Appendix G4

Water baseline report

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Narrabri Gas Project
Water Baseline Report

CDM Smith

Santos NSW (Eastern) Pty Ltd

Narrabri Gas Project
Water Baseline Report

October 2016

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Executive Summary

This Water Baseline Report (WBR) has been prepared to support the Water Monitoring Plan (WMP) for the Narrabri Gas Project (NGP). The WBR forms part of the Environmental Impact Statement (EIS) for the NGP.

The WBR provides a statement of the groundwater and surface water datasets that constitute the baseline monitoring for the NGP. General contextual information on the water resources in the NGP area can be found elsewhere in the Groundwater Impact Assessment (GIA) for the NGP.

The area of baseline monitoring contains eight water sources that are defined in six NSW Water Sharing Plans (WSPs). The baseline data in the WBR are grouped by water source, and the groundwater baseline is sub-grouped by hydrostratigraphic unit.

The baseline monitoring comprises 50 monitoring bores with records of groundwater head, 41 monitoring bores with records of groundwater quality, six streamflow gauging stations and 12 sampling locations for surface water quality.

The baseline data are presented in summary tables that include statistical summaries of the spread and central tendency of the data and selected graphs.

Section 1 Introduction

1.1 Overview

The proponent is proposing to develop natural gas in the Gunnedah Basin in New South Wales (NSW), southwest of Narrabri (Figure 1-1). The project area is located within the Narrabri local government area (LGA). The Narrabri Gas Project (the project, NGP) seeks to develop and operate a gas production field sourcing gas from deeply buried coal seams of the Gunnedah-Oxley Basin, which requires the installation of gas wells, gas and water gathering systems, and supporting infrastructure. The natural gas produced will be treated at a central gas processing facility located on Leeward, a local rural property situated approximately 25 km southwest of Narrabri (Figure 1-1).

The project is considered a State significant development assessable under Division 4.1 of Part 4 of the *NSW Environmental, Planning and Assessment Act 1979*.

1.2 Project Location

The project is located in northwestern NSW, approximately 20 kilometres (km) southwest of Narrabri, within the Narrabri local government area (LGA; Figure 1-1). The project area covers about 950 square kilometres (95,000 hectares), and the project footprint will encompass about one per cent of that area.

The project area contains a portion of the region known as 'the Pilliga'; which is an agglomeration of forested area covering more than 500,000 hectares in north-western NSW around Coonabarabran, Baradine and Narrabri. Nearly half of the Pilliga is allocated to conservation, managed under the *NSW National Parks and Wildlife Act 1974*. The Pilliga has spiritual meaning and cultural significance for the Aboriginal people of the region.

Other parts of the Pilliga were dedicated as State forest, and set aside for the purpose of 'forestry, recreation and mineral extraction, with a strategic aim to "provide for exploration, mining, petroleum production and extractive industry" under the *Brigalow and Nandewar Community Conservation Area Act 2005*. The parts of the project area on state land are located within this section of the Pilliga.

1.3 This Report

This Water Baseline Report (WBR) is a statement of the groundwater and surface water datasets that constitute the baseline monitoring for the Narrabri Gas Project (NGP). The WBR has been prepared to support the Water Monitoring Plan (WMP) for the NGP Environmental Impact Statement (EIS), as well as to satisfy the Secretary's Environmental Assessment Requirements for the EIS, requiring "a description of the existing environment likely to be affected by the development, using sufficient baseline data".

The WBR has the following structure:

- **Section 1, Introduction** – briefly describes the proposed NGP development, proponent, and project area;
- **Section 2, Definition of Water Sources** - describes the Water Sharing Plans covering the NGP area and the water sources defined in those plans;

- **Section 3, Sources of Hydrological Data** – describes the sources of data that are used in this Water Baseline Report;
- **Section 4, Groundwater Baseline Data** – describes the groundwater data that constitute groundwater baseline; and
- **Section 5, Surface Water Baseline Data** – describes the surface water data that constitute the surface water baseline.

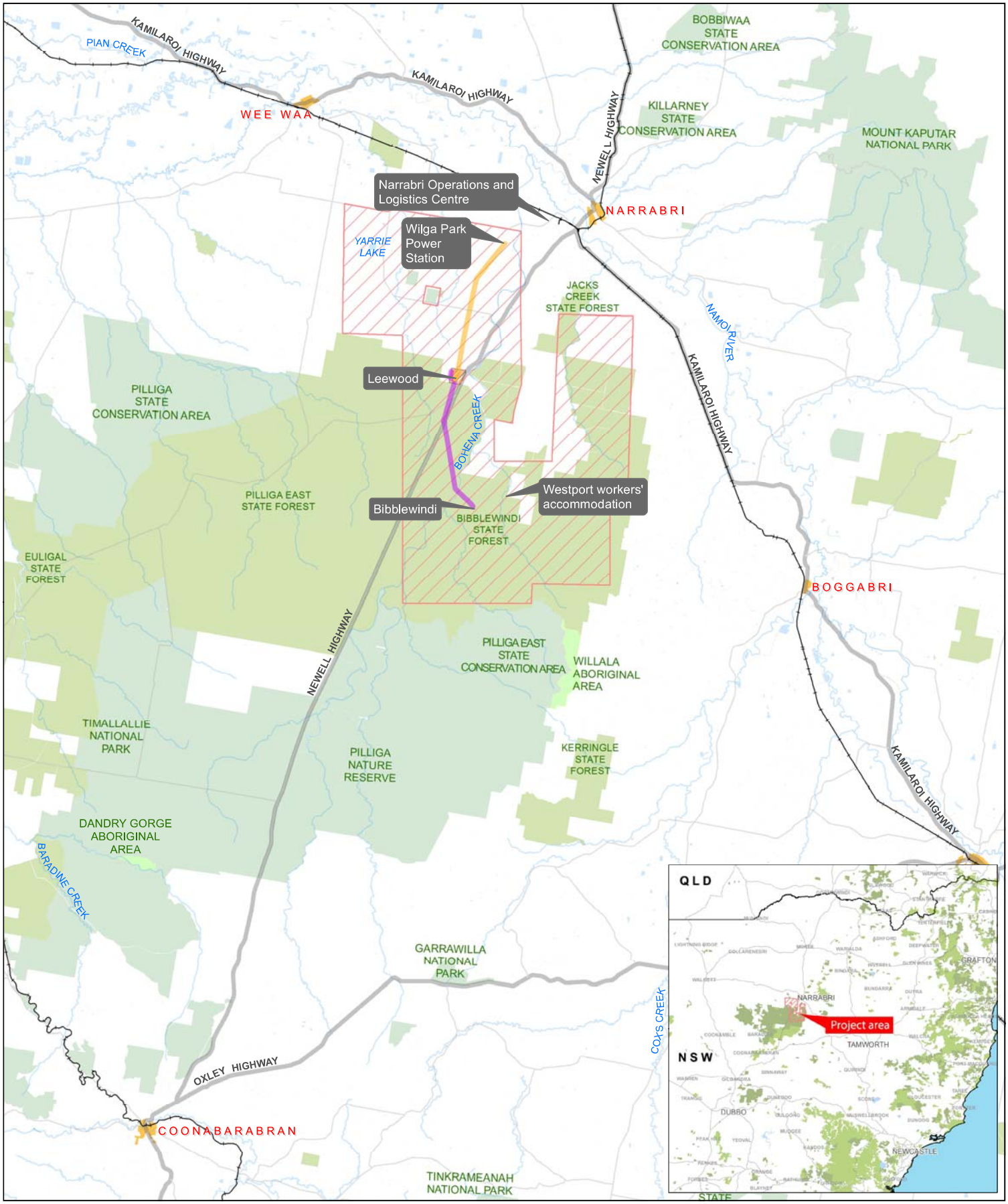
Table 1-1 Project water-related infrastructure components

Component	Infrastructure or Activity
Leewood	▪ A central water management facility including storage and treatment of produced water and brine ▪ Treated water management infrastructure to facilitate the transfer of treated water for irrigation, dust suppression, construction and drilling activities ▪ Continued use of existing facilities such as the brine and produced water ponds
Bibblewindi	▪ Supporting infrastructure including storage and utility areas, treated water holding tank, and a communications tower ▪ Produced water, brine and construction water storage, including recommissioning of two existing ponds ▪ Continued use of existing facilities such as the 5ML water balance tank
Gas exploration, appraisal and production infrastructure	▪ Installation of up to 850 new wells on a maximum of 425 well pads ○ New well types would include exploration, appraisal and production wells ○ Includes well pad surface infrastructure ▪ Water balance tanks
Ancillary	▪ A treated water pipeline and diffuser from Leewood to Bohena Creek ▪ Treated water irrigation infrastructure including: ○ pipeline(s) from Leewood to the irrigation area(s) ○ treated water storage dam(s) offsite from Leewood ○ operation of the irrigation scheme

1.4 Contextual Information on Water Sources

This Water Baseline Report (WBR) has been prepared to support Water Monitoring Plan (WMP) for the Narrabri Gas Project (NGP) and EIS. Within this context, the WBR has not been prepared as a source of contextual information on the water resources of the NGP area.

Contextual information and data on the regional water resources, and hydrogeological conceptualisation and modelling of groundwater sources within the NGP area are reported in detail within the Groundwater Impact Assessment (GIA) for the NGP and its associated appendix reports.



LEGEND

- Project area
- Leewood
- Urban
- State forest
- Parks and reserves
- Aboriginal areas
- Lakes and dams
- Watercourses
- Highways
- Major Roads
- Train line
- Leewood to Wilga Park infrastructure corridor
- Bibblewindi to Leewood infrastructure corridor

0 5 10 20
Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Narrabri Gas Project
EIS Technical Appendix

Regional context and location of key infrastructure

Job Number 21-22463
Revision A
Date 12 Mar 2015

Figure 1-1

C:\Users\AFoddy\Desktop\21_22463_KBM29.mxd [KBM: 221]

Level 15, 133 Castlereagh Street Sydney NSW 2000 T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com.au W www.ghd.com.au

Data source: NSW Department of Lands: DTDB and DCDB - 2012-13. Santos: Operational and Base Data - 2013. Created by: afoddy

Section 2 Definition of Water Sources

2.1 Water Sharing Plans

Water sources in New South Wales are defined and managed using statutory documents called Water Sharing Plans (WSPs). Each WSP defines the water sources covered by that plan and establishes the rules for sharing water between different water users, including the environment.

The area of baseline monitoring in this WBR contains eight distinct water sources that are defined in six separate but overlapping WSPs. The water sources and WSPs are listed in Table 2-1, and Figure 2-1 shows the relationships between stratigraphic units, WSPs and defined water sources, which are depicted in a schematic cross section through the Bohena Trough (Gunnedah Basin) and the on-lapping portion of the GAB and the Namoi alluvium.

Table 2-1 Water sources within the area of baseline monitoring

Water Source	Water Sharing Plan (WSP)
Gunnedah–Oxley Basin MDB Groundwater Source	Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2011
Southern Recharge Groundwater Source, and Surat Groundwater Source	Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2008
Upper and Lower Namoi Groundwater Sources	Water Sharing Plan for the Upper and Lower Namoi Groundwater Sources 2003
Bohena Creek Water Source	Water Sharing Plan for the Namoi Unregulated and Alluvial Water Sources 2012
Liverpool Ranges Basalt MDB Groundwater Source, and Warrumbungle Basalt Groundwater Source	Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011
Lower Namoi Regulated River Water Source	Water Sharing Plan for the Namoi Unregulated and Alluvial Water Sources 2012

2.2 Gunnedah-Oxley Basin MDB Groundwater Source

The Gunnedah–Oxley Basin MDB Groundwater Source is defined in the *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2011*. It includes all water contained in all rocks of Permian, Triassic, Jurassic, Cretaceous and Tertiary age within outcropped and buried areas, and all water contained in all alluvial sediments within the outcropped areas, and within the boundary of the Gunnedah–Oxley Basin defined in the plan map. It excludes groundwater sources otherwise defined in the Water Sharing Plans for the Upper and Lower Namoi Groundwater Sources 2003 and the NSW Great Artesian Basin Groundwater Sources 2008.

2.3 Southern Recharge and Surat Groundwater Sources

The GAB Surat and Southern Recharge Groundwater Sources are defined within the *Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2008*. The Southern Recharge Groundwater Source includes all water contained in all rocks of Cretaceous, Jurassic and Tertiary age, and all alluvial sediments within the boundary defined in the plan map. The Surat Groundwater Source includes water contained in all rocks of Cretaceous and Jurassic age at a depth of more than 60 metres below ground surface within the boundary of the Surat Groundwater Source defined in the plan.

The Southern Recharge and Surat Groundwater Sources exclude groundwater sources otherwise defined in the Water Sharing Plans for the Upper and Lower Namoi Groundwater Sources 2003, and the NSW Murray Darling Basin Porous Rock Groundwater Sources 2011.

2.4 Upper and Lower Namoi Groundwater Sources

The Upper and Lower Namoi Groundwater Sources are defined in the *Water Sharing Plan for the Upper and Lower Namoi Groundwater Sources 2003*. They include all water contained in the unconsolidated alluvial sediment aquifers associated with the Namoi River and its tributaries and lying within the Namoi and Gwydir Water Management Areas.

2.5 Bohena Creek Water Source

The Bohena Creek Water Source is defined in the *Water Sharing Plan for the Namoi Unregulated and Alluvial Water Sources 2012*. Within the subsurface, the Bohena Creek Water Source includes all water below the surface of the ground and within the boundary defined in the plan. Above ground it includes all water occurring naturally on the surface of the ground, and all water in rivers, lakes and wetlands.

2.6 Liverpool Ranges Basalt MDB Groundwater Source

The Liverpool Ranges Basalt MDB Groundwater Source is defined in the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011*. It includes all water contained in all basalt and sediments of Tertiary age, and all water in all alluvial sediments within the boundary of the Liverpool Ranges Basalt MDB Groundwater Source defined in the plan. It excludes groundwater sources otherwise defined in the Water Sharing Plans for the Upper and Lower Namoi Groundwater Sources 2003, NSW Great Artesian Basin Groundwater Sources 2008, NSW Murray Darling Basin Porous Rock Groundwater Sources 2011, and Namoi Unregulated and Alluvial Water Sources 2012.

2.7 Warrumbungle Basalt Groundwater Source

The Warrumbungle Basalt Groundwater Source is defined in the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011*. It includes all water contained in all basalt and sediments of Tertiary age, and all water in all alluvial sediments within the boundary of the Warrumbungle Basalt Groundwater Source defined in the plan map. It excludes groundwater sources otherwise defined in the Water Sharing Plans for the Upper and Lower Namoi Groundwater Sources 2003, NSW Great Artesian Basin Groundwater Sources 2008, NSW Murray Darling Basin Porous Rock Groundwater Sources 2011, and Namoi Unregulated and Alluvial Water Sources 2012.

2.8 Lower Namoi Regulated Rivers Water Source

The Lower Namoi Regulated River Water Source is defined in the *Water Sharing Plan for the Upper Namoi and Lower Namoi Regulated River Water Sources 2003*. It incorporates all water, between the banks of all rivers, from Keepit Dam downstream to the junction of the Namoi River with the Barwon River at Walgett.

2.9 Hydrostratigraphic Units

Groundwater sources are typically classified with reference to the stratigraphic layer, or sequence of strata that contain the water.

The stratigraphic units that are present within the area of baseline monitoring have been grouped into hydrostratigraphic units according to the capacities of the strata to transmit or inhibit the movement of groundwater. Table 2-2 includes:

- Significant transmissive units (STU);
- Less significant transmissive units (LSTU);
- Probable negligibly transmissive units (PNTU); and
- Negligibly transmissive units (NTU).

These definitions identify the relative significance of each stratigraphic unit with respect to the expected hydrogeological response of the subsurface to coal seam gas development. Thus, a very conductive and high-yielding stratum is considered to be a STU, a low-yielding stratum is considered to be a LSTU, and leaky strata and aquitards are considered to be PNTUs and NTUs.

The purpose of Table 2-2 in this WBR is to provide a key to the names of specific stratigraphic and hydrostratigraphic units used elsewhere in the report.

Table 2-2 Hydrostratigraphic unit classification

Province	Period/ Epoch	Division	Group	Sub-group	Formation	Lithology and Hydrogeological Classification
Namoi Alluvium Vocanics	Pleistocene				Narrabri fm	Clay and silt with sand lenses
	Pliocene				Gunnedah fm	Gravel and sand with clay lenses
	Miocene				Cubbaroo fm	Gravel and sand with clay lenses
					Warrumbungle Vol	Basalt, dolerite
	Eocene				Liverpool Range Vol	Basalt, dolerite
Surat Basin	Cretaceous	Middle	Blythesdale Gp (Keelindi Beds)		Bungil Fm Mooga Ss Orallo Fm	Clayey to Quartzose sandstone, subordinate siltstone and conglomerate
		Early			Pilliga Ss	Fluvial, medium to very coarse grained, quartzose sandstone and conglomerate. Minor interbeds of mudstone, siltstone and fine grained sandstone and coal.
	Jurassic	Late				
		Middle			Purlawaugh Fm	Fine to medium grained sandstone thinly interbedded with siltstone, mudstone and thin coal seams
		Early Late	Garrawilla Volcanics			Dolerite, basalt, trachyte, tuff, breccia
Gunnedah Basin	Triassic	Middle			Deriah Fm	Sandstone
					Napperby Fm	Interbedded fine sandstone, claystone and siltstone
						Basal Napperby Shale
		Early			Digby Fm	Quartzose sandstone (Ulinda Ss)
						Lithic sandstone
						Lithic conglomerate (Bomera Conglomerate)
	Permian	Late	Black Jack	Nea	Trinkey Fm	Coal measures - siltstone, fine sandstone, tuffs, stony coal
					Wallala Fm	Conglomerate, sandstone, siltstone, minor coal bands
				Coogal	Breeza Coal	Coal and claystone
					Clare Ss	Medium to coarse-grained quartzose sandstone; quartzose conglomerate
					Hows Hill Coal	Coal
					Benelabri	Claystone, siltstone and sandstone; fining up cycles; more sandy towards top
					Hoskissons Coal	Potential target coal seam
				Brothers	Brigalow Fm	Fining-up sequence of medium to coarse-grained quartzose sandstone and siltstone
					Arkarula Fm	Sandstone and siltstone
					Melvilles Coal Mb	Coal
					Pamboola Fm	Sandstone, siltstone, minor claystone & coal
		Middle	Millie		Watermark Fm	Marine siltstone, shales and sandstone
					Porcupine Fm	Fining upward sequence of conglomerate and sandstone to mudstone
		Early	Bellata		Upper Maules Creek Fm	Sandstone and conglomerate, siltstone, mudstone and coal
					Rutley seam	Potential target coal seam
					Interburden	Sandstone and conglomerate, siltstone, mudstone
					Namoi seam	Potential target coal seam
					Interburden	Sandstone and conglomerate, siltstone, mudstone
					Parkes seam	Potential target coal seam
					Interburden	Sandstone and conglomerate, siltstone, mudstone
					Bohena seam	Potential target coal seam
					Lower Maules Creek Fm	Sandstone and conglomerate, siltstone, mudstone and coal
					Goonbri Fm	Siltstone, sandstone and coal
					Leard Fm	Flinty claystone
Basement			Werrie Basalt and Boggabri Volcanics (Basement)			Rhyolitic to dacitic lavas and ashflow
						Tuffs with interbedded shale. Rare trachyte and andesite. Weathered basic lavas
Colour code key:		**STU** – Significantly Transmissive Unit				
		LSTU – Less Significantly Transmissive Unit				
		PNTU – Probable Negligibly Transmissive Unit				
		NTU – Negligibly Transmissive Unit				

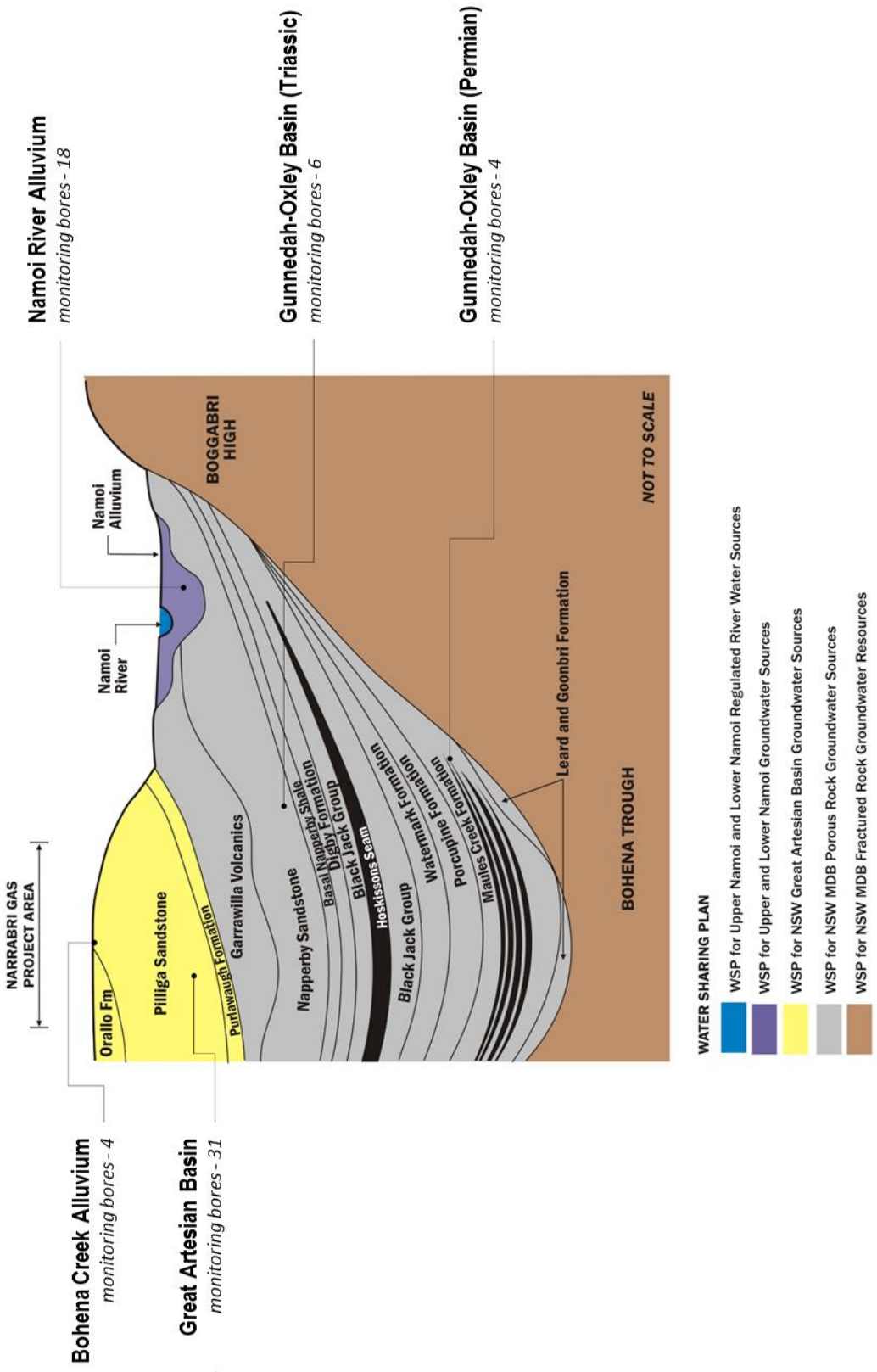


Figure 2-1 Schematic of water sources in the area of baseline monitoring

Section 3 Sources of Hydrological Data

3.1 Overview

Santos NSW (Eastern) Pty Ltd (Santos) has been monitoring hydrological conditions in the project area since 2011. Hydrological measurements were initially collected to support Santos' exploration and appraisal activities, and more recently have been broadened to support the hydrological baseline for the Narrabri Gas Project. The groundwater data consist of observations in bores that are owned and maintained by Santos and in a number of private landholder bores that are sampled by Santos.

In addition to hydrological data held by Santos, the New South Wales Department of Primary Industries (DPI) Water (formerly NSW Office of Water) maintains an extensive network of groundwater monitoring bores and surface water monitoring sites within the area of the baseline monitoring. These data are available through DPI Water's PINNEENA[1] database and online data services.

3.2 Groundwater Datasets

The groundwater baseline is compiled from hydrological data collected by Santos and DPI Water. Overviews of the baseline data for hydraulic head and groundwater quality are shown in Table 3-1 and Table 3-2, respectively.

Locations of groundwater monitoring bores are shown in Figure 3-1 for the Gunnedah-Oxley Basin, in Figure 3-2 for the Great Artesian Basin, and in Figure 3-3 for alluvial water sources. When viewed from above in 2D plan, as is the case in these maps, there is an apparent overlap between the distributions of monitoring bores within each of the water sources; for example, it can be seen that the NGP area contains monitoring bores within the Gunnedah-Oxley Groundwater Source, and within the GAB and alluvial groundwater sources. This apparent overlap in the distributions of the monitoring bores might be incorrectly interpreted to mean that the water sources themselves intersect, but this is not the case. In three-dimensions, the water sources are in fact separated vertically, such that monitoring bores at the same or similar locations can be screened at different depths and within different groundwater sources.

The baseline for hydraulic head is compiled from observations in 50 groundwater monitoring bores, including 9 bores in the Gunnedah-Oxley Basin, 25 bores in the Great Artesian Basin and 16 bores in the Namoi alluvium.

The baseline for groundwater quality is compiled from water quality observations in 40 groundwater monitoring bores, including 2 bores in the Gunnedah-Oxley Basin, 21 bores in the Great Artesian Basin, 13 bores in the Namoi alluvium and 4 bores in the Bohena Creek alluvium.

3.2.1 Private Landholder Bores

In addition to sampling of the above baseline groundwater bores, since 2011 Santos has sampled numerous private landholder bores on behalf of the landholders. While these data do not form part of the formal groundwater baseline, they nonetheless provide information that would help to assess potential impacts on landholder bores from the project should changes in groundwater head or

[1] http://waterinfo.nsw.gov.au/pinneena/

water quality become apparent at those locations. Santos will continue to offer a service to sample landholder bores over the life of the project, particular in situation where there is concern about potential impacts from the project.

A map of private landholder bores that have been sampled by Santos is shown in Figure 3-4. Most private bores were constructed as water supply bores and groundwater head in these bores can be affected by the pumping.

Table 3-1 Overview of baseline data for groundwater hydraulic head

Stratigraphic Unit	Water Source	Number of Monitoring Bores		
		Santos	DPI	Total
Maules Creek Formation	GOB	1	0	1
Porcupine Formation	GOB	2	0	2
Black Jack Group	GOB	0	1	1
Digby Formation	GOB	2	1	3
Napperby Formation	GOB	0	2	2
Purlawaugh Formation	GAB	2	0	2
Pilliga Sandstone	GAB	12	5	17
Orallo Formation	GAB	2	1	3
Mooga Sandstone	GAB	0	3	3
Namoi alluvium	ULNA	0	16	16
TOTAL		**21**	**29**	**50**

GOB - Gunnedah–Oxley Basin MDB Groundwater Source; GAB – Great Artesian Basin Surat and Southern Recharge Groundwater Sources; ULNA - Upper and Lower Namoi Groundwater Sources

Table 3-2 Overview of baseline data for groundwater quality

Stratigraphic Unit	Water Source	Number of Monitoring Bores		
		Santos or Private	DPI	Total
Digby Formation	GOB	1	0	1
Napperby Formation	GOB	1	0	1
Purlawaugh Formation	GAB	1	0	1
Pilliga Sandstone	GAB	12	3	15
Orallo Formation	GAB	5	0	5
Namo alluvium	ULNA	0	13	13
Bohena Creek alluvium	BC	4	0	4
TOTAL		**24**	**16**	**40**

GOB - Gunnedah–Oxley Basin MDB Groundwater Source; GAB - Great Artesian Basin Surat and Southern Recharge Groundwater Sources; ULNA - Upper and Lower Namoi Groundwater Sources; BC - Bohena Creek Water Source

3.3 Surface Water Datasets

The surface water baseline is compiled from streamflow data collected by DPI Water and surface water quality data collected by Santos. Overviews of these datasets are given in Table 3-3 and Table 3-4 below.

The baseline for surface water flows consists of data from six streamflow gauging stations. The baseline for surface water quality consists of water quality measurements from six sampling locations on Bohena Creek and six sampling location on the Namoi River.

The locations of surface water monitoring sites are shown in Figure 3-5 and Figure 3-6.

Table 3-3 Overview of baseline data for streamflow gauging

Station Name	Owner	Station Number	Location
Bohena Ck at Newell Highway	DPI	419905	Newell Highway crossing of Bohena Creek
Namoi River at Boggabri	DPI	419012	Boggabri-Manilla Road crossing
Namoi River at Turrawan (Wallah)	DPI	419023	Namoi River near Turrawan
Narrabri Creek at Narrabri	DPI	419003	Newell Highway crossing of Namoi River at Namoi
Namoi River at Mollee	DPI	419039	Namoi River between Narrabri and Wee Waa
Namoi at D/S Gunidgera Weir	DPI	419059	Namoi River near Wee Waa

Table 3-4 Overview of baseline data for surface water quality

Site ID	Owner	Water Course	Location Description
7505	Santos	Bohena Creek	Downstream of the confluence of Yaminba Creek and Borah Creek
7506	Santos	Bohena Creek	Downstream of the release point for potential managed release scheme
7510	Santos	Bohena Creek	Bohena Creek at crossing of Newell Highway
7511	Santos	Bohena Creek	Road culvert at Yarrie Lake
7512	Santos	Bohena Creek	Bohena Creek upstream of its confluence with Namoi River
7103	Santos	Bohena Creek	Upstream of the release point for potential managed release scheme
7504	Santos	Namoi River	Namoi River at Narrabri township
7513	Santos	Namoi River	Namoi River near the proposed irrigation areas
7517	Santos	Namoi River	Namoi River at Tarriaro Cultural Reserve
7529	Santos	Namoi River	Namoi River upstream of its confluence with Bohena Creek
7533	Santos	Namoi River	Namoi River downstream of its confluence with Bohena Creek
7538	Santos	Namoi River	Namoi River at Kamilaroi Highway Crossing

3.4 Data Management and Quality Control

Santos uses EQuIS[2] (Environmental Quality Information System) to manage the quality and integrity of hydrological data collected for the Narrabri Gas Project. EQuIS is recognised as the world's most widely used software for environmental data management.

An overview of Santos' data management system is shown in Appendix B in the form of a data-management flow chart. The data management system covers all stages of data management from planning to archiving and including: setting of objectives for data collection; planning and scheduling of sampling activities; definition of field and laboratory protocols; data entry and automated completeness checking; data verification, validation and corrective action procedures; and data storage, backup and retrieval.

Additional information about specific aspects of Santos' data management system is available upon request.

