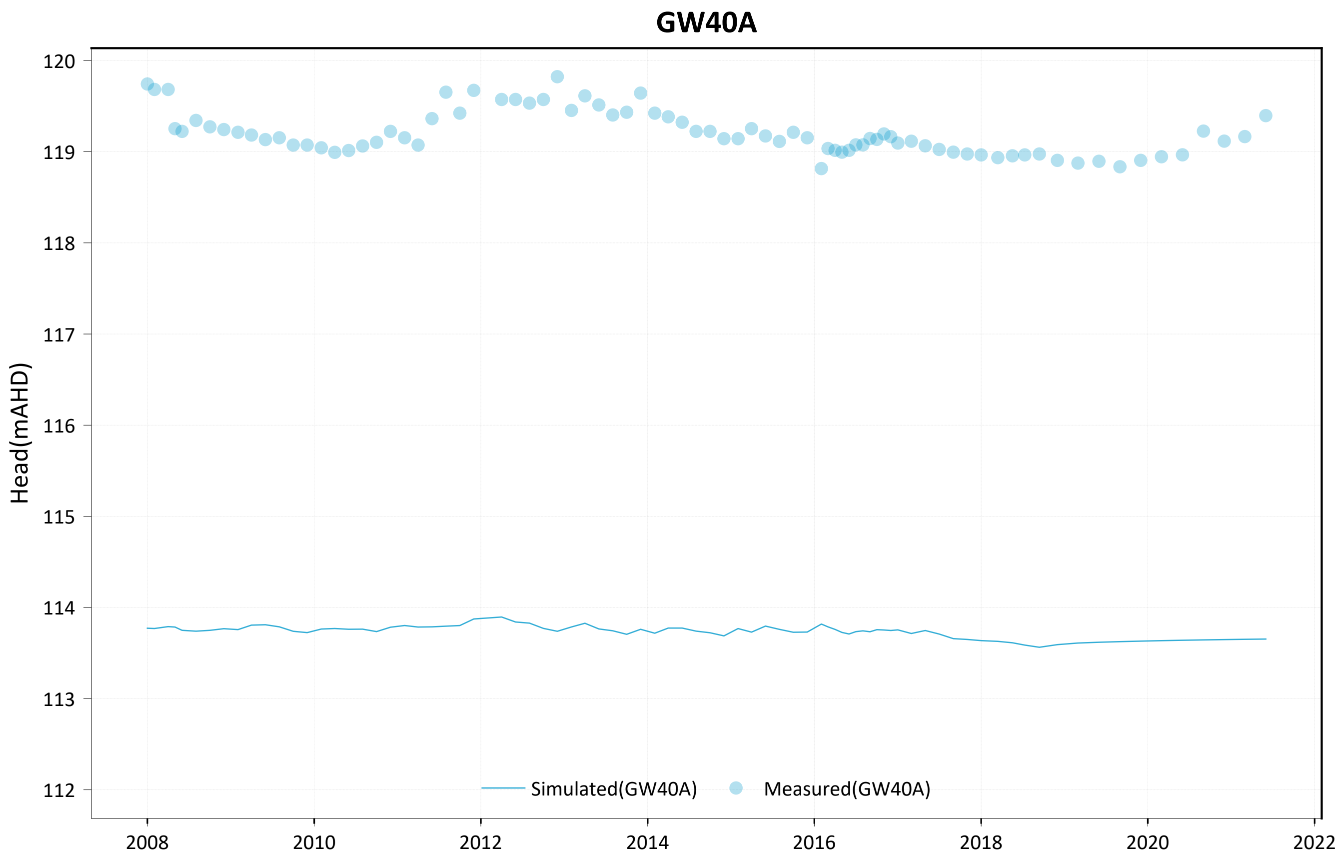

GW3
Head(mAHD)
146
145
144
143
142
141
140
139
138
137
Simulated(GW3)
Measured(GW3)
2008
2010
2012
2014
2016
2018
2020
2022

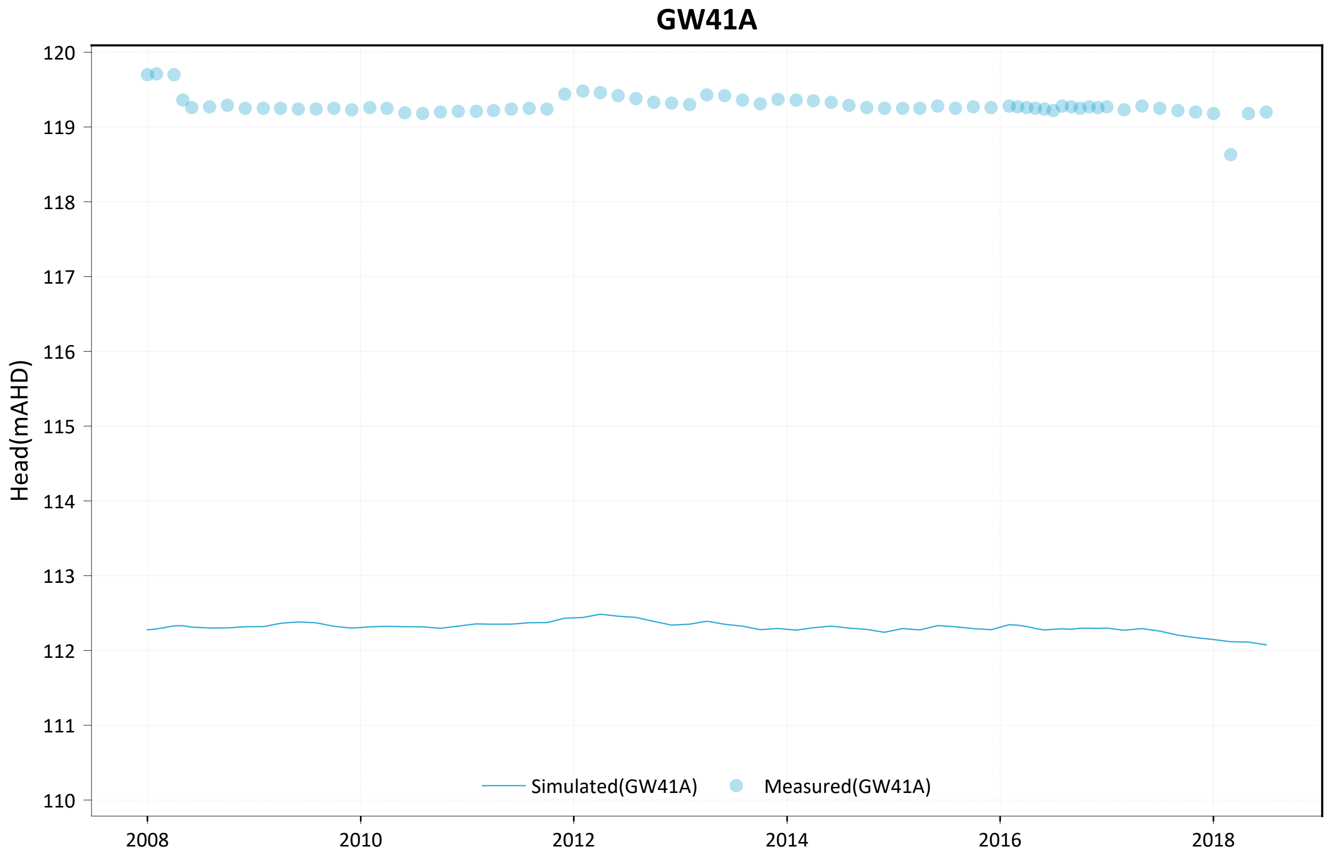

GW38A
Head(mAHD)
123
122
121
120
119
118
117
116
115
114
Simulated(GW38A)
Measured(GW38A)
2008
2010
2012
2014
2016
2018
2020

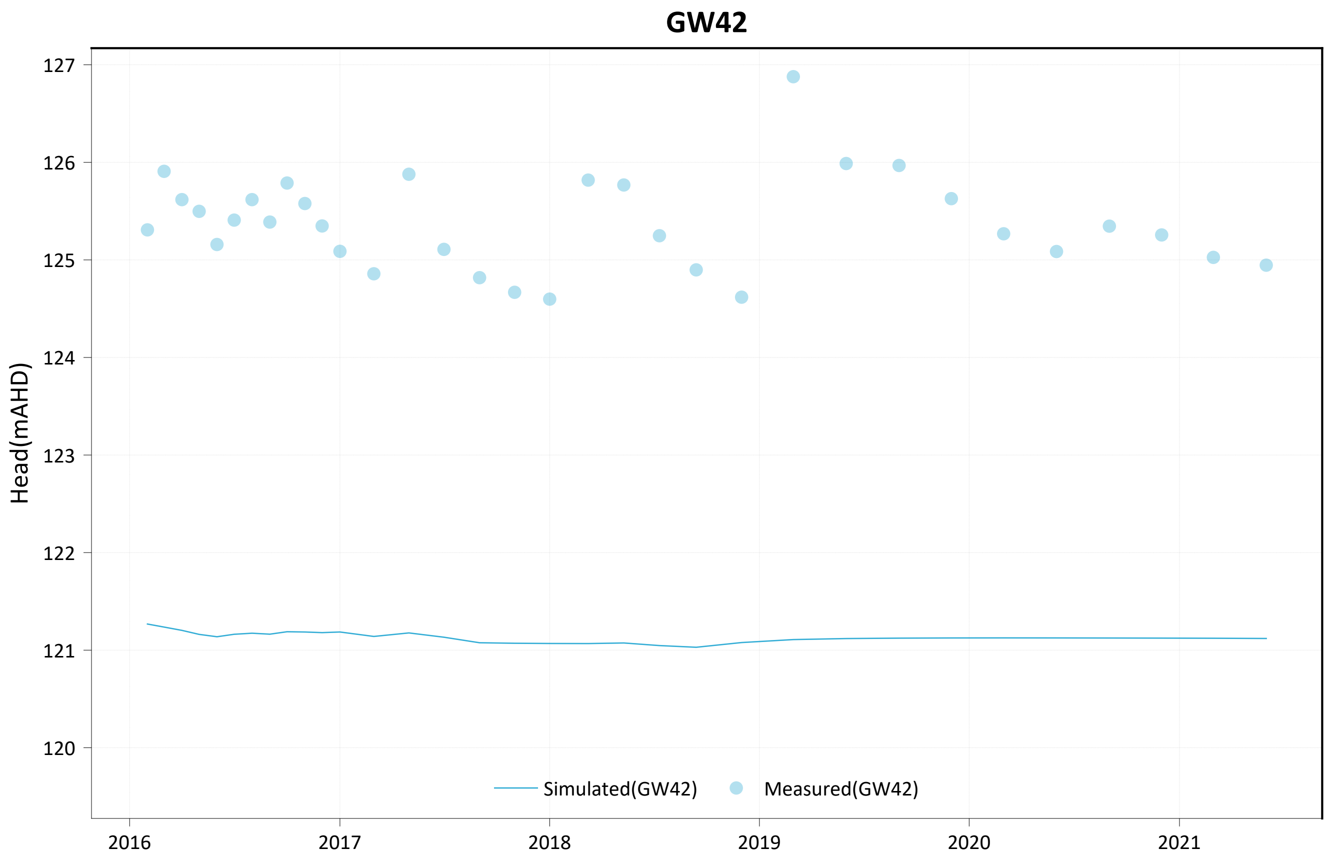

GW38P
Head(mAHD)
122
121
120
119
118
117
116
115
114
113
Simulated(GW38P)
Measured(GW38P)
2008
2010
2012
2014
2016
2018
2020
2022

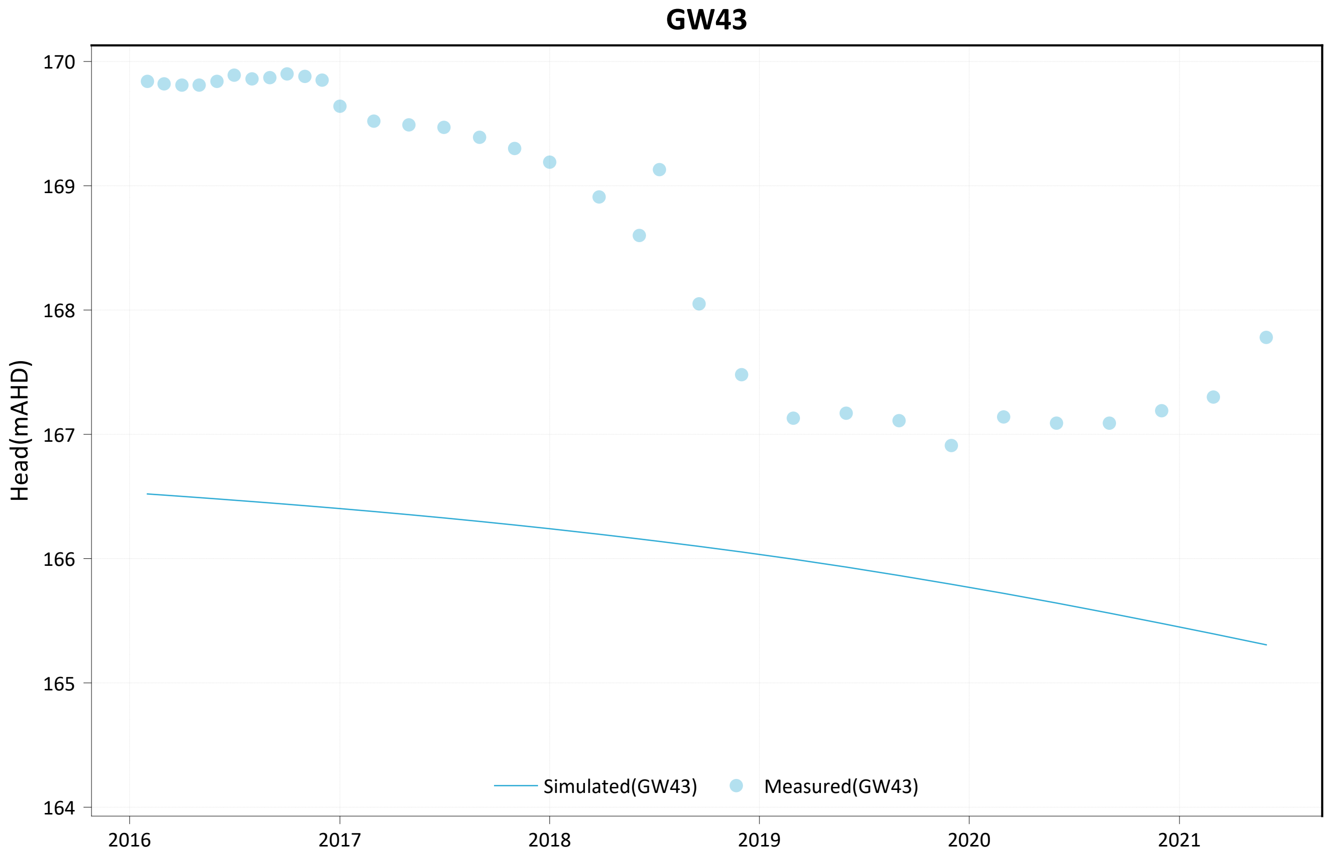

GW39A
Head(mAHD)
122
121
120
119
118
117
116
115
114
Simulated(GW39A)
Measured(GW39A)
2008
2010
2012
2014
2016
2018
2020
2022

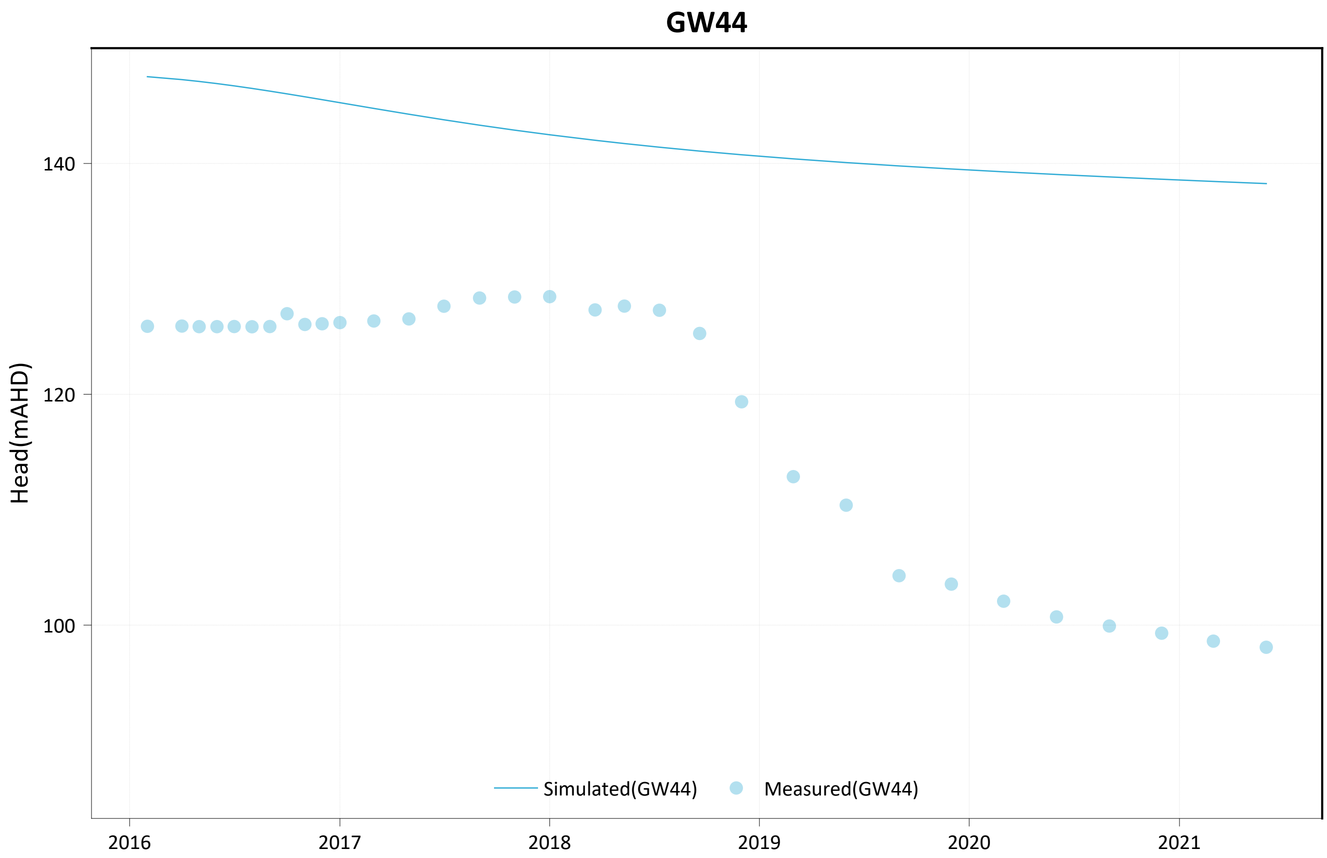

GW39P
Head(mAHD)
122
121
120
119
118
Simulated(GW39P)
Measured(GW39P)
2008
2010
2012
2014
2016
2018

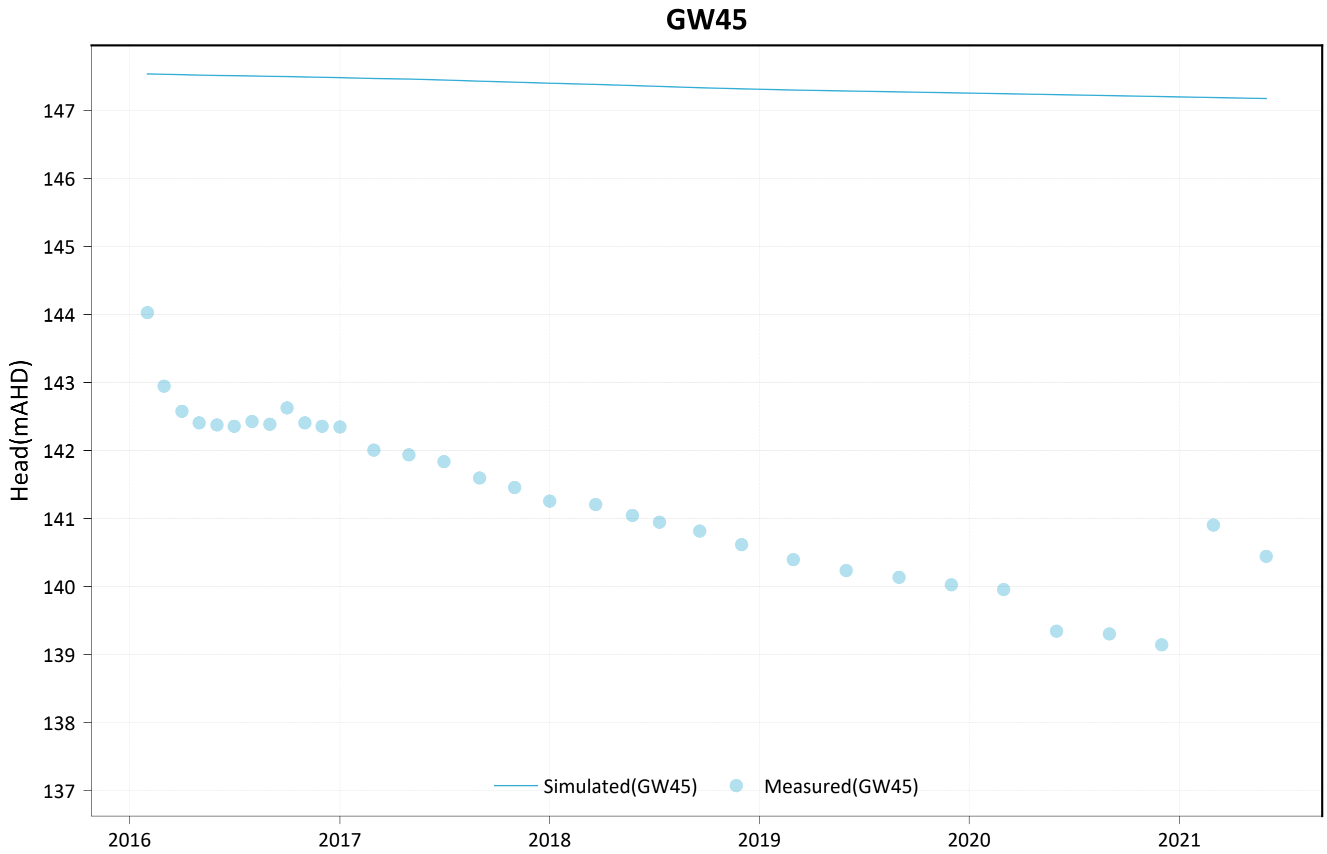

GW40A
Head(mAHD)
120
119
118
117
116
115
114
113
112
Simulated(GW40A)
Measured(GW40A)
2008
2010
2012
2014
2016
2018
2020
2022

