ATTACHMENT AA

Vickery Groundwater Investigation Program

GROUNDWATER FIELD INVESTIGATION

A Groundwater Field Investigation Program In Support Of the Vickery Coal Project Environmental Assessment

FOR

WHITEHAVEN COAL LIMITED

By

Groundwater Exploration Services Pty Ltd

November 2012

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

1.1 BACKGROUND

This document describes the hydrogeological investigation program conducted by Groundwater Exploration Services Pty Ltd in late 2011 and 2012 at the Vickery Mine Site. The program was commissioned by Whitehaven Coal Limited (Whitehaven) to gather hydrogeological and geological information, and to install groundwater monitoring bores.

The Vickery Mine Site is owned by Whitehaven and is located approximately 15 kilometres (km) south-east of Boggabri and 25 km north of Gunnedah in New South Wales (NSW) (**Figure 1.1**). Whitehaven also owns and/or manages the Tarrawonga and Rocglen Coal Mines which are currently operating and are located approximately 10 km to the north and 5 km east of the Vickery Mine Site, respectively (Figure 1). Whitehaven also continues to maintain the Canyon Mine Site (operations ceased in 2009) located to the immediate north of the Vickery Mine Site.

The Vickery Mine Site was most recently operated in the early 1990s and now consists of rehabilitated coal mining and overburden placement areas, which are currently under care and maintenance. Whitehaven is conducting exploration drilling, feasibility studies, and undertaking an environmental impact assessment for the recommencement of open cut mining operations at Vickery. The proposal is known as the Vickery Coal Project (the Project). The Project would involve the development of a 4.5 million tonne per annum (Mtpa) open cut coal mining operation with a mine life of approximately 30 years.

1.2 OVERVIEW OF THE GEOLOGY AND HYDROGEOLOGY OF THE PROJECT AREA

1.2.1 Geology

The Vickery Mine Site is located in the Gunnedah Basin, in the NSW Gunnedah Coalfield, which contains sedimentary rocks, including coal measures, of Permian and Triassic age. Regionally, there are two coal-bearing sequences in the Gunnedah Basin, namely:

- Early Permian Bellata Group (comprising the Maules Creek sub-basin and Mullaley sub-basin, separated by the Boggabri Ridge); and
- Late Permian Black Jack Group.

The Project coal resource is located within the Maules Creek sub-basin of the Early Permian Bellata Group. The target coal seams within the Maules Creek sub-basin are contained within the Maules Creek Formation. They dip towards the east and the south.

The targeted coal seams in the proposed Project open cut are divided into upper and lower groups. The upper group of seams includes:

- Gundawarra Seam;
- Kurrumbede and Welkeree Seams;
- Shannon Harbour Upper Seam;
- Shannon Harbour Lower Seam; and
- Stratford Seam.

The lower group of seams includes:

- Bluevale Upper and Lower Seams;
- Cranleigh Upper Seam; and
- Cranleigh Middle and Lower Seams.

Below the Maules Creek Formation are the Goonbri and Leard Formations, which are basal units of the Gunnedah Basin sedimentary sequence and unconformably overlie the Boggabri Volcanics.

The upper and mid slopes of the Project area generally comprise moderate relief, rounded ridges and hills which are composed of Permian-aged strata from the Maules Creek Formation. The broad valley and outflow plain areas in the lower slopes of the Project area and surrounding floodplains comprise predominantly Quaternary-aged undifferentiated colluvial and alluvial sediments. Minor undifferentiated volcanic and igneous rocks of younger age occur as isolated outcrops in the surrounding area.

The Quaternary-aged alluvial sediments comprise the (upper) Narrabri Formation and the (lower) Gunnedah Formation of the upper Namoi Valley (referred to herein as the Upper Namoi Alluvium).

1.2.2 Hydrogeology

Previous groundwater investigations and monitoring data indicate that the Project area supports two groundwater systems:

- ***Porous Rock Groundwater System*** - including the coal measures of the Maules Creek Formation; and
- ***Alluvial Groundwater System*** – associated with the low-lying flood plains and Upper Namoi Alluvium.

Recharge to the groundwater systems occurs from rainfall and runoff infiltration, lateral groundwater flow and some leakage from surface water sources (e.g. Namoi River). Groundwater levels are sustained by rainfall infiltration, however they are controlled by topography, geology and surface water levels in local drainages. Local groundwater tends to mound beneath hills, with ultimate discharge to distant drainages (via subsurface through-flow) and loss by evapotranspiration through rock outcrops and vegetation where the water table is near the ground surface (generally 2 metres [m] to 3 m below ground level). However, given the typical depth to water (10 to 14 m to the south and west of the Project area), evapotranspiration is considered to be an unlikely occurrence in the vicinity of the Project area and adjacent alluvium (Heritage Computing, 2012).

1.3 SCOPE OF WORK

The scope of work involved design and supervision of a hydrogeological investigation program which included the following components:

- Installation of three vibrating wire piezometers and five standpipes within the Maules Creek Formation within the proposed Project open cut extent.
- Drilling and geological logging of thirty four shallow investigation drillholes within the Upper Namoi Alluvium and weathered Maules Creek Formation strata within, and to the south of, the proposed Project open cut.
- Conversion of four of the above shallow investigation holes to standpipe bores.
- A pumping test at one of the drillholes to the south of the proposed open cut.

- Drilling and geological logging of a shallow investigation drillhole within the Upper Namoi Alluvium to the west of the Western Emplacement.
- Monitoring of groundwater levels from installed bores.
- Hydraulic testing and monitoring of the installed monitoring bores.
- Hydraulic testing of selected drill hole core from the Permian-aged Maules Creek Formation.

2 HYDROGEOLOGICAL INVESTIGATION PROGRAMME

2.1 MAULES CREEK FORMATION PIEZOMETERS

2.1.1 Maules Creek Formation Standpipes

Five new standpipes were installed in existing exploration drillholes in the Maules Creek Formation in December 2011. The locations of the standpipe piezometers are shown in **Figure 2.1**. All five were located within the proposed Project open cut. Each bore was backfilled to target depth and bentonite seals were placed below and above the targeted and screened test intervals. **Table 2.1** provides a summary of the installation details for each standpipe. Further details are provided in **Appendix A**, including the geological logs for the exploration holes and NSW Office of Water (NOW) test bore licences.

Table 2.1
Summary of the Maules Creek Formation Standpipes

Bore	Coordinates		Date Completed	Screened Interval	Aquifer Screened	NOW Licence Number
	Easting	Northing		(m bgl)		
VKY3034	232519	6593822	20/12/2011	118 - 136 (126 - 132)*	Shannon Harbour Seam	90BL256014
VKY3035	232703	6593356	20/12/2011	69 - 79 (72 - 75)*	Kurrumbede - Shannon Harbour Interburden	90BL256013
VKY3036	233120	6592921	21/12/2011	107 - 117 (114 - 111)*	Shannon Harbour - Stratford Interburden	90BL256015
VKY3042	232543	6592598	21/12/2011	134 - 158 (137 - 140/152 -155)*	Stratford Seam	90BL256016
VKY3043	233250	6590533	22/12/2011	225 - 245 (246 - 237)*	Bluevale - Cranleigh Interburden	90BL256011

* Screened interval: 118 - 136 (126 - 132) [Gravel Pack interval (Screen Interval)].

m bgl = metres below ground level.

2.1.2 Maules Creek Formation Vibrating Wire Piezometers

Three multi-level vibrating wire piezometers were installed in the Maules Creek Formation in February 2012. The vibrating wire piezometers were installed in existing exploration holes located within the proposed Project open cut. Each piezometer was installed with transducers targeting coal seams and interburden units to monitor groundwater pressures within the Maules Creek Formation coal measures. The piezometers were located in the Shannon Harbour, Stratford, Kurrumbede, Bluevale and Cranleigh coal seams and also within selected interburden units. **Table 2.2** provides a summary of the installation details for each of the multi-level vibrating wire piezometers. Further details are provided in **Appendix B**, including the geological logs for the original exploration holes and NOW test bore licences. The locations of the three new vibrating wire piezometers are shown in **Figure 2.1**.

Table 2.2
Summary of the Maules Creek Formation Vibrating Wire Piezometers

Bore	Coordinates		Date Completed	Screened Interval	Aquifer Screened	NOW Licence Number
	Easting	Northing		(m bgl)		
VKY3033	232366	6594263	19/02/2012	38.0	Kurrumbede Overburden	90BL256012
				51.0	Kurrumbede Seam	
				70.0	Kurrumbede - Shannon Harbour Interburden	
				90.0	Shannon Harbour Interburden	
				115.0	Stratford Upper Seam	
				140.0	Stratford - Bluevale Interburden	
				170.0	Bluevale - Cranleigh Interburden	
				190.0	Cranleigh Mid Seam	
VKY3041	233397	6591348	18/02/2012	38.0	TRA - GDW Interburden	90BL256010
				51.0	TRA - GDW Interburden	
				70.0	GDW-Kurrumbede Interburden	
				95.0	Kurrumbede - Shannon Harbour Interburden	
				115.0	Kurrumbede - Shannon Harbour Interburden	
				140.0	Shannon Harbour Interburden	
				165.0	Shannon Harbour Interburden	
				190.0	Stratford - Bluevale Interburden.	
VKY3053	230098	6593816	12/02/2012	30.0	Kurrumbede - Shannon Harbour Interburden	90BL256009
				50.0	Stratford - Bluevale Interburden	
				68.0	Bluevale Mid Seam	
				75.0	Bluevale - Cranleigh Interburden	
				89.0	Volcanic Basement	

2.2 UPPER NAMOI ALLUVIUM INVESTIGATION HOLES

Thirty three shallow exploration holes were drilled along four north-south trending transects and one east-west trending transect during the period January to March 2012.

An additional hole was drilled on the southern end of Transect 2 in August 2012 and was used to conduct a pumping test (Section 2.7).

The holes were drilled into the Maules Creek Formation bedrock where possible. The depths of the drilled holes ranged from 13 to 42 m.

Temporary casing was installed in the holes and they were geophysically logged where possible prior to being cemented and rehabilitated in April 2012. Due to the method of drilling (air rotary/hammer), hole instabilities and caving meant that holes rapidly deteriorated and not all were geophysically logged to full depth.

The purpose of these investigation holes was to more accurately delineate the boundary between the weathered Permian-aged Maules Creek Formation (on the upper slopes) and the Quaternary-aged Upper Namoi Alluvium (further down the slope and onto the floodplain). The interpretation of the boundary was primarily based on the geological logs, geophysical logs, and recorded groundwater levels. Consideration was also given to the topography and location of the holes relative to the existing floodplain and adjoining slopes.

The location of the investigation holes and the interpreted boundary between the Maules Creek Formation and Upper Namoi Alluvium in the vicinity of the proposed Project open cut is shown on **Figure 2.2**.

Further detail of the Upper Namoi Alluvium boundary interpretation for each of the transects is provided below and in **Appendix C**, including the geological and geophysical logs.

2.2.1 Transect 1

Transect 1 is the most westerly transect line and closest to Blue Vale Road (**Figure 2.2**). Just to the north of Transect 1 at the corner of Shannon Harbour Road and Blue Vale Road, weathered Maules Creek Formation conglomerate outcrops and is clearly visible on the ground and in aerial photographs. This is the only area of in-situ rock outcrop in the vicinity of the five transects.

The topography along Transect 1 slopes gradually and uniformly from north to south between TR23 and TR5. The southern end of Transect 1 (i.e. between TR5 and TR3) is almost flat and is located on the floodplain.

Figure 2.3 is the interpreted cross section along Transect 1 based on the seven investigation holes.

Drilling in the northern part of Transect 1 (i.e. TR23 and TR24) revealed shallow (i.e. less than 3 m deep) unsaturated conglomerate of the Maules Creek Formation. The conglomerate transitioned from weathered to fresh rock within the upper 5 m at holes TR23, TR24 and TR25. South of TR25, the depth to the conglomerate basement rock progressively increased (i.e. up to approximately 20 m in hole TR3), which indicates that beneath the floodplain is a deepening channel structure which has been filled by alluvial materials of the Upper Namoi Alluvium.

The groundwater levels along Transect 1 were consistently measured at approximately 246 m Australian Height Datum (AHD).

A general trend of increased angularity in gravel particles and overall reduction in the amount of clay was observed north of TR5 (i.e. on the lower slopes). The gravels north of TR5 on the sloping topography were interpreted to be more colluvial in nature, when compared with the alluvial gravels on the floodplain south of TR5.

In the area between holes TR3 and TR5 the first 8 to 20 m of material beneath the surface consists of interbedded alluvium and colluvium. The interpreted boundary of the Upper Namoi Alluvium has been conservatively assumed to be at TR5, which represents the up-slope and unsaturated edge of this zone of interbedded alluvium and colluvium (refer to **Figure 2.2** and **Figure 2.3**).

Figure 2.4 shows chip tray photographs and composite graphical logs which include density trace of selected investigation holes along Transect 1. Highlighted is the apparent relative density showing a transition zone which was typical of the profile seen in most holes. The transition was assessed to be due to in-situ weathered conglomerates and sandstone typical of the local area.

2.2.2 Transect 2

Transect 2 shows very similar features to Transect 1, although the distinction between the floodplain and lower slope is less clear cut and it occurs slightly further north (i.e. approximately TR12). As per Transect 1, the basement conglomerate of the Maules Creek Formation is located relatively close to the surface and generally follows the topography between holes TR20 and TR13.

The recorded groundwater levels along Transect 2 were the same as Transect 1 (i.e. approximately 246 m AHD).

The zone of interbedded alluvium and colluvium occurs between drill holes TR7 and TR12.

Figure 2.5 is the interpreted cross section along Transect 2 based on the six investigation holes.

Figure 2.6 shows chip tray photographs and composite graphical logs which include density trace of selected investigation holes along Transect 2. The transition zone showing a relative density change is again highlighted.

2.2.3 Transect 3

Transect 3 is located near the eastern edge of the proposed Project open cut (**Figure 2.1**).

Figure 2.7 is the interpreted cross section along Transect 3 based on the nine investigation holes.

The topography along Transect 3 slopes gradually and uniformly from north to south (i.e. between TR22 and TR8). Unlike Transect 1 (and to a lesser extent Transect 2) there is no obvious flat floodplain.

The characteristics of the strata intersected by the drill holes on Transect 3 were very similar to Transects 1 and 2. The basement conglomerate of the Maules Creek Formation generally follows the topography, and occurs at a depth of 5 to 10 m below the surface between holes TR22 and TR11. Further to the south, the depth to the basement strata increases notably to approximately 20 m at TR8.

The zone of interbedded alluvium and colluvium occurs between drill holes TR8 and TR16.

Figure 2.8 shows chip tray photographs and composite graphical logs which include density trace of selected investigation holes along Transect 3.

2.2.4 Transect 4

Transect 4 is located west of the proposed Project open cut and to the south of the proposed Eastern Emplacement area (**Figure 2.1**).

Figure 2.9 is the interpreted cross section along Transect 3 based on the four investigation holes.

The topography along Transect 4 slopes gradually from north to south between TR31 and TR27. To the south of TR31, the topography is almost flat and is located on the floodplain.

Drilling in the northern part of Transect 4 (i.e. TR29 and TR27) showed relatively shallow (i.e. less than 5 m deep) unsaturated conglomerate and sandstone of the Maules Creek Formation. The conglomerate transitioned from weathered to fresh rock within the upper 8 to 10 m in holes TR27, TR28 and TR29. South of TR29, the depth to the conglomerate basement rock progressively increased (i.e. up to approximately 20 m in hole TR30).

The zone of interbedded alluvium and colluvium occurs between drill holes TR30 and TR29.

Figure 2.10 shows chip tray photographs and composite graphical logs which include density trace of selected investigation holes along Transect 4. It shows that there are less unconsolidated present with Maules Creek Formation sandstone and conglomerate evident at shallow depths. The deepening channel structure associated with the floodplain appears in the southern margin of the transect.

2.2.5 Transect 5

Transect 5 runs perpendicular to transects 1 to 4 (i.e. east to west orientation) and is located to the southwest of the proposed Project open cut (**Figure 2.2**).

Figure 2.11 is the interpreted cross section along Transect 5 based on the five investigation holes. Drilling along this transect revealed shallow colluvial soils and weathered sandstone of the Maules Creek Formation up to a depth of 10 m from the surface. No alluvial material associated with the Upper Namoi Alluvium was intersected. Water level monitored in TR35 indicates that standing water level (approximately 247 m AHD) is well below the base of the soil and weathered Maules Creek Formation sandstone.

Figure 2.12 shows chip tray photographs and composite graphical logs which include density trace of selected investigation holes along Transect 5. It shows that the transition in density of the shallow stratigraphic profile is not as clear as seen in other transect lines and that the top of weathered Maules Creek Formation strata is undulating. The density of investigation bores is not great enough to refine the undulating surface but does indicate that there are likely drainage/erosion palaeochannels in this area.

2.3 UPPER NAMOI ALLUVIUM/WEATHERED PERMIAN STRATA PIEZOMETERS

Standpipe piezometers were installed in four of the new investigation holes that were drilled in the vicinity of the southern edge of the proposed Project open cut near the boundary of the Upper Namoi Alluvium and the weathered Permian-aged Maules Creek Formation strata.

The piezometers were cased with 50 millimetre (mm) PVC including a 3 m section of factory-slotted screen. The screens were designed to be placed in the lowermost section of the Upper Namoi Alluvium or weathered Permian-aged Maules Creek Formation strata.

The location of the standpipe piezometers are shown on **Figure 2.1. Table 2.3** provides a summary of the installation details for the standpipe piezometers. Further details of the piezometer installation are included in **Appendix C**, including geological logs, geophysical logs and NOW test bore licences.

Table 2.3
Upper Namoi Alluvium Weathered Permian Strata Piezometers

Bore	Coordinates		Date Completed	Screened Interval	Aquifer Screened	NOW Licence Number
	Easting	Northing		(m bgl)		
TR7	232931	6589763	16/02/2012	10 - 18 (15 - 18)	Weathered Conglomerate	90BL256017
TR18	233435	6590015	12/01/2012	12 - 22 (19 - 22)	Weathered Conglomerate	90BL256018
TR26	232438	6590095	13/02/2012	10 - 18 (15 - 18)	Weathered Conglomerate	90BL256019
TR35	233848	6590279	13/02/2012	19 - 24 (21 - 24)	Weathered Permian Sandstone	90BL256020

Screened interval : 10 - 18 (15 - 18) [Gravel Pack interval (Screen Interval)].

2.4 GROUNDWATER MONITORING

2.4.1 Groundwater levels

Groundwater levels are presently recorded daily in all vibrating wire and standpipe bores installed within Maules Creek Formation strata. Within the Upper Namoi Alluvium investigation area, two of the four installed standpipes have downhole loggers monitoring at daily intervals. A summary of the current groundwater monitoring piezometers and groundwater levels recorded in May 2012 are presented in **Table 2.4**.

Hydrographs and hydrostatic head profiles for multi seam vibrating wire piezometers and hydrographs for standpipes piezometers are provide in **Figures 2.13** to **2.15**.

The hydrostatic head profile is used to gauge the quality of data sets and to explore the head gradients which may be apparent. Generally, under pre-mining conditions, pressures plot close to the 45° “hydrostatic line”, while a slight shift away from the line reveals that there is a head gradient throughout the profile. This may not be the case in areas already affected by mining stresses, in elevated terrain where perched systems prevail or where natural artesian conditions exist.

Figure 2.13 shows hydrographs and hydrostatic head profiles for VKY3033 which has eight vibrating wire transducers installed. The hydrostatic profile shows a reasonable linear trend. The increased levels in the upper most piezometer indicate some perching in the weathered strata. Hydrographs for various intervals are stable except for the transducer at 170 m depth which shows some variation since installation.

Figure 2.14 shows hydrographs and hydrostatic head profiles for VKY3041 which also has eight vibrating wire transducers installed. Hydrostatic profile is reasonable uniform however groundwater pressures are slightly lower than the 45 degree hydrostatic line. Hydrographs indicate relatively stable groundwater levels although the temporal groundwater pressures within the lower piezometers show some irregularity. No explanation is evident for the variations seen.

Table 2.4
Current Groundwater Monitoring Piezometers

Bore	Coordinates		Ground Level	Drilled Depth	Screened Interval	Aquifer Screened	Current Status	Water Level May 2012	
	Easting	Northing	(m AHD)	(m bgl)	(m bgl)			m bgl	m AHD
VKY3034	232519	6593822	287.36	200	136 - 118 (126 - 132)	Shannon Harbour Seam	Standpipe Piezometer	42.51	244.85
VKY3035	232703	6593356	290.81	214	69 - 79 (72 - 75)	Kurrumbede - Shannon Harbour Interburden	Standpipe Piezometer	44.29	246.52
VKY3036	233120	6592921	297.89	225	117 – 107 (114 - 111)	Shannon Harbour - Stratford Interburden	Standpipe Piezometer	48.17	249.72
VKY3042	232543	6592598	292.02	219.2	134 - 158 (137 -140/152 -155)	Stratford Seam	Standpipe Piezometer	42.67	249.35
VKY3043	233250	6590533	263.6	245	245 - 225 (246 - 237)	Bluevale - Cranleigh Interburden	Standpipe Piezometer	16.53	247.07
VKY3033	232366	6594263	285.57	258	38.0	Kurrumbede Overburden	Vibrating Wire Piezometer	29.46	256.11
					51.0	Kurrumbede Seam	Vibrating Wire Piezometer	36.37	249.20
					70.0	Kurrumbede - Stratford Interburden	Vibrating Wire Piezometer	39.98	245.59
					90.0	Stratford Interburden	Vibrating Wire Piezometer	43.78	241.79
					115.0	Stratford Upper Seam	Vibrating Wire Piezometer	45.42	240.15
					140.0	Stratford - Bluevale Interburden	Vibrating Wire Piezometer	47.72	237.85
					170.0	Bluevale - Cranleigh Interburden	Vibrating Wire Piezometer	48.05	237.52
					190.0	Cranleigh Mid Seam	Vibrating Wire Piezometer	49.67	235.90

Table 2.4
Current Groundwater Monitoring Piezometers (continued)

Bore	Coordinates		Ground Level	Drilled Depth	Screened Interval	Aquifer Screened	Current Status	Water Level May 2012	
	Easting	Northing	(m AHD)	(m bgl)	(m bgl)			m bgl	m AHD
VKY3041	233397	6591348	291.91	338	38.0	TRA - GDW Interburden	Vibrating Wire Piezometer	36.02	255.89
					51.0	TRA - GDW Interburden	Vibrating Wire Piezometer	34.57	257.34
					70.0	GDW-Kurrumbede Interburden	Vibrating Wire Piezometer	38.14	253.77
					95.0	Kurrumbede - Shannon Harbour Interburden	Vibrating Wire Piezometer	42.48	249.43
					115.0	Kurrumbede - Shannon Harbour Interburden	Vibrating Wire Piezometer	43.56	248.35
					140.0	Shannon Harbour Interburden	Vibrating Wire Piezometer	47.32	244.59
					165.0	Shannon Harbour Interburden	Vibrating Wire Piezometer	41.29	250.62
					190.0	Stratford - Bluevale Interburden	Vibrating Wire Piezometer	39.71	252.2
VKY3053	230098	6593816	264.57	90	30.0	Kurrumbede - Shannon Harbour Interburden	Vibrating Wire Piezometer	15.15	249.42
					50.0	Stratford - Bluevale Interburden	Vibrating Wire Piezometer	18.60	245.97
					68.0	Bluevale Mid Seam	Vibrating Wire Piezometer	18.57	2456.00
					75.0	Bluevale - Cranleigh Interburden	Vibrating Wire Piezometer	19.07	245.50
					89.0	Volcanic Basement	Vibrating Wire Piezometer	41.18	223.39
TR7	232931	6589763	255.17	19	15 - 18	Weathered Conglomerate	Standpipe Piezometer	9.72	245.45
TR18	233435	6590015	239.89	23	19 - 22	Weathered Conglomerate	Standpipe Piezometer	12.98	245.91
TR26	232438	6590095	258.18	19	15 - 18	Weathered Conglomerate	Standpipe Piezometer	12.41	245.77
TR35	233848	6590279	264.59	25	21 - 24	Weathered Permian Sandstone	Standpipe Piezometer	18.25	246.34

Figure 2.15 shows hydrographs and hydrostatic head profiles for VKY3033 which has five vibrating wire transducers installed. The upper 4 transducers are installed within the Maules Creek Formation coal measures while the bottom transducer is installed within the basement volcanics. The hydrostatic profile shows coal measure stratigraphy correlate well with a slight perching in the weathered profile. However, the pressure indicated in the basement is significantly lower than that within the overlying coal measures. This appears unusual and may indicate equipment failure.

Figure 2.16 shows hydrographs for all recently installed standpipe piezometers and includes TR7 and TR18 which are screened within weathered Maules Creek Formation conglomerate. Pressures are stable except for VKY3035. The rising water level is due to recovery of the bore following purging undertaken for groundwater quality sampling.

Groundwater levels in the southern end of the investigation area which focused on delineating the relationship between Maules Creek Formation conglomerate/alluvium/colluvium are approximately 10 m below ground level in the northern most extend of the floodplain. **Figures 2.17** show saturated thickness of the interpreted alluvium and highly weathered Maules Creek Formation conglomerate/ sandstones. That is the difference between the interpreted base of alluvium and standing groundwater level contours. **Figures 2.18** show saturated thickness of the interpreted highly weathered Maules Creek Formation conglomerate/sandstones. This figure indicates that there is an embayment of alluvium and weathered basement strata to the north in the vicinity of Transect 3.

2.4.2 Groundwater Quality

Water quality data obtained from newly installed piezometers is summarised in **Table 2.5** and **Table 2.6.** Where groundwater samples were taken, each piezometer was purged in accordance with AS/NZS 5667 (Standards Australia, 1998) and water samples were collected for field analysis of pH and electrical conductivity (EC), and for laboratory testing of a comprehensive suite of analytes which includes:

- pH, electrical conductivity (EC) and total dissolved solids (TDS);
- major cations and anions; and
- dissolved metals (As, B, Cd, Cr, Cu, Fe, Ni, Pb, Mn, Se, Zn, Hg).

The laboratory analysis was undertaken by ALS Environmental, a NATA-accredited laboratory based in Sydney.

Assessments of groundwater and surface quality can be useful in understanding conceptual hydrogeology, particularly in relation to EC and Piper diagram plots. Different strata horizons can demonstrate differing amounts of salinity, which tend to be low in areas of high recharge or connectivity with surface waters. Piper plots provide an assessment of the recharge-discharge processes, and also allow a comparison of water samples derived from different environments within the hydrological cycle. Recently-recharged water tends to plot closer to the left-hand apex of the diamond field in the Piper diagram, and waters further from the source of recharge closer to the right-hand side.

Figure 2.19 illustrates a piper diagram Piper Diagram based on the March 2012 results which shows that groundwater is generally of a Sodium Chloride type. There is a bicarbonate component seen in the Permian strata but this is noticeably absent from highly saline groundwater found within the shallow weathered Permian conglomerates at the southern end of CL316 suggesting that these water samples are generally not accepting recharge.

Table 2.5
Groundwater Quality – Major Ions

Bore (Registered Bore/Licence Number)	Lithology	Date	pH	EC (µS/cm)	TDS (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Cl (mg/L)	HCO_3 (mg/L)	SO_4 (mg/L)
VKY3034	MCF/Coal	16 Mar 2012	8.1	4040	2430	80	57	855	14	756	807	268
(90BL256014)		Aug 2012	7.9	3770	2703	79	58	800	12	668	826	260
VKY3035	MCF	16 Mar 2012	7.6	2980	1790	64	44	633	11	606	644	88
(90BL256013)		Aug 2012	7.8	3150	2203	55	43	645	10	596	742	112
VKY3036	MCF	16 Mar 2012	7.5	5080	2970	109	95	963	13	1180	706	235
(90BL256015)		Aug 2012	7.8	5350	3446	114	104	1020	13	1160	767	268
VKY3042	MCF/Coal	16 Mar 2012	7.8	4810	2810	126	125	829	17	1150	714	156
(90BL256016)		Aug 2012	7.7	5290	3536	171	210	803	22	1260	800	270
VKY3043	MCF	16 Mar 2012	8.1	2540	1550	12	4	663	7	331	909	8
(90BL256011)		Aug 2012	8.3	3030	2391	6	4	817	6	396	1160	2
TR7	MCF/Regolith	16 Mar 2012	7.3	15900	12500	305	411	2870	20	5250	703	512
(90BL256017)		Aug 2012	7.2	14700	9231	261	356	2600	18	4770	739	487
TR18	MCF/Regolith	16 Mar 2012	7.3	13500	8690	262	370	2490	16	4330	649	656
(90BL256018)		Aug 2012	7.3	13600	8293	232	359	2440	15	4380	722	145
TR26	MCF/Regolith	16 Mar 2012	7.4	4640	2720	105	104	829	10	1040	844	117
(90BL256019)		Aug 2012	7.5	4950	3297	108	115	926	10	1070	923	145
TR35	MCF/Regolith	16 Mar 2012	7.4	13200	9300	323	400	2190	21	4340	710	564
(90BL256020)		Aug 2012	7.3	15400	9940	322	468	2630	20	5020	742	738

MCF = Maules Creek Formation.

Table 2.6
Groundwater Quality – Metals

Registered Bore	Date	Alumin.	Arsenic	Cad.	Chrom.	Copper	Lead	Mang.	Nickel	Selen.	Silver	Zinc	Boron	Iron	Merc.	Nitrite as N	Nitrate as N	Nitrite + Nitrate as N
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
VKY3034	16/03/2012	<0.01	0.005	<0.0001	<0.005	0.004	<0.001	0.283	0.002	<0.01	<0.001	0.008	0.07	<0.05	<0.0001	0.02	0.05	0.07
VKY 3035	16/03/2012	<0.01	0.007	<0.0001	<0.005	0.005	0.006	0.744	0.004	<0.01	<0.001	0.046	<0.05	<0.05	<0.0001	<0.01	0.03	0.03
VKY 3036	16/03/2012	<0.01	0.002	<0.0001	<0.005	0.004	<0.001	0.058	0.004	<0.01	<0.001	0.023	0.06	<0.05	<0.0001	0.02	0.09	0.11
VKY 3042	16/03/2012	<0.01	0.001	<0.0001	<0.005	0.004	0.004	0.786	0.003	<0.01	<0.001	0.028	0.07	0.3	<0.0001	0.03	0.07	0.1
VKY 3043	16/03/2012	0.05	0.01	<0.0001	<0.005	0.002	<0.001	<0.001	0.001	<0.01	<0.001	<0.005	0.08	<0.05	<0.0001	<0.01	<0.01	<0.01
TR7	16/03/2012	<0.01	<0.001	<0.0001	<0.005	0.006	<0.001	0.724	0.004	<0.01	<0.001	0.006	0.06	<0.05	<0.0001	<0.01	0.09	0.09
TR18	16/03/2012	<0.01	<0.001	<0.0001	<0.005	0.006	<0.001	0.498	0.004	<0.01	<0.001	0.006	0.07	<0.05	0.0002	<0.01	0.09	0.09
TR26	16/03/2012	<0.01	<0.001	<0.0001	<0.005	0.003	<0.001	0.022	0.002	<0.01	<0.001	<0.005	0.07	<0.05	<0.0001	0.03	1.08	1.11
TR35	16/03/2012	<0.01	<0.001	<0.0001	<0.005	0.008	<0.001	0.484	0.005	<0.01	<0.001	0.016	0.06	<0.05	<0.0001	<0.01	<0.01	<0.01

In summary, the sampling round conducted in March 2012 resulted in the following findings:

- The water quality in the Permian-aged coal measures of the Maules Creek Formation range from 2,540 to 5,080 µS/cm.
- The water quality in weathered Permian conglomerates located in the southern margins of CL316 are more saline with EC's ranging from 4,640 to 15,900 µS/cm which suggests that there is little interconnection with groundwater from the Namoi River floodplain.
- Most samples are slightly alkaline, with pH values ranging from 7.2 to 8.
- No dissolved metals exceedances were observed.
- The low dissolved iron suggests the likely absence of pyrite in the coal and/or interburden strata, and in conjunction with the mostly alkaline pH, suggests that the mine waters are unlikely to have acid generating potential.

2.5 HYDRAULIC TESTING

Falling head slug tests were carried out during March 2012 on five (VKY3034, VKY3035, VKY3036, VKY3042 and VKY3043) of the standpipe piezometers installed within the Maules Creek Formation to obtain estimates hydraulic conductivity for selected stratigraphic horizons. The procedure involved adding a slug of water to each piezometer/bore and then recording water-level recovery back to a static level using a downhole pressure transducer.

Low flow constant rate and slug tests were conducted within the four (TR7, TR18, TR26 and TR35) standpipes screened within weathered Permian conglomerate underlying the alluvium and colluvium found within the Upper Namoi Alluvium transect drilling program on the southern margins of the proposed Project open cut.

The slug test data were analysed using the Bouwer-Rice method (Bouwer and Rice, 1976) for the tests on unconsolidated sediments (alluvium and colluvium), and the Hvorslev Method (Hvorslev, 1951) for tests on the hard rock units confined, which are suitable for providing 'near well' estimates of aquifer hydraulic conductivity (K).

The limitation in this method is that disturbance to the formation caused during drilling can result in elevated K values in the immediate vicinity of the borehole. Hence, where there was sufficient depth of water in the bore, a Constant Rate Test (CRT) was also conducted using a low capacity sampling pump. The drawdown and pumping rate data obtained from a CRT can provide the basis for estimating a broader range of hydraulic parameters than is achievable from falling head tests.

The constant rate test data were analysed using the Cooper-Jacob method (Cooper and Jacob, 1946) to determine a value of transmissivity, from which a value of average hydraulic conductivity (permeability) can be calculated. A summary of the derived hydraulic conductivity values is presented in **Table 2.7**. Data plots and solutions derived for each CRT test are included for reference in **Appendix D.**

Table 2.7
Summary of Results from Hydraulic Testing Program

Bore	Aquifer Screened	Screened Interval*	Test Date	Type of Test	Duration (min)	Pumping rate	Transmissivity, T	Hydraulic Conductivity, K	Comments
		(m bgl)				(m^3/day)	(m^2/day)	(m/day)	
VKY3034	SH seam	136 - 118 (126 - 132)	15/01/2012	Slug	-	-	2.90×10^{-3}	2.07×10^{-4}	
VKY3035	Ku-SH Interburden	69 - 79 (72 - 75)	15/01/2012	Slug	-	-	3.35×10^{-3}	3.35×10^{-4}	
VKY3036	SH – Str Interburden	117 - 107 (114 - 111)	15/01/2012	Slug	-	-	7.27×10^{-3}	7.27×10^{-4}	
VKY3042	Stratford Seam	134 - 158 (137 - 140/152 - 155)	15/01/2012	Slug	-	-	4.34×10^{-2}	1.81×10^{-4}	
VKY3043	Bluevale – Cranleigh Seam	245 - 225 (246 - 237)	23/01/2012	Slug	-	-	-	-	Seal Failure
TR7	Weathered Permian Conglomerate	10 - 18 (15 - 18)	19/01/2012	CRT (Recovery)	60	13	6.49	0.81	
TR18	Weathered Permian Conglomerate	12 - 22 (19 - 22)	16/01/2012	CRT (Recovery)	60	13	1.29	1.6×10^{-1}	
TR26	Weathered Permian Conglomerate	10 - 18 (15 - 18)	23/03/2012	Slug	-	-	3.28	4.1×10^{-1}	
TR35	Weathered Permian Sandstone	19 - 24 (21 - 24)	25/03/2012	Slug	-	-	3.0×10^{-1}	5.0×10^{-2}	

* Screened interval - 10 - 18 (15 - 18) [Gravel Pack interval (Screen Interval)].

2.6 LABORATORY CORE PERMEABILITY TESTING

Core from four drill holes were sampled to gain representative lithologies from major interburden units. Boreholes from which core samples were taken include VKY002, VKY006, VKY010, VKY017 and VKY020. The locations of these holes are shown in **Figure 2.1**. The core samples were laboratory tested to determine vertical and horizontal hydraulic conductivity. Testing for vertical permeability was taken perpendicular to the bedding planes, while horizontal permeability was taken parallel to the bedding planes. During the testing process one horizontal and two vertical samples failed under the test regime.

A summary of the core test results is provided in **Table 2.8**. These results can be regarded as lower limits for use in model calibration, as cores do not capture the bulk fractured characteristics of a formation.

The results of core permeability testing did not show a noticeable decrease in permeability with depth for the coal seams. Despite this, decreasing permeability with depth is expected with greater cover depth and/or remoteness from outcrop and near-surface effects of weathering. **Figure 2.20** shows depth and hydraulic conductivity results for horizontal and vertical tests respectively.

Table 2.8
Core Permeability Test Results

Horizontal Hydraulic Conductivity (m/d)					
Arithmetic Mean	**Harmonic Mean**	**Number of Samples**	**Max**	**Min**	**Formation**
4.9×10^{-6}	1.65×10^{-6}	11	2.22×10^{-5}	4.9×10^{-7}	Tralee - Stratford Seam - Interburden
1.76×10^{-5}	9.33×10^{-7}	3	3.09×10^{-5}	3.16×10^{-7}	Maules Creek Formation - Interburden
4.04×10^{-5}	4.19×10^{-7}	13	4.35×10^{-4}	6.36×10^{-8}	Bluevale - Cranleigh Seam - Interburden
2.41×10^{-6}	4.03×10^{-7}	2	4.28×10^{-5}	5.4×10^{-7}	Boggabri Volcanics
Vertical Hydraulic Conductivity (m/d)					
Arithmetic Mean	**Harmonic Mean**	**Number of Samples**	**Max**	**Min**	**Formation**
2.3×10^{-6}	5.82×10^{-7}	11	1.19×10^{-5}	2.01×10^{-7}	Tralee - Stratford Seam - Interburden
1.8×10^{-5}	7.21×10^{-6}	3	3.64×10^{-5}	3.12×10^{-6}	Maules Creek Formation - Interburden
4.72×10^{-6}	4.19×10^{-7}	12	2.76×10^{-5}	1.03×10^{-7}	Bluevale - Cranliegh Seam - Interburden
4.03×10^{-6}	4.03×10^{-7}	1	4.03×10^{-6}	4.03×10^{-6}	Boggabri Volcanics

2.7 PUMPING TEST

Groundwater pumping tests were planned in two areas in the vicinity of the Project in order to investigate the potential yield of the weathered materials at the boundary between the Upper Namoi Alluvium and Maules Creek Formation. The first area was located to the south of the proposed cut where Transects 1 to 5 were drilled (**Section 2.2**), and the second area was located to the west of the proposed Western Emplacement.

2.7.1 Bore Location and Construction

Groundwater monitoring bore licences (i.e. 90BL256079 and 90BL256080) were obtained from the NOW in August 2012 prior to installation of both bores. A copy of the licences is contained in **Appendix E**.

The bores were assigned unique identifying numbers (i.e. VKY3092 and VNW385) by Whitehaven. VKY3092 was drilled on 29 August 2012, and VNW385 was drilled on 30 August 2012. Both were drilled by Mannion Drilling using rotary air techniques. **Table 2.9** summarises the bore installation details.

Table 2.9
Installation Details

Bore	Easting (MGA)*	Northing (MGA)	Drilled Depth (m)	Screen (m bgl)	SWL** (m bgl)	NOW License Number
VNW385	228420	6594936	18	12-18	>18 (Dry)	90BL256079
VKY3092	232913	6589765	17	11 – 17	9.98	90BL256080

* MGA = Map Grid Australia.

** SWL = Standing Water Level.

Figure 2.2 shows the location of VKY3092 and VNW385.

VKY3092 was drilled through the colluvium soils, Upper Namoi Alluvium sediments and a short depth into the underlying weathered Permian-aged Maules Creek Formation sedimentary strata. Intersection with the weathered Permian strata was necessary to attain adequate available drawdown for the pump test. VKY3092 was constructed adjacent to standpipe piezometer TR7, which was also screened across alluvium/colluvium and weathered *insitu* Permian conglomerate.

VKY3092 was drilled at a diameter of 165 mm which accommodated 125 mm diameter Class 12 PVC. The production zone consisted of 125 mm diameter PVC, slotted across a 12 m interval at a depth of 12 to 17 m. The screen consisted of vertical slots of 2 mm aperture. The gravel pack extended from 2 to 17 m. A bentonite plug was included at depths of 0 – 2 m.

VNW385 was drilled to a depth of 18 m but did not intersect any groundwater. As a result a pumping test was not able to be undertaken at this location.

2.7.2 Determination of Aquifer Properties at VKY3092

Methods

The pump test was initially intended to be undertaken for a period of 24 hours and was designed to assess whether or not the aquifer could yield at a nominal rate of 5 litres per second (5 L/s). At the initial pump rate of approximately 2 L/s, the bore was drained in less than 10 minutes immediately indicating a yield of 5 L/s was not available.

The pump rate was then reduced and rate varied until a near stable drawdown was attained. The test was run for a total of 12 hours although an apparent valve clogging has effectively limited the test to 8 hours with an average discharge rate of 0.2 L/s (17.3 m^3/d). Variable flow in the early part of the pump test demonstrates the difficulty in attaining a static drawdown under very low yield conditions. Extracted groundwater was discharged to a HDPE lined sump which was installed for drilling purposes but not used.

The hydrogeological assessment utilises Constant Rate Test (CRT) data obtained from the VKY3092 pump test and observation data at TR7.

A suite of published solutions (Kruseman and de Ridder, 1991) have been used to analyse the CRT data from TA122. Automated curve matching was undertaken using Aqtesolv for Windows. During analysis of drawdown and recovery data, it became apparent the curve best fitted a confined or leaky confined model despite being from shallow levels. This could be explained to a degree but the intercalated nature of clays and clayey gravels within the lower part of the alluvium/colluvium sequence and the heavy clay cover in the upper 5 m of the profile. In addition, it has been noted that during excavation of shallow test pits in this area, groundwater seepage into the pits occurred from discrete horizons. It is thought that this is the case through the shallow stratigraphic profile comprised of intercalated alluvium and colluvium. Below this within the weathered Permian conglomerate is expected that groundwater flow is likely to be fracture driven rather than from the rock matrix.

The following methods were used in the analysis:

- Barker (1988) curve fitting method, which is derived for confined aquifers and used using drawdown and recovery for both the pumped bore VKY3092 and adjacent observation bore TR7.
- Hantush (1935) curve fitting method, which is derived for leaky confined aquifers.

Assumptions common to all of these methods are that discharge is constant and that the well where data collection takes place fully penetrates the aquifer.

Analysis

A summary of the hydraulic parameters derived from the CRT are summarised in **Table 2.10** and the calculations from which these are derived are presented in **Figures 2.21 to 2.23.**

Aquifer parameters of transmissivity (T) and aquifer Storage (S) is assessed from the level data within the pumping bore. Aquifer transmissivity is a function of permeability (K) multiplied by aquifer thickness (b) was derived from a combination of methods. An aquifer thickness of 10m was assumed as this was the maximum available drawdown available. These provided results that were in close agreement and indicated an aquifer transmissivity in the range of 0.15 to 0.4 m^2/d (K = 0.015 to 0.04 m/d). Aquifer storage properties from the distance drawdown method also suggest a confined nature with a specific Storage value of 1.3×10^{-7}.

Table 2.10
Summary of Aquifer Properties

Method	T (m^2/sec)	T (m^2/day)	K (m/d)
Barker (Confined)	4.4×10^{-6}	0.38	0.038
Hantush with Aquitard Storage (Leaky Confined)	1.1×10^{-6}	0.10	0.010
Barker (Distance Drawdown TR7)	2.2×10^{-6}	0.19	0.019

Figure 2.21: Curve Matching Solution (Barker Confined)

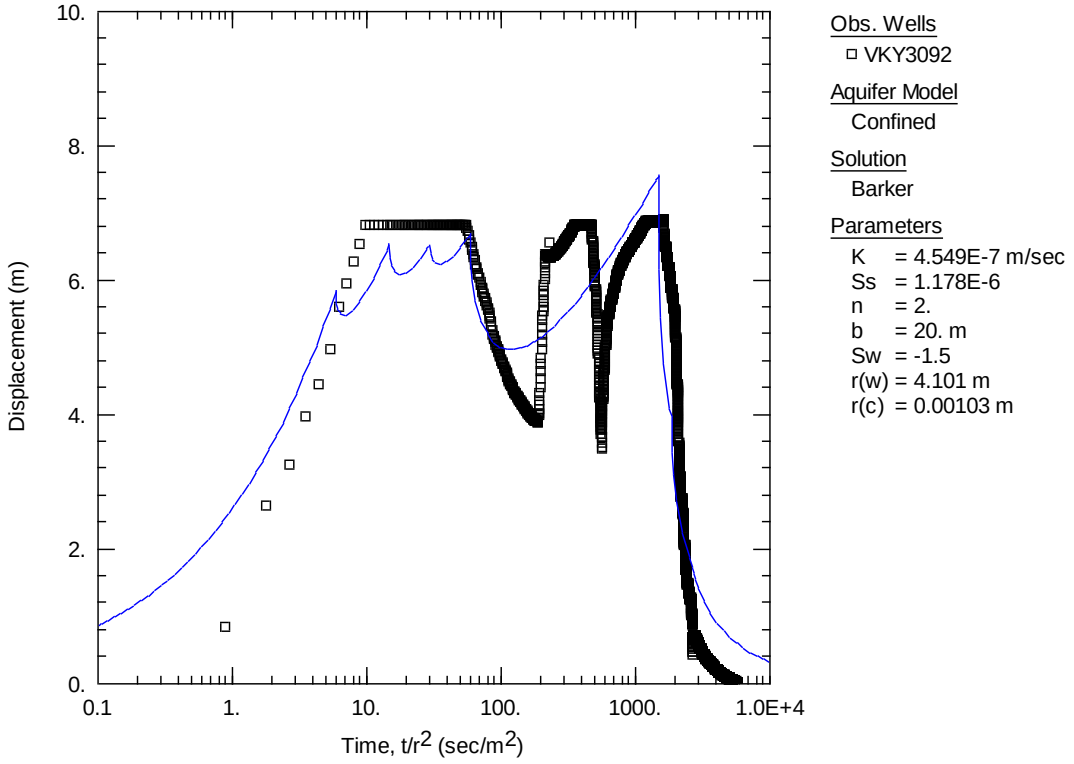


Figure 2.22: Curve Matching Solution (Hantush Leaky))

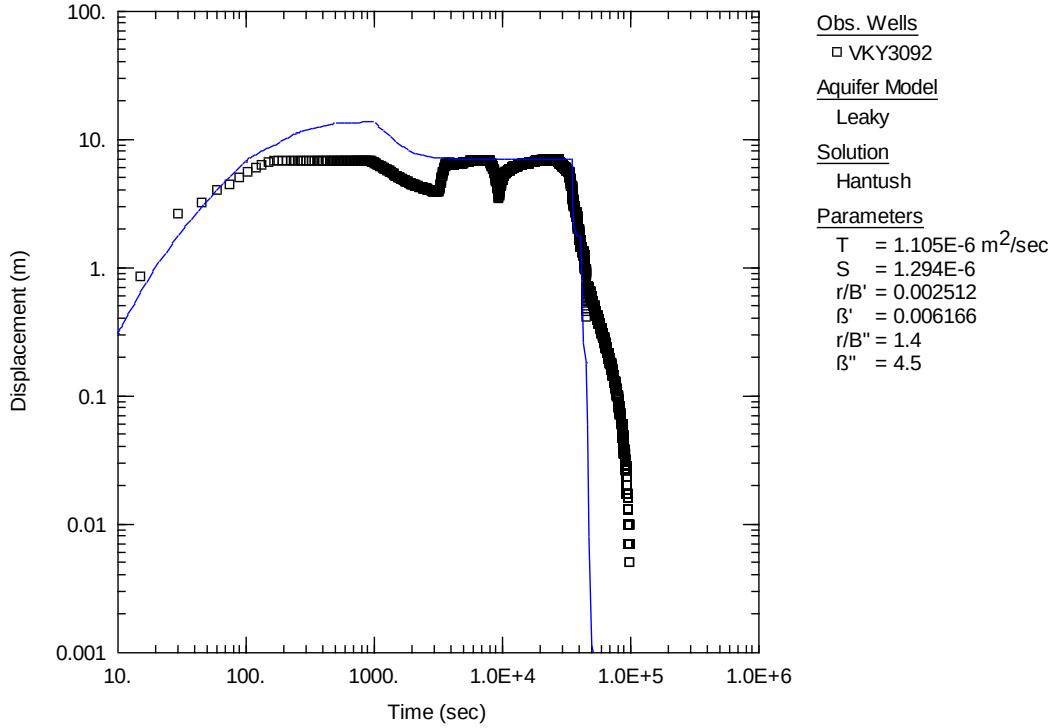
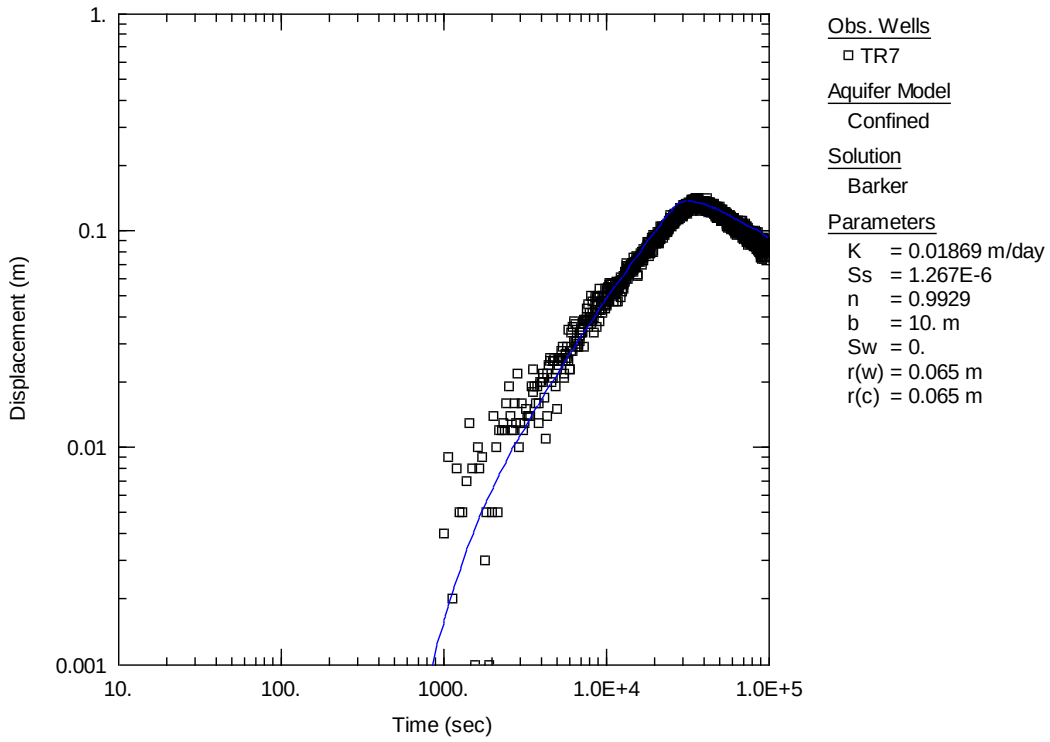


Figure 2.23: Curve Matching Solution (Distance Drawdown TR7 Confined Barker)



Groundwater Quality

Water quality samples were obtained from VKY3092 during the test at periods 1 hour after the start of the pump test, midway (6 hours) and at the end (12 hours) of the pump test. Field water quality data including pH and EC is summarised in **Table 2.11.** It shows that groundwater extracted has a very high level of salinity. Groundwater samples were taken in accordance with AS/NZS 5667 (Standards Australia, 1998) and water samples were sent for laboratory testing of a comprehensive suite of analytes which included:

- pH, EC and TDS;
- major cations and anions; and
- dissolved metals (As, B, Cd, Cr, Cu, Fe, Ni, Pb, Mn, Se, Zn, Hg).

Table 2.11
Summary of Field Water Quality Testing

Time (hr)	pH	EC (µS/cm)	Lab sample ID
1	7.65	18600	TA122A
6	7.67	18600	TA122B
12	7.86	17300	TA122C

The laboratory analysis was undertaken by ALS Environmental, a NATA-accredited laboratory based in Sydney and results are contained in **Appendix F**.

Sustainable Bore Yield

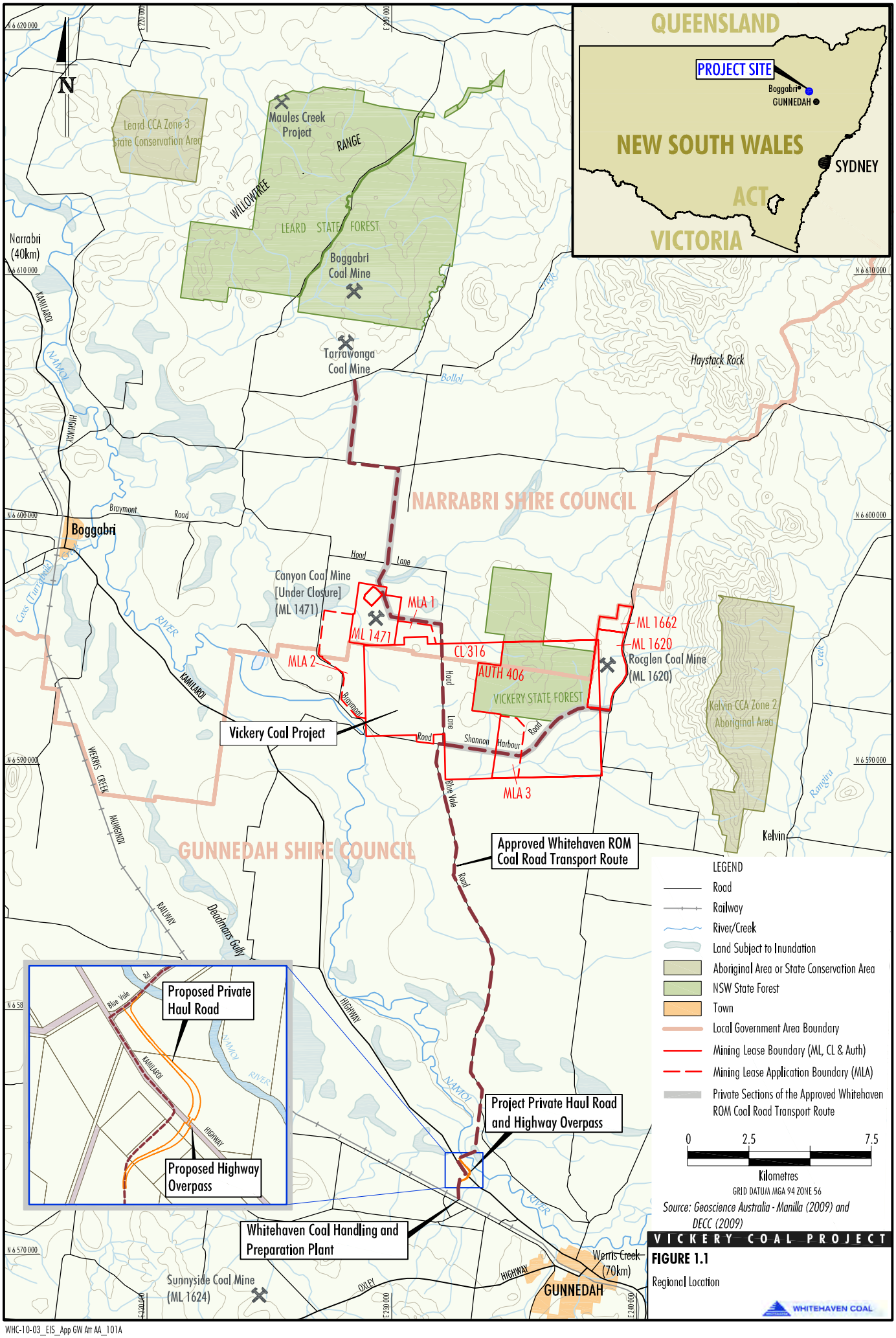
The results show that the alluvium/colluvium contained in the area of flood plains to the south of the proposed Vickery open cut has very limited potential yield and that the bore tested (VKY3092) is not be able to sustain a pumping rate of above 0.25 L/s over the long term. Pumping at this rate resulted drawdown of approximately 8 m over the duration of the pump test. In addition, the groundwater levels did not reach equilibrium at the tested rate, and therefore pumping for extended periods of time may lead to drawdowns approaching maximum available drawdown.

To assess the sustainable yield, the maximum transmissivity value from the various analysis methods used above (T=0.4 m^2/day)) was applied to the Theis Analytical solution for distance drawdown. **Table 2.12** shows drawdown rates for pumping at the low rates of 2.5 and 5 m^3/day (0.06 and 0.12 L/s) over periods of 1 month, 1 year and 10 years. Maximum available drawdown for this bore is approximately 10 m. Longer term drawdown response suggest that the maximum sustainable yield for VKY3092 is in the order rates at less than 2.5 m^3/day.

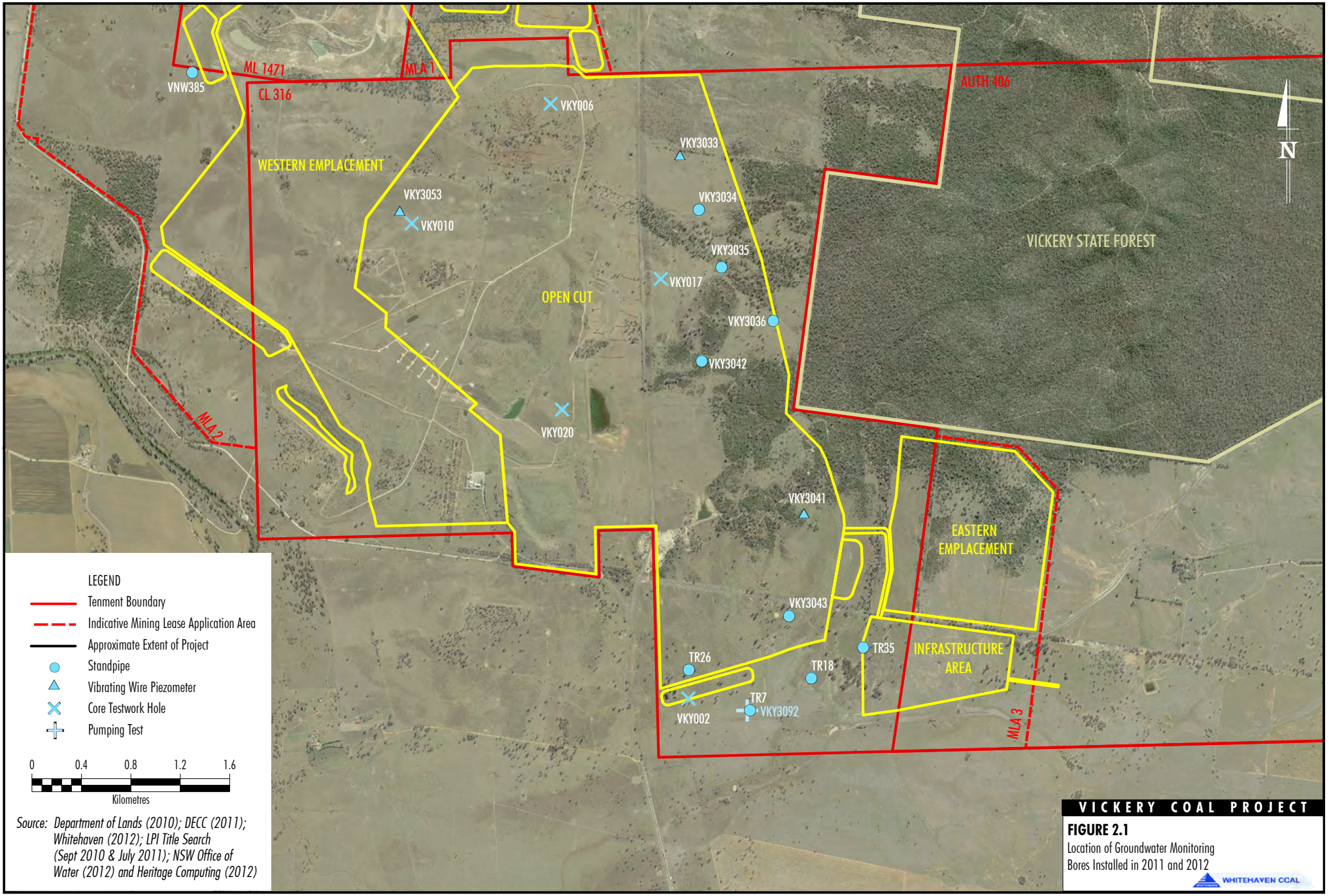
Table 2.12
Predicted Drawdown for Varying Pump Rate and Duration

Pump Rate (m^3/day)	Time (days)	Drawdown (m)
2.5	30	10.5
2.5	365	11.8
2.5	3650	12.9
5	30	20.9
5	365	23.5
5	3650	25.9

FIGURES



WHC-10-03_EIS_App GW Att AA_101A



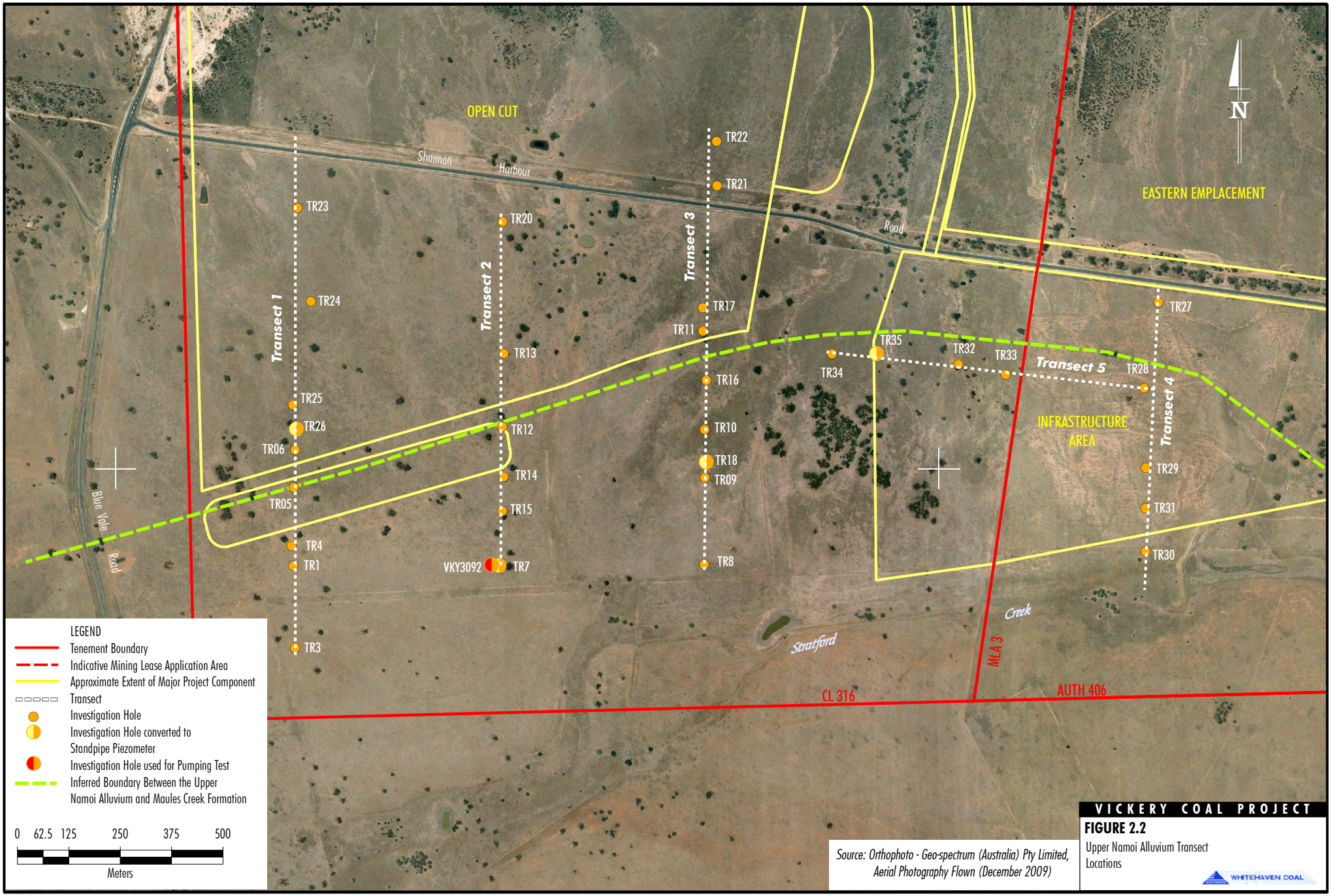
Source: Department of Lands (2010); DECC (2011); Whitehaven (2012); LPI Title Search (Sept 2010 & July 2011); NSW Office of Water (2012) and Heritage Computing (2012)

VICKERY COAL PROJECT

FIGURE 2.1

Location of Groundwater Monitoring Bores Installed in 2011 and 2012

WHITEHAVEN COAL



WHC-10-03 EIS App GW AttAA_202A

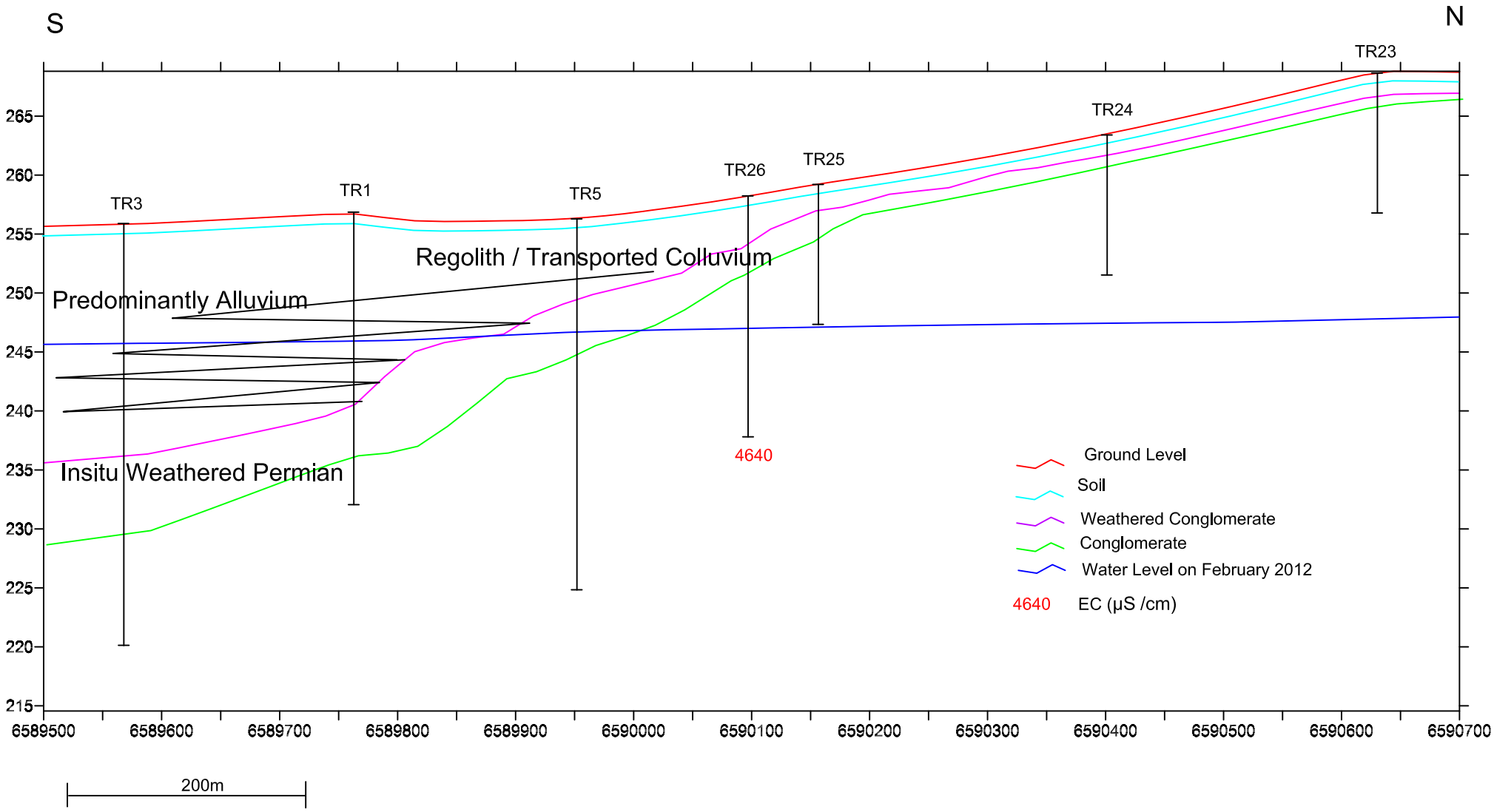
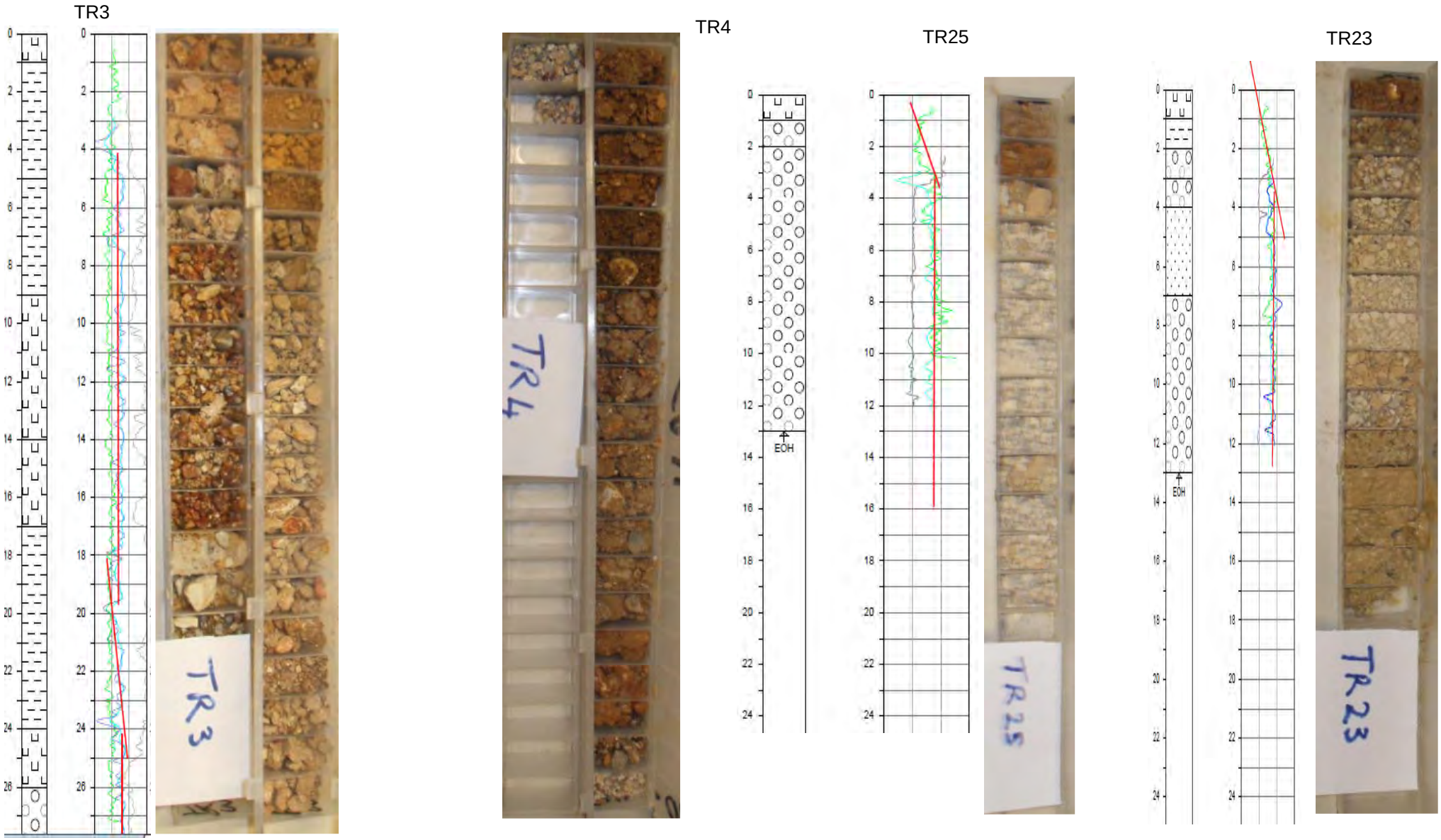


Figure 2.3 Cross-section at Transect 1



Date	**20/02/2012**	Scale	**Whitehaven Coal Pty Ltd**
Initials	**AF**	Project	
Drawing Number		Revision **A**	**Transect 3 Gracphic Logs**
			Figure 2.4

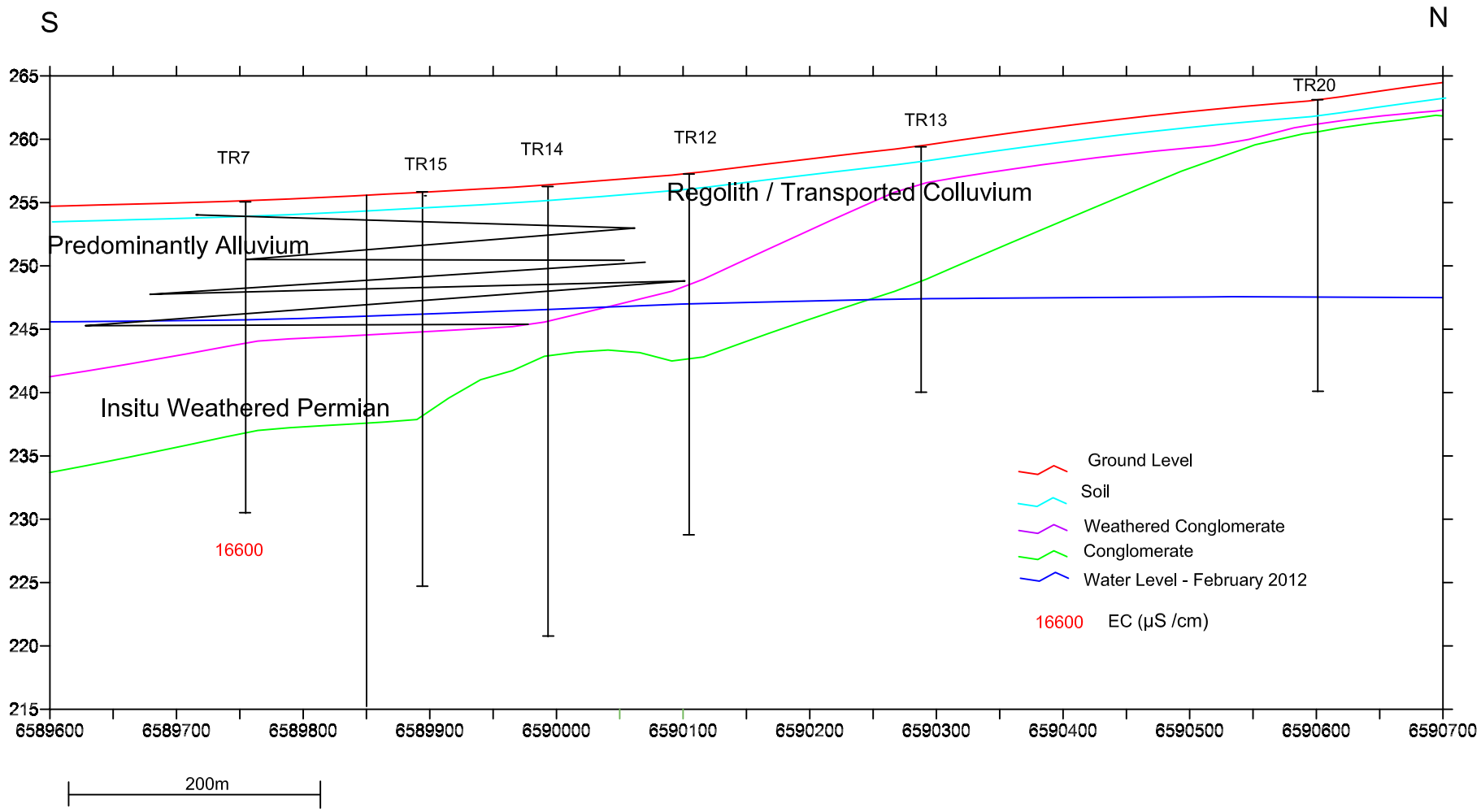
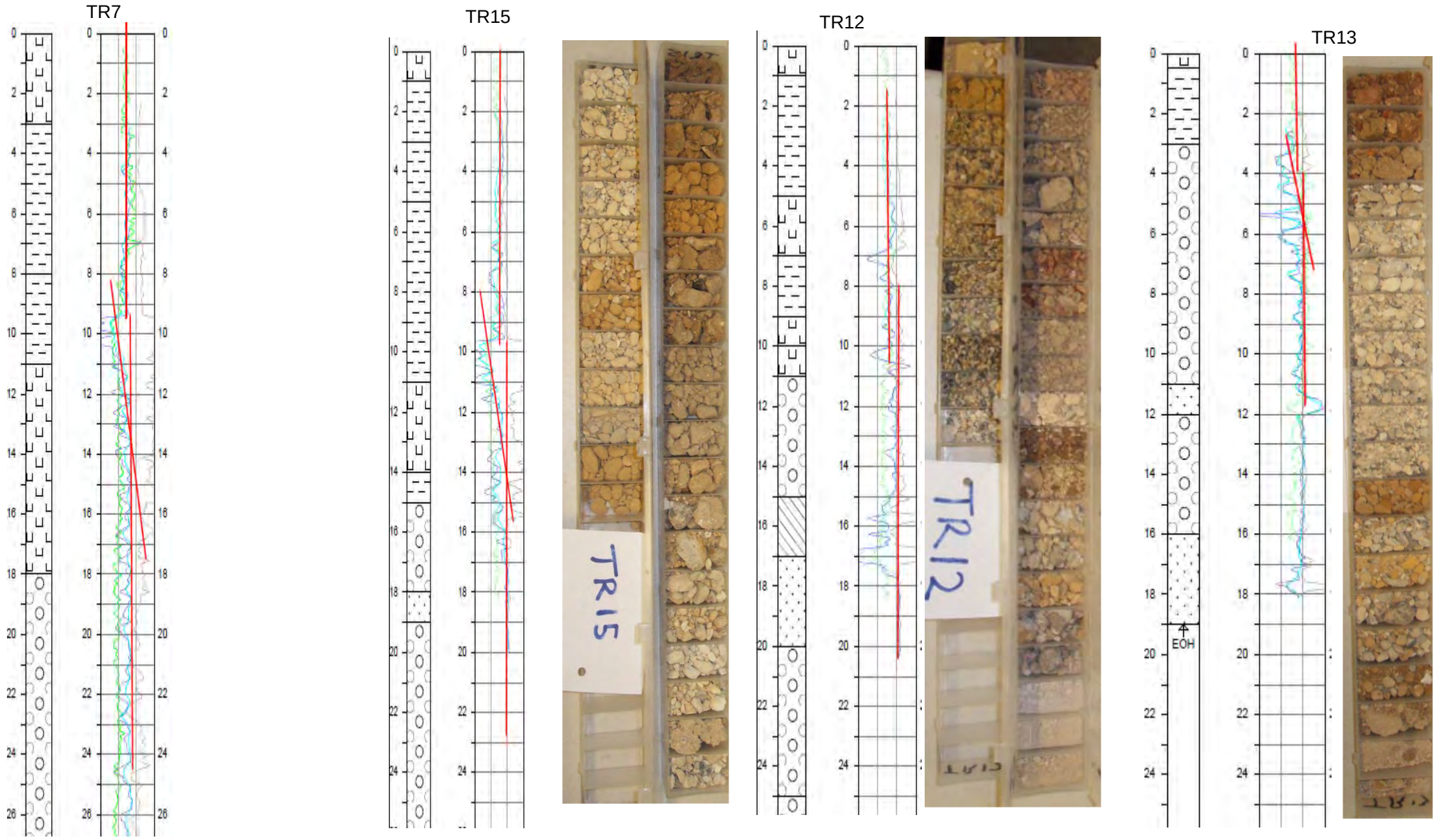


Figure 2.5 Cross-section at Transect 2



Date	**20/02/2012**	Scale	**Whitehaven Coal Pty Ltd**
Initials	**AF**	Project	
Drawing Number		Revision **A**	**Transect 2 Gracphic Logs**
			Figure 2.6

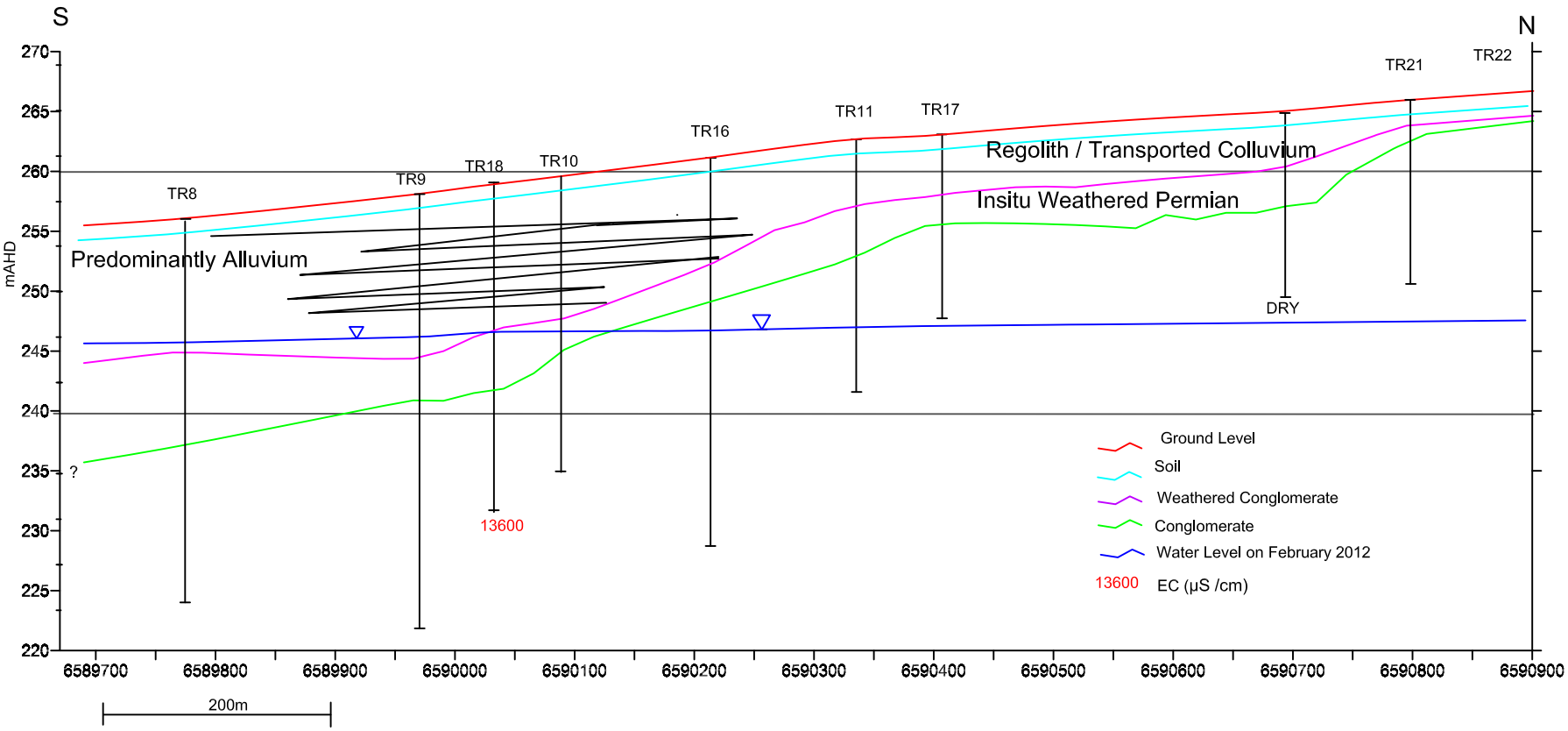


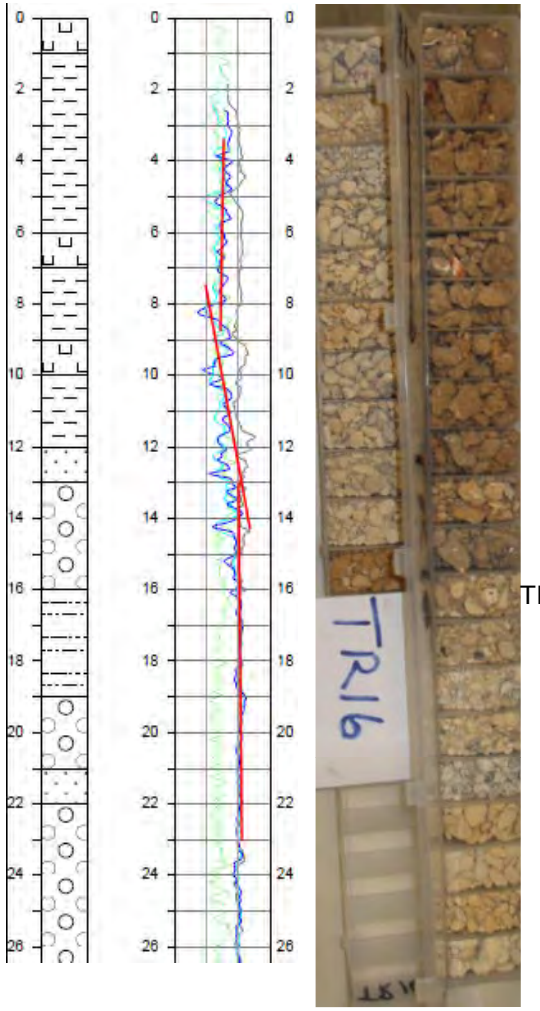
Figure 2.7 Cross-section at Transect 3

TR18

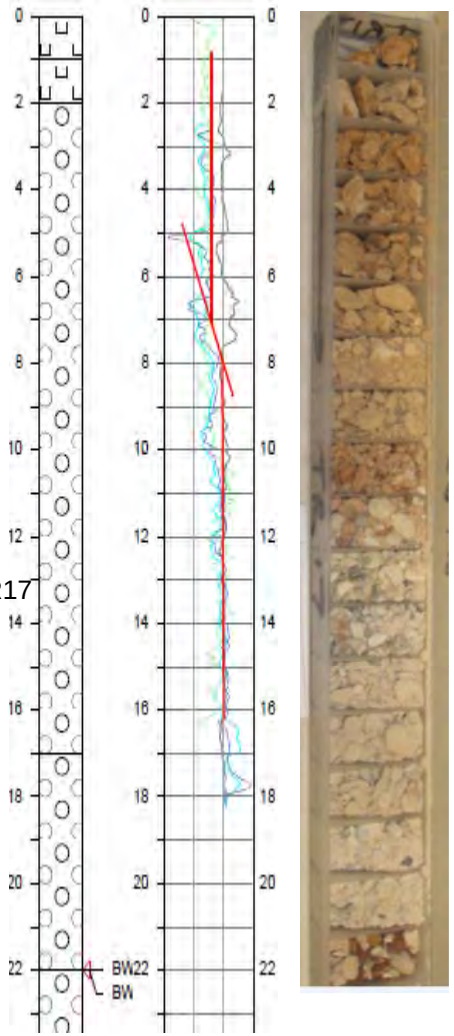
TR16

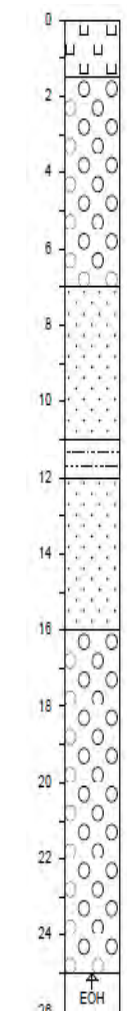
TR17

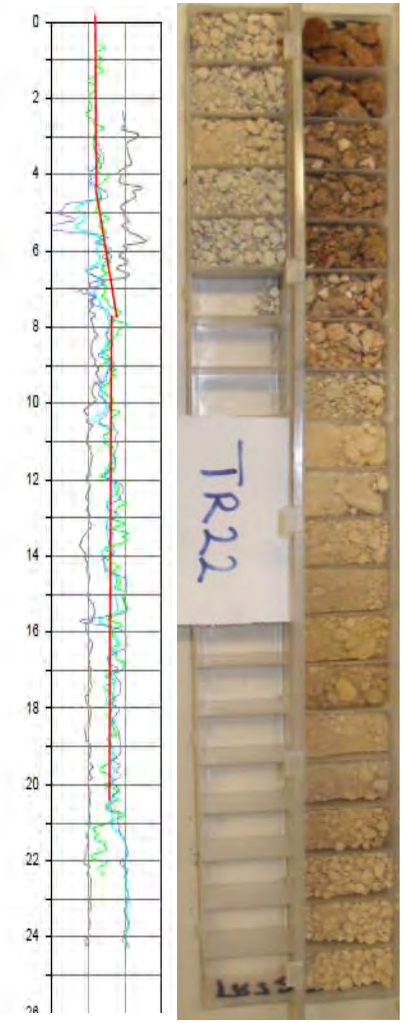
TR22



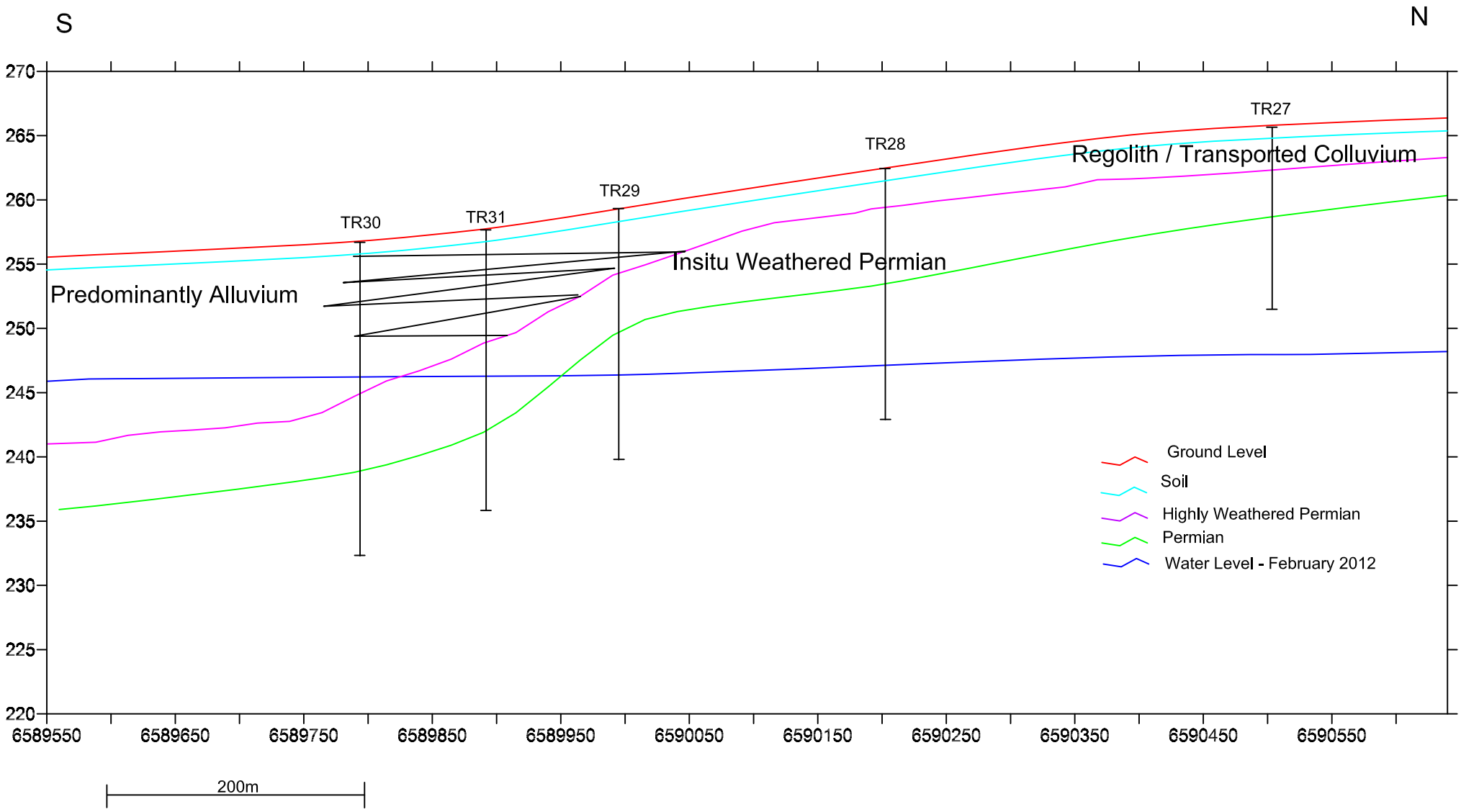
TR17



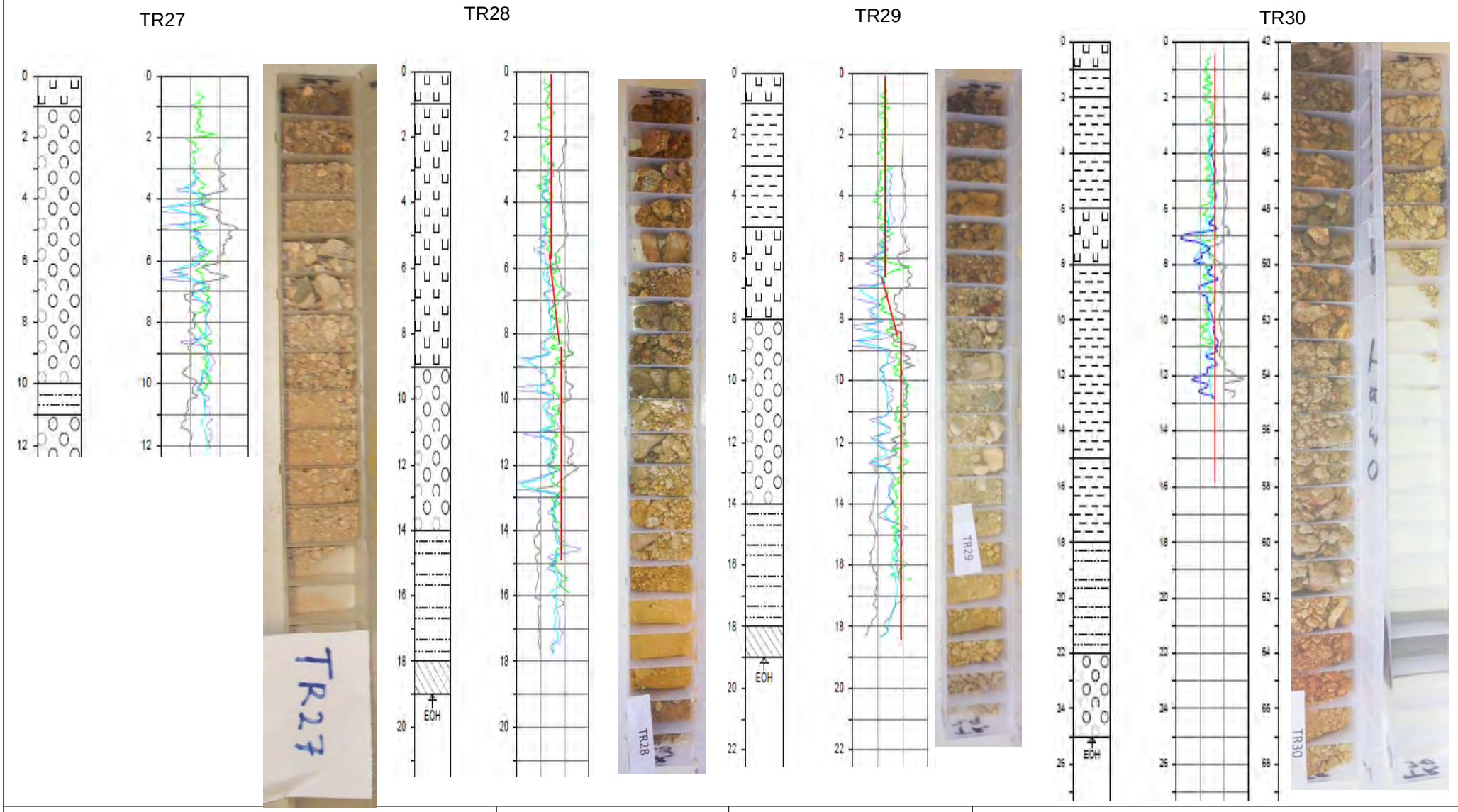




Date	**20/02/2012**	Scale	**Whitehaven Coal Pty Ltd**
Initials	**AF**	Project	
Drawing Number		Revision **A**	**Transect 3 Gracphic Logs**
			Figure 2.8



Fifure 2.9 Cross-section at Transect 4



Date	**20/02/2012**	Scale	**Whitehaven Coal Pty Ltd**
Initials	**AF**	Project	
Drawing Number		Revision **A**	**Transect 4 Gracphic Logs**
			Figure 2.10

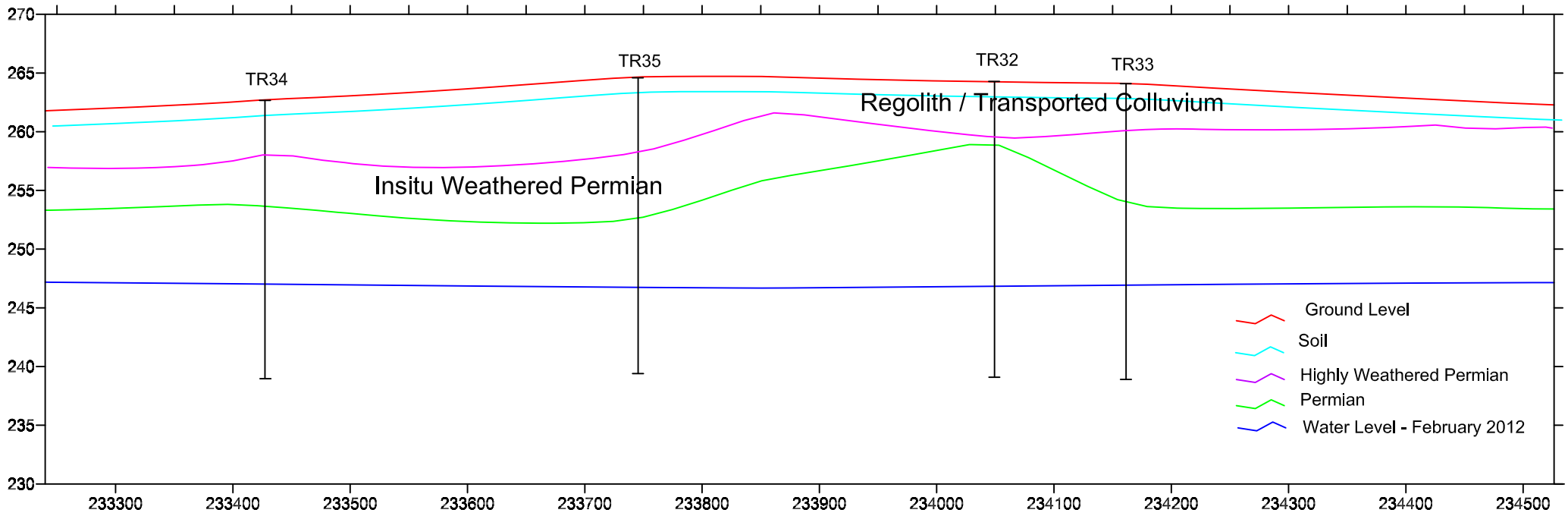
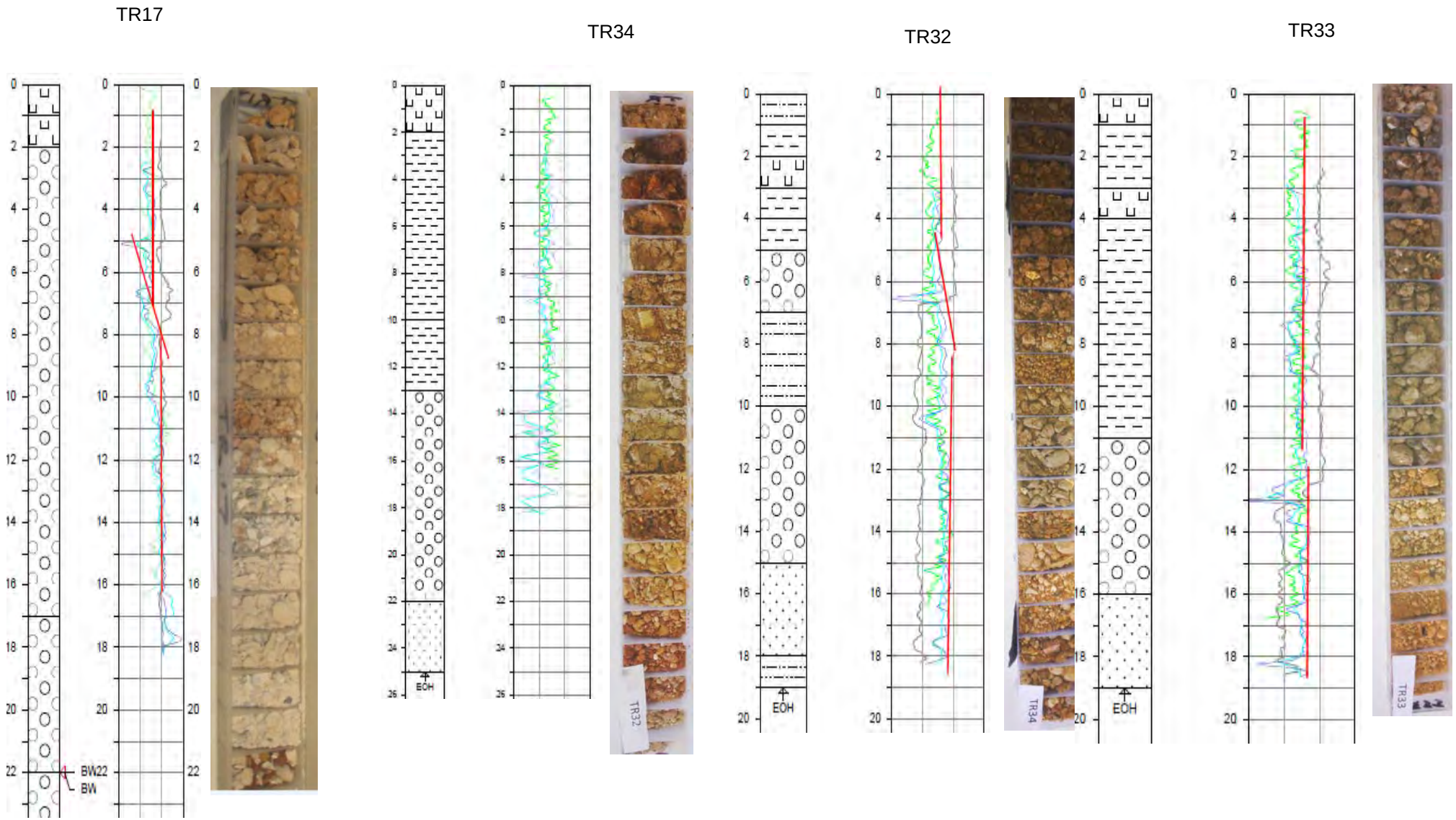
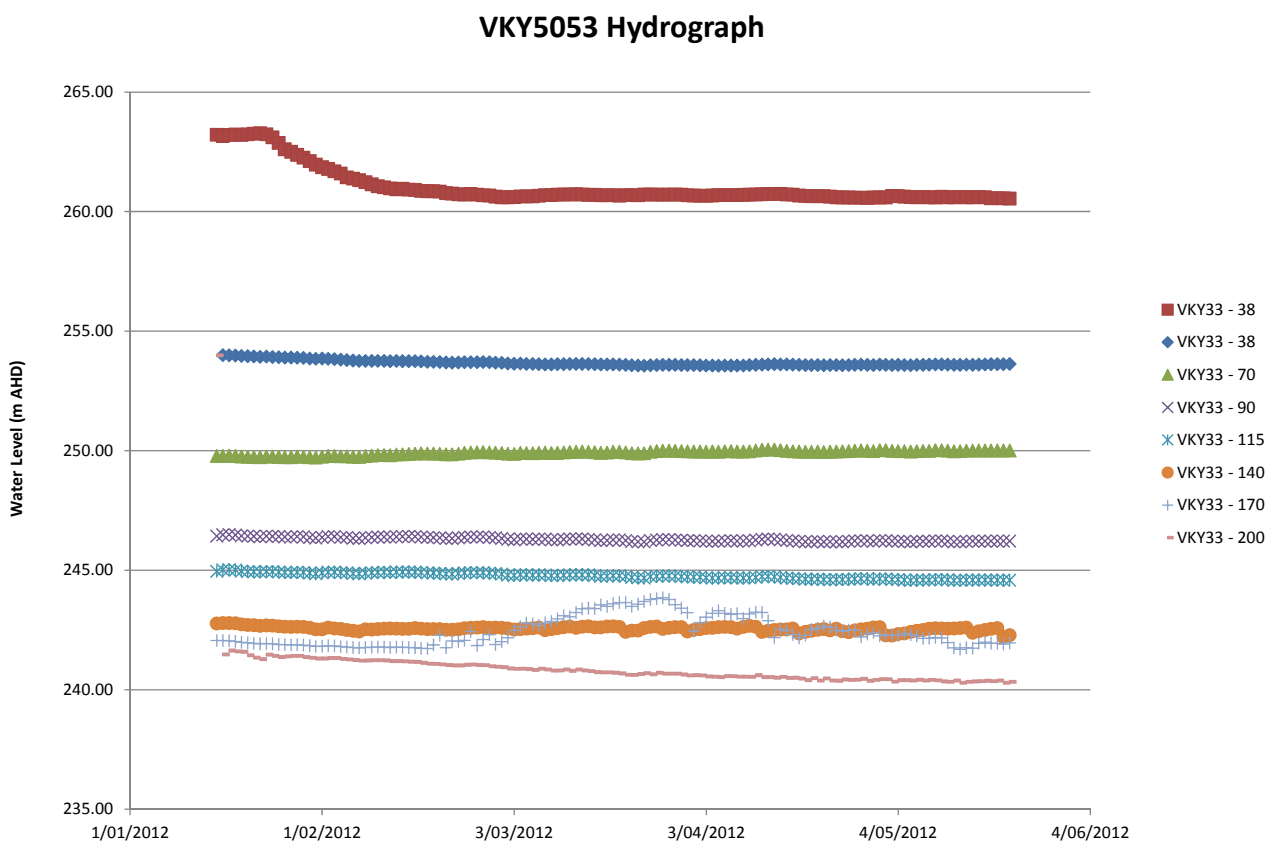
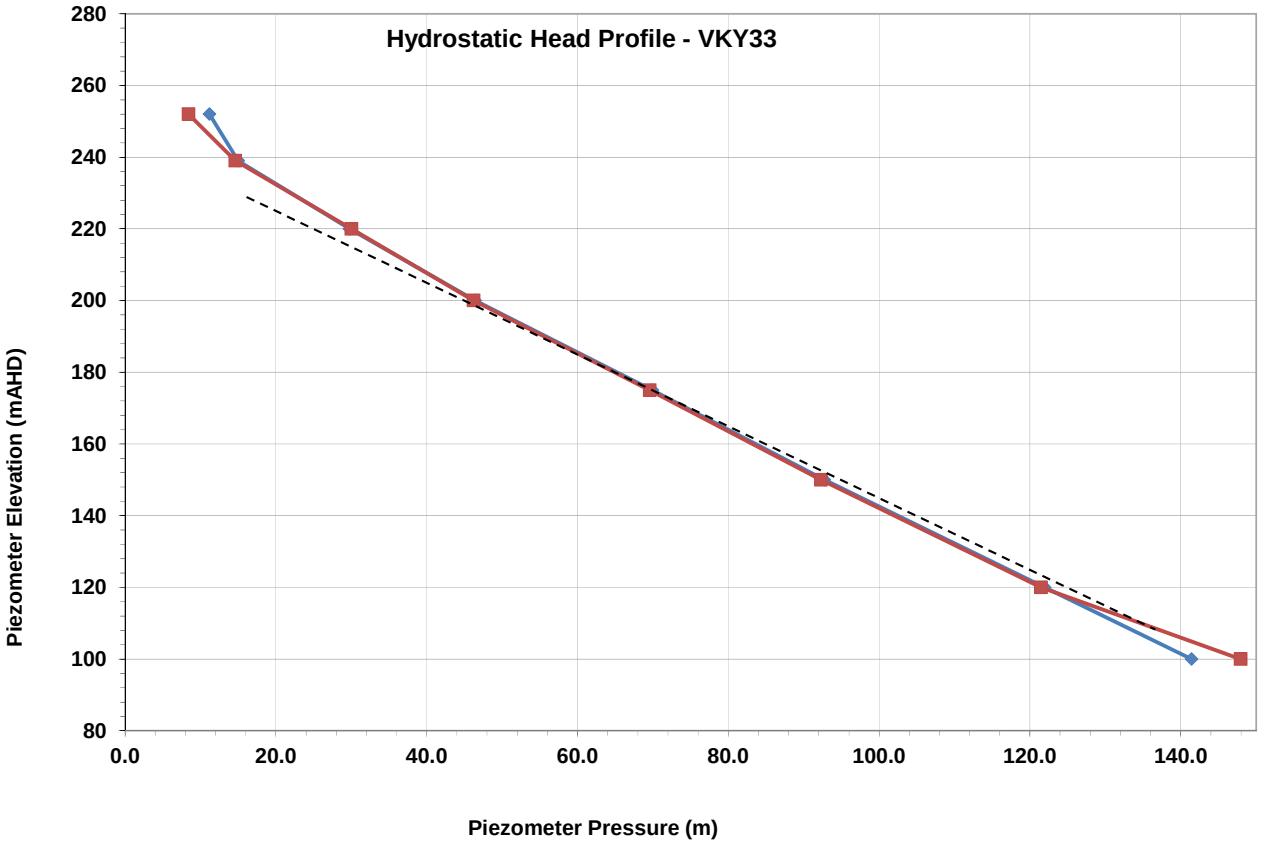


Figure 2.11 Cross-section at Transect 5



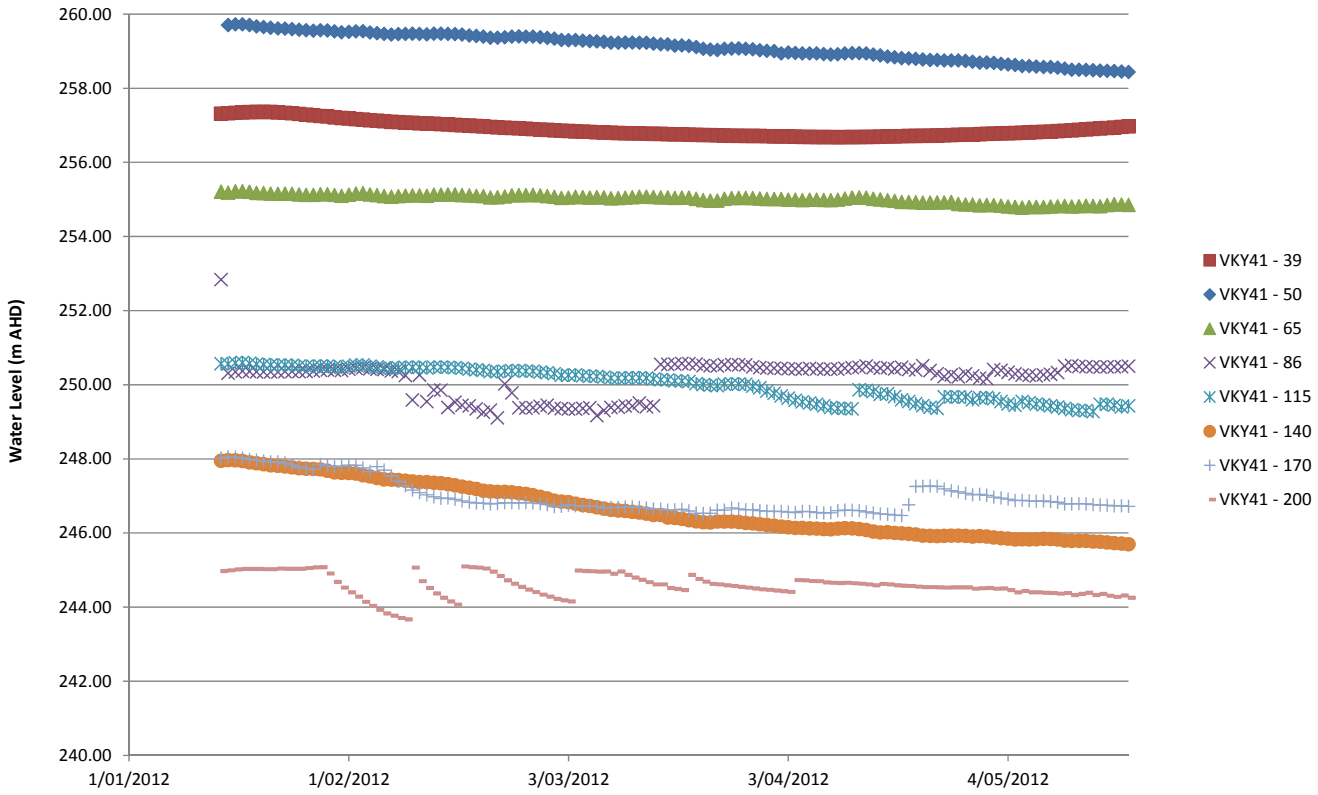
Date	**20/02/2012**	Scale	**Whitehaven Coal Pty Ltd**
Initials	**AF**	Project	
Drawing Number		Revision **A**	**Transect 5 Gracphic Logs**
			Figure 2.12



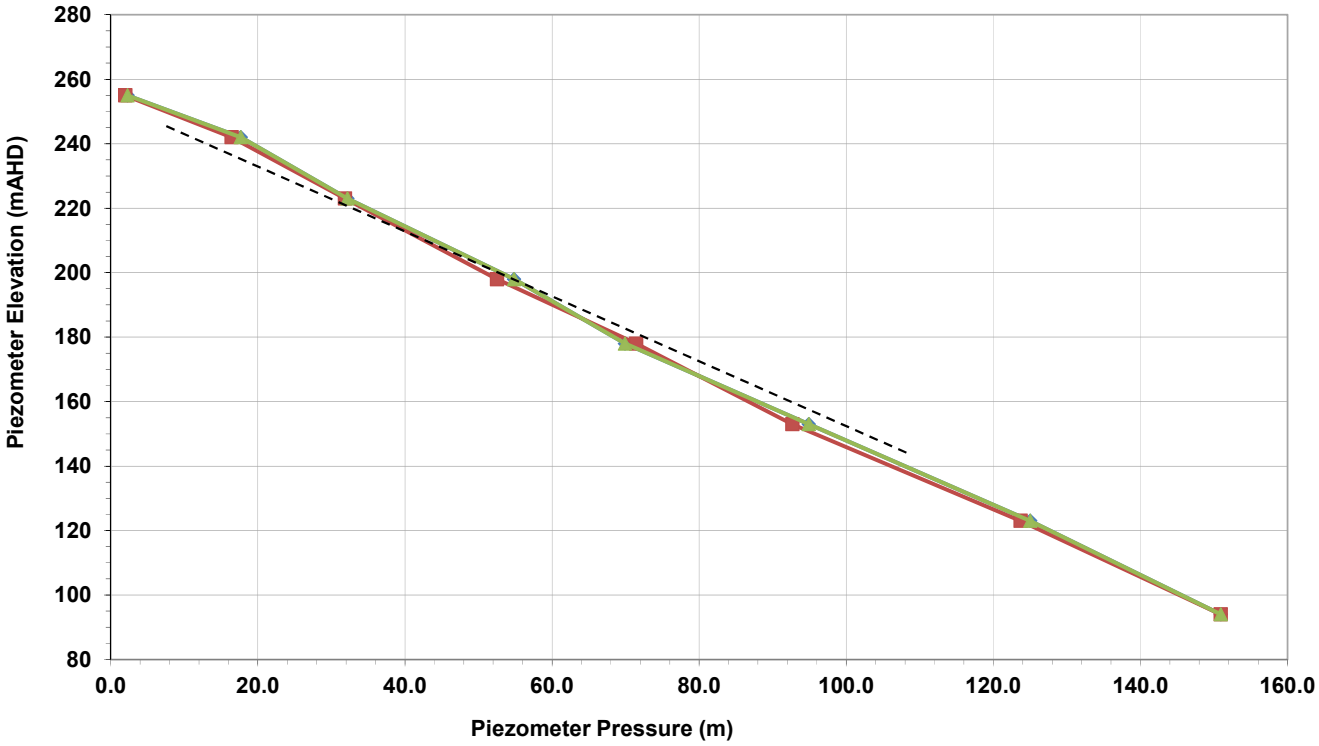


Date **22 May 2012**	Scale **As Shown**	**Whitehaven Coal Pty Ltd**
Drawn by **AF** Checked by	Project	Hydrograph and Hydrostatic Head Profile for VKY3033
Drawing Number	Revision **0**	**Figure 2.13**

VKY41 Hydrograph

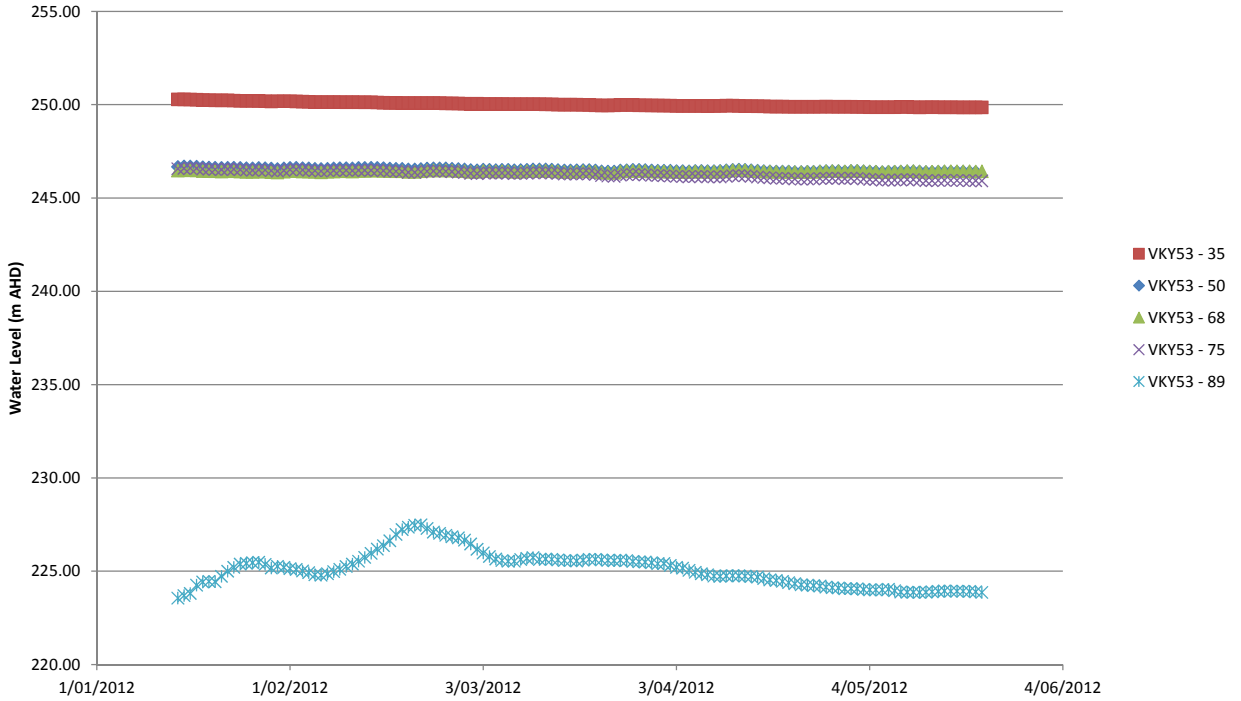


Hydrostatic Head Profile - VKY41

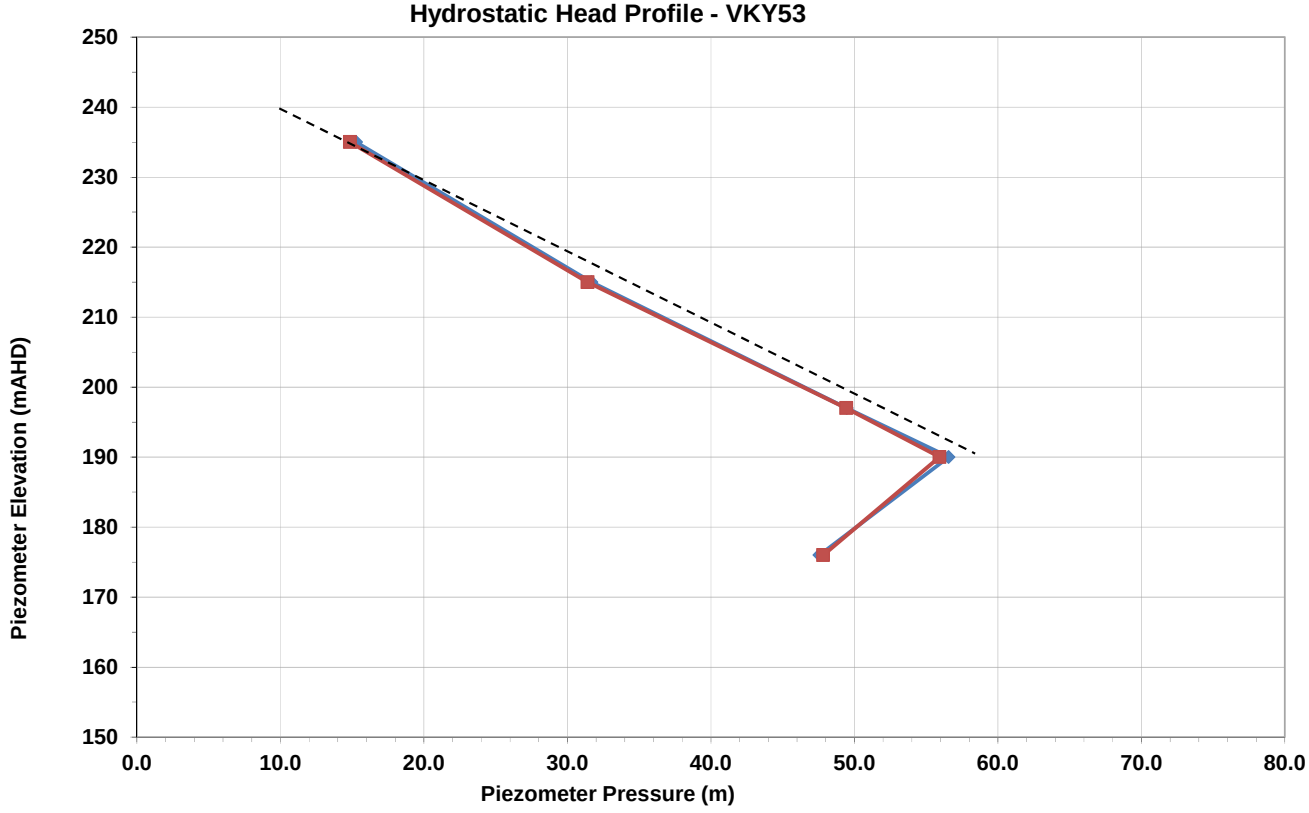


Date 22 May 2012	Scale As Shown	**Whitehaven Coal Pty Ltd**
Drawn by AF Checked by	Project	Hydrograph and Hydrostatic Head Profile for VKY3041
Drawing Number	Revision 0	Figure 2.14

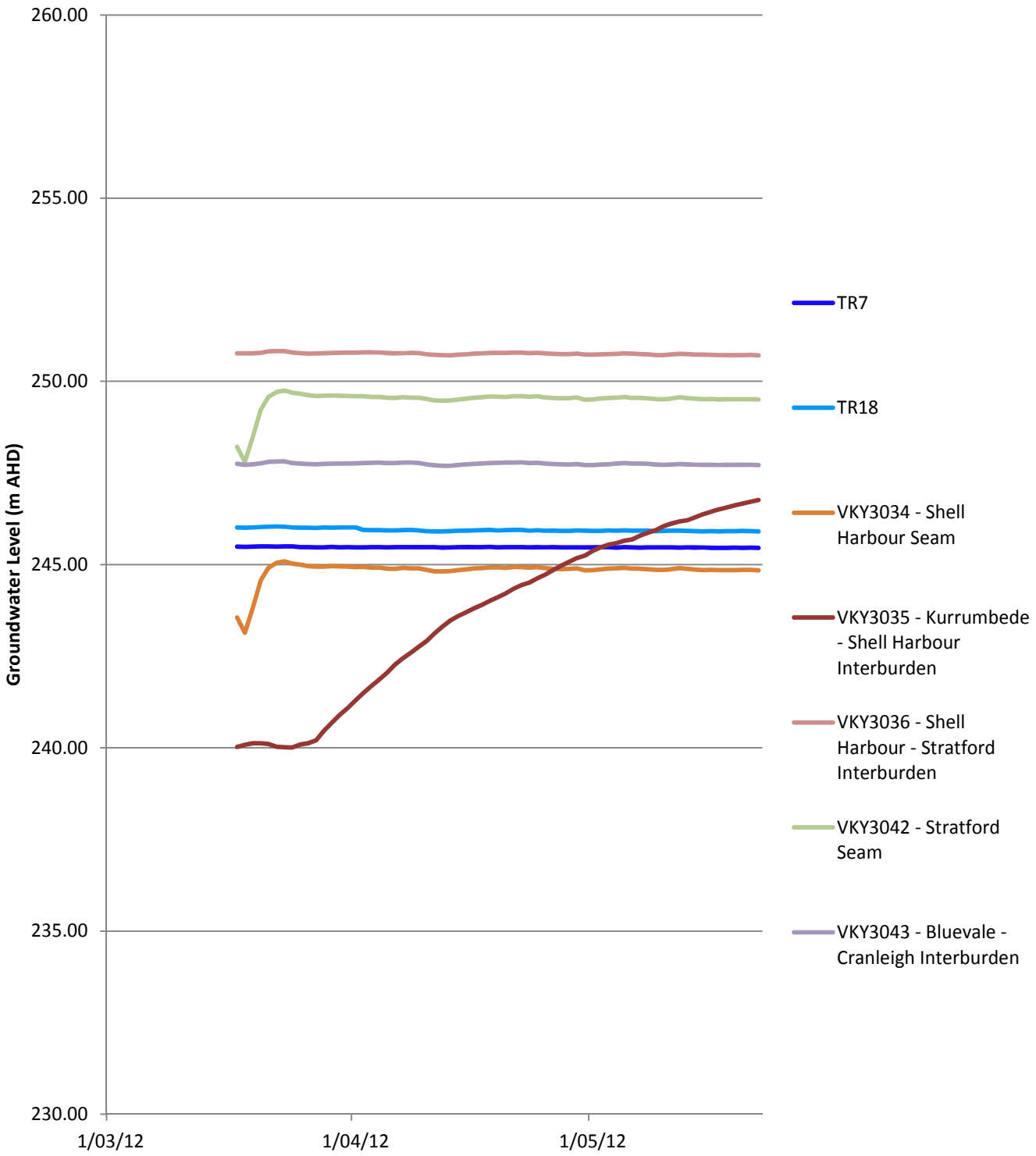
VKY3053 Hydrograph



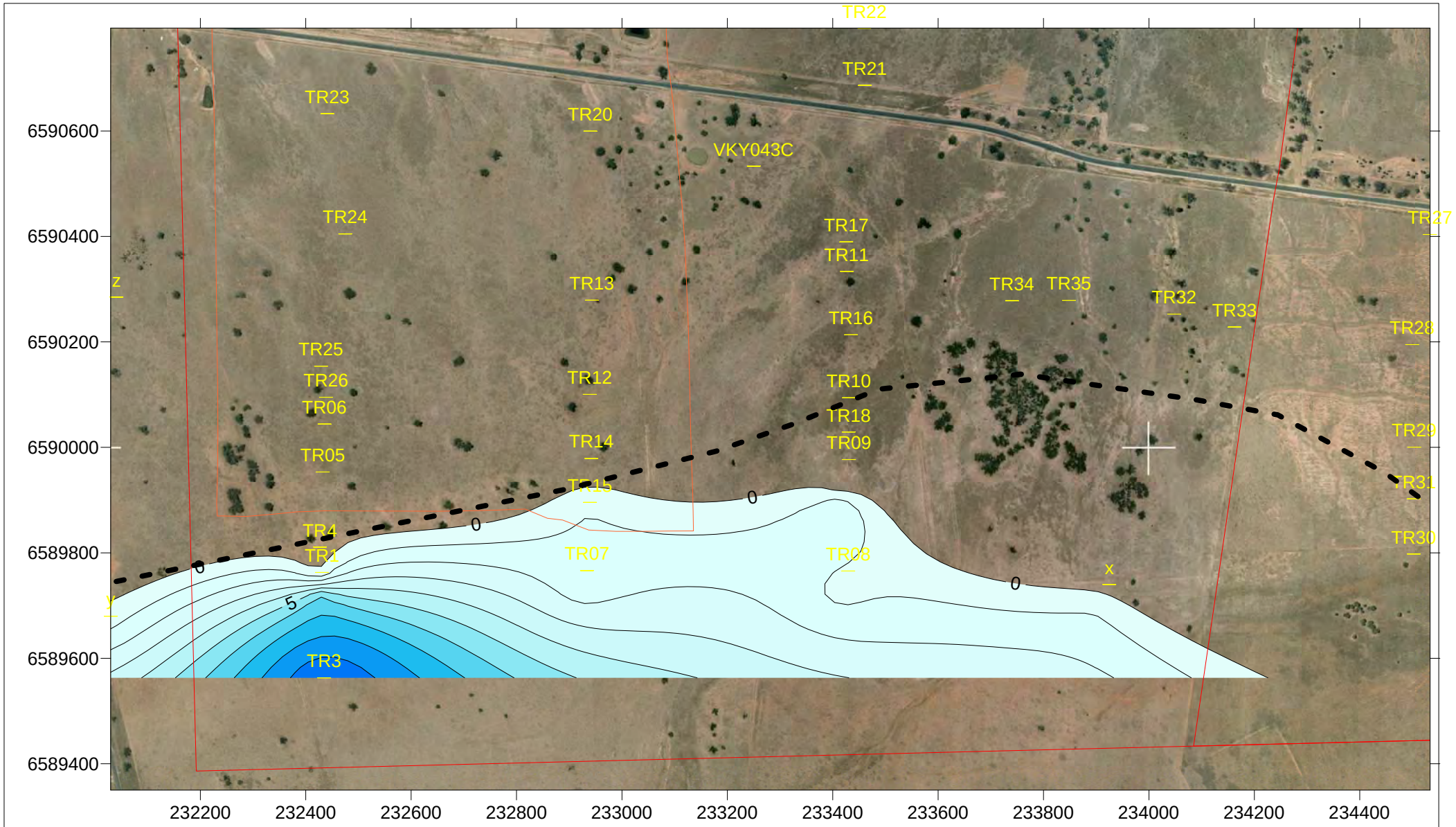
Hydrostatic Head Profile - VKY53



Date **22 May 2012**	Scale **As Shown**	**Whitehaven Coal Pty Ltd**
Drawn by **AF** Checked by	Project	Hydrograph and Hydrostatic Head Profile for VKY3053
Drawing Number	Revision **0**	**Figure 2.15**



Date **22 May 2012**	Scale **As Shown**	**Whitehaven Coal Pty Ltd**
Drawn by **AF** Checked by	Project	**Hydrograph for Installed Standpipes**
Drawing Number	Revision **0**	**Figure 2.16**