[2] http://earthsoft.com/

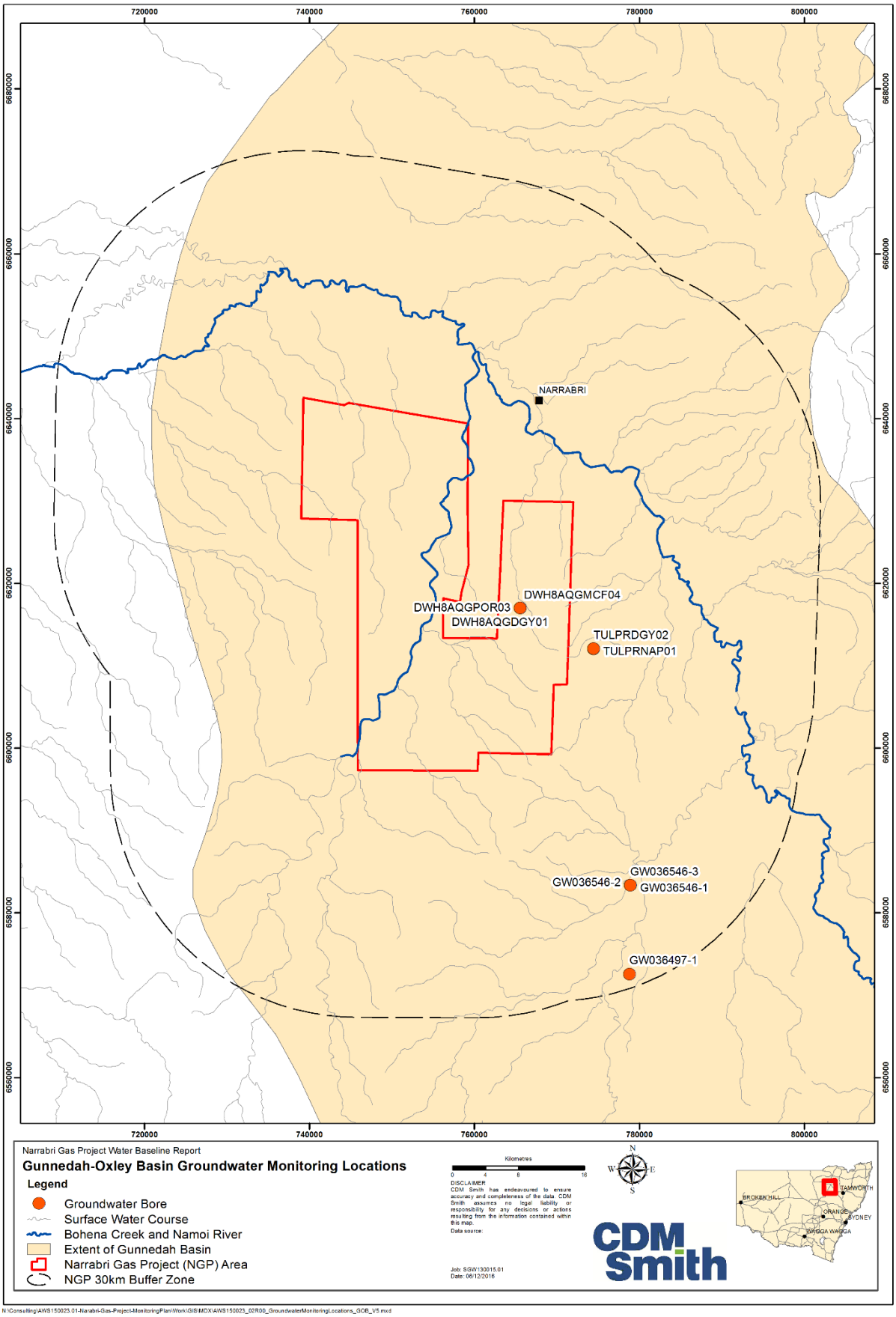


Figure 3-1 Groundwater monitoring locations in the Gunnedah-Oxley Basin

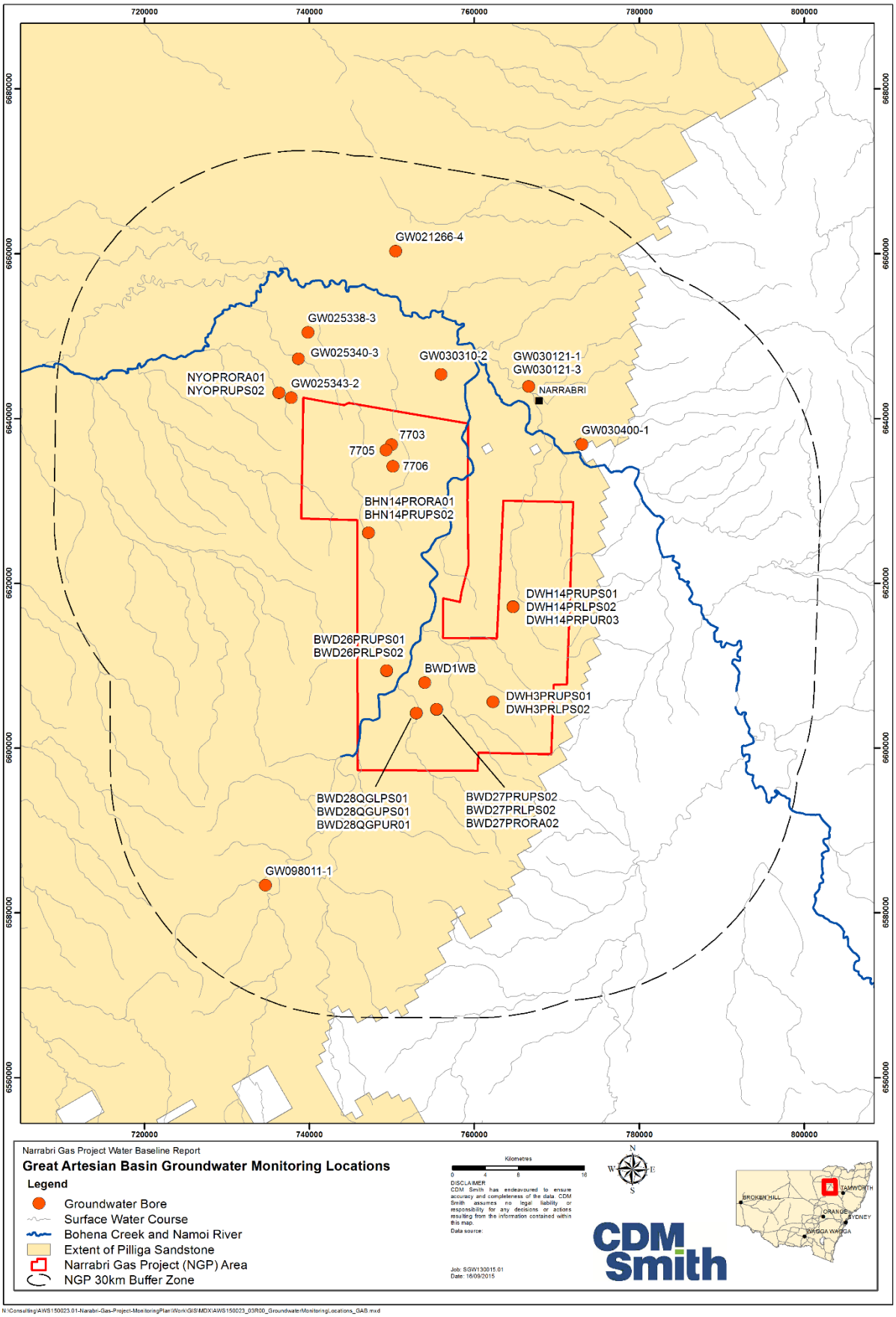


Figure 3-2 Groundwater monitoring locations in the Great Artesian Basin

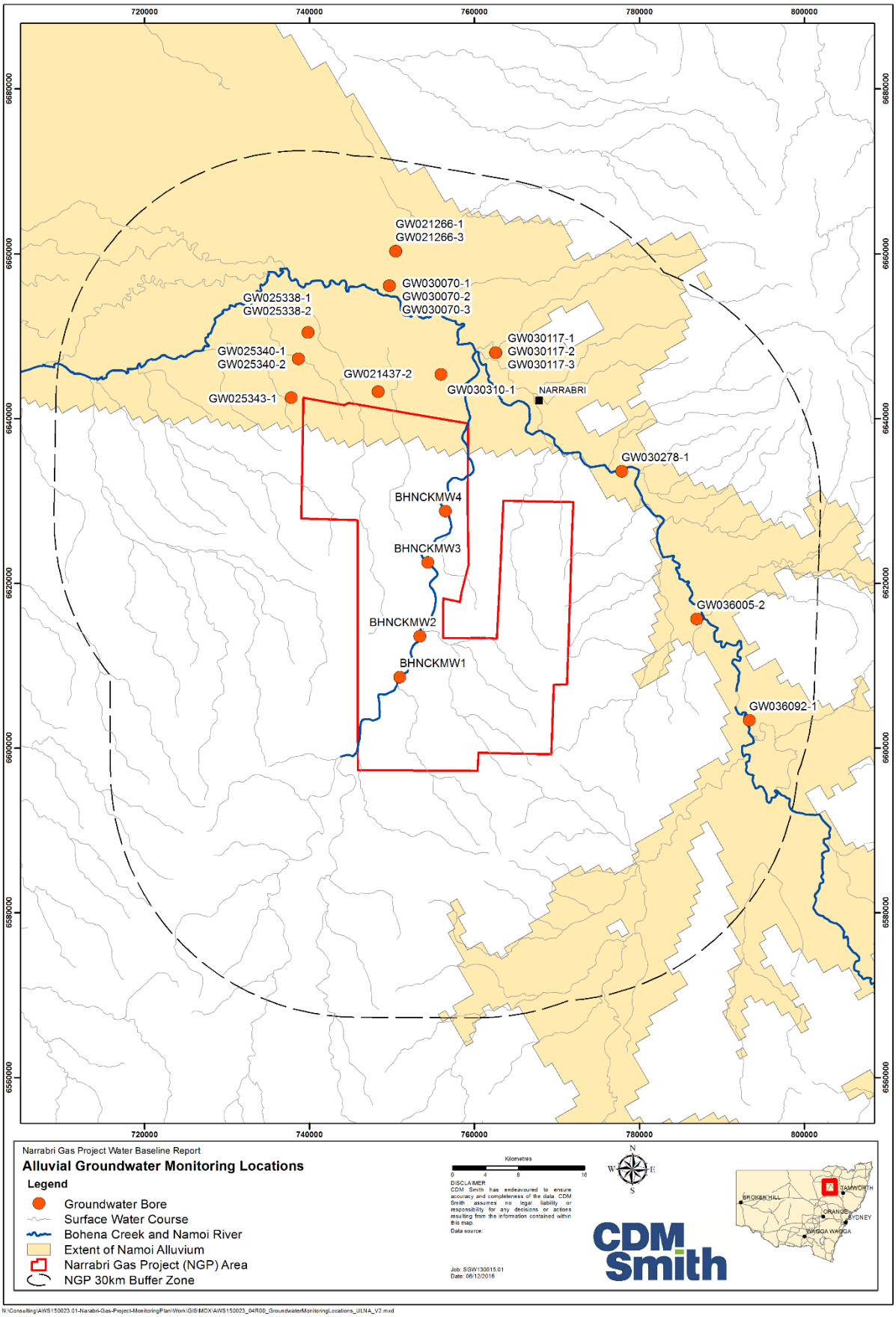


Figure 3-3 Groundwater monitoring locations in alluvial water sources

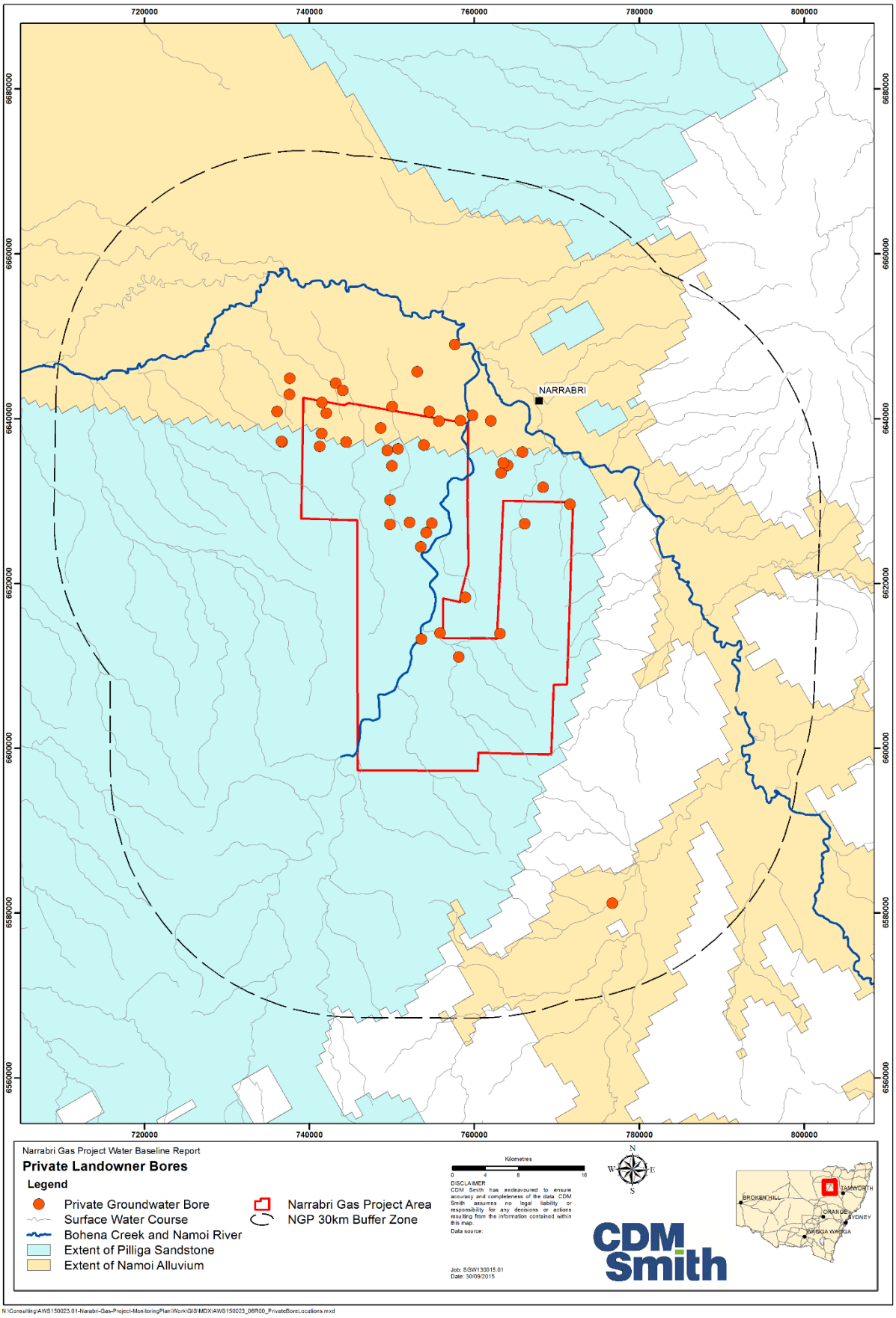


Figure 3-4 Locations of private landholder bores

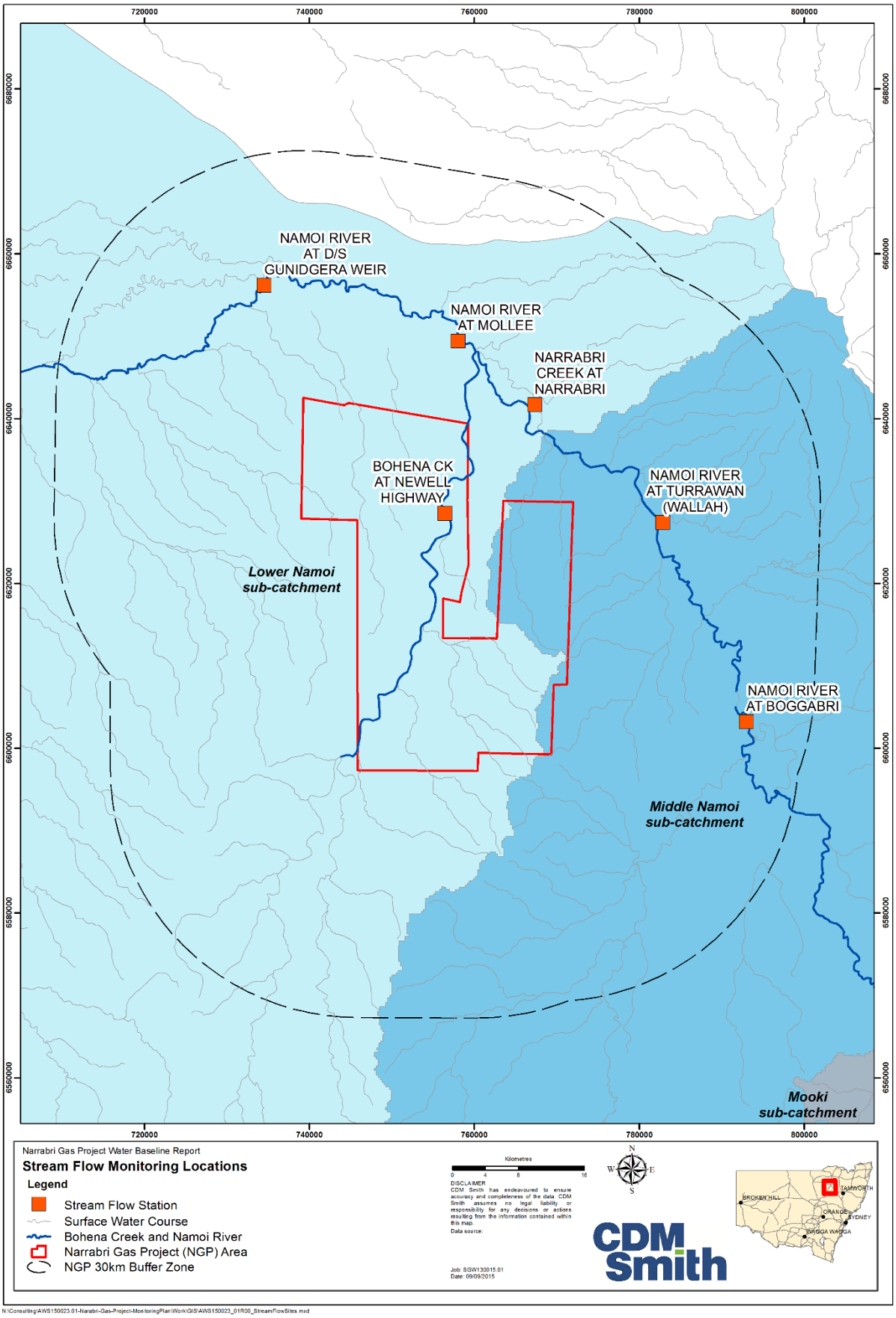


Figure 3-5 Monitoring locations for streamflow

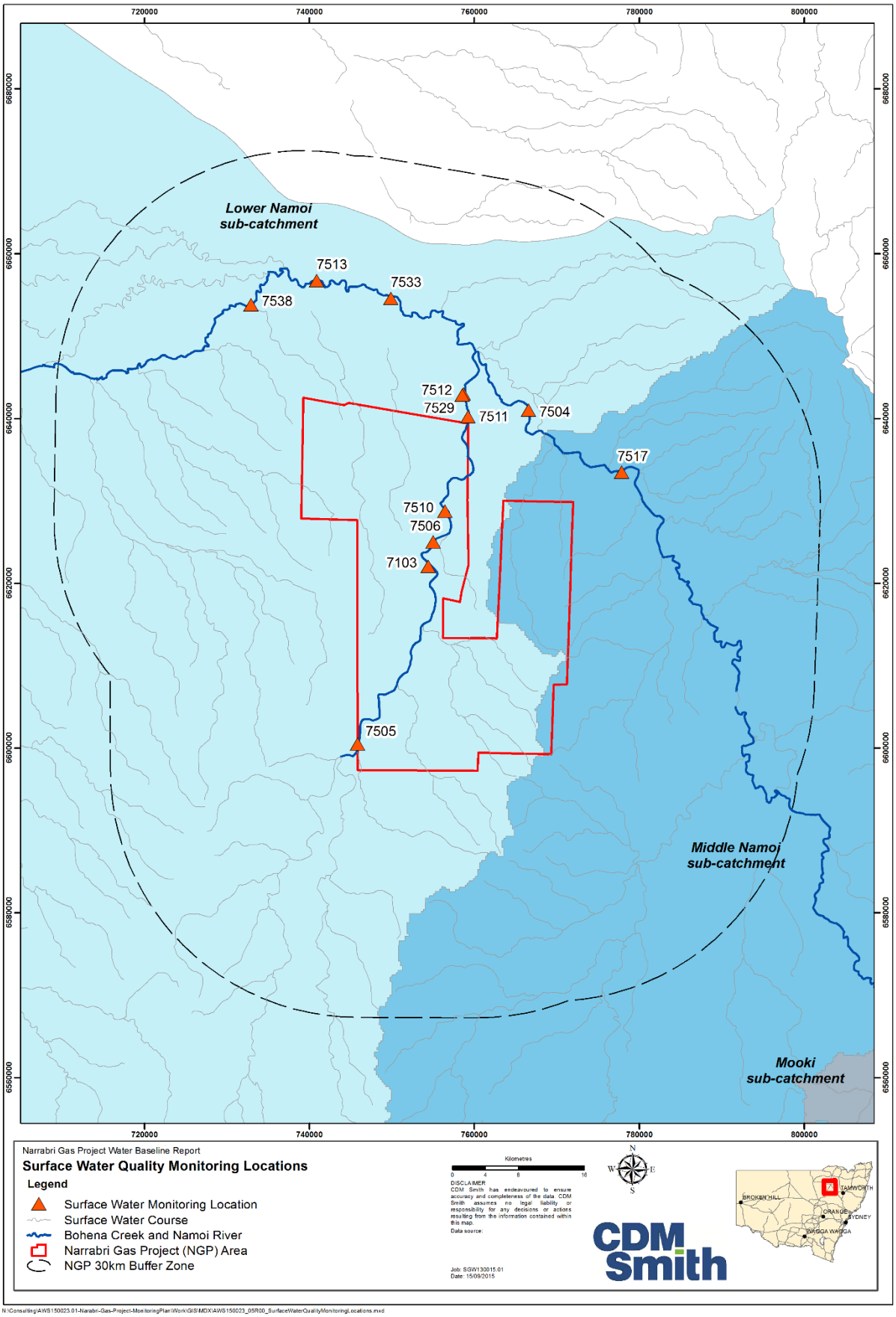


Figure 3-6 Monitoring locations for surface water quality

Section 4 Groundwater Baseline Data

4.1 Hydraulic Head and Pressure

Table 4-1 lists the 50 groundwater monitoring bores that constitute the baseline monitoring locations for groundwater hydraulic head. The table contains a simple statistical summary of the spread (minimum and maximum values) and central tendency (mean and median values) of measurements of hydraulic head in each bore. Additional information on the screened intervals of the bores is contained in Appendix C.

Hydrographs for individual monitoring bores listed in Table 4-1 are presented below in sections 4.1.1 to 4.1.3, and the locations of the bores are shown in Figure 3-1 to Figure 3-3 in Section 3.

Table 4-1 Summary of baseline data for groundwater head

Bore	Owner	Unit	Water Source	Hydraulic Head, m AHD						
				No. of Records	Start Date	End Date	Min.	Max.	Mean	Median
DWH8AQGMCF04	Santos	Maules Creek Fm	GOB	361	6/15	6/16	389.9	391.1	390.4	390.4
DWH8AQGPOR03	Santos	Porcupine Fm	GOB	361	6/15	6/16	353.3	364.2	356.7	354.6
BWD6	Santos	Porcupine Fm	GOB	427	5/15	6/16	354.2	369.7	362.3	362.6
GW036546-3	DPI	Black Jack	GOB	152	5/86	7/14	230.9	240.4	237.2	237.0
DWH8AQGDGY01	Santos	Digby Fm	GOB	361	6/15	6/16	329.3	330.1	329.7	329.7
TULPRDGY02	Santos	Digby Fm	GOB	481	4/14	9/15	245.0	248.8	248.5	248.6
GW036546-1	Santos	Digby Fm	GOB	151	5/86	7/14	233.6	240.4	238.4	238.3
GW036546-2	DPI	Napperby Fm	GOB	152	5/86	7/14	231.0	240.4	237.2	237.0
GW036497-1	DPI	Napperby Fm	GOB	164	6/84	2/15	254.3	257.3	255.8	255.8
BWD28QGPUR01	Santos	Purlawaugh Fm	GAB	809	3/14	6/16	278.5	279.5	278.9	278.9
DWH14PRPUR03	Santos	Purlawaugh Fm	GAB	392	3/14	6/15	236.3	237.2	236.8	236.9
BHN14PRUPS02	Santos	Pilliga Ss	GAB	453	3/14	8/15	225.4	226.7	226.5	226.6
BWD26PRLPS02	Santos	Pilliga Ss	GAB	300	3/14	3/15	247.4	248.3	248.1	248.1
BWD26PRUPS01	Santos	Pilliga Ss	GAB	507	12/13	7/15	247.5	248.0	247.9	248.0
BWD27PRLPS03	Santos	Pilliga Ss	GAB	485	3/14	9/15	253.6	254.2	254.0	254.1
BWD27PRUPS02	Santos	Pilliga Ss	GAB	460	3/14	9/15	253.1	253.7	253.5	253.5
BWD28QGLPS01	Santos	Pilliga Ss	GAB	809	3/14	6/16	284.6	290.3	286.4	285.1
BWD28QGUPS01	Santos	Pilliga Ss	GAB	819	3/14	6/16	270.2	283.2	281.7	282.1
DWH14PRLPS02	Santos	Pilliga Ss	GAB	463	3/14	9/15	234.5	235.2	235.0	235.0
DWH14PRUPS01	Santos	Pilliga Ss	GAB	530	12/13	9/15	235.6	236.0	235.8	235.8
DWH3PRLPS02	Santos	Pilliga Ss	GAB	412	3/14	5/15	249.1	249.8	249.7	249.7
DWH3PRUPS01	Santos	Pilliga Ss	GAB	493	12/13	5/15	249.0	250.1	249.8	249.8
NYOPRUPS02	Santos	Pilliga Ss	GAB	251	3/14	4/15	204.0	210.1	204.1	204.0
GW030310-2	DPI	Pilliga Ss	GAB	325	3/74	8/14	179.8	199.1	194.4	195.9
GW030121-3	DPI	Pilliga Ss	GAB	334	4/71	8/14	193.9	208.2	203.8	204.4
GW030400-1	DPI	Pilliga Ss	GAB	321	11/73	1/15	208.1	220.8	212.0	212.1
GW030889-1	DPI	Pilliga Ss	GAB	7	4/82	6/14	164.9	173.9	170.0	172.9
GW098011-1	DPI	Pilliga Ss	GAB	2436	12/12	3/15	305.2	305.4	305.3	305.3
GW021266-4	DPI	Orallo Fm	GAB	1011	6/73	8/14	128.0	186.7	171.2	177.1
BHN14PRORA01	Santos	Orallo Fm	GAB	506	2/14	8/15	215.2	217.1	216.4	216.3
NYOPRORA01	Santos	Orallo Fm	GAB	52	1/15	4/15	203.9	210.1	204.3	204.1
GW025343-2	DPI	Mooga Ss	GAB	1059	1/70	8/14	171.9	179.8	175.2	174.9
GW025338-3	DPI	Mooga Ss	GAB	1071	12/69	8/14	168.1	181.5	174.9	174.6
GW025340-3	DPI	Mooga Ss	GAB	1068	4/70	8/14	169.8	179.8	173.9	173.3
GW021266-3	DPI	Namoi alluvium	ULNA	1005	6/73	8/14	164.4	185.8	179.5	181.1

Bore	Owner	Unit	Water Source	Hydraulic Head, m AHD						
				No. of Records	Start Date	End Date	Min.	Max.	Mean	Median
GW021437-2	DPI	Namoi alluvium	ULNA	1116	5/68	8/14	178.3	185.2	181.9	182.1
GW025338-1	DPI	Namoi alluvium	ULNA	1071	12/69	8/14	170.9	181.8	175.5	174.9
GW025338-2	DPI	Namoi alluvium	ULNA	1071	12/69	8/14	162.3	181.6	174.4	174.2
GW025340-1	DPI	Namoi alluvium	ULNA	1068	4/70	8/14	169.7	180.5	173.7	172.9
GW025340-2	DPI	Namoi alluvium	ULNA	1074	4/70	8/14	169.5	180.5	173.7	172.9
GW025343-1	DPI	Namoi alluvium	ULNA	1059	4/70	8/14	171.8	179.7	175.2	174.8
GW030070-1	DPI	Namoi alluvium	ULNA	343	8/70	8/14	182.9	192.7	188.7	189.3
GW030070-2	DPI	Namoi alluvium	ULNA	354	8/70	8/14	172.3	190.2	185.4	187.1
GW030070-3	DPI	Namoi alluvium	ULNA	354	8/70	8/14	171.6	190.1	185.3	186.9
GW030310-1	DPI	Namoi alluvium	ULNA	323	3/74	8/14	183.1	195.9	192.5	193.3
GW030117-1	DPI	Namoi alluvium	ULNA	320	6/72	8/14	199.6	204.2	202.7	202.7
GW030117-2	DPI	Namoi alluvium	ULNA	285	6/72	8/14	201.7	204.6	202.8	202.8
GW030278-1	DPI	Namoi alluvium	ULNA	390	4/72	1/15	213.0	222.0	216.7	216.8
GW036005-2	DPI	Namoi alluvium	ULNA	309	9/74	8/14	211.8	227.2	223.7	225.2
GW036092-1	DPI	Namoi alluvium	ULNA	297	12/74	8/14	231.0	234.4	232.4	232.5

GOB – Gunnedah–Oxley Basin MDB Groundwater Source; GAB - Great Artesian Basin Surat and Southern Recharge Groundwater Sources; ULNA – Upper and Lower Namoi Alluvium Source
Note: screened intervals of bores are listed in Appendix C

4.1.1 Gunnedah-Oxley Basin Monitoring Bores

Figure 4-4 to Figure 4-11 show hydrographs for the baseline groundwater monitoring bores located within the Gunnedah-Oxley Basin. The locations of these bores are shown in Figure 3-1.

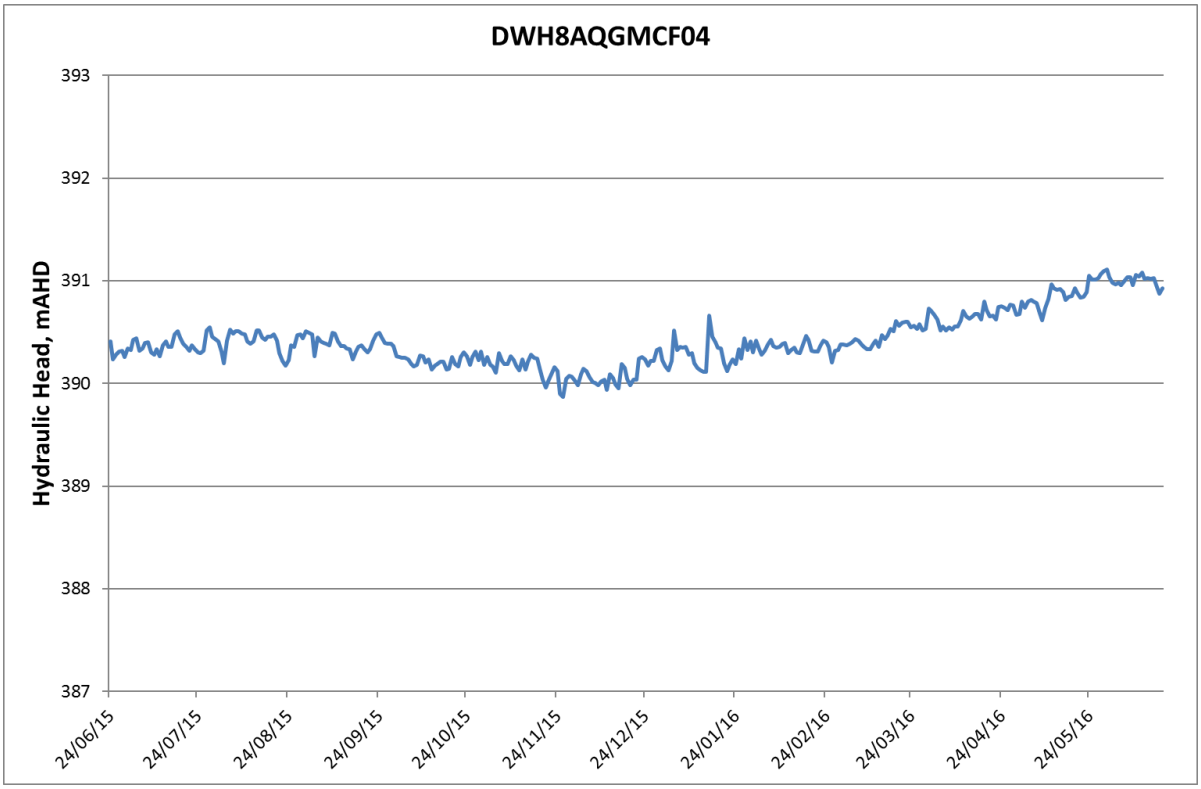


Figure 4-1 Hydrograph for monitoring bore DWH8AQGMCF04 (Maules Creek Formation)

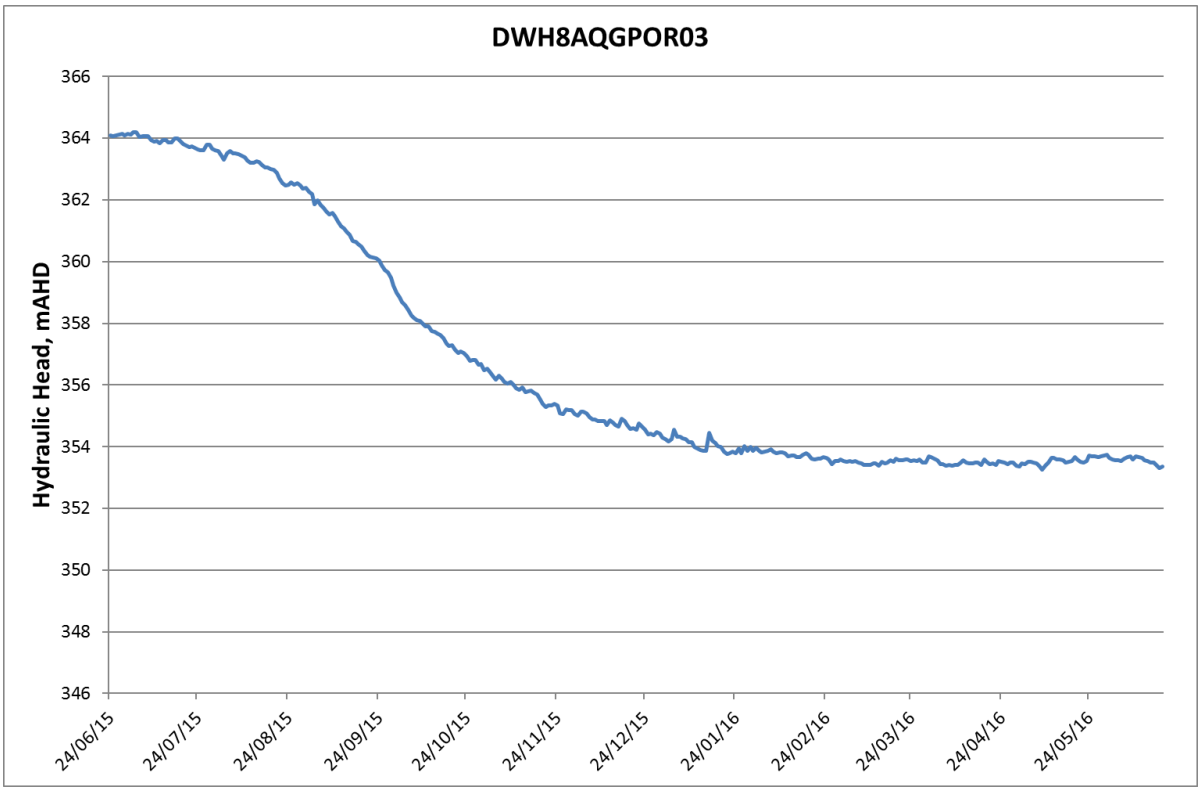


Figure 4-2 Hydrograph for monitoring bore DWH8AQGPOR03 (Porcupine Formation)

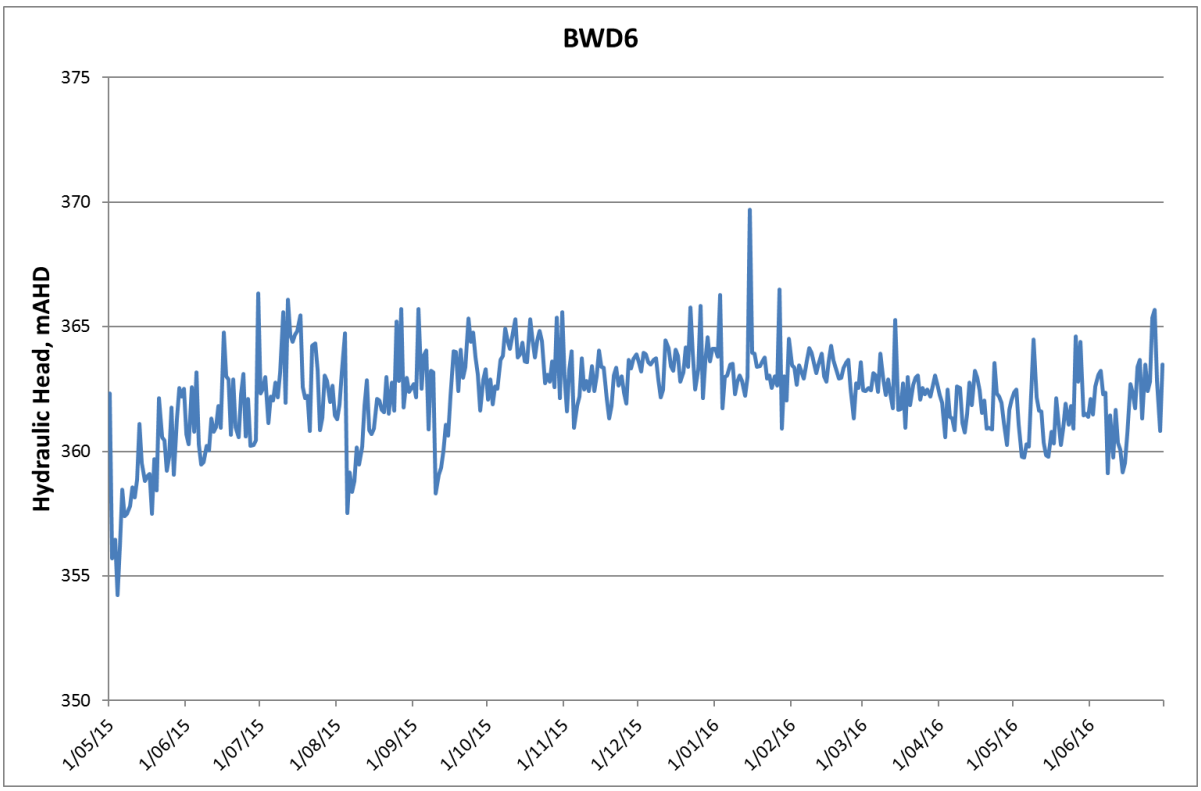


Figure 4-3 Hydrograph for monitoring bore BWD6 (Porcupine Formation)

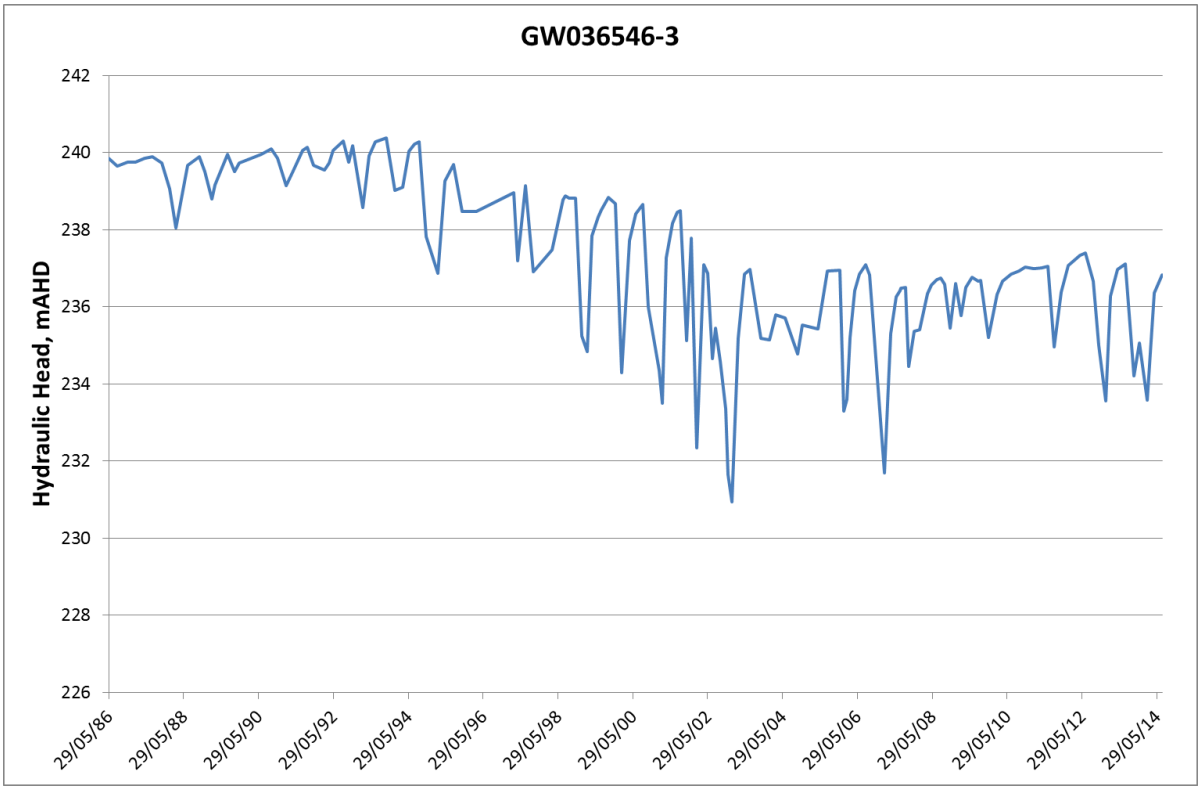


Figure 4-4 Hydrograph for monitoring bore GW036546-3 (Black Jack Group)

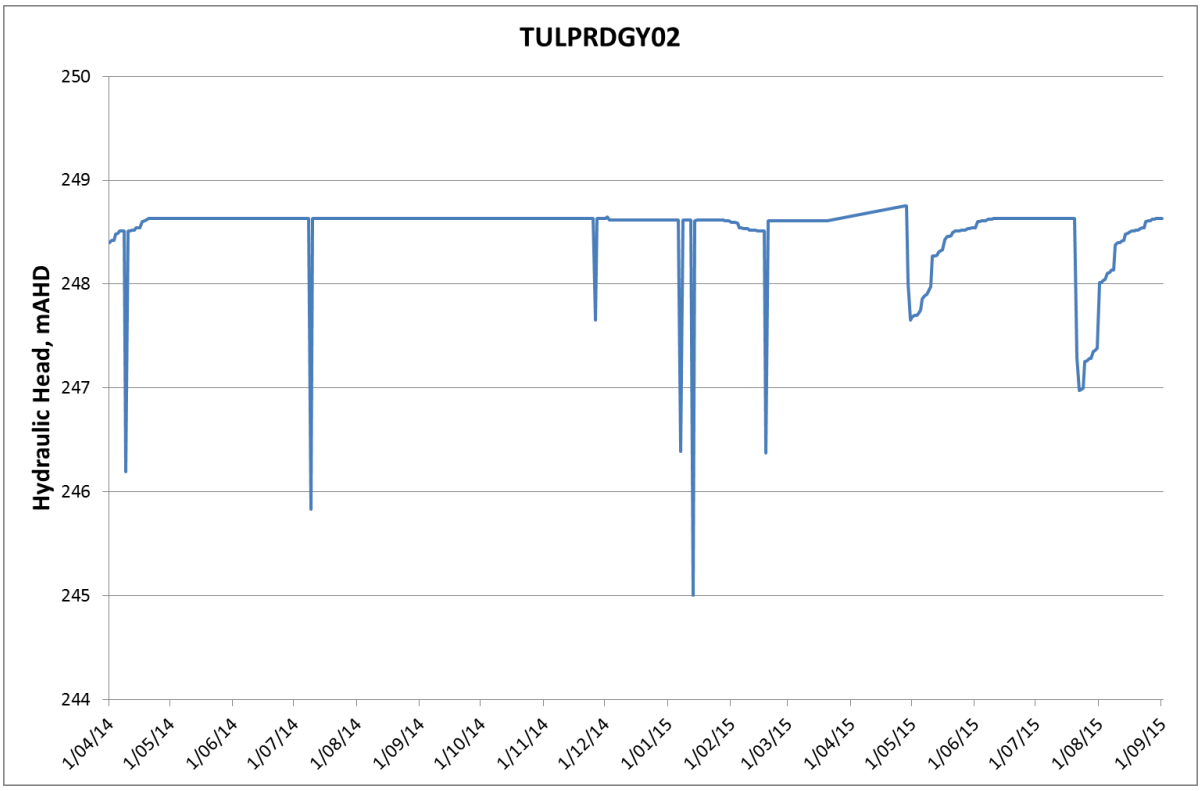


Figure 4-5 Hydrograph for monitoring bore TULPRDGY02 (Digby Formation)

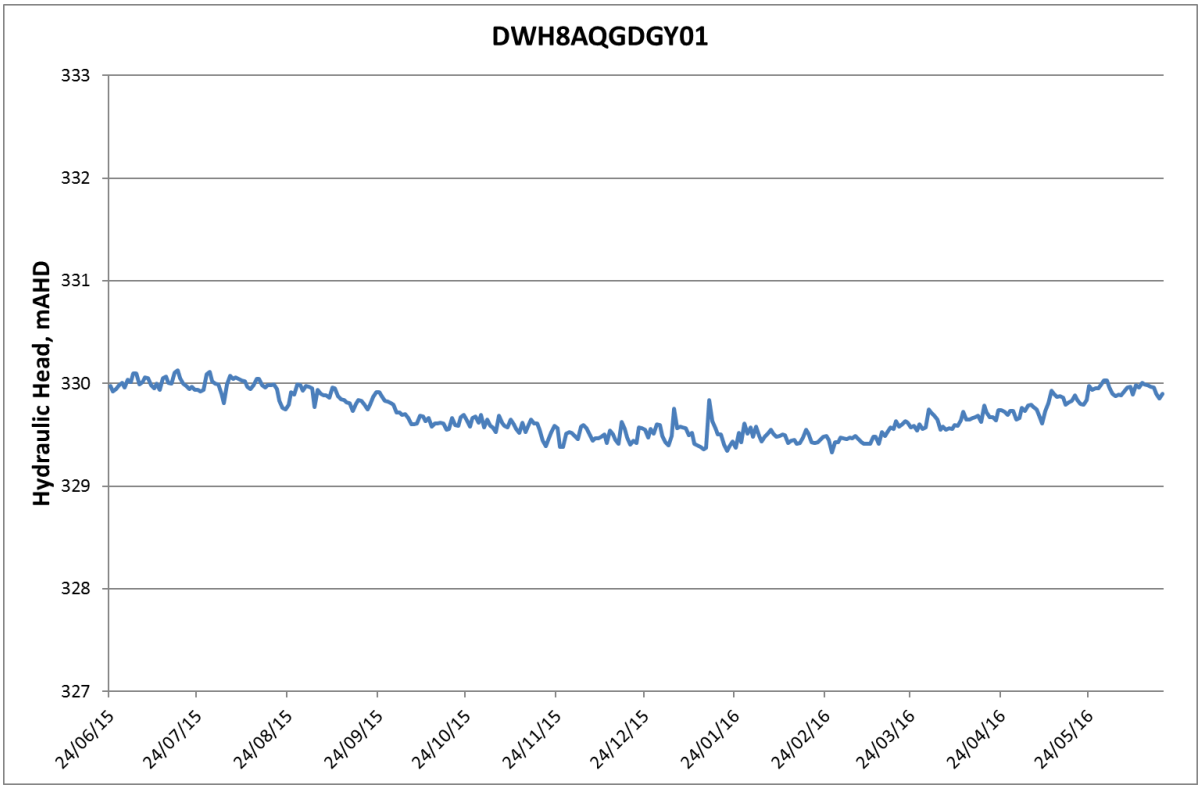


Figure 4-6 Hydrograph for monitoring bore DWH8AQGDGY01 (Digby Formation)

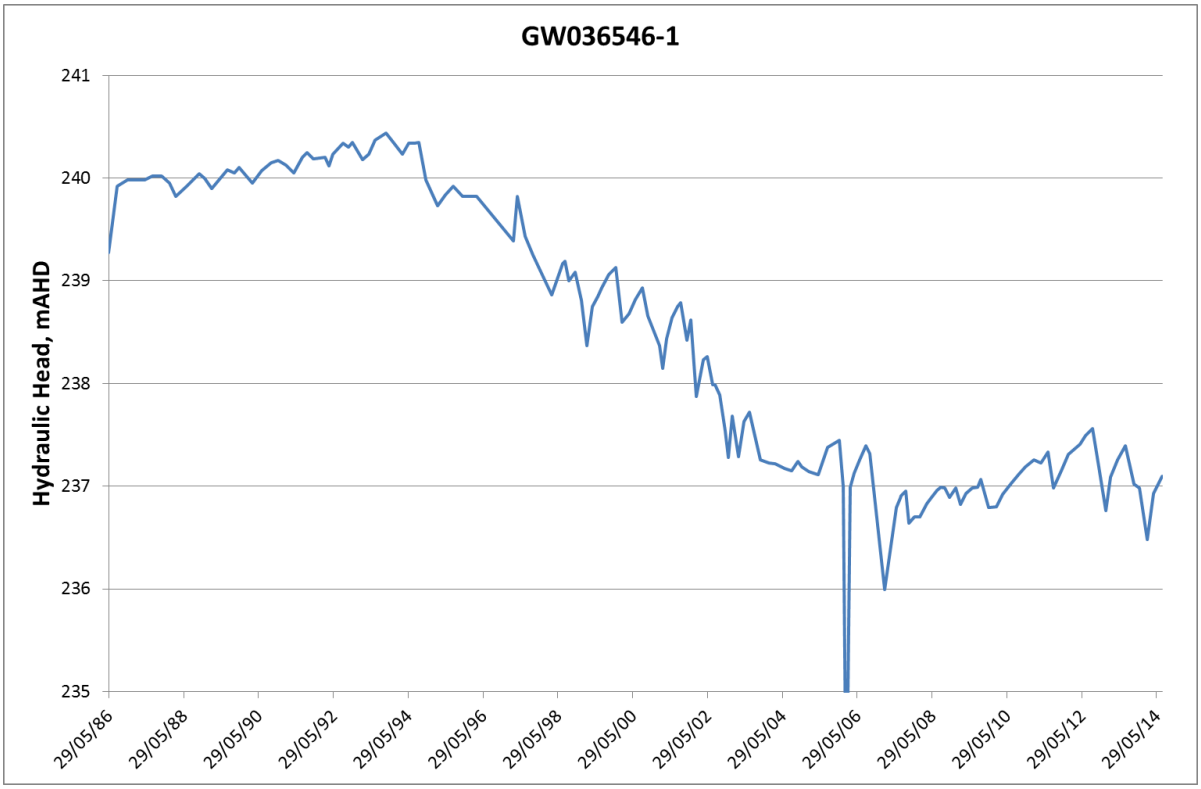


Figure 4-7 Hydrograph for monitoring bore GW036546-1 (Digby Formation)