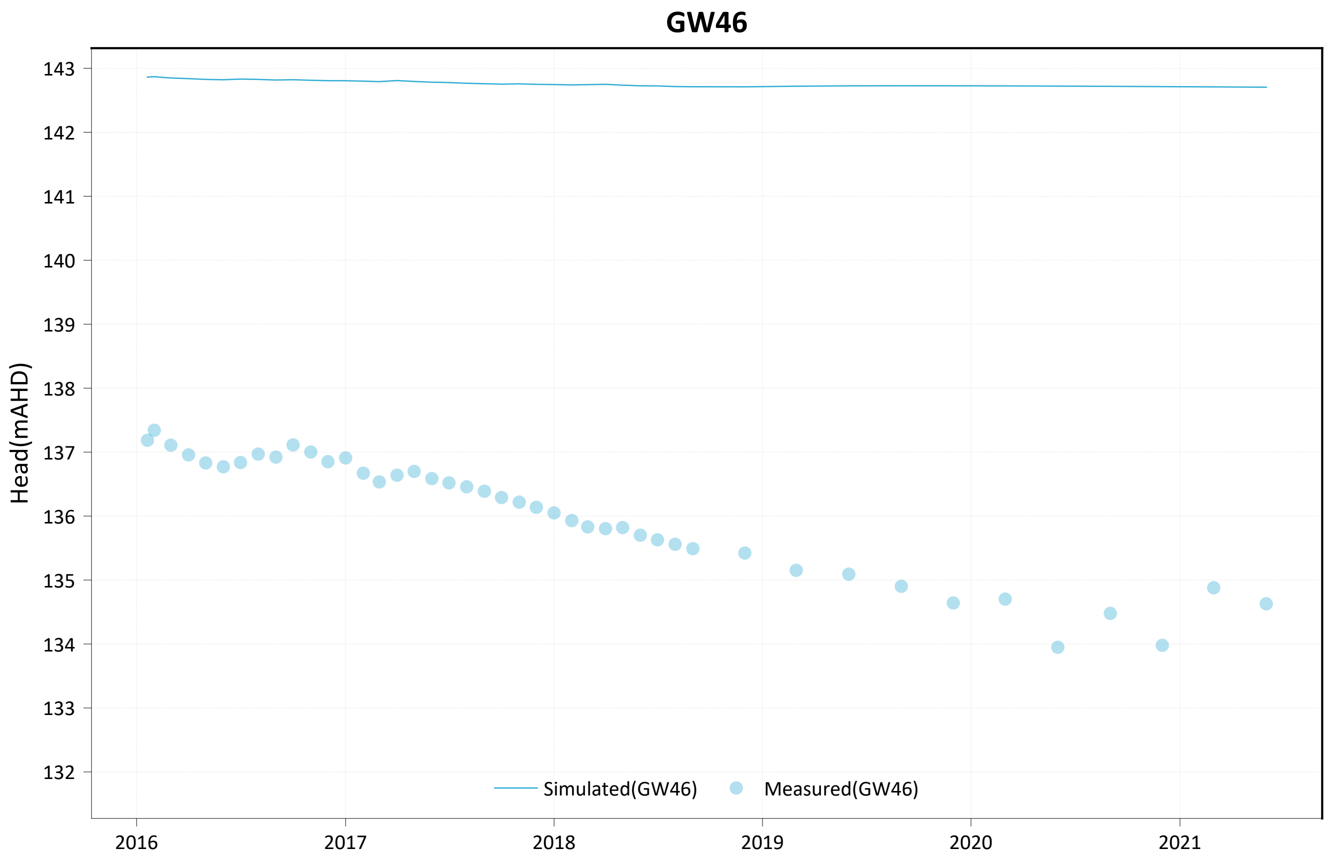

GW41A
Head(mAHD)
120
119
118
117
116
115
114
113
112
111
110
2008
2010
2012
2014
2016
2018
Simulated(GW41A)
Measured(GW41A)

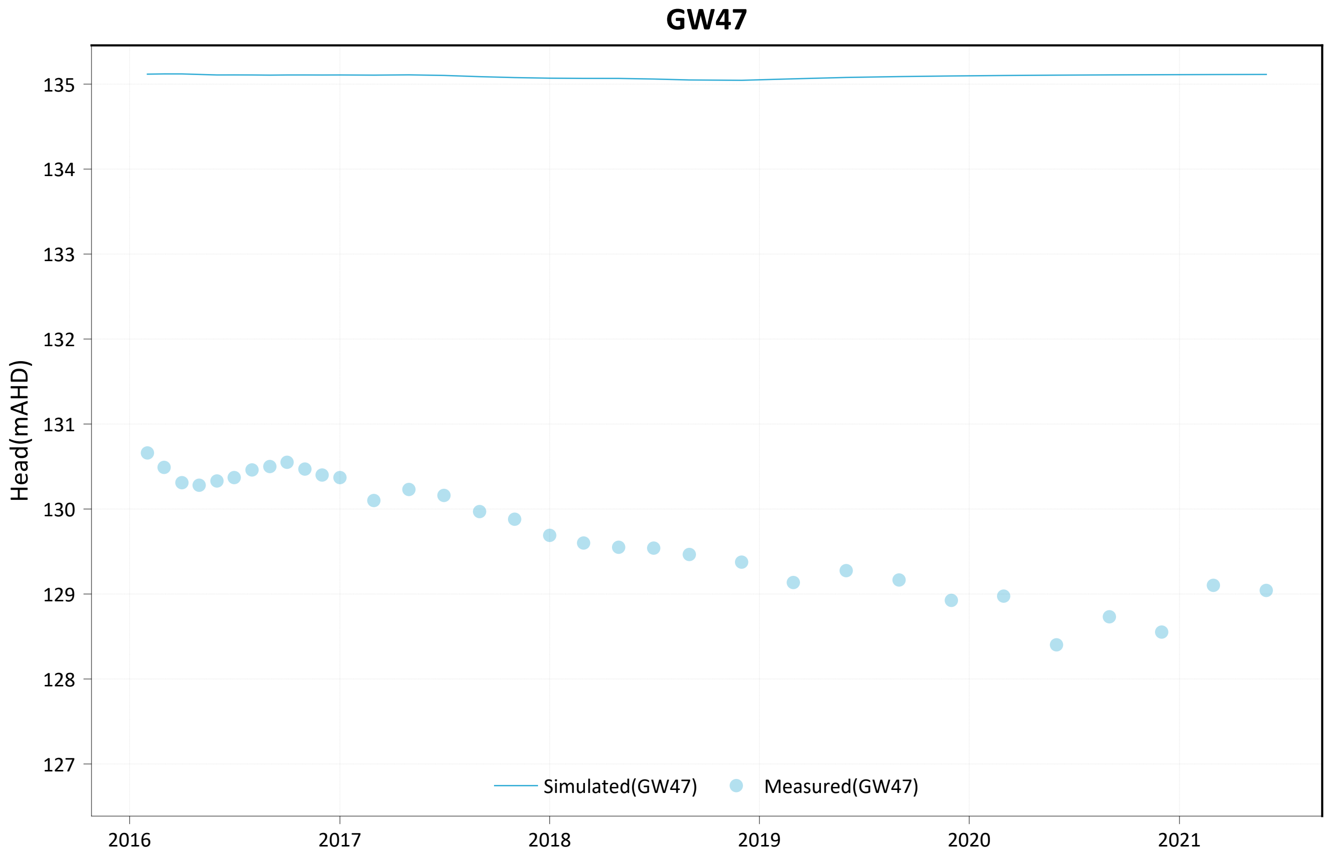

GW42
Head(mAHD)
127
126
125
124
123
122
121
120
2016
2017
2018
2019
2020
2021
Simulated(GW42)
Measured(GW42)

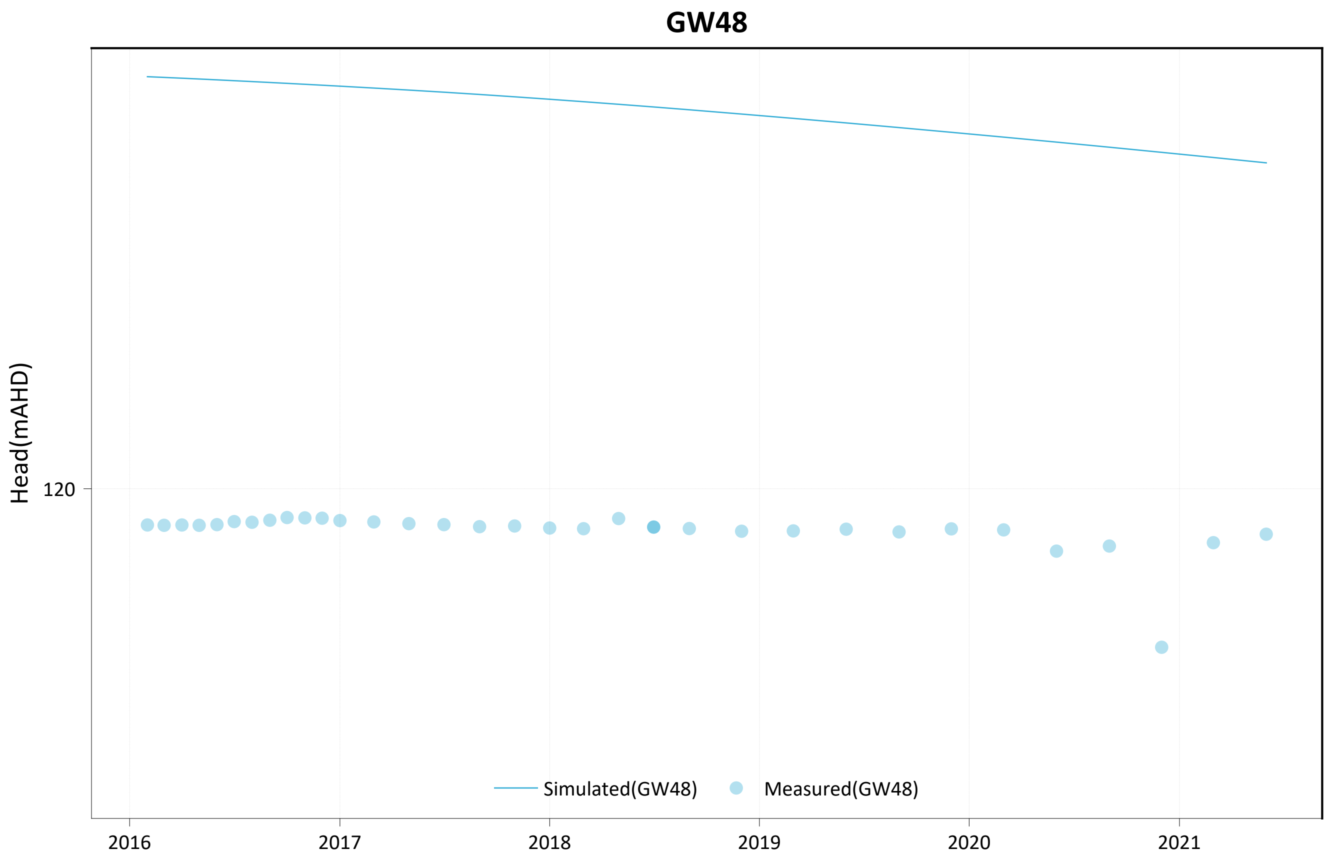

GW43
Head(mAHD)
170
169
168
167
166
165
164
2016
2017
2018
2019
2020
2021
Simulated(GW43)
Measured(GW43)

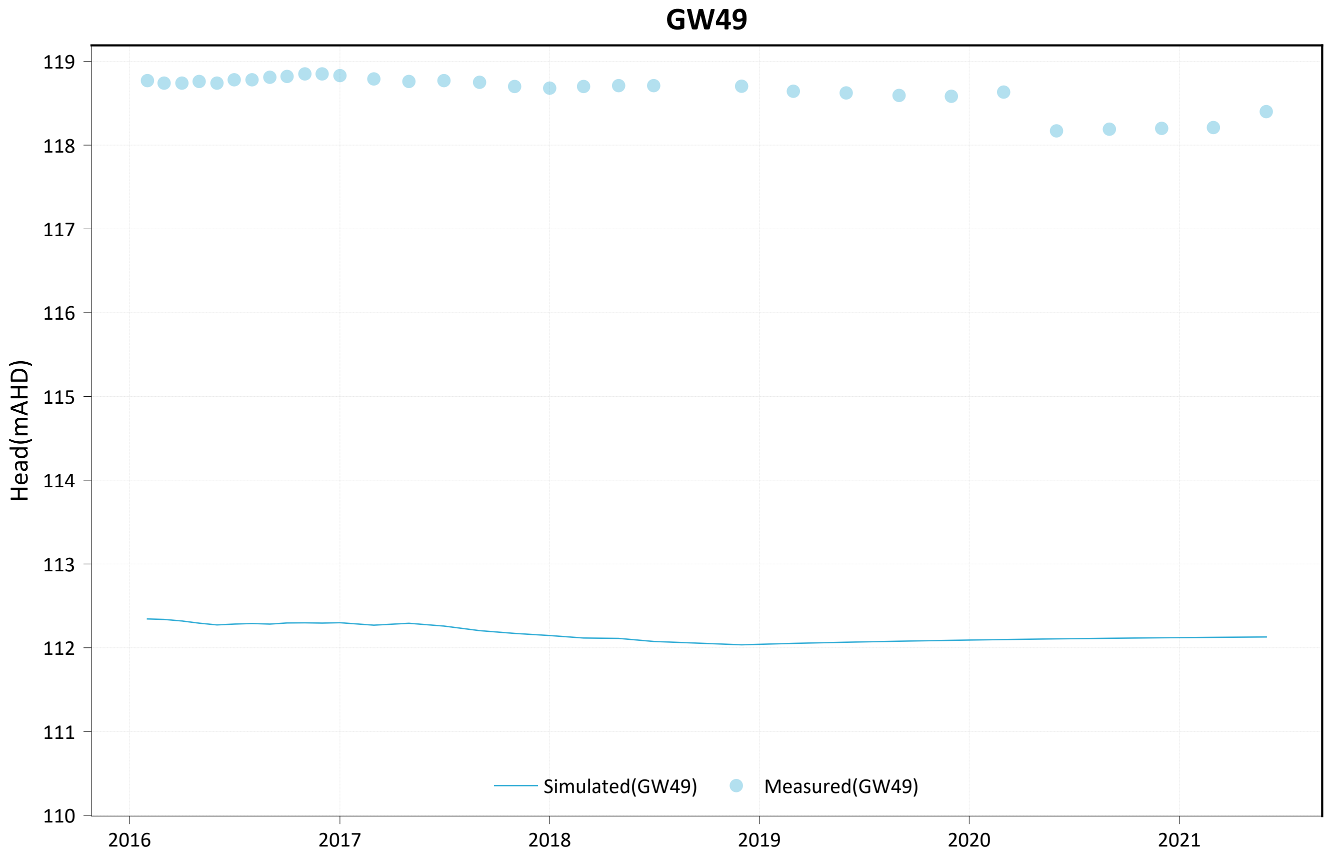

GW44
Head(mAHD)
140
120
100
2016
2017
2018
2019
2020
2021
Simulated(GW44)
Measured(GW44)

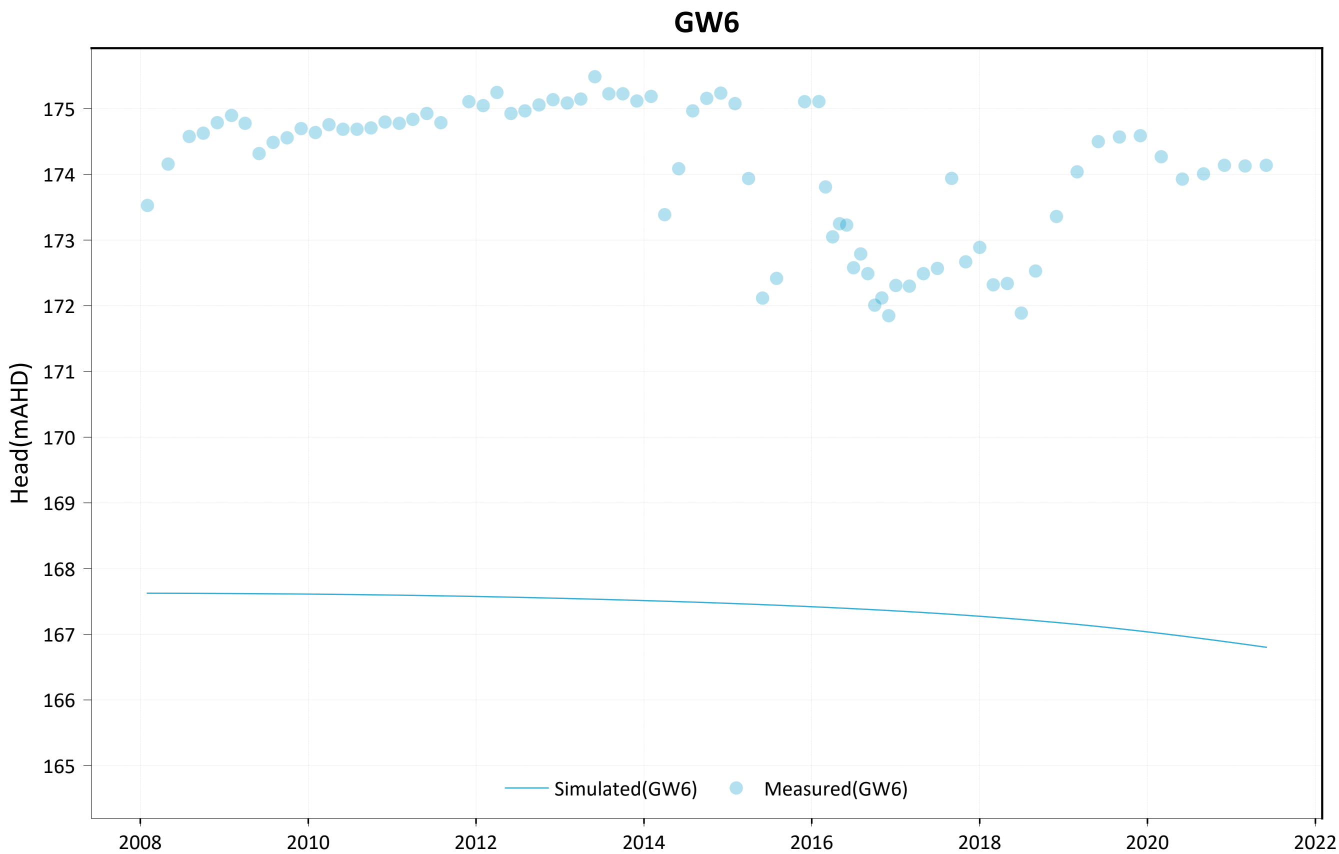

GW45
Head(mAHD)
147
146
145
144
143
142
141
140
139
138
137
2016
2017
2018
2019
2020
2021
Simulated(GW45)
Measured(GW45)