Pit Boundary 2028

CL 316

Assessed Alluvium Boundary

TR16

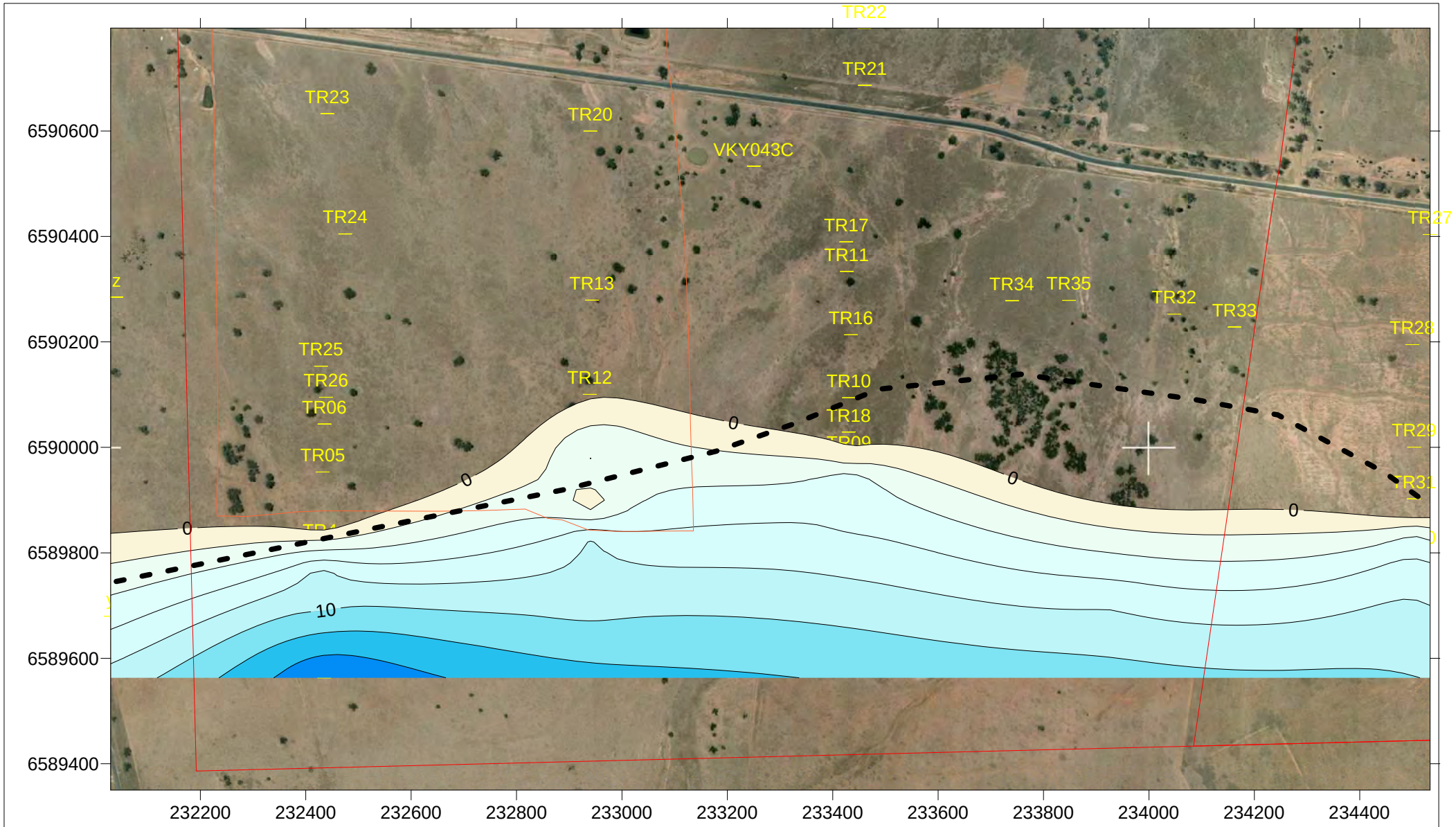
Transect Investigation Hole

Date	**14/04/2011**	Scale	**As Shown**
Initials	**AF**	Project	
Drawing Number		Revision	**A**

Whitehaven Coal

Extent of Saturated Alluvium (m)

Figure 2.17



Pit Boundary 2028

CL 316

Assessed Alluvium Boundary

TR16

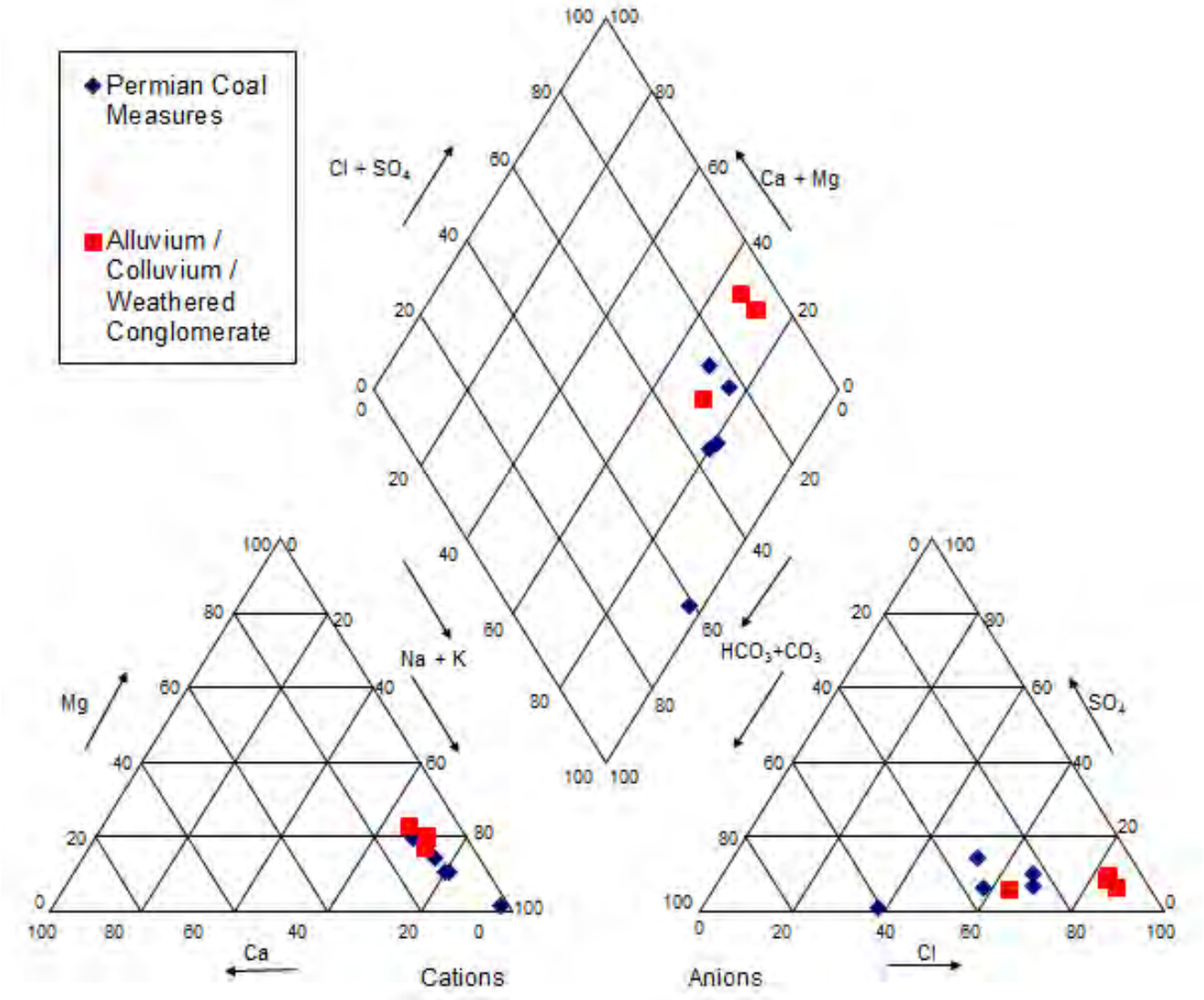
Transect Investigation Hole

Date	**14/04/2011**	Scale	**As Shown**
Initials	**AF**	Project	
Drawing Number		Revision	**A**

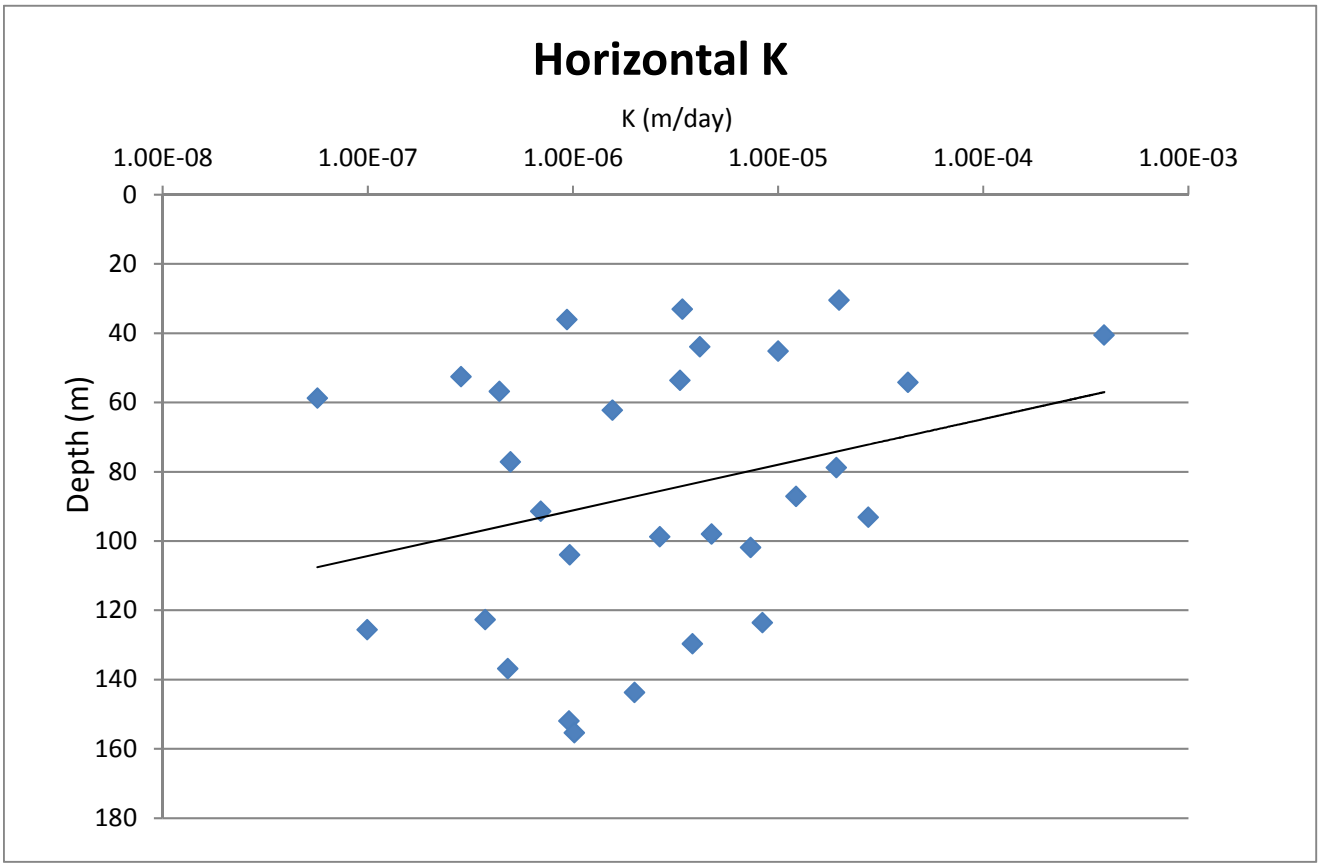
Whitehaven Coal

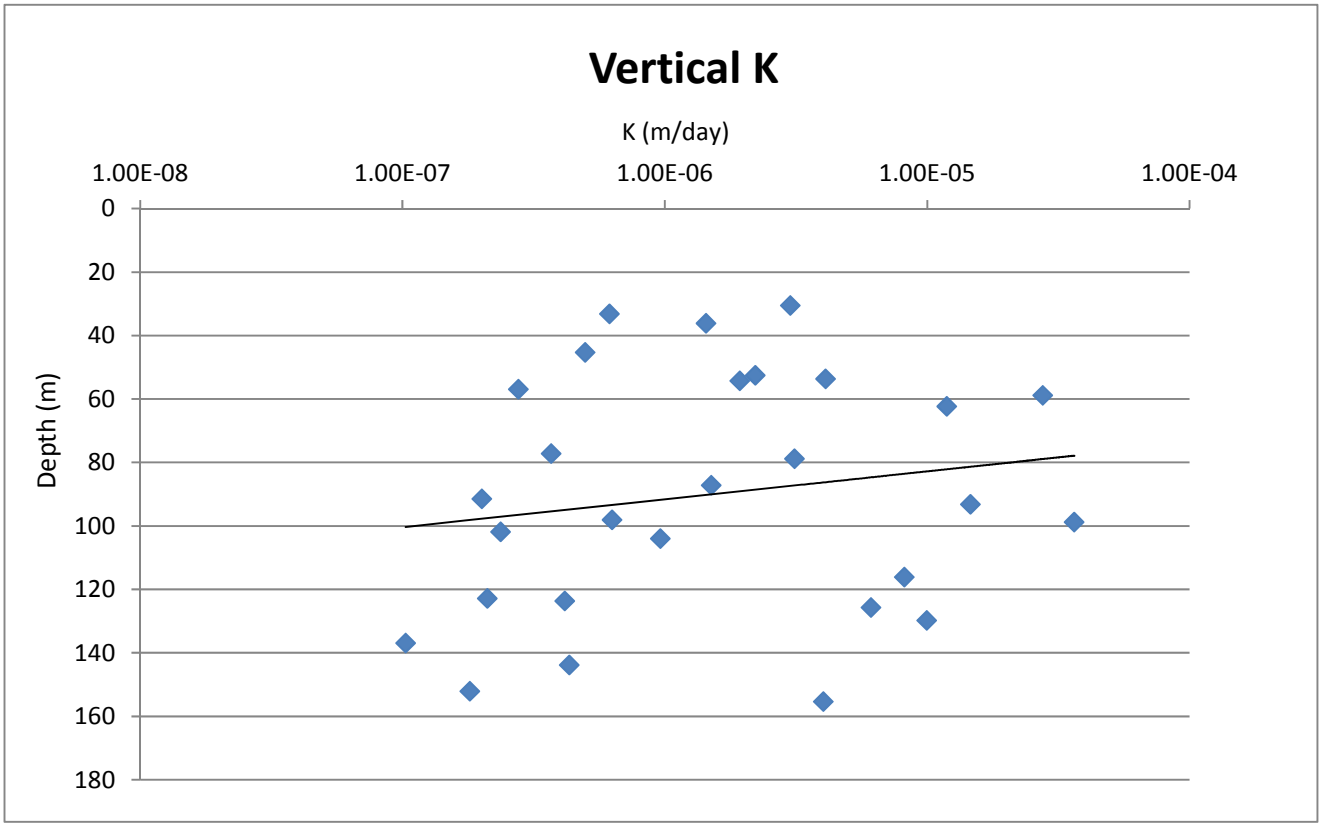
Extent of Saturated Highly Weathered Permian Conglomerate / Sandstones(m)

Figure 2.18



Date **22 May 2012**	Scale **As Shown**	**Whitehaven Coal Pty Ltd**	
Drawn by **AF** Checked by	Project		
Drawing Number	Revision **0**	**Piper Diagram**	
			Figure 2.19





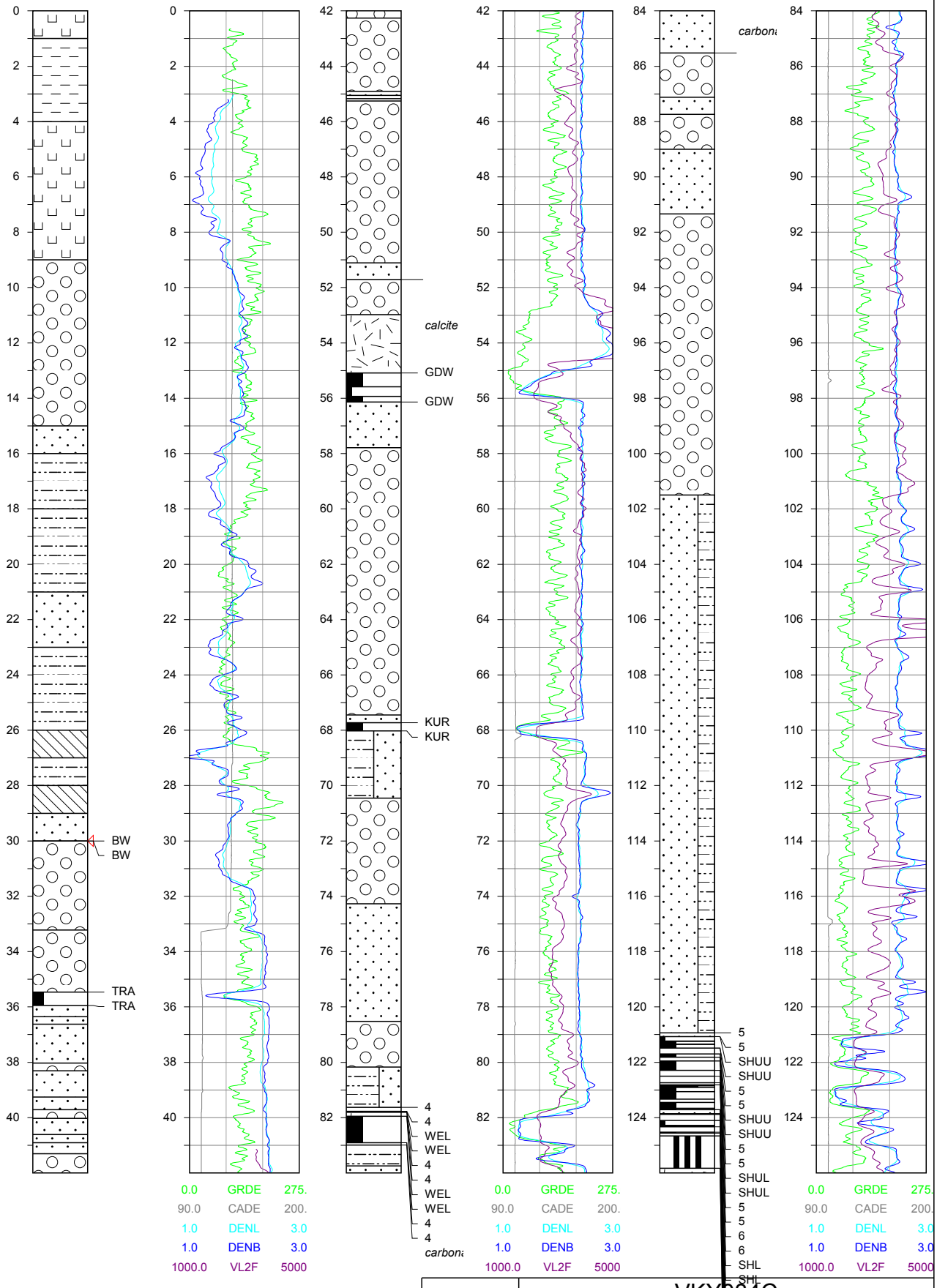
Date **12 March2012**	Scale **NA**	**Whitehaven Coal Pty Ltd**
Drawn by **AF** Checked by	Project	**Core Test Data - Hydraulic Conductivity (m/d) vs. Depth (m)**
Drawing Number	Revision **0**	

Figure 2.20

APPENDIX A
STANDPIPE PIEZOMETER BORE LOGS AND LICENCE DETAILS

Table A1: Standpipe Piezometer Drillhole Details

Hole ID	Easting (MGA)	Northing (MGA)	Bore Depth (m)
VKY3034	232519	6593822	200
VKY3035	232703	6593356	214
VKY3036	233120	6592921	225
VKY3042	232543	6592598	219.2
VKY3043	233250	6590533	245



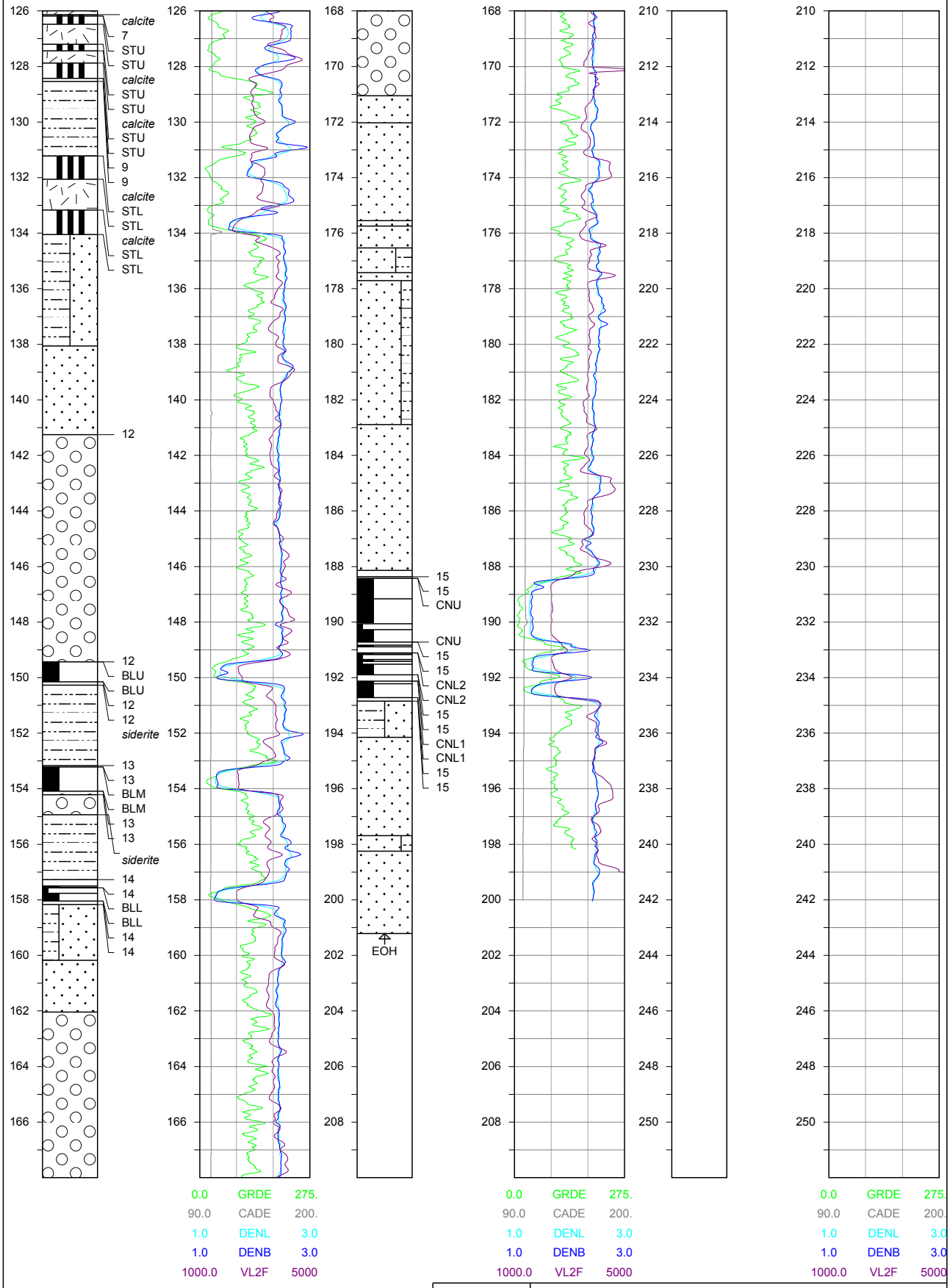
WHITEHAVEN

VKY034C

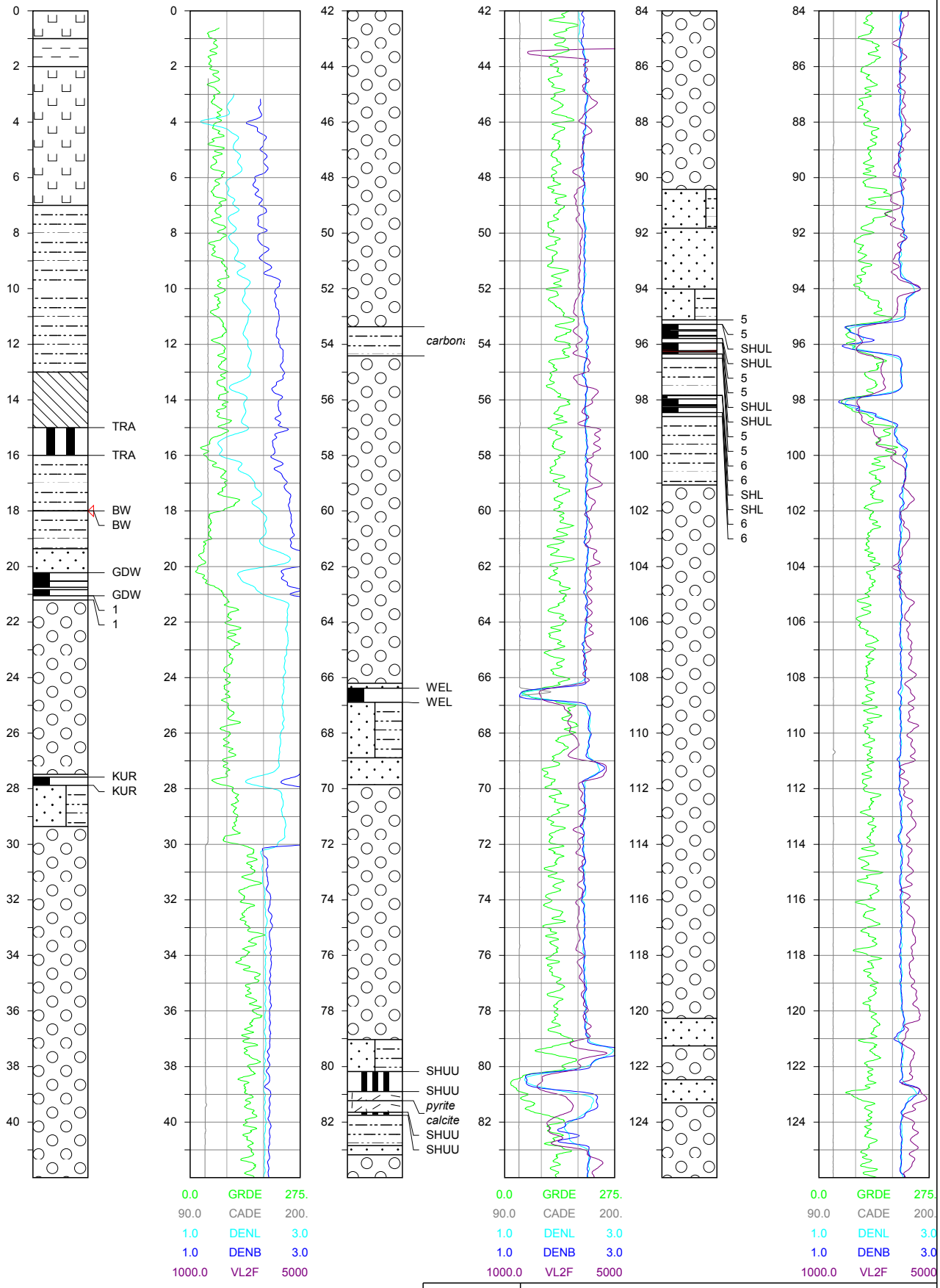
Vickery

Page 1/2

21/10/2011



WHITEHAVEN	VKY034C	
	Vickery	
	Page 2/2	21/10/2011



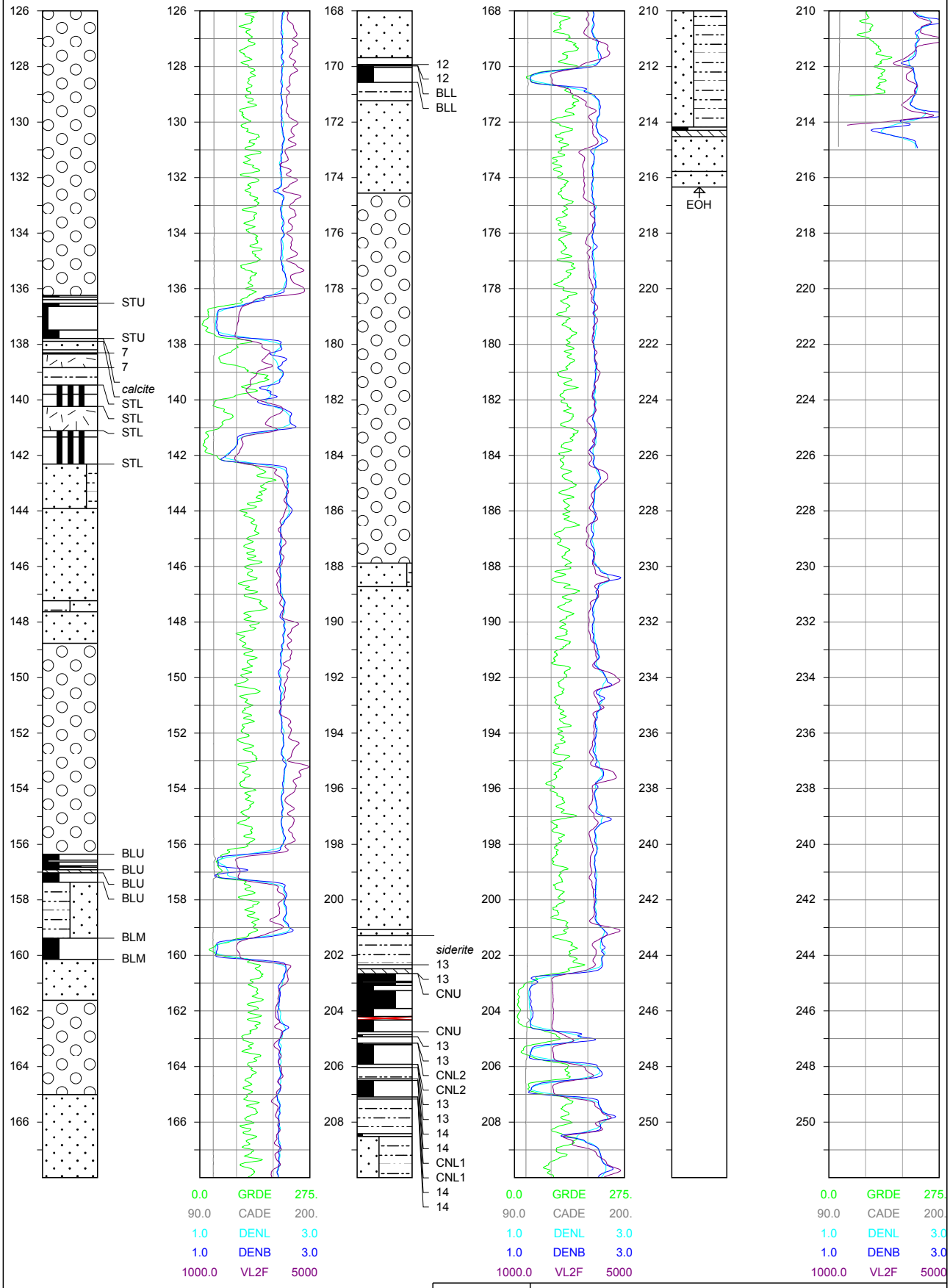
WHITEHAVEN

VKY035C

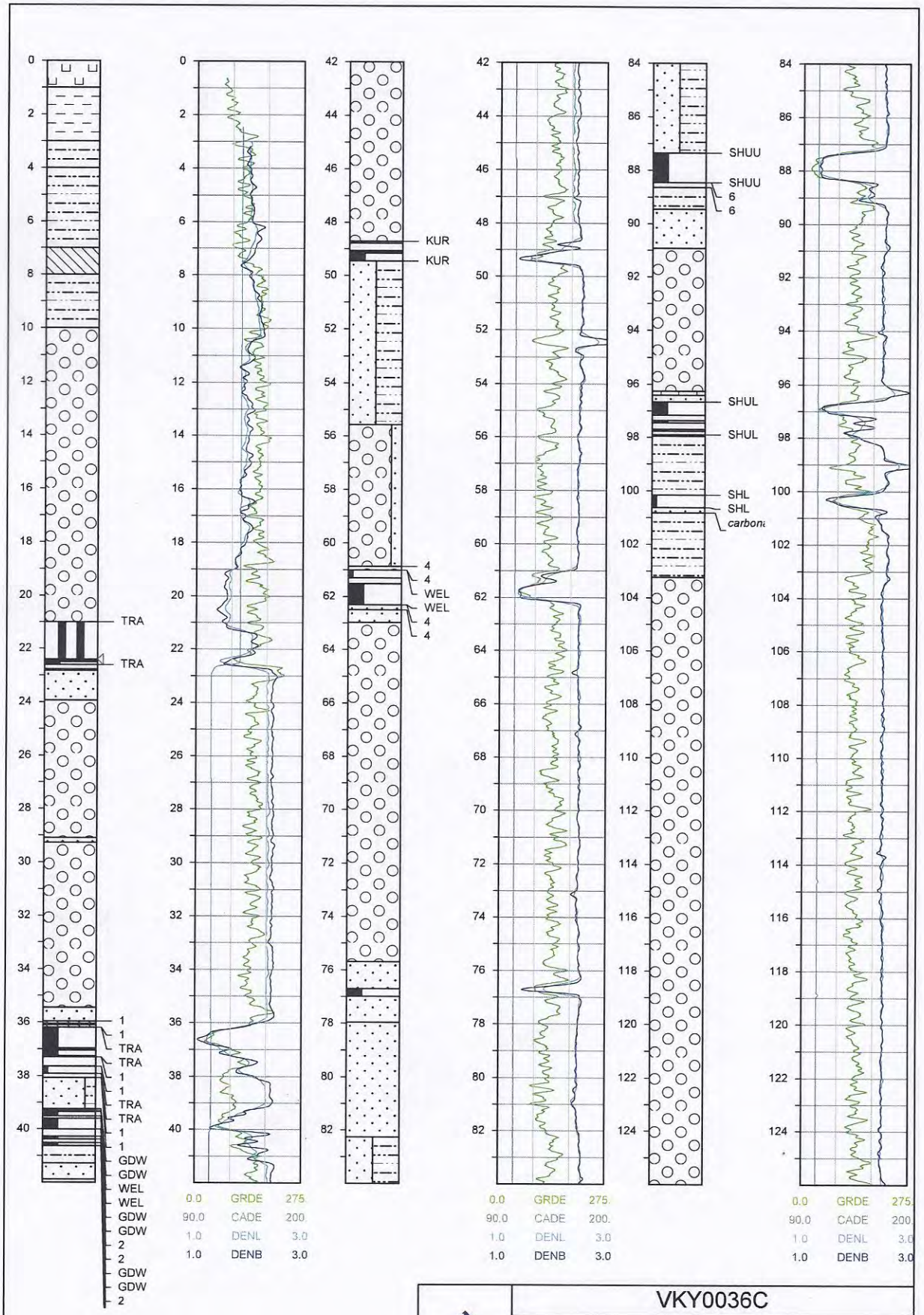
Vickery

Page 1/2

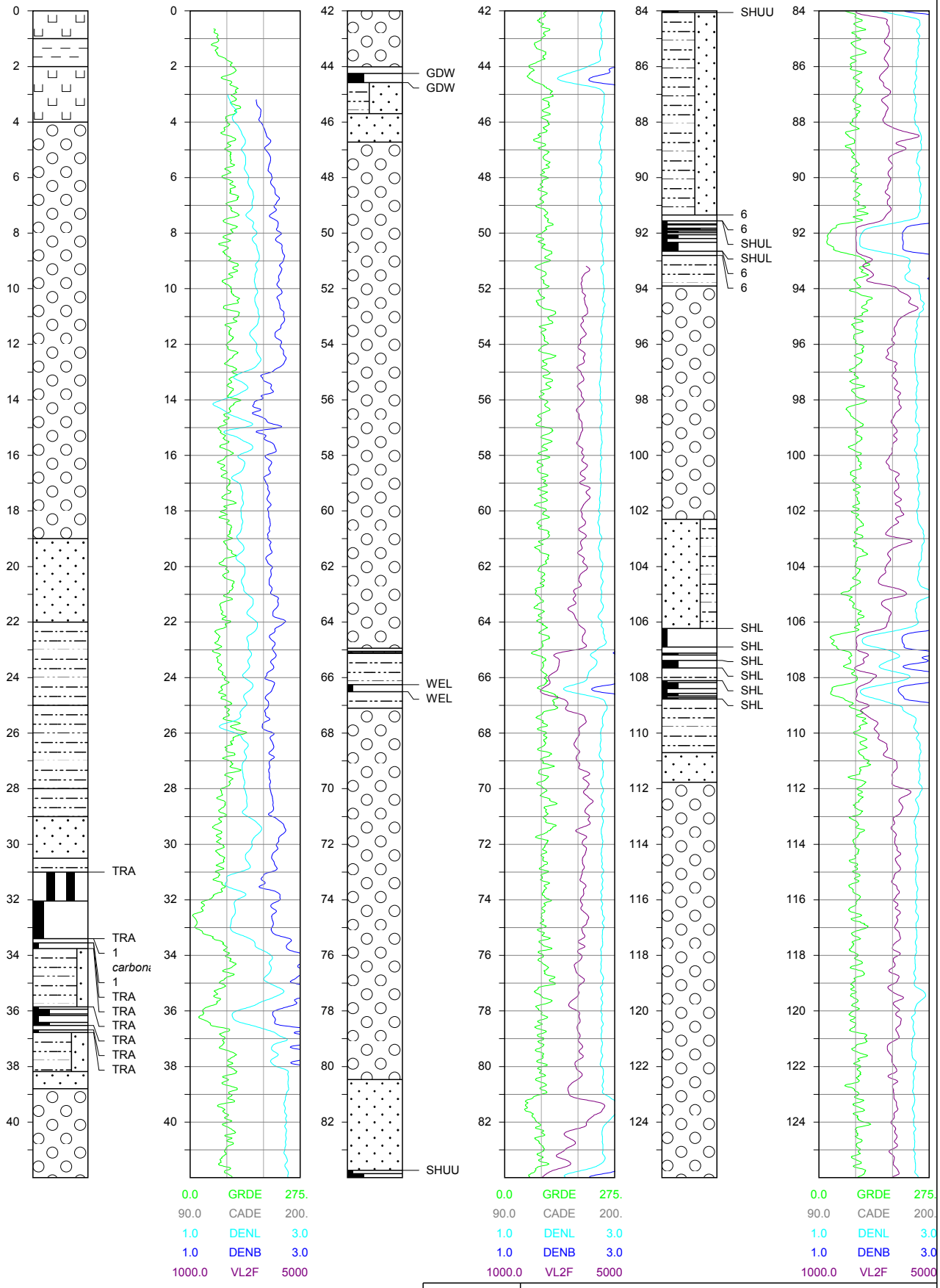
27/10/2011



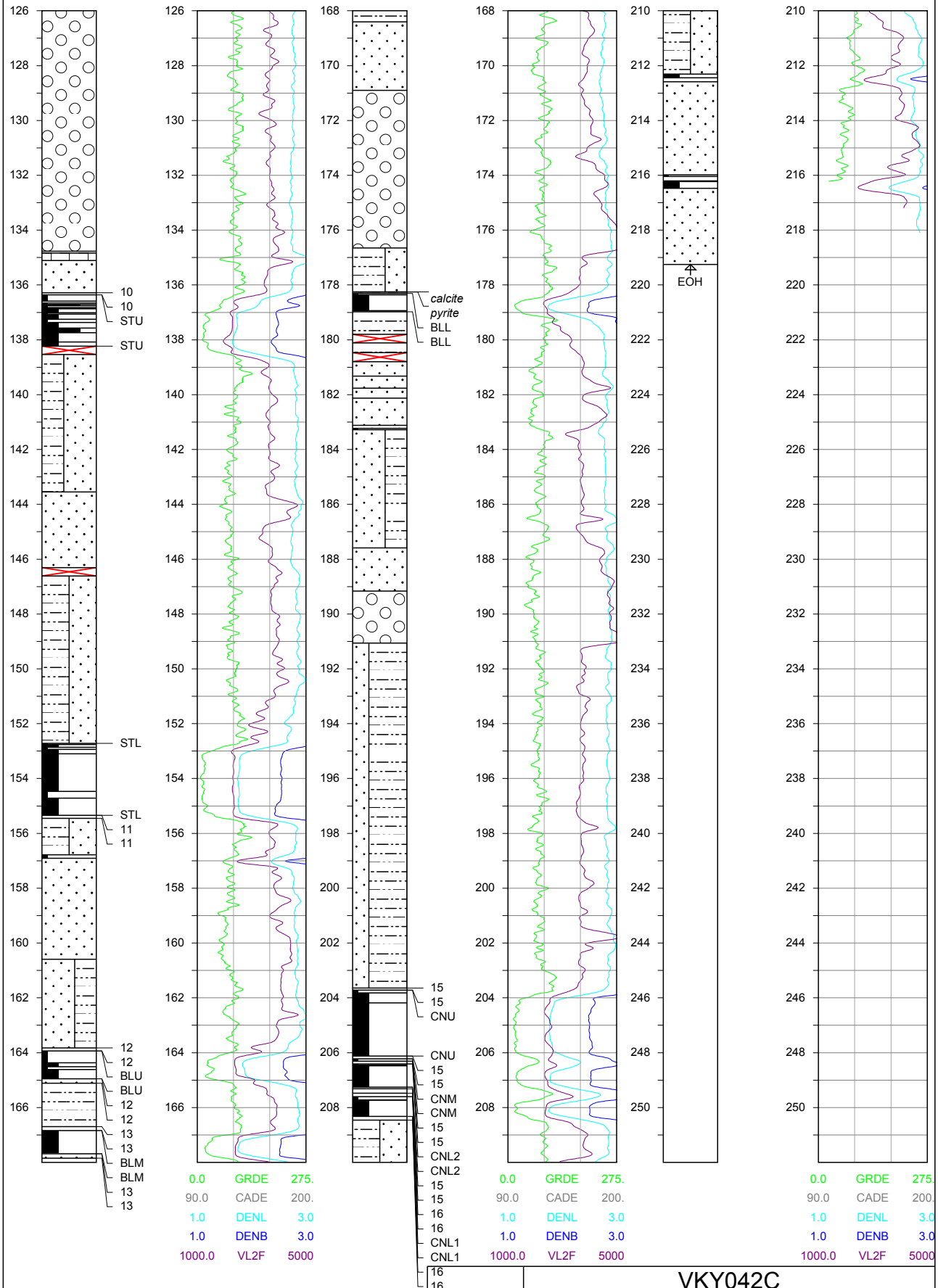
WHITEHAVEN	VKY035C
	Vickery
Page 2/2	27/10/2011



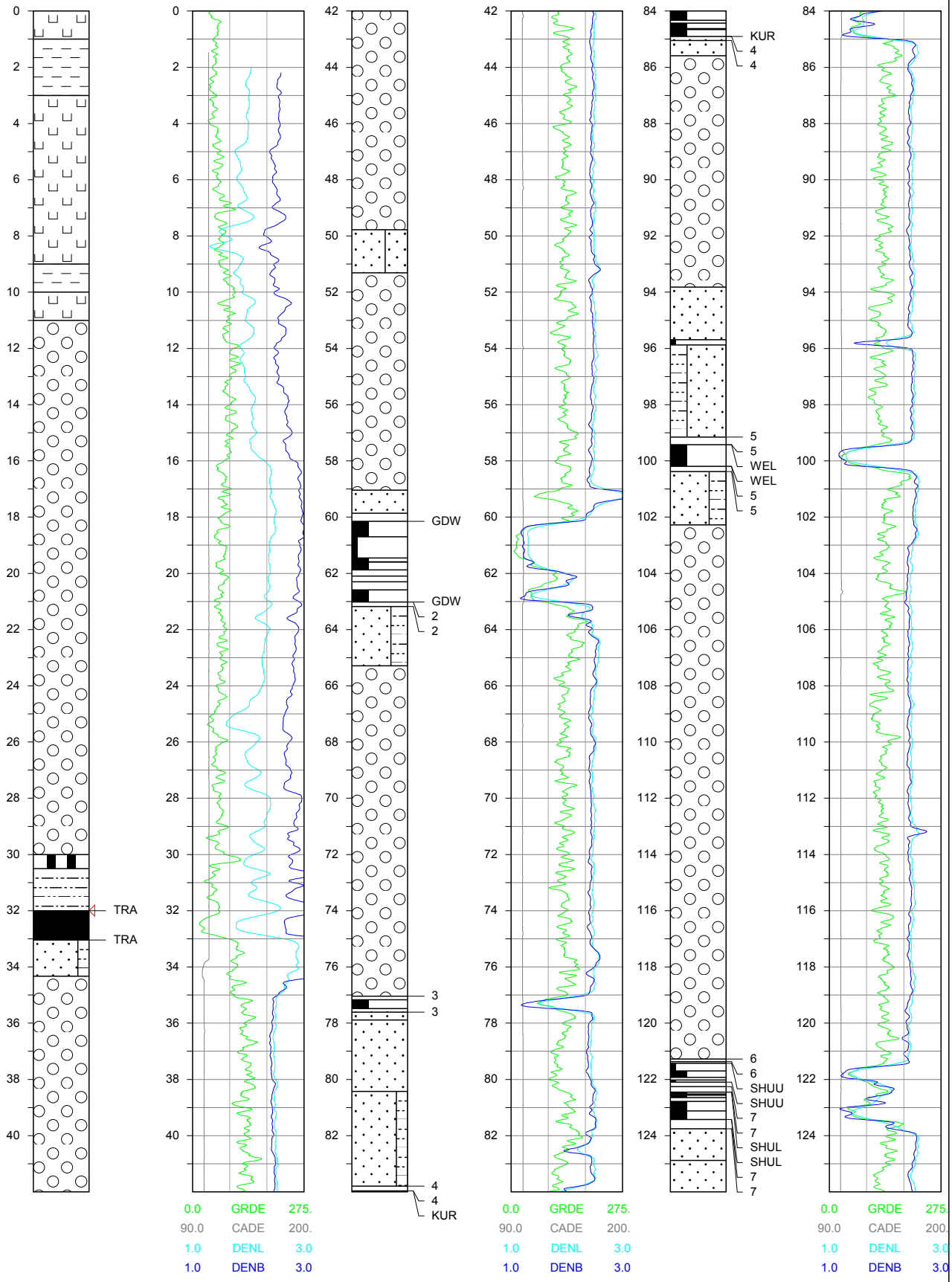
WHITEHAVEN	VKY0036C
	Vickery
Page 1/2	3/11/2011



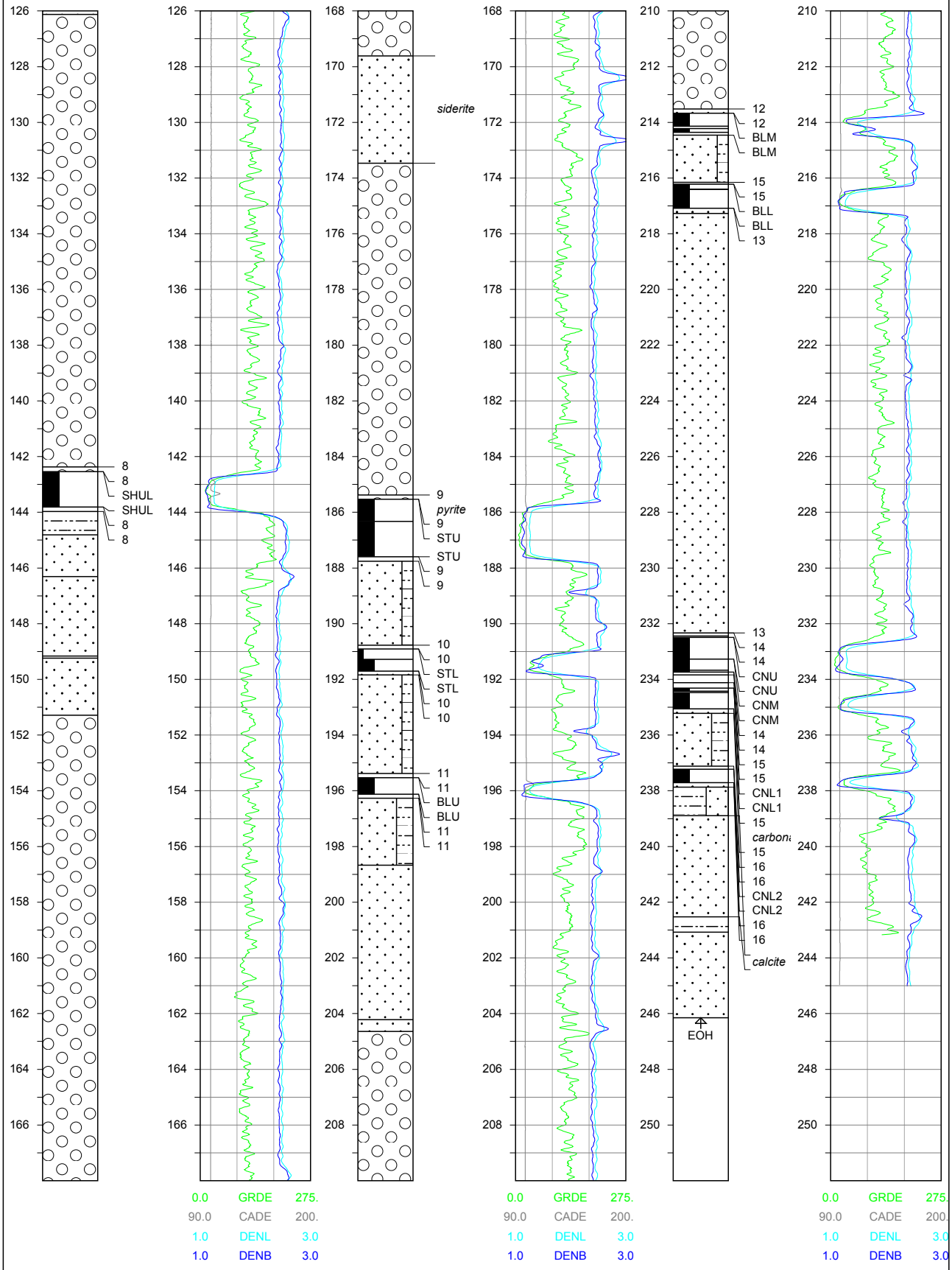
	VKY042C
	Vickery
Page 1/2	28/10/2011



VKY042C	
Vickery	
Page 2/2	28/10/2011



Vickery	
VKY043C	
Page 1/2	15/02/2012



WHITEHAVEN	Vickery	
	VKY043C	
	Page 2/2	15/02/2012

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Driller's Licence No:		1
Class of Licence:		
Driller's Name:		
Assistant Driller:		
Contractor:		
New bore	X	Replacement bore
Deepened		Enlarged
Reconditioned		Other (specify)
Final Depth	132 m	

Work Licence No:	90BL256014	2
Name of Licensee:	Whitehaven Coal Mine Ltd	
Intended Use:	Monitoring	
Completion Date:	20/12/2012	

DRILLING DETAILS 3

From (m)	To (m)	Hole Diameter (mm)	Drilling Method See Code 3
0	201	203	13

WATER BEARING ZONES 4

From (m)	To (m)	Thickness (m)	S W L (m)	Estimated Yield (L/s) Individual Aquifer	Estimated Yield (L/s) Cumulative	Test method See Code 4		D D L at end of test (m)	Duration Hrs	Duration min	Salinity (Conductivity or TDS) Cond (µS/cm)	Salinity (Conductivity or TDS) TDS (mg/L)

CASING / LINER DETAILS 5

Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Method Fixing Code 5
8	50	2	0	132	1

Casing support method — See Code 5: 2

Type of casing bottom — See Code 5: 2

Centralisers installed {Yes/No}	No	(indicate on sketch)					
Sump installed {Yes/No}	Yes	From	126	m	To	129	m
Pressure cemented {Yes/No}	No	From		m	To		m
Casing Protector cemented in place							

WATER ENTRY DESIGN 6

General Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Opening type See Code 6	Fixing See Code 5	Screen Aperture (mm)	Slot Details Length (mm)	Width (mm)	Alignment See Code 6
6	50	2	126	132	3	1	1	150	1	V

GRAVEL PACK 7

Type		Grade		Grain size (mm) From	Grain size (mm) To	Depth (m) From	Depth (m) To	Quantity Litres	Quantity m^3
Rounded		Graded	X	3	5	118	136		
Crushed		Ungraded							
Bentonite/Grout seal (Yes/No)	Yes								
Method of placement of Gravel Pack	See Code 7: 1								

For Departmental use only: G W

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Work Licence No: 90BL256014

BORE DEVELOPMENT 8

Chemical used for breaking down drilling mud (Yes/No) No Name:

Method	Bailing/Surging	Jetting	Airlifting	Backwashing	Pumping	Other:
Duration	hrs	hrs	hrs	hrs	hrs	hrs

DISINFECTION ON COMPLETION 9

Chemical(s) used	Quantity applied (Litres)	Method of application

PUMPING TESTS ON COMPLETION 10

Test type		Date	Pump intake depth (m)	Initial Water Level (SWL) (m)	Pumping rate (L/s)	Water Level at end of pumping (DDL) (m)	Duration of Test (hrs)	Recovery: Water level (m)	Recovery: Time taken (hrs)	Recovery: Time taken (mins)
Multi stage (stepped drawdown)	Stage 1									
	Stage 2									
	Stage 3									
	Stage 4									
Single stage (constant rate)										

Height of measuring point above ground level m Test Method See Code 4

WORK PARTLY BACKFILLED OR ABANDONED 11

Original depth of work: 201 m Is work partly backfilled: (Yes/No) Yes

Is work abandoned: (Yes/No) No Method of abandonment: Backfilled X Plugged Capped

Has any casing been left in the work (Yes/No) From 134 m To 201 m

Sealing / fill type (See Code 11)	From depth (m)	To depth (m)	Sealing / fill type (See Code 11)	From depth (m)	To depth (m)
3	132	134	3		

Site chosen by: Hydrogeologist X Geologist Driller Diviner Client Other 12

Lot No 2 DP No 1102940 13

Work Location Co ordinates Easting 232519 Northing 6593822 Zone 56

GPS: (Yes/No) Yes >> AMG/AGD or MGA/GDA X (See explanation)

Please mark the work site with "X" on the CLID provided map.

Indicate also the distances in metres from two (2) adjacent boundaries, and attach the map to this Form A package.

Signatures:

Driller: ---------- **Licensee:** ----------

Date: ---------- **Date:** ----------

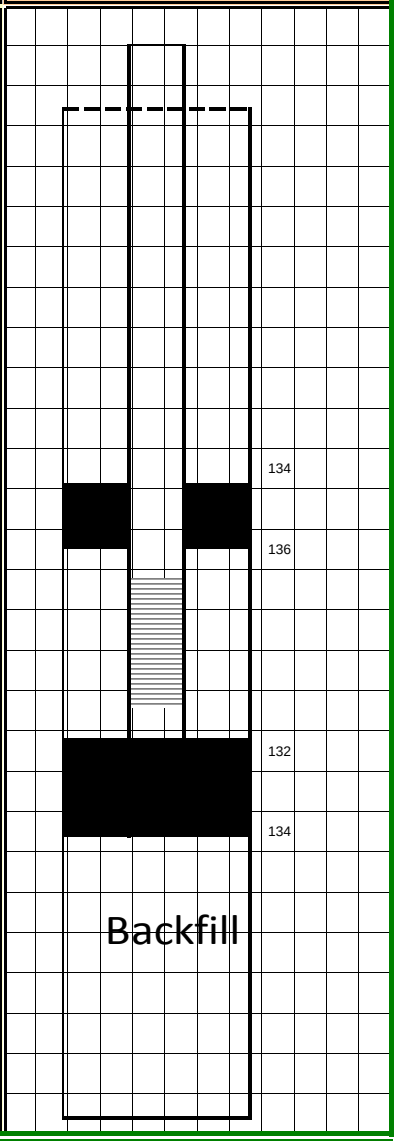
Work Licence No: 90BL256014

DRILLER'S ROCK/STRATA DESCRIPTION (LITHOLOGY)

15

Depth From (m)	Depth To (m)	Description (See Code 15)
0	1	Soil
1	4	Clay minor sand
4	30	Weathered Conglomerate / Sandstone
30	55	Conglomerate / Minor sandstone
55	56	Coal
56	74	Conglomerate / Minor sandstone
74	82	Sandstone / Minor Conglomerate
82	83	Coal
83	102	Conglomerate / Minor sandstone
102	121	Sandstone / Minor Siltstone
121	134	Coal / Minor Sandstone
134	150	Sandstone / Conglomerate
150	151	Coal
151	153	Siltstone
153	154	Coal
154	158	Siltstone
158	158.5	Coal
158.5	188	Sandstone / Conglomerate
188	192	Coal
192	201	Sandstone
201	EOH	

WORK CONSTRUCTION SKETCH



WORK NOT CONSTRUCTED BY DRILLING RIG

16

Method of excavation: Hand dug ☐ Back hoe ☐ Dragline ☐ Dozer ☐ Other

Depth (m)	Length (m)	Width (m)	Diameter (m)	Lining material	Dimentions of liner (m)	From Depth (m)	To Depth (m)

Please attach copies of the following if available

17

Geologist log	(Yes/No) ☐	Laboratory analysis of water Sample	(Yes/No) ☐	Pumping test(s)	(Yes/No) ☐
Geophysical log	(Yes/No) ☐	Sieve analysis of aquifer material	(Yes/No) ☐	Installed Pump details	(Yes/No) ☐

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Driller's Licence No:		1
Class of Licence:		
Driller's Name:		
Assistant Driller:		
Contractor:		
New bore	X	Replacement bore
Deepened		Enlarged
Reconditioned		Other (specify)
Final Depth	79 m	

Work Licence No:	90BL256013	2
Name of Licensee:	Whitehaven Coal Mine Ltd	
Intended Use:	Monitoring	
Completion Date:	20/12/2011	

DRILLING DETAILS 3

From (m)	To (m)	Hole Diameter (mm)	Drilling Method See Code 3
0	214	96	13

WATER BEARING ZONES 4

From (m)	To (m)	Thickness (m)	S W L (m)	Estimated Yield (L/s) Individual Aquifer	Estimated Yield (L/s) Cumulative	Test method See Code 4		D D L at end of test (m)	Duration Hrs	Duration min	Salinity (Conductivity or TDS) Cond (µS/cm)	Salinity (Conductivity or TDS) TDS (mg/L)

CASING / LINER DETAILS 5

Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Method Fixing Code 5
8	50	2	0	78	5

Casing support method — See Code 5: 2

Type of casing bottom — See Code 5: 2

Centralisers installed	{Yes/No}	No	(indicate on sketch)					
Sump installed	{Yes/No}	Yes	From	75	m	To	78	m
Pressure cemented	{Yes/No}	No	From		m	To		m
Casing Protector cemented in place								

WATER ENTRY DESIGN 6

General Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Opening type See Code 6	Fixing See Code 5	Screen Aperture (mm)	Slot Details Length (mm)	Width (mm)	Alignment See Code 6
8	50	2	72	75	5	5	1	150	1	V

GRAVEL PACK 7

Type		Grade		Grain size (mm) From	Grain size (mm) To	Depth (m) From	Depth (m) To	Quantity Litres	Quantity m^3
Rounded		Graded	X	3	5	69	79		
Crushed		Ungraded							
Bentonite/Grout seal	(Yes/No) Yes					67	69		

Method of placement of Gravel Pack — See Code 7: 1

For Departmental use only: G W

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Work Licence No: 90BL256013

BORE DEVELOPMENT 8

Chemical used for breaking down drilling mud (Yes/No) No Name:

Method	Bailing/Surging	Jetting	Airlifting	Backwashing	Pumping	Other:
Duration	hrs	hrs	hrs	hrs	hrs	hrs

DISINFECTION ON COMPLETION 9

Chemical(s) used	Quantity applied (Litres)	Method of application

PUMPING TESTS ON COMPLETION 10

Test type		Date	Pump intake depth (m)	Initial Water Level (SWL) (m)	Pumping rate (L/s)	Water Level at end of pumping (DDL) (m)	Duration of Test (hrs)	Recovery: Water level (m)	Recovery: Time taken (hrs)	Recovery: Time taken (mins)
Multi stage (stepped drawdown)	Stage 1									
	Stage 2									
	Stage 3									
	Stage 4									
Single stage (constant rate)										

Height of measuring point above ground level 0.47 m Test Method (See Code 4)

WORK PARTLY BACKFILLED OR ABANDONED 11

Original depth of work: 216 m Is work partly backfilled: (Yes/No) Yes

Is work abandoned: (Yes/No) No Method of abandonment: Backfilled Plugged Capped

Has any casing been left in the work (Yes/No) Yes From 0 m To 75 m

Sealing / fill type (See Code 11)	From depth (m)	To depth (m)	Sealing / fill type (See Code 11)	From depth (m)	To depth (m)
3	79	81			

Site chosen by: Hydrogeologist X Geologist Driller Diviner Client Other 12

Lot No 2 DP No 1102940 13

Work Location Co ordinates Easting 232703.5 Northing 6593356.68 Zone 56

GPS: (Yes/No) Yes >> AMG/AGD or MGA/GDA X (See explanation)

Please mark the work site with "X" on the CLID provided map.

Indicate also the distances in metres from two (2) adjacent boundaries, and attach the map to this Form A package.

Signatures:

Driller: ---------- **Licensee:** ----------

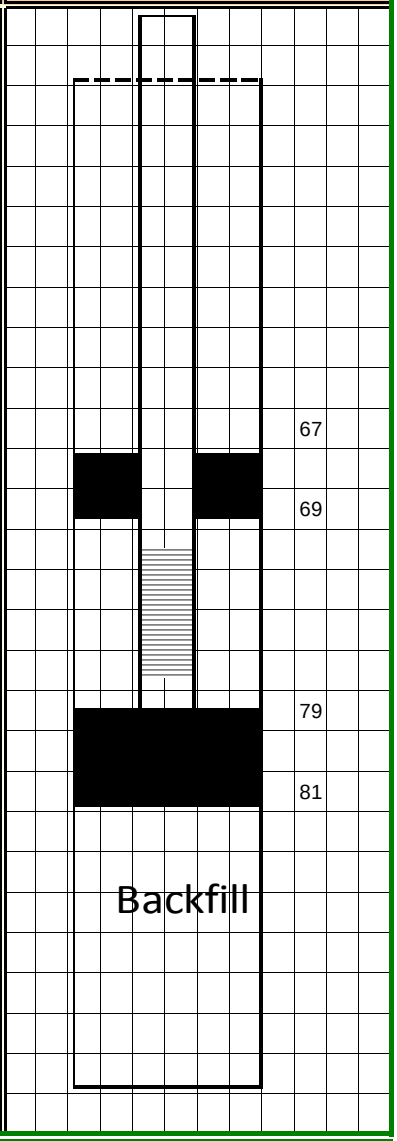
Date: ---------- **Date:** ----------

Work Licence No: 90BL256013

DRILLER'S ROCK/STRATA DESCRIPTION (LITHOLOGY) — 15

Depth From (m)	Depth To (m)	Description (See Code 15)
1	4	Soil / Clay minor sand
4	7	Clay
7	15	Weathered Siltstone
15	16	Coal
16	20	Weathered Siltstone
20	21	Coal
21	27.5	Conglomerate / Minor sandstone
27.5	28	Coal
28	66	Conglomerate
66	67	Coal
67	80	Conglomerate / Minor sandstone
80	81	Coal
81	95	Conglomerate / Minor sandstone
95	99	Coal / Minor sandstone / siltstone
99	136	Conglomerate / Minor sandstone
136	142	Coal
142	156	Sandstone / Conglomerate
156	160	Coal
160	170	Sandstone / Conglomerate
170	171	Coal
171	202	Sandstone / Conglomerate
202	207	Coal
207	216	Sandstone / Siltstone
216		EOH

WORK CONSTRUCTION SKETCH



WORK NOT CONSTRUCTED BY DRILLING RIG — 16

Method of excavation: Hand dug ☐ Back hoe ☐ Dragline ☐ Dozer ☐ Other ☐

Depth (m)	Length (m)	Width (m)	Diameter (m)	Lining material	Dimentions of liner (m)	From Depth (m)	To Depth (m)

Please attach copies of the following if available — 17

Geologist log	(Yes/No) ☐	Laboratory analysis of water Sample	(Yes/No) ☐	Pumping test(s)	(Yes/No) ☐
Geophysical log	(Yes/No) ☐	Sieve analysis of aquifer material	(Yes/No) ☐	Installed Pump details	(Yes/No) ☐

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Driller's Licence No:		1
Class of Licence:		
Driller's Name:		
Assistant Driller:		
Contractor:		
New bore	X	Replacement bore
Deepened		Enlarged
Reconditioned		Other (specify)
Final Depth	117 m	

Work Licence No:	90BL256015	2
Name of Licensee:	Whitehaven Coal Mine Ltd	
Intended Use:	Monitoring	
Completion Date:	20/12/2011	

DRILLING DETAILS 3

From (m)	To (m)	Hole Diameter (mm)	Drilling Method See Code 3
0	214	96	13

WATER BEARING ZONES 4

From (m)	To (m)	Thickness (m)	S W L (m)	Estimated Yield (L/s) Individual Aquifer	Estimated Yield (L/s) Cumulative	Test method See Code 4		D D L at end of test (m)	Duration Hrs	Duration min	Salinity (Conductivity or TDS) Cond (µS/cm)	Salinity (Conductivity or TDS) TDS (mg/L)

CASING / LINER DETAILS 5

Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Method Fixing Code 5
8	50	5	0	114	5

Casing support method — See Code 5: 2

Type of casing bottom — See Code 5: 2

Centralisers installed	{Yes/No}	No	(indicate on sketch)					
Sump installed	{Yes/No}	Yes	From	75	m	To	78	m
Pressure cemented	{Yes/No}	No	From		m	To		m
Casing Protector cemented in place								

WATER ENTRY DESIGN 6

General Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Opening type See Code 6	Fixing See Code 5	Screen Aperture (mm)	Slot Details Length (mm)	Width (mm)	Alignment See Code 6
8	50	2.5	114	111	5	1	1	150	1	V

GRAVEL PACK 7

Type		Grade		Grain size (mm) From	Grain size (mm) To	Depth (m) From	Depth (m) To	Quantity Litres	Quantity m^3
Rounded		Graded	X	3	5	107	117		
Crushed		Ungraded							
Bentonite/Grout seal (Yes/No)	Yes					105	107		

Method of placement of Gravel Pack — See Code 7: 1

For Departmental use only: G W

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Work Licence No: 90BL256015

BORE DEVELOPMENT 8

Chemical used for breaking down drilling mud (Yes/No) No Name:

Method	Bailing/Surging	Jetting	Airlifting	Backwashing	Pumping	Other:
Duration	hrs	hrs	hrs	hrs	hrs	hrs

DISINFECTION ON COMPLETION 9

Chemical(s) used	Quantity applied (Litres)	Method of application

PUMPING TESTS ON COMPLETION 10

Test type		Date	Pump intake depth (m)	Initial Water Level (SWL) (m)	Pumping rate (L/s)	Water Level at end of pumping (DDL) (m)	Duration of Test (hrs)	Recovery: Water level (m)	Recovery: Time taken (hrs)	Recovery: Time taken (mins)
Multi stage (stepped drawdown)	Stage 1									
	Stage 2									
	Stage 3									
	Stage 4									
Single stage (constant rate)										

Height of measuring point above ground level 0.65 m Test Method (See Code 4)

WORK PARTLY BACKFILLED OR ABANDONED 11

Original depth of work: 226 m Is work partly backfilled: (Yes/No) Yes

Is work abandoned: (Yes/No) No Method of abandonment: Backfilled Plugged Capped

Has any casing been left in the work (Yes/No) Yes From 0 m To 114 m

Sealing / fill type (See Code 11)	From depth (m)	To depth (m)	Sealing / fill type (See Code 11)	From depth (m)	To depth (m)
3	117	119	8		

Site chosen by: Hydrogeologist X Geologist Driller Diviner Client Other 12

Lot No 2 DP No 1102940 13

Work Location Co ordinates Easting 233120 Northing 6592922 Zone 56

GPS: (Yes/No) Yes >> AMG/AGD or MGA/GDA X (See explanation)

Please mark the work site with "X" on the CLID provided map.

Indicate also the distances in metres from two (2) adjacent boundaries, and attach the map to this Form A package.

Signatures:

Driller: ---------- **Licensee:** ----------

Date: ---------- **Date:** ----------

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

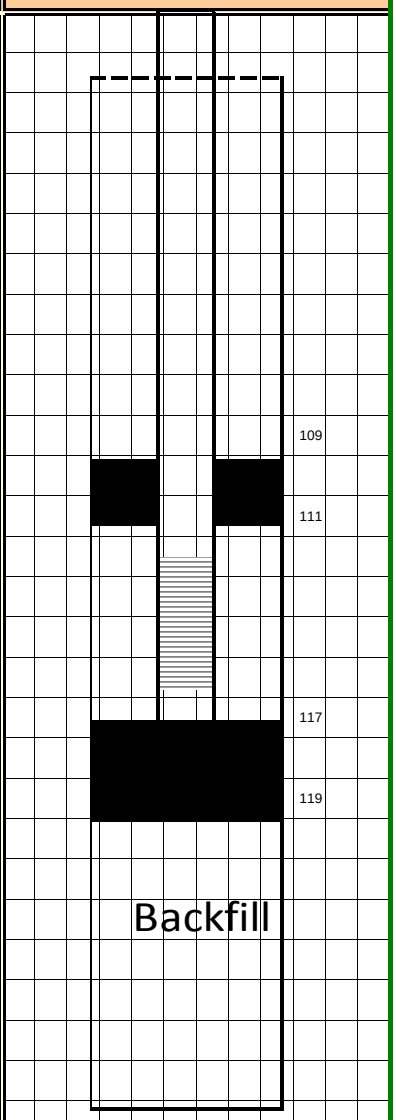
Work Licence No: 90BL256015

DRILLER'S ROCK/STRATA DESCRIPTION (LITHOLOGY)

15

Depth From (m)	Depth To (m)	Description (See Code 15)
1	4	Soil / Clay minor sand
4	10	Clay
10	21	Weathered Conglomerate
21	22.5	Coal
22.5	36	Conglomerate
36	41	Coal
41	48.5	Conglomerate / Minor sandstone
48.5	49.5	Coal
49.5	61	Conglomerate
61	62.5	Coal
62.5	96	Conglomerate / Minor sandstone
96	98	Coal
98	154	Conglomerate / Minor sandstone
154	161	Coal
161	166	Sandstone / Siltstone
166	170	Coal / Sandstone
170	184	Conglomerate
184	184.5	Coal
184.5	202	Sandstone / Conglomerate
202	205	Coal
205	210	Sandstone / Conglomerate
210	216	Coal / Sandstone
216	226	Sandstone / Siltstone
226		EOH

WORK CONSTRUCTION SKETCH



WORK NOT CONSTRUCTED BY DRILLING RIG

16

Method of excavation: Hand dug ☐ Back hoe ☐ Dragline ☐ Dozer ☐ Other

Depth (m)	Length (m)	Width (m)	Diameter (m)	Lining material	Dimentions of liner (m)	From Depth (m)	To Depth (m)

Please attach copies of the following if available

17

Geologist log	(Yes/No) ☐	Laboratory analysis of water Sample	(Yes/No) ☐	Pumping test(s)	(Yes/No) ☐
Geophysical log	(Yes/No) ☐	Sieve analysis of aquifer material	(Yes/No) ☐	Installed Pump details	(Yes/No) ☐

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Driller's Licence No:	DL1500	1
Class of Licence:		
Driller's Name:	Jason Manion	
Assistant Driller:		
Contractor:	Manion Drilling	
New bore	X	Replacement bore
Deepened		Enlarged
Reconditioned		Other (specify)
Final Depth	242 m	

Work Licence No:	90BL256010	2
Name of Licensee:	Whitehaven Coal Mine Ltd	
Intended Use:	Vibrating Wire Piezometer	
Completion Date:	18/02/2012	

DRILLING DETAILS 3

From (m)	To (m)	Hole Diameter (mm)	Drilling Method See Code 3
0	30	150	10
30	242	96	13

WATER BEARING ZONES 4

From (m)	To (m)	Thickness (m)	S W L (m)	Estimated Yield (L/s) Individual Aquifer	Estimated Yield (L/s) Cumulative	Test method See Code 4		D D L at end of test (m)	Duration Hrs	Duration min	Salinity (Conductivity or TDS) Cond (µS/cm)	Salinity (Conductivity or TDS) TDS (mg/L)

CASING / LINER DETAILS 5

Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Method Fixing Code 5

Casing support method — See Code 5: 1

Type of casing bottom — See Code 5: 1

Centralisers installed {Yes/No}: No (indicate on sketch)

Sump installed {Yes/No}: No From m To m

Pressure cemented {Yes/No}: No From m To m

Casing Protector cemented in place

WATER ENTRY DESIGN 6

General Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Opening type See Code 6	Fixing See Code 5	Screen Aperture (mm)	Slot Details Length (mm)	Width (mm)	Alignment See Code 6

GRAVEL PACK 7

Type		Grade		Grain size (mm) From	Grain size (mm) To	Depth (m) From	Depth (m) To	Quantity Litres	Quantity m^3
Rounded		Graded					0		
Crushed		Ungraded							
Bentonite/Grout seal (Yes/No)	Yes					0	242		2
Method of placement of Gravel Pack	See Code 7								

For Departmental use only: G W

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Work Licence No: 90BL256010

BORE DEVELOPMENT 8

Chemical used for breaking down drilling mud (Yes/No) No Name:

Method	Bailing/Surging	Jetting	Airlifting	Backwashing	Pumping	Other:
Duration	hrs	hrs	hrs	hrs	hrs	hrs

DISINFECTION ON COMPLETION 9

Chemical(s) used	Quantity applied (Litres)	Method of application

PUMPING TESTS ON COMPLETION 10

Test type		Date	Pump intake depth (m)	Initial Water Level (SWL) (m)	Pumping rate (L/s)	Water Level at end of pumping (DDL) (m)	Duration of Test (hrs)	Recovery: Water level (m)	Recovery: Time taken (hrs)	Recovery: Time taken (mins)
Multi stage (stepped drawdown)	Stage 1									
	Stage 2									
	Stage 3									
	Stage 4									
Single stage (constant rate)										

Height of measuring point above ground level m Test Method See Code 4

WORK PARTLY BACKFILLED OR ABANDONED 11

Original depth of work: 242 m Is work partly backfilled: (Yes/No) Yes

Is work abandoned: (Yes/No) No Method of abandonment: Backfilled X Plugged Capped

Has any casing been left in the work (Yes/No) No From m To m

Sealing / fill type (See Code 11)	From depth (m)	To depth (m)	Sealing / fill type (See Code 11)	From depth (m)	To depth (m)
1	0	242			

Site chosen by: Hydrogeologist X Geologist Driller Diviner Client Other 12

Lot No 2 DP No 1102940 13

Work Location Co ordinates Easting 233397.62 Northing 6591348.76 Zone 56

GPS: (Yes/No) Yes >> AMG/AGD or MGA/GDA X (See explanation)

Please mark the work site with "X" on the CLID provided map.

Indicate also the distances in metres from two (2) adjacent boundaries, and attach the map to this Form A package.

Signatures:

Driller: ---------- **Licensee:** ----------

Date: ---------- **Date:** ----------

Work Licence No: 90BL256010

DRILLER'S ROCK/STRATA DESCRIPTION (LITHOLOGY)

15

Depth From (m)	Depth To (m)	Description (See Code 15)

WORK CONSTRUCTION SKETCH

WORK NOT CONSTRUCTED BY DRILLING RIG

16

Method of excavation: Hand dug ☐ Back hoe ☐ Dragline ☐ Dozer ☐ Other

Depth (m)	Length (m)	Width (m)	Diameter (m)	Lining material	Dimentions of liner (m)	From Depth (m)	To Depth (m)

Please attach copies of the following if available

17

Geologist log	(Yes/No) ☐	Laboratory analysis of water Sample	(Yes/No) ☐	Pumping test(s)	(Yes/No) ☐
Geophysical log	(Yes/No) ☐	Sieve analysis of aquifer material	(Yes/No) ☐	Installed Pump details	(Yes/No) ☐

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Driller's Licence No:	DL1500	1
Class of Licence:		
Driller's Name:	Jason Manion	
Assistant Driller:		
Contractor:	Manion Drilling	

New bore	X	Replacement bore	
Deepened		Enlarged	
Reconditioned		Other (specify)	

Final Depth: 246 m

Work Licence No:	90BL256011	2
Name of Licensee:	Whitehaven Coal Mine Ltd	
Intended Use:	Monitoring	
Completion Date:	20/12/2012	

DRILLING DETAILS (3)

From (m)	To (m)	Hole Diameter (mm)	Drilling Method (See Code 3)
0	48	150	10
48	246	96	13

WATER BEARING ZONES (4)

From (m)	To (m)	Thickness (m)	S W L (m)	Estimated Yield (L/s) Individual Aquifer	Estimated Yield (L/s) Cumulative	Test method (See Code 4)	D D L at end of test (m)	Duration Hrs	Duration min	Salinity (Conductivity or TDS) Cond (µS/cm)	Salinity (Conductivity or TDS) TDS (mg/L)

CASING / LINER DETAILS (5)

Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Method Fixing Code 5
8	50	2	0	230	1

Casing support method (See Code 5): 2

Type of casing bottom (See Code 5): 2

Centralisers installed {Yes/No}	No	(indicate on sketch)					
Sump installed {Yes/No}	Yes	From	246	m	To	246	m
Pressure cemented {Yes/No}	No	From		m	To		m
Casing Protector cemented in place							

WATER ENTRY DESIGN (6)

General Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Opening type See Code 6	Fixing See Code 5	Screen Aperture (mm)	Slot Details Length (mm)	Width (mm)	Alignment See Code 6
6	50	2	234	243	3	1	1	150	1	V

GRAVEL PACK (7)

Type		Grade		Grain size (mm) From	Grain size (mm) To	Depth (m) From	Depth (m) To	Quantity Litres	Quantity m^3
Rounded		Graded	X	3	5	230	246		
Crushed		Ungraded							
Bentonite/Grout seal (Yes/No)	Yes					228	230		

Method of placement of Gravel Pack (See Code 7): 1

For Departmental use only: G W

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Work Licence No: 90BL256011

BORE DEVELOPMENT 8

Chemical used for breaking down drilling mud (Yes/No) No Name:

Method	Bailing/Surging	Jetting	Airlifting	Backwashing	Pumping	Other:
Duration	hrs	hrs	hrs	hrs	hrs	hrs

DISINFECTION ON COMPLETION 9

Chemical(s) used	Quantity applied (Litres)	Method of application

PUMPING TESTS ON COMPLETION 10

Test type		Date	Pump intake depth (m)	Initial Water Level (SWL) (m)	Pumping rate (L/s)	Water Level at end of pumping (DDL) (m)	Duration of Test (hrs)	Recovery: Water level (m)	Recovery: Time taken (hrs)	Recovery: Time taken (mins)
Multi stage (stepped drawdown)	Stage 1									
	Stage 2									
	Stage 3									
	Stage 4									
Single stage (constant rate)										

Height of measuring point above ground level m Test Method See Code 4

WORK PARTLY BACKFILLED OR ABANDONED 11

Original depth of work: 246 m Is work partly backfilled: (Yes/No) No

Is work abandoned: (Yes/No) No Method of abandonment: Backfilled Plugged Capped

Has any casing been left in the work (Yes/No) No From m To m

Sealing / fill type (See Code 11)	From depth (m)	To depth (m)	Sealing / fill type (See Code 11)	From depth (m)	To depth (m)
3		134			

Site chosen by: Hydrogeologist X Geologist Driller Diviner Client Other 12

Lot No 2 DP No 1102940 13

Work Location Co ordinates Easting 233250.25 Northing 6590533.37 Zone 56

GPS: (Yes/No) Yes >> AMG/AGD or MGA/GDA X (See explanation)

Please mark the work site with "X" on the CLID provided map.

Indicate also the distances in metres from two (2) adjacent boundaries, and attach the map to this Form A package.

Signatures:

Driller: ---------- **Licensee:** ----------

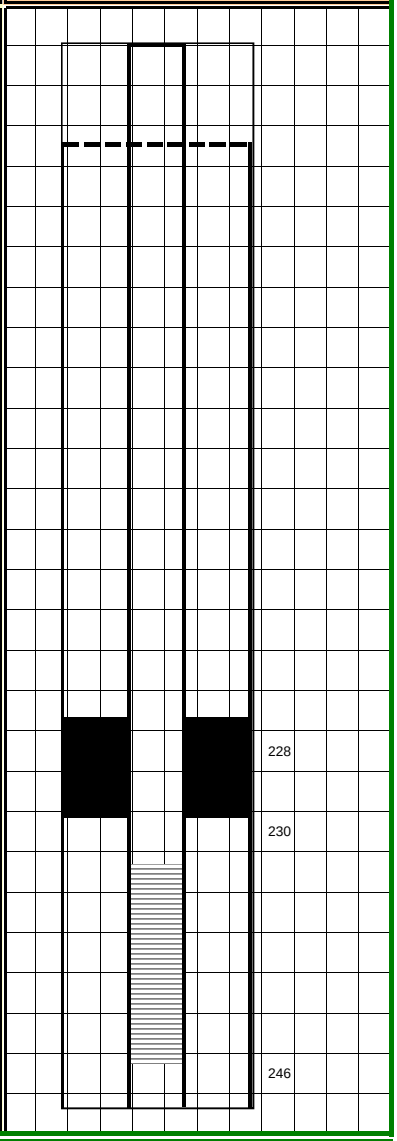
Date: ---------- **Date:** ----------

Work Licence No: 90BL256011

DRILLER'S ROCK/STRATA DESCRIPTION (LITHOLOGY) — 15

Depth From (m)	Depth To (m)	Description (See Code 15)
0	1	Soil
1	3	Clay minor sand
4	30	Weathered Conglomerate / Sandstone
11	30	Conglomerate / Minor sandstone
30	34	Coal / Minor Sandstone
34	59	Conglomerate / Minor sandstone
59	60	Sandstone
60	63	Coal
69	65	Sandstone
65	77	Conglomerate / Minor sandstone
77	77.5	Coal
77.5	84	Sandstone / Conglomerate
84	85	Coal
85	99	Sandstone / Conglomerate
99	100	Coal
100	121	Conglomerate / Minor sandstone
121	123	Coal
123	142.5	Sandstone / Conglomerate
142.5	144	Coal
144	151	Sandstone
151	185.5	Conglomerate / Minor sandstone
185.5	187	Coal
187	204	Sandstone / Coal
204	213.5	Conglomerate / Minor sandstone
213.5	217	Sandstone / Coal
217	232	Sandstone
232	238	Sandstone / Coal
238	246	Sandstone

WORK CONSTRUCTION SKETCH



WORK NOT CONSTRUCTED BY DRILLING RIG — 16

Method of excavation: Hand dug ☐ Back hoe ☐ Dragline ☐ Dozer ☐ Other ☐

Depth (m)	Length (m)	Width (m)	Diameter (m)	Lining material	Dimentions of liner (m)	From Depth (m)	To Depth (m)

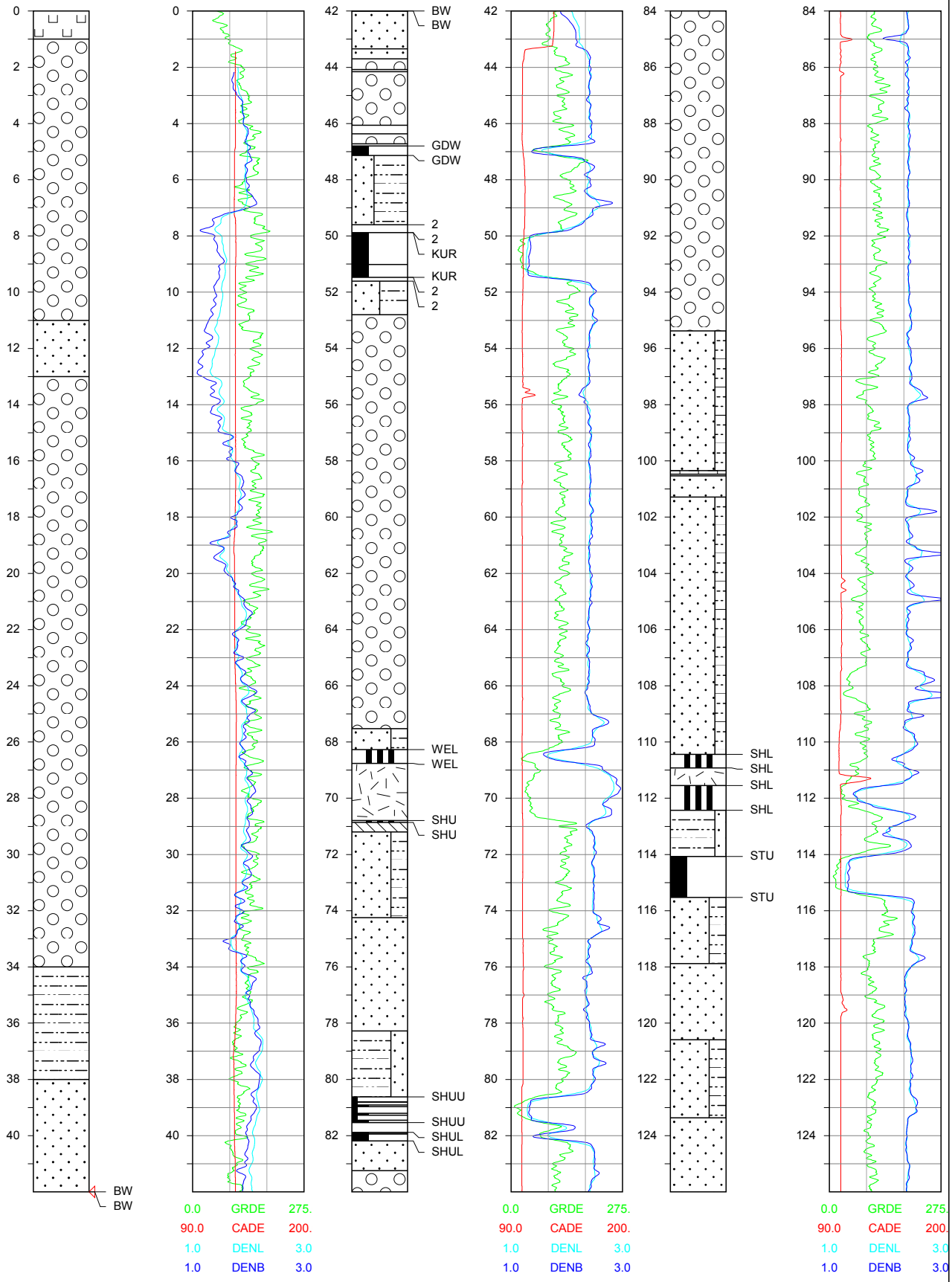
Please attach copies of the following if available — 17

Geologist log	(Yes/No) ☐	Laboratory analysis of water Sample	(Yes/No) ☐	Pumping test(s)	(Yes/No) ☐
Geophysical log	(Yes/No) ☐	Sieve analysis of aquifer material	(Yes/No) ☐	Installed Pump details	(Yes/No) ☐

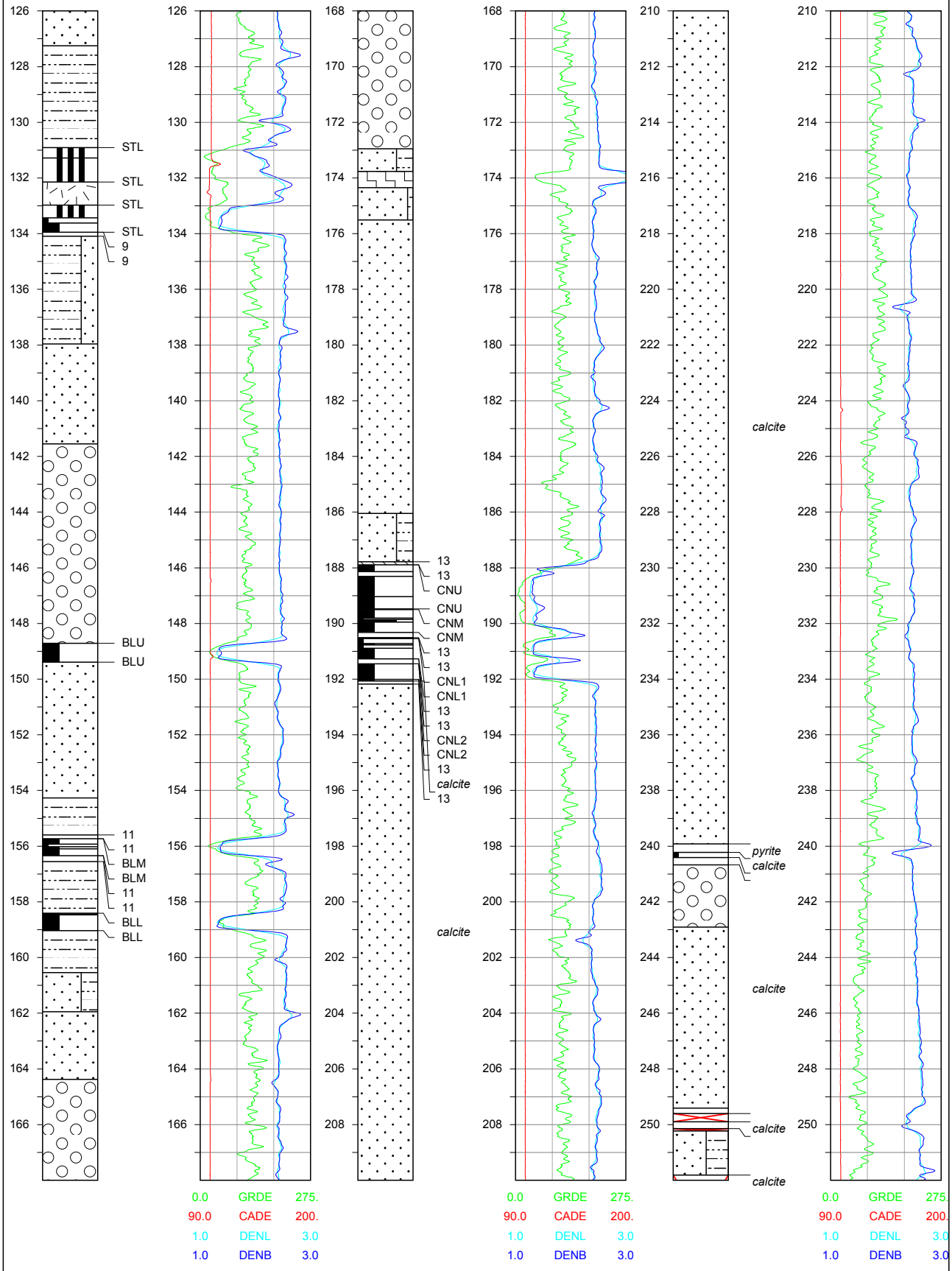
APPENDIX B
VIBRATING WIRE PIEZOMETER BORE LOGS AND LICENCE DETAILS

Table B1: Vibrating Wire Piezometer Drillhole Details

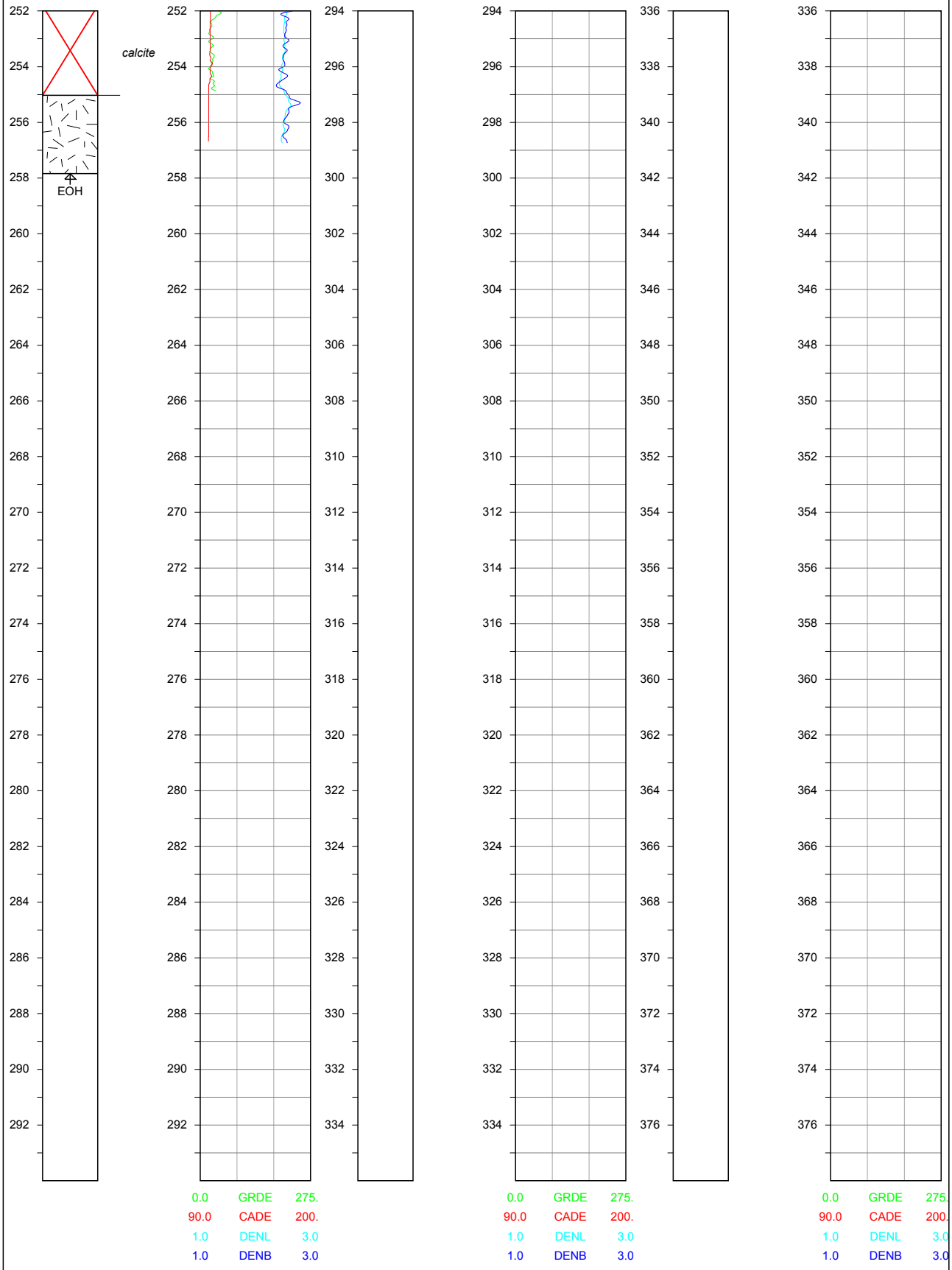
Hole ID	Easting (MGA)	Northing (MGA)	Bore Depth (m)
VKY3033	232366	6594263	258
VKY3041	233397	6591348	338
VKY3053	230098	6593816	90



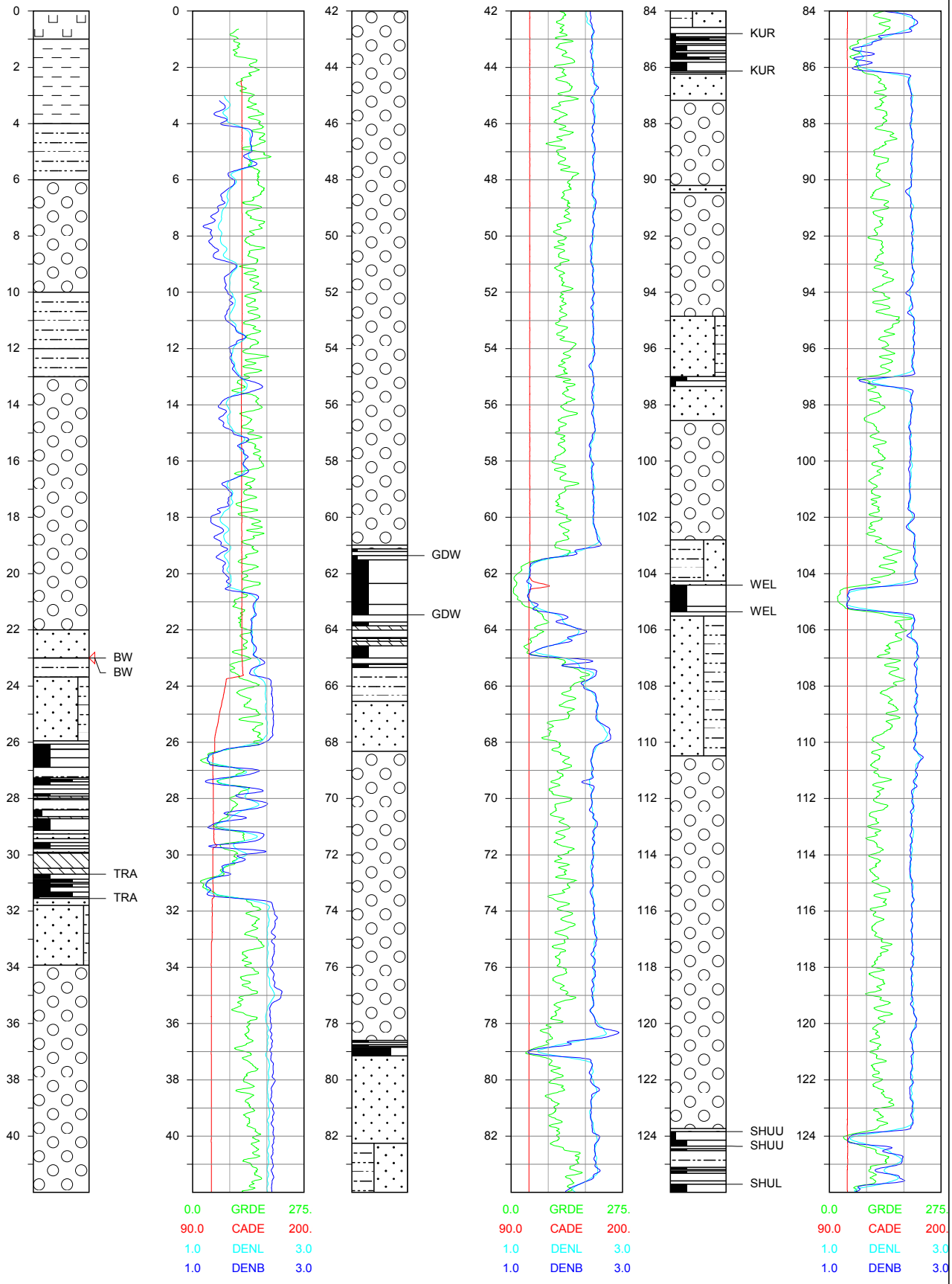
	VKY033C
	Vickery
Page 1/3	20/10/2011



WHITEHAVEN	VKY033C	
	Vickery	
	Page 2/3	20/10/2011



WHITEHAVEN	VKY033C	
	Vickery	
	Page 3/3	20/10/2011



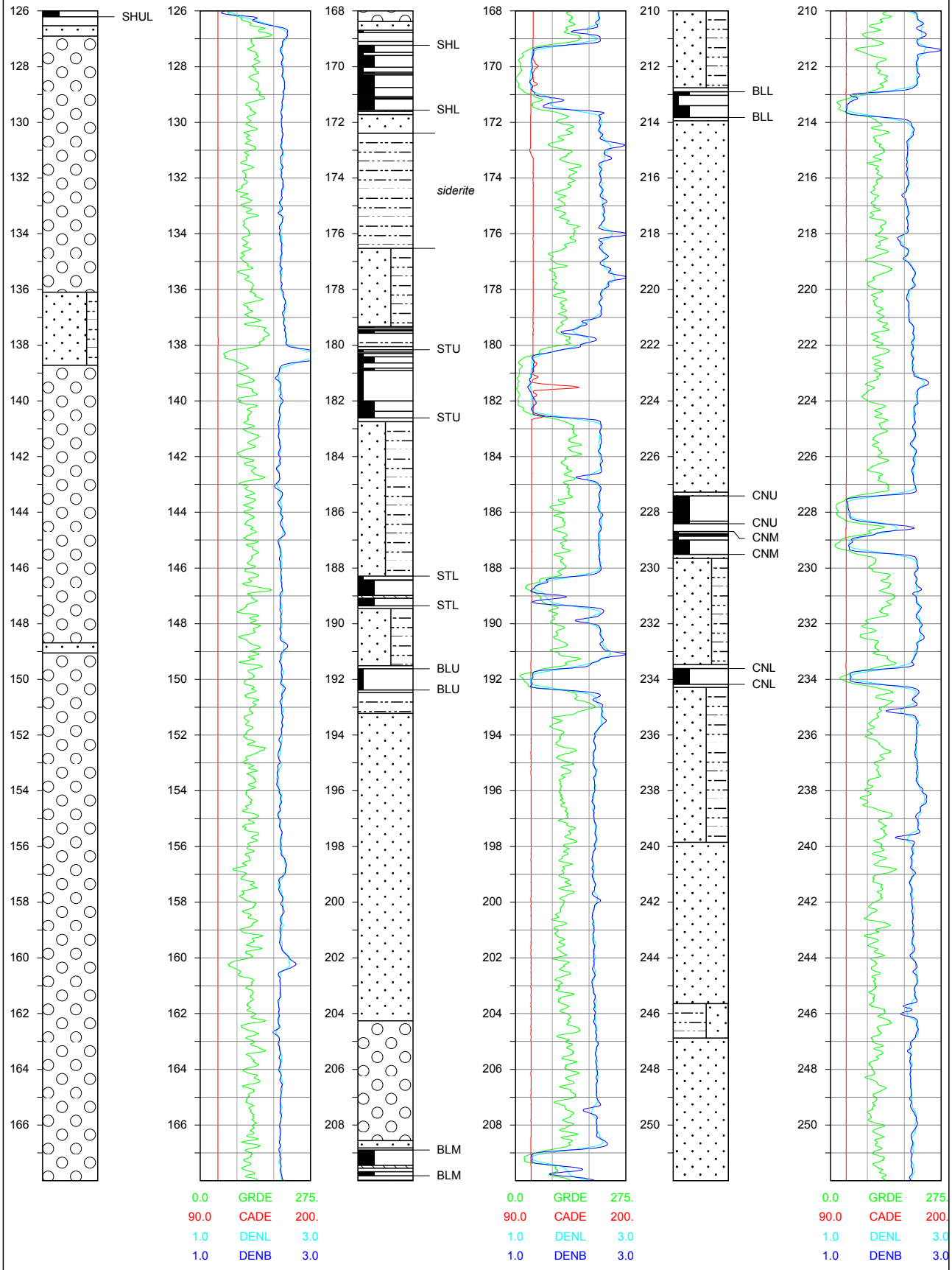
WHITEHAVEN

VICKERY

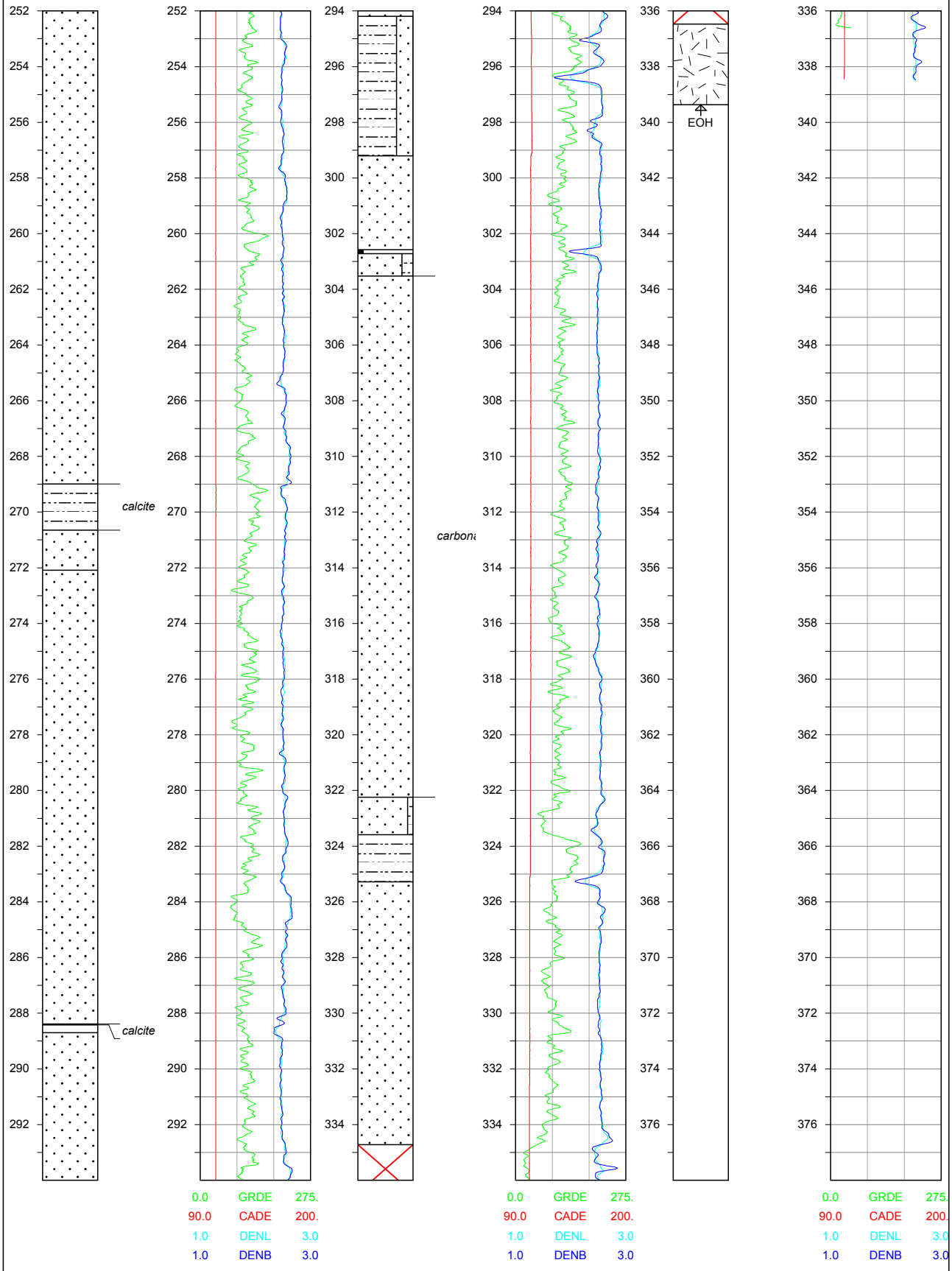
VKY0041C

Page 1/3

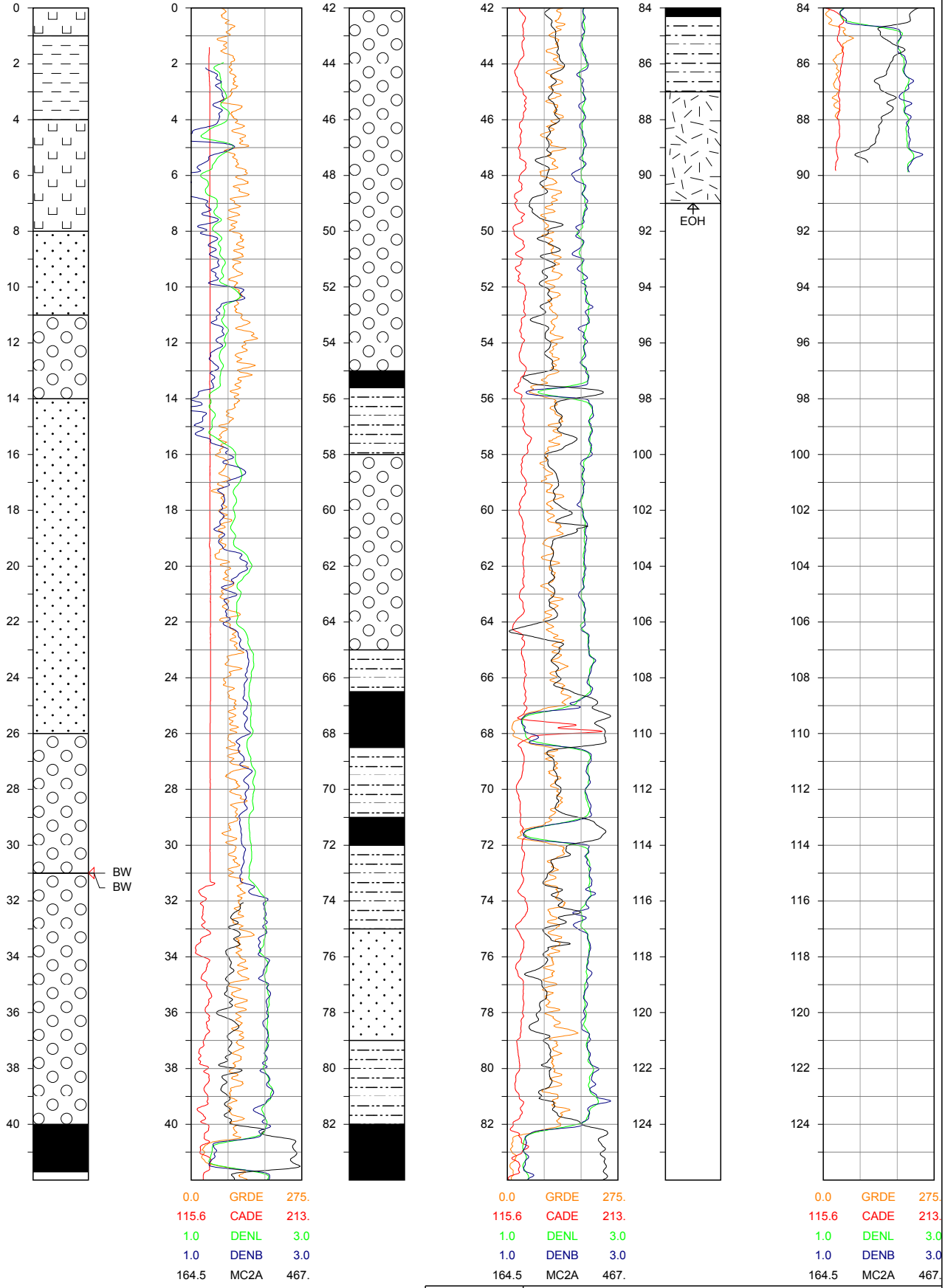
23/02/2012



WHITEHAVEN	VICKERY	
	VKY0041C	
	Page 2/3	23/02/2012



WHITEHAVEN	VICKERY	
	VKY0041C	
	Page 3/3	23/02/2012



VKY3053

Vickery

Page 1/1

5/10/2011

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Driller's Licence No:	DL1500	1
Class of Licence:		
Driller's Name:	Jason Manion	
Assistant Driller:		
Contractor:	Manion Drilling	
New bore	X	Replacement bore
Deepened		Enlarged
Reconditioned		Other (specify)
Final Depth	258 m	

Work Licence No:	90BL256012	2
Name of Licensee:	Whitehaven Coal Mine Ltd	
Intended Use:	Vibrating Wire Piezometer	
Completion Date:	19/02/2012	

DRILLING DETAILS 3

From (m)	To (m)	Hole Diameter (mm)	Drilling Method See Code 3
0	31	150	10
31	258	96	13

WATER BEARING ZONES 4

From (m)	To (m)	Thickness (m)	S W L (m)	Estimated Yield (L/s) Individual Aquifer	Estimated Yield (L/s) Cumulative	Test method See Code 4		D D L at end of test (m)	Duration Hrs	Duration min	Salinity (Conductivity or TDS) Cond (µS/cm)	Salinity (Conductivity or TDS) TDS (mg/L)

CASING / LINER DETAILS 5

Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Method Fixing Code 5

Casing support method — See Code 5: 1

Type of casing bottom — See Code 5: 1

Centralisers installed {Yes/No}: No (indicate on sketch)

Sump installed {Yes/No}: No From ____ m To ____ m

Pressure cemented {Yes/No}: No From ____ m To ____ m

Casing Protector cemented in place

WATER ENTRY DESIGN 6

General Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Opening type See Code 6	Fixing See Code 5	Screen Aperture (mm)	Slot Details Length (mm)	Width (mm)	Alignment See Code 6

GRAVEL PACK 7

Type	Grade	Grain size (mm) From	Grain size (mm) To	Depth (m) From	Depth (m) To	Quantity Litres	Quantity m^3
Rounded	Graded				0		
Crushed	Ungraded						
Bentonite/Grout seal (Yes/No) Yes				0	91		0.8

Method of placement of Gravel Pack — See Code 7:

For Departmental use only: G W

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Work Licence No: 90BL256012

BORE DEVELOPMENT 8

Chemical used for breaking down drilling mud (Yes/No) No Name:

Method	Bailing/Surging	Jetting	Airlifting	Backwashing	Pumping	Other:
Duration	hrs	hrs	hrs	hrs	hrs	hrs

DISINFECTION ON COMPLETION 9

Chemical(s) used	Quantity applied (Litres)	Method of application

PUMPING TESTS ON COMPLETION 10

Test type		Date	Pump intake depth (m)	Initial Water Level (SWL) (m)	Pumping rate (L/s)	Water Level at end of pumping (DDL) (m)	Duration of Test (hrs)	Recovery: Water level (m)	Recovery: Time taken (hrs)	Recovery: Time taken (mins)
Multi stage (stepped drawdown)	Stage 1									
	Stage 2									
	Stage 3									
	Stage 4									
Single stage (constant rate)										

Height of measuring point above ground level m Test Method See Code 4

WORK PARTLY BACKFILLED OR ABANDONED 11

Original depth of work: 258 m Is work partly backfilled: (Yes/No) Yes

Is work abandoned: (Yes/No) No Method of abandonment: Backfilled X Plugged Capped

Has any casing been left in the work (Yes/No) No From m To m

Sealing / fill type (See Code 11)	From depth (m)	To depth (m)	Sealing / fill type (See Code 11)	From depth (m)	To depth (m)
1	0	258			

Site chosen by: Hydrogeologist X Geologist Driller Diviner Client Other 12

Lot No 2 DP No 1102940 13

Work Location Co ordinates Easting 232366.51 Northing 6594263.41 Zone 56

GPS: (Yes/No) Yes >> AMG/AGD or MGA/GDA X (See explanation)

Please mark the work site with "X" on the CLID provided map.

Indicate also the distances in metres from two (2) adjacent boundaries, and attach the map to this Form A package.

Signatures:

Driller: ---------- **Licensee:** ----------

Date: ---------- **Date:** ----------

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Work Licence No: 90BL256012

DRILLER'S ROCK/STRATA DESCRIPTION (LITHOLOGY) — 15

Depth From (m)	Depth To (m)	Description (See Code 15)
0	1	Soil
1	42	Weathered Conglomerate / Sandstone
42	44	Sandstone
44	44.5	Coal
44.5	50	Conglomerate / Minor sandstone
50	52	Coal
52	81	Conglomerate / Minor sandstone
81	82	Coal
82	110	Conglomerate / Minor sandstone
110	115	Coal
115	131	Siltstone / Sandstone
131	134	Coal
134	149	Siltstone / Sandstone
149	150	Coal
150	155	Siltstone
155	157	Coal
157	188	Siltstone / Sandstone / Conglomerate
188	192	Coal
192	255	Sandstone / minor conglomerate
255	258	Volcanics

WORK CONSTRUCTION SKETCH

WORK NOT CONSTRUCTED BY DRILLING RIG — 16

Method of excavation: Hand dug ☐ Back hoe ☐ Dragline ☐ Dozer ☐ Other

Depth (m)	Length (m)	Width (m)	Diameter (m)	Lining material	Dimentions of liner (m)	From Depth (m)	To Depth (m)

Please attach copies of the following if available — 17

Geologist log	(Yes/No) ☐	Laboratory analysis of water Sample	(Yes/No) ☐	Pumping test(s)	(Yes/No) ☐
Geophysical log	(Yes/No) ☐	Sieve analysis of aquifer material	(Yes/No) ☐	Installed Pump details	(Yes/No) ☐

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Driller's Licence No:	DL1500	1
Class of Licence:		
Driller's Name:	Jason Manion	
Assistant Driller:		
Contractor:	Manion Drilling	
New bore	X	Replacement bore
Deepened		Enlarged
Reconditioned		Other (specify)
Final Depth	242 m	

Work Licence No:	90BL256010	2
Name of Licensee:	Whitehaven Coal Mine Ltd	
Intended Use:	Vibrating Wire Piezometer	
Completion Date:	18/02/2012	

DRILLING DETAILS 3

From (m)	To (m)	Hole Diameter (mm)	Drilling Method See Code 3
0	30	150	10
30	242	96	13

WATER BEARING ZONES 4

From (m)	To (m)	Thickness (m)	S W L (m)	Estimated Yield (L/s) Individual Aquifer	Estimated Yield (L/s) Cumulative	Test method See Code 4		D D L at end of test (m)	Duration Hrs	Duration min	Salinity (Conductivity or TDS) Cond (µS/cm)	Salinity (Conductivity or TDS) TDS (mg/L)

CASING / LINER DETAILS 5

Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Method Fixing Code 5

Casing support method — See Code 5: 1

Type of casing bottom — See Code 5: 1

Centralisers installed {Yes/No}: No (indicate on sketch)

Sump installed {Yes/No}: No From m To m

Pressure cemented {Yes/No}: No From m To m

Casing Protector cemented in place

WATER ENTRY DESIGN 6

General Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Opening type See Code 6	Fixing See Code 5	Screen Aperture (mm)	Slot Details Length (mm)	Width (mm)	Alignment See Code 6

GRAVEL PACK 7

Type		Grade		Grain size (mm) From	Grain size (mm) To	Depth (m) From	Depth (m) To	Quantity Litres	Quantity m^3
Rounded		Graded					0		
Crushed		Ungraded							
Bentonite/Grout seal (Yes/No)	Yes					0	242		2
Method of placement of Gravel Pack	See Code 7								

For Departmental use only: G W

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Work Licence No: 90BL256010

BORE DEVELOPMENT 8

Chemical used for breaking down drilling mud (Yes/No) No Name:

Method	Bailing/Surging	Jetting	Airlifting	Backwashing	Pumping	Other:
Duration	hrs	hrs	hrs	hrs	hrs	hrs

DISINFECTION ON COMPLETION 9

Chemical(s) used	Quantity applied (Litres)	Method of application

PUMPING TESTS ON COMPLETION 10

Test type		Date	Pump intake depth (m)	Initial Water Level (SWL) (m)	Pumping rate (L/s)	Water Level at end of pumping (DDL) (m)	Duration of Test (hrs)	Recovery: Water level (m)	Recovery: Time taken (hrs)	Recovery: Time taken (mins)
Multi stage (stepped drawdown)	Stage 1									
	Stage 2									
	Stage 3									
	Stage 4									
Single stage (constant rate)										

Height of measuring point above ground level m Test Method See Code 4

WORK PARTLY BACKFILLED OR ABANDONED 11

Original depth of work: 242 m Is work partly backfilled: (Yes/No) Yes

Is work abandoned: (Yes/No) No Method of abandonment: Backfilled X Plugged Capped

Has any casing been left in the work (Yes/No) No From m To m

Sealing / fill type (See Code 11)	From depth (m)	To depth (m)	Sealing / fill type (See Code 11)	From depth (m)	To depth (m)
1	0	242			

Site chosen by: Hydrogeologist X Geologist Driller Diviner Client Other 12

Lot No 2 DP No 1102940 13

Work Location Co ordinates Easting 233397.62 Northing 6591348.76 Zone 56

GPS: (Yes/No) Yes >> AMG/AGD or MGA/GDA X (See explanation)

Please mark the work site with "X" on the CLID provided map.

Indicate also the distances in metres from two (2) adjacent boundaries, and attach the map to this Form A package.

Signatures:

Driller: ---------- **Licensee:** ----------

Date: ---------- **Date:** ----------

Work Licence No: 90BL256010

DRILLER'S ROCK/STRATA DESCRIPTION (LITHOLOGY)

15

Depth From (m)	Depth To (m)	Description (See Code 15)

WORK CONSTRUCTION SKETCH

WORK NOT CONSTRUCTED BY DRILLING RIG

16

Method of excavation: Hand dug ☐ Back hoe ☐ Dragline ☐ Dozer ☐ Other

Depth (m)	Length (m)	Width (m)	Diameter (m)	Lining material	Dimentions of liner (m)	From Depth (m)	To Depth (m)

Please attach copies of the following if available

17

Geologist log	(Yes/No) ☐	Laboratory analysis of water Sample	(Yes/No) ☐	Pumping test(s)	(Yes/No) ☐
Geophysical log	(Yes/No) ☐	Sieve analysis of aquifer material	(Yes/No) ☐	Installed Pump details	(Yes/No) ☐

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Driller's Licence No:	DL1500	1
Class of Licence:		
Driller's Name:	Jason Manion	
Assistant Driller:		
Contractor:	Manion Drilling	
New bore	X	Replacement bore
Deepened		Enlarged
Reconditioned		Other (specify)
Final Depth	91 m	

Work Licence No:	90BL256009	2
Name of Licensee:	Whitehaven Coal Mine Ltd	
Intended Use:	Vibrating Wire Piezometer	
Completion Date:	12/02/2012	

DRILLING DETAILS 3

From (m)	To (m)	Hole Diameter (mm)	Drilling Method See Code 3
0	31	150	10
31	91	96	13

WATER BEARING ZONES 4

From (m)	To (m)	Thickness (m)	S W L (m)	Estimated Yield (L/s) Individual Aquifer	Estimated Yield (L/s) Cumulative	Test method See Code 4		D D L at end of test (m)	Duration Hrs	Duration min	Salinity (Conductivity or TDS) Cond (µS/cm)	Salinity (Conductivity or TDS) TDS (mg/L)

CASING / LINER DETAILS 5

Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Method Fixing Code 5

Casing support method — See Code 5: 2

Type of casing bottom — See Code 5: 2

Centralisers installed {Yes/No}: No (indicate on sketch)

Sump installed {Yes/No}: No From ____ m To ____ m

Pressure cemented {Yes/No}: No From ____ m To ____ m

Casing Protector cemented in place

WATER ENTRY DESIGN 6

General Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Opening type See Code 6	Fixing See Code 5	Screen Aperture (mm)	Slot Details Length (mm)	Width (mm)	Alignment See Code 6

GRAVEL PACK 7

Type	Grade	Grain size (mm) From	Grain size (mm) To	Depth (m) From	Depth (m) To	Quantity Litres	Quantity m^3
Rounded	Graded				0		
Crushed	Ungraded						
Bentonite/Grout seal (Yes/No) Yes				0	91		0.8

Method of placement of Gravel Pack — See Code 7:

For Departmental use only: G W

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Work Licence No: 90BL256009

BORE DEVELOPMENT 8

Chemical used for breaking down drilling mud (Yes/No) No Name:

Method	Bailing/Surging	Jetting	Airlifting	Backwashing	Pumping	Other:
Duration	hrs	hrs	hrs	hrs	hrs	hrs

DISINFECTION ON COMPLETION 9

Chemical(s) used	Quantity applied (Litres)	Method of application

PUMPING TESTS ON COMPLETION 10

Test type		Date	Pump intake depth (m)	Initial Water Level (SWL) (m)	Pumping rate (L/s)	Water Level at end of pumping (DDL) (m)	Duration of Test (hrs)	Recovery: Water level (m)	Recovery: Time taken (hrs)	Recovery: Time taken (mins)
Multi stage (stepped drawdown)	Stage 1									
	Stage 2									
	Stage 3									
	Stage 4									
Single stage (constant rate)										

Height of measuring point above ground level m Test Method See Code 4

WORK PARTLY BACKFILLED OR ABANDONED 11

Original depth of work: 91 m Is work partly backfilled: (Yes/No) Yes

Is work abandoned: (Yes/No) No Method of abandonment: Backfilled X Plugged Capped

Has any casing been left in the work (Yes/No) No From m To m

Sealing / fill type (See Code 11)	From depth (m)	To depth (m)	Sealing / fill type (See Code 11)	From depth (m)	To depth (m)
1	0	91			

Site chosen by: Hydrogeologist X Geologist Driller Diviner Client Other 12

Lot No 37 DP No 754929 13

Work Location Co ordinates Easting 230098.36 Northing 6593816.53 Zone 56

GPS: (Yes/No) Yes >> AMG/AGD or MGA/GDA X (See explanation)

Please mark the work site with "X" on the CLID provided map.

Indicate also the distances in metres from two (2) adjacent boundaries, and attach the map to this Form A package.

Signatures:

Driller: ---------- **Licensee:** ----------

Date: ---------- **Date:** ----------

Work Licence No: 90BL256009

DRILLER'S ROCK/STRATA DESCRIPTION (LITHOLOGY)

15

Depth From (m)	Depth To (m)	Description (See Code 15)
0	1	Soil
1	3	Clay minor sand
4	8	Weathered Conglomerate / Sandstone
8	11	Sandstone
11	14	Conglomerate / Minor sandstone
14	26	Sandstone
26	40	Conglomerate / Minor sandstone
40	42	Coal
42	55	Conglomerate / Minor sandstone
55	55.5	Coal
55.5	58	Siltstone
58	65	Conglomerate / Minor sandstone
65	66.5	Siltstone
66.5	68.5	Coal
68.5	71	Siltstone
71	72	Coal
72	75	Siltstone
75	79	Sandstone
79	82	Siltstone
82	84	Coal
84	87	Siltstone
87	91	Volcanics

WORK CONSTRUCTION SKETCH

WORK NOT CONSTRUCTED BY DRILLING RIG

16

Method of excavation: Hand dug ☐ Back hoe ☐ Dragline ☐ Dozer ☐ Other

Depth (m)	Length (m)	Width (m)	Diameter (m)	Lining material	Dimentions of liner (m)	From Depth (m)	To Depth (m)

Please attach copies of the following if available

17

Geologist log	(Yes/No) ☐	Laboratory analysis of water Sample	(Yes/No) ☐	Pumping test(s)	(Yes/No) ☐
Geophysical log	(Yes/No) ☐	Sieve analysis of aquifer material	(Yes/No) ☐	Installed Pump details	(Yes/No) ☐

APPENDIX C

UPPER NAMOI ALLUVIUM / WEATHERED PERMIAN STRATA BORE LOGS AND LICENCE DETAILS

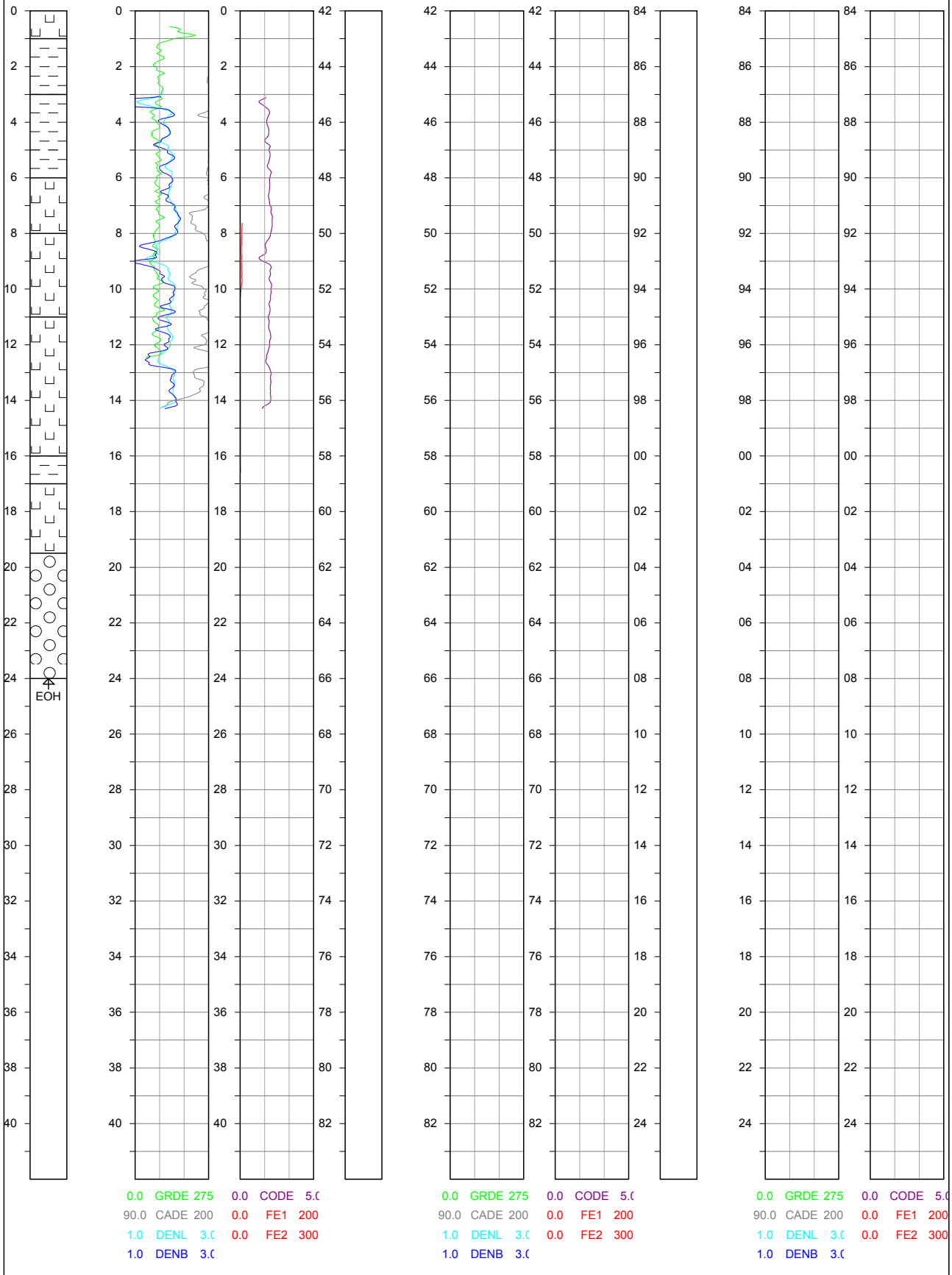
Project Vickery
BoreName TR 0001
Total Depth 24m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting 232431
Northing 6589763

County
Parish
Portion
Map
File

Date Commenced 7/12/2011
Date Completed 7/12/2011
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Shane Cox
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0001 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA		SEAM	COMMENTS
1.000	1.000	1.000	Soil	brown, unconsolidated, extremely weathered.		
3.000	2.000	2.000	Clay	yellow brown, soft, highly weathered.		
6.000	3.000	3.000	Clay	grey brown, soft, moderately weathered.		
8.000	2.000	2.000	Gravel	orange brown, pebbly, unconsolidated, highly weathered.		
11.000	3.000	3.000	Gravel	grey brown, pebbly, unconsolidated, moderately weathered.		
16.000	5.000	5.000	Gravel	yellow brown, pebbly, unconsolidated, highly weathered.		
17.000	1.000	1.000	Clay	grey brown, soft, highly weathered.		
19.500	2.500	2.500	Gravel	mottled brown, pebbly, unconsolidated, ferruginous, highly weathered.		
24.000	4.500	4.500	Conglomerate	mottled brown, cobbly, hard, moderately weathered, subrounded.		Water @ 17m



	Vickery
	TR001
Page 1/1	1/02/2012

Project Vickery

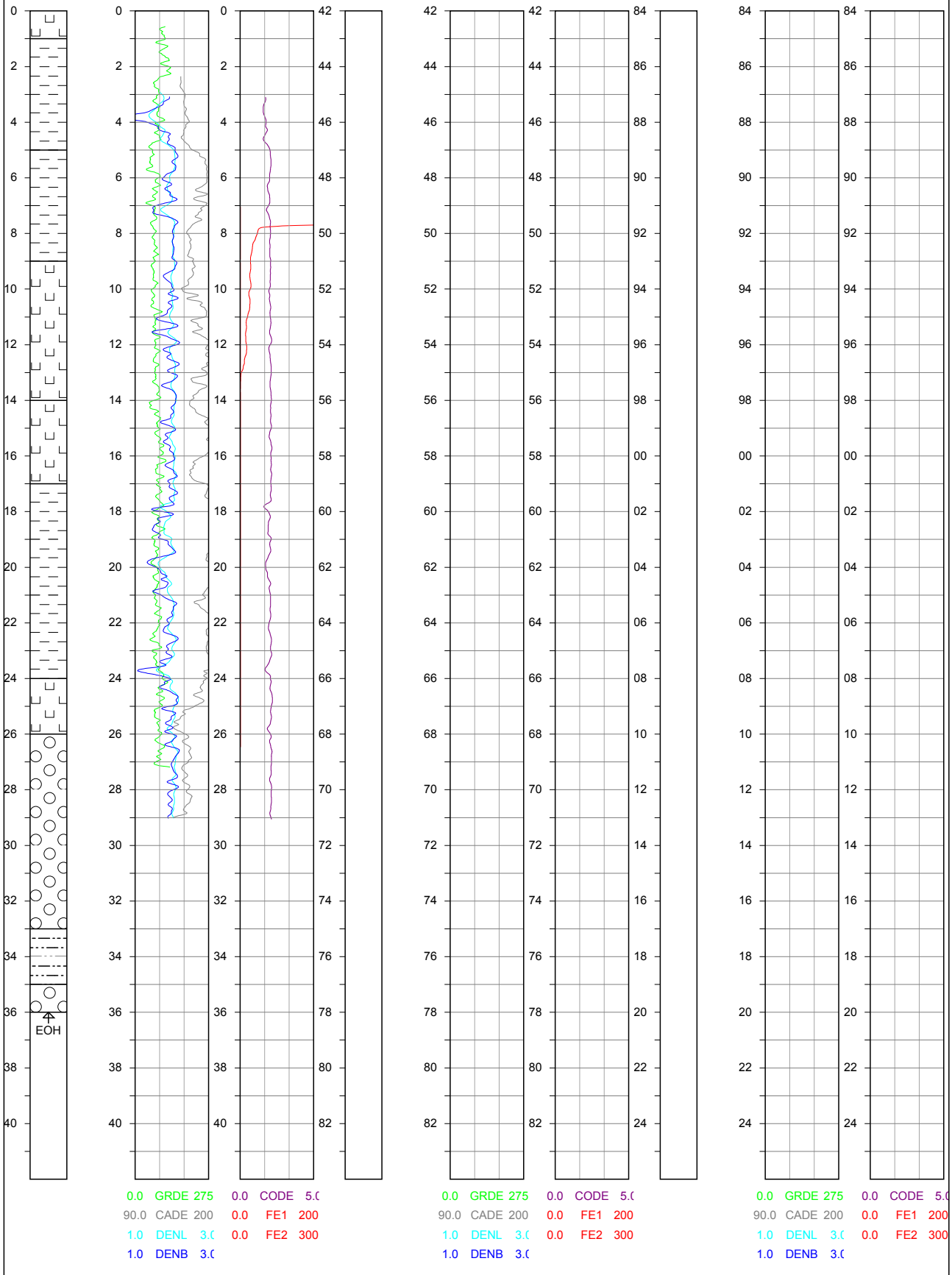
BoreName TR 0003
Total Depth 36m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting 232431
Northing 6589563

County
Parish
Portion
Map
File

Date Commenced 7/12/2011
Date Completed 7/12/2011
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Shane Cox
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0003 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA	SEAM	COMMENTS
1.000	1.000	1.000	Soil dark brown, unconsolidated, extremely weathered.		
5.000	4.000	4.000	Clay orange brown, unconsolidated, ferruginous, moderately weathered.		
9.000	4.000	4.000	Clay grey brown, soft, moderately weathered.		
14.000	5.000	5.000	Gravel grey brown, pebbly, unconsolidated, moderately weathered.		
17.000	3.000	3.000	Gravel orange brown, cobbly, unconsolidated, sandy ferruginous, moderately weathered.		
24.000	7.000	7.000	Clay grey brown, pebbly, soft, moderately weathered.		
26.000	2.000	2.000	Gravel mottled brown, cobbly, unconsolidated, highly weathered.		
33.000	7.000	7.000	Conglomerate red brown, pebbly, moderately hard, ferruginous, moderately weathered.		
35.000	2.000	2.000	Siltstone light grey, moderately hard, slightly weathered.		
36.000	1.000	1.000	Conglomerate mottled brown, pebbly, hard, slightly weathered.		Water @ 17m



WHITEHAVEN	Vickery
	TR003
Page 1/1	1/02/2012

Project Vickery
Bore Name TR 0004
Total Depth 21m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting 232431
Northing 6589963

County
Parish
Portion
Map
File

Date Commenced 7/12/2011
Date Completed 7/12/2011
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Shane Cox
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0004 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA	SEAM	COMMENTS
1.000	1.000	1.000	Soil brown, unconsolidated, extremely weathered.		
4.000	3.000	3.000	Clay yellow brown, unconsolidated, highly weathered.		
6.000	2.000	2.000	Sand brown, medium to coarse grained, unconsolidated, highly weathered.		
8.000	2.000	2.000	Clay grey brown, soft, highly weathered.		
10.000	2.000	2.000	Gravel red brown, pebbly, clayey, highly weathered.		
16.000	6.000	6.000	Gravel mottled brown, pebbly, unconsolidated, moderately weathered.		
19.000	3.000	3.000	Gravel brown, cobbly, unconsolidated, highly weathered.		
21.000	2.000	2.000	Conglomerate mottled brown, pebbly, hard, moderately weathered.		Water @ 17m

Project Vickery
BoreName TR 0005
Total Depth 31m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

Date Commenced 15/12/2011
Date Completed 15/12/2011
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Shane Cox
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0005 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA		SEAM	COMMENTS
2.000	2.000	2.000	Soil	red brown, unconsolidated, extremely weathered.		
3.000	1.000	1.000	Clay	grey brown, unconsolidated, highly weathered.		
6.000	3.000	3.000	Gravel	grey brown, pebbly, unconsolidated, highly weathered.		
9.000	3.000	3.000	Clay	brown grey, unconsolidated, highly weathered.		
11.000	2.000	2.000	Gravel	red brown, unconsolidated, highly weathered.		
13.000	2.000	2.000	Clay	brown grey, pebbly, unconsolidated, highly weathered.		
14.000	1.000	1.000	Gravel	mottled brown, pebbly, unconsolidated, highly weathered.		Small amount of water @ 14m > 16.0m > 23m
22.000	8.000	8.000	Conglomerate	mottled brown, pebbly, hard, moderately weathered.		
23.000	1.000	1.000	Conglomerate	orange brown, pebbly, hard, moderately weathered.		
31.000	8.000	8.000	Conglomerate	mottled brown, pebbly, hard, slightly weathered.		