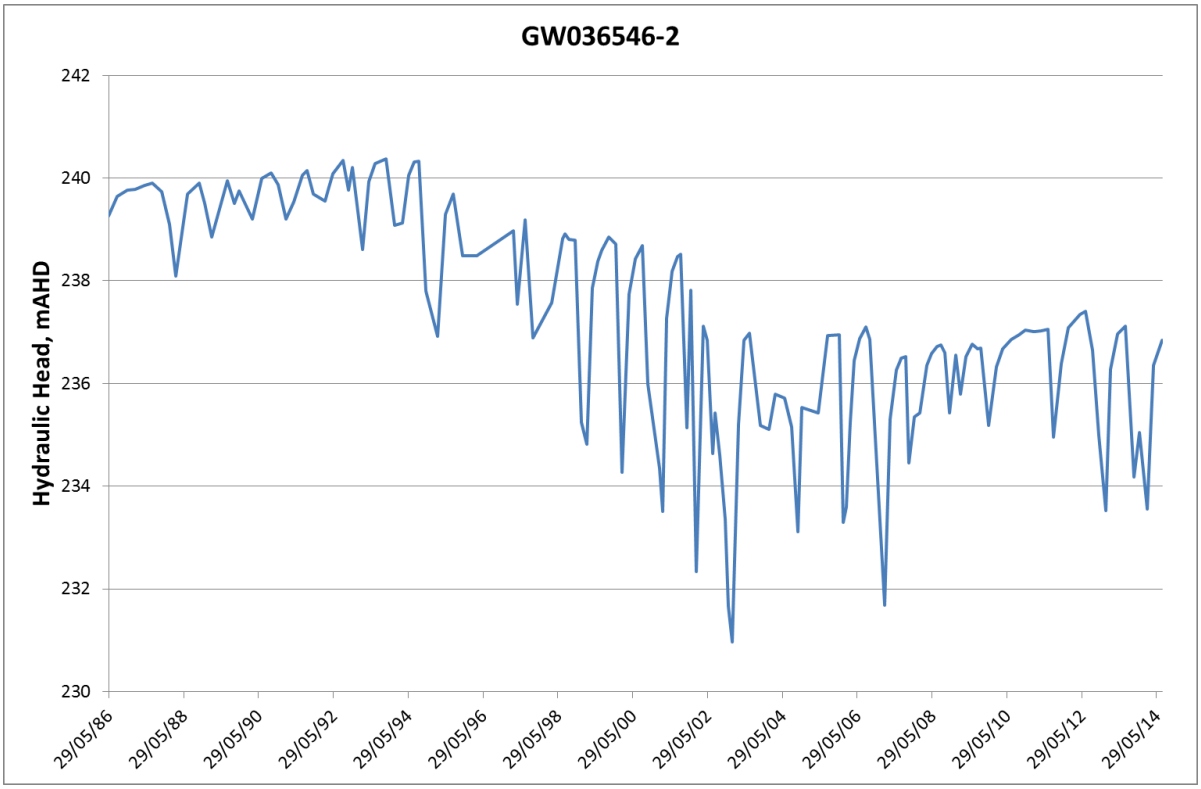


Figure 4-8 Hydrograph for monitoring bore GW036546-2 (Napperby Formation)

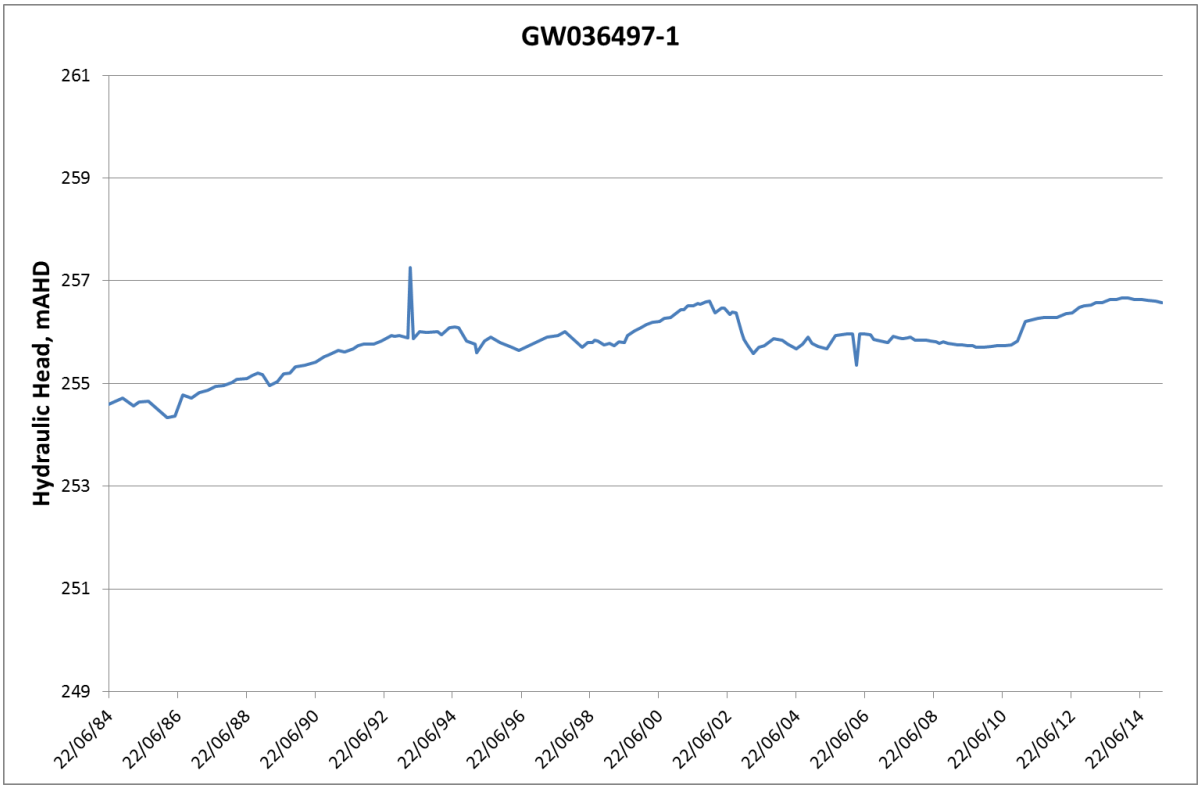


Figure 4-9 Hydrograph for monitoring bore GW036497-1 (Napperby Formation)

4.1.2 Great Artesian Basin Monitoring Bores

Figure 4-12 to Figure 4-33 show hydrographs for the baseline groundwater monitoring bores located within the Great Artesian Basin. The locations of these bores are shown in Figure 3-2.

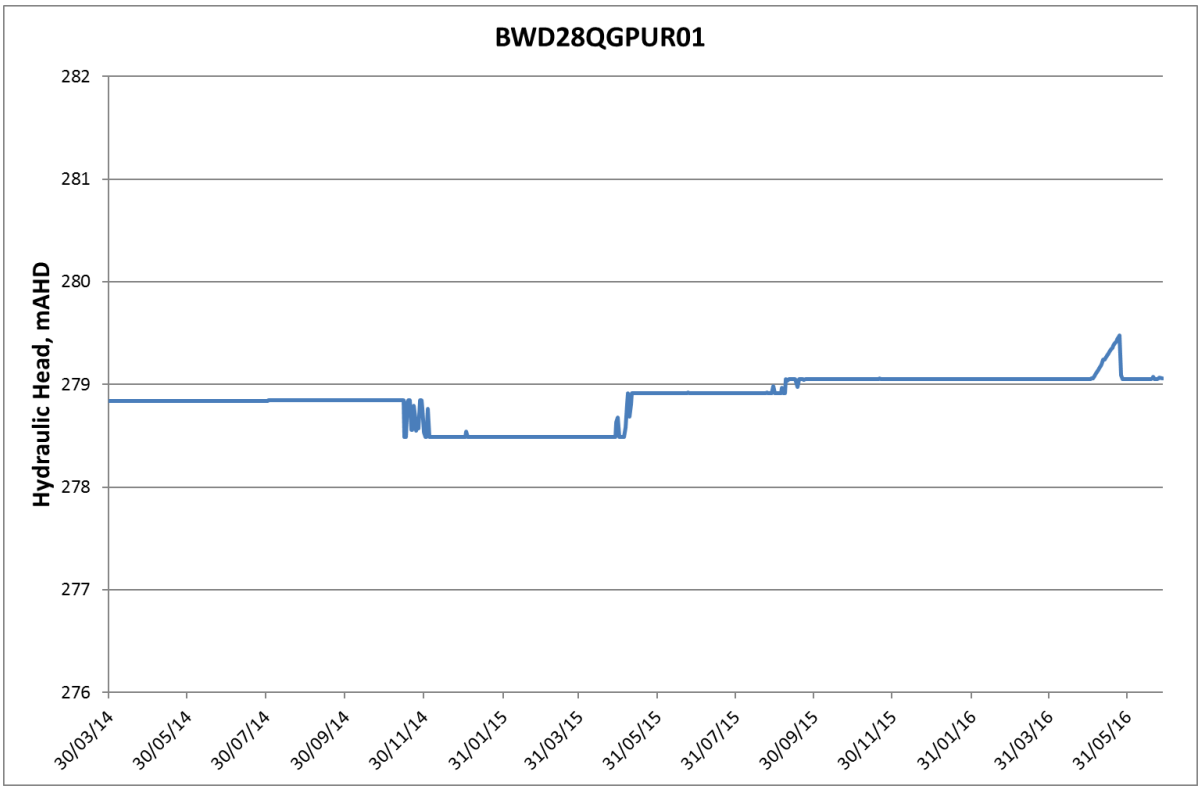


Figure 4-10 Hydrograph for monitoring bore BWD28QGPUR01 (Purlawaugh Formation)

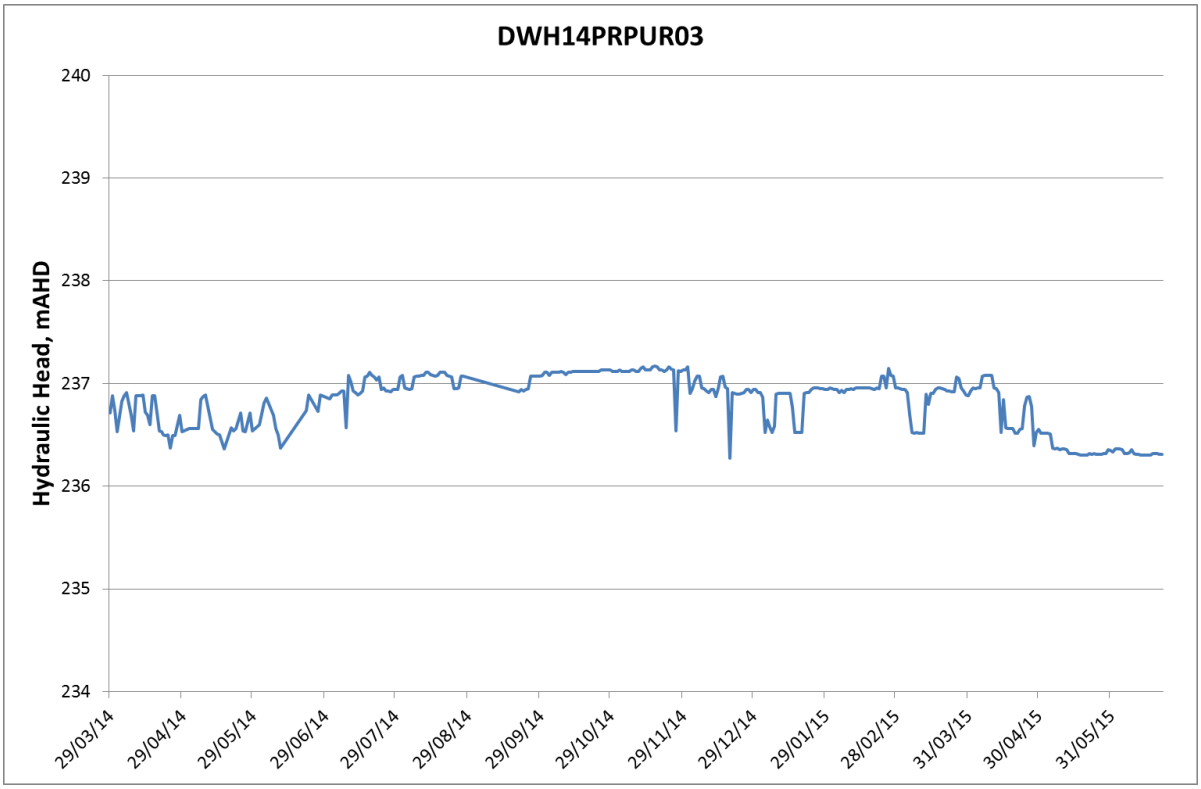


Figure 4-11 Hydrograph for monitoring bore DWH14PRPUR03 (Purlawaugh Formation)

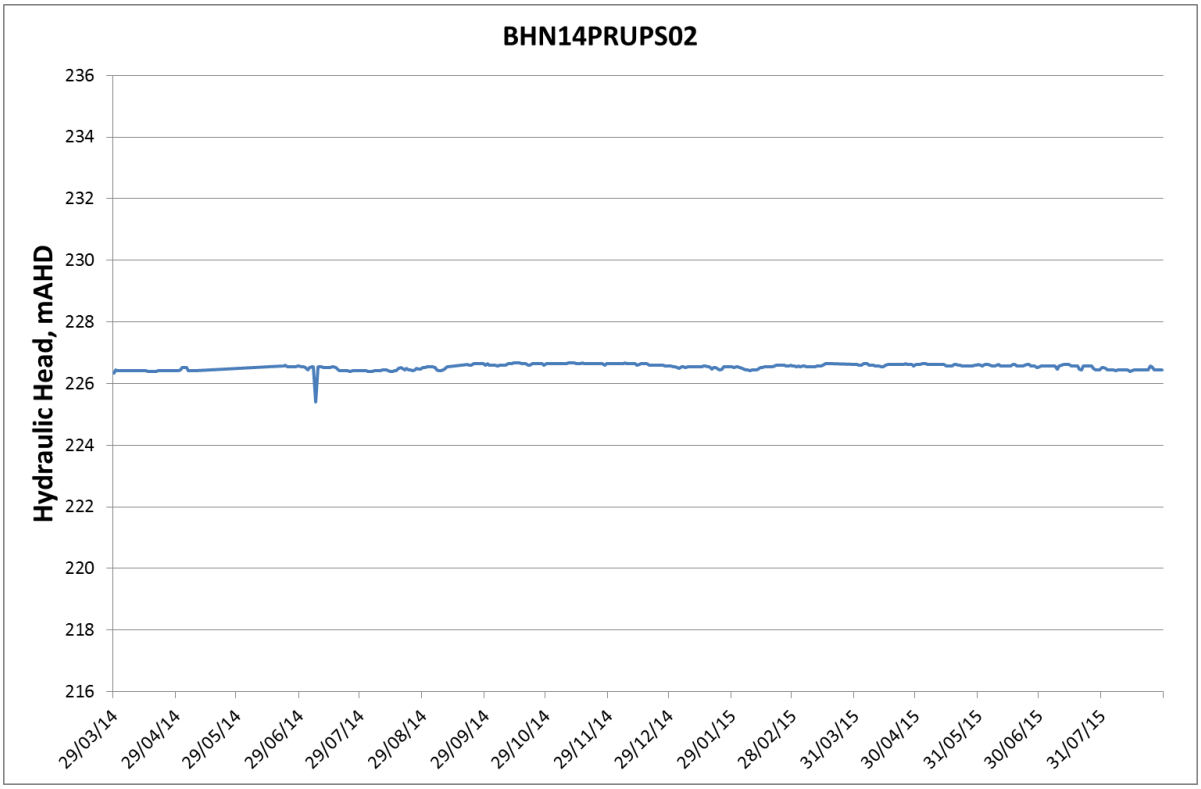


Figure 4-12 Hydrograph for monitoring bore BHN14PRUPS02 (Pilliga Sandstone)

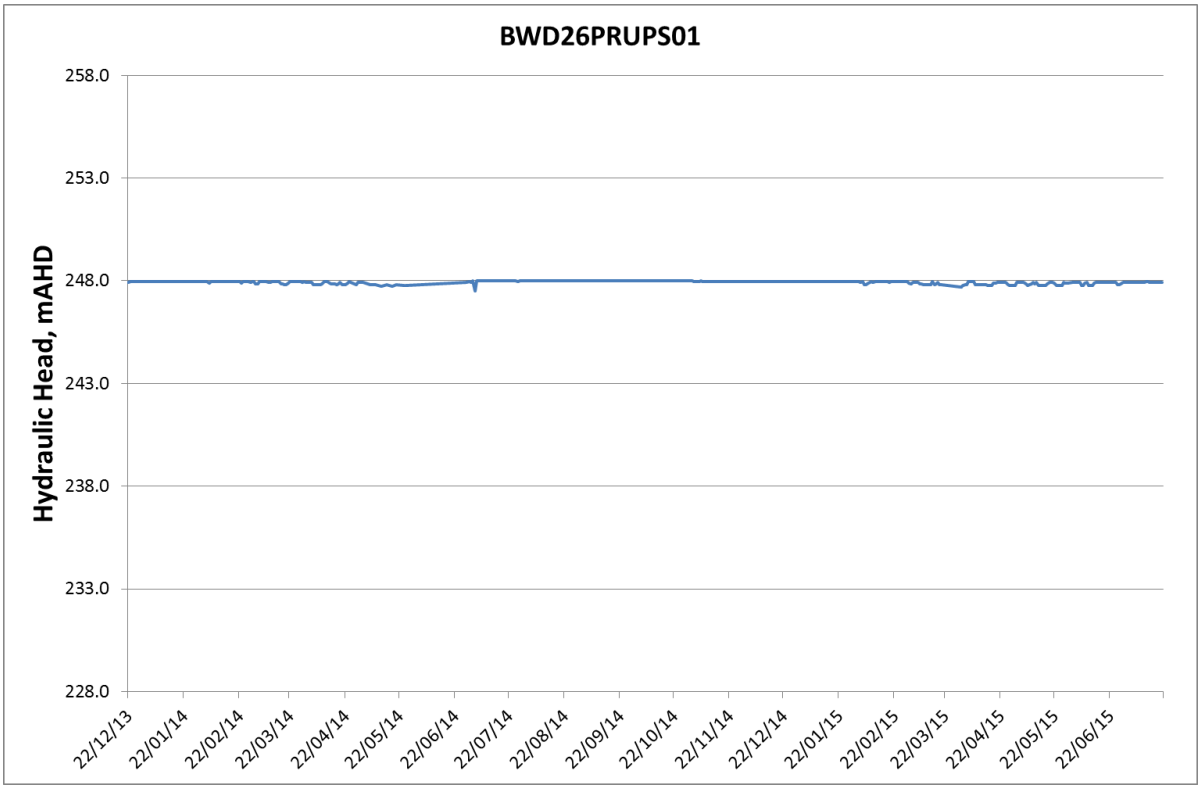


Figure 4-13 Hydrograph for monitoring bore BWD26PRUPS01 (Pilliga Sandstone)

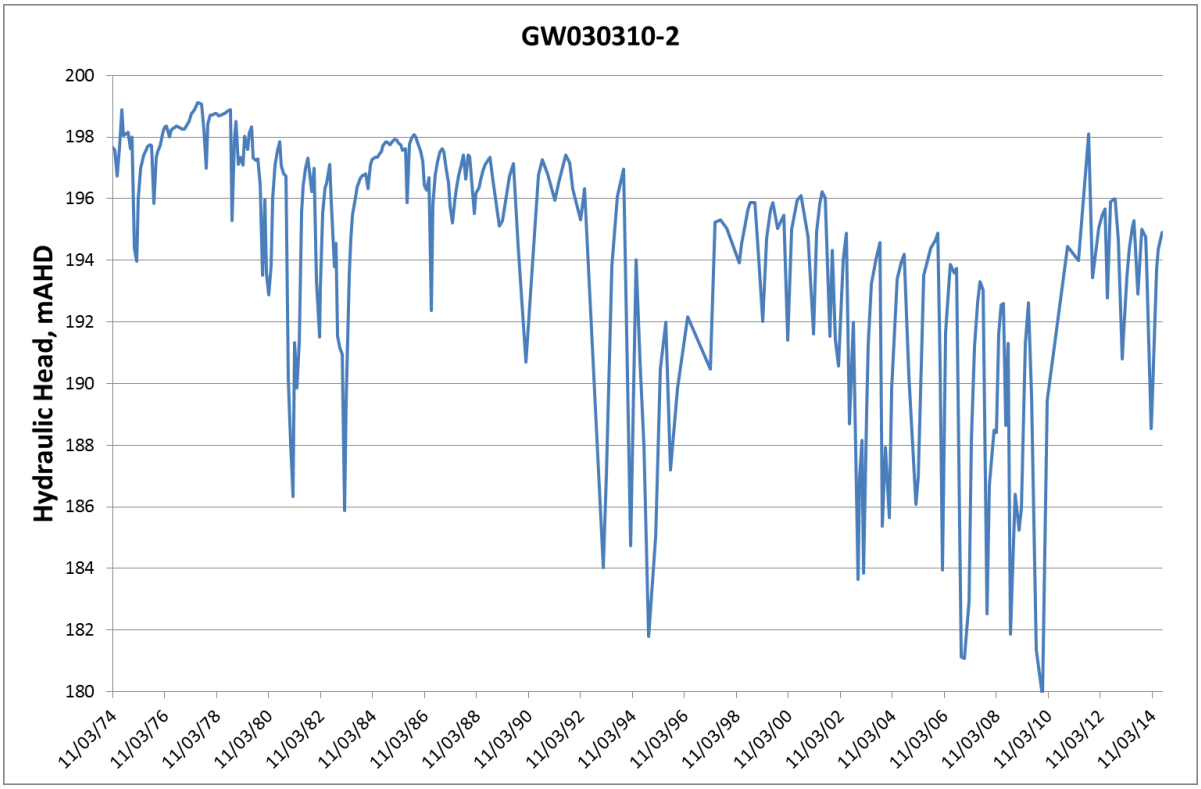


Figure 4-14 Hydrograph for monitoring bore GW030310-2 (Pilliga Sandstone)

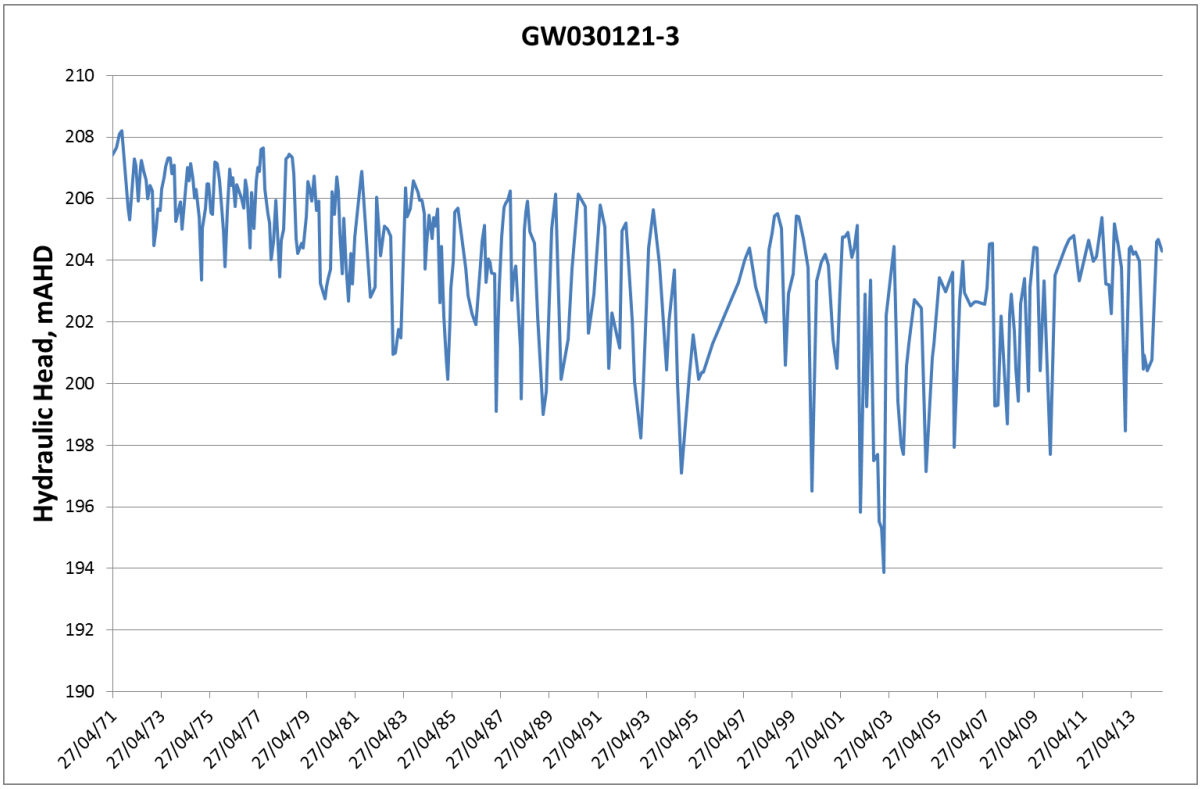


Figure 4-15 Hydrograph for monitoring bore GW030121-3 (Pilliga Sandstone)

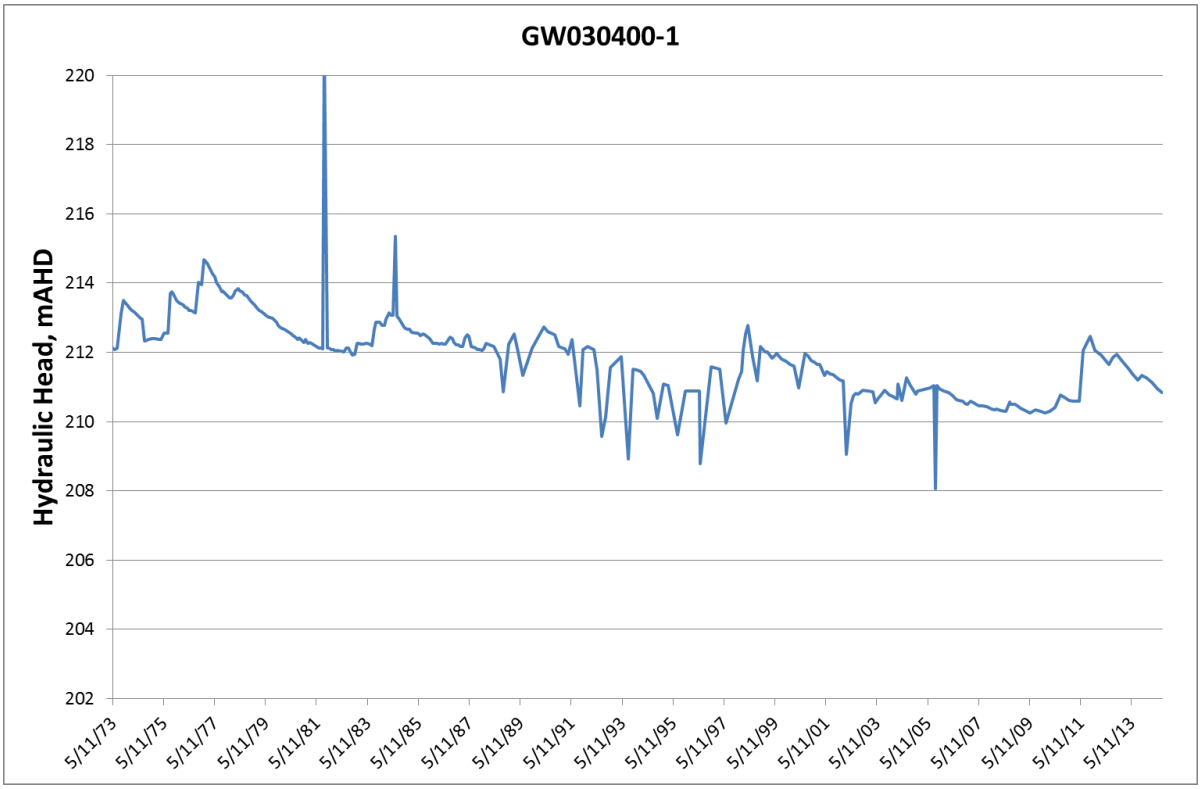


Figure 4-16 Hydrograph for monitoring bore GW030400-1 (Pilliga Sandstone)

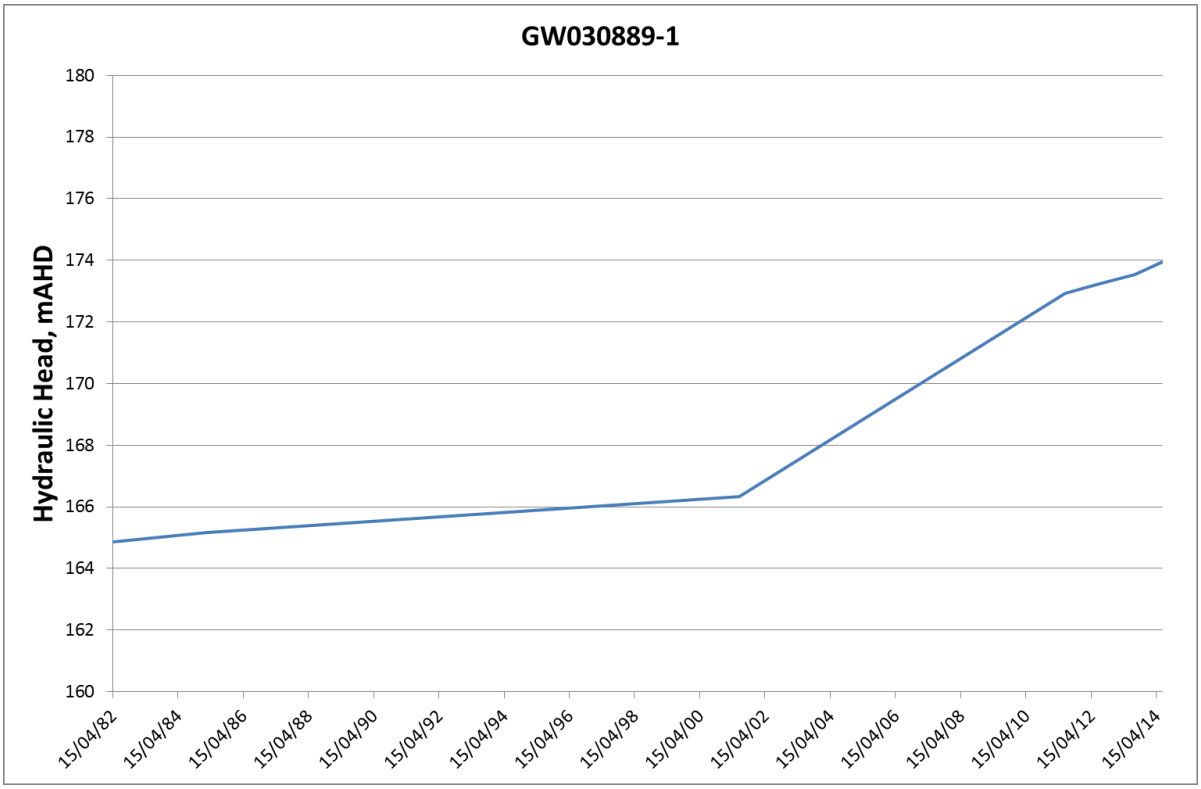


Figure 4-17 Hydrograph for monitoring bore GW030889-1 (Pilliga Sandstone)

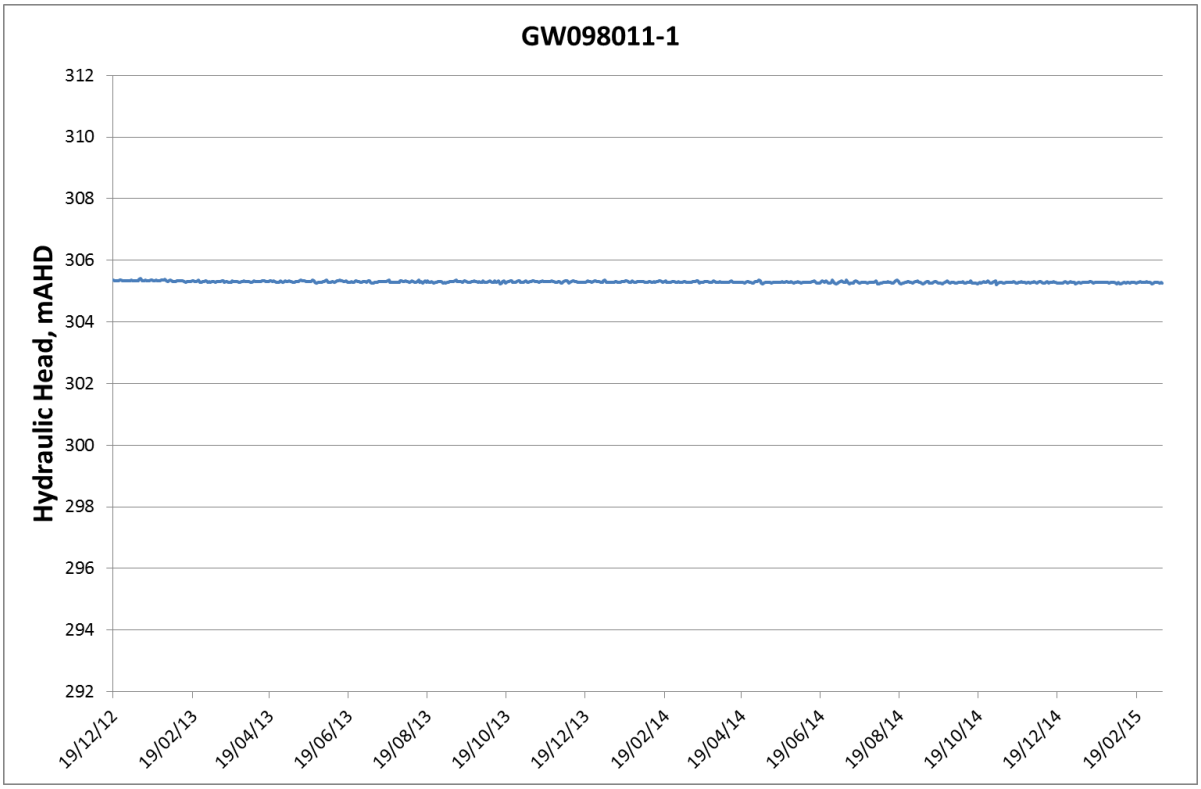


Figure 4-18 Hydrograph for monitoring bore GW098011-1 (Pilliga Sandstone)

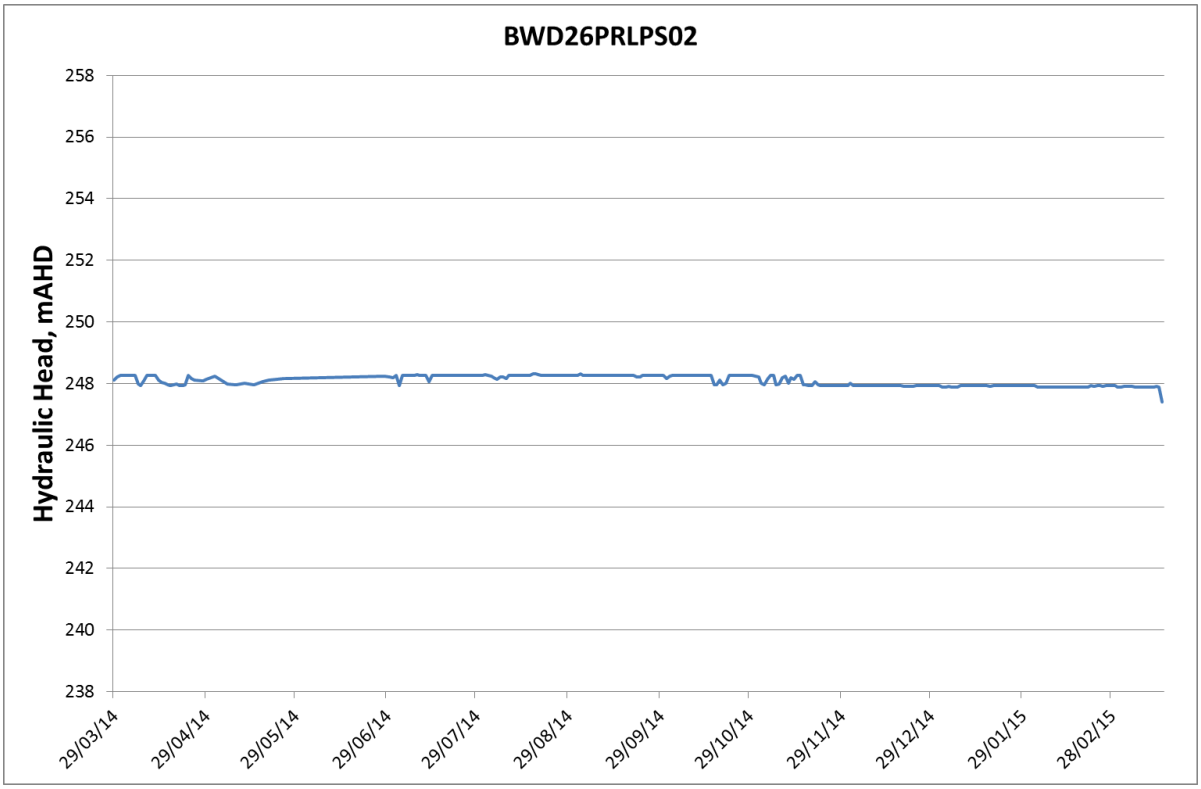


Figure 4-19 Hydrograph for monitoring bore BWD26PRLPS02 (Pilliga Sandstone)

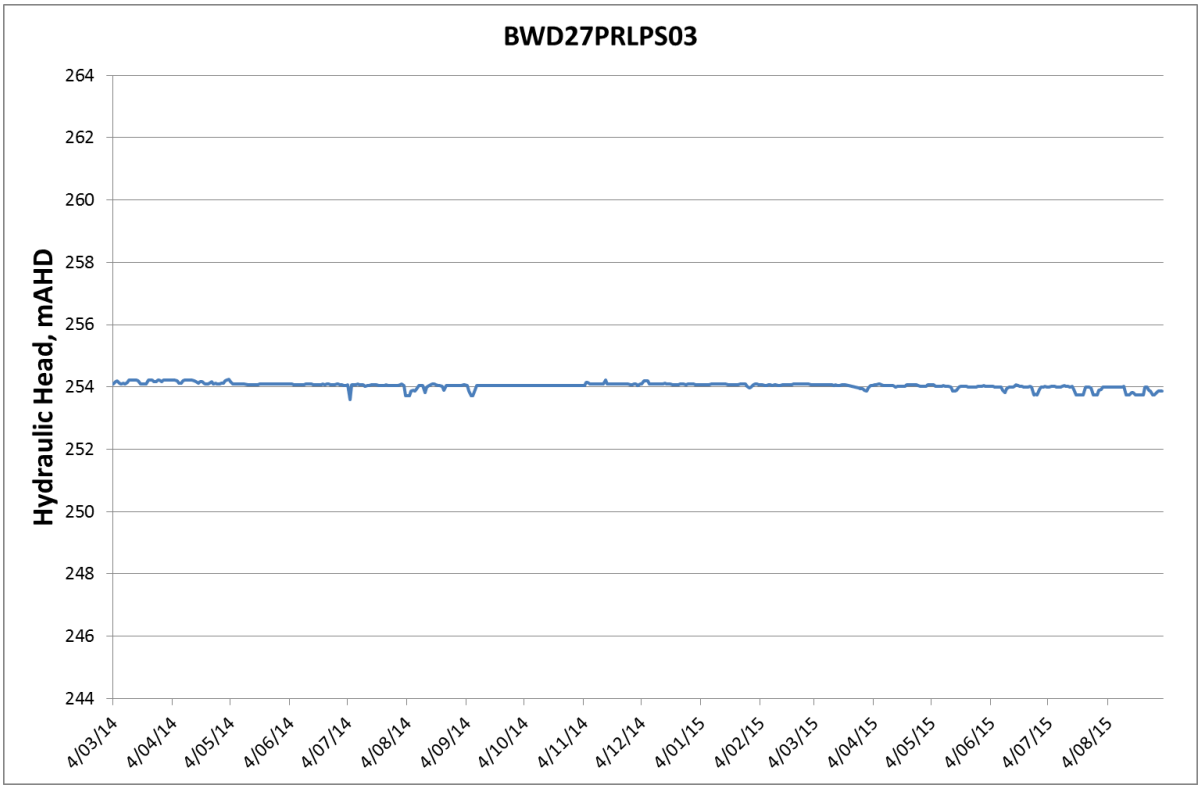


Figure 4-20 Hydrograph for monitoring bore BWD27PRLPS03 (Pilliga Sandstone)