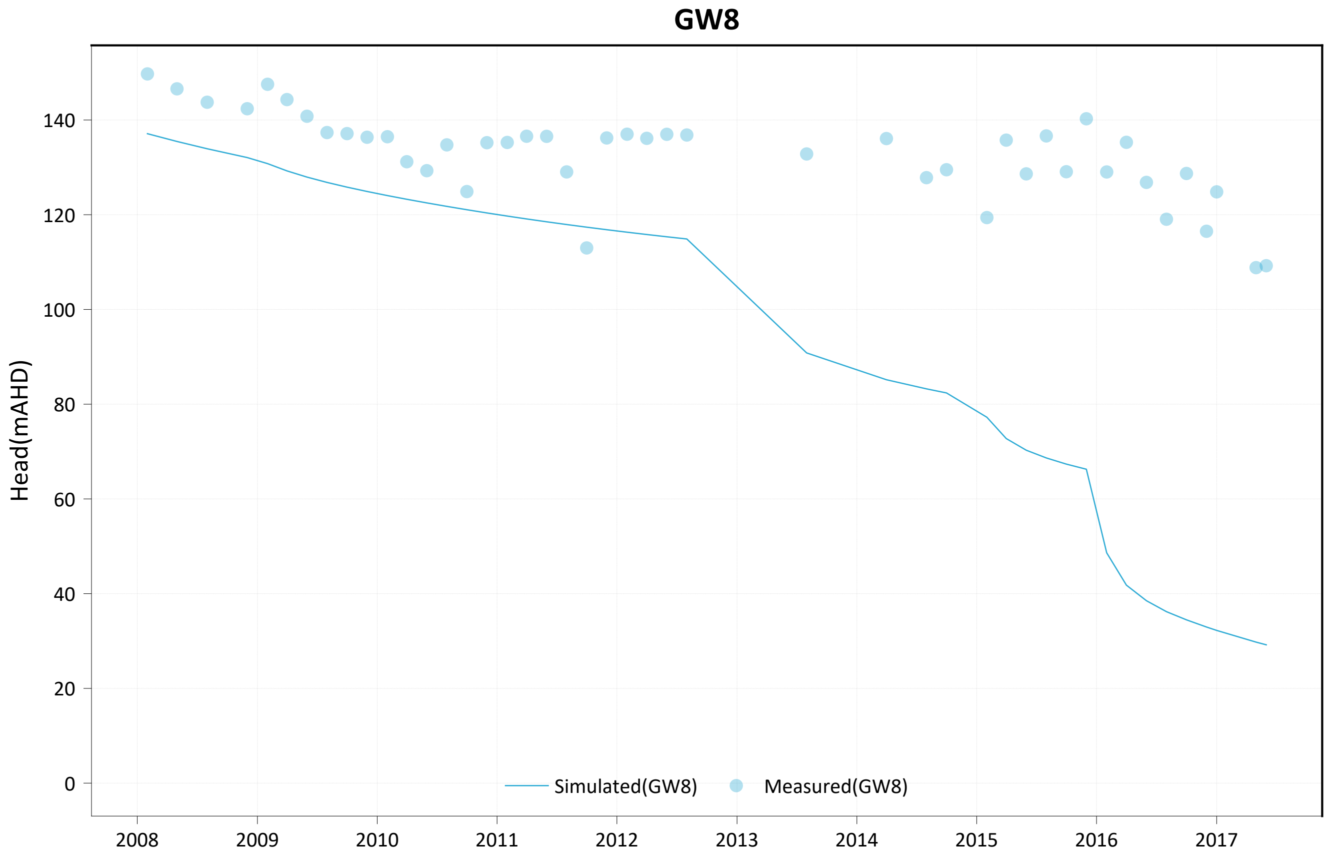

GW46
Head(mAHD)
143
142
141
140
139
138
137
136
135
134
133
132
2016
2017
2018
2019
2020
2021
Simulated(GW46)
Measured(GW46)

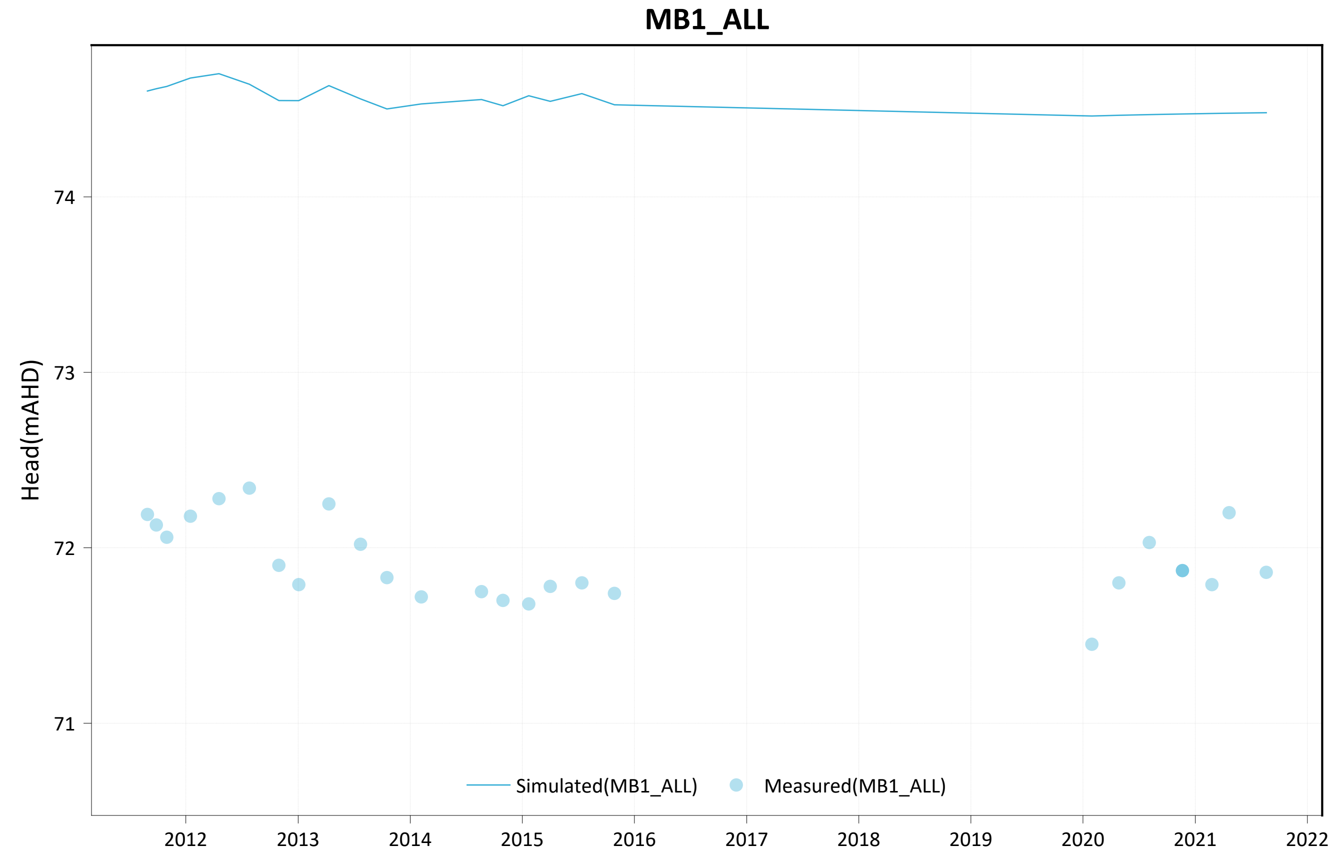

GW47
135
134
133
132
131
130
129
128
127
Head(mAHD)
Simulated(GW47)
Measured(GW47)
2016
2017
2018
2019
2020
2021

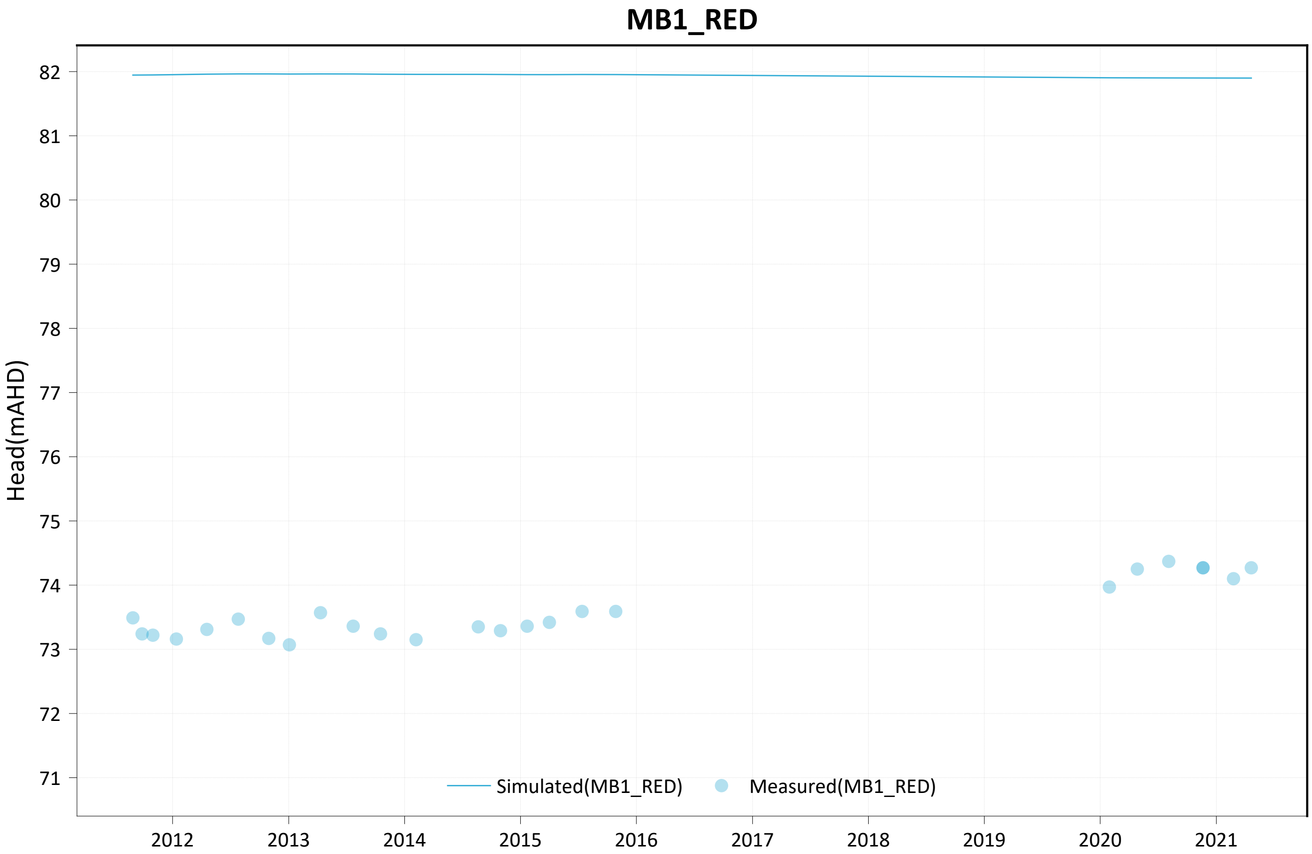

GW48
120
Head(mAHD)
Simulated(GW48)
Measured(GW48)
2016
2017
2018
2019
2020
2021


GW49
Head(mAHD)
119
118
117
116
115
114
113
112
111
110
2016
2017
2018
2019
2020
2021
Simulated(GW49)
Measured(GW49)

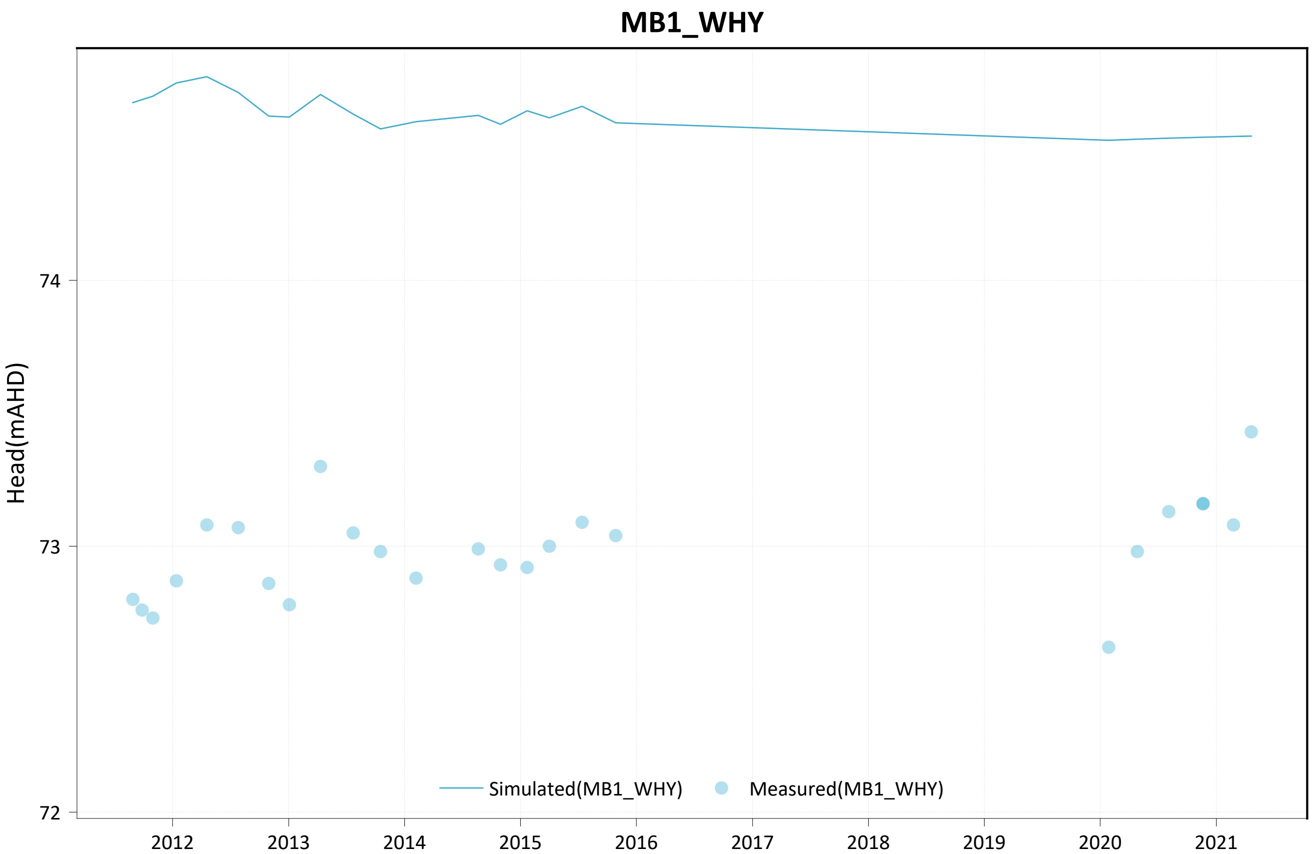

GW6
Head(mAHD)
175
174
173
172
171
170
169
168
167
166
165
2008
2010
2012
2014
2016
2018
2020
2022
Simulated(GW6)
Measured(GW6)


GW8
Head(mAHD)
140
120
100
80
60
40
20
0
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Simulated(GW8)
Measured(GW8)


MB1_ALL
Head(mAHD)
74
73
72
71
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Simulated(MB1_ALL)
Measured(MB1_ALL)

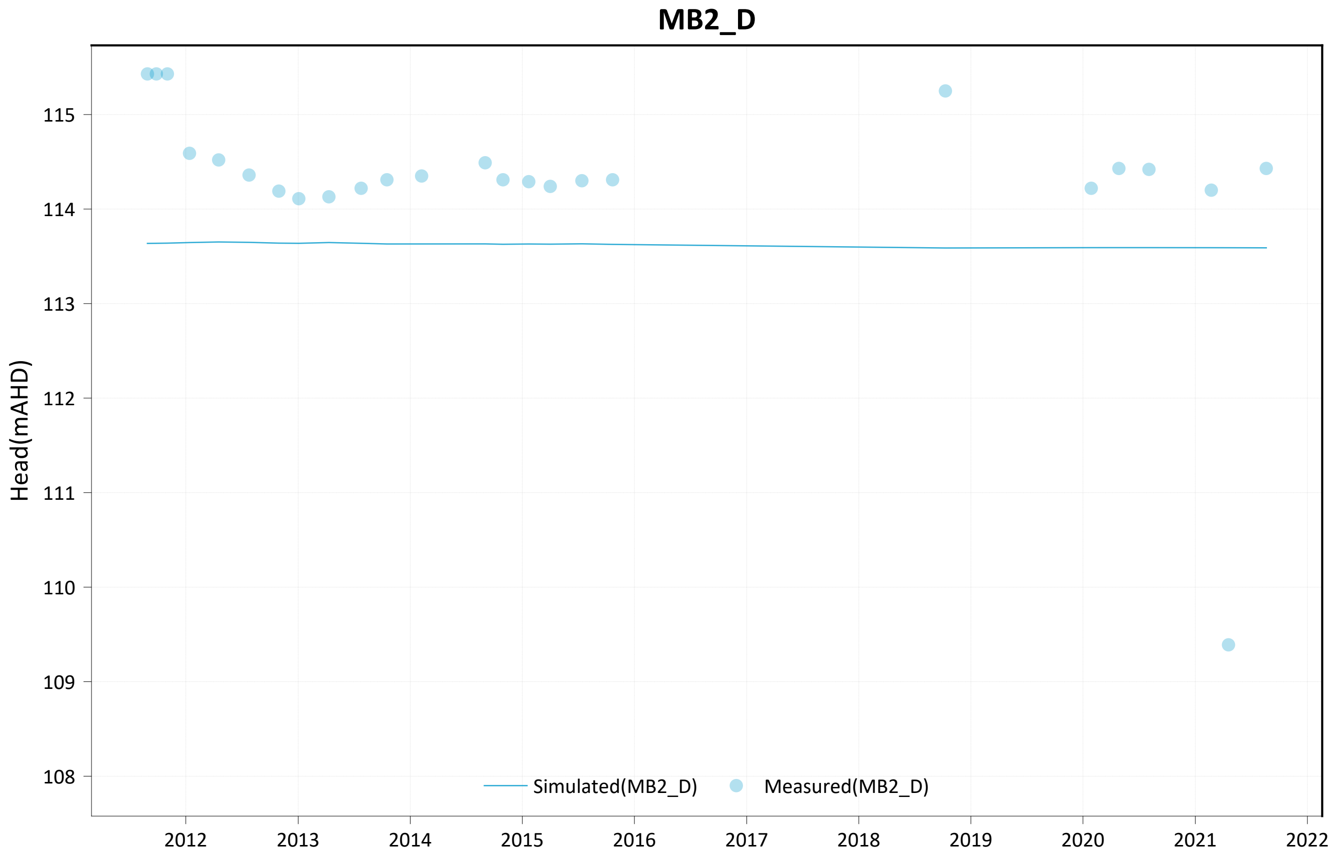


MB1_RED
Head(mAHD)
82
81
80
79
78
77
76
75
74
73
72
71
Simulated(MB1_RED)
Measured(MB1_RED)
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021



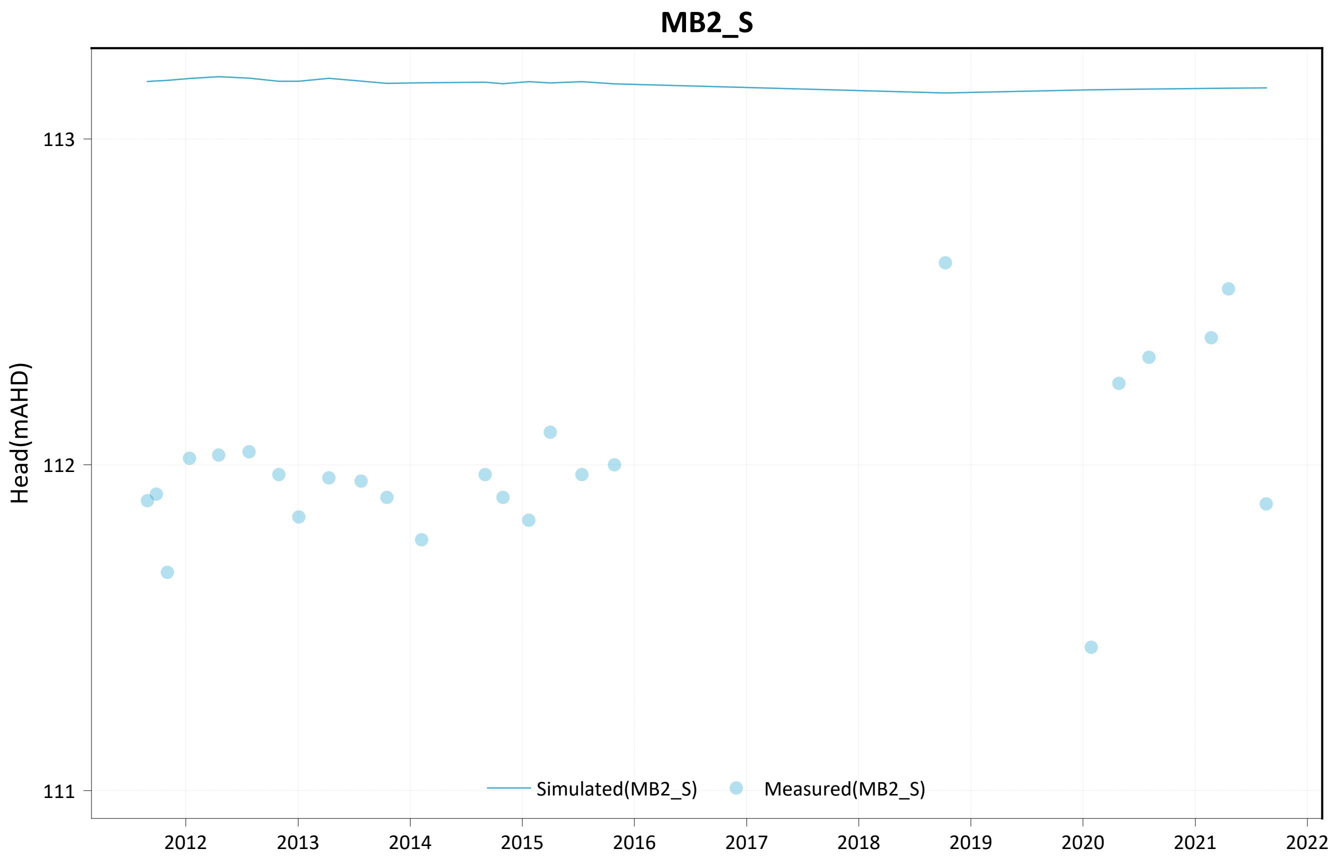
MB1_WHY
Head(mAHD)
74
73
72
Simulated(MB1_WHY)
Measured(MB1_WHY)
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021