_ Project Vickery
BoreName TR 0006
Total Depth 25m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

Date Commenced 15/12/2011
Date Completed 15/12/2011
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Shane Cox
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0006 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA		SEAM	COMMENTS
1.000	1.000	1.000	Soil	red brown, unconsolidated, extremely weathered.		
4.000	3.000	3.000	Gravel	red brown, pebbly, unconsolidated, highly weathered.		
7.000	3.000	3.000	Clay	light grey, unconsolidated, moderately weathered.		
17.000	10.000	10.000	Conglomerate	mottled brown, pebbly, moderately hard, moderately weathered.		
19.000	2.000	2.000	Claystone	brown, moderately hard, moderately weathered.		
25.000	6.000	6.000	Conglomerate	mottled brown, hard, slightly weathered.		

Project Vickery

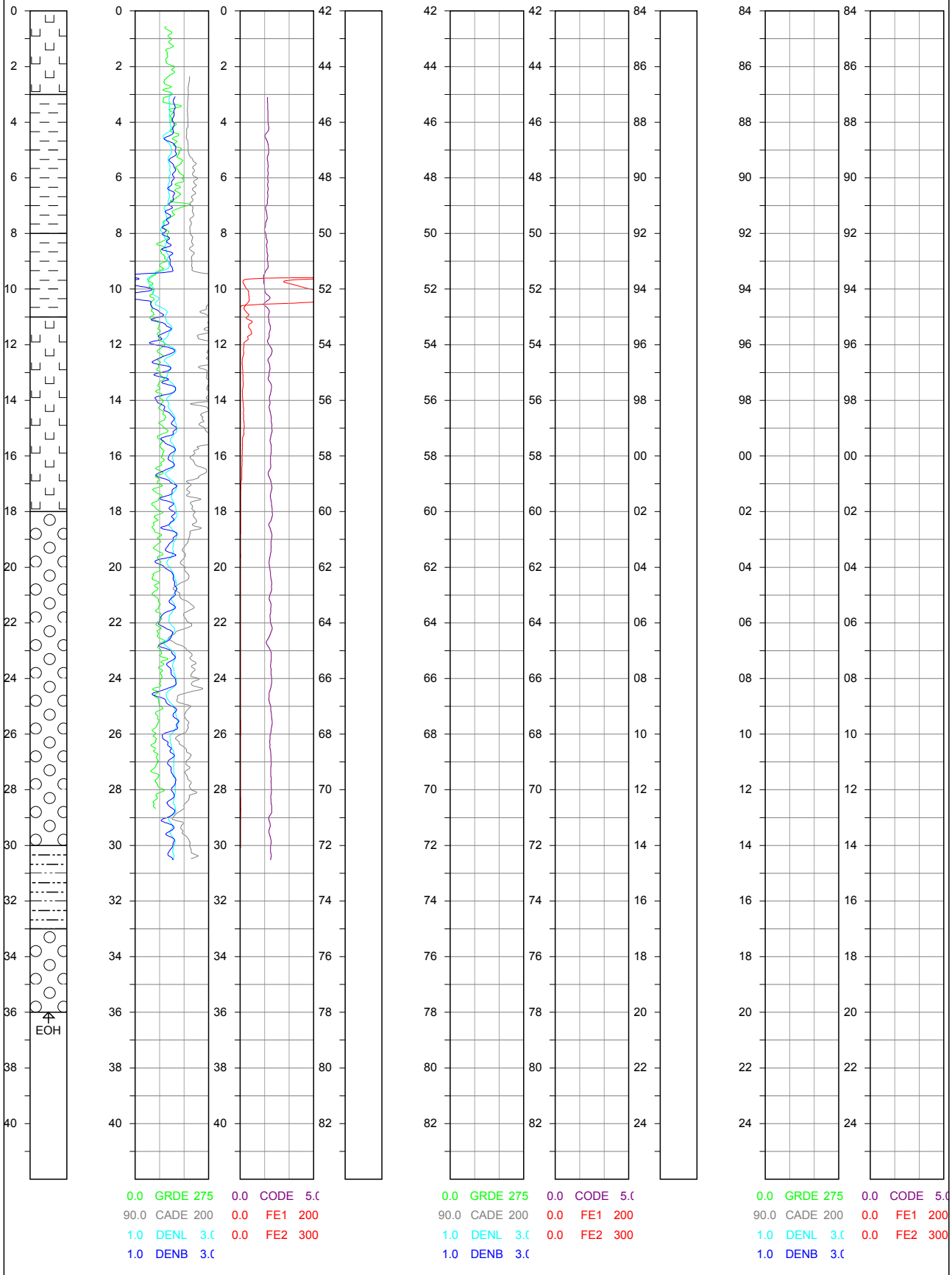
BoreName TR 0007
Total Depth 36m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

Date Commenced 15/12/2011
Date Completed 16/12/2011
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Shane Cox
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0007 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA		SEAM	COMMENTS
3.000	3.000	3.000	Soil	grey brown, unconsolidated, extremely weathered.		
8.000	5.000	5.000	Clay	grey brown, unconsolidated, highly weathered.		
11.000	3.000	3.000	Clay	brown grey, unconsolidated, highly weathered.		
18.000	7.000	7.000	Gravel	mottled brown, cobbly, unconsolidated, highly weathered.		Water @ 17m-600g/hr-conglomerate fractionated - gravel like
30.000	12.000	12.000	Conglomerate	mottled brown, pebbly, moderately hard, ferruginous, moderately weathered.		
33.000	3.000	3.000	Siltstone	light grey, soft, clayey, moderately weathered.		
36.000	3.000	3.000	Conglomerate	mottled brown, pebbly, moderately hard, slightly weathered.		



WHITEHAVEN	Vickery
	TR007
Page 1/1	1/02/2012

Project Vickery
BoreName TR 0008
Total Depth 42m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

Date Commenced 16/12/2011
Date Completed 16/12/2011
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Shane Cox
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0008 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA		SEAM	COMMENTS
1.000	1.000	1.000	Soil	dark brown, unconsolidated, extremely weathered.		
4.000	3.000	3.000	Clay	yellow brown, unconsolidated, highly weathered.		
7.000	3.000	3.000	Clay	grey brown, unconsolidated, highly weathered.		
11.000	4.000	4.000	Gravel	mottled brown, pebbly, unconsolidated, highly weathered.		
14.000	3.000	3.000	Sand	red brown, medium to coarse grained, unconsolidated, highly weathered.		Moisture @ 13m > 19m
19.000	5.000	5.000	Gravel	mottled brown, pebbly, unconsolidated, highly weathered.		
21.000	2.000	2.000	Siltstone	light brown, soft, moderately weathered.		
24.000	3.000	3.000	Sandstone	light brown, medium to coarse grained, soft, clayey, moderately weathered.		
28.000	4.000	4.000	Conglomerate	mottled brown, pebbly, hard, moderately weathered.		Water 1100g/hr @ 25 > 26m
30.000	2.000	2.000	Sandstone	red brown, medium to coarse grained, moderately hard, moderately weathered.		
40.000	10.000	10.000	Conglomerate	mottled brown, pebbly, hard, slightly weathered.		
42.000	2.000	2.000	COAL	Weathered, brown black, slightly weathered.		

Project Vickery
BoreName TR 0009
Total Depth 37m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

Date Commenced 16/12/2011
Date Completed 16/12/2011
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Shane Cox
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0009 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA		SEAM	COMMENTS
1.000	1.000	1.000	Soil	brown, unconsolidated, extremely weathered.		
3.000	2.000	2.000	Clay	dark brown, unconsolidated, moderately weathered.		
7.000	4.000	4.000	Gravel	mottled brown, pebbly, unconsolidated, clayey, highly weathered.		
9.000	2.000	2.000	Gravel	red brown, cobbly, unconsolidated, highly weathered.		
14.000	5.000	5.000	Clay	light grey, soft, highly weathered.		
15.000	1.000	1.000	Sand	orange brown, medium to coarse grained, unconsolidated, highly weathered.		Moisture @ 15m
17.000	2.000	2.000	Gravel	mottled brown, pebbly, unconsolidated, moderately weathered.		
26.000	9.000	9.000	Conglomerate	mottled brown, pebbly, hard, moderately weathered.		Water 1000g/hr @ 23m
27.000	1.000	1.000	Sandstone	light brown, medium to coarse grained, moderately hard, moderately weathered.		
37.000	10.000	10.000	Conglomerate	mottled brown, pebbly, hard, slightly weathered.		

Project Vickery
BoreName TR 0010
Total Depth 25m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

Date Commenced 16/12/2011
Date Completed 16/12/2011
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Shane Cox
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0010 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA		SEAM	COMMENTS
1.000	1.000	1.000	Soil	dark brown, unconsolidated, extremely weathered.		
9.000	8.000	8.000	Gravel	mottled brown, unconsolidated, clayey, highly weathered.		
12.000	3.000	3.000	Clay	light grey, soft, highly weathered.		
14.000	2.000	2.000	Gravel	mottled brown, unconsolidated, sandy, highly weathered.		Slightly moist 13-14m
18.000	4.000	4.000	Siltstone	light brown, moderately hard, moderately weathered.		
21.000	3.000	3.000	Conglomerate	mottled brown, pebbly, hard, moderately weathered.		
22.000	1.000	1.000	Sandstone	orange brown, medium to coarse grained, moderately hard, ferruginous, slightly weathered.		
25.000	3.000	3.000	Conglomerate	mottled brown, pebbly, hard, slightly weathered.		

Project Vickery
BoreName TR 0011
Total Depth 19m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

Date Commenced 16/12/2011
Date Completed 16/12/2011
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Shane Cox
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0011 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA	SEAM	COMMENTS
1.000	1.000	1.000	Soil brown, unconsolidated.		
4.000	3.000	3.000	Clay grey brown, pebbly, unconsolidated.		
10.000	6.000	6.000	Gravel mottled brown, pebbly, unconsolidated, clayey.		
19.000	9.000	9.000	Conglomerate mottled brown, cobbly, hard.		

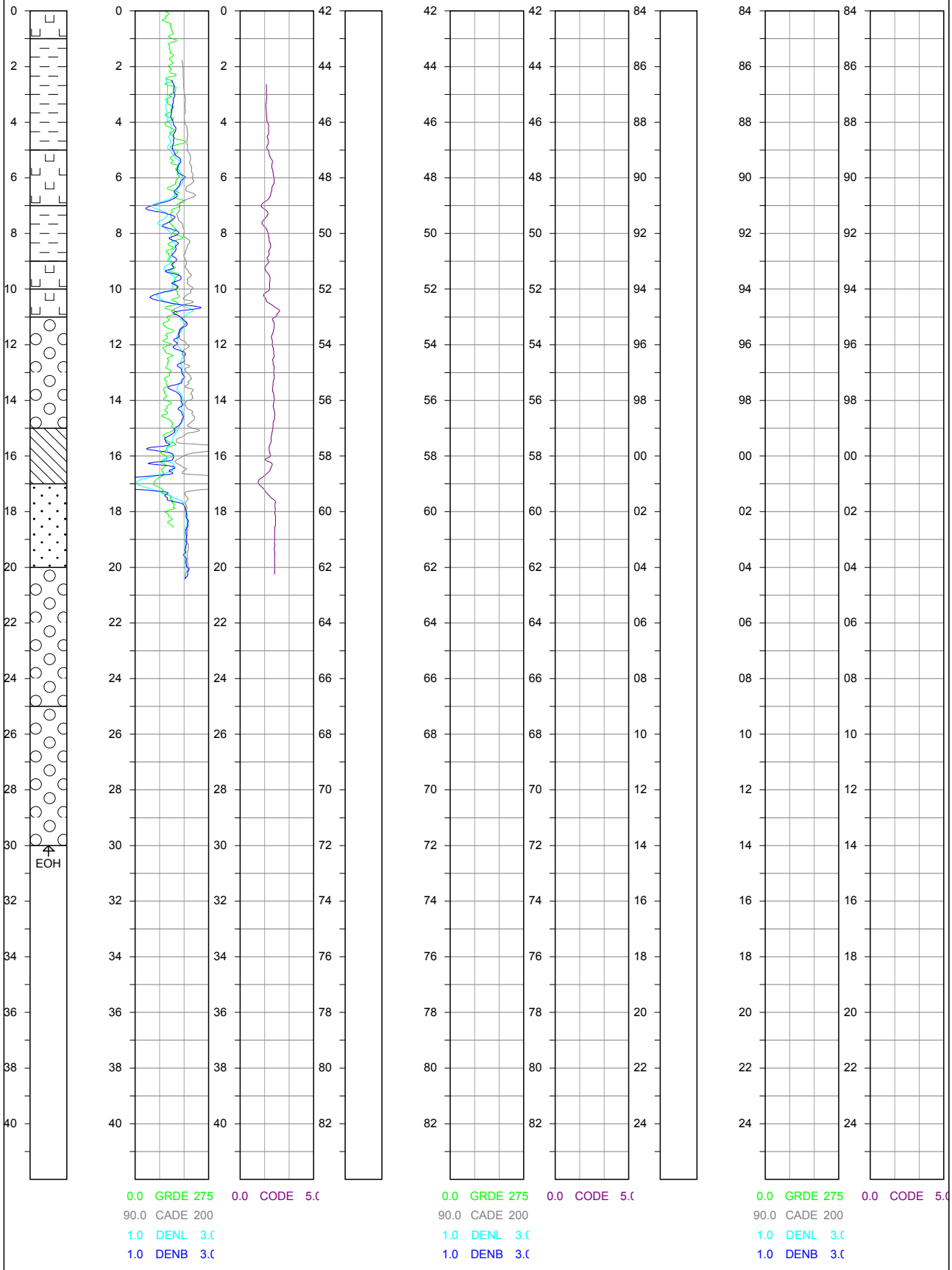
Project Vickery
BoreName TR 0012
Total Depth 30m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

Date Commenced 11/1/2012
Date Completed 11/1/2012
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Jason Mannion
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0012 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA		SEAM	COMMENTS
1.000	1.000	1.000	Soil	light brown, unconsolidated, extremely weathered.		
5.000	4.000	4.000	Clay	brown grey, unconsolidated, highly weathered.		
7.000	2.000	2.000	Gravel	red brown, pebbly, unconsolidated, highly weathered.		
9.000	2.000	2.000	Clay	brown grey, unconsolidated, highly weathered.		
10.000	1.000	1.000	Gravel	mottled brown, pebbly, unconsolidated, highly weathered.		
11.000	1.000	1.000	Gravel	dark brown, pebbly, unconsolidated, ferruginous, highly weathered.		
15.000	4.000	4.000	Conglomerate	mottled brown, pebbly, hard, moderately weathered.		
17.000	2.000	2.000	Carbonaceous Mudstone	brown black, soft, puggy, moderately weathered.		
20.000	3.000	3.000	Sandstone	grey brown, moderately hard, moderately weathered.		
25.000	5.000	5.000	Conglomerate	mottled brown, pebbly, hard, moderately weathered.		Slight amount of water @21m
30.000	5.000	5.000	Conglomerate	mottled, cobbly, hard, slightly weathered.		



WHITEHAVEN	Vickery
	TR012
Page 1/1	1/02/2012

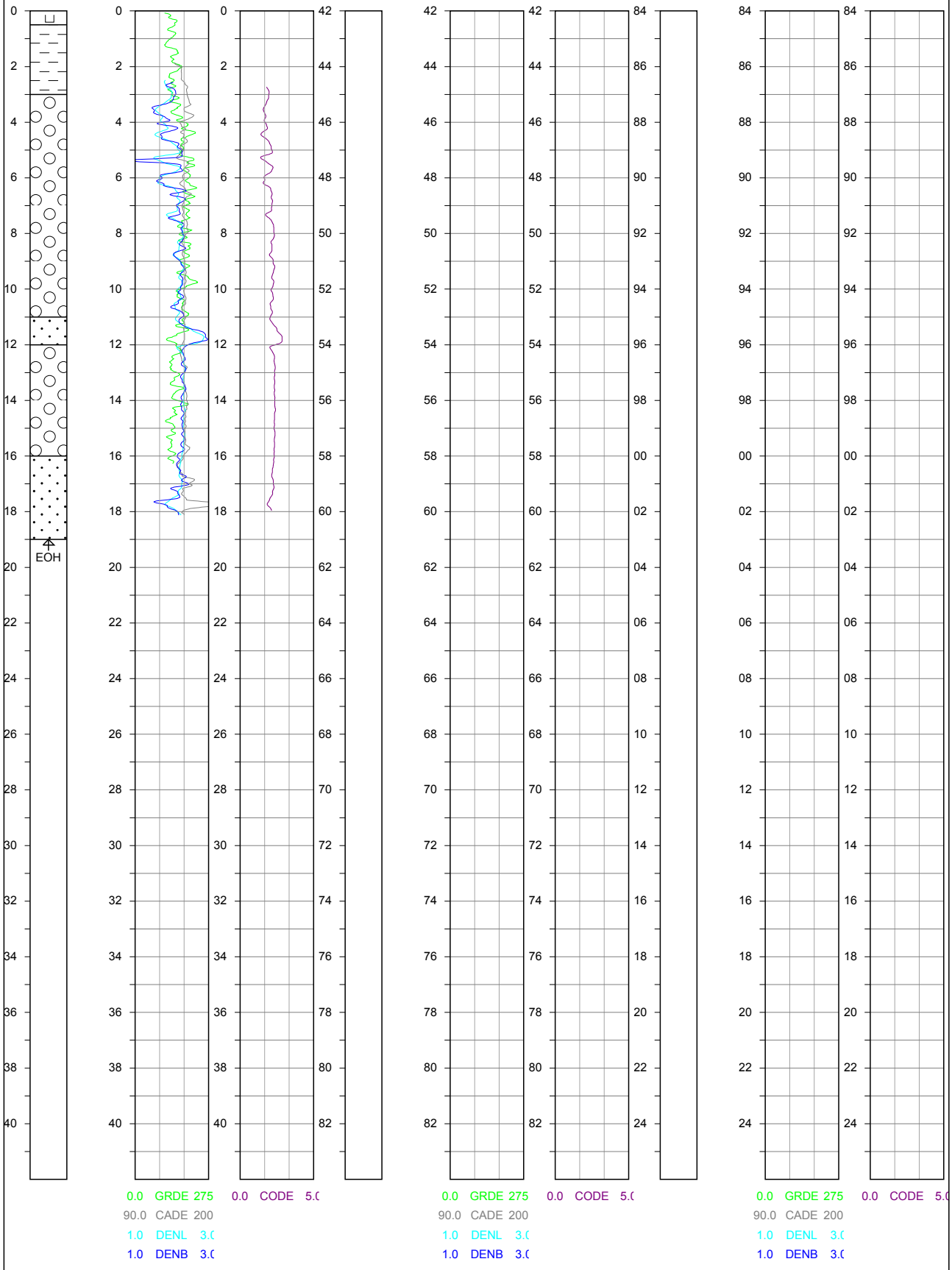
Project Vickery
BoreName TR 0013
Total Depth 19m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

Date Commenced 11/1/2012
Date Completed 11/1/2012
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Jason Mannion
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0013 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA		SEAM	COMMENTS
0.500	0.500	0.500	Soil	red brown, unconsolidated, extremely weathered.		
3.000	2.500	2.500	Clay	red brown, unconsolidated, highly weathered.		
11.000	8.000	8.000	Conglomerate	mottled grey, pebbly, hard, moderately weathered.		
12.000	1.000	1.000	Sandstone	brown, medium to coarse grained, hard, ferruginous, moderately weathered.		
16.000	4.000	4.000	Conglomerate	mottled brown, hard, moderately weathered.		
19.000	3.000	3.000	Sandstone	light brown, medium to coarse grained, moderately hard, moderately weathered.		Water @ 17m



WHITEHAVEN	Vickery
	TR013
Page 1/1	1/02/2012

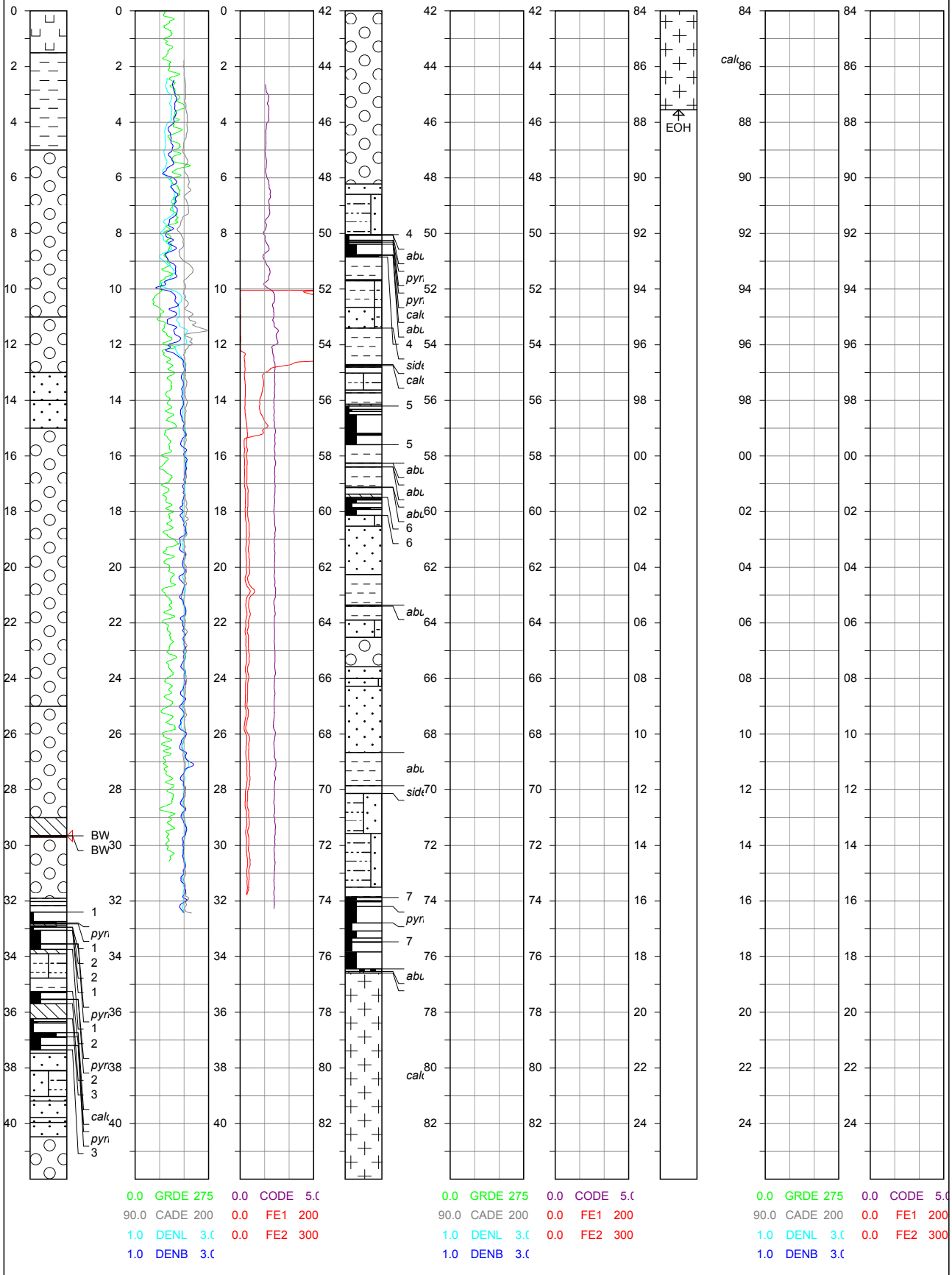
Project Vickery
BoreName TR 0014
Total Depth 37m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

Date Commenced 11/1/2012
Date Completed 11/1/2012
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Jason Mannion
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0014 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA	SEAM	COMMENTS
1.000	1.000	1.000	Soil red brown, unconsolidated.		
4.000	3.000	3.000	Clay brown, unconsolidated.		
9.000	5.000	5.000	Clay brown purple, pebbly, unconsolidated.		
11.000	2.000	2.000	Clay brown grey, unconsolidated.		
12.000	1.000	1.000	Sandstone light brown, fine to medium grained, moderately hard.		
23.000	11.000	11.000	Conglomerate mottled brown, pebbly, hard.		
26.000	3.000	3.000	Sandstone light brown, medium to coarse grained, moderately hard.		
30.000	4.000	4.000	Conglomerate mottled brown, pebbly, hard.		
31.000	1.000	1.000	Sandstone grey brown, medium to coarse grained, moderately hard.		
33.000	2.000	2.000	Conglomerate mottled brown, pebbly, hard, ferruginous.		
34.000	1.000	1.000	No Recovery		Water
37.000	3.000	3.000	Conglomerate mottled brown, pebbly, hard.		



WHITEHAVEN	Vickery
	TR014
Page 1/1	1/02/2012

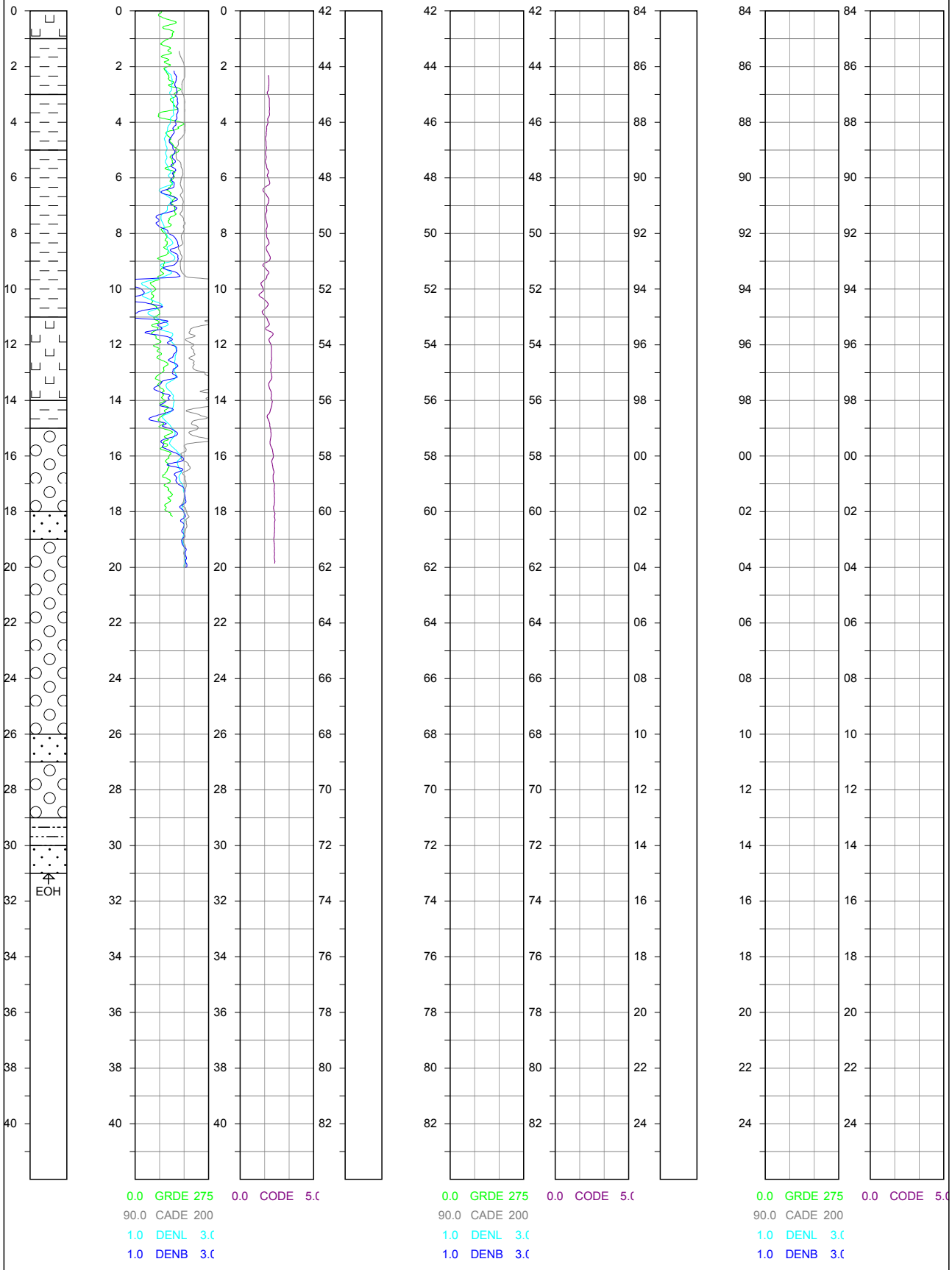
Project Vickery
BoreName TR 0015
Total Depth 31m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

Date Commenced 12/1/2012
Date Completed 12/1/2012
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Jason Mannion
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0015 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA		SEAM	COMMENTS
1.000	1.000	1.000	Soil	dark brown, unconsolidated.		
3.000	2.000	2.000	Clay	grey brown, unconsolidated.		
5.000	2.000	2.000	Clay	yellow brown, unconsolidated.		
11.000	6.000	6.000	Clay	brown grey, unconsolidated.		
14.000	3.000	3.000	Gravel	grey brown, cobbly, unconsolidated.		
15.000	1.000	1.000	Clay	brown grey, unconsolidated.		Moisture
18.000	3.000	3.000	Conglomerate	mottled brown, pebbly, hard.		
19.000	1.000	1.000	Sandstone	brown, medium to coarse grained, moderately hard.		
26.000	7.000	7.000	Conglomerate	mottled brown, pebbly, hard.		
27.000	1.000	1.000	Sandstone	grey brown, medium to coarse grained, moderately hard, ferruginous.		
29.000	2.000	2.000	Conglomerate	mottled brown, pebbly, hard.		
30.000	1.000	1.000	Siltstone	brown grey, moderately hard.		
31.000	1.000	1.000	Sandstone	orange brown, moderately hard.		



WHITEHAVEN	Vickery
	TR015
Page 1/1	1/02/2012

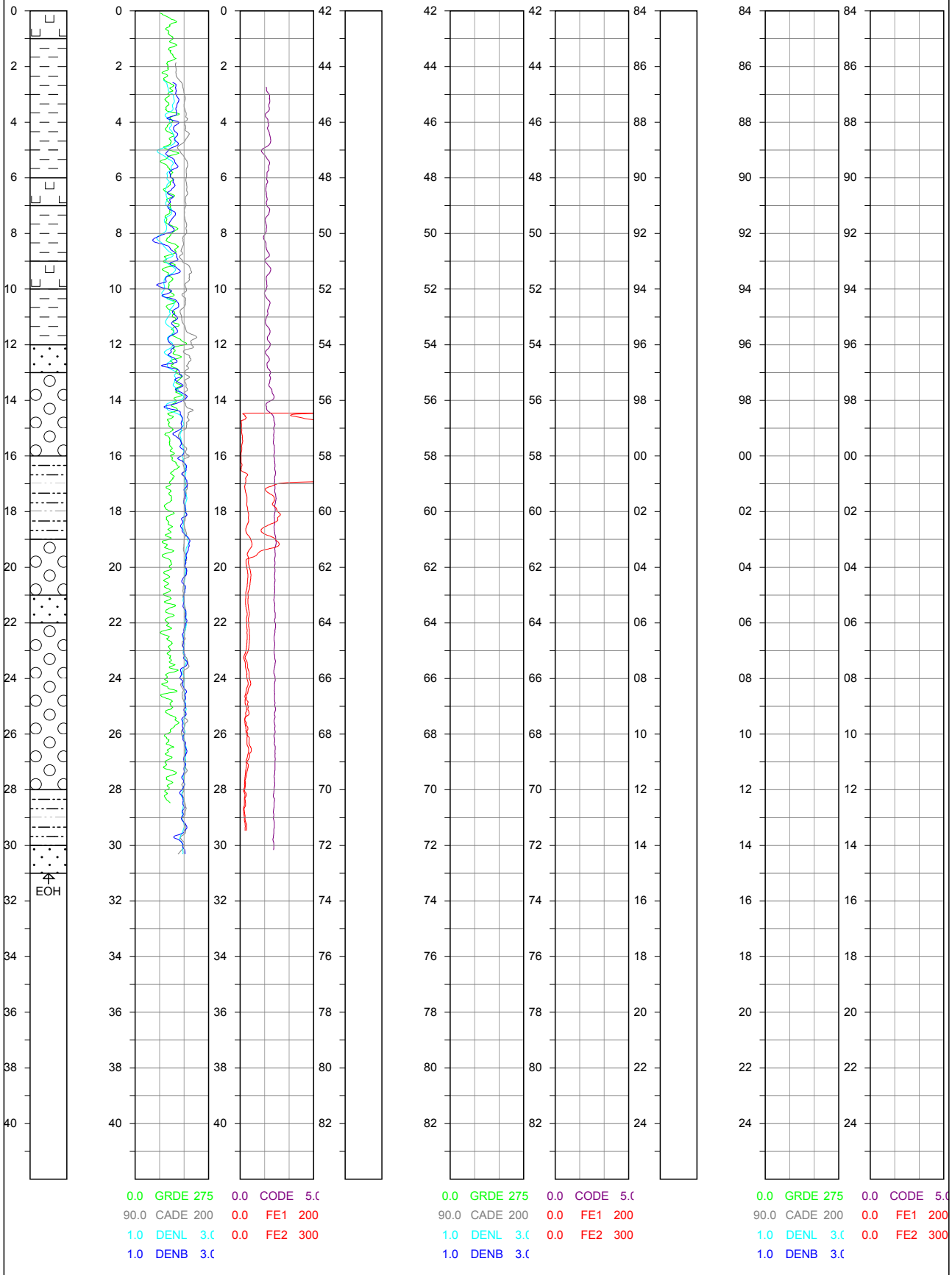
Project Vickery
BoreName TR 0016
Total Depth 31m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

Date Commenced 12/1/2012
Date Completed 12/1/2012
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Jason Mannion
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0016 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA	SEAM	COMMENTS
1.000	1.000	1.000	Gravel mottled brown, unconsolidated.		
6.000	5.000	5.000	Clay grey brown, unconsolidated.		
7.000	1.000	1.000	Gravel grey brown, pebbly, unconsolidated.		
9.000	2.000	2.000	Clay grey brown, unconsolidated.		
10.000	1.000	1.000	Gravel mottled brown, pebbly, unconsolidated.		
12.000	2.000	2.000	Clay grey brown, unconsolidated.		Moisture
13.000	1.000	1.000	Sandstone light brown, medium to coarse grained, moderately hard.		
16.000	3.000	3.000	Conglomerate mottled brown, pebbly, hard.		
19.000	3.000	3.000	Siltstone grey brown, moderately hard.		
21.000	2.000	2.000	Conglomerate mottled brown, pebbly, hard.		
22.000	1.000	1.000	Sandstone light brown, medium to coarse grained, moderately hard.		
28.000	6.000	6.000	Conglomerate mottled brown, pebbly, hard.		
30.000	2.000	2.000	Siltstone grey brown, moderately hard.		
31.000	1.000	1.000	Sandstone dark brown, moderately hard.		



WHITEHAVEN	Vickery
	TR016
Page 1/1	1/02/2012

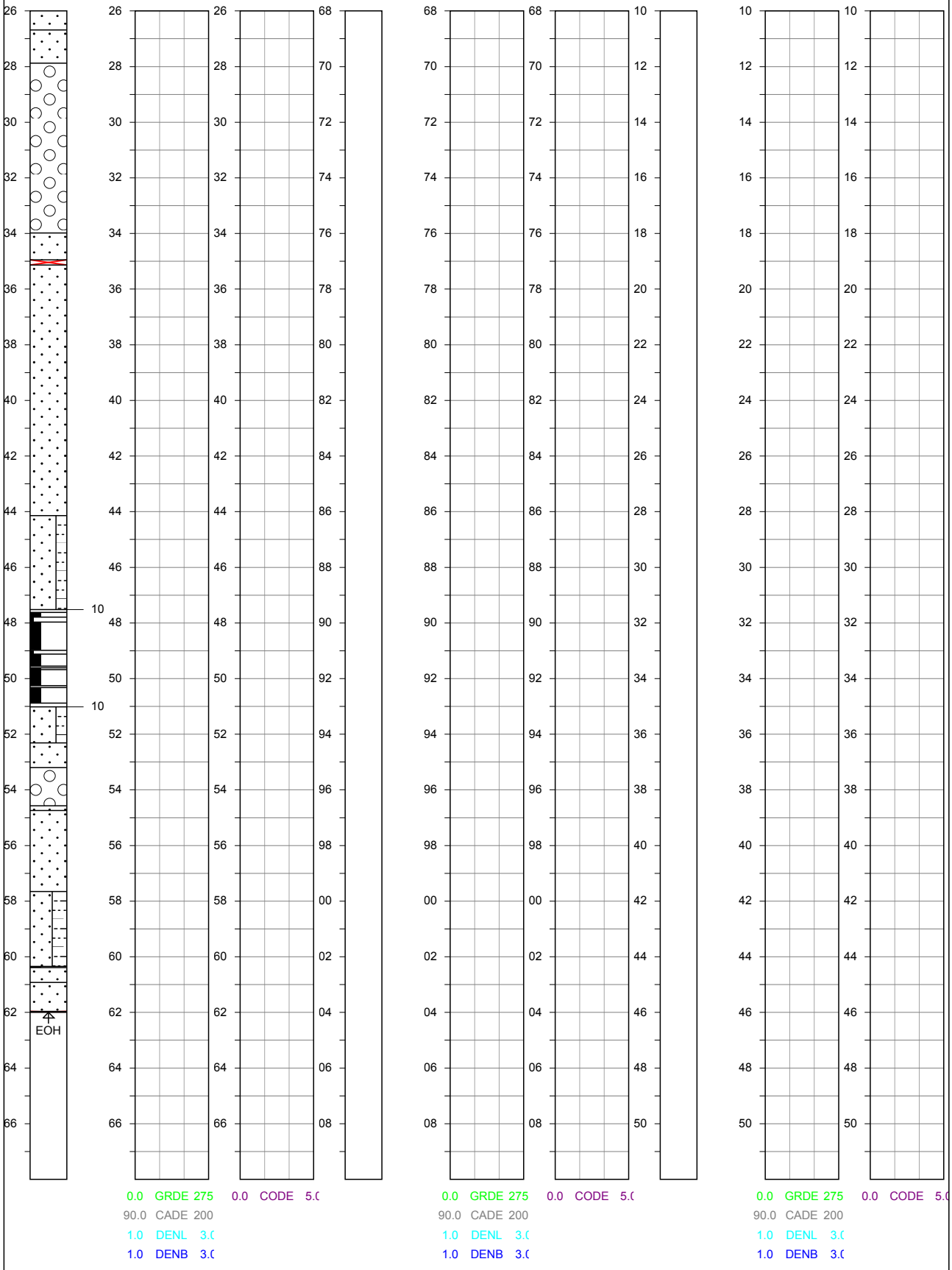
Project Vickery
BoreName TR 0017
Total Depth 19m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

Date Commenced 12/1/2012
Date Completed 12/1/2012
Commissioned by Whitehaven Coal
Contractor Mannion Drilling
Driller Jason Mannion
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0017 PAGE 1

DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA	SEAM	COMMENTS
0.500	0.500	0.500	Soil brown, unconsolidated.		
5.000	4.500	4.500	Clay mottled brown, pebbly, unconsolidated.		
8.000	3.000	3.000	Gravel mottled brown, pebbly, unconsolidated.		
9.000	1.000	1.000	Clay red brown, unconsolidated, ferruginous.		
12.000	3.000	3.000	Conglomerate mottled brown, pebbly, hard.		
16.000	4.000	4.000	Sandstone light brown, fine to medium grained, moderately hard.		
17.000	1.000	1.000	Conglomerate mottled brown, pebbly.		
18.000	1.000	1.000	Sandstone red brown, medium to coarse grained, moderately hard, ferruginous.		
19.000	1.000	1.000	Conglomerate mottled brown, pebbly, hard.		



	Vickery
	TR017
Page 2/2	1/02/2012

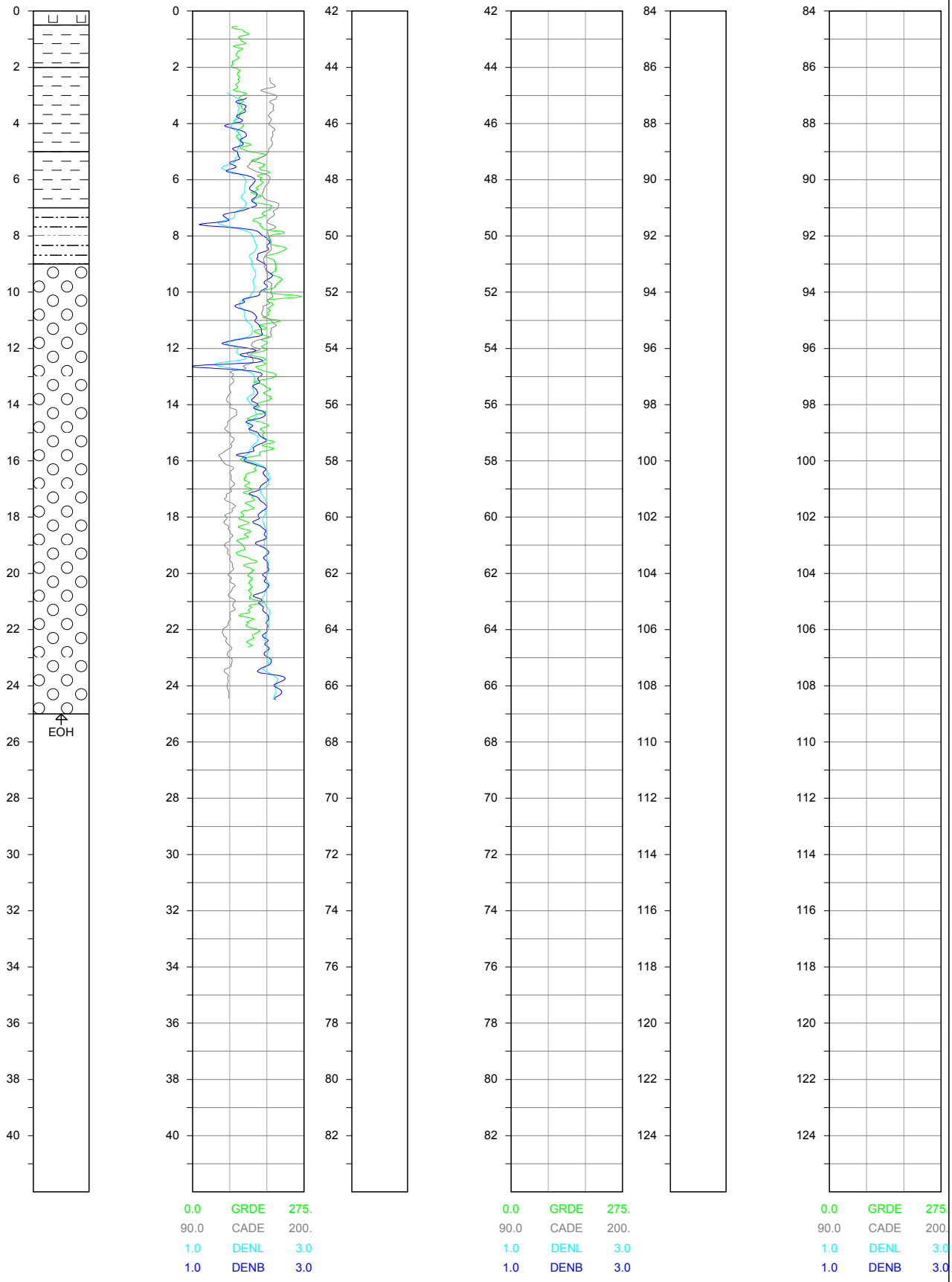
Project Vickery
BoreName TR0018
Total Depth 23m
Site Vickery
Locality
Collar Level
Datum AHD
Easting
Northing
Collar Level
Easting
Northing

County
Parish
Portion
Map
File

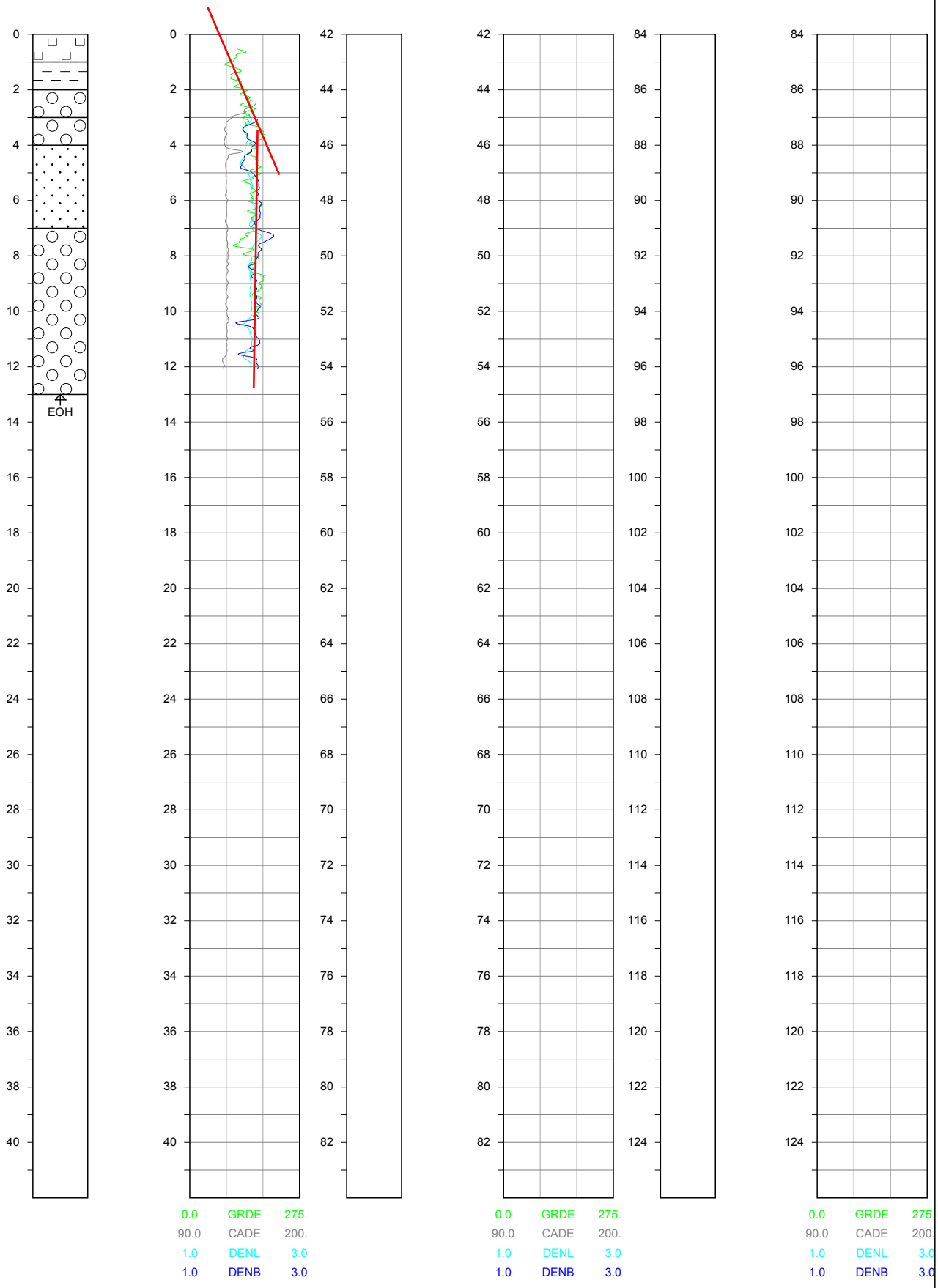
Date Commenced 12/1/2012
Date Completed 12/1/2012
Commissioned by Whiteven Coal
Contractor Mannion Drilling
Driller Jason Mannion
Logged By Craig Zirkler
District
Distribution
Comments

BORE NAME TR 0018 PAGE 1

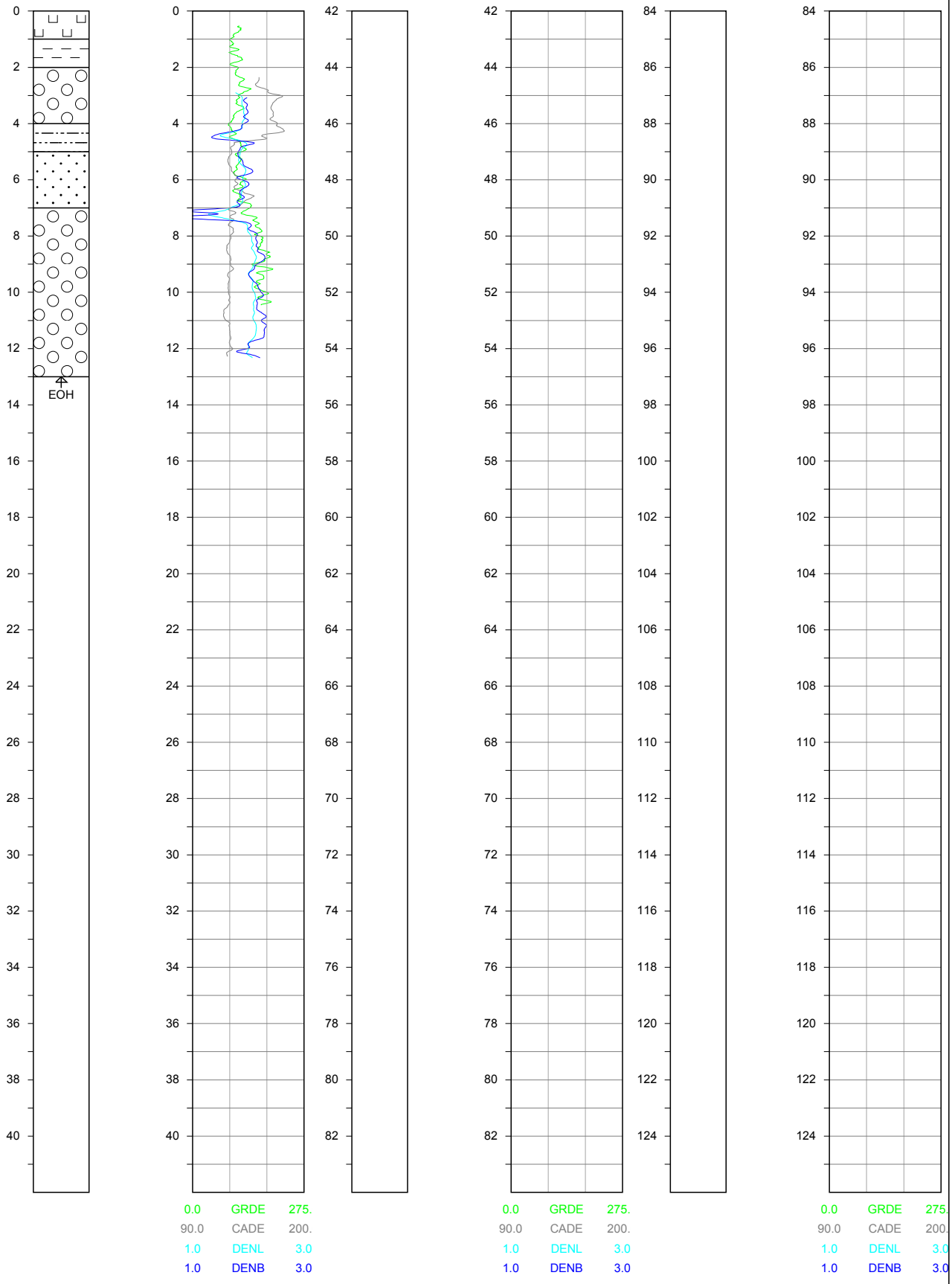
DEPTH	THICKNESS	RECOVERED	GEOLOGICAL DESCRIPTION OF STRATA		SEAM	COMMENTS
1.000	1.000	1.000	Soil	dark brown, unconsolidated, extremely weathered.		
12.000	11.000	11.000	Clay	grey brown, unconsolidated, moderately weathered.		
15.000	3.000	3.000	Gravel	mottled brown, unconsolidated, moderately weathered.		
18.000	3.000	3.000	Gravel	buff, unconsolidated, highly weathered.		
19.000	1.000	1.000	Conglomerate	brown, pebbly, hard, moderately weathered.		
20.000	1.000	1.000	Siltstone	grey brown, moderately hard, moderately weathered.		
21.000	1.000	1.000	Sandstone	light brown, fine to medium grained, moderately hard, moderately weathered.		Water @ 18m
23.000	2.000	2.000	Conglomerate	mottled brown, pebbly, hard, moderately weathered.		



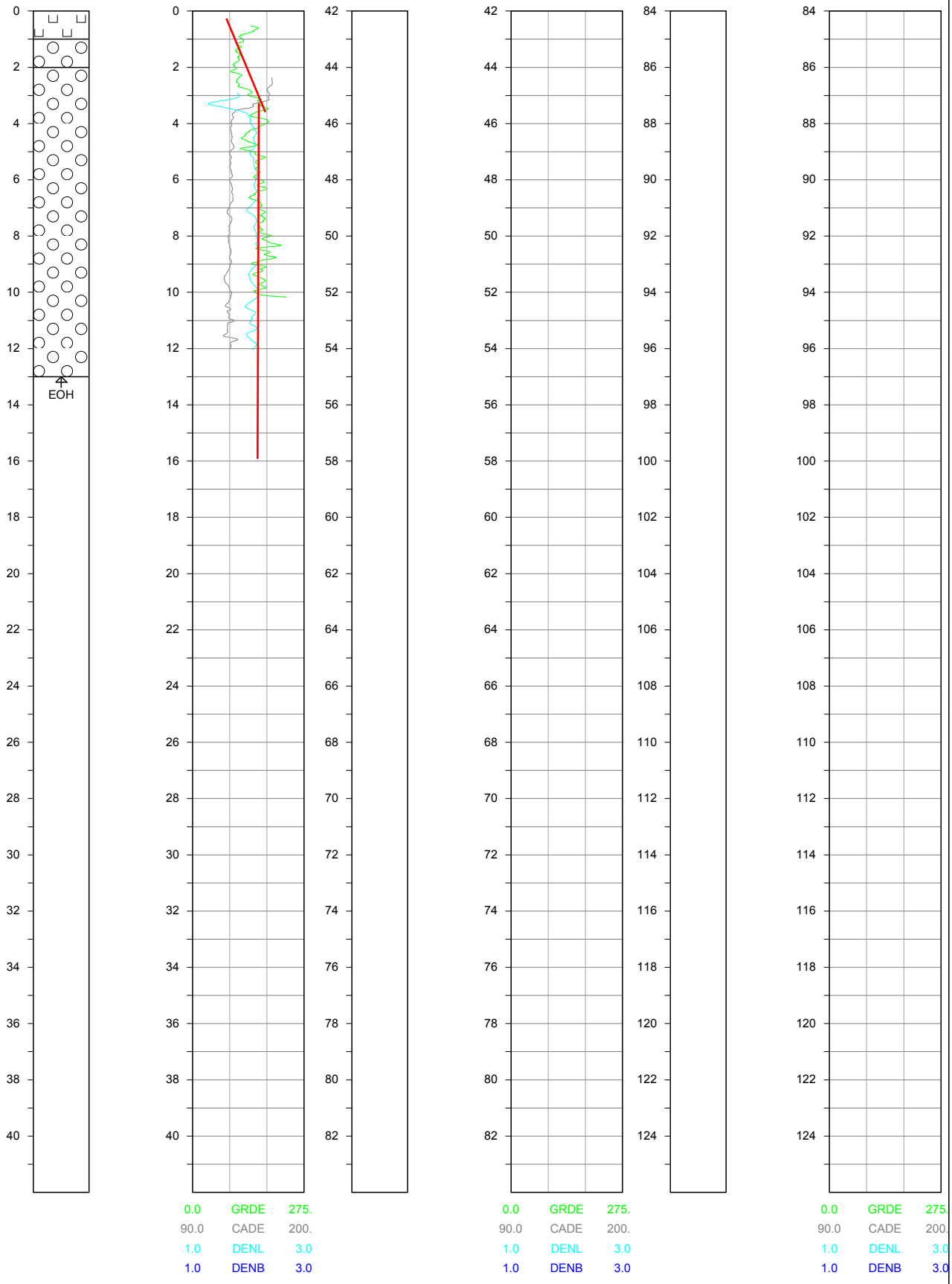
	Vickery
	TR0020
Page 1/1	26/03/2012



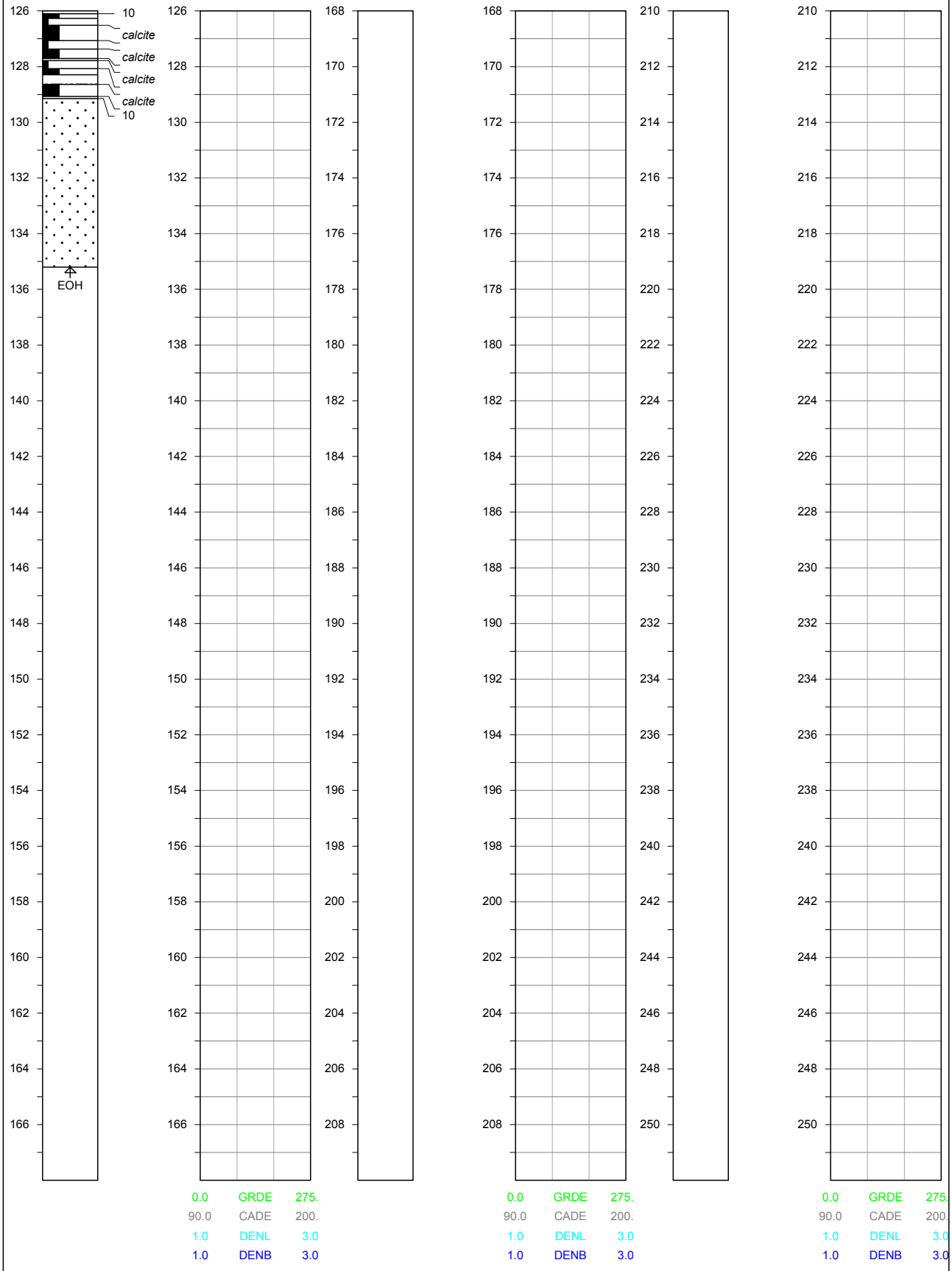
	Vickery
	TR0023
Page 1/1	26/03/2012



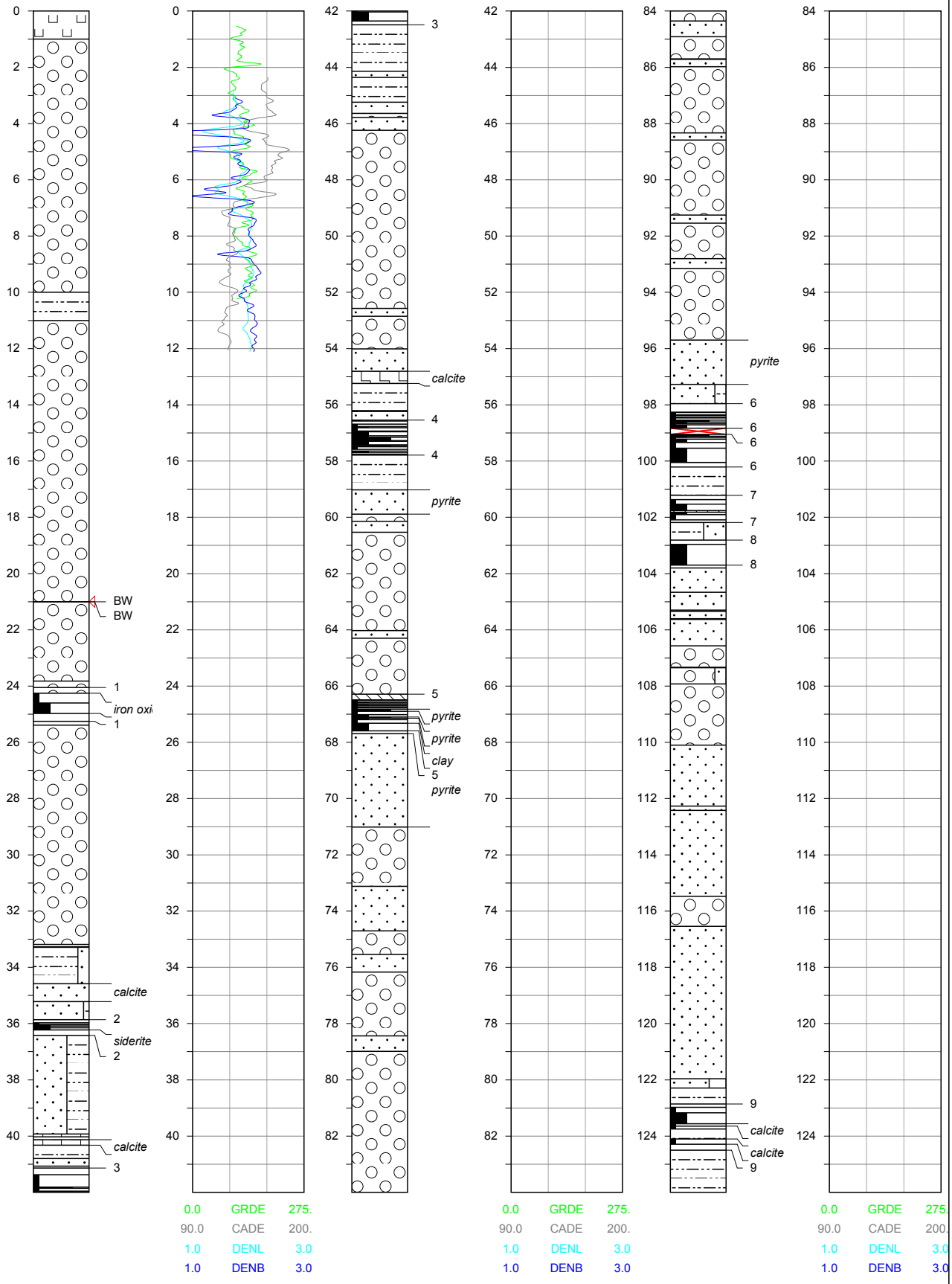
	Vickery
	TR0024
Page 1/1	26/03/2012



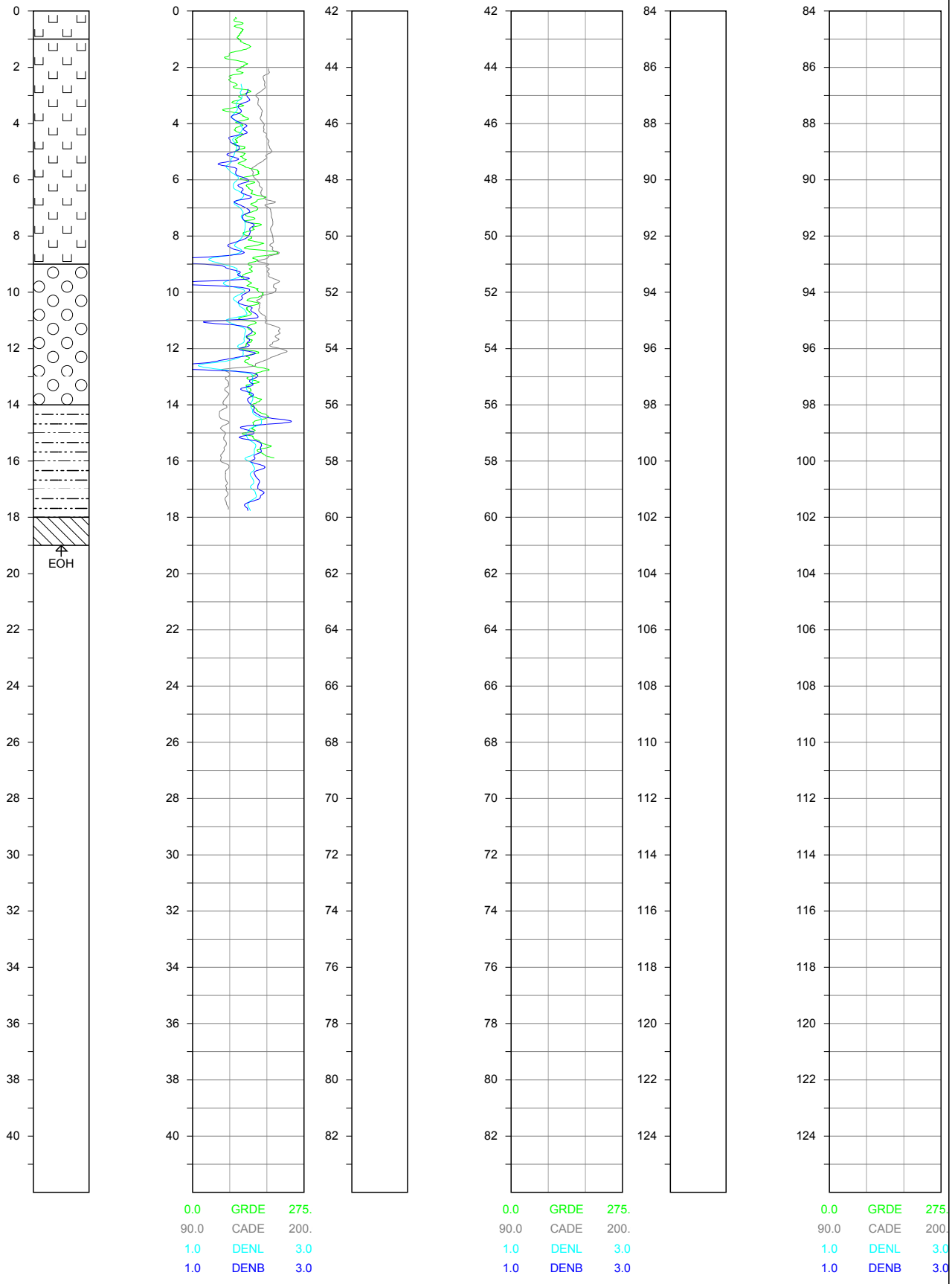
	Vickery
	TR0025
Page 1/1	26/03/2012



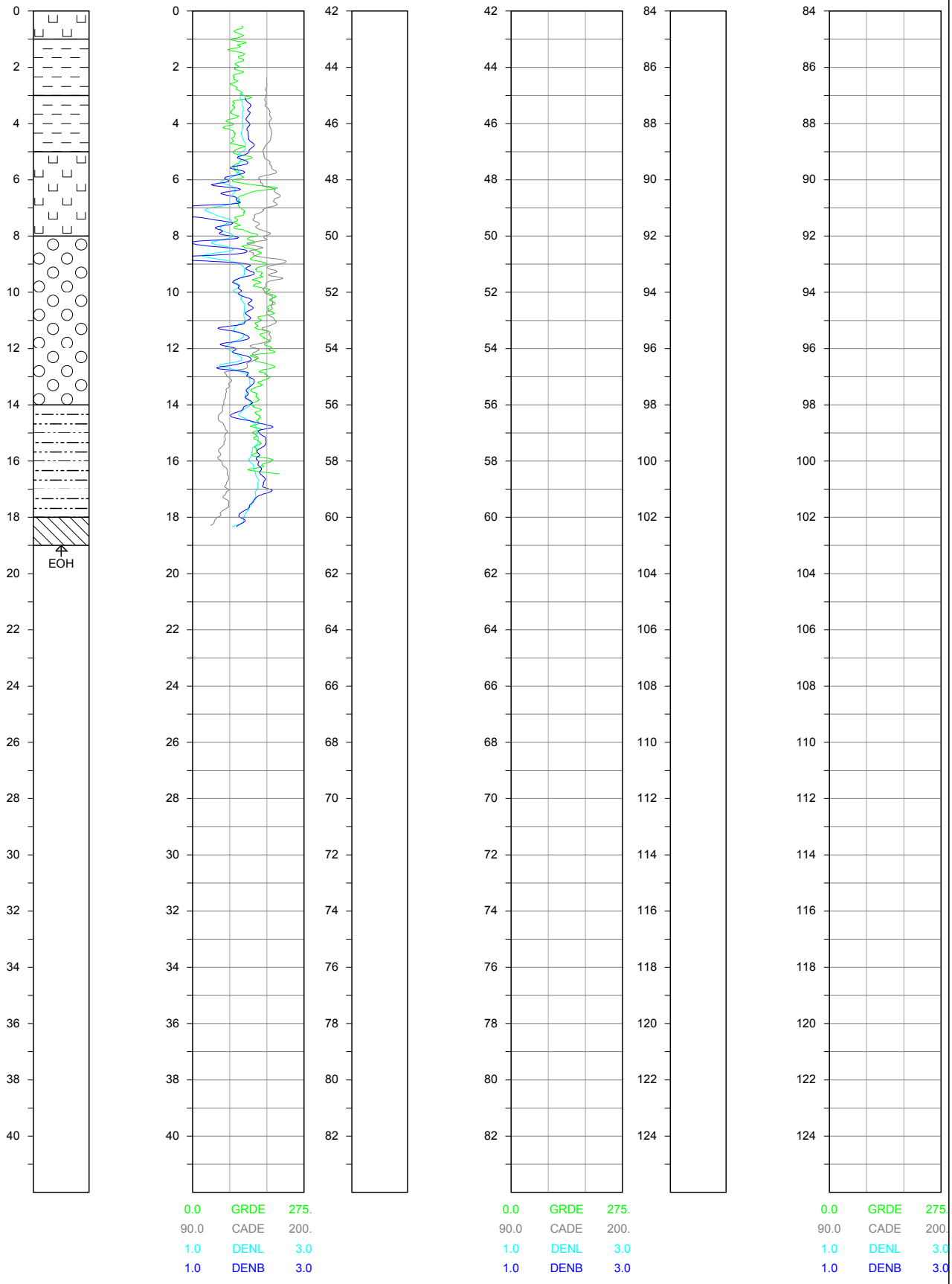
	Vickery
	TR0027
Page 2/2	26/03/2012



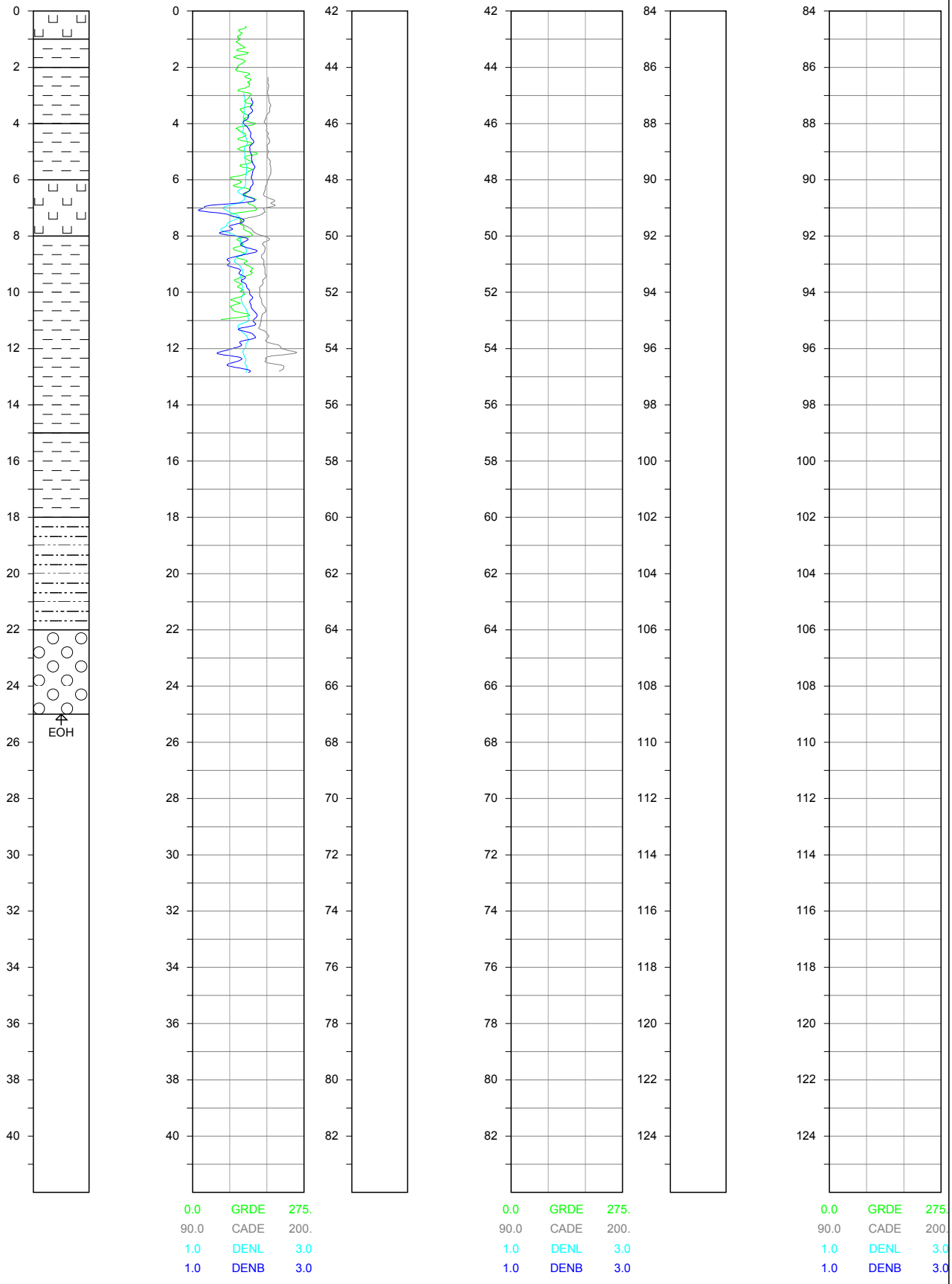
WHITEHAVEN	Vickery	
	TR0027	
	Page 1/2	26/03/2012



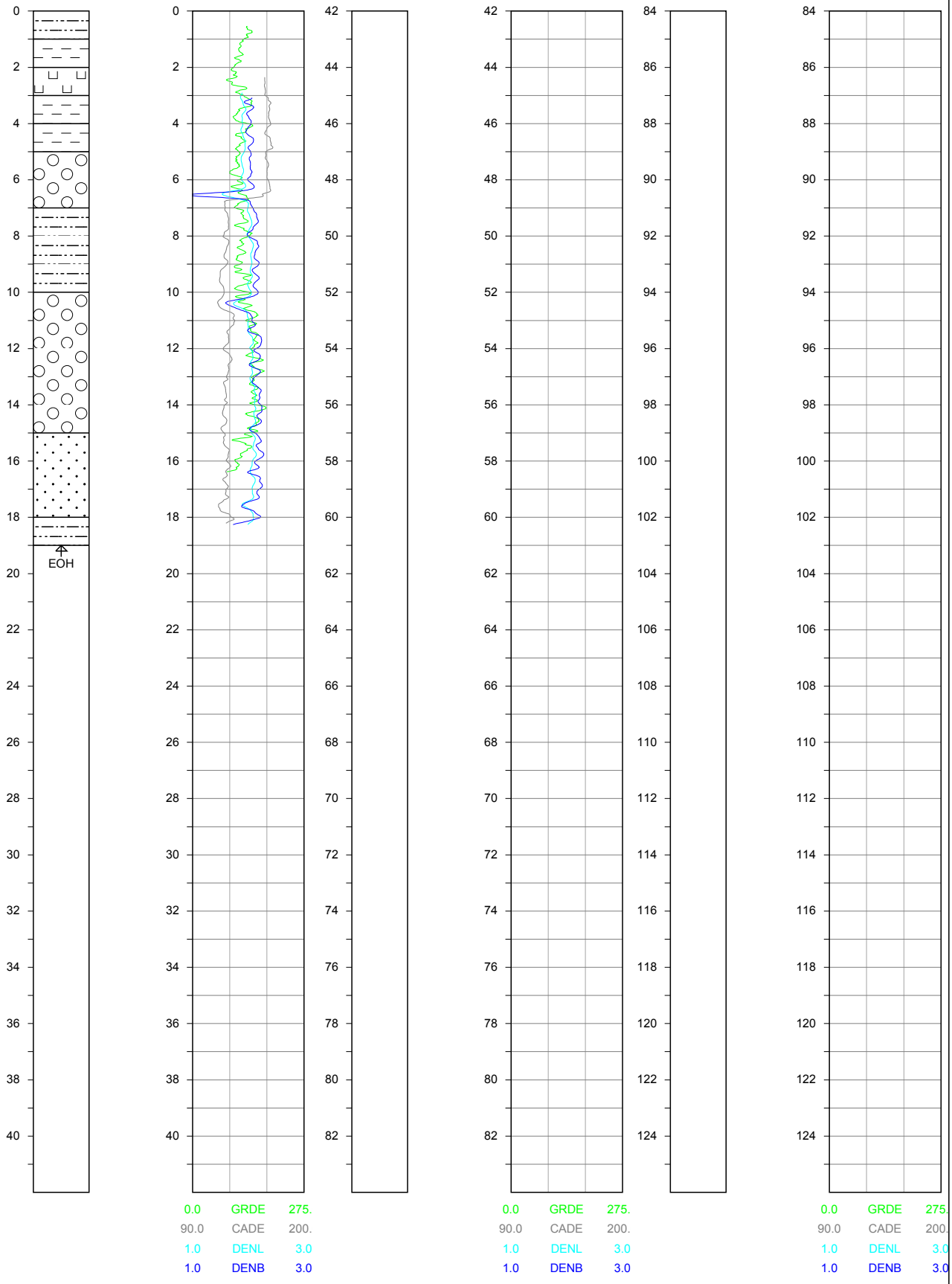
	Vickery
	TR0028
Page 1/1	26/03/2012



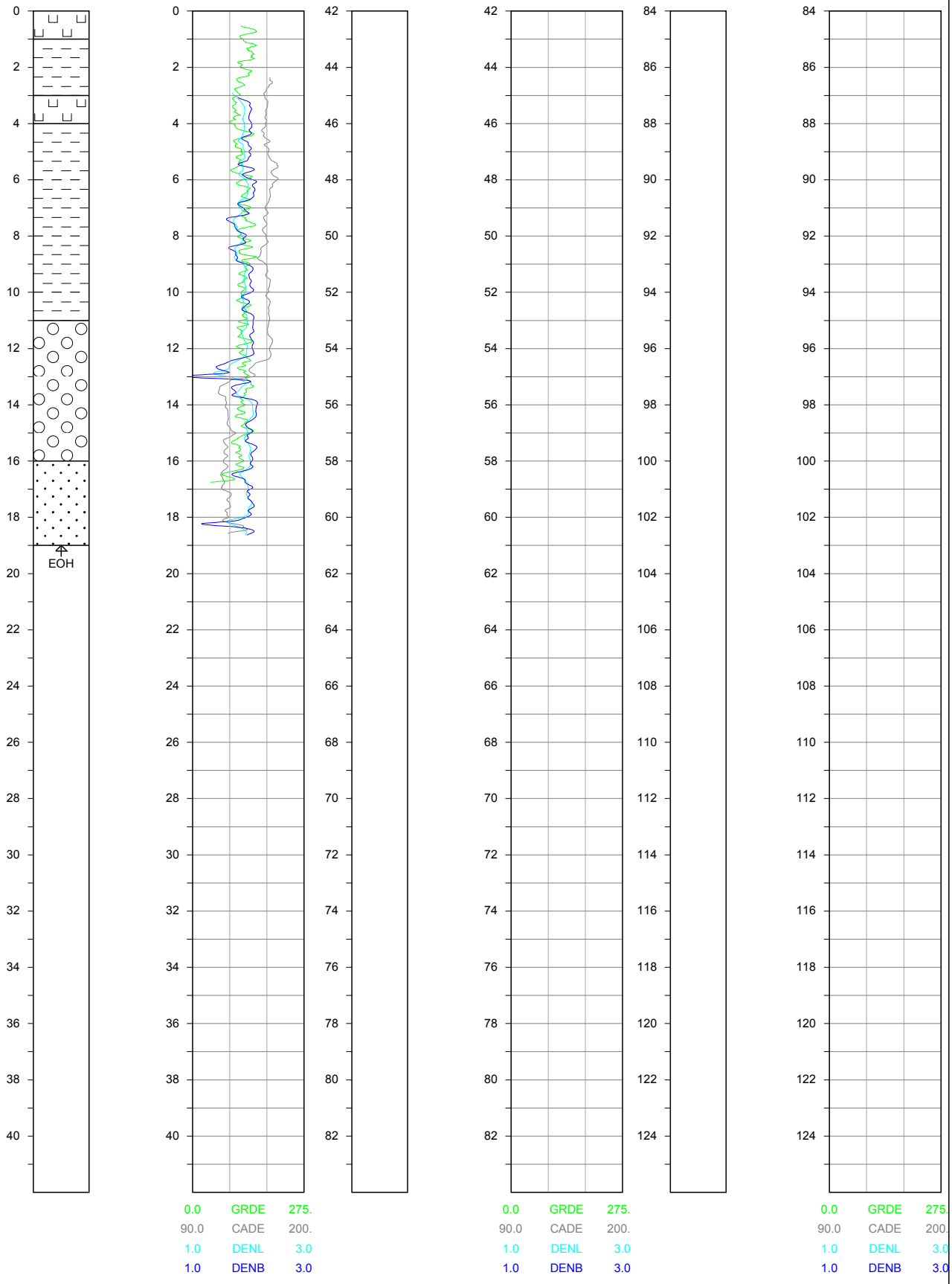
Vickery	
TR0029	
Page 1/1	26/03/2012



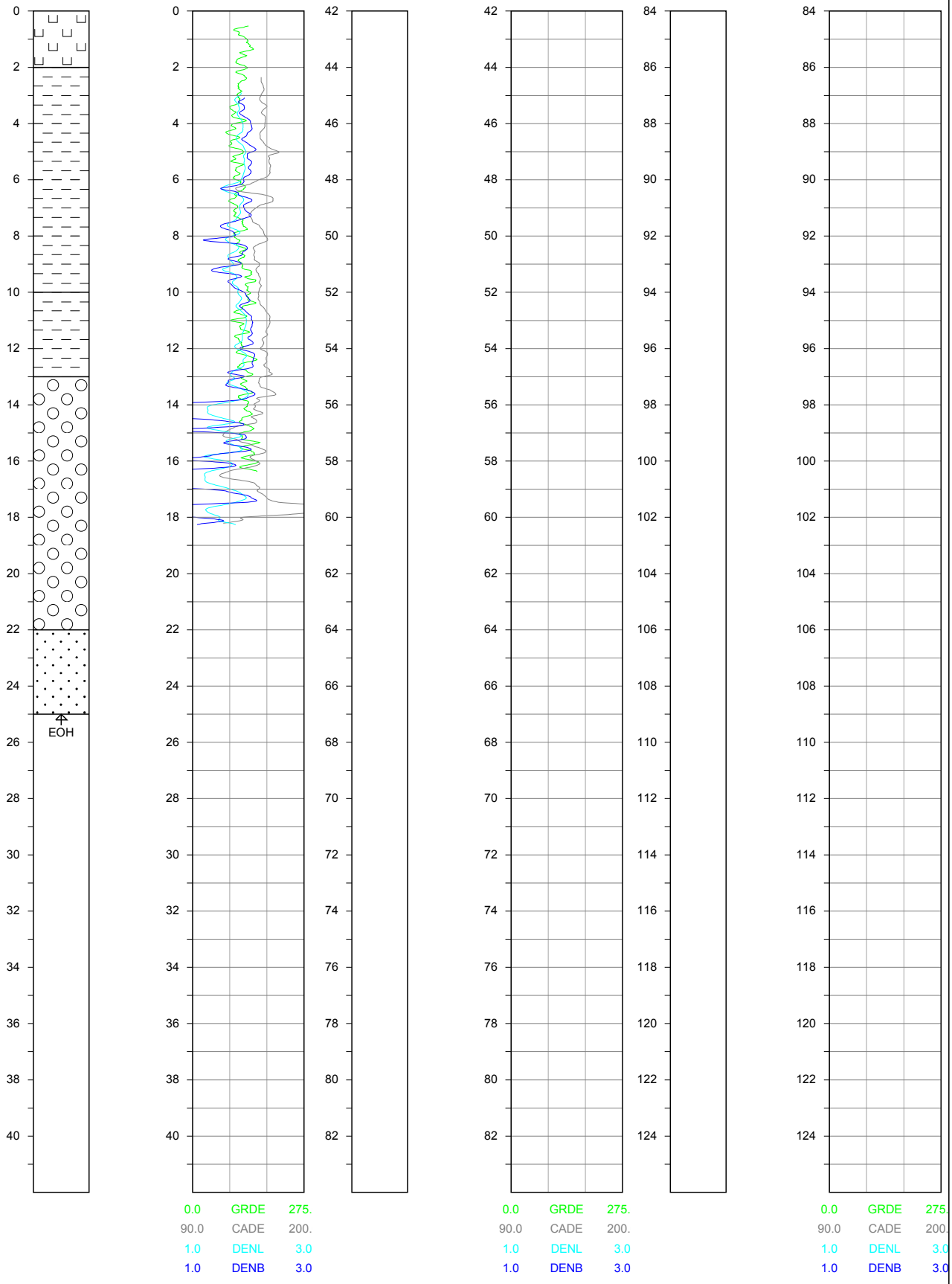
	Vickery
	TR0030
Page 1/1	26/03/2012



	Vickery
	TR0032
Page 1/1	26/03/2012



	Vickery
	TR0033
Page 1/1	26/03/2012

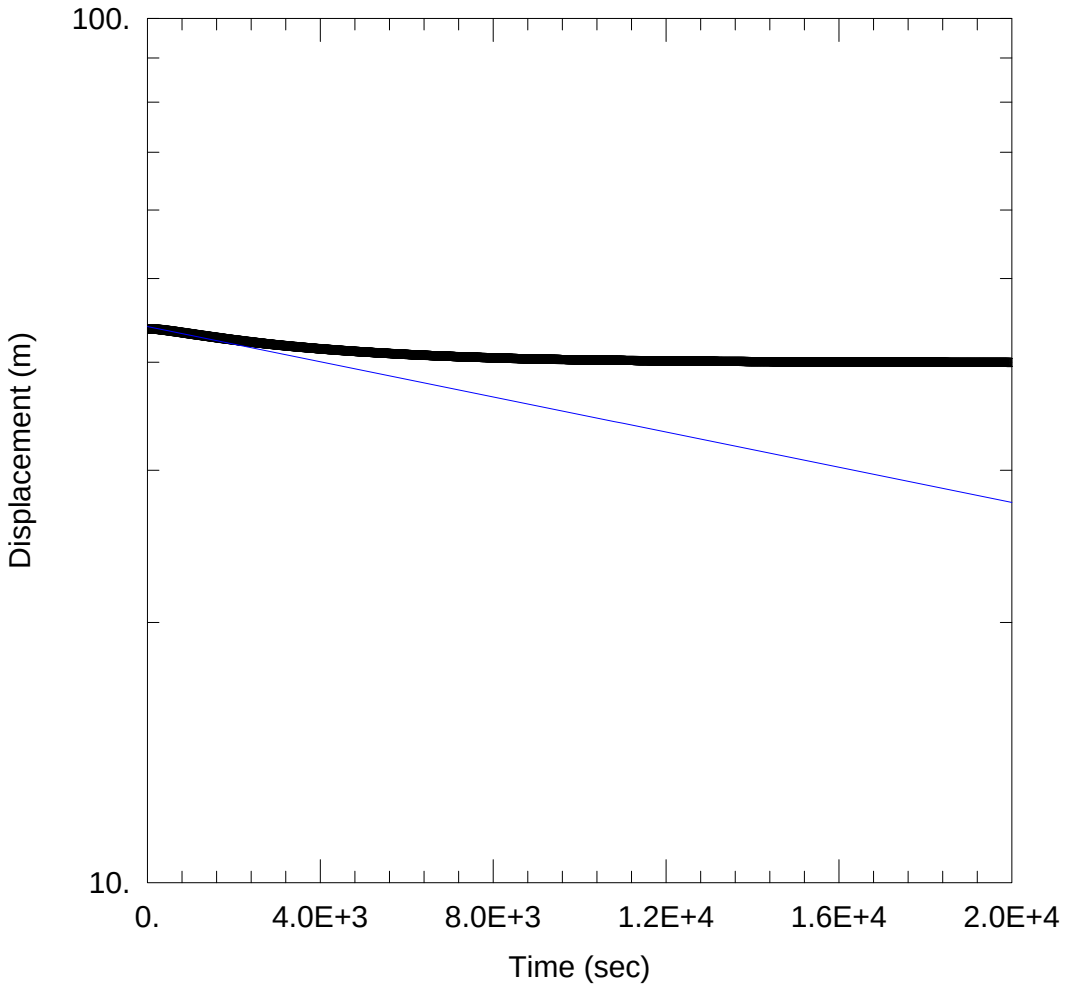


	Vickery
	TR0034
Page 1/1	26/03/2012

Table C1: Upper Namoi Alluvium / Weathered Permian Strata Drillhole Details

Hole ID	Easting (MGA)	Northing (MGA)	Bore Depth (m)
TR1	232431	6589763	24
TR3	232435	6589563	36
TR4	232427	6589811	21
TR05	232432.49	6589953.56	31
TR06	232435.56	6590044.62	25
TR07	232933.73	6589766.46	36
TR08	233429.58	6589765.81	42
TR09	233431.1	6589977.15	37
TR10	233430.72	6590094.33	25
TR11	233426.72	6590333.85	19
TR12	232939.05	6590100.65	30
TR13	232942.97	6590279.33	19
TR14	232942.12	6589979.23	37
TR15	232939.49	6589895.91	31
TR16	233434.71	6590213.8	31
TR17	233426	6590390	19
TR18	233430.14	6590029.2	23
TR20	232940	6590600	25
TR21	233461	6590687	31
TR22	233460	6590795	25
TR23	232441	6590633	13
TR24	232475	6590405	13
TR25	232429	6590154	13
TR26	232438.49	6590095.19	19
TR27	234533.5	6590403.81	13
TR28	234499.4	6590195.21	19
TR29	234503.44	6590000.66	19
TR30	234502.56	6589797.84	25
TR31	234502.49	6589902.69	25
TR32	234047.87	6590252.88	19
TR33	234162.6	6590228.44	19
TR34	233740.23	6590278.27	25
TR35	233848.31	6590279.05	25

APPENDIX D
HYDRAULIC TEST RESULTS



WELL TEST ANALYSIS

Data Set: F:\Vick\Vickery\VKY35.aqt
Date: 06/25/12 Time: 16:00:54

PROJECT INFORMATION

Test Well: VKY35

AQUIFER DATA

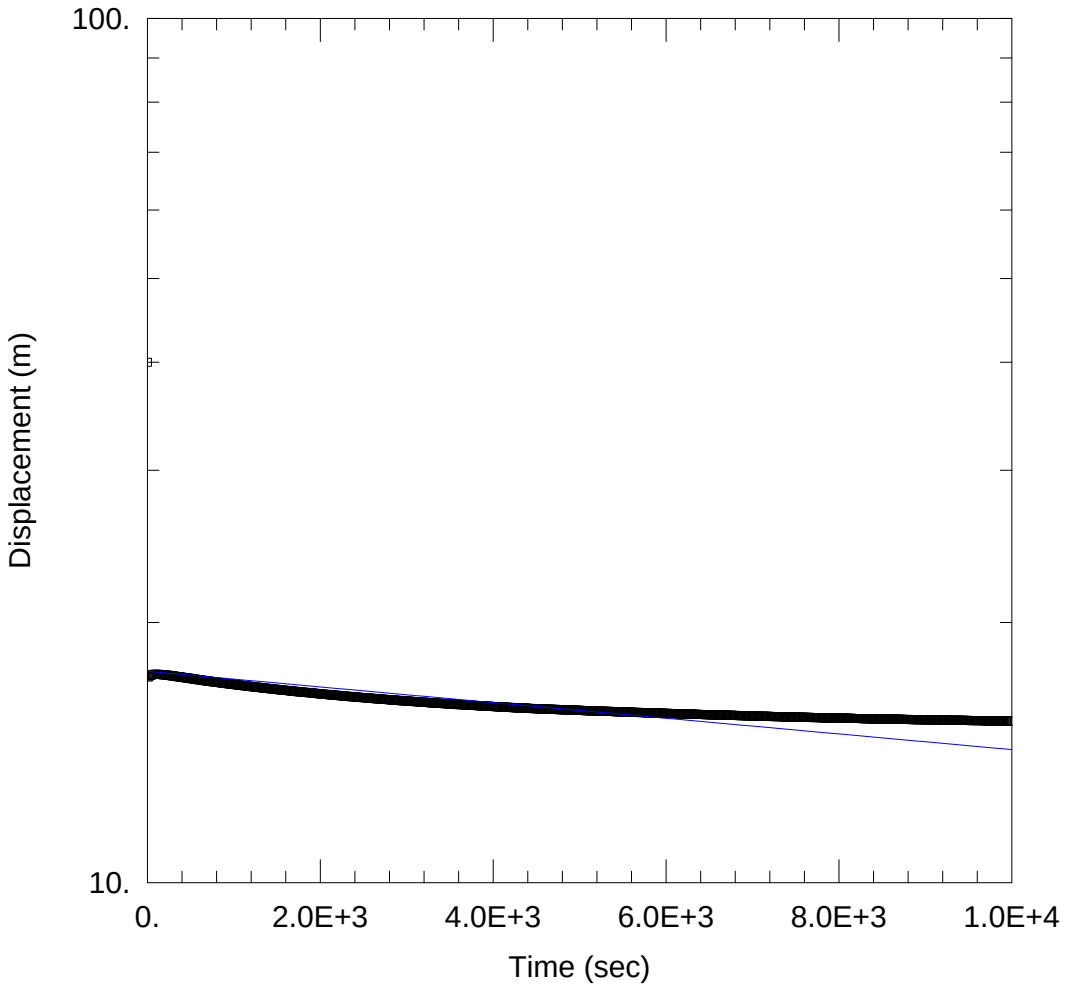
Saturated Thickness: 10. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (New Well)

Initial Displacement: 3.7 m
Static Water Column Height: 39. m
Total Well Penetration Depth: 79. m
Screen Length: 10. m
Casing Radius: 0.025 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Confined
Solution Method: Hvorslev
K = 3.882E-9 m/sec
y0 = 44. m



WELL TEST ANALYSIS

Data Set: C:\Andy\Jobs\Vickery\Data\Hydraulic Tests\VKY34.aqt
Date: 08/01/12 Time: 08:11:30

PROJECT INFORMATION

Company: GES
Client: Whitehave
Location: Vickery
Test Well: VKY34

AQUIFER DATA

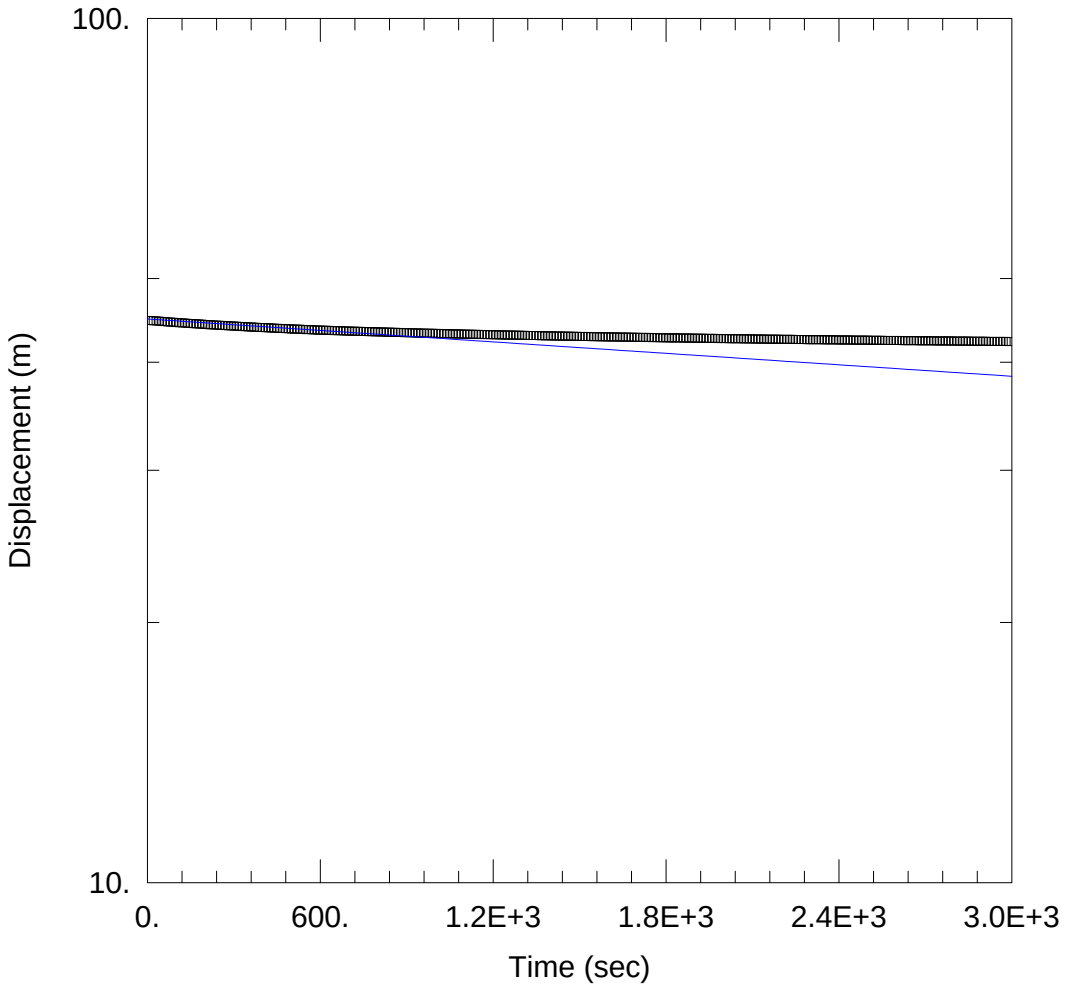
Saturated Thickness: 100. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (New Well)

Initial Displacement: 40. m
Total Well Penetration Depth: 140. m
Casing Radius: 0.025 m
Static Water Column Height: 100. m
Screen Length: 20. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Confined
Solution Method: Hvorslev
K = 2.406E-9 m/sec
y0 = 17.56 m



WELL TEST ANALYSIS

Data Set: F:\Vick\Vickery\VKY36.aqt
Date: 06/25/12 Time: 16:02:06

PROJECT INFORMATION

Test Well: VKY36

AQUIFER DATA

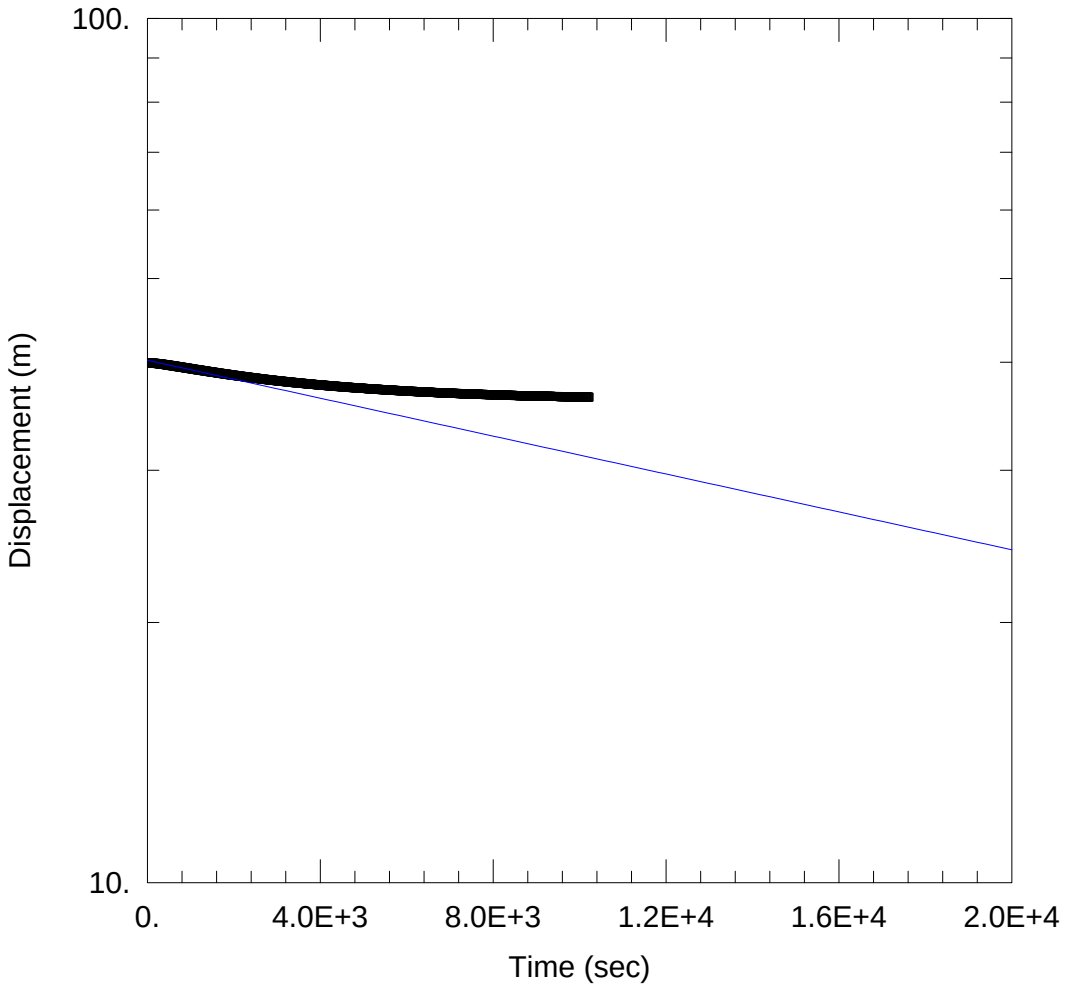
Saturated Thickness: 10. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (VKY36)

Initial Displacement: 4.4 m
Static Water Column Height: 77. m
Total Well Penetration Depth: 117. m
Screen Length: 10. m
Casing Radius: 0.025 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Confined
Solution Method: Hvorslev
K = 8.42E-9 m/sec
y0 = 44.89 m



WELL TEST ANALYSIS

Data Set: F:\Vick\Vickery\VKY42.aqt
Date: 06/25/12 Time: 16:02:34

PROJECT INFORMATION

Test Well: VKY42

AQUIFER DATA

Saturated Thickness: 20. m Anisotropy Ratio (Kz/Kr): 1.

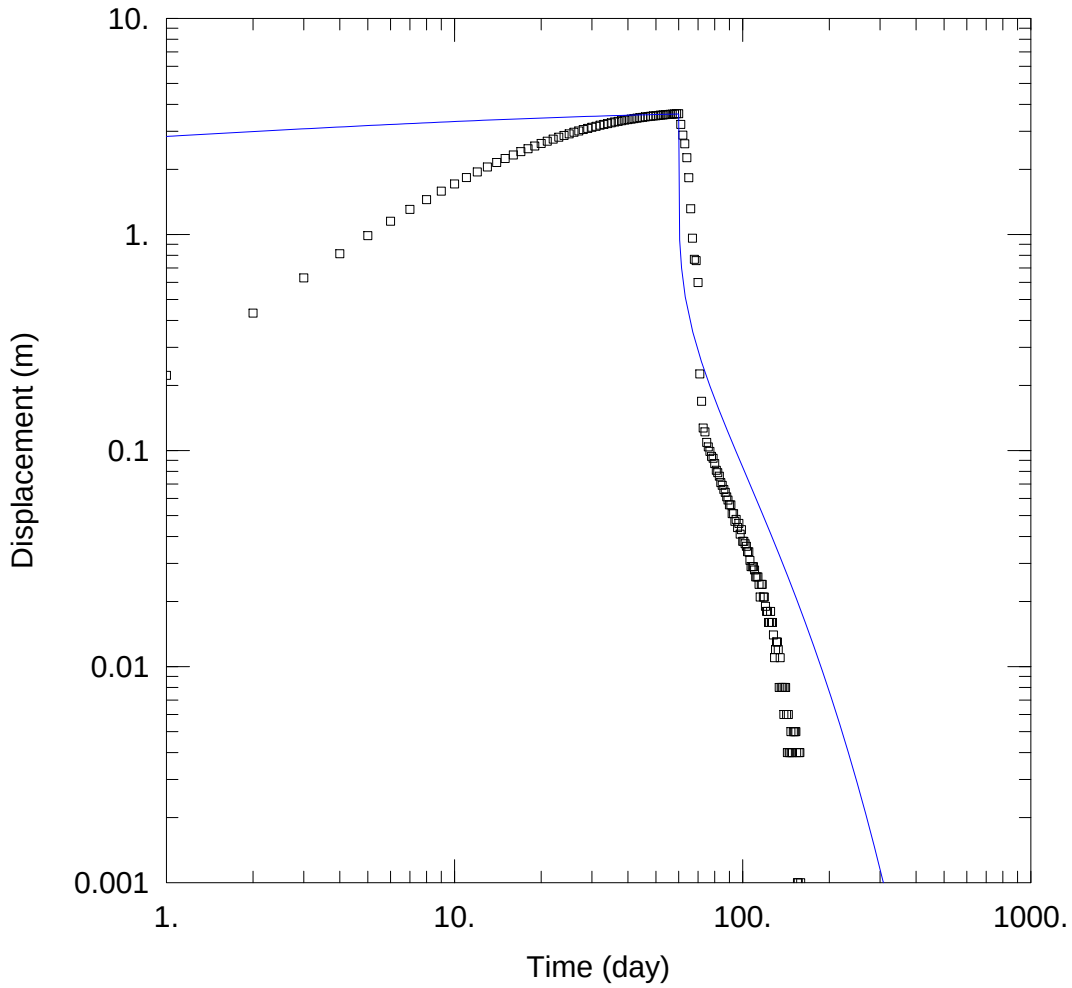
WELL DATA (New Well)

Initial Displacement: 3.5 m
Total Well Penetration Depth: 110. m
Casing Radius: 0.025 m
Static Water Column Height: 70. m
Screen Length: 20. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev

K = 2.09E-9 m/sec y0 = 40.21 m



WELL TEST ANALYSIS

Data Set: C:\Andy\Jobs\Vickery\Data\Hydraulic Tests\TR7 Recovery.aqt
Date: 07/31/12 Time: 11:51:40

PROJECT INFORMATION

Company: GES
Client: Whitehaven
Location: Vickery
Test Well: TR7

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
New Well	0	0

Observation Wells

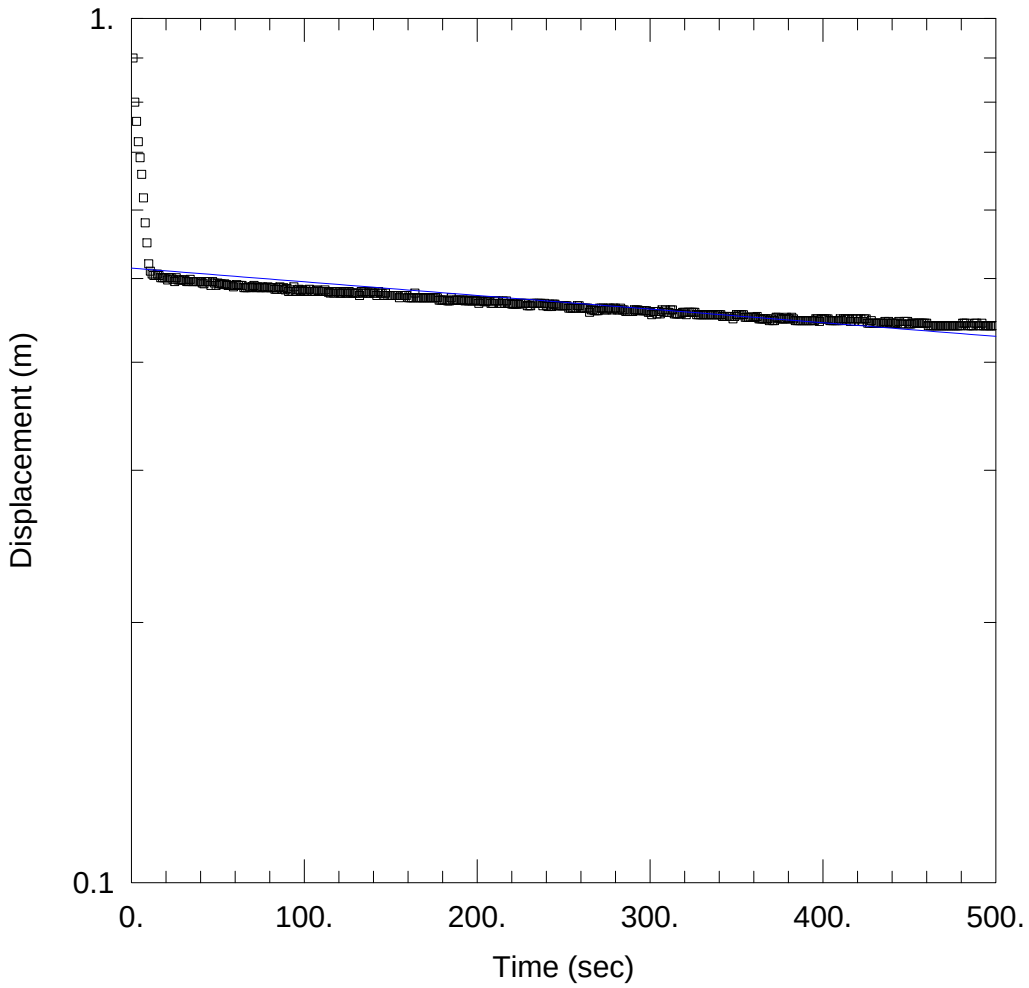
Well Name	X (m)	Y (m)
New Well	0	0

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 7.089 m^2/day
r/B = 0.0003162
b = 8. m

S = 0.08023
Kz/Kr = 0.3633



WELL TEST ANALYSIS

Data Set: C:\Andy\Jobs\Vickery\Data\Hydraulic Tests\TR18.aqt
Date: 07/31/12 Time: 14:59:42

PROJECT INFORMATION

Company: GES
Client: Whitehaven
Location: Vickery
Test Well: TR18

AQUIFER DATA

Saturated Thickness: 9. m Anisotropy Ratio (Kz/Kr): 1.

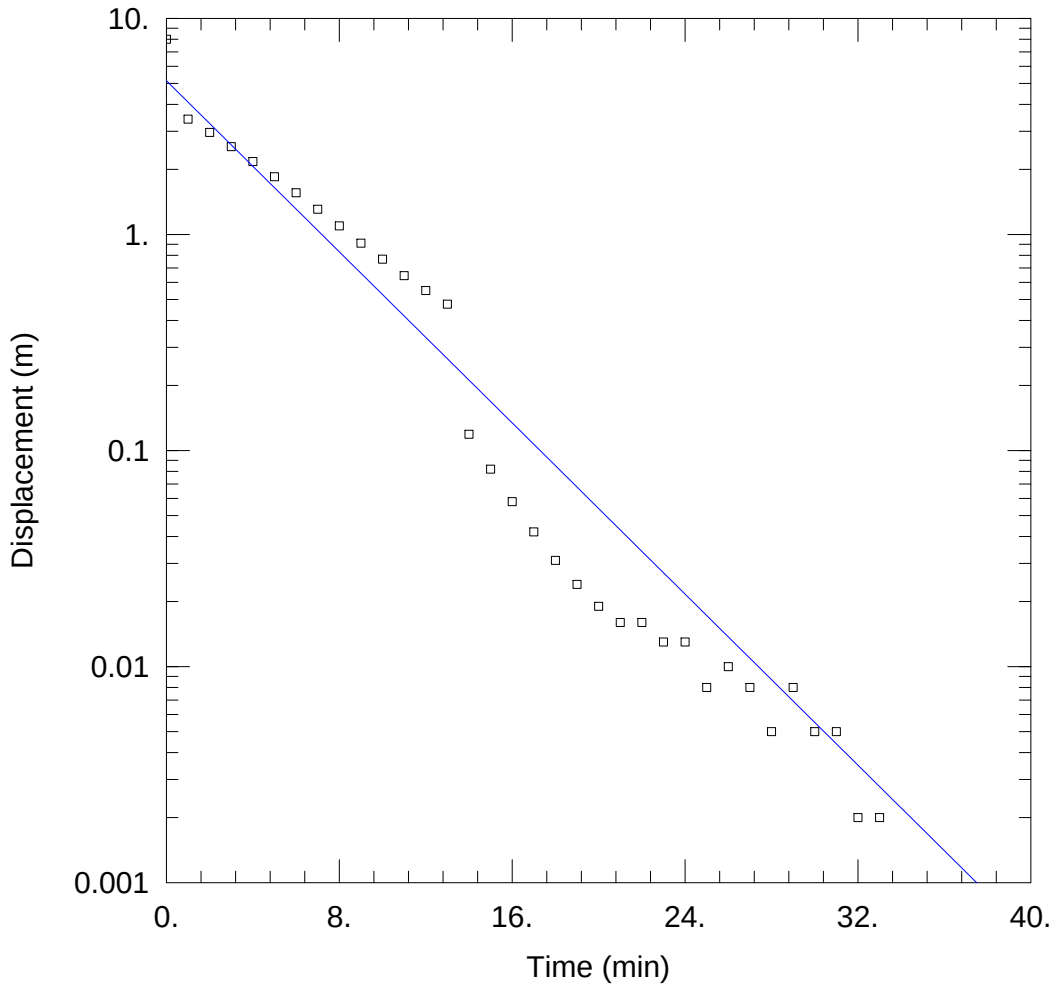
WELL DATA (New Well)

Initial Displacement: 13. m
Total Well Penetration Depth: 22. m
Casing Radius: 0.025 m
Static Water Column Height: 9. m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.859E-7 m/sec
y0 = 0.514 m



WELL TEST ANALYSIS

Data Set: C:\Andy\Jobs\Vickery\Data\Hydraulic Tests\TR26b.aqt
Date: 07/31/12 Time: 12:21:57

PROJECT INFORMATION

Test Well: TR26

AQUIFER DATA

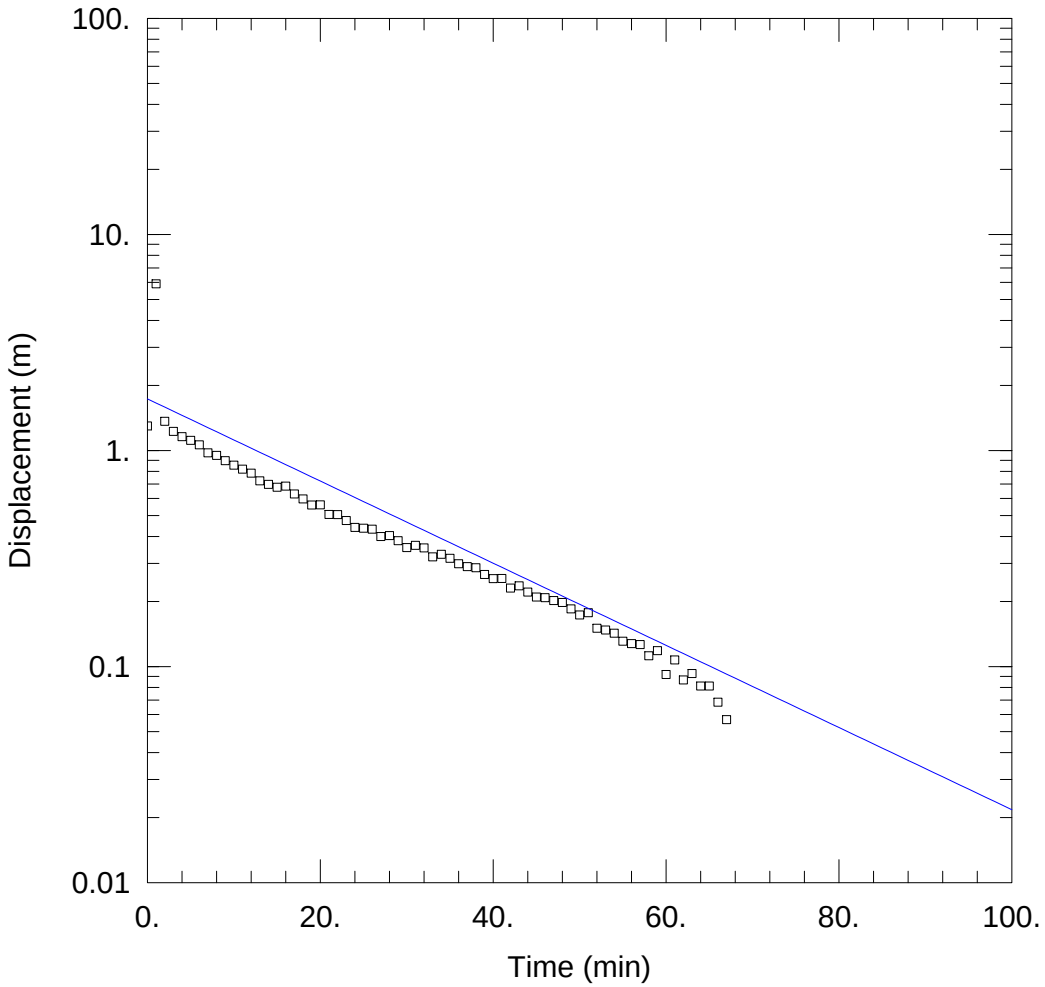
Saturated Thickness: 16. m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (New Well)

Initial Displacement: 8. m
Static Water Column Height: 10. m
Total Well Penetration Depth: 18. m
Screen Length: 3. m
Casing Radius: 0.025 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.000114 m/min
y0 = 5.144 m



WELL TEST ANALYSIS

Data Set: C:\Andy\Jobs\Vickery\Data\Hydraulic Tests\TRT35 Unconfined.aqt
Date: 07/31/12 Time: 12:23:19

PROJECT INFORMATION

Test Well: TR35

AQUIFER DATA

Saturated Thickness: 5. m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (New Well)

Initial Displacement: 1.3 m
Total Well Penetration Depth: 24. m
Casing Radius: 0.025 m
Static Water Column Height: 6. m
Screen Length: 5. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.405E-5 m/min
y0 = 1.733 m

APPENDIX E
PUMPING TEST LICENCE DETAILS

NEW SOUTH WALES
NSW Government

NSW OFFICE OF WATER

Whitehaven Coal Mining Pty Limited
PO Box 600
GUNNEDAH NSW 2380

11th July, 2012 .

Dear Sir,

MONITORING BORE LICENCE

Please find enclosed your licence(s). Together with a blank **"Form A" (Particulars of Completed bore)** and map for recording details of the bore. Also attached is a copy of the new procedure for the handling of the **"Form A".**

Your attention is drawn to the nature and description of the work, terms, limitations and conditions under which the licence(s) is/are issued.
You are able to sink multiple test bores under this Test License.

Please show the licence to the Driller so that he is aware of any conditions affecting the construction of the bore. The driller must have a current Driller's Licence issued by this Department.

Condition (2) of the license applies whether the bore is successful or not. The attached **"Form A"** has been provided for the recording of details of the proposed bore. The driller is required to record the details of the bore, and **provide you** with the **completed form**. The driller is also required to mark the location of the bore site on the attached plan. This sketch is required even though you may have already indicated the site to the Department.

You are required to return the completed "Form A" and map to the contact officer and address shown in this letter. Failure to do so could restrict future actions relating to the licensed work, such as the future conversion from a Water Act license to a Water Management Act approval.

If your monitoring bore is to be converted into a production bore, it will be necessary to apply and obtain a new licence. The following should be kept in mind when selecting the site of the test bore, if it is to be used for any purpose other that stock, domestic and farming:-

The bore must be located:

** 200 metres from any boundary of the property
** 400 metres from any irrigation bore on an adjoining property
** 500 metres from any town water supply bore
** 400 metres from any Department Water Monitoring Bore
** 40 metres from the nearest bank of any river or creek
** 400 metres from any Artesian Bore on an adjoining property
** 200 metres from any wetland or other nature/conservation area

And any relevant distance conditions as set out in the Water Sharing Plans for your specific area.

Yours faithfully

K Schubert

Karen Schubert
Licensing Division
Area North
Moree Office

NSW Office of Water

Licensing North
Po Box 550
155-157 Marius Street
Tamworth NSW 2340
Phone: (02) 67019600

BORE LICENSE CERTIFICATE
UNDER SECTION 115 OF THE WATER ACT, 1912

90BL256080

Department of Primary Industries
Office of Water

Whitehaven Coal Mining Pty Ltd
Po Box 600
Gunnedah NSW 2380

LICENSE NUMBER
90BL256080
DATE LICENSE VALID FROM
11-Jul-2012
DATE LICENSE VALID TO
PERPETUITY
FEE
$0.00

ABN 47661556763 GST NIL

LOCATION OF WORKS

Portion(s) or Lot/Section/DP	PARISH	COUNTY
2//219923	Brentry	Nandewar

TYPE OF WORKS	PURPOSE(S) FOR WHICH WATER MAY BE USED
Bore	Monitoring Bore

CONDITIONS APPLYING TO THIS LICENSE ARE

As shown on the attached Condition Statement

ORIGINAL

NSW Office of Water

CONDITIONS STATEMENT REFERRED TO ON 90BL256080 ISSUED UNDER PART V OF THE WATER ACT, 1912 ON 11-Jul-2012

(1) THE LICENCE SHALL LAPSE IF THE WORK IS NOT COMMENCED AND COMPLETED WITHIN THREE YEARS OF THE DATE OF THE ISSUE OF THE LICENCE.

(2) THE LICENSEE SHALL WITHIN TWO MONTHS OF COMPLETION OR AFTER THE ISSUE OF THE LICENSE IF THE WORK IS EXISTING, FURNISH TO NSW OFFICE OF WATER:-

(A) DETAILS OF THE WORK SET OUT IN THE ATTACHED FORM "A" (MUST BE COMPLETED BY A DRILLER).

(B) A PLAN SHOWING ACCURATELY THE LOCATION OF THE WORK, IN RELATION TO PORTION AND PROPERTY BOUNDARIES.

(C) A ONE LITRE WATER SAMPLE FOR ALL LICENCES OTHER THAN THOSE FOR STOCK, DOMESTIC, TEST BORES AND FARMING PURPOSES.

(D) DETAILS OF ANY WATER ANALYSIS AND/OR PUMPING TESTS.

(3) THE LICENSEE SHALL ALLOW NSW OFFICE OF WATER OR ANY PERSON AUTHORISED BY IT, FULL AND FREE ACCESS TO THE WORKS, EITHER DURING OR AFTER CONSTRUCTION, FOR THE PURPOSE OF CARRYING OUT INSPECTION OR TEST OF THE WORKS AND ITS FITTINGS AND SHALL CARRY OUT ANY WORK OR ALTERATIONS DEEMED NECESSARY BY THE DEPARTMENT FOR THE PROTECTION AND PROPER MAINTENANCE OF THE WORKS, OR THE CONTROL OF THE WATER EXTRACTED AND FOR THE PROTECTION OF THE QUALITY AND THE PREVENTION FROM POLLUTION OR CONTAMINATION OF SUB-SURFACE WATER.

(4) IF DURING THE CONSTRUCTION OF THE WORK, SALINE OR POLLUTED WATER IS ENCOUNTERED ABOVE THE PRODUCING AQUIFER, SUCH WATER SHALL BE SEALED OFF BY:-

(A) INSERTING THE APPROPRIATE LENGTH(S) OF CASING TO A DEPTH SUFFICIENT TO EXCLUDE THE SALINE OR POLLUTED WATER FROM THE WORK.

(B) CEMENTING BETWEEN THE CASING(S) AND THE WALLS OF THE BORE HOLE FROM THE BOTTOM OF THE CASING TO GROUND LEVEL.

ANY DEPARTURE FROM THESE PROCEDURES MUST BE APPROVED BY THE DEPARTMENT BEFORE UNDERTAKING THE WORK.

(5) (A) THE LICENSEE SHALL NOTIFY NSW OFFICE OF WATER IF A FLOWING SUPPLY OF WATER IS OBTAINED. THE BORE SHALL THEN BE LINED WITH CASING AND CEMENTED AND A SUITABLE CLOSING GEAR SHALL BE ATTACHED TO THE BOREHEAD AS SPECIFIED BY NSW OFFICE OF WATER.

(B) IF A FLOWING SUPPLY OF WATER IS OBTAINED FROM THE WORK, THE LICENSEE SHALL ONLY DISTRIBUTE WATER FROM THE BORE HEAD BY A SYSTEM OF PIPE LINES AND SHALL NOT DISTRIBUTE IT IN DRAINS, NATURAL OR ARTIFICIAL CHANNELS OR DEPRESSIONS.

(6) IF A WORK IS ABANDONED AT ANY TIME THE LICENSEE SHALL NOTIFY NSW OFFICE OF WATER THAT THE WORK HAS BEEN ABANDONED AND SEAL OFF THE AQUIFER BY:-

(A) BACKFILLING THE WORK TO GROUND LEVEL WITH CLAY OR CEMENT AFTER WITHDRAWING THE CASING (LINING); OR

(B) SUCH METHODS AS AGREED TO OR DIRECTED BY NSW OFFICE OF WATER.

(7) THE LICENSEE SHALL NOT ALLOW ANY TAILWATER/DRAINAGE TO DISCHARGE INTO OR ONTO:-

- ANY ADJOINING PUBLIC OR CROWN ROAD;
- ANY OTHER PERSONS LAND;
- ANY CROWN LAND;
- ANY RIVER, CREEK OR WATERCOURSE;
- ANY NATIVE VEGETATION AS DESCRIBED UNDER THE NATIVE VEGETATION CONSERVATION ACT 1997;
- ANY WETLANDS OF ENVIRONMENTAL SIGNIFICANCE.

(8) WORKS USED FOR THE PURPOSE OF CONVEYING, DISTRIBUTING OR STORING WATER TAKEN BY MEANS OF THE LICENSED WORK SHALL NOT BE CONSTRUCTED OR INSTALLED SO AS TO OBSTRUCT THE REASONABLE PASSAGE OF FLOOD WATERS FLOWING INTO OR FROM A RIVER.

(9) IF THE BORE AUTHORISED BY THIS LICENSE IS LINED WITH STEEL OR PLASTIC CASING THE INSIDE DIAMETER OF THAT CASING SHALL NOT EXCEED 220 MM.

(10) WATER SHALL NOT BE PUMPED FROM THE BORE AUTHORISED BY THIS LICENSE FOR ANY PURPOSE OTHER THAN GROUNDWATER INVESTIGATION.

(11) SUBJECT TO CONDITION (12) THE LICENSEE SHALL WITHIN TWO MONTHS OF THE DATE OF COMPLETION OF THE BORE AUTHORISED BY THE LICENSE,

(1) BACKFILL IT WITH CLAY OR CEMENT TO GROUND LEVEL, AFTER WITHDRAWING ANY CASING(LINING), OR:-
(2) RENDER IT INEFFECTIVE BY ANY OTHER MEANS ACCEPTABLE TO THE DEPARTMENT.

(12) CONDITION (11) SHALL HAVE NO FORCE OR EFFECT IF:-

(1) AT THE RELEVANT TIME THERE IS WITH NSW OFFICE OF WATER, AN APPLICATION IN RESPECT OF WHICH THE DEPARTMENT HAS NOT MADE A DECISION TO CONVERT THE GROUNDWATER INVESTIGATION BORE INTO A PRODUCTION BORE; OR
(2) THE LICENSEE HAS COMPLETED THE BORE FOR THE PURPOSE OF MEASURING WATER LEVELS OR WATER QUALITY BY THE ADDITION OF CASING WITH A DIAMETER NOT EXCEEDING 220MM.

End Of Conditions

NEW SOUTH WALES
NSW Government

NSW OFFICE OF WATER

Whitehaven Coal Mining Pty Limited
PO Box 600
GUNNEDAH NSW 2380

11th July, 2012 .

Dear Sir,

MONITORING BORE LICENCE

Please find enclosed your licence(s). Together with a blank **"Form A" (Particulars of Completed bore)** and map for recording details of the bore. Also attached is a copy of the new procedure for the handling of the **"Form A".**

Your attention is drawn to the nature and description of the work, terms, limitations and conditions under which the licence(s) is/are issued.
You are able to sink multiple test bores under this Test License.

Please show the licence to the Driller so that he is aware of any conditions affecting the construction of the bore. The driller must have a current Driller's Licence issued by this Department.

Condition (2) of the license applies whether the bore is successful or not. The attached **"Form A"** has been provided for the recording of details of the proposed bore. The driller is required to record the details of the bore, and **provide you** with the **completed form**. The driller is also required to mark the location of the bore site on the attached plan. This sketch is required even though you may have already indicated the site to the Department.

You are required to return the completed "Form A" and map to the contact officer and address shown in this letter. Failure to do so could restrict future actions relating to the licensed work, such as the future conversion from a Water Act license to a Water Management Act approval.