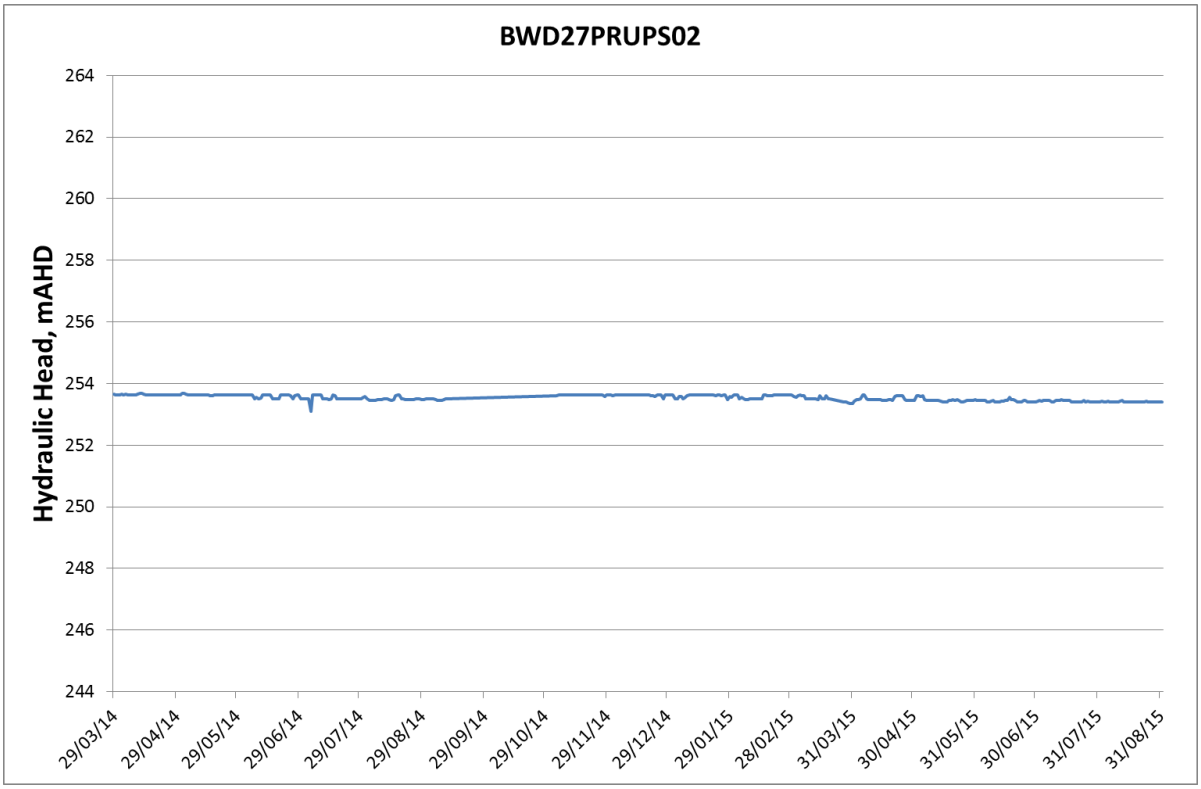


Figure 4-21 Hydrograph for monitoring bore BWD27PRUPS02 (Pilliga Sandstone)

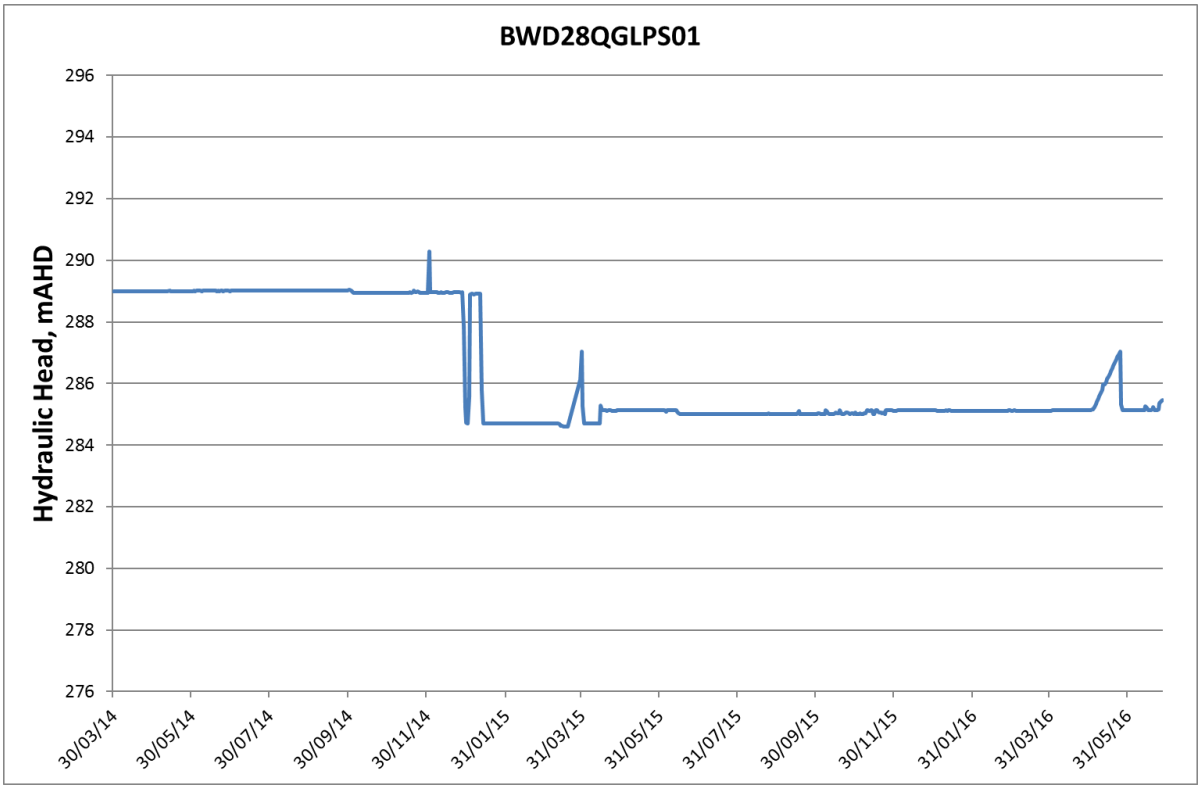


Figure 4-22 Hydrograph for monitoring bore BWD28QGLPS01 (Pilliga Sandstone)

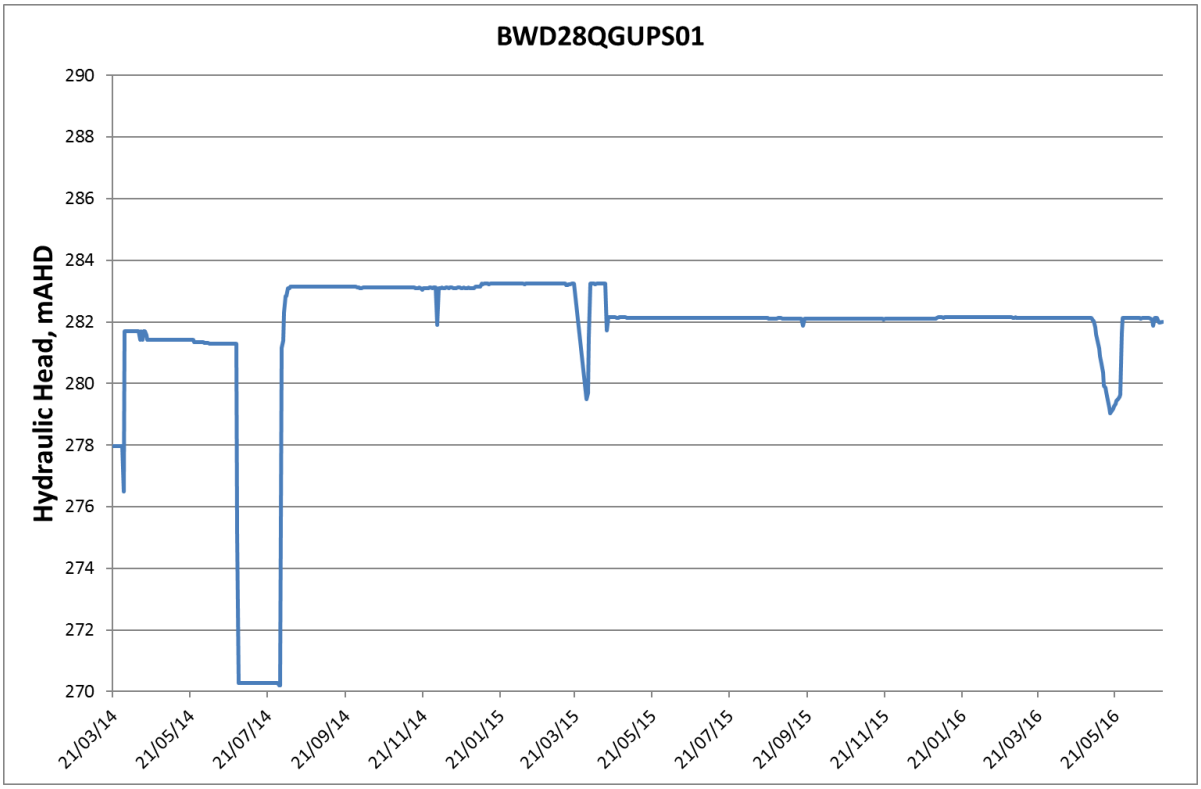


Figure 4-23 Hydrograph for monitoring bore BWD28QGUPS01 (Pilliga Sandstone)

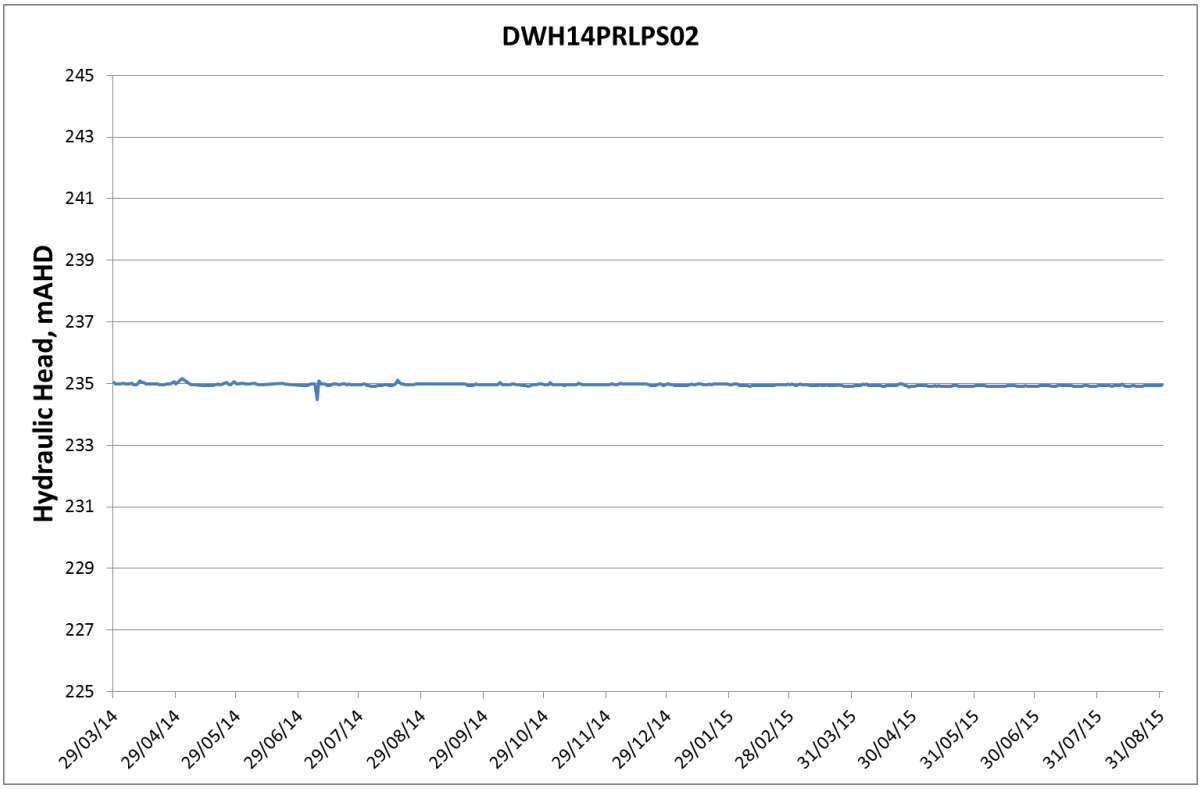


Figure 4-24 Hydrograph for monitoring bore DWH14PRLPS02 (Pilliga Sandstone)

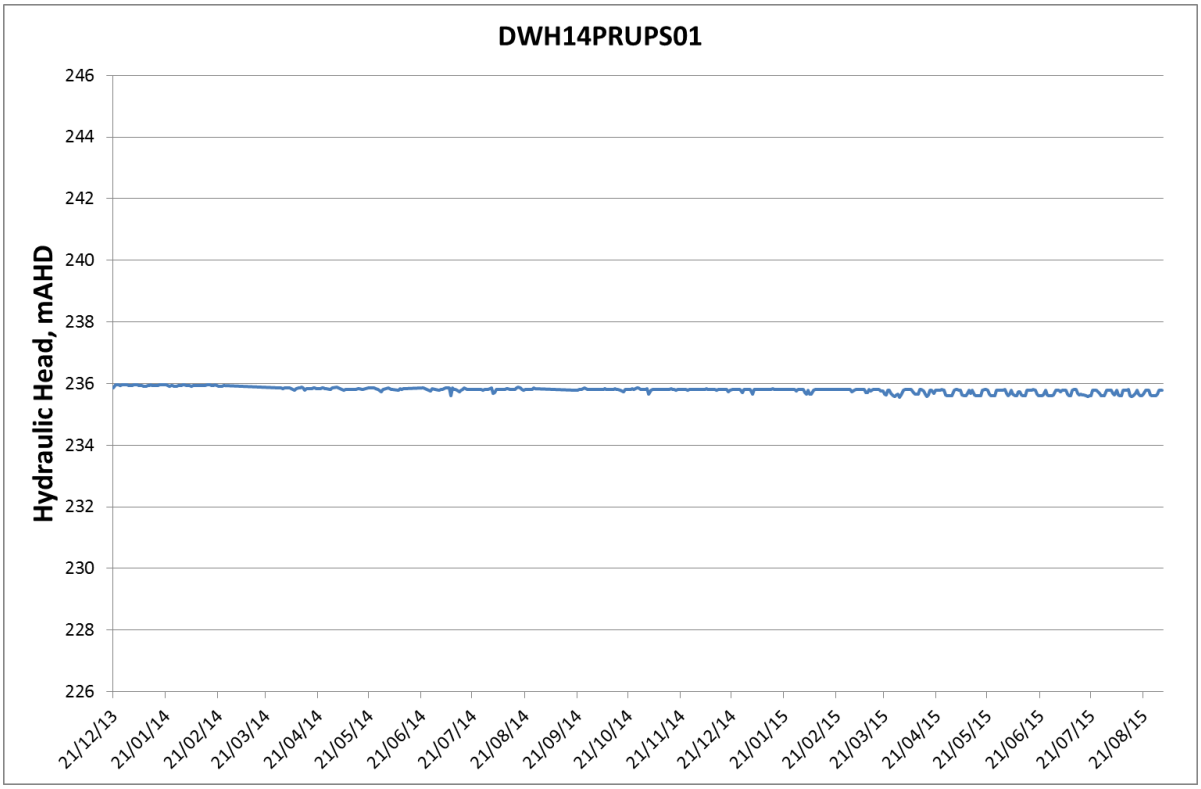


Figure 4-25 Hydrograph for monitoring bore DWH14PRUPS01 (Pilliga Sandstone)

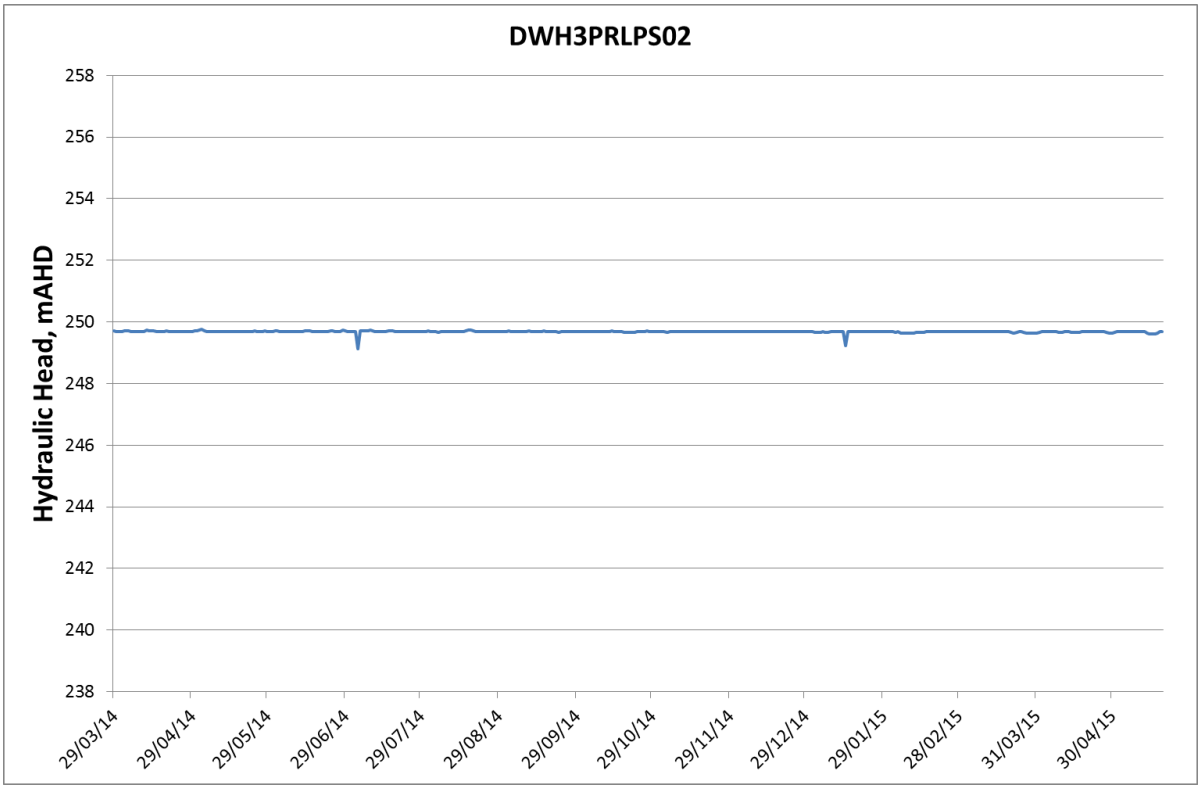


Figure 4-26 Hydrograph for monitoring bore DWH3PRLPS02 (Pilliga Sandstone)

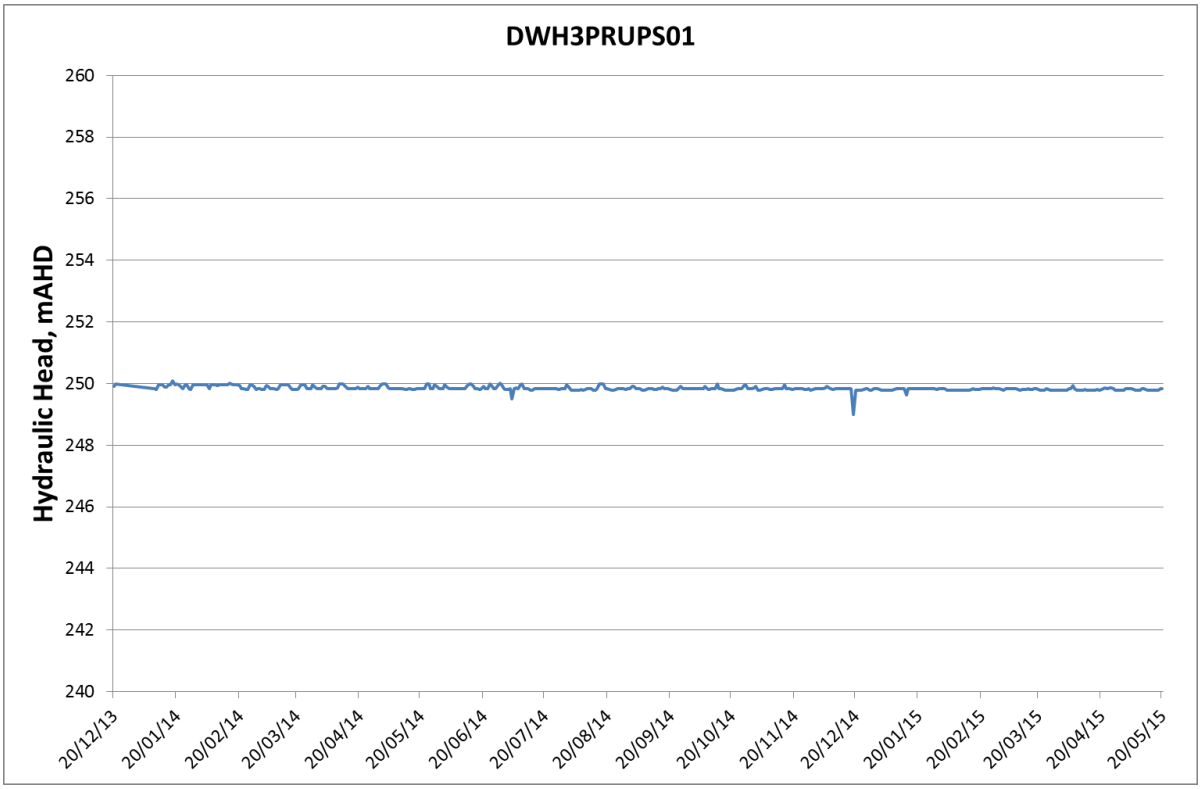


Figure 4-27 Hydrograph for monitoring bore DWH3PRUPS01 (Pilliga Sandstone)

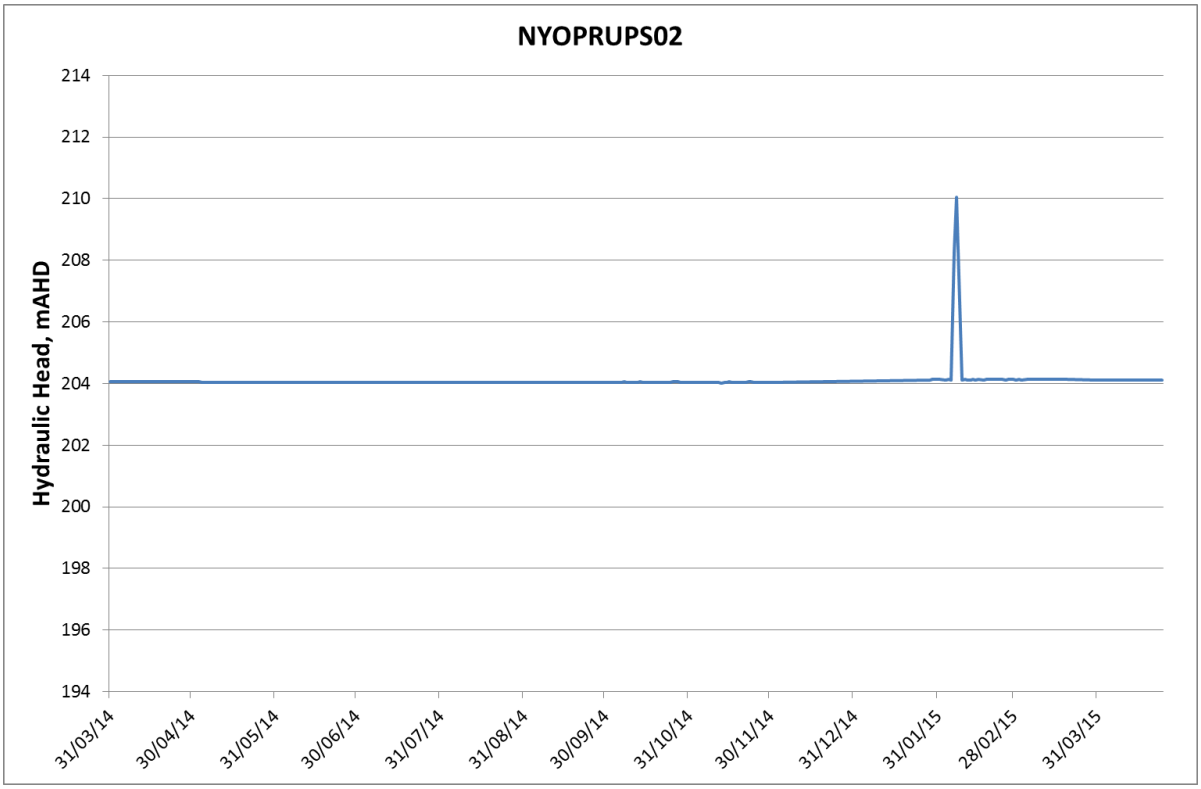


Figure 4-28 Hydrograph for monitoring bore NYOPRUPS02 (Pilliga Sandstone)

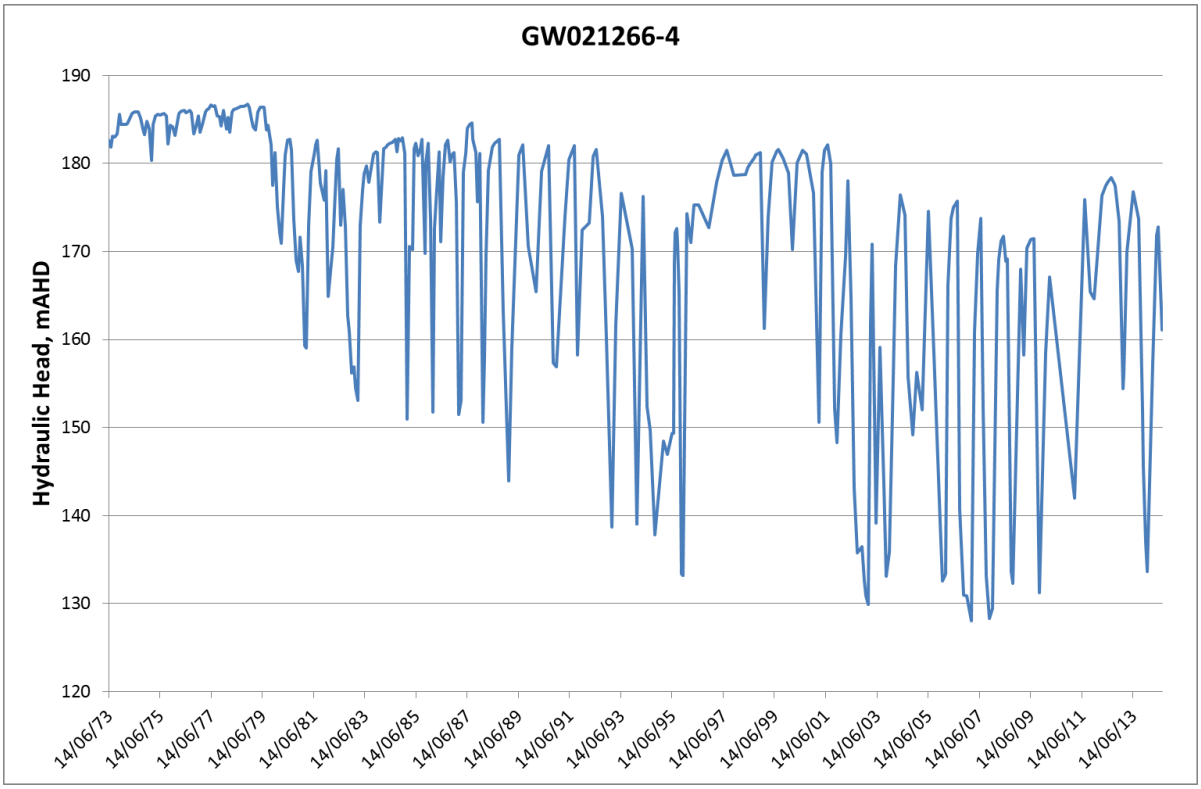


Figure 4-29 Hydrograph for monitoring bore GW021266-4 (Orallo Formation)

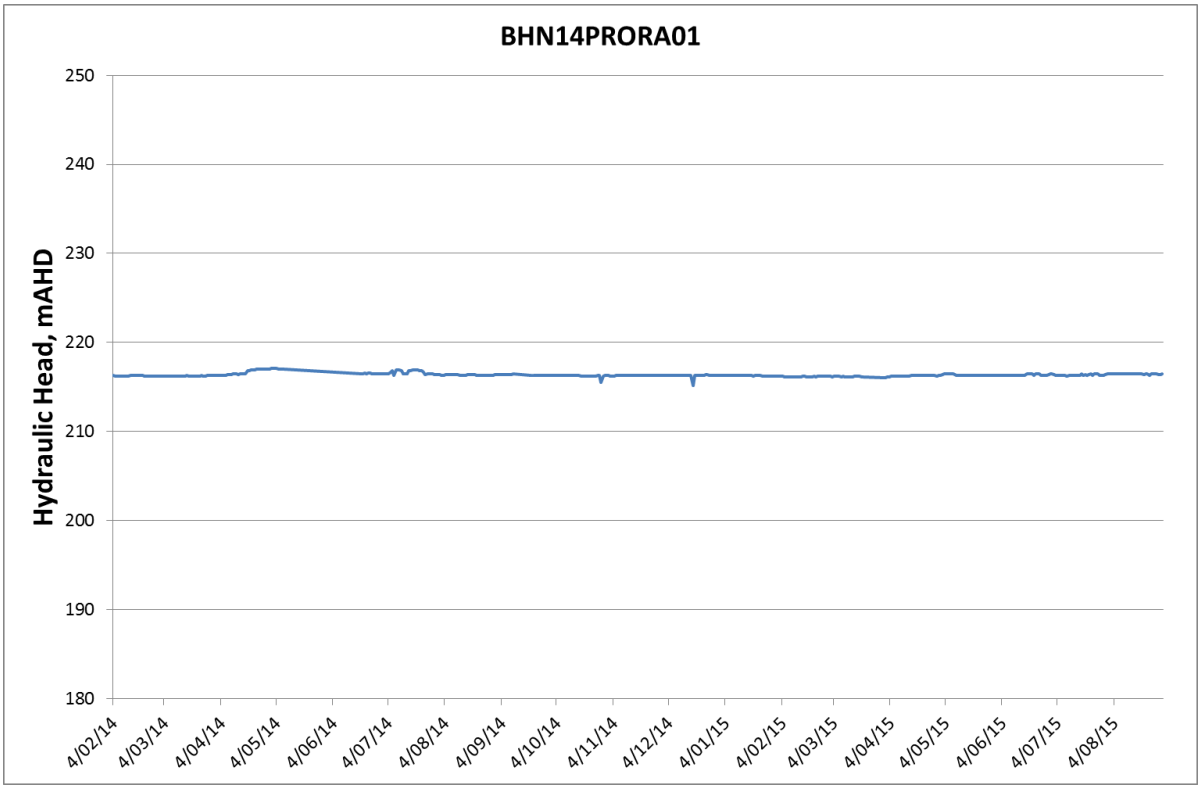


Figure 4-30 Hydrograph for monitoring bore BHN14PRORA01 (Orallo Formation)

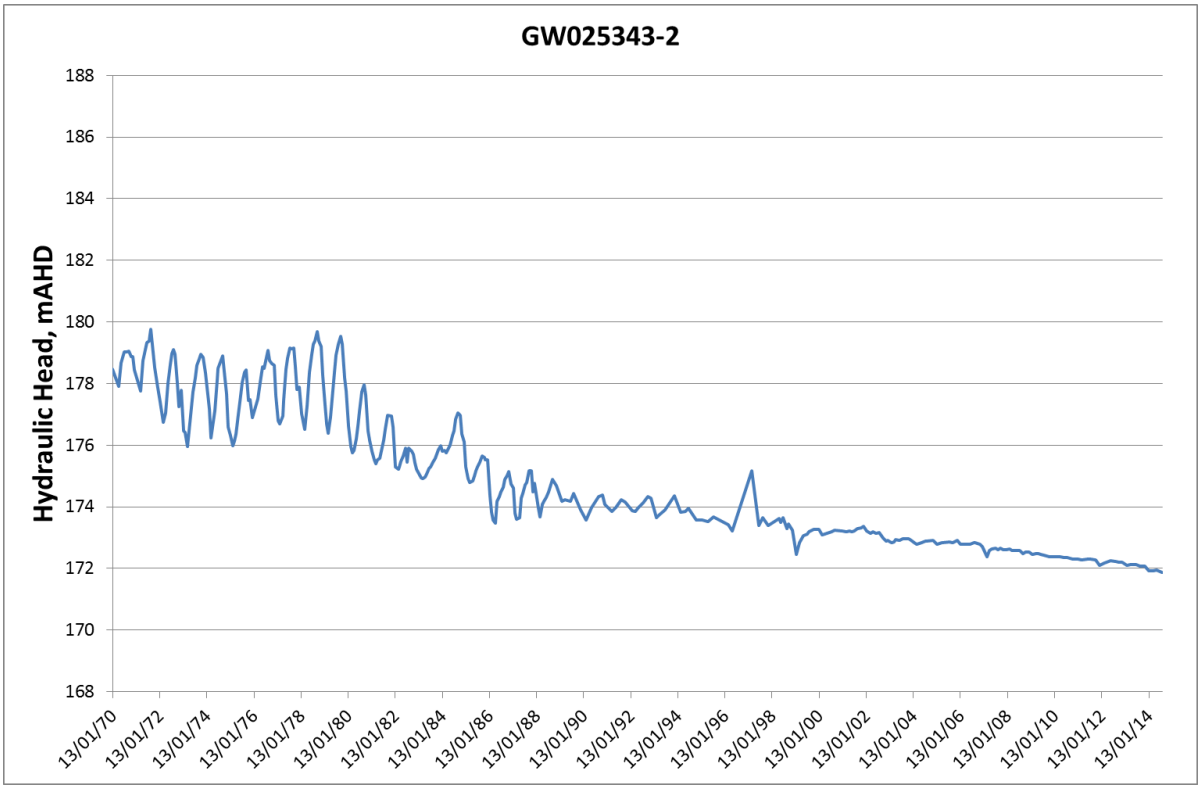


Figure 4-31 Hydrograph for monitoring bore GW025343-2 (Mooga Sandstone)

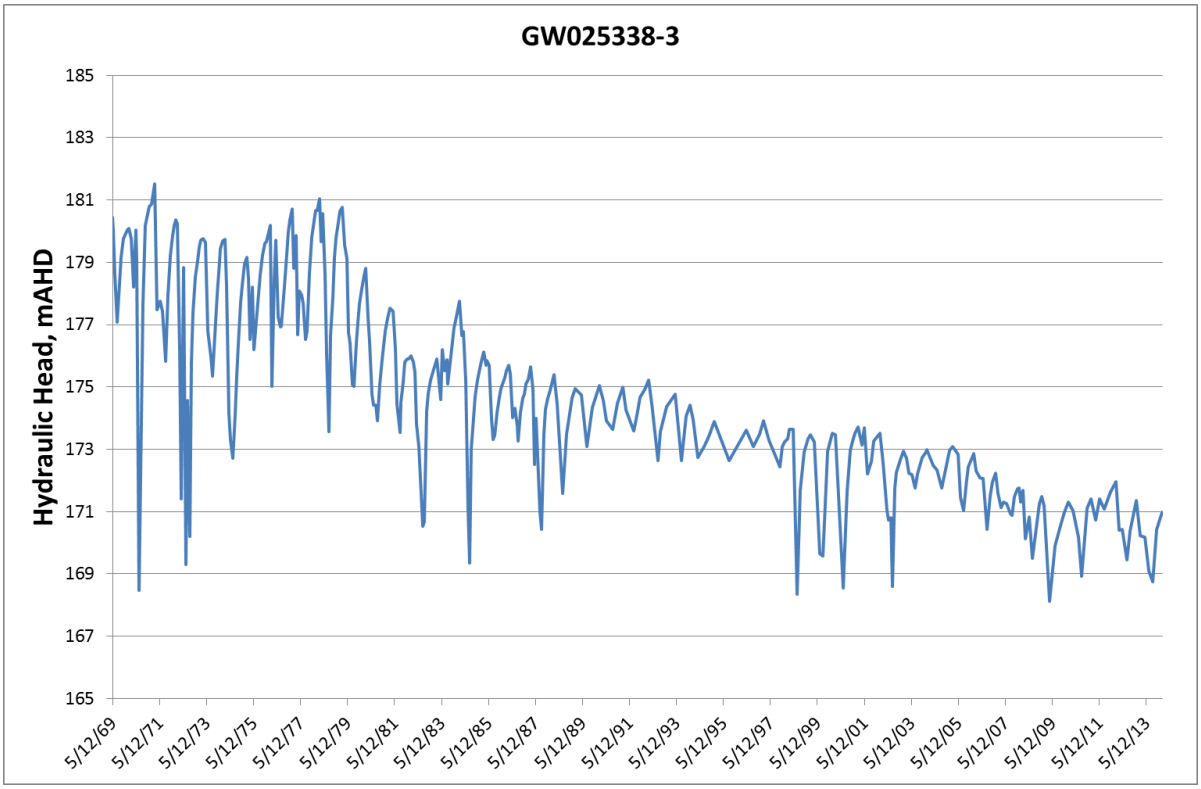


Figure 4-32 Hydrograph for monitoring bore GW025338-3 (Mooga Sandstone)

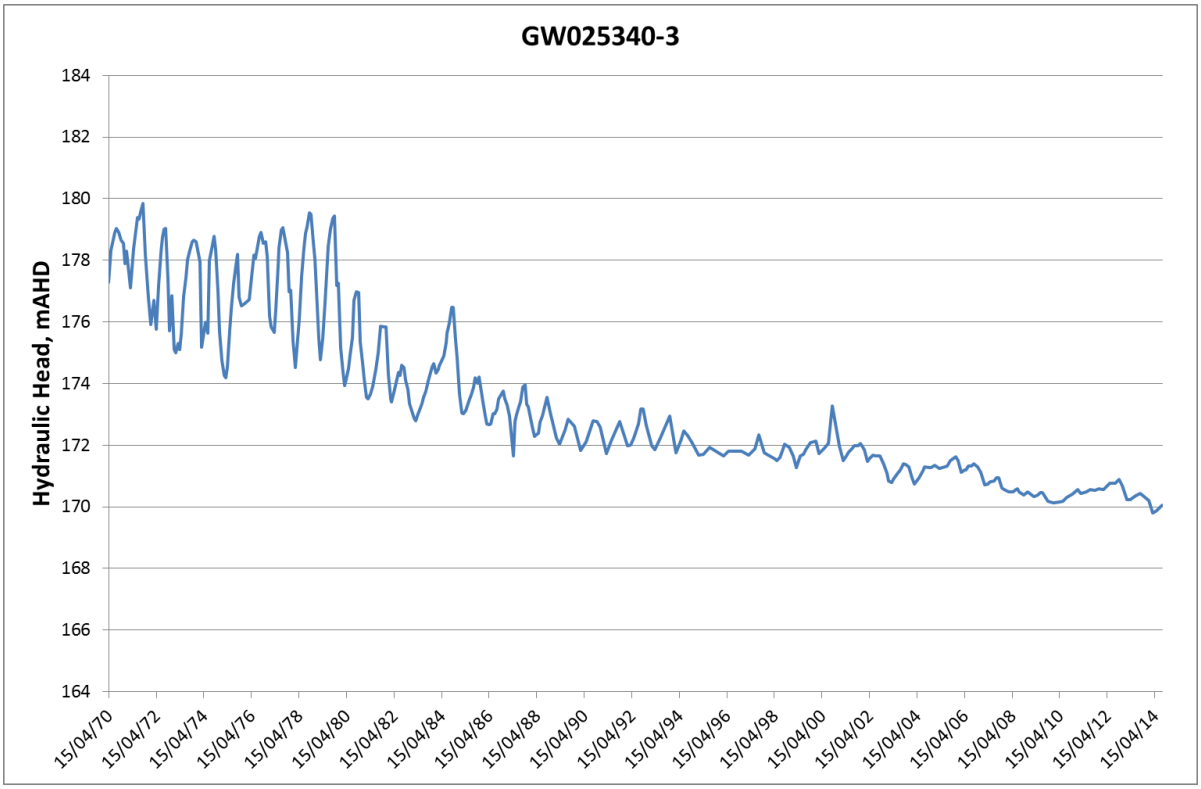


Figure 4-33 Hydrograph for monitoring bore GW025340-3 (Mooga Sandstone)

4.1.3 Namoi Alluvium Monitoring Bores

Figure 4-34 to Figure 4-49 show hydrographs for the baseline groundwater monitoring bores located within the Great Artesian Basin. The locations of these bores are shown in Figure 3-3.