MB2_D

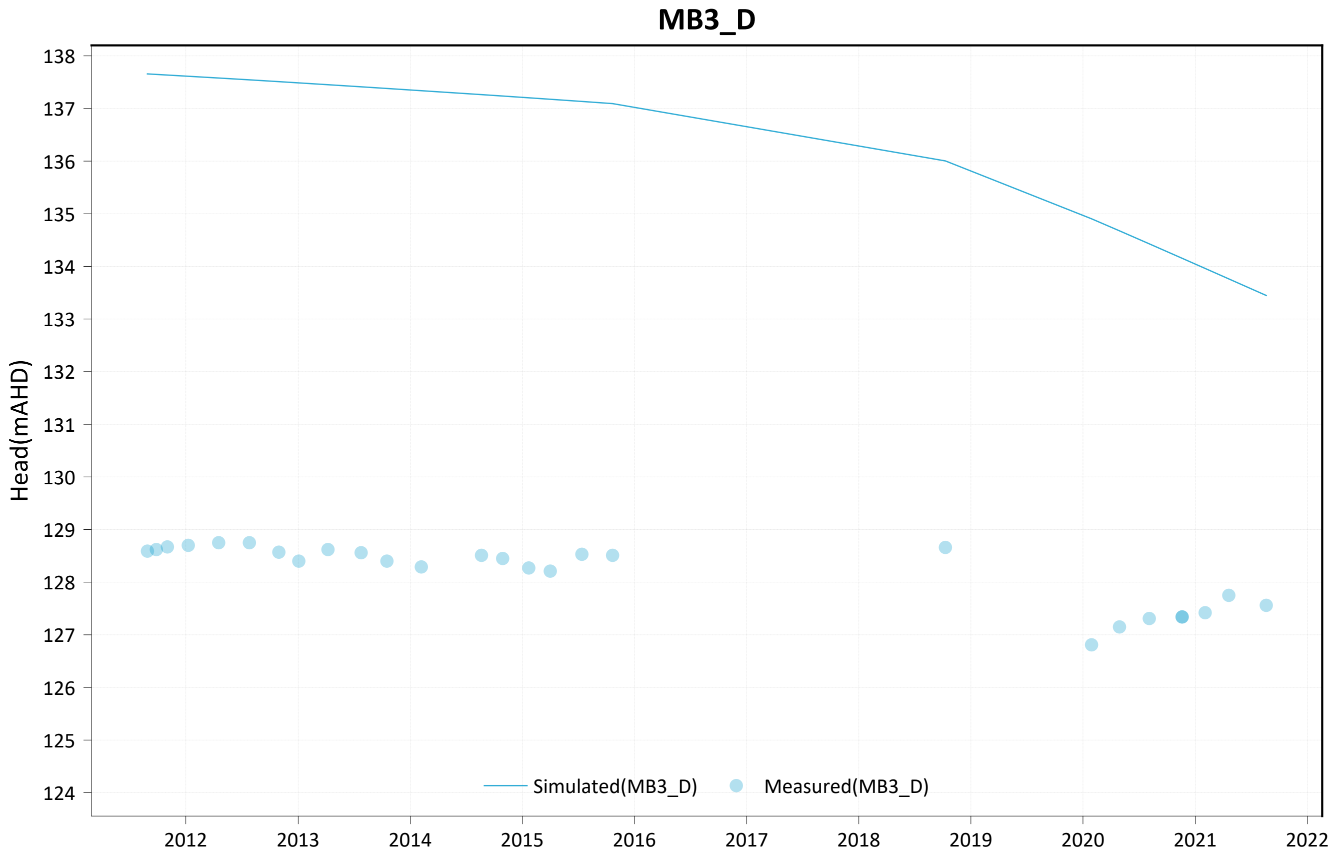


MB2_D
Head(mAHD)
115
114
113
112
111
110
109
108
Simulated(MB2_D)
Measured(MB2_D)
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

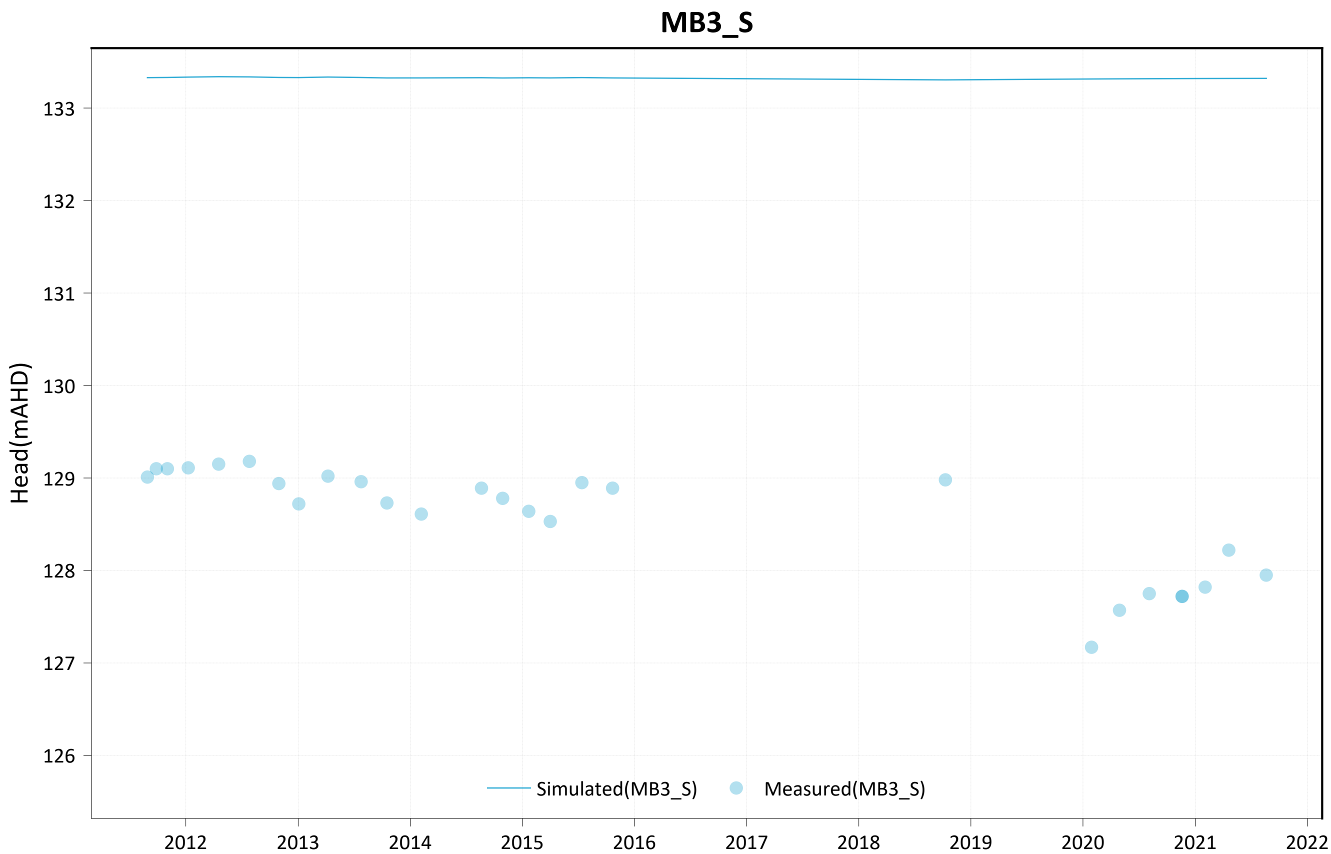
MB2_S



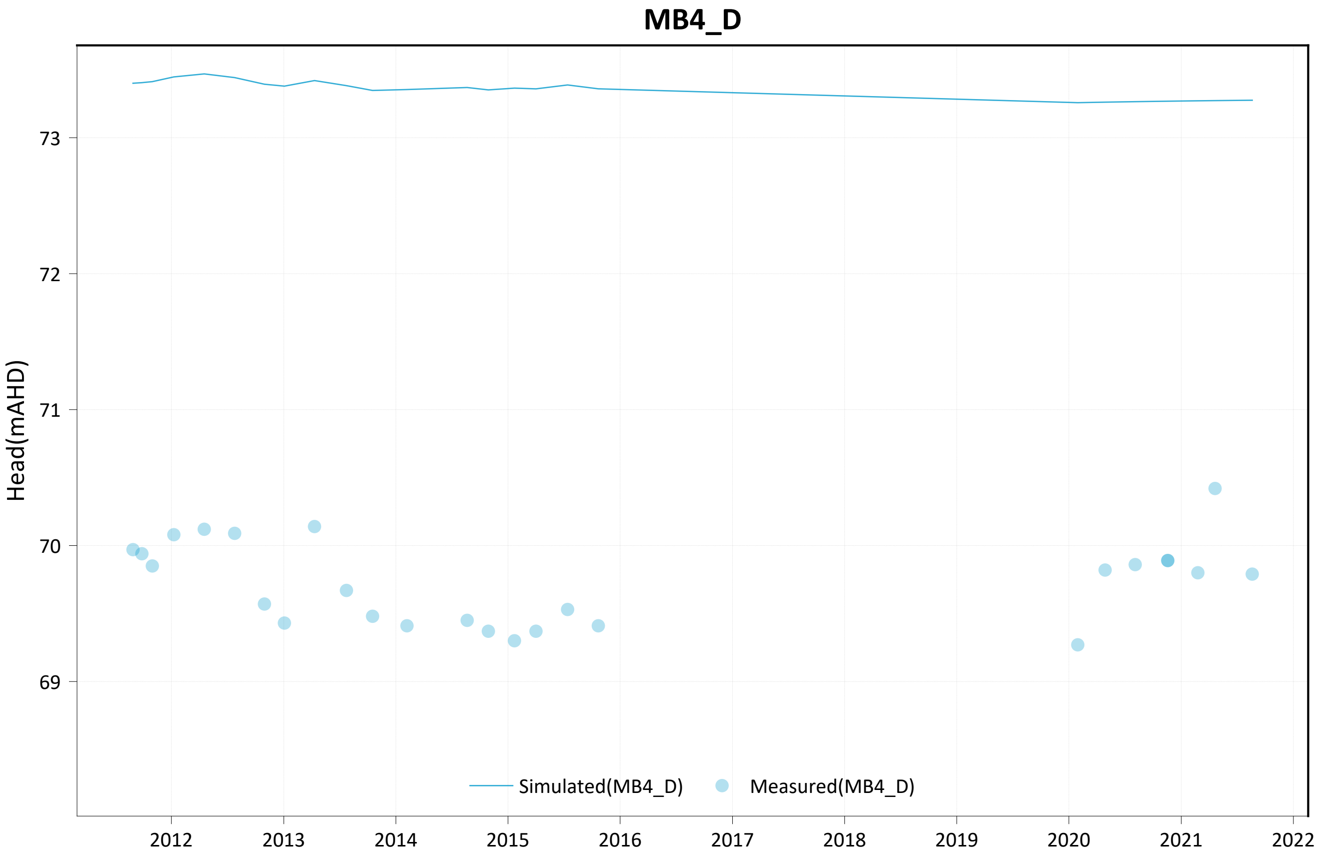
MB2_S
Head(mAHD)
113
112
111
Simulated(MB2_S)
Measured(MB2_S)
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

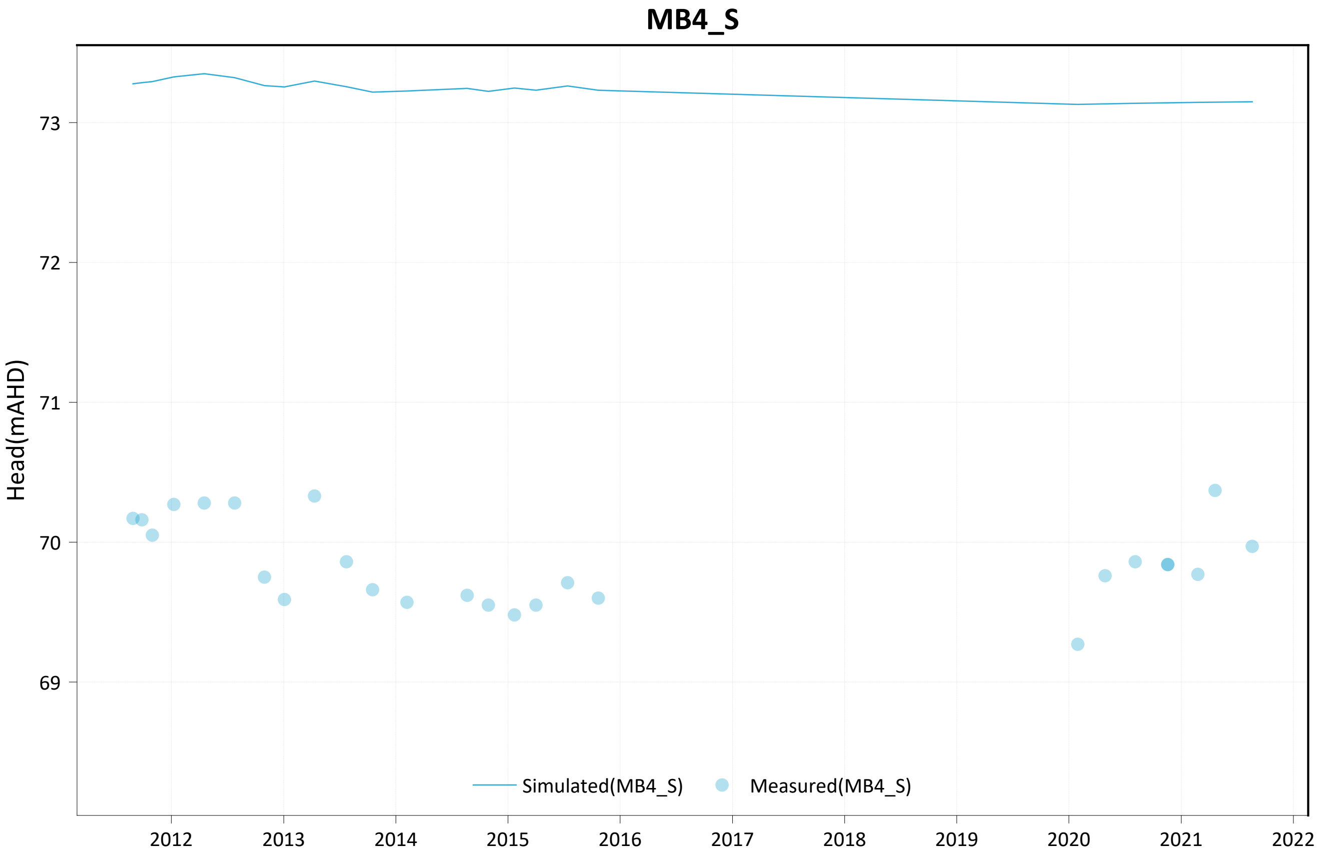


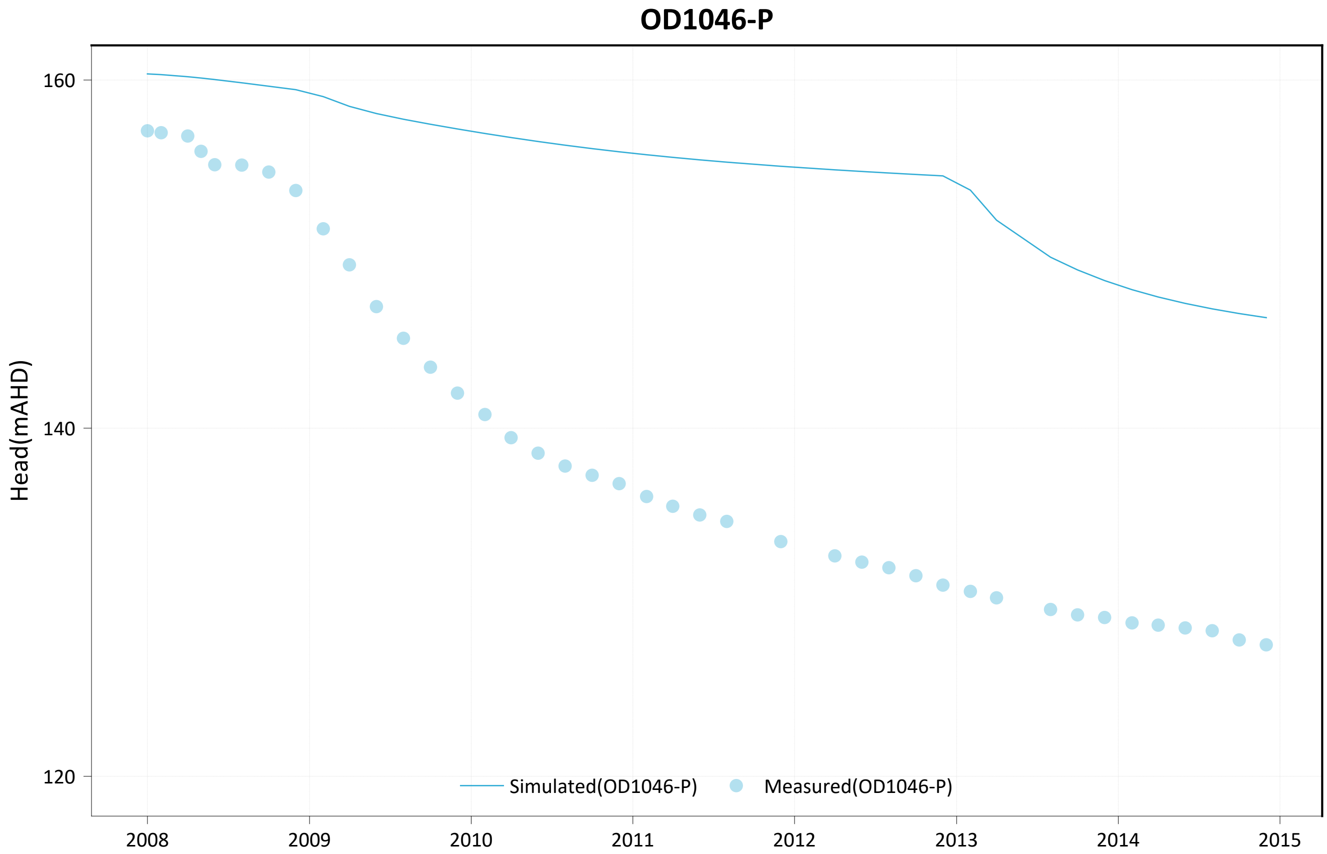
MB3_D
Head(mAHD)
138
137
136
135
134
133
132
131
130
129
128
127
126
125
124
Simulated(MB3_D)
Measured(MB3_D)
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