If your monitoring bore is to be converted into a production bore, it will be necessary to apply and obtain a new licence. The following should be kept in mind when selecting the site of the test bore, if it is to be used for any purpose other that stock, domestic and farming:-

The bore must be located:

** 200 metres from any boundary of the property
** 400 metres from any irrigation bore on an adjoining property
** 500 metres from any town water supply bore
** 400 metres from any Department Water Monitoring Bore
** 40 metres from the nearest bank of any river or creek
** 400 metres from any Artesian Bore on an adjoining property
** 200 metres from any wetland or other nature/conservation area

And any relevant distance conditions as set out in the Water Sharing Plans for your specific area.

Yours faithfully

K Schubert

Karen Schubert
Licensing Division
Area North
Moree Office

NSW Office of Water

Licensing North
Po Box 550
155-157 Marius Street
Tamworth NSW 2340
Phone: (02) 67019600

BORE LICENSE CERTIFICATE
UNDER SECTION 115 OF THE WATER ACT, 1912

90BL256079

Department of Primary Industries
Office of Water

Whitehaven Coal Mining Pty Ltd
Po Box 600
Gunnedah NSW 2380

LICENSE NUMBER
90BL256079
DATE LICENSE VALID FROM
11-Jul-2012
DATE LICENSE VALID TO
PERPETUITY
FEE
$0.00

ABN 47661556763 GST NIL

LOCATION OF WORKS

Portion(s) or Lot/Section/DP	PARISH	COUNTY
2//219923	Brentry	Nandewar

TYPE OF WORKS	PURPOSE(S) FOR WHICH WATER MAY BE USED
Bore	Monitoring Bore

CONDITIONS APPLYING TO THIS LICENSE ARE

As shown on the attached Condition Statement

ORIGINAL

NSW Office of Water

CONDITIONS STATEMENT REFERRED TO ON 90BL256079 ISSUED UNDER PART V OF THE WATER ACT, 1912 ON 11-Jul-2012

(1) THE LICENCE SHALL LAPSE IF THE WORK IS NOT COMMENCED AND COMPLETED WITHIN THREE YEARS OF THE DATE OF THE ISSUE OF THE LICENCE.

(2) THE LICENSEE SHALL WITHIN TWO MONTHS OF COMPLETION OR AFTER THE ISSUE OF THE LICENSE IF THE WORK IS EXISTING, FURNISH TO NSW OFFICE OF WATER:-

(A) DETAILS OF THE WORK SET OUT IN THE ATTACHED FORM "A" (MUST BE COMPLETED BY A DRILLER).

(B) A PLAN SHOWING ACCURATELY THE LOCATION OF THE WORK, IN RELATION TO PORTION AND PROPERTY BOUNDARIES.

(C) A ONE LITRE WATER SAMPLE FOR ALL LICENCES OTHER THAN THOSE FOR STOCK, DOMESTIC, TEST BORES AND FARMING PURPOSES.

(D) DETAILS OF ANY WATER ANALYSIS AND/OR PUMPING TESTS.

(3) THE LICENSEE SHALL ALLOW NSW OFFICE OF WATER OR ANY PERSON AUTHORISED BY IT, FULL AND FREE ACCESS TO THE WORKS, EITHER DURING OR AFTER CONSTRUCTION, FOR THE PURPOSE OF CARRYING OUT INSPECTION OR TEST OF THE WORKS AND ITS FITTINGS AND SHALL CARRY OUT ANY WORK OR ALTERATIONS DEEMED NECESSARY BY THE DEPARTMENT FOR THE PROTECTION AND PROPER MAINTENANCE OF THE WORKS, OR THE CONTROL OF THE WATER EXTRACTED AND FOR THE PROTECTION OF THE QUALITY AND THE PREVENTION FROM POLLUTION OR CONTAMINATION OF SUB-SURFACE WATER.

(4) IF DURING THE CONSTRUCTION OF THE WORK, SALINE OR POLLUTED WATER IS ENCOUNTERED ABOVE THE PRODUCING AQUIFER, SUCH WATER SHALL BE SEALED OFF BY:-

(A) INSERTING THE APPROPRIATE LENGTH(S) OF CASING TO A DEPTH SUFFICIENT TO EXCLUDE THE SALINE OR POLLUTED WATER FROM THE WORK.

(B) CEMENTING BETWEEN THE CASING(S) AND THE WALLS OF THE BORE HOLE FROM THE BOTTOM OF THE CASING TO GROUND LEVEL.

ANY DEPARTURE FROM THESE PROCEDURES MUST BE APPROVED BY THE DEPARTMENT BEFORE UNDERTAKING THE WORK.

(5) (A) THE LICENSEE SHALL NOTIFY NSW OFFICE OF WATER IF A FLOWING SUPPLY OF WATER IS OBTAINED. THE BORE SHALL THEN BE LINED WITH CASING AND CEMENTED AND A SUITABLE CLOSING GEAR SHALL BE ATTACHED TO THE BOREHEAD AS SPECIFIED BY NSW OFFICE OF WATER.

(B) IF A FLOWING SUPPLY OF WATER IS OBTAINED FROM THE WORK, THE LICENSEE SHALL ONLY DISTRIBUTE WATER FROM THE BORE HEAD BY A SYSTEM OF PIPE LINES AND SHALL NOT DISTRIBUTE IT IN DRAINS, NATURAL OR ARTIFICIAL CHANNELS OR DEPRESSIONS.

(6) IF A WORK IS ABANDONED AT ANY TIME THE LICENSEE SHALL NOTIFY NSW OFFICE OF WATER THAT THE WORK HAS BEEN ABANDONED AND SEAL OFF THE AQUIFER BY:-

(A) BACKFILLING THE WORK TO GROUND LEVEL WITH CLAY OR CEMENT AFTER WITHDRAWING THE CASING (LINING); OR

(B) SUCH METHODS AS AGREED TO OR DIRECTED BY NSW OFFICE OF WATER.

(7) THE LICENSEE SHALL NOT ALLOW ANY TAILWATER/DRAINAGE TO DISCHARGE INTO OR ONTO:-

- ANY ADJOINING PUBLIC OR CROWN ROAD;
- ANY OTHER PERSONS LAND;
- ANY CROWN LAND;
- ANY RIVER, CREEK OR WATERCOURSE;
- ANY NATIVE VEGETATION AS DESCRIBED UNDER THE NATIVE VEGETATION CONSERVATION ACT 1997;
- ANY WETLANDS OF ENVIRONMENTAL SIGNIFICANCE.

(8) WORKS USED FOR THE PURPOSE OF CONVEYING, DISTRIBUTING OR STORING WATER TAKEN BY MEANS OF THE LICENSED WORK SHALL NOT BE CONSTRUCTED OR INSTALLED SO AS TO OBSTRUCT THE REASONABLE PASSAGE OF FLOOD WATERS FLOWING INTO OR FROM A RIVER.

(9) IF THE BORE AUTHORISED BY THIS LICENSE IS LINED WITH STEEL OR PLASTIC CASING THE INSIDE DIAMETER OF THAT CASING SHALL NOT EXCEED 220 MM.

(10) WATER SHALL NOT BE PUMPED FROM THE BORE AUTHORISED BY THIS LICENSE FOR ANY PURPOSE OTHER THAN GROUNDWATER INVESTIGATION.

(11) SUBJECT TO CONDITION (12) THE LICENSEE SHALL WITHIN TWO MONTHS OF THE DATE OF COMPLETION OF THE BORE AUTHORISED BY THE LICENSE,

(1) BACKFILL IT WITH CLAY OR CEMENT TO GROUND LEVEL, AFTER WITHDRAWING ANY CASING(LINING), OR:-
(2) RENDER IT INEFFECTIVE BY ANY OTHER MEANS ACCEPTABLE TO THE DEPARTMENT.

(12) CONDITION (11) SHALL HAVE NO FORCE OR EFFECT IF:-

(1) AT THE RELEVANT TIME THERE IS WITH NSW OFFICE OF WATER, AN APPLICATION IN RESPECT OF WHICH THE DEPARTMENT HAS NOT MADE A DECISION TO CONVERT THE GROUNDWATER INVESTIGATION BORE INTO A PRODUCTION BORE; OR
(2) THE LICENSEE HAS COMPLETED THE BORE FOR THE PURPOSE OF MEASURING WATER LEVELS OR WATER QUALITY BY THE ADDITION OF CASING WITH A DIAMETER NOT EXCEEDING 220MM.

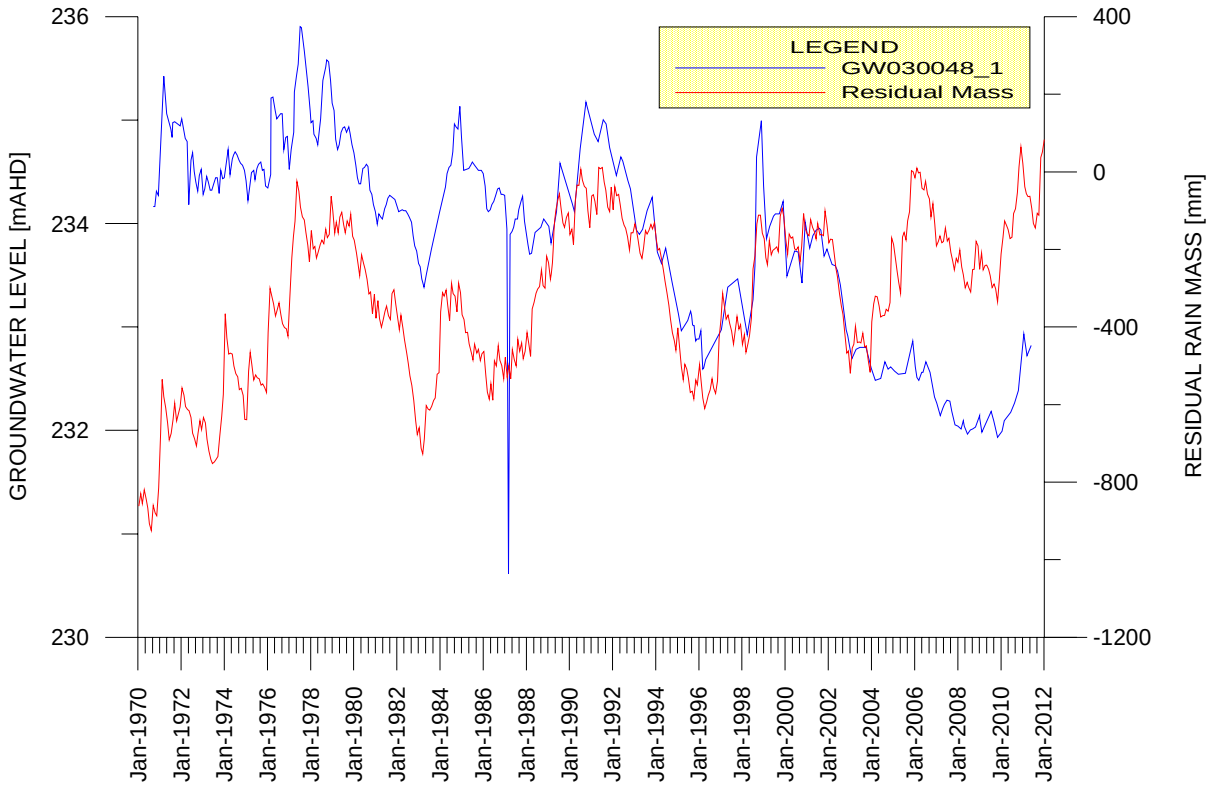
End Of Conditions

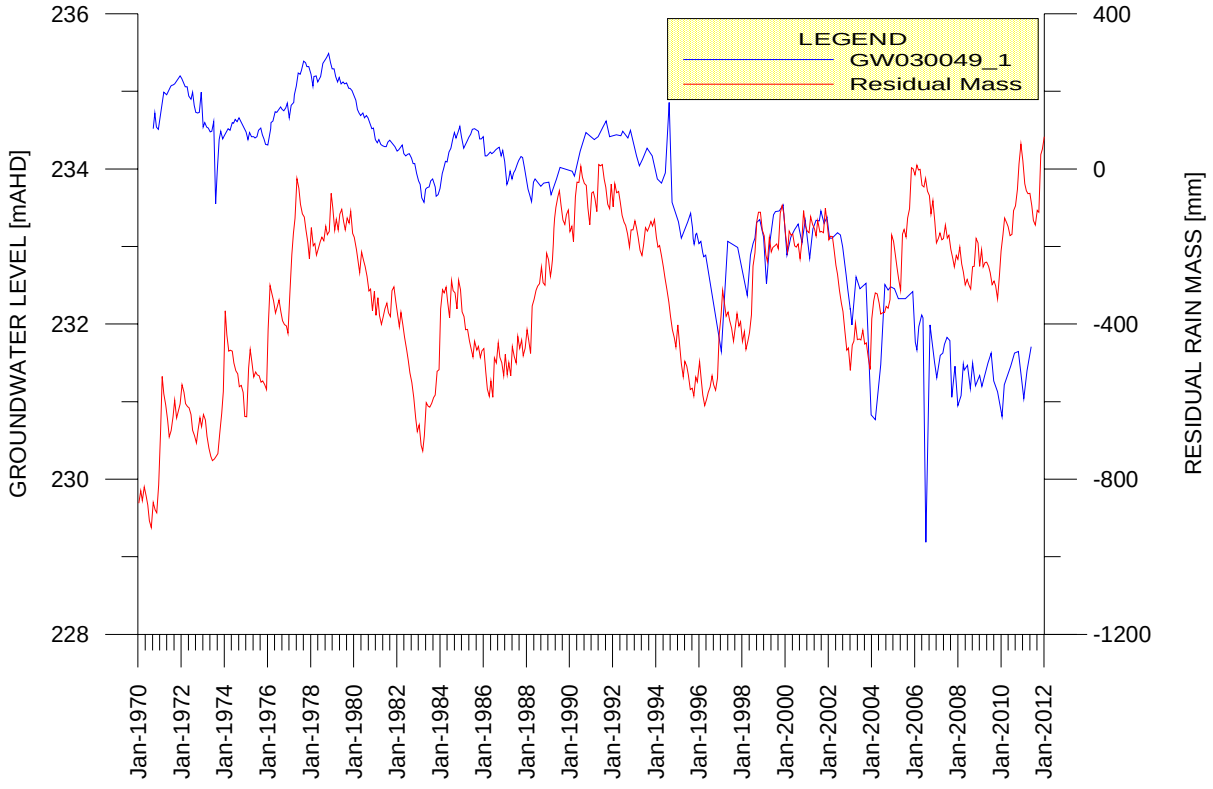
APPENDIX F
BORE VKY3092 GROUNDWATER CHEMISTRY RESULTS

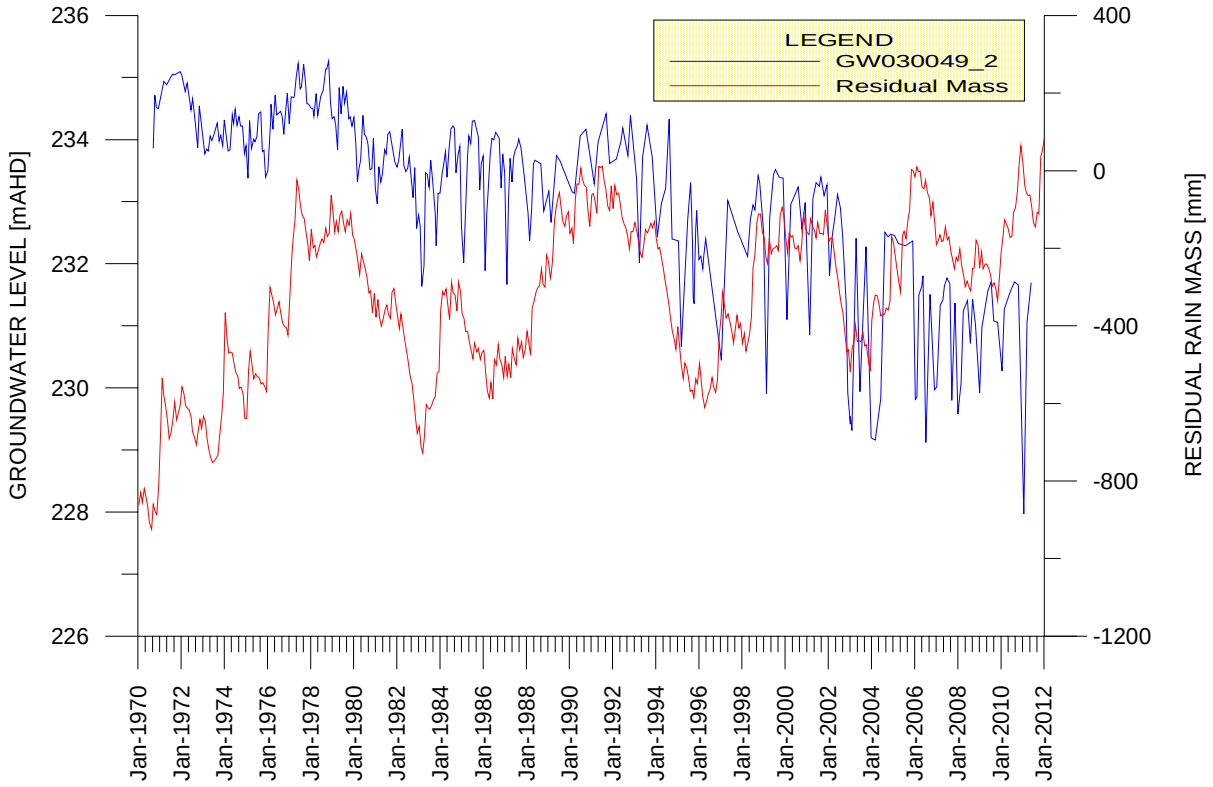
Sample		VKY3092 A	VKY3092B	VKY3092C
Date	Unit	16/08/2012	16/08/2012	16/08/2012
Electrical Conductivity	µS/cm	18600	18600	17300
pH (Field)		7.25	7.21	7.16
pH(Lab)		7.61	7.59	7.73
Calcium	mg/L	378	390	348
Magnesium	mg/L	537	558	493
Sodium	mg/L	3740	3840	2960
Potassium	mg/L	20	21	22
Chloride	mg/L	6250	6420	5680
Sulfate as SO4	mg/L	757	752	704
Hydroxide Alkalinity as CaCO3	mg/L	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	816	811	782
Total Alkalinity as CaCO3	mg/L	816	811	782
Arsenic	mg/L	<0.001	<0.001	<0.001
Cadmium	mg/L	<0.0001	<0.0001	<0.0001
Chromium	mg/L	<0.001	<0.001	<0.001
Copper	mg/L	0.032	0.032	0.037
Lead	mg/L	0.001	0.001	0.002
Nickel	mg/L	<0.001	<0.001	<0.001
Zinc	mg/L	0.155	0.189	0.319
Iron	mg/L	<0.05	<0.05	<0.05
Mercury	mg/L	<0.0001	<0.0001	<0.0001
Total Anions	meq/L	208	213	190
Total Cations	meq/L	226	233	187
Ionic Balance	%	4.1	4.47	0.87

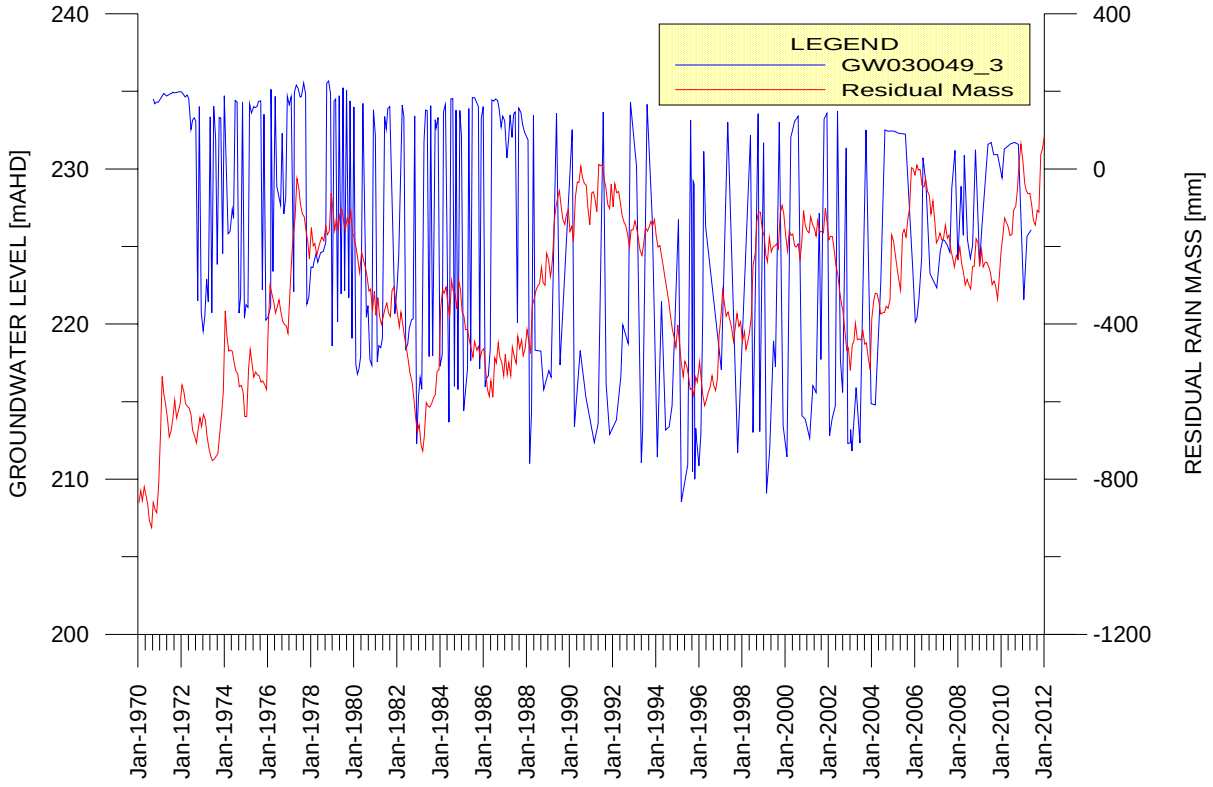
ATTACHMENT AB

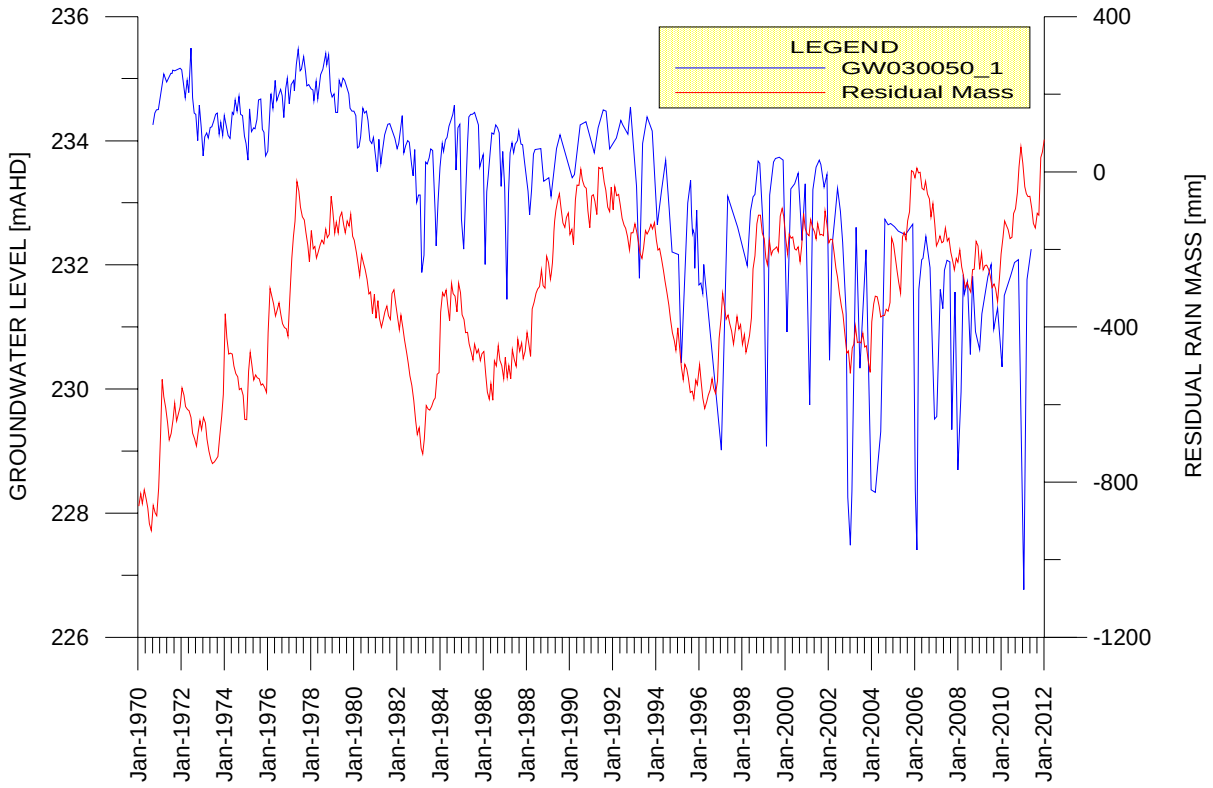
Groundwater Hydrographs for NOW Bores located in Zone 4 and Residual Rain Mass

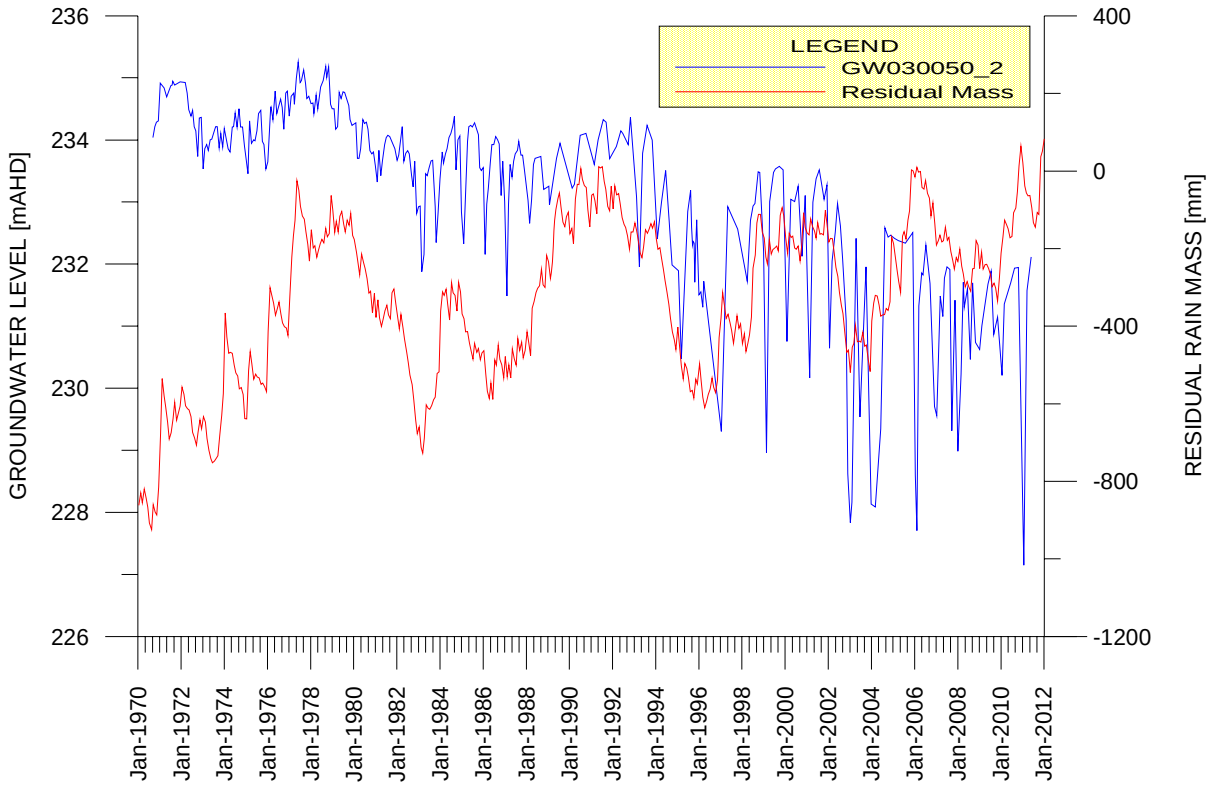

LEGEND
GW030048_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
236
234
232
230
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

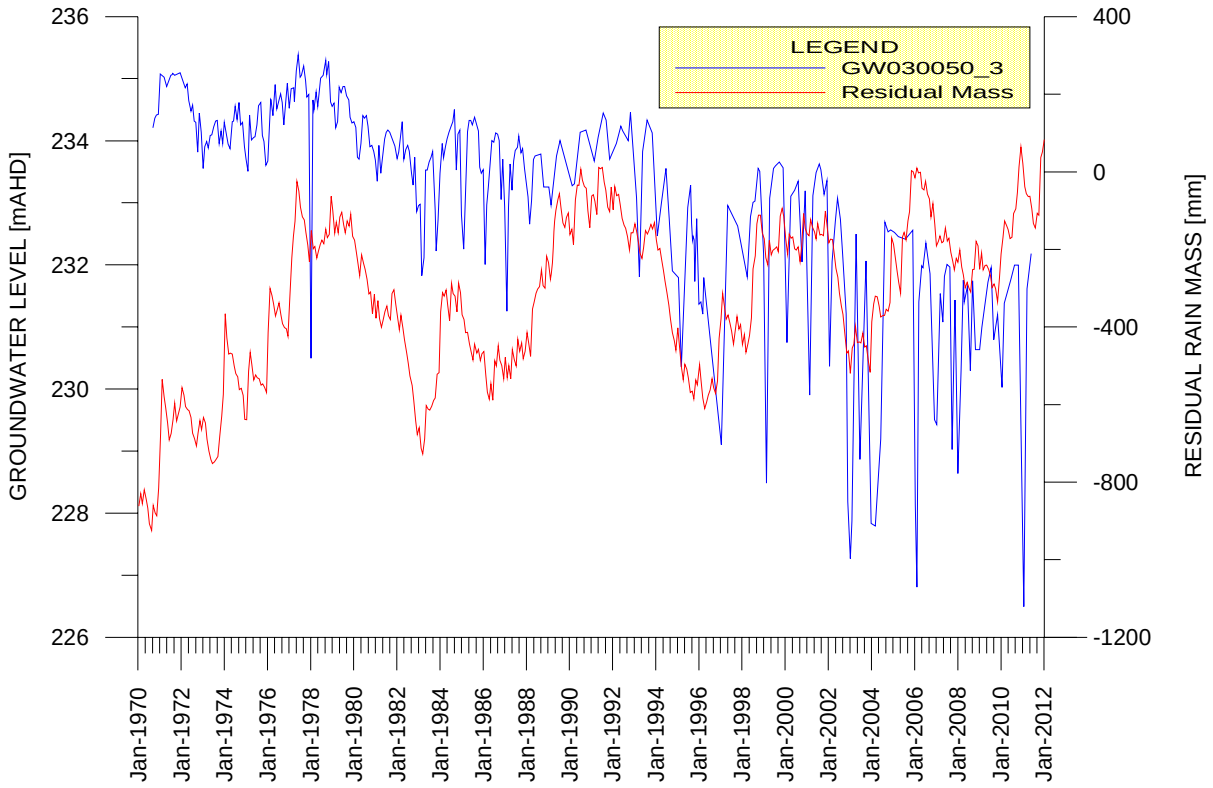

LEGEND
GW030049_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
236
234
232
230
228
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

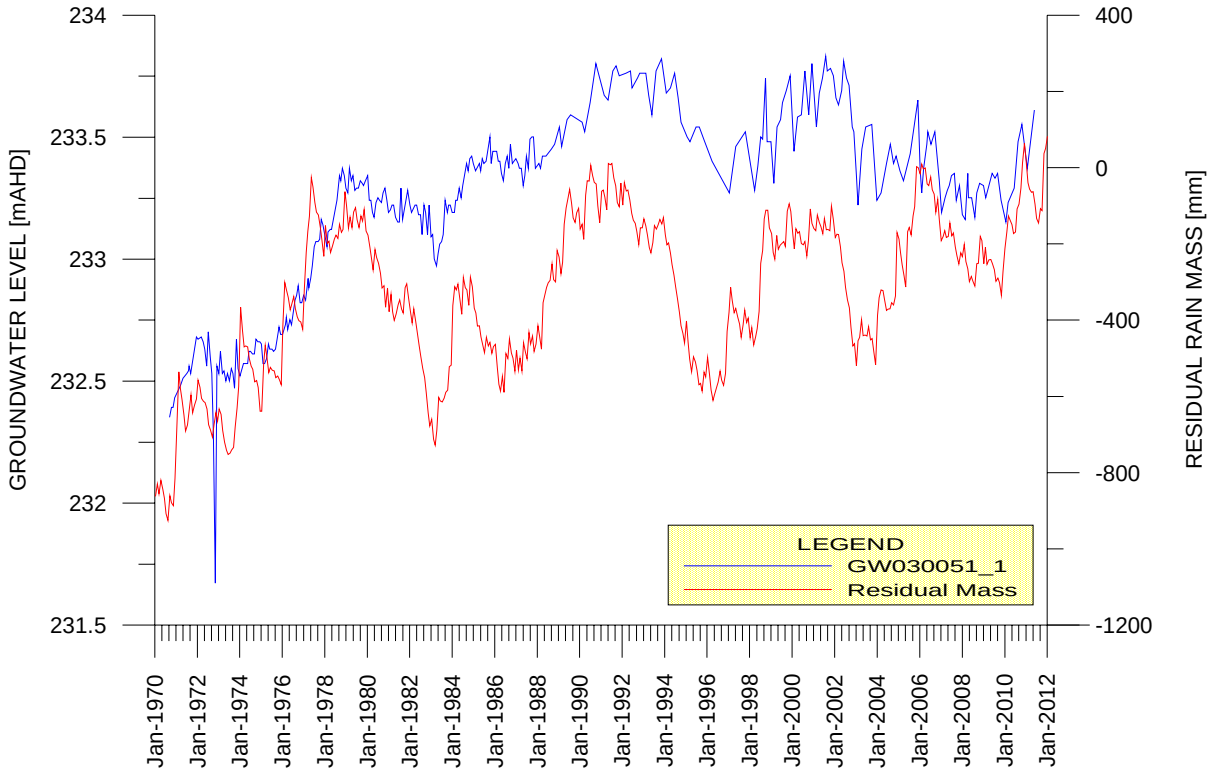

LEGEND
GW030049_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
236
234
232
230
228
226
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

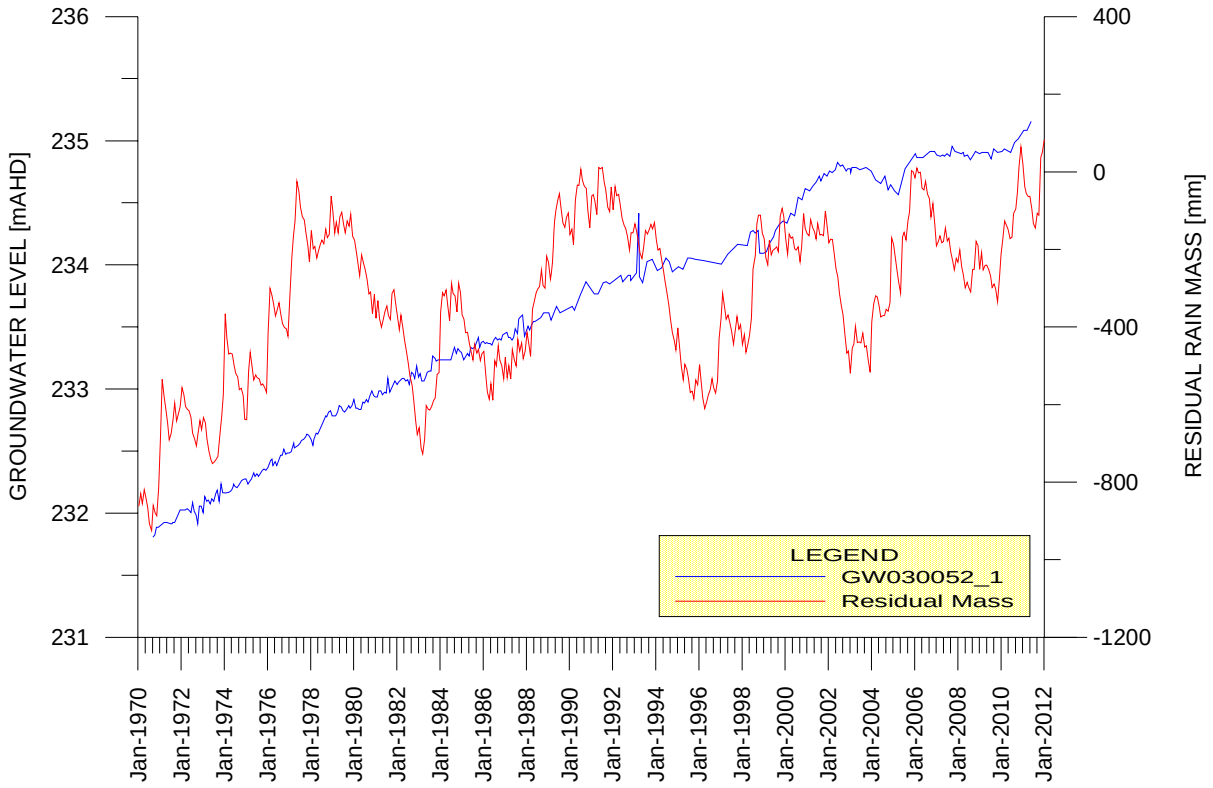

LEGEND
GW030049_3
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
240
230
220
210
200
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

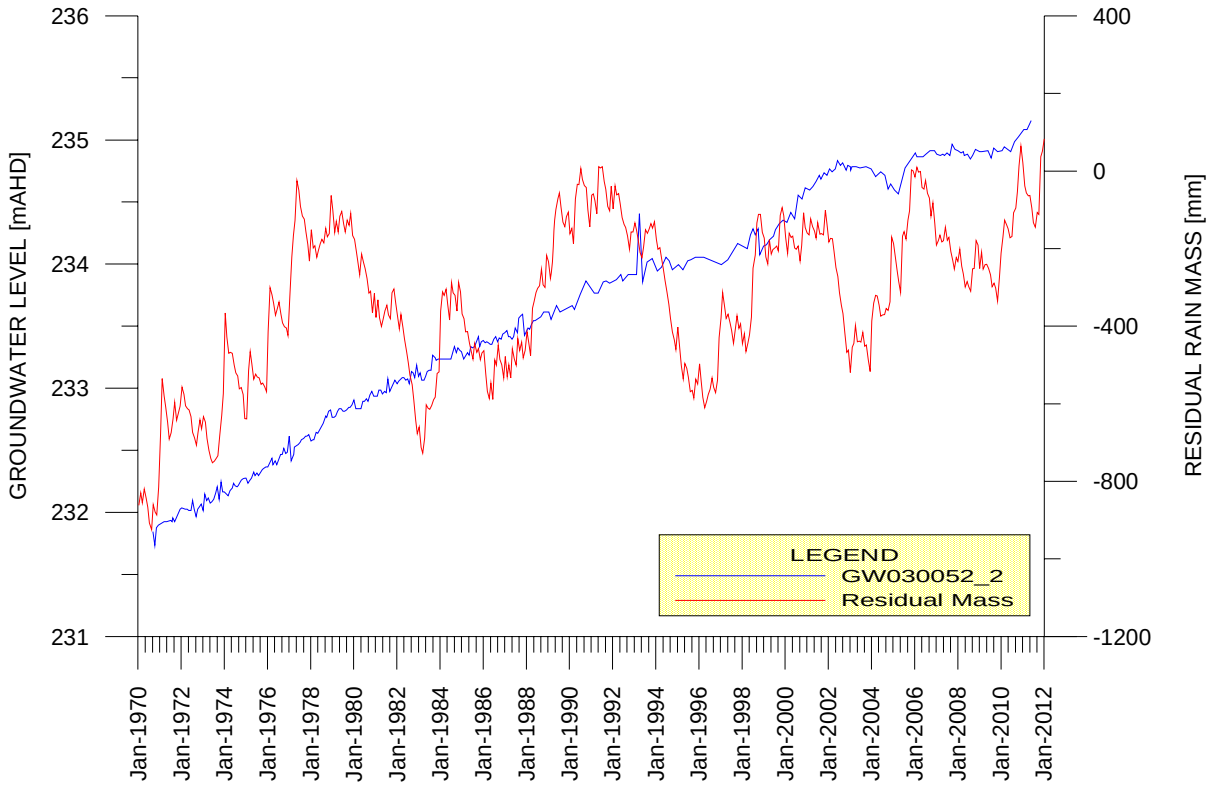

LEGEND
GW030050_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
236
234
232
230
228
226
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

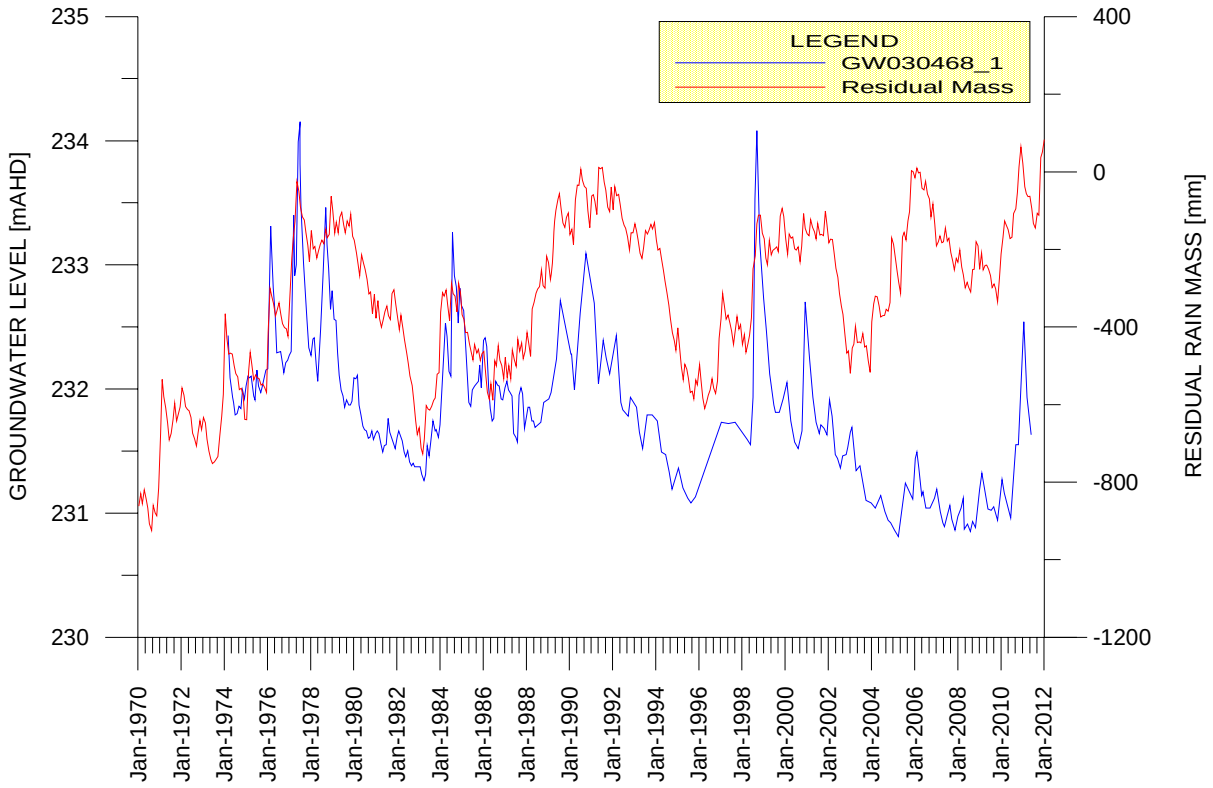

LEGEND
GW030050_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
236
234
232
230
228
226
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

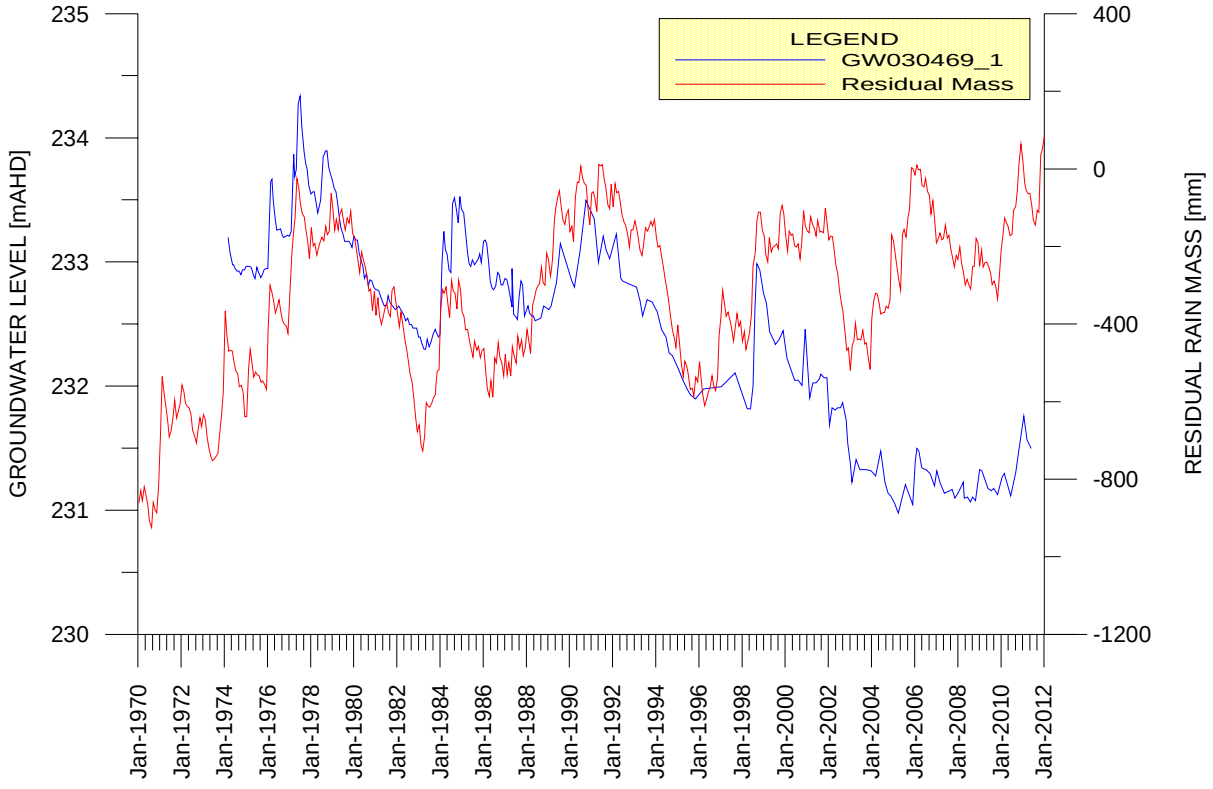

LEGEND
GW030050_3
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
236
234
232
230
228
226
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

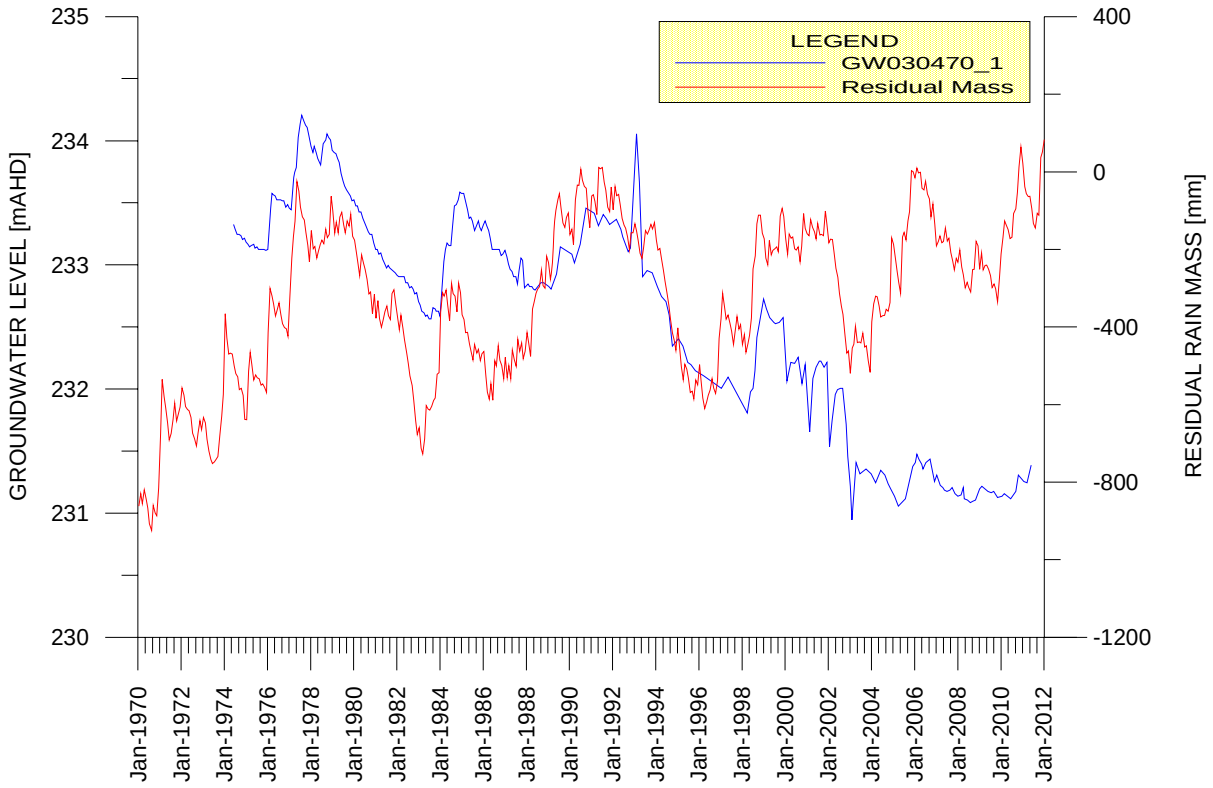

LEGEND
GW030051_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
234
233.5
233
232.5
232
231.5
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

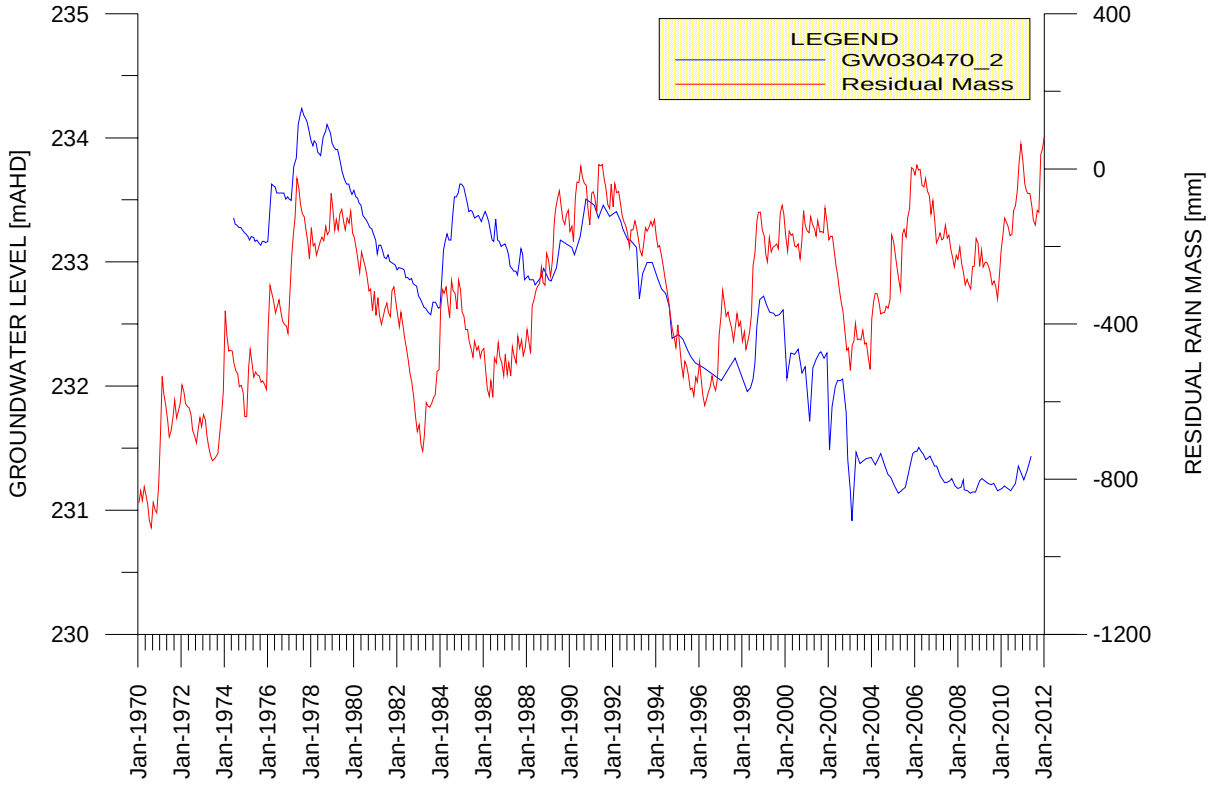

GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
236
235
234
233
232
231
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012
LEGEND
GW030052_1
Residual Mass

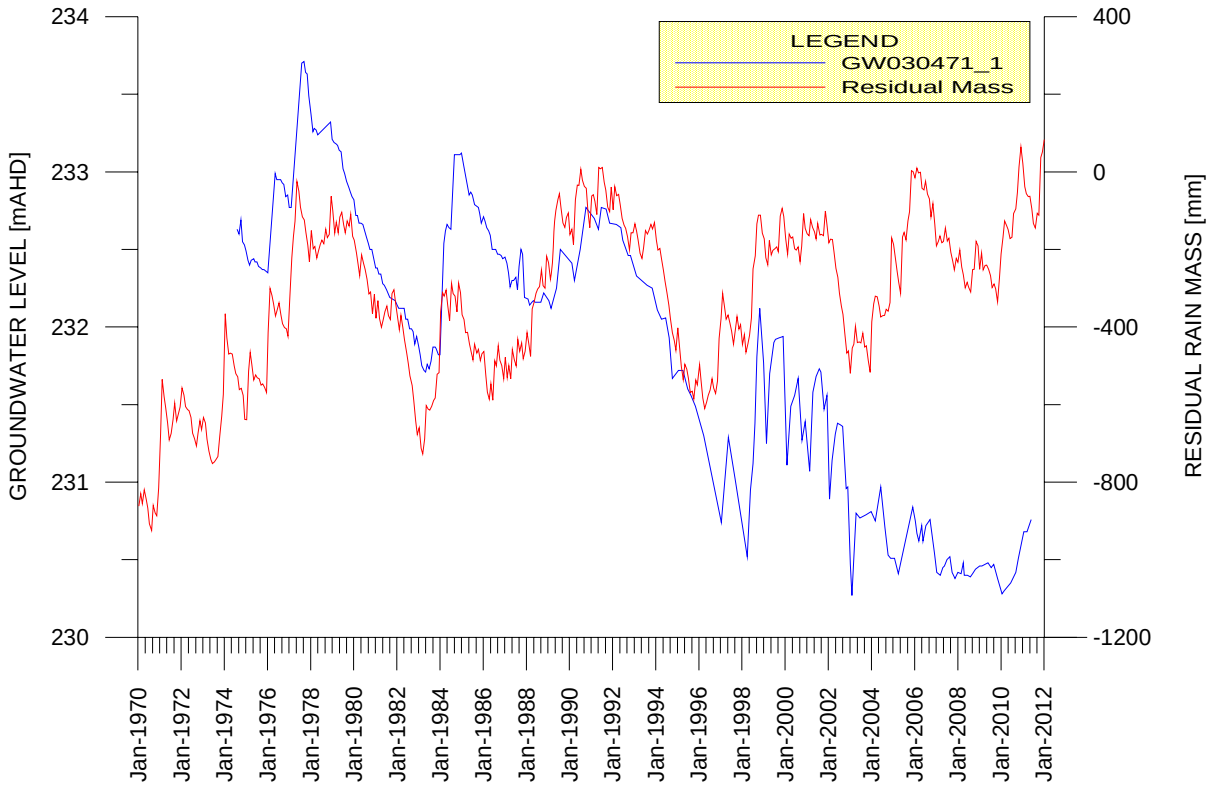

GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
236
235
234
233
232
231
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012
LEGEND
GW030052_2
Residual Mass

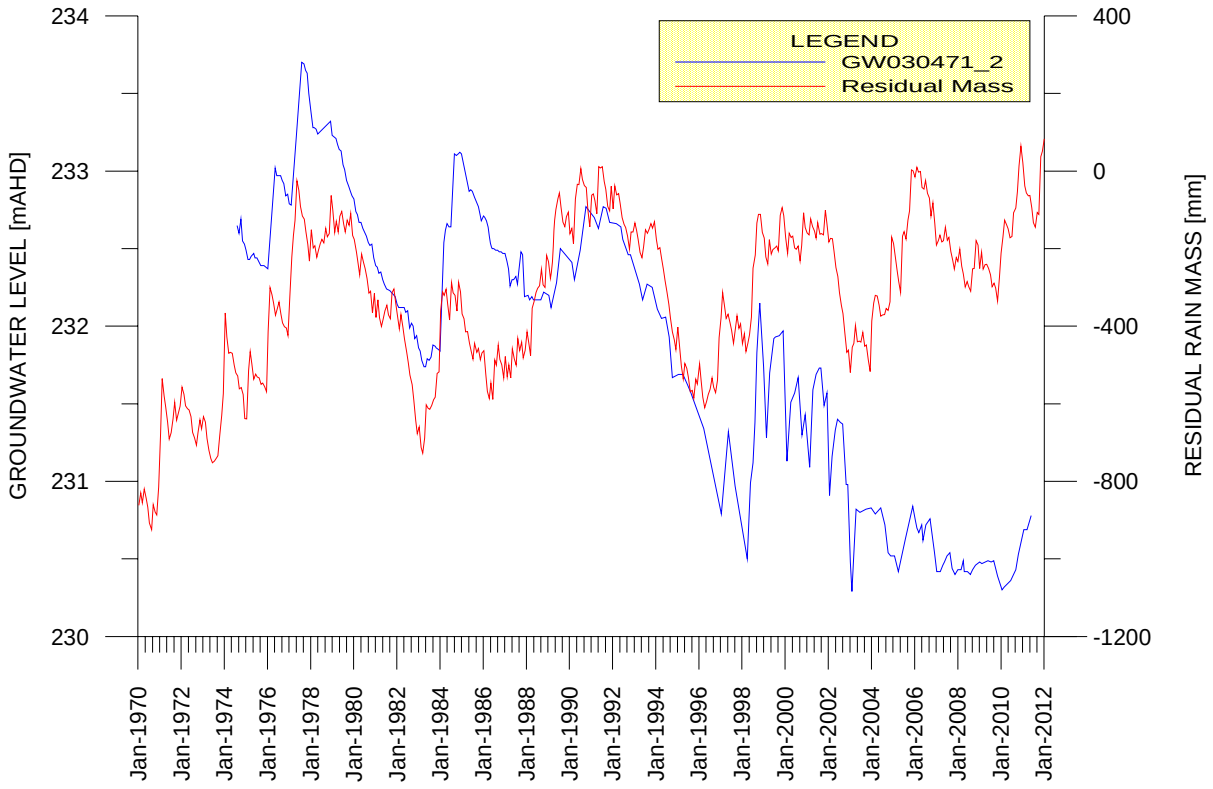

LEGEND
GW030468_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
235
234
233
232
231
230
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

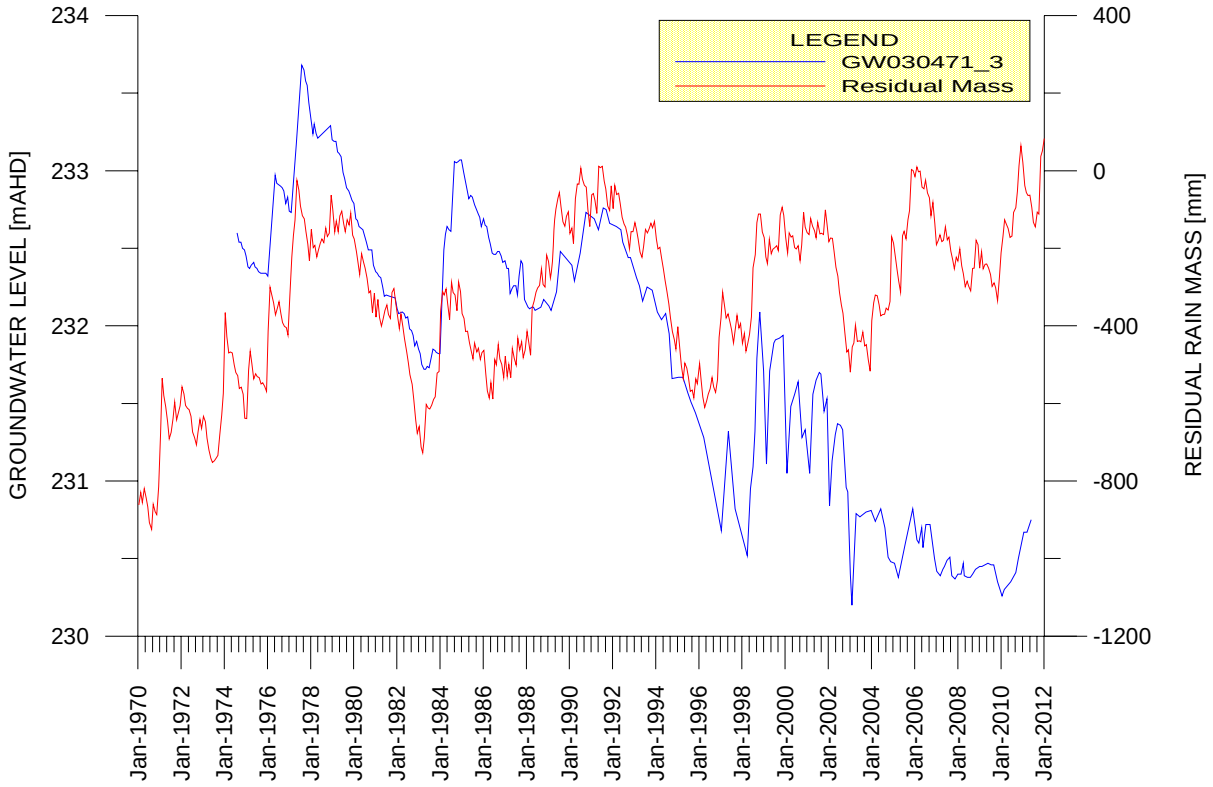

LEGEND
GW030469_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
235
234
233
232
231
230
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

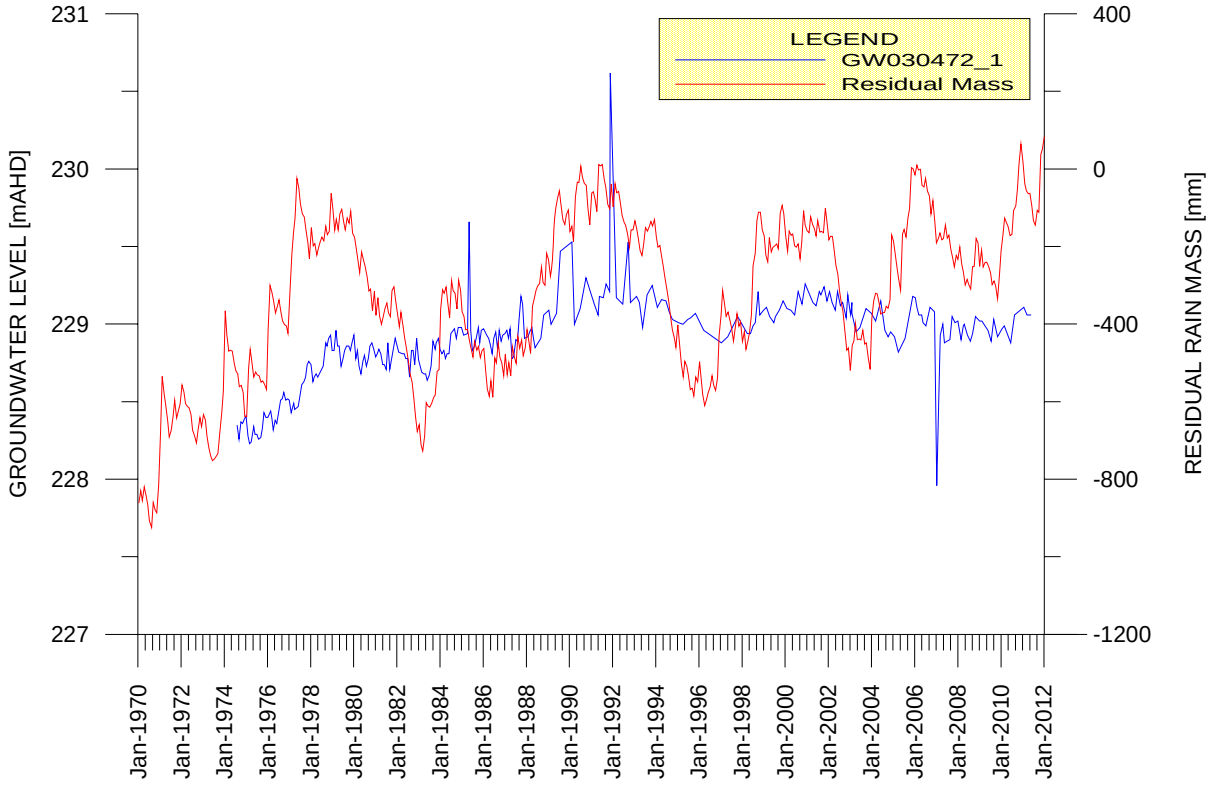

LEGEND
GW030470_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
235
234
233
232
231
230
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

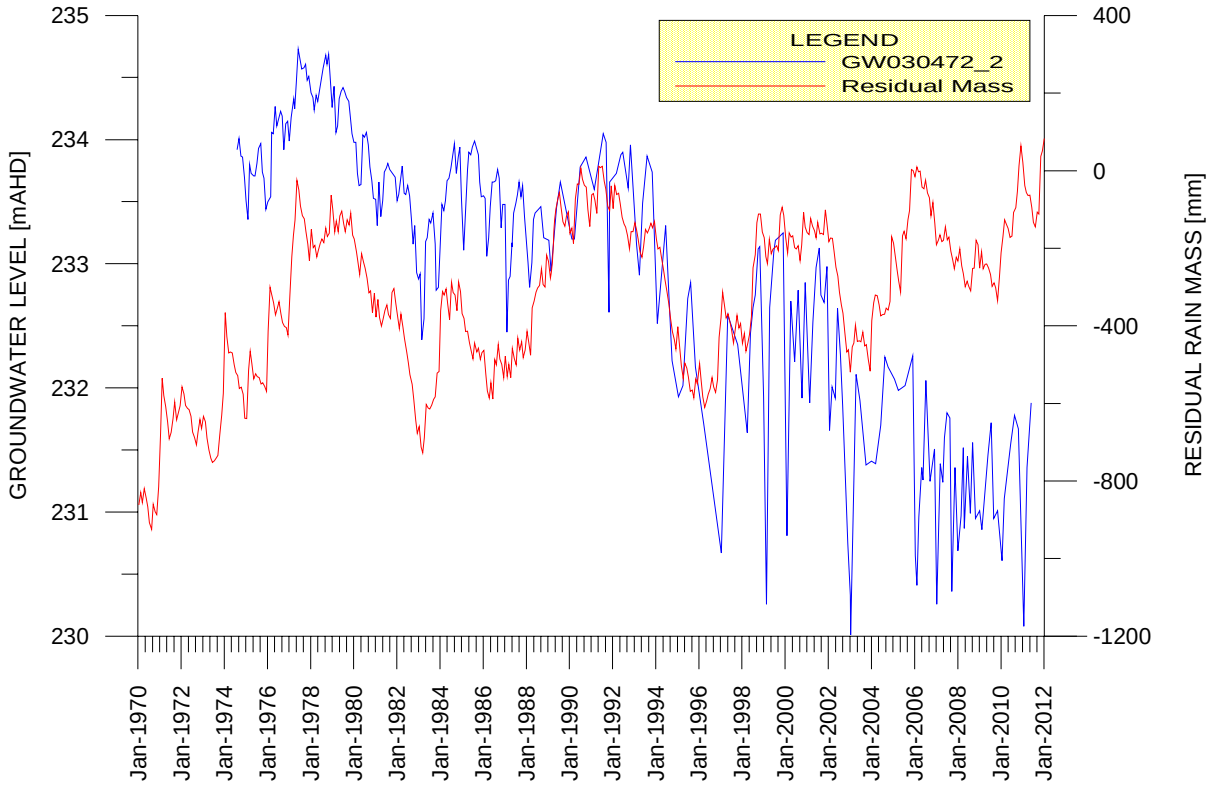

LEGEND
GW030470_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
235
234
233
232
231
230
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

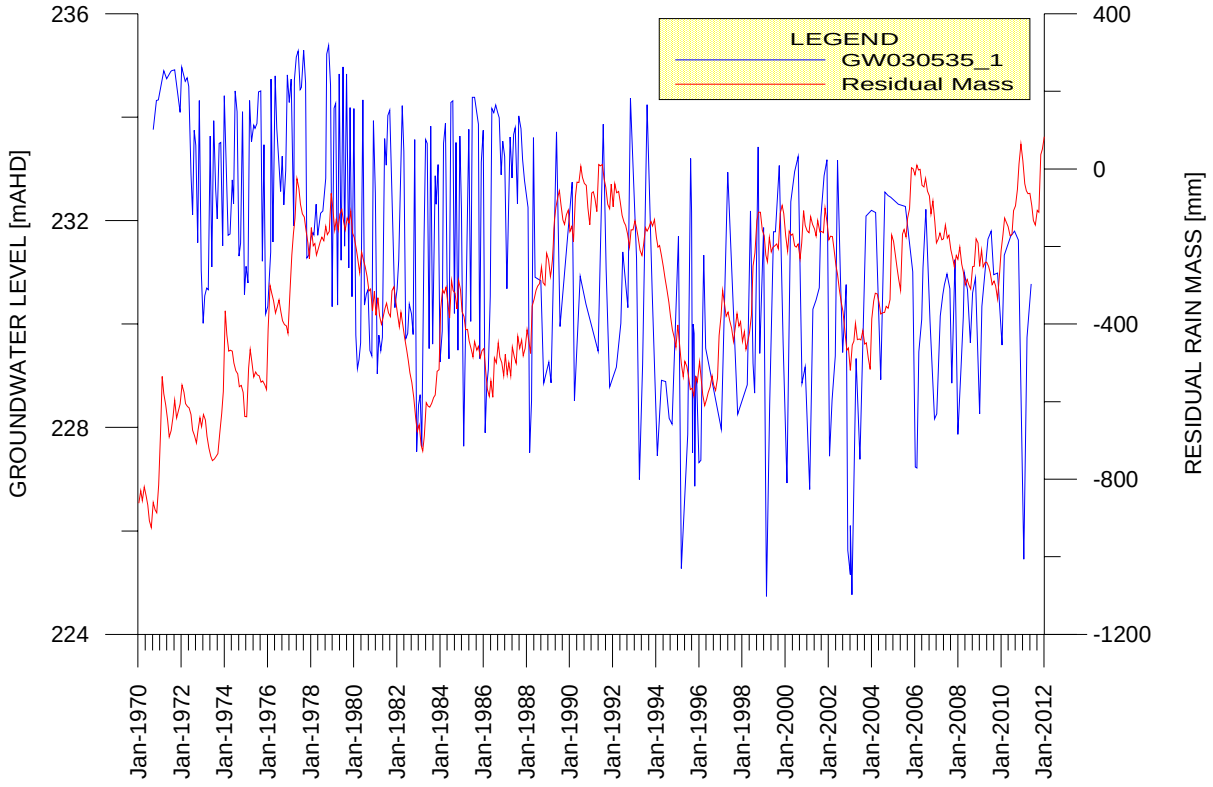

LEGEND
GW030471_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
234
233
232
231
230
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

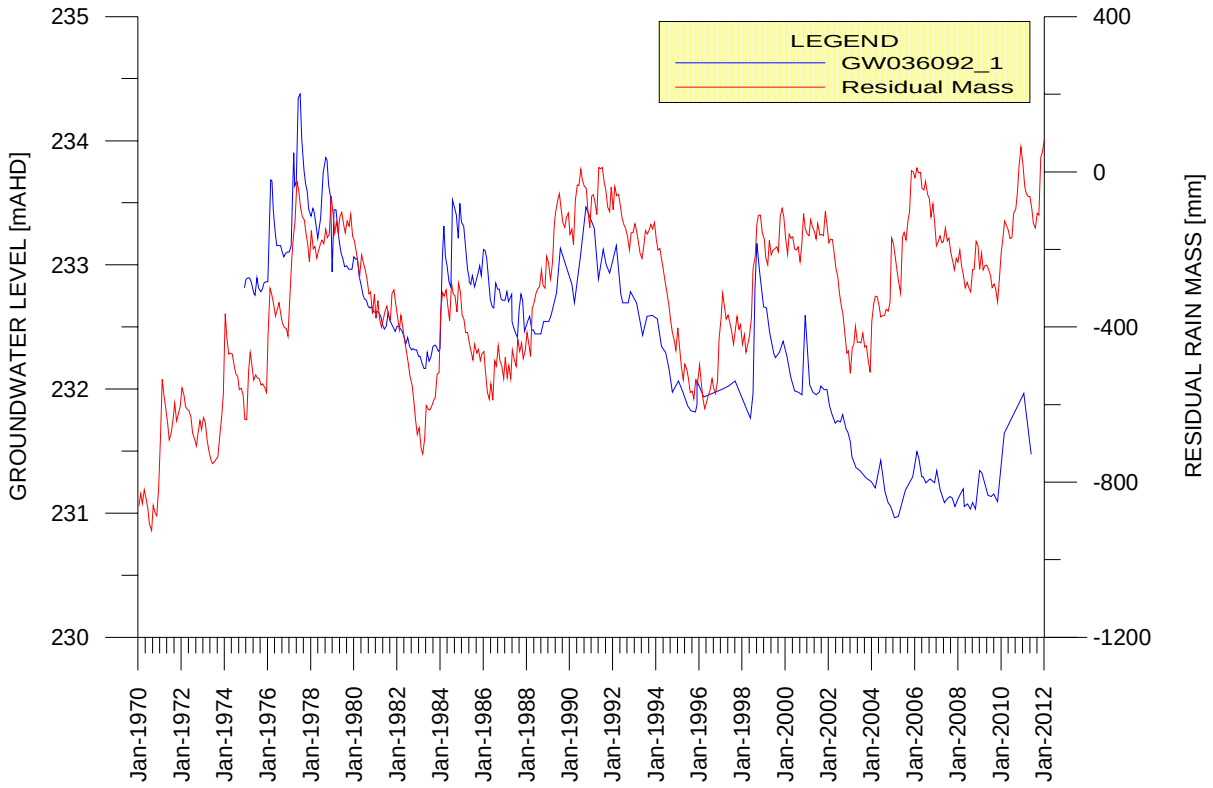

LEGEND
GW030471_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
234
233
232
231
230
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

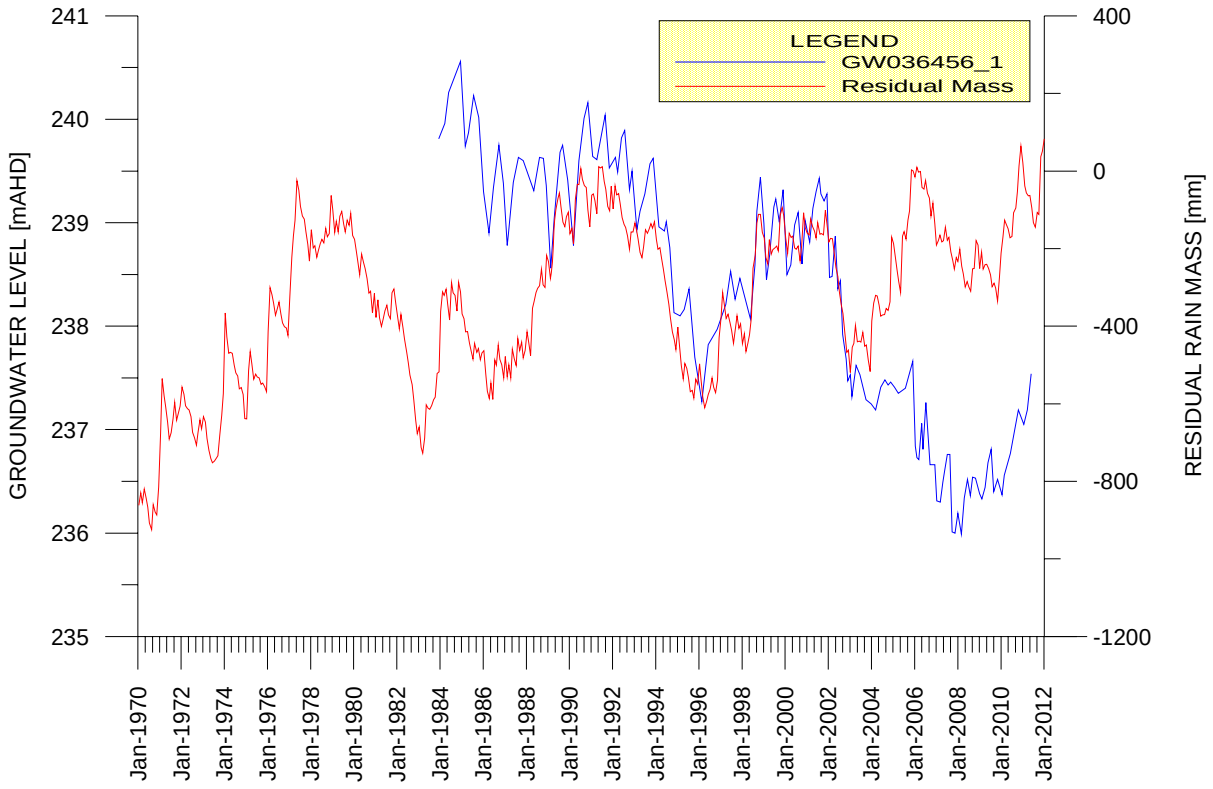

LEGEND
GW030471_3
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
234
233
232
231
230
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

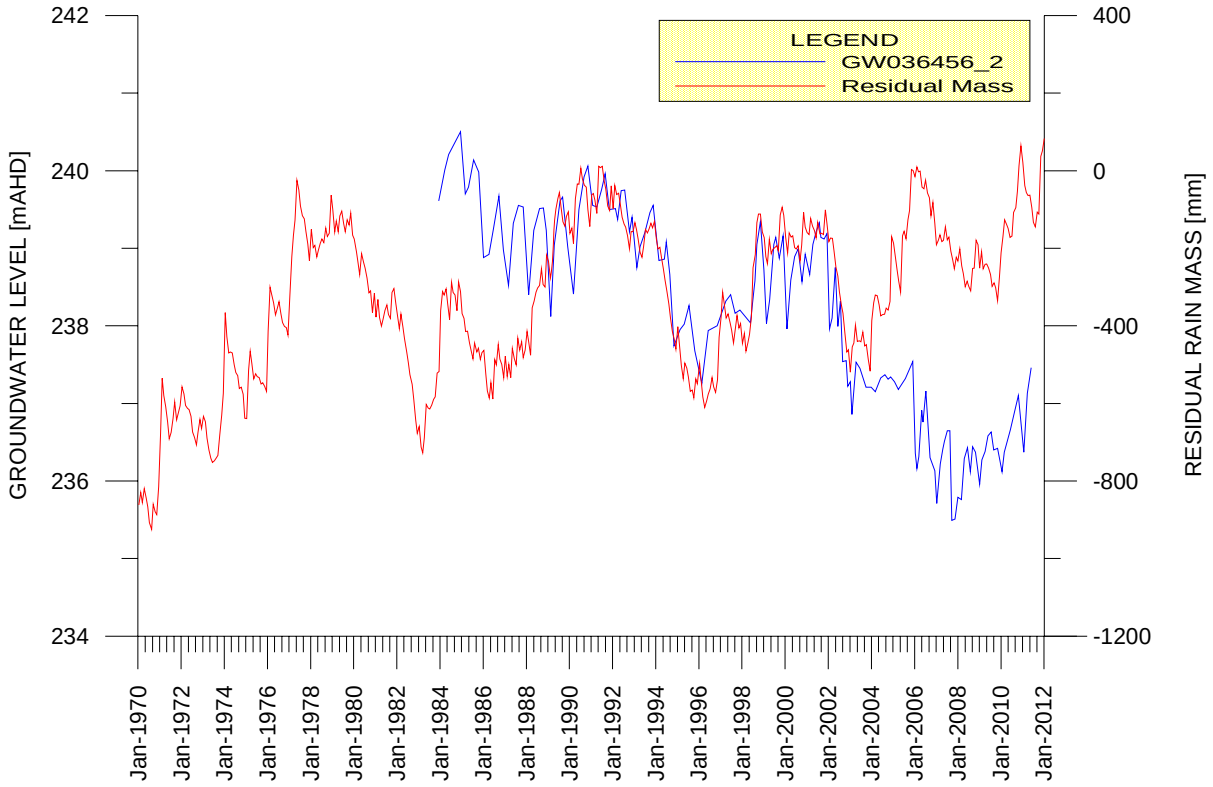

LEGEND
GW030472_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
231
230
229
228
227
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

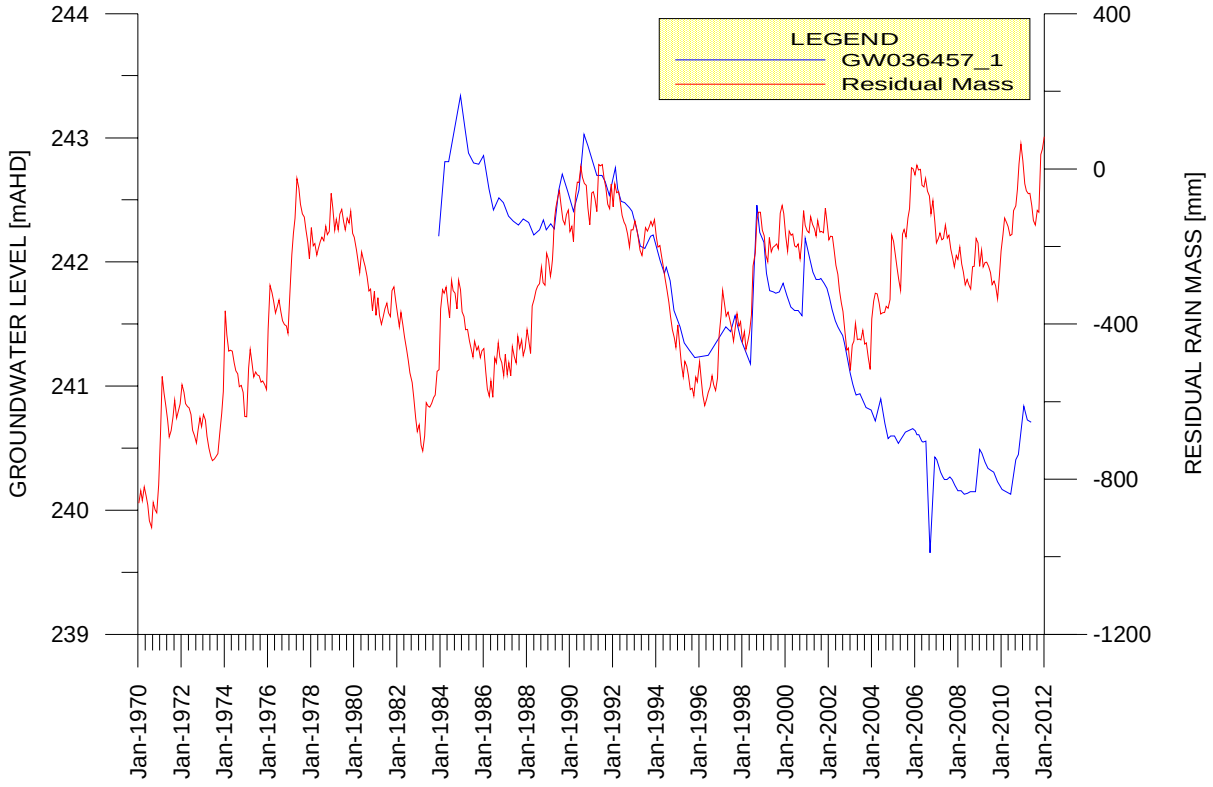

LEGEND
GW030472_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
235
234
233
232
231
230
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

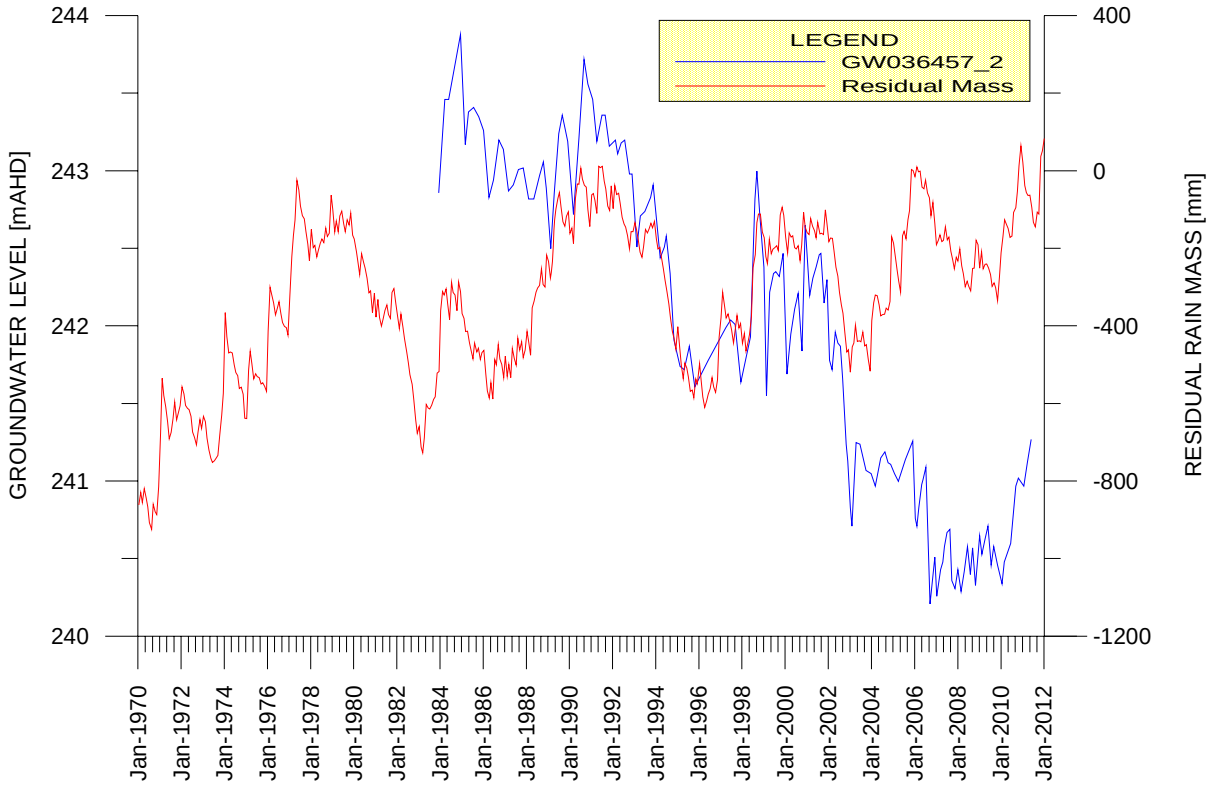

LEGEND
GW030535_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
236
232
228
224
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

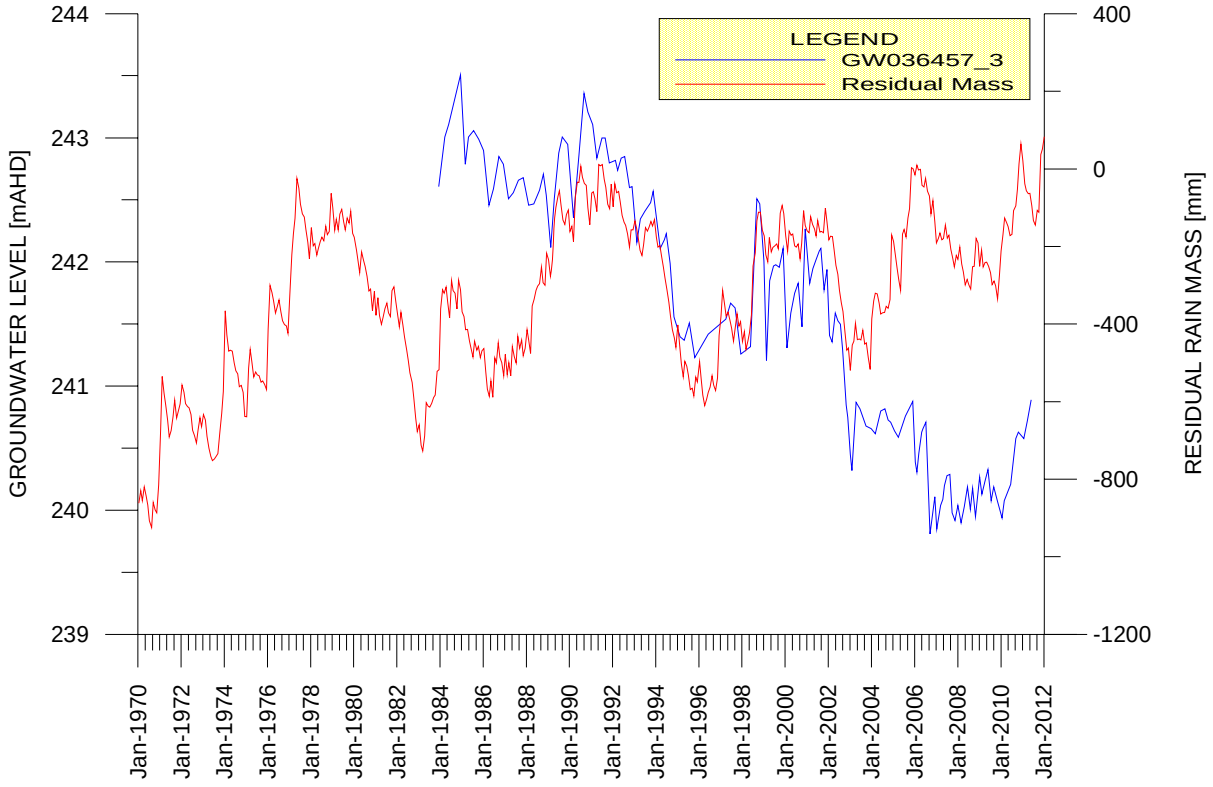

LEGEND
GW036092_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
235
234
233
232
231
230
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

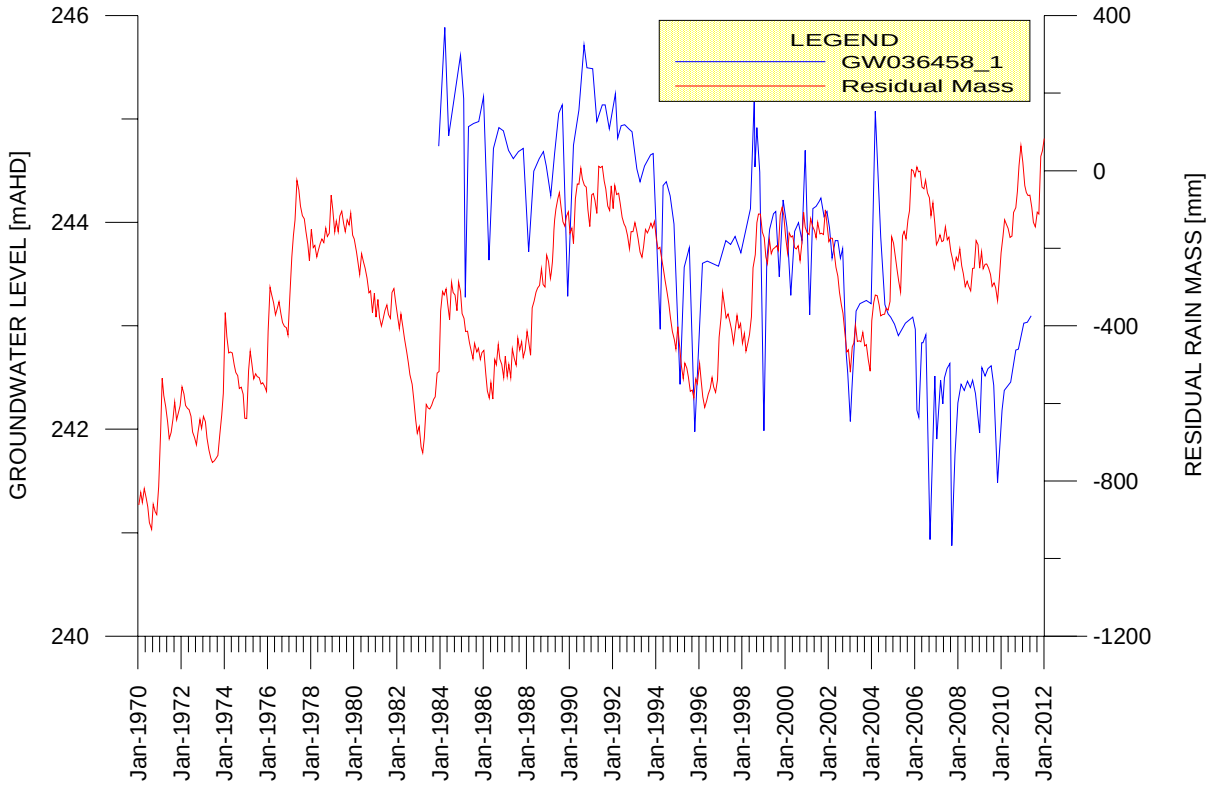

LEGEND
GW036456_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
241
240
239
238
237
236
235
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

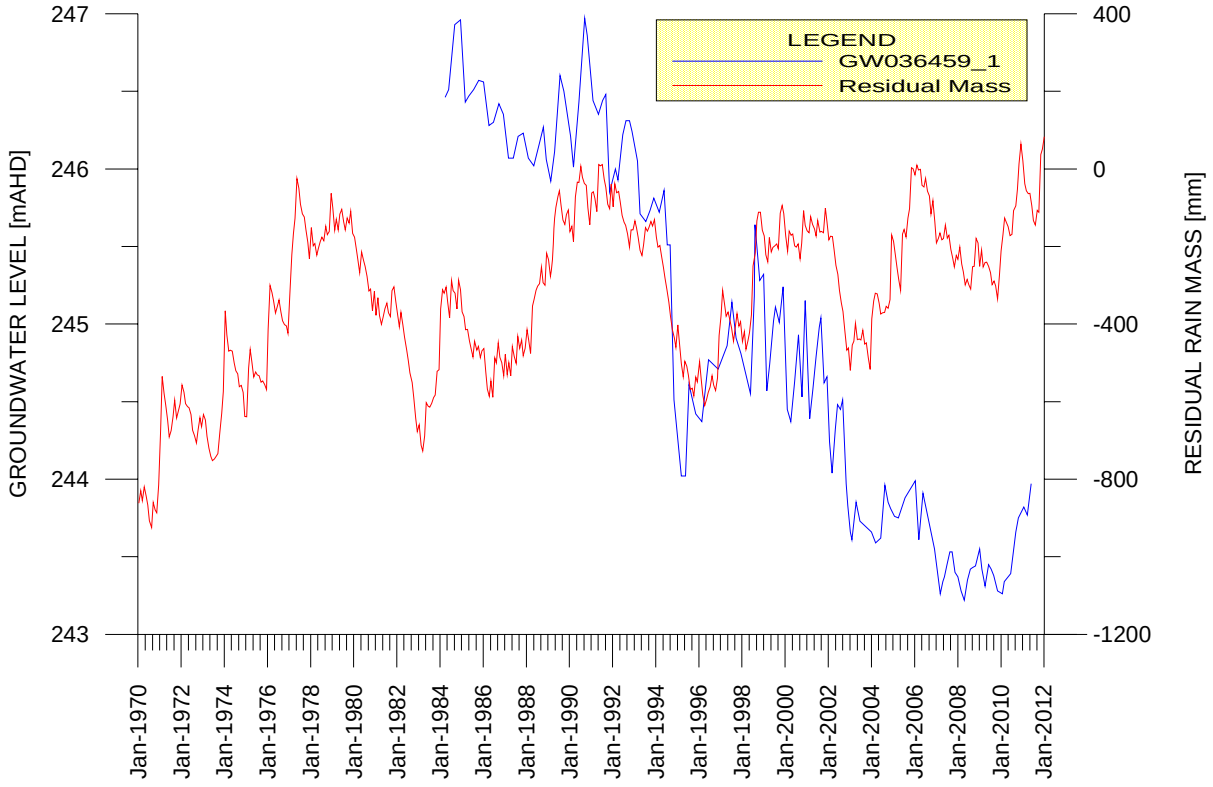

LEGEND
GW036456_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
242
240
238
236
234
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

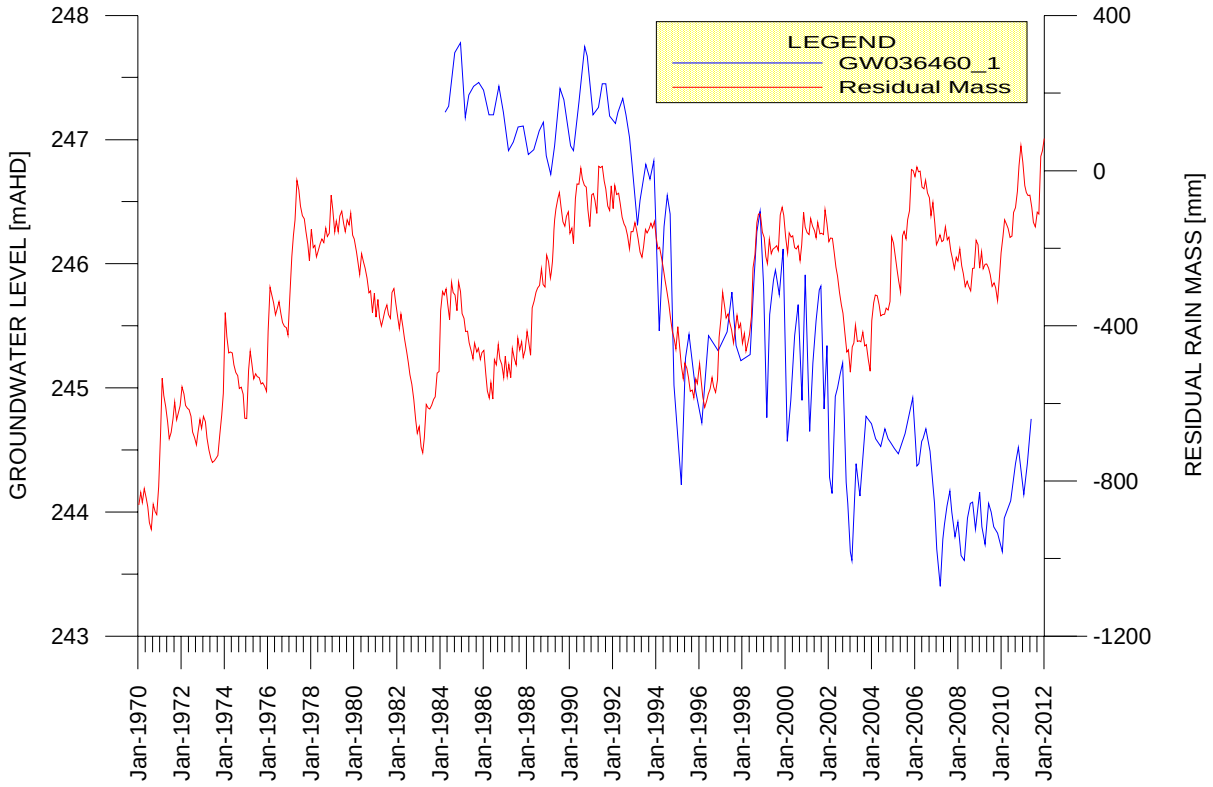

LEGEND
GW036457_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
244
243
242
241
240
239
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

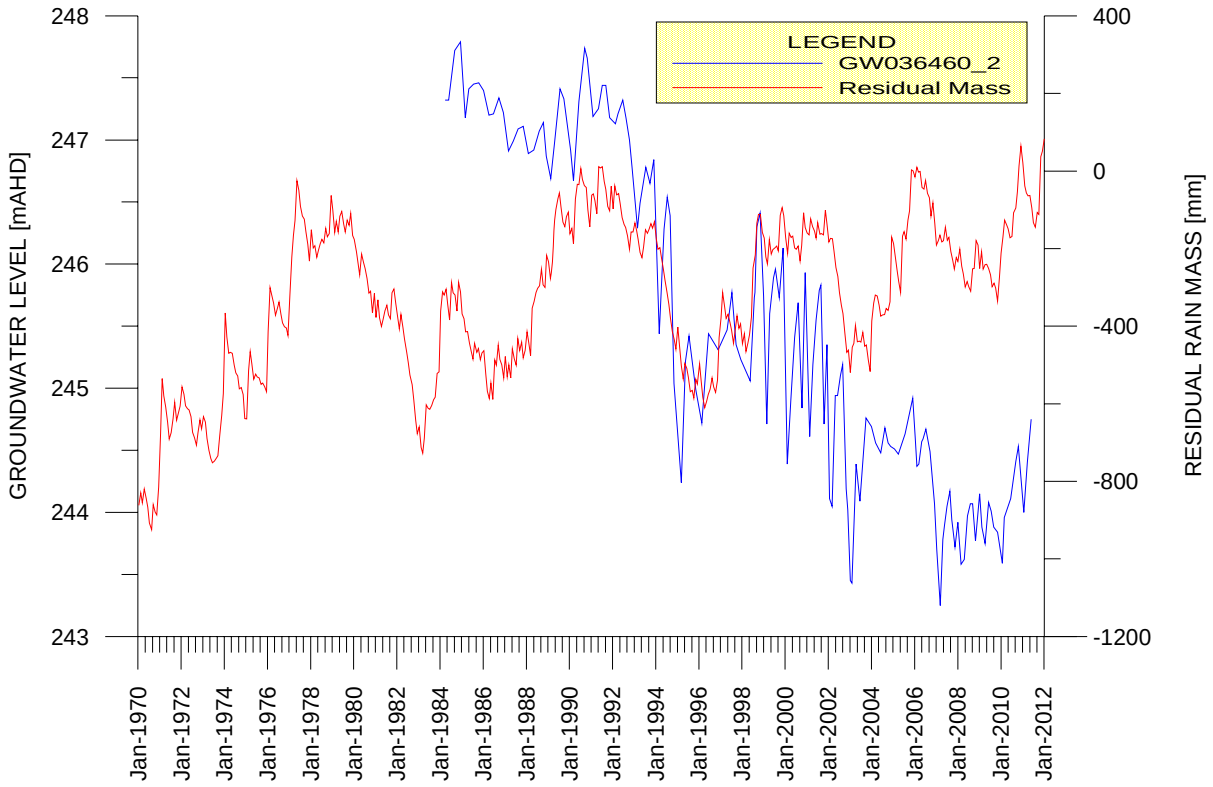

LEGEND
GW036457_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
244
243
242
241
240
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

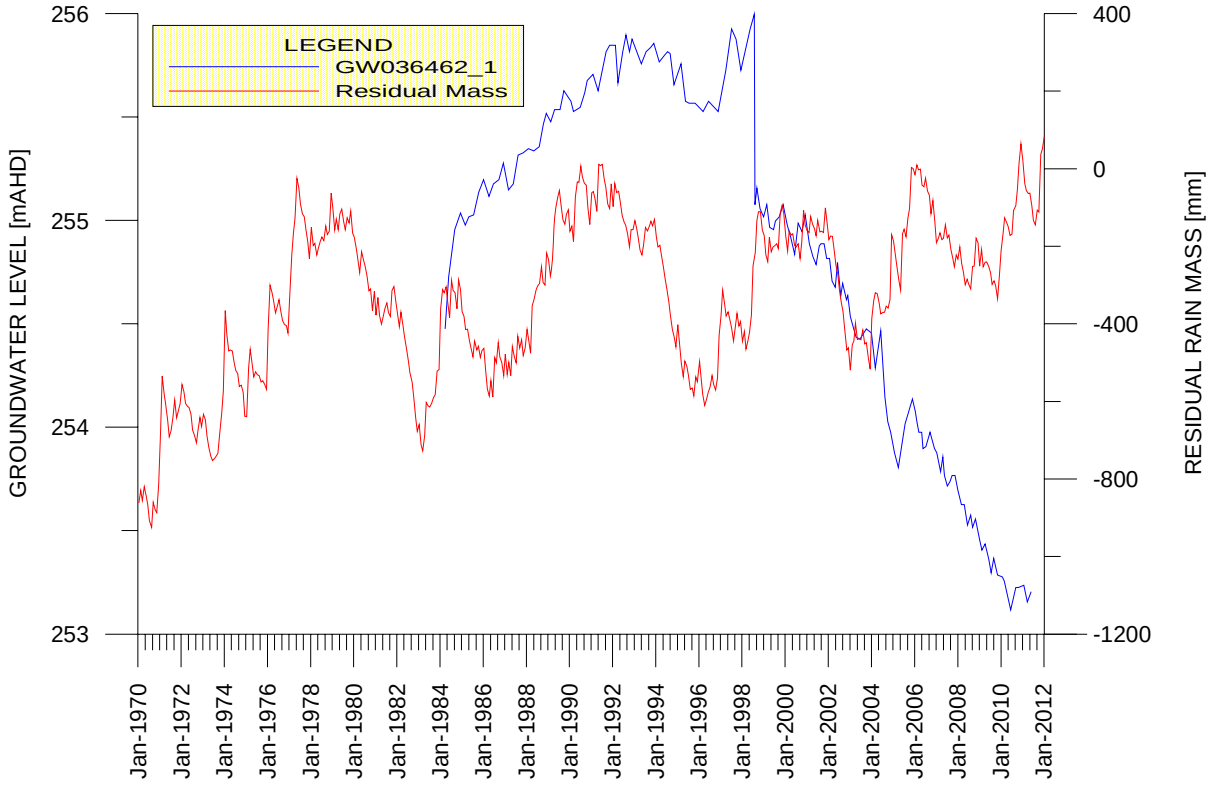

LEGEND
GW036457_3
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
244
243
242
241
240
239
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

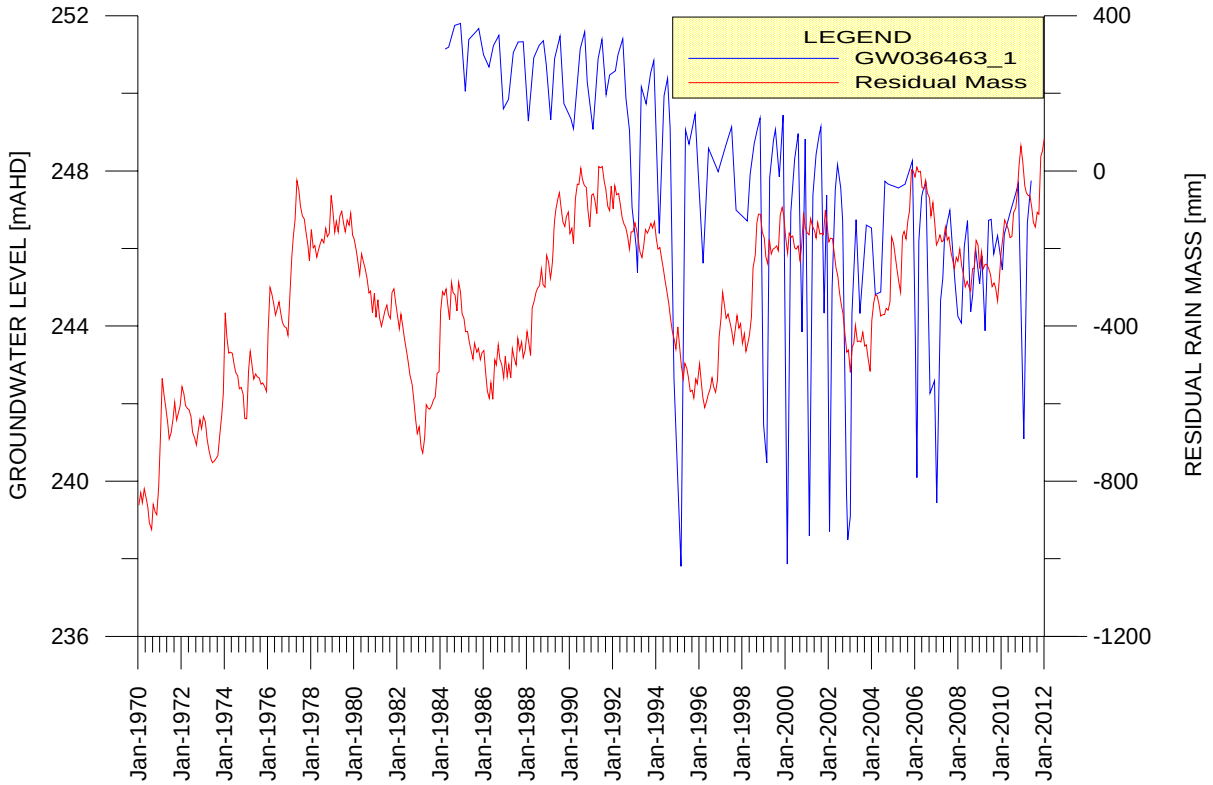

LEGEND
GW036458_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
246
244
242
240
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

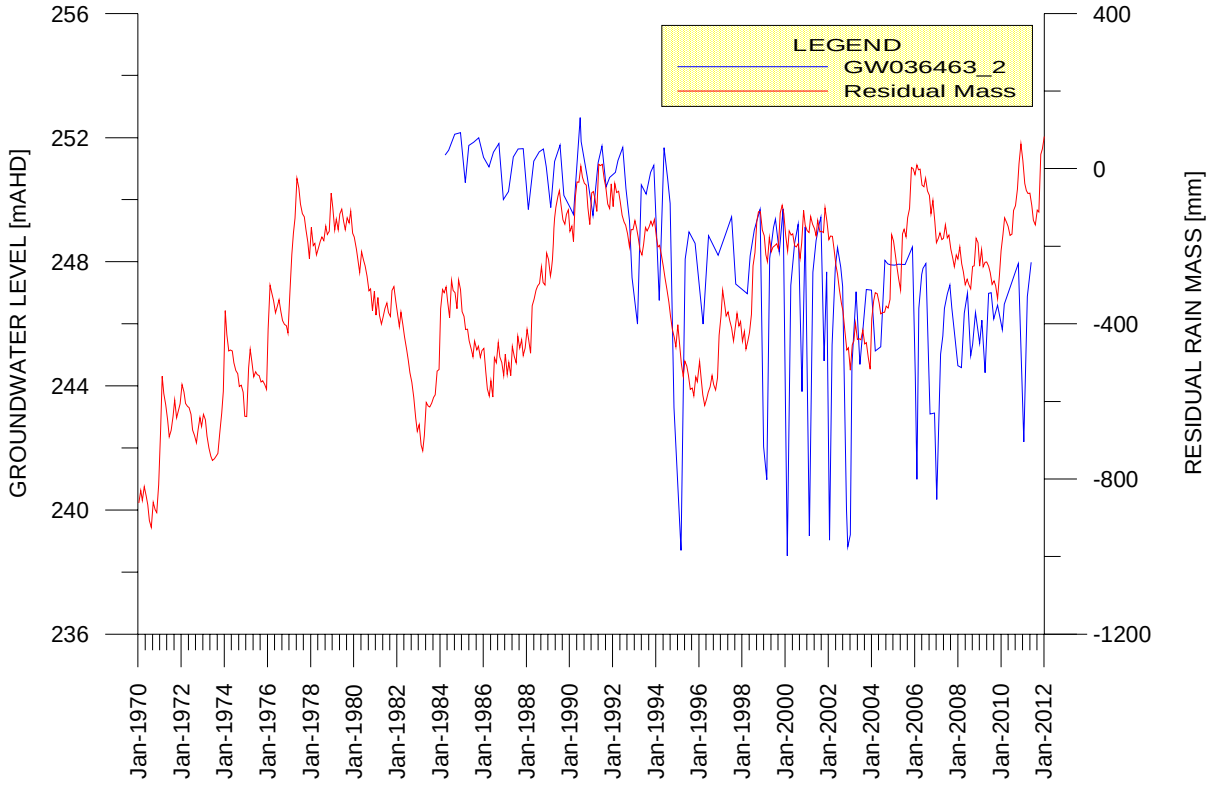

LEGEND
GW036459_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
247
246
245
244
243
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

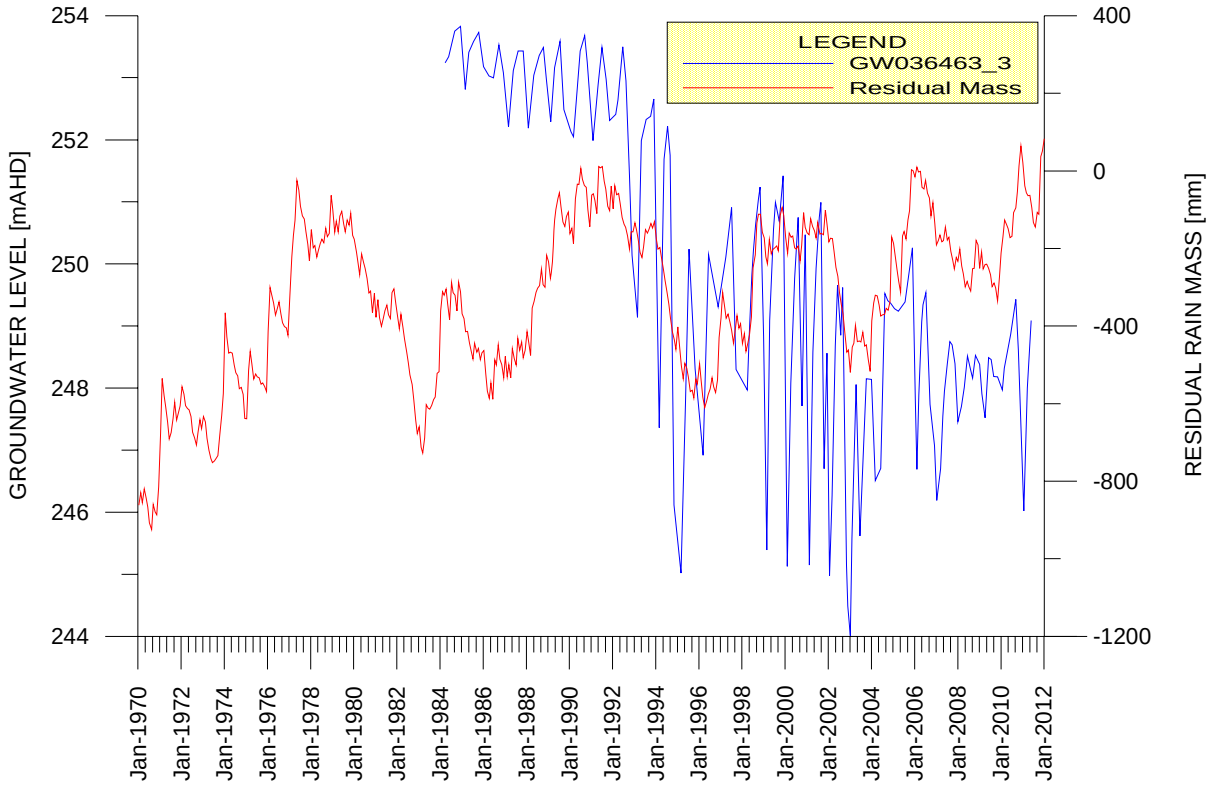

LEGEND
GW036460_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
248
247
246
245
244
243
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

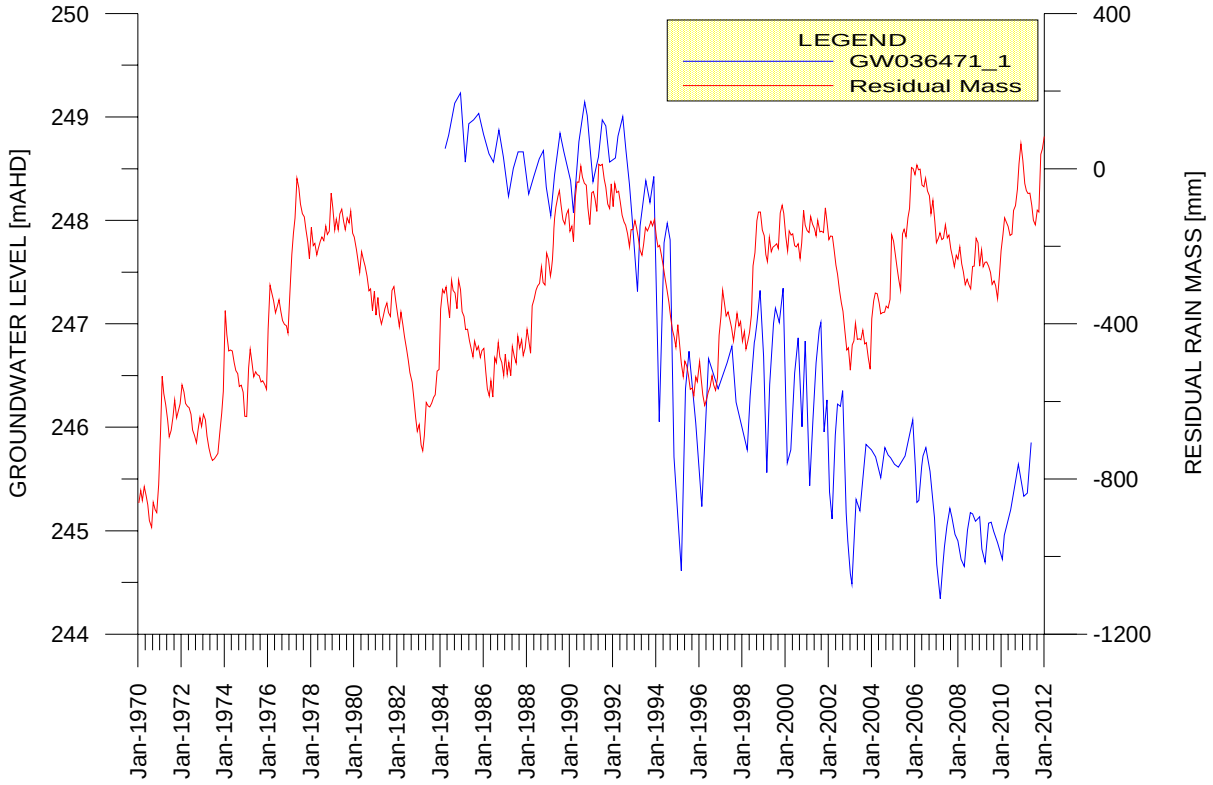

LEGEND
GW036460_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
248
247
246
245
244
243
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

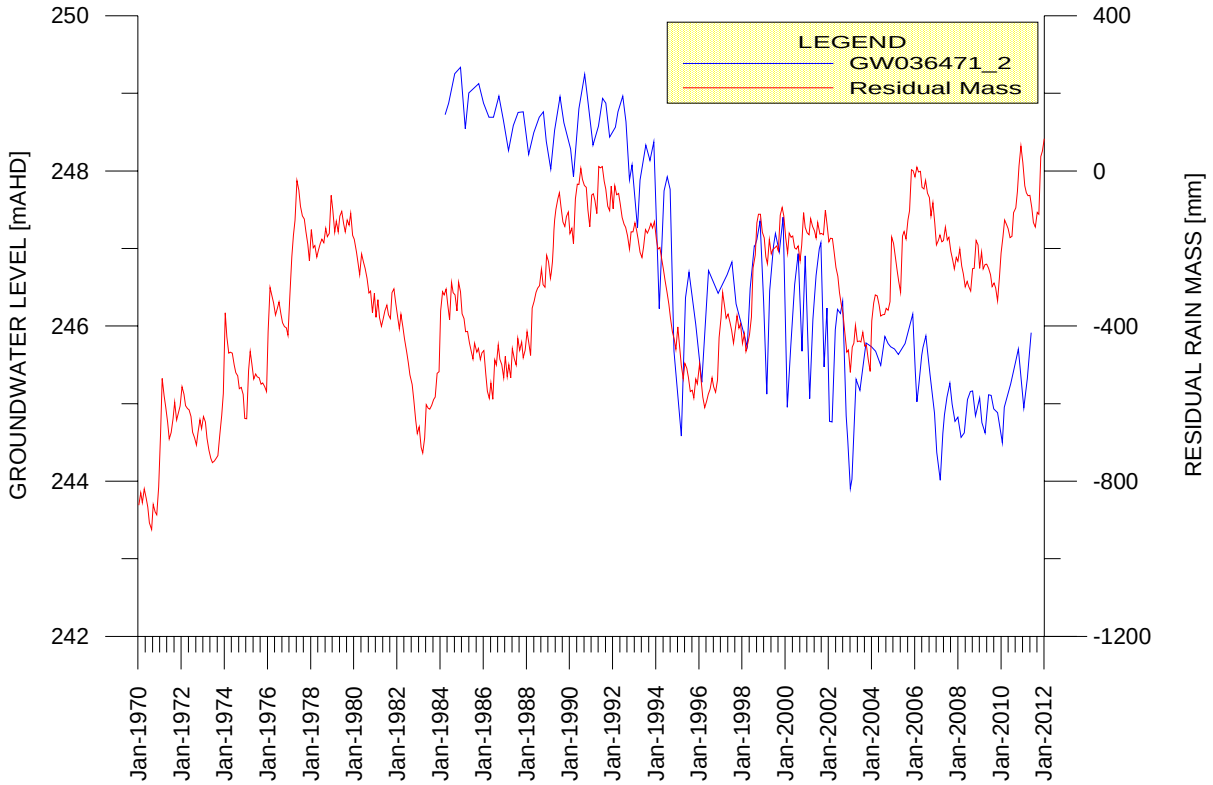

LEGEND
GW036462_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
256
255
254
253
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

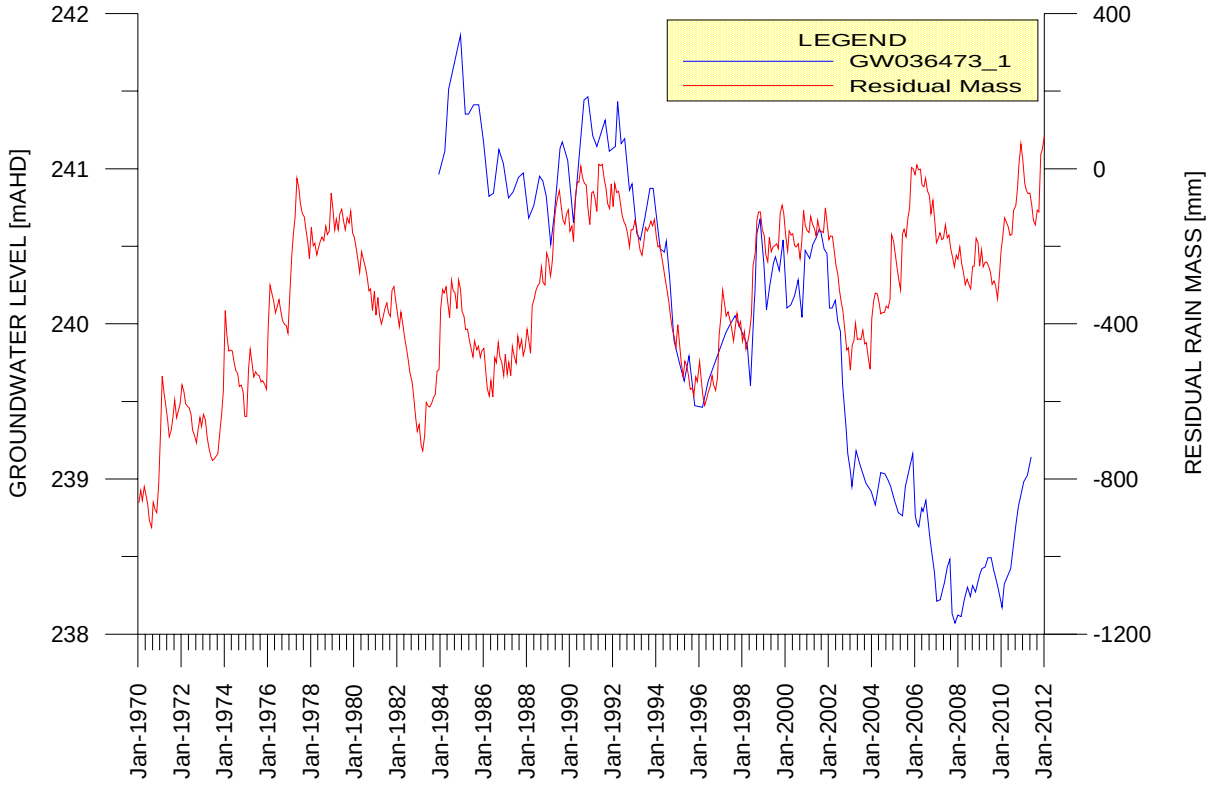

LEGEND
GW036463_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
252
248
244
240
236
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

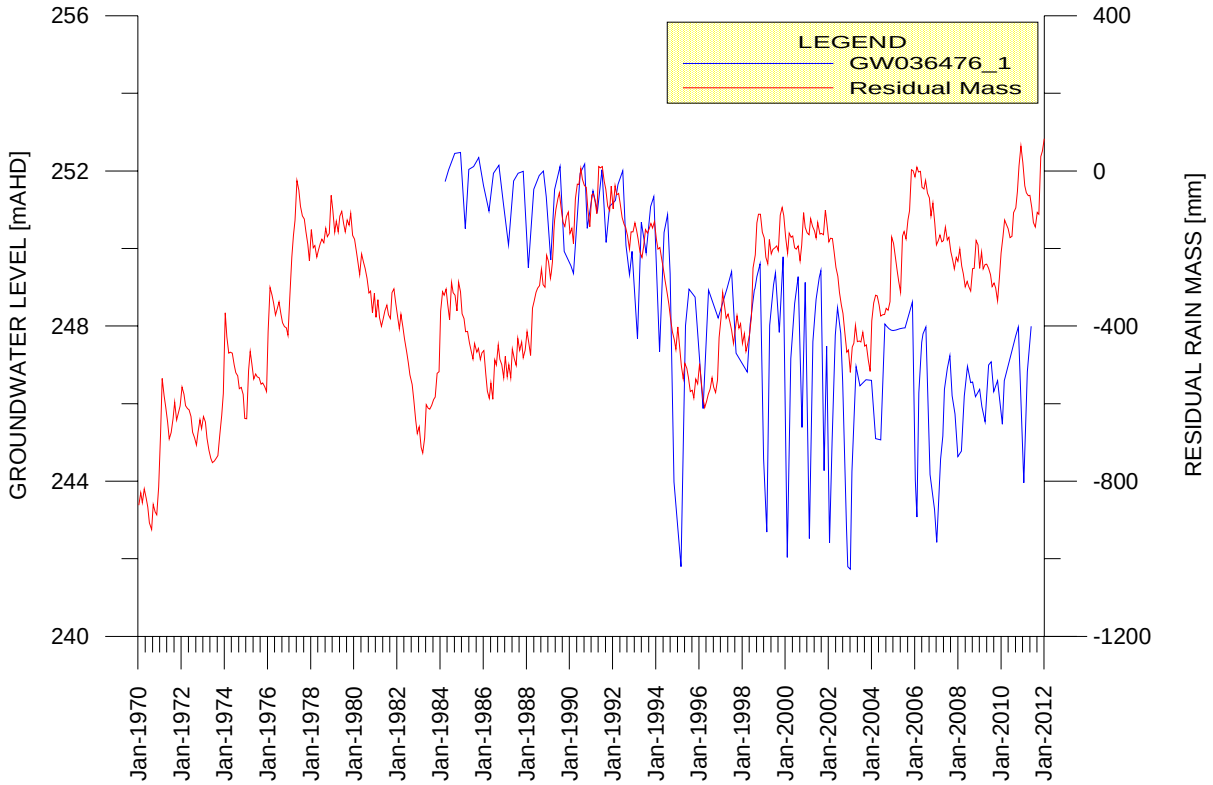

LEGEND
GW036463_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
256
252
248
244
240
236
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

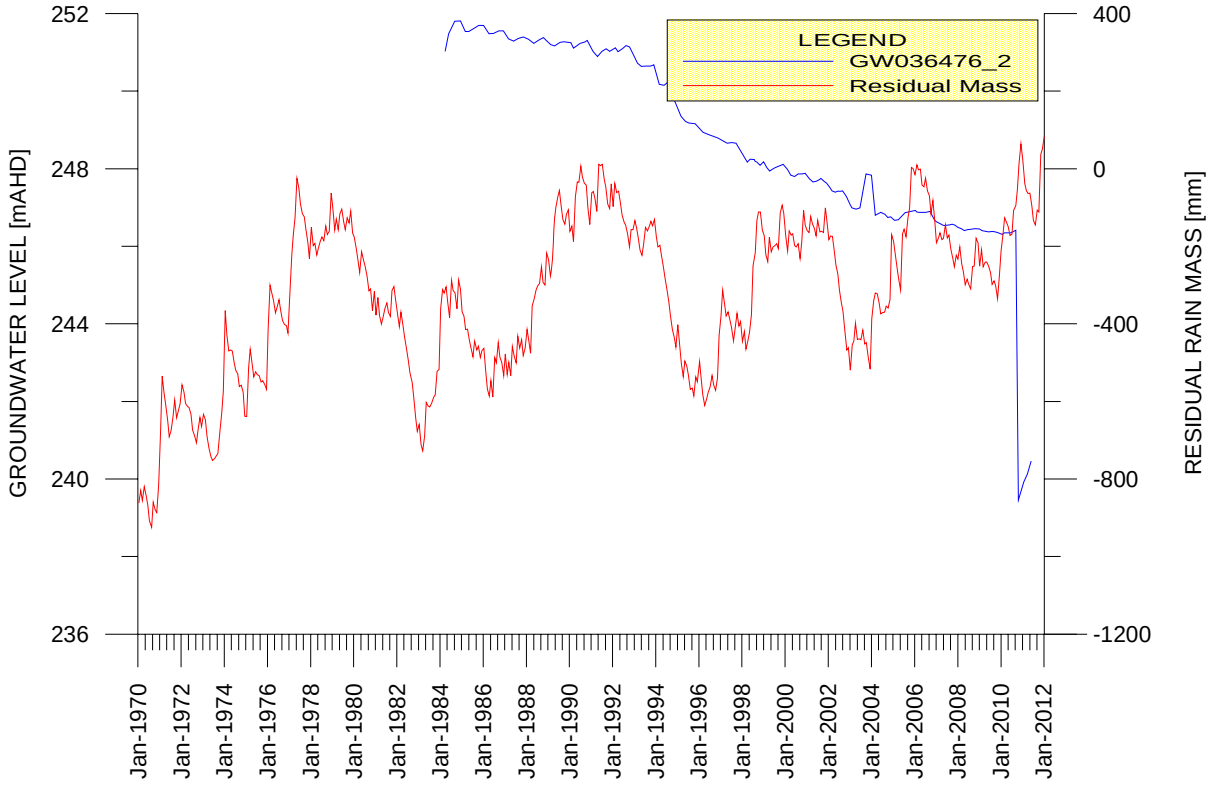

LEGEND
GW036463_3
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
254
252
250
248
246
244
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

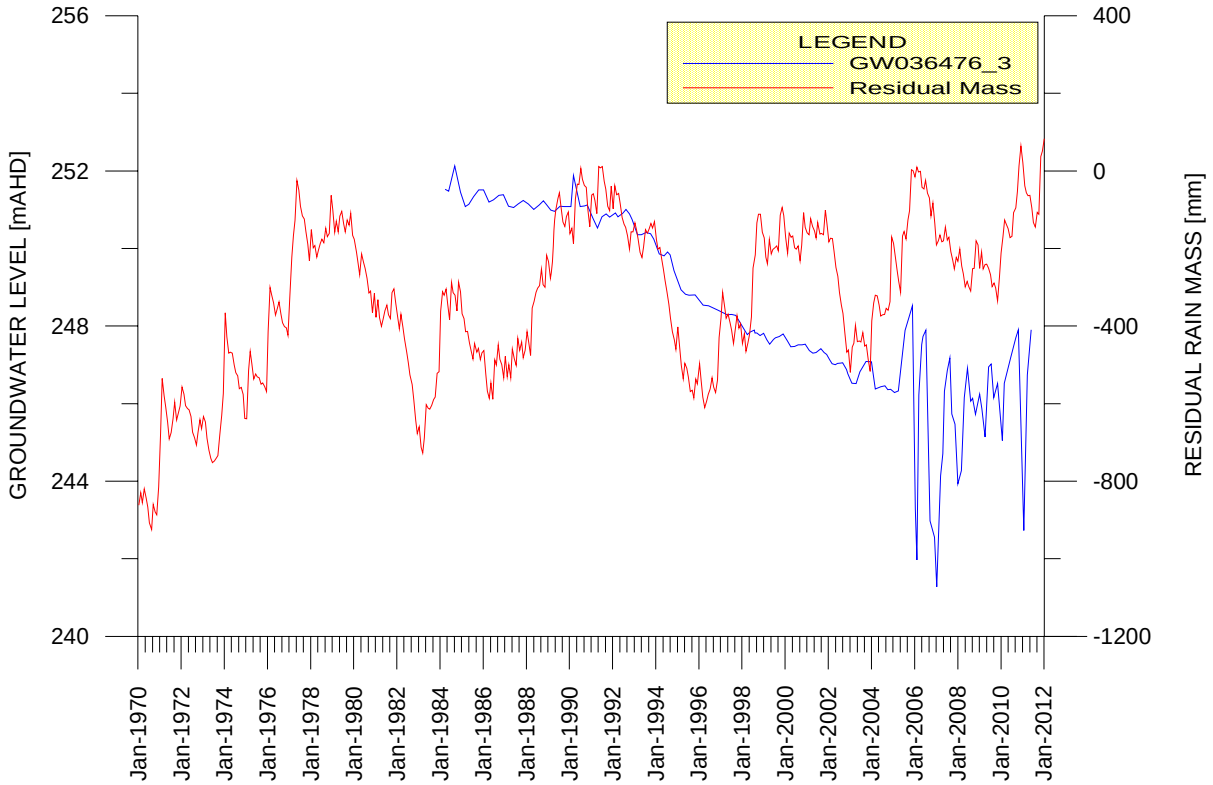

LEGEND
GW036471_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
250
249
248
247
246
245
244
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