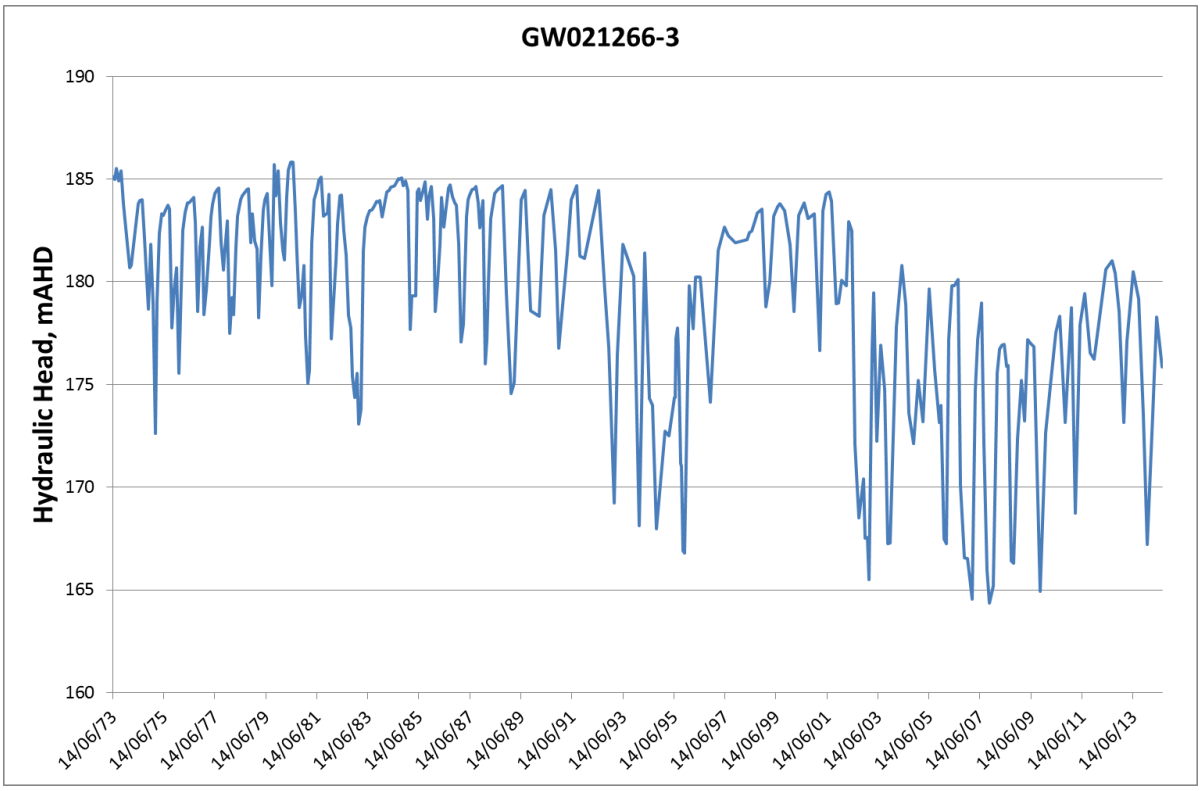


Figure 4-34 Hydrograph for monitoring bore GW021266-3 (Namoi alluvium)

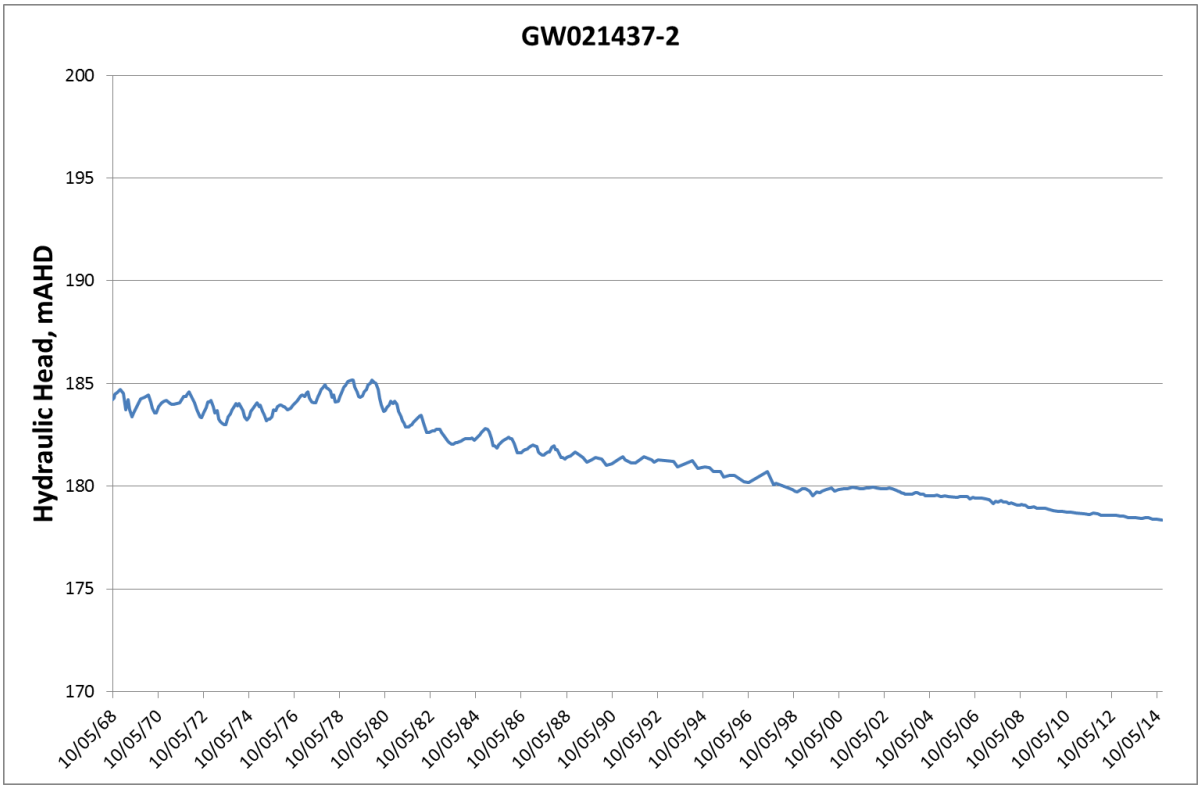


Figure 4-35 Hydrograph for monitoring bore GW021437-2 (Namoi alluvium)

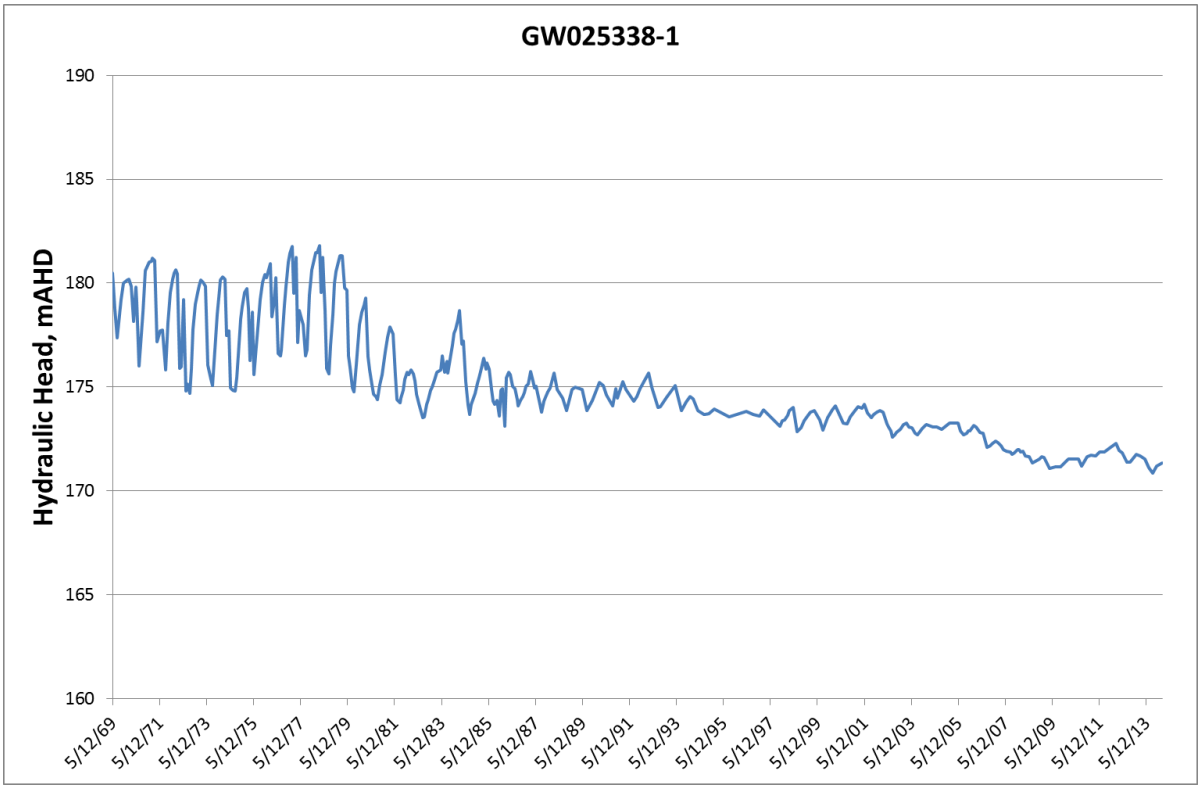


Figure 4-36 Hydrograph for monitoring bore GW025338-1 (Namoi alluvium)

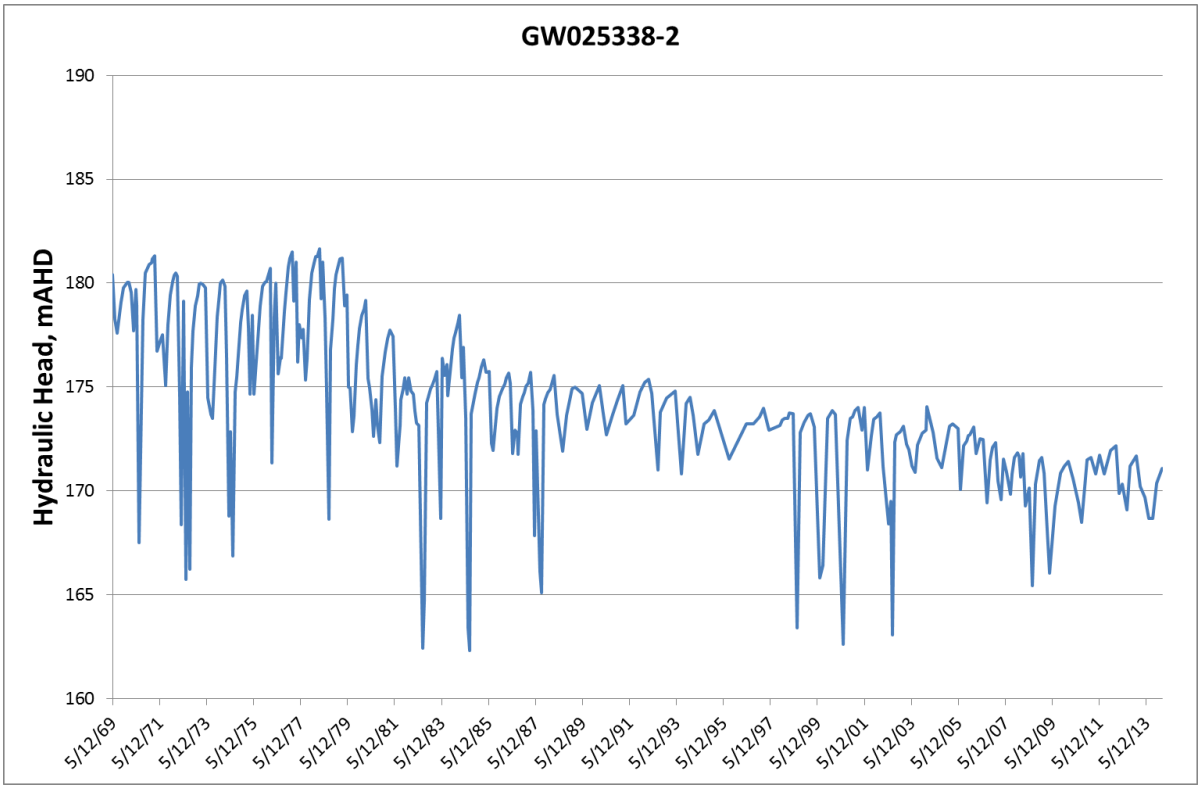


Figure 4-37 Hydrograph for monitoring bore GW025338-2 (Namoi alluvium)

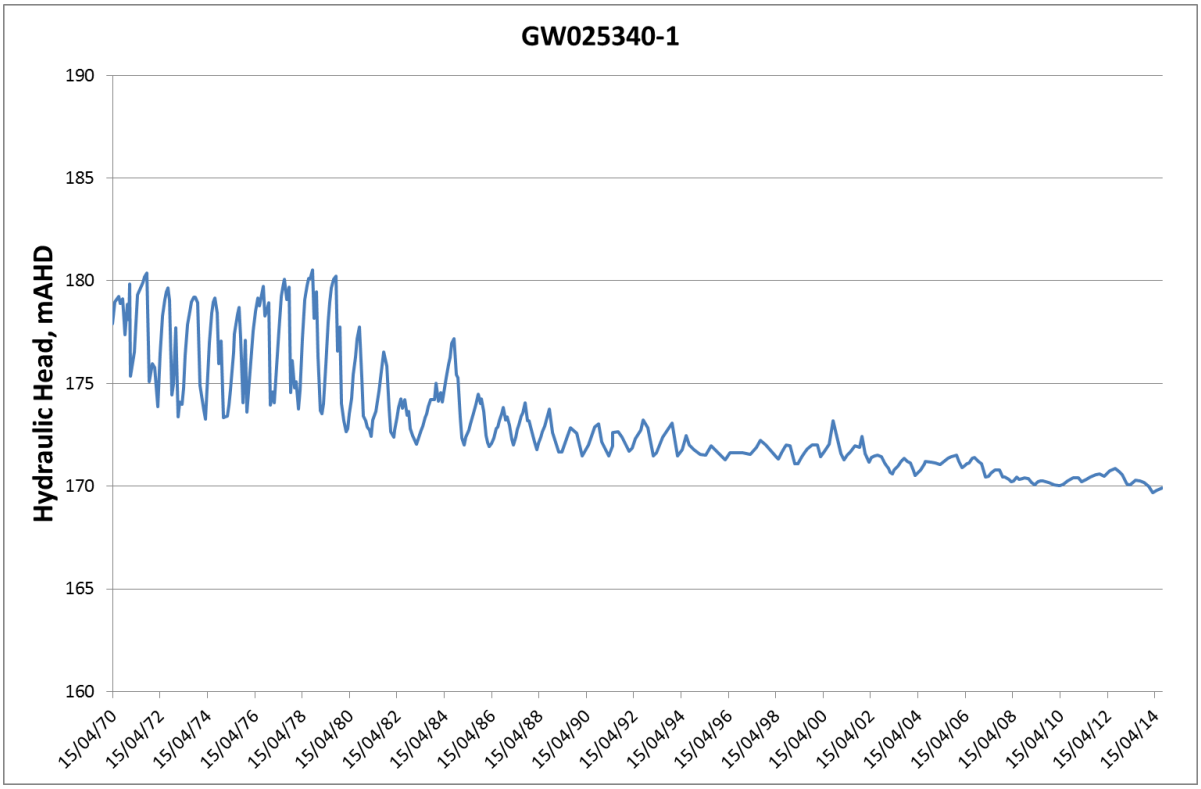


Figure 4-38 Hydrograph for monitoring bore GW025340-1 (Namoi alluvium)

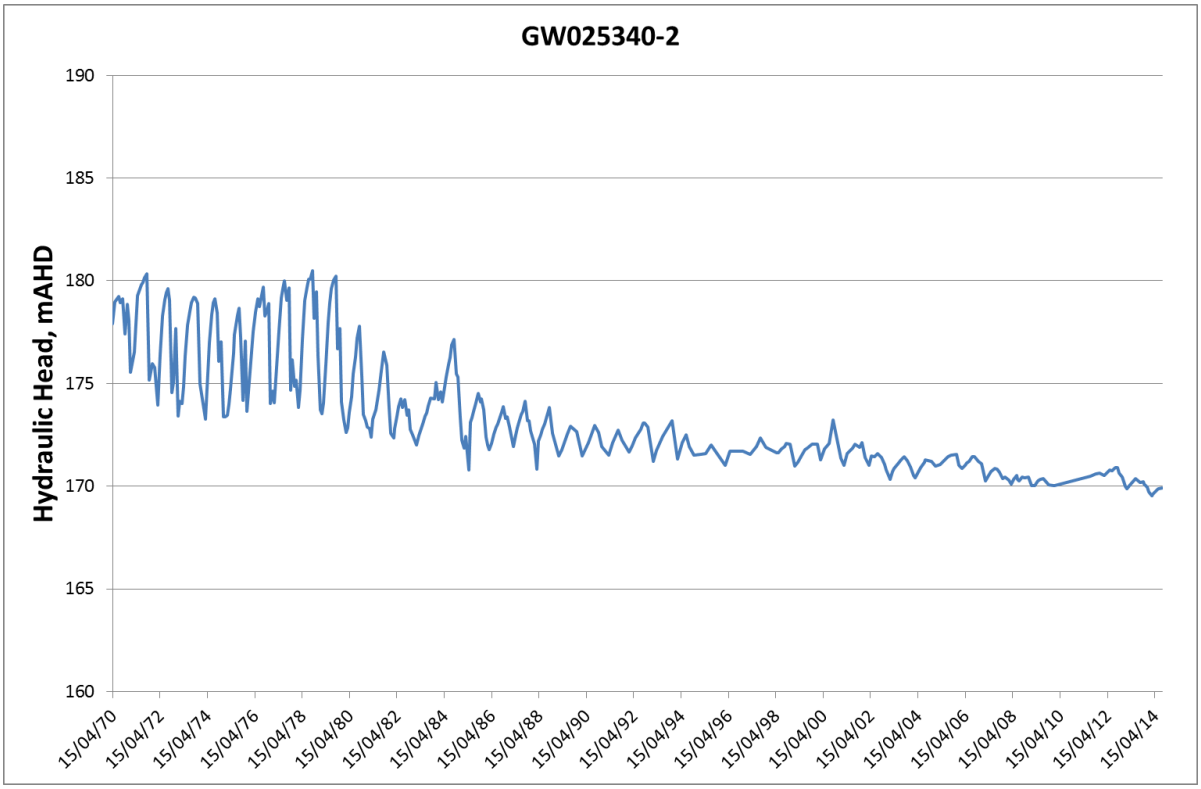


Figure 4-39 Hydrograph for monitoring bore GW025340-2 (Namoi alluvium)

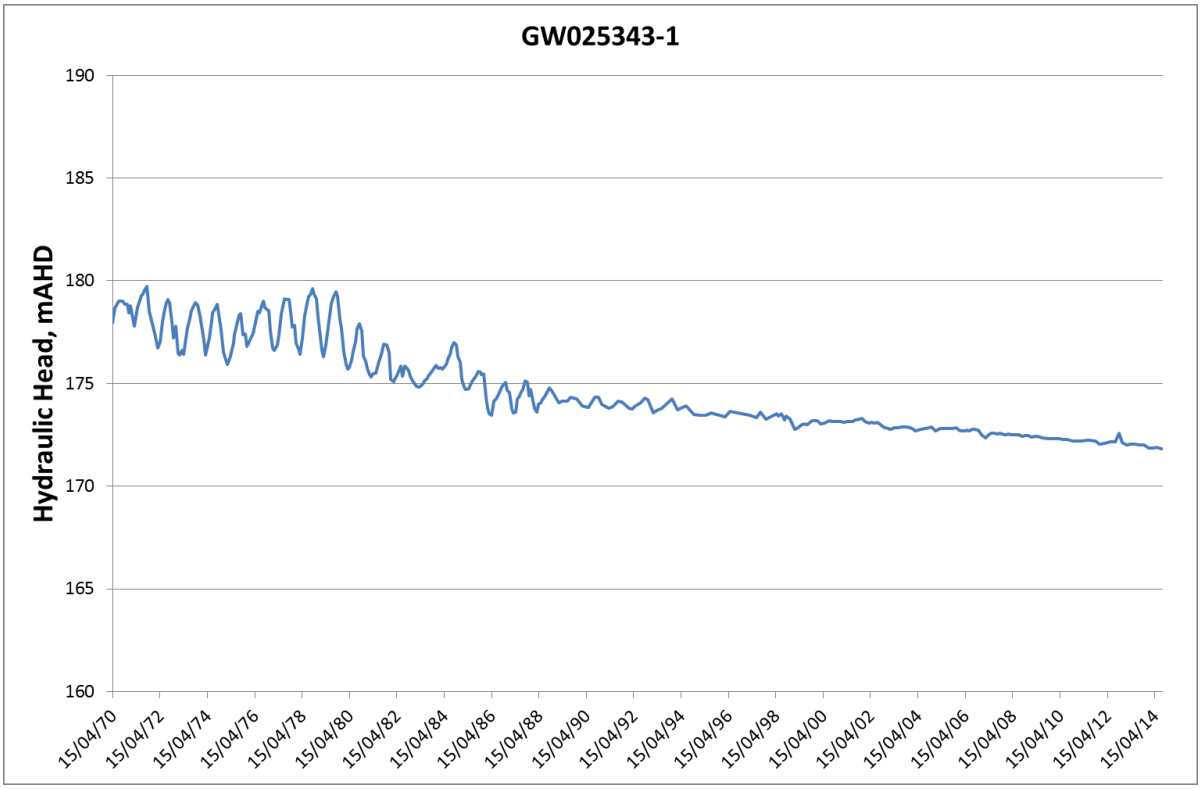


Figure 4-40 Hydrograph for monitoring bore GW025343-1 (Namoi alluvium)

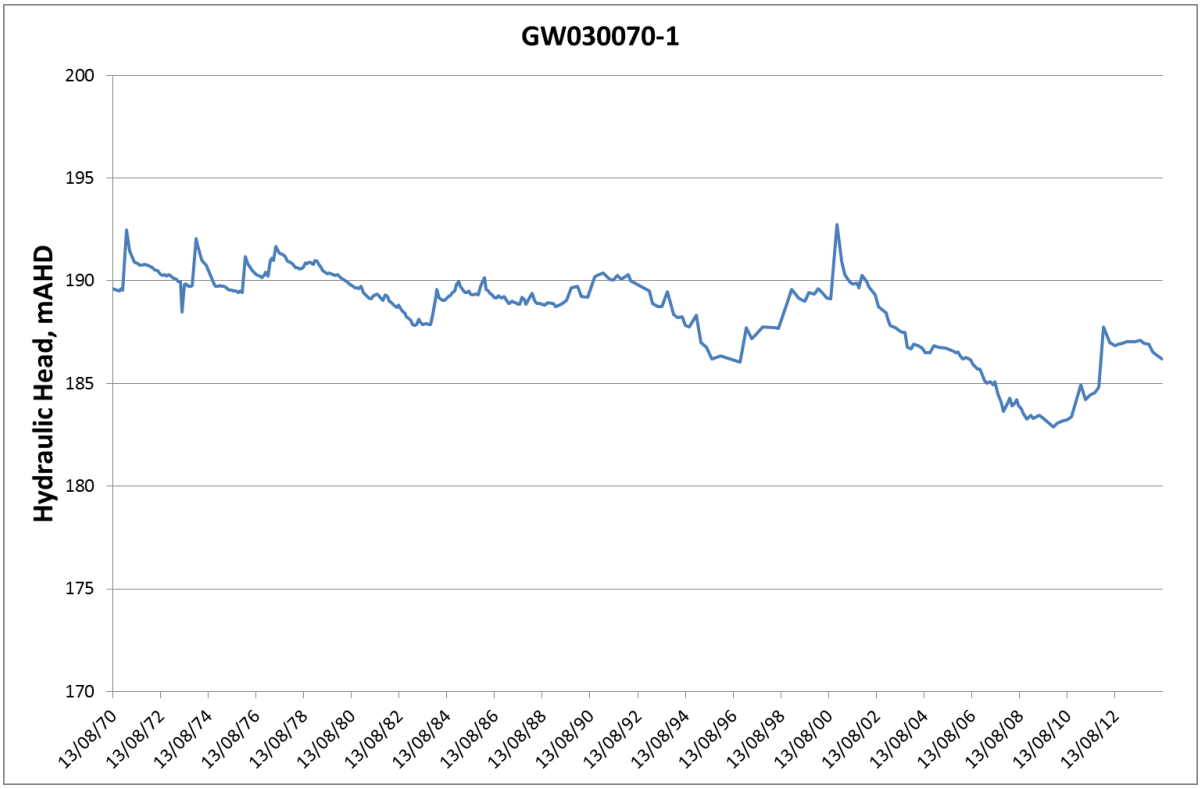


Figure 4-41 Hydrograph for monitoring bore GW030070-1 (Namoi alluvium)

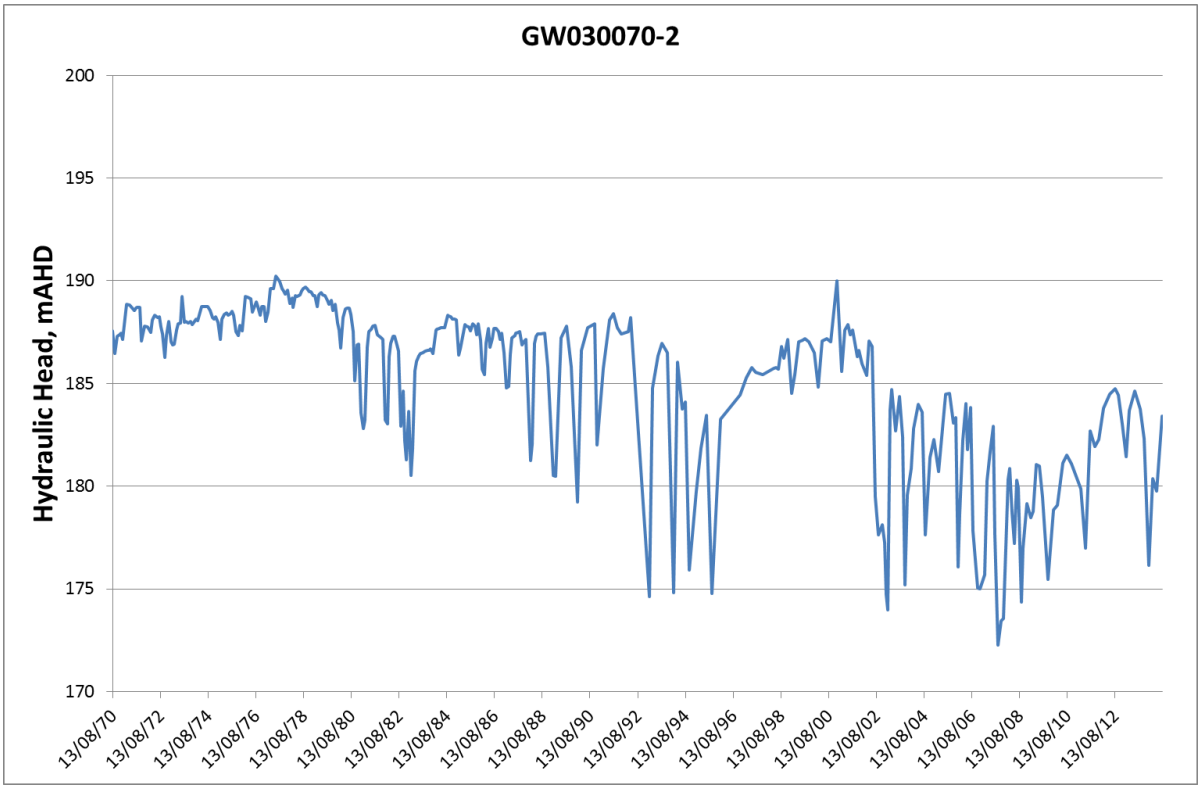


Figure 4-42 Hydrograph for monitoring bore GW030070-2 (Namoi alluvium)

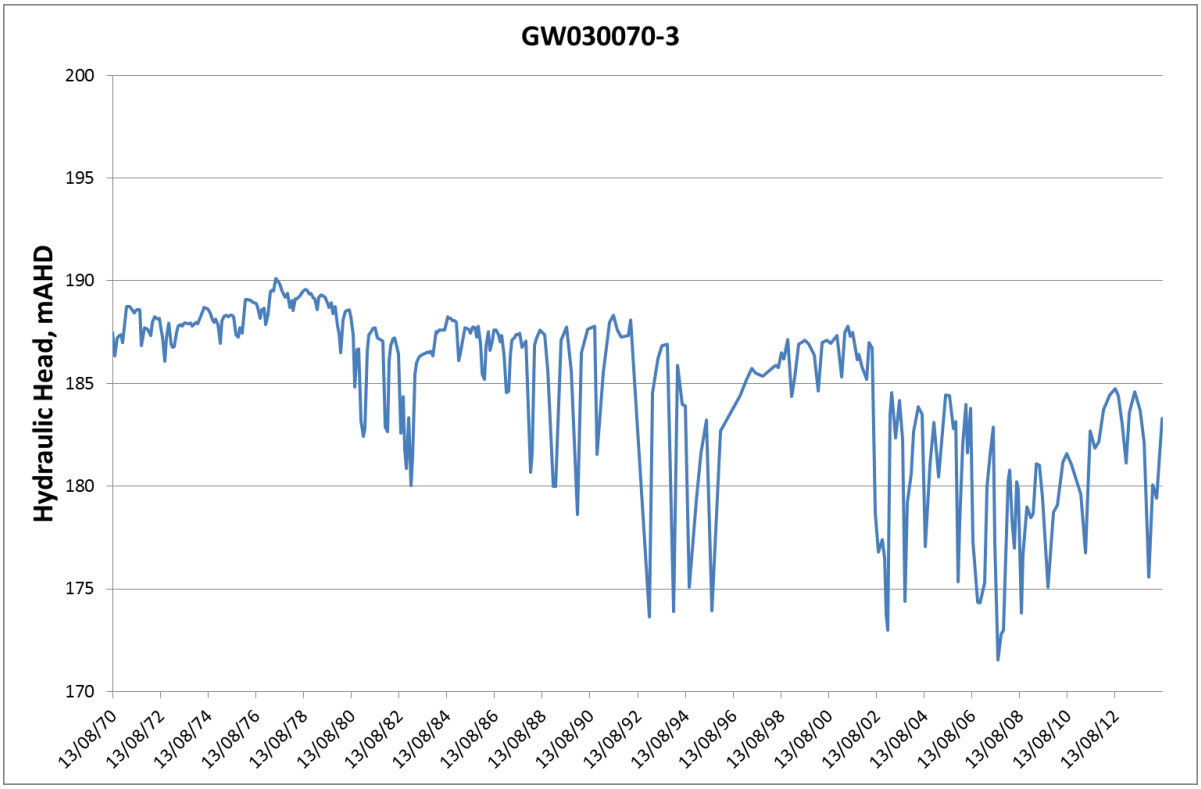


Figure 4-43 Hydrograph for monitoring bore GW030070-3 (Namoi alluvium)

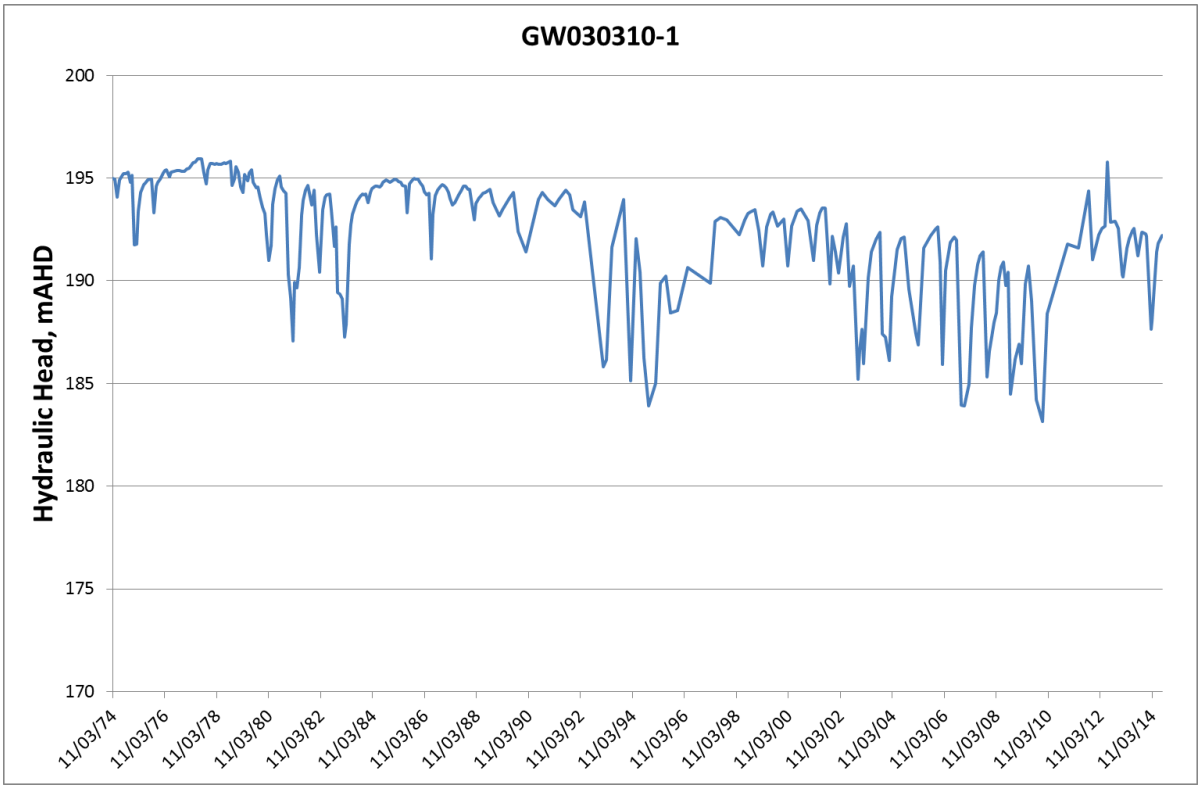


Figure 4-44 Hydrograph for monitoring bore GW030310-1 (Namoi alluvium)

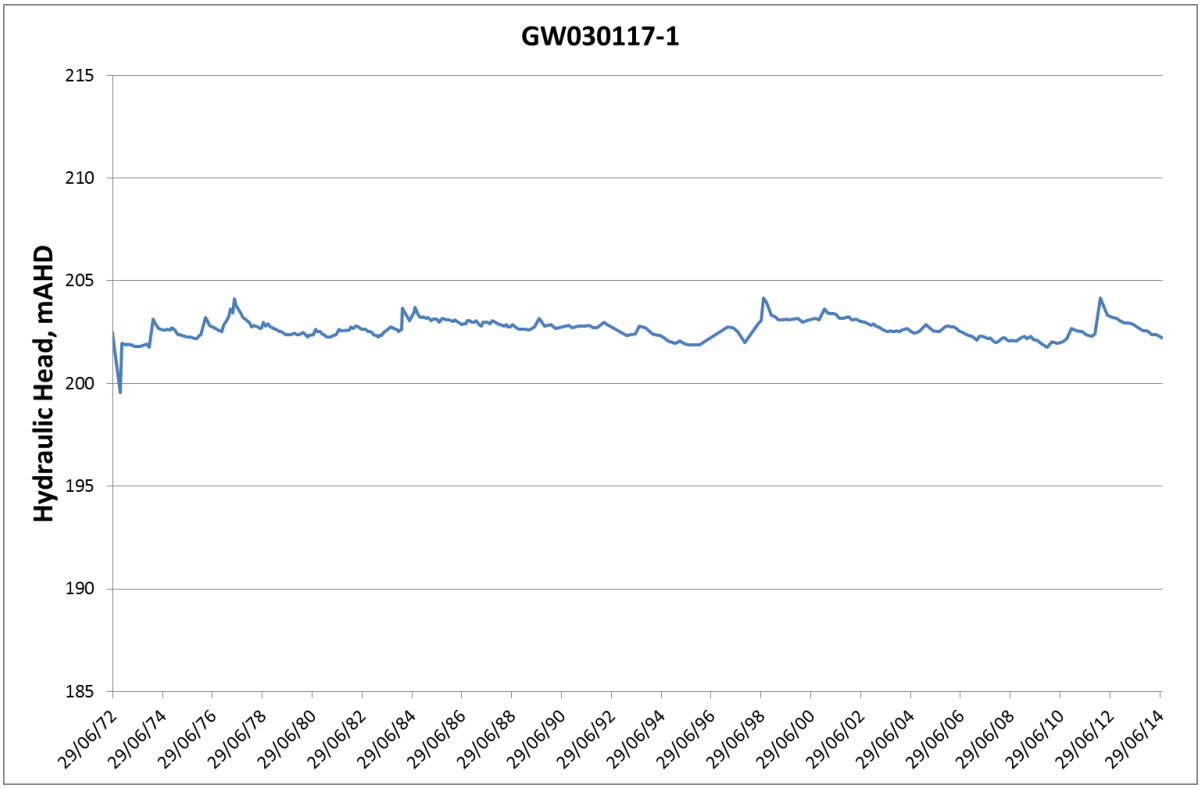


Figure 4-45 Hydrograph for monitoring bore GW030117-1 (Namoi alluvium)

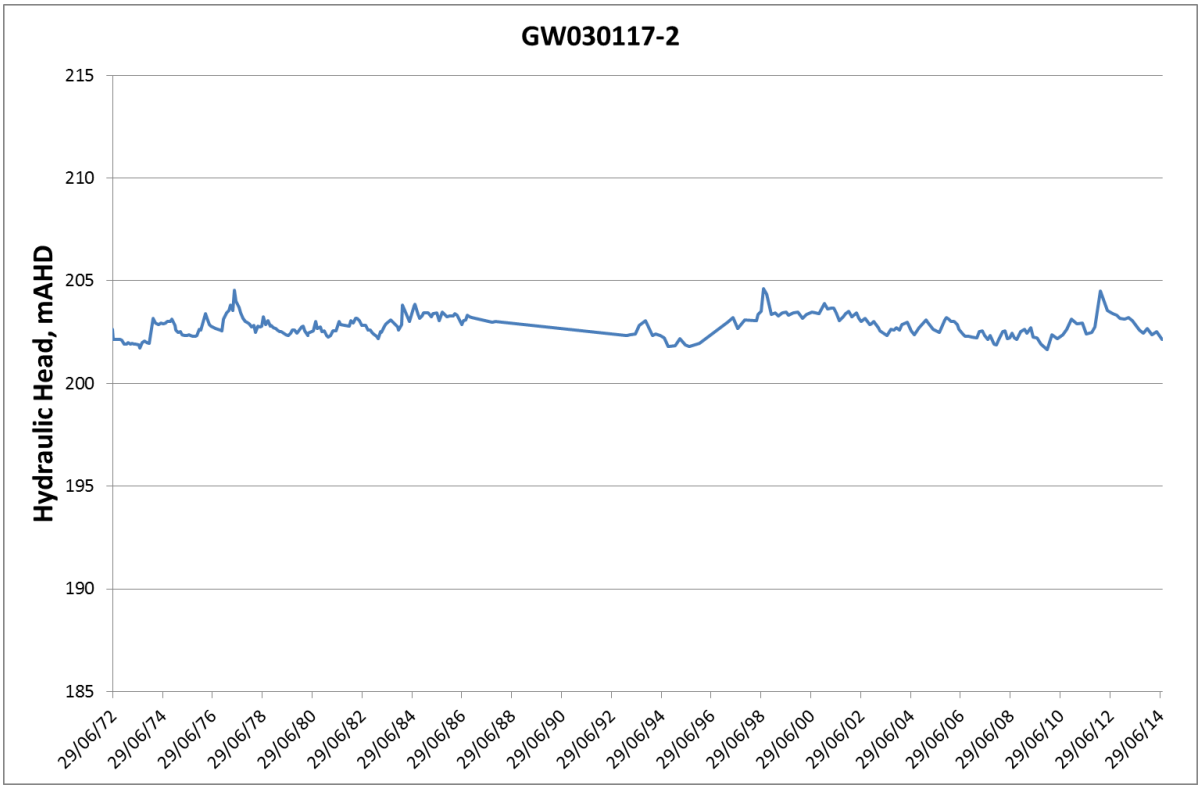


Figure 4-46 Hydrograph for monitoring bore GW030117-2 (Namoi alluvium)