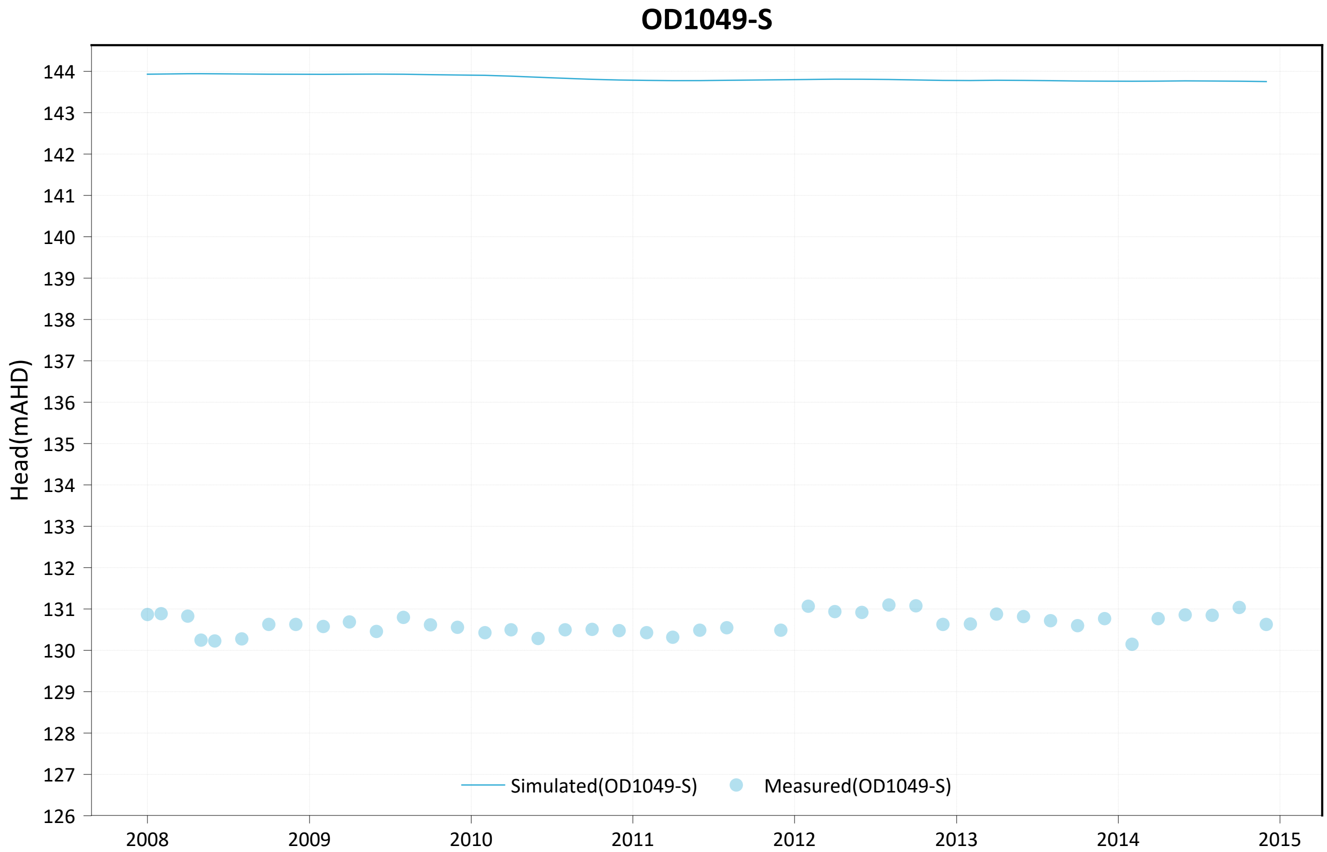


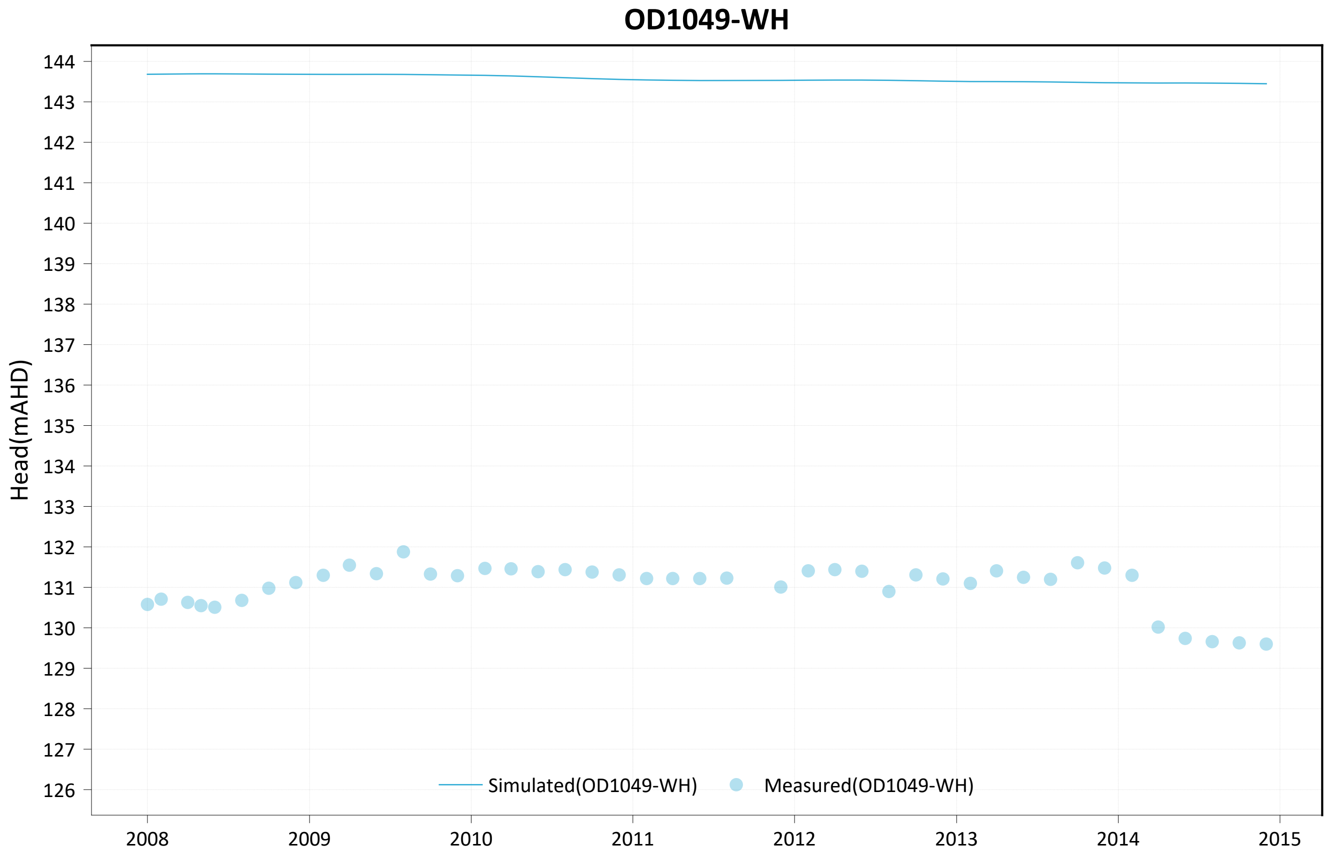
MB3_S
Head(mAHD)
133
132
131
130
129
128
127
126
Simulated(MB3_S)
Measured(MB3_S)
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

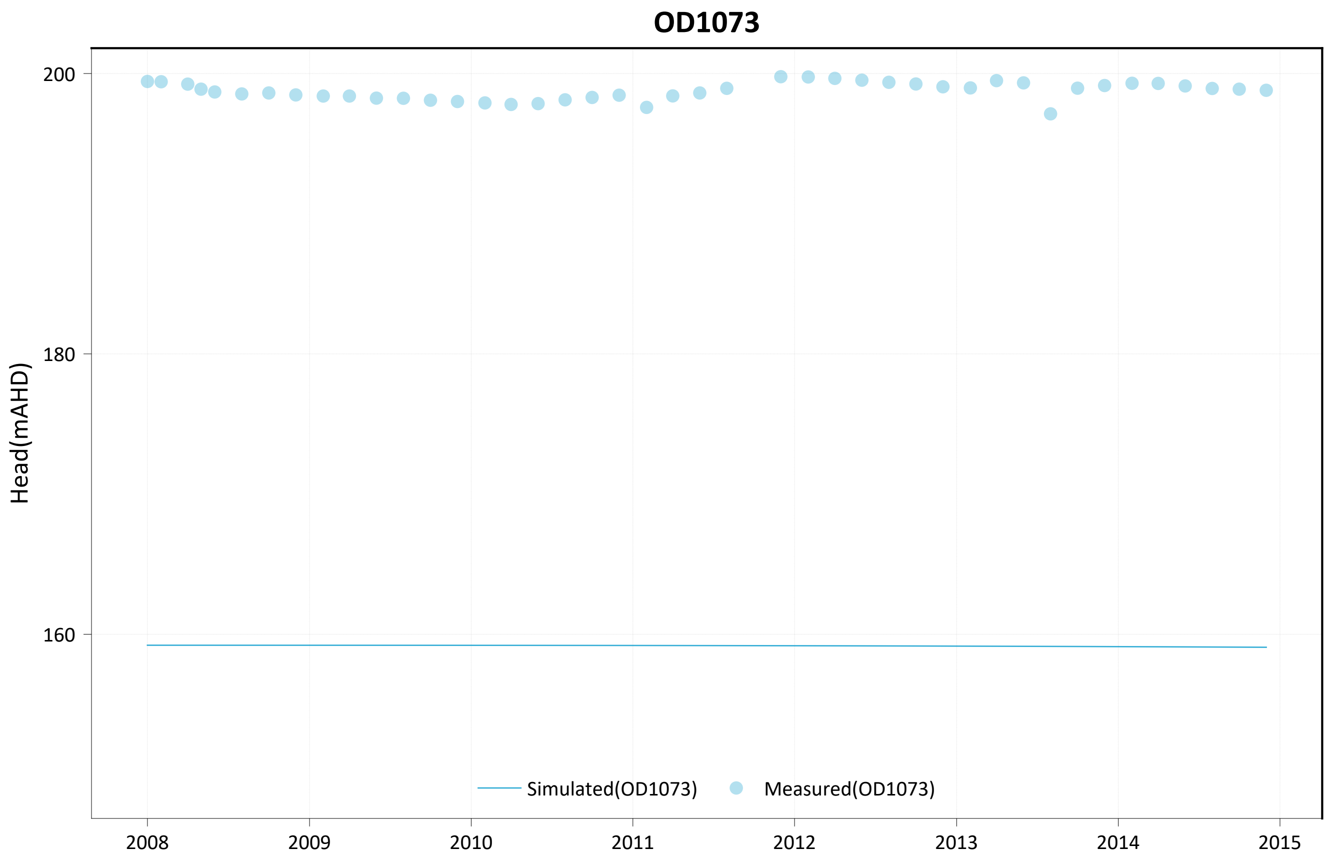

MB4_D
Head(mAHD)
73
72
71
70
69
Simulated(MB4_D)
Measured(MB4_D)
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

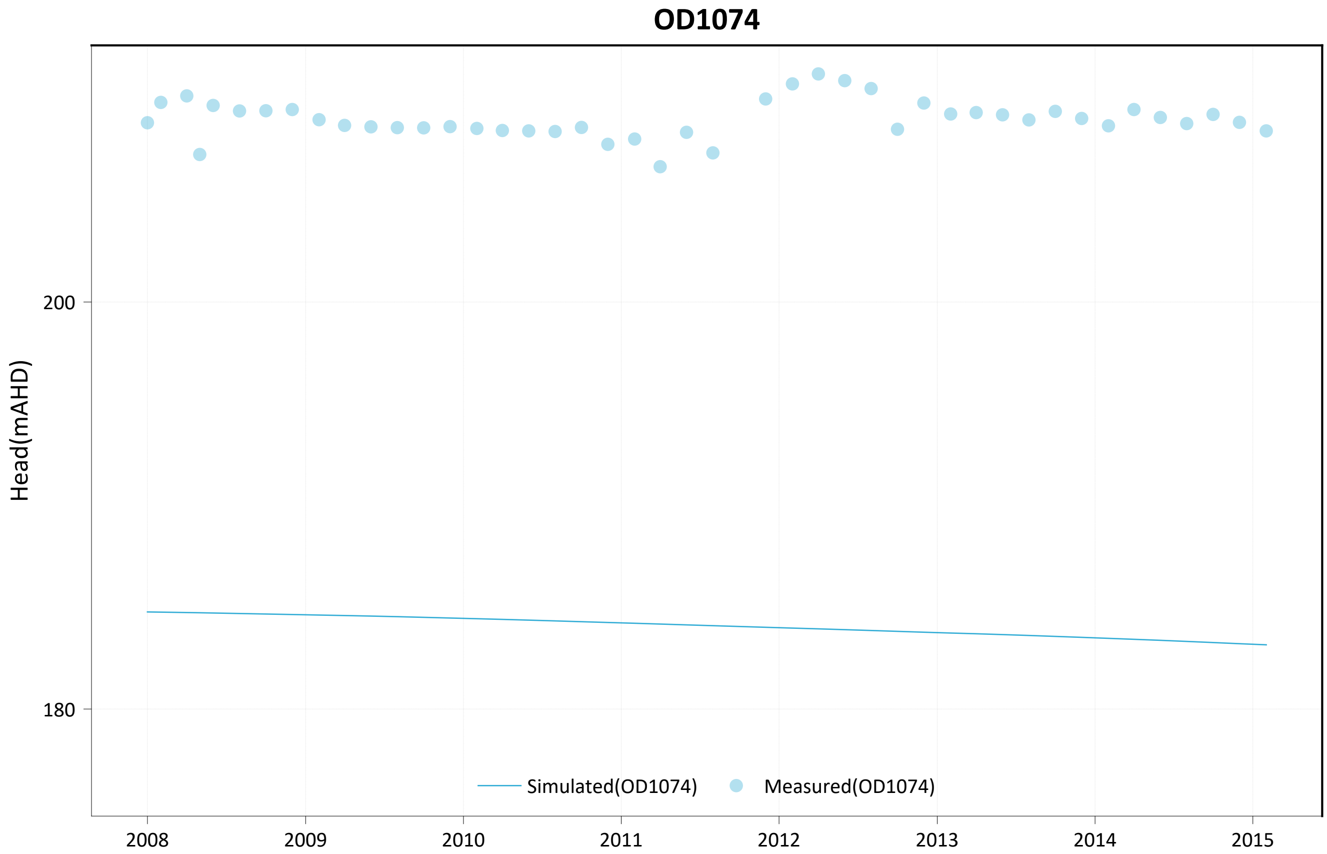

MB4_S
Head(mAHD)
73
72
71
70
69
Simulated(MB4_S)
Measured(MB4_S)
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022


OD1046-P
Head(mAHD)
160
140
120
2008
2009
2010
2011
2012
2013
2014
2015
Simulated(OD1046-P)
Measured(OD1046-P)

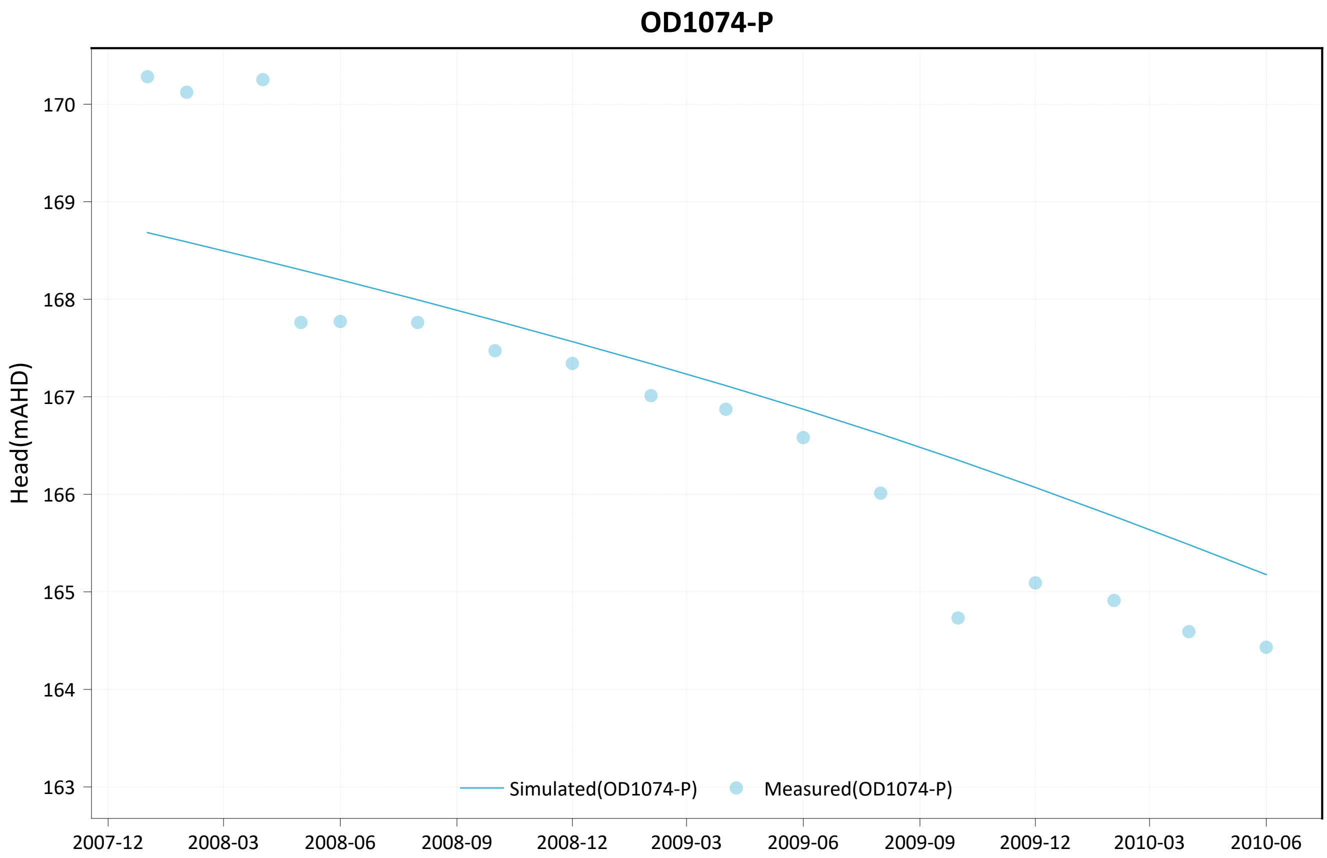

OD1049-S
Head(mAHD)
144
143
142
141
140
139
138
137
136
135
134
133
132
131
130
129
128
127
126
2008
2009
2010
2011
2012
2013
2014
2015
Simulated(OD1049-S)
Measured(OD1049-S)


OD1049-WH
Head(mAHD)
144
143
142
141
140
139
138
137
136
135
134
133
132
131
130
129
128
127
126
Simulated(OD1049-WH)
Measured(OD1049-WH)
2008
2009
2010
2011
2012
2013
2014
2015

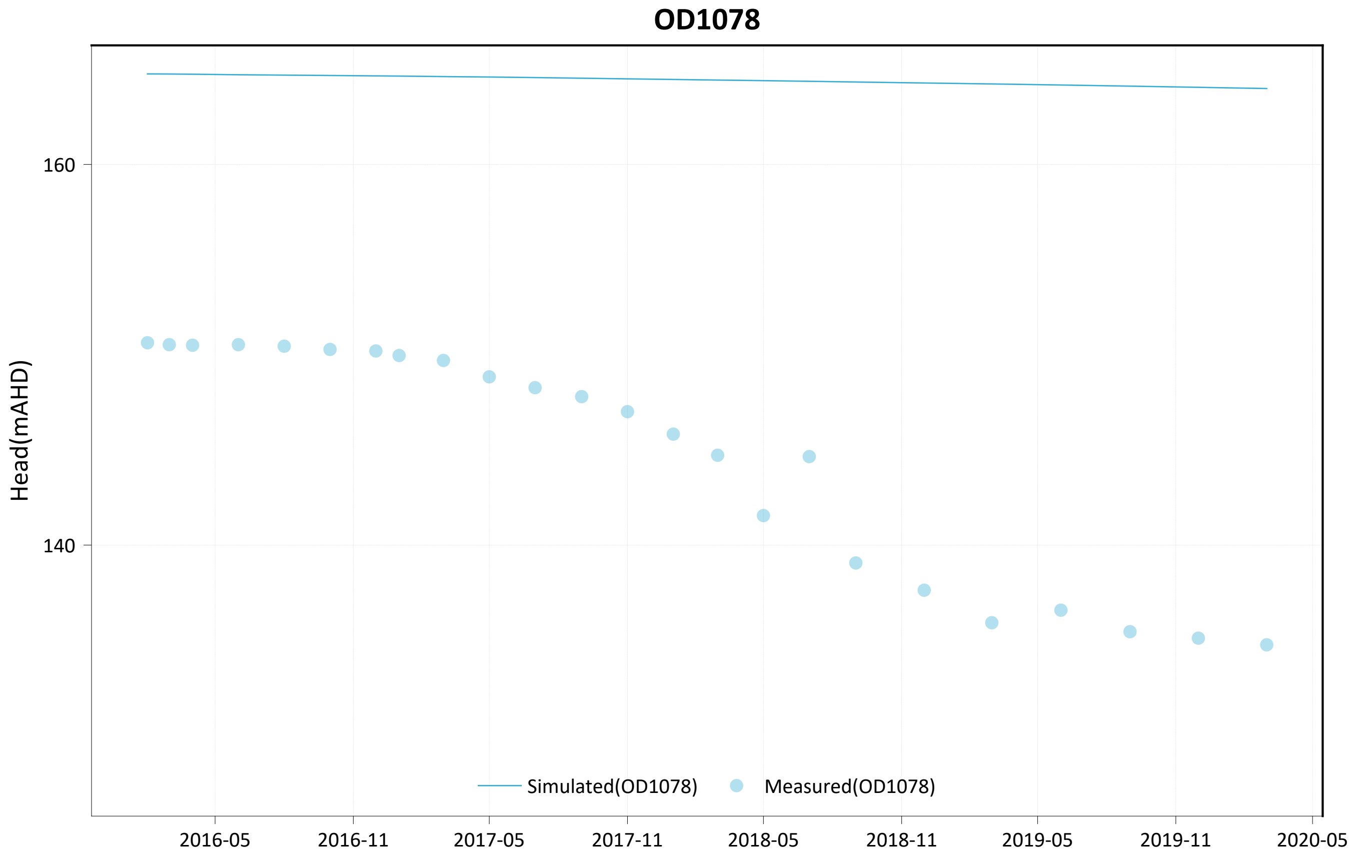

OD1073
Head(mAHD)
200
180
160
Simulated(OD1073)
Measured(OD1073)
2008
2009
2010
2011
2012
2013
2014
2015