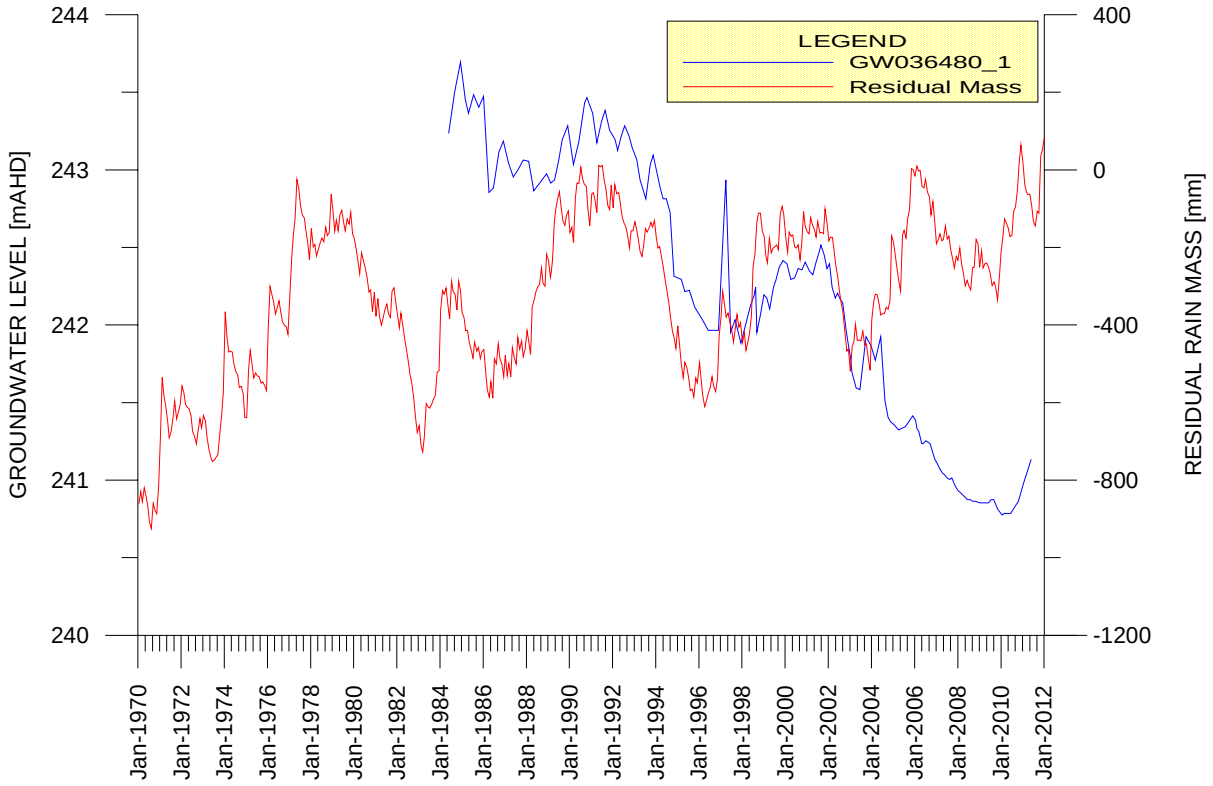

LEGEND
GW036471_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
250
248
246
244
242
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

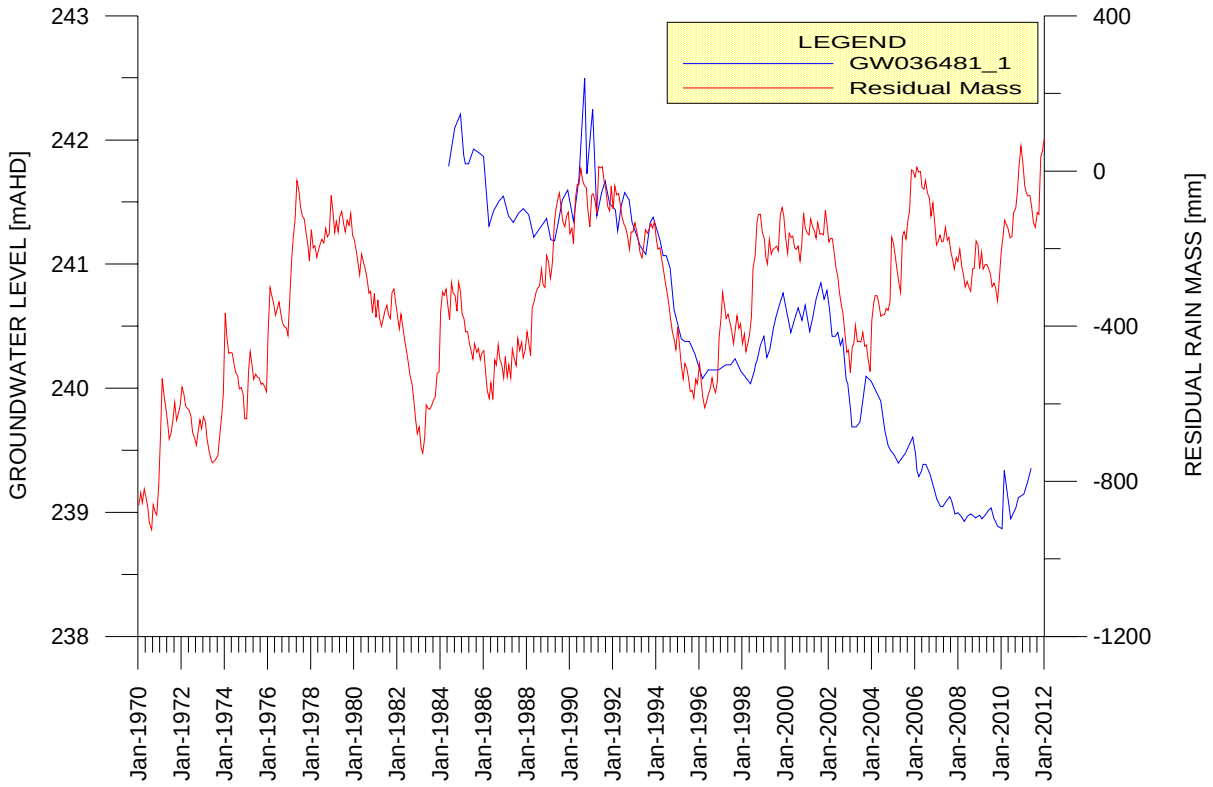

LEGEND
GW036473_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
242
241
240
239
238
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

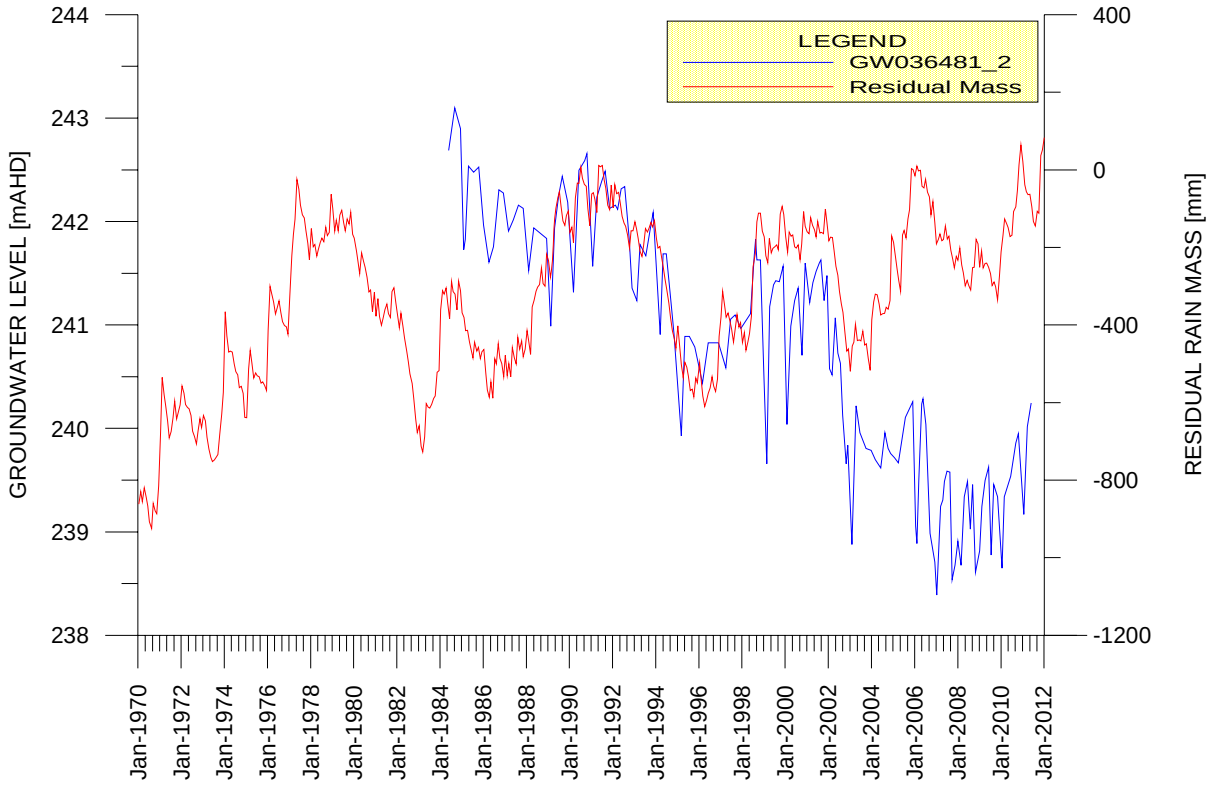

LEGEND
GW036476_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
256
252
248
244
240
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

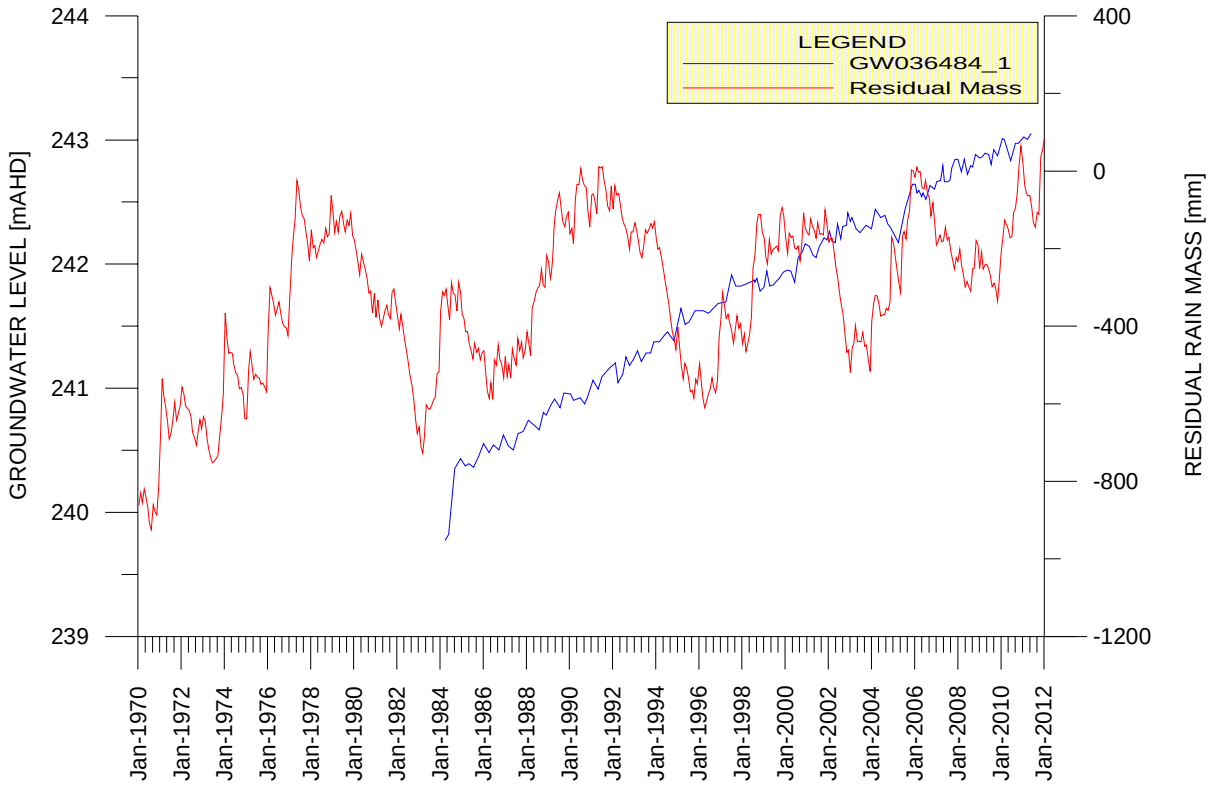

LEGEND
GW036476_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
252
248
244
240
236
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

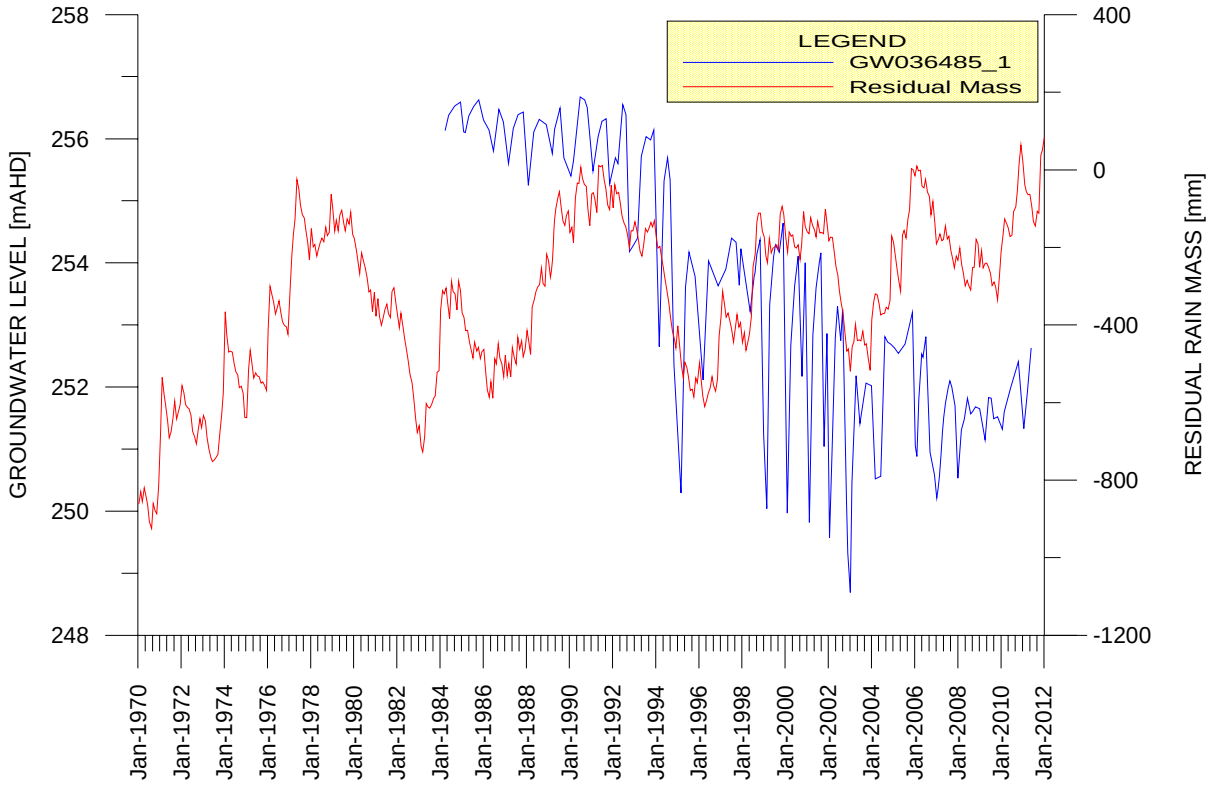

LEGEND
GW036476_3
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
256
252
248
244
240
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

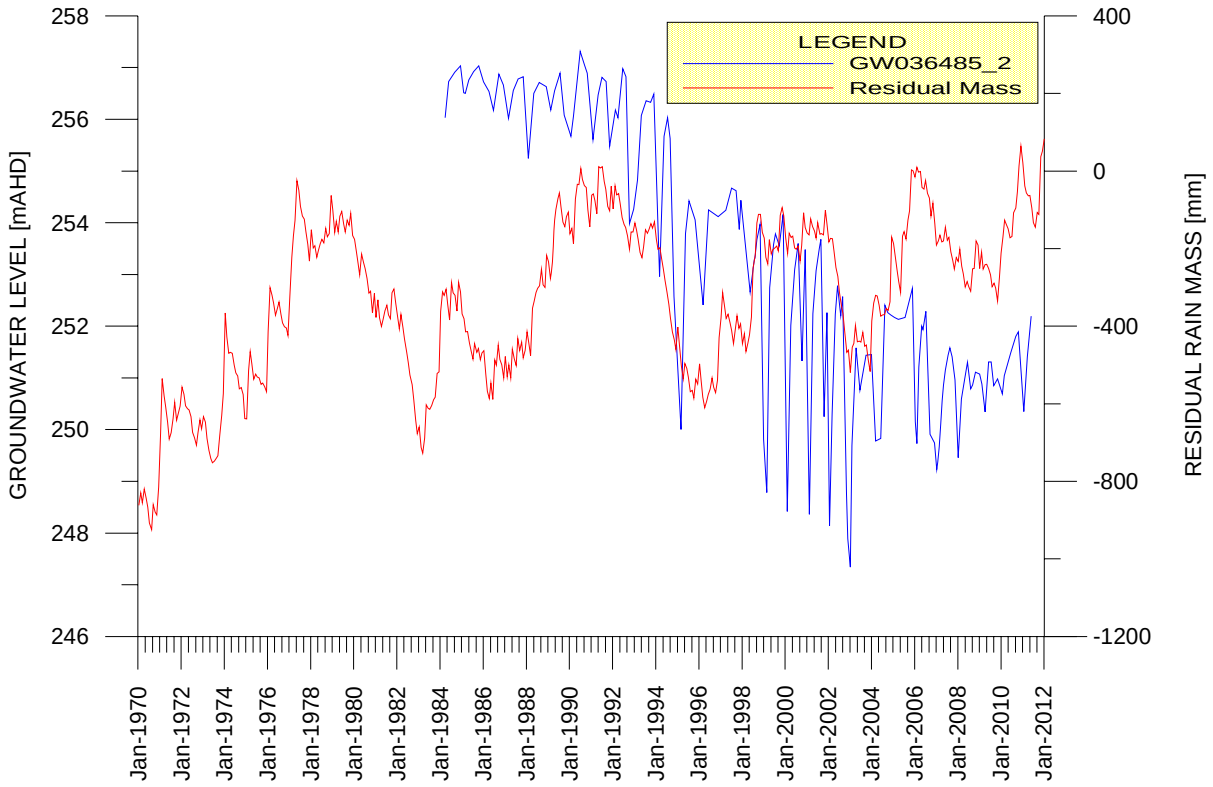

LEGEND
GW036480_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
244
243
242
241
240
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

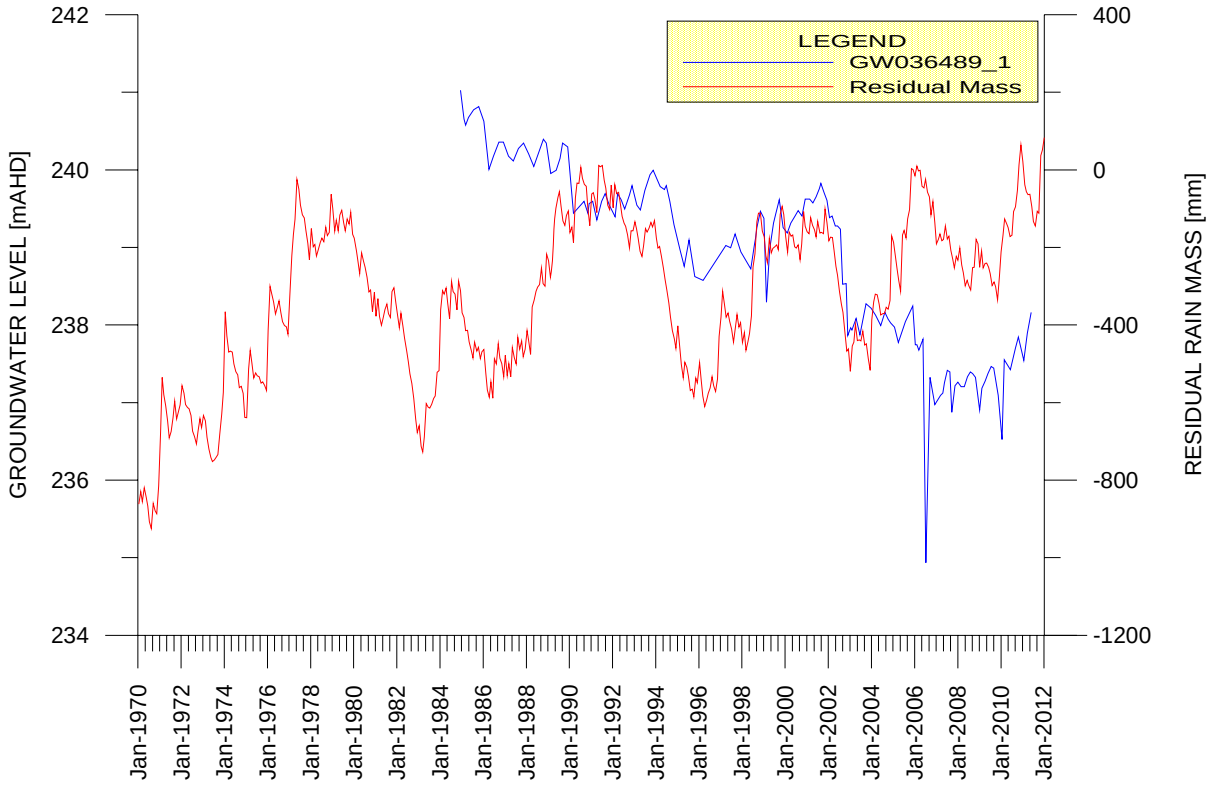

LEGEND
GW036481_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
243
242
241
240
239
238
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

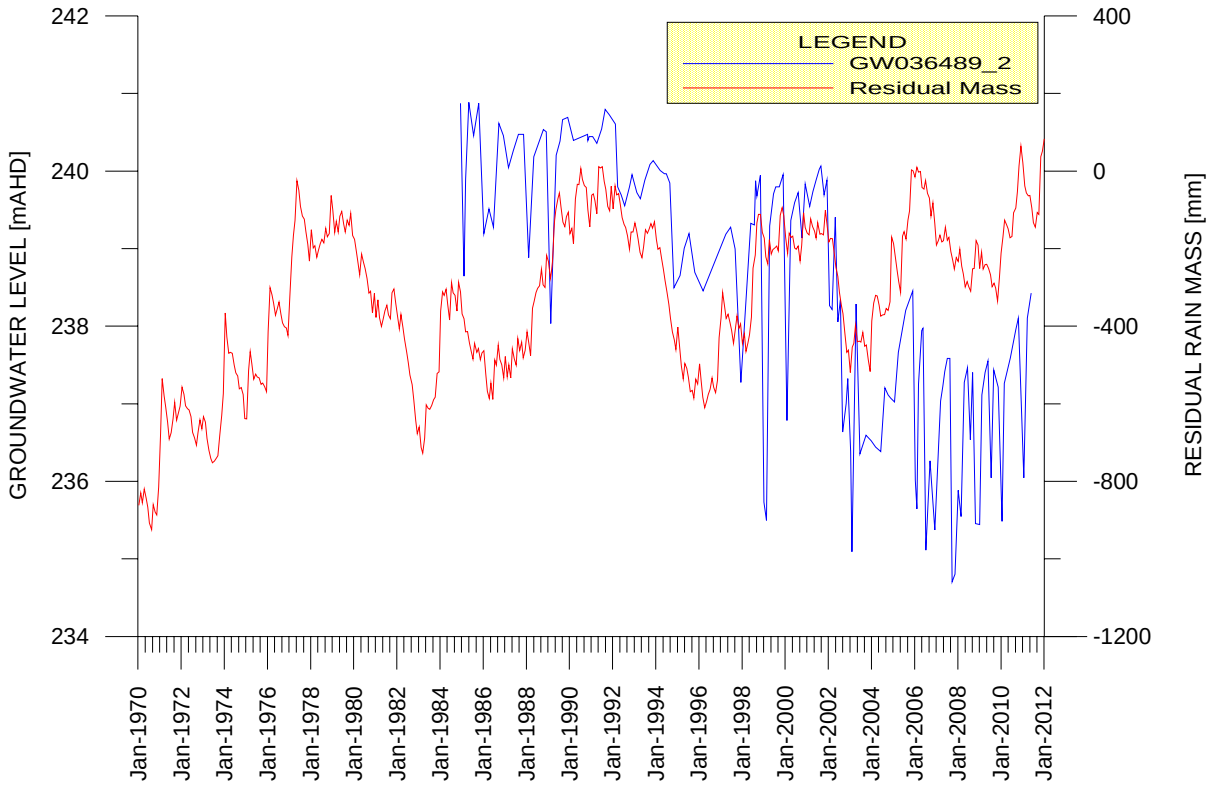

LEGEND
GW036481_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
244
243
242
241
240
239
238
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

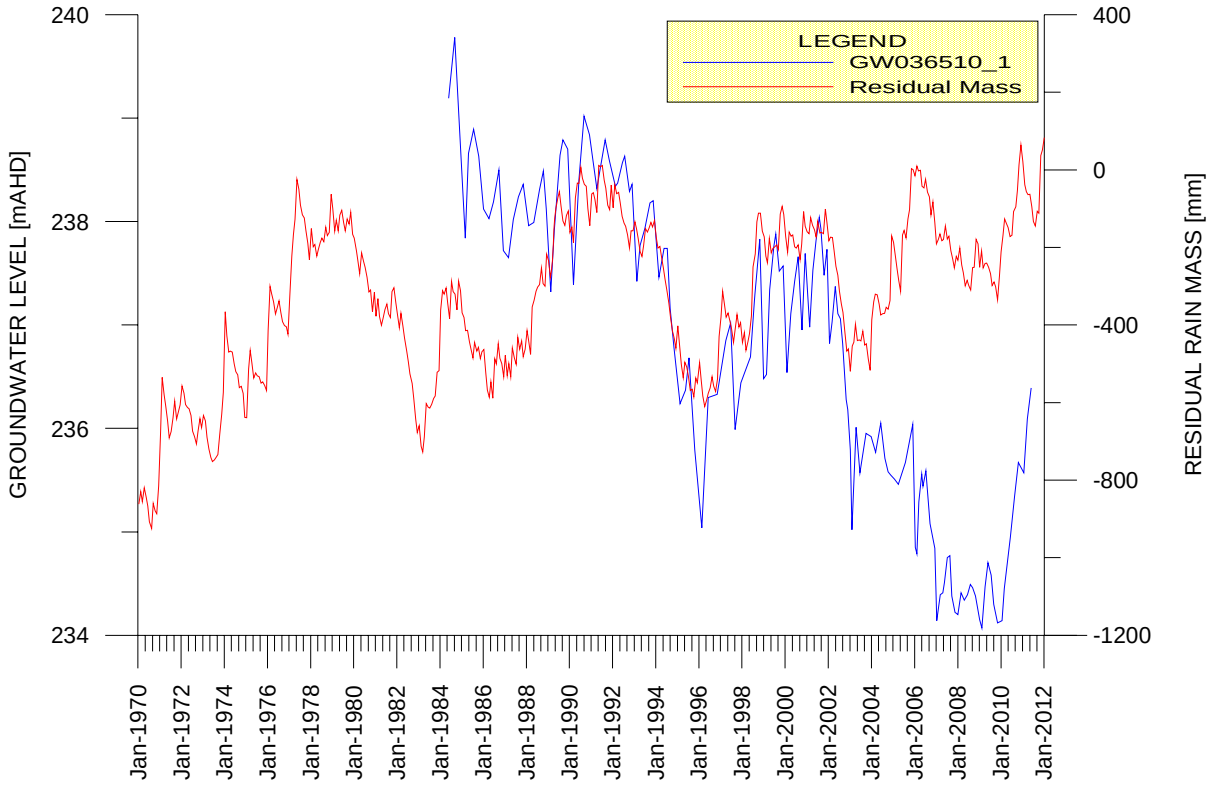

LEGEND
GW036484_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
244
243
242
241
240
239
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

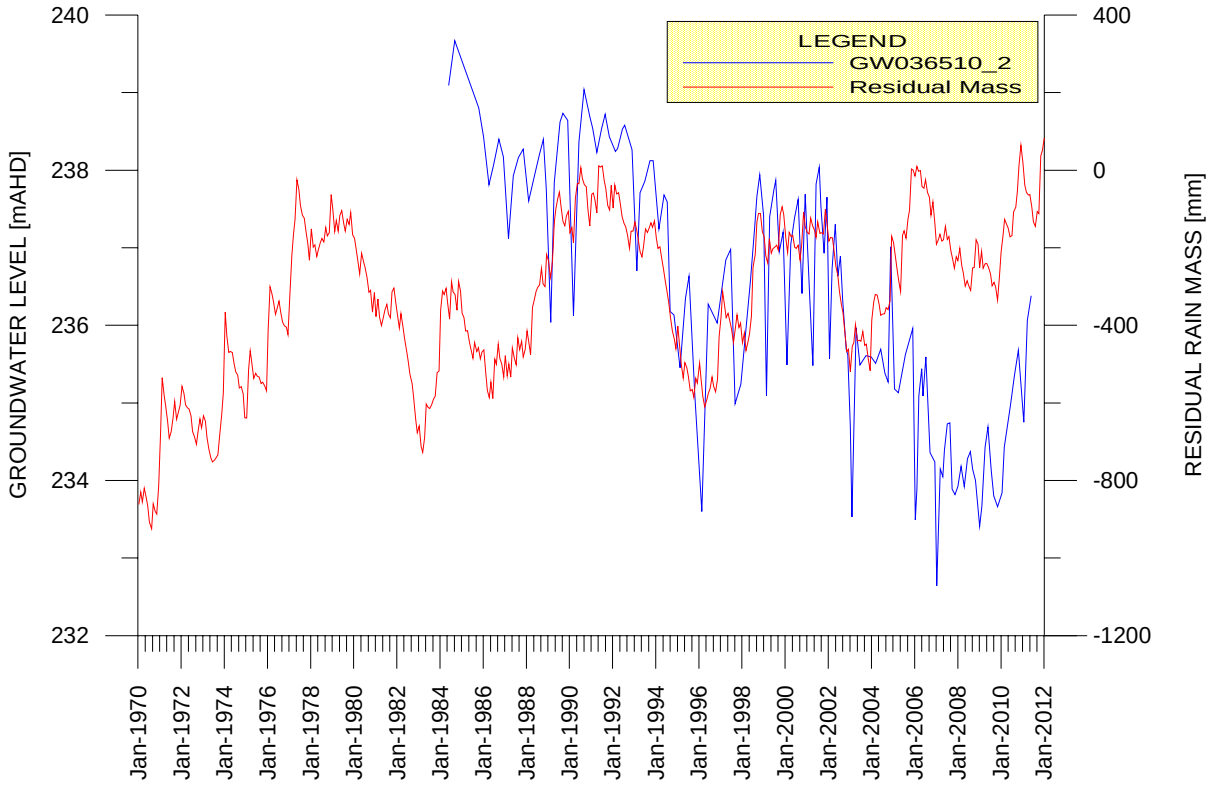

LEGEND
GW036485_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
258
256
254
252
250
248
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

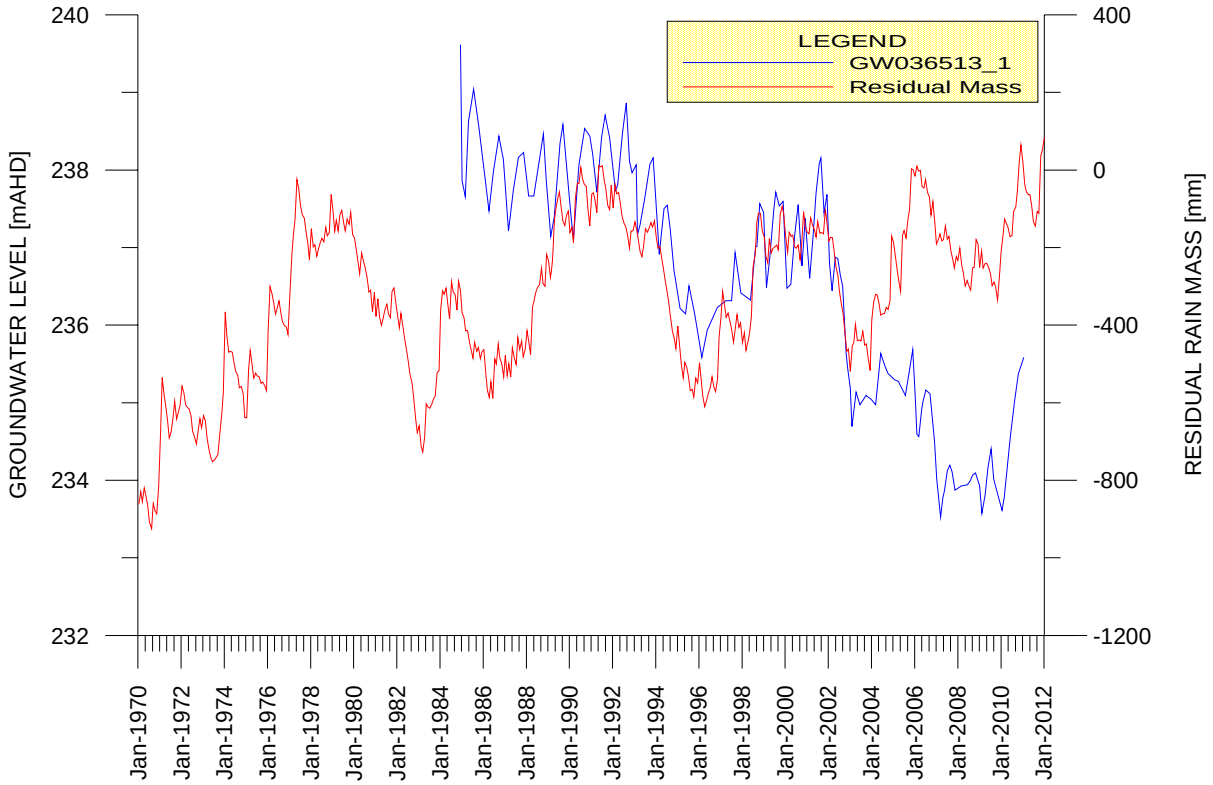

LEGEND
GW036485_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
258
256
254
252
250
248
246
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

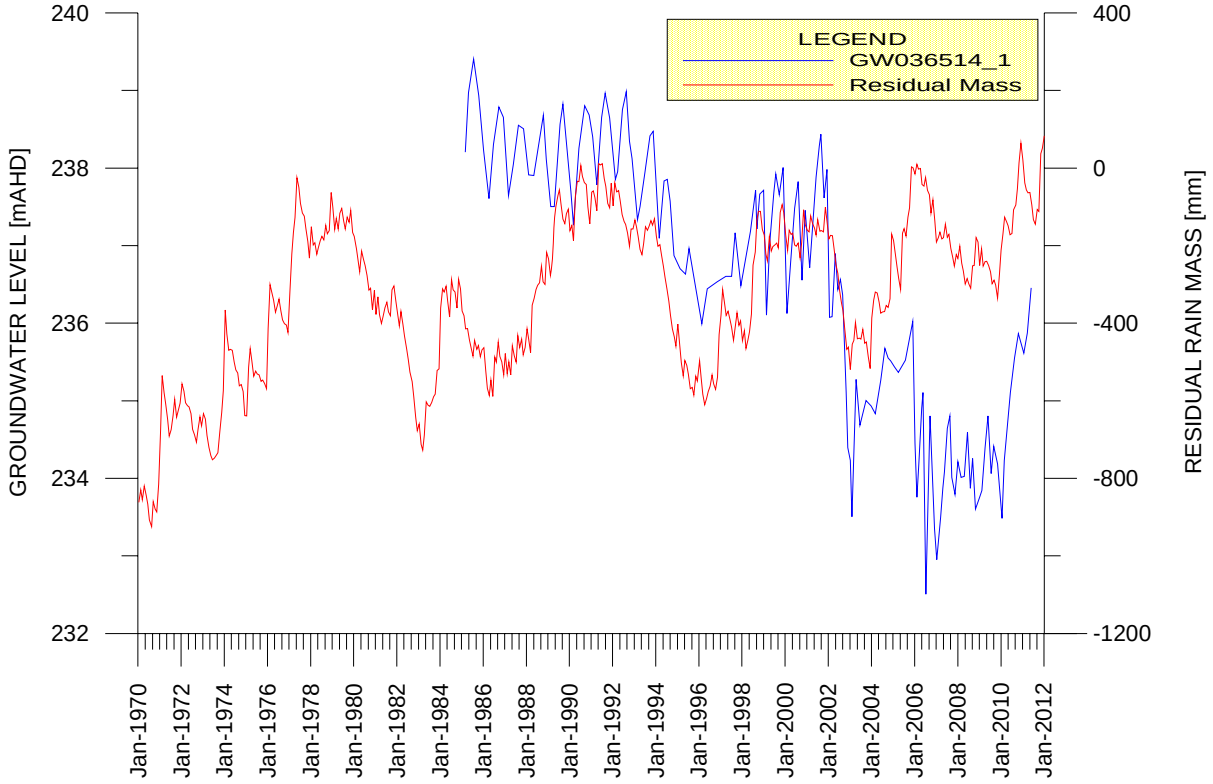

LEGEND
GW036489_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
242
240
238
236
234
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

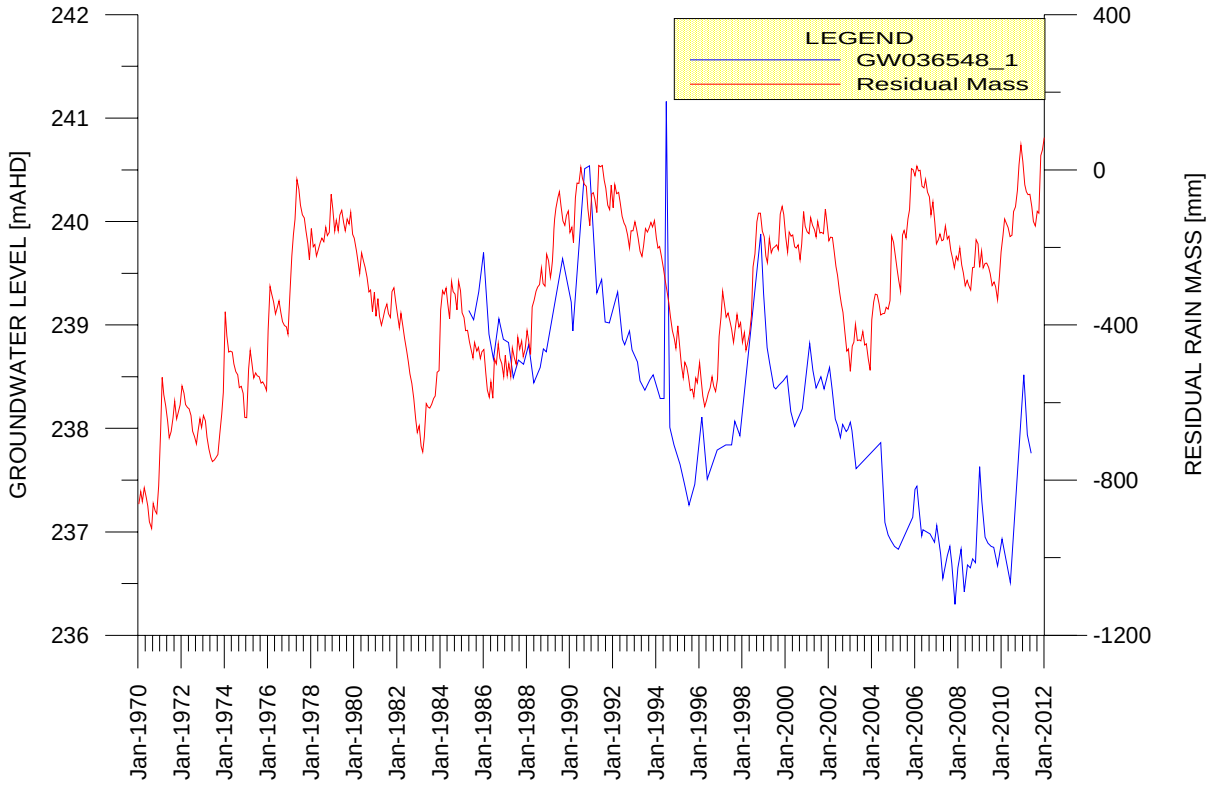

LEGEND
GW036489_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
242
240
238
236
234
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

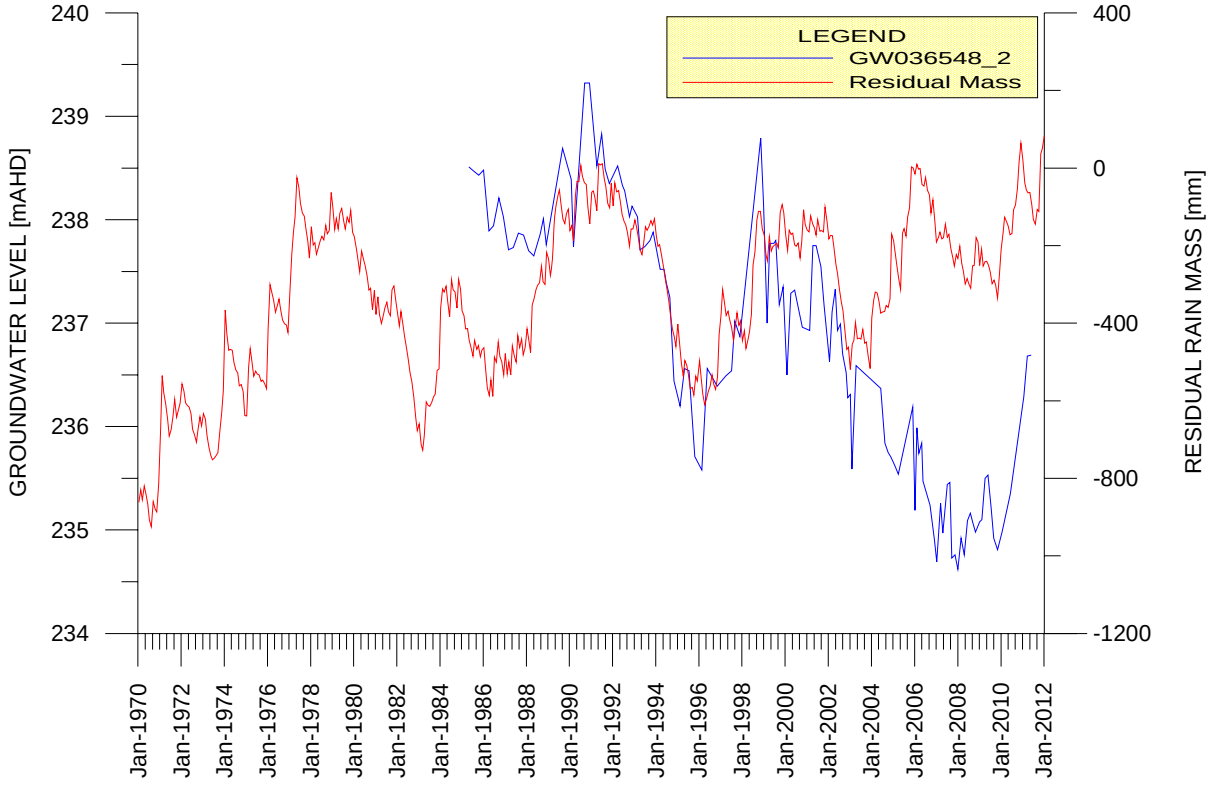

LEGEND
GW036510_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
240
238
236
234
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

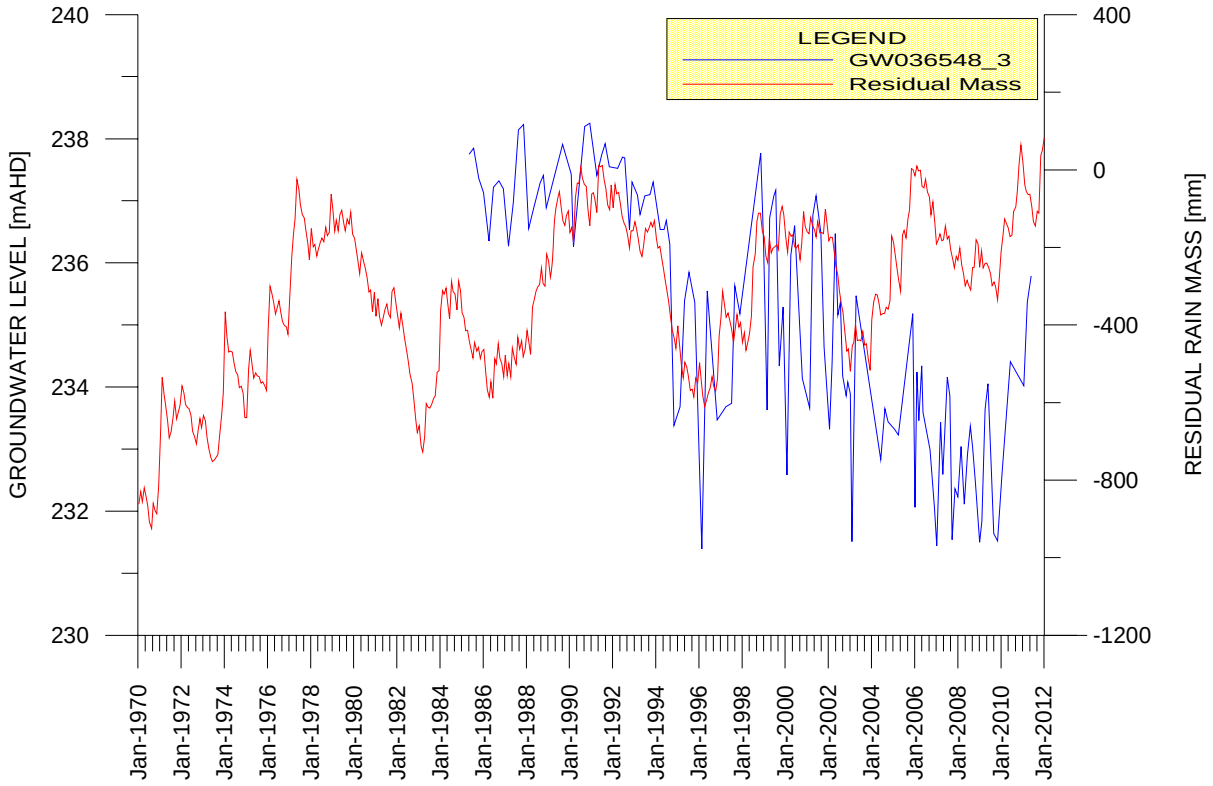

LEGEND
GW036510_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
240
238
236
234
232
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

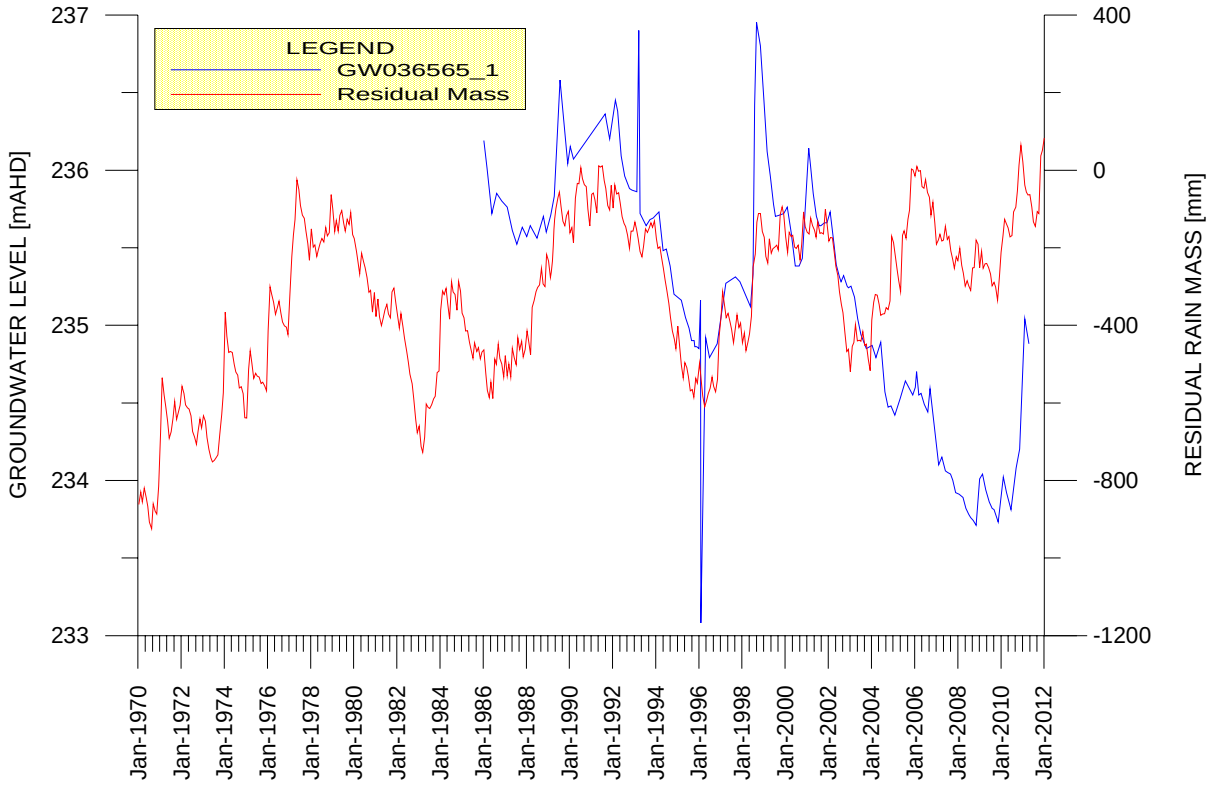

LEGEND
GW036513_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
240
238
236
234
232
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

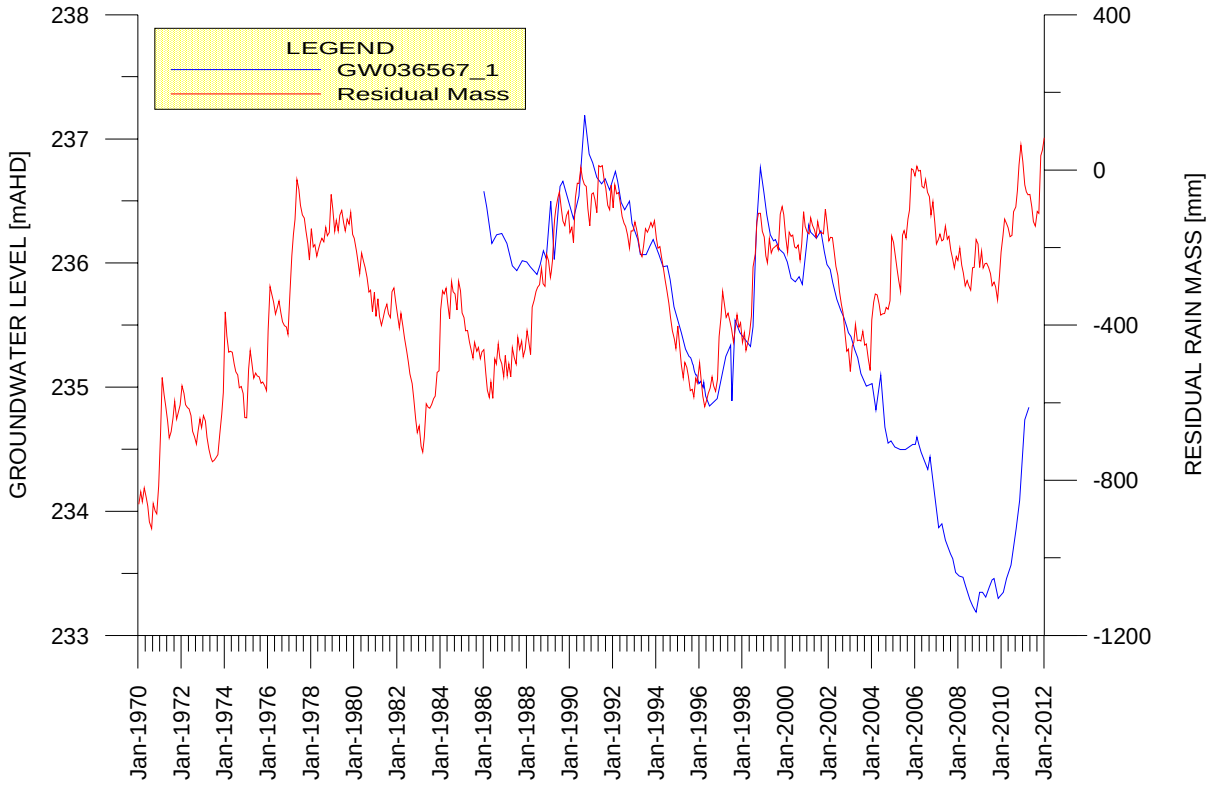

LEGEND
GW036514_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
240
238
236
234
232
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

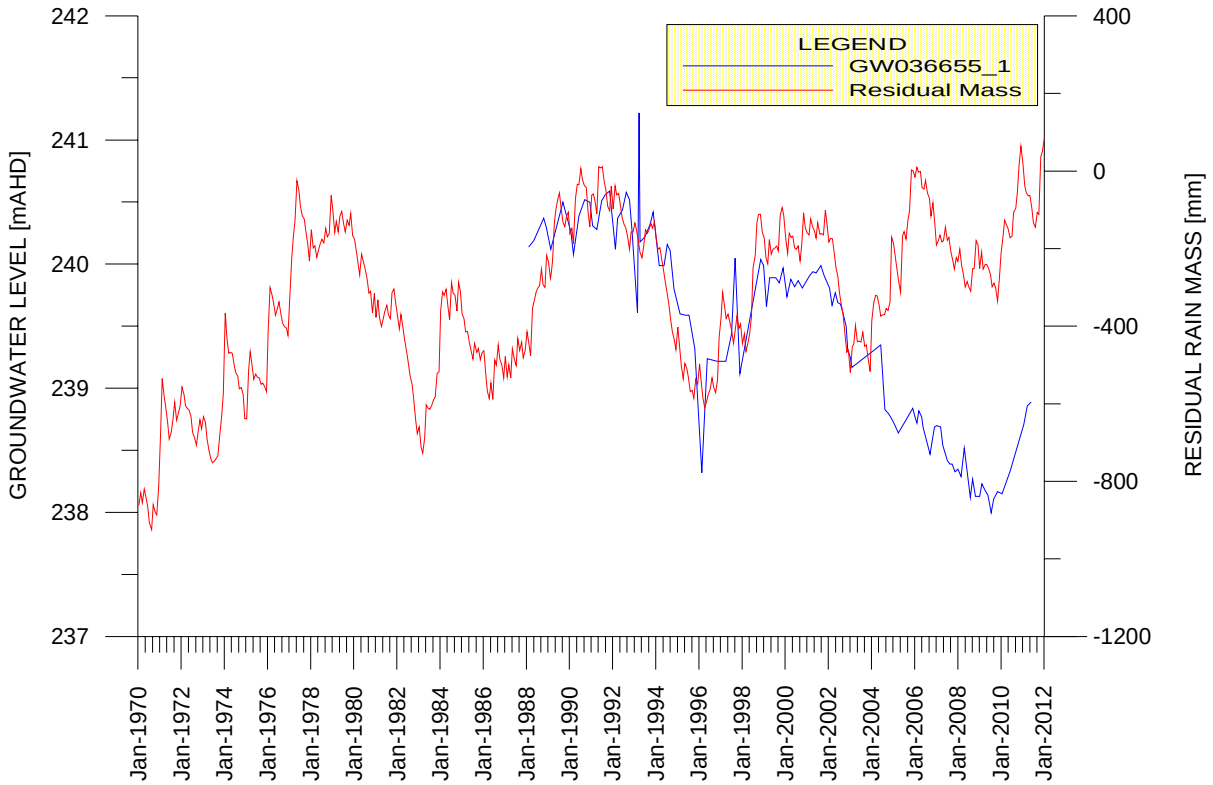

LEGEND
GW036548_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
242
241
240
239
238
237
236
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

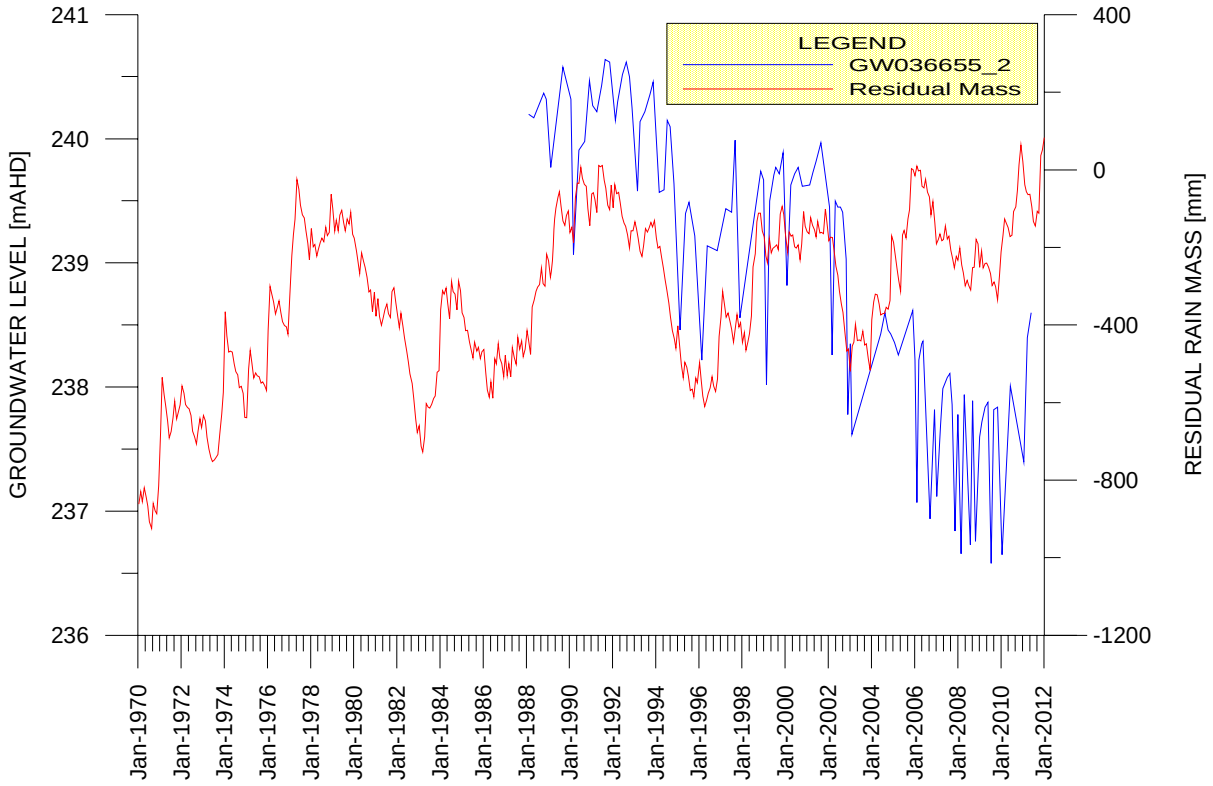

LEGEND
GW036548_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
240
239
238
237
236
235
234
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012


LEGEND
GW036548_3
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
240
238
236
234
232
230
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012


LEGEND
GW036565_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
237
236
235
234
233
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

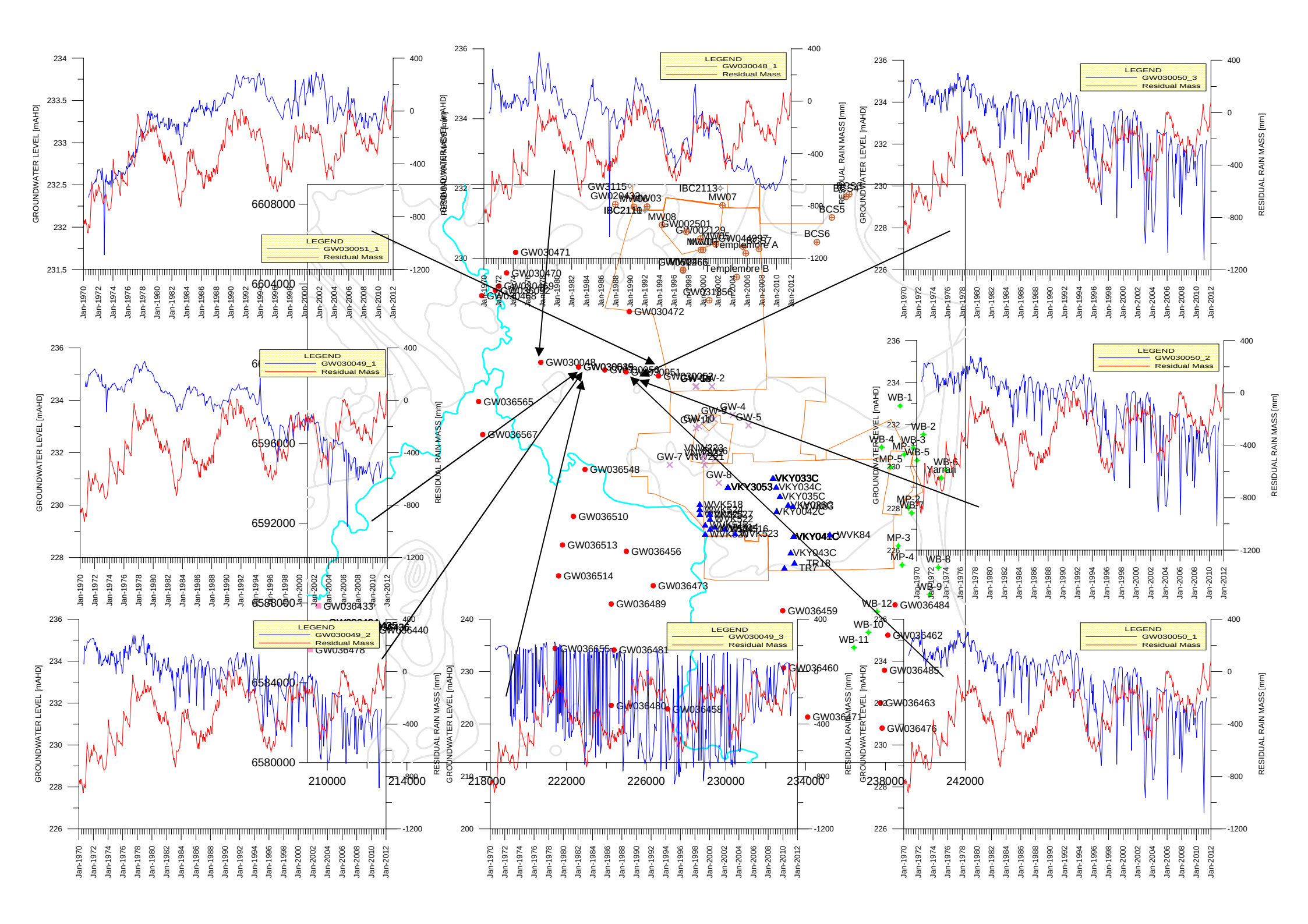

LEGEND
GW036567_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
238
237
236
235
234
233
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

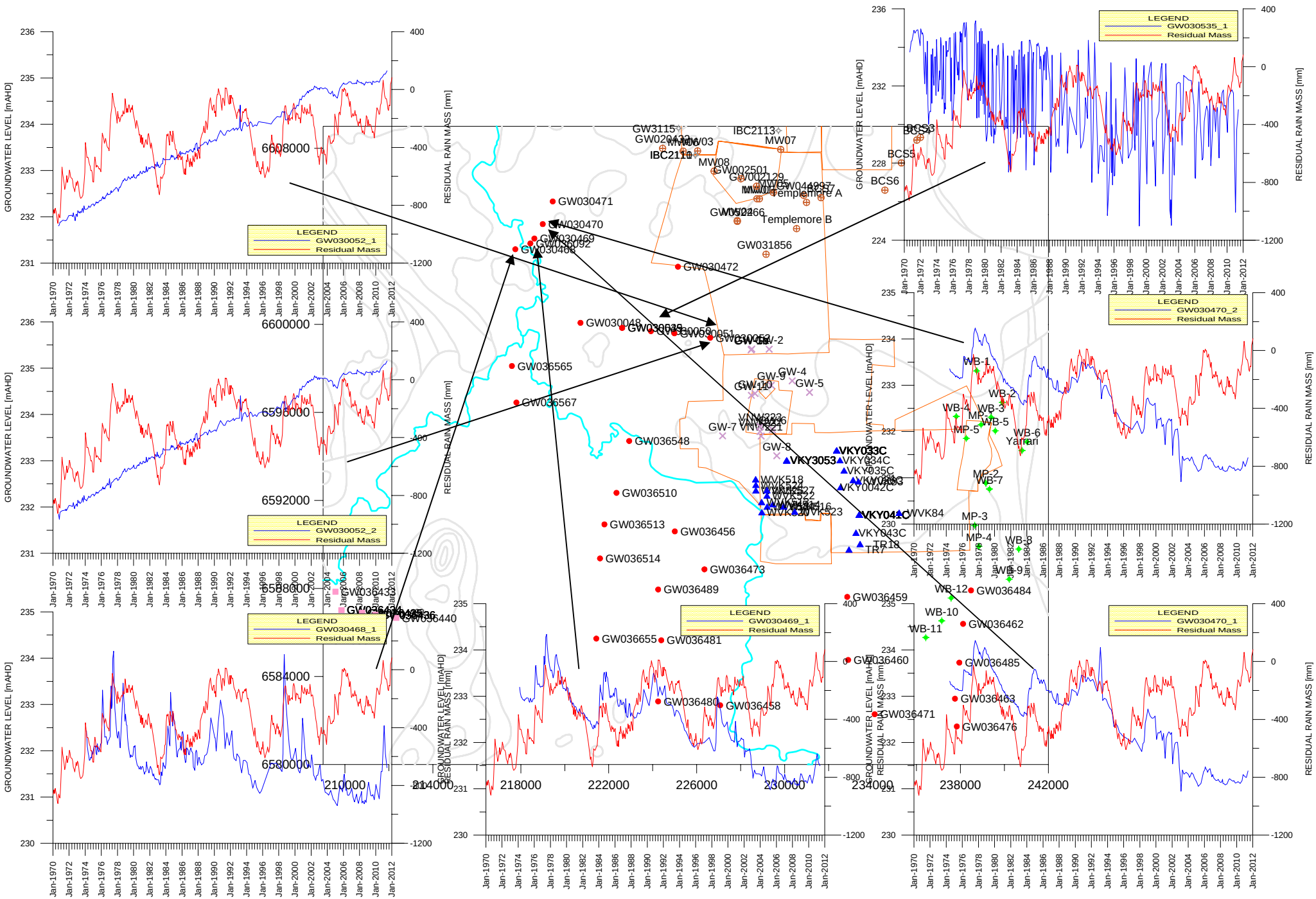

LEGEND
GW036655_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
242
241
240
239
238
237
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

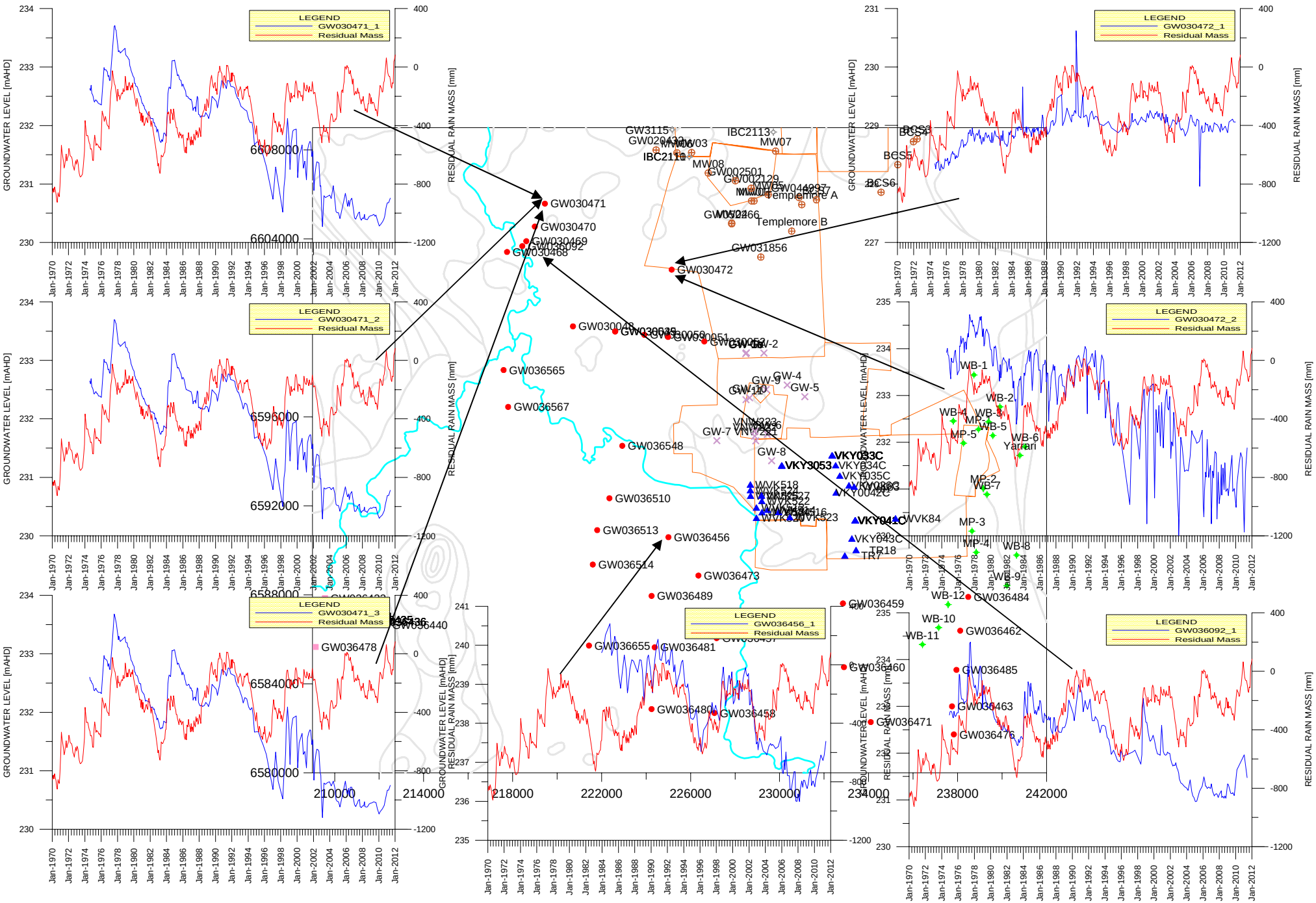

LEGEND
GW036655_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
241
240
239
238
237
236
400
0
-400
-800
-1200
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012

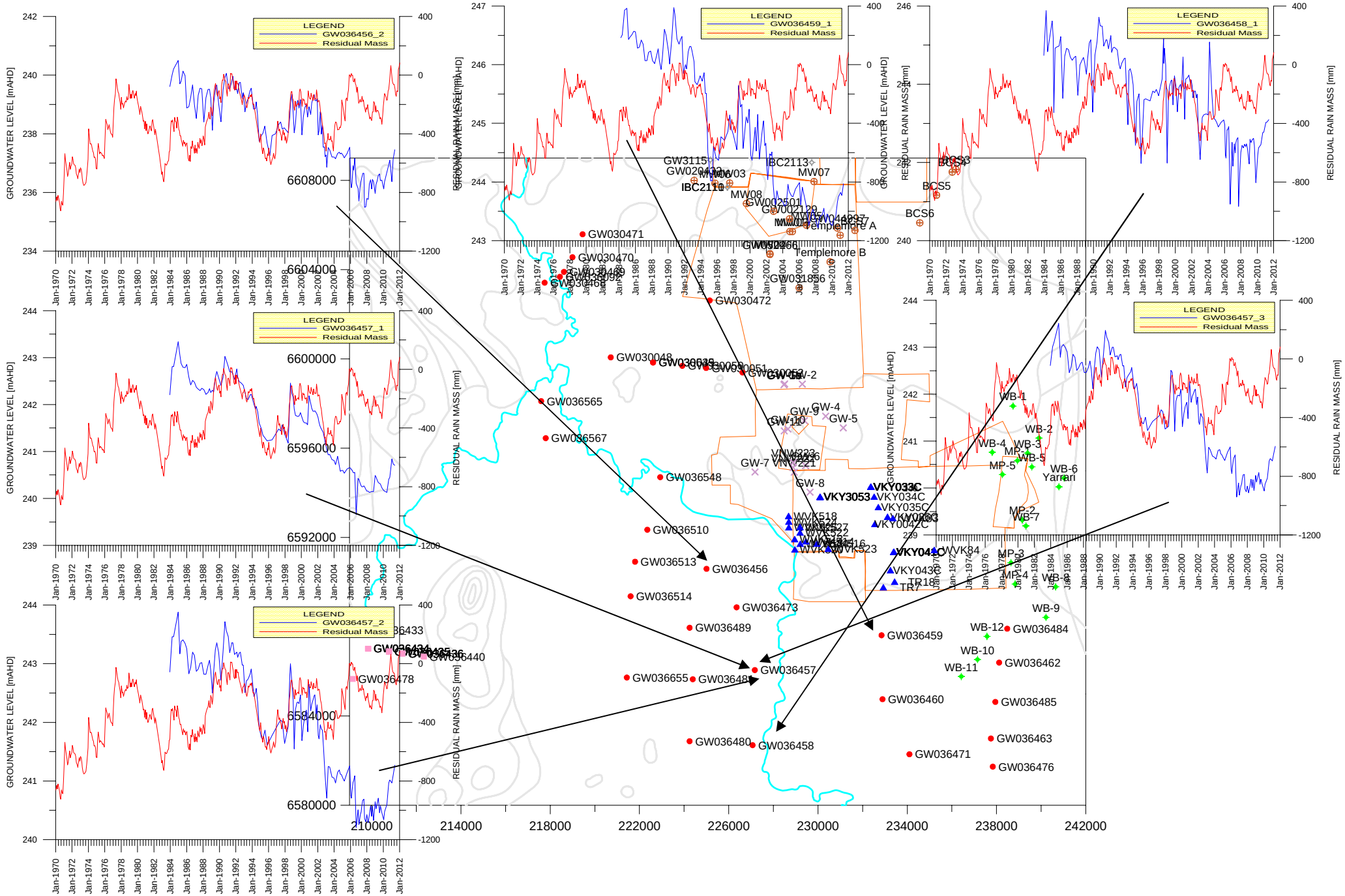
ATTACHMENT AC

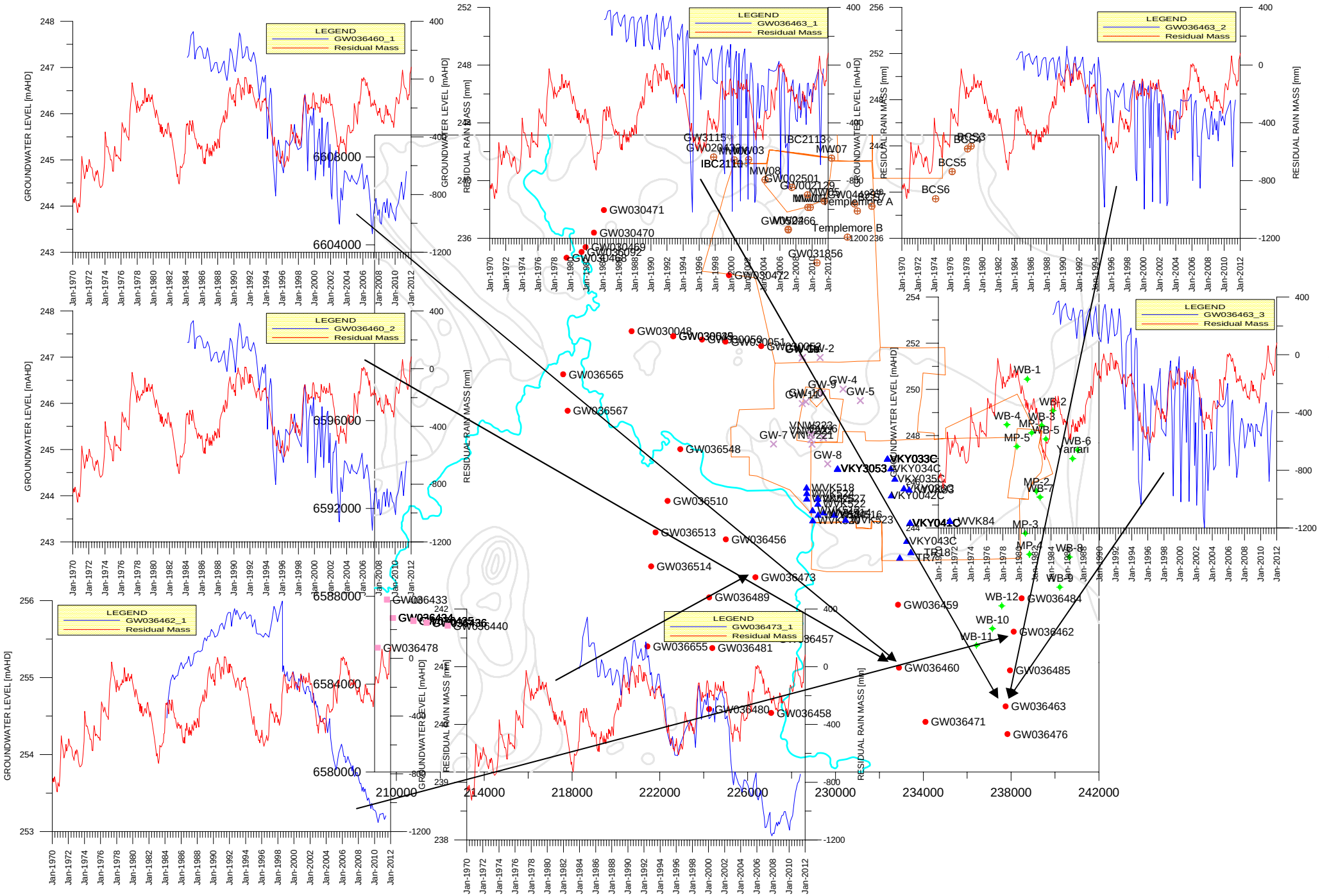
Storyboard Figures for NOW Bores in Zone4

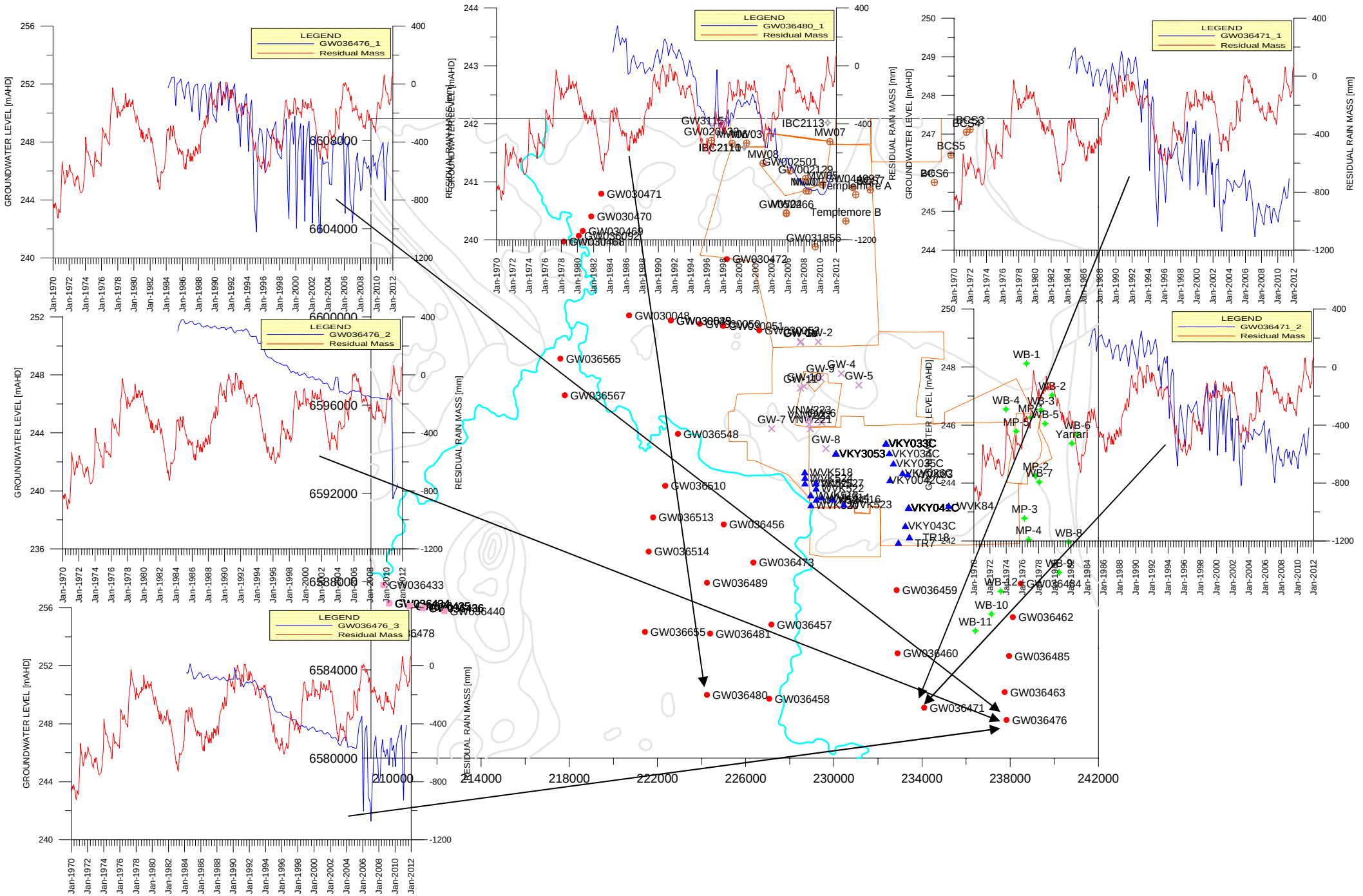

LEGEND
GW030051_1
Residual Mass
LEGEND
GW030048_1
Residual Mass
LEGEND
GW030050_3
Residual Mass
LEGEND
GW030049_1
Residual Mass
LEGEND
GW030050_2
Residual Mass
LEGEND
GW030049_2
Residual Mass
LEGEND
GW030049_3
Residual Mass
LEGEND
GW030050_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
GW030471
GW030470
GW030472
GW030048
GW036565
GW036567
GW036548
GW036510
GW036513
GW036456
GW036514
GW036473
GW036489
GW036459
GW036433
GW036478
GW036655
GW036481
GW036480
GW036458
GW036460
GW036462
GW036485
GW036463
GW036476
GW036484
IBC2113
MW07
MW08
BCS5
BCS6
Templemore A
Templemore B
GW-2
GW-4
GW-5
GW-7
GW-8
VKY033C
VKY3053
VKY034C
VKY035C
VKY042C
VKY041C
VKY043C
WVK84
TR7
TR18
WB-1
WB-2
WB-3
WB-4
WB-5
WB-6
Yarran
WB-8
WB-9
WB-10
WB-11
WB-12
MP-1
MP-2
MP-3
MP-4
MP-5
6608000
6604000
6596000
6592000
6588000
6584000
6580000
210000
214000
218000
222000
226000
230000
234000
238000
242000

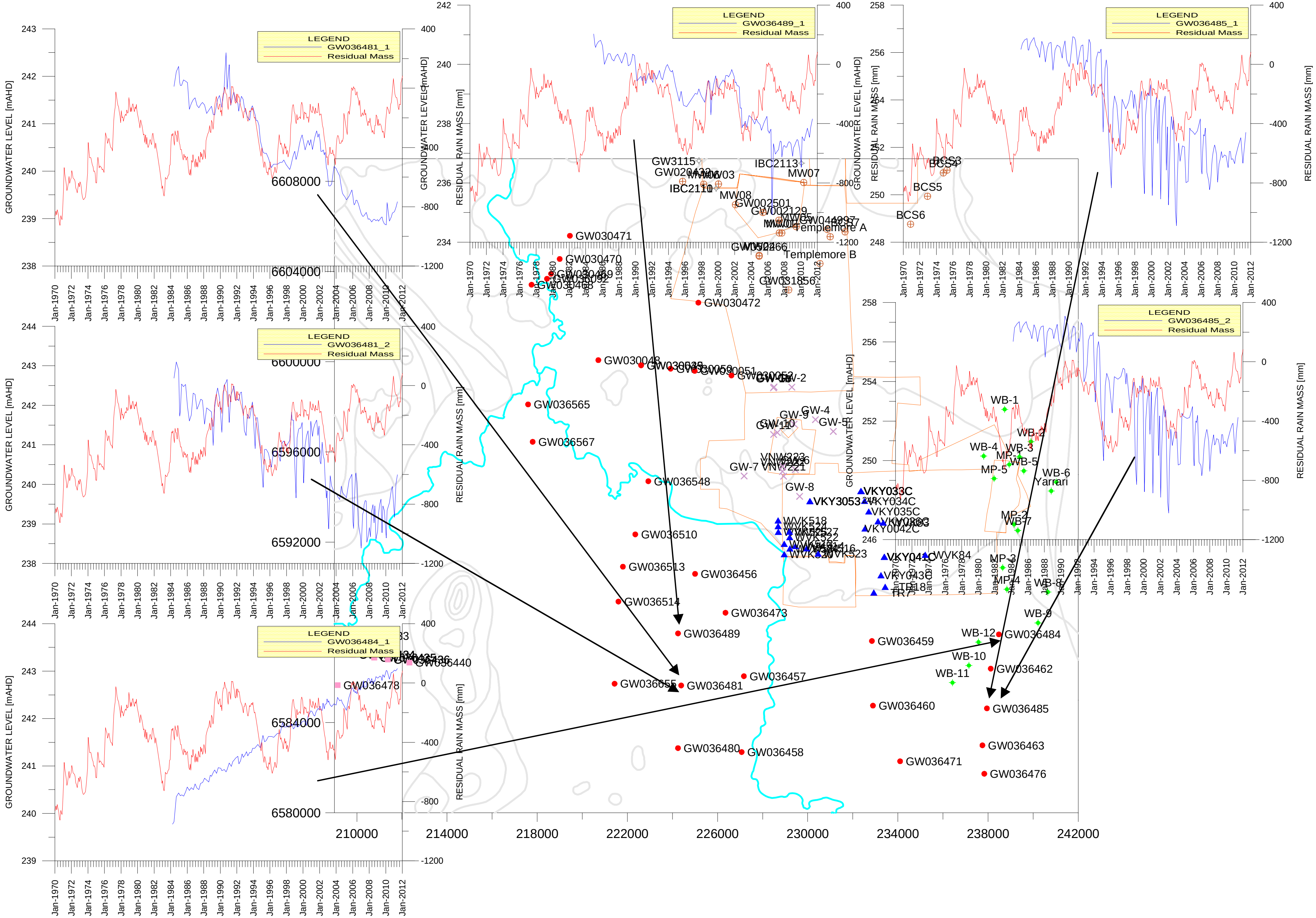

GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
LEGEND
GW030052_1
Residual Mass
GW030052_2
GW030468_1
GW030469_1
GW030470_1
GW030470_2
GW030535_1
6608000
6600000
6592000
6588000
6584000
6580000
210000
214000
218000
222000
226000
230000
234000
238000
242000
GW030471
GW030470
GW030469
GW030092
GW030468
GW030472
GW030048
GW030051
GW030565
GW036567
GW036548
GW036510
GW036513
GW036456
GW036514
GW036473
GW036489
GW036655
GW036481
GW036480
GW036458
GW036459
GW036460
GW036471
GW036462
GW036485
GW036463
GW036476
GW036484
GW031856
GW3115
IBC2113
MW07
MW08
MW05
Templemore A
Templemore B
BCS3
BCS5
BCS6
VKY033C
VKY034C
VKY035C
VKY042C
VKY043C
VKY3053
WB-1
WB-2
WB-3
WB-4
WB-5
WB-6
WB-7
WB-8
WB-9
WB-10
WB-11
WB-12
MP-1
MP-2
MP-3
MP-4
MP-5
Yarran
TR7
TR18

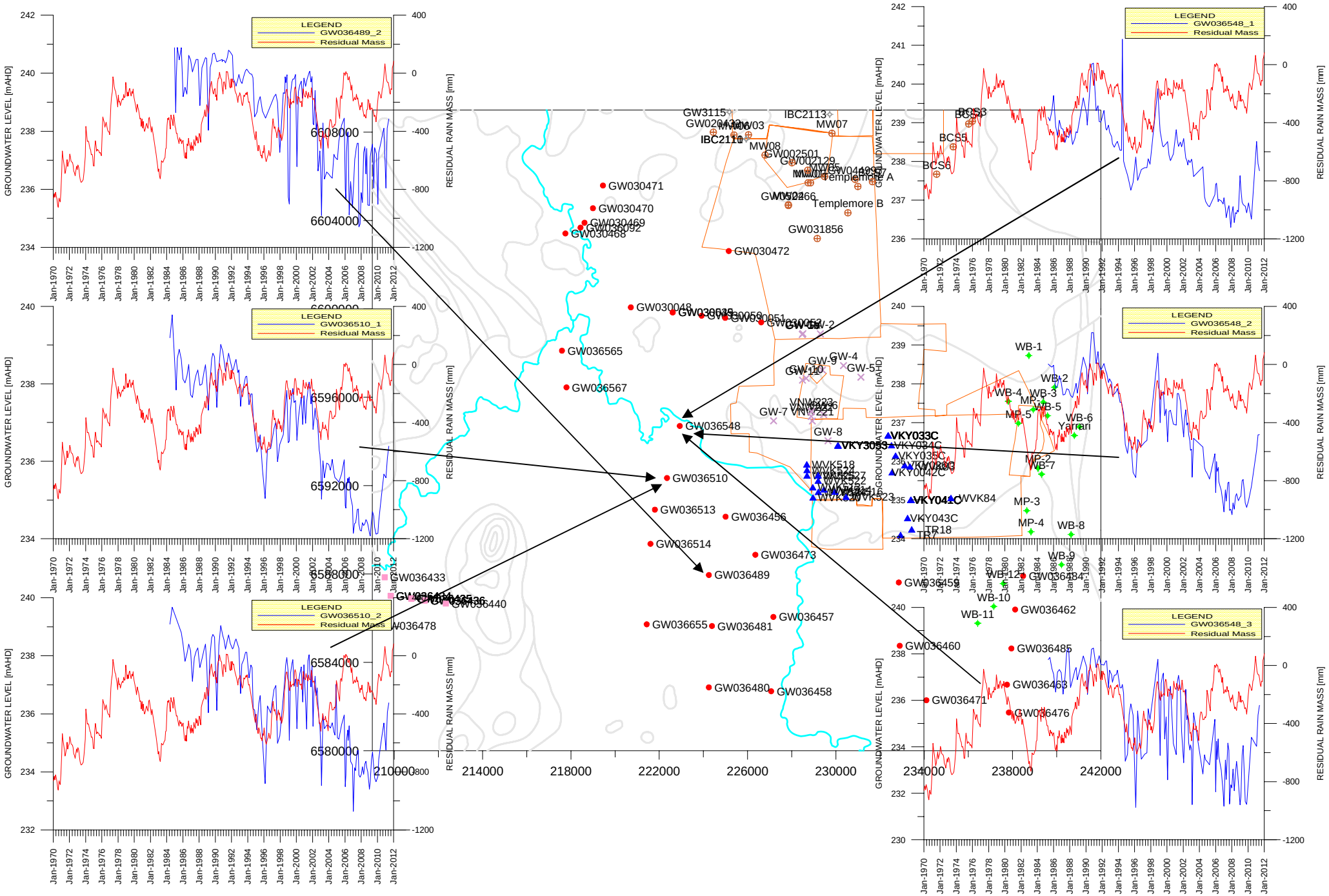

LEGEND
GW030471_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
LEGEND
GW030471_2
Residual Mass
LEGEND
GW030471_3
Residual Mass
LEGEND
GW030456_1
Residual Mass
LEGEND
GW030472_1
Residual Mass
LEGEND
GW030472_2
Residual Mass
LEGEND
GW036092_1
Residual Mass
GW030471
GW030470
GW030469
GW030468
GW030472
GW031856
Templemore A
Templemore B
GW036565
GW036567
GW036548
GW036510
GW036513
GW036514
GW036456
GW036473
GW036489
GW036478
GW036655
GW036481
GW036480
GW036458
GW036459
GW036460
GW036471
GW036462
GW036485
GW036463
GW036476
GW036484
WB-1
WB-2
WB-3
WB-4
WB-5
WB-6
WB-7
WB-8
WB-9
WB-10
WB-11
WB-12
MP-1
MP-2
MP-3
MP-4
MP-5
Yarran
TR7
TR18
BCS3
BCS5
BCS6
IBC2113
MW07
MW08
GW-1
GW-2
GW-3
GW-4
GW-5
GW-7
GW-8
6608000
6604000
6596000
6592000
6588000
6584000
6580000
210000
214000
218000
222000
226000
230000
234000
238000
242000

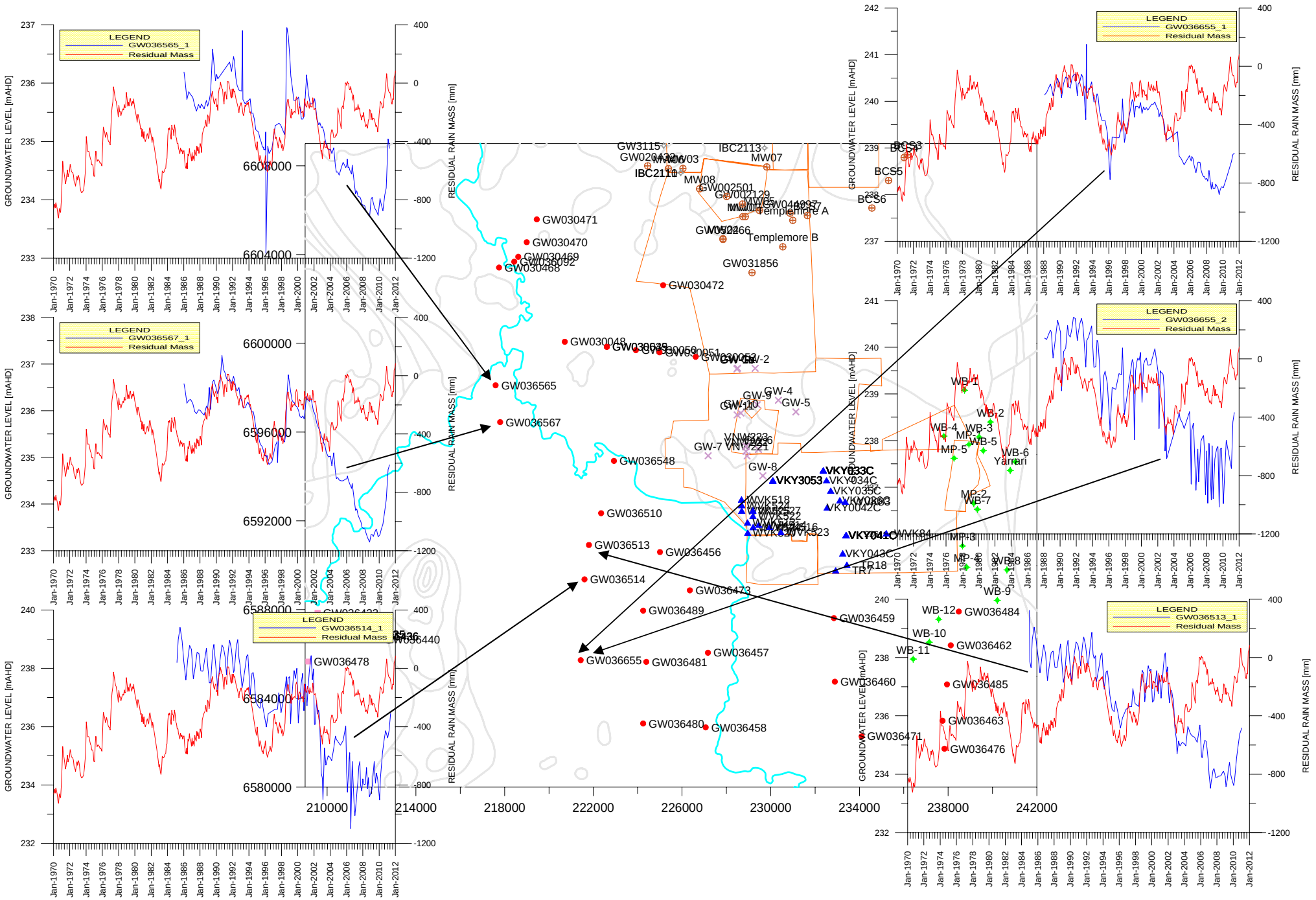

LEGEND
GW036456_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
LEGEND
GW036459_1
Residual Mass
LEGEND
GW036458_1
Residual Mass
LEGEND
GW036457_1
Residual Mass
LEGEND
GW036457_3
Residual Mass
LEGEND
GW036457_2
Residual Mass
GW3115
GW029432
IBC2113
IBC2114
MW03
MW07
MW08
GW002501
GW002129
GW030471
GW030470
GW030469
GW030468
GW031856
GW030472
Templemore A
Templemore B
BCS3
BCS4
BCS5
BCS6
GW030048
GW030049
GW030050
GW030051
GW030052
GW030053
GW036565
GW036567
GW036548
GW036510
GW036513
GW036456
GW036514
GW036473
GW036489
GW036459
GW036457
GW036655
GW036488
GW036480
GW036458
GW036460
GW036471
GW036462
GW036484
GW036485
GW036463
GW036476
GW036478
GW036440
GW036433
GW-1
GW-2
GW-4
GW-5
GW-7
GW-8
GW-9
GW-10
VKY033C
VKY034C
VKY035C
VKY036C
VKY3053
VKY044C
VKY043C
WVK518
WVK523
WVK84
TR7
TR18
WB-1
WB-2
WB-3
WB-4
WB-5
WB-6
WB-7
WB-8
WB-9
WB-10
WB-11
WB-12
MP-1
MP-2
MP-3
MP-4
MP-5
Yarrari
6608000
6604000
6600000
6596000
6592000
6588000
6584000
6580000
210000
214000
218000
222000
226000
230000
234000
238000
242000


LEGEND
GW036460_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
LEGEND
GW036463_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
LEGEND
GW036463_2
Residual Mass
RESIDUAL RAIN MASS [mm]
LEGEND
GW036460_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
LEGEND
GW036463_3
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
LEGEND
GW036462_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
LEGEND
GW036473_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
6608000
6604000
6596000
6592000
6588000
6584000
6580000
210000
214000
218000
222000
226000
230000
234000
238000
242000
GW030471
GW030470
GW030469
GW030468
GW030092
GW030048
GW030635
GW030059
GW030051
GW030052
GW030472
GW031856
GW036565
GW036567
GW036548
GW036510
GW036513
GW036456
GW036514
GW036473
GW036489
GW036433
GW036440
GW036478
GW036655
GW036481
GW036480
GW036458
GW036457
GW036459
GW036460
GW036471
GW036484
GW036462
GW036485
GW036463
GW036476
GW3115
GW020412
IBC2110
IBC2113
MW03
MW07
MW08
GW002501
GW002129
Templemore A
Templemore B
GW002266
BCS3
BCS4
BCS5
BCS6
GW-1
GW-2
GW-4
GW-5
GW-7
GW-8
GW-9
GW-10
VKY033C
VKY034C
VKY035C
VKY042C
VKY043C
VKY3053
WVK84
WB-1
WB-2
WB-3
WB-4
WB-5
WB-6
WB-7
WB-8
WB-9
WB-10
WB-11
WB-12
MP-1
MP-2
MP-3
MP-4
MP-5
Yarrari


LEGEND
GW036476_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
LEGEND
GW036480_1
Residual Mass
LEGEND
GW036471_1
Residual Mass
LEGEND
GW036476_2
Residual Mass
LEGEND
GW036471_2
Residual Mass
LEGEND
GW036476_3
Residual Mass
GW030471
GW030470
GW030469
GW030468
GW030472
GW030048
GW030049
GW030051
GW030052
GW036565
GW036567
GW036548
GW036510
GW036513
GW036456
GW036514
GW036473
GW036489
GW036457
GW036655
GW036481
GW036480
GW036458
GW036459
GW036460
GW036471
GW036462
GW036485
GW036463
GW036476
GW036433
GW036440
GW036478
GW036484
GW031856
Temptemore A
Temptemore B
IBC2113
MW07
MW08
GW002501
GW002129
GW002466
GW3115
IBC2110
BCS3
BCS4
BCS5
BCS6
WB-1
WB-2
WB-3
WB-4
WB-5
WB-6
WB-7
WB-8
WB-9
WB-10
WB-11
WB-12
Yarrari
MP-1
MP-2
MP-3
MP-4
MP-5
GW-2
GW-4
GW-5
GW-7
GW-8
GW-9
GW-10
VKY033C
VKY034C
VKY035C
VKY042C
VKY043C
VKY3053
WVK84
TR18
TR7
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012
210000
214000
218000
222000
226000
230000
234000
238000
242000

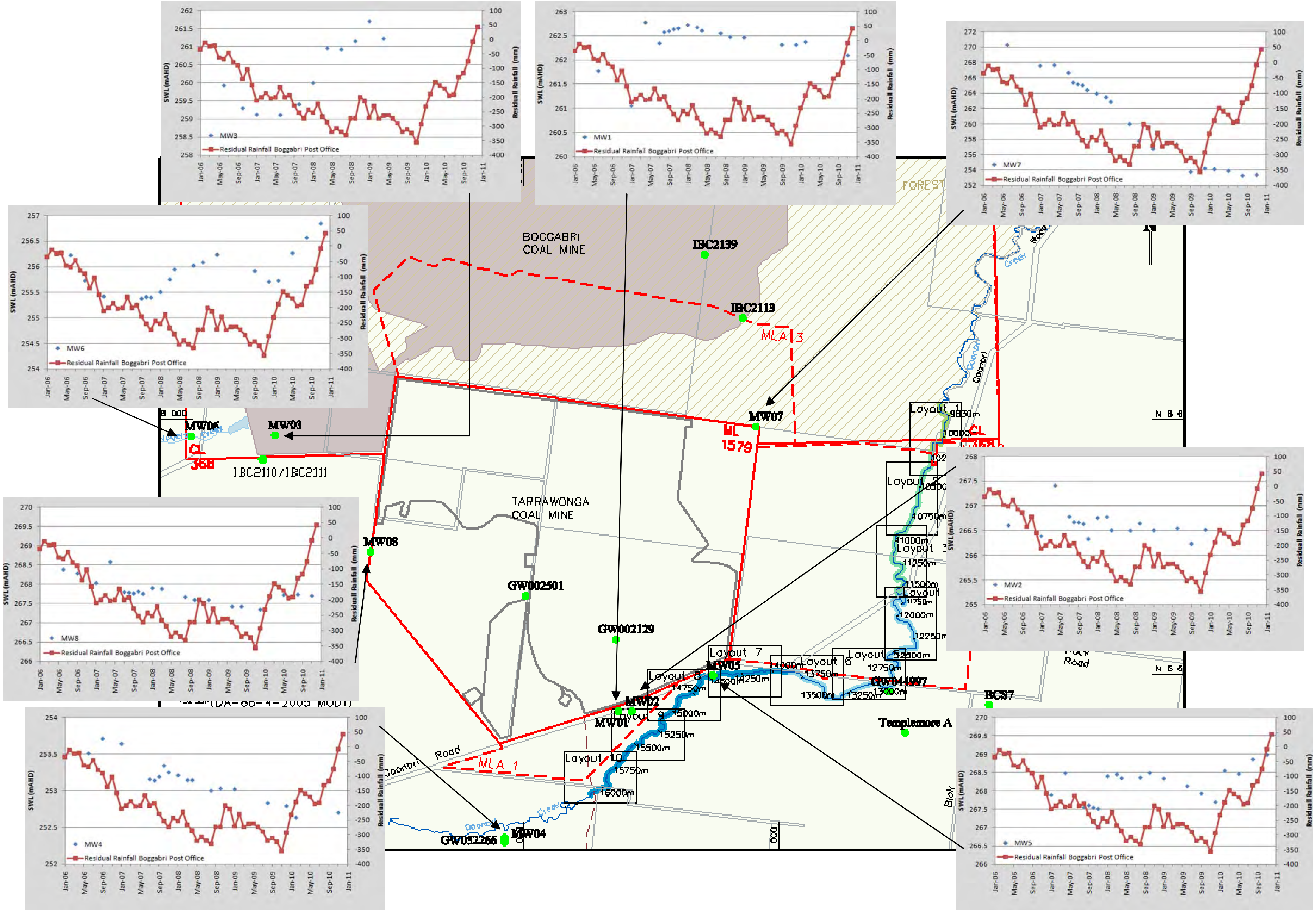

LEGEND
GW036481_1
Residual Mass
LEGEND
GW036481_2
Residual Mass
LEGEND
GW036484_1
Residual Mass
LEGEND
GW036489_1
Residual Mass
LEGEND
GW036485_1
Residual Mass
LEGEND
GW036485_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
GW030471
GW030470
GW030472
GW036565
GW036567
GW036548
GW036510
GW036513
GW036456
GW036514
GW036473
GW036489
GW036459
GW036484
GW036457
GW036481
GW036462
GW036460
GW036485
GW036463
GW036480
GW036458
GW036471
GW036476
GW036478
VKY033C
VKY034C
VKY035C
VKY042C
Templemore A
Templemore B
BCS5
BCS6
Yarrari
6608000
6604000
6600000
6596000
6592000
6584000
6580000
210000
214000
218000
222000
226000
230000
234000
238000
242000


LEGEND
GW036489_2
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
LEGEND
GW036510_1
Residual Mass
LEGEND
GW036510_2
Residual Mass
LEGEND
GW036548_1
Residual Mass
LEGEND
GW036548_2
Residual Mass
LEGEND
GW036548_3
Residual Mass
GW030471
GW030470
GW030469
GW030468
GW030472
GW031856
GW036565
GW036567
GW036548
GW036510
GW036513
GW036456
GW036514
GW036473
GW036489
GW036457
GW036655
GW036481
GW036480
GW036458
GW036433
GW036478
GW036440
Templemore A
Templemore B
IBC2113
MW07
MW08
GW002501
GW002129
GW002266
GW3115
BCS3
BCS5
BCS6
WB-1
WB-2
WB-3
WB-4
WB-5
WB-6
WB-7
WB-8
WB-9
WB-10
WB-11
WB-12
MP-1
MP-2
MP-3
MP-4
MP-5
Yarrari
VKY033C
VKY034C
VKY035C
VKY042C
VKY043C
VKY044C
WVK84
TR18
GW036459
GW036462
GW036460
GW036485
GW036463
GW036471
GW036476
GW036484
6608000
6604000
6596000
6592000
6584000
6580000
210000
214000
218000
222000
226000
230000
234000
238000
242000

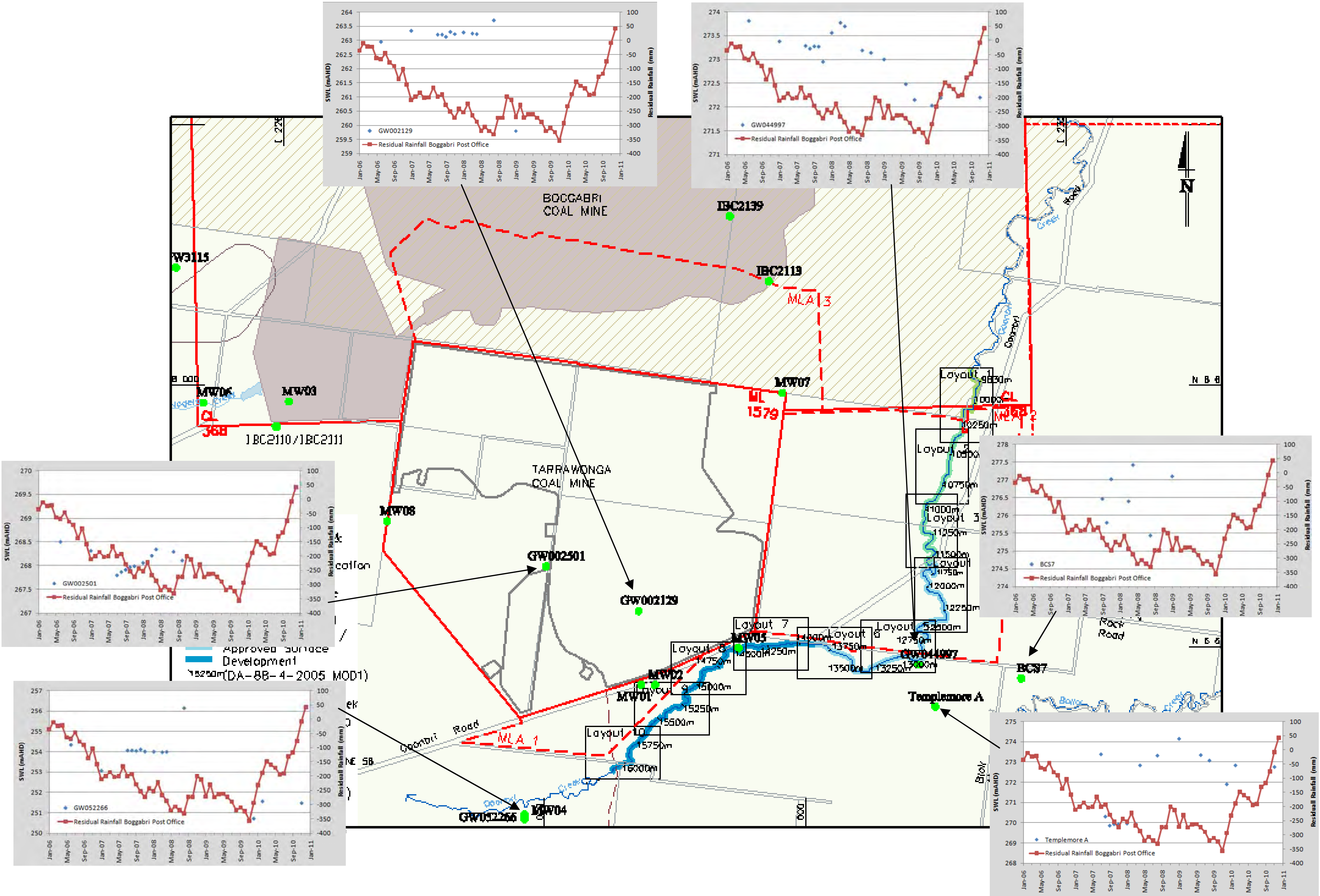

LEGEND
GW036565_1
Residual Mass
GROUNDWATER LEVEL [mAHD]
RESIDUAL RAIN MASS [mm]
LEGEND
GW036567_1
Residual Mass
LEGEND
GW036514_1
Residual Mass
LEGEND
GW036655_1
Residual Mass
LEGEND
GW036655_2
Residual Mass
LEGEND
GW036513_1
Residual Mass
GW036565
GW036567
GW036514
GW036513
GW036655
GW036478
GW036548
GW036510
GW036456
GW036473
GW036489
GW036457
GW036481
GW036480
GW036458
GW036459
GW036460
GW036471
GW036462
GW036484
GW036485
GW036463
GW036476
GW030471
GW030470
GW030469
GW030468
GW030472
GW031856
Templemore A
Templemore B
IBC2110
IBC2113
MW07
MW08
BCS3
BCS5
BCS6
WB-1
WB-2
WB-3
WB-4
WB-5
WB-6
WB-7
WB-8
WB-9
WB-10
WB-11
WB-12
MP-1
MP-2
MP-3
MP-5
Yarrari
GW-2
GW-4
GW-5
GW-7
GW-8
GW-9
GW-10
TR7
TR18

ATTACHMENT AD

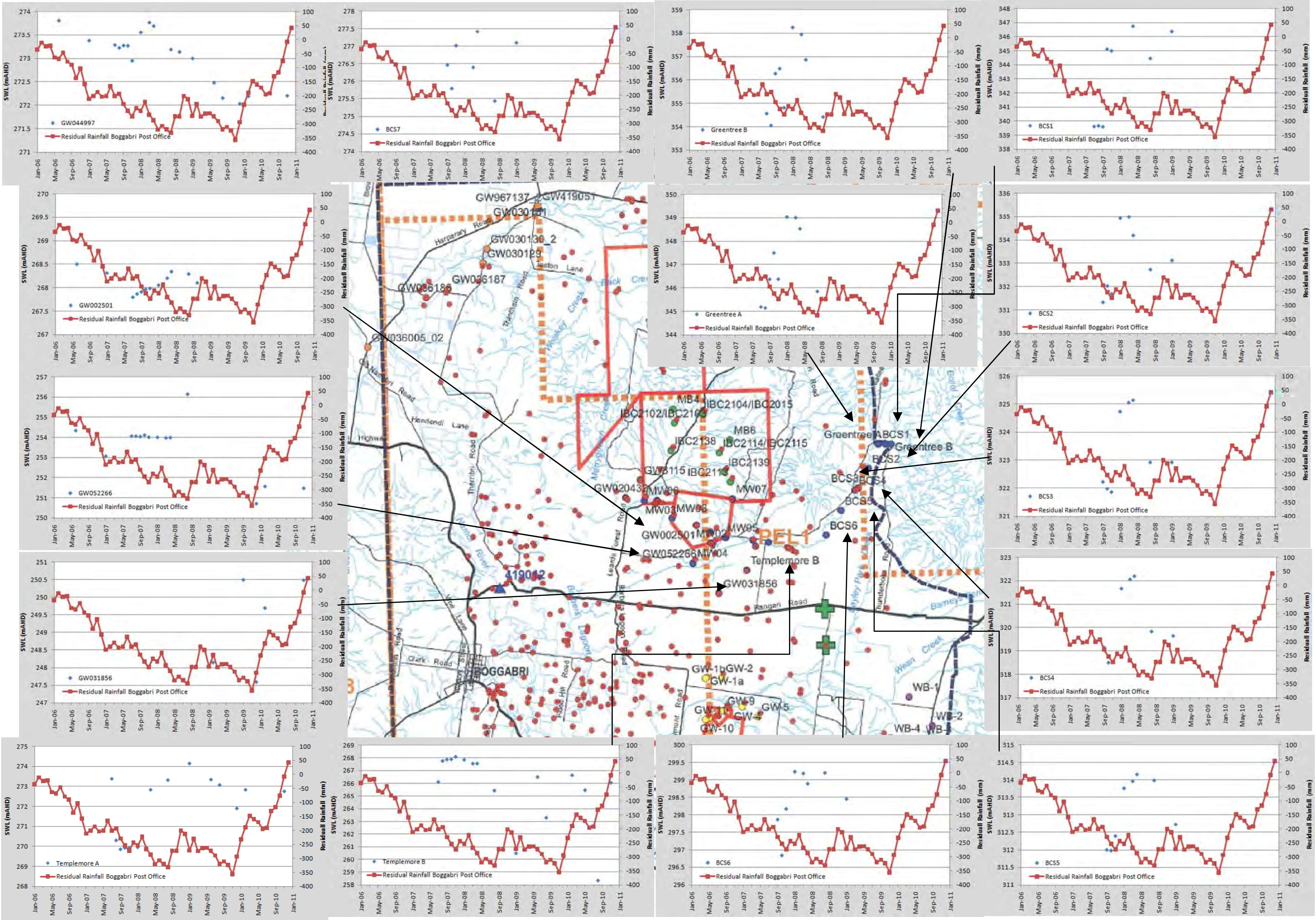
Storyboard Figures for Tarrawonga Bores



SWL (mAHD)
Residual Rainfall (mm)
MW3
MW1
MW7
MW6
MW8
MW2
MW4
MW5
Residual Rainfall Boggabri Post Office
BOGGABRI COAL MINE
TARRAWONGA COAL MINE
FOREST
IBC2139
IBC2113
IBC2110 / IBC2111
MLA 3
MLA 1
ML 1579
CL 368
MW06
MW03
MW07
MW08
GW002501
GW002129
MW05
MW02
MW01
MW04
GW032266
GW044097
BC97
Templemore A
Layout 1
Layout 3
Layout 6
Layout 7
Layout 8
Layout 10
Road
Creek



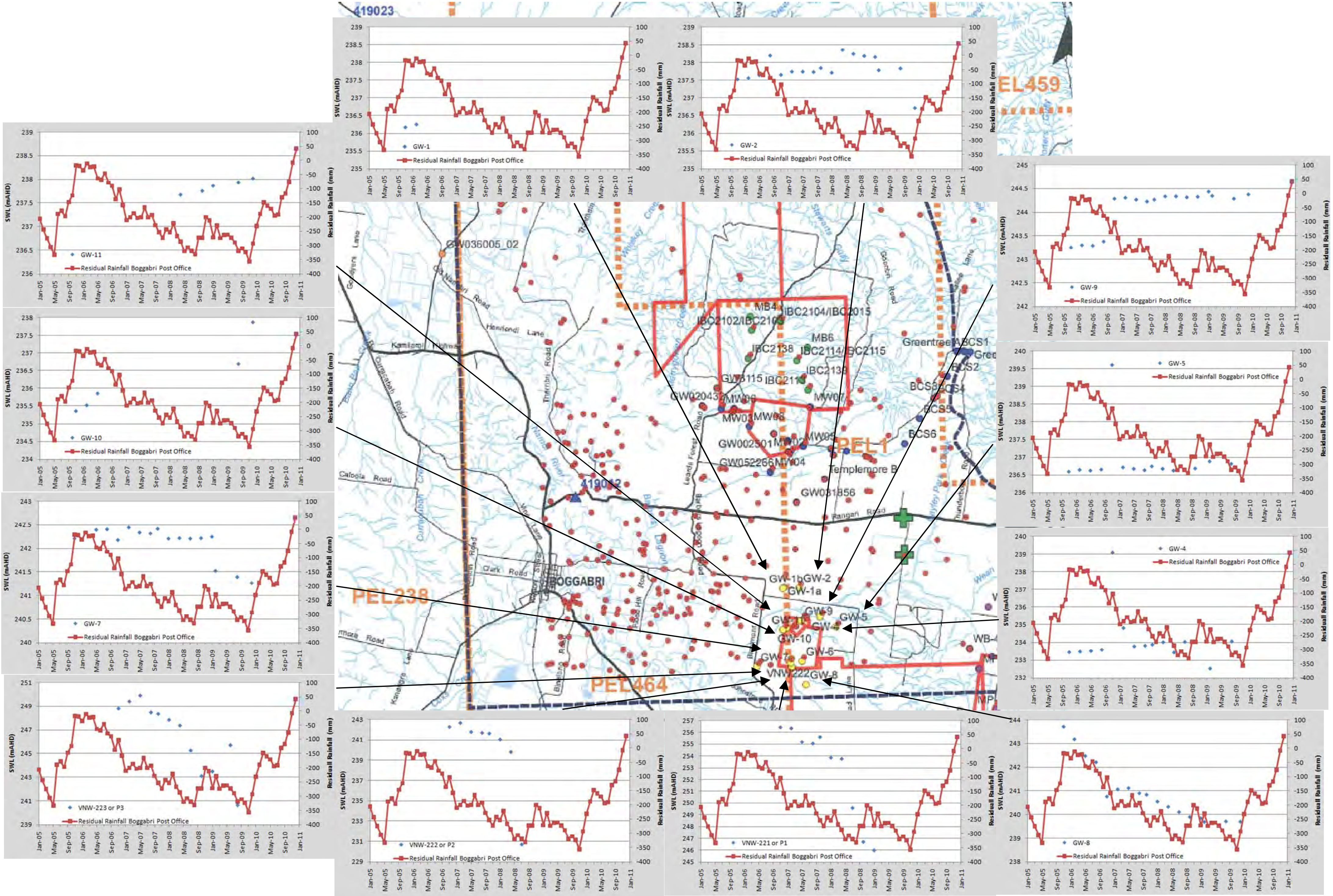
GW002129
Residual Rainfall Boggabri Post Office
SWL (mAHD)
Residual Rainfall (mm)
GW044997
BCS7
Templemore A
GW002501
GW052266
BOGGABRI COAL MINE
TARRAWONGA COAL MINE
IBC2139
IBC2119
IBC2110/IBC2111
MW03
MW06
MW07
MW08
MW05
MW02
MW01
MW04
GW3115
MLA 3
MLA 2
MLA 1
ML 1579
CL 368
Layout 1
Layout 2
Layout 3
Layout 7
Layout 8
Layout 10
Approved Surface Development
(DA-88-4-2005 MOD1)
Goonbri Road
N



SWL (mAHD)
Residual Rainfall (mm)
Residual Rainfall Boggabri Post Office
GW044997
BCS7
Greentree B
BCS1
GW002501
Greentree A
BCS2
GW052266
BCS3
GW031856
BCS4
Templemore A
Templemore B
BCS6
BCS5
GW967137
GW419051
GW030141
GW030130_2
GW030129
GW036187
GW036186
GW036005_02
Harparary Road
Blue Vale Road
Henriendi Lane
Highway
Black Creek
Whiskey Creek
MB4
IBC2102/IBC2103
IBC2104/IBC2015
MB6
IBC2138
IBC2114/IBC2115
IBC2139
IBC2113
MW07
MW06
MW03
MW08
MW05
MW02
MW04
GW020430
REL1
Greentree A
Greentree B
Templemore B
419012
BOGGABRI
Rangari Road
Clark Road
Namoi River
GW-1b
GW-2
GW-1a
GW-9
GW-5
GW-4
GW-10
WB-1
WB-2
WB-4
Bollol Creek
Barneys Springs
Nagero Creek
Jan-06
May-06
Sep-06
Jan-07
May-07
Sep-07
Jan-08
May-08
Sep-08
Jan-09
May-09
Sep-09
Jan-10
May-10
Sep-10
Jan-11

ATTACHMENT AE

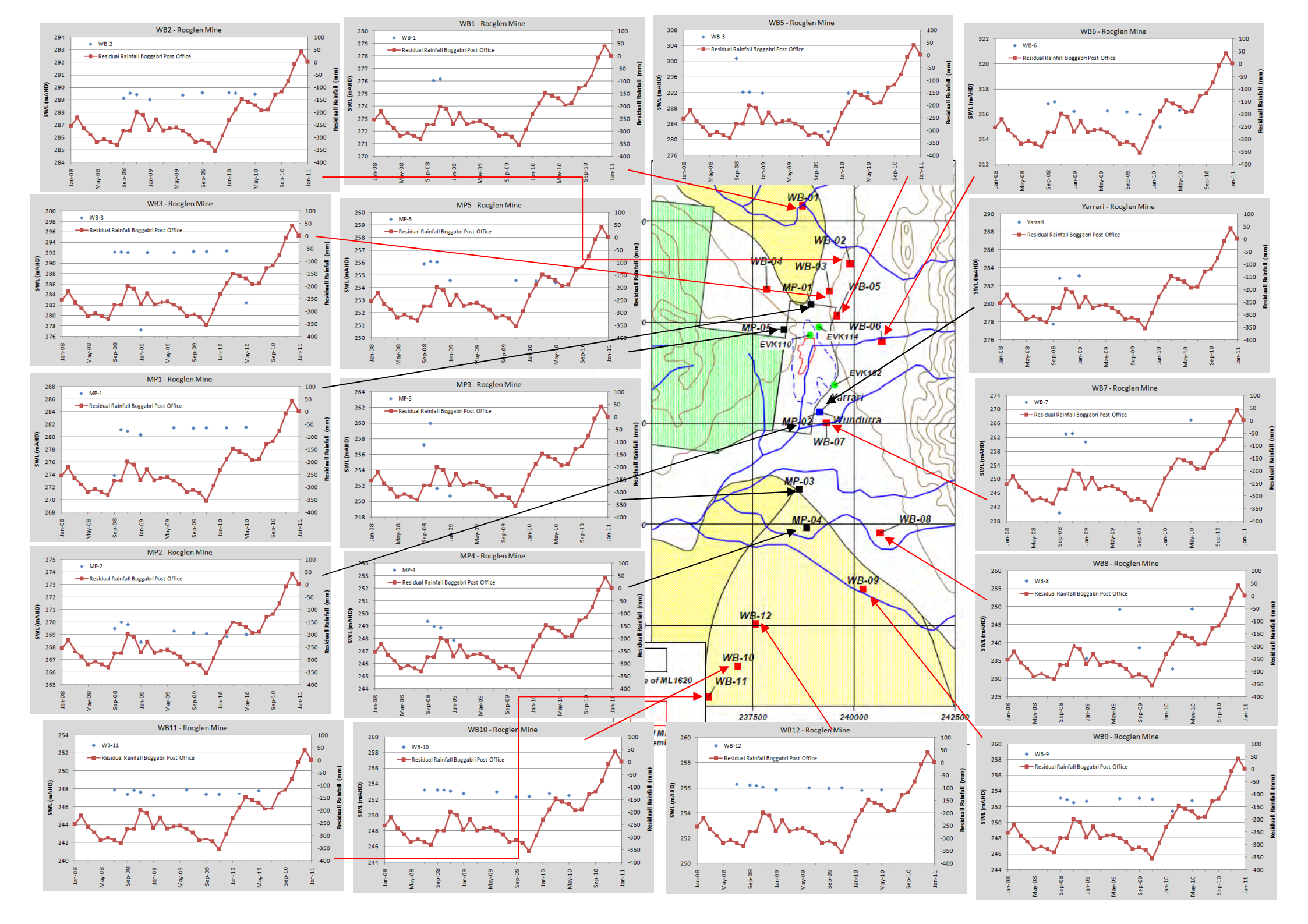
Storyboard Figures for Canyon Bores



SWL (mAHD)
Residual Rainfall (mm)
GW-1
GW-2
GW-11
GW-10
GW-7
VNW-223 or P3
VNW-222 or P2
VNW-221 or P1
GW-8
GW-4
GW-5
GW-9
Residual Rainfall Boggabri Post Office
419023
419012
EL459
PEL238
PEL464
PEL1
BOGGABRI
GW036005_02
Kamilaroi Highway
Rangari Road
Clark Road
Templemore B
Greentree
BCS1
BCS2
BCS3
BCS5
BCS6
MB4
MB6
IBC2102/IBC2103
IBC2104/IBC2015
IBC2138
IBC2114/IBC2115
IBC2139
IBC2116
GW0204
MW06
MW01
MW03
MW07
MW05
MW02
MW04
GW002501
GW052266
GW031856
GW-1b
GW-1a
GW-6
WB-4

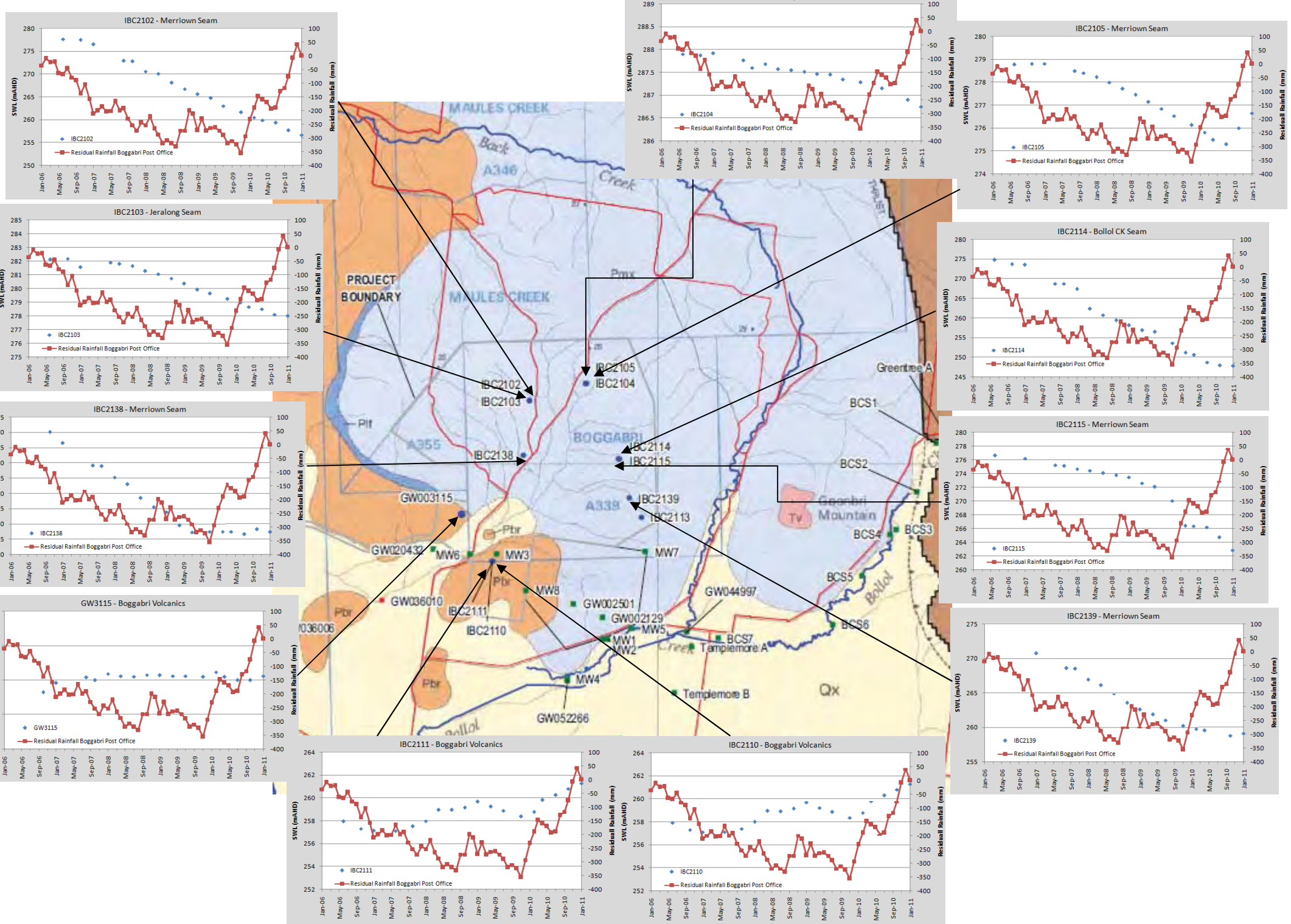
ATTACHMENT AF

Storyboard Figures for Rocglen Bores


WB2 - Rocglen Mine
WB-2
Residual Rainfall Boggabri Post Office
WB1 - Rocglen Mine
WB-1
Residual Rainfall Boggabri Post Office
WB5 - Rocglen Mine
WB-5
Residual Rainfall Boggabri Post Office
WB6 - Rocglen Mine
WB-6
Residual Rainfall Boggabri Post Office
WB3 - Rocglen Mine
WB-3
Residual Rainfall Boggabri Post Office
MP5 - Rocglen Mine
MP-5
Residual Rainfall Boggabri Post Office
Yarrari - Rocglen Mine
Yarrari
Residual Rainfall Boggabri Post Office
MP1 - Rocglen Mine
MP-1
Residual Rainfall Boggabri Post Office
MP3 - Rocglen Mine
MP-3
Residual Rainfall Boggabri Post Office
WB7 - Rocglen Mine
WB-7
Residual Rainfall Boggabri Post Office
MP2 - Rocglen Mine
MP-2
Residual Rainfall Boggabri Post Office
MP4 - Rocglen Mine
MP-4
Residual Rainfall Boggabri Post Office
WB8 - Rocglen Mine
WB-8
Residual Rainfall Boggabri Post Office
WB11 - Rocglen Mine
WB-11
Residual Rainfall Boggabri Post Office
WB10 - Rocglen Mine
WB-10
Residual Rainfall Boggabri Post Office
WB12 - Rocglen Mine
WB-12
Residual Rainfall Boggabri Post Office
WB9 - Rocglen Mine
WB-9
Residual Rainfall Boggabri Post Office
SWL (mAHD)
Residual Rainfall (mm)
WB-01
WB-02
WB-04
WB-03
MP-01
WB-05
MP-05
EVK110
EVK114
WB-06
EVK102
Yarrari
Wundurra
MP-02
WB-07
MP-03
MP-04
WB-08
WB-09
WB-12
WB-10
WB-11
237500
240000
242500