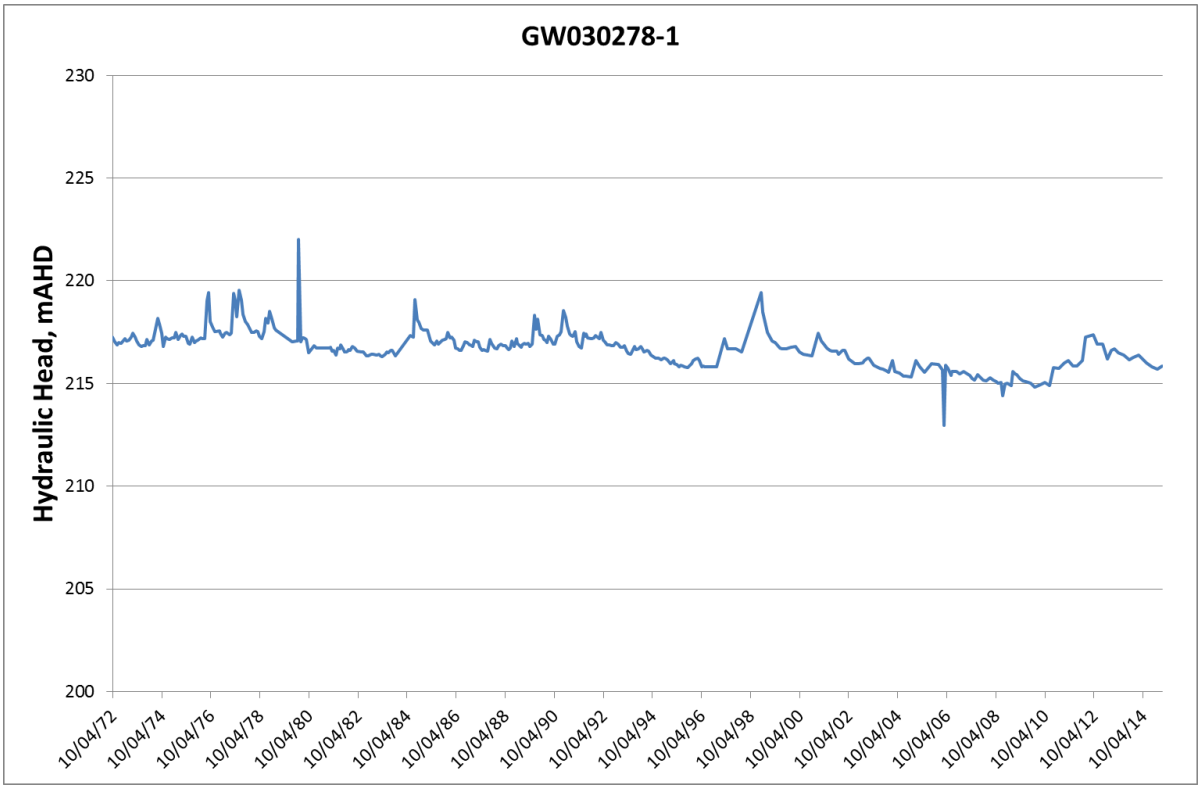


Figure 4-47 Hydrograph for monitoring bore GW030278-1 (Namoi alluvium)

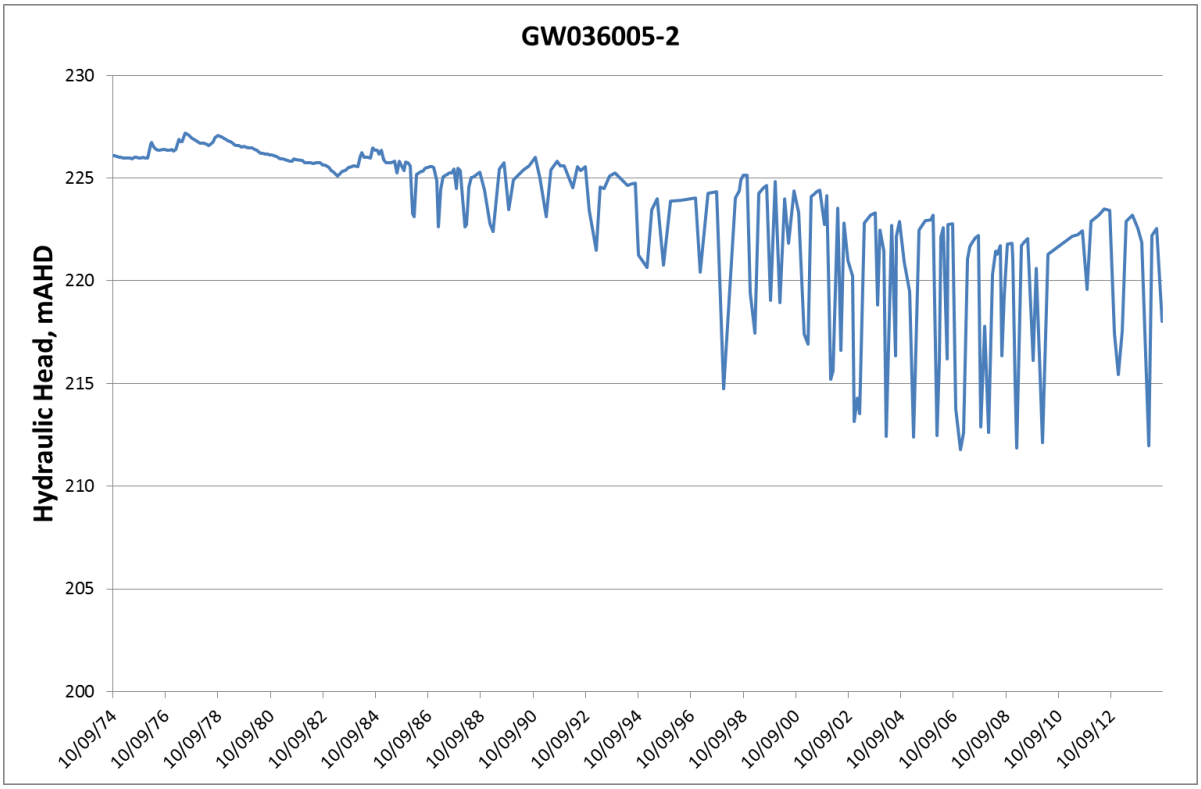


Figure 4-48 Hydrograph for monitoring bore GW036005-2 (Namoi alluvium)

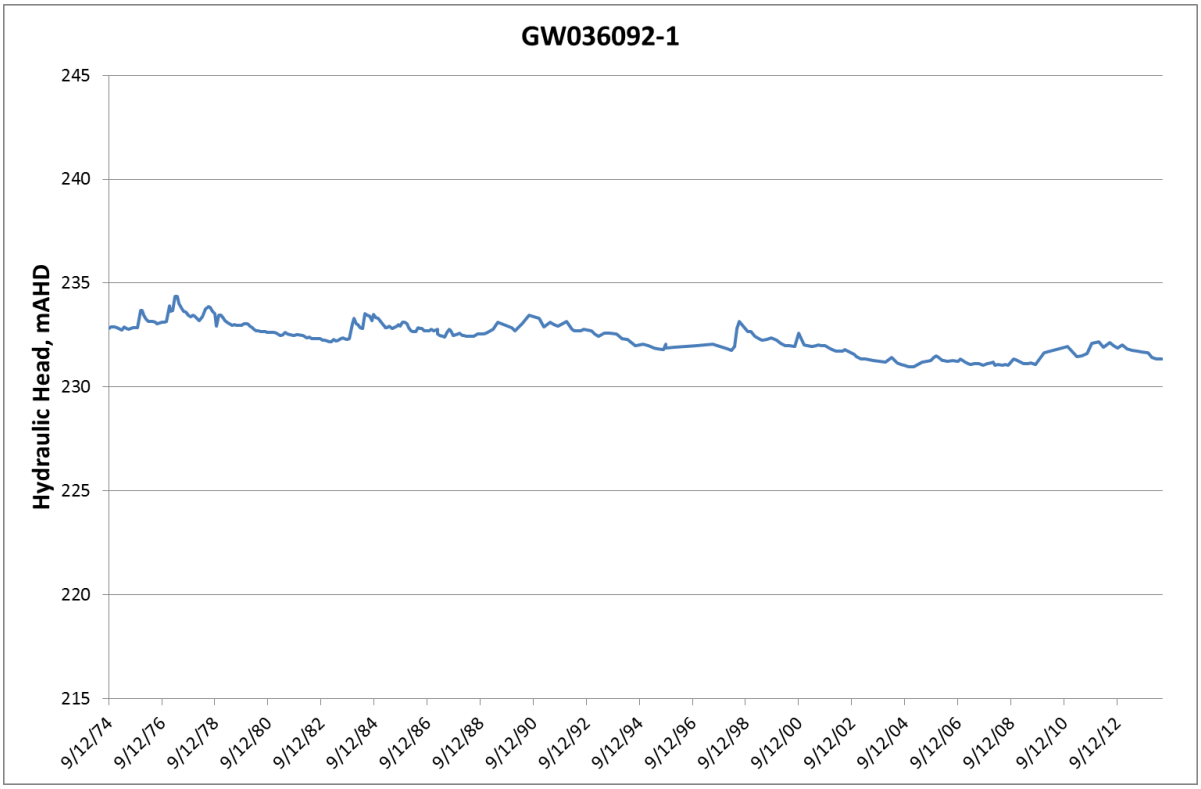


Figure 4-49 Hydrograph for monitoring bore GW036092-1 (Namoi alluvium)

4.2 Groundwater Quality

Table 4-2 lists the 42 groundwater monitoring bores that constitute the baseline monitoring locations for groundwater quality. These bore locations are shown in Figure 3-1 to Figure 3-3 in Section 3. Additional information on the screened intervals of the bores is contained in Appendix C

Figure 4-50 and Table 4-3 to Table 4-7 are summaries of the baseline data for the monitoring locations in Table 4-2. The groundwater monitoring bores are grouped by stratigraphic unit; including Permo-Triassic strata (Napperby, Digby and Purlawaugh Formations), Pilliga Sandstone, Orallo Formation, Namoi alluvium and Bohena Creek alluvium. The tables contain statistical measures of the spread (minimum, maximum and percentiles values) and central tendency (mean values) of these data. For large sample populations that follow a Normal distribution, the 16th and 84th percentiles are equivalent to -1 and +1 standard deviations from the mean (50th percentile). Approximately 68 percent of a data population lies within the 16th and 84th percentile, and approximately 32 percent of the data lies outside of this range. A sample size greater than or equal to six is needed to identify the 16th and 84th percentiles.

Additional tables in sections 4.2.1 to 4.2.4 contain statistical summaries of the water quality data for the individual monitoring bores listed in Table 4-2.

The Durov diagram in Figure 4-50 is based on average values of water quality within each stratigraphic group. Overall, the water quality of groundwater in each stratigraphic unit is similar with respect to the major cation compositions (sodium-potassium dominant) and anion compositions (bicarbonate dominant).

Groundwater in the Permo-Triassic strata of the Gunnedah Basin is distinguishable by larger salinity (EC) and acidity (pH) compared to groundwater in the Great Artesian Basin and alluvial groundwater sources.

Table 4-2 Summary of baseline data for groundwater quality

Bore	Owner	Stratigraphic Unit	Water Source	Date Range	
				Start Date	End Date
TULPRDGY02	Santos	Digby Fm	GOB	13/01/15	18/07/16
TULPRNAP01	Santos	Napperby	GOB	09/07/14	18/07/16
DWH14PRPUR03	Santos	Purlawaugh Fm	GAB	29/10/13	05/07/16
BHN14PRUPS02	Santos	Pilliga Ss	GAB	12/12/13	14/07/16
BWD26PRLPS02	Santos	Pilliga Ss	GAB	19/09/13	04/07/16
BWD1WB	Santos	Pilliga Ss	GAB	17/10/12	23/10/13
BWD26PRUPS01	Santos	Pilliga Ss	GAB	27/07/14	04/07/16
BWD27PRLPS03	Santos	Pilliga Ss	GAB	15/11/13	20/07/16
BWD27PRUPS02	Santos	Pilliga Ss	GAB	29/07/13	20/07/16
DWH14PRLPS02	Santos	Pilliga Ss	GAB	27/10/13	05/07/16
DWH14PRUPS01	Santos	Pilliga Ss	GAB	07/11/13	05/07/16
DWH3PRLPS02	Santos	Pilliga Ss	GAB	30/09/13	06/07/16
DWH3PRUPS01	Santos	Pilliga Ss	GAB	02/10/13	06/07/16
NYOPRUPS02	Santos	Pilliga Ss	GAB	01/12/13	19/07/16
BWD5WB	Santos	Pilliga Ss	GAB	18/10/12	18/10/12
GW030121-1	DPI	Pilliga Ss	GAB	20/04/71	27/05/99
GW030310-2	DPI	Pilliga Ss	GAB	27/02/85	30/05/99
GW030400-1	DPI	Pilliga Ss	GAB	15/08/73	23/01/85
BHN14PRORA01	Santos	Orallo Fm	GAB	14/12/13	14/07/16
NYOPRORA01	Santos	Orallo Fm	GAB	30/11/13	19/07/16
7703	Private	Orallo Fm	GAB	25/05/12	07/05/14
7705	Private	Orallo Fm	GAB	25/05/12	07/05/14
7706	Private	Orallo Fm	GAB	25/05/12	25/06/14

Bore	Owner	Stratigraphic Unit	Water Source	Date Range	
				Start Date	End Date
GW021266-1	DPI	Namoi alluvium	ULNA	01/04/66	21/09/99
GW021437-2	DPI	Namoi alluvium	ULNA	09/06/67	22/03/85
GW025338-1	DPI	Namoi alluvium	ULNA	14/11/69	11/11/99
GW025343-1	DPI	Namoi alluvium	ULNA	15/12/69	04/12/86
GW030070-1	DPI	Namoi alluvium	ULNA	22/05/70	02/06/99
GW030070-2	DPI	Namoi alluvium	ULNA	02/06/99	02/06/99
GW030070-3	DPI	Namoi alluvium	ULNA	02/06/99	02/06/99
GW030117-1	DPI	Namoi alluvium	ULNA	07/03/72	28/05/99
GW030117-2	DPI	Namoi alluvium	ULNA	28/05/99	28/05/99
GW030117-3	DPI	Namoi alluvium	ULNA	28/05/99	28/05/99
GW030278-1	DPI	Namoi alluvium	ULNA	21/11/78	21/11/78
GW030310-1	DPI	Namoi alluvium	ULNA	16/08/76	31/05/99
GW036005-2	DPI	Namoi alluvium	ULNA	04/06/74	06/09/84
BHNCKMW1	Santos	BC alluvium	BC	17/07/13	25/10/13
BHNCKMW2	Santos	BC alluvium	BC	17/07/13	25/10/13
BHNCKMW3	Santos	BC alluvium	BC	17/07/13	25/10/13
BHNCKMW4	Santos	BC alluvium	BC	17/07/13	22/10/13

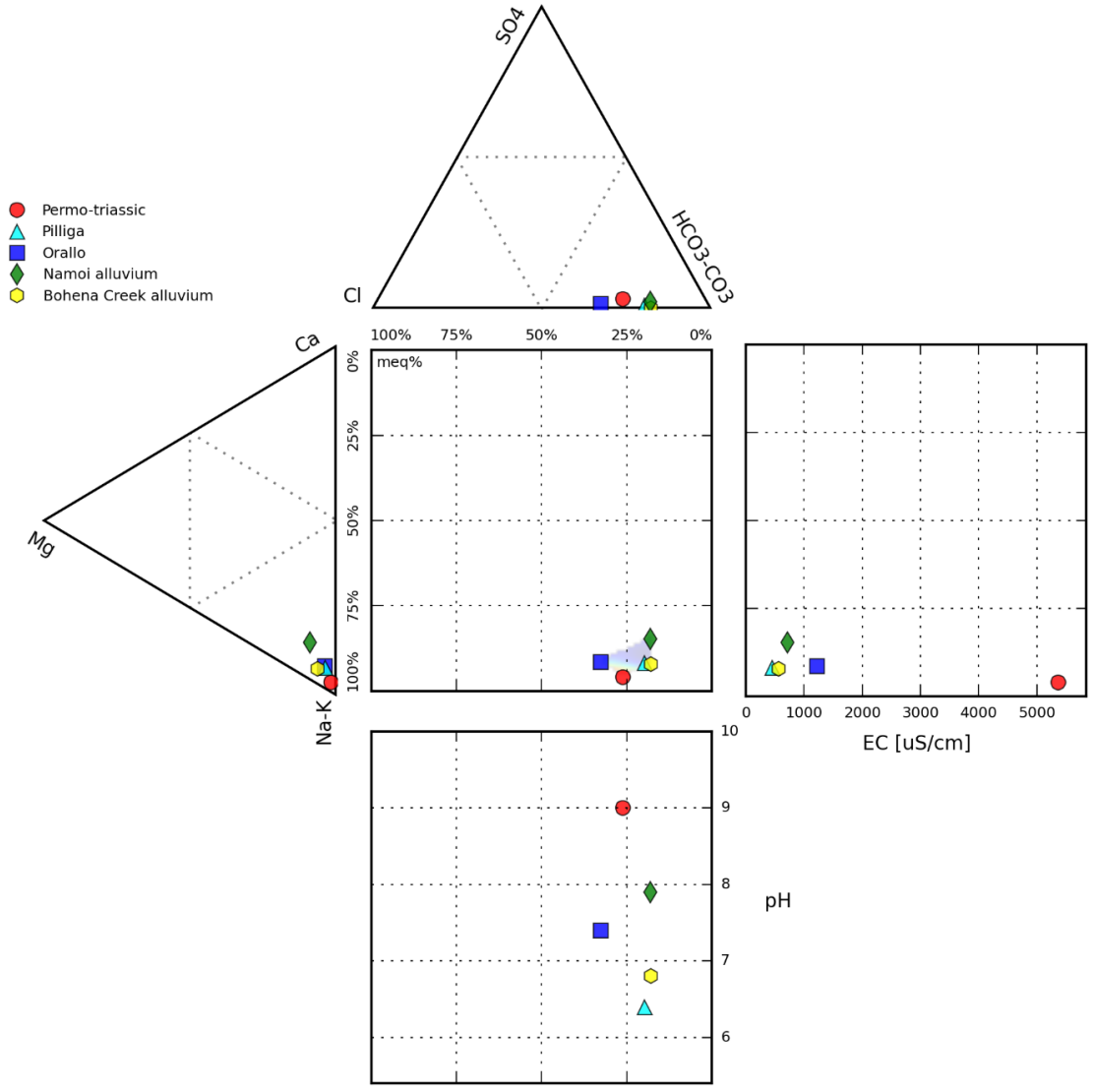


Figure 4-50 Durov diagram of average groundwater quality for monitoring locations in Table 4-2

Table 4-3 Summary of baseline data for groundwater quality in Permo-Triassic strata

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	15	0.1	3.3	1.1	0.1	3.1
HCO_3 alkalinity as $CaCO_3$ (mg/L)	15	1	3840	1089.5	1	2511.2
B (mg/L)	15	0.1	1.2	0.5	0.1	1.1
Ca (mg/L)	15	1	77	26.4	2.6	51.3
CO_3 alkalinity as $CaCO_3$ (mg/L)	15	1	427	114.1	1	306.1
Cl (mg/L)	15	28	865	263.5	32.6	725.3
EC (field) (µS/cm)	21	407	10773	5397	573	10103
EC @ 25C (lab) (µS/cm)	14	456	10300	4784.7	550.6	9652
F (mg/L)	15	0.3	1.5	0.8	0.5	1.2
Li (mg/L)	4	0	1.2	0.3	ISS	ISS
Mg (mg/L)	15	1	38	12.9	1	33.4
Mn (mg/L)	15	0.001	0.543	0.116	0.001	0.466
pH (field)	21	5.8	13	9.2	6.7	12.6
pH (lab)	14	6.9	12.4	9.3	7	12.4
K (mg/L)	15	12	305	85.7	23.9	288.3
Na (mg/L)	15	78	1760	866.5	90.1	1727.6
SAR	4	27	50.2	36.2	ISS	ISS
Sr (mg/L)	15	0.1	5.2	1.9	0.2	3.4
Sulfate as SO_4^{2-}	15	1	239	45.6	1	129.2

Stratigraphic units: Digby, Napperby and Purlawaugh Formations
Date range: 29/10/2013 to 18/7/2016
ISS – insufficient sample size

Table 4-4 Summary of baseline data for groundwater quality in Pilliga Sandstone

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	79	0.02	1.62	0.28	0.06	0.51
HCO_3 alkalinity as $CaCO_3$ (mg/L)	96	1	839	164	10.5	514.4
B (mg/L)	80	0.1	0.2	0.1	0.1	0.1
Ca (mg/L)	80	1	45	5.5	1	5
CO_3 alkalinity as $CaCO_3$ (mg/L)	88	0.3	45.6	3.8	1	1
Cl (mg/L)	96	5	63	31.6	18	52.4
EC (field) (µS/cm)	99	70	1389	303.3	120.7	478.9
EC @ 25C (lab) (µS/cm)	96	76	1400	402.2	127.5	1200
F (mg/L)	80	0.1	1	0.2	0.1	0.2
Li (mg/L)	35	0.001	0.032	0.007	0.002	0.012
Mg (mg/L)	79	1	10	2.2	1	3
Mn (mg/L)	79	0.001	0.406	0.093	0.011	0.215
pH (field)	115	4.4	8.7	6.2	5.2	8
pH (lab)	79	4.1	9.5	6.6	5.8	7.6
K (mg/L)	94	2	14	5.4	2	7
Na (mg/L)	94	7	352	76.8	17	280.2
SAR	28	1.4	86.4	8	2.3	5.2
Sr (mg/L)	79	0.01	0.62	0.08	0.02	0.11
Sulfate as SO_4^{2-}	89	0.5	35	2.7	1	3

Stratigraphic unit: Pilliga Sandstone
Date range: 20/4/1971 to 20/7/2016

Table 4-5 Summary of baseline data for groundwater quality in Orallo Formation

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	18	0.1	0.9	0.3	0.1	0.6
HCO_3 alkalinity as $CaCO_3$ (mg/L)	18	178	684	373.7	194.3	571.7
B (mg/L)	18	0.1	0.3	0.2	0.1	0.3
Ca (mg/L)	18	1	39	18.2	4	35.9
CO_3 alkalinity as $CaCO_3$ (mg/L)	18	1	89	11.4	1	27.6
Cl (mg/L)	18	25	698	95.2	30	170.5
EC (field) (µS/cm)	17	470	3079	923.1	502.4	1351.8
EC @ 25C (lab) (µS/cm)	17	471	3280	1029.8	484.6	1351.2
F (mg/L)	18	0.1	1.1	0.6	0.1	1
Li (mg/L)	12	0.001	0.044	0.022	0.001	0.041
Mg (mg/L)	18	1	14	6.2	1	10
Mn (mg/L)	18	0.003	0.683	0.119	0.009	0.228
pH (field)	17	6.4	8.9	7.4	6.8	8.2
pH (lab)	17	7.3	8.9	8	7.5	8.5
K (mg/L)	18	2	13	5.5	2	9
Na (mg/L)	18	53	638	212.3	62	334.7
SAR	12	2.1	85.3	22.6	2.1	39.1
Sr (mg/L)	17	0.1	0.6	0.3	0.1	0.5
Sulfate as SO_4^{2-}	18	1	37	8.1	1	29.2

Stratigraphic unit: Orallo Formation
Date range: 25/5/2012 to 14/7/2016

Table 4-6 Summary of baseline data for groundwater quality in Namoi alluvium

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	9	0.001	0.2	0.06	0.01	0.1
HCO_3 alkalinity as $CaCO_3$ (mg/L)	78	125	1190	436	180	799
B (mg/L)	9	0.03	0.2	0.1	0.03	0.2
Ca (mg/L)	9	1.7	55	19	2.3	54
CO_3 alkalinity as $CaCO_3$ (mg/L)	54	0.3	130	11	1	25
Cl (mg/L)	78	7.8	242	61.7	13.1	124
EC (field) (µS/cm)	47	248	2170	1006	344.8	1747
EC @ 25C (lab) (µS/cm)	32	318	2390	696.7	330.6	1109
F (mg/L)	10	0.05	2	0.9	0.2	2
Li (mg/L)	9	0.001	0.02	0.007	0.001	0.02
Mg (mg/L)	9	0.3	40	10	0.5	30
Mn (mg/L)	9	0.001	0.2	0.02	0.001	0.08
pH (field)	79	6.3	9.6	7.9	7.5	8.4
pH (lab)	0	-	-	-	-	-
K (mg/L)	76	0.08	23	3.2	1.2	6.3
Na (mg/L)	77	14.9	520	165	44	355
SAR	0	-	-	-	-	-
Sr (mg/L)	9	0.06	0.7	0.3	0.06	0.6
Sulfate as SO_4^{2-}	73	0.48	75	13	2.4	21

Stratigraphic unit: Namoi alluvium
Date range: 1/4/1966 to 11/11/1999

Table 4-7 Summary of baseline data for groundwater quality in Bohena Creek alluvium

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	12	0.04	0.1	0.08	0.06	0.1
HCO_3 alkalinity as $CaCO_3$ (mg/L)	12	40	596	231	41.1	594
B (mg/L)	12	0.05	0.2	0.1	0.05	0.2
Ca (mg/L)	12	3	8	5.1	3	7
CO_3 alkalinity as $CaCO_3$ (mg/L)	12	1	21	4.2	1	18
Cl (mg/L)	12	18	58	36	20	58
EC (field) (µS/cm)	6	173	1388	576.2	173.2	1367
EC @ 25C (lab) (µS/cm)	12	137	1330	559.4	148	1314
F (mg/L)	12	0.1	1.1	0.42	0.1	1.1
Li (mg/L)	12	0.001	0.03	0.01	0.001	0.03
Mg (mg/L)	12	1	9	4.6	1.1	7.9
Mn (mg/L)	12	0.001	0.8	0.3	0.001	0.6
pH (field)	10	6.2	7.9	6.8	6.4	7.9
pH (lab)	8	6.3	8.5	7.5	6.5	8.5
K (mg/L)	12	1	3	2.2	2	3
Na (mg/L)	12	12	321	114	14.2	311
SAR	12	0.9	47	13	1	44
Sr (mg/L)	12	0.07	0.2	0.1	0.07	0.1
Sulfate as SO_4^{2-}	12	1	2	1.1	1	1

Stratigraphic unit: Bohena Creek alluvium
Date range: 24/5/2012 to 24/6/2014

4.2.1 Gunnedah-Oxley Basin Monitoring Bores

Table 4-8 to Table 4-9 are statistical summaries of the baseline data for groundwater quality at monitoring locations within the Gunnedah-Oxley Basin. Statistical measures of the spread and central tendency of the data are calculated for monitoring locations with more than two samples; however, these measures may not be statistically significant if the number of samples is small. For large and normally-distributed data populations, the 16th and 84th percentiles represent -1 and +1 standard deviations from the mean, respectively. Approximately 68% of a data population lies within the 16th and 84th percentiles. A sample size greater than or equal to six is needed to identify the 16th and 84th percentiles.

The locations of monitoring bores are shown in Figure 3-1.

Table 4-8 Baseline data for groundwater quality monitoring at location TULPRDGY02

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	4	0.4	3.2	1.2	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	4	< 1	3840	960.8	ISS	ISS
B (mg/L)	4	0.2	1.1	0.4	ISS	ISS
Ca (mg/L)	4	12	77	32.3	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	4	< 1	427	261	ISS	ISS
Cl (mg/L)	4	33	152	65.3	ISS	ISS
EC (field) (µS/cm)	7	6714	10773	9161	6736.1	10657.1
EC @ 25C (lab) (µS/cm)	4	7220	10300	9173	ISS	ISS
F (mg/L)	4	0.5	1.5	0.8	ISS	ISS
Li (mg/L)	1	1.18	1.18	1.18	ISS	ISS
Mg (mg/L)	4	1	38	10.3	ISS	ISS
Mn (mg/L)	4	< 0.001	0.05	0.01	ISS	ISS
pH (field)	7	6.6	13	11	6.6	12.9
pH (lab)	4	6.9	12.4	11	ISS	ISS
K (mg/L)	4	60	305	235.5	ISS	ISS
Na (mg/L)	4	815	1760	1085	ISS	ISS
SAR	1	50.2	50.2	50.2	ISS	ISS
Sr (mg/L)	4	2.2	2.4	2.4	ISS	ISS
Sulfate as SO_4^{2-}	4	1	2	1.3	ISS	ISS

Stratigraphic unit: Digby Formation
Date range: 13/1/2015 to 18/7/2016
ISS – insufficient sample size

Table 4-9 Baseline data for groundwater quality monitoring at location TULPRNAP01

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	6	0.7	3.3	1.9	0.7	3.3
HCO_3 alkalinity as $CaCO_3$ (mg/L)	6	1380	2640	2040	1380	2612.4
B (mg/L)	6	0.3	1.2	0.8	0.3	1.2
Ca (mg/L)	6	30	53	41.7	30	52.6
CO_3 alkalinity as $CaCO_3$ (mg/L)	6	< 1	1	1	1	1
Cl (mg/L)	6	300	865	587.8	300	863.6
EC (field) (µS/cm)	8	3126	7327	5721	3396.2	7151.4
EC @ 25C (lab) (µS/cm)	5	2400	7400	5470	ISS	ISS
F (mg/L)	6	1	1.2	1.1	1	1.2
Li (mg/L)	2	0.089	0.089	0.089	ISS	ISS
Mg (mg/L)	6	12	34	24.7	12	33.9
Mn (mg/L)	6	0.05	0.54	0.28	0	0.5
pH (field)	8	5.8	7	6.7	6.2	6.9
pH (lab)	5	6.9	7.4	7.2	ISS	ISS
K (mg/L)	6	27	42	35.7	27	41.9
Na (mg/L)	6	866	1750	1365.3	866	1745.2
SAR	2	33.8	33.8	33.8	ISS	ISS
Sr (mg/L)	6	1.5	5.2	3	1.5	5
Sulfate as SO_4^{2-}	6	< 1	239	82.5	1	239

Stratigraphic unit: Napperby
Date range: 9/7/2014 to 18/7/2016
ISS – insufficient sample size

4.2.2 Great Artesian Basin Monitoring Bores

Table 4-26 to Table 4-30 are statistical summaries of the baseline data for groundwater quality at monitoring locations within the Great Artesian Basin. Statistical measures of the spread and central tendency of the data are calculated for monitoring locations with more than two samples; however, these measures may not be statistically significant if the number of samples is small. For large and normally-distributed data populations, the 16th and 84th percentiles represent -1 and +1 standard deviations from the mean, respectively. Approximately 68% of a data population lies within the 16th and 84th percentiles. A sample size greater than or equal to six is needed to identify the 16th and 84th percentiles.

The locations of monitoring bores are shown in Figure 3-2.

Table 4-10 Baseline data for groundwater quality monitoring at location DWH14PRPUR03

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	5	0.1	0.1	0.1	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	5	7	159	52	ISS	ISS
B (mg/L)	5	< 0.05	0.1	0.1	ISS	ISS
Ca (mg/L)	5	1	7	3.4	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	5	94	176	132.4	ISS	ISS
Cl (mg/L)	5	28	36	32.8	ISS	ISS
EC (field) (µS/cm)	6	407	753	575	ISS	ISS
EC @ 25C (lab) (µS/cm)	5	456	700	589.2	ISS	ISS
F (mg/L)	5	0.3	0.6	0.5	ISS	ISS
Li (mg/L)	1	0.034	0.034	0.034	ISS	ISS
Mg (mg/L)	5	< 1	1	1	ISS	ISS
Mn (mg/L)	5	0.001	0.012	0.004	ISS	ISS
pH (field)	6	10.1	11	10.5	10.1	10.9
pH (lab)	5	9.6	10.4	10	ISS	ISS
K (mg/L)	5	12	39	25.8	ISS	ISS
Na (mg/L)	5	78	109	93.2	ISS	ISS
SAR	1	27	27	27	ISS	ISS
Sr (mg/L)	5	0.1	0.2	0.2	ISS	ISS
Sulfate as SO42-	5	20	43	36.8	ISS	ISS

Stratigraphic unit: Purlawaugh Formation
Date range: 29/10/2013 to 5/7/2016
ISS – insufficient sample size

Table 4-11 Baseline data for groundwater quality monitoring at location BHN14PRUPS02

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	6	0.4	0.9	0.6	0.4	0.9
HCO_3 alkalinity as $CaCO_3$ (mg/L)	6	190	252	213.8	190.8	249.6
B (mg/L)	6	< 0.05	0.1	0.1	0.1	0.1
Ca (mg/L)	6	39	45	41.8	39.1	44.8
CO_3 alkalinity as $CaCO_3$ (mg/L)	6	< 1	2	1.2	1	1.9
Cl (mg/L)	6	16	23	19.8	16.2	22.9
EC (field) (µS/cm)	9	471	599	518	475.8	593.6
EC @ 25C (lab) (µS/cm)	6	456	565	491.2	456.4	559.5
F (mg/L)	6	< 0.1	0.3	0.2	0.1	0.3
Li (mg/L)	2	0.014	0.026	0.02	ISS	ISS
Mg (mg/L)	6	8	10	8.8	8	9.9
Mn (mg/L)	6	0.01	0.3	0.16	0	0.3
pH (field)	9	6.6	7.4	7	6.8	7.2
pH (lab)	6	7.3	8.3	7.7	7.3	8.3
K (mg/L)	6	6	7	6.3	6	7
Na (mg/L)	6	42	61	49	42	59.9
SAR	2	1.8	2.1	1.9	ISS	ISS
Sr (mg/L)	6	0.4	0.6	0.5	0.4	0.6
Sulfate as SO_4^{2-}	6	< 1	< 10	3.2	1	9.4

Stratigraphic unit: Pilliga Sandstone
Date range: 12/12/2013 to 14/7/2016
ISS – insufficient sample size

Table 4-12 Baseline data for groundwater quality monitoring at location BWD26PRLPS02

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	7	0.2	0.6	0.4	0.3	0.6
HCO_3 alkalinity as $CaCO_3$ (mg/L)	7	32	39	35.1	32	39
B (mg/L)	7	< 0.05	0.2	0.1	0.1	0.1
Ca (mg/L)	7	< 0.05	3	1.9	1	2.7
CO_3 alkalinity as $CaCO_3$ (mg/L)	7	< 1	1	1	1	1
Cl (mg/L)	7	7	27	18.6	10.1	25.6
EC (field) (µS/cm)	11	141	293	180	142.8	247.1
EC @ 25C (lab) (µS/cm)	7	101	169	149.9	115.6	165.9
F (mg/L)	7	< 0.1	0.2	0.2	0.1	0.2
Li (mg/L)	2	< 0.001	0.003	0.002	ISS	ISS
Mg (mg/L)	7	1	2	1.7	1	2
Mn (mg/L)	7	0.01	0.33	0.14	0	0.3
pH (field)	10	5.8	6.4	6.1	5.8	6.3
pH (lab)	7	6.5	7.5	6.8	6.5	7.3
K (mg/L)	7	6	14	11.6	7.4	13.7
Na (mg/L)	7	12	21	15.9	12.6	19.9
SAR	2	1.4	3.6	2.5	ISS	ISS
Sr (mg/L)	7	0.04	0.05	0.04	0	0
Sulfate as SO_4^{2-}	7	< 1	10	2.4	1	7.8

Stratigraphic unit: Pilliga Sandstone
Date range: 19/9/2013 to 4/7/2016
ISS – insufficient sample size

Table 4-13 Baseline data for groundwater quality monitoring at location BWD26PRUPS01

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	7	0.2	0.5	0.3	0.2	0.5
HCO_3 alkalinity as $CaCO_3$ (mg/L)	7	23	58	35.1	23	57.4
B (mg/L)	7	0.1	0.2	0.1	0.1	0.2
Ca (mg/L)	7	< 1	4	2	1	3.7
CO_3 alkalinity as $CaCO_3$ (mg/L)	7	< 1	1	1	1	1
Cl (mg/L)	7	5	20	9.4	5	19.7
EC (field) (µS/cm)	10	70	254	111	73	183.6
EC @ 25C (lab) (µS/cm)	7	76	182	109.3	76	181.7
F (mg/L)	7	< 0.1	0.3	0.1	0.1	0.3
Li (mg/L)	2	0.003	0.004	0.004	ISS	ISS
Mg (mg/L)	7	1	2	1.9	1.3	2
Mn (mg/L)	7	0.02	0.41	0.14	0	0.4
pH (field)	10	5	6.4	5.7	5.3	6.1
pH (lab)	7	6.2	6.9	6.6	6.2	6.9
K (mg/L)	7	6	13	8	6	12.7
Na (mg/L)	7	7	23	12.7	7	23
SAR	2	2.3	2.5	2.4	ISS	ISS
Sr (mg/L)	7	0.02	0.07	0.04	0	0.1
Sulfate as SO_4^{2-}	7	< 1	2	1.1	1	1.7

Stratigraphic unit: Pilliga Sandstone
Date range: 27/7/2014 to 4/7/2016
ISS – insufficient sample size

Table 4-14 Baseline data for groundwater quality monitoring at location BWD27PRLPS03

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	7	0.1	0.1	0.1	0.1	0.1
HCO_3 alkalinity as $CaCO_3$ (mg/L)	7	< 1	41	22.6	3.5	39.6
B (mg/L)	7	< 0.05	0.1	0.1	0.1	0.1
Ca (mg/L)	7	< 1	2	1.1	1	1.7
CO_3 alkalinity as $CaCO_3$ (mg/L)	7	< 1	1	1	1	1
Cl (mg/L)	7	35	46	41	35.8	46
EC (field) (µS/cm)	10	186	360	229	186	311.5
EC @ 25C (lab) (µS/cm)	7	182	239	206	184	232.8
F (mg/L)	7	< 0.1	0.1	0.1	0.1	0.1
Li (mg/L)	3	0.001	0.001	0.001	ISS	ISS
Mg (mg/L)	7	< 1	3	1.9	1	2.7
Mn (mg/L)	7	0.02	0.07	0.03	0	0.1
pH (field)	10	5.1	6.1	5.5	5.2	5.8
pH (lab)	7	4.1	6.3	5.8	4.6	6.3
K (mg/L)	7	3	5	4	3.3	4.7
Na (mg/L)	7	27	36	31.9	27.8	35.4
SAR	1	5.2	5.2	5.2	ISS	ISS
Sr (mg/L)	7	0.02	0.03	0.03	0	0
Sulfate as SO_4^{2-}	7	< 1	35	5.9	1	25.5

Stratigraphic unit: Pilliga Sandstone
Date range: 15/11/2013 to 20/7/2016
ISS – insufficient sample size

Table 4-15 Baseline data for groundwater quality monitoring at location BWD27PRUPS02

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	9	0.1	0.2	0.2	0.1	0.2
HCO_3 alkalinity as $CaCO_3$ (mg/L)	9	8	18	13	8	16.2
B (mg/L)	9	< 0.05	0.1	0.1	0.1	0.1
Ca (mg/L)	9	< 1	1	1	1	1
CO_3 alkalinity as $CaCO_3$ (mg/L)	9	< 1	1	1	1	1
Cl (mg/L)	9	22	33	28.7	22.6	32.4
EC (field) (µS/cm)	9	126	300	169	131.3	244.4
EC @ 25C (lab) (µS/cm)	10	129	864	210	129.8	319.1
F (mg/L)	9	0.1	0.1	0.1	0.1	0.1
Li (mg/L)	5	0.002	0.002	0.002	ISS	ISS
Mg (mg/L)	9	< 1	2	1.4	1	2
Mn (mg/L)	9	0.004	0.097	0.057	0	0.1
pH (field)	9	4.8	5.6	5.2	4.9	5.5
pH (lab)	10	5.8	8.8	6.4	5.8	7.6
K (mg/L)	9	6	7	6.2	6	7
Na (mg/L)	9	17	20	17.9	17	19.4
SAR	3	3.9	4.3	4.1	ISS	ISS
Sr (mg/L)	9	0.02	0.03	0.02	0	0
Sulfate as SO_4^{2-}	9	< 1	1	1	1	1

Stratigraphic unit: Pilliga Sandstone
Date range: 29/7/2013 to 20/7/2016
ISS – insufficient sample size

Table 4-16 Baseline data for groundwater quality monitoring at location DWH14PRLPS02

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	9	0.1	0.1	0.1	0.1	0.1
HCO_3 alkalinity as $CaCO_3$ (mg/L)	9	14.0	79.0	36.9	18.8	66.4
B (mg/L)	9	< 0.05	0.1	0.1	0.1	0.1
Ca (mg/L)	9	< 1	16.0	5.9	1.6	13.6
CO_3 alkalinity as $CaCO_3$ (mg/L)	9	< 1	1.0	1.0	1	1
Cl (mg/L)	9	31.0	43.0	37.7	31.6	42.4
EC (field) (µS/cm)	9	196.0	617.0	268.0	198.2	419
EC @ 25C (lab) (µS/cm)	8	181.0	299.0	208.6	183.6	260.3
F (mg/L)	9	< 0.1	0.1	0.1	0.1	0.1
Li (mg/L)	5	0.003	0.006	0.005	ISS	ISS
Mg (mg/L)	9	1.0	3.0	1.7	1	2.4
Mn (mg/L)	9	0.01	0.28	0.1	0	0.2
pH (field)	9	5.2	5.9	5.6	5.3	5.8
pH (lab)	8	6.0	7.5	6.6	6	7.5
K (mg/L)	9	4.0	6.0	4.7	4	6
Na (mg/L)	9	25.0	38.0	30.9	25.6	36.8
SAR	5	2.3	5.8	4.3	ISS	ISS
Sr (mg/L)	9	0.02	0.07	0.04	0	0.1
Sulfate as SO_4^{2-}	9	< 1	2.0	1.1	1	1.4

Stratigraphic unit: Pilliga Sandstone
Date range: 27/10/2013 to 5/7/2016
ISS – insufficient sample size

Table 4-17 Baseline data for groundwater quality monitoring at location DWH14PRUPS01