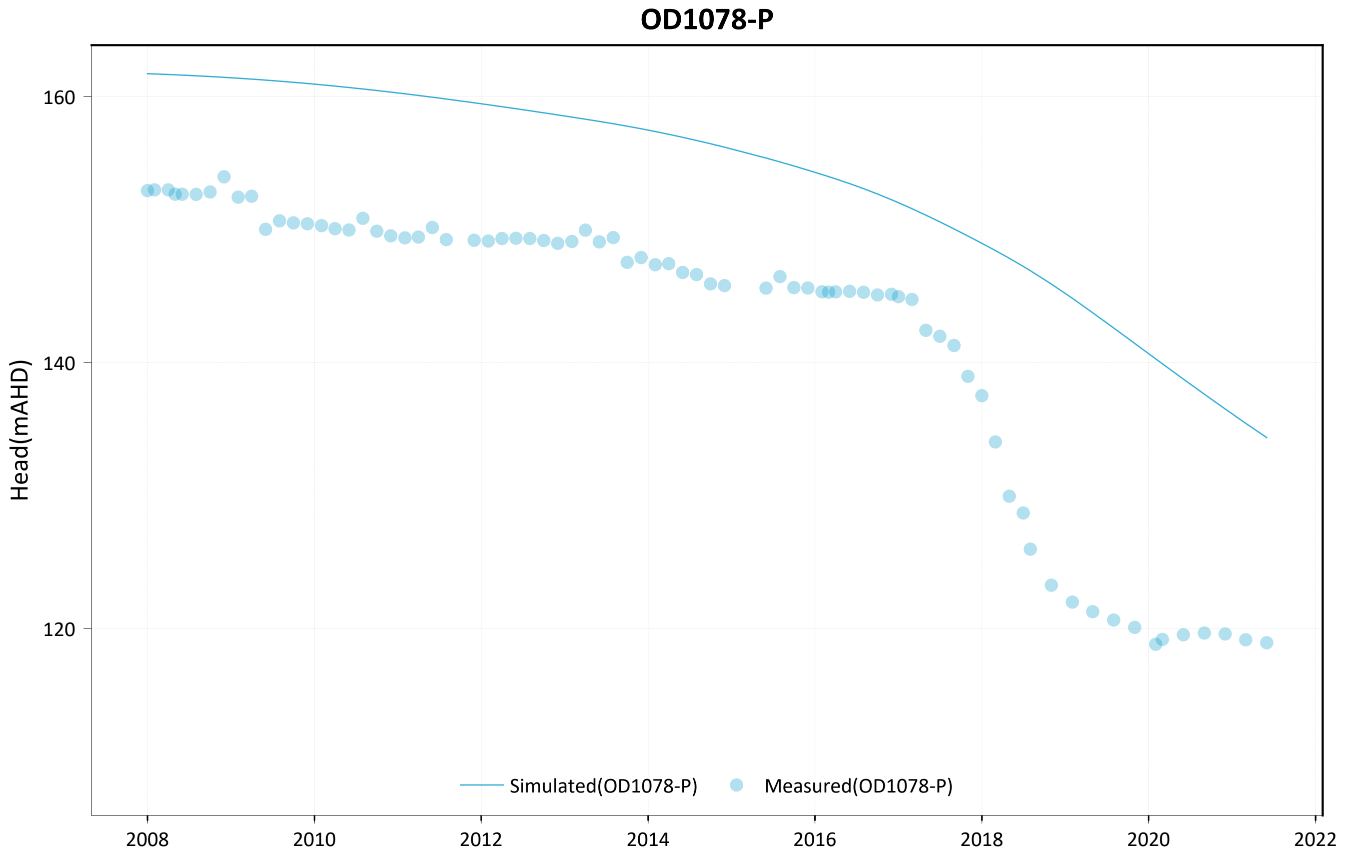


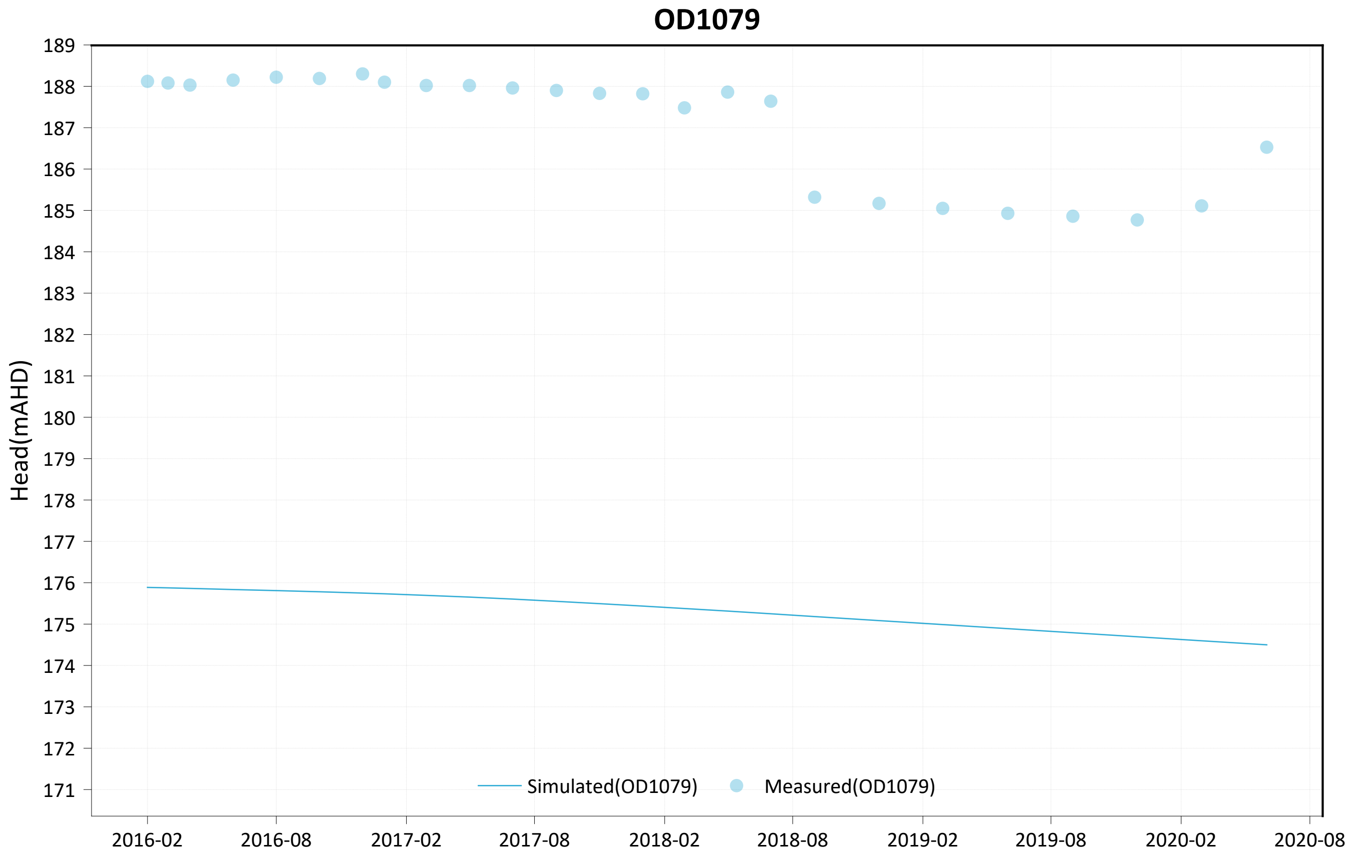
OD1074
Head(mAHD)
200
180
Simulated(OD1074)
Measured(OD1074)
2008
2009
2010
2011
2012
2013
2014
2015

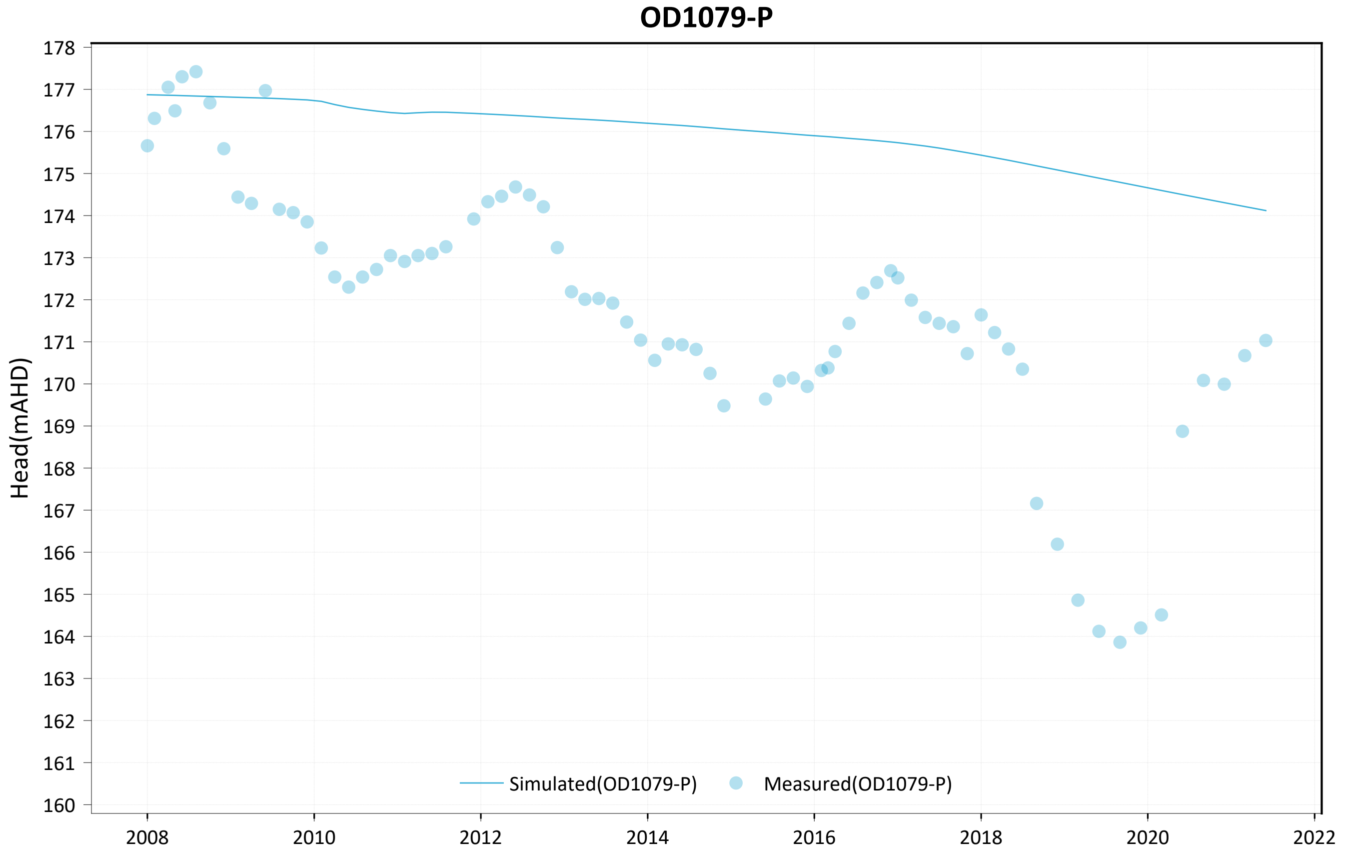


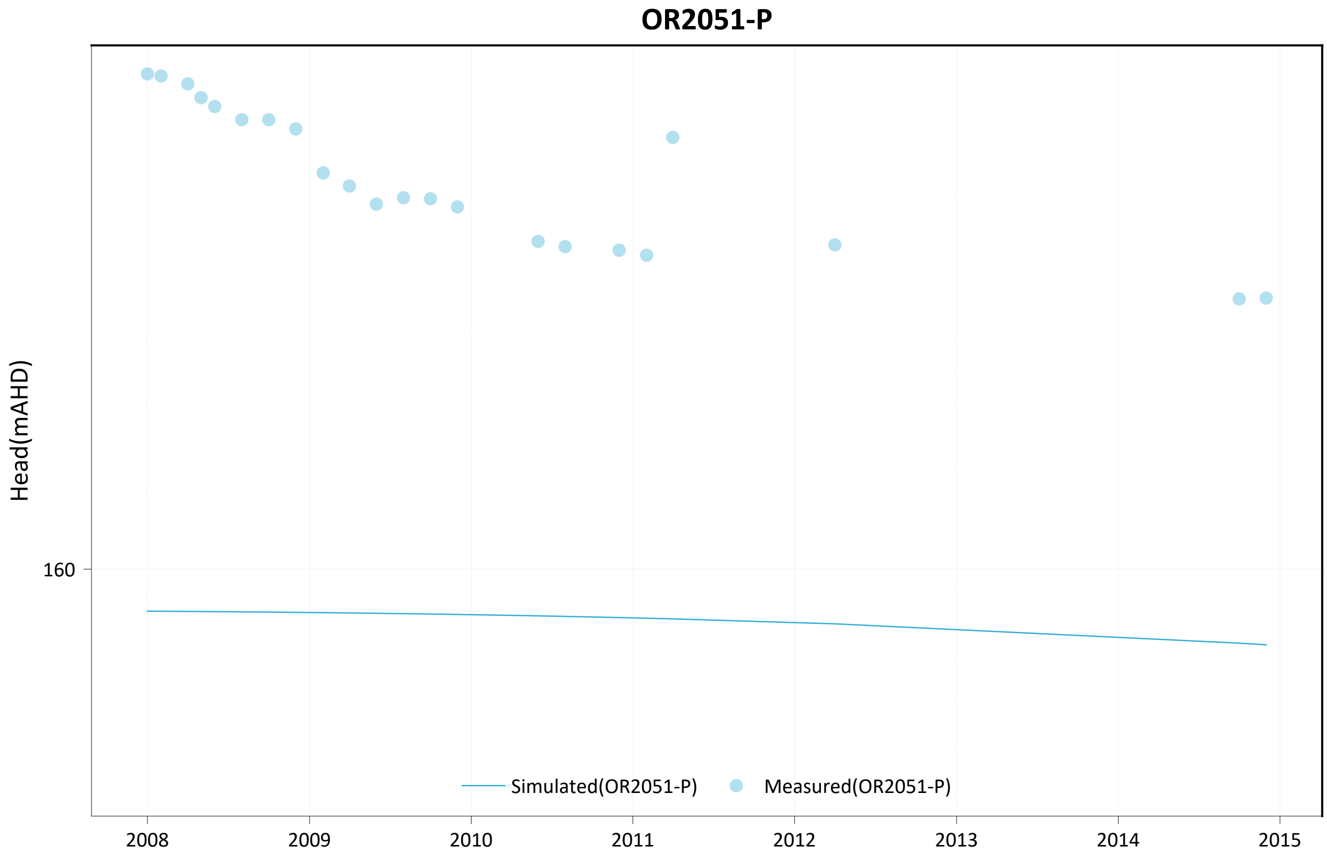
OD1074-P
Head(mAHD)
170
169
168
167
166
165
164
163
Simulated(OD1074-P)
Measured(OD1074-P)
2007-12
2008-03
2008-06
2008-09
2008-12
2009-03
2009-06
2009-09
2009-12
2010-03
2010-06

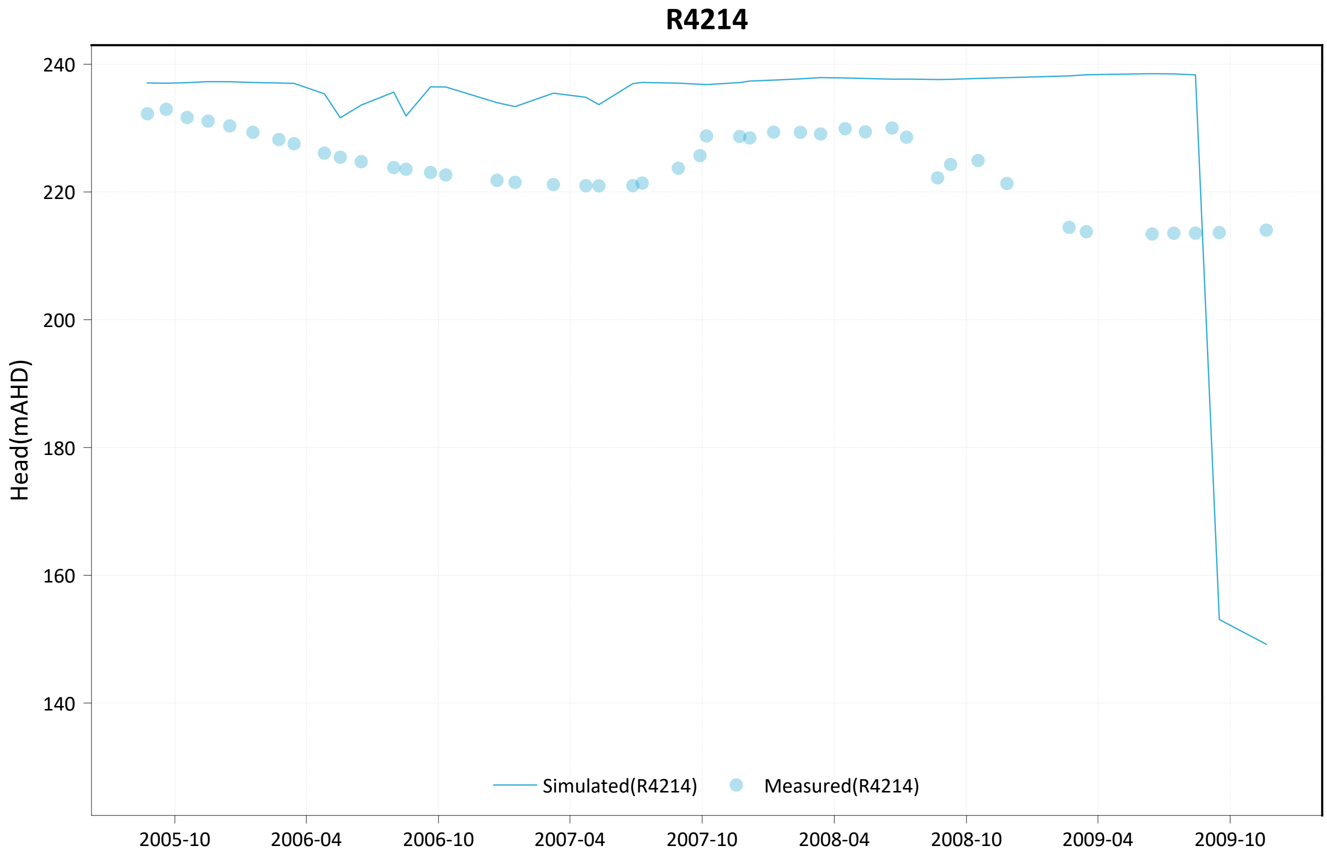

OD1078
Head(mAHD)
160
140
Simulated(OD1078)
Measured(OD1078)
2016-05
2016-11
2017-05
2017-11
2018-05
2018-11
2019-05
2019-11
2020-05

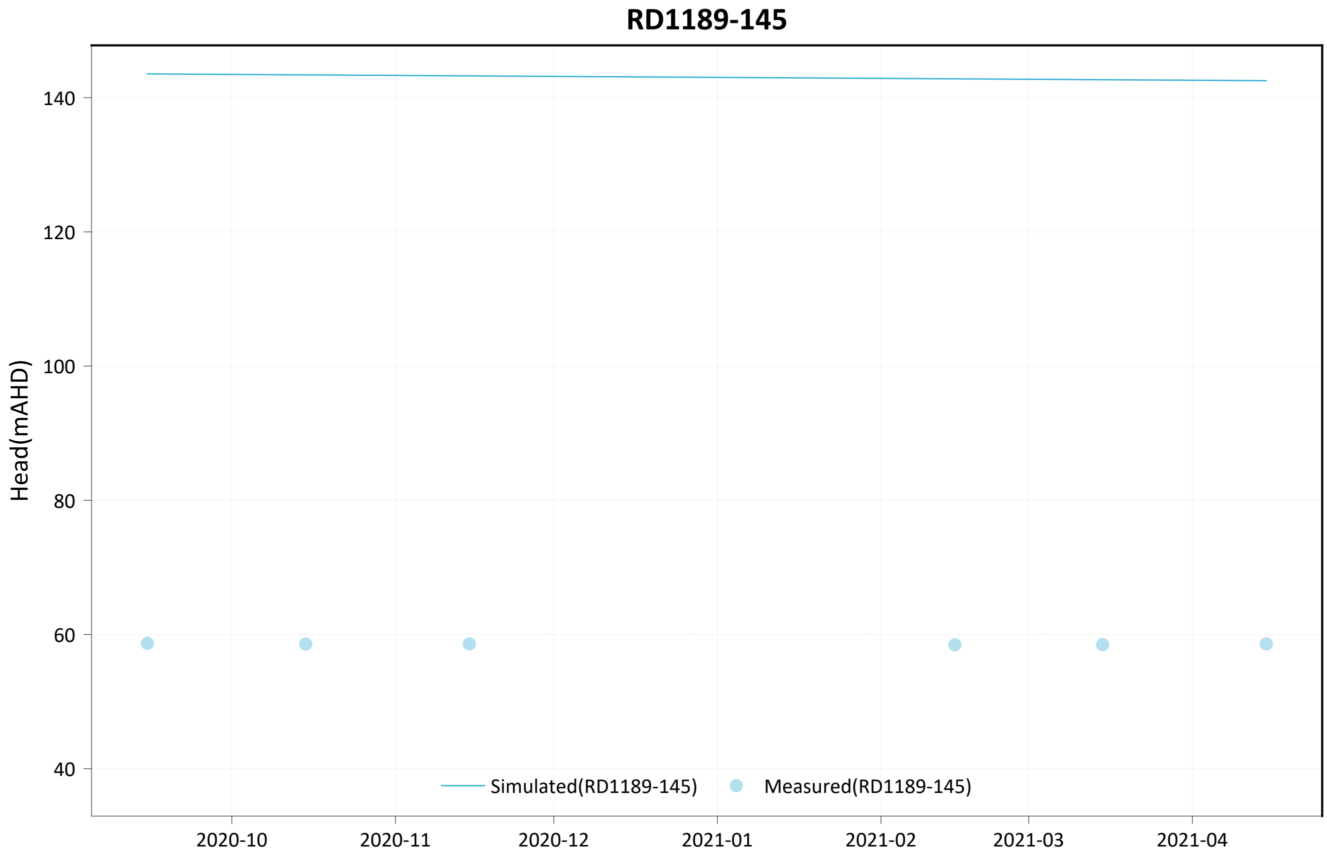

OD1078-P
Head(mAHD)
160
140
120
Simulated(OD1078-P)
Measured(OD1078-P)
2008
2010
2012
2014
2016
2018
2020
2022