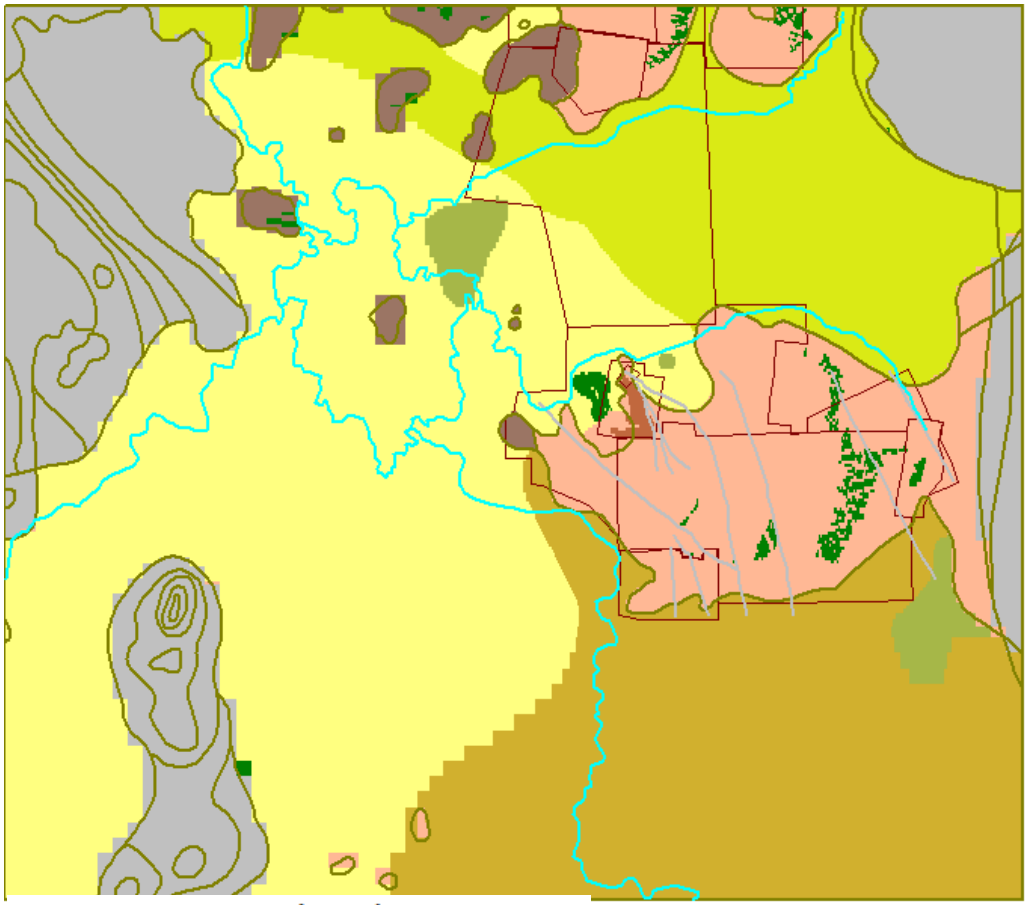
ATTACHMENT AG

Storyboard Figures for Boggabri Bores


IBC2102 - Merriown Seam
IBC2104 - Braymont Seam
IBC2105 - Merriown Seam
IBC2103 - Jeralong Seam
IBC2114 - Bollol CK Seam
IBC2138 - Merriown Seam
IBC2115 - Merriown Seam
GW3115 - Boggabri Volcanics
IBC2139 - Merriown Seam
IBC2111 - Boggabri Volcanics
IBC2110 - Boggabri Volcanics
SWL (mAHD)
Residual Rainfall (mm)
Residual Rainfall Boggabri Post Office
PROJECT BOUNDARY
MAULES CREEK
BOGGABRI
Back Creek
Bollol
Greentree A
Templemore A
Templemore B
Goonbri Mountain
A346
A355
A339
Pmx
Pbr
Pit
Tv
Qx
IBC2102
IBC2103
IBC2104
IBC2105
IBC2138
IBC2114
IBC2115
IBC2139
IBC2113
IBC2111
IBC2110
GW003115
GW020432
GW036010
GW036006
GW002501
GW002129
GW044997
GW052266
MW1
MW2
MW3
MW4
MW5
MW6
MW7
MW8
BCS1
BCS2
BCS3
BCS4
BCS5
BCS6
BCS7

ATTACHMENT AH

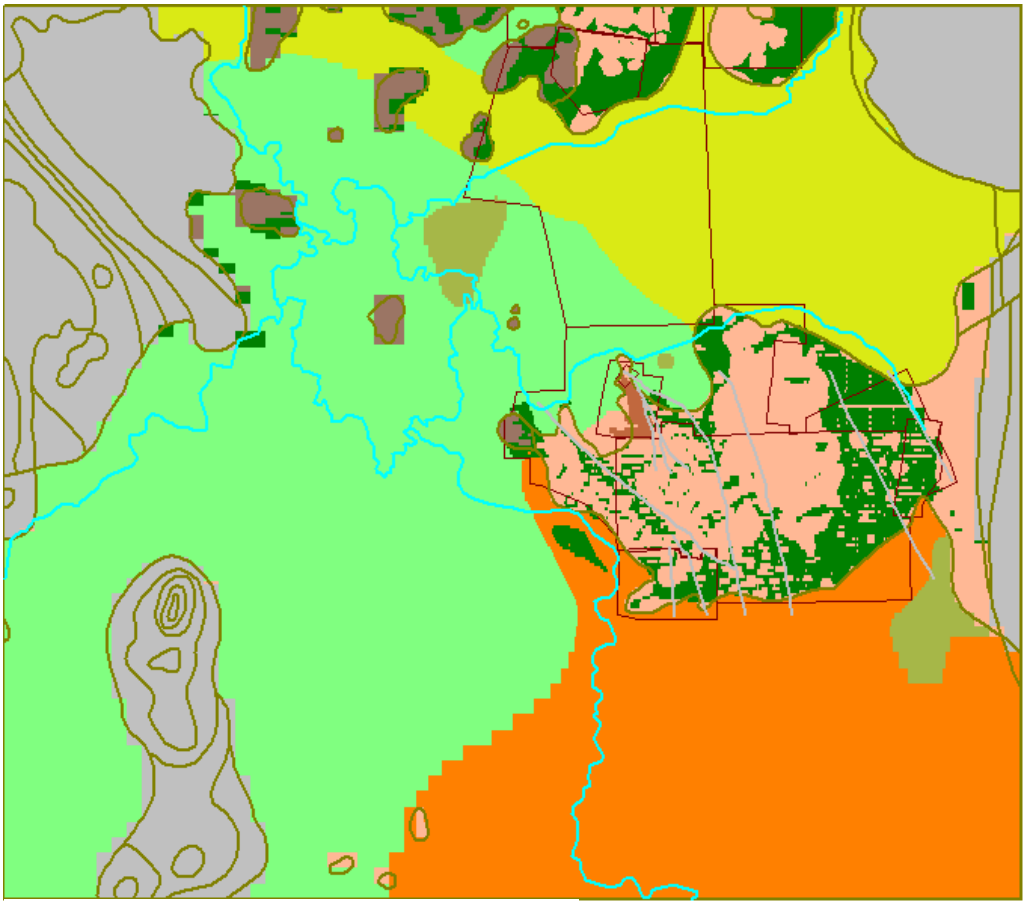
Calibrated Hydraulic and Storage Parameter Distributions



Legend

Zone	Kh (m/d)	Kv (m/d)	Sy	S
1	1.0e+001	5.0e-002	5.0e-002	1.0e-003
14	2.5e-003	5.0e-004	1.0e-002	1.0e-004
15	1.0e-002	1.0e-003	1.0e-002	1.0e-004
17	5.0e-003	5.0e-004	1.0e-002	1.0e-004
21	1.0e+000	1.0e+000	1.0e-001	5.0e-003
24	3.5e-001	1.0e-002	5.0e-002	1.0e-003
25	4.0e+001	1.0e-001	5.0e-002	1.0e-003
26	5.0e+000	1.0e-001	2.0e-001	1.0e-003

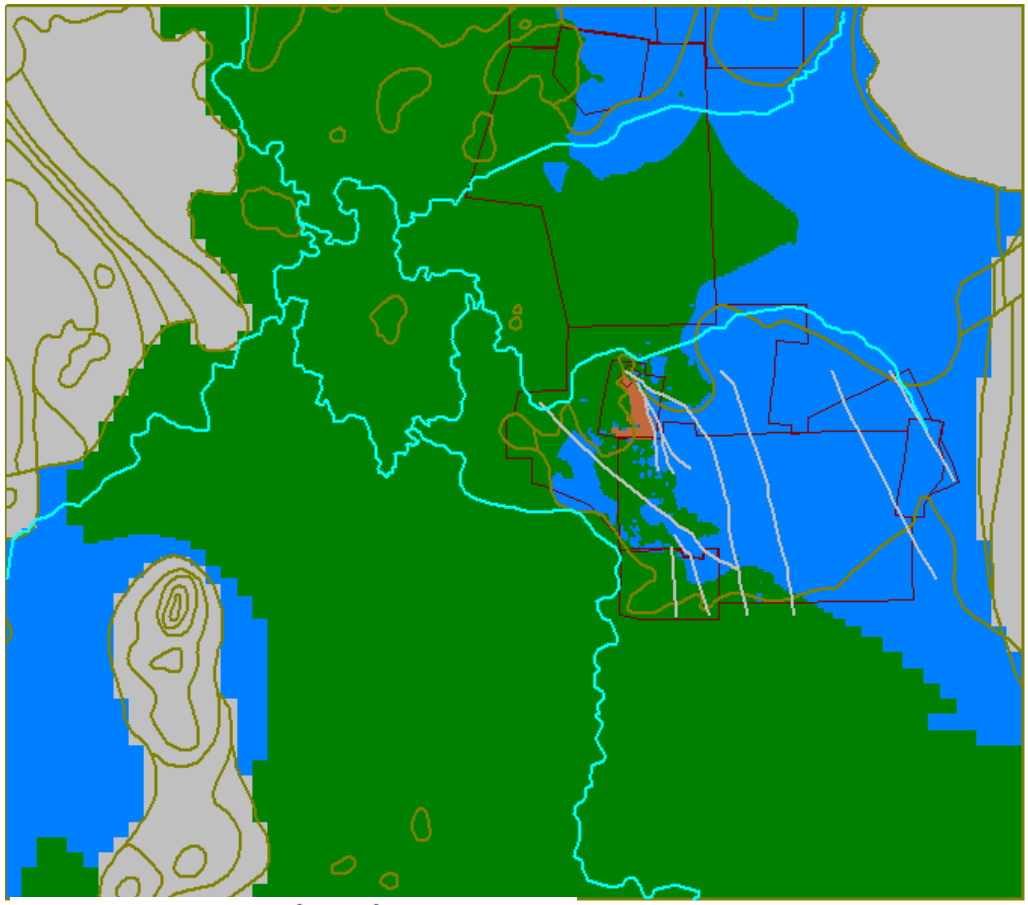
Figure AH-1. Hydraulic Property Zones for Layer 1



Legend

Zone	Kh (m/d)	Kv (m/d)	Sy	S
2	1.5e+001	1.0e-001	2.0e-001	5.0e-003
14	2.5e-003	5.0e-004	1.0e-002	1.0e-004
15	1.0e-002	1.0e-003	1.0e-002	1.0e-004
17	5.0e-003	5.0e-004	1.0e-002	1.0e-004
21	1.0e+000	1.0e+000	1.0e-001	5.0e-003
24	3.5e-001	1.0e-002	2.0e-001	5.0e-003
25	4.0e+001	1.0e-001	2.0e-001	5.0e-003
27	8.0e+000	5.0e-002	2.0e-001	5.0e-003

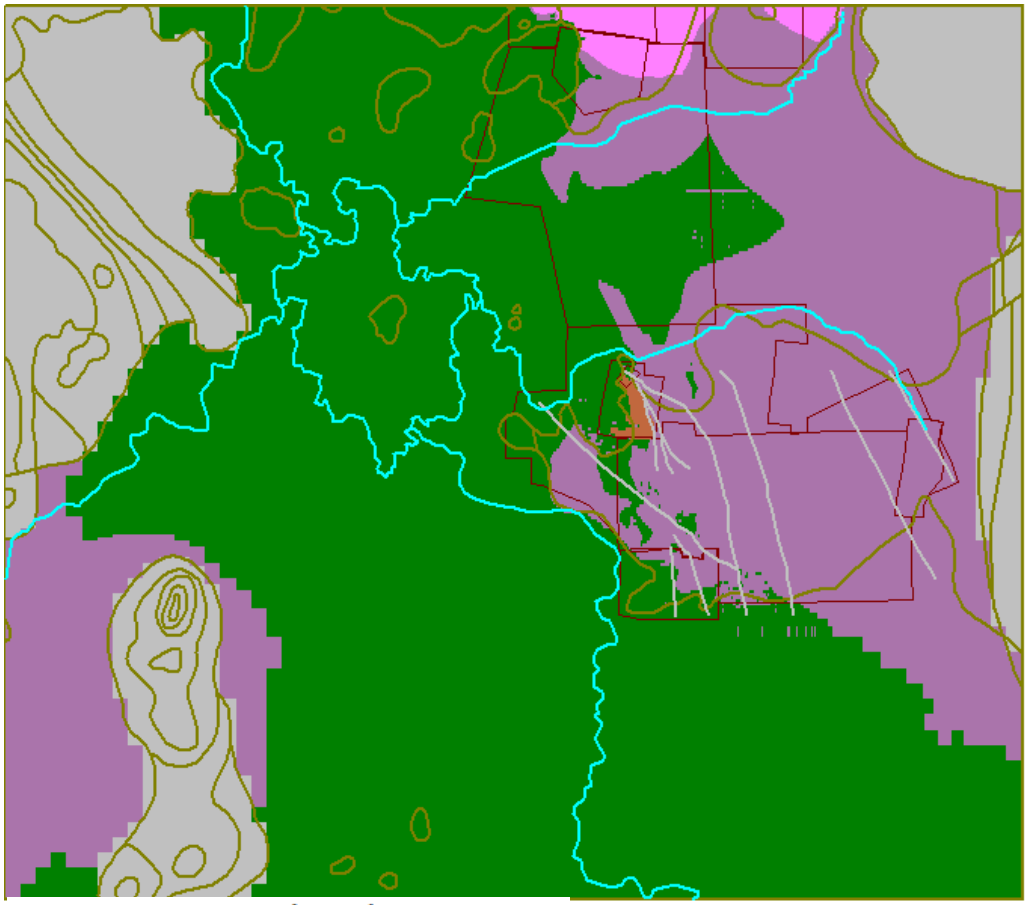
Figure AH-2. Hydraulic Property Zones for Layer 2



Legend

Zone	Kh (m/d)	Kv (m/d)	Sy	S
3	3.4e-004	1.2e-005	5.0e-003	5.0e-005
17	5.0e-003	5.0e-004	1.0e-002	1.0e-004
21	1.0e+000	1.0e+000	1.0e-001	5.0e-003

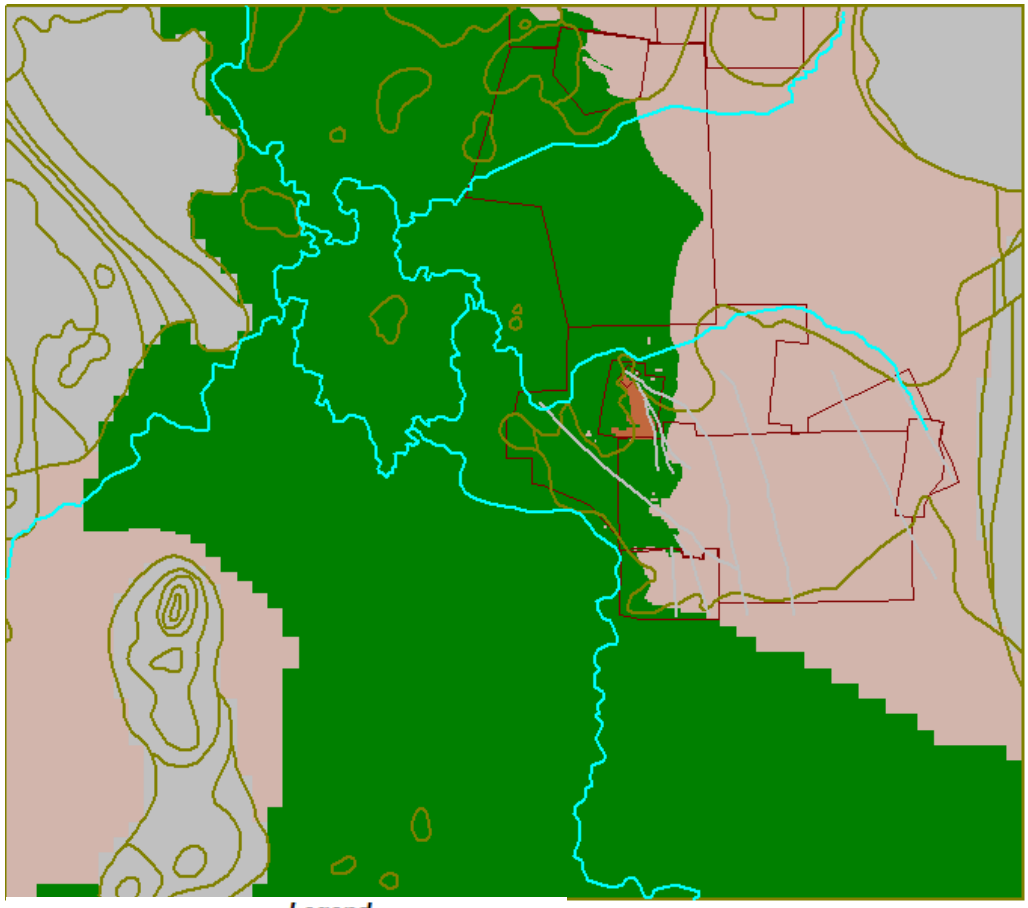
Figure AH-3. Hydraulic Property Zones for Layer 3



Legend

Zone	Kh (m/d)	Kv (m/d)	Sy	S
4	4.0e-001	1.0e-002	1.0e-002	1.0e-004
17	5.0e-003	5.0e-004	1.0e-002	1.0e-004
18	2.5e-001	1.0e-002	1.0e-002	1.0e-004
21	1.0e+000	1.0e+000	1.0e-001	5.0e-003

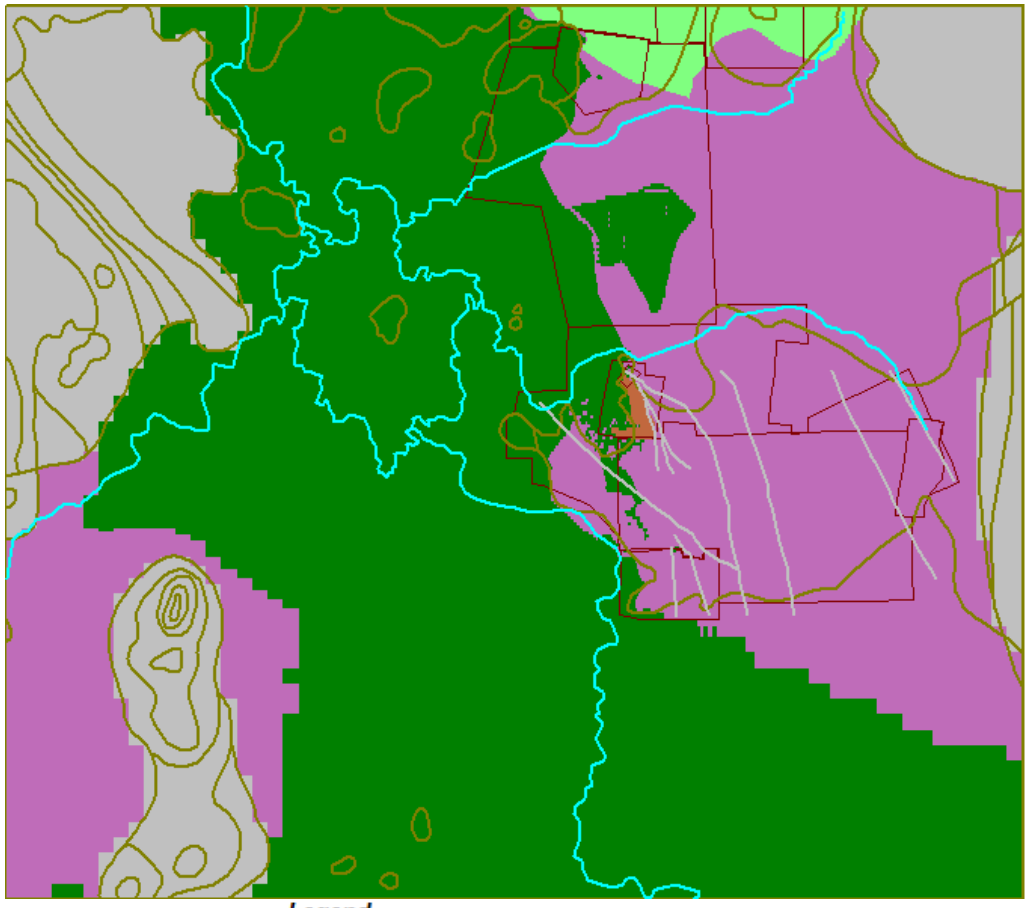
Figure AH-4. Hydraulic Property Zones for Layer 4



Legend

Zone	Kh (m/d)	Kv (m/d)	Sy	S
5	2.5e-004	1.3e-006	5.0e-003	5.0e-005
17	5.0e-003	5.0e-004	1.0e-002	1.0e-004
21	1.0e+000	1.0e+000	1.0e-001	5.0e-003

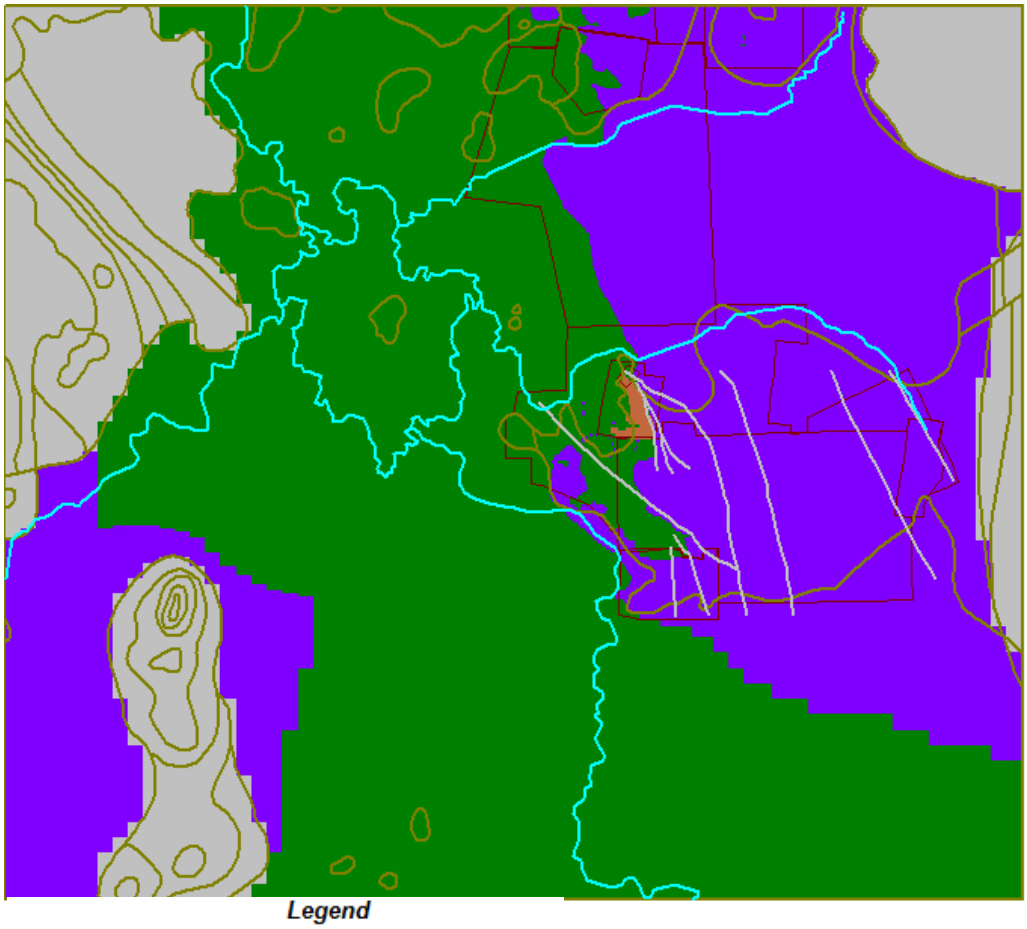
Figure AH-5. Hydraulic Property Zones for Layer 5



Legend

Zone	Kh (m/d)	Kv (m/d)	Sy	S
6	4.0e-001	1.0e-002	1.0e-002	1.0e-004
17	5.0e-003	5.0e-004	1.0e-002	1.0e-004
19	2.5e-001	1.0e-002	1.0e-002	1.0e-004
21	1.0e+000	1.0e+000	1.0e-001	5.0e-003

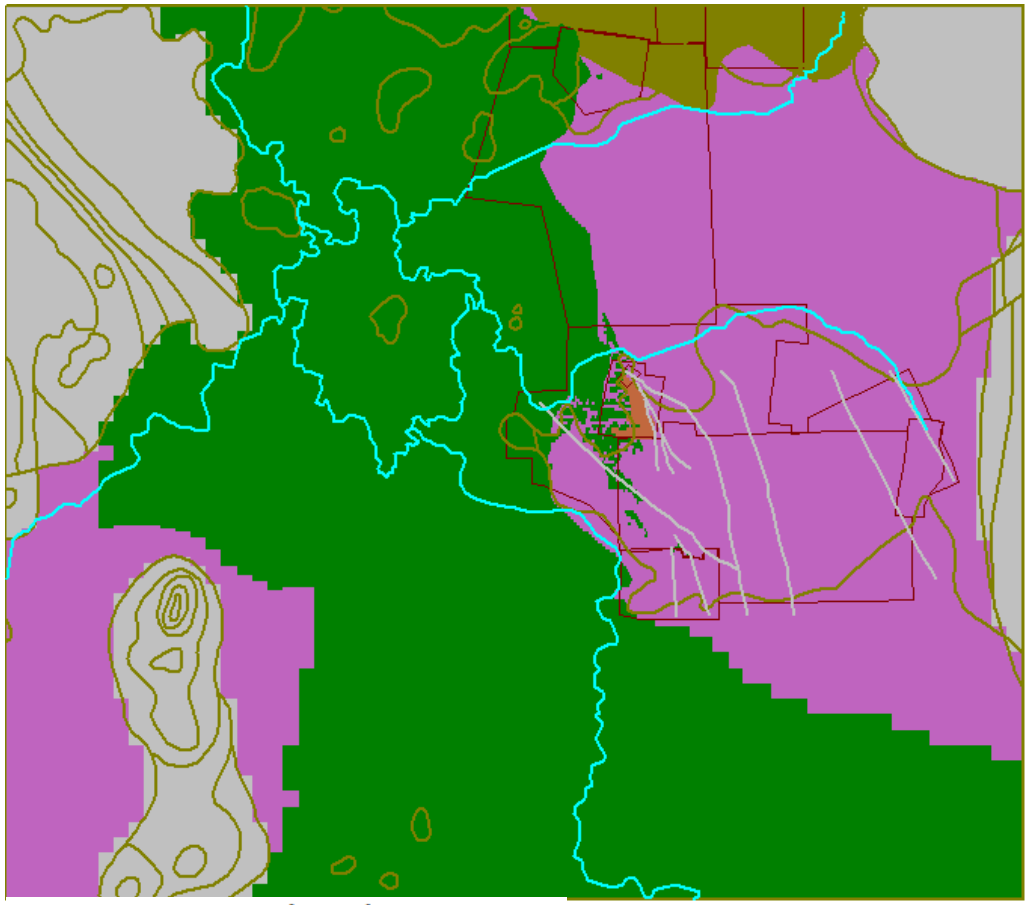
Figure AH-6. Hydraulic Property Zones for Layer 6



Legend

Zone	Kh (m/d)	Kv (m/d)	Sy	S
7	4.0e-005	1.1e-006	5.0e-003	5.0e-005
17	5.0e-003	5.0e-004	1.0e-002	1.0e-004
21	1.0e+000	1.0e+000	1.0e-001	5.0e-003

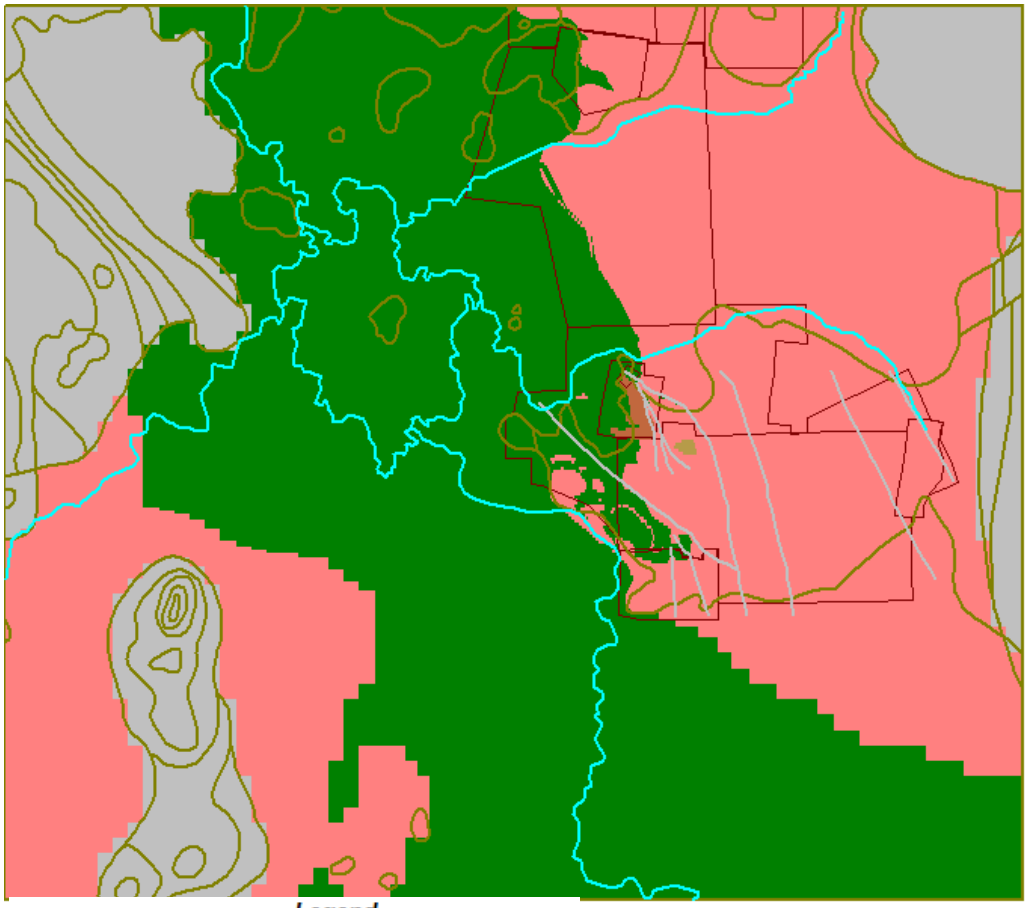
Figure AH-7. Hydraulic Property Zones for Layer 7



Legend

Zone	Kh (m/d)	Kv (m/d)	Sy	S
8	3.0e-001	1.0e-002	1.0e-002	1.0e-004
17	5.0e-003	5.0e-004	1.0e-002	1.0e-004
20	2.5e-001	1.0e-002	1.0e-002	1.0e-004
21	1.0e+000	1.0e+000	1.0e-001	5.0e-003

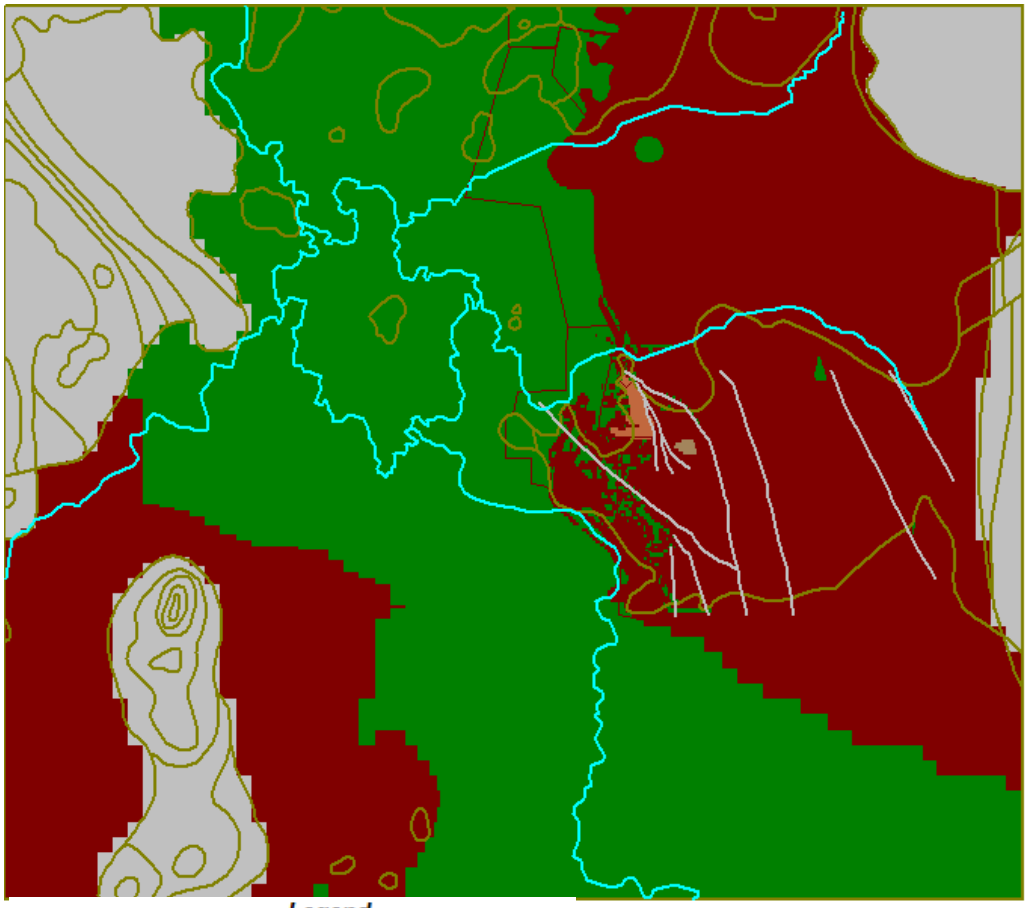
Figure AH-8. Hydraulic Property Zones for Layer 8



Legend

Zone	Kh (m/d)	Kv (m/d)	Sy	S
9	3.0e-005	8.3e-007	5.0e-003	5.0e-005
17	5.0e-003	5.0e-004	1.0e-002	1.0e-004
21	1.0e+000	1.0e+000	1.0e-001	5.0e-003
23	6.1e-005	8.3e-006	4.0e-002	1.0e-004

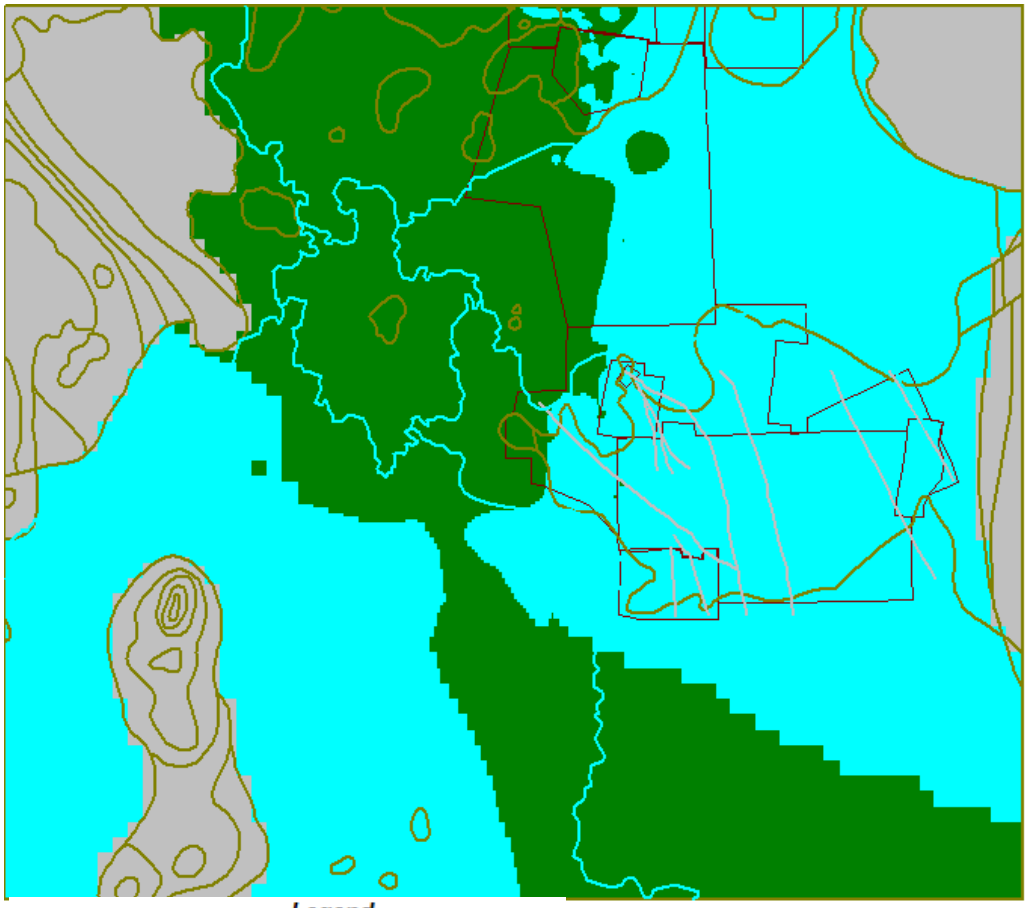
Figure AH-9. Hydraulic Property Zones for Layer 9



Legend

Zone	Kh (m/d)	Kv (m/d)	Sy	S
10	5.0e-002	1.0e-002	1.0e-002	1.0e-004
17	5.0e-003	5.0e-004	1.0e-002	1.0e-004
21	1.0e+000	1.0e+000	1.0e-001	5.0e-003
22	1.0e+001	1.0e+001	2.5e-001	5.0e-004

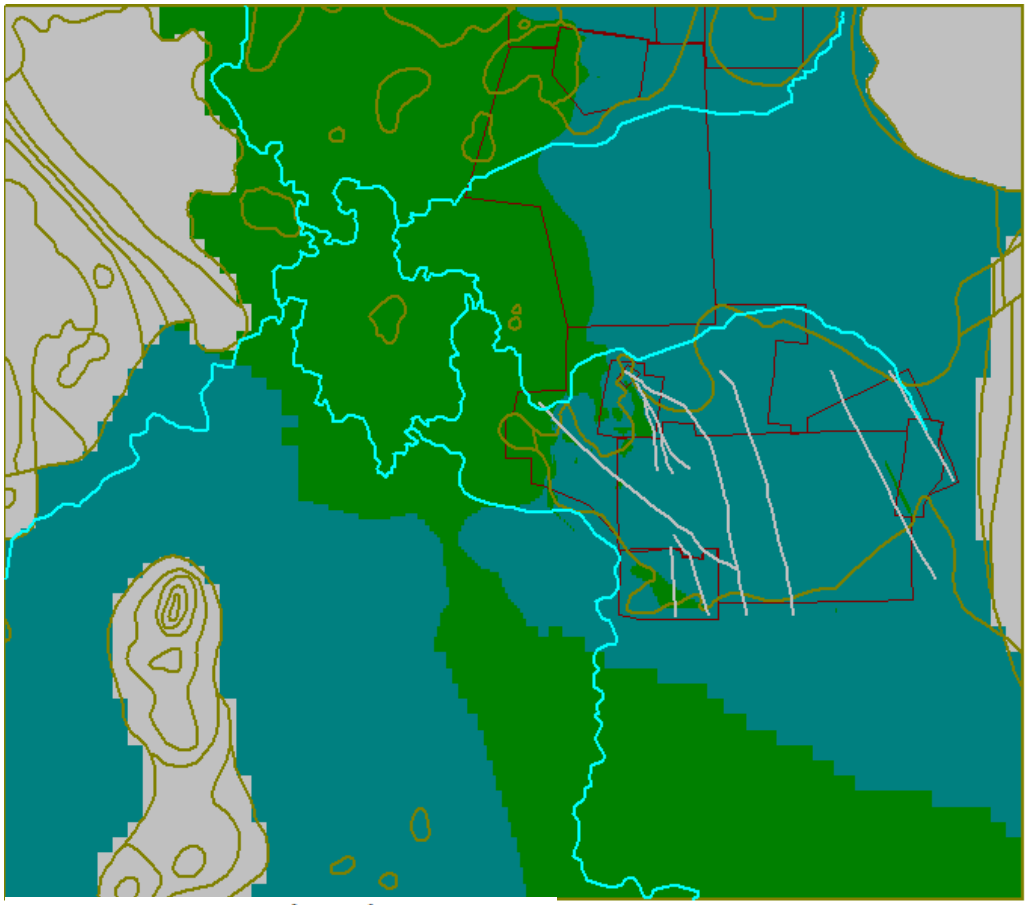
Figure AH-10. Hydraulic Property Zones for Layer 10



Legend

Zone	Kh (m/d)	Kv (m/d)	Sy	S
11	3.0e-005	3.6e-006	5.0e-003	5.0e-005
17	5.0e-003	5.0e-004	1.0e-002	1.0e-004

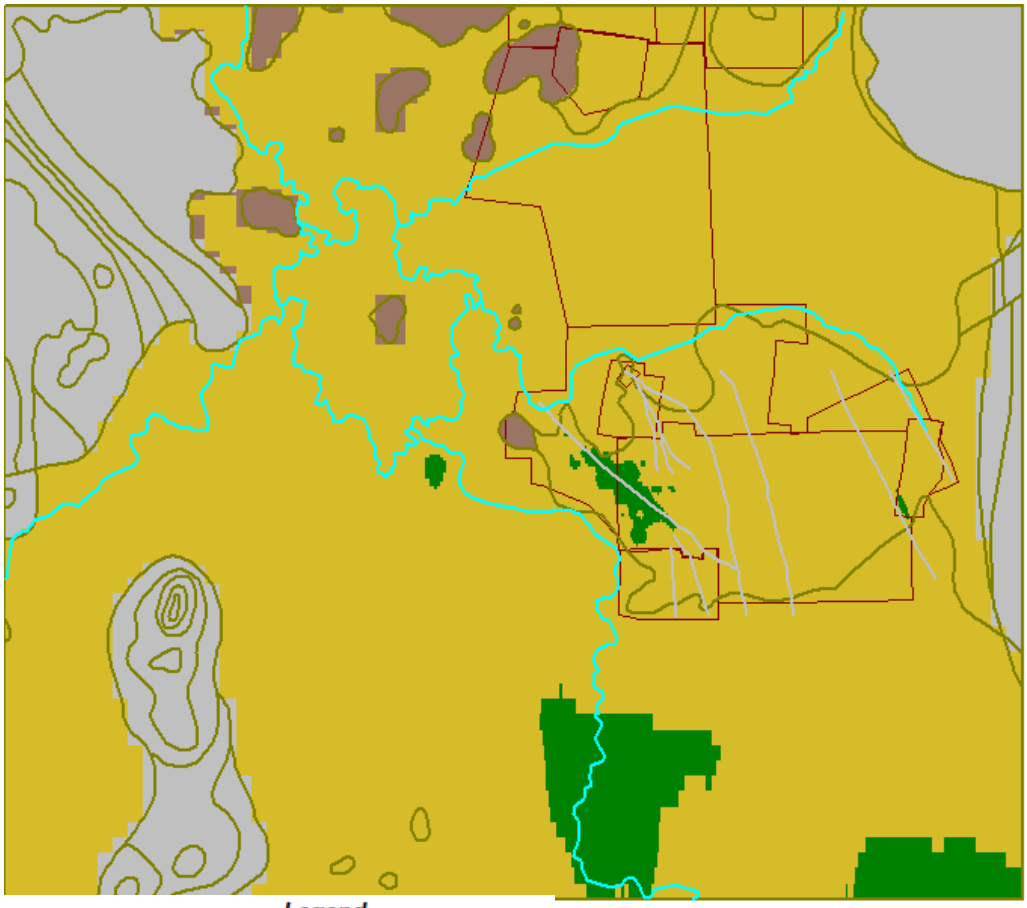
Figure AH-11. Hydraulic Property Zones for Layer 11



Legend

Zone	Kh (m/d)	Kv (m/d)	Sy	S
12	5.0e-002	1.0e-002	1.0e-002	1.0e-004
17	5.0e-003	5.0e-004	1.0e-002	1.0e-004

Figure AH-12. Hydraulic Property Zones for Layer 12



Legend

Zone	Kh (m/d)	Kv (m/d)	Sy	S
13	3.0e-005	2.0e-006	5.0e-003	5.0e-005
14	2.5e-003	5.0e-004	1.0e-002	1.0e-004
17	5.0e-003	5.0e-004	1.0e-002	1.0e-004

Figure AH-13. Hydraulic Property Zones for Layer 13

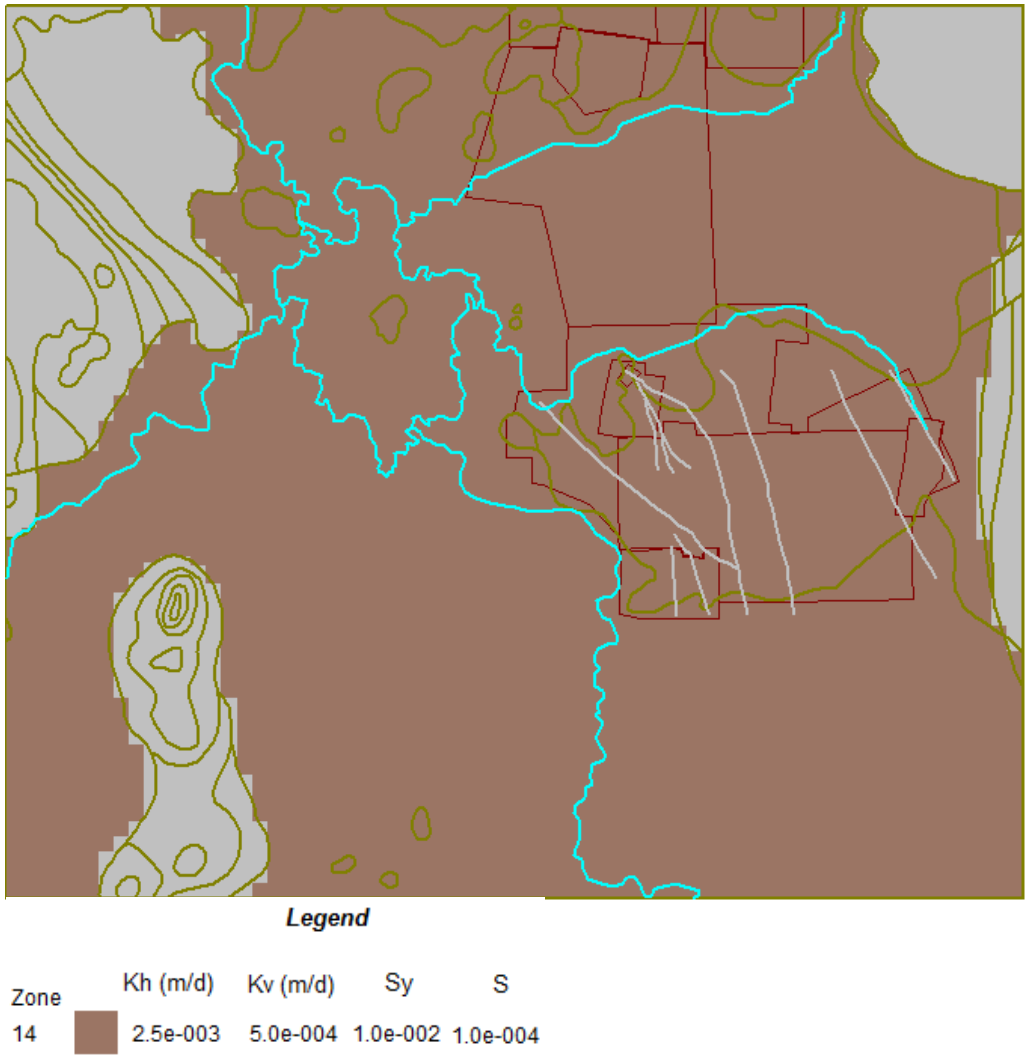


Figure AH-14. Hydraulic Property Zone for Layer 14

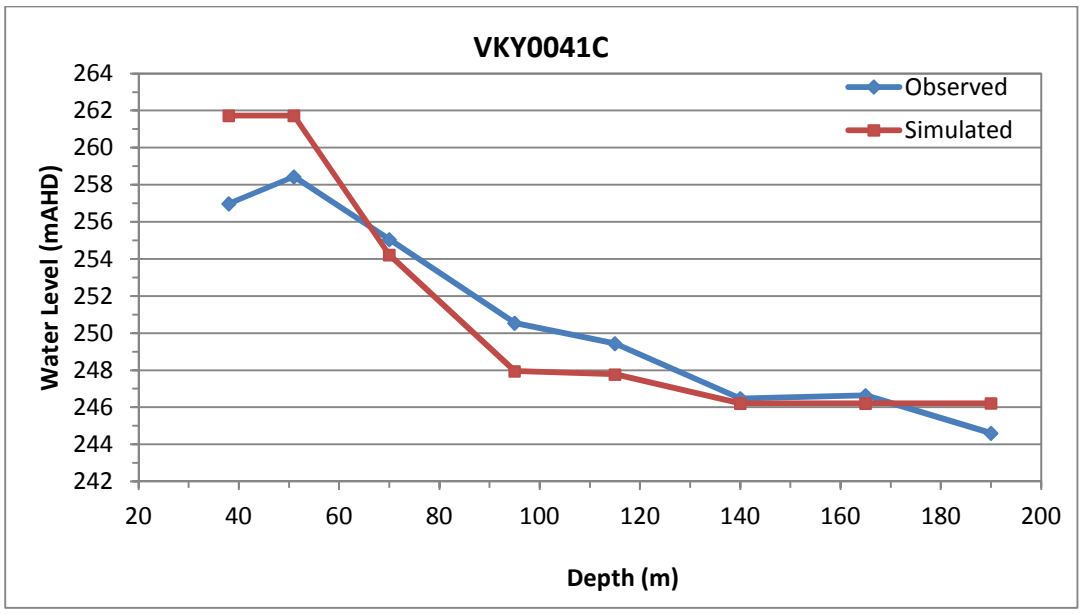
ATTACHMENT AI

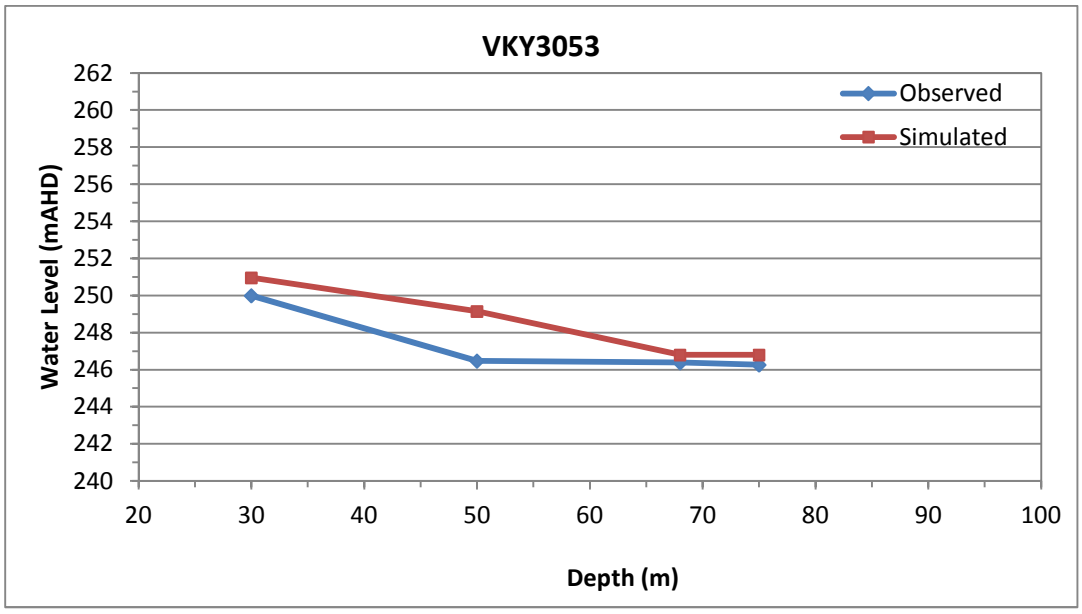
Calibration Hydrographs

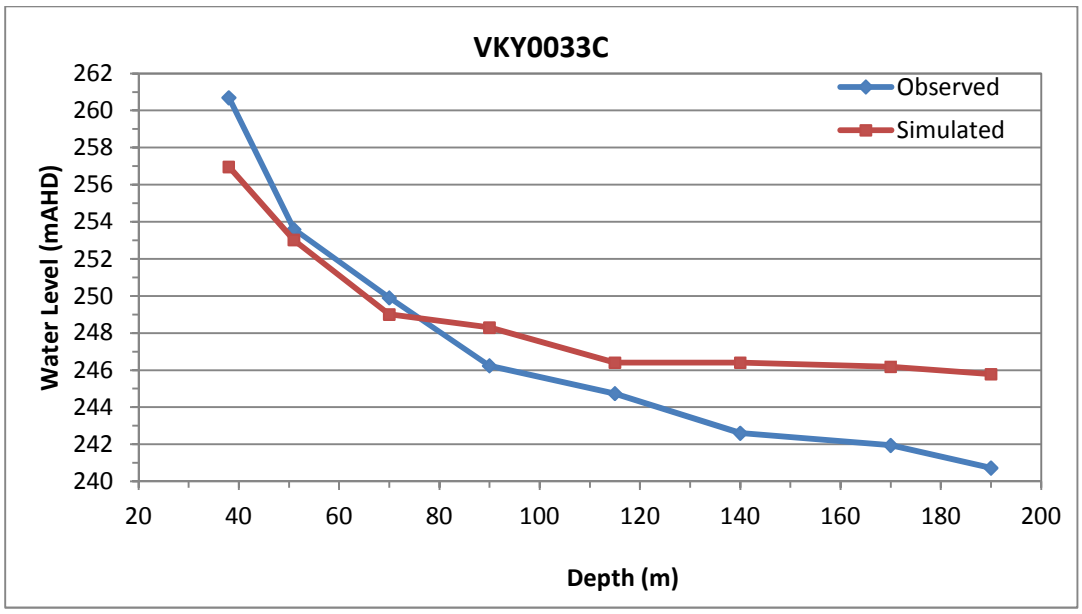
Vickery Coal Mine Monitoring Network

Vibrating Wire Piezometers

VKY0041C, VKY3053 and VKY0033C


VKY0041C
Observed
Simulated
Water Level (mAHD)
264
262
260
258
256
254
252
250
248
246
244
242
20
40
60
80
100
120
140
160
180
200
Depth (m)


VKY3053
Observed
Simulated
Water Level (mAHD)
262
260
258
256
254
252
250
248
246
244
242
240
20
30
40
50
60
70
80
90
100
Depth (m)


VKY0033C
Observed
Simulated
Water Level (mAHD)
262
260
258
256
254
252
250
248
246
244
242
240
20
40
60
80
100
120
140
160
180
200
Depth (m)

Vickery Coal Mine Monitoring Network

Standpipes

TR7, TR18, VKY0034, VKY0035, VKY0036, VKY0042 and VKY0043

Stand Pipe	Formation	Measured Water Level (mAHD)	Simulated Water Level (mAHD)	Residual
TR7	Alluvium	245.5	246.1	-0.6
TR18	Alluvium	246.0	249.4	-3.4
VKY0034	Shannon Harbour Seam	244.8	246.5	-1.7
VKY0035	Kurrumbede - Shannon Harbour interburden	243.7	246.3	-2.6
VKY0036	Shannon Harbour - Stratford Interburden	250.8	246.2	4.5
VKY0042	Stratford Seam	249.5	246.7	2.8
VKY0043	Bluevale - Cranleigh	247.7	245.7	2.0

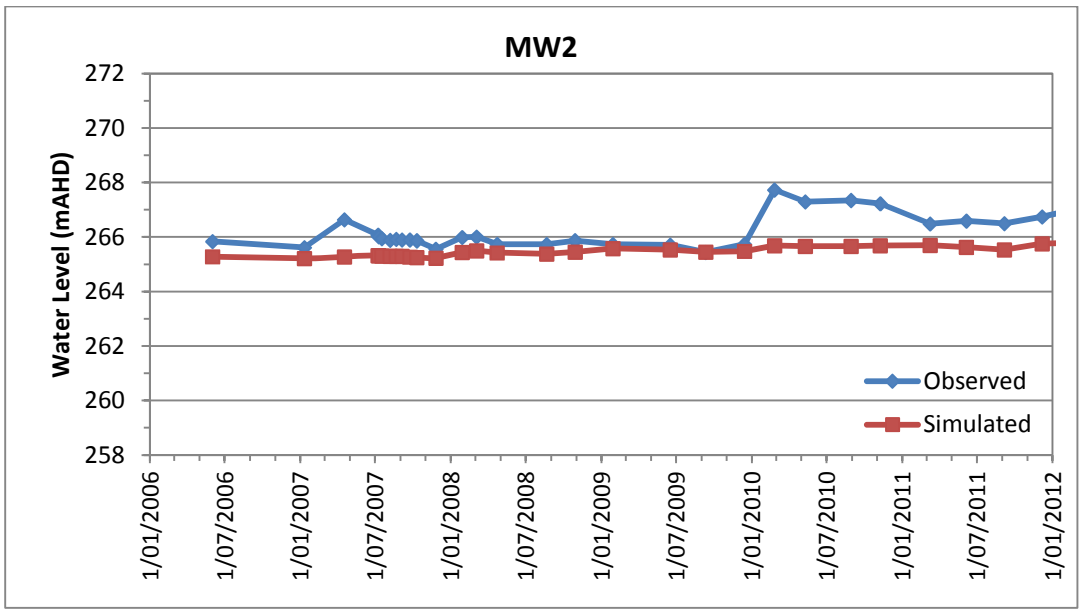
Tarrawonga Coal Mine Monitoring Network – Alluvium

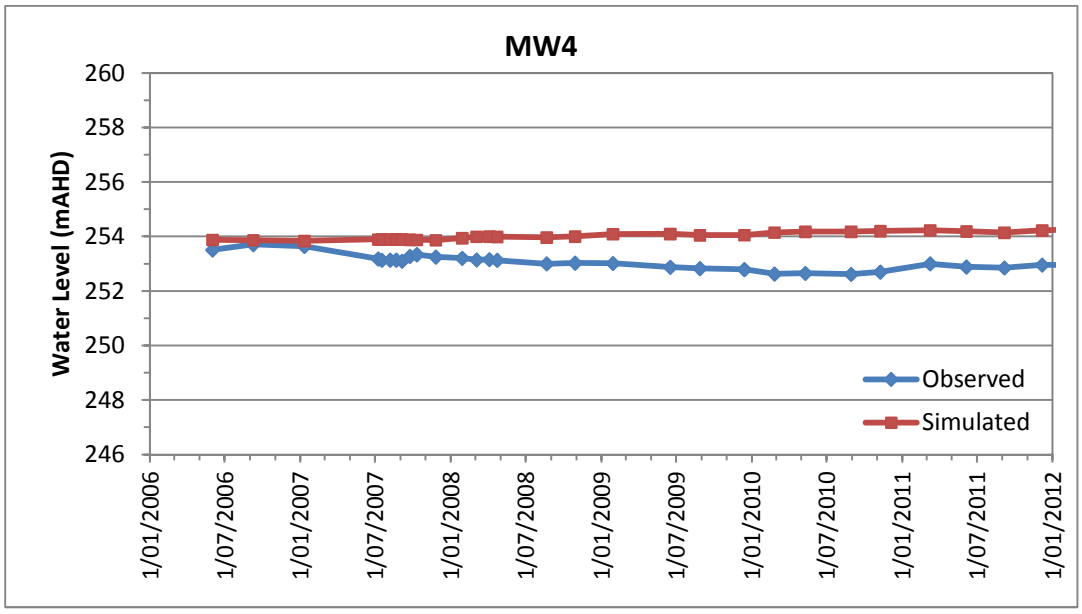
MW2, MW4, MW5, MW6

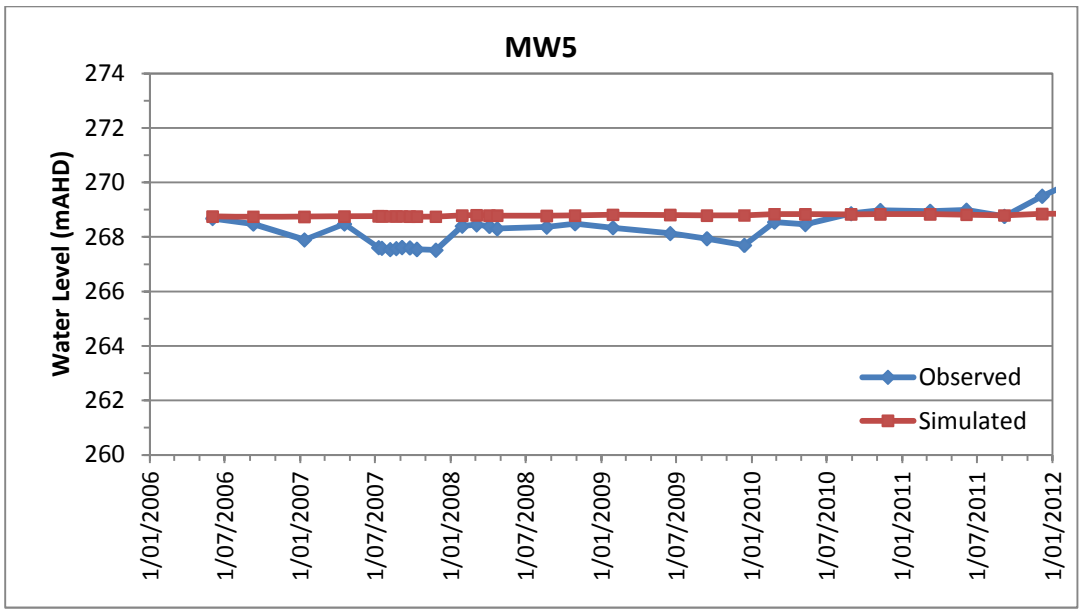
GW031856, GW044997, GW052266

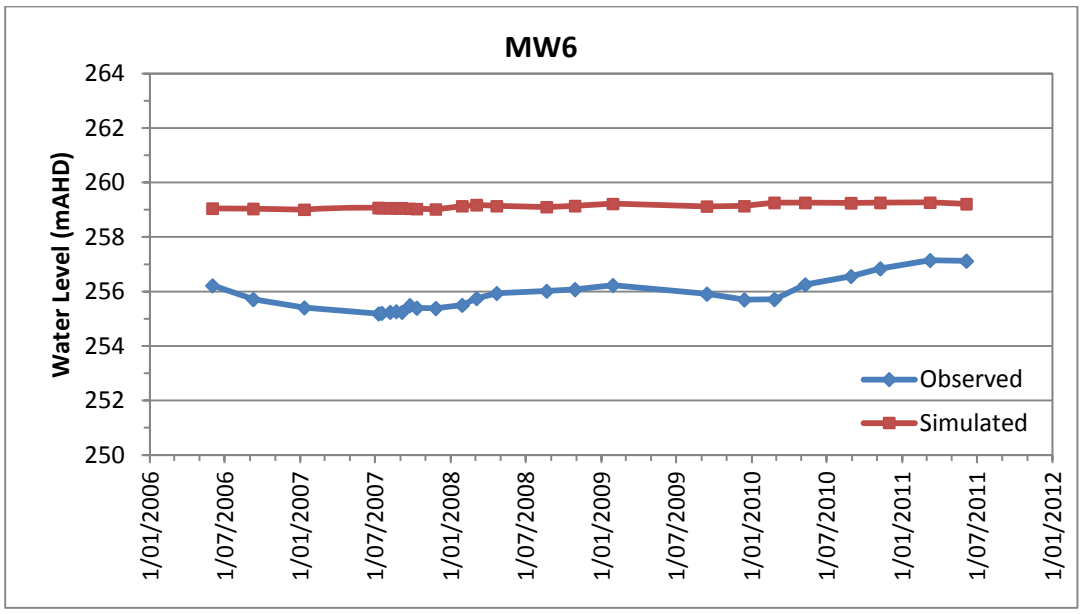
Templemore A and B

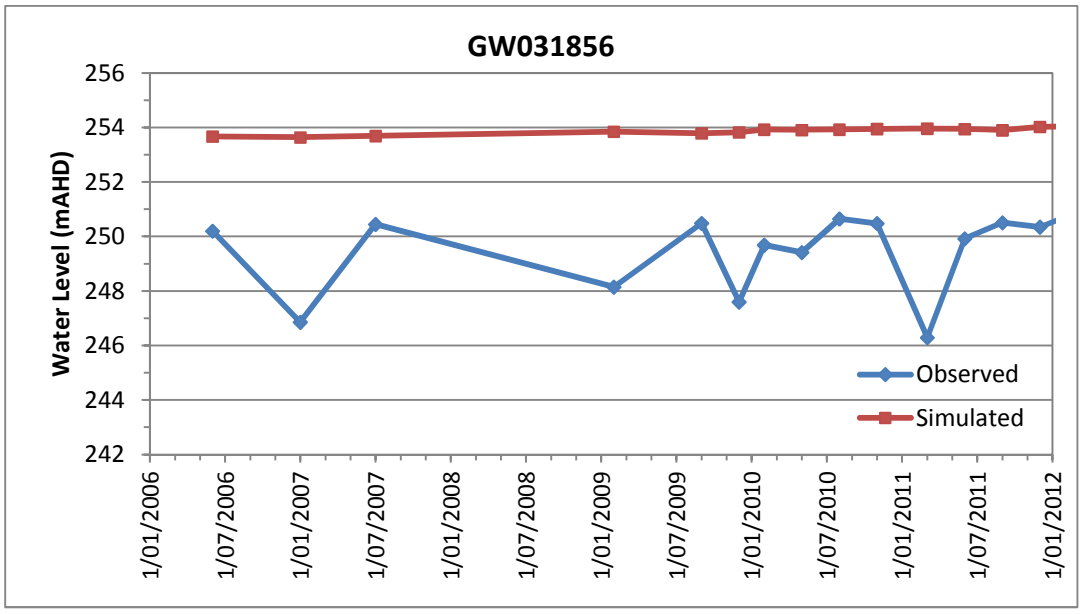
BCS3 to BCS7

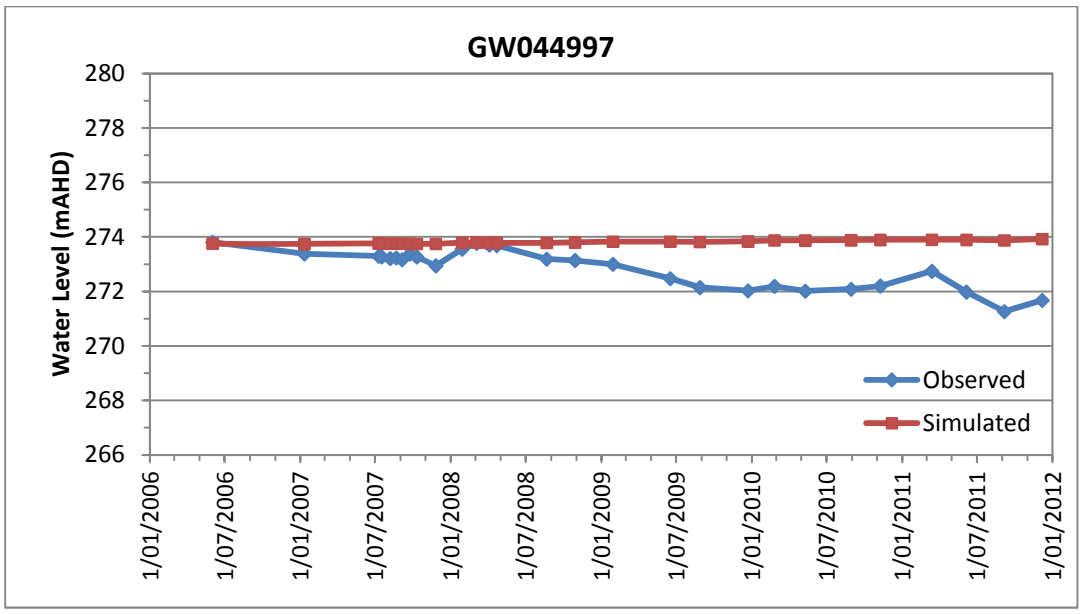

MW2
Water Level (mAHD)
272
270
268
266
264
262
260
258
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

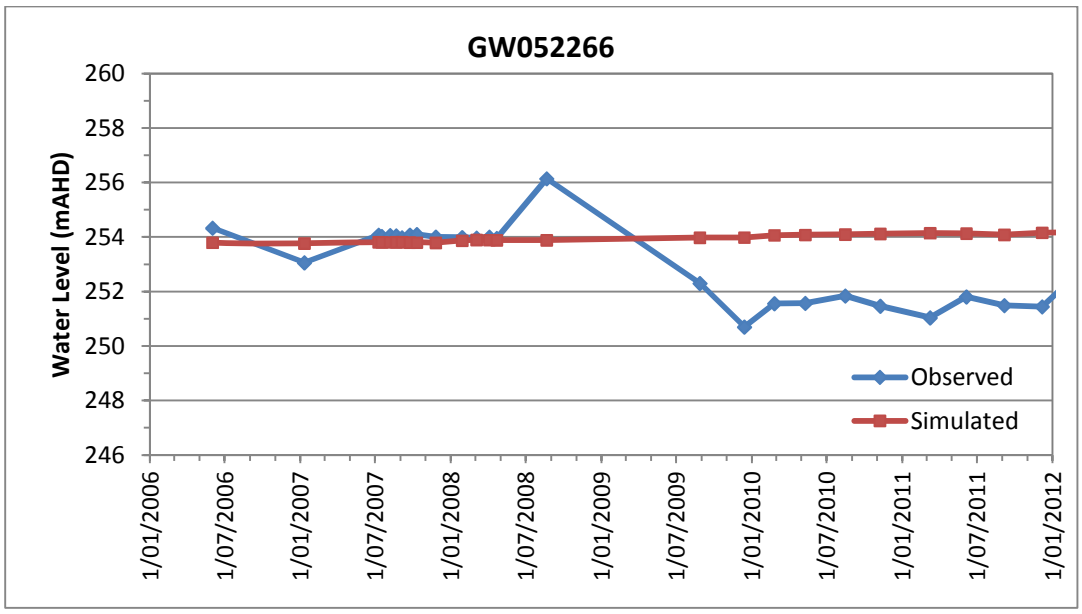

MW4
Water Level (mAHD)
260
258
256
254
252
250
248
246
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

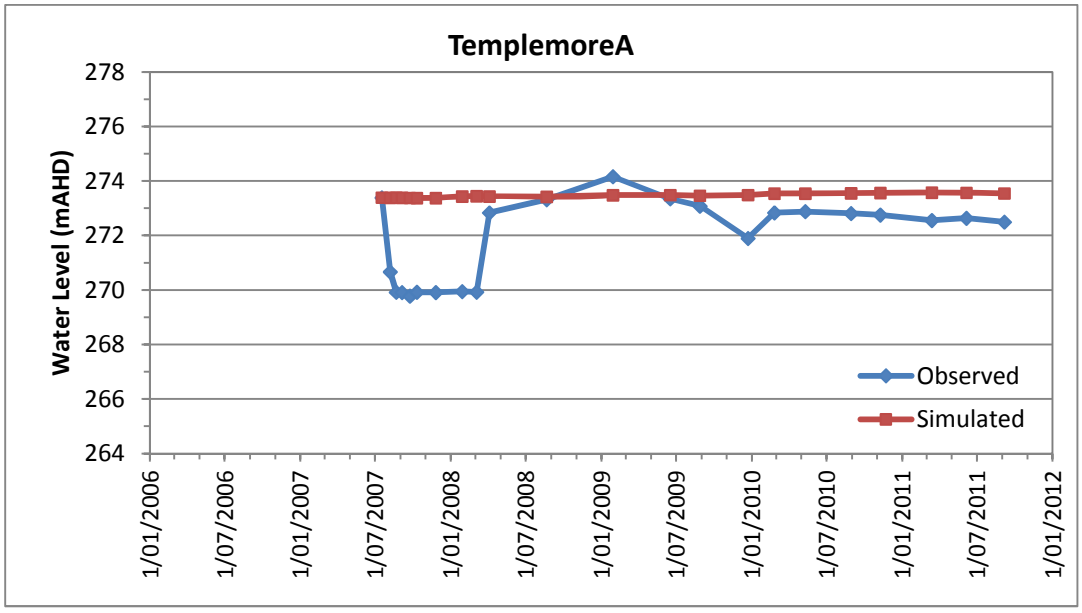

MW5
Water Level (mAHD)
274
272
270
268
266
264
262
260
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

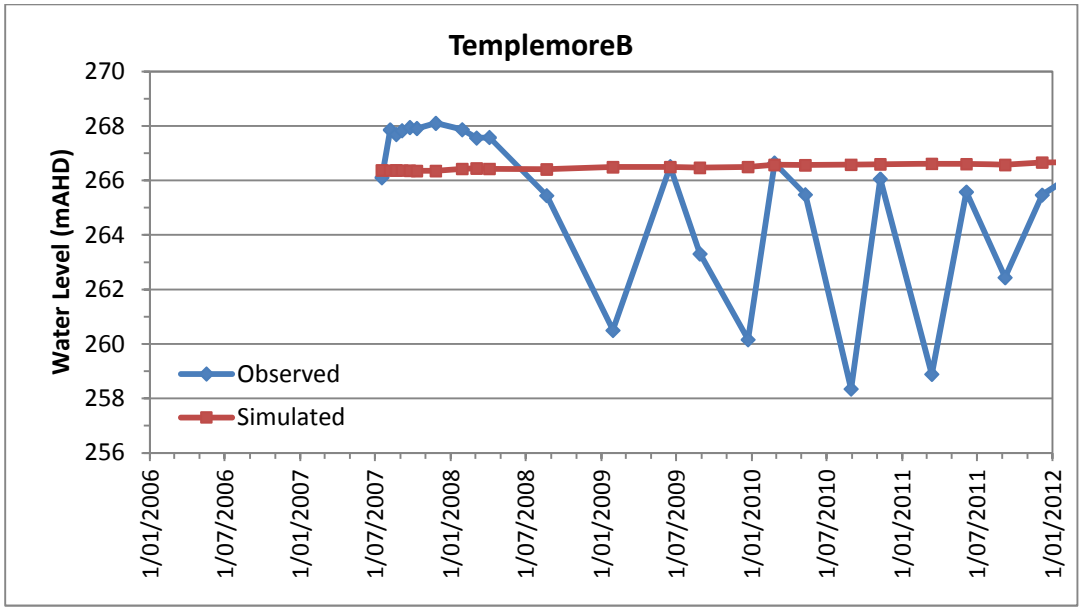

MW6
Water Level (mAHD)
264
262
260
258
256
254
252
250
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

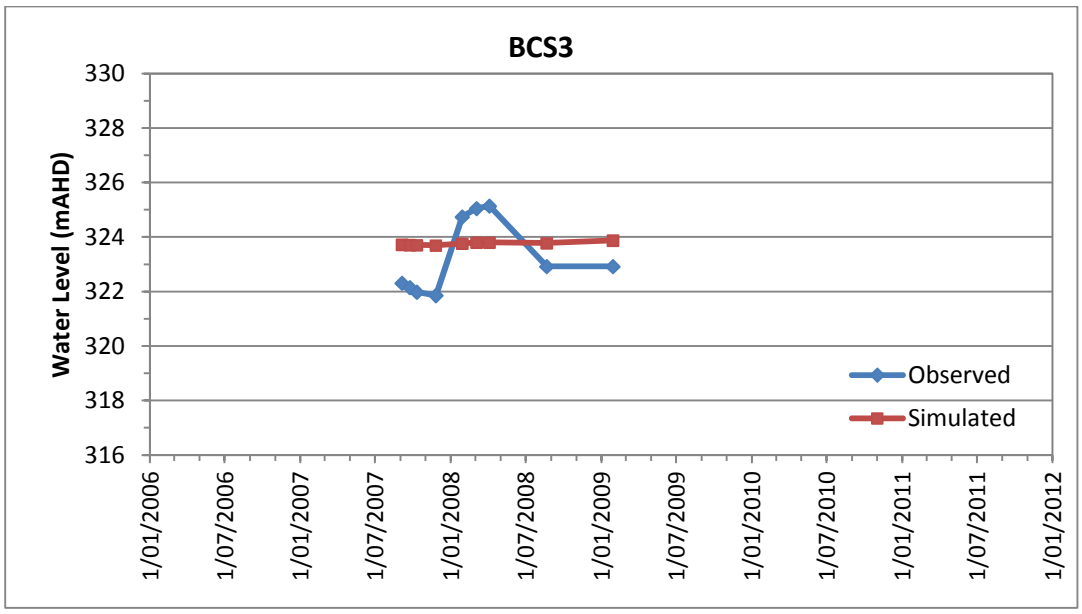

GW031856
Water Level (mAHD)
256
254
252
250
248
246
244
242
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

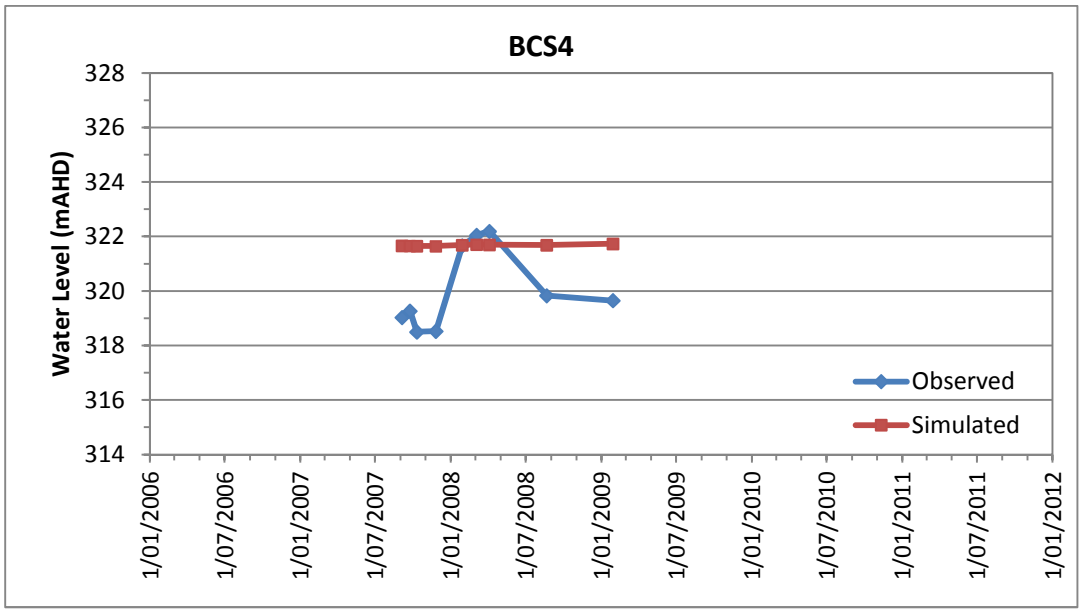

GW044997
Water Level (mAHD)
280
278
276
274
272
270
268
266
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

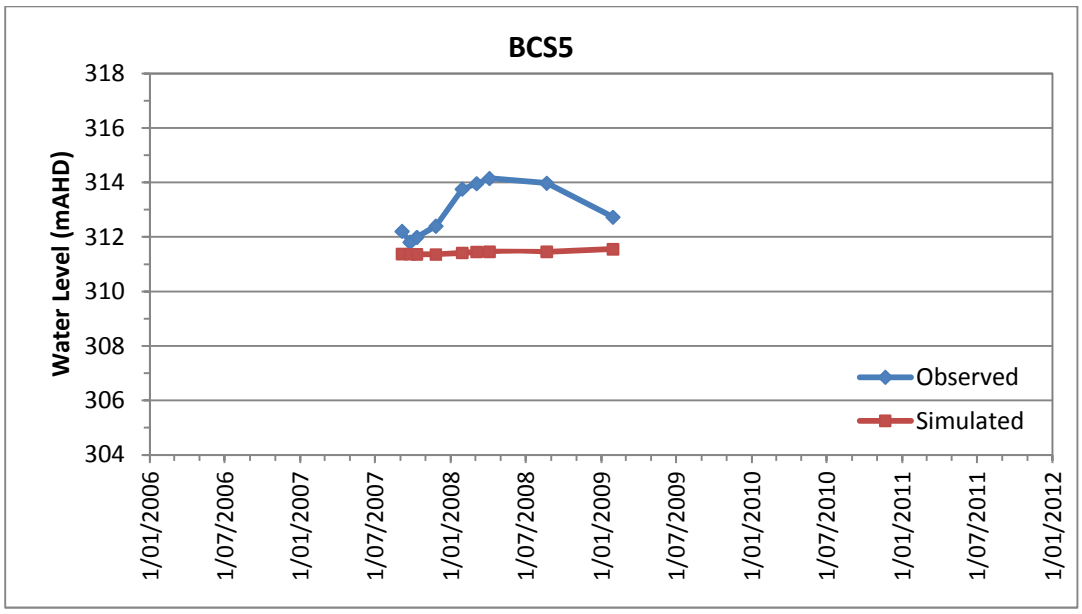

GW052266
Water Level (mAHD)
260
258
256
254
252
250
248
246
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

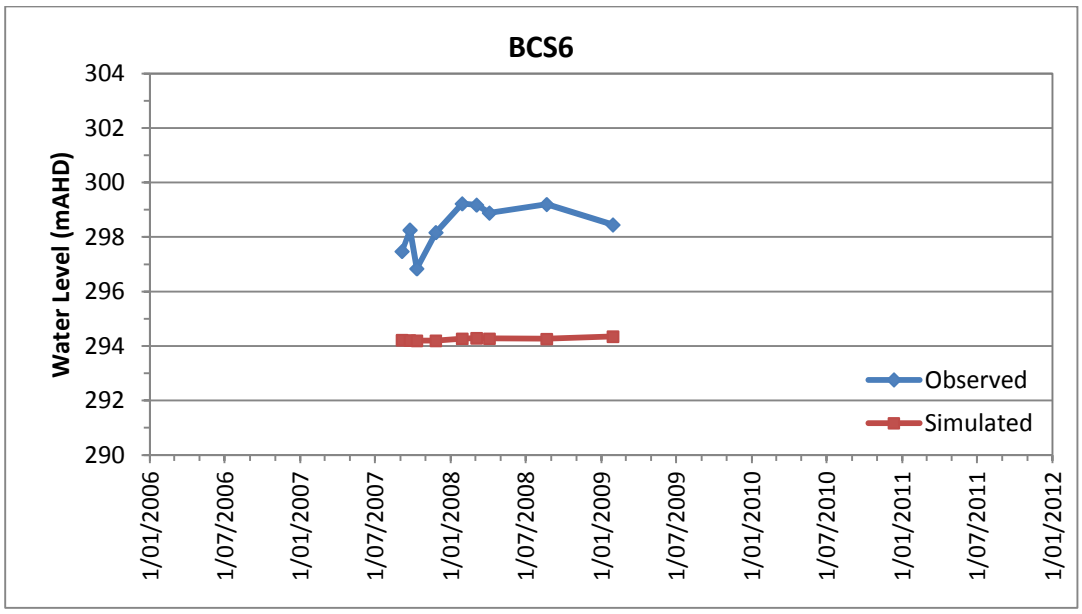

TemplemoreA
Water Level (mAHD)
278
276
274
272
270
268
266
264
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

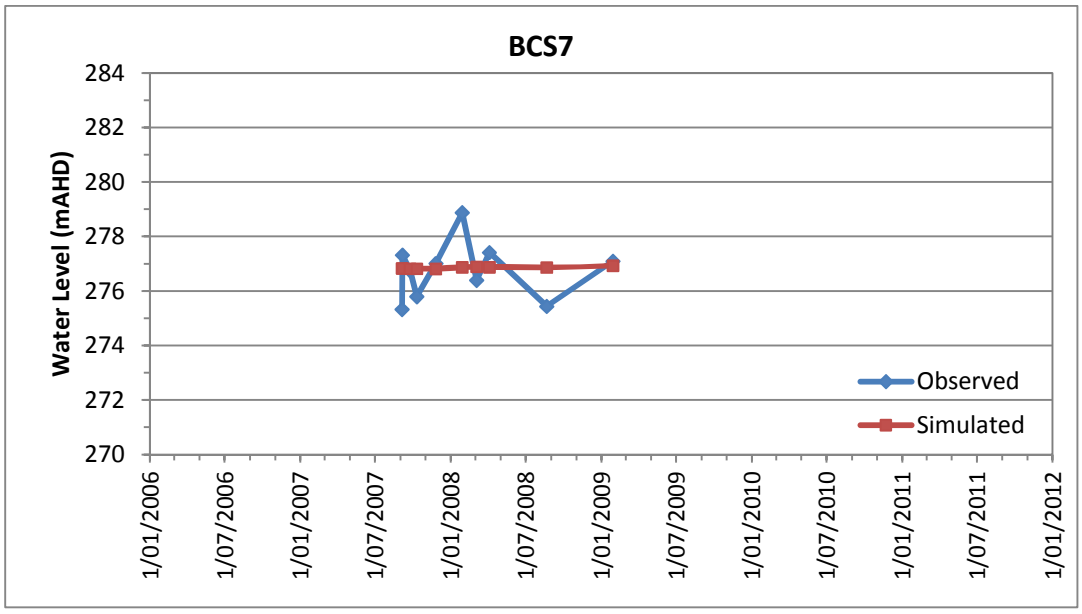

TemplemoreB
Water Level (mAHD)
270
268
266
264
262
260
258
256
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated


BCS3
Water Level (mAHD)
330
328
326
324
322
320
318
316
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated


BCS4
Water Level (mAHD)
328
326
324
322
320
318
316
314
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated


BCS5
Water Level (mAHD)
318
316
314
312
310
308
306
304
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

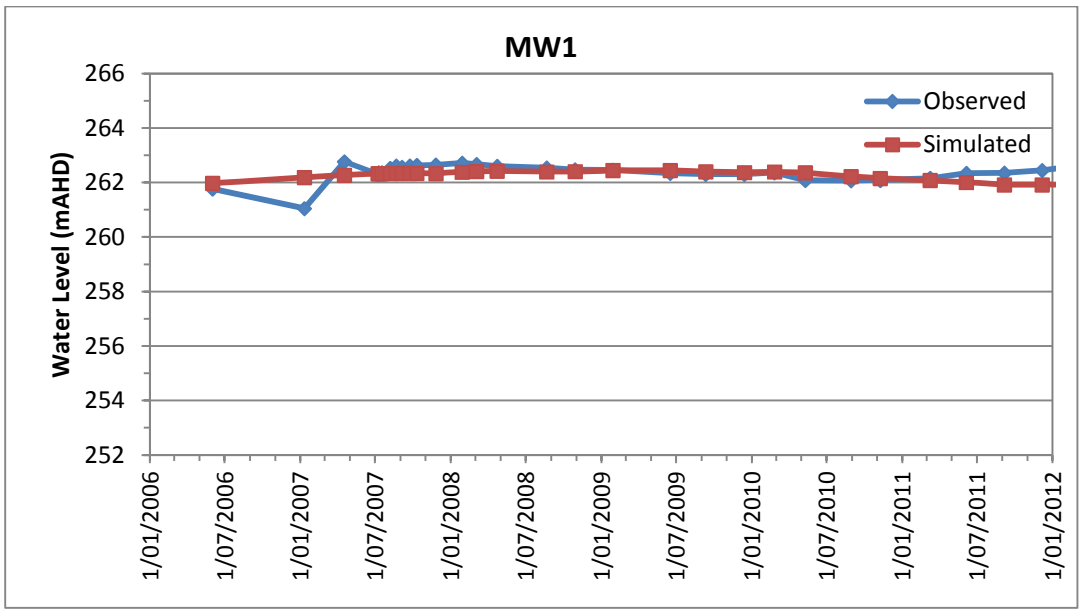

BCS6
Water Level (mAHD)
304
302
300
298
296
294
292
290
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

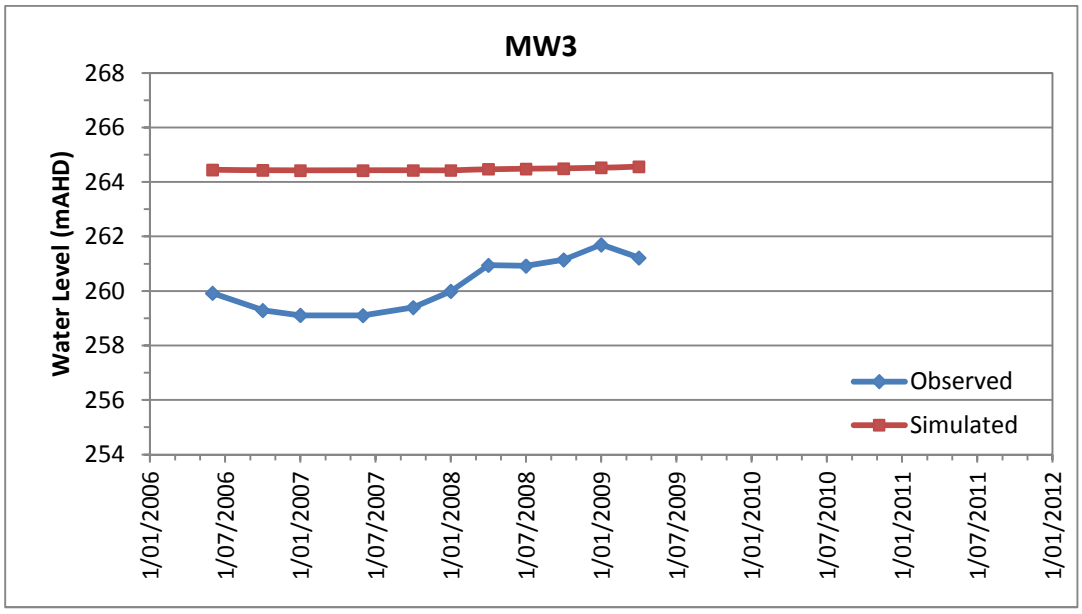

BCS7
Water Level (mAHD)
284
282
280
278
276
274
272
270
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

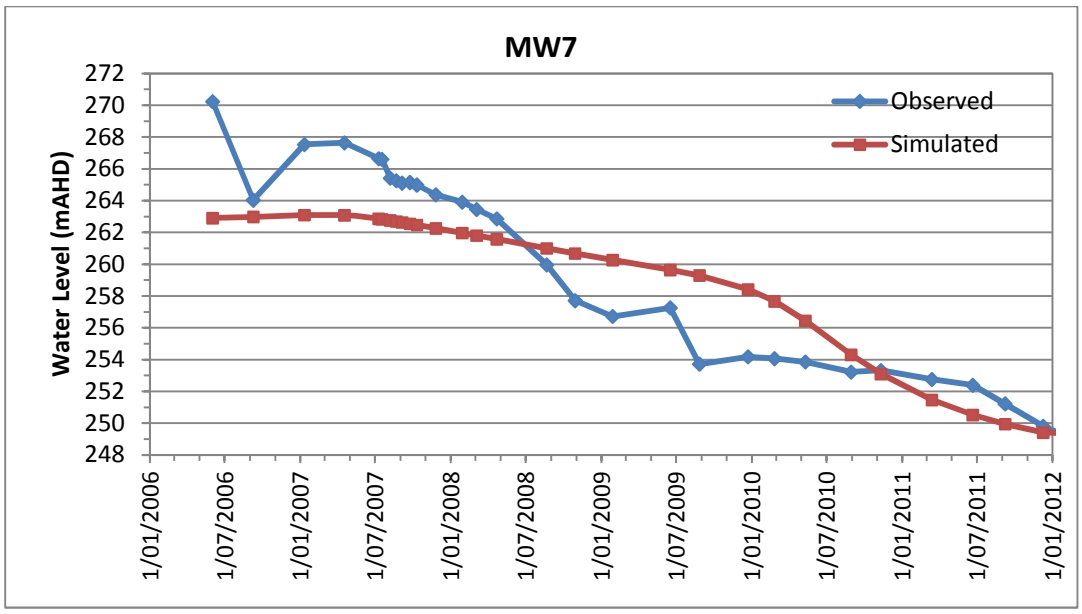
Tarrawonga Mine Coal, Coal Measures and Volcanics

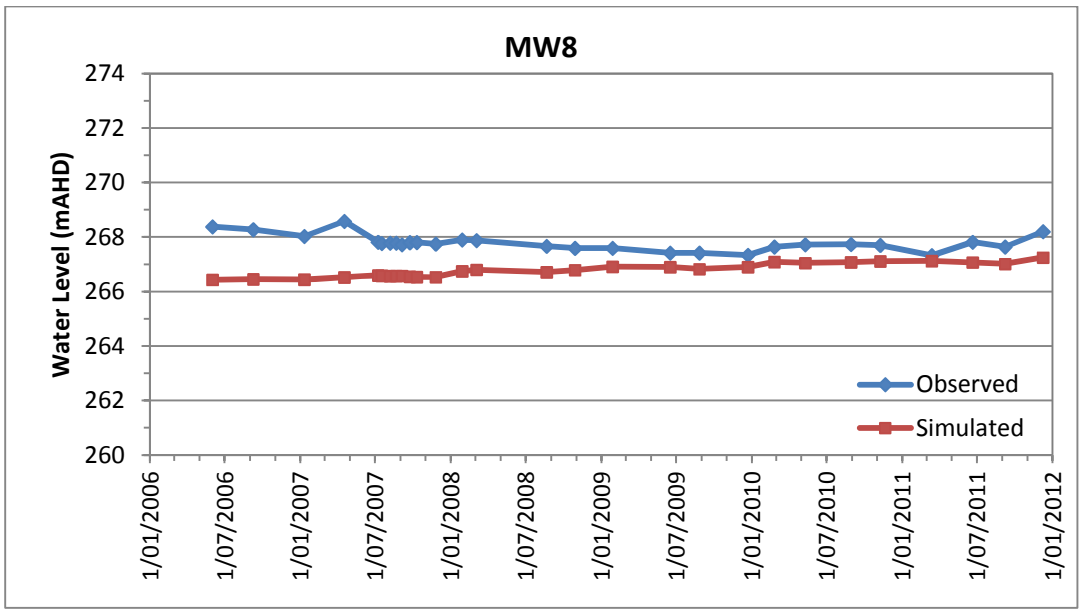
MW1, MW3, MW7, MW8

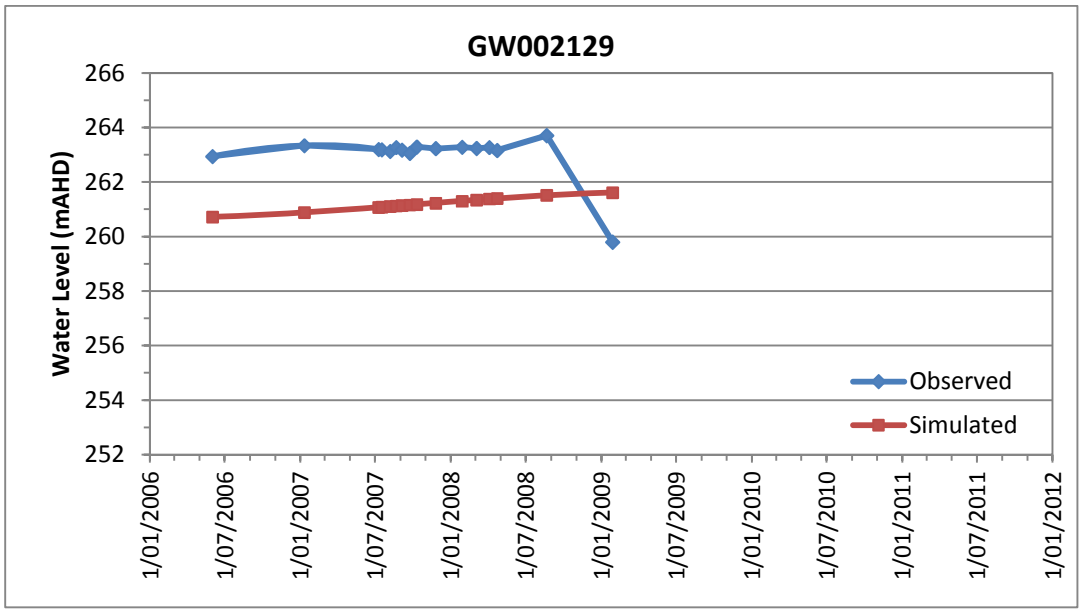
GW002129, GW002501

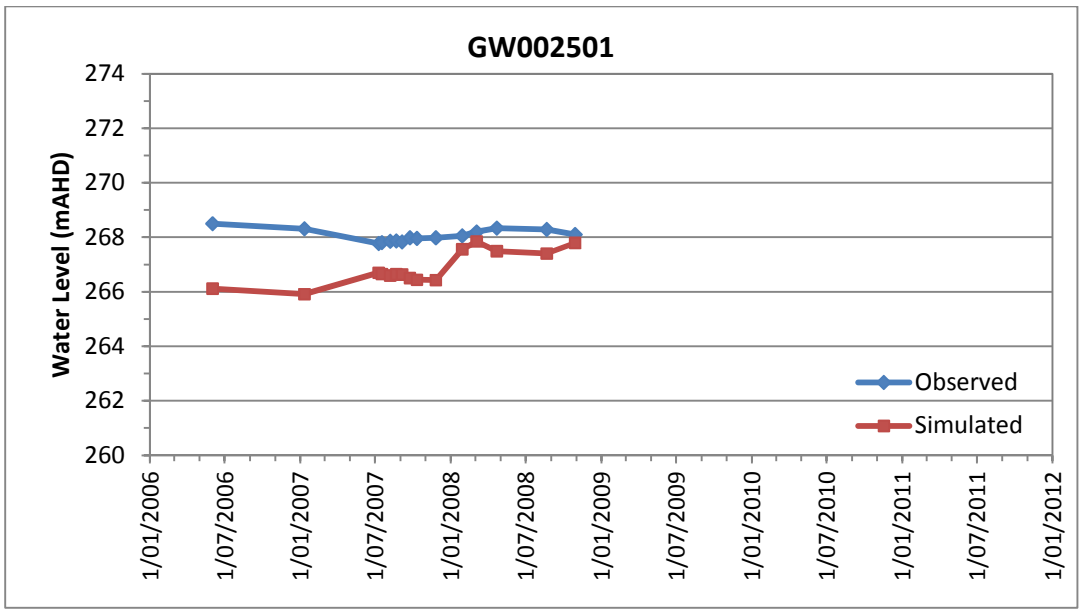

MW1
Water Level (mAHD)
266
264
262
260
258
256
254
252
Observed
Simulated
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012


MW3
Water Level (mAHD)
268
266
264
262
260
258
256
254
Observed
Simulated
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012


MW7
Water Level (mAHD)
272
270
268
266
264
262
260
258
256
254
252
250
248
Observed
Simulated
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012

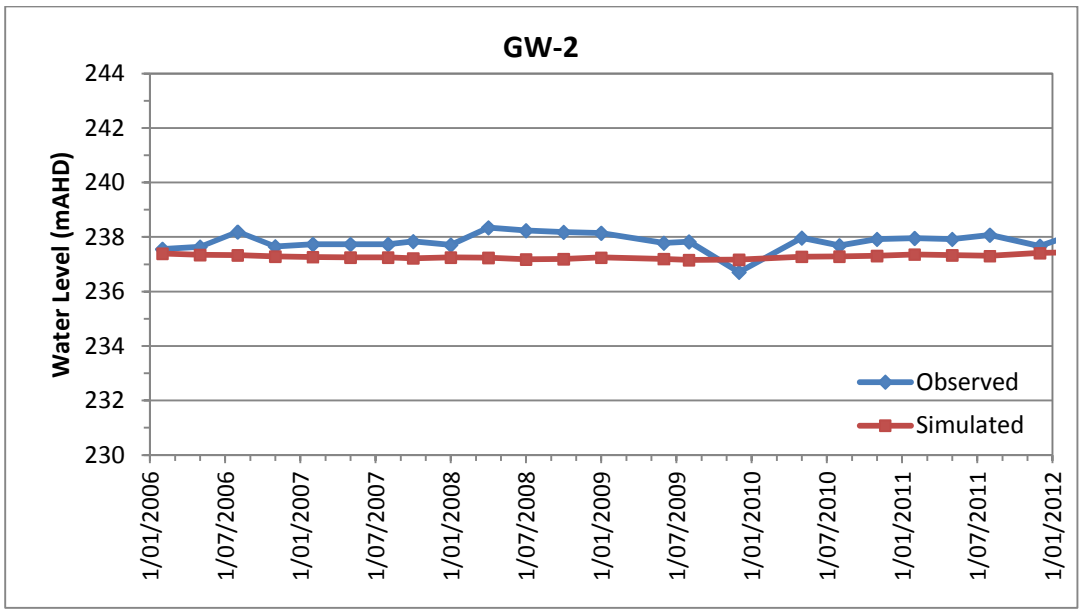

MW8
Water Level (mAHD)
274
272
270
268
266
264
262
260
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

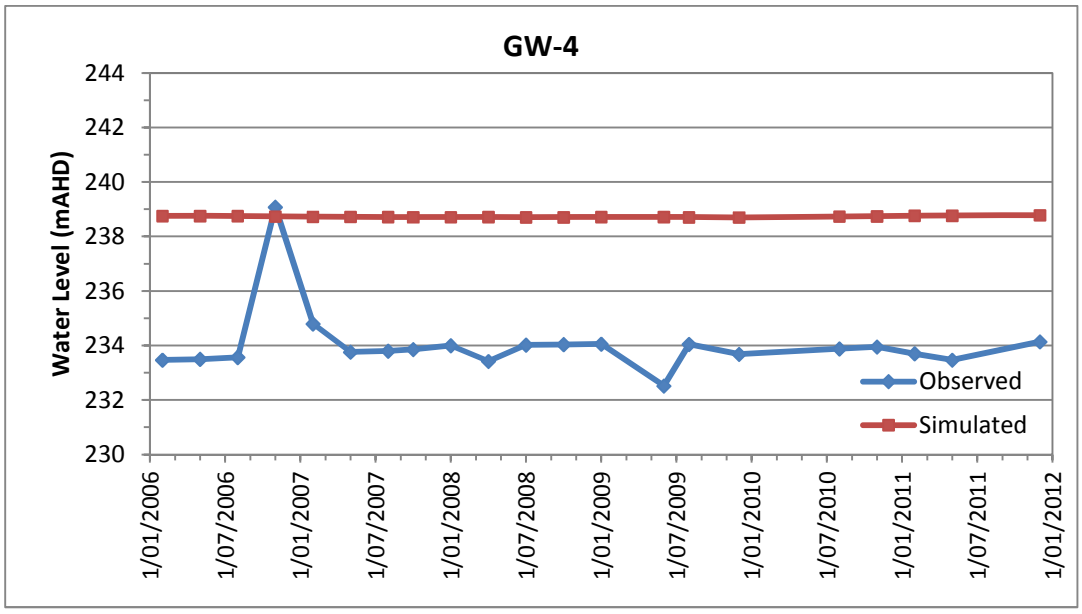

GW002129
Water Level (mAHD)
266
264
262
260
258
256
254
252
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

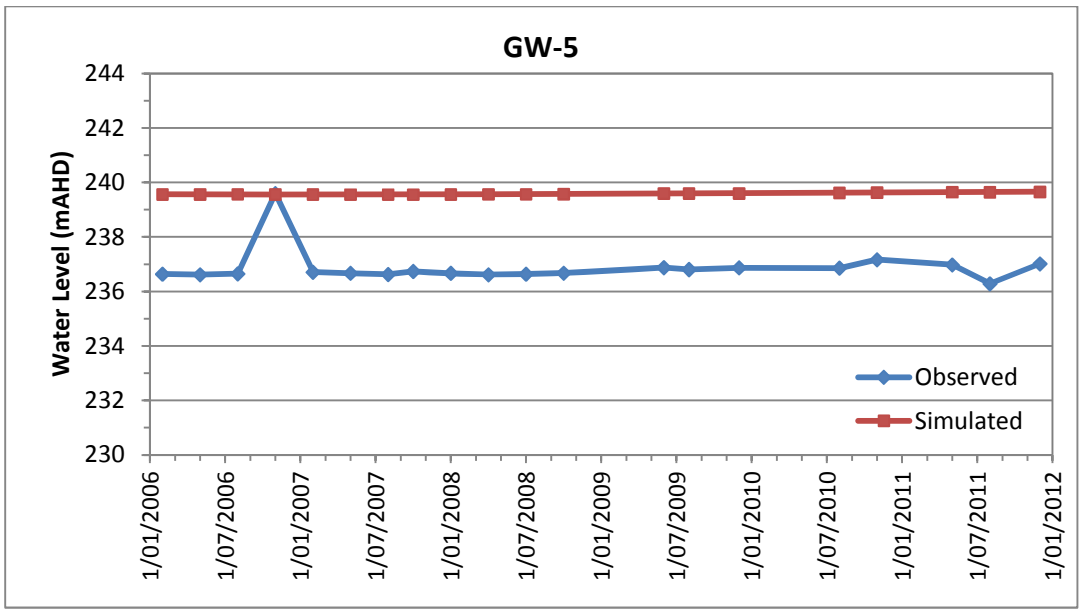

GW002501
Water Level (mAHD)
274
272
270
268
266
264
262
260
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

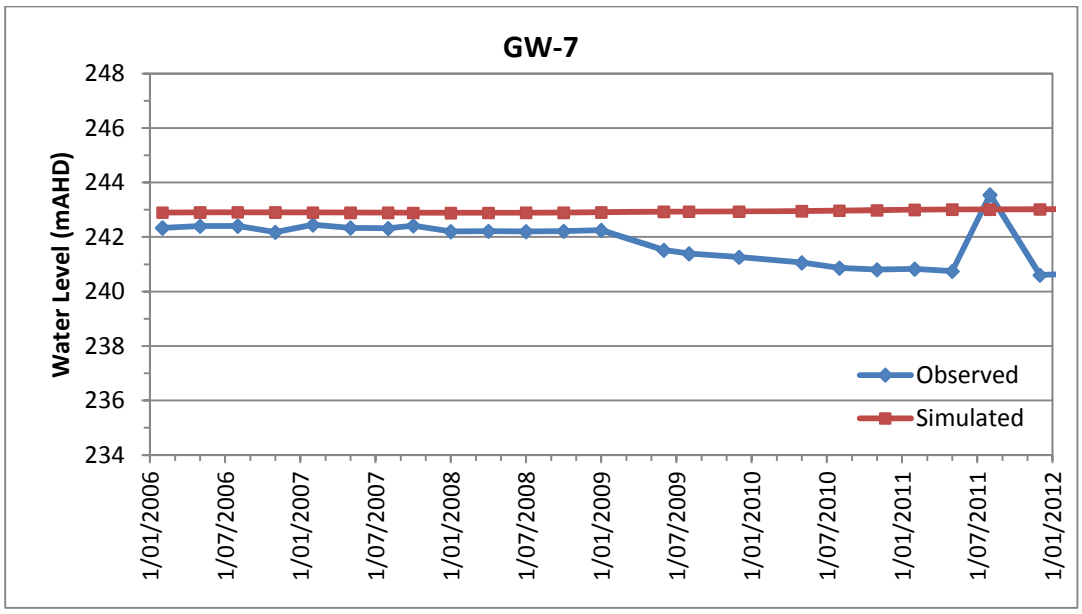
Canyon Coal Mine Monitoring Network

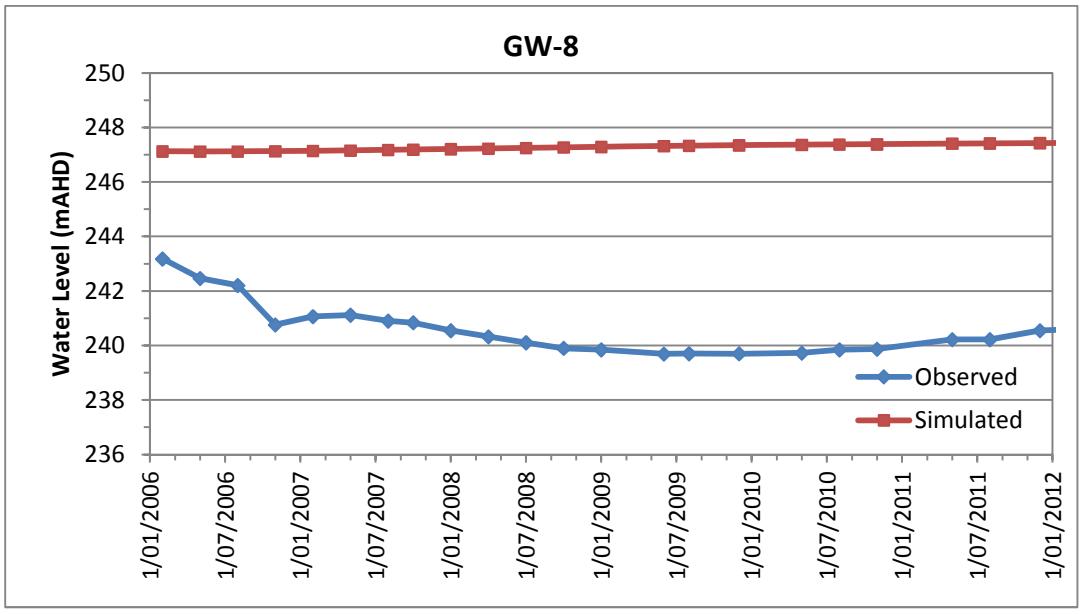
GW2, GW4, GW5, GW7 to GW11
VNW221, VNW222, VNW223

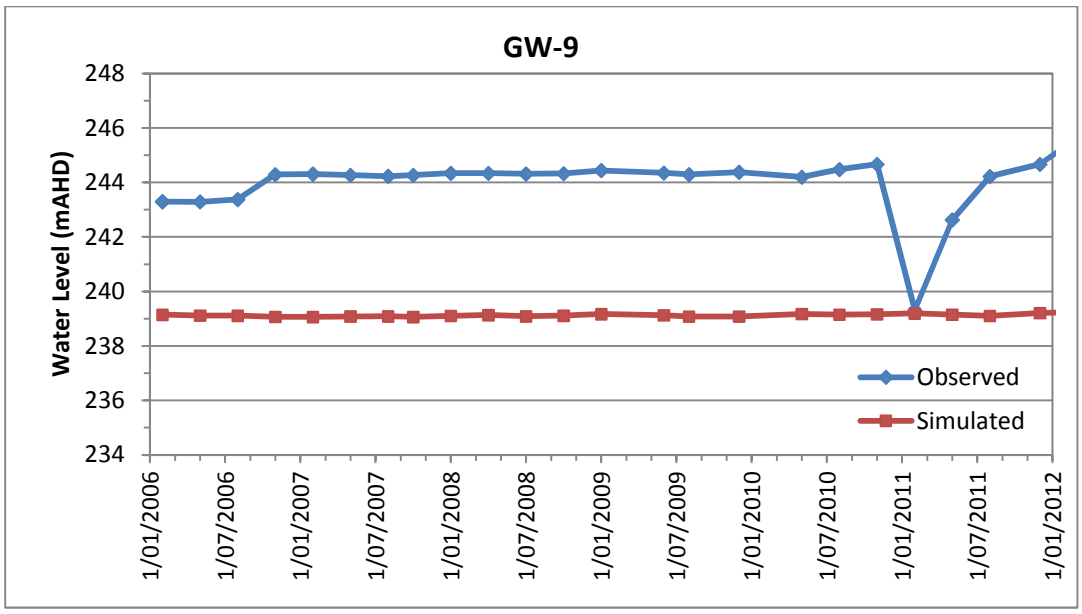

GW-2
Water Level (mAHD)
244
242
240
238
236
234
232
230
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

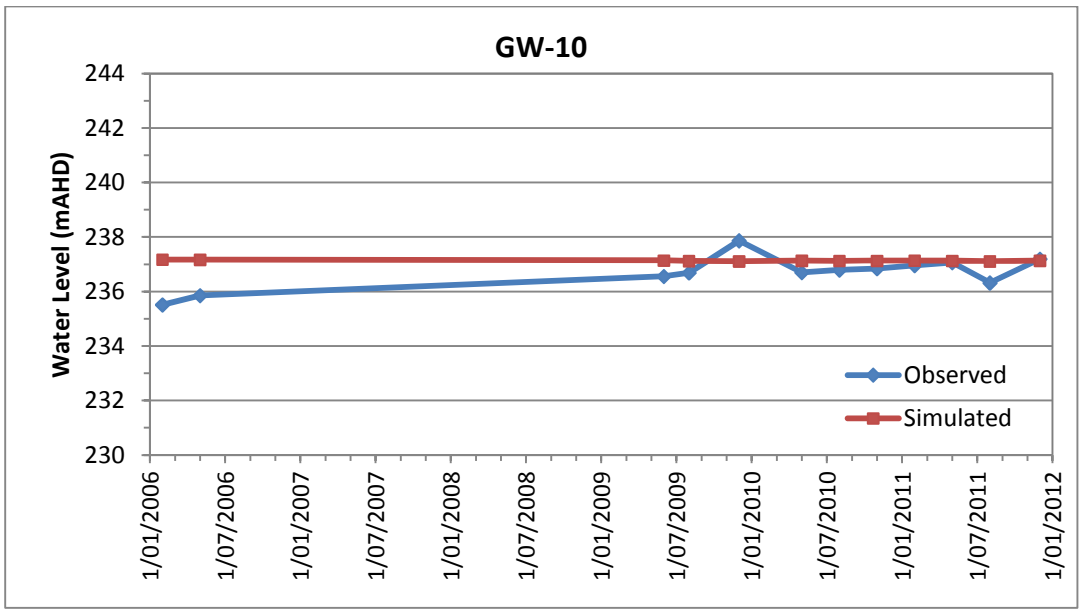

GW-4
Water Level (mAHD)
244
242
240
238
236
234
232
230
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

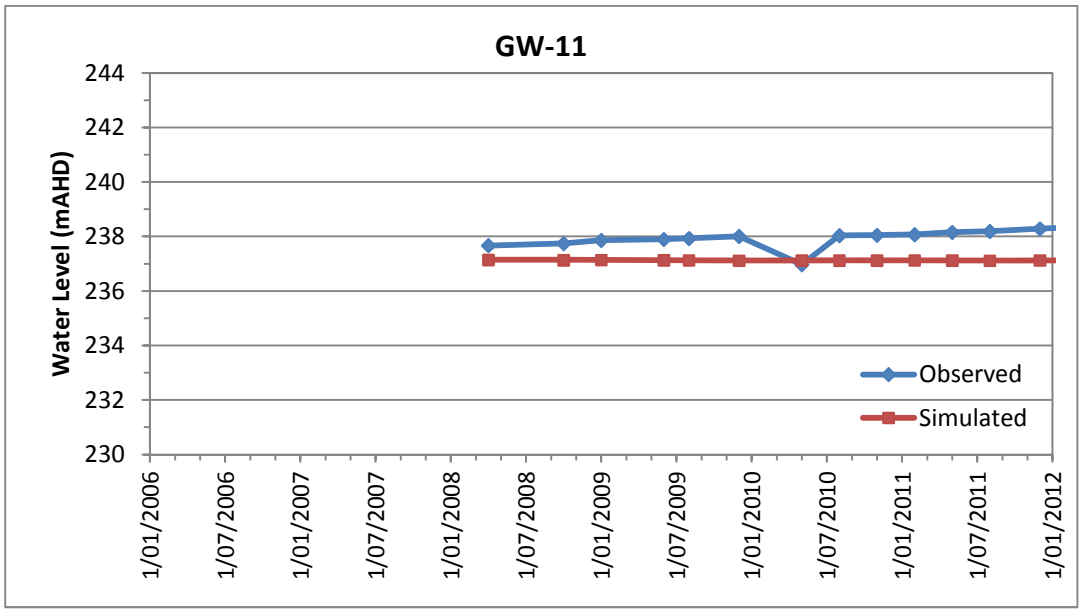

GW-5
Water Level (mAHD)
244
242
240
238
236
234
232
230
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

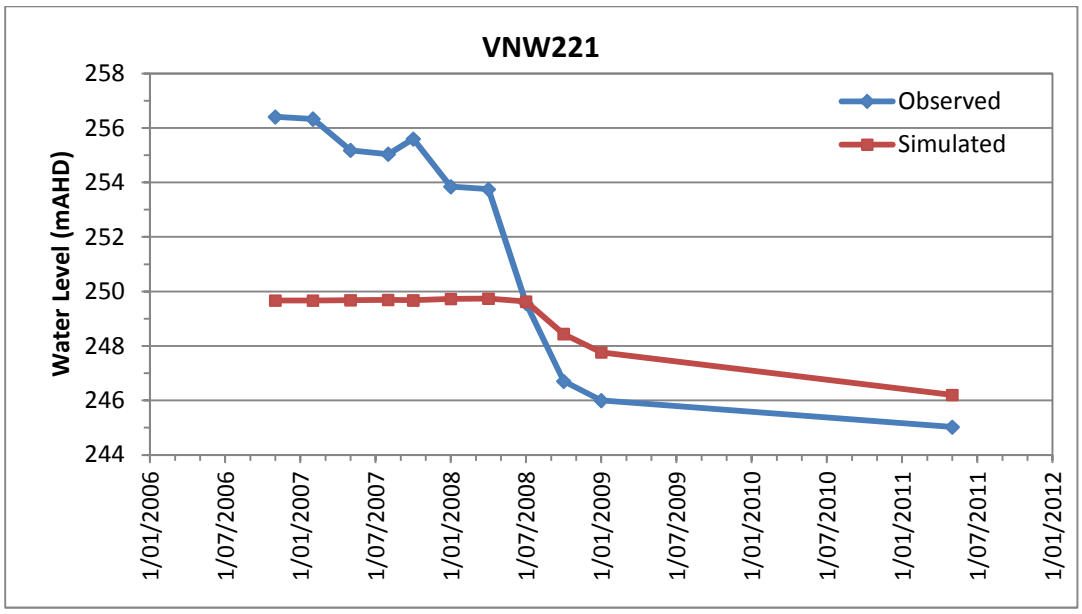

GW-7
Water Level (mAHD)
248
246
244
242
240
238
236
234
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

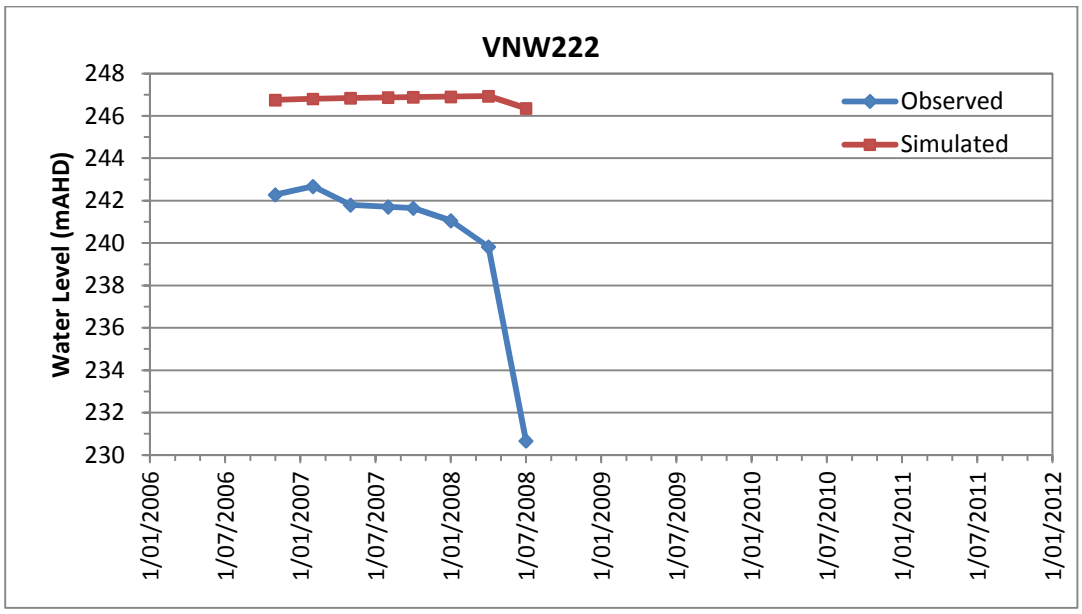

GW-8
Water Level (mAHD)
250
248
246
244
242
240
238
236
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

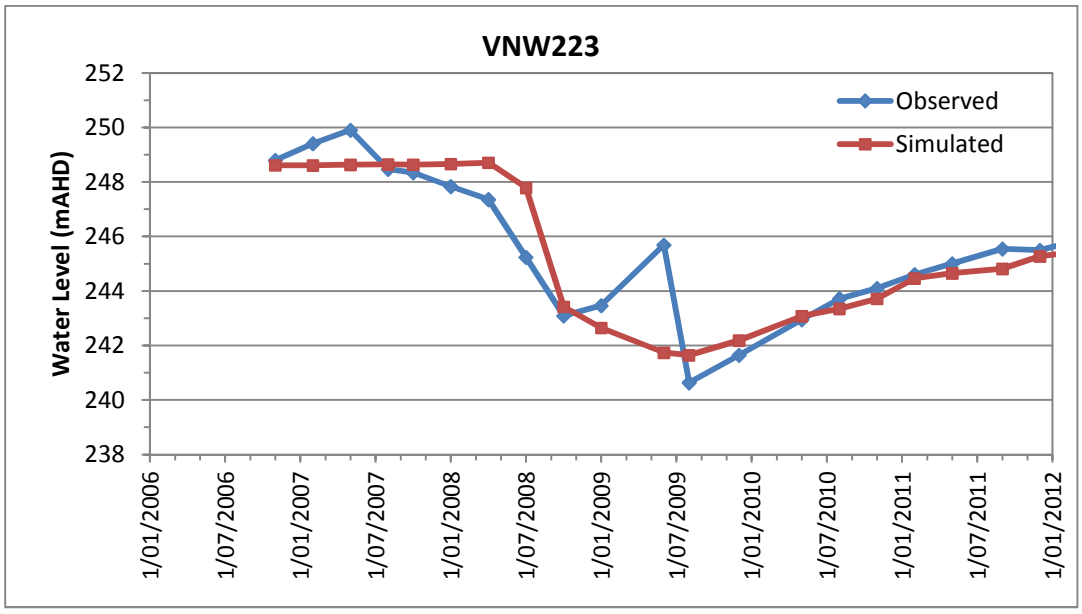

GW-9
Water Level (mAHD)
248
246
244
242
240
238
236
234
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated


GW-10
Water Level (mAHD)
244
242
240
238
236
234
232
230
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated


GW-11
Water Level (mAHD)
244
242
240
238
236
234
232
230
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated


VNW221
Water Level (mAHD)
258
256
254
252
250
248
246
244
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

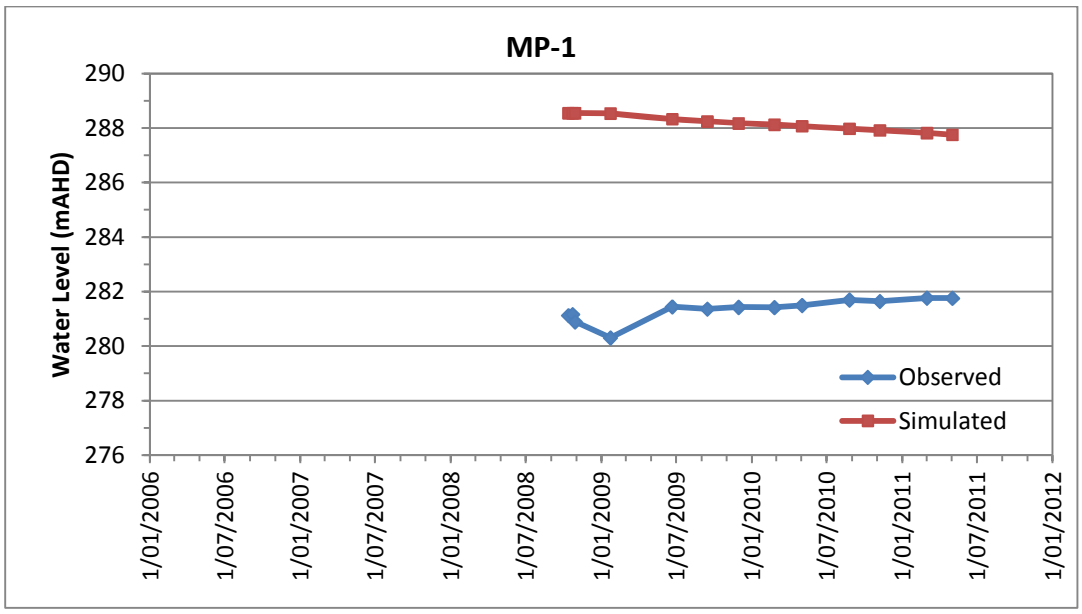

VNW222
Water Level (mAHD)
248
246
244
242
240
238
236
234
232
230
Observed
Simulated
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012

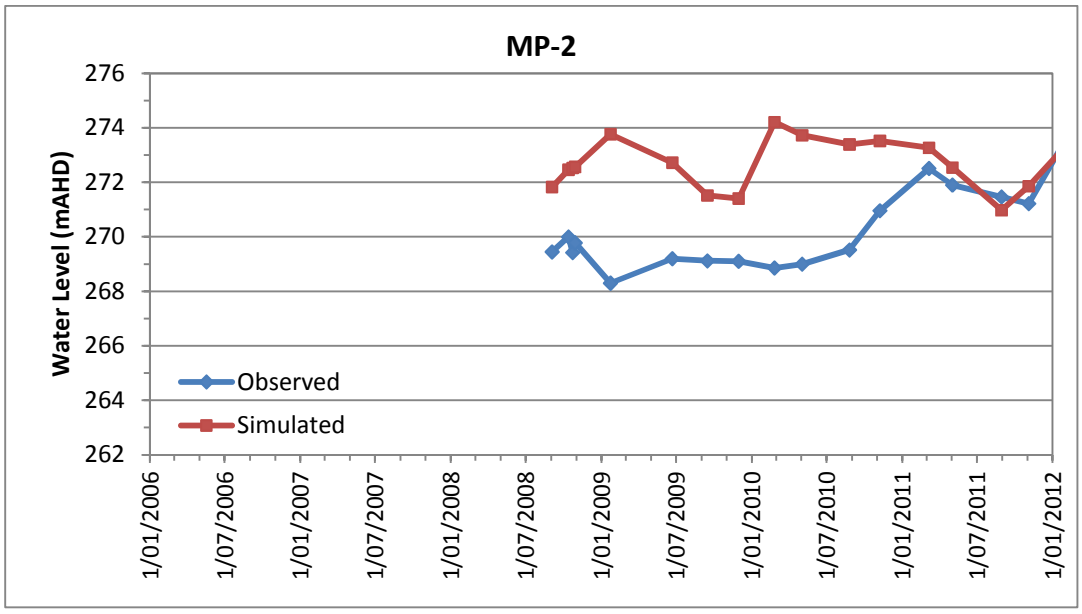

VNW223
Water Level (mAHD)
252
250
248
246
244
242
240
238
Observed
Simulated
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012

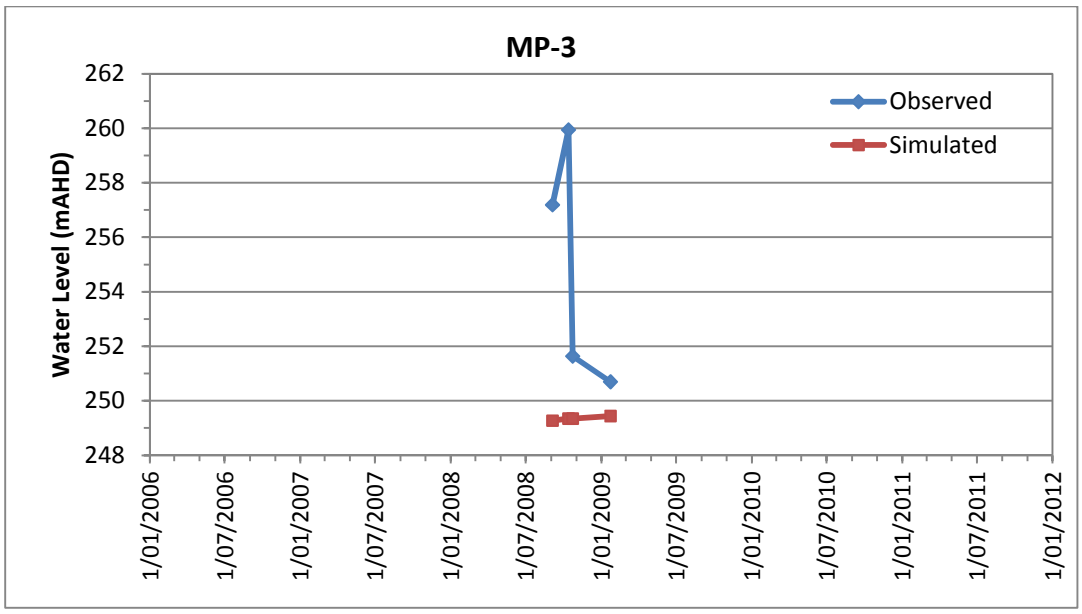
Rocglen Coal Mine Monitoring Network

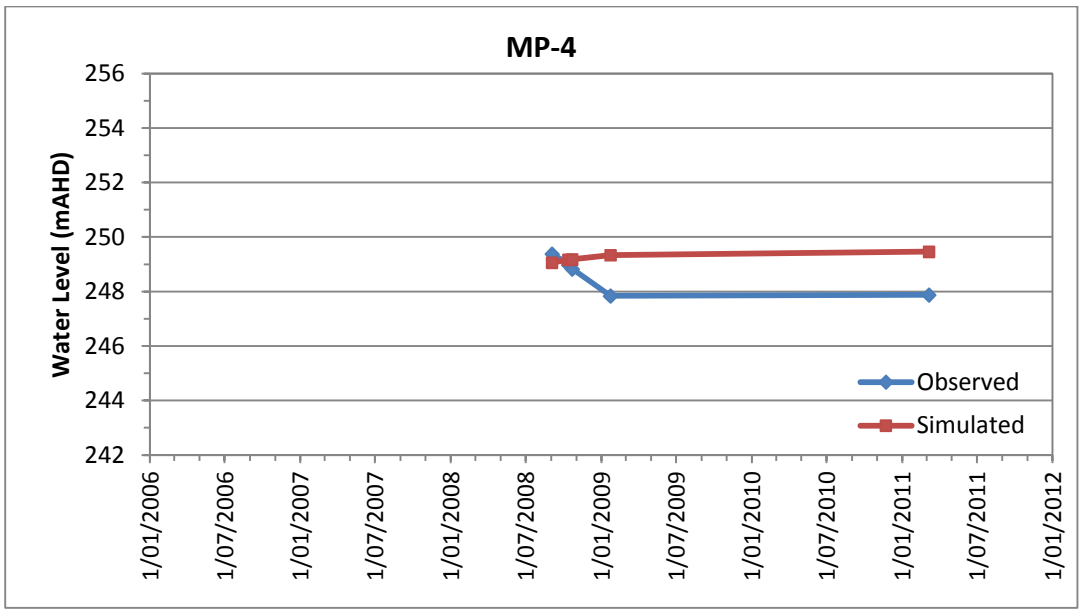
MP Series 1-5

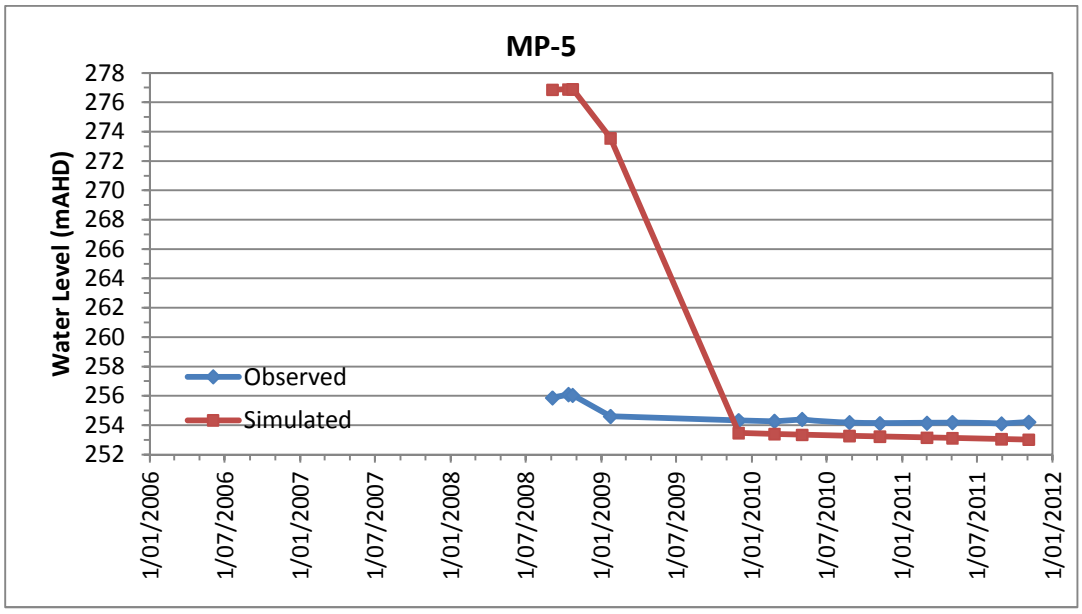
WB Series 1, 2, 3, 5, 7, 8, 9, 10, 12

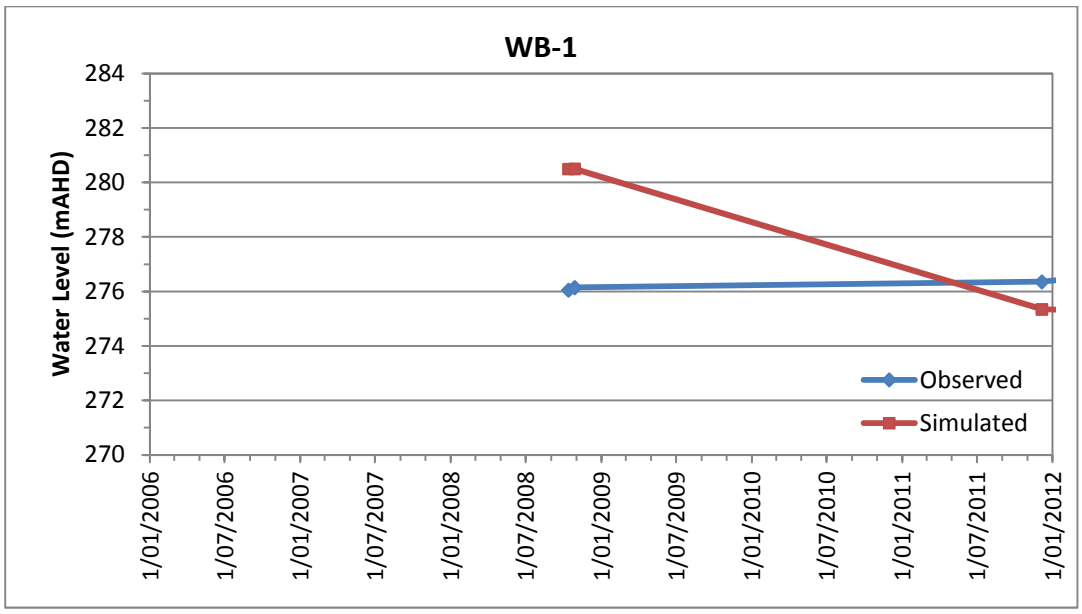

MP-1
Water Level (mAHD)
290
288
286
284
282
280
278
276
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