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	8	0.1	0.2	0.2	0.1	0.2
HCO_3 alkalinity as $CaCO_3$ (mg/L)	9	10	47	25.6	10	42.2
B (mg/L)	9	< 0.05	0.1	0.1	0.1	0.1
Ca (mg/L)	9	< 1	4	2.1	1	4
CO_3 alkalinity as $CaCO_3$ (mg/L)	9	< 1	1	1	1	1
Cl (mg/L)	9	32	42	37.9	32.6	41.4
EC (field) (µS/cm)	9	207	450	250	207.4	336
EC @ 25C (lab) (µS/cm)	9	192	721	268.4	192	430
F (mg/L)	9	< 0.1	0.1	0.1	0.1	0.1
Li (mg/L)	5	0.005	0.009	0.006	ISS	ISS
Mg (mg/L)	9	2	4	3.1	2	4
Mn (mg/L)	9	0.01	0.36	0.16	0	0.3
pH (field)	9	5	6	5.6	5.1	5.9
pH (lab)	9	5.6	9.5	6.8	5.6	9.4
K (mg/L)	9	6	8	7.1	6.6	8
Na (mg/L)	9	25	34	27.3	25	31
SAR	5	2.5	5.2	3.8	ISS	ISS
Sr (mg/L)	9	0.02	0.1	0.06	0	0.1
Sulfate as SO_4^{2-}	9	< 1	1	1	1	1

Stratigraphic unit: Pilliga Sandstone
Date range: 26/10/2013 to 5/7/2016
ISS – insufficient sample size

Table 4-18 Baseline data for groundwater quality monitoring at location DWH3PRLPS02

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	7	0.02	0.13	0.06	0	0.1
HCO_3 alkalinity as $CaCO_3$ (mg/L)	7	< 1	64	26.1	4.9	55.9
B (mg/L)	7	< 0.05	0.1	0.1	0.1	0.1
Ca (mg/L)	7	< 1	8	2.9	1	6.9
CO_3 alkalinity as $CaCO_3$ (mg/L)	7	< 1	1	1	1	1
Cl (mg/L)	7	22	32	24.9	22.3	30.3
EC (field) (µS/cm)	10	122	301	175	132.7	256.9
EC @ 25C (lab) (µS/cm)	7	122	215	155	125.4	203.2
F (mg/L)	7	< 0.1	0.2	0.1	0.1	0.2
Li (mg/L)	2	0.002	0.011	0.007	ISS	ISS
Mg (mg/L)	7	< 1	1	1	1	1
Mn (mg/L)	7	0.01	0.37	0.11	0	0.3
pH (field)	10	4.4	5.9	5.3	4.8	5.7
pH (lab)	7	4.2	7.1	6	4.6	6.9
K (mg/L)	7	2	6	3.4	2.3	5.4
Na (mg/L)	7	20	29	22.6	20.3	27.3
SAR	1	2.6	2.6	2.6	ISS	ISS
Sr (mg/L)	7	0.01	0.13	0.04	0	0.1
Sulfate as SO_4^{2-}	7	1	20	4.3	1	15

Stratigraphic unit: Pilliga Sandstone
Date range: 30/9/2013 to 6/7/2016
ISS – insufficient sample size

Table 4-19 Baseline data for groundwater quality monitoring at location DWH3PRUPS01

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	7	0.03	0.09	0.05	0	0.1
HCO_3 alkalinity as $CaCO_3$ (mg/L)	7	9	33	14.7	9.3	28.5
B (mg/L)	7	< 0.05	0.1	0.1	0.1	0.1
Ca (mg/L)	7	< 1	5	1.7	1	4.2
CO_3 alkalinity as $CaCO_3$ (mg/L)	7	< 1	1	1	1	1
Cl (mg/L)	7	22	33	24.6	22	30.5
EC (field) (µS/cm)	10	112	293	147	117.1	195
EC @ 25C (lab) (µS/cm)	7	117	164	126.4	117.3	153.6
F (mg/L)	7	< 0.1	0.1	0.1	0.1	0.1
Li (mg/L)	2	0.002	0.002	0.002	ISS	ISS
Mg (mg/L)	7	< 1	1	1	1	1
Mn (mg/L)	7	0.01	0.25	0.06	0	0.2
pH (field)	10	4.5	6.5	5.1	4.6	5.8
pH (lab)	7	5.4	7.3	6.1	5.5	7.1
K (mg/L)	7	2	4	2.3	2	3.4
Na (mg/L)	7	18	25	20.3	18	24.7
SAR	1	3.5	3.5	3.5	ISS	ISS
Sr (mg/L)	7	0.01	0.06	0.02	0	0
Sulfate as SO_4^{2-}	7	2	3	2.3	2	3

Stratigraphic unit: Pilliga Sandstone
Date range: 2/10/2013 to 6/7/2016
ISS – insufficient sample size

Table 4-20 Baseline data for groundwater quality monitoring at location NYOPRUPS02

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	7	0.3	1.6	1.1	0.3	1.6
HCO_3 alkalinity as $CaCO_3$ (mg/L)	7	500	637	550.7	503.1	618.8
B (mg/L)	7	0.2	0.2	0.2	0.2	0.2
Ca (mg/L)	7	1	13	4	1	10.5
CO_3 alkalinity as $CaCO_3$ (mg/L)	7	< 1	43	25.4	4.1	42.4
Cl (mg/L)	7	47	61	55.6	48.4	60.7
EC (field) (µS/cm)	8	1127	1389	1266	1173.2	1352
EC @ 25C (lab) (µS/cm)	6	1270	1320	1298.3	1271.2	1318.8
F (mg/L)	7	0.9	1	1	0.9	1
Li (mg/L)	2	0.03	0.032	0.031	ISS	ISS
Mg (mg/L)	7	< 1	1	1	1	1
Mn (mg/L)	7	0.001	0.057	0.023	0	0.1
pH (field)	8	7.8	8.5	8.2	7.9	8.4
pH (lab)	6	8.3	8.7	8.5	8.3	8.7
K (mg/L)	7	2	2	2	2	2
Na (mg/L)	7	291	352	321.4	295.2	346.1
SAR	2	48.4	86.4	67.4	ISS	ISS
Sr (mg/L)	6	0.1	0.1	0.1	0.1	0.1
Sulfate as SO_4^{2-}	7	< 1	5	1.6	1	3.9

Stratigraphic unit: Pilliga Sandstone
Date range: 1/12/2013 to 19/7/2016
ISS – insufficient sample size

Table 4-21 Baseline data for groundwater quality monitoring at location BWD1WB

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	2	0.08	0.09	0.08	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	2	6	6	6	ISS	ISS
B (mg/L)	2	0.05	0.05	0.05	ISS	ISS
Ca (mg/L)	2	1	1	1	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	2	1	1	1	ISS	ISS
Cl (mg/L)	2	27	31	29	ISS	ISS
EC (field) (µS/cm)	2	115	119	117	ISS	ISS
EC @ 25C (lab) (µS/cm)	2	124	128	126	ISS	ISS
F (mg/L)	2	0.1	0.1	0.1	ISS	ISS
Li (mg/L)	2	0.002	0.003	0.003	ISS	ISS
Mg (mg/L)	2	1	2	1.5	ISS	ISS
Mn (mg/L)	1	0.006	0.006	0.006	ISS	ISS
pH (field)	2	5	5.6	5.3	ISS	ISS
pH (lab)	2	5.8	5.9	5.8	ISS	ISS
K (mg/L)	2	5	5	5	ISS	ISS
Na (mg/L)	2	17	17	17	ISS	ISS
SAR	2	2.7	3.6	3.2	ISS	ISS
Sr (mg/L)	2	0.01	0.02	0.01	ISS	ISS
Sulfate as SO_4^{2-}	2	1	1	1	ISS	ISS

Stratigraphic unit: Pilliga Sandstone
Date range: 17/10/2012 to 23/10/2013
ISS – insufficient sample size

Table 4-22 Baseline data for groundwater quality monitoring at location BWD5WB

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	2	0.1	0.1	0.1	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	2	6	7	6.5	ISS	ISS
B (mg/L)	2	0.05	0.05	0.05	ISS	ISS
Ca (mg/L)	2	1	1	1	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	2	1	1	1	ISS	ISS
Cl (mg/L)	2	30	33	32	ISS	ISS
EC (field) (µS/cm)	2	113	121	117	ISS	ISS
EC @ 25C (lab) (µS/cm)	2	124	129	127	ISS	ISS
F (mg/L)	2	0.1	0.1	0.1	ISS	ISS
Li (mg/L)	2	0.003	0.004	0.004	ISS	ISS
Mg (mg/L)	1	2	2	2	ISS	ISS
Mn (mg/L)	2	0.003	0.02	0.01	ISS	ISS
pH (field)	2	5.3	5.4	5.3	ISS	ISS
pH (lab)	2	5.6	6	5.8	ISS	ISS
K (mg/L)	1	5	5	5	ISS	ISS
Na (mg/L)	1	14	14	14	ISS	ISS
SAR	2	2.3	3.4	2.9	ISS	ISS
Sr (mg/L)	2	0.02	0.02	0.02	ISS	ISS
Sulfate as SO_4^{2-}	2	1	2	1.5	ISS	ISS

Stratigraphic unit: Pilliga Sandstone
Date range: 8/10/2012 to 18/10/2012
ISS – insufficient sample size

Table 4-23 Baseline data for groundwater quality monitoring at location GW030121-1

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	0	-	-	-	-	-
HCO_3 alkalinity as $CaCO_3$ (mg/L)	0	-	-	-	-	-
B (mg/L)	8	658	839	743	659	820
Ca (mg/L)	0	-	-	-	-	-
CO_3 alkalinity as $CaCO_3$ (mg/L)	0	-	-	-	-	-
Cl (mg/L)	5	1	46	15	ISS	ISS
EC (field) (µS/cm)	8	53	63	56	53	61
EC @ 25C (lab) (µS/cm)	0	-	-	-	-	-
F (mg/L)	8	1200	1400	1273	1202	1369
Li (mg/L)	0	-	-	-	-	-
Mg (mg/L)	0	-	-	-	-	-
Mn (mg/L)	0	-	-	-	-	-
pH (field)	0	-	-	-	-	-
pH (lab)	8	6.2	8.7	7.9	7	8.5
K (mg/L)	0	-	-	-	-	-
Na (mg/L)	8	4.7	7.4	5.8	4.8	7.3
SAR	8	271	345	305	275	339
Sr (mg/L)	0	-	-	-	-	-
Sulfate as SO_4^{2-}	0	-	-	-	-	-

Stratigraphic unit: Pilliga Sandstone
Date range: 20/4/1971 to 27/5/1999
ISS – insufficient sample size

Table 4-24 Baseline data for groundwater quality monitoring at location GW030310-2

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	1	0.08	0.08	ISS	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	2	711	760	736	ISS	ISS
B (mg/L)	1	0.2	0.2	ISS	ISS	ISS
Ca (mg/L)	1	8.6	8.6	ISS	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	0	-	-	-	-	-
Cl (mg/L)	2	54	55	54	ISS	ISS
EC (field) (µS/cm)	0	-	-	-	-	-
EC @ 25C (lab) (µS/cm)	2	760.3	1250	1005	ISS	ISS
F (mg/L)	0	-	-	-	-	-
Li (mg/L)	1	0.03	0.03	ISS	ISS	ISS
Mg (mg/L)	1	1.5	1.5	ISS	ISS	ISS
Mn (mg/L)	1	0.005	0.005	ISS	ISS	ISS
pH (field)	2	7.4	8.3	7.8	ISS	ISS
pH (lab)	0	-	-	-	-	-
K (mg/L)	2	2.3	2.4	2.4	ISS	ISS
Na (mg/L)	2	279	343	311	ISS	ISS
SAR	0	-	-	-	-	-
Sr (mg/L)	1	0.2	0.2	ISS	ISS	ISS
Sulfate as SO_4^{2-}	2	0.48	1	0.74	ISS	ISS

Stratigraphic unit: Pilliga Sandstone
Date range: 27/2/1985 to 30/5/1999
ISS – insufficient sample size

Table 4-25 Baseline data for groundwater quality monitoring at location GW030400-1

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	0	-	-	-	-	-
HCO_3 alkalinity as $CaCO_3$ (mg/L)	7	212	232	221	214	229
B (mg/L)	0	-	-	-	-	-
Ca (mg/L)	0	-	-	-	-	-
CO_3 alkalinity as $CaCO_3$ (mg/L)	4	0.3	1	0.83	ISS	ISS
Cl (mg/L)	7	8.9	12	11	9.1	12
EC (field) (µS/cm)	0	-	-	-	-	-
EC @ 25C (lab) (µS/cm)	7	355	390	367	356	385
F (mg/L)	1	0.23	0.23	ISS	ISS	ISS
Li (mg/L)	0	-	-	-	-	-
Mg (mg/L)	0	-	-	-	-	-
Mn (mg/L)	0	-	-	-	-	-
pH (field)	7	7.2	8.2	8	7.4	8.2
pH (lab)	0	-	-	-	-	-
K (mg/L)	6	2	6.3	2.9	2	5.8
Na (mg/L)	6	24	34	27	24	34
SAR	0	-	-	-	-	-
Sr (mg/L)	0	-	-	-	-	-
Sulfate as SO_4^{2-}	6	3.8	14	8.3	4	14

Stratigraphic unit: Pilliga Sandstone
Date range: 15/8/1973 to 23/1/1985
ISS – insufficient sample size

Table 4-26 Baseline data for groundwater quality monitoring at location BHN14PRORA01

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	6	0.6	0.9	0.7	0.6	0.8
HCO_3 alkalinity as $CaCO_3$ (mg/L)	6	178	262	205.5	178.2	256.7
B (mg/L)	6	< 0.05	0.2	0.1	0.1	0.2
Ca (mg/L)	6	21	36	30.5	21.5	35.8
CO_3 alkalinity as $CaCO_3$ (mg/L)	6	< 1	< 1	1	1	1
Cl (mg/L)	6	30	39	33.5	30.1	38.5
EC (field) (µS/cm)	9	490	930	576	498.5	733.2
EC @ 25C (lab) (µS/cm)	6	474	600	523.2	476.6	596.6
F (mg/L)	6	< 0.1	0.3	0.2	0.1	0.3
Li (mg/L)	2	0.005	0.016	0.011	ISS	ISS
Mg (mg/L)	6	7	11	8.8	7.1	10.9
Mn (mg/L)	6	0.1	0.7	0.3	0.1	0.6
pH (field)	9	6.7	7.4	7.1	6.8	7.3
pH (lab)	6	7.3	8.3	7.7	7.4	8.3
K (mg/L)	6	4	5	4.3	4	5
Na (mg/L)	6	62	89	68.8	62	87.1
SAR	2	3	3.3	3.2	ISS	ISS
Sr (mg/L)	6	0.5	0.6	0.5	0.5	0.6
Sulfate as SO_4^{2-}	6	< 1	11	5.3	1.1	10.8

Stratigraphic unit: Orallo Formation
Date range: 14/12/2013 to 14/7/2016
ISS – insufficient sample size

Table 4-27 Baseline data for groundwater quality monitoring at location NYOPRORA01

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	9	0.1	0.4	0.2	0.1	0.3
HCO_3 alkalinity as $CaCO_3$ (mg/L)	9	420	684	562.8	492	630
B (mg/L)	9	0.2	0.3	0.3	0.2	0.3
Ca (mg/L)	9	1	9	4.7	1.6	7.2
CO_3 alkalinity as $CaCO_3$ (mg/L)	9	3	89	26.4	5.4	59.6
Cl (mg/L)	9	48	63	56.9	51	62.4
EC (field) (µS/cm)	7	1263	1468	1353	1272.2	1461.8
EC @ 25C (lab) (µS/cm)	8	1090	1360	1311.3	1186.8	1360
F (mg/L)	9	0.9	1.1	1	0.9	1.1
Li (mg/L)	5	0.024	0.044	0.036	ISS	ISS
Mg (mg/L)	9	< 1	4	1.3	1	2.2
Mn (mg/L)	9	0.003	0.063	0.029	0	0.1
pH (field)	7	7.5	8.2	7.9	7.6	8.2
pH (lab)	8	8.3	8.9	8.5	8.3	8.8
K (mg/L)	9	2	12	3.7	2	8.4
Na (mg/L)	9	266	343	320.3	291.8	342.4
SAR	5	18.5	85.3	41.5	ISS	ISS
Sr (mg/L)	8	0.11	0.17	0.15	0.1	0.2
Sulfate as SO_4^{2-}	9	< 1	< 10	2	1	4.6

Stratigraphic unit: Orallo Formation
Date range: 30/11/2013 to 19/7/2016
ISS – insufficient sample size

Table 4-28 Baseline data for groundwater quality monitoring at location 7703

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	2	0.08	0.08	0.08	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	2	432	439	436	ISS	ISS
B (mg/L)	2	0.06	0.08	0.07	ISS	ISS
Ca (mg/L)	2	15	20	18	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	2	1	1	1	ISS	ISS
Cl (mg/L)	2	698	721	710	ISS	ISS
EC (field) (µS/cm)	2	2991	3079	3035	ISS	ISS
EC @ 25C (lab) (µS/cm)	2	2980	3280	3130	ISS	ISS
F (mg/L)	2	0.6	0.6	0.6	ISS	ISS
Li (mg/L)	2	0.001	0.001	0.001	ISS	ISS
Mg (mg/L)	2	14	17	16	ISS	ISS
Mn (mg/L)	2	0.03	0.04	0.04	ISS	ISS
pH (field)	2	6.9	8.9	7.9	ISS	ISS
pH (lab)	2	7.7	7.8	7.8	ISS	ISS
K (mg/L)	2	12	13	13	ISS	ISS
Na (mg/L)	2	586	638	612	ISS	ISS
SAR	2	23	29	26	ISS	ISS
Sr (mg/L)	2	0.5	0.5	0.5	ISS	ISS
Sulfate as SO_4^{2-}	2	37	57	47	ISS	ISS

Stratigraphic unit: Orallo Formation
Date range: 25/5/2012 to 7/5/2014
ISS – insufficient sample size

Table 4-29 Baseline data for groundwater quality monitoring at location 7705

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	2	0.1	0.1	0.1	ISS	ISS
HCO3 alkalinity as CaCO3 (mg/L)	2	327	343	335	ISS	ISS
B (mg/L)	2	0.05	0.05	0.05	ISS	ISS
Ca (mg/L)	2	9	12	11	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	2	1	1	1	ISS	ISS
Cl (mg/L)	2	175	180	178	ISS	ISS
EC (field) (µS/cm)	2	1141	1163	1152	ISS	ISS
EC @ 25C (lab) (µS/cm)	2	1140	1220	1180	ISS	ISS
F (mg/L)	2	0.4	0.4	0.4	ISS	ISS
Li (mg/L)	2	0.001	0.001	0.001	ISS	ISS
Mg (mg/L)	2	8	10	9	ISS	ISS
Mn (mg/L)	2	0.004	0.01	0.009	ISS	ISS
pH (field)	2	6.4	8.3	7.4	ISS	ISS
pH (lab)	2	7.4	7.6	7.5	ISS	ISS
K (mg/L)	2	8	9	8.5	ISS	ISS
Na (mg/L)	2	220	236	228	ISS	ISS
SAR	2	11	14	13	ISS	ISS
Sr (mg/L)	2	0.2	0.2	0.2	ISS	ISS
Sulfate as SO_4^{2-}	2	30	37	34	ISS	ISS

Stratigraphic unit: Orallo Formation
Date range: 25/5/2012 to 7/5/2014
ISS – insufficient sample size

Table 4-30 Baseline data for groundwater quality monitoring at location 7706

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	2	0.2	0.2	0.2	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	2	222	226	224	ISS	ISS
B (mg/L)	2	0.05	0.05	0.05	ISS	ISS
Ca (mg/L)	2	37	39	38	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	2	1	1	1	ISS	ISS
Cl (mg/L)	2	25	27	26	ISS	ISS
EC (field) (µS/cm)	2	470	531	501	ISS	ISS
EC @ 25C (lab) (µS/cm)	2	471	486	479	ISS	ISS
F (mg/L)	2	0.1	0.1	0.1	ISS	ISS
Li (mg/L)	2	0.03	0.03	0.03	ISS	ISS
Mg (mg/L)	2	8	8	8	ISS	ISS
Mn (mg/L)	2	0.04	0.05	0.04	ISS	ISS
pH (field)	2	6.8	7.4	7.1	ISS	ISS
pH (lab)	2	7.9	8	7.9	ISS	ISS
K (mg/L)	2	6	8	7	ISS	ISS
Na (mg/L)	2	53	54	54	ISS	ISS
SAR	2	2.1	2.1	2.1	ISS	ISS
Sr (mg/L)	2	0.3	0.3	0.3	ISS	ISS
Sulfate as SO_4^{2-}	2	1	1	1	ISS	ISS

Stratigraphic unit: Orallo Formation
Date range: 25/5/2012 to 25/6/2014
ISS – insufficient sample size

4.2.3 Namoi Alluvium Monitoring Bores

Table 4-31 to Table 4-43 are statistical summaries of the baseline data for groundwater quality at monitoring locations within the Namoi alluvium. Statistical measures of the spread and central tendency of the data are calculated for monitoring locations with more than two samples; however,

these measures may not be statistically significant if the number of samples is small. For large and normally-distributed data populations, the 16th and 84th percentiles represent -1 and +1 standard deviations from the mean, respectively. Approximately 68% of a data population lies within the 16th and 84th percentiles. A sample size greater than or equal to six is needed to identify the 16th and 84th percentiles.

The locations of monitoring bores are shown in Figure 3-3.

Table 4-31 Baseline data for groundwater quality monitoring at location GW021266-1

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	0	-	-	-	-	-
HCO_3 alkalinity as $CaCO_3$ (mg/L)	19	164	1190	347	175	585
B (mg/L)	0	-	-	-	-	-
Ca (mg/L)	0	-	-	-	-	-
CO_3 alkalinity as $CaCO_3$ (mg/L)	17	1	36	10	1	23
Cl (mg/L)	19	9.9	52	31	10	50
EC (field) (µS/cm)	0	-	-	-	-	-
EC @ 25C (lab) (µS/cm)	20	318	2390	661.4	327.7	1080
F (mg/L)	0	-	-	-	-	-
Li (mg/L)	0	-	-	-	-	-
Mg (mg/L)	0	-	-	-	-	-
Mn (mg/L)	0	-	-	-	-	-
pH (field)	19	7.5	8.9	8.1	7.6	8.6
pH (lab)	0	-	-	-	-	-
K (mg/L)	19	0.78	23	2.8	1.2	2.3
Na (mg/L)	19	36.1	244	93.7	45.7	215
SAR	0	-	-	-	-	-
Sr (mg/L)	0	-	-	-	-	-
Sulfate as SO_4^{2-}	18	0.96	23	9.9	2.5	18

Stratigraphic unit: Namoi alluvium
Date range: 1/4/1966 to 21/9/1999

Table 4-32 Baseline data for groundwater quality monitoring at location GW021437-2

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	0	-	-	-	-	-
HCO_3 alkalinity as $CaCO_3$ (mg/L)	6	171	801	408	173	773
B (mg/L)	0	-	-	-	-	-
Ca (mg/L)	0	-	-	-	-	-
CO_3 alkalinity as $CaCO_3$ (mg/L)	2	33.9	126	80	ISS	ISS
Cl (mg/L)	6	25.5	158	104	29.4	155
EC (field) (µS/cm)	0	-	-	-	-	-
EC @ 25C (lab) (µS/cm)	6	387	1370	1041	433	1370
F (mg/L)	0	-	-	-	-	-
Li (mg/L)	0	-	-	-	-	-
Mg (mg/L)	0	-	-	-	-	-
Mn (mg/L)	0	-	-	-	-	-
pH (field)	6	7	9.6	8.2	7.1	9.4
pH (lab)	0	-	-	-	-	-
K (mg/L)	6	1.6	5.5	3.6	1.6	5.4
Na (mg/L)	6	35.9	312	220	51.1	311
SAR	0	-	-	-	-	-
Sr (mg/L)	0	-	-	-	-	-
Sulfate as SO_4^{2-}	6	1	61	19	1	57

Stratigraphic unit: Namoi alluvium
Date range: 9/6/1967 to 22/3/1985
ISS – insufficient sample size

Table 4-33 Baseline data for groundwater quality monitoring at location GW025338-1

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	1	0.1	0.1	ISS	ISS	ISS
HCO3 alkalinity as CaCO3 (mg/L)	7	209	289	248	210	289
B (mg/L)	1	0.07	0.07	ISS	ISS	ISS
Ca (mg/L)	1	54	54	ISS	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	6	1	9.6	2.6	1	8.7
Cl (mg/L)	7	13	146	39.8	13.2	117
EC (field) (µS/cm)	2	990	997	ISS	ISS	ISS
EC @ 25C (lab) (µS/cm)	6	367	580	470	372	575
F (mg/L)	1	0.4	0.4	ISS	ISS	ISS
Li (mg/L)	1	0.001	0.001	ISS	ISS	ISS
Mg (mg/L)	1	36	36	ISS	ISS	ISS
Mn (mg/L)	1	0.001	0.001	ISS	ISS	ISS
pH (field)	8	6.3	8.6	7.7	6.5	8.5
pH (lab)	0	-	-	-	-	-
K (mg/L)	7	0.78	3.5	2	1	3.2
Na (mg/L)	7	68.1	123	94.4	68.6	120
SAR	0	-	-	-	-	-
Sr (mg/L)	1	0.7	0.7	ISS	ISS	ISS
Sulfate as SO_4^{2-}	6	4.1	75	20	4.1	68

Stratigraphic unit: Namoi alluvium
Date range: 14/11/1969 to 11/11/1999
ISS – insufficient sample size

Table 4-34 Baseline data for groundwater quality monitoring at location GW025343-1

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	0	-	-	-	-	-
HCO_3 alkalinity as $CaCO_3$ (mg/L)	10	794	1010	916	797	980
B (mg/L)	0	-	-	-	-	-
Ca (mg/L)	0	-	-	-	-	-
CO_3 alkalinity as $CaCO_3$ (mg/L)	10	1	47	16	1	37
Cl (mg/L)	10	115	242	150	118	231
EC (field) (µS/cm)	10	1556	2170	1827	1642	2155
EC @ 25C (lab) (µS/cm)	0	-	-	-	-	-
F (mg/L)	1	1	1	ISS	ISS	ISS
Li (mg/L)	0	-	-	-	-	-
Mg (mg/L)	0	-	-	-	-	-
Mn (mg/L)	0	-	-	-	-	-
pH (field)	10	7.6	8.8	8.3	8	8.7
pH (lab)	0	-	-	-	-	-
K (mg/L)	10	6.3	9.8	7.5	6.6	9.2
Na (mg/L)	10	366	520	426	372	470
SAR	0	-	-	-	-	-
Sr (mg/L)	0	-	-	-	-	-
Sulfate as SO_4^{2-}	10	3.7	60	12	4.5	22

Stratigraphic unit: Namoi alluvium
Date range: 15/12/1969 to 4/12/1986
ISS – insufficient sample size

Table 4-35 Baseline data for groundwater quality monitoring at location GW030070-1

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	1	0.001	0.001	ISS	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	14	125	671	221	132	130
B (mg/L)	1	0.03	0.03	ISS	ISS	ISS
Ca (mg/L)	1	34	34	ISS	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	8	0.3	3.6	1.2	0.61	0.61
Cl (mg/L)	14	7.8	96	39	9.6	9.6
EC (field) (µS/cm)	13	248	1190	518.2	276.9	275
EC @ 25C (lab) (µS/cm)	0	-	-	-	-	-
F (mg/L)	3	0.05	0.5	0.3	ISS	ISS
Li (mg/L)	1	0.001	0.001	ISS	ISS	ISS
Mg (mg/L)	1	17	17	ISS	ISS	ISS
Mn (mg/L)	1	0.001	0.001	ISS	ISS	ISS
pH (field)	14	6.3	8.3	7.7	7.1	7.1
pH (lab)	0	-	-	-	-	-
K (mg/L)	13	0.78	3.1	1.8	1.1	1.1
Na (mg/L)	14	15	240	56	23	23
SAR	0	-	-	-	-	-
Sr (mg/L)	1	0.4	0.4	ISS	ISS	ISS
Sulfate as SO_4^{2-}	13	6.2	41	18	7.6	7.6

Stratigraphic unit: Namoi alluvium
Date range: 22/5/1970 to 2/6/1999
ISS – insufficient sample size

Table 4-36 Baseline data for groundwater quality monitoring at location GW030070-2

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	1	0.1	0.1	ISS	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	1	261	261	ISS	ISS	ISS
B (mg/L)	1	0.05	0.05	ISS	ISS	ISS
Ca (mg/L)	1	55	55	ISS	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	0	-	-	-	-	-
Cl (mg/L)	1	55	55	ISS	ISS	ISS
EC (field) (µS/cm)	1	356	356	ISS	ISS	ISS
EC @ 25C (lab) (µS/cm)	0	-	-	-	-	-
F (mg/L)	0	-	-	-	-	-
Li (mg/L)	1	0.001	0.001	ISS	ISS	ISS
Mg (mg/L)	1	21	21	ISS	ISS	ISS
Mn (mg/L)	1	0.001	0.001	ISS	ISS	ISS
pH (field)	1	6.3	6.3	ISS	ISS	ISS
pH (lab)	0	-	-	-	-	-
K (mg/L)	1	1.9	1.9	ISS	ISS	ISS
Na (mg/L)	1	68	68	ISS	ISS	ISS
SAR	0	-	-	-	-	-
Sr (mg/L)	1	0.5	0.5	ISS	ISS	ISS
Sulfate as SO_4^{2-}	1	48	48	ISS	ISS	ISS

Stratigraphic unit: Namoi alluvium
Date range: 2/6/1999 to 2/6/1999
ISS – insufficient sample size

Table 4-37 Baseline data for groundwater quality monitoring at location GW030070-3

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	1	0.03	0.03	ISS	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	1	178	178	ISS	ISS	ISS
B (mg/L)	1	0.04	0.04	ISS	ISS	ISS
Ca (mg/L)	1	7.1	7.1	ISS	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	0	-	-	-	-	-
Cl (mg/L)	1	13	13	ISS	ISS	ISS
EC (field) (µS/cm)	1	308	308	ISS	ISS	ISS
EC @ 25C (lab) (µS/cm)	0	-	-	-	-	-
F (mg/L)	0	-	-	-	-	-
Li (mg/L)	1	0.001	0.001	ISS	ISS	ISS
Mg (mg/L)	1	3.9	3.9	ISS	ISS	ISS
Mn (mg/L)	1	0.01	0.01	ISS	ISS	ISS
pH (field)	1	6.4	6.4	ISS	ISS	ISS
pH (lab)	0	-	-	-	-	-
K (mg/L)	1	0.66	0.66	ISS	ISS	ISS
Na (mg/L)	1	65	65	ISS	ISS	ISS
SAR	0	-	-	-	-	-
Sr (mg/L)	1	0.1	0.1	ISS	ISS	ISS
Sulfate as SO_4^{2-}	1	8.3	8.3	ISS	ISS	ISS

Stratigraphic unit: Namoi alluvium
Date range: 2/6/1999 to 2/6/1999
ISS – insuffucuent sample size

Table 4-38 Baseline data for groundwater quality monitoring at location GW030117-1

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	1	0.02	0.02	ISS	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	5	319	583	479	ISS	ISS
B (mg/L)	1	0.1	0.1	ISS	ISS	ISS
Ca (mg/L)	1	1.7	1.7	ISS	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	3	1	24	8.7	ISS	ISS
Cl (mg/L)	5	44.3	167	72.4	ISS	ISS
EC (field) (µS/cm)	5	880	987	949	ISS	ISS
EC @ 25C (lab) (µS/cm)	0	-	-	-	-	-
F (mg/L)	2	0.76	1.1	0.95	ISS	ISS
Li (mg/L)	1	0.01	0.01	ISS	ISS	ISS
Mg (mg/L)	1	0.3	0.3	ISS	ISS	ISS
Mn (mg/L)	1	0.007	0.007	ISS	ISS	ISS
pH (field)	5	7.6	8.5	8	ISS	ISS
pH (lab)	0	-	-	-	-	-
K (mg/L)	4	0.08	7.8	3.1	ISS	ISS
Na (mg/L)	4	202	248	222	ISS	ISS
SAR	0	-	-	-	-	-
Sr (mg/L)	1	0.06	0.06	ISS	ISS	ISS
Sulfate as SO_4^{2-}	4	1	9.6	4.3	ISS	ISS

Stratigraphic unit: Namoi alluvium
Date range: 7/3/1972 to 28/5/1999
ISS – insufficient sample size

Table 4-39 Baseline data for groundwater quality monitoring at location GW030117-2

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	1	0.02	0.02	ISS	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	1	578	578	ISS	ISS	ISS
B (mg/L)	1	0.1	0.1	ISS	ISS	ISS
Ca (mg/L)	1	4	4	ISS	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	0	-	-	-	-	-
Cl (mg/L)	1	54	54	ISS	ISS	ISS
EC (field) (µS/cm)	1	986	986	ISS	ISS	ISS
EC @ 25C (lab) (µS/cm)	0	-	-	-	-	-
F (mg/L)	0	-	-	-	-	-
Li (mg/L)	1	0.01	0.01	ISS	ISS	ISS
Mg (mg/L)	1	0.9	0.9	ISS	ISS	ISS
Mn (mg/L)	1	0.01	0.01	ISS	ISS	ISS
pH (field)	1	7.9	7.9	ISS	ISS	ISS
pH (lab)	0	-	-	-	-	-
K (mg/L)	1	1	1	ISS	ISS	ISS
Na (mg/L)	1	273	273	ISS	ISS	ISS
SAR	0	-	-	-	-	-
Sr (mg/L)	1	0.06	0.06	ISS	ISS	ISS
Sulfate as SO_4^{2-}	1	1	1	ISS	ISS	ISS

Stratigraphic unit: Namoi alluvium
Date range: 28/5/1999 to 28/5/1999
ISS – insufficient sample size

Table 4-40 Baseline data for groundwater quality monitoring at location GW030117-3

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	1	0.03	0.03	ISS	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	1	486	486	ISS	ISS	ISS
B (mg/L)	1	0.1	0.1	ISS	ISS	ISS
Ca (mg/L)	1	2.7	2.7	ISS	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	0	-	-	-	-	-
Cl (mg/L)	1	37	37	ISS	ISS	ISS
EC (field) (µS/cm)	1	815	815	ISS	ISS	ISS
EC @ 25C (lab) (µS/cm)	0	-	-	-	-	-
F (mg/L)	0	-	-	-	-	-
Li (mg/L)	1	0.01	0.01	ISS	ISS	ISS
Mg (mg/L)	1	0.7	0.7	ISS	ISS	ISS
Mn (mg/L)	1	0.02	0.02	ISS	ISS	ISS
pH (field)	1	7.9	7.9	ISS	ISS	ISS
pH (lab)	0	-	-	-	-	-
K (mg/L)	1	0.39	0.39	ISS	ISS	ISS
Na (mg/L)	1	196	196	ISS	ISS	ISS
SAR	0	-	-	-	-	-
Sr (mg/L)	1	0.08	0.08	ISS	ISS	ISS
Sulfate as SO_4^{2-}	1	1	1	ISS	ISS	ISS

Stratigraphic unit: Namoi alluvium
Date range: 28/5/1999 to 28/5/1999
ISS – insufficient sample size

Table 4-41 Baseline data for groundwater quality monitoring at location GW030278-1

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	0	-	-	-	-	-
HCO_3 alkalinity as $CaCO_3$ (mg/L)	1	235	235	ISS	ISS	ISS
B (mg/L)	0	-	-	-	-	-
Ca (mg/L)	0	-	-	-	-	-
CO_3 alkalinity as $CaCO_3$ (mg/L)	0	-	-	-	-	-
Cl (mg/L)	1	43	43	ISS	ISS	ISS
EC (field) (µS/cm)	1	520	520	ISS	ISS	ISS
EC @ 25C (lab) (µS/cm)	0	-	-	-	-	-
F (mg/L)	0	-	-	-	-	-
Li (mg/L)	0	-	-	-	-	-
Mg (mg/L)	0	-	-	-	-	-
Mn (mg/L)	0	-	-	-	-	-
pH (field)	1	7.9	7.9	ISS	ISS	ISS
pH (lab)	0	-	-	-	-	-
K (mg/L)	1	2.3	2.3	ISS	ISS	ISS
Na (mg/L)	1	37	37	ISS	ISS	ISS
SAR	0	-	-	-	-	-
Sr (mg/L)	0	-	-	-	-	-
Sulfate as SO_4^{2-}	1	2.4	2.4	ISS	ISS	ISS

Stratigraphic unit: Namoi alluvium
Date range: 21/11/1978 to 21/11/1978
ISS – insufficient sample size

Table 4-42 Baseline data for groundwater quality monitoring at location GW030310-1

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	1	0.2	0.2	ISS	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	5	711	907	767	ISS	ISS
B (mg/L)	1	0.2	0.2	ISS	ISS	ISS
Ca (mg/L)	1	8.5	8.5	ISS	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	4	1	60	16	ISS	ISS
Cl (mg/L)	5	53	96	64	ISS	ISS
EC (field) (µS/cm)	5	1227	1450	1340	ISS	ISS
EC @ 25C (lab) (µS/cm)	0	-	-	-	-	-
F (mg/L)	3	1	2	2	ISS	ISS
Li (mg/L)	1	0.02	0.02	ISS	ISS	ISS
Mg (mg/L)	1	2.7	2.7	ISS	ISS	ISS
Mn (mg/L)	1	0.2	0.2	ISS	ISS	ISS
pH (field)	5	7.2	8.8	8.1	ISS	ISS
pH (lab)	0	-	-	-	-	-
K (mg/L)	5	1.6	5.3	3.6	ISS	ISS
Na (mg/L)	5	268	375	323	ISS	ISS
SAR	0	-	-	-	-	-
Sr (mg/L)	1	0.2	0.2	ISS	ISS	ISS
Sulfate as SO_4^{2-}	4	0.48	7.2	3.7	ISS	ISS

Stratigraphic unit: Namoi alluvium
Date range: 16/8/1976 to 31/5/1999
ISS – insufficient sample size

Table 4-43 Baseline data for groundwater quality monitoring at location GW036005-2

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	0	-	-	-	-	-
HCO_3 alkalinity as $CaCO_3$ (mg/L)	6	327	379	339	327	374
B (mg/L)	0	-	-	-	-	-
Ca (mg/L)	0	-	-	-	-	-
CO_3 alkalinity as $CaCO_3$ (mg/L)	4	1	1	1	ISS	ISS
Cl (mg/L)	6	32	60	42	32	59
EC (field) (µS/cm)	6	620	795	674	621	785
EC @ 25C (lab) (µS/cm)	0	-	-	-	-	-
F (mg/L)	0	-	-	-	-	-
Li (mg/L)	0	-	-	-	-	-
Mg (mg/L)	0	-	-	-	-	-
Mn (mg/L)	0	-	-	-	-	-
pH (field)	6	7.4	8.1	7.8	7.4	8.1
pH (lab)	0	-	-	-	-	-
K (mg/L)	6	1	3.5	1.9	1	3.4
Na (mg/L)	6	42	81	68	43	80
SAR	0	-	-	-	-	-
Sr (mg/L)	0	-	-	-	-	-
Sulfate as SO_4^{2-}	6	13	28	19	13	27

Stratigraphic unit: Namoi alluvium
Date range: 4/6/1974 to 6/9/1984
ISS – insufficient sample size

4.2.4 Bohena Creek Alluvium Monitoring Bores

Table 4-44 to Table 4-47 are statistical summaries of the baseline data for groundwater quality at monitoring locations within the Bohena Creek alluvium. Statistical measures of the spread and central tendency of the data are calculated for monitoring locations with more than two samples; however, these measures may not be statistically significant if the number of samples is small. For large and normally-distributed data populations, the 16th and 84th percentiles represent -1 and +1 standard deviations from the mean, respectively. Approximately 68% of a data population lies within the 16th and 84th percentiles. A sample size greater than or equal to six is needed to identify the 16th and 84th percentiles.

The locations of monitoring bores are shown in Figure 3-3.