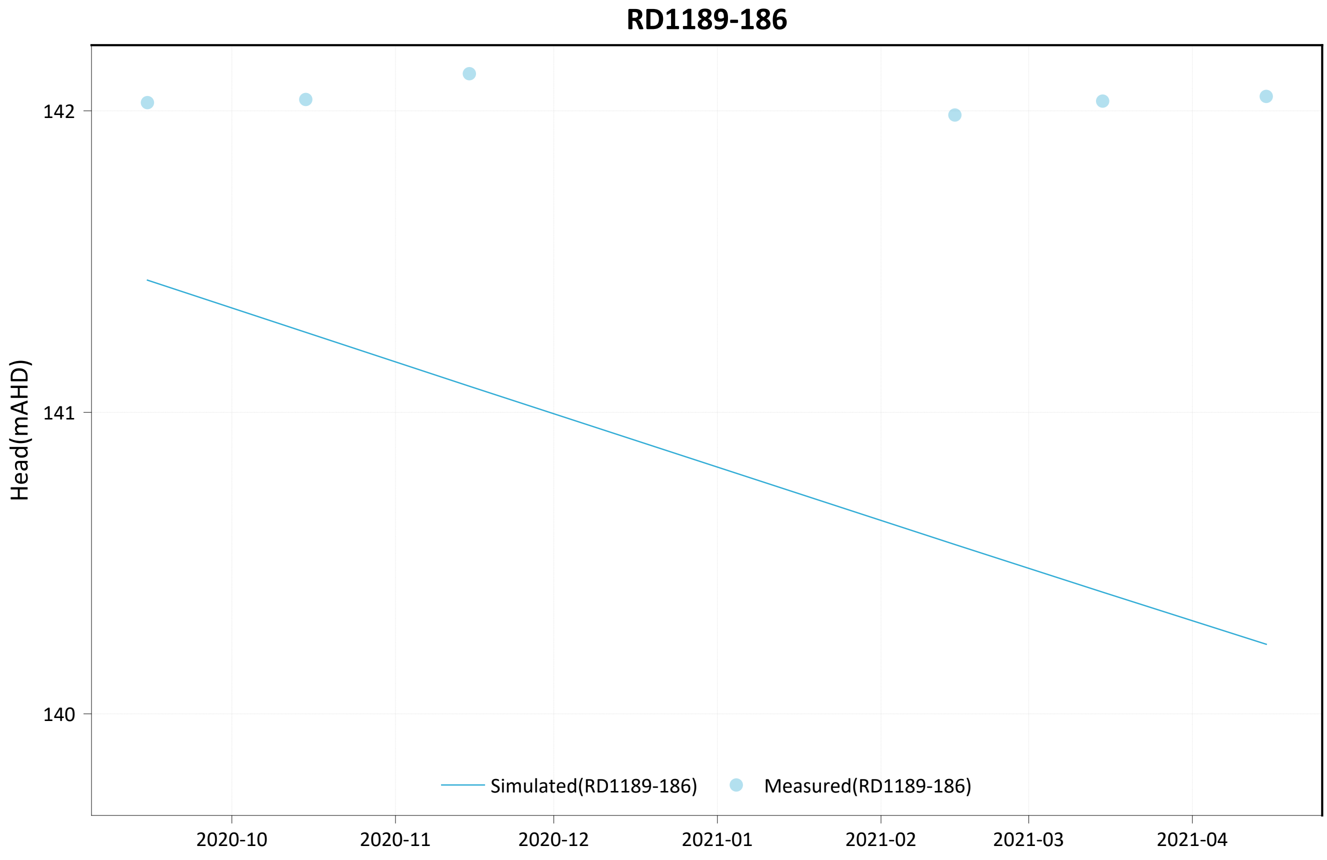

OD1079
Head(mAHD)
189
188
187
186
185
184
183
182
181
180
179
178
177
176
175
174
173
172
171
Simulated(OD1079)
Measured(OD1079)
2016-02
2016-08
2017-02
2017-08
2018-02
2018-08
2019-02
2019-08
2020-02
2020-08

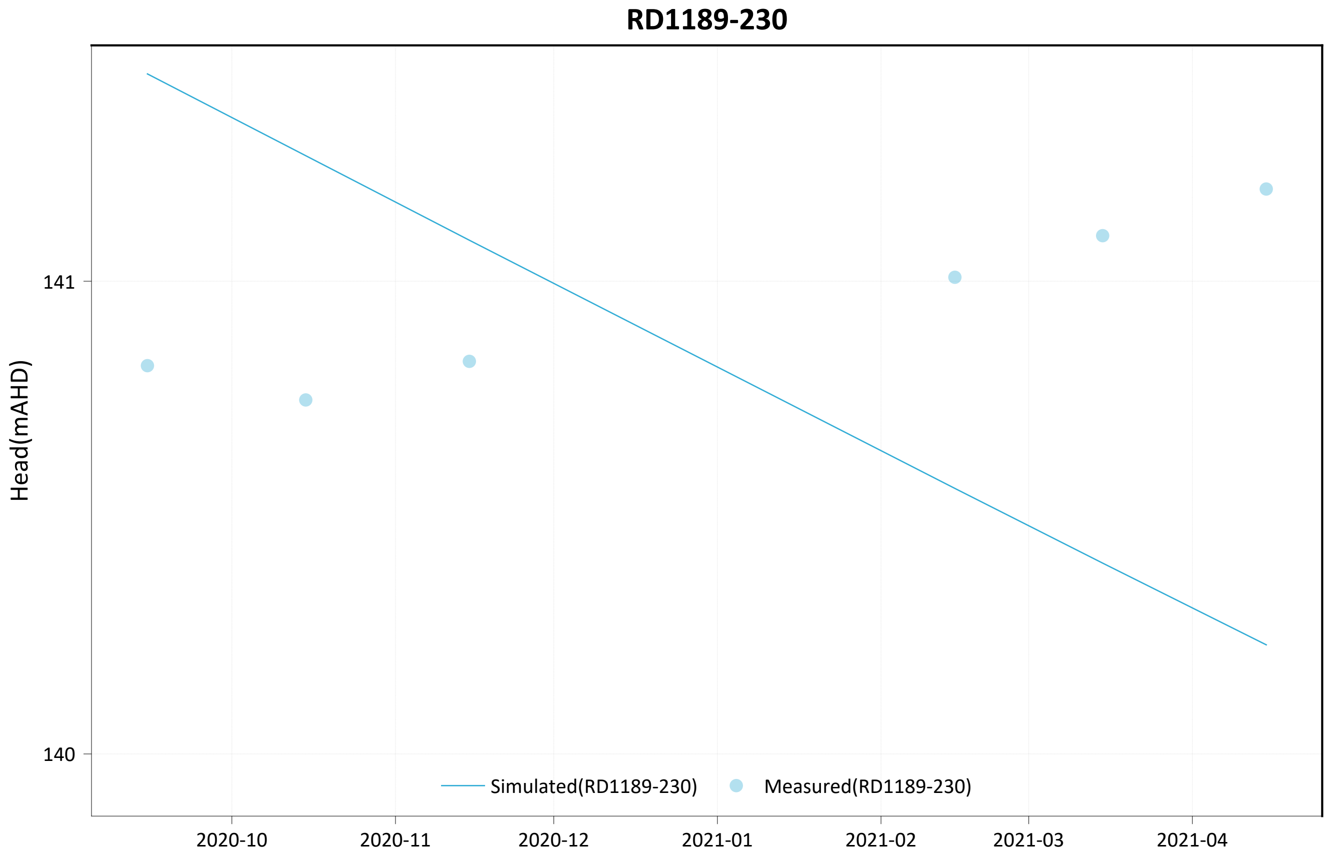

OD1079-P
Head(mAHD)
178
177
176
175
174
173
172
171
170
169
168
167
166
165
164
163
162
161
160
Simulated(OD1079-P)
Measured(OD1079-P)
2008
2010
2012
2014
2016
2018
2020
2022

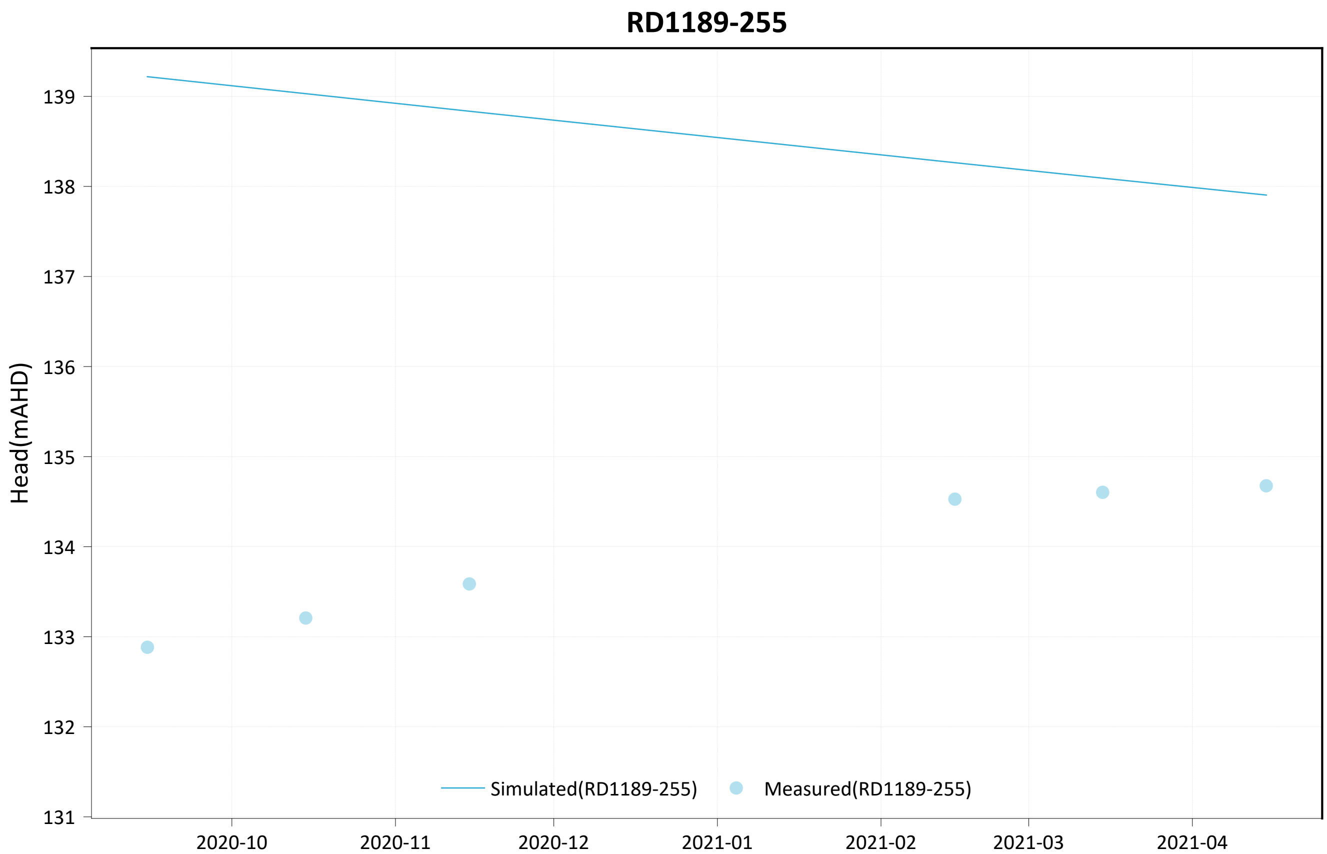

OR2051-P
Head(mAHD)
160
Simulated(OR2051-P)
Measured(OR2051-P)
2008
2009
2010
2011
2012
2013
2014
2015


R4214
Head(mAHD)
240
220
200
180
160
140
Simulated(R4214)
Measured(R4214)
2005-10
2006-04
2006-10
2007-04
2007-10
2008-04
2008-10
2009-04
2009-10

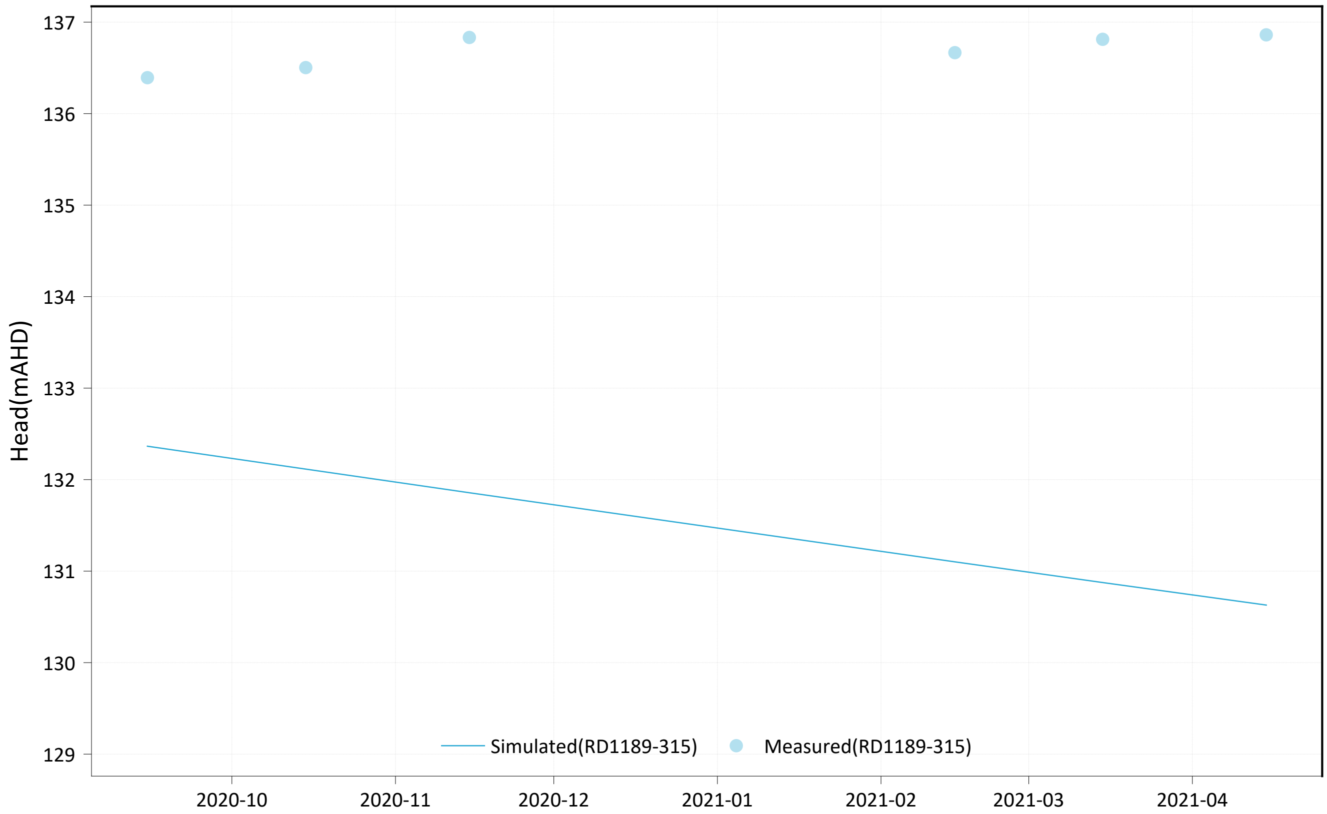

RD1189-145
Head(mAHD)
140
120
100
80
60
40
Simulated(RD1189-145)
Measured(RD1189-145)
2020-10
2020-11
2020-12
2021-01
2021-02
2021-03
2021-04


RD1189-186
Head(mAHD)
142
141
140
Simulated(RD1189-186)
Measured(RD1189-186)
2020-10
2020-11
2020-12
2021-01
2021-02
2021-03
2021-04

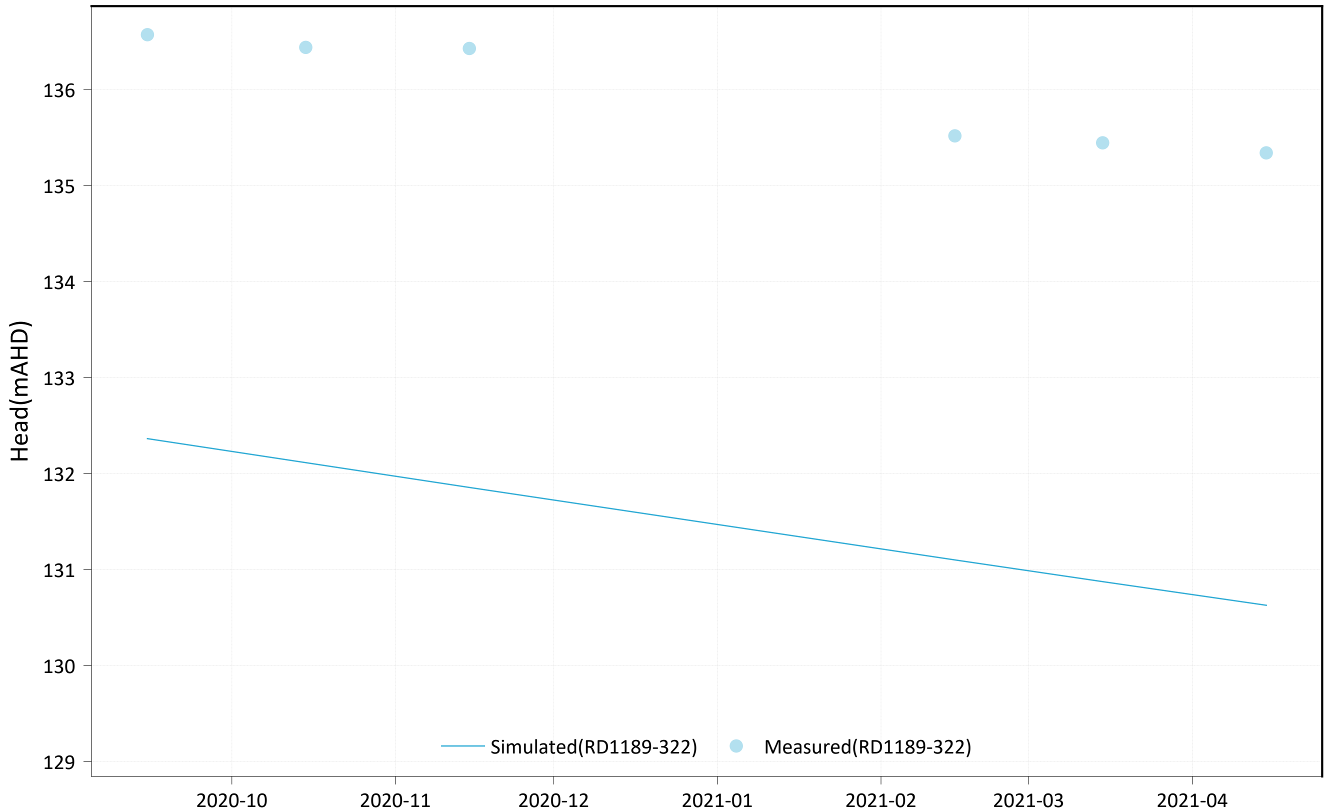

RD1189-230
Head(mAHD)
141
140
Simulated(RD1189-230)
Measured(RD1189-230)
2020-10
2020-11
2020-12
2021-01
2021-02
2021-03
2021-04

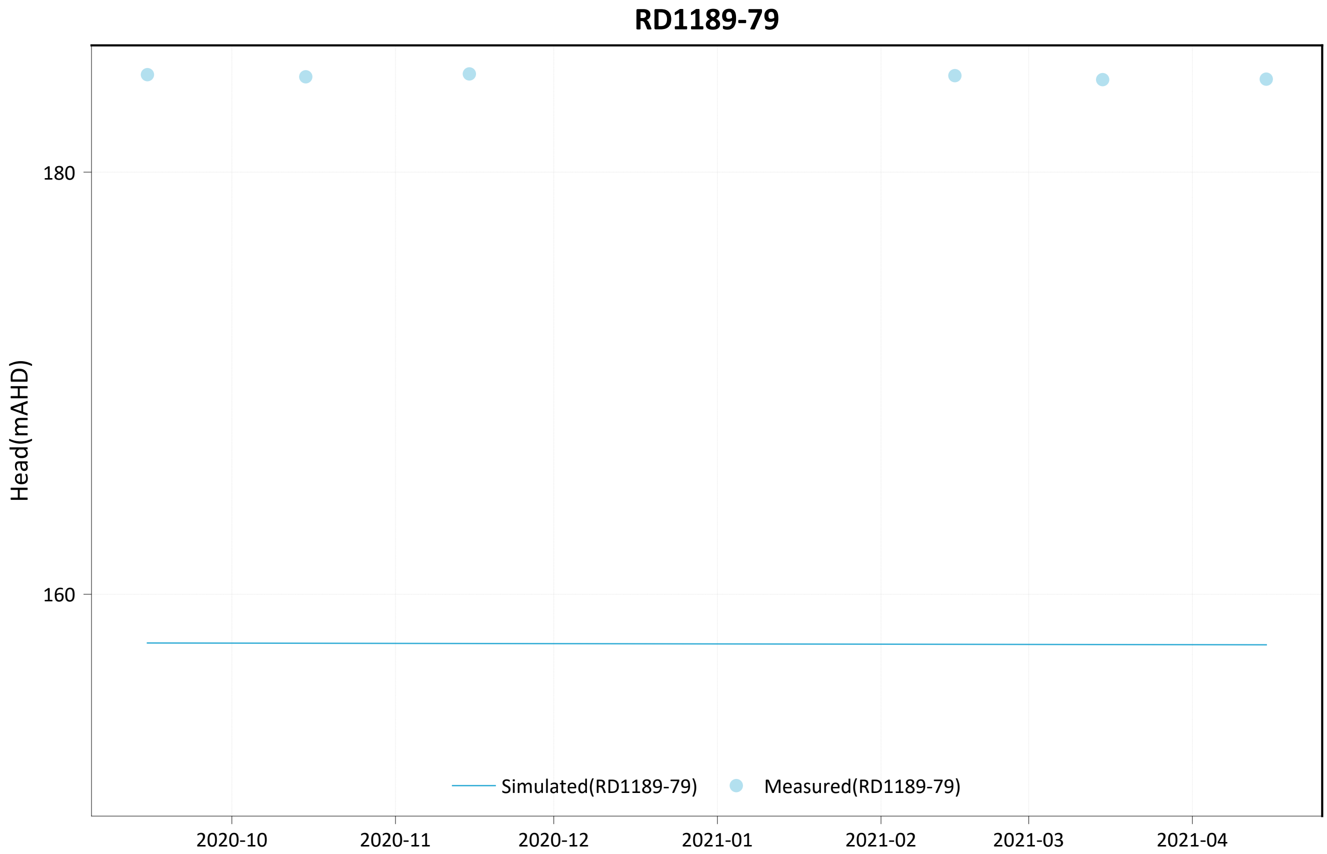

RD1189-255
Head(mAHD)
139
138
137
136
135
134
133
132
131
Simulated(RD1189-255)
Measured(RD1189-255)
2020-10
2020-11
2020-12
2021-01
2021-02
2021-03
2021-04