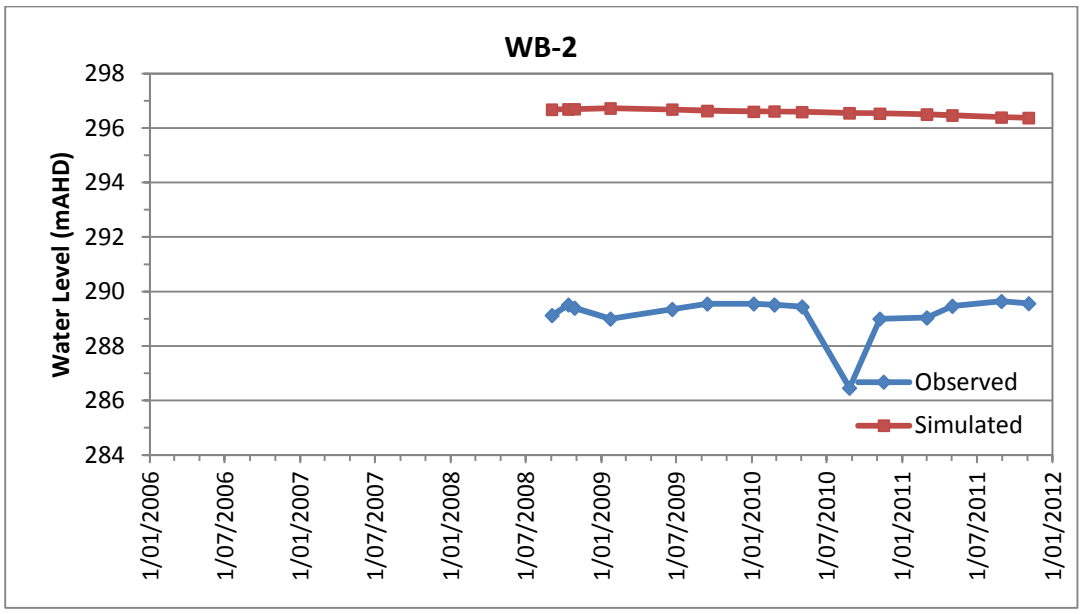

MP-2
Water Level (mAHD)
276
274
272
270
268
266
264
262
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

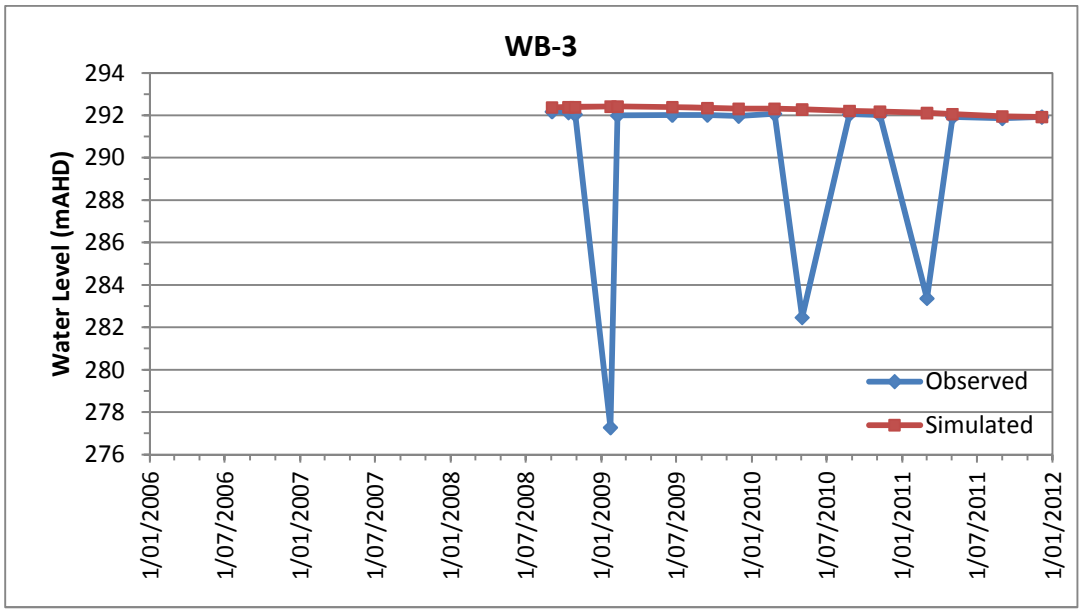

MP-3
Water Level (mAHD)
262
260
258
256
254
252
250
248
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

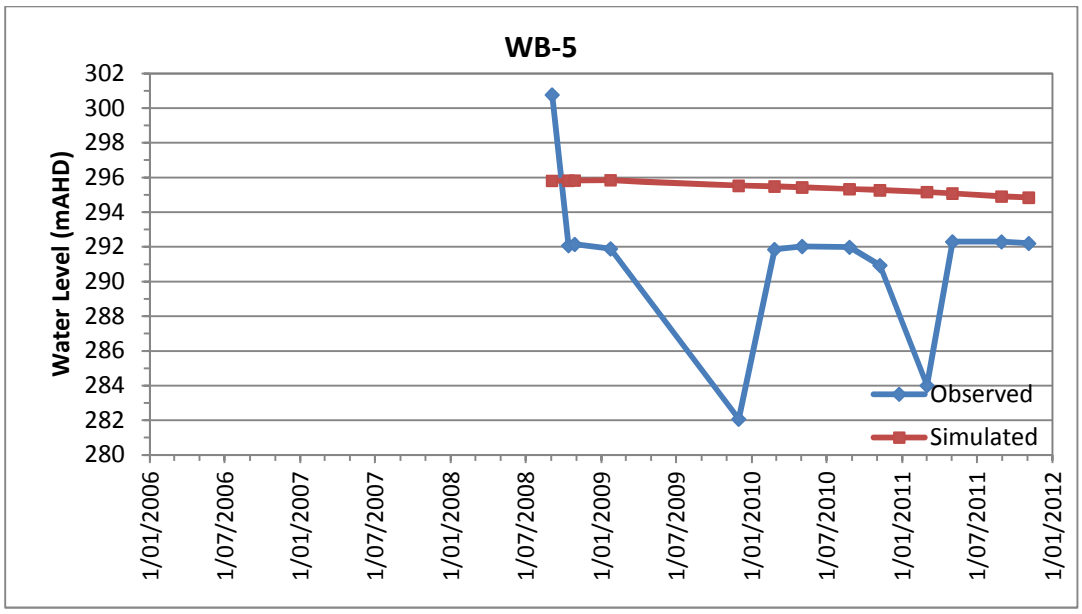

MP-4
Water Level (mAHD)
256
254
252
250
248
246
244
242
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

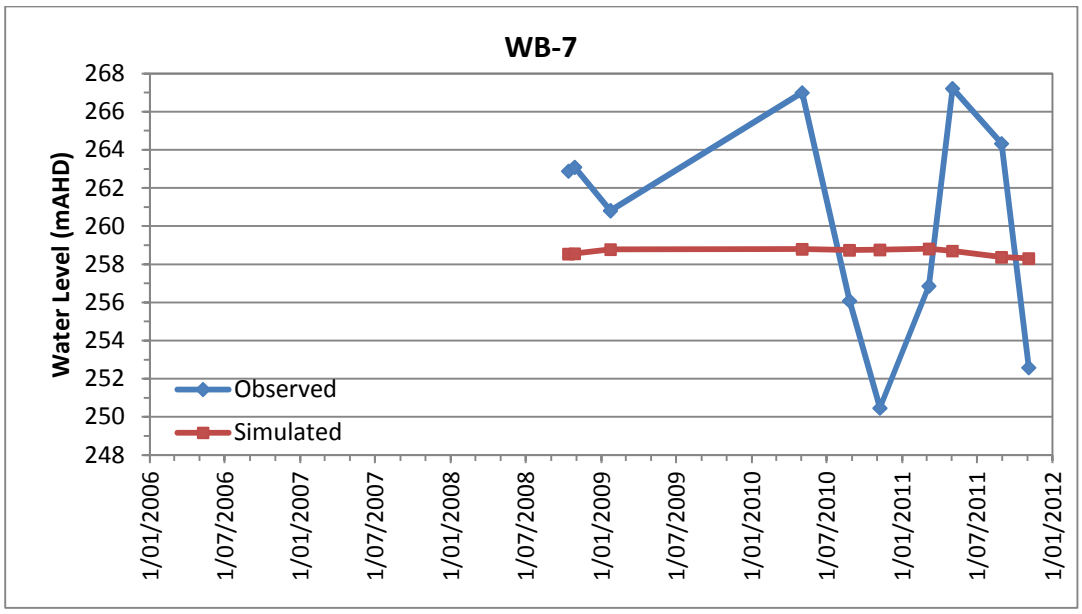

MP-5
Water Level (mAHD)
278
276
274
272
270
268
266
264
262
260
258
256
254
252
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

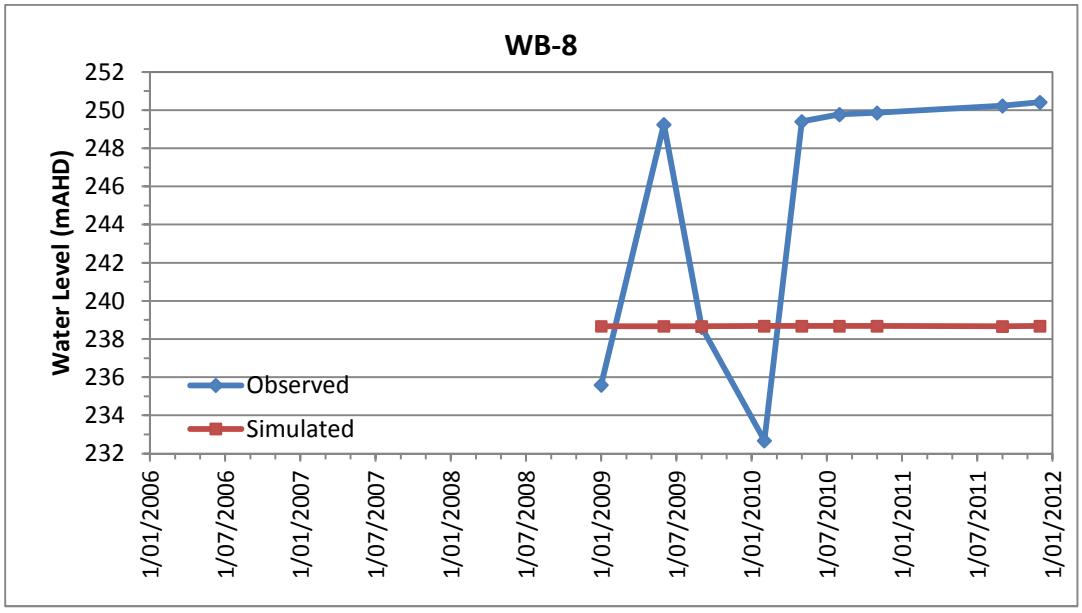

WB-1
Water Level (mAHD)
284
282
280
278
276
274
272
270
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

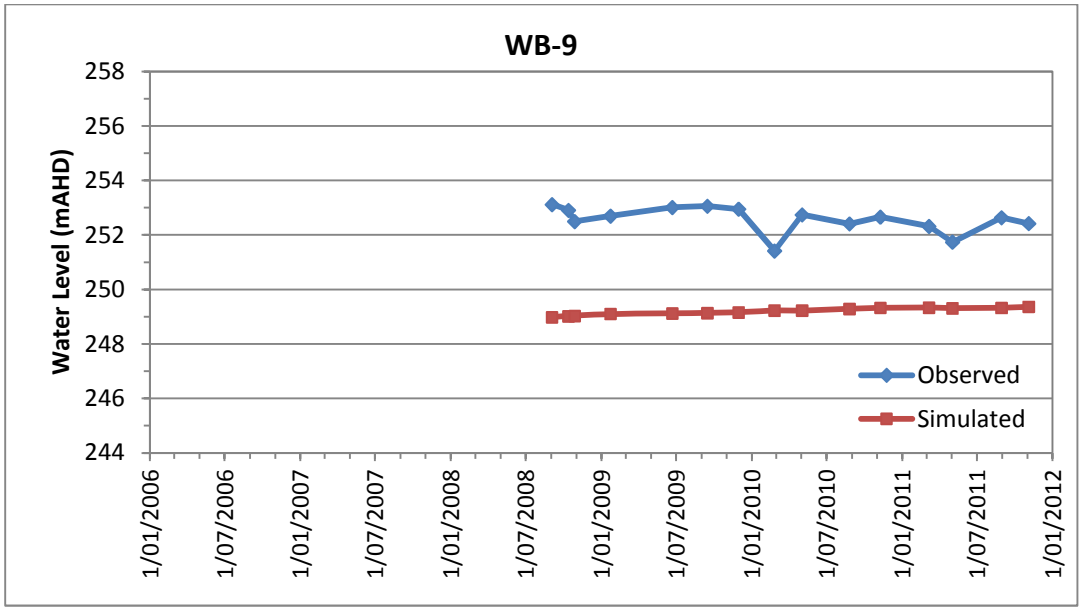

WB-2
Water Level (mAHD)
298
296
294
292
290
288
286
284
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

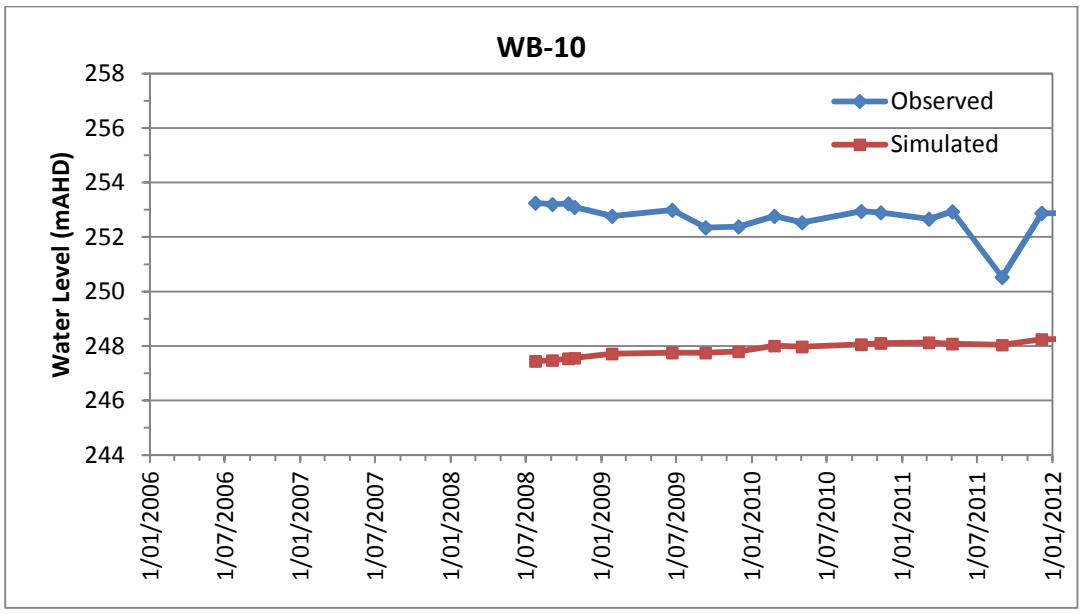

WB-3
Water Level (mAHD)
294
292
290
288
286
284
282
280
278
276
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

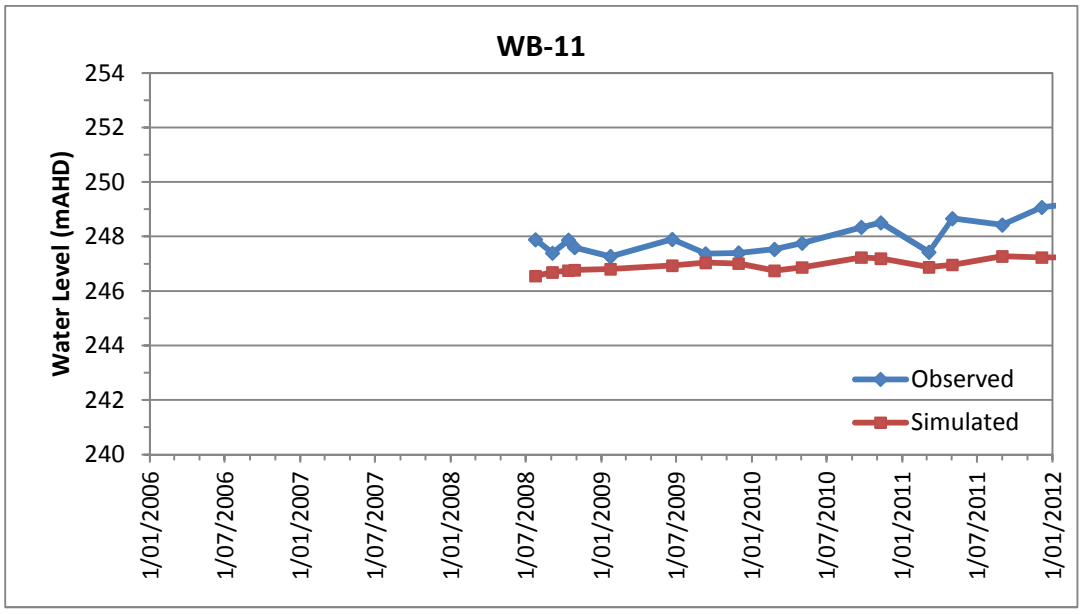

WB-5
Water Level (mAHD)
302
300
298
296
294
292
290
288
286
284
282
280
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012
Observed
Simulated

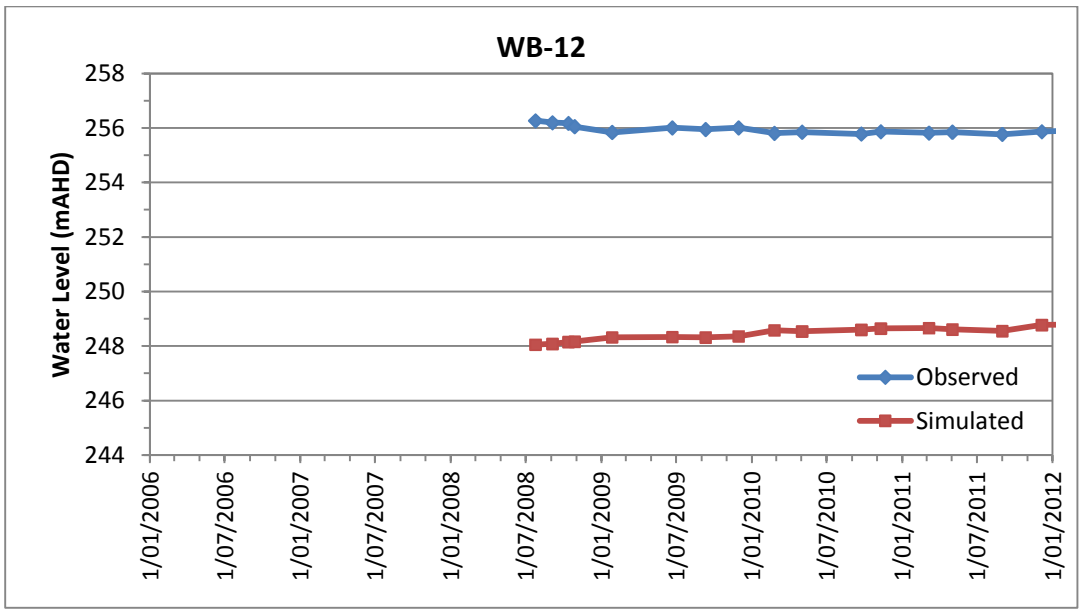

WB-7
Water Level (mAHD)
268
266
264
262
260
258
256
254
252
250
248
Observed
Simulated
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012


WB-8
Water Level (mAHD)
252
250
248
246
244
242
240
238
236
234
232
Observed
Simulated
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012


WB-9
Water Level (mAHD)
258
256
254
252
250
248
246
244
Observed
Simulated
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012


WB-10
Water Level (mAHD)
258
256
254
252
250
248
246
244
Observed
Simulated
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012


WB-11
Water Level (mAHD)
254
252
250
248
246
244
242
240
Observed
Simulated
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012


WB-12
Water Level (mAHD)
258
256
254
252
250
248
246
244
Observed
Simulated
1/01/2006
1/07/2006
1/01/2007
1/07/2007
1/01/2008
1/07/2008
1/01/2009
1/07/2009
1/01/2010
1/07/2010
1/01/2011
1/07/2011
1/01/2012

NSW Office of Water Monitoring Network – Alluvium (Zone 4)

GW030048_1

GW030049_1, GW030049_2, GW030049_3

GW030050_1, GW030050_2, GW030050_3

GW030051_1

GW030052_1, GW030052_2

GW030468_1

GW030469_1

GW030470_1, GW030470_2

GW030471_1, GW030471_2, GW030471_3

GW030472_1, GW030472_2

GW030535_1

GW036092_1

GW036456_1, GW036456_2

GW036457_1, GW036457_2, GW036457_3

GW036458_1

GW036459_1

GW036460_1, GW036460_2

GW036462_1

GW036463_1, GW036463_2, GW036463_3

GW036471_1, GW036471_2

GW036473_1

GW036476_1, GW036476_2, GW036476_3

GW036480_1

GW036481_1, GW036481_2

GW036484_1

GW036485_1, GW036485_2

GW036489_1, GW036489_2

GW036510_1, GW036510_2

GW036513_1

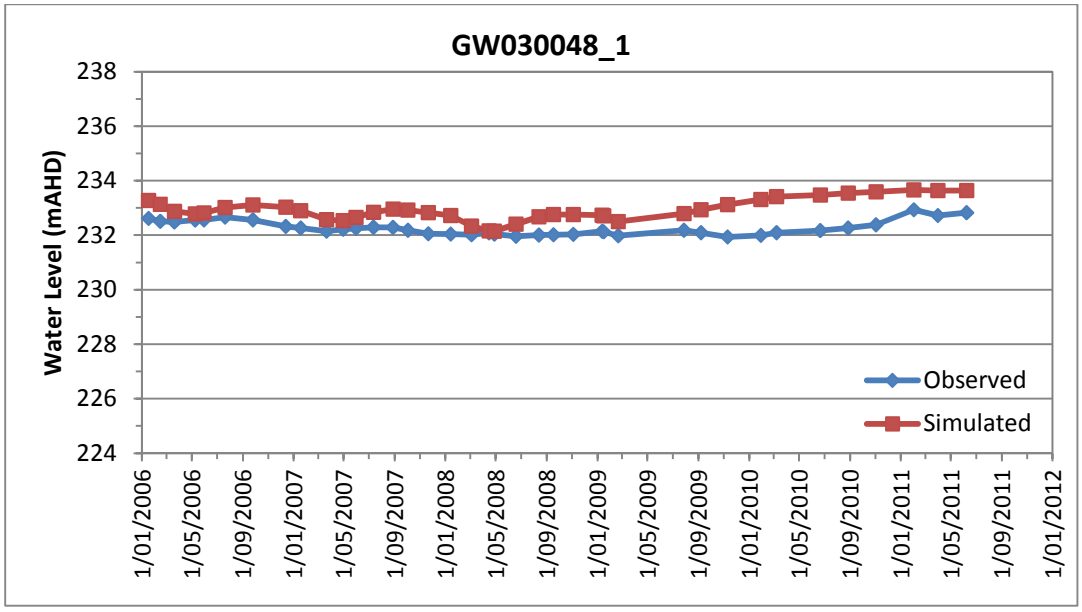
GW036514_1

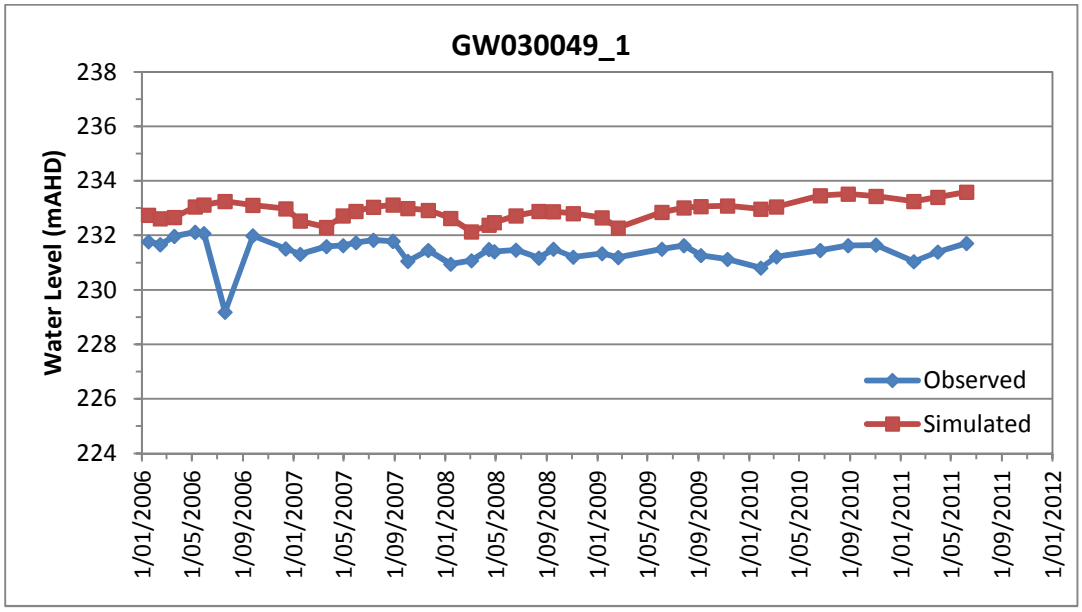
GW036548_1, GW036548_2, GW036548_3

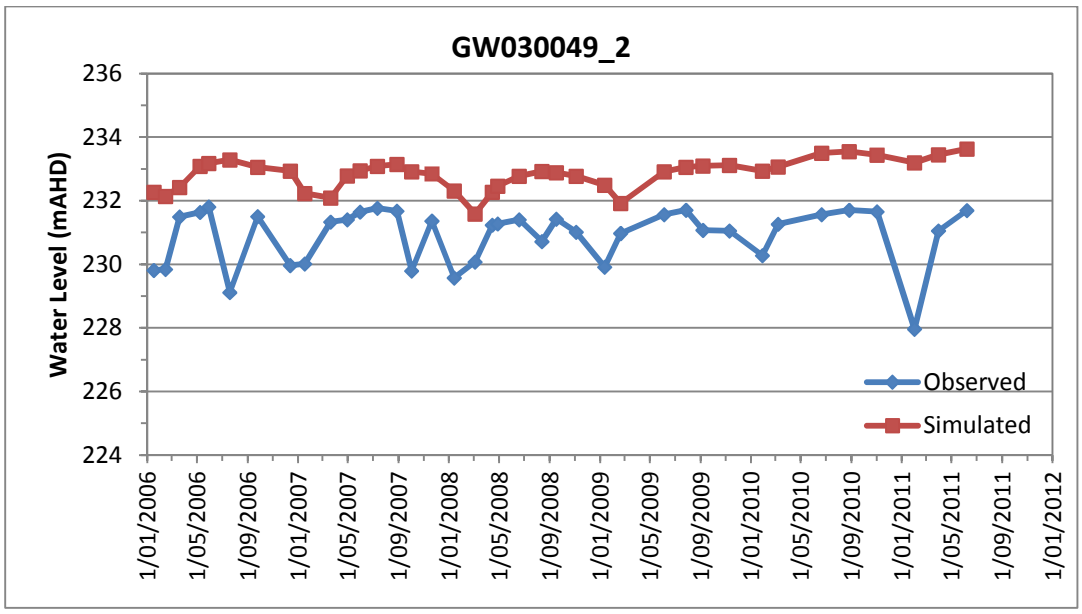
GW036565_1

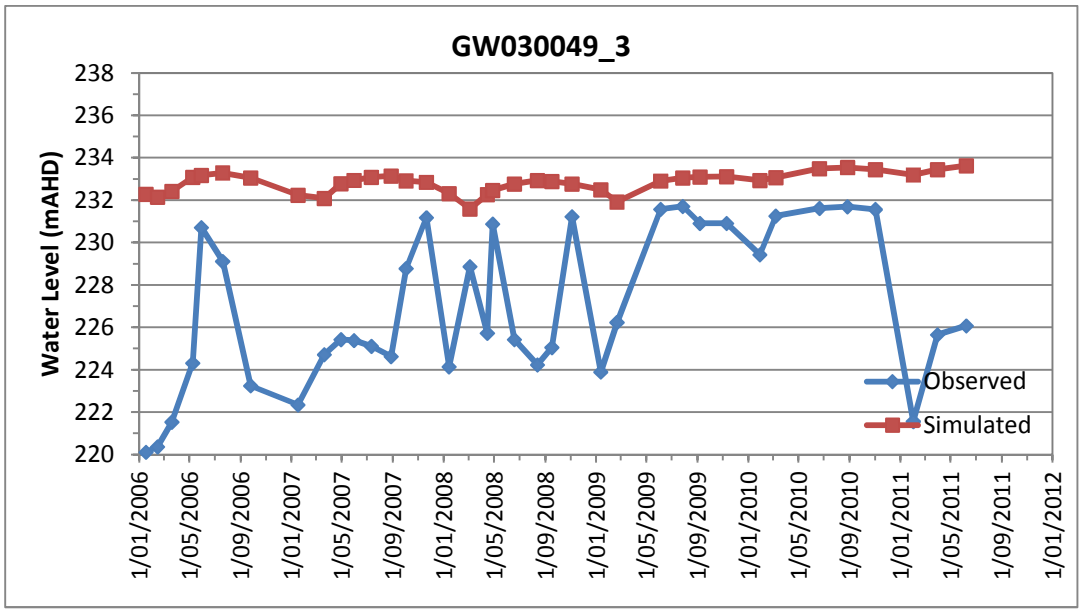
GW036567_1

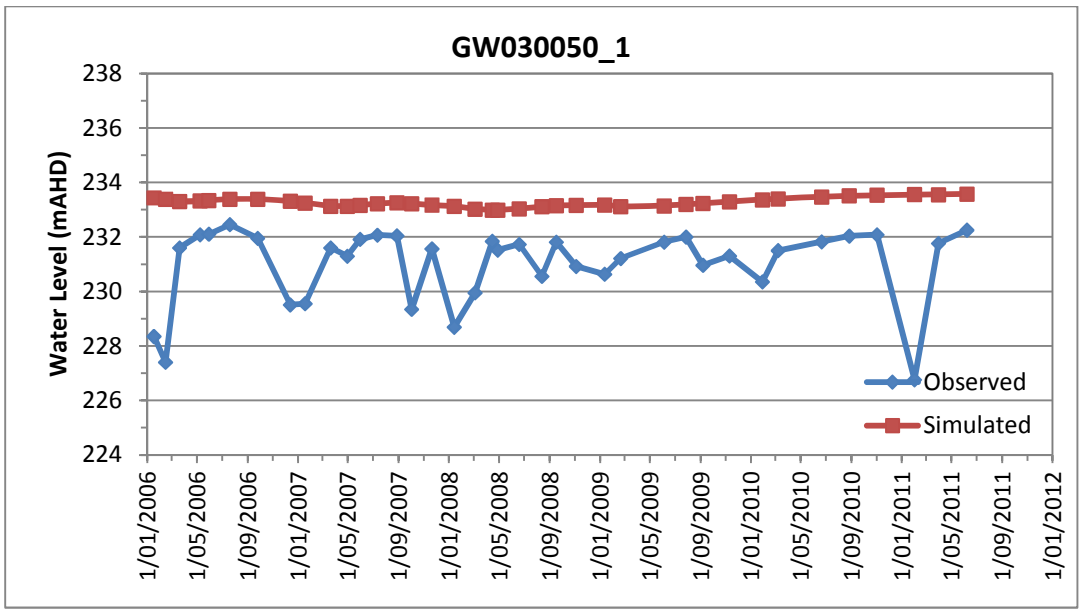
GW036655_1, GW036655_2

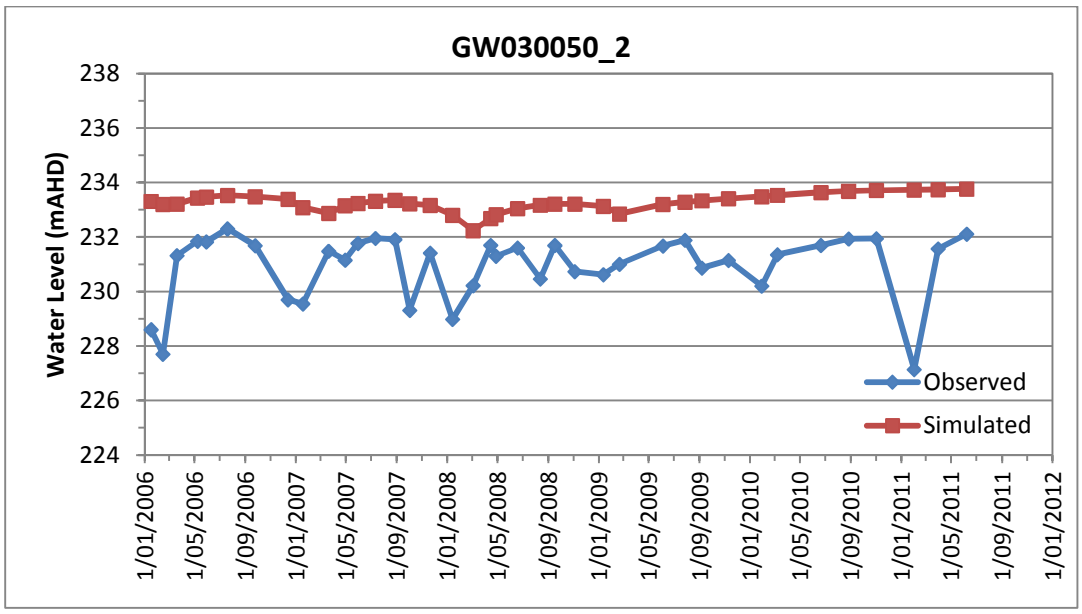

GW030048_1
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

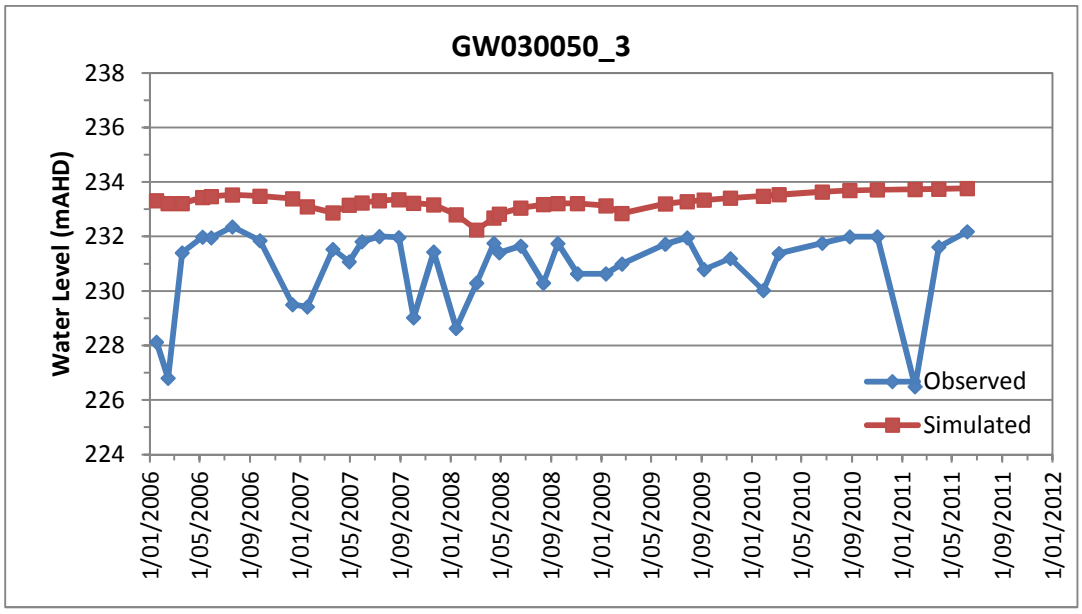

GW030049_1
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

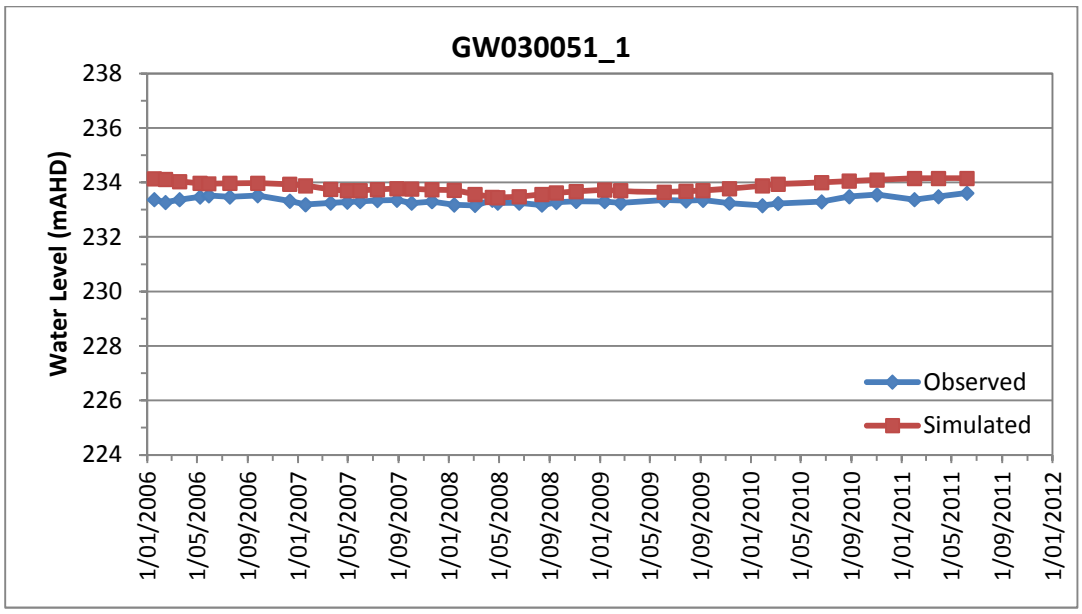

GW030049_2
Water Level (mAHD)
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

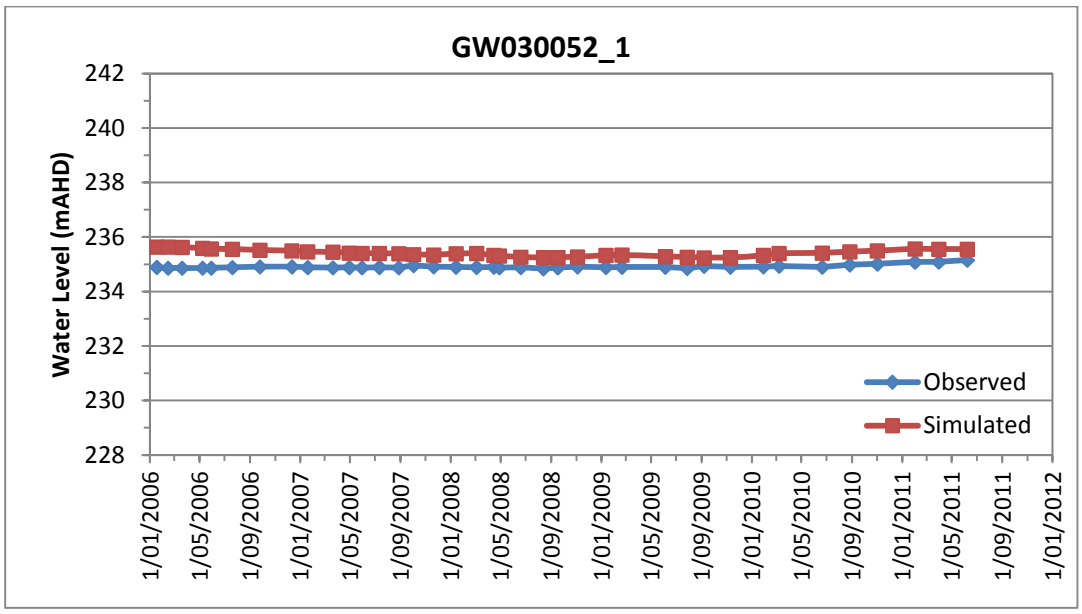

GW030049_3
Water Level (mAHD)
238
236
234
232
230
228
226
224
222
220
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

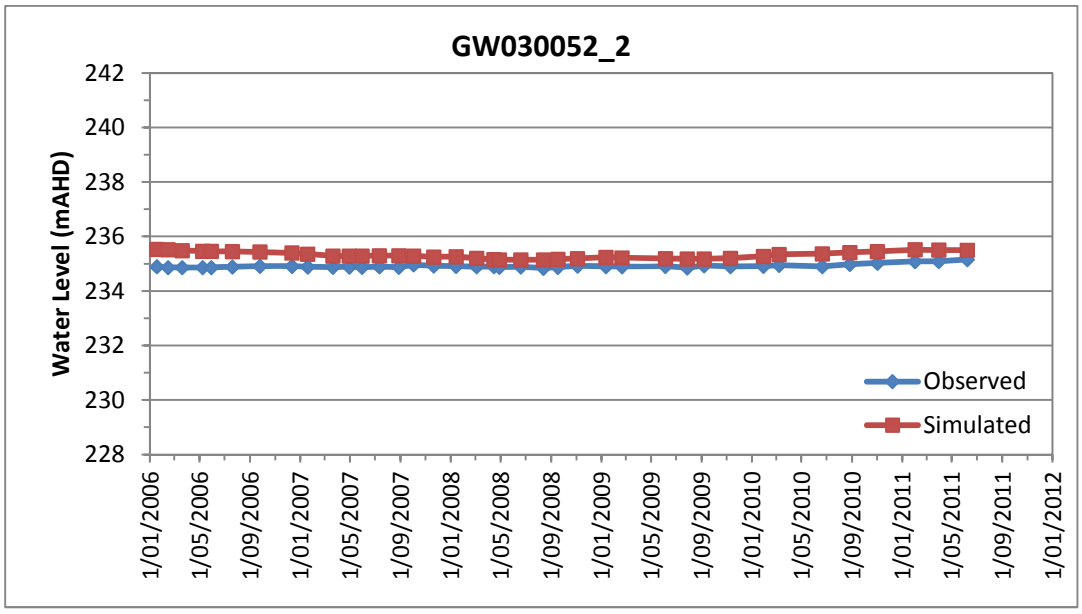

GW030050_1
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

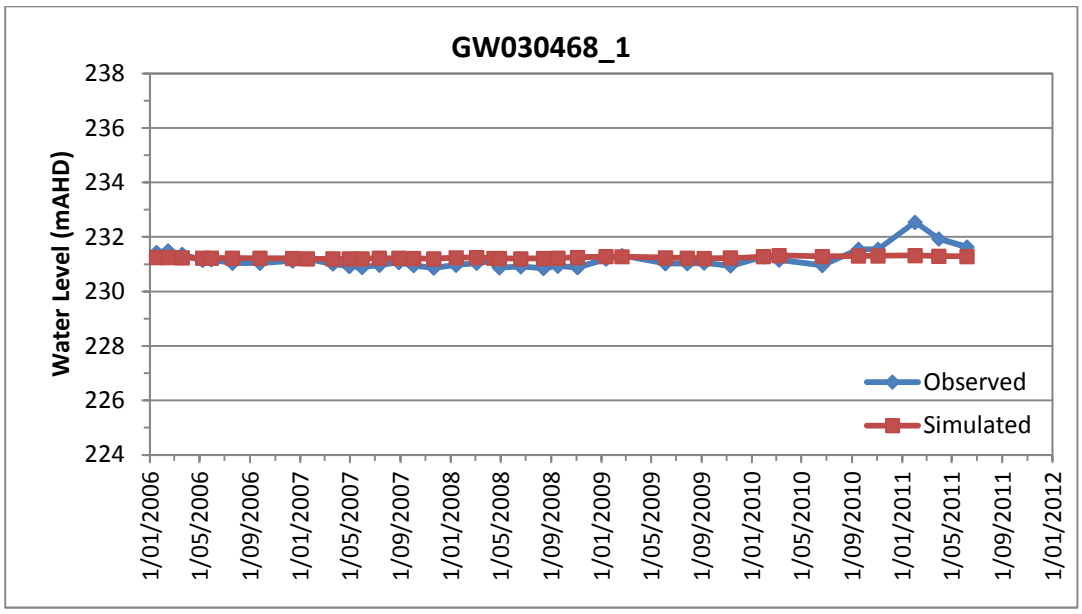

GW030050_2
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

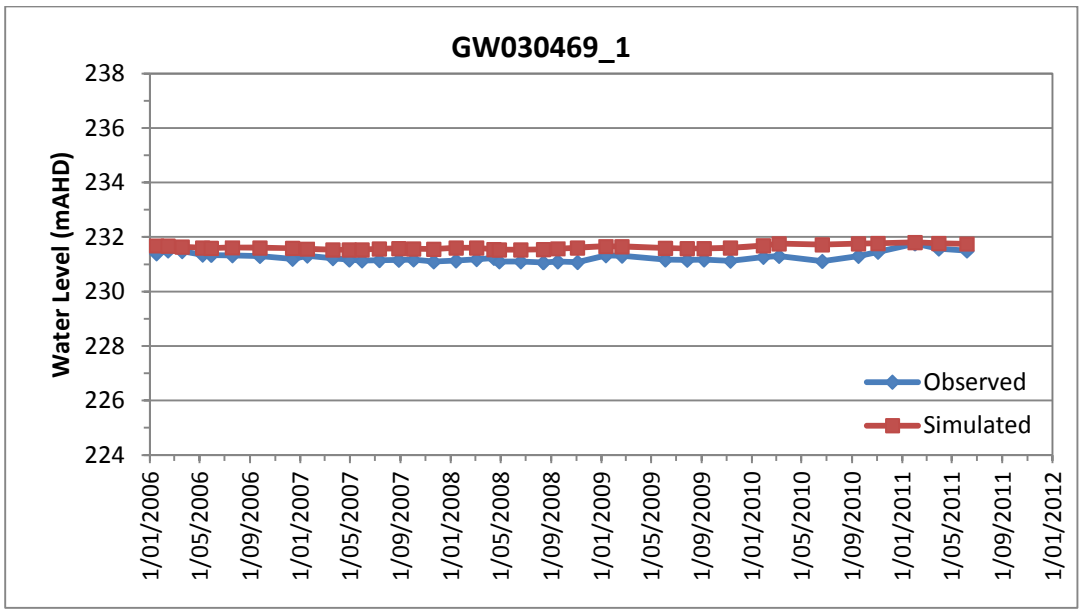

GW030050_3
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

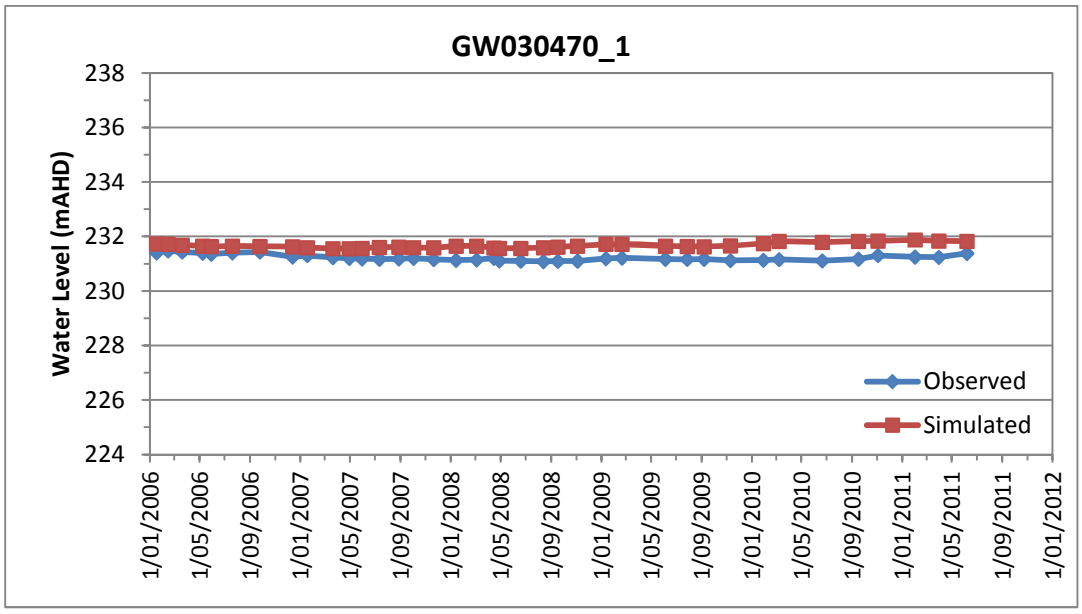

GW030051_1
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

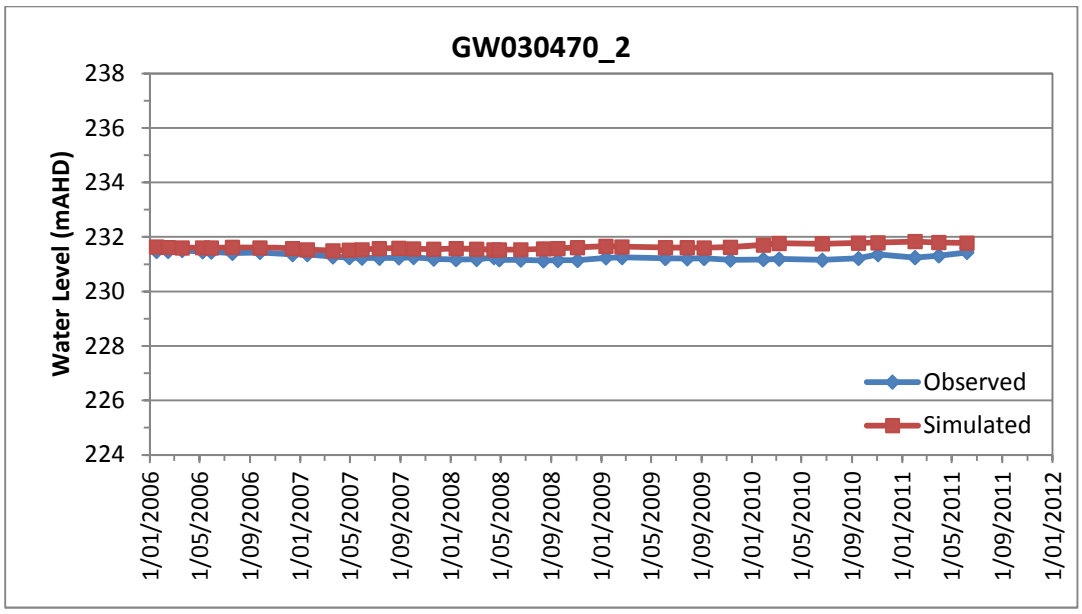

GW030052_1
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

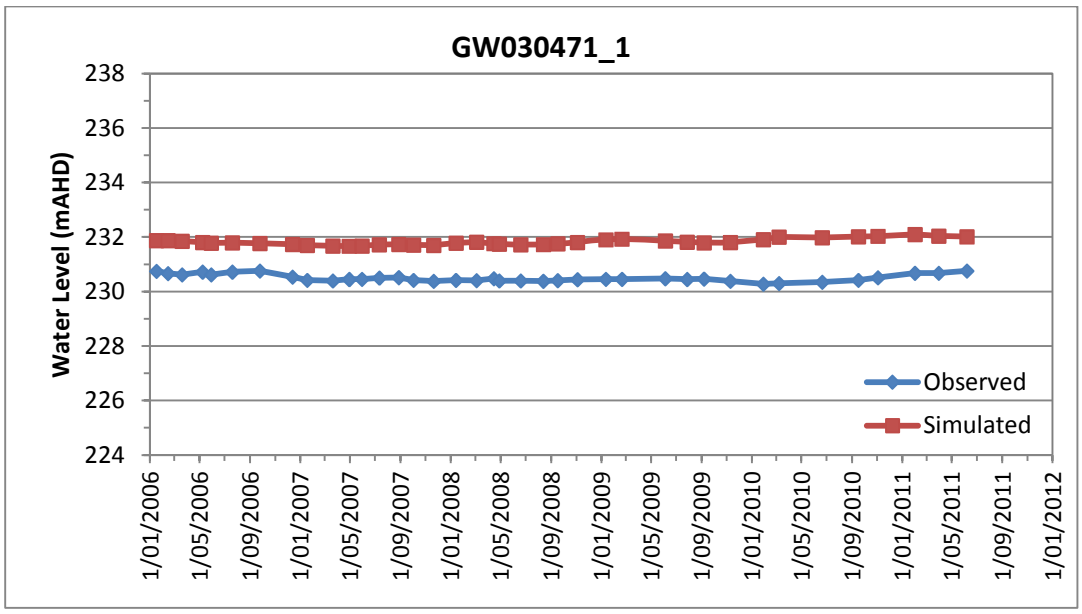

GW030052_2
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

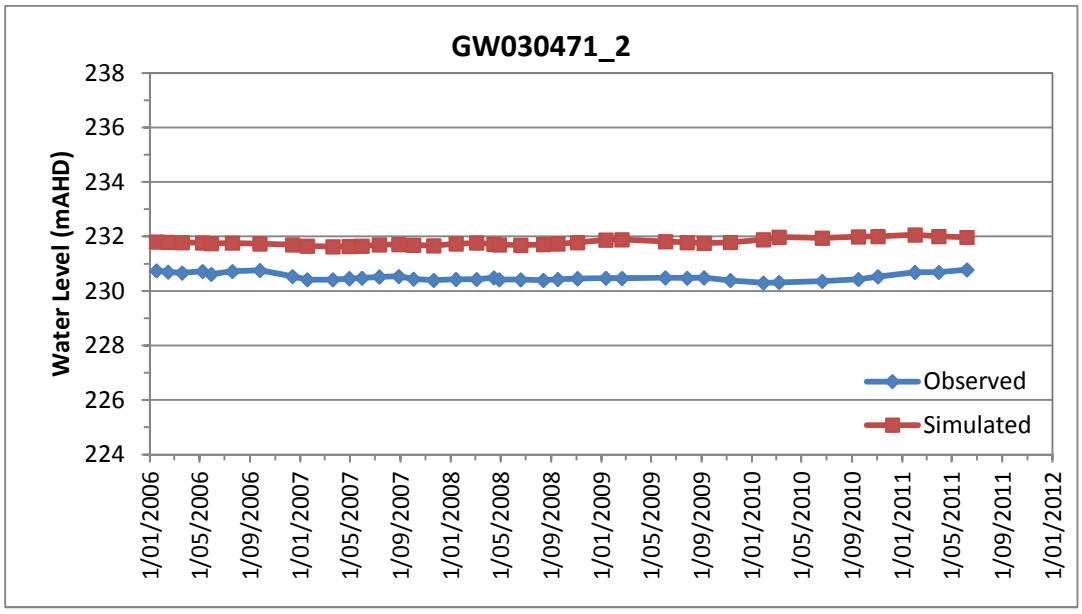

GW030468_1
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

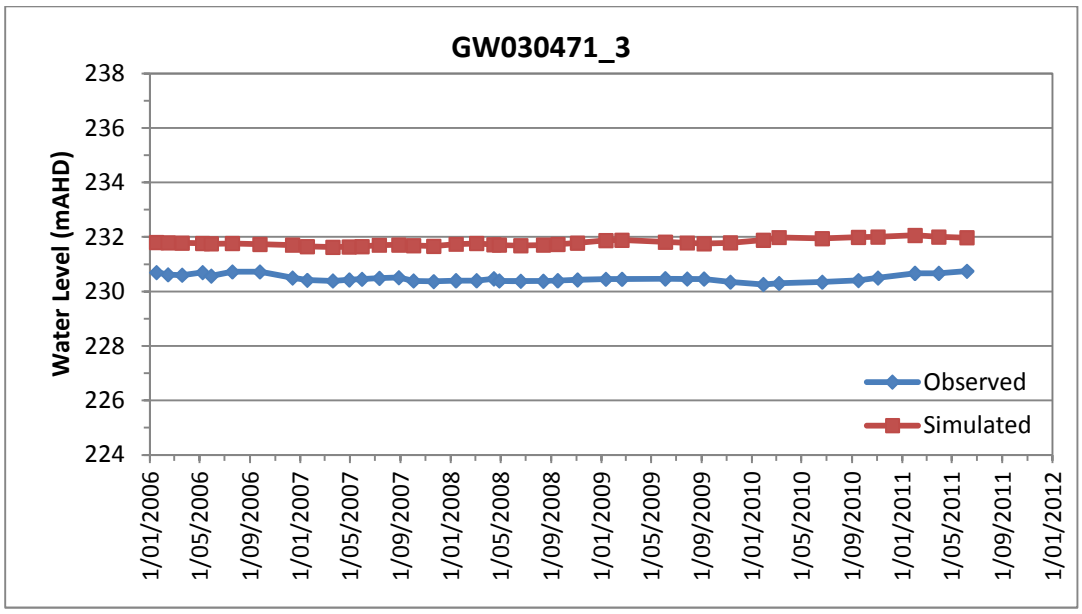

GW030469_1
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

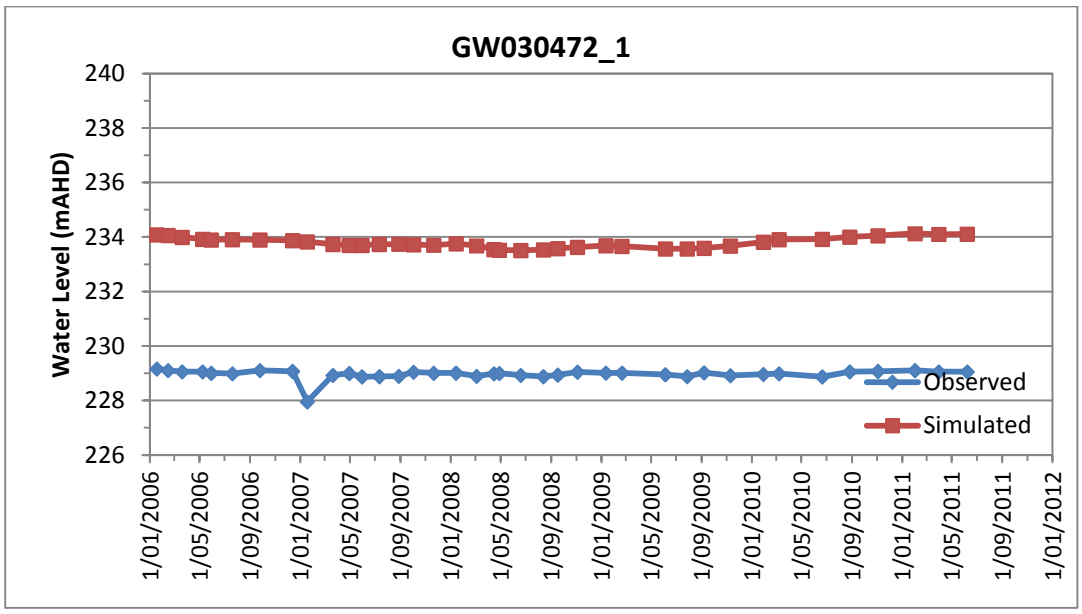

GW030470_1
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

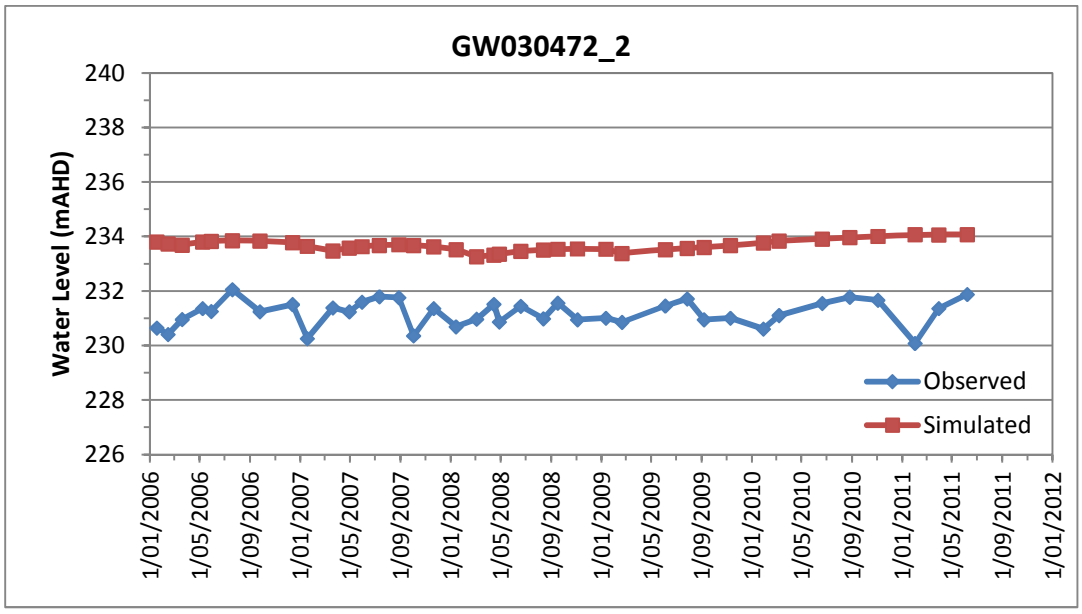

GW030470_2
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

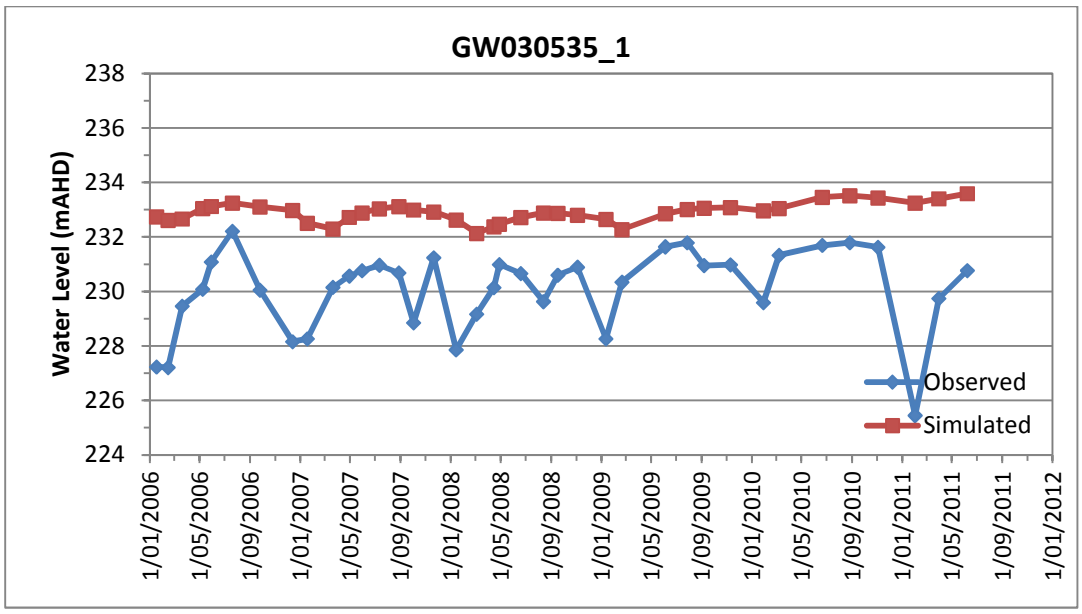

GW030471_1
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

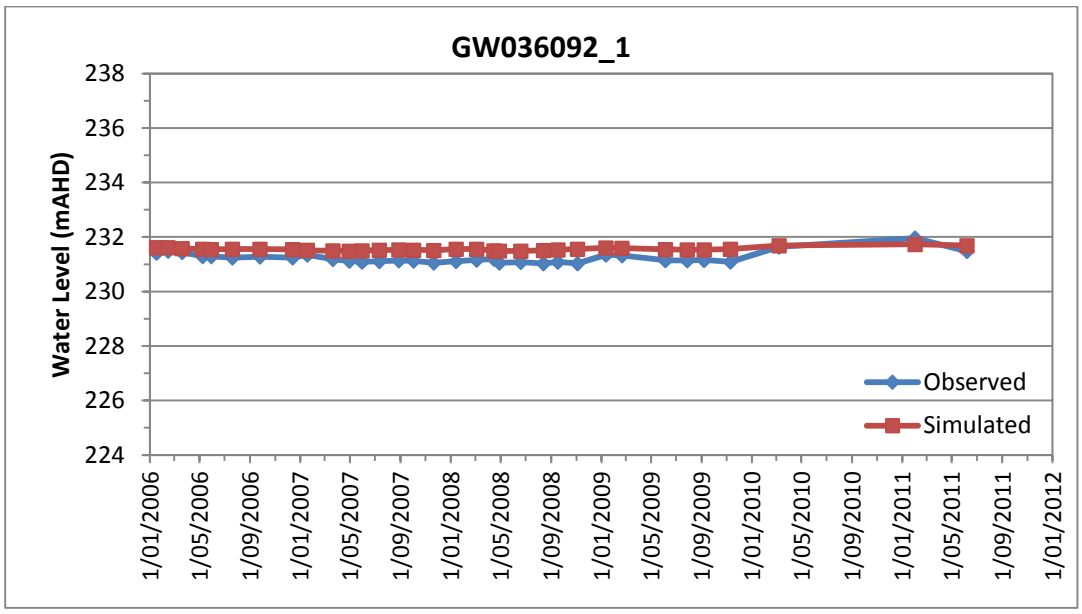

GW030471_2
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

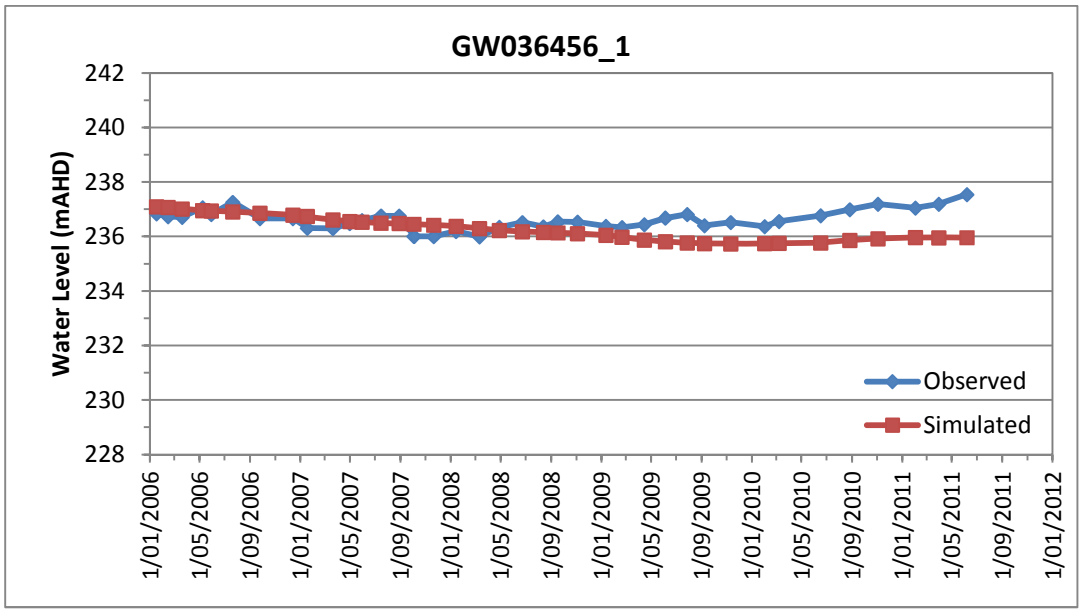

GW030471_3
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

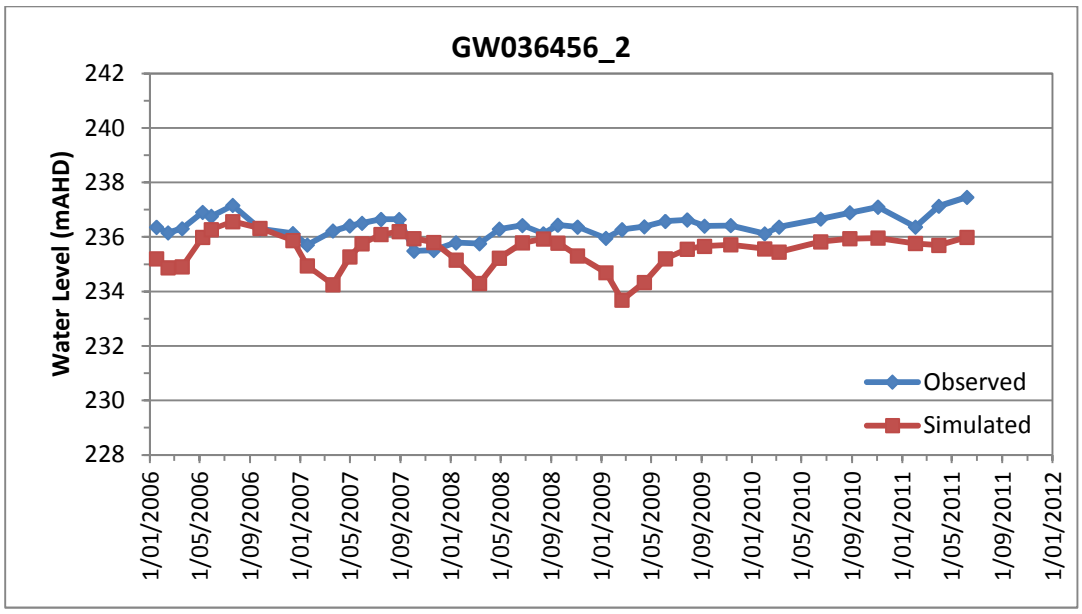

GW030472_1
Water Level (mAHD)
240
238
236
234
232
230
228
226
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

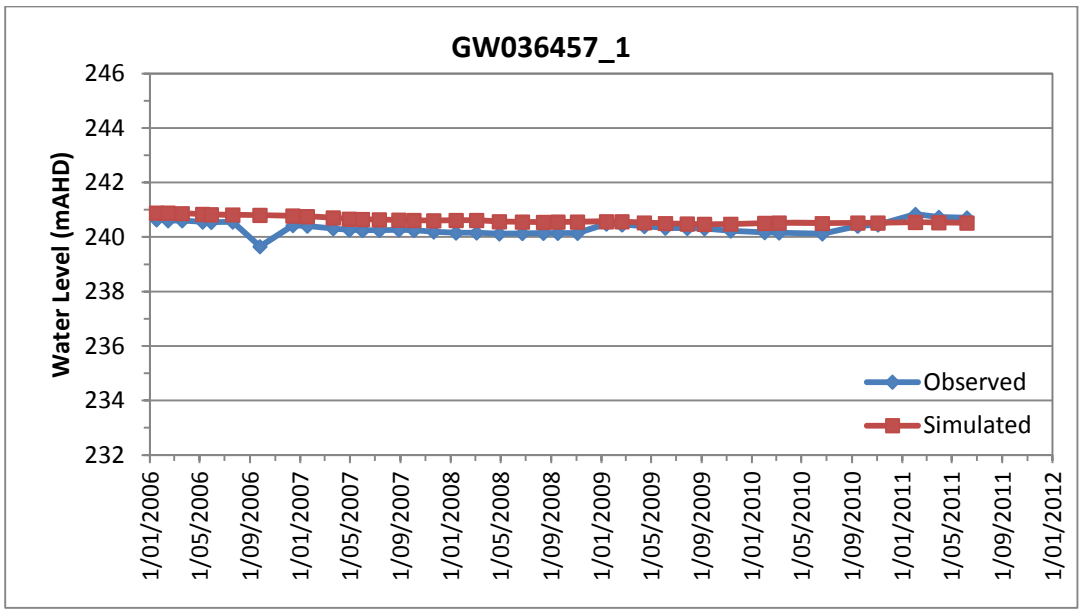

GW030472_2
Water Level (mAHD)
240
238
236
234
232
230
228
226
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

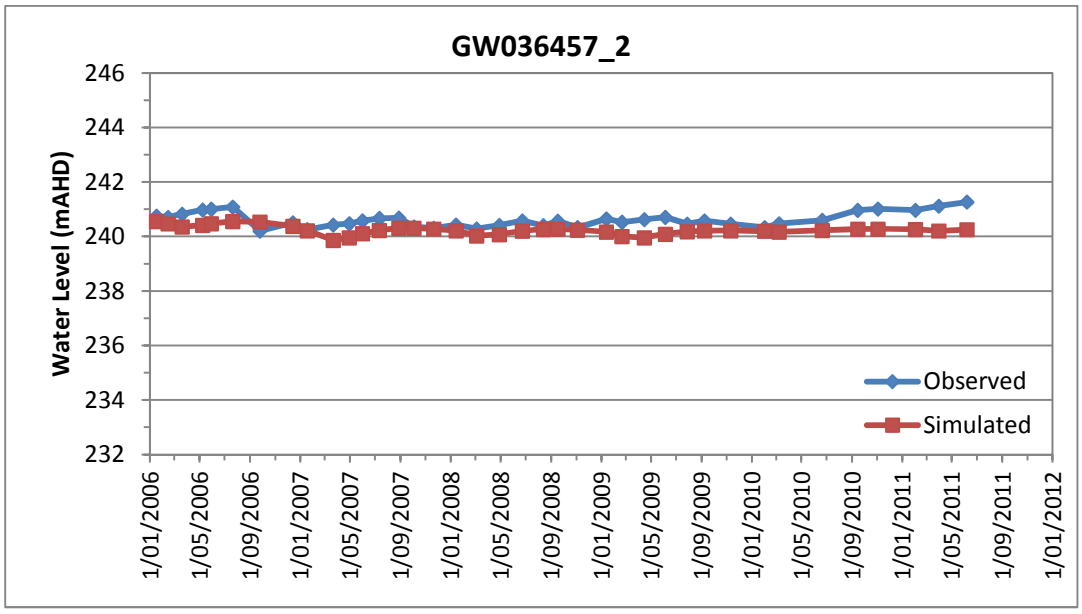

GW030535_1
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

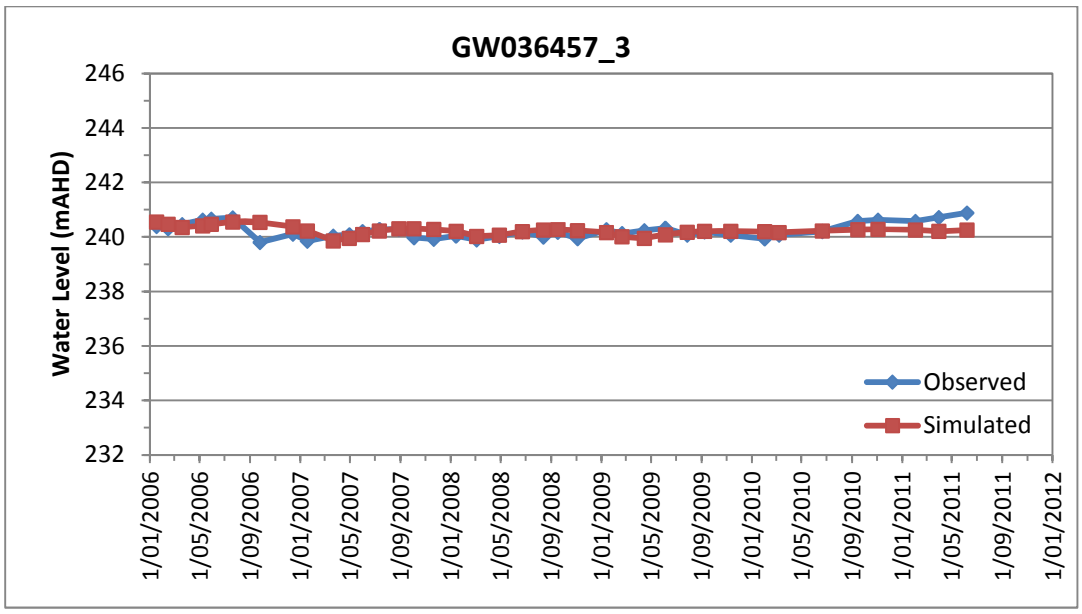

GW036092_1
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

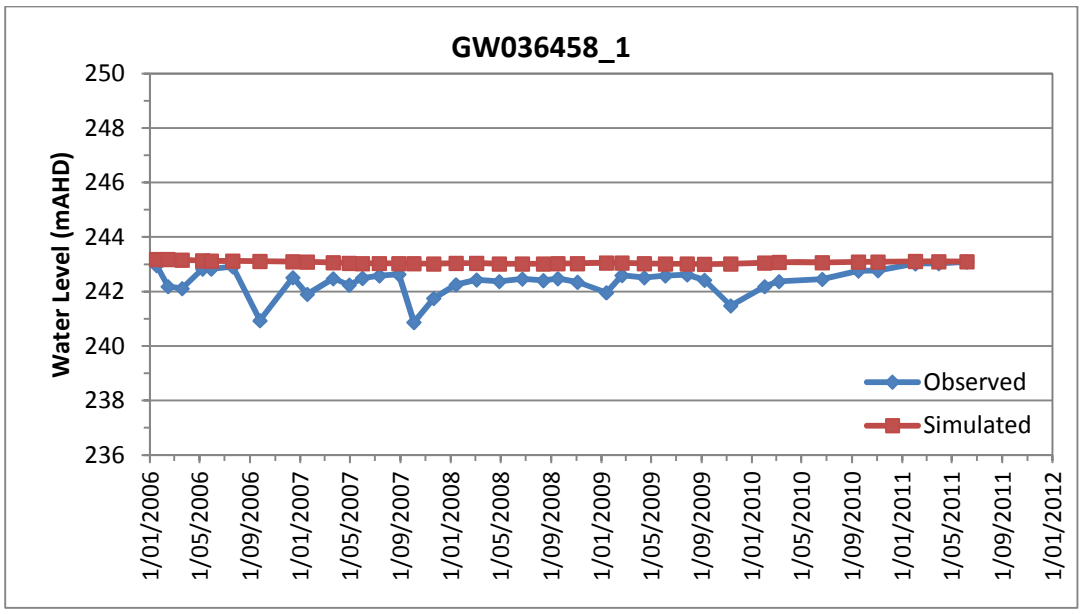

GW036456_1
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

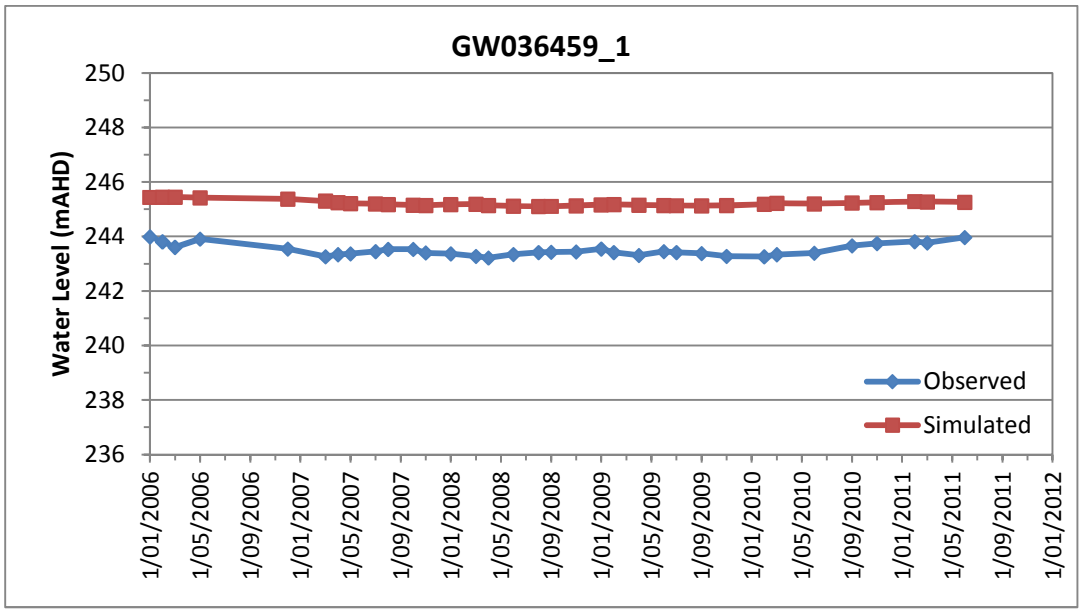

GW036456_2
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

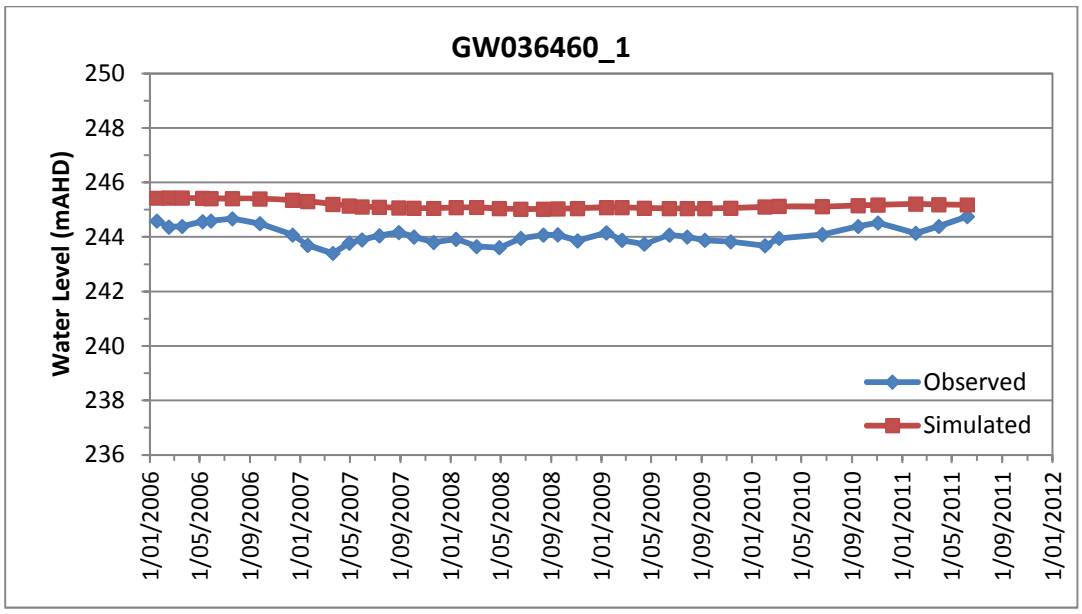

GW036457_1
Water Level (mAHD)
246
244
242
240
238
236
234
232
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

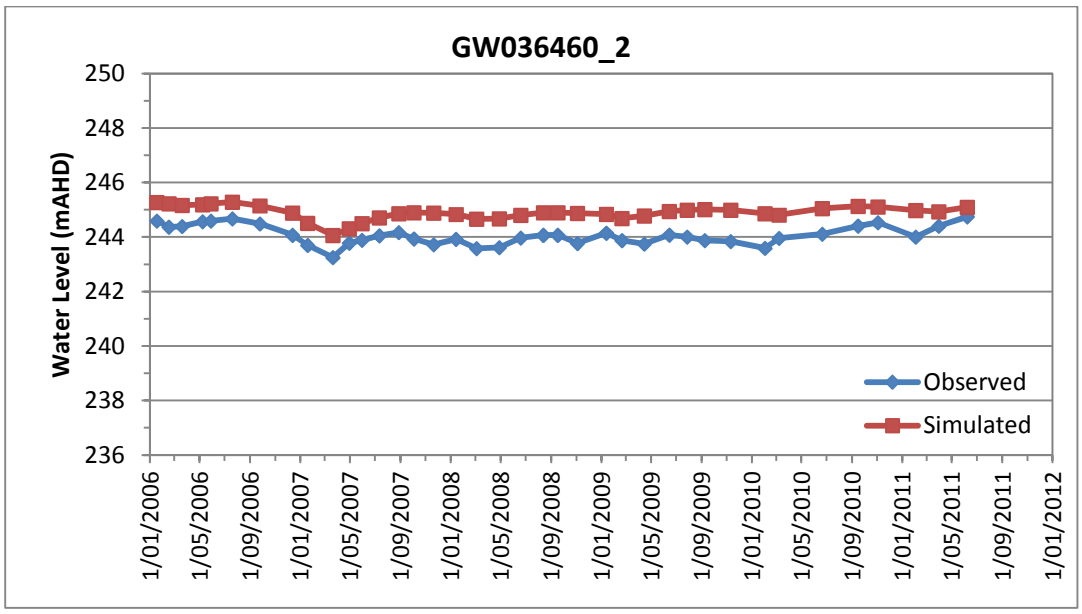

GW036457_2
Water Level (mAHD)
246
244
242
240
238
236
234
232
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

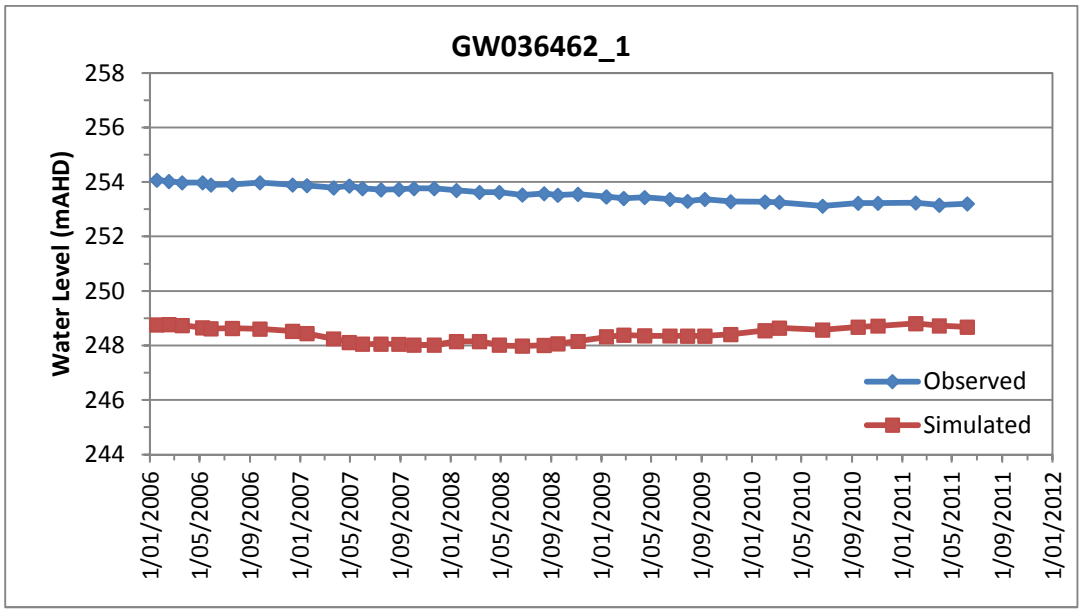

GW036457_3
Water Level (mAHD)
246
244
242
240
238
236
234
232
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

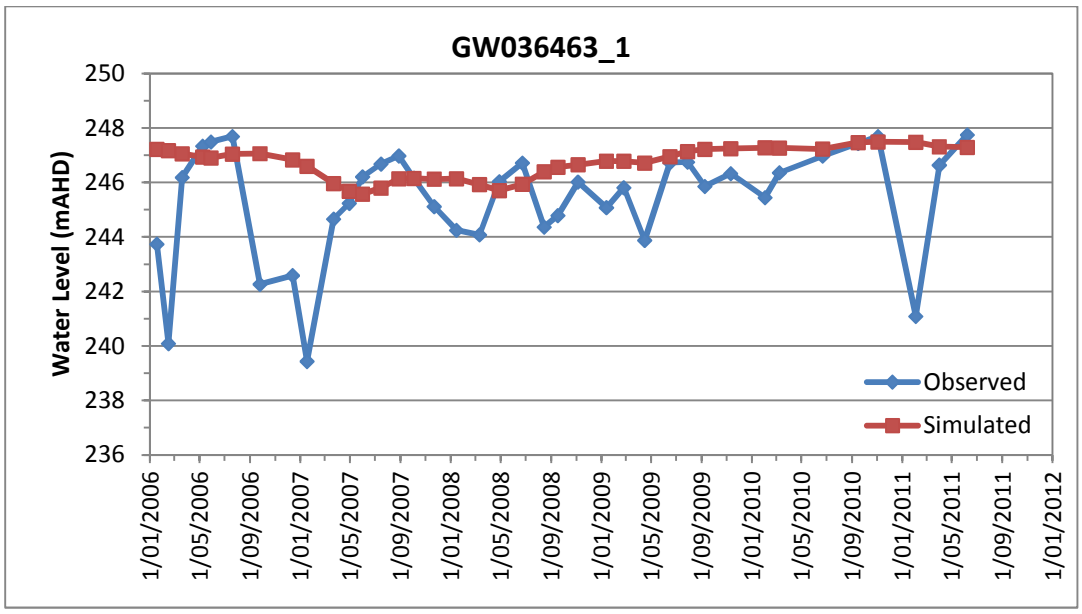

GW036458_1
Water Level (mAHD)
250
248
246
244
242
240
238
236
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

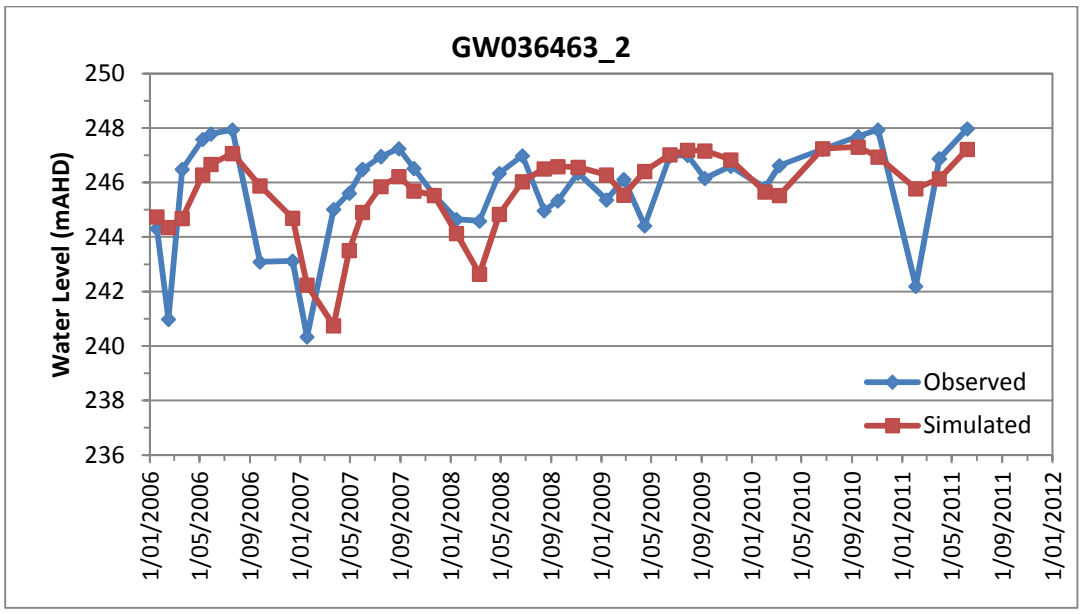

GW036459_1
Water Level (mAHD)
250
248
246
244
242
240
238
236
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

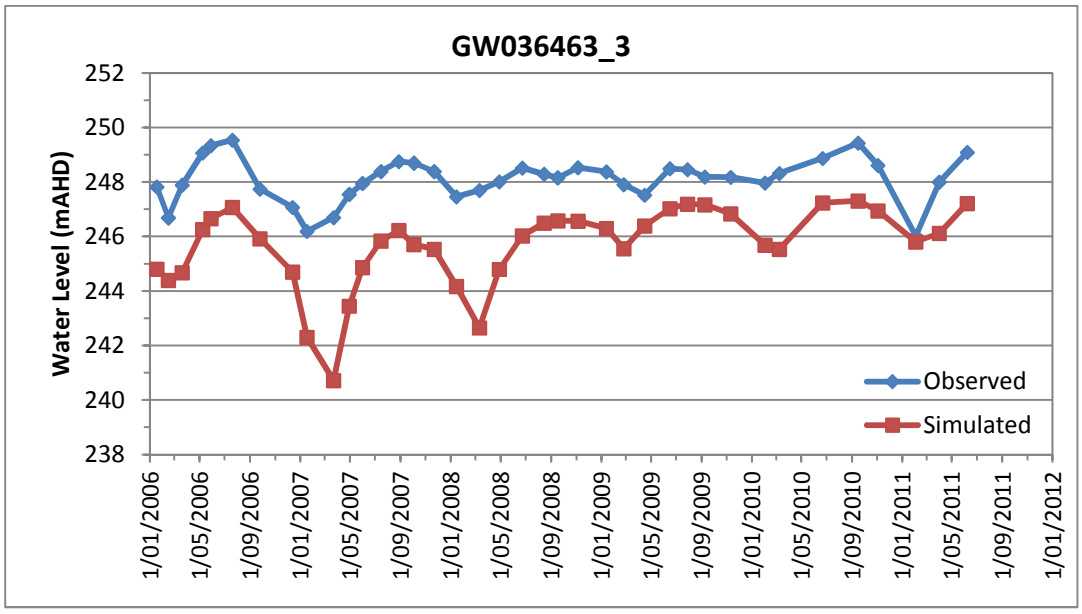

GW036460_1
Water Level (mAHD)
250
248
246
244
242
240
238
236
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

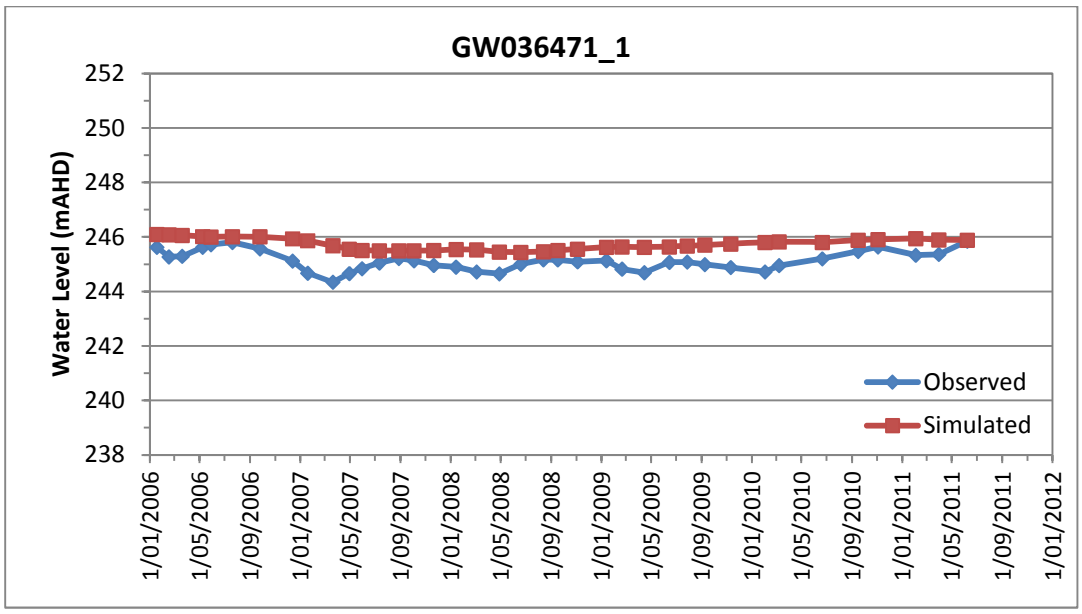

GW036460_2
Water Level (mAHD)
250
248
246
244
242
240
238
236
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

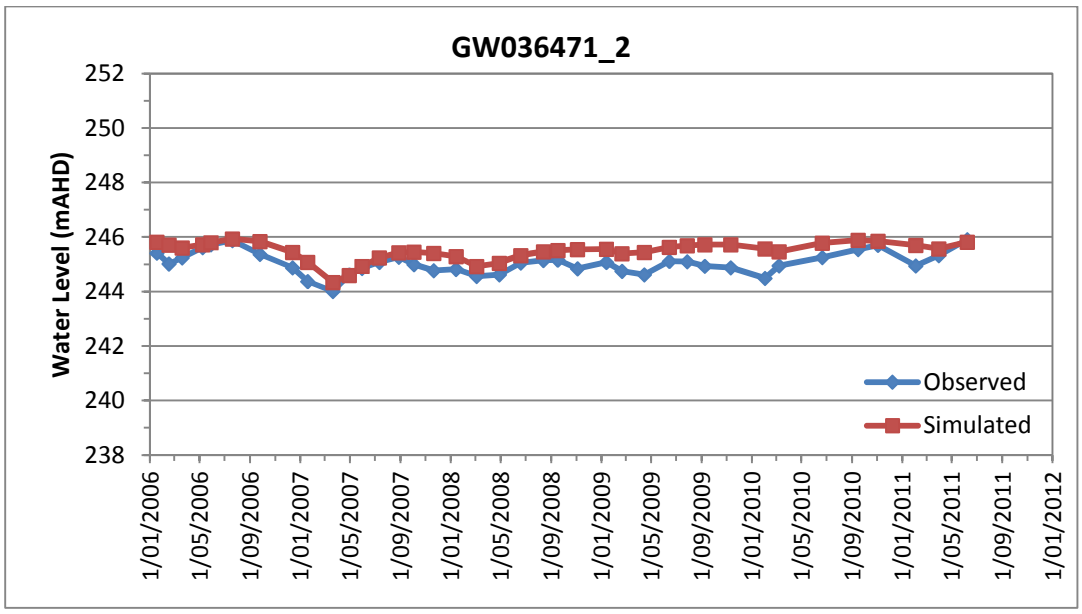

GW036462_1
Water Level (mAHD)
258
256
254
252
250
248
246
244
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

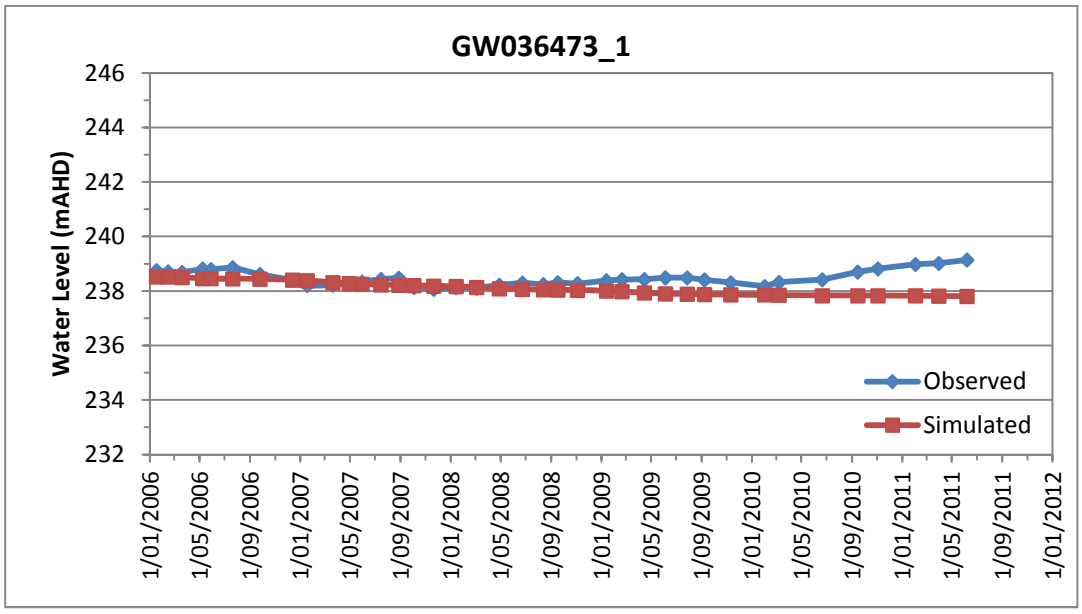

GW036463_1
Water Level (mAHD)
250
248
246
244
242
240
238
236
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

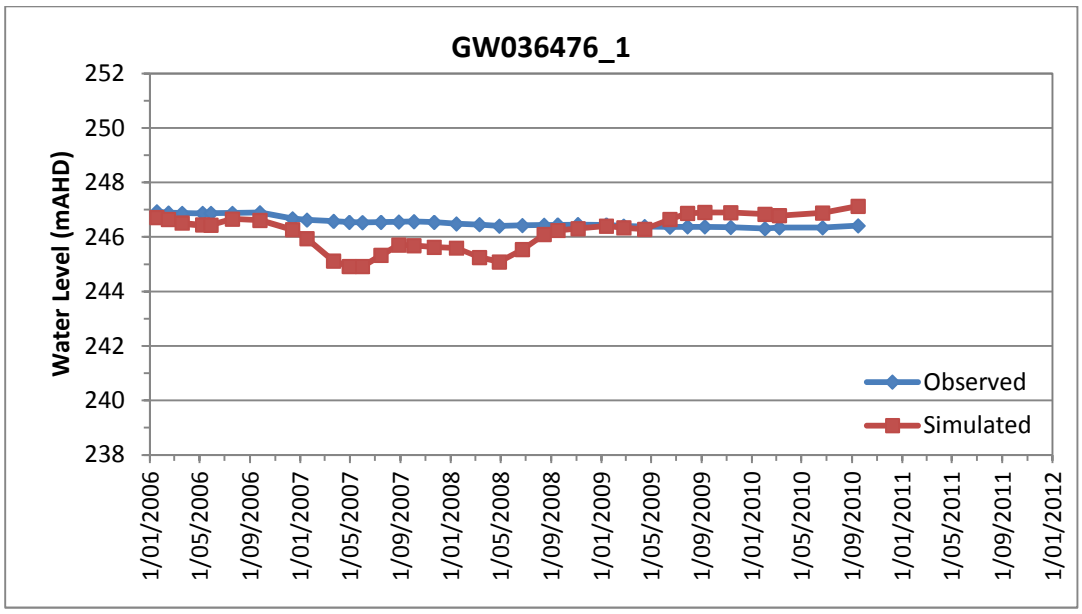

GW036463_2
Water Level (mAHD)
250
248
246
244
242
240
238
236
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

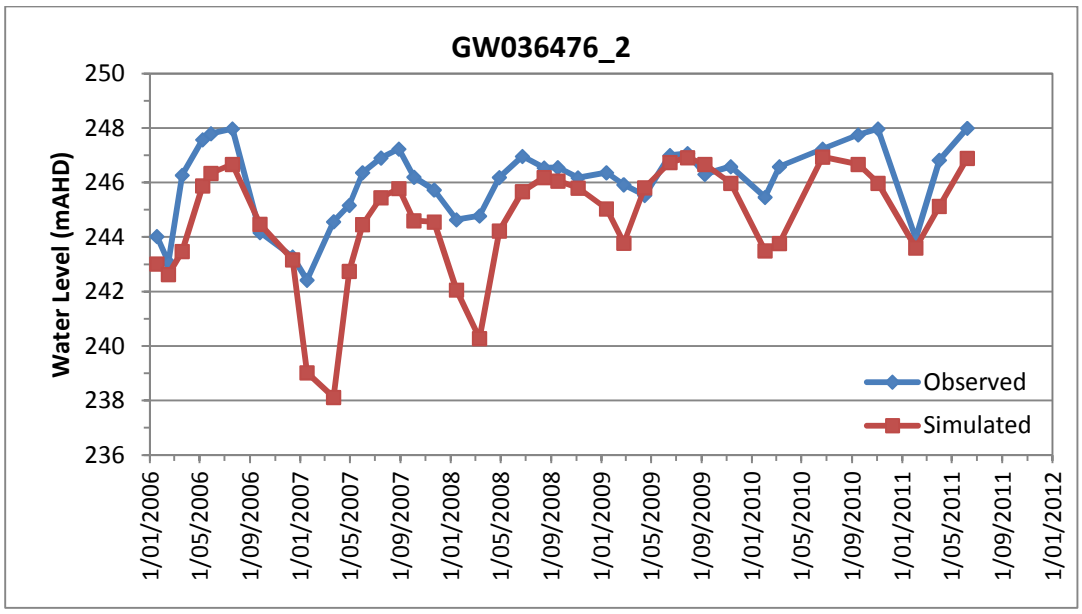

GW036463_3
Water Level (mAHD)
252
250
248
246
244
242
240
238
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

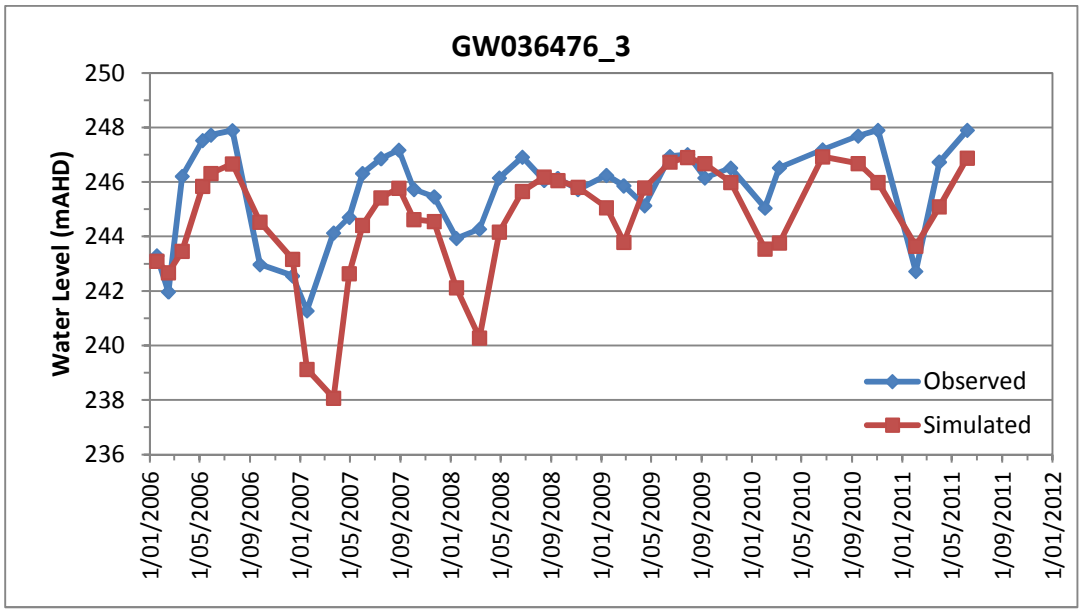

GW036471_1
Water Level (mAHD)
252
250
248
246
244
242
240
238
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

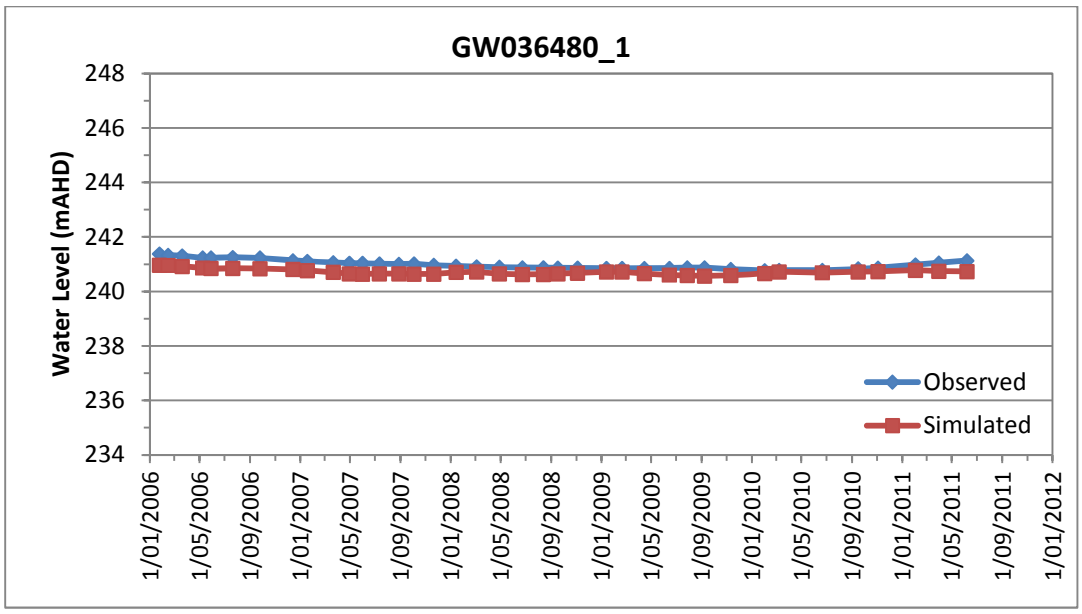

GW036471_2
Water Level (mAHD)
252
250
248
246
244
242
240
238
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

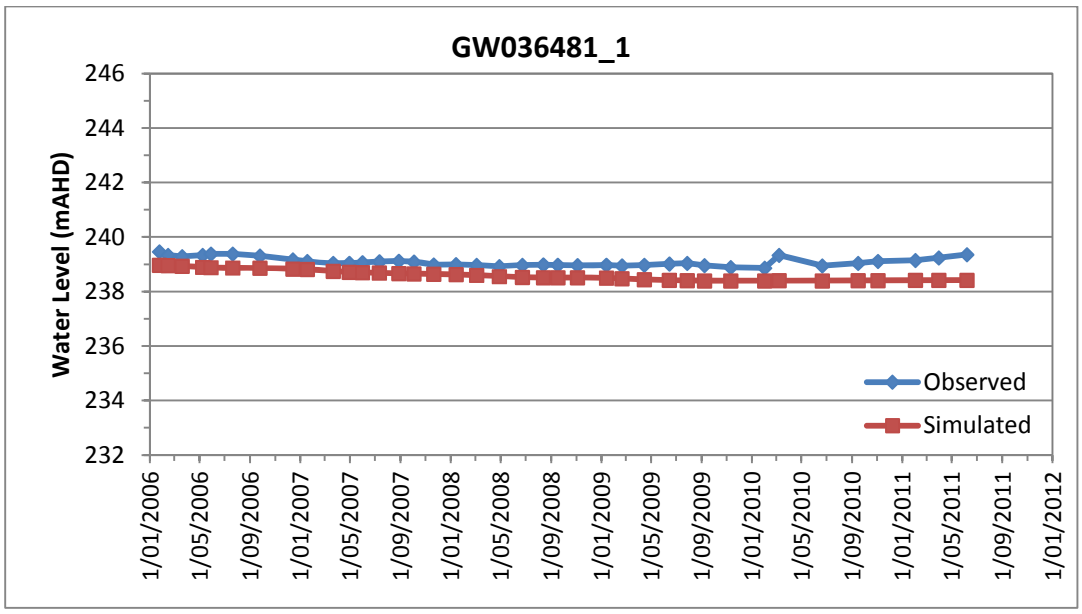

GW036473_1
Water Level (mAHD)
246
244
242
240
238
236
234
232
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

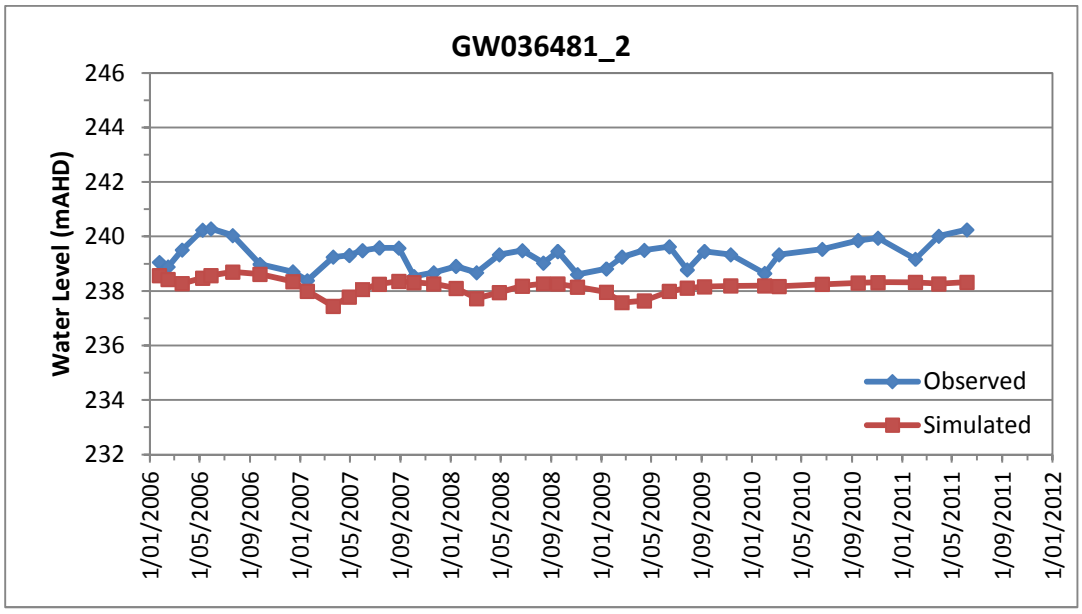

GW036476_1
Water Level (mAHD)
252
250
248
246
244
242
240
238
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

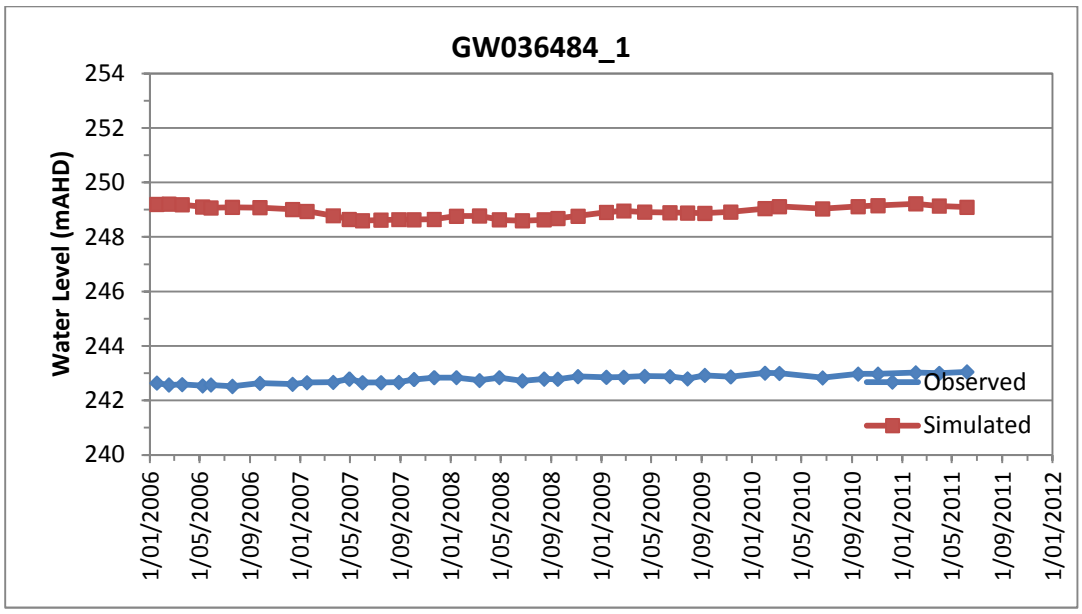

GW036476_2
Water Level (mAHD)
250
248
246
244
242
240
238
236
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

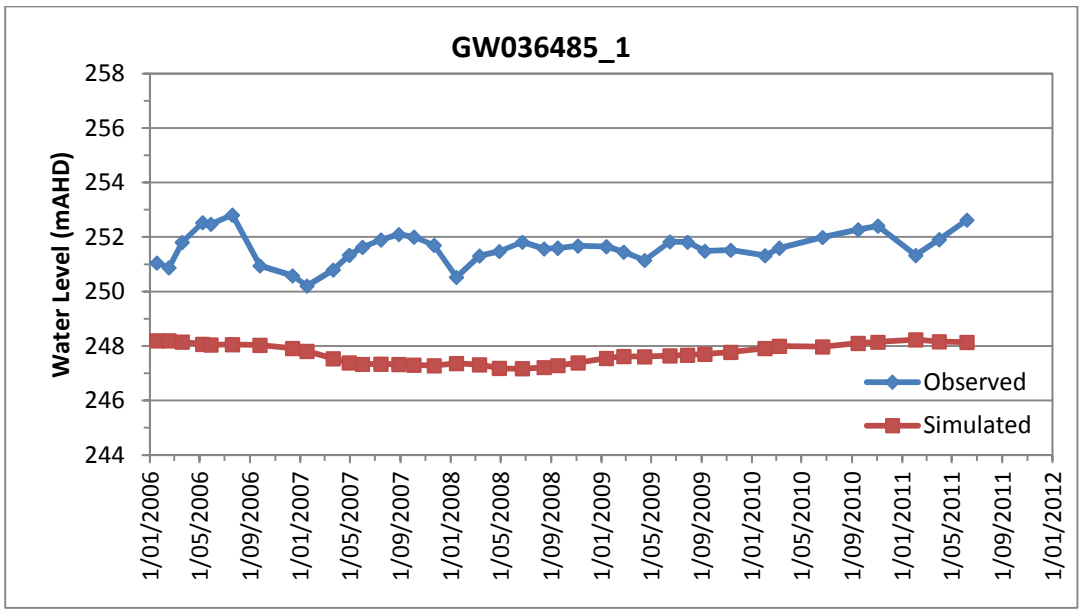

GW036476_3
Water Level (mAHD)
250
248
246
244
242
240
238
236
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

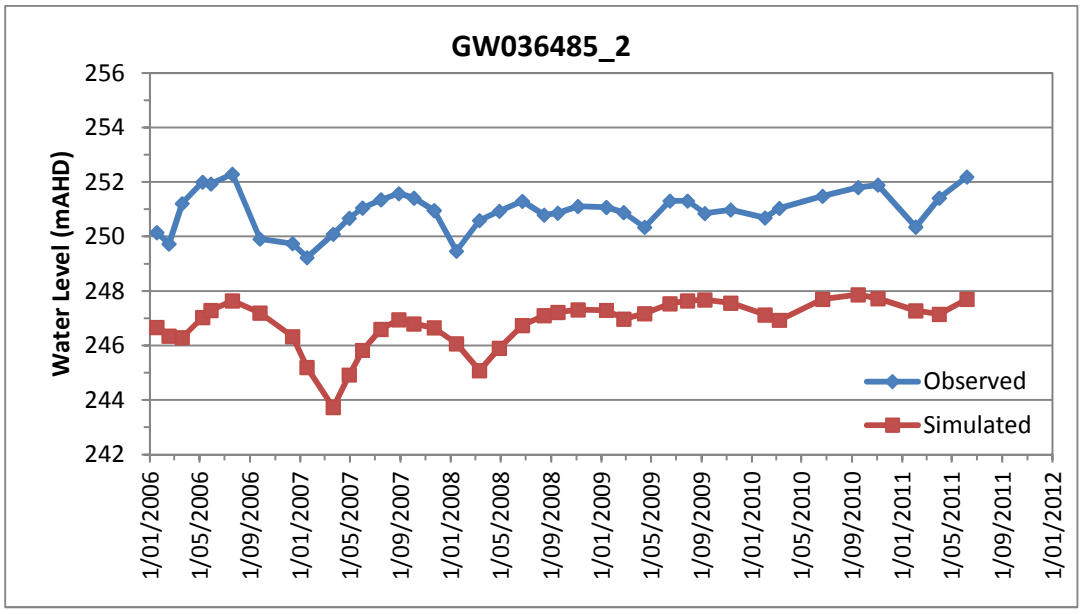

GW036480_1
Water Level (mAHD)
248
246
244
242
240
238
236
234
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

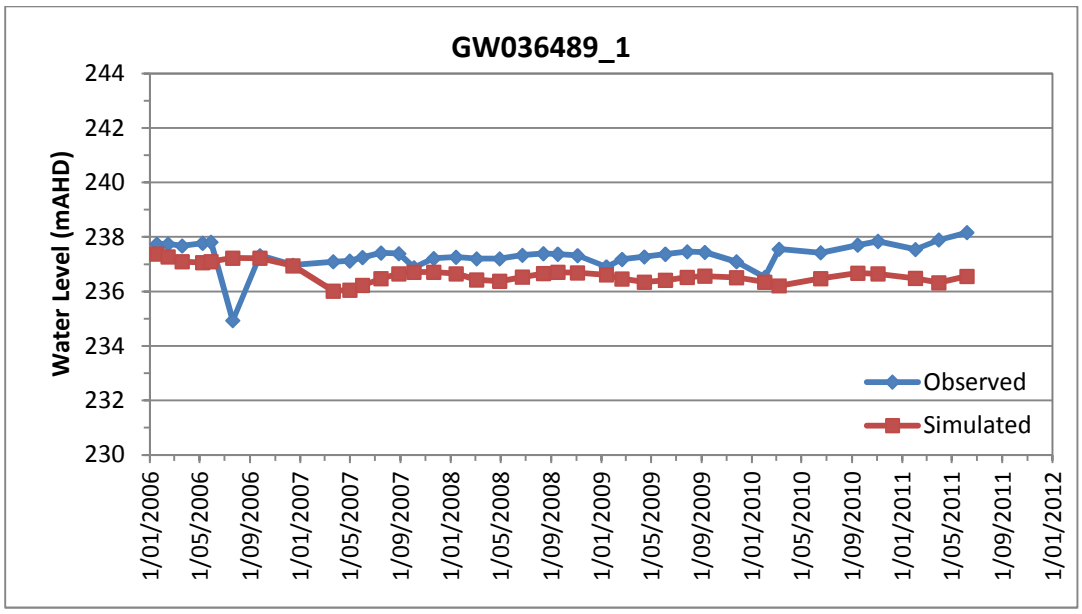

GW036481_1
Water Level (mAHD)
246
244
242
240
238
236
234
232
Observed
Simulated
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012

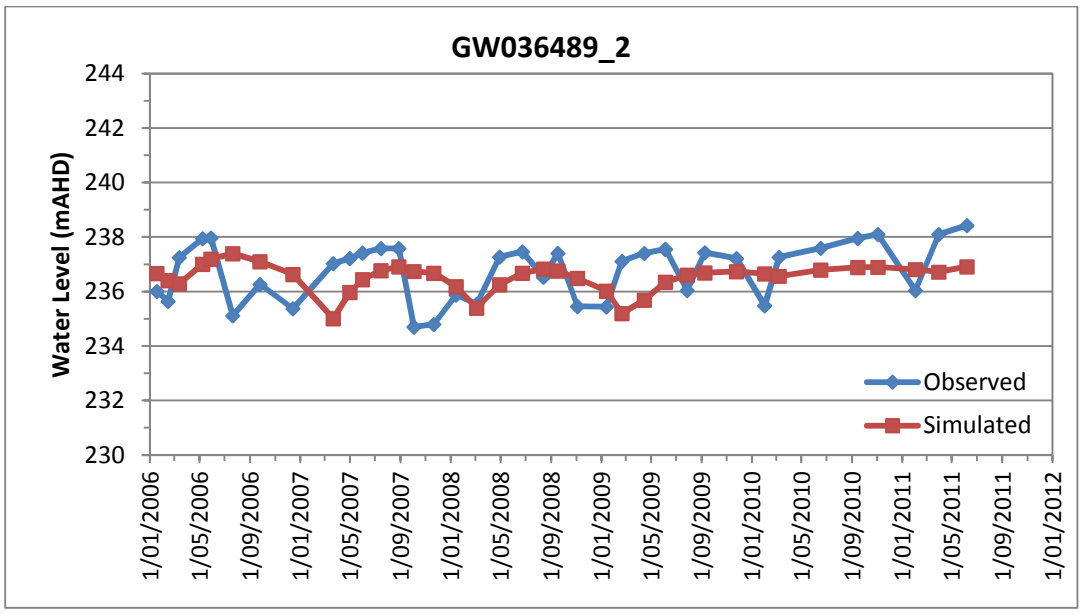

GW036481_2
Water Level (mAHD)
246
244
242
240
238
236
234
232
Observed
Simulated
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012

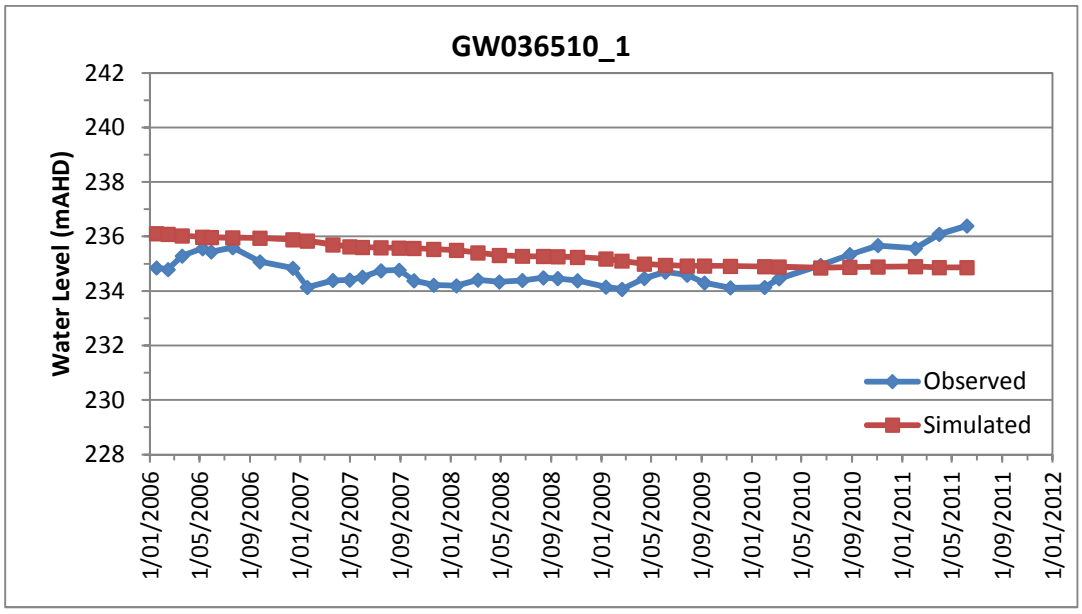

GW036484_1
Water Level (mAHD)
254
252
250
248
246
244
242
240
Observed
Simulated
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012

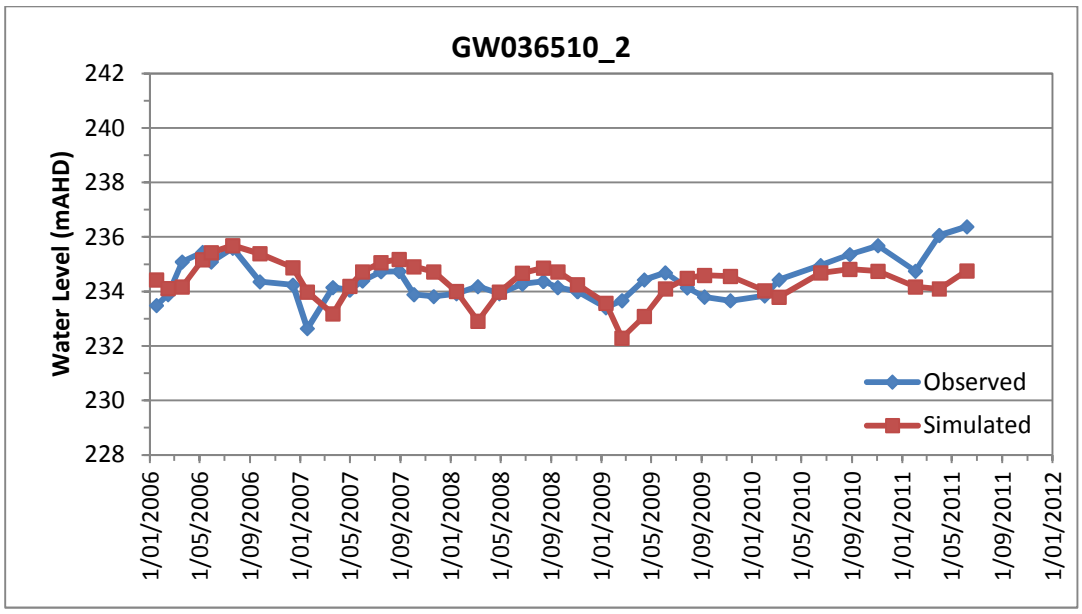

GW036485_1
Water Level (mAHD)
258
256
254
252
250
248
246
244
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

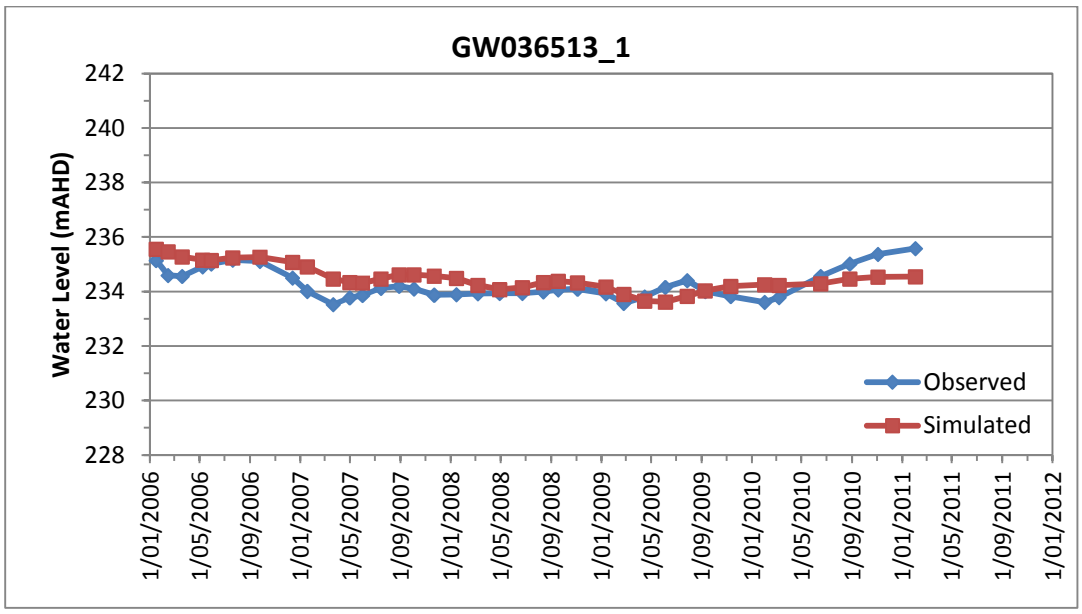

GW036485_2
Water Level (mAHD)
256
254
252
250
248
246
244
242
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

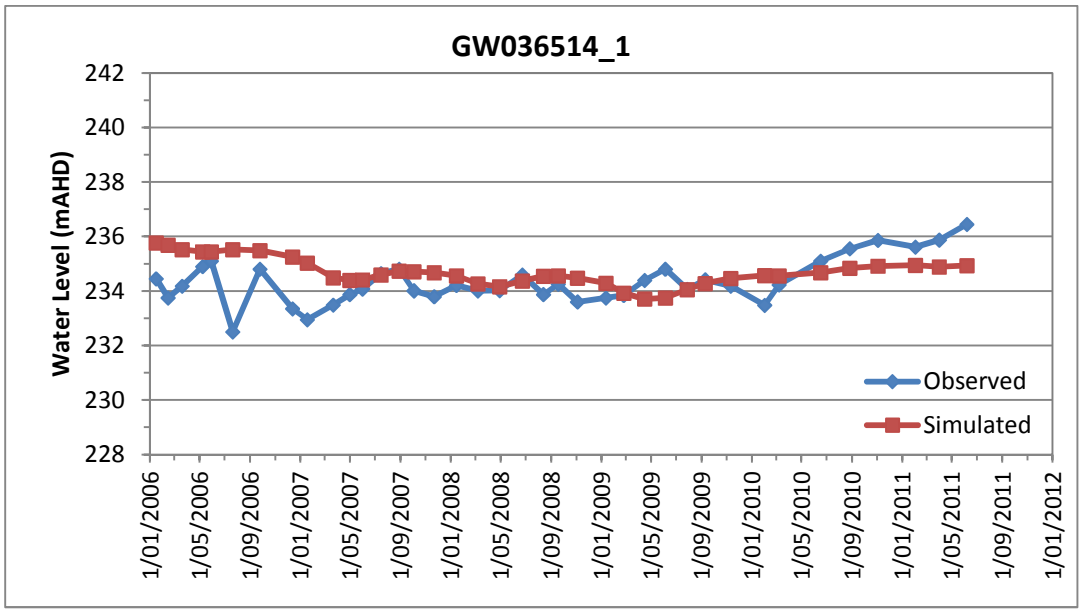

GW036489_1
Water Level (mAHD)
244
242
240
238
236
234
232
230
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