Table 4-44 Baseline data for groundwater quality monitoring at location BHNCKMW1

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	2	0.06	0.06	0.06	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	2	42	50	46	ISS	ISS
B (mg/L)	2	0.05	0.05	0.05	ISS	ISS
Ca (mg/L)	2	7	7	7	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	2	1	1	1	ISS	ISS
Cl (mg/L)	2	28	34	31	ISS	ISS
EC (field) (µS/cm)	1	240	240	ISS	ISS	ISS
EC @ 25C (lab) (µS/cm)	2	200	207	204	ISS	ISS
F (mg/L)	2	0.1	0.1	0.1	ISS	ISS
Li (mg/L)	2	0.001	0.001	0.001	ISS	ISS
Mg (mg/L)	2	7	7	7	ISS	ISS
Mn (mg/L)	2	0.48	0.54	0.51	ISS	ISS
pH (field)	2	6.6	6.7	6.7	ISS	ISS
pH (lab)	1	6.9	6.9	ISS	ISS	ISS
K (mg/L)	2	2	2	2	ISS	ISS
Na (mg/L)	2	14	16	15	ISS	ISS
SAR	2	0.9	1.02	0.96	ISS	ISS
Sr (mg/L)	2	0.14	0.16	0.15	ISS	ISS
Sulfate as SO_4^{2-}	2	1	1	1	ISS	ISS

Stratigraphic unit: Bohena Creek alluvium
Date range: 17/7/2013 to 25/10/2013
ISS – insufficient sample size

Table 4-45 Baseline data for groundwater quality monitoring at location BHNCKMW2

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	2	0.09	0.1	0.1	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	2	40	52	46	ISS	ISS
B (mg/L)	2	0.05	0.05	0.05	ISS	ISS
Ca (mg/L)	2	3	5	4	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	2	1	1	1	ISS	ISS
Cl (mg/L)	2	18	20	19	ISS	ISS
EC (field) (µS/cm)	1	175	175	ISS	ISS	ISS
EC @ 25C (lab) (µS/cm)	2	137	171	154	ISS	ISS
F (mg/L)	2	0.1	0.1	0.1	ISS	ISS
Li (mg/L)	2	0.001	0.001	0.001	ISS	ISS
Mg (mg/L)	2	3	5	4	ISS	ISS
Mn (mg/L)	2	0.5	0.6	0.5	ISS	ISS
pH (field)	2	6.4	6.6	6.5	ISS	ISS
pH (lab)	1	6.7	6.7	ISS	ISS	ISS
K (mg/L)	2	2	3	2.5	ISS	ISS
Na (mg/L)	2	12	18	15	ISS	ISS
SAR	2	1.2	1.4	1.3	ISS	ISS
Sr (mg/L)	2	0.09	0.1	0.1	ISS	ISS
Sulfate as SO_4^{2-}	2	1	2	1.5	ISS	ISS

Stratigraphic unit: Bohena Creek alluvium
Date range: 17/7/2013 to 25/10/2013
ISS – insufficient sample size

Table 4-46 Baseline data for groundwater quality monitoring at location BHNCKMW3

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	2	0.08	0.1	0.1	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	2	41	54	48	ISS	ISS
B (mg/L)	2	0.05	0.05	0.05	ISS	ISS
Ca (mg/L)	2	3	4	3.5	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	2	1	1	1	ISS	ISS
Cl (mg/L)	2	20	20	20	ISS	ISS
EC (field) (µS/cm)	1	173	173	ISS	ISS	ISS
EC @ 25C (lab) (µS/cm)	2	146	186	166	ISS	ISS
F (mg/L)	2	0.1	0.1	0.1	ISS	ISS
Li (mg/L)	2	0.001	0.001	0.001	ISS	ISS
Mg (mg/L)	2	4	6	5	ISS	ISS
Mn (mg/L)	2	0.2	0.5	0.3	ISS	ISS
pH (field)	2	6.2	6.4	6.3	ISS	ISS
pH (lab)	1	6.3	6.3	ISS	ISS	ISS
K (mg/L)	2	1	2	1.5	ISS	ISS
Na (mg/L)	2	16	22	19	ISS	ISS
SAR	2	1.4	1.6	1.5	ISS	ISS
Sr (mg/L)	2	0.07	0.09	0.08	ISS	ISS
Sulfate as SO_4^{2-}	2	1	1	1	ISS	ISS

Stratigraphic unit: Bohena Creek alluvium
Date range: 17/10/2013 to 25/10/2013
ISS – insufficient sample size

Table 4-47 Baseline data for groundwater quality monitoring at location BHNCKMW4

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Percentile 16%	Percentile 84%
Ba (mg/L)	2	0.04	0.08	0.06	ISS	ISS
HCO_3 alkalinity as $CaCO_3$ (mg/L)	2	56	88	72	ISS	ISS
B (mg/L)	2	0.05	0.05	0.05	ISS	ISS
Ca (mg/L)	2	6	8	7	ISS	ISS
CO_3 alkalinity as $CaCO_3$ (mg/L)	2	1	1	1	ISS	ISS
Cl (mg/L)	2	32	35	34	ISS	ISS
EC (field) (µS/cm)	1	270	270	ISS	ISS	ISS
EC @ 25C (lab) (µS/cm)	2	236	290	263	ISS	ISS
F (mg/L)	2	0.1	0.1	0.1	ISS	ISS
Li (mg/L)	2	0.001	0.001	0.001	ISS	ISS
Mg (mg/L)	2	8	9	8.5	ISS	ISS
Mn (mg/L)	2	0.6	0.8	0.7	ISS	ISS
pH (field)	2	6.7	6.7	6.7	ISS	ISS
pH (lab)	1	6.8	6.8	ISS	ISS	ISS
K (mg/L)	2	3	3	3	ISS	ISS
Na (mg/L)	2	27	31	29	ISS	ISS
SAR	2	1.6	2	1.8	ISS	ISS
Sr (mg/L)	2	0.11	0.13	0.12	ISS	ISS
Sulfate as SO_4^{2-}	2	1	1	1	ISS	ISS

Stratigraphic unit: Bohena Creek alluvium
Date range: 17/7/2013 to 22/10/2013
ISS – insufficient sample size

Section 5 Surface Water Baseline Data

5.1 Streamflow Data

The baseline for surface water flow consists of data from six streamflow gauging station that are owned and operated by DPI Water. A summary of these data is given in Table 5-1, including the number of days within the period of record that have flow readings recorded, the start and end dates for the period of record, and the area of catchment contributing to flow at the gauging location.

The locations of the streamflow gauging station are shown in Figure 3-5 in in Section 3.

Table 5-1 Overview of baseline data for streamflow

Station Name	Station Number	No. of Days with Readings	Period of Record		Catchment Area (km²)
			Start Date	End Date	
Bohena Ck at Newell Highway	419905	3583	02/09/1995	12/12/2010	2,180
Namoi River at Boggabri	419012	13392	22/09/1979	01/09/2015	22,600
Namoi River at Turrawan	419023	7322	21/05/1995	01/09/2015	24,500
Narrabri Creek at Narrabri	419003	30042	01/02/1913	01/09/2015	25,400
Namoi River at Mollee	419039	15495	13/10/1972	01/09/2015	27,800
Namoi at D/S Gunidgera Weir	419059	14257	08/04/1976	01/09/2015	28,400

5.1.1 Namoi River

Table 5-2 is a summary of the daily streamflow records that form the baseline surface water flow in the Namoi River. Flow in the Namoi River is perennial, with all six gauging station having records of zero flow.

Near Narrabri, the Namoi drainage has two branches, the Namoi River to the south and Narrabri Creek to the north (gauging station 419003). Narrabri Creek extends roughly 15 km, from around 4 km upstream of Narrabri to around 3 km upstream of Mollee Weir and carries most of the low to moderate flow events. The Namoi River at Narrabri is only activated during high flow events.

Graphs of the historical daily flows at the baseline gauging stations are shown in Figure 5-1, and flow duration curves for the gauging stations are shown in Figure 5-2.

Table 5-2 Baseline data for streamflow in the Namoi River

Station Name	Station Number	Flow, ML/d					
		Start Date	End Date	Min.	Max.	Mean	Median
Namoi River at Boggabri	419012	22/9/1979	1/9/2015	0	323,352	1,859	400
Namoi River at Turrawan	419023	21/5/1995	1/9/2015	0	165,903	1,427	231
Narrabri Creek at Narrabri	419003	1/2/1913	1/9/2015	0	179,312	1,544	436
Namoi River at Mollee	419039	13/10/1972	1/9/2015	0	187,920	2,017	552
Namoi at D/S Gunidgera Weir	419059	8/4/1976	1/9/2015	0	141,008	1,314	218

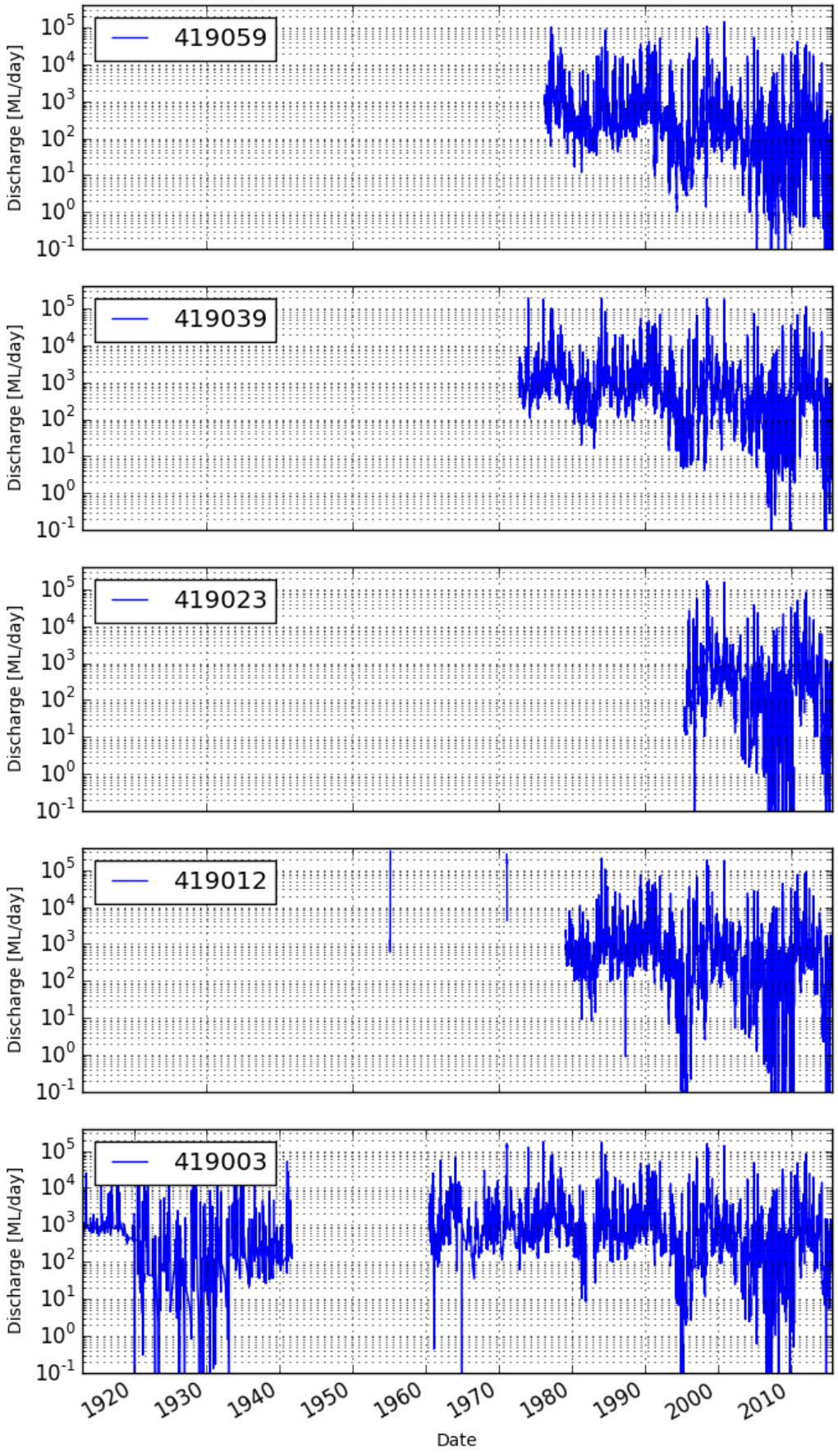


Figure 5-1 Historical daily flow at the baseline gauging stations on the Namoi River

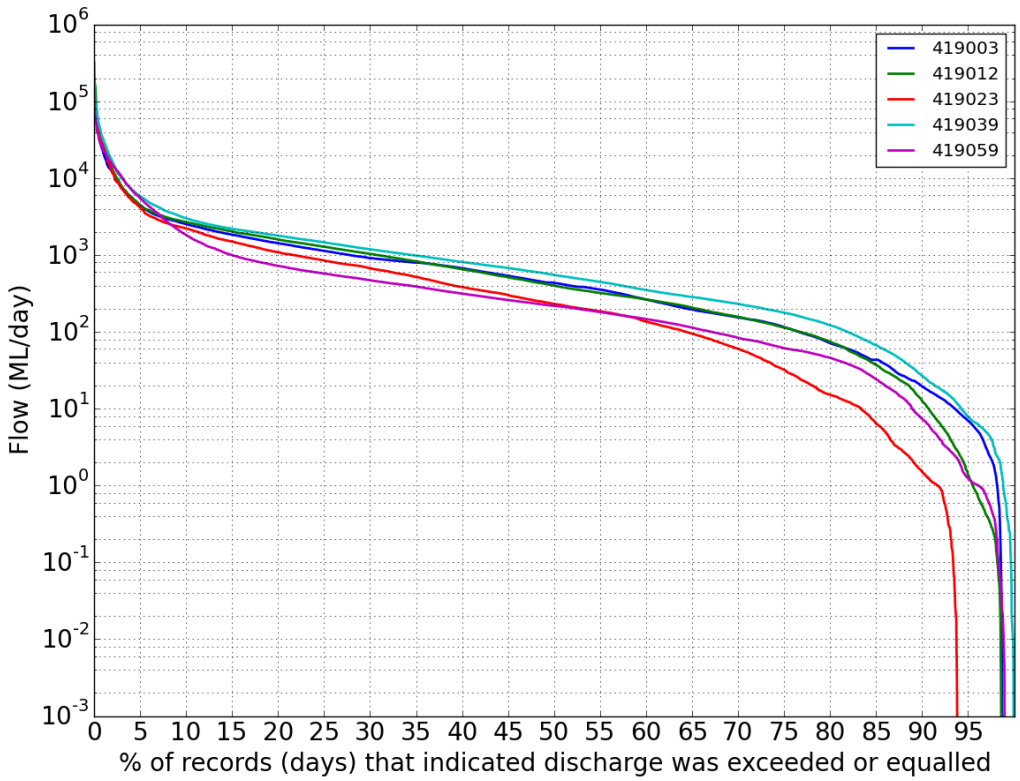


Figure 5-2 Flow duration curves at the baseline gauging stations on the Namoi River

5.1.2 Bohena Creek

Table 5-3 is a summary of the daily streamflow data that forms the baseline for surface flow in Bohena Creek at Newell Highway. Flow records end in 2010; however, water level has been recorded since then but not converted to flows.

A graph of the historical daily streamflow and a flow duration curve are shown in Figure 5-3 and Figure 5-4, respectively. It can be seen that records of streamflow are sparse. Flows were recorded on only 15 percent of days between September 1995 and June 2005.

Table 5-3 Baseline data for streamflow in Bohena Creek

Station Name	Station Number	Flow, ML/d					
		Start Date	End Date	Min.	Max.	Mean	Median
Bohena Ck at Newell Highway	419905	2/9/1995	12/12/2010	0	20,820	128	0

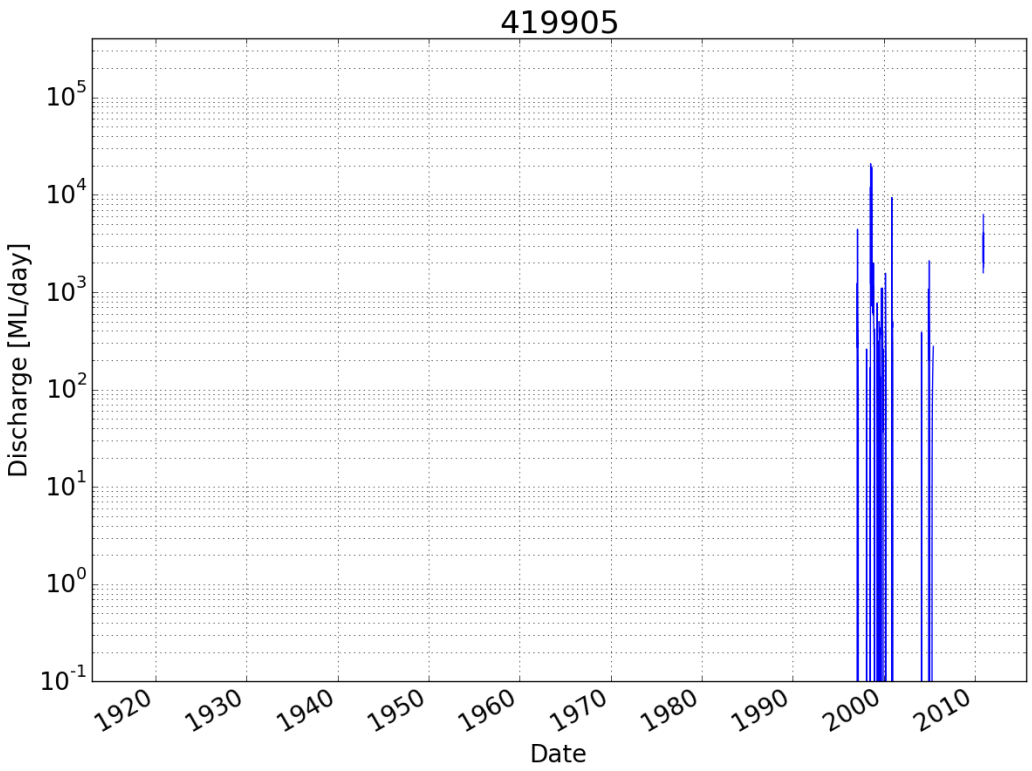


Figure 5-3 Historical daily flow in Bohena Creek at Newell Highway

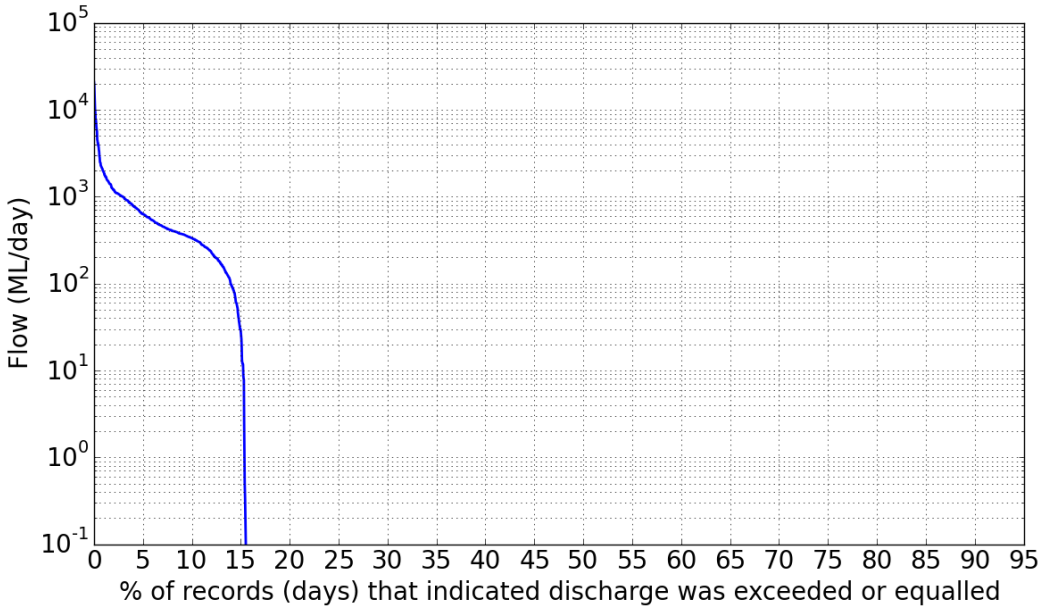


Figure 5-4 Flow duration curve for Bohena Creek

5.2 Surface Water Quality

The surface water monitoring stations that constitute the baseline for groundwater quality are listed in Table 3-4 in Section 3, and the locations are shown in Figure 3-6. Summary tables for the individual monitoring stations are presented below in sections 5.2.1 and 5.2.2.

5.2.1 Namoi River

Table 5-4 to Table 5-9 are summaries of the baseline data for surface water quality at monitoring stations along the Namoi River. Statistical measures of the spread and central tendency of the data are calculated for stations with more than two samples. For large and normally-distributed data populations, the 16th and 84th percentiles represent -1 and +1 standard deviations from the mean, respectively. Approximately 68% of a data population lies within the 16th and 84th percentiles. A sample size greater than or equal to six is needed to identify the 16th and 84th percentiles.

The locations of monitoring stations are shown in Figure 3-6.

Table 5-4 Baseline water quality data for surface water monitoring location 7504

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Median	Percentile 16%	Percentile 84%
pH (field)	17	5.7	8.2	7.5	7.5	7.1	8.1
K (mg/l)	17	5	11	7.4	7	5.9	10
F (mg/l)	17	<0.10	0.4	0.2	0.2	0.1	0.2
Ba (mg/l)	17	0.01	0.04	0.03	0.03	0.02	0.03
B (mg/l)	17	<0.05	0.06	-	-	-	-
Li (mg/l)	17	<0.001	<0.001	-	-	-	-
Sr (mg/l)	17	0.05	0.4	0.3	0.3	0.1	0.3
Mn (mg/l)	17	0.005	0.7	0.2	0.1	0.03	0.4
Na (mg/l)	17	7	44	27	25	13	40
Ca (mg/l)	17	3	42	23	24	7.9	31
Cl (mg/l)	17	6	39	22	21	9.8	31
TDS@180C (lab) (mg/l)	17	81	328	200	206	120	269
SAR	17	0.8	2	1	1	0.9	1
EC@25C (lab) (µS/cm)	16	82.2	596	357	352	244	481
Mg (mg/l)	17	2	23	12	13	4.9	17
SO4 (mg/l)	17	<1.0	14	3.8	2	1	10

Water course: Namoi River
Date range: 24/2/2012 to 10/4/2014

Table 5-5 Baseline water quality data for surface water monitoring location 7513

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Median	Percentile 16%	Percentile 84%
pH (field)	14	6.8	8.5	7.8	7.8	7	8.5
K (mg/l)	15	3	7	3.9	4	3	4.4
F (mg/l)	15	<0.10	0.2	0.2	0.2	0.1	0.2
Ba (mg/l)	15	0.02	0.05	0.03	0.03	0.02	0.04
B (mg/l)	15	<0.05	0.06	-	-	-	-
Li (mg/l)	15	<0.001	0.001	-	-	-	-
Sr (mg/l)	15	0.2	0.5	0.3	0.3	0.2	0.5
Mn (mg/l)	15	<0.001	0.003	0.002	0.002	0.001	0.003
Na (mg/l)	15	16	47	33	35	19	45
Ca (mg/l)	15	18	46	31	32	19	43
Cl (mg/l)	15	12	53	34	37	12	51
TDS@180C (lab) (mg/l)	15	120	373	268	294	187	343
SAR	15	0.7	1.4	1.1	1.2	0.86	1.4
EC@25C (lab) (µS/cm)	14	243	693	467	480	280	612
Mg (mg/l)	15	10	29	18	19	11	26
SO4 (mg/l)	15	15	42	27	27	17	35

Water course: Namoi River
Date range: 15/3/2012 to 9/4/2014

Table 5-6 Baseline water quality data for surface water monitoring location 7517

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Median	Percentile 16%	Percentile 84%
pH (field)	16	5.8	8.7	7.7	8	6.7	8.2
K (mg/l)	16	3	5	3.4	3	3	4
F (mg/l)	16	<0.10	0.3	0.2	0.2	0.1	0.2
Ba (mg/l)	16	<0.001	0.05	0.03	0.03	0.02	0.04
B (mg/l)	16	<0.05	0.4	-	-	-	-
Li (mg/l)	16	<0.001	0.004	0.001	0.001	0.001	0.001
Sr (mg/l)	16	<0.001	0.6	0.3	0.3	0.2	0.5
Mn (mg/l)	16	<0.001	0.04	0.006	0.003	0.002	0.008
Na (mg/l)	16	16	58	32	29	21	48
Ca (mg/l)	16	18	49	28	28	20	36
Cl (mg/l)	16	12	69	32	29	18	50
TDS@180C (lab) (mg/l)	16	131	425	244	228	161	328
SAR	16	0.7	1.6	1.1	1	0.87	1.4
EC@25C (lab) (µS/cm)	16	261	733	430	398	292	577
Mg (mg/l)	16	11	30	18	17	11	24
SO4 (mg/l)	16	1	47	25	26	16	34

Water course: Namoi River
Date range: 15/3/2012 to9/4/2014

Table 5-7 Baseline water quality data for surface water monitoring location 7529

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Median	Percentile 16%	Percentile 84%
pH (field)	15	6.7	8.7	7.8	8.1	6.9	8.4
K (mg/l)	15	3	6	3.9	4	3	5
F (mg/l)	15	0.1	0.5	0.2	0.2	0.1	0.2
Ba (mg/l)	15	0.02	0.05	0.03	0.03	0.02	0.05
B (mg/l)	15	<0.05	<0.05	-	-	-	-
Li (mg/l)	15	<0.001	0.001	-	-	-	-
Sr (mg/l)	15	0.2	0.5	0.3	0.3	0.2	0.5
Mn (mg/l)	15	<0.001	0.02	0.004	0.002	0.001	0.01
Na (mg/l)	15	15	58	33	32	20	50
Ca (mg/l)	15	18	48	30	27	20	44
Cl (mg/l)	15	11	86	37	30	18	63
TDS@180C (lab) (mg/l)	15	148	372	254	252	173	337
SAR	15	0.68	1.6	1.1	1	0.88	1.4
EC@25C (lab) (µS/cm)	15	255	734	433	416	283	648
Mg (mg/l)	15	10	31	18	16	11	28
SO4 (mg/l)	15	<1	37	26	24	15	35

Water course: Namoi River
Date range: 17/4/2012 to 9/4/2014

Table 5-8 Baseline water quality data for surface water monitoring location 7533

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Median	Percentile 16%	Percentile 84%
pH (field)	13	6.2	8.6	7.9	8.1	7.1	8.4
K (mg/l)	12	3	6	3.8	3	3	5
F (mg/l)	12	0.1	0.2	0.2	0.2	0.1	0.2
Ba (mg/l)	12	0.02	0.04	0.03	0.03	0.02	0.04
B (mg/l)	12	<0.05	0.06	-	-	-	-
Li (mg/l)	12	<0.001	0.001	-	-	-	-
Sr (mg/l)	12	0.2	0.5	0.3	0.3	0.2	0.4
Mn (mg/l)	12	0.001	0.005	0.002	0.002	0.001	0.004
Na (mg/l)	12	16	51	32	32	17	46
Ca (mg/l)	12	18	48	29	27	18	40
Cl (mg/l)	12	12	62	33	32	12	52
TDS@180C (lab) (mg/l)	12	134	354	259	277	143	340
SAR	12	0.75	1.4	1.1	1.2	0.78	1.4
EC@25C (lab) (µS/cm)	11	238	690	448	472	255	612
Mg (mg/l)	12	10	29	18	18	10	26
SO4 (mg/l)	12	14	36	25	26	15	33

Water course: Namoi River
Date range: 17/5/2012 to 9/4/2014

Table 5-9 Baseline water quality data for surface water monitoring location 7538

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Median	Percentile 16%	Percentile 84%
pH (field)	12	7.3	9.3	8	8	7.4	8.6
K (mg/l)	11	2	6	4.2	4	2.9	6
F (mg/l)	10	<0.10	0.3	0.2	0.2	0.1	0.2
Ba (mg/l)	11	0.02	0.05	0.03	0.03	0.02	0.05
B (mg/l)	11	<0.05	<0.05	-	-	-	-
Li (mg/l)	11	<0.001	0.001	-	-	-	-
Sr (mg/l)	11	0.2	0.5	0.3	0.3	0.2	0.5
Mn (mg/l)	11	0.002	0.005	0.003	0.003	0.002	0.005
Na (mg/l)	11	16	52	34	32	22	48
Ca (mg/l)	11	16	49	30	29	17	45
Cl (mg/l)	11	9	69	36	31	12	56
TDS@180C (lab) (mg/l)	11	120	404	268	248	159	375
SAR	11	0.79	1.6	1.2	1.2	0.91	1.4
EC@25C (lab) (µS/cm)	10	249	651	478	506	311	641
Mg (mg/l)	11	8	34	19	19	8.9	28
SO4 (mg/l)	11	2	40	24	28	13	36

Water course: Namoi River
Date range: 24/5/2012 to 9/4/2014

5.2.2 Bohena Creek

Table 5-10 to Table 5-15 are summaries of the baseline data for surface water quality at monitoring stations along Bohena Creek. Statistical measures of the spread and central tendency of the data are calculated for stations with more than two samples; however, these measures may not be statistically significant if the number of samples is small. For large and normally-distributed data populations, the 16th and 84th percentiles represent -1 and +1 standard deviations from the mean, respectively. Approximately 68% of a data population lies within the 16th and 84th percentiles. A sample size greater than or equal to six is needed to identify the 16th and 84th percentiles.

The locations of monitoring stations are shown in Figure 3-6.

Table 5-10 Baseline water quality data for surface water monitoring location 7505

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Median	Percentile 16%	Percentile 84%
pH (field)	2	7	8.1	7.5	ISS	ISS	ISS
K (mg/l)	2	2	5	4	ISS	ISS	ISS
F (mg/l)	2	<0.1	0.1	ISS	ISS	ISS	ISS
Ba (mg/l)	2	0.02	0.07	0.05	ISS	ISS	ISS
B (mg/l)	2	<0.05	<0.05	ISS	ISS	ISS	ISS
Li (mg/l)	2	<0.001	0.001	ISS	ISS	ISS	ISS
Sr (mg/l)	2	0.03	0.3	0.2	ISS	ISS	ISS
Mn (mg/l)	2	0.007	0.07	0.04	ISS	ISS	ISS
Na (mg/l)	2	21	37	29	ISS	ISS	ISS
Ca (mg/l)	2	2	21	12	ISS	ISS	ISS
Cl (mg/l)	2	25	102	63.5	ISS	ISS	ISS
TDS@180C (lab) (mg/l)	2	86	586	336	ISS	ISS	ISS
SAR	2	1.3	2.2	1.8	ISS	ISS	ISS
EC@25C (lab) (µS/cm)	2	147	512	330	ISS	ISS	ISS
Mg (mg/l)	2	3	23	13	ISS	ISS	ISS
SO4 (mg/l)	2	<1.0	10	ISS	ISS	ISS	ISS

Water course: Bohena Creek
Date range: 27/2/2012 to 16/7/2012
ISS – insufficient sample size

Table 5-11 Baseline water quality data for surface water monitoring location 7506

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Median	Percentile 16%	Percentile 84%
pH (field)	8	5.6	7.7	6.8	6.9	5.7	7.5
K (mg/l)	11	1	4	2.3	2	1.9	4
F (mg/l)	11	<0.1	<0.1	-	-	-	-
Ba (mg/l)	11	0.02	0.05	0.03	0.03	0.02	0.04
B (mg/l)	11	<0.05	<0.05	-	-	-	-
Li (mg/l)	11	<0.001	<0.001	-	-	-	-
Sr (mg/l)	11	0.04	0.1	0.08	0.09	0.06	0.1
Mn (mg/l)	11	4	10	6.5	6	4.9	8.2
Na (mg/l)	11	14	19	16	17	14	18
Ca (mg/l)	11	3	7	5.7	6	3.9	7
Cl (mg/l)	11	17	32	26	27	22	30
TDS@180C (lab) (mg/l)	11	87	220	139	126	89.8	194
SAR	11	0.94	1.3	1.1	1.1	1	1.2
EC@25C (lab) (µS/cm)	11	118	212	173	172	145	200
Mg (mg/l)	11	4	10	6.5	6	4.9	8.2
SO4 (mg/l)	10	<1.0	<1.0	-	-	-	-

Water course: Bohena Creek
Date range: 16/4/2012 to 14/3/2013

Table 5-12 Baseline water quality data for surface water monitoring location 7510

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Median	Percentile 16%	Percentile 84%
pH (field)	4	6.3	7.6	7.1	7.2	ISS	ISS
K (mg/l)	8	2	5	3	3	2	4.1
F (mg/l)	8	<0.10	0.1	-	-	-	-
Ba (mg/l)	8	0.03	0.05	0.04	0.04	0.03	0.05
B (mg/l)	8	<0.05	<0.05	-	-	-	-
Li (mg/l)	8	<0.001	<0.001	-	-	-	-
Sr (mg/l)	8	0.05	0.2	0.1	0.1	0.06	0.2
Mn (mg/l)	8	0.02	1	0.2	0.1	0.03	0.7
Na (mg/l)	8	12	28	20	20	14	27
Ca (mg/l)	8	4	14	8	7.5	4.4	13
Cl (mg/l)	8	20	38	29	31	21	37
TDS@180C (lab) (mg/l)	8	132	210	164	152	133	210
SAR	8	1	1.5	1.2	1.1	1	1.4
EC@25C (lab) (µS/cm)	8	117	301	200	206	121	290
Mg (mg/l)	8	4	16	9.6	9	4.4	16
SO4 (mg/l)	8	<1.0	45	-	-	-	-

Water course: Bohena Creek
Date range: 16/4/2012 to 6/5/2013
ISS – insufficient sample size

Table 5-13 Baseline water quality data for surface water monitoring location 7511

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Median	Percentile 16%	Percentile 84%
pH (field)	11	5.7	8	6.8	6.6	6.1	7.6
K (mg/l)	12	3	9	4.6	4	3.1	6
F (mg/l)	12	<0.10	0.1	-	-	-	-
Ba (mg/l)	12	0.03	0.2	0.06	0.05	0.03	0.1
B (mg/l)	12	<0.05	<0.05	-	-	-	-
Li (mg/l)	12	<0.001	0.001	-	-	-	-
Sr (mg/l)	12	0.05	0.2	0.1	0.1	0.07	0.2
Mn (mg/l)	12	0.005	2.3	0.5	0.027	0.006	1.4
Na (mg/l)	12	29	47	39	41	32	45
Ca (mg/l)	12	4	12	8.3	8.5	5.2	11
Cl (mg/l)	12	33	59	49	51	39	57
TDS@180C (lab) (mg/l)	12	178	397	231	215	183	251
SAR	12	1.7	3	2.3	2.2	1.9	2.5
EC@25C (lab) (µS/cm)	11	260	361	311	313	277	344
Mg (mg/l)	12	4	14	9.1	9.5	6.1	11
SO4 (mg/l)	12	< 1.0	< 1.0	-	-	-	-

Water course: Bohena Creek
Date range: 20/3/2012 to 8/4/2014

Table 5-14 Baseline water quality data for surface water monitoring location 7512

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Median	Percentile 16%	Percentile 84%
pH (field)	5	7.1	7.5	7.3	7.3	ISS	ISS
K (mg/l)	5	3	6	4.2	4	ISS	ISS
F (mg/l)	5	<0.10	0.1	-	-	-	-
Ba (mg/l)	5	0.02	0.1	0.07	0.06	ISS	ISS
B (mg/l)	4	<0.05	<0.05	-	-	-	-
Li (mg/l)	4	<0.001	0.001	-	-	-	-
Sr (mg/l)	5	0.06	0.2	0.1	0.1	ISS	ISS
Mn (mg/l)	5	0.004	2.6	0.79	0.5	ISS	ISS
Na (mg/l)	5	28	37	33	34	ISS	ISS
Ca (mg/l)	5	4	11	7.8	8	ISS	ISS
Cl (mg/l)	5	11	56	38	36	ISS	ISS
TDS@180C (lab) (mg/l)	5	170	292	223	219	ISS	ISS
SAR	5	1.7	2.3	2	2	ISS	ISS
EC@25C (lab) (µS/cm)	5	222	362	287	303	ISS	ISS
Mg (mg/l)	5	4	11	8.2	9	ISS	ISS
SO4 (mg/l)	5	<1.0	<1.0	-	-	-	-

Water course: Bohena Creek
Date range: 20/3/2012 to 12/3/2013
ISS – insufficient sample size

Table 5-15 Baseline water quality data for surface water monitoring location 7103

Water Quality Measure	No. of Samples	Min.	Max.	Mean	Median	Percentile 16%	Percentile 84%
pH (field)	2	7	7.3	7.1	ISS	ISS	ISS
K (mg/l)	2	2	2	2	ISS	ISS	ISS
F (mg/l)	2	-	-	-	ISS	ISS	ISS
Ba (mg/l)	2	0.02	0.03	0.03	ISS	ISS	ISS
B (mg/l)	2	0.02	0.03	0.03	ISS	ISS	ISS
Li (mg/l)	2	-	-	-	ISS	ISS	ISS
Sr (mg/l)	2	0.05	0.06	0.06	ISS	ISS	ISS
Mn (mg/l)	2	0.01	0.08	0.05	ISS	ISS	ISS
Na (mg/l)	2	9	10	9.5	ISS	ISS	ISS
Ca (mg/l)	2	4	4	4	ISS	ISS	ISS
Cl (mg/l)	2	16	16	16	ISS	ISS	ISS
TDS@180C (lab) (mg/l)	2	160	202	181	ISS	ISS	ISS
SAR	2	0.7	0.8	0.8	ISS	ISS	ISS
EC@25C (lab) (µS/cm)	1	125	125	ISS	ISS	ISS	ISS
Mg (mg/l)	2	5	5	5	ISS	ISS	ISS
SO4 (mg/l)	2	<1.0	<1.0	-	ISS	ISS	ISS

Water course: Bohena Creek
Date range: 12/3/2013 to 12/3/2013
ISS – insufficient sample size

Appendix A - Disclaimer and Limitations

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If further information becomes available, or additional assumptions need to be made, CDM Smith reserves its right to amend this report.

Appendix B - Santos Data Management Process

Appendix C – Screened Intervals of Bores

Bore	Owner	Unit	Water Source	Screened Interval, m BGL	
				Top	Bottom
DWH8AQGMCF04	Santos	Maules Creek Fm	GOB	Sensor depth	855.4
DWH8AQGPOR03	Santos	Porcupine Fm	GOB	Sensor depth	779.7
BWD6	Santos	Porcupine Fm	GOB	Sensor depth	647.7
GW036546-3	DPI	Black Jack	GOB	87	91
DWH8AQGDGY01	Santos	Digby Fm	GOB	Sensor depth	505.0
TULPRDGY02	Santos	Digby Fm	GOB	214	217
GW036546-1	Santos	Digby Fm	GOB	80	82.5
TULPRNAP01	Santos	Napperby Fm	GOB	124	130
GW036546-2	DPI	Napperby Fm	GOB	27	29
GW036497-1	DPI	Napperby Fm	GOB	18	20
BWD28QGPUR01	Santos	Purlawaugh Fm	GAB	Sensor depth	292.8
DWH14PRPUR03	Santos	Purlawaugh Fm	GAB	263	269
BHN14PRUPS02	Santos	Pilliga Ss	GAB	212	218
BWD26PRLPS02	Santos	Pilliga Ss	GAB	140	146
BWD26PRUPS01	Santos	Pilliga Ss	GAB	95	101
BWD27PRLPS03	Santos	Pilliga Ss	GAB	198	204
BWD27PRUPS02	Santos	Pilliga Ss	GAB	94	100
BWD28QGLPS01	Santos	Pilliga Ss	GAB	Sensor depth	246.8
BWD28QGUPS01	Santos	Pilliga Ss	GAB	Sensor depth	80.9
DWH14PRLPS02	Santos	Pilliga Ss	GAB	213	219
DWH14PRUPS01	Santos	Pilliga Ss	GAB	63	69
DWH3PRLPS02	Santos	Pilliga Ss	GAB	150	156
DWH3PRUPS01	Santos	Pilliga Ss	GAB	77	83
NYOPRUPS02	Santos	Pilliga Ss	GAB	207	213
GW030310-2	DPI	Pilliga Ss	GAB	100.5	106.6
GW030121-3	DPI	Pilliga Ss	GAB	106.7	112.8
GW030400-1	DPI	Pilliga Ss	GAB	60.6	61.8
GW030889-1	DPI	Pilliga Ss	GAB	350.3	370.0
GW098011-1	DPI	Pilliga Ss	GAB	50.0	56.0
GW021266-4	DPI	Orallo Fm	GAB	107.3	113.4
BHN14PRORA01	Santos	Orallo Fm	GAB	109	115
NYOPRORA01	Santos	Orallo Fm	GAB	147	153
GW025343-2	DPI	Mooga Ss	GAB	45.1	50
GW025338-3	DPI	Mooga Ss	GAB	65.5	70.1
GW025340-3	DPI	Mooga Ss	GAB	62.2	65.9
GW021266-3	DPI	Namoi alluvium	ULNA	60	70.1
GW021437-2	DPI	Namoi alluvium	ULNA	47.9	49.4
GW025338-1	DPI	Namoi alluvium	ULNA	25.9	30.5
GW025338-2	DPI	Namoi alluvium	ULNA	46.9	50.6
GW025340-1	DPI	Namoi alluvium	ULNA	25.6	31.7
GW025340-2	DPI	Namoi alluvium	ULNA	35.4	41.5
GW025343-1	DPI	Namoi alluvium	ULNA	35.1	38.1
GW030070-1	DPI	Namoi alluvium	ULNA	12.2	18.3
GW030070-2	DPI	Namoi alluvium	ULNA	38.1	44.2
GW030070-3	DPI	Namoi alluvium	ULNA	57.9	64
GW030310-1	DPI	Namoi alluvium	ULNA	34.1	40.2
GW030117-1	DPI	Namoi alluvium	ULNA	15.2	21.3
GW030117-2	DPI	Namoi alluvium	ULNA	36.6	39.3
GW030278-1	DPI	Namoi alluvium	ULNA	24.7	27.7
GW036005-2	DPI	Namoi alluvium	ULNA	76	78
GW036092-1	DPI	Namoi alluvium	ULNA	19.8	22.8
GW021266-1	DPI	Namoi alluvium	ULNA	21.0	21.9

Bore	Owner	Unit	Water Source	Screened Interval, m BGL	
				Top	Bottom
GW030117-3	DPI	Namoi alluvium	ULNA	57.9	64.0
BHNCKMW1	Santos	BC alluvium	BC	1.8	2.3
BHNCKMW2	Santos	BC alluvium	BC	1.8	2.3
BHNCKMW3	Santos	BC alluvium	BC	1.5	2.0
BHNCKMW4	Santos	BC alluvium	BC	1.5	1.7