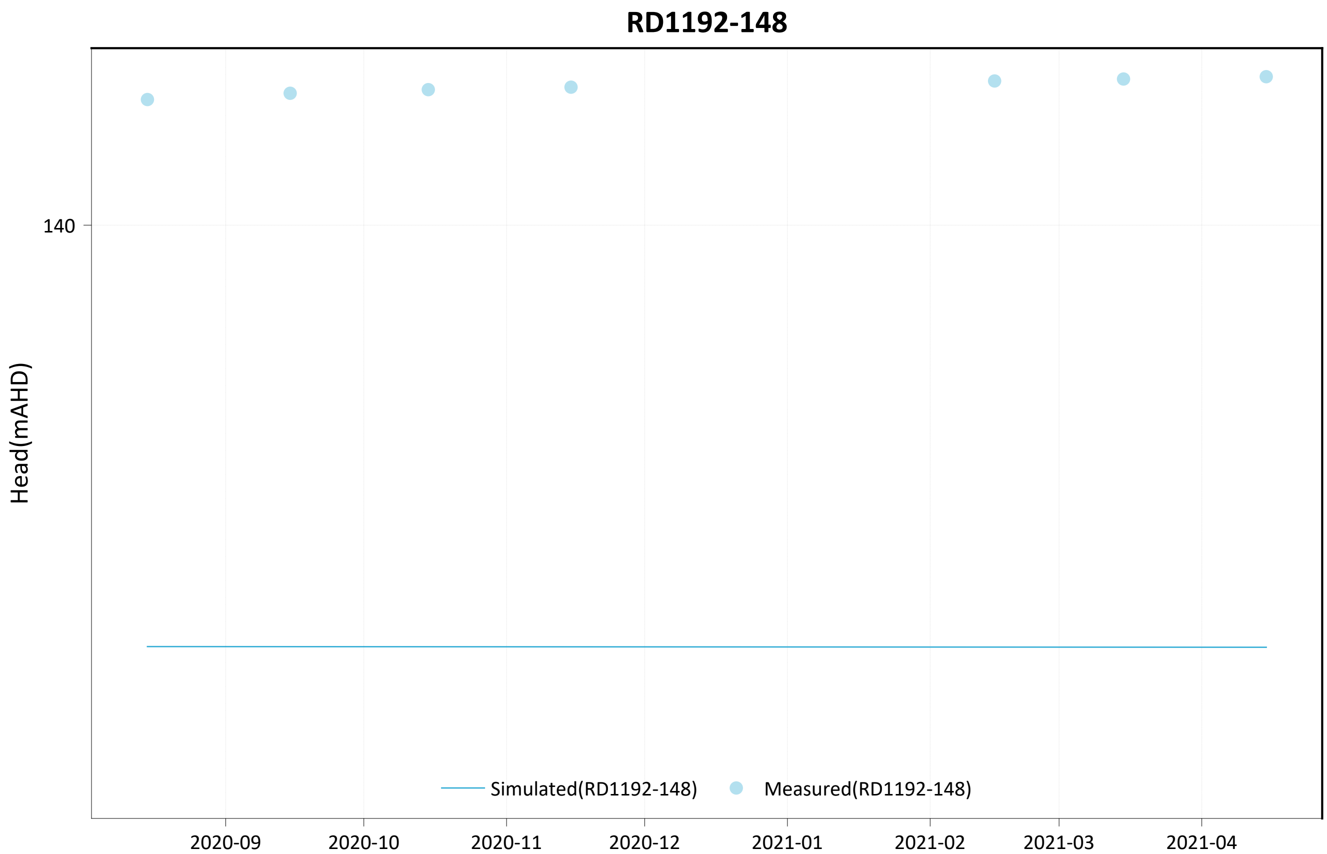
RD1189-315

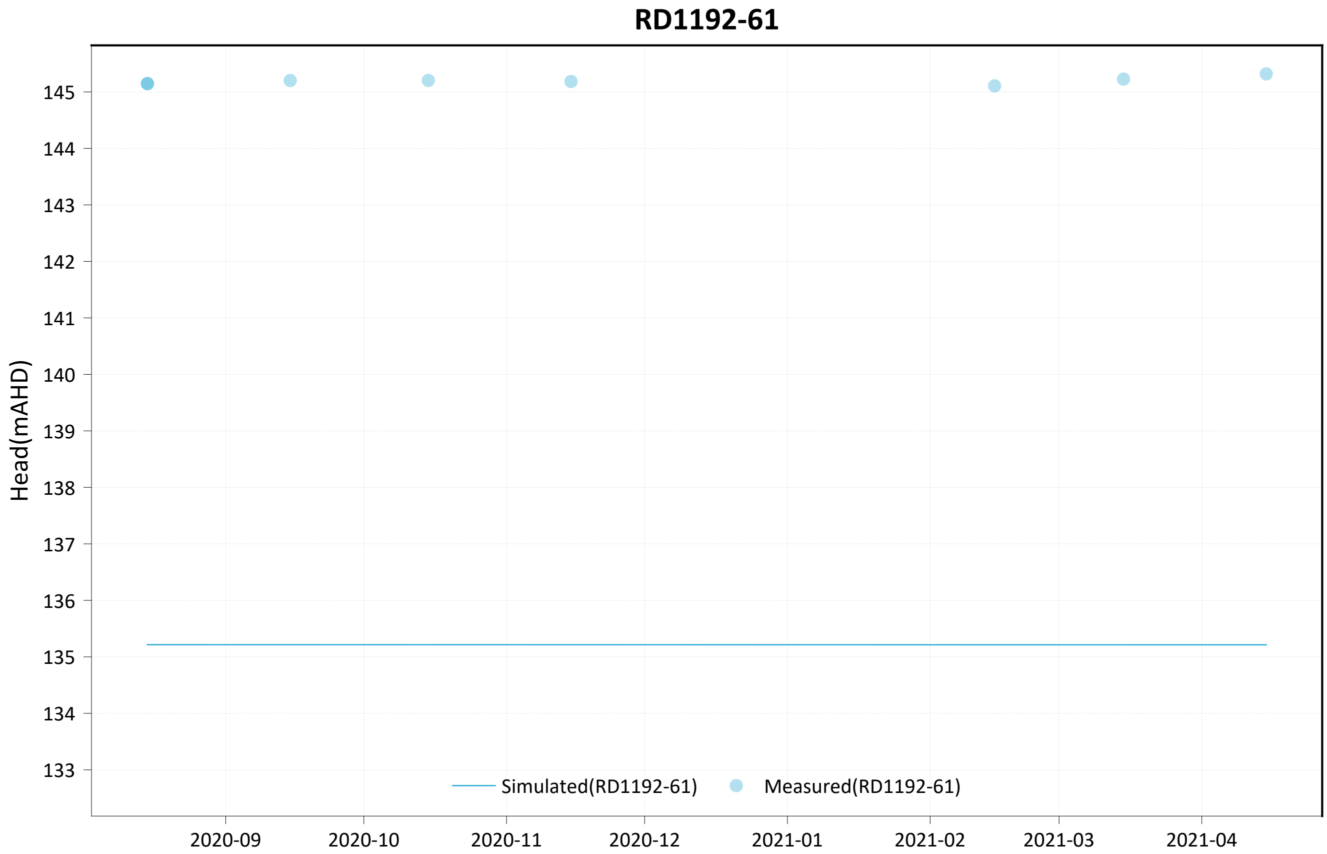


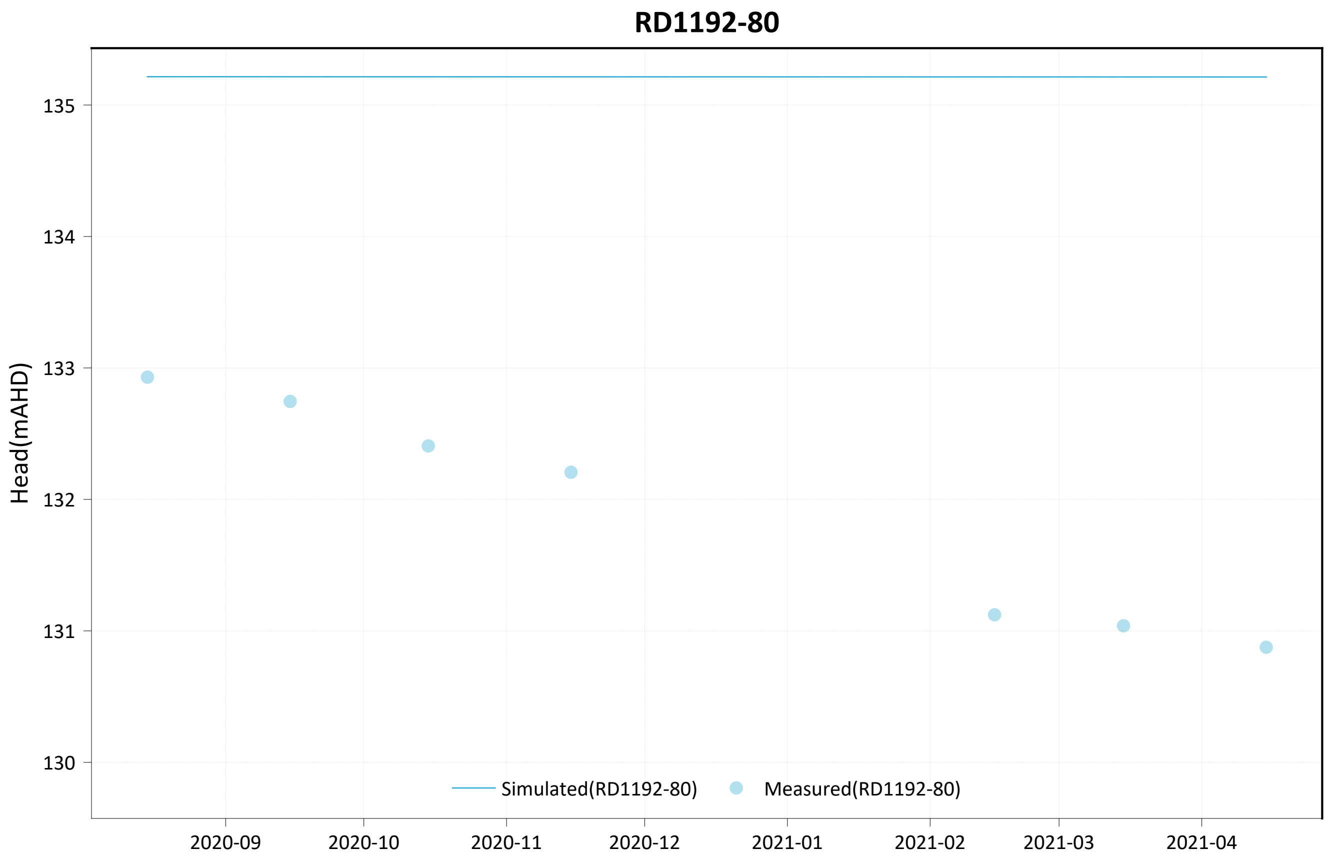
RD1189-322

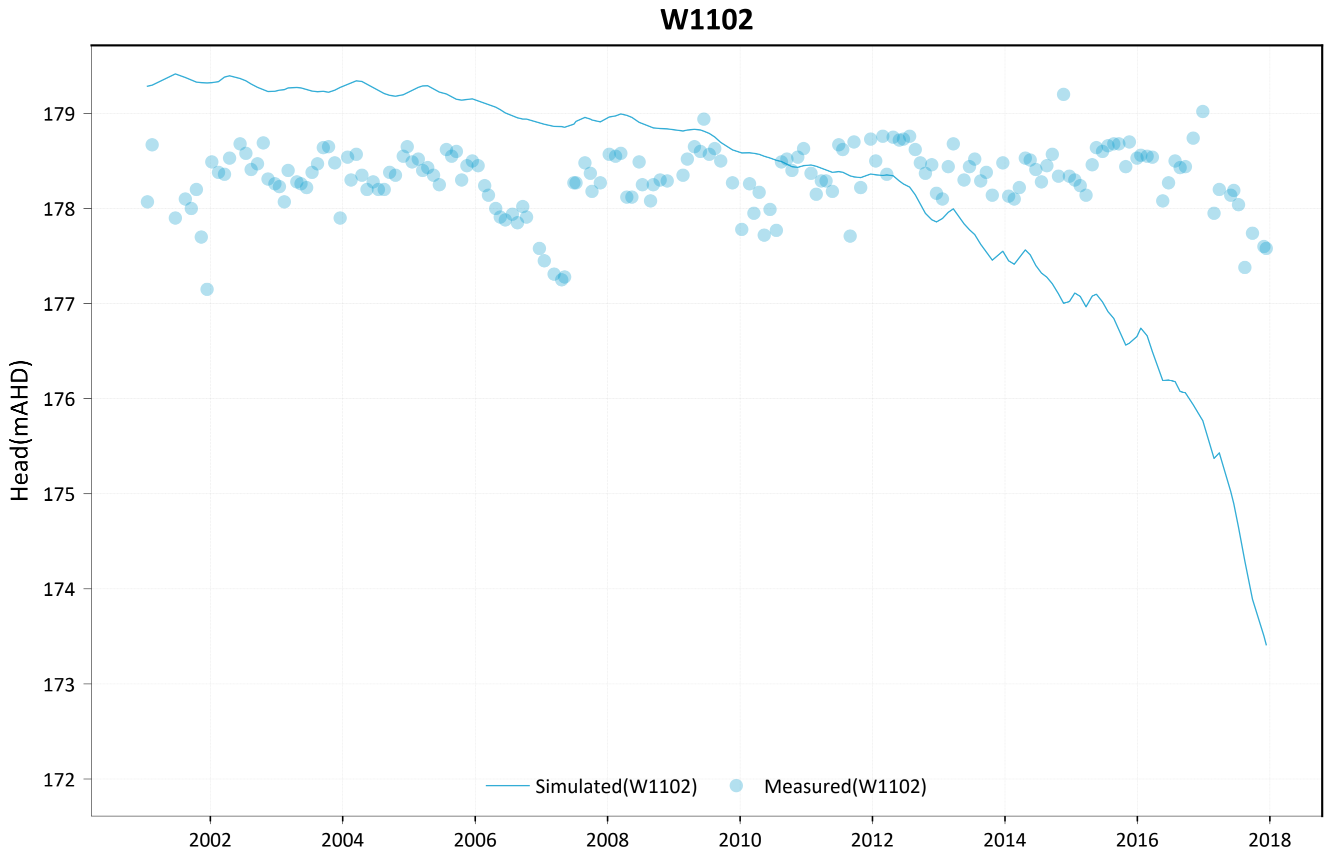


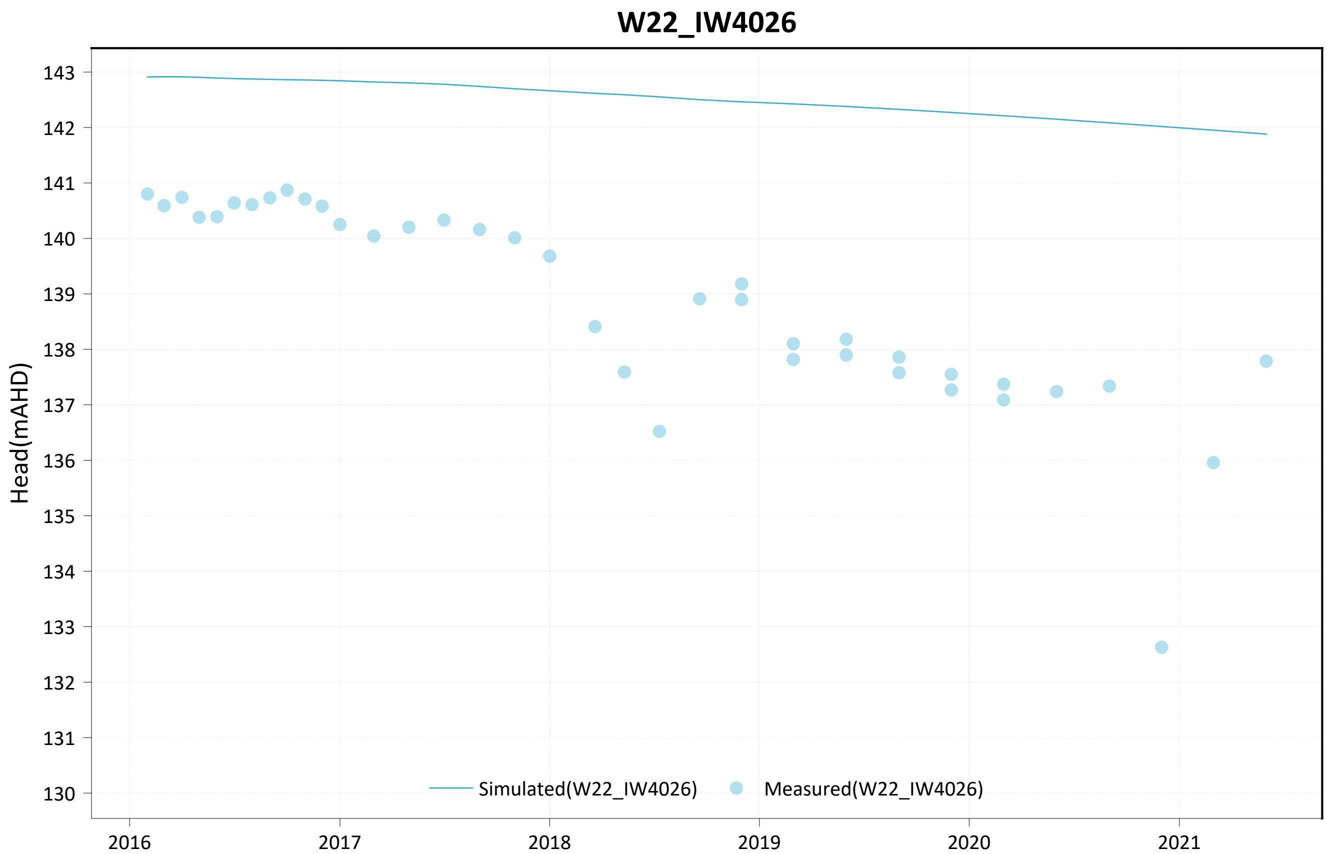

RD1189-79
Head(mAHD)
180
160
Simulated(RD1189-79)
Measured(RD1189-79)
2020-10
2020-11
2020-12
2021-01
2021-02
2021-03
2021-04


RD1192-148
Head(mAHD)
140
Simulated(RD1192-148)
Measured(RD1192-148)
2020-09
2020-10
2020-11
2020-12
2021-01
2021-02
2021-03
2021-04


RD1192-61
Head(mAHD)
145
144
143
142
141
140
139
138
137
136
135
134
133
Simulated(RD1192-61)
Measured(RD1192-61)
2020-09
2020-10
2020-11
2020-12
2021-01
2021-02
2021-03
2021-04


RD1192-80
Head(mAHD)
135
134
133
132
131
130
Simulated(RD1192-80)
Measured(RD1192-80)
2020-09
2020-10
2020-11
2020-12
2021-01
2021-02
2021-03
2021-04


W1102
Head(mAHD)
179
178
177
176
175
174
173
172
2002
2004
2006
2008
2010
2012
2014
2016
2018
Simulated(W1102)
Measured(W1102)


W22_IW4026
Head(mAHD)
143
142
141
140
139
138
137
136
135
134
133
132
131
130
2016
2017
2018
2019
2020
2021
Simulated(W22_IW4026)
Measured(W22_IW4026)

ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY
Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 404 939 922

AUCKLAND
68 Beach Road
Auckland 1010
New Zealand
T: 0800 757 695

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628