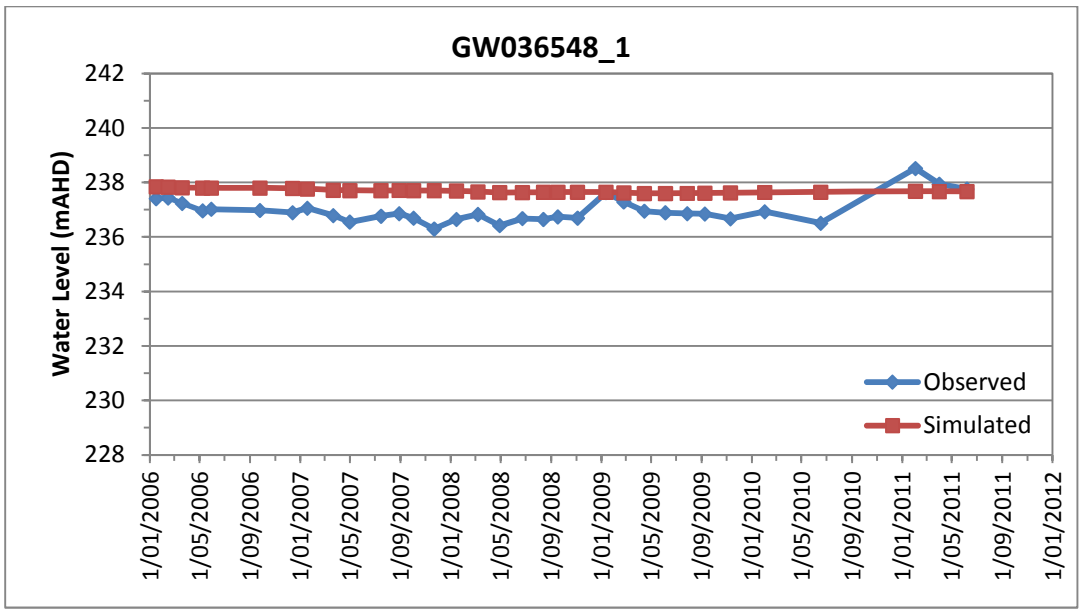

GW036489_2
Water Level (mAHD)
244
242
240
238
236
234
232
230
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

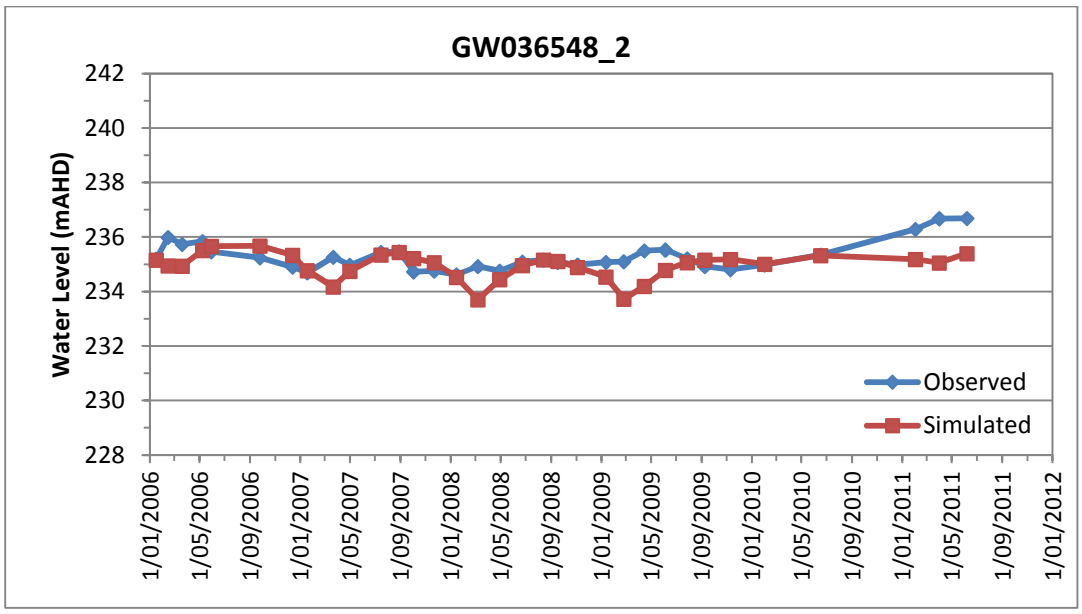

GW036510_1
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

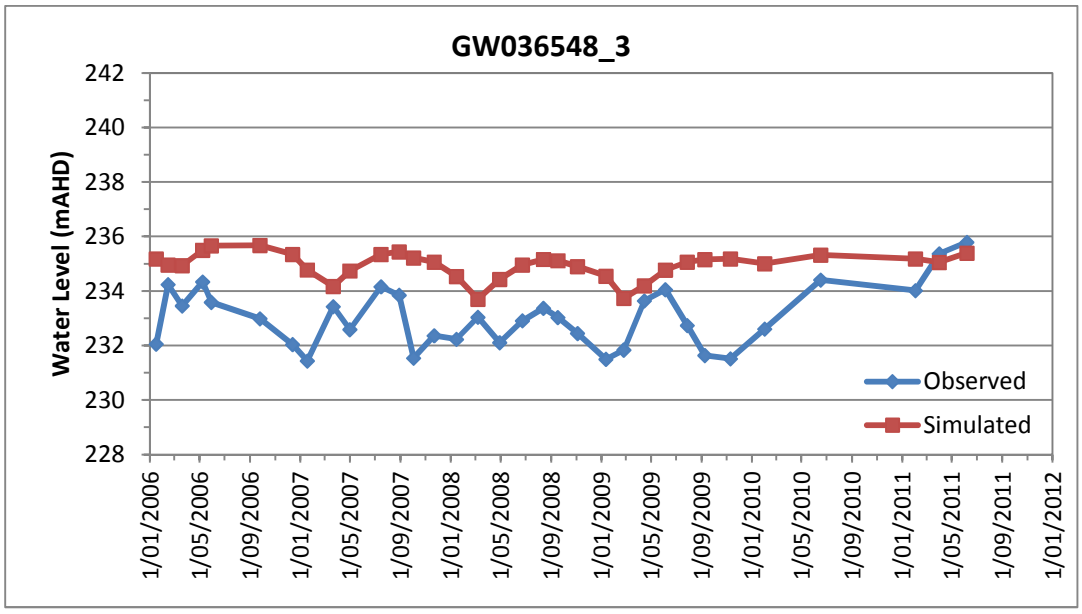

GW036510_2
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

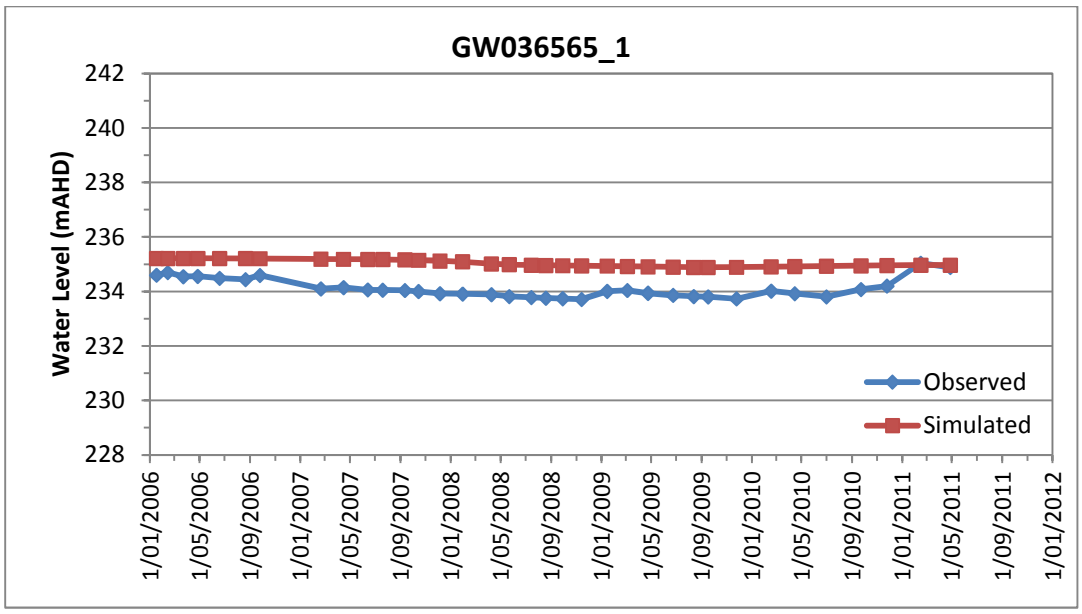

GW036513_1
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

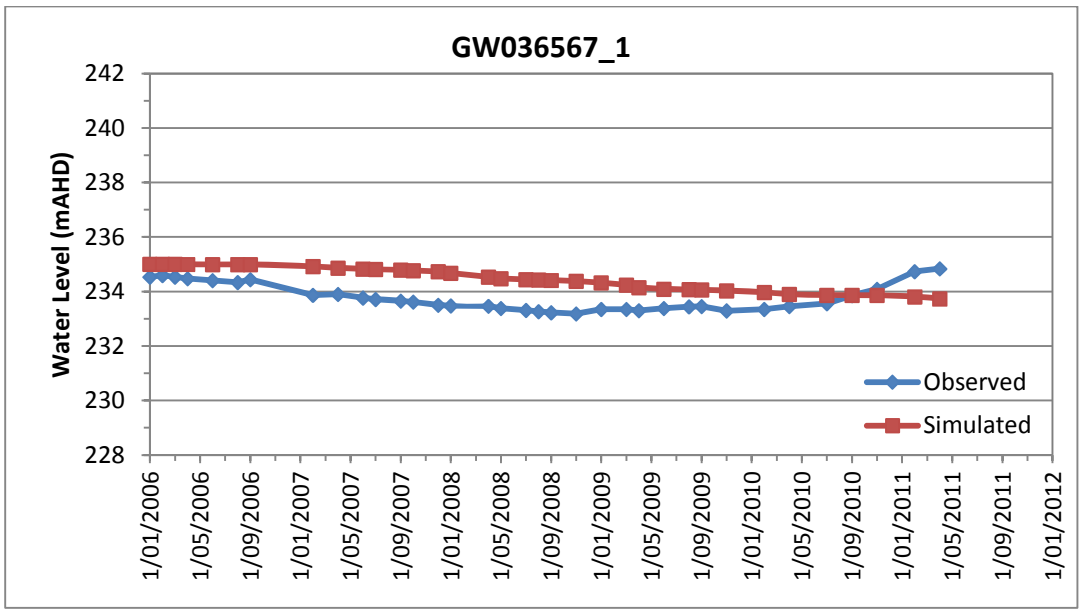

GW036514_1
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

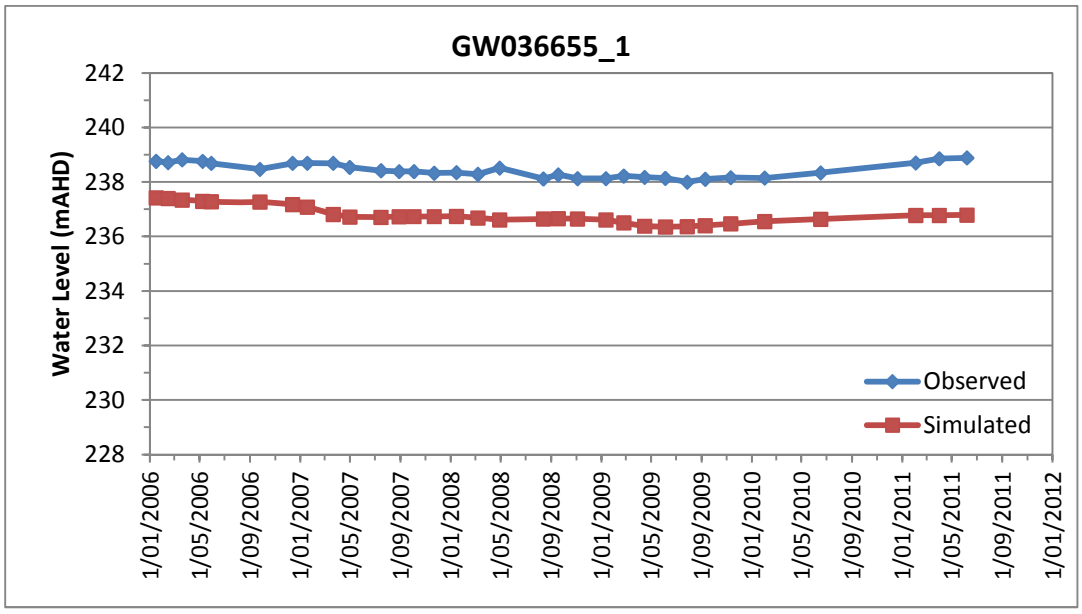

GW036548_1
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

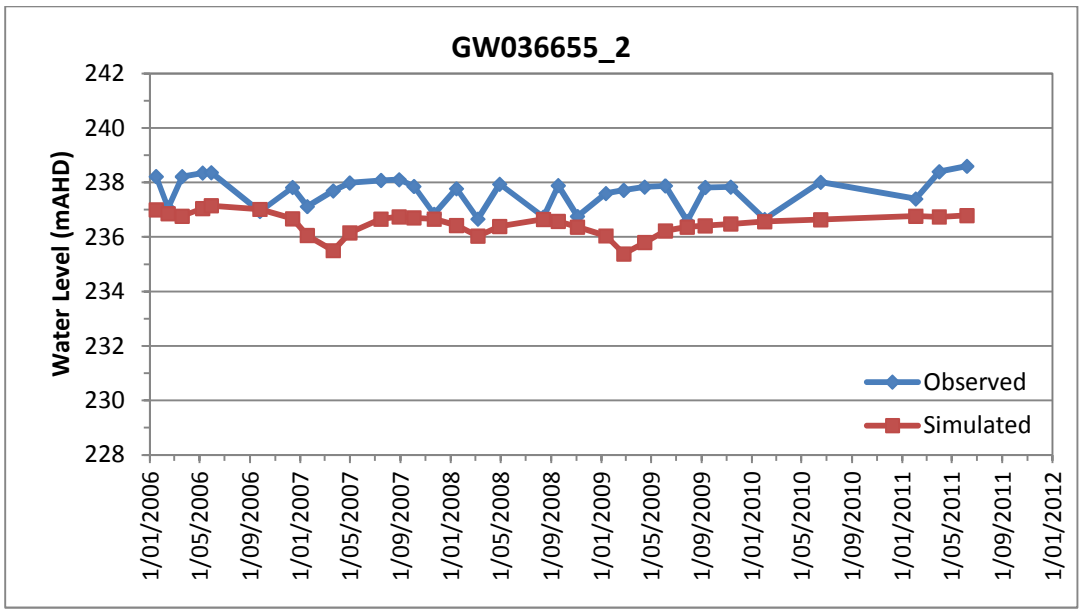

GW036548_2
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated


GW036548_3
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated


GW036565_1
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated


GW036567_1
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated


GW036655_1
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated


GW036655_2
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
1/05/2010
1/09/2010
1/01/2011
1/05/2011
1/09/2011
1/01/2012
Observed
Simulated

NSW Office of Water Monitoring Network – Alluvium (Zone 2)

GW036433_1

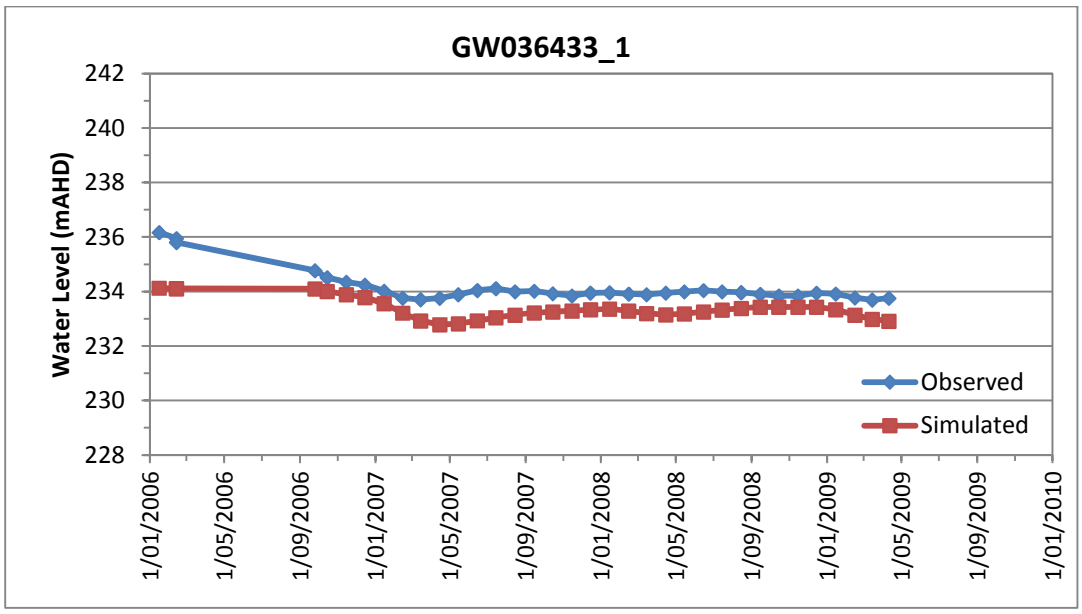
GW036434_1, GW036434_2, GW036434_3

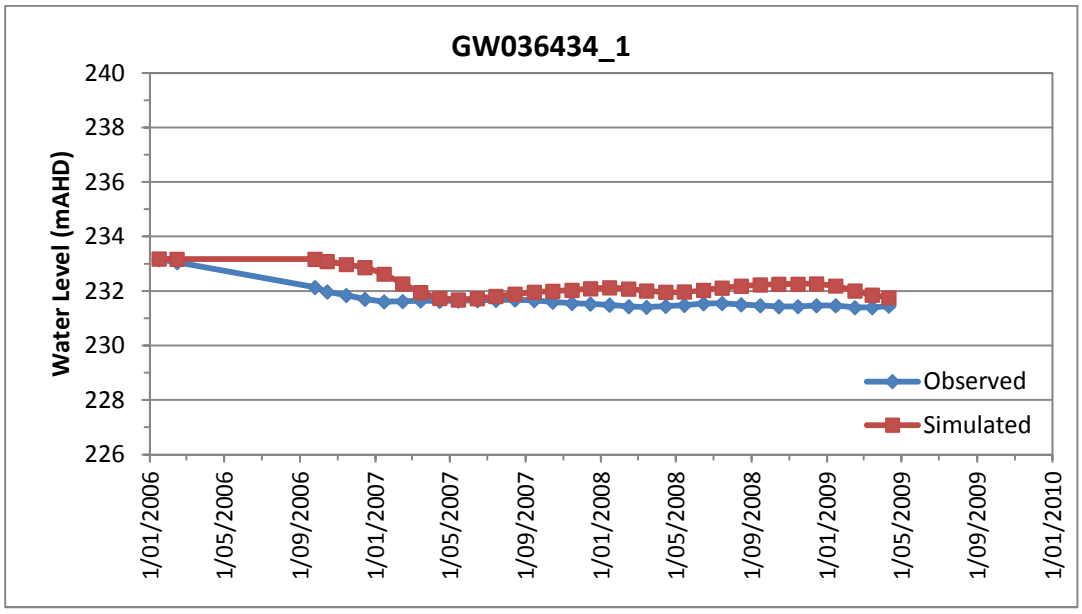
GW036435_1, GW036435_2

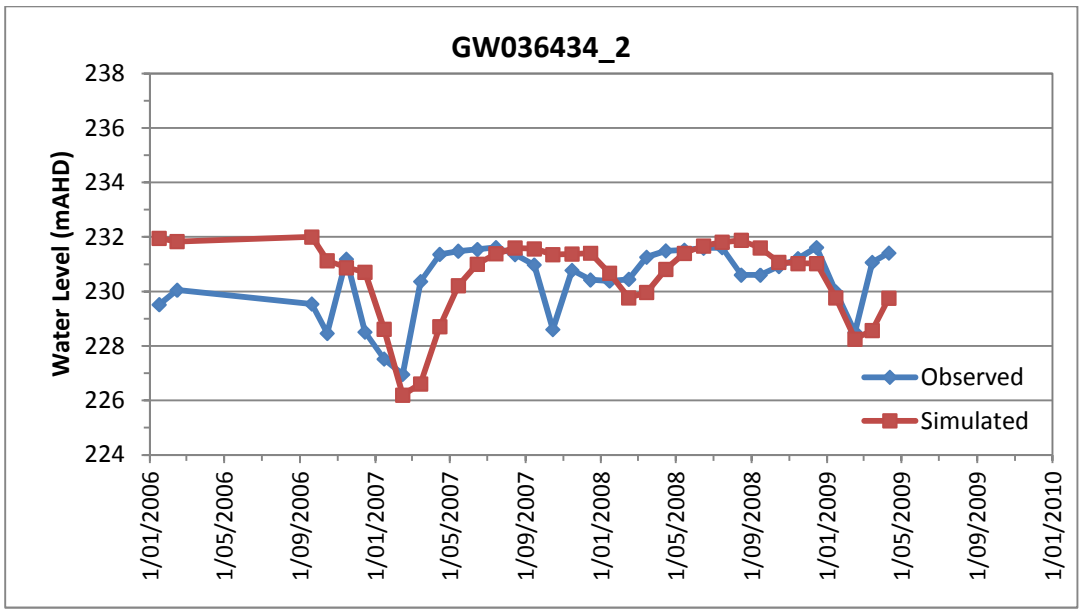
GW036436_1, GW036436_2

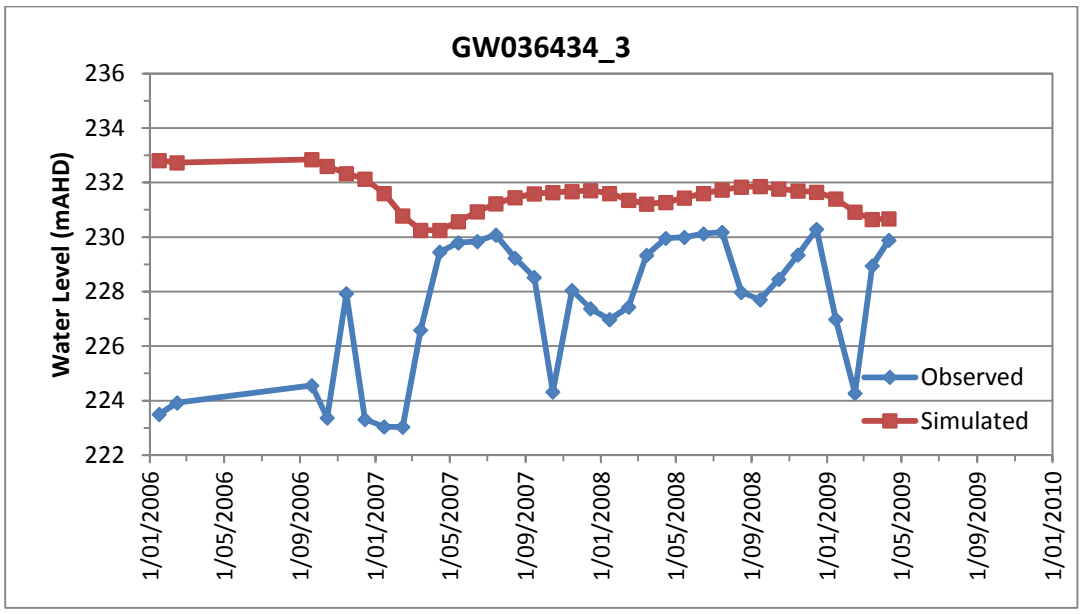
GW036440_1

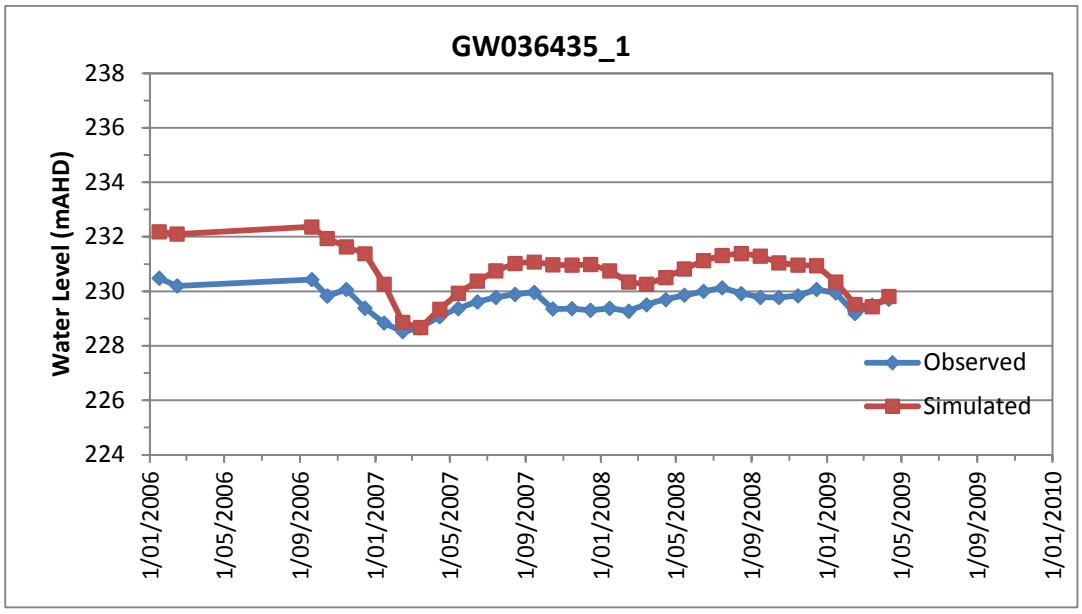
GW036478

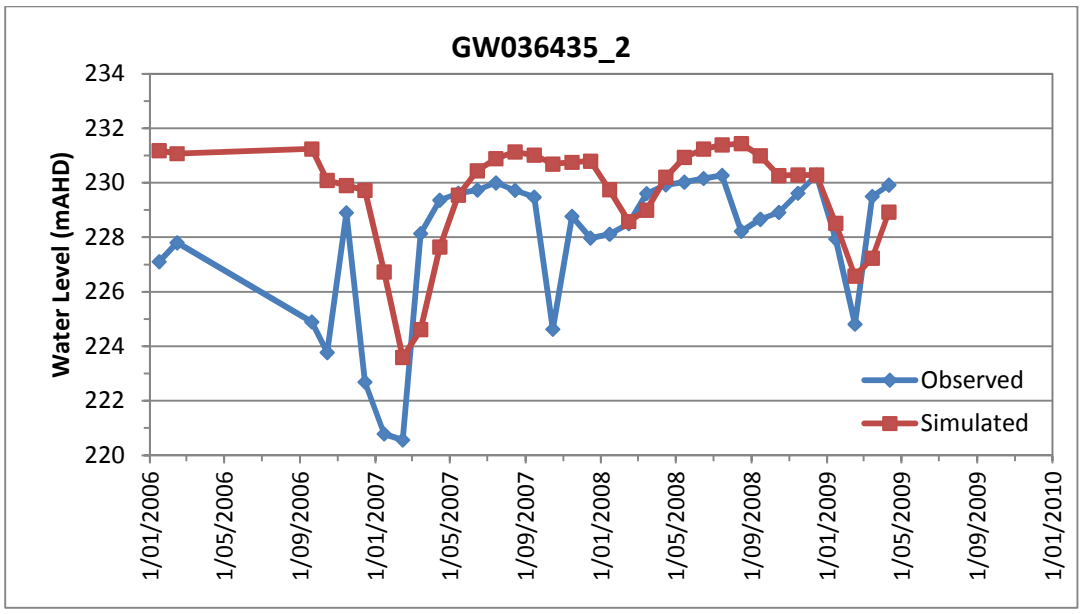

GW036433_1
Water Level (mAHD)
242
240
238
236
234
232
230
228
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
Observed
Simulated

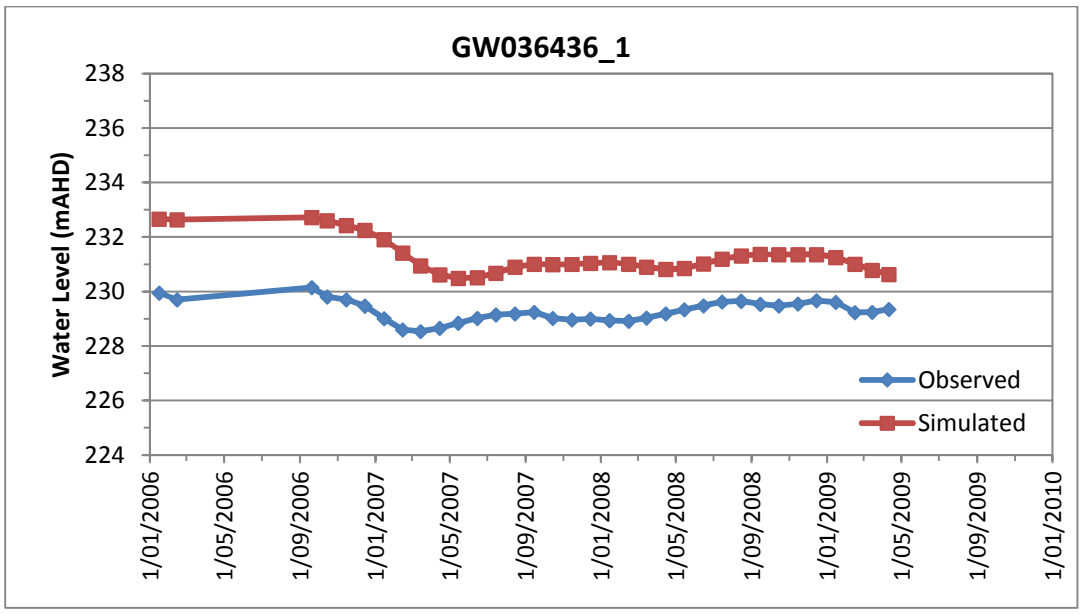

GW036434_1
Water Level (mAHD)
240
238
236
234
232
230
228
226
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
Observed
Simulated

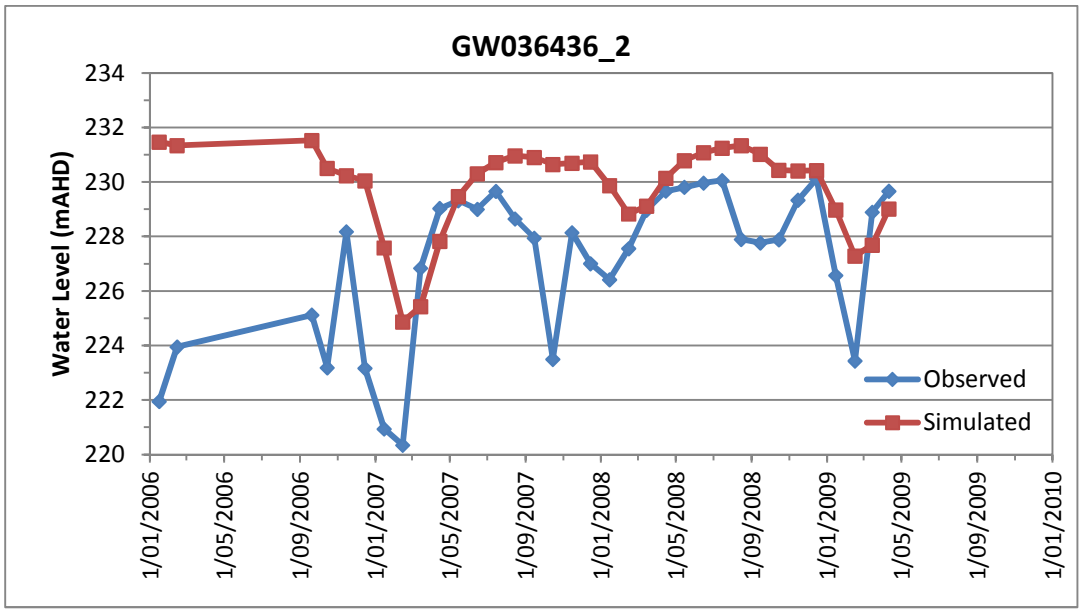

GW036434_2
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
Observed
Simulated

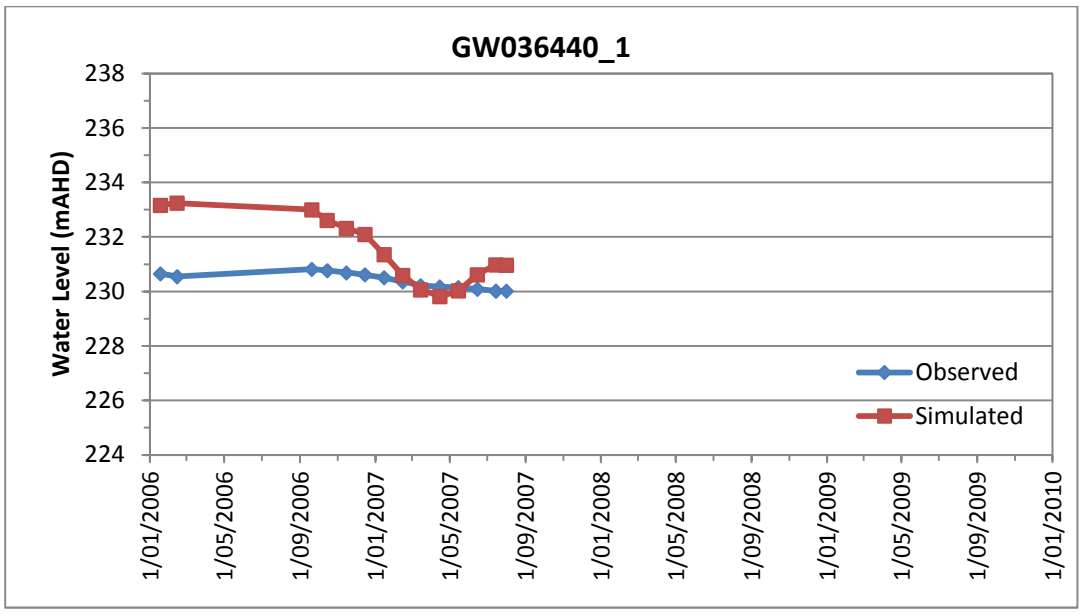

GW036434_3
Water Level (mAHD)
236
234
232
230
228
226
224
222
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
Observed
Simulated

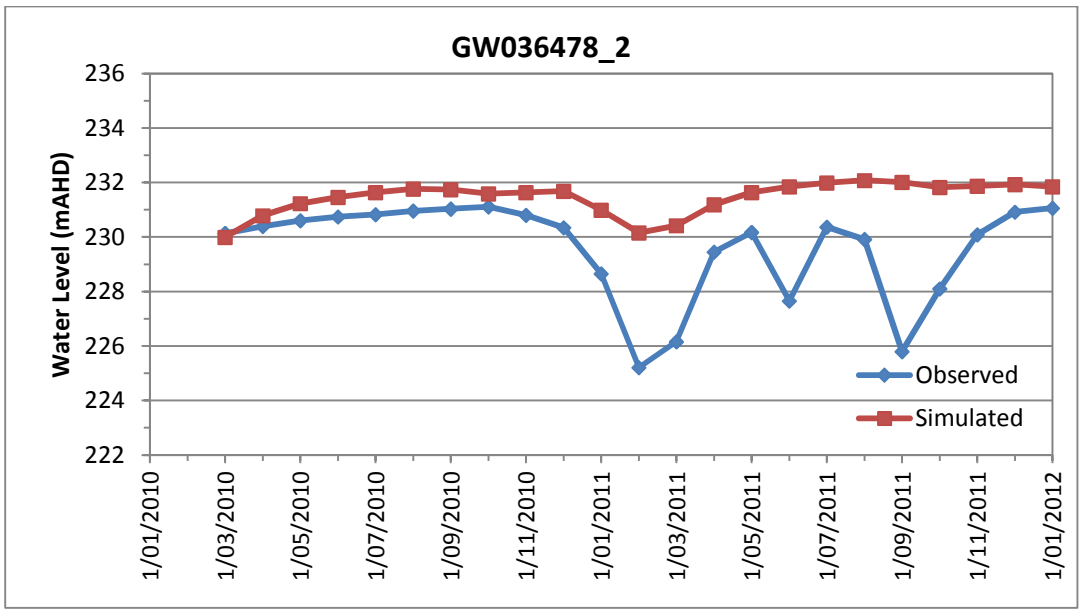

GW036435_1
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
Observed
Simulated


GW036435_2
Water Level (mAHD)
234
232
230
228
226
224
222
220
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
Observed
Simulated


GW036436_1
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
Observed
Simulated

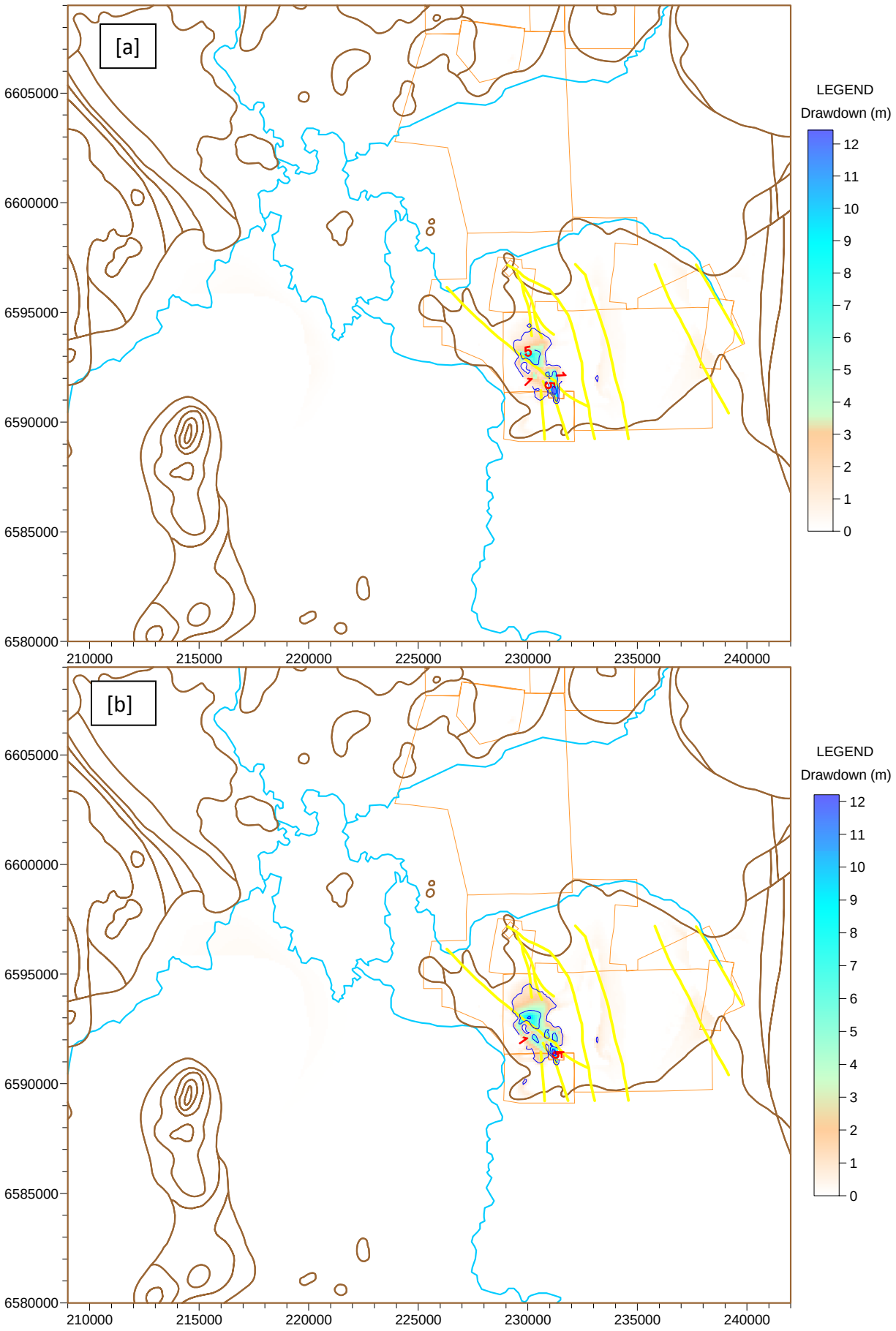

GW036436_2
Water Level (mAHD)
234
232
230
228
226
224
222
220
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
Observed
Simulated


GW036440_1
Water Level (mAHD)
238
236
234
232
230
228
226
224
1/01/2006
1/05/2006
1/09/2006
1/01/2007
1/05/2007
1/09/2007
1/01/2008
1/05/2008
1/09/2008
1/01/2009
1/05/2009
1/09/2009
1/01/2010
Observed
Simulated

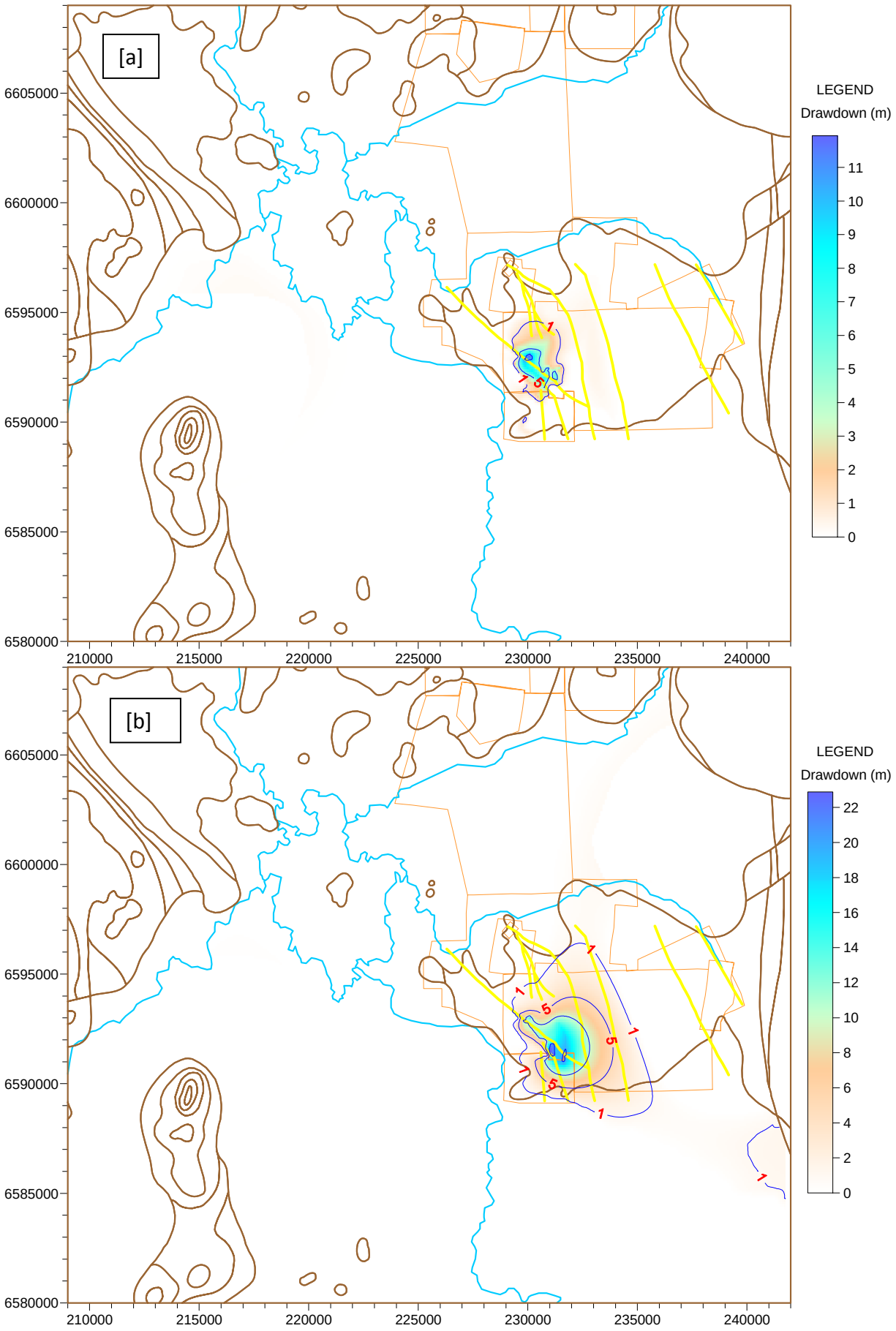

GW036478_2
Water Level (mAHD)
236
234
232
230
228
226
224
222
1/01/2010
1/03/2010
1/05/2010
1/07/2010
1/09/2010
1/11/2010
1/01/2011
1/03/2011
1/05/2011
1/07/2011
1/09/2011
1/11/2011
1/01/2012
Observed
Simulated

ATTACHMENT AJ

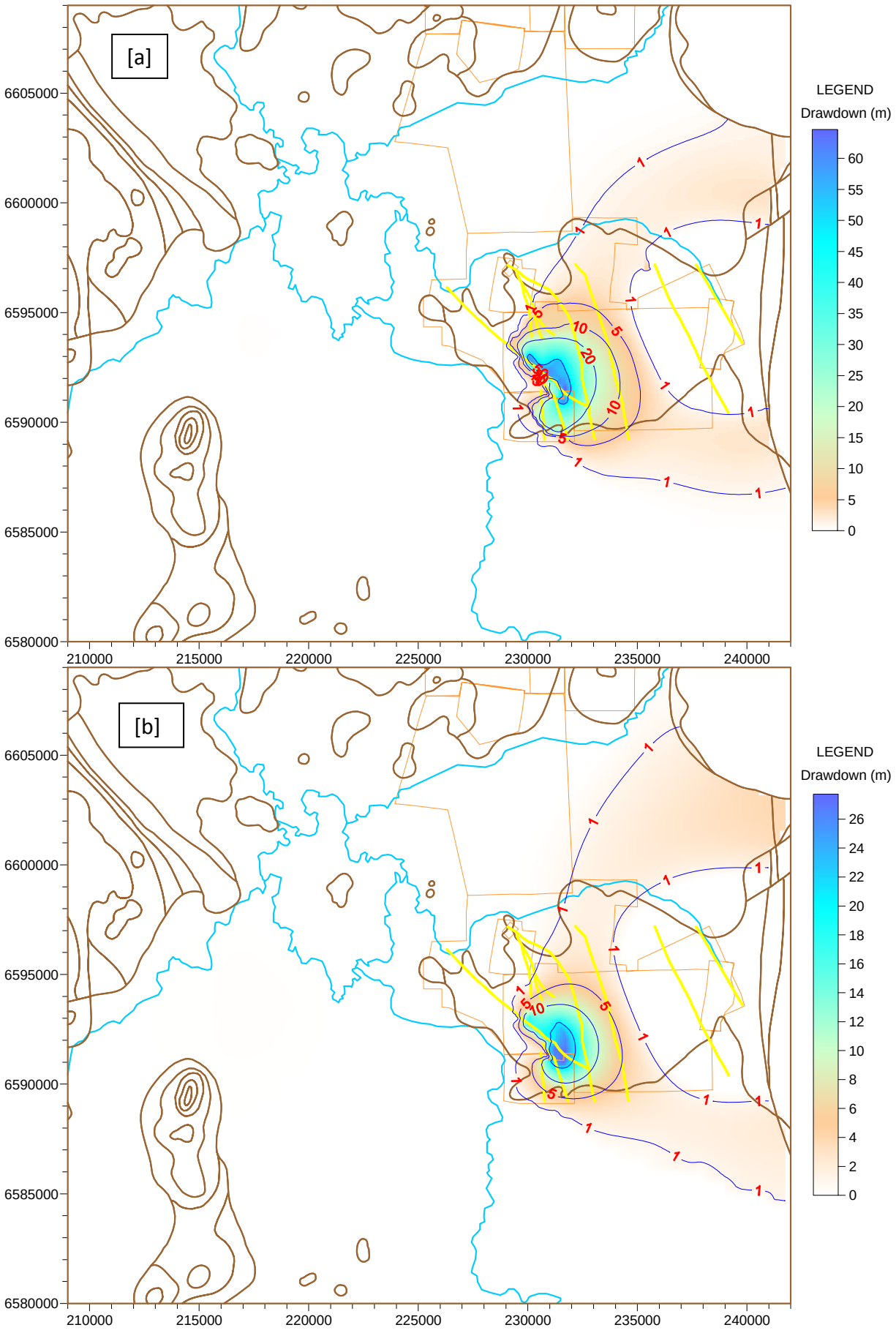
Five-Yearly Drawdown Contour Maps



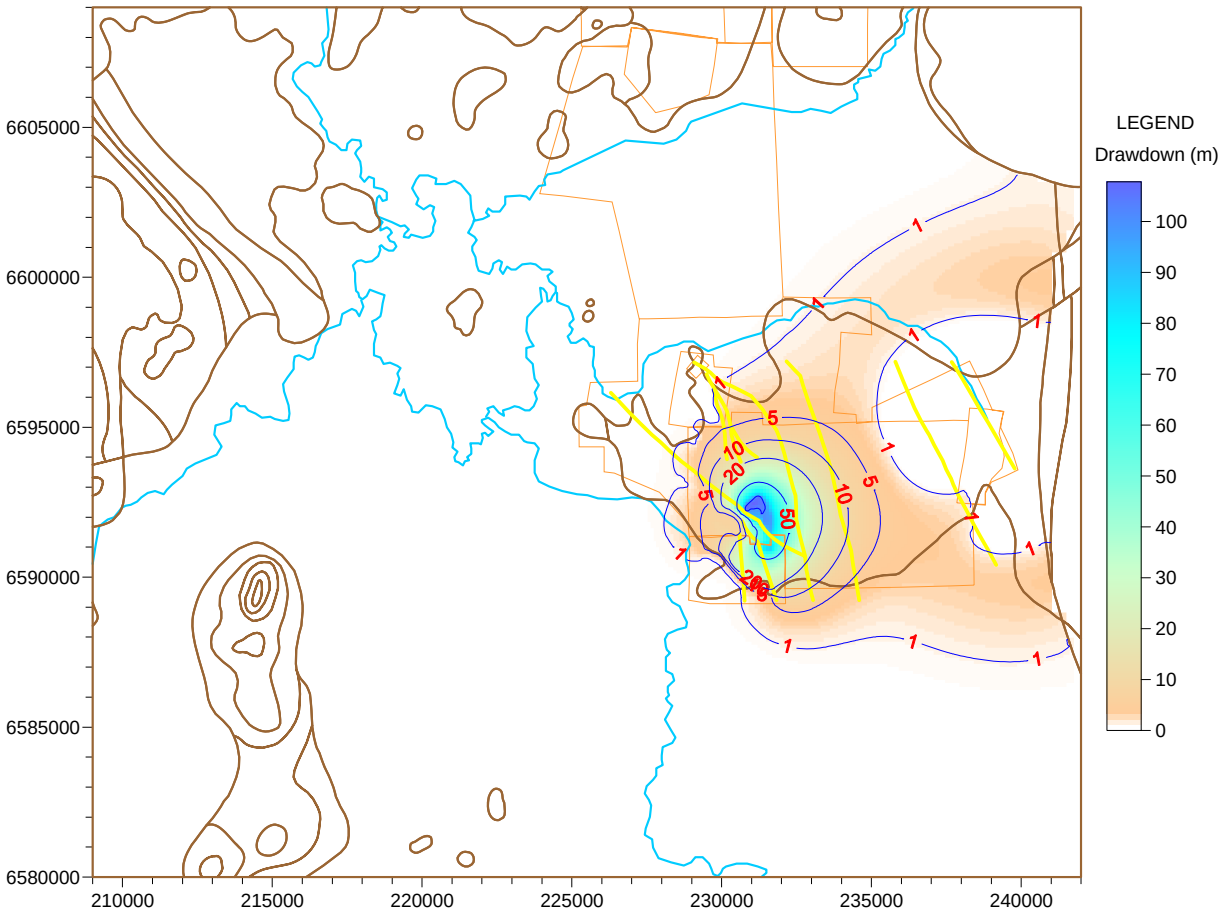
Predicted Drawdown Contours at the of End of Stress Period 5 (End of Year 2016) in Layers [a] 1 and [b] 2



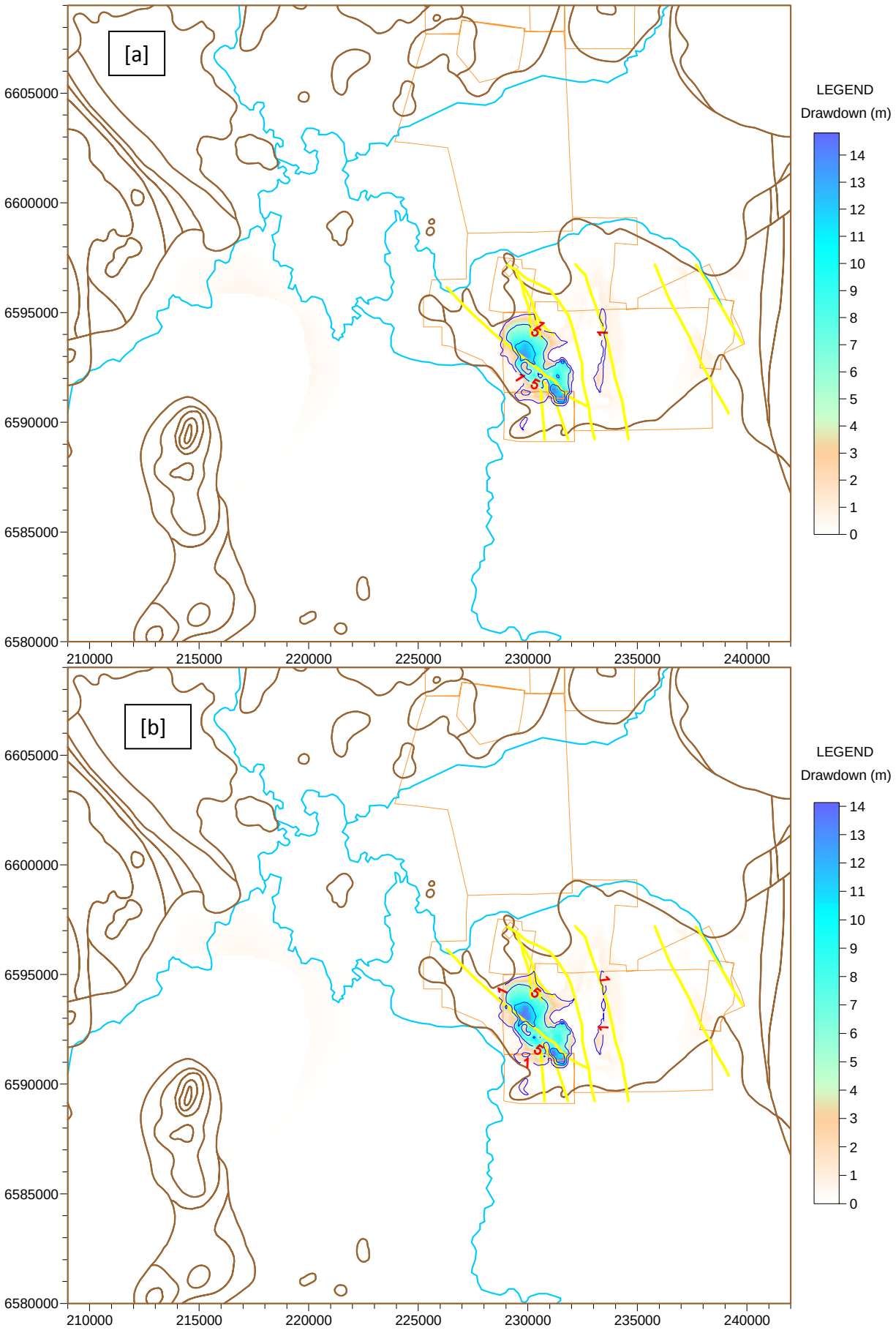
Predicted Drawdown Contours at the of End of Stress Period 5 (End of Year 2016) in Layers [a] 4 and [b] 6



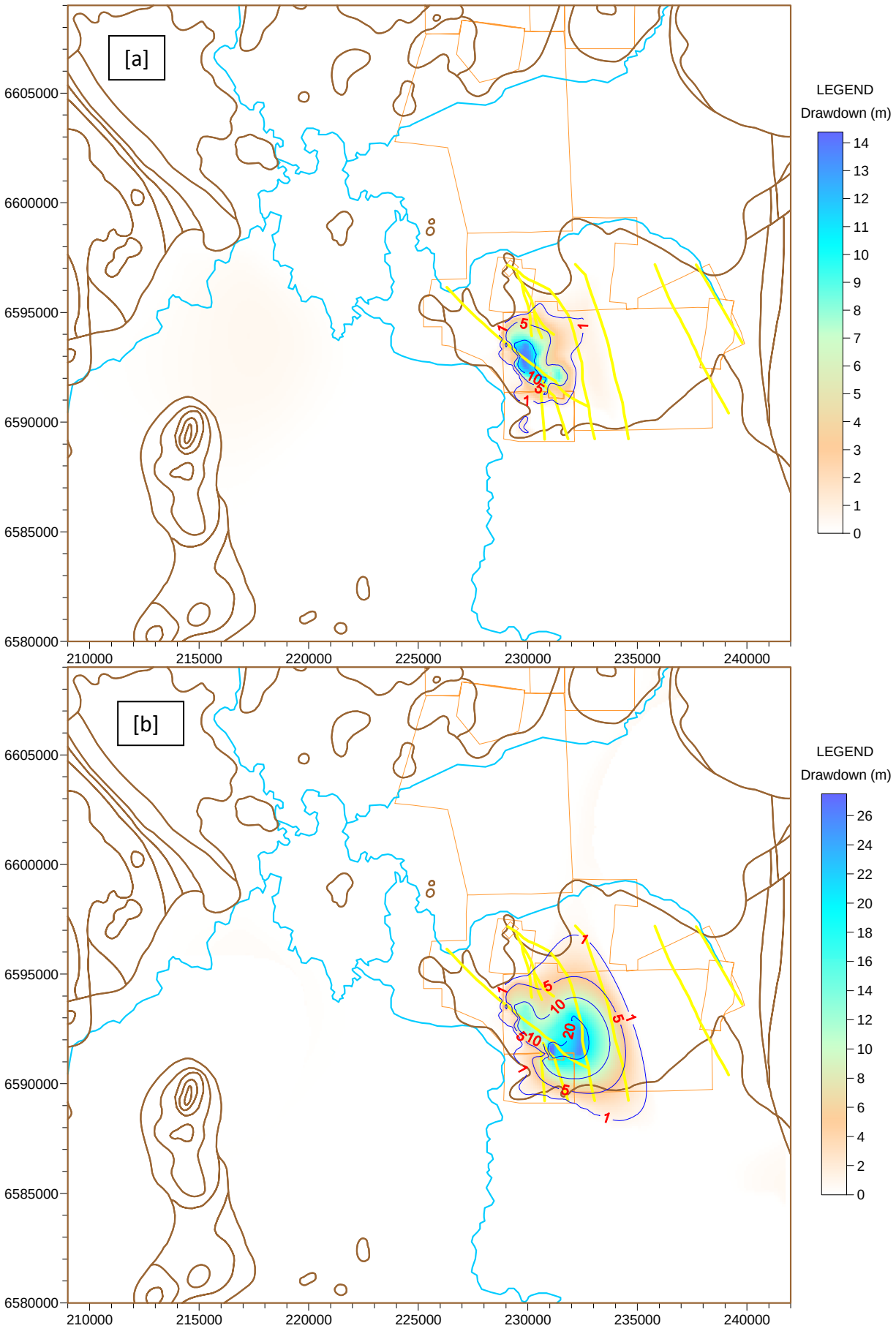
Predicted Drawdown Contours at the of End of Stress Period 5 (End of Year 2016) in Layers [a] 8 and [b] 10



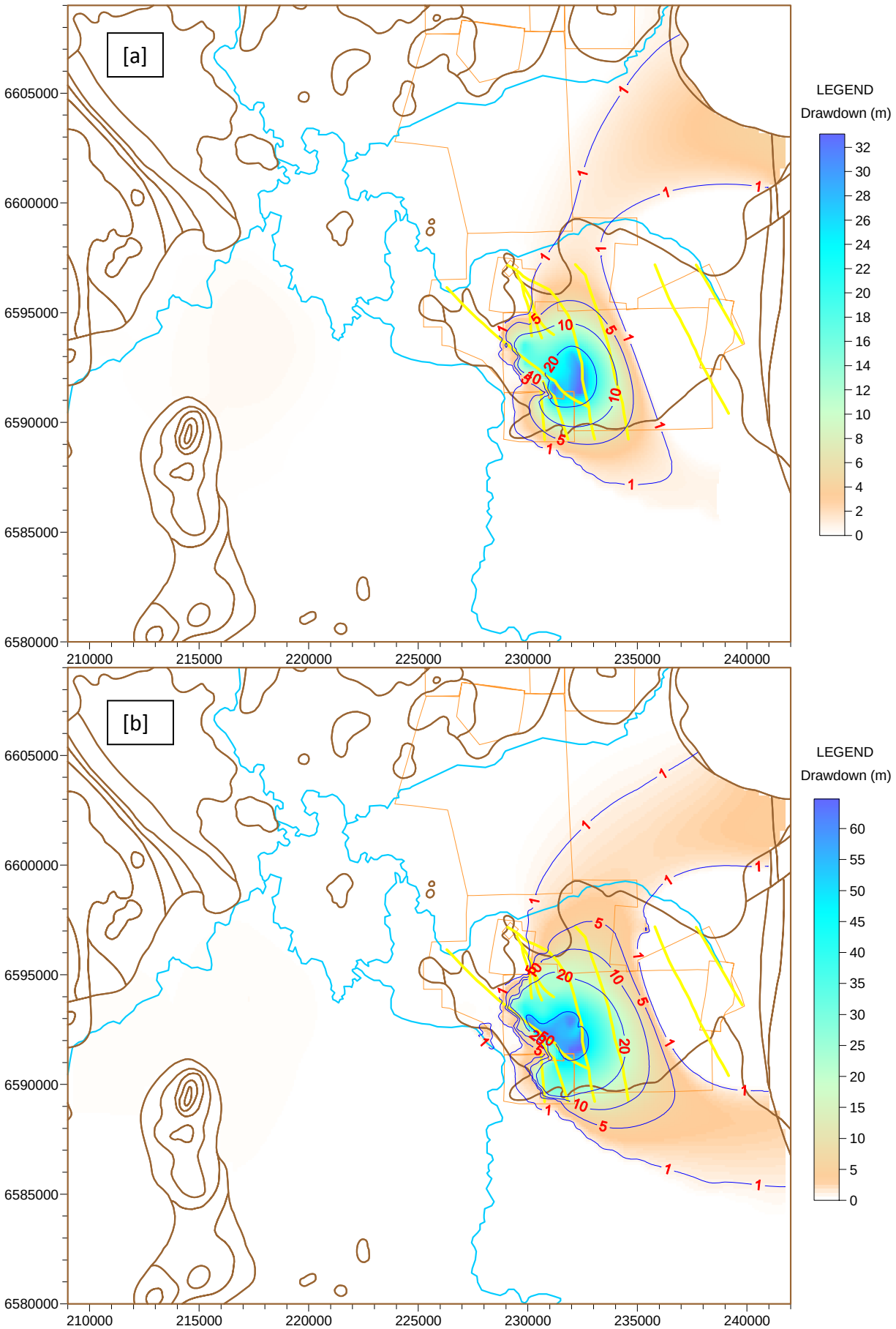
Predicted Drawdown Contours at the of End of Stress Period 5 (End of Year 2016) in Layer 12



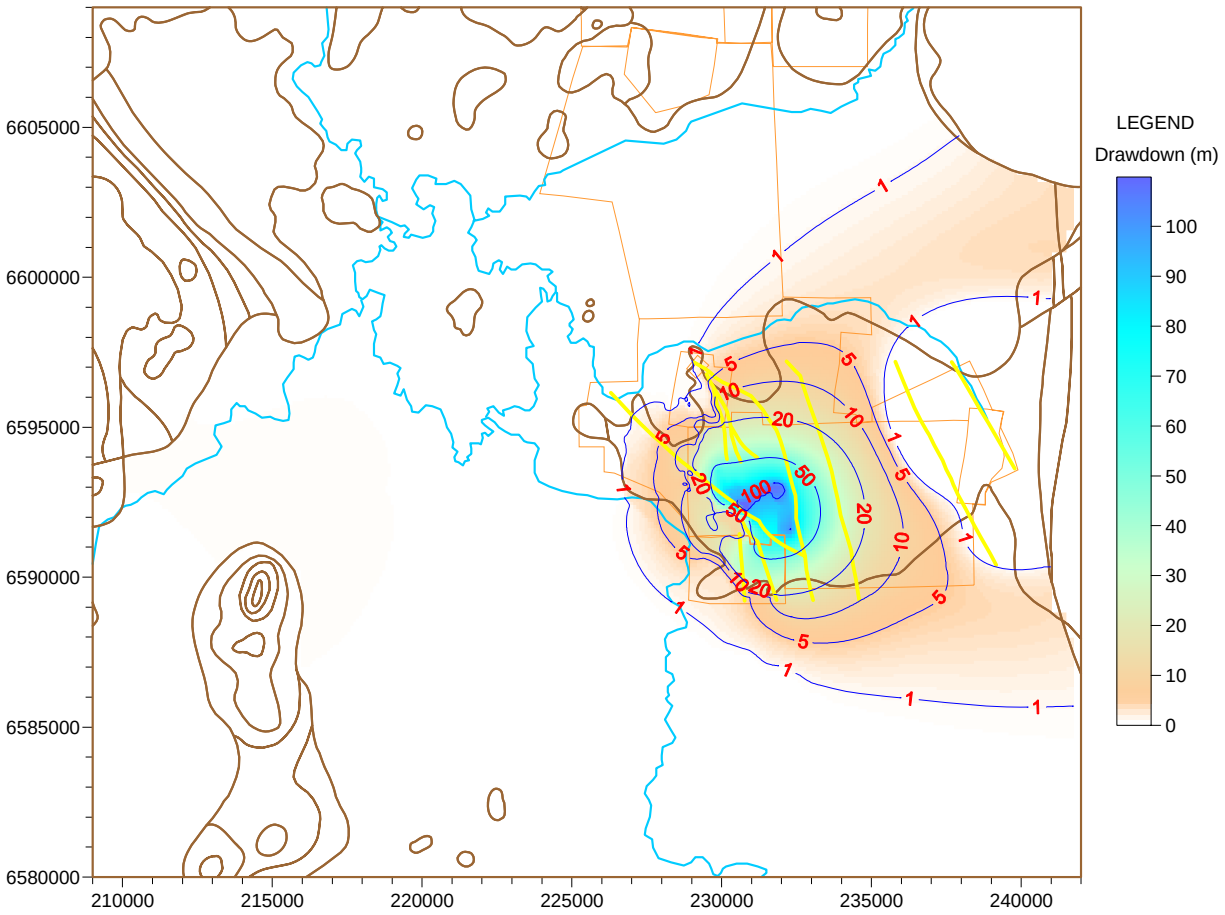
Predicted Drawdown Contours at the of End of Stress Period 10 (End of Year 2021) in Layers [a] 1 and [b] 2



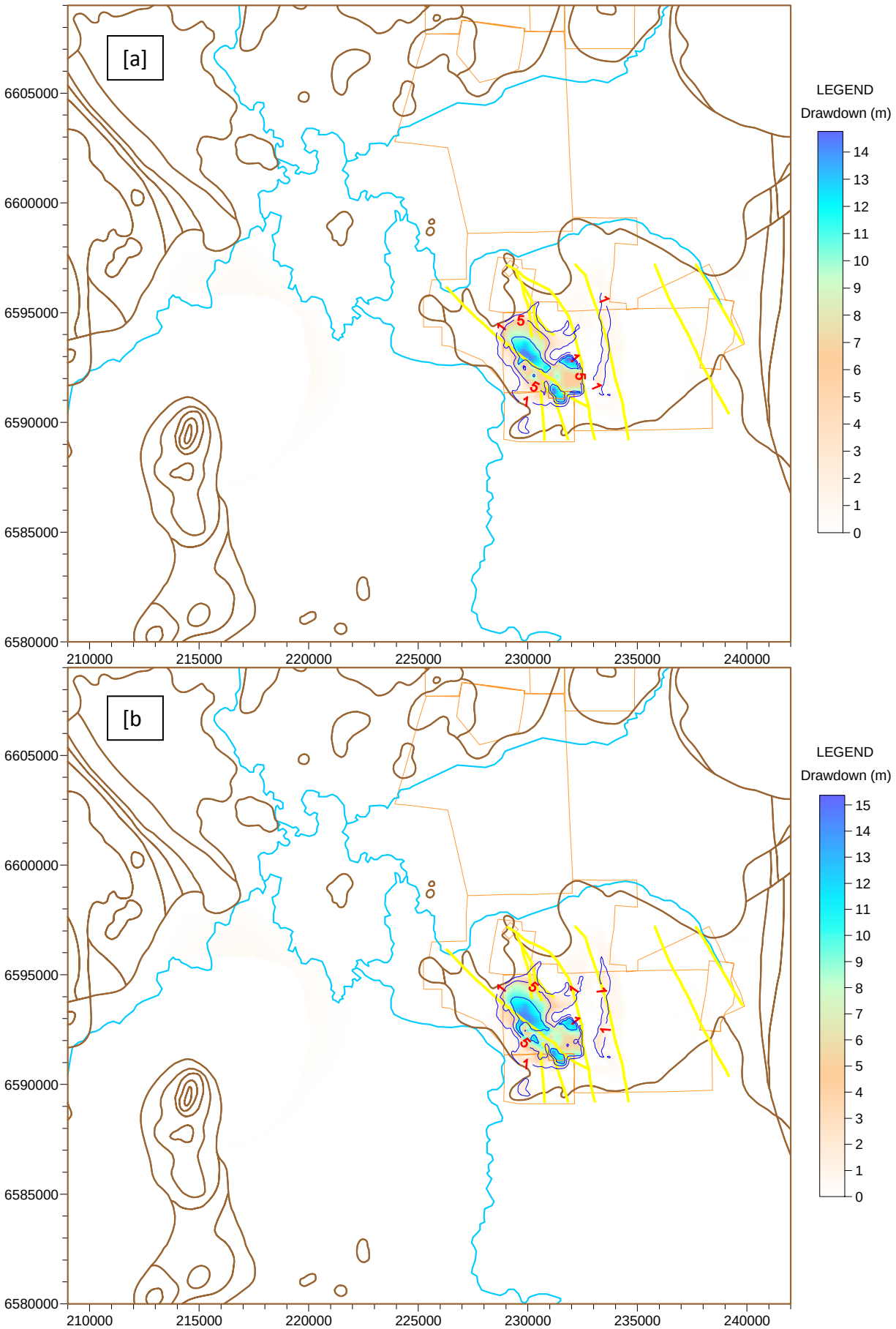
Predicted Drawdown Contours at the of End of Stress Period 10 (End of Year 2021) in Layers [a] 4 and [b] 6



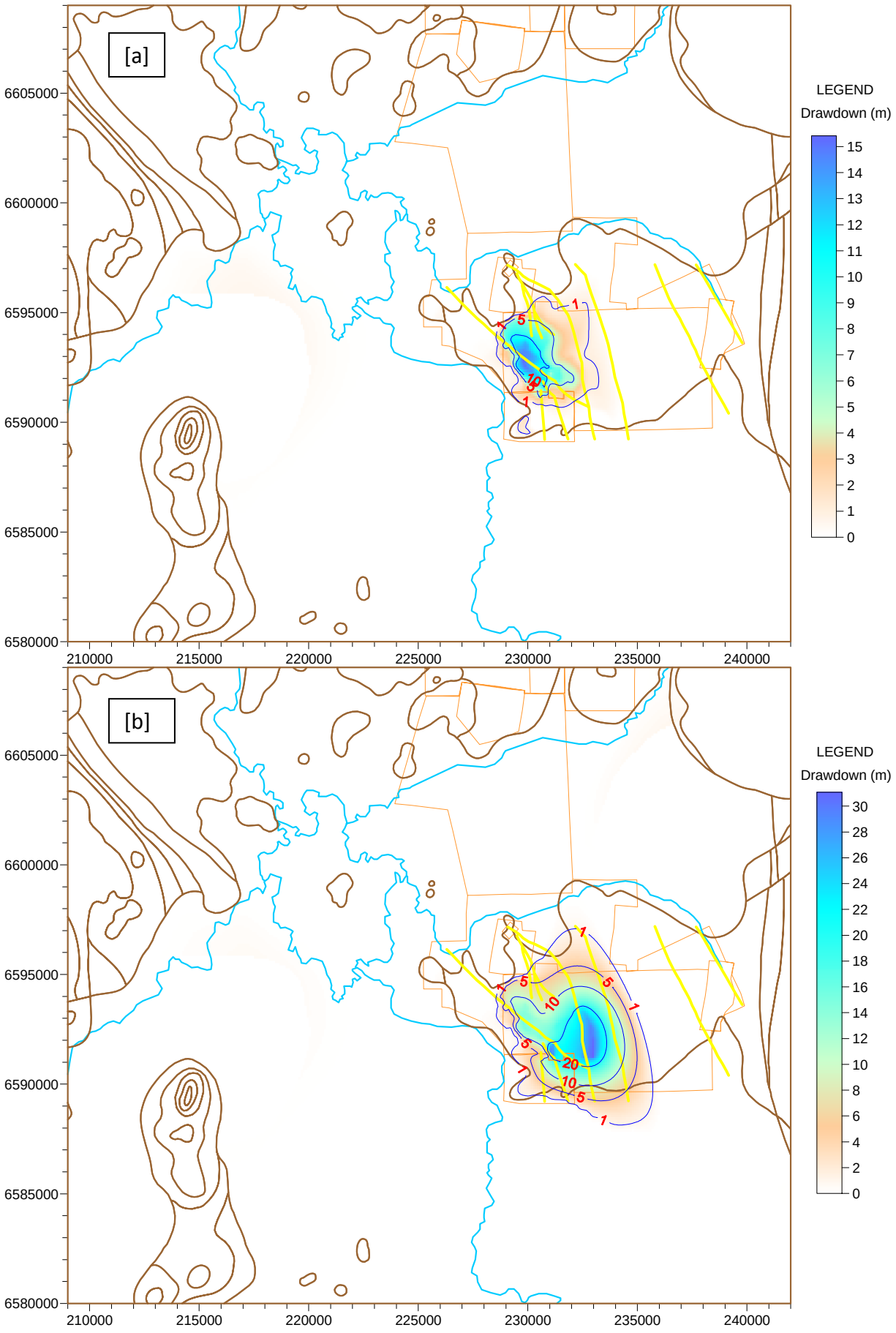
Predicted Drawdown Contours at the of End of Stress Period 10 (End of Year 2021) in Layers [a] 8 and [b] 10



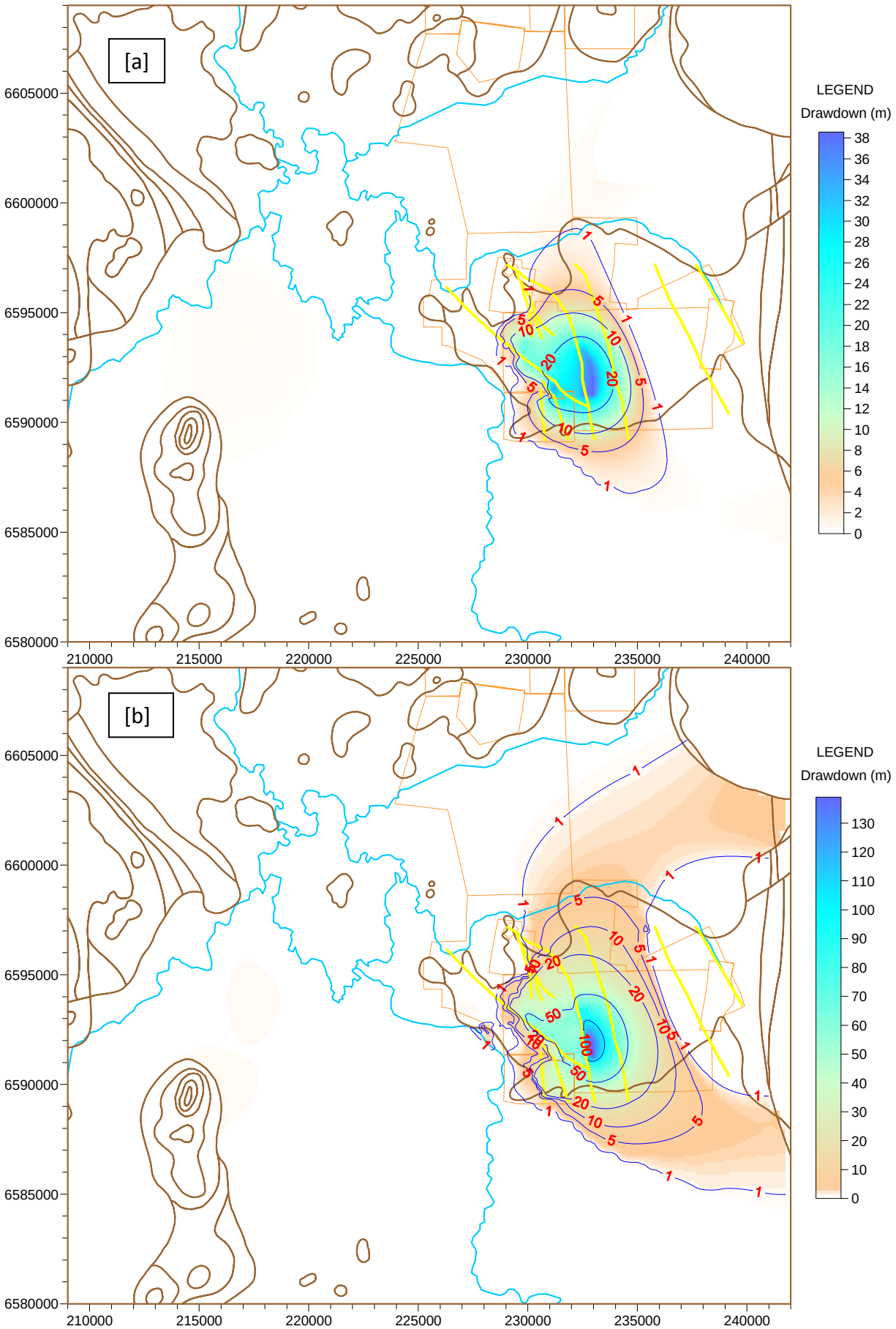
Predicted Drawdown Contours at the of End of Stress Period 10 (End of Year 2021) in Layer 12



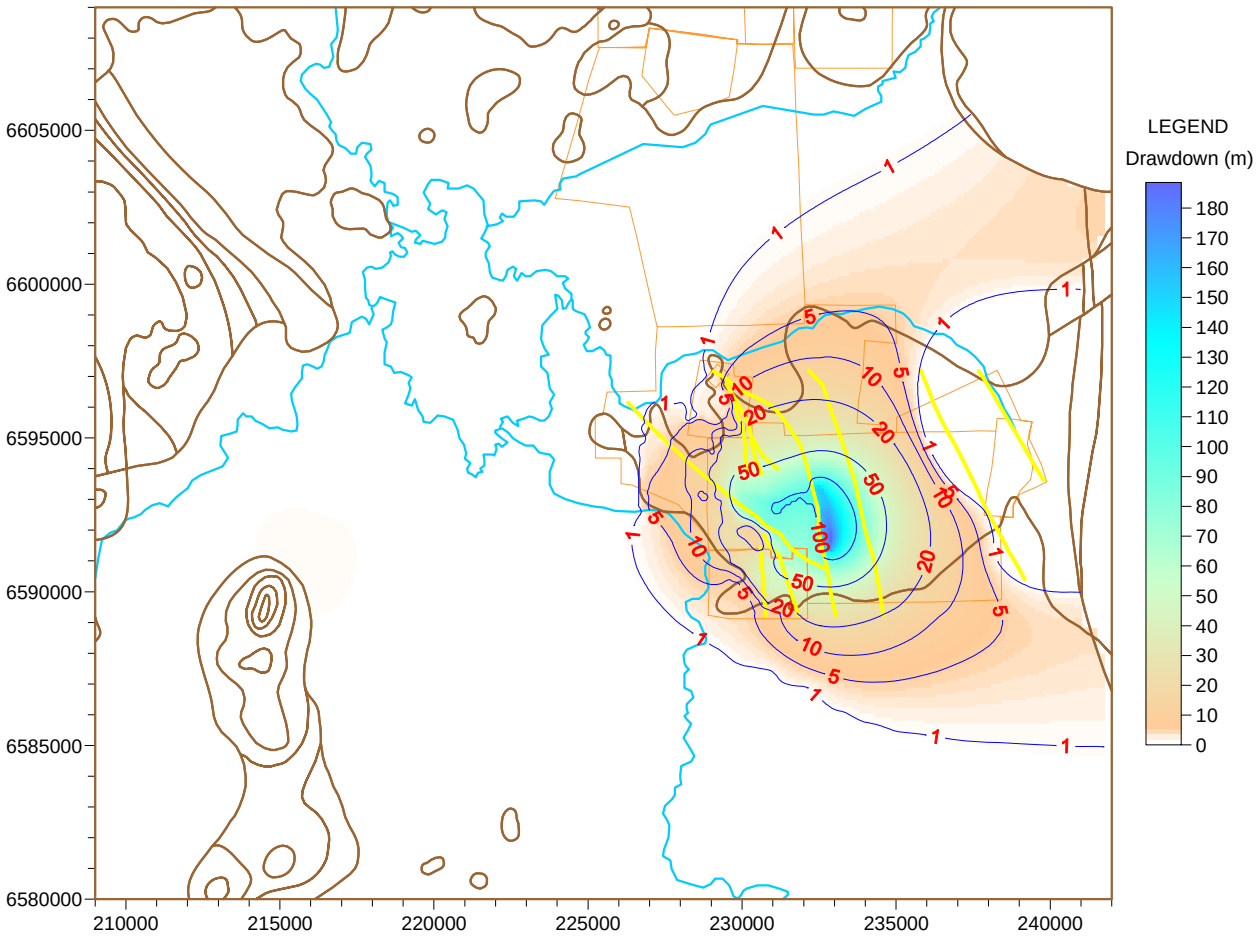
Predicted Drawdown Contours at the of End of Stress Period 15 (End of Year 2026) in Layers [a] 1 and [b] 2



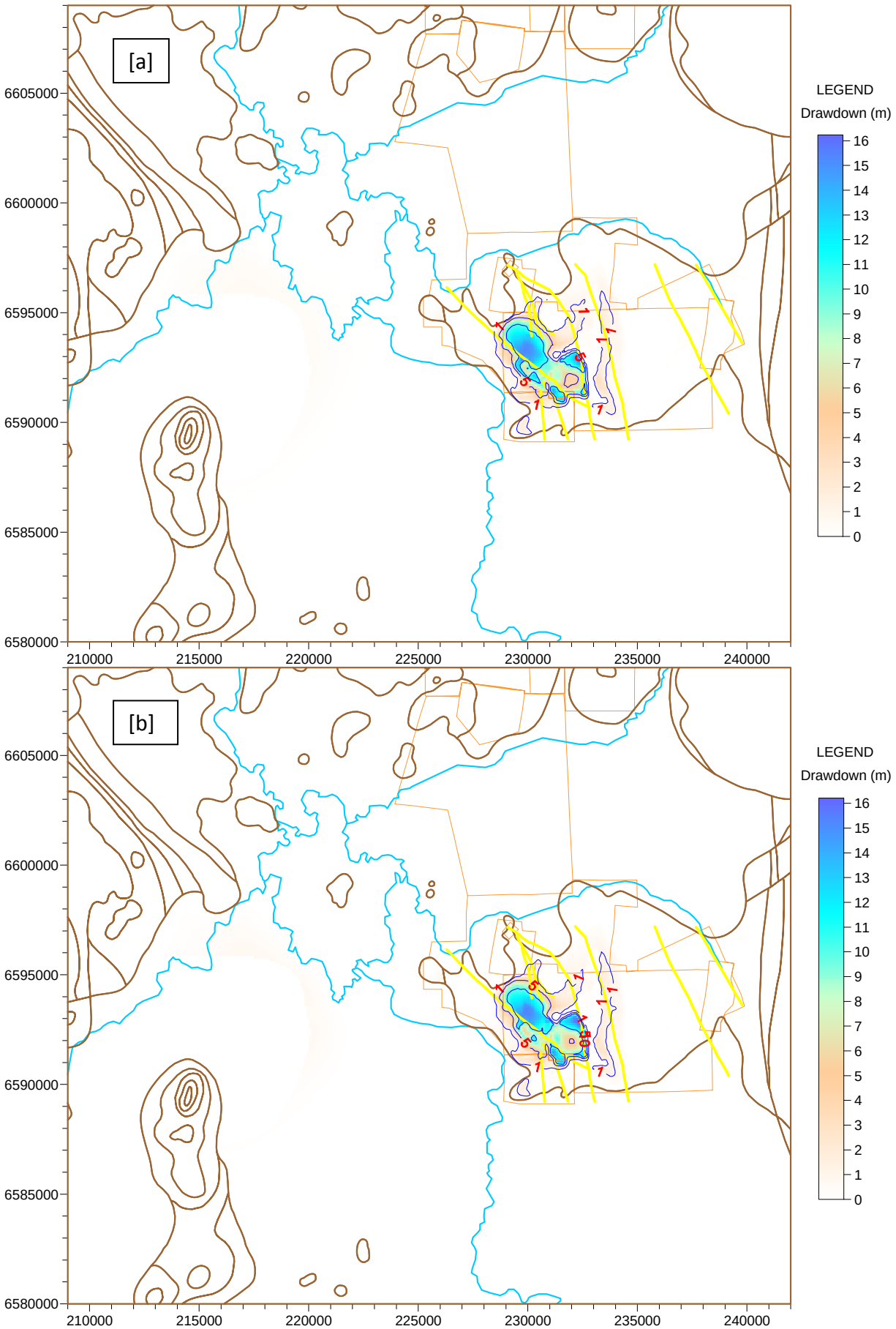
Predicted Drawdown Contours at the of End of Stress Period 15 (End of Year 2026) in Layers [a] 4 and [b] 6



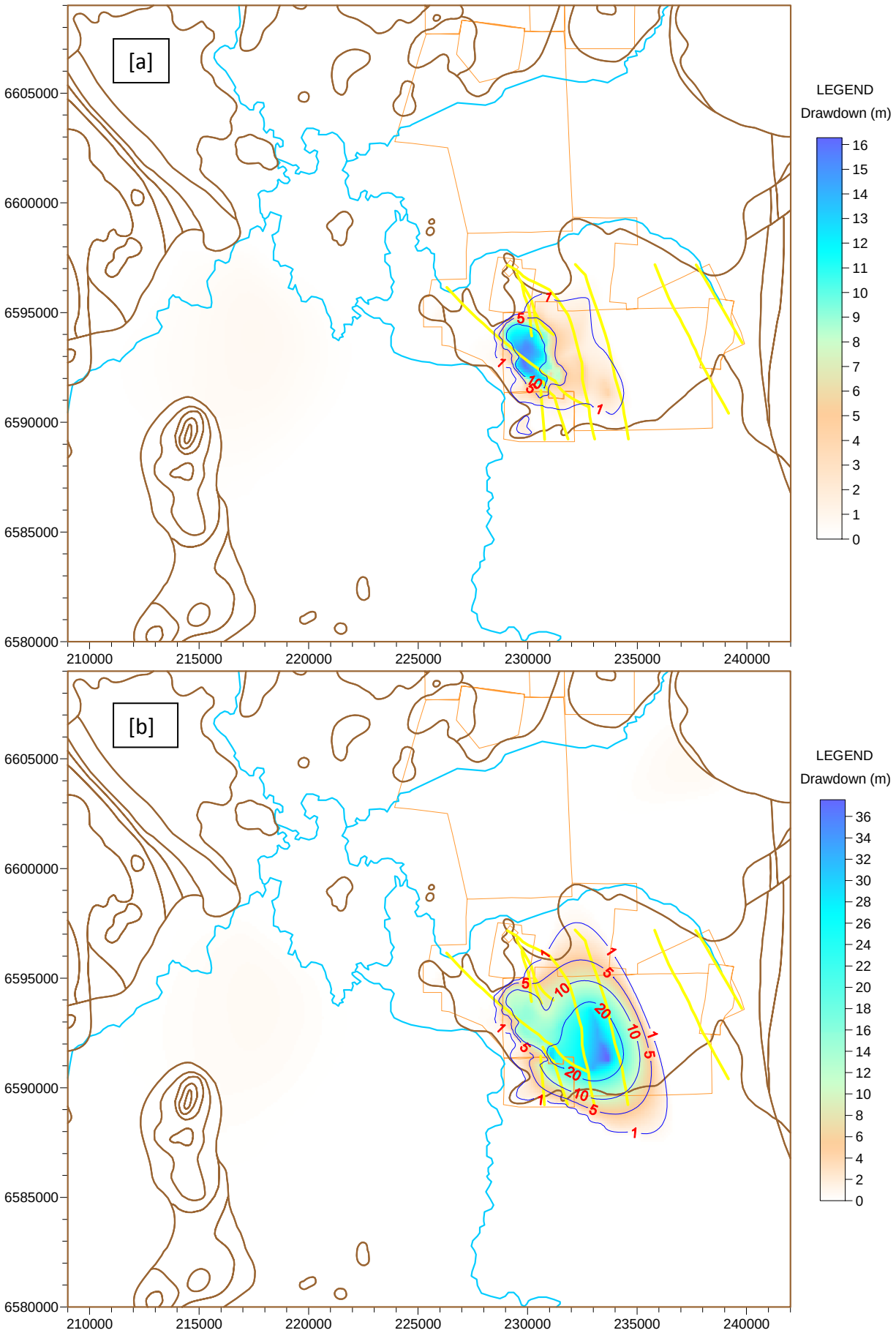
Predicted Drawdown Contours at the of End of Stress Period 15 (End of Year 2026) in Layers [a] 8 and [b] 10



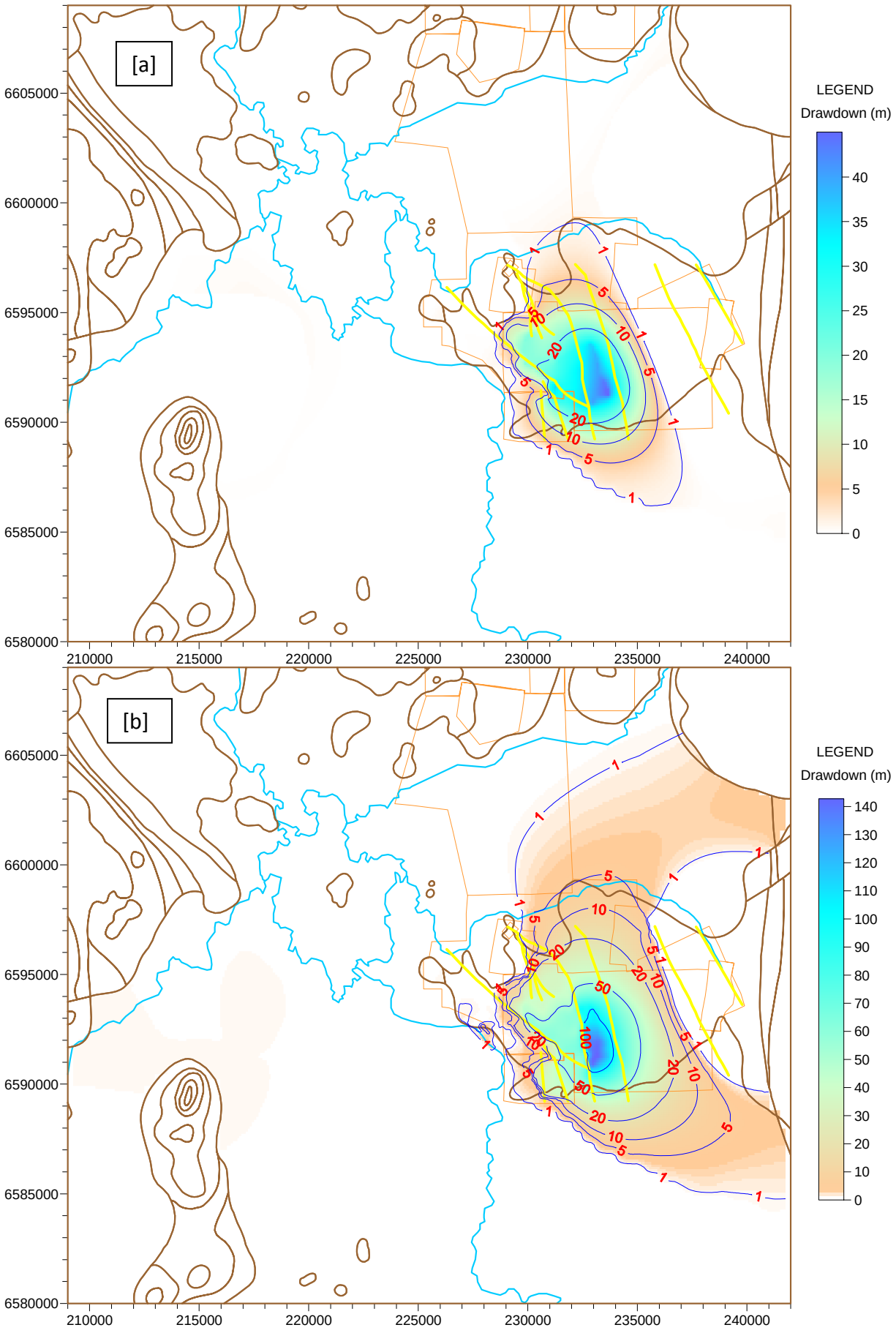
Predicted Drawdown Contours at the of End of Stress Period 15 (End of Year 2026) in Layer 12



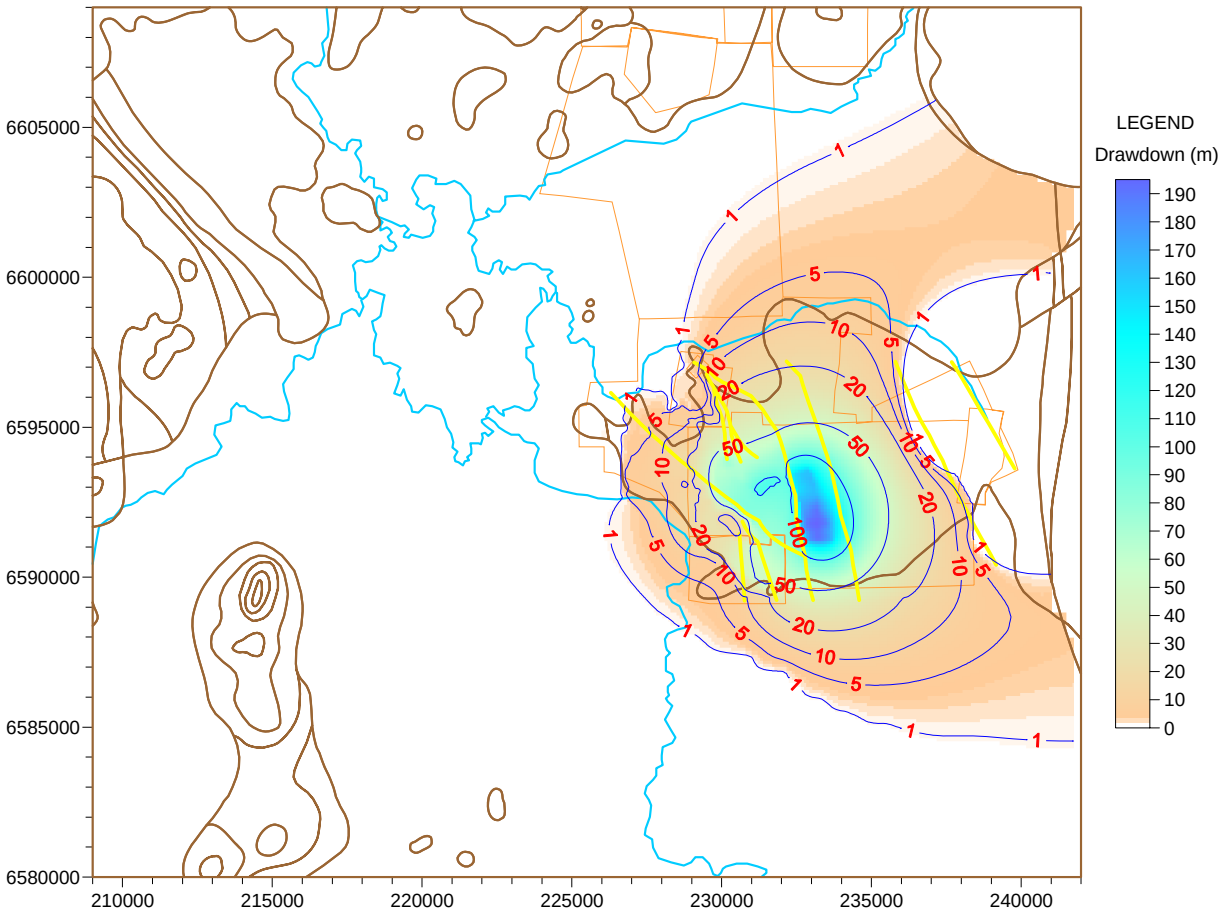
Predicted Drawdown Contours at the of End of Stress Period 20 (End of Year 2031) in Layers [a] 1 and [b] 2



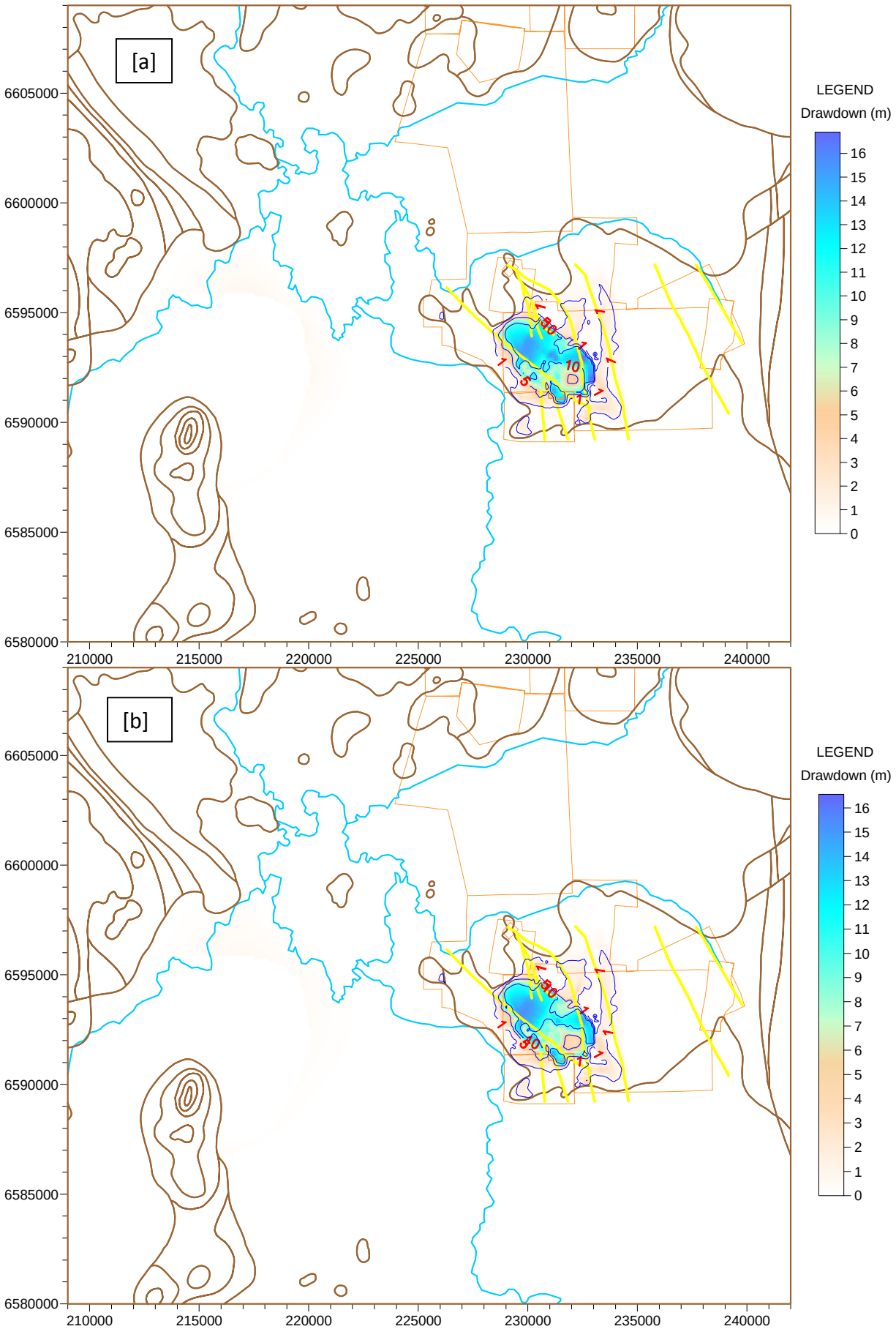
Predicted Drawdown Contours at the of End of Stress Period 20 (End of Year 2031) in Layers [a] 4 and [b] 6



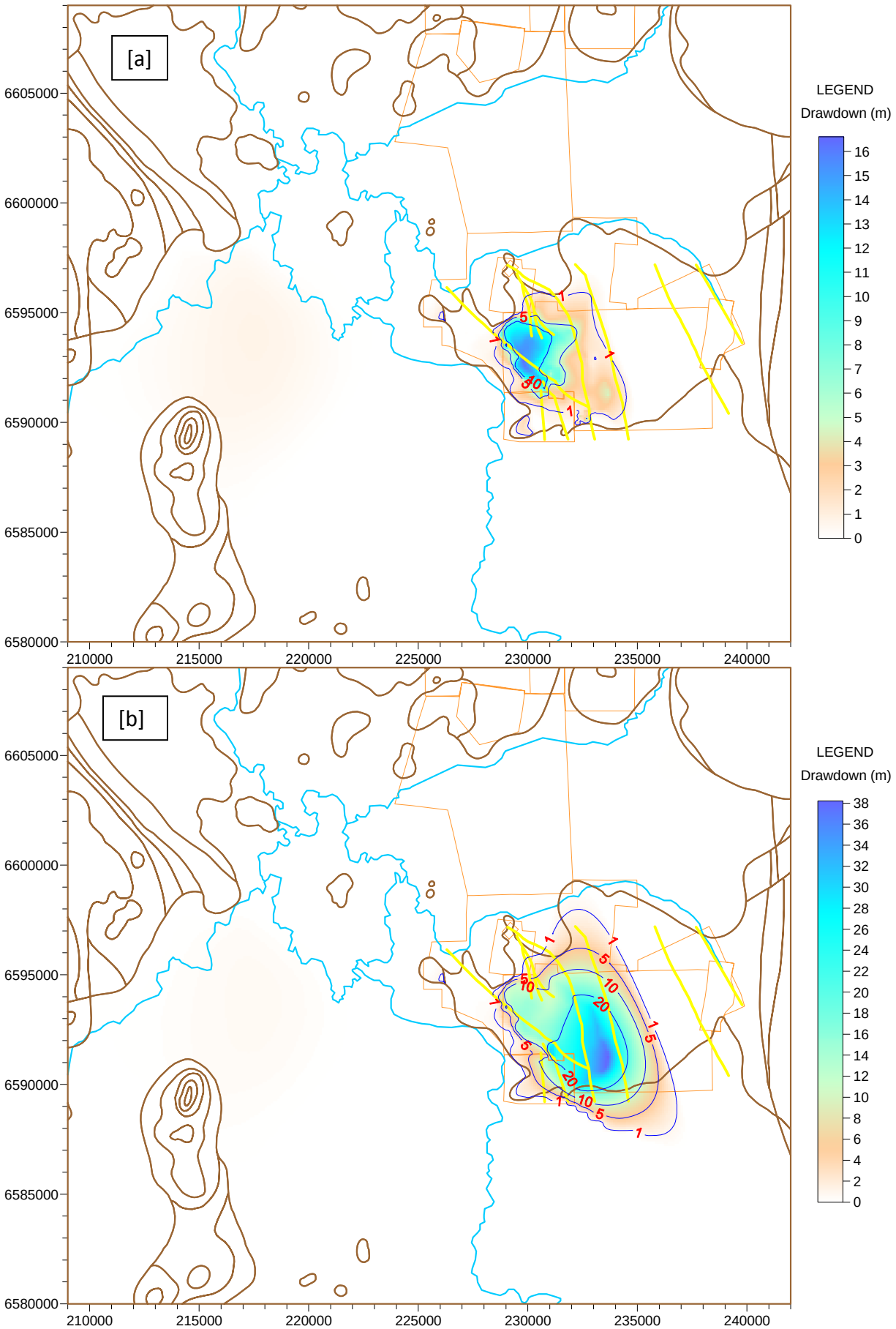
Predicted Drawdown Contours at the of End of Stress Period 20 (End of Year 2031) in Layers [a] 8 and [b] 10



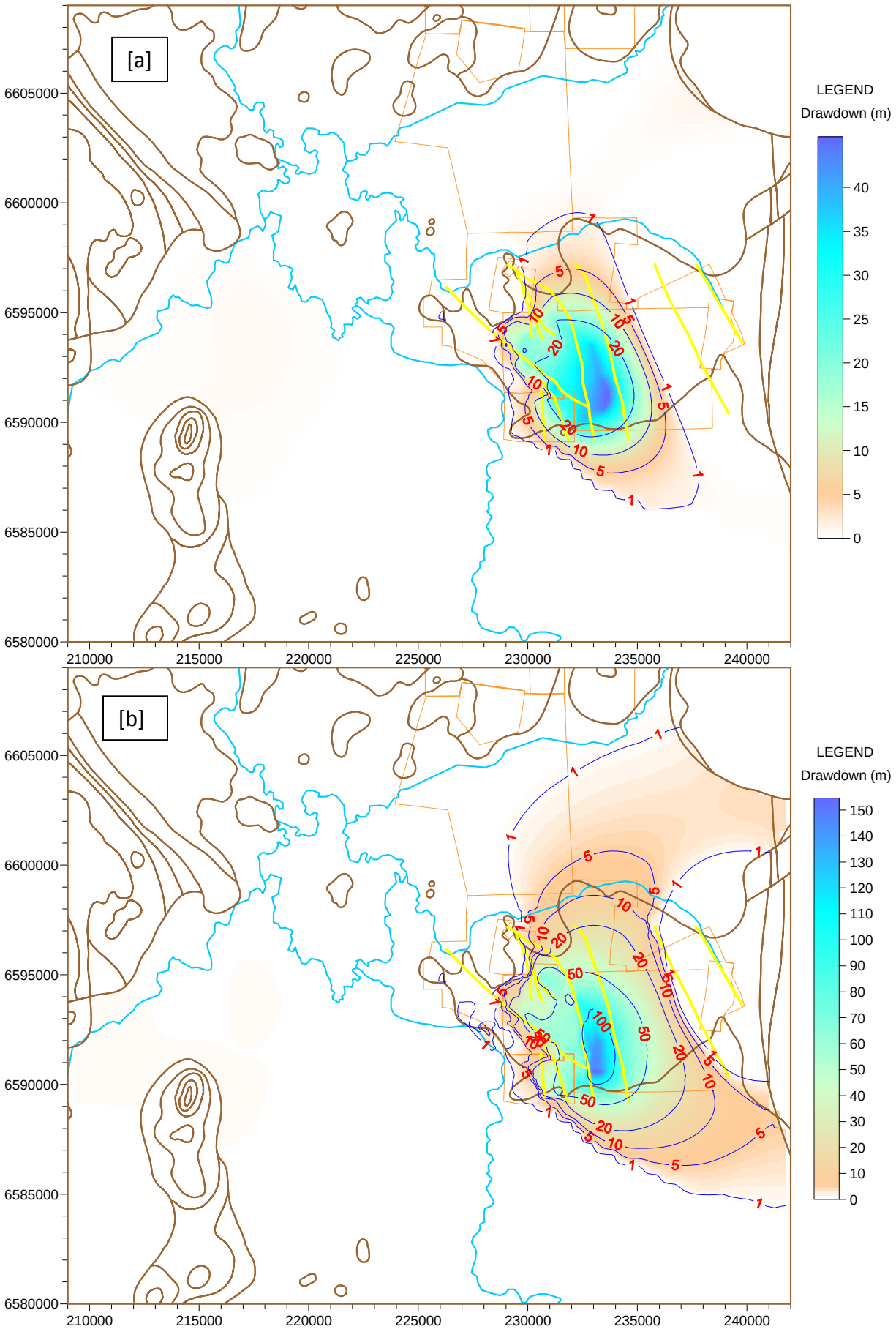
Predicted Drawdown Contours at the of End of Stress Period 20 (End of Year 2031) in Layer 12



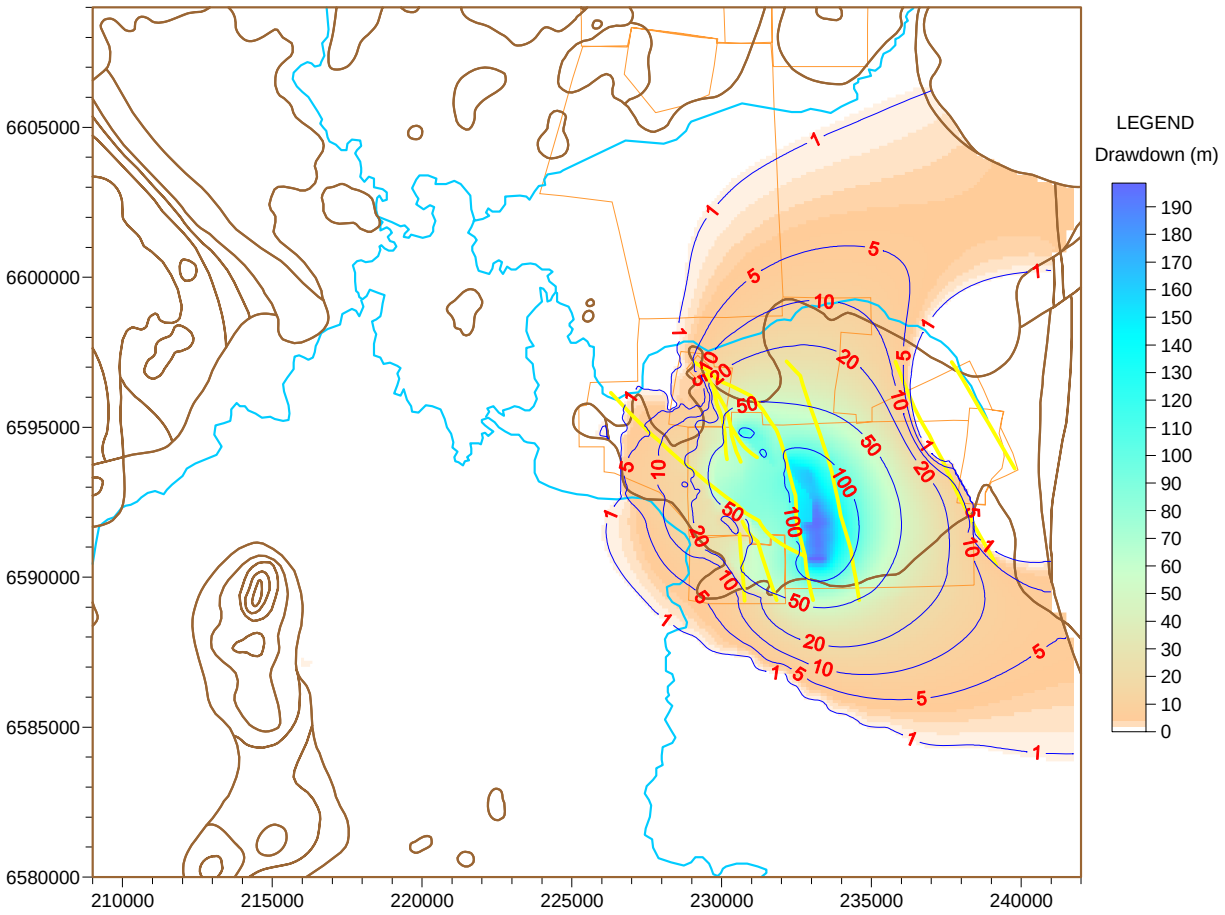
Predicted Drawdown Contours at the of End of Stress Period 25 (End of Year 2036) in Layers [a] 1 and [b] 2



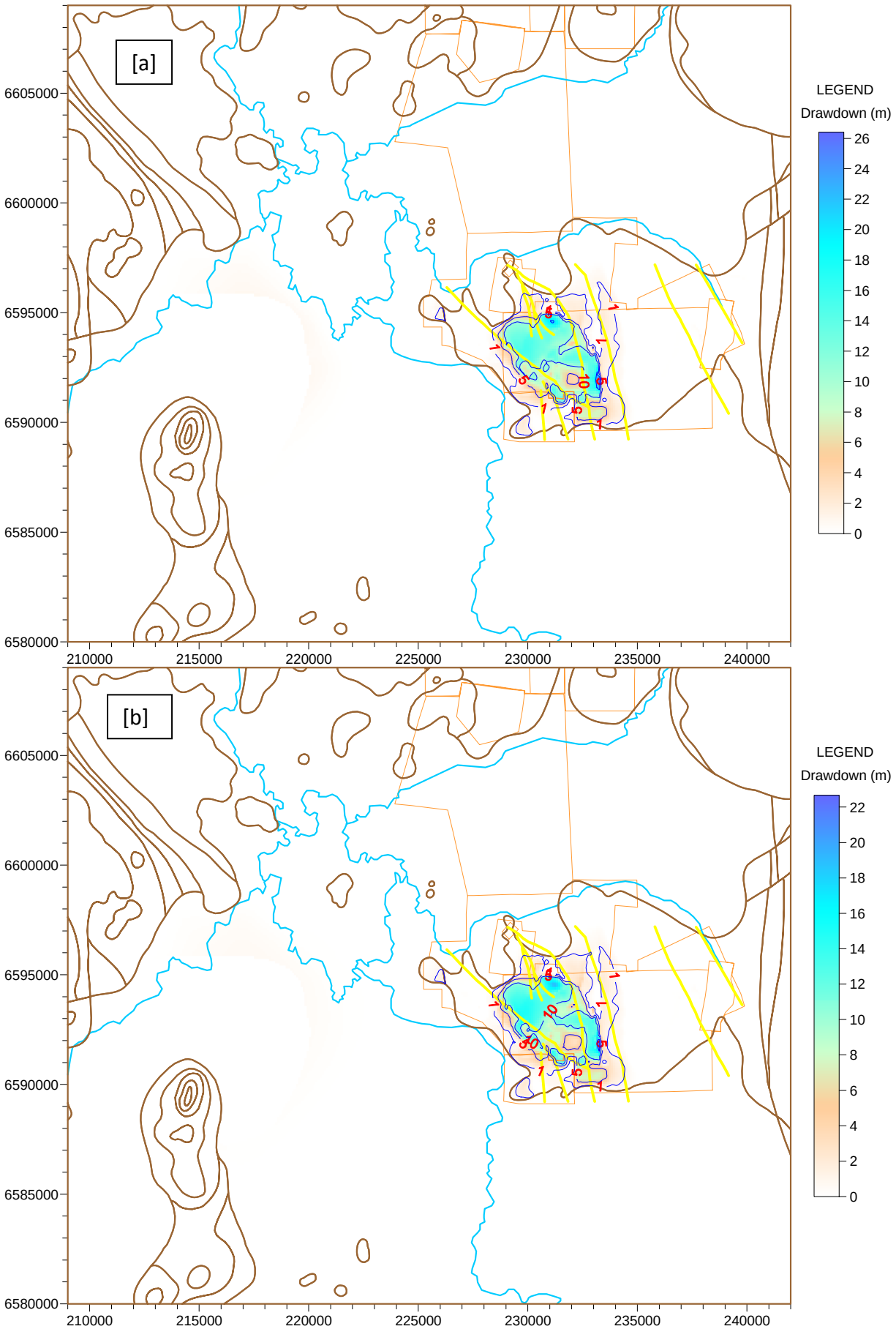
Predicted Drawdown Contours at the of End of Stress Period 25 (End of Year 2036) in Layers [a] 4 and [b] 6



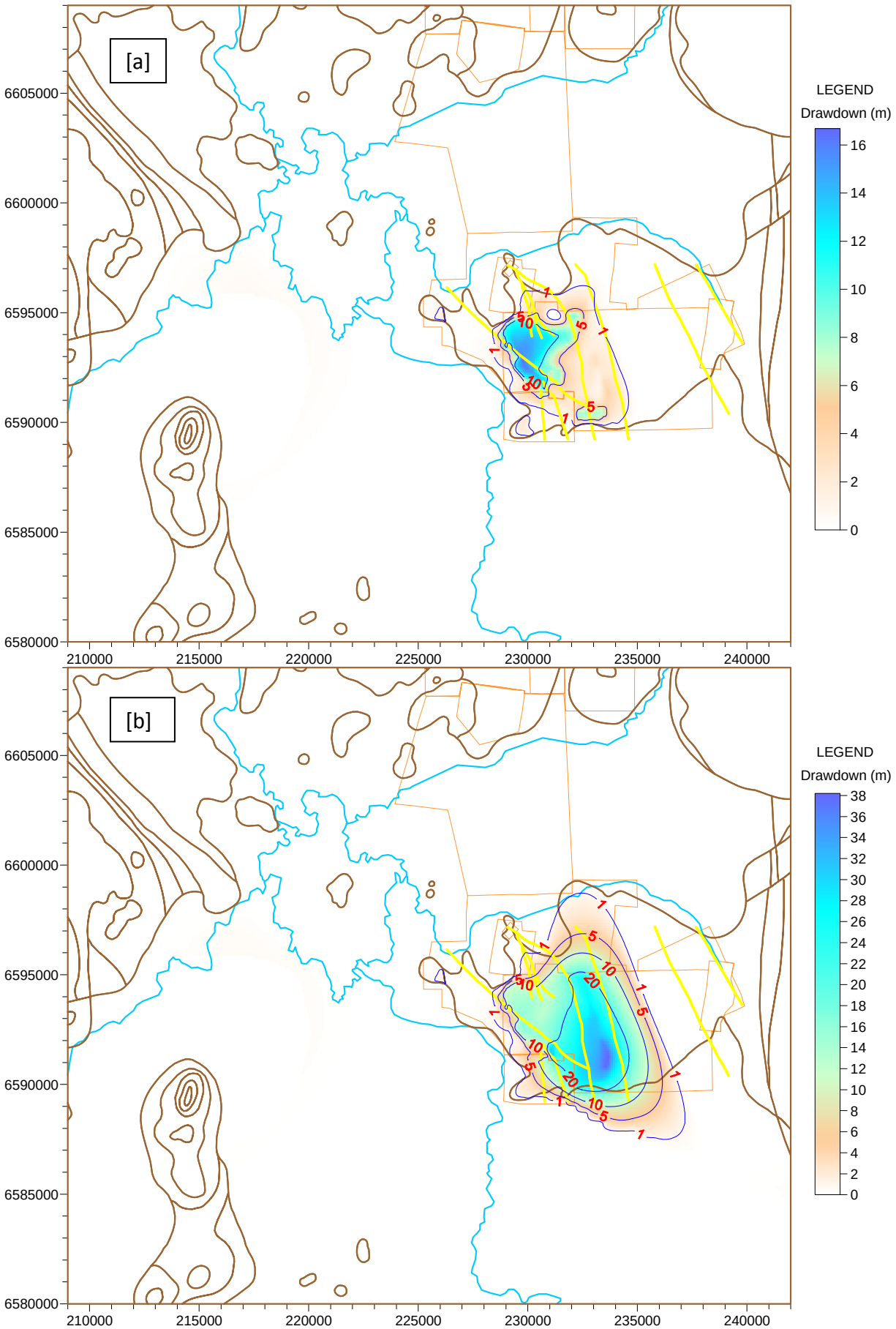
Predicted Drawdown Contours at the of End of Stress Period 25 (End of Year 2036) in Layers [a] 8 and [b] 10



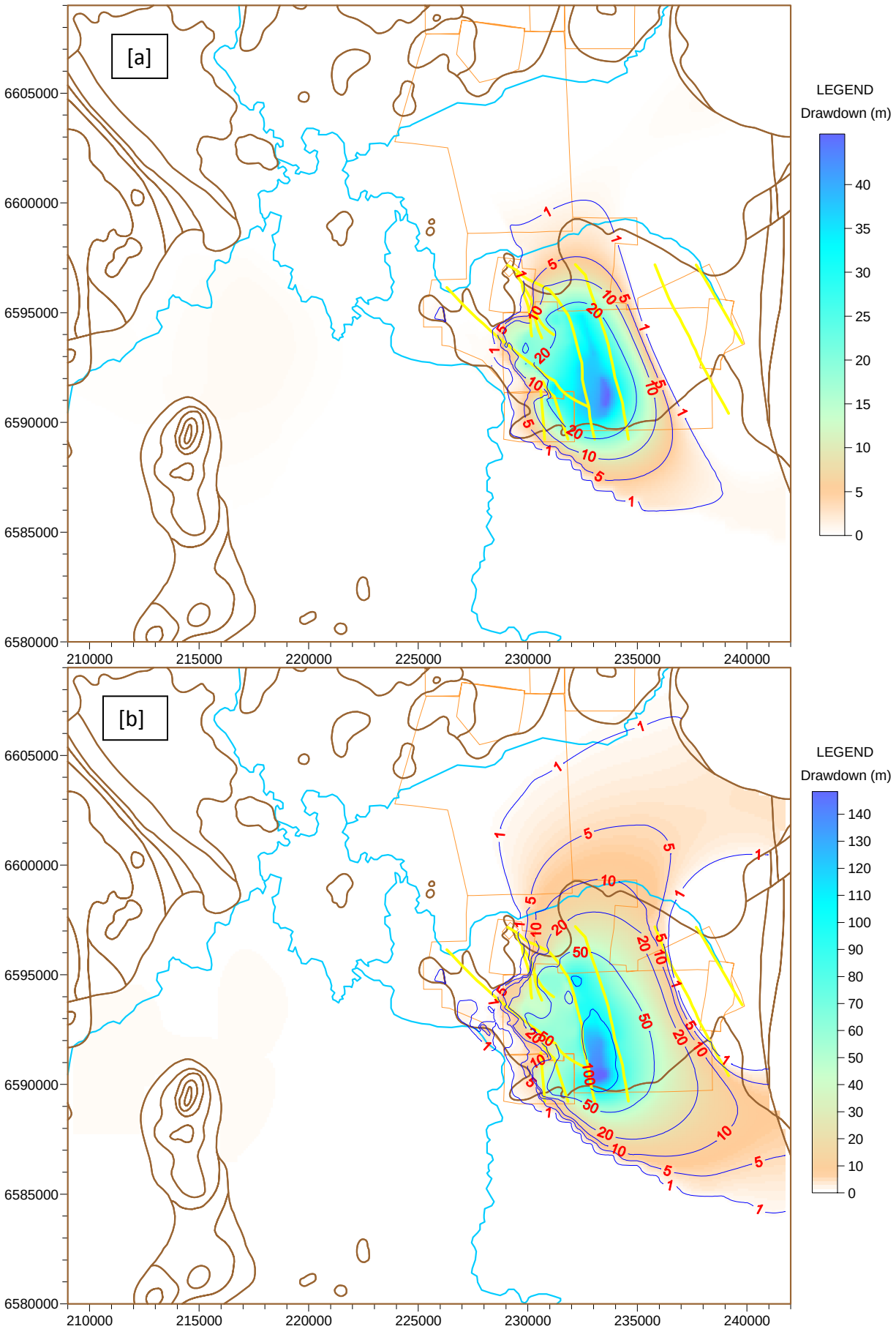
Predicted Drawdown Contours at the of End of Stress Period 25 (End of Year 2036) in Layer 12



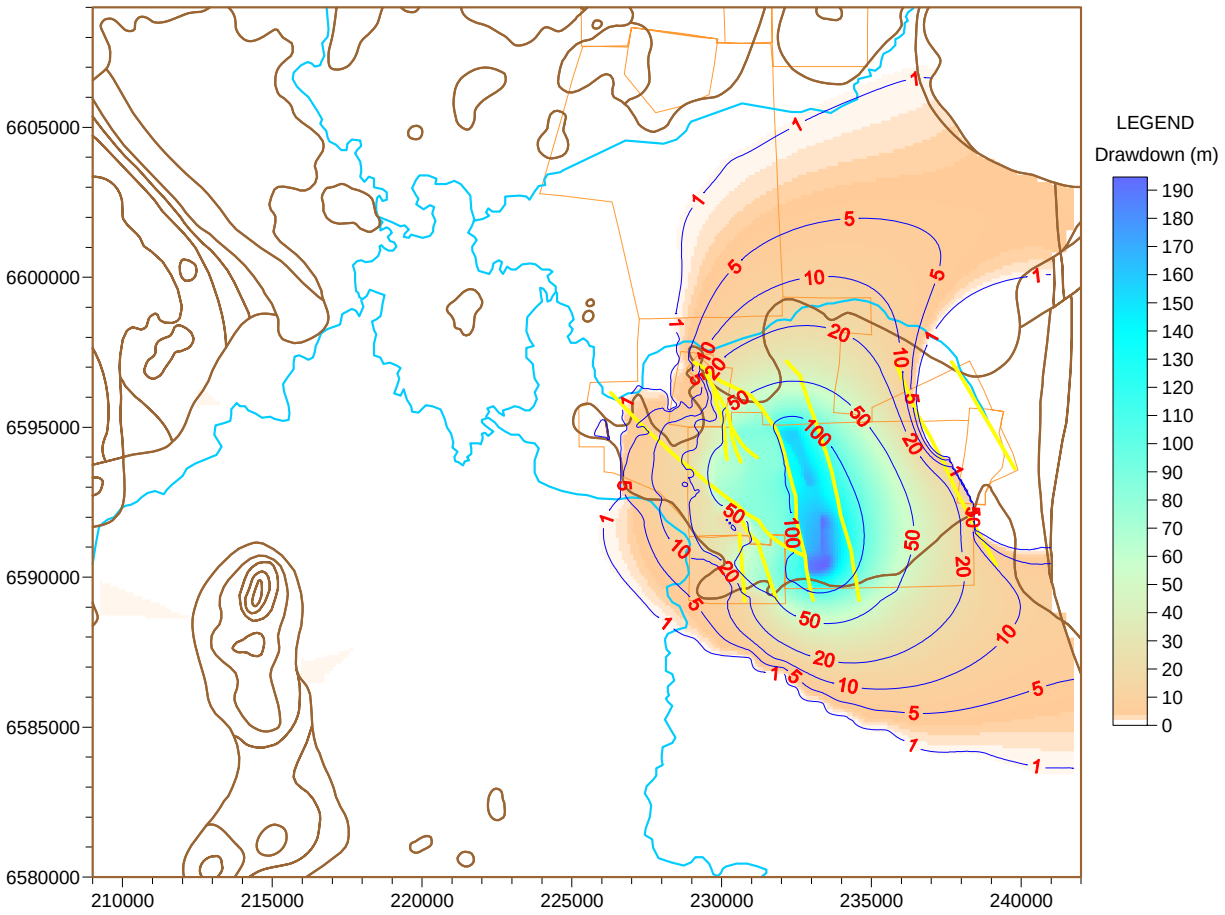
Predicted Drawdown Contours at the of End of Stress Period 31 (End of Year 2042) in Layers [a] 1 and [b] 2



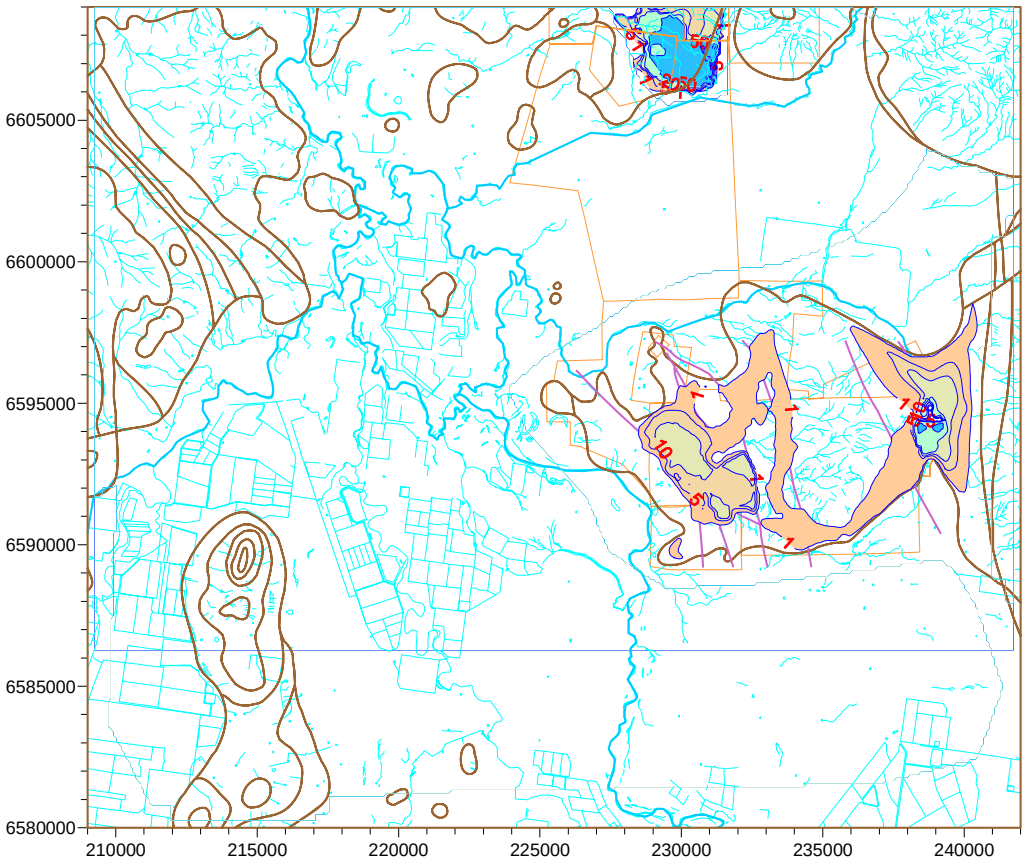
Predicted Drawdown Contours at the of End of Stress Period 31 (End of Year 2042) in Layers [a] 4 and [b] 6



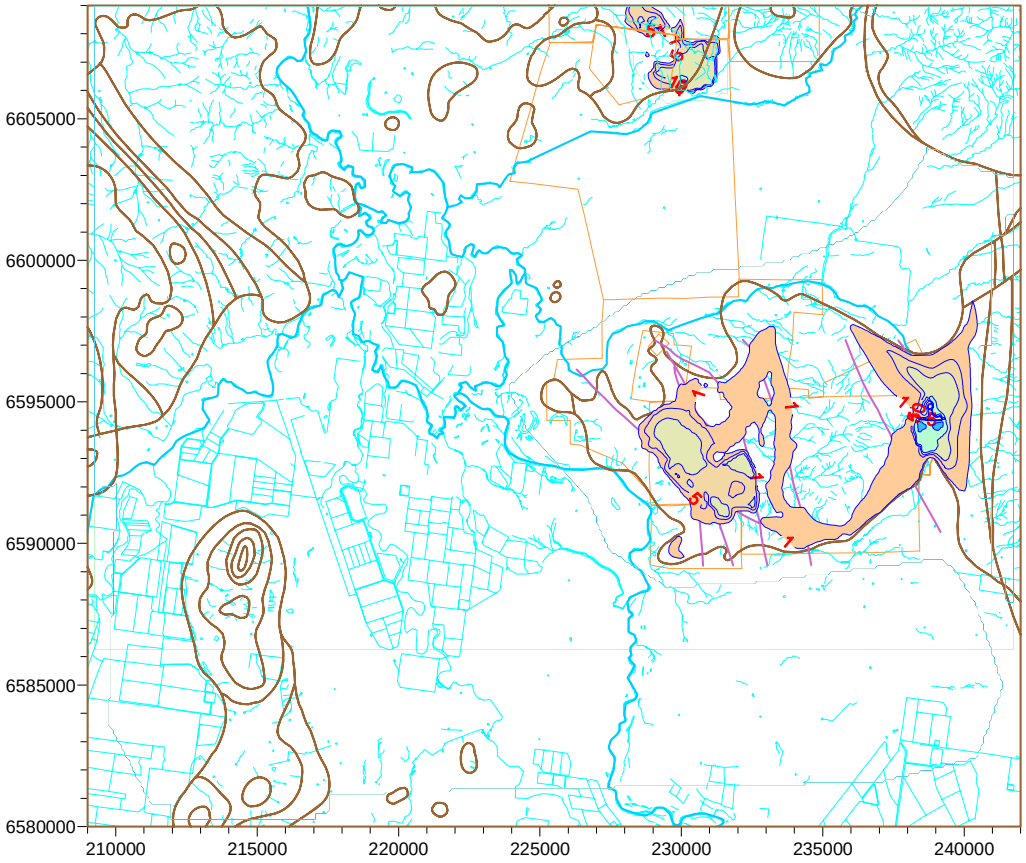
Predicted Drawdown Contours at the of End of Stress Period 31 (End of Year 2042) in Layers [a] 8 and [b] 10



Predicted Drawdown Contours at the of End of Stress Period 31 (End of Year 2042) in Layer 12



Cumulative Drawdown Contour Map for Layer 1 at the of End of Stress Period 19 (End of Year 2030)



Cumulative Drawdown Contour Map for Layer 2 at the of End of Stress Period 19 (End of Year 2030)